

# Odonatological Abstract Service

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## 1997

**26004** Wendler, A.; Nüss, J.-H. (1997): Libellules. Guide d'identification des libellules de France, d'Europe septentrionale et centrale par Arne Wendler et Johann-Hendrik Nüss. Traduction et adaptation française: Harald Heidemann et Jean-Louis Dommanget. Société Française d'Odonatologie: 139 pp. (in French) [Translation of an identification key adopted from a German book.] Address: <https://insectes.org/wp-content/uploads/2026/04/Wendler-Nuss-1997-Libellules-Fr-cc-Opie-odonates.pdf>

## 1999

**26005** Monnerat, C. (1999): Premières données de Gomphus vulgatissimus L. et Ophiogomphus cecilia (Fourcroy) (Odonata, Anisoptera) pour les cantons du Jura et de Bâle-Campagne et statut régional des autres espèces de Gomphidae. Bulletin Romand d'Entomologie 17: 21-38. (in French, with English summary) ["The first records of G. vulgatissimus and O. cecilia for the cantons of Jura and Basel-Land (Bâle Campagne) are reported and the status of other species of Gomphidae is discussed in regard of the new occurrences recorded between 1993 and 1998. The ecology of Gomphus pulchellus in the area is also described." (Author)] Address: Monnerat, C., Info fauna, Bellevaux 51, 2000 Neuchâtel, Switzerland. E-mail: christian.monnerat@unine.ch

## 2005

**26006** Donath, H. (2005): 3.1.4. Libellen. Naturkundlicher Jahresbericht 2005 – Naturpark Niederlausitzer Landrücken: 13-14. (in German) ["In 2005, 49 dragonfly species were recorded in the National Park. Categorizing the missing species into ecological groups within the table highlights specific deficiencies in the conservation status of the waters where these insects breed. Species associated with flowing waters are particularly affected; in addition to persistent structural deficits—such as straightening, channel deepening, and homogenization caused by ongoing maintenance—factors resulting from mining activities, specifically acidification, iron hydroxide deposits, and frequent drying out, play a significant role. Planned restoration measures for the Schrage-Dobra and Wudritz watercourses offer some grounds for hope in this regard. Furthermore, the work already initiated on the Schuge stream must be consistently continued. Dragonflies associated with peat bogs represent the group most severely impacted. For the first time, no records were obtained for Leucorrhinia rubicunda or Aeshna isoeles within the National Park. The situation regarding the few remaining bog waters remains critical. Unfortunately, the Gustenteich project has also not yet been implemented as planned, as

the forest owner rejected the proposed re-wetting measures." (Author/Google translate)] Address: Donath, H., Caule Nr. 1, 15926 Zieckau, Germany

## 2008

**26007** Dana, D. (2008): Red-veined darter, first confirmed breeding on the Isle of Wight. Proc. Isle Wight nat. Hist. archaeol. Soc. 23: 73-75. (in English) ["On the Isle of Wight the species has been recorded every year (except 2001) since 2000 (Cheverton 2001-7). In 2007 five adults were recorded at Leycroft Farm reservoir on 13th June. How long they had been there is not known. On 8th September a teneral (recently emerged) male was seen entangled in an apparently disused spider's web on the bank of the reservoir. The specimen was sent to Adrian Parr, Migrant Dragonfly Recorder for the British Dragonfly Society, who confirmed the identification. A teneral dragonfly present at or near the water's edge is normally accepted as sufficient evidence to confirm successful breeding." (Author)] Address: Dana, D., 38 Yarborough Road, Wroxall, Ventnor, Isle of Wight PO38 3EA, UK

## 2009

**26008** Varanguin, N.; Ruffoni, A. (2009): Ophiogomphus cecilia et Gomphus flavipes, deux espèces d'odonates bourguignons protégés: état des lieux et perspectives en Bourgogne. Rev. sci. Bourgogne-Nature 9/10: 118. (in French) [Verbatim/Google translate: "The Burgundy region is home to seven species of Gomphidae, two of which are protected in France: G. flavipes listed in Annex IV of the European Habitats Directive, and O. cecilia listed in Annexes II and IV of the same directive. The larvae of both species live in large rivers and streams with predominantly sandy bottoms. \*O. cecilia\* is also sometimes found in smaller watercourses. These are indicators of healthy habitats. These two species, which have separate distribution ranges, are very localized in France. Their main populations are found in the middle and lower reaches of the Loire and Allier rivers. Naturalist surveys conducted in the twentieth century revealed their presence in Burgundy on these two waterways, as well as in the upper Yonne valley in the Morvan region. To better understand the distribution of these two anisopterans in Burgundy and to gather essential knowledge for their inclusion in nature conservation, systematic surveys were carried out between 2003 and 2005. Some of the main waterways where their presence was highly suspected were sampled, such as the Loire, the Allier, the Arroux, the Cousin, and the Doubs. The new data collected now complement the ZNIEFF or NATURA 2000 inventories, and also outline avenues for research and monitoring for the coming years, particularly on the more precise identification of development environments,

on improving knowledge of the Morvan populations, or of the Doubs valley, which were thought to have disappeared." Sampling points and number of *G. flavipes exuviae* collected during the 2003-2005 inventory are documented.] Address: Varanguin, N., Société d'histoire naturelle d'Autun – Maison du Parc – 58230 Saint-Brissson, France

## 2011

**26009** Donath, H. (2011): 3.1.2. Libellen. Naturkundlicher Jahresbericht 2011 – Naturpark Niederlausitzer Landrücken: 16-20. (in German) ["Of the 60 species recorded in the nature park, 56 were or are autochthonous. Of these, only 49 species were detected in 2011. Records of *Gomphus vulgatissimus* raise hopes for recolonization of the area. While sightings of *Leucorrhinia rubicunda* failed to occur for the second consecutive year, *Sympetrum flaveolum* also went undetected for the first time. Among the four species previously recorded only as visitors—including those that breed in the area—*Libellula fulva* and *Sympetrum fonscolombii* were once again confirmed." (Author/Google translate) [https://www.niederlausitzer-landruecken-naturpark.de/fileadmin/user\\_upload/PDF/-Niederlau-Landruecken/Naturk\\_Jahresberichte/Naturk\\_Jahresbericht\\_2011.pdf](https://www.niederlausitzer-landruecken-naturpark.de/fileadmin/user_upload/PDF/-Niederlau-Landruecken/Naturk_Jahresberichte/Naturk_Jahresbericht_2011.pdf)] Address: Donath, H., Caule Nr. 1, D-15926 Zieckau, Germany

## 2012

**26010** Kapusinski, D.J. (2012): Factors affecting invertebrate and fish communities in coastal wetlands of the Great Lakes. Ph.D. thesis, Department of Biological Sciences, College of Arts and Sciences, Kent State University: 223 pp. (in English) [Ohio, USA "I sampled benthic invertebrate [including *Argia*, *Nehalennia*, and *Erythemis*] and fish in a Lake Erie open coastal wetland and five nearby impounded wetlands. Five sampling sites were selected in the open coastal marsh, and one site was chosen in each of the five impounded wetlands. In June, July and August 2006, benthic invertebrates were sampled with an Ekman dredge in shallow depths (<18 cm), medium depths (18 – 34 cm) and deep depths (>34 cm), and fish were sampled nearby with fyke nets. I collected 26 fish species that are common in Lake Erie marshes including bluegill, gizzard shad, emerald shiner, yellow perch and bullhead. Fish were significantly larger in open coastal wetlands in June. However, I did not detect any other differences in fish community structure between the wetland types. The invertebrate community was dominated by Amphipoda, Chironomidae, Ceratopogonidae, Cladocera, Copepoda, Ostracoda, Nematoda, and Oligochaeta. Total numbers and densities of cladocerans, ostracods, nematodes and oligochaetes were higher in the open coastal marsh, but ceratopogonids and copepods were more abundant in impounded." (Author)] Address: [https://etd.ohiolink.edu/acprod/odb\\_etd/etd/r/1501/10?clear=10&p10\\_accesion\\_num=kent1353202400](https://etd.ohiolink.edu/acprod/odb_etd/etd/r/1501/10?clear=10&p10_accesion_num=kent1353202400)

## 2013

**26011** Van Duinen, G.A. (2013): Rehabilitation of aquatic invertebrate communities in raised bog landscapes. PhD thesis, Radboud University Nijmegen: 184 pp. (in English, with Dutch summary) ["Peatlands are considered as one of the most important natural ecosystems of the world, because of their characteristic biodiversity and highly valued ecosystem services. However, the degradation of peatlands is ongoing due to cultivation, drainage, afforestation, peat extraction, increased atmospheric deposition of nitrogen and sulphur, and climate change. Restoration measures are carried out in raised bog remnants abandoned after peat extraction or

forestry. These measures include rainwater retention, aiming at regenerating a self-sustaining bog ecosystem or maintaining viable populations of characteristic species. An introduction to characteristics of raised bog landscapes and the causes of degradation is presented in Chapter 1. An essential feature of active raised bogs is the accumulation and storage of peat. Hydrology and Sphagnum mosses play a key role in this feature. The composition of bog landscapes at different spatial scales is important for faunal diversity characteristic of raised bogs. Complete bog landscapes are characterised by both an ombrotrophic bog massif that is acid and extremely nutrient limited, as well as gradients from the bog massif to the more minerotrophic surroundings, where these harsh conditions are gradually attenuated. The presence of these gradients particularly contribute to a high faunal diversity of the bog landscape. Many investigations on raised bog degradation and restoration focus on bog vegetation and key factors involved in its recovery. The impact of both degradation and restoration measures on invertebrate fauna remained largely unknown. The aim of this thesis is to assess the effectiveness of restoration measures and the key factors involved in the degradation and rehabilitation of aquatic invertebrate communities in raised bog landscapes in order to improve restoration management practices. To assess whether raised bog restoration measures contribute to the conservation and restoration of the fauna diversity, aquatic macroinvertebrate species assemblages were studied in Dutch raised bog remnants. The fauna diversity was compared between A) water bodies created by rewetting measures and B) water bodies which have not been subject to restoration measures, but are remnants of peat cutting pits and trenches that remained after 'traditional' exploitation of raised bogs (Chapter 2). The restoration sites are inhabited by characteristic raised bog species and rare species, but their numbers are higher at the remnant sites not affected by restoration management. Forty percent of the characteristic and rare fauna species are only found at the remnant sites. The remnant sites show much more variation in macroinvertebrate species assemblages and a higher cumulative species richness. The number of characteristic macroinvertebrate species is not clearly related to the presence of a characteristic raised bog vegetation. In restoration sites, the numbers of rare and characteristic species per site tend to increase with the time elapsed after rewetting, indicating a colonisation process. However, restoration measures will not automatically result in recovery of a more or less complete macroinvertebrate species spectrum. The restoration measures have so far resulted in habitats for only two third of the characteristic species. Different species or species groups may respond differently to restoration measures. Contrary to most aquatic macroinvertebrates, microinvertebrates, such as Rotifera and small crustaceans (Copepoda and Cladocera), are easily spread by wind and animal vectors and have a short life cycle that can be completed in one water body. Chapter 3 evaluates effects of restoration measures in raised bog remnants on the species composition of Rotifera and microcrustaceans. The species assemblages, total numbers of species and numbers of characteristic raised bog species do not differ between the restoration and remnant sites. Environmental variables related to vegetation microinvertebrate assemblages. Furthermore, the species assemblages of water bodies situated in the same area are on average more similar to each other than to assemblages from other areas. These differences between areas may be due to differences in environmental conditions of water bodies and local differences in the sequence and timing of colonisation by which niches were already occupied (priority effects). Species already abundant in a bog remnant may be among the first to colonise new water bodies and to successfully establish a population.

Species arriving later may generally have a lower chance to establish a population, as interactions with resident species may prevent them from increasing numbers. In contrast to findings on aquatic macroinvertebrates, populations of microinvertebrate species, including characteristic species, can either persist in the raised bog remnants during the process of rewetting or (re)establish within a period of time less than five years. Raised bog landscapes are degraded by reclamation, causing loss of natural gradients between ombrotrophic bog massifs and the surrounding minerotrophic landscape. In addition, bogs are vulnerable to nutrient enrichment. To restore degraded bogs rainwater is retained, aiming at recovery of a Sphagnum-dominated vegetation. Two complementary hypotheses are tested by comparison of aquatic macroinvertebrate assemblages between pristine reference systems in Estonia and degraded bog remnants in The Netherlands (Chapter 4). The latter have a 4-6 fold increase of N and P compounds in surface water. The first hypothesis is that increased nutrient availability enables invertebrate species naturally absent from extremely nutrient limited bog massifs to become abundant in nutrient enriched bog remnants. The second hypothesis is that invertebrate assemblages characteristic of gradients from ombrotrophic bogs to minerotrophic surroundings hardly profit from the restoration practice focusing on ombrotrophic conditions solely. The aquatic macroinvertebrate abundance is higher in bog remnants in The Netherlands than in ombrotrophic water bodies and in transitional mires in Estonia. This difference in abundance is indeed primarily due to species that are absent from Estonian bogs and species preferring transitional mires. In water bodies created by rewetting measures the abundance of species preferring nutrient poor ombrotrophic pools is increased compared to water bodies remaining after historical use of bogs, like peat cutting pits. However, the cumulative species richness of species preferring nutrient poor ombrotrophic pools is not increased. The cumulative species richness and abundance of species preferring more minerotrophic parts of bog gradients are decreased compared to the remnant sites. In contrast to restoration sites, the group of remnant sites includes the whole gradient from acid water bodies in bog massifs to the lagg of complete raised bog landscapes. Further insight in how loss of groundwater influence and increase in nutrient availability affect the species occurrence has been obtained by comparing studying aquatic oligochaete species composition within and between pristine raised bogs in Estonia and raised bog remnants in The Netherlands (Chapter 5). Within the pristine bog landscape a distinct pattern in the species assemblage is present. In the most nutrient-poor water bodies in the ombrotrophic raised bog, only one oligochaete species was present. This is an acid-tolerant species that almost never matures and reproduces by fragmentation. In Estonia, other oligochaete species are limited to more minerotrophic water bodies, which have a higher decomposition rate of dead organic matter and, consequently, higher nutrient availability. Comparison of the occurrence of three oligochaete species between Estonian and Dutch sites indicate that these three species respond differently to the increased nutrient availability in The Netherlands, which can be linked to differences in their diets. In The Netherlands, the occurrence of oligochaetes appeared to be not limited anymore by nutrient availability. The lagg zone is the most species-rich part of a pristine bog landscape. Most of these lagg zone species are not present in Dutch bog remnants as this part of the bog landscape has long been cultivated. Overall, it is concluded that the degradation of Dutch raised bogs has resulted in the loss of both the nutrient-poor parts of the landscape and the special lagg conditions, clearly reflected by oligochaete occurrence. Raised bog pools are naturally extremely nutrient poor and rich in humic substances, limiting primary production. To assess the

base of the invertebrate food web in bog pools stable isotopic values of primary producers, dead organic matter, and invertebrates, as well as the composition and stable carbon isotope ratio of phospholipid fatty acids (PLFAs) were measured in pristine bog pools in Estonia (Chapter 6). The stable isotopic values show the presence of multiple trophic levels and a differential use of basal food sources by the invertebrates, both between different species and within species, among different individuals and size classes. Carnivorous and omnivorous invertebrates assimilate polyunsaturated fatty acids (PUFAs) derived from algae, and possibly macrophytes, as well as fatty acids that are specific for methane oxidizing bacteria (MOB). A considerable part of the bacterial biomass conveyed to higher trophic levels in the bog pools likely originates from MOB. Protozoa and zooplankton synthesizing PUFAs commonly used as biomarkers for algae may play a role in this pathway. Pelagic zooplankton seems to rely more on bacteria, whereas for insects algae (periphyton and possibly phytoplankton) are more important. The relatively depleted  $\delta^{13}\text{C}$  values of PUFAs in invertebrates point to the use of algae that possibly derived carbon from MOB. Therefore, depleted  $\delta^{13}\text{C}$  values of invertebrates do not necessarily implicate a direct pathway between MOB and these invertebrates, but algal food sources forming an intermediate level. Stable isotopic values measured in potential basal carbon sources and aquatic invertebrates in Dutch bogs indicate that increasing nutrient availability results in shifts in the use of basal carbon sources. Other types of algae and dead organic matter may support an increasing proportion of the invertebrate community, whereas the role of methane and methanotrophic bacteria at the basis of the food web may decrease. The effectiveness of restoration measures and the key factors involved in the degradation and rehabilitation of aquatic invertebrate communities in raised bog landscapes are discussed in the synthesis (Chapter 7). This chapter concludes with recommendations for restoration management and further research: - Measures to further reduce atmospheric nitrogen deposition and to reduce the elevated phosphate concentration in Dutch bog remnants are required to allow for further rehabilitation of aquatic macroinvertebrate communities of raised bog landscapes. - Restoration of gradients from groundwater influenced to acid parts of raised bog landscapes. Opportunities may be found in buffer zones on former agricultural grounds adjacent to current bog remnants, as well as in fen reserves that include patches in succession to bog. - Conservation of relict populations of characteristic species of raised bog landscapes currently present in bog remnants, as well as fen reserves and moorland pools. - Further research focussing on mechanisms that cause the species responses observed in this study, as well as an evaluation of the effects of implementation of the recommendations for the management practice given in this thesis." (Author) The study includes references to Odonata,]Address: <https://repositorio.ubn.ru.nl/bitstream/handle/2066/107698/107698.pdf>

## 2014

**26012** Castagnet, J.-B.; Chazalmartin, S.; Christophe, F.; Merly, S. (2014): Cartographie des sites d'émergence de la Cordulie splendide *Macromia splendens* (Pictet, 1843) et de la Cordulie à corps fin *Oxygastra curtisii* (Dale, 1834) dans les Gorges du Tarn (Lozère-48): répartition, biologie et écologie. l'Association Lozérienne pour l'Etude et la Protection de l'Environnement: 68 pp. (in French) ["Conclusions and perspectives: For the first time in 2014, a survey of the entire length of the Tarn River in Lozère, from the Tarn/Tarnon confluence to Le Rozier, allowed for a more precise determination of the distribution of two heritage- and threatened dragonfly

species: *M. splendens* and *O. curtisii*. Detailed surveys conducted at emergence sites also clarified the preferred macro- and micro-habitats of both species, providing precise and unprecedented information on their ecology. This information is particularly valuable for *Macromia splendens*, as it is found in a specific environment (karst habitat in the peri-Mediterranean zone), at the geographical and altitudinal limits of its distribution range. The quantitative data obtained, in addition to allowing an estimation of the relative abundance of the two species, constitute a baseline for future monitoring. These findings allow us to consider *M. splendens* as a rare and potentially threatened species in the Lozère region of the Tarn River, and *O. curtisii* as a more abundant and widespread species in the study area, seemingly less ecologically constrained than the former. The main threat identified in the study area is hypothetical but serious, linked to the presence of the signal crayfish (*Pacifastacus leniusculus*). This introduced and invasive species, of American origin, is suspected of having a very negative impact on Odonata, and could explain the decline in odonate populations and the disappearance of *M. splendens* from certain historical sites in the Tarn River in the Midi-Pyrénées region. Following the presentation of the study results and discussions with D. MEYRUEIS (river technician for the Grand Site Syndicate of the Tarn, Jonte, and Causses Gorges), no specific habitat management interventions appear necessary to benefit the two Odonata, other than continuing to preserve and maintain the significant length of riparian vegetation and preserving the current state of the streambed, which has been significantly altered in its upstream section by past aggregate extraction. These two imperatives are already part of the priority missions of the inter-municipal cooperation structure responsible for managing the waterway. Based on the current state of investigations and available data, the following research avenues appear most important for improving our knowledge of the two species: - clarifying the emergence phenology of the larvae, in order to standardize the dates and protocols of future surveys and optimize the results of field investigations. Collecting all exuviae of both species at regular intervals from a sample of larval habitats would allow us to determine the date when 50% of emergences are found (EM50) and the date when 90% of emergences are produced (EM90). Monitoring the populations of both species, primarily *M. splendens*, which appears to be the most threatened species in the study area, is also crucial. Given the interannual and natural fluctuations in odonate populations, monitoring larval sites for one or three consecutive years seems necessary. The interval between two multi-year monitoring periods remains to be determined. The water temperature requirements of these species need to be clarified, as this appears to be a key factor influencing their distribution and could explain their absence in many areas and habitats considered a priori very favorable. The population trends of the Signal Crayfish (distribution and numbers) should be monitored to detect any correlation between the densities and biomass of this crustacean and the population trends of dragonflies in general, and the two emerald dragonflies in particular. The dispersal capacity of adult crayfish (for example, through capture-mark-recapture) should be studied. This demographic data is particularly important for an isolated population at the edge of its range, such as that of *Macromia splendens* in the Tarn Gorges, within a population fragmented by the heterogeneity of the environment, especially flow patterns and hydrological conditions (disrupted by numerous springs influencing water temperature). Finally, it should be noted that *M. splendens* and *O. curtisii* are two species present or potentially present in other watercourses in Lozère: - in the Lot River, in the Adour-Garonne watershed (but whose altitude in Lozère is greater than or equal to 500 m); - in the Gardon rivers

of the Cévennes region in the Rhône-Mediterranean basin (Gardon d'Alès, Luech, Galeizon, Cèze, Chassezac, etc.), in ecological conditions that are a priori more favorable due to more pronounced Mediterranean influences and at lower altitudes than those of the Tarn River in Lozère, at least with regard to slow-moving facies. The distribution and population sizes of both species should also be assessed in these areas of presence." (Authors/Google translate)] Address: [https://libellules.pnaopie.fr/wp-content/uploads/2024/09/ALEPE\\_2-015\\_Cartographie\\_Macromia\\_splendens\\_et\\_Oxygastra\\_curtisii\\_dans\\_les\\_Gorges\\_du\\_Tarn.pdf](https://libellules.pnaopie.fr/wp-content/uploads/2024/09/ALEPE_2-015_Cartographie_Macromia_splendens_et_Oxygastra_curtisii_dans_les_Gorges_du_Tarn.pdf)

## 2015

**26013** Hutchinson, R.; Ménard, B. (2015): À la recherche de la naïade (larve) de *Gomphus borealis* (Needham, 1901) (Odonata: Gomphidae). *Nouv'Ailes* 25(2): 17-18. (in French) ["Identifying the species-specific larval form in the insect world often relies on observing and recognizing subtle, variable, and sometimes unstable morphological characteristics. Furthermore, a lack of knowledge about habitats and microhabitats can make the task even more challenging. It is known that in many insect species, the specific identity of the larval, pupal, and pupal stages remains impossible to establish without rearing the insect from egg to adult. Moreover, almost all Odonata naiad species in Quebec have now been described. It remains to discover and illustrate the characteristics that allow for the precise identification of each naiad within Quebec's dragonfly and damselfly fauna. Initially, we present a brief overview of the data and descriptions of the species in its larval stage gleaned from the odonatological literature since the first identification of the *Gomphus borealis* naiad. We then present data concerning the larval specimens of this gomphid species in our collections. The history of the *Gomphus borealis* naiad, as described by Walker (1958), illustrates the difficulties in establishing the identity of *G. borealis* naiads. He writes that Cornell University, at his request, sent two mature larvae and four exuviae labeled *G. borealis*. The specimens came from the type locality (of the original adult description), namely Saranac Inn, NY. According to Walker (1958), it appeared that one of the two larvae was a *Gomphus descriptus*. Furthermore, he stated that he was unable to distinguish or separate these larvae from those of *G. spicatus*. In his original description of the species, Needham (1901) even went so far as to confuse the *borealis* and *spicatus* larvae. Needham and Harwood's 1929 work on North American dragonflies perpetuates the confusion between the two species. However, Adrien Robert of the University of Montreal found *G. borealis* emerging in 1953 in Mont-Tremblant Park (Robert 1954) and sent numerous exuviae to Walker. Walker noted that it was very difficult to distinguish *borealis* from *spicatus*. It can be noted that *G. borealis* and *G. spicatus* possess lateral spines on abdominal segments 7 to 9, the ninth of *borealis* being shorter than that of *spicatus*. Among the characteristics to observe, the following should be noted: the lateral spines of the ninth abdominal segment are shorter in *borealis*. The seventh abdominal segment is wider than it is long compared to that of *spicatus*. The naiads of *borealis* are slightly shorter, from head to abdomen. Their bodies are slightly more depressed and their abdomens slightly wider. Furthermore, the ligule is somewhat more convex in *\*Borealis\**. Finally, it is noted that the wing sheaths reach the tip of the third abdominal segment in late-stage individuals (Walker, 1958), which is the norm in *\*Gomphus gomphus\** (sensu stricto) (five species in Quebec), at the very least. Moreover, lateral spines 7 to 9 of *G. borealis* are generally smaller than those of *G. spicatus*. We are attempting to identify other morphological characteristics, but this remains a difficult task at present.

We hope to resolve the difficulties, but in the meantime, we present a photograph of a naiad of the three species: *G. borealis*, *G. spicatus* (two species with seven to nine lateral spines), and *G. descriptus* (with six to nine lateral spines). Literature data: Needham & Westfall (2000) report that *G. borealis* is found in four Canadian provinces, from Ontario to New Brunswick, and in ten American states, primarily in northeastern North America. Pilon and Lagacé (1998) and Savard (2011) report two records in the boreal zone, notably in the Saguenay region. Pilon & Lagacé report the presence of the species in just over 15 locations in the cold temperate zone, concentrated in southwestern Quebec. Donnelly (1995) reports observations and captures of numerous individuals in fields along the road leading to Mont Sainte-Marie. Some of the larvae in our collection come from sites not too far from these fields (see Ménard, 1996)." (Verbatim/Google translate)] Address: Ménard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

**26014** Hutchinson, R.; Ménard, B. (2015): Recherche d'espèces de libellules de grandes rivières difficiles à trouver, notamment au stade adulte. *Nouv'Ailes* 25(2): 14-15. (in French) ["Adult dragonfly species, particularly those found in large rivers, remain very difficult to observe and especially to capture. The reasons for this can be varied. For example, they spend long periods in the tops of riverside trees and are present above the river at times of day that have not yet been precisely determined. Odonatologists rarely observe adults of these species on the banks at eye level. Furthermore, males of some species patrol the middle of the river, an area often inaccessible to most of us. In these locations, they seek out females for mating. Capturing them from a boat in the middle of a large waterway remains difficult and risky. It is also important to remember that large rivers are often heavily polluted and altered by dams in many countries, which can lead to a significant decline, or even the loss, of these dragonfly species' populations. Finally, these dragonflies can fly around and over many private properties along the riverbanks, areas difficult for the modern-day collector of adult dragonflies to access. There is a way to check if these species are still present in our major rivers. This involves finding the remains or exuviae of these dragonflies on the banks of these large waterways. The adult individuals emerge from these exuviae. The new adult does not damage the exuviae in any way, so it can be identified as a final instar larva, easier to identify than young, immature larvae. The undersides of bridges are ideal for spotting this valuable find. However, in the Outaouais region, over many years, BM and RH have found hundreds of exuviae of these species on stone walls and rocks along the shoreline. They scrutinized the stones along the riverbank, the muddy or dry ground, the crevices in the stones, the debris that accumulates at the water's edge, and the stems of standing aquatic plants. Yet, we rarely capture breeding adults in these same environments. It is important to note that our collections are spread over many years, during only a few hours in the dragonfly flight season, and that we continue this activity. Furthermore, Perron and Ruel (2002) also collected thousands of large-stream dragonfly exuviae on the banks of the St. Lawrence River at Saint-Augustin-de-Desmaures, near Quebec City, over three seasons. These were systematic collections. The most fascinating aspect of this research is that these exuviae are subject to the action of the river's tides in this location near Quebec City. Of the exuviae collected, 2,245 belonged to the species *Stylurus notatus* and 5,234 to *Ophiogomphus colubrinus*. The latter species is almost entirely absent from our collections in the Outaouais region. In contrast, our collections of *Ophiogomphus anomalus* number in the hundreds in the Petite-Nation River. For six other gomphid

species, the number of exuviae collected was more modest in the St. Lawrence River near Quebec City. Following these searches in the Outaouais and Saint-Augustin-de-Desmaures regions, it would be worthwhile to investigate whether the Rivière des Prairies and the Rivière des Mille Îles, in the Montreal and Laval area, still harbor these species, whose adults are so elusive and difficult to spot. It is likely that they do. These rivers, between the Outaouais region and Quebec City, are potential sites. Naturalists and entomologists need to verify this hypothesis. The presence and existence of these species are invaluable assets for the natural environment, and understanding them would allow us to find other ways to preserve the living ecosystem of these two rivers, a precious heritage for the Montreal and Laval regions. It is crucial to remember that the larvae and adults of these dragonfly species are part of the diet of fish, birds, and other organisms in large waterways. Indeed, over a period of about ten years, up until 2001, my partner, Benoît Ménard, and I collected numerous specimens of 39 species of Odonata by collecting larvae and exuviae. These were collected sporadically, meaning each outing was relatively short and not very intensive. We can add at least four new species: *Celithemis eponina*, *Perithemis tenera*, and *Pachydiplax longipennis* and *Enallagma civile* (recently found by Caroline Piché). This brings our total to 43 of the 146 odonate species recorded in Quebec to date. Of these numbers, only about six or seven species are primarily associated with large rivers, including those reported in this article, with the exception of *Neurocordulia yamaskanensis*. Such results open new perspectives for those wishing to explore rivers like the Rivière des Prairies and the Rivière des Mille Îles in the Montreal and Laval region. Collection of exuviae for preservation: Exuviae can be placed in dry containers, such as vials, pots, or jars, without preservatives. However, they are easily broken and damaged, as they become friable and brittle when dry. They must be handled with care. RH preserves them in 70% alcohol to prevent them from becoming brittle. It is best to put only a few in each container. Most importantly, each vial must have a label with the following information: the country, or province, the locality or site, the mention of the habitat, the date of collection, and the name of the collector, otherwise the specimen(s) have no scientific value." (Verbatim/Google translate)] Address: Ménard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

**26015** Hutchinson, R.; Ménard, B. (2015): La minuscule *Nannothemis bella* (Uhler) (Odonata: Libellulidae). Nouvelles récoltes de larves rarement trouvées. *Nouv'Ailes* 25(2): 10-11. (in French) ["It is almost certain that collections of larvae (naiads) and exuviae of *N. bella* are very rare occurrences, probably throughout North America, due to the minuscule size of this aquatic organism and the extreme difficulty in spotting individuals in their microhabitat. Furthermore, the fact that few people identify the larval forms of dragonflies and damselflies to the species could be a second reason for this scarcity. In this context, our enthusiasm was at its peak when we were able to collect a dozen of these larvae (mostly by BM) in a fen (minerotrophic bog) located north of Sainte-Cécile-de-Masham, very close to Lake Jean-Venne, in the Outaouais region of Quebec. This was on the afternoon of May 17, 2015. This is the site where we found these naiads some twenty years ago or more. First, we detail the circumstances of these 2015 finds and the technique used, which was innovative for us. Second, we review some data from the literature on collecting these very small larvae, and finally, we present perspectives that could lead to more frequent discoveries of this tiny species in its larval stage. The fen we have been surveying for many years presents a highly diverse landscape,

depending on the naturalist's location. Following our intuition, we needed to focus our attention on the tiny pools containing very little water and a great deal of standing or attached (sphagnum moss) or suspended (decomposing or not) plant matter; these are located near the large body of water in the biotope. While collecting suspended matter with our nets, designed by BM, very small, slightly greenish larvae, lying ventrally, caught our eye, despite their near-total immobility within the collected vegetation. Our search resulted in the collection of twelve naiads in a short period of time, an hour or less. Our only other collection of *N. bella* larvae dates back to May 14, 1988, 27 years ago, in the same location within the fen. However, the collection method was very different. "We had to grasp piles of vegetation from the pool and carefully examine each stem, twig, branch, and twig" (Hutchinson, 1990). We had concentrated our efforts in a single pool. Ménard (1996) reports collecting exuviae from June 17 to 19, 1988, at the same site. Finally, in June 1995, we were able to visit Lake Gingras, another peatland site located one or two kilometers from Lake Jean-Venne, which allowed us to collect *Nannothermis* exuviae. Both of these sites are located north of Sainte-Cécile-de-Masham, in the Gatineau census division, Masham Township, in the Outaouais region of Quebec. Walker & Corbet (1975) do not specifically mention fishing or observations of *Nannothermis* larvae or naiads, but rather observations of female egg-laying in temporary waters one to two inches deep, data recorded in Needham (1901). Walker & Corbet (1975) describe the larva in detail. Furthermore, Needham et al. (2000, 2014, revised edition) cite the efforts of Weith & Needham (1901), who, after many attempts, succeeded in discovering and locating the larval microhabitat. They had initially explored numerous aquatic and wetland environments, often large ones, only to realize that these naiads must be sought in peaty microhabitats easily overlooked by dragonflies and damselflies. In short, anyone wishing to fish for naiads and exuviae of *N. bella* must concentrate their efforts in small pools often containing little water, in peaty environments, until proven otherwise." (Verbatim/Google translate)] Address: Ménard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

**26016** McNab, A. (2015): Dynamics of the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) in isolated patches of lowland rainforest. MSc thesis, James Cook University. <https://doi.org/10.25903/pn47-dd72>: 77 pp. (in English) ["Over the past 20 years, amphibian declines caused by *Batrachochytrium dendrobatidis* (Bd) have prompted a significant amount of research into the amphibian-chytrid host-parasite relationship. The complexities of the relationship have limited our ability to understand the pathogen, particularly as differences are observed in the impacts of Bd among different amphibian species, and the variation in the impact of the pathogen along an elevation gradient. The significant declines of amphibians at high elevations (400+ m asl) in the Wet Tropics bioregion of north eastern Australia has focused research on endemic species, and the environmental conditions they experience. There is, however, little research on tropical lowland areas. Within tropical lowlands rainforest of the Wet Tropics bioregion, Bd-susceptible amphibians continue to thrive, and although Bd is present in the tropical lowlands, it has not been as devastating to amphibian populations. Much of the lowland tropical rainforest of the Wet Tropics is contiguous with higher elevation areas, providing the potential for Bd at higher elevations to influence lowland populations as infected hosts and Bd zoospores move downstream. However, not all areas of lowland rainforest are contiguous with the uplands. There are isolated rainforest patches, with no connection to high-elevation streams, where Bd is present and experiences a

different set of environmental conditions to much of the rest of the Wet Tropics. It is within these lowland areas, which are not contiguous with highland rainforest streams, that I conducted my research. The aims of my study were to investigate the ecology of the common mist frog (*Litoria rheocola*), and determine the influence of Bd in this system. This was done by a) investigating seasonal variation in the behaviour of uninfected *L. rheocola*, b) examining behavioural differences between Bd infected and uninfected *L. rheocola*, and c) investigating the potential reservoir hosts of the amphibian chytrid fungus Bd of various amphibian and non-amphibian species. The common mist frog, *L. rheocola*, has similar ecological requirements to Bd; both share the need of moisture and relatively cool conditions. I examined seasonal changes in the thermal microenvironment, behaviour, movement, microhabitat selection and body temperatures of uninfected *L. rheocola*, using harmonic radar tracking. Warm environmental temperatures in my study area limit the suitability of the tropical lowlands for Bd to winter. Movements and microhabitat use of *L. rheocola* were similar year-round. My results suggested that increases in body temperatures due to seasonal increases in environmental temperatures may protect lowland populations from decline due to Bd. During the winter, a large proportion of *L. rheocola* in my study area became infected. Comparing the behaviours of infected and uninfected individuals in winter suggested that uninfected individuals maintained higher body temperatures, perched further from the stream, and used microhabitats that minimized the probability of becoming infected. The behaviour of individuals during periods of high infection risk can reduce their probability of infection. In my study areas, prevalence of Bd dropped to zero in *L. rheocola* in the summer. The range of amphibians that naturally become infected by Bd is large, but Bd has not been recorded in all amphibians, including species common within the distributional range of Bd. By swabbing all the frogs in my study area, I detected Bd in northern dwarf treefrogs (*Litoria bicolor*) and Australian wood frogs (*Hylarana daemeli*), in which Bd had not previously been detected. I also detected Bd on a range of stream-associated invertebrates. If Bd can persist on flying invertebrates, it provides a potential method for the spread and dispersal of Bd, an aspect of the pathogen's ecology that remains unknown. Stream-associated invertebrates provide a potential vector that could have aided in the spread of Bd within and between regions and countries. The tropical lowlands of the Wet Tropics provide a refuge for many species of Bd-susceptible amphibians. Their persistence may permit the evolution of increased immunity, allowing recolonisation of upland areas. My study of lowland populations has provided an increased understanding of the dynamics allowing persistence of these frogs." (Author) "Non-aquatic invertebrates with high water contact, e.g., adult dragonflies [Gomphidae, Telephlebiidae], were opportunistically captured. Each invertebrate was scabbed for Bd individually, on all external body parts." Odonata were uninfected with zoospores.] Address: <https://researchonline.jcu.edu.au/41341/1/41341-mcnab-2015-thesis.pdf>

**26017** Sellami, E.L.; Meurgey, F.; Barbouche, N.; Romdhane, M.S. (2015): Odonates dans les principaux cours d'eau du parc national de l'Ichkeul (Tunisie). *Entomologie Faunistique – Faunistic Entomology* 68: 93-100. (in French, with English summary) ["Study of the structure of the dragonflies was undertaken during the period from October 2005 to July 2006, in the four principal streams of the national park of Ichkeul: Tinja, Sejnane, Meleh and Joumine. A total of 88 individuals were collected, divided into 7 families, 8 Genera and 8 species. Several indices were used for the study of the structure of the population on the one hand, and its diversity on the

other hand: frequency, density, specific richness, and equitability Spatio-temporal evolution shows that the number of the larva of dragonflies collected is more important in the two streams of Sejnane and Joumine. In time, the density is the highest for the spring period, in all the study sites. Among the species, *Erythromma lindenii* and *Platycnemis subdilatata* are the most frequent in all the stations and for all the period of the study. Joumine is the stream where the specific richness and the Shannon Weaver index are the most important. These two indices show also the same profile as for their temporal evolution. They are relatively average in autumn, low in winter and high in spring. Survey of the equitability in space and time, shows that this index is high in all the stations and for all the period of the study ( $E_s > 0.9$ ), testifying to an equal distribution between the various listed families." (Authors)] Address: Sellami, E.L., Institut Supérieur Agronomique de Chott Meriem, 4042 Sousse, Tunisie. Email: [essia.limem@hotmail.com](mailto:essia.limem@hotmail.com)

## 2016

**26018** Anonymus (2016): Publication d'un guide sur les naïades et exuvies des libellules du Québec. *Nouv'Ailes* 26(2): 4. (in French) ["Have you long wanted to identify the exuvia left behind by a dragonfly? A new guide, in French, has just been published: "Naiads and Exuviae of Dragonflies of Quebec: Key to Genera Identification," published by Entomofaune du Québec. The two authors, Raymond Hutchinson and Benoît Ménard, well known to members of the AEAQ (Association des Entomofaunes du Québec), offer naturalists the culmination of some thirty years of work dedicated to observing the underwater world of dragonflies. This practical 73-page guide opens up a vast field of knowledge. It allows for the identification and study of dragonfly naiads, either before they emerge from the water or as exuviae left by new adults. The identification key provided allows for the confident separation of the 52 genera of Odonata recorded in Quebec and near its borders. Furthermore, the key allows for the identification of 32 species. Starting with a scientific name, the naturalist can consult reference works in natural sciences and navigate the internet efficiently to expand upon previously accumulated knowledge. This will enable them to communicate their observations and discoveries with passion and accuracy. No fewer than 116 anatomical drawings and 15 illustration plates, including 79 color photographs, will help the naturalist finally identify their dragonfly exuvia or naiad specimens. The spiral-bound book, measuring 7" x 9" (18 x 23 cm), printed on thick, semi-gloss paper, is suitable for intensive use in the workshop or laboratory. This magnificent guide can be ordered for \$33 (taxes and postage included) by visiting the publisher's website: [www.entomofaune.qc.ca](http://www.entomofaune.qc.ca) or by writing to: Entomofaune du Québec inc. 108-637 Talbot Boulevard, Saguenay (Chicoutimi), Quebec G7H 6A4 (418) 545-5011, extensions 6542 or 5076" (Verbatim/Google translate)]

**26019** Cano Villegas, F.J.; Ortega, S.C.; de la Haza, E.Z. (2016): Odonatos de Córdoba. Ayuntamiento de Córdoba: 84 pp. (in Spanish or English) ["The municipality of Córdoba boasts exceptional "odonatological heritage"—no fewer than 53 species out of the 79 recorded on the Iberian Peninsula. Europe is not particularly rich in odonates, as the climate is generally unfavorable for their activity; however, Córdoba enjoys an excellent climate for these creatures—which are tropical in origin—with drought conditions being the only factor that works against them. Where I am writing this—in the Lower Amazon region of Brazil's Pará state—there is a megadiverse odonate fauna, and just a few streams can easily harbor around 40 species. Yet, unlike in Amazonian

forests, where the number of individuals per species is very low, Córdoba is home to massive odonate populations, making them relatively easy to observe. This book is precisely what is needed for beauty-loving individuals to discover the small fraction of biodiversity represented by Odonata. Getting to know these animals—naming, photographing, or simply observing them—can be a deeply rewarding activity. The pages of this book provide the foundational information needed by anyone approaching the study of odonates for the first time. It features excellent photographs of the animals in their natural habitat, capturing their characteristic behaviors, and describes their flight periods and habits. With this tool in hand, naturalists in Córdoba will be able to easily identify local species and contribute to the understanding of our natural heritage." (Publisher) <https://www.cordoba.es/servicios/medio-ambiente/guia-de-odonatos-de-cordoba#toc-informacion-general>] Address: <https://socochina.org/wp-content/uploads/2018/11/sin-tc3adtulo.pdf>

**26020** Menard, B.; Hutchinson, R. (2016): Pêche de 2 larvules de *Progomphus obscurus* (Odonata: Gomphidae) près de Maniwaki: une première et une deuxième mentions de l'espèce pour la province de Québec. *Nouv'Ailes* 26(2): 6-7. (in French) ["On August 12, 2016, BM caught an immature dragonfly nymph, a larva, in the Desert River in Maniwaki (Mont Cerf) during a visit to relatives of his partner, Lyne. It was raining that day. He wanted to explore the beach and do some net work. He only had 15 minutes to catch nymphs in the river. Vast sandy beaches stretched along the banks. On his first cast, he caught a small, very fast-moving gomphid larva that buried itself in the sand with lightning speed. The unusual shape and morphological characteristics of this nymph allowed us to quickly conclude that it was a gomphid, specifically *Progomphus obscurus*. This is the first record for the province of Quebec of both this genus and species of dragonfly. Subsequently, about 30 more net sweeps allowed BM to catch *Ophiogomphus colubrinus* nymphs, *Gomphus adelphus* nymphs, and *Macromia* larvae. Locals refer to this section of the riverbank as the 16th beach from the Maniwaki bridge. There are reportedly as many as 104 beaches in the area. On August 20, 2016, BM decided to return to the site where the first *Ophiogomphus* was caught on August 12. He was again accompanied by his partner, Lyne, and his daughter, Sophie. Lyne caught what turned out to be the second specimen of this dragonfly in Quebec. The nymph was pulled from the sand among piles of dead wood lying in the river water. Lyne also collected several *Stylurus amnicola* larvae (8?). The expedition also brought back specimens of the following species: *Stylurus spiniceps* and *scudderii*, as well as *Stylogomphus albistylus*. They also found *Macromia* larvae and *Ophiogomphus* naiads. Geographic distribution: Dunkle (1989, 2000) lists four *Progomphus* species in North America and 63 others in tropical America. Only one of these species has a sufficiently boreal distribution for odonatologists to find this dragonfly in our regions. Paulson (2013) adds that 69 species of the genus *Progomphus* inhabit our planet. According to Needham et al. (2000), *Progomphus obscurus* is found in 36 US states and one Canadian province, Ontario. Jones et al. (2013, second edition) report that individuals of this gomphid are known from several Ontario sites in Peterborough and Haliburton counties and mention a record for the city of Windsor. Biological sketch: Paulson (2013) specifies that *Progomphus* larvae have morphological structures adapted to their burrowing activities in the sand, the substrate where their larval life takes place. Needham et al. (2000) provide some details regarding the naiads. They live in sandy beds of streams and lakes. Their body coloration matches that of the surrounding sand. Their bodies remain clean. The length and

slender appearance of the caudal appendages are noteworthy. The unusual length and distinctly inclined appearance of the fourth antennal segment, as well as the structures that adorn the legs, cannot escape the observer (see photos). According to these authors, *Progomphus* are abundant in shifting sandbanks. They are among the most agile of the burrowing dragonflies. The speed with which these damselflies can flee and move under the sand is truly astonishing. The discovery of this dragonfly species with its unique habits is a most interesting addition to Quebec's dragonfly fauna. We can only hope to discover this fascinating species of dragonfly from the Gomphidae family elsewhere in our province." (Verbatim/Google translate)] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

**26021** Sander, B. (2016): Lake Erie coastal marsh aquatic invertebrate community structure across habitats dominated by two different emergent macrophytes. MSc thesis, Department of Biology, Eastern Michigan University: VI + 56 pp. (in English) ["The objective of this observational study was to determine if there was a difference in aquatic invertebrate communities between areas dominated by *Phragmites australis* and areas dominated by *Typha* spp. in a freshwater coastal marsh. The hypothesis was that aquatic invertebrate diversity and abundance would be greater in *Typha*-dominated locations as opposed to *Phragmites*-dominated locations. Sampling took place at Lake Erie Metropark in southeast Michigan during the summer of 2013. Invertebrates were collected using Hester-Dendy samplers and identified in the laboratory. Invertebrates were assessed using the Shannon-Wiener Index, taxon richness, and abundance values which were all analyzed using t-tests and Mann-Whitney U-tests. Invertebrate community structure was analyzed using principal component analysis (PCA) and multivariate analysis of variance (MANOVA) was used to compare factor scores. Environmental variables of water temperature, pH, dissolved oxygen concentration, and percent dissolved oxygen saturation were measured and analyzed using repeated measures analysis of variance and Spearman correlations. There was no significant difference in invertebrate richness or diversity ( $p > 0.05$ ), nor were there any significant differences in the abundance of individual invertebrate taxa between the two plant types ( $p > 0.05$ ), except for *Helobdella modesta*, which was significantly more abundant in *Typha*-dominated areas ( $p < 0.05$ ). PCA of invertebrate taxa captured >70% of total variance in community structure in the first two factors (55.4% and 15.6%, respectively). Plotted sites on PCA axes showed no grouping patterns with respect to dominant plant species, suggesting invertebrate communities were not different based on plant type, and MANOVA confirmed the lack of groupings based on plant type ( $p > 0.05$ ). PCA suggested three groupings of invertebrate taxa which occurred together frequently. In regards to invertebrate functional feeding groups (FFG), there were no significant differences in mean FFG abundance based on plant type ( $p$  always  $> 0.05$ ), except for the predator group, which was statistically greater at *Typha* sites ( $p < 0.05$ ). PCA of FFG captured >80% of total variance in community structure in the first two factors (46.1% and 34.3%, respectively). Plotted sites on PCA axes showed no grouping patterns based on plant type, suggesting FFGs were not different based on plant type, and MANOVA confirmed the lack of groupings ( $p > 0.05$ ). In conclusion, these findings suggest that freshwater *Phragmites* and *Typha* marshes are equally capable of supporting abundant and diverse aquatic invertebrate communities. ... Odonata frequented *Typha* sites with a total of 12 individuals and only 2 individuals at *Phragmites* sites. Mean ( $\pm 1$ SD) Odonata abundance at *Phragmites* sites was  $0.5 \pm 0.6$  individuals per site and a mean ( $\pm 1$ SD)

abundance at *Typha* sites was  $2.4 \pm 2.9$  individuals per site. These abundances are not statistically different across the two plant types ( $p = 0.304$ )."] (Author)] Address: <https://commons.emich.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2051&context=theses>

## 2018

**26022** Cleres, M.; Eßer, G. (2018): Die Bedeutung rekultivierter Gewässer im Rheinischen Revier für Vögel und Libellen. *Der Niederrhein* 85(4): 148-151. (in German) ["A wide variety of dragonfly species was recorded in the Ville/Südreivier area, some of which are notably rare—such as the *Aeshna grandis*. It favors woodland areas near still waters, such as Silbersee, Villenhofer Maar, and Entenweiher. These three bodies of water also feature a high proportion of floating-leaf vegetation, which benefits *Erythronia najas*. Also frequently present are *Lestes sponsa*, which seeks out vegetation-rich shorelines, and *Libellula fulva*, which is common in floodplain waters. A total of 56 dragonfly species were documented in the Ville and Südreivier areas (Forschungsstelle Rekultivierung 2017a). *L. sponsa*, *E. najas*, and *L. fulva* appear at all the bodies of water surveyed. Species such as *Anax parthenope*, *Orthetrum coerulescens*, and *Anax ephippiger* were recorded at the waters of the Frechen open-cast mine. All three species prefer waters with higher temperatures, such as those fed by inflows. 59 dragonfly species alone were counted in the Frechen area (Forschungsstelle Rekultivierung 2017a). The lakes at the Fortuna and Frimmersdorf open-cast mines are home predominantly to thermophilic species, such as *A. parthenope*. However, species typical of floodplain waters, such as *L. fulva*, are also widespread (Forschungsstelle Rekultivierung 2017a). The Inde area offers a diverse range of habitats. There are both small and large flood hollows—some holding water temporarily and others permanently—representing various stages of ecological succession. This ensures a high diversity of dragonfly species (31 species recorded between 2003 and 2015). Of particular note here is *Onychogomphus forcipatus*, which is threatened with extinction. Other documented threatened species include *Sympetrum pedemontanum*, *Ischnura pumilio*, and *Calopteryx virgo*. The latter, in turn, is more commonly found in the upper reaches of watercourses rather than in their middle reaches (Forschungsstelle Rekultivierung 2017a)."] (Athors/Google translate)] Address: not stated

**26023** Poignant, M. (2018): Les Odonates du Perche. État des connaissances. Maison du Parc, Courboyer - 61340 Perche-en-Nocé: 82 pp. (in French) [Department of Eure-et-Loir, northern France: "The diversity of landscapes within the Parc has allowed for the observation of 52 odonate species (including *Calopteryx virgo meridionalis*) since the beginning of the 20th century. Currently, 23 species are classified as native (index 1), 7 as probably native (index 2), and 10 as possibly native (index 3), while no evidence of native status was found for the remaining 12 species. The habitat types most frequently surveyed are ponds and pools (Figure 14), followed by watercourses, wet meadows, and finally peat bogs. However, according to the inventory of wetlands in the Grand Perche territory (covering both Park municipalities and surrounding areas), 39% of these zones consist of wet meadows and pastures (600 ha), whereas pools and bodies of open water account for only 6% of the total wetland area (Table 3). Consequently, it is highly likely that we currently possess only a limited glimpse of the odonate richness of the Perche region." (Author/Google translate)] Address: <https://www.calameo.com/read/0024904749e9c0b5b4b68>

**26024** Mezquita, I. (2019): Clave para la identificación de los Odonatos del País Vasco / Euskal Herriko Odonatuen identifikazioarako gakoa. Sociedad de Ciencias Aranzadi: 78 pp. (in Spanish) [Identification key for the regional odonate fauna.] Address: [https://cpie-littoral-basque.eu/lib/pdf/450274\\_.pdf](https://cpie-littoral-basque.eu/lib/pdf/450274_.pdf)

**26025** Veel, P (2019): Libellen in Zuid-Kennemerland. Tus-sen Duin & Dijk 18(2): 19-22. (in Dutch) [Twenty years ago, work began on the systematic investigation of the distribution of dragonflies in South Kennemerland. This prompted an atlas project to comprehensively map this region and publish the results in an atlas." (Author/Google translate)] Address: not stated

**26026** Casanueva, P.; Santamaría Polo, T.; Ferreira Nunes, L.; Hernández Minguillón, A.; Sánchez Sastre, L.F.; Sánchez-Bordona, F.C. (2020): *Cordulegaster boltonii*. La libélula tigre de los arroyos. Universidad Católica de Ávila: 107 pp. (in Spanish) ["The book describes the characteristics of the species *Cordulegaster boltonii* (Donovan, 1807) in the Central System of the Iberian Peninsula. It specifically addresses aspects related with its habitats (rivers and mountain streams), its morphology in the larvae instar and the imago or flying adult, as well as its behaviour. The book presents some of the data obtained through a literature review, being the majority of the data original and obtained through the study of that population on the referred area. A special attention was given to the larvae and exuviae, across the whole period of emergency. Among the data collected, we outline: a) the phases of larvae development, F-3 to F-0, can be distinguished through the analysis of the measurements of the head width and wing sheaths; b) the presence of stream slopes seem to influence the amount of larvae stage F-0: the larger the stream slope, the bigger the proportion of these larvae; c) the majority of the larvae emerge less than 5 m from the rim of the streams (in almost 97% of the cases); d) the presence of direct sunlight influences the area where the larvae emerge: 90,5% emerge in areas exposed to the sun; e) sex ratio is statistically balance during the emergency period, with no predominance of male or female. On the mountains, where the study was conducted, *C. boltonii* is present in a wide variety of streams and altitudes. Despite a raise in the average temperature of the environment under study, for the same period and based on bibliographical data, this distribution did not change for the last 30 years." (Authors) [https://www.researchgate.net/publication/339628327\\_Cordulegaster\\_boltonii\\_La\\_libelula\\_de\\_los\\_arroyos](https://www.researchgate.net/publication/339628327_Cordulegaster_boltonii_La_libelula_de_los_arroyos)] Address: Casanueva, Patricia, Department of Experimental Sciences, European University Miguel de Cervantes, CI Padre Julio Chevalier 2, 47012 Valladolid, Spain. E-mail: [pcasanueva@uemc.es](mailto:pcasanueva@uemc.es)

## 2020

**26027** Crosby, P. (2020): Chasing dragonflies. A natural, cultural, and personal history. Northwestern University Press, Evanston: 248 pp. (in English) ["Chasing Dragonflies: A Natural, Cultural, and Personal History is an engaging, beautifully illustrated introduction to these remarkable insects. Drawing on her experiences as a natural history instructor, dragonfly monitor, cancer survivor, grandmother, and steward, Crosby tells the stories of dragonflies: their roles in poetry and art, their fascinating sex life—unique within the animal kingdom—and their evolution from dark-water dwellers to denizens of the air. We follow Crosby and other citizen-scientists into the prairies, wetlands, and woodlands of the Midwest, where they observe the environment and chronicle

dragonfly populations and migration to decipher critical clues about our changing waterways and climate. Woven throughout are personal stories: reflections on the author's cancer diagnosis and recovery, change, loss, aging, family, joy, and discovering what it means to be at home in the natural world. Crosby draws an intimate portrait of a landscape teeming with variety and mystery, one that deserves our attention and conservation. As warm as it is informative, this book will interest gardeners, readers of literary nonfiction, and anyone intrigued by transformation, whether in nature or our personal lives." (Publisher)

**26028** Verspui, K.; Wasscher, M. (2020): Conflicting views on the status of *Orthetrum cancellatum kraepelini*. *Agrion* 24(2): 149-154. (in English) ["We present here different views on the taxon *Orthetrum cancellatum kraepelini* Ris, 1897. Friedrich Ris published the first species description in 1897 but in 1909 he changed its status to a subspecies. In December 1896, before the first description by Ris, Edmond de Selys Longchamps commissioned a watercolour of *O. kraepelini*. The accompanying text shows that Selys did not consider this taxon a species but a subspecies of *Orthetrum cancellatum*. Currently different views are held on its status. The distribution and various characteristics are listed to distinguish this subspecies from the nominal form of *O. cancellatum*. A thorough study of the specimens, the geographical distribution and possibly molecular differences in DNA is needed to determine the true status of *Orthetrum cancellatum kraepelini*." (Authors)] Address: Verspui, Karin, Lingedijk 104, Tricht, the Netherlands. Email: [karin.verspui@gmail.com](mailto:karin.verspui@gmail.com)

## 2021

**26029** Salvador, P.; Fava, F. (2021): Nuovo limite settentrionale della distribuzione di *Ophiogomphus cecilia* (Fourcroy, 1785) (Insecta: Odonata) in Veneto. *Studi Trentini di Scienze Naturali* 101: 91-94. (in Italian, with English summary) ["*O. cecilia* is an odonate species widespread in most of central and north-eastern Europe. In Italy, it is found only in the northern regions (mostly in the Po river basin). With this work, we update the informations on the Italian distribution of the species, reporting a new occurrence site in Veneto, which represents the new northern range limit for the region. The current distribution in the region is discussed along with some notes on the importance of the new occurrence site, the SPA "Sile: sorgenti, paludi di Morgano and S. Cristina" (SPA IT3240011)." (Authors)] Address: Salvador, P., Via Munaron, 35017 Piombino Dese (PD), Italy. Email: [paolosalvador83@gmail.com](mailto:paolosalvador83@gmail.com)

## 2022

**26030** Charest, P. (2022): Dix années d'inventaire des libellules de la rivière Batisca. *Bulletin de l'entomofaune* 55: 6-11. (in French) [A list of 37 species is presented, including seven Red listed species. Records of *Neurocordulia michaeli*, *Gomphus ventricosus*, *Stylurus amnicola*, *Stylurus spiniceps*, and *Libellula incesta* are documented with figures.] Address: not stated

**26031** Conesa, M.A. (2022): Larvas de libélulas en la península ibérica. Torres Editores: 532 pp. (in Spanish) ["Discover the second edition of "Larvas de Libélulas en la península ibérica" (Dragonfly Larvae of the Iberian Peninsula), a book covering 81 species recorded on the Iberian Peninsula between 1980 and 2021. In addition to providing a general overview of larval morphology, physiology, ecology, and distribution, the work excludes *Pseudagrion microcephalum* - which arrived via the aquarium plant trade - and *Lindenia*

tetraphylla, due to the absence of records for over half a century; however, the description of the *Lindenia* larva has been retained in case an unknown population exists, although the author personally considers it extinct in the eastern region of the peninsula. This second edition adds two species classified, for the time being, as accidental: *Trithemis arteriosa* and *Pantala flavescens*. These two species, along with *Orthetrum albistylum* and *Leucorrhinia pectoralis*, are included in this manual despite having been recorded only once on the Iberian Peninsula or in the Eastern Pyrenees. Beyond the general review of larval morphology, physiology, ecology, and distribution, the book provides identification keys and morphometric relationships designed to assist in identifying species at their final larval stages and as exuviae. These keys, which accompany the species descriptions, are based on purely morphological criteria while drawing upon established phylogenetic analyses. Miguel Conesa holds a PhD in Biological Sciences, serves as a Biology Tutor at UNED (Málaga), is a member of the Natural Heritage Expert Panel of the Regional Government of Andalusia (Junta de Andalucía), and is a founding member of the Andalusian Odonatological Association." (Publisher/Google Translate)] Address: <https://torreseditores.com/ciencias-naturales/77-larvas-de-libelulas-en-la-peninsula-iberica.html>

**26032** Eislöffel, J.; Riedel, R.; Rathmann, R. (2022): Zur Ausbreitung der Kleinen Zangenlibelle *Onychogomphus forcipatus* (Linnaeus, 1758) in Thüringen (Insecta: Odonata). *Thüringer Faunistische Abhandlungen* 27: 87-97. (in German, with English summary) ["On the range expansion of the Small Pincertail *Onychogomphus forcipatus* (Linnaeus, 1758) in Thuringia (Insecta: Odonata) - One known and two previously unnoticed specimens of *O. forcipatus* in the Carl Feustel Collection in the Phyletisches Museum Jena support the assumption that this species was more widespread in Germany and Thuringia at the beginning of the 20th century than it is today. A systematic search in the year 2022 revealed new locations on both the Middle Saale and the Weiße Elster rivers - another finding was made in the Frießnitzer See nature reserve. These records show that the species, following new findings mainly along the Upper Saale and the Werra rivers in recent years, is now expanding northward along the rivers beyond the Thuringian Schiefergebirge." (Authors)] Address: Eislöffel, J., Ziegenhainer Str. 27B, 07749 Jena, Germany. Email: [jochen.eisloeffel@web.de](mailto:jochen.eisloeffel@web.de)

**26033** Pothier, I. (2022): Découverte d'une 152e espèce de libellule au Québec, le Gomphe des fosses, *Phanogomphus quadricolor*. *Bulletin de l'entomofaune* 55: 12. (in French) [P. quadricolor, 10-VII-2021, river l'Aigle Outaouais region, Quebec, Canada] Address: not stated

**26034** Savard, M.; Lemelin, G.; Savard, R.-J. (2022): Nomenclature française des libellules du Québec et du Canada. *Entomofaune du Québec* - ISBN 978-2-9802763-8-5: 40 pp. ["Since the introduction of a French nomenclature for the dragonflies of the province of Québec in 1998, a revision of the French names was necessary to support the popularization of newly acquired knowledge in the science of odonatology, and also to satisfy the growing public interest in the observation and conservation of these fascinating insects across Canada. This document provides a logical list of French names for the 218 native and the three exotic dragonfly species recorded in this country. The basic principles employed, the criteria applied, and the references used to name each species are specified, and the meaning of each name is provided. Teaching French names and their use in publications and the field will undoubtedly encourage their eneral use

and promote learning about the diversity of our dragonflies." (Publisher)] Address: Savard, M., Entomofaune du Québec, 637 boulevard Talbot, Saguenay, Québec G7H 6A4 Canada. Email: [m\\_savard@hotmail.com](mailto:m_savard@hotmail.com)

**26035** Savchenko, E.Yu.; Stratiychuk, A.A. (2022): Ecological and faunal review of dragonflies (Insecta: Odonata) of the Republican landscape park «Zuevsky». *Problems of Ecology and Nature Conservation in a Technogenic Region*. 2022. No. 3-4: 51-55. (in Russian, with English summary) [Ukraine "The paper analyzes the taxonomic structure and biotopic distribution of dragonflies on the territory of RLP «Zuyevsky», identifies the species composition, studies the ecological groups and the seasonal dynamics of dragonflies in the studied areas." (Authors) The list of species includes among others *Coenagrion ornatum*, *Aeshna viridis*, *Sympecma paedisca*, *Lestes macrostigma*, and *Lindenia tetraphylla*.] Address: Savchenko, E.Yu., State Educational Institution of Higher Professional Education "Donetsk National University" 283050, 46 Shchorsa St., Ukraine. Email: [katrinsavchenko@mail.ru](mailto:katrinsavchenko@mail.ru)

**26036** Susanth, C. (2022): Checklist of odonates of Akkulam Lake (January-February 2022). *Prakrithi Books, Prakrithi Series 1c*: 7 pp. (in English) ["Akkulam Lake (8°31'11.4"N; 76°33'57.9"E) in Thiruvananthapuram, the southernmost district of Kerala (India). The lake is part of the Akkulam-Veli Lake system, one of the southernmost lakes on the southwest coast of the Indian peninsula. Akkulam Lake is one of the important wetland ecosystems in Thiruvananthapuram city. The lake is a home of various migratory bird species. Akkulam boat club premises, lake at Nish and adjacent areas are very rich in Odonata diversity. The Odonata diversity study was conducted at Akkulam lake premises during January and February 2022. The field studies conducted on 26th January and 4th February 2022. 30 species were observed during the present study." (Authors)] Address: [https://www.researchgate.net/publication/358404501\\_CHECKLIST\\_OF\\_ODONATES\\_OF\\_AKKULAM\\_LAKE\\_JANUARY\\_FEBRUARY\\_2022](https://www.researchgate.net/publication/358404501_CHECKLIST_OF_ODONATES_OF_AKKULAM_LAKE_JANUARY_FEBRUARY_2022)

## 2023

**26037** Office de l'Eau de Guyane (2023): Atlas des invertébrés aquatique de Guyane. Office de l'Eau de Guyane, 10, rue des Remparts — Vieux Port, 97300 Cayenne, French Guiana, France. ISBN 978-2-9590191-1-1: 720 pp. (in French) ["Aquatic invertebrates are a diverse group of animals: mayflies, water mites, shrimp, megalopods, and more. They inhabit rivers, creeks, and streams, even the bromeliads of the canopy, and have developed remarkable ingenuity to adapt to their environment. Their essential role in maintaining ecosystem balance and their bioindicator properties are attracting increasing interest from the scientific community. In French Guiana, a land of abundant water, they are extraordinarily diverse. Some groups, such as dragonflies and mosquitoes, have twice as many species as all of Europe! Small, discreet, and generally well-hidden, they easily go unnoticed, and their existence still holds a great deal of mystery. The result of more than thirty years of research and illustrated with numerous original photographs, this book offers an immersion into the little-known microcosm of aquatic invertebrates. Learn to identify different groups of insects using our numerous identification keys and discover the secrets of their incredible abilities in over 250 fact sheets. Did you know that a flatworm (*Platyhelminthe*) cannot die if you cut it into pieces? That water scorpions (*Elmidae*) can spend their entire lives underwater thanks to an air bubble? That in water scorpions (*Nepidae*), the father takes care of the offspring?

That the giant Amazonian leech was considered extinct until two individuals were captured in French Guiana in the 1970s? That new species are discovered there every year? Dive in and meet the invisible inhabitants of the creeks!" (Publisher) Odonate larvae are treated on pages 413-538.] Address: [https://eaguyane.fr/images/2024/Publications24/ATLAS\\_MACROFAUNE\\_BENTHIQUE\\_Numerique\\_basse\\_def\\_oct\\_2023.pdf](https://eaguyane.fr/images/2024/Publications24/ATLAS_MACROFAUNE_BENTHIQUE_Numerique_basse_def_oct_2023.pdf)

**26038** Verspui, K.; de Vos, R. (2023): Identificatie van vlin-ders en andere insecten op illustraties uit het achttiende- en negentiende-eeuwse Nederland. Entomologische Berichten 83(5): 131-149. (in Dutch, with English summary) ["Identifi-cation of butterflies, moths and other insects on illustrations from eighteenth and nineteenth century Netherlands - The li-brary of the Dutch Entomological Society (Nederlandse En-tomologische Vereniging) contains a unique collection of wa-tercolours and drawings of butterflies, moths and other in-sects, from the 18th and 19th century. This library is on loan at the library of Naturalis Biodiversity Center in Leiden (the Neth-erlands). The collection turns out to be two collections in one, donations from the widow of Cornelis Sepp and from the son of Maurits Ver Huell. The most illustrations in the collection were produced by Maurits Ver Huell, Jan Christiaan Sepp and Christiaan Sepp featuring Dutch butterfly and moth species and they were the preparatory studies for the first book series 'Beschouwing der wonderen Gods, in de minstgeachte Schep-zelen of Nederlandsche Insecten' published by Uitgeverij J.C. Sepp en Zn. The illustrations of butterflies, moths and other insects were digitalized and notes on the illustrations were transcribed. Experts of the Dutch Entomological Soci-ety studied the 221 illustrated adult butterflies and moths and associated 202 with current species names (91%). For approximately 100 illustrations clear similarities were found between the illustrations and the prints in the books. Illus-trations of butterflies from other continents and of other in-sects were associated with current species names by spe-cialists. This collection remarkable illustrations is now digitally accessible and can be found on the website of the Dutch En-tomological Society (<https://nev.nl/zonder-categorie-nl/vlind-erillustraties-18e-en-19e-eeuw>). It is now available as a source for all those people interested in history, culture, and nature as well as for research on natural and cultural history." (Au-thors) The illustrator of the only illustration featuring dragon-flies from 1866 is Rocho van Oddy, and three taxa are con-sidered: *Libellula quadrimaculata*, *Coenagrionidae* imago, and *Brachytron pratense*.] Address: Verspui, Karin, Lingedijk 104, Tricht, the Netherlands. Email: [karin.verspui@gmail.com](mailto:karin.verspui@gmail.com)

## 2024

**26039** Donath, H. (2024): Die Libellenfauna am Oberlauf der Dahme. Biologische Studien, Luckau 52: 23-34. (in Ger-man) ["For decades, the upper reaches of the Dahme were se-verely polluted by sewage. Thanks to the construction of sew-age treatment plants after 1990, the ecosystem began to re-cover. This is evident from the return of dragonfly species suited to the habitat. The widespread cessation of maintenance measures has also had a positive effect on structural diversity. The negative impacts on the water balance in the headwa-ters cannot be remedied in the short term; at best, they can be mitigated in the long term. The species of the Rhitral identi-fied as stenochthonous stream species are *Cordulegaster boltonii* and *Calopteryx virgo*. Also of potamal importance are the equally stenochthonous species *C. splendens* and *Oph-iogomphus cecilia*. Among the stream-lake species, *Gom-phus vulgatus* has higher habitat requirements, whilst *Platycnemis pennipes*, *Pyrhosoma nymphula*, *Somatochlora*

*metallica* and *Libellula fulva* are more widespread. In the com-ing years, the status of *C. boltonii*, *G. vulgatus* and *O. cecilia* should be investigated in greater detail. To safeguard the remarkable occurrence of *C. virgo*, it is essential to preserve the largely continuous riparian woodland fringe along the upper reaches of the Dahme." (Author/DeepL.com (free version)) Address: Donath, H., Caule Nr. 1, 15926 Zieckau, Germany

**26040** Kagami, T.; Ozono, A.; Futahashi, R.; Kakinuma, S. (2024): Observation on oviposition behavior into a tree hol-low in *Lyriothemis flava* Oguma, 1915 Tomoya. Tombo 67: 191-192. (in Japanese, with English summary) ["The larvae of *L. flava* have been reported from water-filled tree hollows, but there was little information on the oviposition behavior of females. Here we recorded the movie of the female laying eggs in a tree hollow." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: [ryo-futa-hashi@aist.go.jp](mailto:ryo-futa-hashi@aist.go.jp)

**26041** Kennedy, L. (2024): Dragonfly News 85. Dragonfly News 85: 1-44. (in English) ["03: Editor's Notes Lauren Ken-nedy. 04: Chairman's Report Tim Coleshaw 06: News From You [Tripple connection between *Chalcolestes viridis* pair and *Lestes sponsa* male] 07 - 09: Migrant News and Last Dates Adrian Parr 10 - 12: The Red River Valley: a Cornish Hidden Gem Steve Jones 13: BDS Corbet Moore Award Leyland Ponds Update Ian Fairey 14 - 17: National Dragonfly Recording Re-port 2023 Ellie Colver 18 - 19: News from Scotland Danièle Muir and Stephen Corcoran 20 - 21: Dragonfly Hotspot News 22 - 23: Chasing Dragonflies: a Summer in the Eddleston Wa-ter Catchment Julie Fahy 24 - 25: My Dragonfly Diary Ethan Westcott 26: Launching the BDS Youth Panel! 27: BDS Be-ginnings Rod Dunn 28 - 31 Trieragan Dragonflies Rachel Bicker 32 - 33: Field Notes 35 - 37: Field Meetings 2024 38 - 39: BDS Business Update 40 - 41: CDR Listing 42 - 43: Checklist of the Damselflies and Dragonflies of Britain and Ire-land 44: Our Shop." (Publisher)] Address: <https://british-drag-onflies.org.uk/wp-content/uploads/2026/04/DN2024-Spring-FINAL-lowres.pdf>

**26042** Kennedy, L. (2024): Dragonfly News 86. Dragonfly News 86: 1-40. (in English) ["03: Editor's Notes Lauren Ken-nedy 04: Chair's Report Tim Coleshaw 06: News From You 07 - 09: Migrant News and First Dates Adrian Parr 10: Intro-ducing our new Patron Megan McCubbin 11: Dragonfly Hot-spots 2024 12 - 13: Events of 2024 14 - 15: The Emergence of Arcadia's Dragonfly at Glastonbury Festival 16 - 17: Euro-pean Congress of Odonatology 2024 Ellie Colver 18 - 19: News from Scotland Daniele Muir and Jennifer Davidson 20 - 23: Young Naturalist Section written by Youth Panel Members 24 - 27: Our Missing Heathland Dragonflies Alan Holmes 28 - 29: Field Notes David Clarke 30 - 31: 2024 - A Bad Year for Dragonflies? Dave Smallshire 32 BDS: joins the Pesti-cide Collaboration 33 - 35: Photo Competition 36: Annual Meet-ing 38 - 39: Checklist of the Damselflies and Dragonflies of Britain and Ireland 40: Our Shop." (Publisher)] Address: <https://british-dragonflies.org.uk/wp-content/uploads/2026/04/DN-2024-Autumn.pdf>

**26043** Kijta, H.; Kadoya, T.; Suda, S.; Nakagawa, M. (2024): *Sympetrum fonscolombii* (Selys, 1840) emerged on Okinawa Islana in March. Tombo 67: 193-196. (in Japanese, with English summary) ["In March 2024, *S. fonscolombii* was observed emerg-ing in Nago City, Okinawa Prefecture. This is the first time that the emergence of *S. fonscolombii* from larvae has been confirmed in natural conditions on Okinawa Island. Adults of *S. fonscolombii* were observed at the site in November of the

previous year, and together with the finding of this report, it is likely that this species laid eggs around November 2023, overwintered, and became adults at this site." (Authors)] Address: Křta, H.: Email: kita1114-age@u01.gate01.com

**26044** Kopetz, A.; Anton, E.; Bellstedt, R.; Krebs, D.; Müller, M.; Weigel, A. (2024): Gemeinschaftsexkursion des Thüringer Entomologenverbandes e.V. (TEV) 2024 in das Gebiet der "Herbstleber Teiche" im Thüringer Becken (Unstrut-Hainich-Kreis). Mitteilungen des Thüringer Entomologenverbandes 31(): 120-213. (in German) [20 odonate species including *Coenagrion mercuriale* are listed in an appendix on pages 167-168. A special focus in discussion (135-136) of the results is set on increasing number of Mediterranean species as *Crocothemis erythraea*.] Address: Bellstedt, R., Brühl 2, 99867 Gotha, Germany. Email: ronald.blstedt@t-online.de

**26045** Niehuis, M. (2024): Beitrag zur Kenntnis der Libellenfauna des Gebietes „Speyerer Dünen und Bruchbachtal“ (Insecta: Odonata) (Stand 1994). Mainzer naturwissenschaftliches Archiv 61: 387-398. (in German, with English summary) [Rheinland-Pfalz, Germany "In the area of the "Speyerer Dünen" and the "Bruchbachtal", 31 species of dragonflies have been observed between 1980 and 1994 living in running waters, excavation pits, puddles or swampy areas. The list includes rarities such as *Lestes barbarus*, *Lestes dryas*, *Libellula fulva* and *Sympetrum flaveolum*. Due to the continuous dry weather the shallow pools have been dried out in it i cut years. All waters of the area, including the dessicated ones, should be preserved." (Author)] Address: deceased

**26046** Petzold, F.; Mey, D. (2024): Die Gabel-Azurjungfer *Coenagrion scitulum* - eine neue Libellenart in Thüringen (Insecta: Odonata: Coenagrionidae). Thüringer Faunistische Abhandlungen 29: 15-29. (in German, with English summary) ["The forked damselfly *Coenagrion scitulum* - a new damselfly in Thuringia (Insecta: Odonata: Coenagrionidae) - *C. scitulum* was first recorded in Thuringia (Germany) in 2022. There is currently an evidence from 22 ponds in western Thuringia. In most cases, only a few individuals were found. Occurrences with several hundred individuals were only found in three ponds. The successful development of the species is proven by the findings of freshly hatched individuals. The records in Thuringia should be seen in the context of the current spread of the species in Central Europe from its centre of occurrence in France to the north and east." (Authors)] Address: Petzold, F., Lutherstr. 130, 07743 Jena, Germany. E-mail: falk\_petzold@web.de

**26047** Poskocilová, A.M.; Harabiš, F.; Tetaur, A.; Josková, A. (2024): Restored post-mining areas as a potential ecological trap for Odonata? Ecological Engineering 204, 107283: 8 pp. (in English) ["Habitat restoration in post-mining landscapes is undertaken to improve ecological conditions and ecosystem functioning. However, despite good intentions, such efforts often fall short of benefiting wildlife. A significant contributing factor to this outcome is the human-centric approach, where aesthetic considerations and human perceptions of suitable habitats overshadow the needs of animals. Restored habitats may appear attractive, but their low quality can create ecological traps, leading to restoration failure in providing intended fitness benefits for target species. Our study focuses on dragonflies and presents a two-part framework. First, we identify habitats with discrepancies between adult preference and dragonfly larval performance, termed "potential ecological traps". Second, we compare larval survival, immunity, and body condition, to evaluate larval lifetime reproduction success in both habitat types. In general, larvae reared in natural habitats exhibit superior larval conditions

and survival rates compared to restored habitats. However, restored sites were also less attractive to ovipositing tandems, indicating the ability of dragonfly parents to discern suitable conditions for their offspring. Our findings emphasize the complex interplay between habitat preference, true quality, and behavioral responses of dragonflies. Recognizing and mitigating ecological traps are crucial in designing and managing restored habitats to ensure the long-term viability and conservation of dragonfly populations in human-altered landscapes. The ability of dragonflies to adapt to their environment suggests that the evolutionary mechanism of habitat selection remains effective even in anthropogenically altered environments. By addressing potential risks associated with ecological traps, restoration practitioners can enhance habitat recovery and promote sustainable ecosystem functioning." (Authors)] Address: Poskocilová, Anna-Marie, Faculty of Environmental Sciences, Czech University of Life Sciences Prague, Kamýcká 129, Suchbát, 165 00 Prague, Czech Republic. Email: poskocilovaa@fzp.czu.cz

**26048** Stratiychuk, A.A.; Savchenko, E.Yu. (2024): [Zoogeographical analysis of the dragonfly fauna (Insecta: Odonata) of the 'Zuevsky' Republican Landscape Park.]. Donetsk National Technical University. CONFERENCE: Environmental Protection and Rational Use of Natural Resources. Donetsk, April 17–18, 2024. Organizers: Donetsk National Technical University: 283-286. (in Russian, with English summary) [Ukraine "The objective of this study is to conduct a zoogeographical analysis of the dragonfly fauna within the "Zuevsky" Republican Landscape Park (RLP). This analysis was based on an examination of both the authors' personal collections—gathered within the RLP "Zuevsky" territory—and materials processed from the collections of the Department of Zoology and Ecology at the Donetsk State University. Three reservoirs—Olkhovskoye, Zuevskoye, and Khanzhenskoye—located either within the park's boundaries or in its immediate vicinity, were selected as stationary sites for material collection. The areas along the Olkhovka and Krynk rivers were also surveyed. In total, the research conducted within the RLP "Zuevsky" territory identified 28 dragonfly species. To analyze the representation of zoogeographical elements within the dragonfly fauna of RLP "Zuevsky," we utilized the zoogeographical regionalization scheme for the Palearctic developed by A.F. Emelyanov [1], which accounts for both the latitudinal and longitudinal components of each species' geographic range. An analysis of the general distribution patterns of the dragonfly species comprising the fauna of the study area allowed for their classification into four types based on longitudinal extent and seven types based on latitudinal extent (Table 1)." (Authors/Google translate)] Address: Savchenko, E.Yu., State Educational Institution of Higher Professional Education "Donetsk National University" 283050, 46 Shchorsa St., Ukraine. Email: katrinsavchenko@mail.ru

**26049** Stübing, S.; Eichelmann, R.; Seum, U.; Schmidt, W. (2024): Tierarten der Feuchtgebiete: Entwicklung bundesweit bedeutender Erfolge in der Wetterau. Jahrbuch Naturschutz in Hessen 23: 38-42. (in German) ["Dragonflies: With 45 species, approximately two-thirds of Hesse's dragonfly fauna have been recorded. The occurrences of *Aeshna affinis*, *Lestes barbarus*, and especially *Sympetrum meridionale* are of particular importance. These species are adapted to the late-summer drying phases of their overwintering in the egg stage. The area represents the most important habitat for these species in the state and, in the case of *S. meridionale*, even nationwide (Stübing et al. 2020)." (Authors/Google translate)] Address: Stübing, S., HGON-AK Wetterau, Lindenstr. 5, 61209 Echzell, Germany. Email: Stefan.Stuebing@hgon.de

**26050** Tamm, J. (2024): 8.3 Die Quelljungfern *Cordulegaster bidentata* und *C. boltonii*. Quellen und Fließgewässer im Nationalpark Kellerwald-Edersee; Forschungsberichte des Nationalparks Kellerwald-Edersee Band 3. Nationalparkamt Kellerwald-Edersee (Hrsg.), Bad Wildungen: 235 S.: 128-131. (in German) ["In the Kellerwald-Edersee National Park (Hessen, Germany), both odonatesspecies were systematically mapped during the summers of 2009 and 2010 (Tamm 2011). Previously, only a few isolated records had been known from the area (see Chapter 6, Source Research). The survey revealed that the rare *C. bidentata* – contrary to its general distribution – was by far the more common species in the Kellerwald-Edersee National Park. It occurred at 18 of the 40 mapped streams (frequency 45%). This corresponds to the situation in the rest of the Kellerwald (Tamm 2012b), where the dragonfly was found at 34 of 87 streams (frequency 39%). This places the Kellerwald among the regions with the highest population densities of this species worldwide. The structure of the Kellerwald-Edersee National Park offers particularly favorable conditions for *C. bidentata*. It can be assumed that a significant number of occurrences were missed during the initial mapping. This was partly due to the fact that \**C. boltonii*\* was also being mapped, requiring the streams to be traversed in their entirety. This left insufficient time to examine many of the small spring-fed rivulets. Furthermore, some streams were surveyed from mid-August onwards, when most of the adult dragonflies had already disappeared. It is therefore likely that *C. bidentata* reaches one of its highest population densities in its global distribution area within the Kellerwald-Edersee National Park. Consequently, this indicator species of forest spring-fed streams – also a European endemic and a "Hessian species" – should be subject to regular monitoring within the park. The only dragonfly whose distribution largely coincides with that of the European beech (*Fagus sylvatica*) deserves special attention in a beech-dominated national park." (Author/Google translate)] Address: Tamm, J. Elgershäuser Str. 12, 34131 Kassel, Germany. Email: jochen.tamm@t-online.de

**26051** Verwaltungen des UNESCO-Biosphärenreservats Rhön (Hrsg.) (2024): Libellen reagieren sensibel und zeigen klimatische Veränderungen auf. Band 1 - Insekten in den Kernzonen des UNESCO-Biosphärenreservats Rhön: 31-36. (in German) [Germany, Hessen, Bayern, Thüringen; Verbatim/Google translate: "Dragonfly species specifically adapted to bogs are particularly vulnerable due to their close dependence on this increasingly rare and highly specialized habitat. Between 2019 and 2021, the dragonfly fauna of the Red Bog and the Black Bog in the UNESCO Rhön Biosphere Reserve was studied in detail. On sunny, warm, and windless days, both raised bogs were searched, focusing primarily on areas with open water. \*15 species in the Black Bog: The Black Bog is located directly at the tripoint of Bavaria, Hesse, and Thuringia. At approximately 66 hectares, it is the largest bog in the Rhön region, situated in a shallow depression on the volcanic plateau of the Lange Rhön. Unlike many other bogs, it has remained largely untouched by drainage and peat extraction. As a result, the Black Bog retains a relatively pristine character and is considered one of the most beautiful geotopes in the Rhön. Since 2013, it has been protected as one of the core zones in the Bavarian part of the UNESCO Rhön Biosphere Reserve. A total of 15 different dragonfly species have been identified in the Black Moor (Schwarzes Moor). Seven species are considered endangered, and six are particularly or even exclusively dependent on bogs. \* 22 dragonfly species in the Red Moor (Rotes Moor): The Red Moor is a raised bog fed by rain and formed in a shallow depression with clay deposits. The original bog area of 50 hectares

was significantly reduced by 175 years of peat extraction. Following several restoration projects – including one in 2023 – additional small bodies of water have formed alongside the remaining raised bog areas, now providing significant habitat potential for dragonflies. Two areas surrounding the bog are designated as core zones. A total of 22 different dragonfly species have been identified in the Red Moor, seven of which are particularly or even exclusively dependent on bogs. Climate change is taking its toll on bog dragonflies: Raised bogs are considered the habitats most severely affected by climate change. Rising temperatures, changes in annual precipitation, and prolonged periods of drought threaten raised bogs and, consequently, their specialized communities of species. Sensitive dragonfly species that specialize in bog habitats will lose their habitat as a result. This is especially true for *Somatochlora arctica*, while *Leucorrhinia dubia* also inhabits larger bog bodies of water and is therefore not quite as threatened. Both species live in small, water-filled formations that can dry out very quickly during dry summer months. *Coenagrion hastulatum*, which primarily inhabits areas of siltation, is also particularly vulnerable to prolonged periods of drought." The following species are treated in more details: *Leucorrhinia pectoralis*, *Leucorrhinia dubia*, *Somatochlora arctica*, *Coenagrion hastulatum*, *Aeshna juncea*, *Lestes dryas*, and *Thecagaster bidentata*.] Address: [https://www.biosphaerenreservat-rhoen.de/fileadmin/media/publikationen/Broschuere\\_Insekten-in-den-Kernzonen\\_Band1\\_Mobil.pdf](https://www.biosphaerenreservat-rhoen.de/fileadmin/media/publikationen/Broschuere_Insekten-in-den-Kernzonen_Band1_Mobil.pdf)

**26052** Warr, A. (2024): Unusual behaviour of egg-laying Willow Emerald Damselfly *Chalcolestes viridis*. Worcester-shire Record 52: 11. (in English) [Willow Emerald Damselfly egg-laying in leaf of *Salix* sp. at Throckmorton Outer Lagoons, 14th October 2023] Address: Warr, A., 14 Broms-grove Street, Worcester, Worcestershire WR3 8AR, UK.

## 2025

**26053** Adelman, J. (2025): Bemerkenswerte Libellenbeobachtungen an einem temporären Waldsumpf - Wiederfund von *Sympetrum danae* im Kreis Darmstadt-Dieburg (Odonata: Libellulidae). Libellen in Hessen 18: 83-92. (in German) ["As a result of rainfall that was approximately 40% above average between August 2023 and July 2024, a small, richly structured marshland formed on a section of a pine forest in the Darmstadt-Dieburg district (Hesse, Germany) that had been destroyed by a major fire in 2019. A total of 18 dragonfly species were observed in this newly created habitat during the summer of 2024, including several species that are rapidly declining and now rare in southern Hesse (*Lestes sponsa*, *Ischnura pumilio*, and *Sympetrum danae*). This is the first record of *S. danae* in the Darmstadt-Dieburg district since 2011. The diversity of the observed species, which also includes *Coenagrion scitulum* and *Aeshna affinis*, two species not entirely suited to the habitat, is remarkable and is due to the open location and the proximity to the shallow waters typical for these species. The origin of these rare species, for which there is no evidence in the wider area, remains unclear. These observations, as well as further finds of *S. danae* in the southern part of the Offenbach district, are presented and discussed." (Author/Google translate)] Address: Adelman, J., Potsdamer Str. 70, 64372 Ober-Ramstadt, Germany. Email: jadelmann@web.de

**26054** Adelman, J.; Frank, M. (2025): Die Teichjungfern in Hessen - Verbreitung und Bestandsentwicklung (Odonata: Lestidae). Libellen in Hessen 18: 43-65. (in German) ["Among the six Lestidae native to Hesse, the genus *Lestes* forms the largest group with four species. Although they do not appear to differ significantly in their habitat requirements at first glance,

and it is not uncommon to find several species at the same body of water, their population trends are sometimes very different. While sightings of *L. virens* have increased considerably in recent years, those of the formerly much more common *L. sponsa* have declined sharply. A slight increase has also been observed in *L. barbarus*. In contrast, the populations of *L. dryas*, as well as those of the two other, much more common damselflies, *Chalcolestes viridis* and *Sympecma fusca*, are considered to be stable. All species are distributed throughout the country, with regional variations in the size and density of populations depending on their habitat and climate requirements. The distribution and habitat requirements of each species are presented, and typical biotopes with a rich diversity of damselfly species are listed." (Authors/Google translate)] Address: Adelman, J., Potsdamer Str. 70, 64372 Ober-Ramstadt, Germany. Email: jadelmann@web.de

**26055** Adelman, J.; Frank, M. (2025): Nord-Süd-Verbreitung der Libellenarten in Hessen -eine aktuelle Auswertung nach Landesteilen. *Libellen in Hessen* 18: 93-104. (in German) ["The division of the state of Hesse into the three administrative districts of Kassel, Gießen, and Darmstadt also corresponds to the climatic division into North, Central, and South Hesse. While many species, especially the common ones, are fairly evenly distributed across the state, those species known to be "climate-sensitive" are concentrated in the northern parts of the state and the higher elevations of the low mountain ranges. Conversely, the "warm-loving," southern species are more prevalent or exclusively found in the lowlands of southern Hesse. An analysis that compensates for the varying levels of mapping across different state offices illustrates the north-south distribution of all species occurring in Hesse. By examining the two time periods 2006–2014 and 2015–2023, an attempt is made to incorporate the effects of climate change into the discussion." (Authors/Google translate)] Address: Adelman, J., Potsdamer Str. 70, 64372 Ober-Ramstadt, Germany. Email: jadelmann@web.de

**26056** Averill, M. (2025): Worcestershire gets a UK first for an exotic dragonfly – the Slender Skimmer *Orthetrum sabina*. *Worcestershire Record* 54: 34-35. (in English) [United Kingdom, Bromsgrove, 11-X-2024] Address: Averill, M., 49 James Rd, Kidderminster, Worcs, UK, DY10 2TR. Email: mike.averill@blueyonder.co.uk

**26057** Canyelles, X. (2025): *Les libel·lules i els cavallets del dimoni de les Balears*. Edicions Documenta Balear: 150 pp. (in Catalan) ["The stylized, aerodynamic and almost fantastic shape of Odonata has always been a source of attention for popular culture and naturalists. If, in addition, we add their interesting biological cycle associated with water or the long migrations they make, their study is more than justified. There are twenty-four species in the Balearic Islands, which we can identify with the help of this informative book with scientific rigor, which, as a guide, presents each species in full detail, accompanied by updated information. Xavier Canyelles is a naturalist and illustrator, specializing in entomology. With this nature notebook he makes it possible for knowledge about the odonates of the Balearic Islands to be within everyone's reach." (Publisher)]

**26058** Corso, A.; Silvestrini, W.; Amata, C. (2025): *Atlas of the distribution and taxonomy of the Odonata of Sicily*. Info Bologna. *Natura Edizione Scientifiche*: 320 pp. (in English) ["A landmark publication on the Odonata of Sicily and beyond: a vast body of research and study that has occupied the authors for fifteen years, including data collection in the field and at museums. Nearly ten thousand photographs taken

in nature, in the studio, and under the microscope are included. This is a must-have volume for specialists, naturalists, and enthusiasts alike." (Publisher)]

**26059** Deepak, R. (2025): Evaluation of conservation status of reported Indian Odonates (Insecta: Odonata). *Biospectra* 20(1): 73-80. (in English) ["This study assesses the conservation status of all Odonata reported from India. 3 suborders, 17 families and 504 species of odonates are reported from India till now. IUCN has done excellent work on assessing status of conservation, population trends, and distribution of odonates. IUCN Red List provides a comprehensive catalogue and framework for evaluating the conservation status of odonates. However, no consolidated and annotated list of Indian odonates with their conservation status is present, so this study fills this research gap and provides a complete list of reported Indian odonates along with their conservation status. Maximum odonate species were reported under Least Concern and Data Deficient Categories." (Author)] Address: Deepak, R., Dept of Zoology, Mohanlal Sukhadia Univ. Udaipur, India. Email: deepakrawal5@gmail.com

**26060** Finkelstein, I. (2025): *Territoriality in Odonata: Its evolution across the order and role in character displacement in two Japanese damselfly species*. MSc thesis, Biology, Carleton University, Ottawa, Ontario: 101 pp. (in English) ["This thesis investigates territoriality in odonates. The first chapter is a phylogenetic analysis of the causes and consequences of territoriality in the odonate order. The results indicate that there is a strong phylogenetic signal for territoriality. The ancestral state of territoriality for all Zygoptera was likely non-territorial and for all Anisoptera was likely territorial. As predicted, we found that non-contact mate guarding was associated with territoriality, but contrary to our predictions, we did not find that perching behaviour, oviposition method, or habitat type was associated with territoriality. The second chapter investigates aggressive interactions between males of two closely related *Mnais* species where males are polymorphic in one sympatric region, but monomorphic in another sympatric region. We found evidence that there is greater aggression between orange morphs than between orange and clear morphs, potentially providing the basis for the evolution of monomorphism." (Author)] Address: <https://carleton.scholaris.ca/server/api/core/bitstreams/5b078d8a-4e1a-4f16-8b79-fcd4d08563ac/content>

**26061** Friedrich, M. (2025): "Only insects (and angels) were able to acquire wings without sacrificing a limb": Remembering the evodevo legacy of insect paleontologist Jarmila Kukalová-Peck. *Journal of Experimental Zoology Part B Molecular and Developmental Evolution* 344(8): 477-481. (in English) ["On August 13, 2024, comparative biology lost paleontologist Jarmila Kukalová-Peck, a consummate integrative biologist and the pioneer of an innovative model of insect wing evolution, which, partly informed by developmental genetics, remains a key reference in molecular evodevo studies of insect flight appendage evolution. An effort is made to retrace key steps toward this achievement in the scientific trajectory of a unique and exemplary scientist." (Author)] Address: Friedrich, M., Dept of Ophthalmological, Visual, and Anatomical Sciences Wayne State University, School of Medicine Detroit Michigan USA. Email: friedrichm@wayne.edu

**26062** Fukawa, H. (2025): A record of *Brachydiplax chalybea flavovittata* Ris, 1911 from Tokushima Prefecture. *Tombo* 68: 108-109. (in Japanese, with English summary) ["*B. chalybea flavovittata* is a southern species, was observed in Kamoda, Tsubaki-sho, Anan City, Tokushima Prefecture, from August

to September 2024. This is the second record from the prefecture." (Author)] Address: Fukawa, H.: Email: work615@gmail.com 23.05.2026

**26063** Fukaya, W. (2025): Monitoring trade of Japanese Odonata species at Internet auctions. Tombo 68: 70-77. (in Japanese, with English summary) ["I analyzed past trades using Internet auctions of Japanese Odonata specimens and examined the factors influencing the number or successful bids and prices. 187 taxa were traded, the families Aeshnidae and Chlorogomphidae were traded at high prices and frequencies. Model analysis showed that the narrower the distribution range of the taxa, the fewer the number of individuals traded, but the higher the price paid for. The rank on the Red List of the Ministry of the Environment of Japan had no significant effect on the number of traded individuals and prices. Sold prices varied among taxa and sellers, suggesting that factors not considered in this study (e.g., species popularity, specimen quality) may have influenced the number of individuals traded and prices. Although it is unclear whether the commercial trade in Odonata species threatens the populations conservation, there is concern that it may lead to stricter regulations on insect collecting, particularly in the Ryukyu Islands." (Author)] Address: Fukaya, W.: Email: aeshna2074@gmail.com

**26064** Futahashi, R.; Futahashi, H. (2025): A male interspecific hybrid between *Mnais costalis* and *Mnais pruinosa*, identified by RNA sequencing (Zygoptera: Calopterygidae). Tombo 68: 18-22. (in English, With Japanese summary) ["*M. costalis* and *M. pruinosa* have very similar characteristics and are sometimes difficult to identify from external morphology. It has been reported that *M. costalis* and *M. pruinosa* can be identified by sequencing the nuclear DNA ITS 1 region and interspecific hybrids between these two species have been occasionally reported, however, no male interspecific hybrids have ever been obtained. In this study, we analyzed multiple genes on different autosomal chromosomes by RNA sequencing of a male individual with intermediate characteristics collected from Toyama Prefecture, and confirmed that it was an F1 interspecific hybrid derived from a female *M. pruinosa* and a male *M. costalis*. Importantly, nuclear ITS region is located on a sex chromosome in the Japanese *Mnais* species; thus, ITS sequences cannot be judged to determine hybrids because males have only one sex chromosome. Our results indicate that it is necessary to analyze multiple genes on different autosomal chromosomes for male individuals of the genus *Mnais* that are expected to be interspecific hybrids." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

**26065** Futahashi, R.; Matsuhira, K. (2025): An interspecific hybrid between *Rhyothemis regia* (Brauer, 1867) and *Rhyothemis variegata* (Linnaeus, 1763) collected from Amami-Oshima Island, Kagoshima Prefecture, Japan. Tombo 68: 78-79. (in Japanese, with English summary) ["We report on a male interspecific hybrid between *R. regia* and *R. variegata* collected from Amami-Oshima Island, Kagoshima Prefecture, Japan. Although this individual was originally reported as *R. regia*, it had more yellowish wings than *R. regia*, yellowish-brown areas on the head as in *R. variegata*, and yellowish-brown hairs around the secondary male genitalia as in *R. variegata*. The result of a nuclear DNA analysis of ITS region confirmed that this specimen is an interspecific hybrid between *R. regia* and *R. variegata*." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

**26066** Gebbert, J.; Klausnitzer, B. (2025): Bericht über die 31. Jahrestagung Sächsischer Entomologen am 11. Oktober 2025 in Dresden-Johannstadt. Entomologische Nachrichten und Berichte 69(3): 349-350. (in German) [Brief report on a lecture of T. Brockhaus reporting on the Odonata fauna of bogs in Sachsen, Germany.] Address: Klausnitzer, B., Lan-nerstr. 5, 01219 Dresden, Germany

**26067** Gesellschaft deutschsprachiger Odonatologen GdO e.V., Professur für Angewandte Zoologie der Technischen Universität Dresden; Senckenberg Museum für Tierkunde Dresden (Hrsg.) (2025): 42. Jahrestagung der Gesellschaft deutschsprachiger Odonatologen GdO e.V. Technische Universität Dresden 14. bis 16. März 2025. Abstracts of the 42. Jahrestagung der Gesellschaft deutschsprachiger Odonatologen GdO e.V.: 50 pp. (in German and English) [Verbatim/Google translate: Lecture Program – Saturday, March 15, 2025 9:00 Opening Klaus Reinhardt, Klaus-Jürgen Conze 9:15 – 11:00 The Dragonfly Fauna of the Host Region Session Chair: Viola Clausnitzer 9:15 André Günther, Freiberg Changes in the Dragonfly Fauna of Saxony 9:40 Thomas Brockhaus, Jahnisdorf Moorland Dragonflies in Saxony – Current Distribution and Conservation Status 10:00 Karsten Wesche, J. Ahlborn, L. Janke, H. Scholz, M. Trampenau, M. Keitel The Upper Lusatian Heath and Pond Landscape – A Biodiversity Hotspot for Dragonflies, Too 10:20 Susanne Kurze, Freiberg; Matthias Nuß, Dresden Dragonflies in the "Insekten-Sachsen" Citizen Science Project 10:40 Bernard Hachmöller Moorland Revitalization and Dragonfly Fauna in the Georgenfeld Raised Bog in the Eastern Ore Mountains (Saxony) 10:55 – 11:30 Coffee Break 11:30 – 12:30 Open Topics I Session Chair: Diana Goertzen (invited) 11:30 Jolan Hogreve, Frank Suhling, Frank Johansson, Braunschweig Size matters? Prey Capture Success of \**Sympetrum striolatum*\* Larvae 11:45 Ojonugwa Ekpah, Kehinde Abike Kernabonta, Frank Suhling, Braunschweig Records and Distribution of Nigerian Odonata 12:00 Natalie Lazovic, Anna-Maria Röthig, Emily Franke, Oliver Otti, Yvette M. von Bredow, Christian Schmidt, Klaus Reinhardt, Christoph-Rüdiger von Bredow, Dresden Comparative Glycoconjugate Analysis of Insect Sperm: Three Examples from the Zygoptera (Insecta: Odonata) 12:15 Short Poster Presentations (3 min) in the Following Order 1) Klaus-Jürgen Conze: History of Odonatology in Germany – Status Update on Volume III (Germany Atlas) 2) Balázs Mátyus, György Dévai, Tibor Jakab: Change in the Occurrence of Dragonfly Species Along the River Tisza (Odonata: Gomphidae) 3) Anna-Maria Röthig, Emily Franke, Natalie Lazovic, Oliver Otti, Yvette M. von Bredow, Christian Schmidt, Klaus Reinhardt, Christoph-Rüdiger von Bredow: Glycosylation and Morphometry of *Calopteryx splendens* Spermatozoa 4) Kerstin Mammen: Dragonflies and Dragonfly Habitats in the "Green Belt" National Natural Monument (Saxony-Anhalt) Transition to the Foyer and Room E33, Biology Building at TU Dresden – see map on the back cover. 12:35 – 14:00 Lunch Break Please use the lunch break to take another thorough look at the posters. Unfortunately, you must return to the lecture hall for the presentations. 14:00 – 15:00 Documenting Germany's Dragonflies Session Chair: Klaus Reinhardt 14:00 Klaus-Jürgen Conze, Essen Analysis of Threats and Red List of Germany's Dragonflies – Current Status and Outlook 14:25 Klaus-Jürgen Conze, Christian Göcking, Mathias Lohr, Norbert Menke, Christopher Mollmann Call for Participation: Dragonfly Monitoring in Germany 14:50 Thore Engel, Maya Bosch, Martin Friedrichs-Manthey, Aletta Bonn, Leipzig The Living Atlas of Germany's Nature (LAND) and Dragonfly Data: Collaboration for National and International Biodiversity Analyses 15:15 – 15:45 Coffee Break (Foyer and Room E33, Biology Building, TU Dresden) 15:45 – 17:45 General

Meeting of the GdO e.V. Foyer and Room E33, Biology Building, TU Dresden – see diagram on the inside back cover. Lecture Program: Sunday, March 16, 2025 9:00 – 10:20 Dragonflies in New Environments Session Chair: Jan Hogreve 9:00 Daniel Kürty, Basel (CH) From Sewage Pond to Dragonfly Paradise – A Project to Enhance an Oxbow Lake on the Upper Rhine 9:20 Alexander Hermann, Karlsruhe Dragonflies and Photovoltaics – Are Polarotactic Distortions Caused by PV Modules a Problem for Species Conservation? 9:40 Jule Lubczyk, Janina Dreyer, Jana Packmor, Rainer Buchwald, Oldenburg Road Bridges as Barriers: The Influence of Light on the Behavior of Demoiselles (*Calopteryx* spp.) on the Delme Stream (Lower Saxony) 10:00 Diana Goertzen, Braunschweig New Occurrences of *Coenagrion mercuriale* in the Braunschweig Region 10:20 to 11:00 Coffee Break 11:00 Adam Tarkowski: Information regarding the ECOO26 Conference in Poland 11:05 to 12:30 Distribution and Conservation of Dragonflies; Open Topics 2 Discussion Chair: André Günther 11:05 Paweł Buczyński, Edyta Buczyńska, Paweł Bojar, Krystian Adam Oldak, Agnieszka Tanczuk, Lublin (PL) The Dragonfly Fauna of Old Peat Pits in a Pond Pine Forest within Poleski National Park (Eastern Poland) 11:20 Barbara Thomas, Nettetal Dragonflies and Climate Change in the Viersen District (NRW) – Long-Term Observations 11:40 Matthias Hartung, Kyritz Details regarding the book “Dragonflies and Damselflies of the Continents” 11:55 Andreas Martens, Karlsruhe The Dragonflies of \*Archetypa studiaque\* by Jacob Hoefnagel (1592): Now Identified to Species Level 12:10 Wolfgang Zessin, Picher Net or Hammer? An Amusing Insight into the Practice of Dragonfly Catching 12:25 Closing Remarks Klaus-Jürgen Conze Feedback geben] Address: [https://www.libellula.org/wp-content/uploads/2025/07/2025\\_GdO42\\_Dresden\\_Programm\\_opt.pdf](https://www.libellula.org/wp-content/uploads/2025/07/2025_GdO42_Dresden_Programm_opt.pdf)

**26068** Herrero Hemán, J.; Sanchis Carles, M.J.; Evangelio Pinach, J.M. (2025): Nuevos registros de libélulas (Insecta: Odonata) y aproximación al listado odonológico del paisaje protegido de la Serra del Maigó y Serra del Sit (Alacant, sureste de España). *Nemus* 15: 297-307. (in Spanish, with English summary) [“New records of dragonflies and approximation to the odontological list of the Protected Landscape of the Serra del Maigó and Serra del Sit (Alacant, southeastern Spain): This work presents the first study on dragonflies from the Protected Landscape of Serra del Maigó and Serra del Sit, along five localities near its perimeter (Alicante, southeastern Spain), based on records collected from August 5, 2012 to August 6, 2024. Likewise, the provisional Odonata list of the Protected Landscape is prepared, which currently amounts to 24 species. Among the most interesting, due to their scarcity in the province of Alicante, are *Coenagrion mercuriale*, *Coenagrion caerulescens*, *Lestes virens* or *Libellula depressa*.” (Authors)] Address: Hemán, J., Sociedad Odonatológica de la Comunitat Valenciana-Parotets; Partida Las Tiesas, 266, 03400, Villena, Alacant, Spain. Email: [gorkaupa@gmail.com](mailto:gorkaupa@gmail.com)

**26069** Karube, H. (2025): Northern limit record of *Aeshna subarctica* subarctica Walker, 1908 and its swarming. *Tombo* 68: 99-101. (in Japanese, with English summary) [“*A. s. subarctica* is a species found only in limited parts of Hokkaido in Japan. In the Soya region of northern Hokkaido, Miyazaki (1974) recorded this species in Iovotomi Town from a single male specimen, and Kawasaki & Yokoyama (2022) additionally recorded the species from Horonobe Town of the same region. In this report, the author found a new habitat for this species in the northern limit of its range, which is close to the location of Miyazaki's record. The author also observed swarming behavior in this species there.” (Author)] Address:

Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: [paruki@nh-kanagawa-museum.jp](mailto:paruki@nh-kanagawa-museum.jp)

**26070** Karube, H.; Watanabe, S.; Kaga, R. (2025): The current status of the declining dragonflies of Tsushima 3 - Estimation of factors contributing to the decline of *Sympetrum frequens* (Selys, 1883). *Tombo* 68: 63-69. (in Japanese, with English summary) [“We reported on the drastic decline of *S. frequens* in the Tsushima Islands, Nagasaki Prefecture, in 2024, and stated the possibility that it may not be able to survive the summer, due to the rapid warming of recent years. In this report, we use actual meteorological data collected by observation equipment on the highest peaks of both Shimojima and Kamijima in Tsushima in 2024. From the measured data, it becomes clear for the first time that more than 30 °C, far exceeding 23 °C, which is considered as the upper limit of optimal temperature for *S. frequens* to survive the summer, was observed even in the area of the highest peak of the Tsushima Islands. Moreover, the high temperature period lasted from mid-July to mid-September, indicating that abnormally high temperatures are actually continuing. The temperature difference between the meteorological observation point of Izuhara and the highest peak area was used to estimate the temperature transition of the highest peak area in the past. The results show a temporary period of high temperatures in the 1960s, followed by periods of rarely exceeding 30 °C from the 1970s to the 1990s, then since the 2010s, the frequency of high temperatures increasing and high temperatures becoming the norm. In the field survey of *S. frequens*, as in the previous year, no individuals were found to have survived the summer in the highlands of the island, strongly suggesting the possibility that the current generation on the Tsushima Islands has been interrupted by the inability to survive the summer due to the unusual high temperatures during the summer.” (Authors)] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: [paruki@nh-kanagawa-museum.jp](mailto:paruki@nh-kanagawa-museum.jp)

**26071** Karube, H.; Kaga, R. (2025): The current status of the declining dragonflies of Tsushima 2 - From the 2024 survey. *Tombo* 68: 56-62. (in Japanese, with English summary) [“In the survey of the current status of the Odonata fauna in Tsushima Island, Nagasaki Prefecture, Japan, which started in the summer of 2023, we conducted five surveys from May to October in 2024. In the previous paper, we reported on the decline of the genus *Sympetrum*. This paper reveals that *Orthetrum internum* is now localized with fragmented habitats, due to the decrease of wetlands, *Mortonagrion hirosei*, the habitat status of which had been unknown, was reconfirmed in two locations; and *Libellula quadrimaculata asahinai* and *Sympetrum striolatum imitoides* were found to be in a very critical situation, with only one confirmed habitat, respectively, although they are still present. Four species (*Lestes sponsa*, *Mortonagrion selenion*, *Ceragrion nipponicum*, *Pseudocopteryx annulata*), with only one previous record, could not be found in this survey, more than 50 years after they were recorded. We point out that these species may have become extinct from Tsushima Island or may have been mis-recorded. In Tsushima Island, which is characterized by its mountainous terrain, the habitats of Odonata species living in stagnant water have been limited, and the wetlands that once existed at the back of the bay have been converted into rice paddies by agricultural development, and most of them have been turned into grasslands due to the subsequent abandonment of cultivation. The water environment on Tsushima Island has changed greatly in recent years caused by pesticide pollution and other factors, and the situation is expected to continue

to worsen in the future." (Authors)] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp

**26072** Kennedy, L. (2025): Dragonfly News 87. Dragonfly News 87: 1-44. (in English) ["**DRAGONFLIES AND YOU**: Photos and dragonfly stories from you. From voracious predatory beetles to award winning photography. Don't forget to send in your images to be featured! **WWT SUMMER OF WONDER**: This year, WWT, the charity for wetlands, is celebrating dragonflies and all the hard work done by site teams to manage and enhance habitats for the benefit of dragonflies at its 10 wetland sites across the UK. Find out how you can get involved this summer. Penny Smallshire **THE CHALLENGE - OBTAINING PROOF OF BREEDING LESSER EMPEROR**: Records of Lesser Emperor (*Anax parthenope*) have been increasing, but are these migrants or are they breeding more locally? Steve Cham **DRAGONFLIES HQ**: The latest news and updates from Team Dragonfly. Including: a summary of recording in 2024, an introduction to new staff members, and the latest in Colonist and Migrant News. **FIELD MEETINGS AND EVENTS**: A snapshot of some of our events and field meetings taking place this summer. For our full list of events and up to date information take a look at the events page of our website. Collated by Adrian Parr **ANNUAL MEETING**: Henry Curry provides a personal view of our 2024 Annual Meeting. Looking forward to 2025, we have updates on this years conference and a notification of the date for our AGM. Henry Curry and Lauren Kennedy **SCOTLAND PROJECTS**: An update on our exciting work in Scotland including two new projects: Dragonflies on the Bog and 100 Ponds Project. Jen Davidson **VOLUNTEERING AND PROJECTS SPOTLIGHT**: Highlighting volunteering, volunteer groups and current projects active across the UK. **EXPANSION OF "SOUTHERN DRAGONFLIES" INTO SCOTLAND**: Since 2000, five species of dragonfly have been recorded for the first time in Scotland. This article is part one of two, covering the spread of these species into Scotland, starting with the spread of Emperor and Migrant Hawker. Pat Batty and Barbara Mearns **YOUTH PANEL**: Prepare to be inspired with poetry created from an encounter with a Banded Demoiselle and dragonfly photography tips that will have you reaching for your camera ready for the coming season! Emily Hunt and Holly Daniels **DAVID MCCULLOCH; A DRAGONFLY'S FRIEND**: Last autumn we were very sorry to hear that David McCulloch, a very keen volunteer and dragonfly champion, had passed away. Danielle pays tribute to his hard work and passion for dragonflies and wildlife. Danielle Muir **RECORDING SCHEME**: Up to date contact information for County Dragonfly Record-ers." (Publisher) Address: <https://british-dragonflies.org.uk/wp-content/uploads/2023/07/DN2025-Spring.pdf>

**26073** Kita, H.; Kawata, N.; Suda, S.-i. (2025): Behavior of male *Leptogomphus yayeyamensis* Oguma, 1926 that remained stationary over a mating female. Tombo 68: 91-93. (in Japanese, with English summary) ["A male of *L. yayeyamensis* was observed remaining motionless for long periods of time on top of a mating female on Ishigaki Island in Okinawa Prefecture. Triple connections in the same species have been reported in the past, however, in this study, the other male did not engage in a tandem state, but rather remained stationary on the female for a long period of time, more than 40 minutes. In this report, we report the details of this observation and attempt to consider it." (Authors)] Address: Kita, H.: Email: kita1114-age@u01.gate01.com

**26074** Kutsuma, T.; Futahashi, R.; Ozono, A. (2025): An interfamilial male-male tandem between *Anax parthenope*

(Selys, 1839) and *Macromia amphigena* Selys, 1871. Tombo 68: 97-98. (in Japanese, with English summary) ["We report on an interspecific male-male tandem between *A. parthenope* and *M. amphigena*, photographed in Koumi-machi, Nagano Prefecture. This is probably the first report of interfamilial male-male tandem between large-sized dragonflies, and the second record of a tandem between families Aeshnidae and Macromiidae in Japan." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

**26075** Longarela, I.O.; Cabana, M. (2025): Libélulas (Insecta: Odonata) do curso alto do rio Ulla. Chiglossa 5: 15 pp. (in Galician, with English summary) ["The results of dragonfly surveys conducted in the upper basin of the Ulla River and adjacent areas are presented, incorporating information from citizen science platforms. A total of 876 observations were collected in 85 UTM grids of 1x1 km, with a total of 40 species of dragonflies observed in the study area, which represents 75.5% of the 53 species present in Galicia." (Authors)] Address: Longarela, I.O., Lema de Abaixo, 29. Arzúa. 15819 A Coruña, Spain. Email: oroisivan@gmail.com

**26076** LPO (2025): Étude du Leste à grands stigmas *Lestes macrostigma* (Eversmann, 1836) en Charente-Maritime et des paramètres environnementaux influençant la sélection d'habitat de reproduction. Ligue pour la Protection des Oiseaux: 76 pp. (in French) ["Study of the *Lestes macrostigma* (Eversmann, 1836) in Charente-Maritime and of the environmental parameters influencing breeding habitat selection: ... Conclusion: In light of the findings of this study—as well as those proposed regarding Mediterranean and Vendée populations—it appears that the conservation of *L. macrostigma* requires a multi-pronged approach involving both practical action and strategic reflection: 1. A strategy of land acquisition or habitat restoration aimed at securing, over the long term, a diversity of hydrological regimes and basin structures, thereby establishing a geographical network of viable habitats for *L. macrostigma*. Indeed, the environments frequented by *L. macrostigma* are subject to significant seasonal fluctuations (cycles of flooding and drying out). Since water levels cannot be controlled on a large scale across such a multitude of micro-habitats, placing a wide array of sites—identified as favorable to the species and possessing natural hydrological regimes—under protection could significantly contribute to its conservation on a broader scale. 2. At known key sites currently under active management, maintaining practices that benefit the species is crucial. In addition to appropriate water management, measures to protect bulrush beds (*scirpaies*) can be implemented; these include the establishment of grazing exclosures, as well as actions to limit the impact of coypu ("ragondin") populations (e.g., population control or the installation of physical barriers). 3. Ongoing monitoring of *L. macrostigma* populations is also essential. Currently, in the Charente-Maritime department, only the surveys conducted within the National Nature Reserves (Moëze-Oléron and Marais-Baie d'Yves) provide a genuine overview of population trends. However, given that this species is highly sensitive to local conditions and prone to significant fluctuations, these monitoring efforts are currently too geographically limited in scope. Such monitoring would also facilitate vigilant oversight regarding both established and emerging threats—specifically, the presence of non-native crayfish, the long-term impact of *Azolla filiculoides* on bulrush beds, and the increasing frequency of extreme climatic events (ranging from severe droughts to periods of heavy rainfall). Ideally, these actions should be carefully considered

and coordinated across the Atlantic seaboard in order to maintain geographical coherence for the species. This entails designing future monitoring and conservation programs spanning two regions: Nouvelle-Aquitaine and Pays de la Loire. The national working group dedicated to this species serves as a driving force in this regard, bringing together all stakeholders involved in working with the species." (Authors/Google translate)] Address: [https://libellules.pnaopie.fr/wp-content/uploads/2026/05/Etude\\_Lestes\\_macrostigma\\_en\\_Charente-Maritime\\_2023-2025\\_LPO.pdf](https://libellules.pnaopie.fr/wp-content/uploads/2026/05/Etude_Lestes_macrostigma_en_Charente-Maritime_2023-2025_LPO.pdf)

**26077** Mallick, Md.A.I.; Malakar, R.; Midya, P. (2025): Abundance and diversity of Odonata (Insecta) as an environmental indicator at two land use types in Kalyani Lake Park and Bortir bill (Nadia and North 24 Parganas district), West Bengal, India. *Munis Entomology & Zoology* 20(2): 2238-2260. (in English) ["To understand the effects of changing proportions of land-use patterns on species diversity. Odonates are good bio-indicators of environmental changes. The present studies were conducted in Kalyani Lake Park and Bortir Bill, West Bengal, India from June to December 2021 and 2022 to assess the diversity of Odonata species. The present study recorded a total of 41 species of Odonata. 35 species were found in Kalyani Lake Park as compared to 25 species in Bortir Bill agricultural land, with 19 species common to both the localities. This study found a total of 41 species of Odonata.... Factors that affected biodiversity included water availability, vegetation cover and abundance of predatory species like water spiders during monsoon and post-monsoon period. The degradation of the wetland by human activities are a potential threat to the Odonate individuals and on biodiversity overall. It is recommended that increased awareness on the importance of using native insect species as first-level indicators of environmental health can save the nation's significant funds over chemical interventions. Relative abundance, shannon winner diversity index, margalef's richness index, evenness index, dominance index, simpson index, descriptive statistics, students't-test and one-way ANOVA have been used to establish the relation between species diversity and habitat. The present investigation provides baseline data for future research and conservation of odonate species in places like the model city, which face rapid urbanization." (Authors)] Address: Mallick, Md. A.I., West Bengal Biodiversity Board, Prani Sampad Bhawan, 5th Floor, Salt Lake, LB-2, Sector-III, Kolkata, West Bengal - 700106, India. Email: [imranmallick708@gmail.com](mailto:imranmallick708@gmail.com)

**26078** Marín-Hernández, E.M.; Chico-Úbeda, G.; Martínez-Torres, S.; Martínez-Ruzafe, P.; Millán, A.; Sánchez-Fernández, D.; García-Meseguer, A.J. (2025): Aportación al conocimiento de los coleópteros, hemípteros, odonatos y moluscos acuáticos en fuentes del sureste ibérico. *Boletín de la Sociedad Entomológica Aragonesa (S.E.A.)* 77: 91-96. (in Spanish, with English summary) ["Contribution to the knowledge of Coleoptera, Hemiptera, Odonata and aquatic molluscs in springs of the southeastern Iberian Peninsula. - Springs or water sources are vital ecosystems in a Mediterranean context as they provide essential ecosystem services harboring a unique biodiversity. However, we still need deeper knowledge about the community of macroinvertebrates inhabiting them. This study analyzes the taxonomic composition of four groups of aquatic macroinvertebrates in eleven springs located in the Segura River basin. A total of 45 species were identified: ... 11 odonates...." (Authors)] Address: Marín-Hernández, Eva María, Depto. Ecol. e Hidrología, Fac. Biol., Univ. de Murcia, 30100. Espinardo, Murcia, Spain. Email: [evamaria.marin@um.es](mailto:evamaria.marin@um.es)

**26079** Mochon, A. (2025): Rencontre fortuite avec une libellule migratrice inattendue au Québec: La Traméa rayée.

*Bulletin de l'entomofaune* 57: 9-10. (in French) ["On July 10, 2025, an odonatological field trip to Grande Baie in Lake of Two Mountains, Oka National Park, led to the first recorded sighting of *Tramea darwini* in Quebec, bringing the number of odonate species identified in the province to 154. It now appears on the Entomofaune du Québec Odonata list ([https://entomofaune.qc.ca/entomofaune/odonates/Liste\\_especes.html](https://entomofaune.qc.ca/entomofaune/odonates/Liste_especes.html)). Note that in 2021, the species' scientific name changed from *T. calverti* to *T. darwini* (Lorenzo-Carballe et al., 2021). Spotted by chance in flight, the individual perched briefly on the tip of a bulrush stem. It was thus identified thanks to photographs revealing the black band at the base of the hindwings and the black coloration of the last abdominal segments. Figure 3 shows the Striped Saddlebag, which displays broad hindwings, smoky at the base, and a contrasting bright red abdomen, with segments 8 to 10 and the anal appendages being black. In this photograph taken on July 10, 2025, the two pale lateral bands on the thorax—the origin of its French and English names (Striped Saddlebags)—are hidden in shadow. The genus *Tramea* comprises 21 species widely distributed in tropical and subtropical zones (Paulson et al., 2025), including seven in North America and four in Canada. Until now, only the Laced Saddlebag (*T. lacerata*) was known locally in Quebec, where it breeds occasionally in the St. Lawrence Lowlands. Like their relatives in the genus *Pantala*, *Tramea* are excellent migrants; their very broad hindwings facilitate long-distance gliding (Cannings et al., 2024; Lam, 2024). Native to Central America and the Caribbean, the striped *Tramea* is rarely seen north of Texas, but occasionally ventures northward, often associated with tropical depressions moving up the East Coast and into the Midwest (Needham et al., 2014; Paulson, 2011). Since the observation of an exceptional dispersal that reached Canada in 2010 (Cannings et al., 2024), 16 further sightings have been reported between October 6, 2014, and September 1, 2025, primarily in southern Ontario, with one isolated sighting as far north as Nova Scotia on September 29, 2020, and another in New Brunswick on July 22, 2023 (iNaturalist). The sighting on July 10, 2025, in Oka National Park is not only a first for Quebec, but also the earliest in Canada and one of the northernmost on the continent, along with those in Michigan, New Brunswick, and Nova Scotia (Abbott, 2006–2025; Figure 4). These recent sightings illustrate the remarkable dispersal potential of certain migratory Neotropical dragonflies." (Verbatim/Google translate)] Address: Mochon, A. E-mail: [mochon.alain@sepaq.com](mailto:mochon.alain@sepaq.com)

**26080** Naaz, F. (2025): Relationships between mother and daughter in the mirror of socio-historical realities of the 20th century: An analysis of the novel by O. Slavnikova "A dragonfly enlarged to the size of a dog". *The International Journal of Novel Research and Development* 10(7), b778-b786. <https://ijnrd.org/papers/IJNRD2507182.pdf>. 9 pp. (in Russian, with English summary) ["In the present article, we analyse the debut novel by O. Slavnikova "A Dragonfly Enlarged to the Size of a Dog", which attracted not only the attention of the readers but critics too, because of its critical and controversial character. In this novel writer describes how the socio-historical realities of the soviet period impacted the individual and personal life of its citizens and how these conditions complexed the relation amongst the family members. This novel breaks the stereotypical image of the mother, traditionally accepted in patriarchal societies, and reflects different shades of the relationship between mother and daughter. This relationship is not ideal, but complicated and deformed. The writer also looks for the reasons for the spiritual illness and suffering of this mother and daughter pair and the complexity in their relationship." (Author)] Address: Naaz, Fahimina, Department of Slavonic and Finno-Ugrian Studies,

**26081** Naraoka, H. (2025): Larval development of two generations of *Paracercion calamorum* (Ris, 1916). Tombo 68: 51-55. (in Japanese, with English summary) ["Larval development of *P. calamorum* was studied from 1985-1988, using natural populations, at Aomori Prefecture, Japan. Univoltine larvae hatched after July and hibernated with 6-10 instars. The mature larval size was gradually smaller from December to next July. Bivoltine larvae appeared during May and August. Unlike univoltine larvae the final stage for bivoltine larvae was the 9th instar, and the larval size of final stage was almost equal throughout the emergence period. The final instar of univoltine larva was larger than that of bivoltine, though each stage or 2-9 instars in bivoltine larva was larger than the correspondence of univoltine. Antennal development from 3 segments in first instar to 7 segments in final instar, was persistent through two generations. Tip of wing sheaths reached the thoracic 2nd segment up to the 4th instar, developing to abdominal 3rd segment by the final instar in both generations." (Author)] Address: Naraoka, H. Email: naraoka62@gmail.com

**26082** Nemoto, Y.; Takahashi, H.; Kjkuchi, T.; Miyagami, K.; Murakami, F.; Kajitani, M. (2025): Identification of two species of *Mnais* damselflies from Tochigi Prefecture using a new DNA typing method and their distribution. Tombo 68: 23-31. (in Japanese, with English summary) ["A simple method for identifying two species of the genus *Mnais* was devised. This new DNA typing method is a PCR method using primers specific to the SNP site in the ITS 1 region that are effective only for *Mnais costalis* or *Mnais pruinosa*. Using this method, 108 damselflies collected at 16 locations in Tochigi Prefecture were examined, and 85 were *M. costalis* and 23 were *M. pruinosa*. *M. costalis* was distributed throughout the prefecture, while *M. pruinosa* was restricted to Nikko, Kanuma, Tochigi, and Yaita. The two species of *Mnais* damselflies from Tochigi Prefecture tended to be small in body length." (Authors)] Address: Kajitani, M. Email: kajitani@nasu.bio.teikyo-u.ac.jp

**26083** Ota, S. (2025): First *Sympetrum cordulegaster* (Selys, 1883) recorded from Mt. Haruna in Gunma Prefecture. Tombo 68: 106-107. (in Japanese, with English summary) ["*S. cordulegaster* was photographed on Mount Haruna 5-VIII-2024, which is the first record of this species from Gunma Prefecture. This record is considered to be a natural occurrence and is unique as it is an unprecedented record at such a high altitude." (Author)] Address: Ota, S.: Email: sho39ota@gmail.com

**26084** Petzold, F.; Zimmermann, W. (2025): Faunistik und praxisnahe Weiterbildung: Der Arbeitskreis Libellen Thüringen. Landschaftspflege und Naturschutz in Thüringen 61(4): 180-181. (in German) [Verbatim/Google translate: The roots of the current Dragonfly Working Group date back to 1994. At that time, Dr. W. Zimmermann presented a draft of a mapping program for dragonflies in Thuringia to the Advisory Board of the Thuringian State Institute for the Environment (TLU). The idea met with approval. To advance the systematic recording of the dragonfly fauna more effectively, the TLU—specifically through Dr. F. Fritzlar—expressly requested and supported the establishment of a "Dragonfly Interest Group" to assist the Advisory Board. Consequently, contact was established with the dragonfly faunists active in the region at that time. On January 17, 1994, an initial gathering took place at the Museum of Nature Gotha, led by Dr. W. Zimmermann and Dr. F. Fritzlar; this meeting is regarded as the founding session of the Dragonfly Interest Group. Additional participants included P. Beck, R. Bellstedt, Dr. U. Bößneck, R. Brettfeld, M. Jänicke, S. Kognitzki, D. Mey, C. Nöllert, R. Samitz, Dr. K. Reinhardt, and B. Trockur. The primary objective was to create a platform

for exchange among the faunists. Annual meetings followed to evaluate the results of the mapping surveys that had been conducted. A shared goal soon emerged: the compilation of a comprehensive dragonfly fauna of Thuringia. Although this ambitious undertaking was initially targeted for completion by 1997 or 1998, it was not ultimately brought to fruition until 2005, with the publication of the "Distribution Atlas of the Dragonflies of Thuringia" (Zimmermann et al. 2005). Concurrently, collaborative work was undertaken on the first "Red List of the Dragonflies of Thuringia" (Zimmermann 2001). Organized by M. Klöppel, a working excursion of the Interest Group took place on June 22, 2001, within the "Thuringian Slate Mountains/Upper Saale" Nature Park. This gave birth to the idea of supporting faunistics through joint excursions of the Interest Group, while simultaneously combining this with practical professional development. Following Dr. W. Zimmermann's retirement from the Scientific Advisory Board of the Thuringian State Institute for Environment and Geology (TLUG), leadership of the "Dragonfly Interest Group" passed to F. Petzold in 2007. He was supported by D. Mey (Nature Park "Eichsfeld – Hainich – Werratal") and M. Klöppel (Nature Park "Thuringian Slate Mountains/Upper Saale"). Since then, the association has operated under the name "Thuringian Dragonfly Working Group." In the years that followed, the focus of the group's work shifted: given the declining number of active dragonfly surveyors, attention turned increasingly toward imparting fundamental knowledge of dragonfly ecology. In collaboration with the TLUG, the concept of annual excursions was revived. These excursions serve to showcase areas of particular interest for dragonfly studies or to explore regions where data is currently lacking. Participants learn how dragonflies can be utilized as indicator species to assess the ecological quality of aquatic habitats; they receive identification aids and gain insights into habitat requirements, survey methods, and the proper documentation of collected data. The target audience for these events includes employees of nature conservation agencies, planning consultancies, and associations, as well as biologists, nature guides, and anyone with a general interest in dragonflies. The first excursion under the new leadership took place on July 15, 2007, near Ebeleben. Since then, it has been held annually in June at various locations as part of the event program of the Thuringian State Office for Environment, Mining, and Nature Conservation. Additionally, in the winters of 2008 and 2009, the working group organized seminars on identifying exuviae. Exuviae—the shed skins of dragonfly larvae left behind after emergence—serve as important indicators of the successful development (and thus the established presence) of a dragonfly species at a specific body of water. At the beginning of each year, the working group distributes a review of the previous dragonfly season to all interested parties, supplemented by information on ongoing projects and publications on dragonflies relevant to the Thuringia region. Furthermore, the group answers inquiries regarding dragonflies. Anyone with an interest in dragonflies is cordially invited to participate in the working group's next field excursion. Information regarding upcoming dates can be found on the website prior to each event: <https://tlubn.thueringen.de/service/termine-und-veranstaltungen>.] Address: Petzold, F., Pappelallee 73, 10437 Berlin, Germany. Email: petzold.falk@googlemail.com

**26085** Pyone, A.A.; Htwe, Z.C. (2025): Species composition and relative abundance of some dragonfly species in Mingun Village, Sagaing Township. Sagaing University Research Journal 11(1): 239-246. (in English) ["The present study was carried out based on the data gained from Mingun Village of Sagaing Township from December 2019 to August 2020. Dragonfly species from two sampling sites were collected

twice a week throughout the study period. A total of 17 species belonging to 12 genera, two subfamilies under two families of dragonflies were recorded. It indicated that the species composition of family Libellulidae was the highest with 2413 (99.63%) and Gomphidae was the lowest with nine (0.37%). Dragonflies were successfully recorded at two study sites. Species composition and relative abundance of the recorded species were described with tables. The maximum number of species (16) were recorded in Site II and the minimum number of species (six) in Site I during study period. Out of all recorded species, *Brachythemis contaminata*, *Crocothemis servilia*, *Orthetrum sabina*, *Pantala flavescens* and *Trithemis pallidinervis* were found in both study sites. The relative abundance of *P. flavescens* was found to be the highest (0.2585) while *Ictinogomphus rapax* was the lowest, only (0.0037)." (Authors)] Address: Pyone, A.A., Dept of Zoology, Sagaing University, Myanmar

**26086** Rana, L.; Bhatia, S. (2025): The role of Odonata in wetland ecosystems: An ecological perspective. *International Journal of Environmental Chemistry* 11(1): 15-20. (in English) ["Odonata ... are integral to the health and sustainability of wetland ecosystems. These insects serve as both apex predators in aquatic habitats and key prey species in terrestrial food webs, ensuring ecological balance. In their larval stage, Odonata contributes to nutrient cycling and water quality by preying on detritivores and controlling populations of aquatic pests, such as mosquitoes. As adults, they help regulate terrestrial insect populations, acting as natural pest control agents. Additionally, Odonata are bioindicators of wetland health, responding sensitively to changes in water quality, habitat structure, and climate conditions. Their presence and diversity reflect the ecological integrity of wetland systems, making them invaluable for monitoring environmental changes. This review highlights the multifaceted ecological roles of Odonata, emphasizing their importance in trophic dynamics, ecosystem services, and conservation efforts to preserve biodiversity and wetland functionality. Recognizing their ecological contributions is crucial for designing sustainable management strategies for wetland habitats globally." (Authors)] Address: Bhatia, Shweta, Research Scholar, Department of Biosciences, Himachal Pradesh University, Summerhill, Shimla, Himachal Pradesh, India. Email: shwetabhatia302@gmail.com

**26087** Samandarova O. D.; Medetov M. J. (2025): Faunistic analysis of dragonfly (Insecta: Odonata) distributed in Tashkent region. *International Journal of Virology and Molecular Biology* 14(5): 73-76. (in English) ["This article describes the collection of samples from different regions of the Tashkent region and their species composition analysis. The research was carried out in the Tashkent region of the Republic of Uzbekistan in 2024 (spring, summer, autumn) and 2025 (April, May)." Records of *Calopteryx splendens*, *Calopteryx virgo*, *Platycnemis pennipes*, *Lestes dryas*, *Sympecma fusca*, *Coenagrion pulchellum*, *Enallagma cyathigerum*, *Ischnura elegans*, *Ischnura pumilio*, *Ischnura forcipata*, *Anax parthenope*, *Libellula quadrimaculata*, *Sympetrum vulgatum*, *Sympetrum flaveolum*, *Sympetrum meridionale*, *Orthetrum brunneum*, *Orthetrum cancellatum*, and *Orthetrum sabina* are documented.] Address: Samandarova O., National University of Uzbekistan, Tashkent, Uzbekistan

**26088** Sampa, T. (2025): Autumn records of Odonata larvae in the school swimming pool located on Yonaguni Island, Okinawa Prefecture. *Tombo* 68: 80-83. (in Japanese, with English summary) ["We investigated the species composition of Odonata larvae at the school swimming pool located on Yonaguni Island, Okinawa Prefecture in early October

2024. A total of four species of Odonata larvae were recorded at the survey site. *Orthetrum sabina* was the most abundant followed by *Pantala flavescens*, *Anax parthenope julius* and *Tramea* sp. With consideration of the known species range and biology, the species composition observed in the school swimming pools is likely to be consistent with those of the Yae-yama Islands." (Author)] Address: Sampa, T.: Email: sampa.ta-tsuya@gmail.com

**26089** Sano, S.; Kameoka, J. (2025): First records of *Brachytron anisopterum* (Selys, 1883) and *Brachydiplax chalybea flavovittata* Ris, 1911 from Iki Island, Nagasaki Prefecture, Japan. *Tombo* 68: 101-111. (in Japanese, with English summary) [B. anisopterum: 31-VII-2024; B. chalybea flavovittata: 31-VII and 1-VIII-2024] Address: Sano, S.: Email: sano-gengoroh@kannonzaki-nature-museum.org

**26090** Savard, M.; Chiricota, L. (2025): Northward surprise: Overwintering naiads of Common Green Darner (*Anax junius*) near the 49th parallel in the province of Québec, Canada / Surprise nordique: hivernage de naïades de l'anax précoce (*Anax junius*) près du 49e parallèle au Québec, Canada. *Argia* 37(4): 22-27. (in Bilingual in English and French) ["In a previous article, we reported, with surprise, a first observation of the fall emergence of *A. junius* in the Saguenay-Lac-Saint-Jean plain of Québec, extending northward the known area of successful breeding of this migratory species (Savard & Chiricota, 2025). In the meantime, we did not expect to observe emergences the following year at this latitude, especially at the beginning of the summer!"] Address: Savard, M., Entomofaune du Québec, 637 boulevard Talbot, Saguenay, Québec G7H 6A4 Canada. Email: m\_savard@hotmail.com

**26091** Seehausen, M. (2025): Name-bearing types of Libellulidae preserved at the Senckenberg Naturmuseum Frankfurt/Main (Odonata: Anisoptera). *Odonatologica* 54(3/4): 257-297. (in English) ["The name-bearing types of Libellulidae preserved at the Senckenberg-Museum Frankfurt/Main, Germany (SMF) are catalogued. There are 124 name-bearing types of 56 taxa deposited at the SMF as well as 40 additional paratypes and paralectotypes. The syntypes of *Orthetrum bismarckianum*, *Perithemis naias*, and *Perithemis domitia octoxantha* as well as the paratypes of *Perithemis electra* and *Perithemis comelia* could not be found at SMF, although they are stated to be deposited there. The type status of *Orthetrum stemmale lemur*, *Orthetrum azureum lugubre*, *Trithemis selika maia*, and *Crocothemis saxicolor* is investigated. All types of these taxa are considered syntypes, because their previous lectotype designations were invalid. In addition, 103 paratypes and paralectotypes of 34 other taxa are listed. A supplementary list of name-bearing types of Libellulidae of 89 taxa described by Friedrich Ris and deposited in collections other than the SMF is provided. Another list refers to previously overlooked type specimens and contains five name-bearing types of five taxa, of these taxa additionally six paratypes, as well as 23 paratypes of seven other taxa within the families Calopterygidae, Coenagrionidae, Petaluridae and Gomphidae." (Author)] Address: Seehausen, M., Zoologisches Museum der CAU zu Kiel, Hegewischstr. 3, 24105 Kiel, Germany. Email: mseehausen@zoolmuseum.uni-kiel.de

**26092** Shiroishi, T. (2025): The first records of *Macromia daimoji* Okumura, 1949 from Iwate Prefecture, north-eastern Honshu, Japan. *Tombo* 68: 102-103. (in Japanese, with English summary) ["Two larvae and one adult male of *M. daimoji* were collected at Satetsugawa River, Ichinoseki. These are the first records of this species from Iwate Prefecture." (Author)] Address: Shiroishi, T.: Email: t\_shiroishi\_aeschna@yahoo.co.jp

**26093** Taguchi, M. (2025): Territorial battle over a shiny passenger car between *Orthetrum albistylum* (Selys, 1848) and *O. melania* (Selys, 1883). Tombo 68: 84-90. (in Japanese, with English summary) ["Shortly before 8:00 a.m. on August 1, a male *O. albistylum* flew to a glossy painted passenger car parked near a house in an urban district and began to occupy a territory above it. 45 minutes later, a male *O. melania* flew in and began a struggle to occupy the same space. After 24 minutes following the arrival of the *O. melania* male, the *O. melania* male was dominant over the *O. albistylum* male in a chase relationship, and the *O. albistylum* male could no longer perch in the territory. At 10:00 am, a female *O. albistylum* appeared and the male *O. albistylum* chased her, followed by the male *O. melania*. The *O. albistylum* male remained in this waterless territory for about 2 hours and the *O. melania* male for 1 hour and 45 minutes, expending energy in patrolling and tracking." (Author)] Address: Taguchi, M.: Email: taguchim@cameo.plala.or.jp

**26094** Tamada, A. (2025): First and second record of *Acia grion migratum* (Selys, 1876) from Miyagi Prefecture. Tombo 68: 104-105. (in Japanese, with English summary) ["On 26 April 2024, seven adults of *A. migratum* were recorded in Miyagi Prefecture for the first time. The author additionally observed two adults laying eggs in the same location in May 2024. Some dragonflies, including *A. migratum*, that inhabit southern regions are spreading their distributions to the more northern part of Japan. The author is going to keep watching these trends." (Author)] Address: Tamada, A.: Email: t.dragonflew@gmail.com

**26095** Ubukata, H.; Sakoda, T.; Nohara, S. (2025): Environmental preference of the imagines of each odonate species and the changes in population over time (2003, 2010) in the Akanuma-Onnenai district of the Kushiro Mire. Tombo 68: 32-50. (in Japanese, with English summary) ["In the Kushiro Mire in eastern Hokkaido, environmental changes such as the inflow and accumulation of silt and nutrient salts have led to the expansion of alder forests and the extinction of aquatic plants. In order to monitor the impact on the occurrence status of each odonate species, including rare endemic species, five survey areas were set up in the Akanuma-Onnenai district, and line censuses of the number of adult odonates were conducted twice a month in principle in 2003 and 2010, as well as environmental surveys of the vegetation and water quality of each area. Comparison of area occupancy ratio and canonical correspondence analysis (CCA) using the density of each odonate species and vegetation cover rates revealed the area preference for each species as follows: *Nehalennia speciosa* and *Aeshna subarctica* were concentrated in the high moor area and the lakeside area of Akanuma which is almost surrounded by the high moor; *Cordulia amurensis*, *Sympetrum croceolum* and five other species were concentrated on the shore of Akanuma; and *Lestes sponsa*, *Aeshna crenata*, *Leucorrhinia intermedia*, *Sympetrum eroticum* and three other species were concentrated in the side gutters of the huge embankment that crosses the mire, where aquatic plants have taken root and turned it into a pond. When comparing the combined census scores for this district between 2003 and 2010, which took into account the differences in survey area size and annual survey frequency between the two years, a clear increase of approximately 45 times was observed in the value of *Aeshna crenata*. On the other hand, population declines were suggested for the following species: *Nehalennia speciosa*, *Epitheca bimaculata*, *Somatochlora graeseri*, and *Sympetrum infuscatum*. Of the odonate species recorded in the Akanuma-Onnenai district by 1994 (Ubukata et al., 1995), two species, *Erythromma humerale* and

*Somatochlora arctica* had obviously decreased. Although *Aeshna juncea* and *Leucorrhinia dubia* still remained in the district, their numbers were confirmed to have declined in and around the Akanuma area. After examining relevant literatures, we pointed out the possibility that the changes in marsh vegetation and water quality caused by the inflow of silt and nutrient salts from rivers were influencing the changes in the odonate assemblage mentioned above." (Authors)]

**26096** Unger, C.; Gründel, K.; Helk, C.; Volkmar, V. (2025): Die Heidefläche im Hildburghäuser Stadtwald - ein geschichtlicher Abriss der Entstehung, Pflegemaßnahmen und vorkommende Arten. Thüringer Faunistische Abhandlungen 30: 25-38. (in German, with English summary) [Thüringen, Germany. *Lestes virens* is the only Odonata recorded.] Address: Unger, C., Naturkundemuseum Erfurt, Große Arche 14, 99084 Erfurt, Germany

**26097** Warr, A. (2025): Occurrence of Southern Migrant Hawker *Aeshna affinis* at Ryall Pits in 2024. Worcestershire Record 54: 30-34. (in English) [Between 2-VIII and 26-VIII-2025m app. 14 differently distinguishable specimens were recorded. Key features to separate *A. affinis* from *A. mixta* are documented.] Address: Warr, A., 14 Bromsgrove Street, Worcester, Worcestershire WR3 8AR, UK.

**26098** Watanabe, K. (2025): A record of *Neurothemis ramburii ramburii* (Brauer, 1866) ovipositing in a rain tank, and emerging from it. Tombo 68: 94-96. (in Japanese, with English summary) ["The oviposition and breeding in a rain tank, including emergence, of *N. ramburii ramburii* were observed in my house garden, Ishigaki City, Okinawa Prefecture. The oviposition of this species was observed on June 10, and its larva was confirmed on July 7, then an exuvia on the nearby wall was found on August 4." (Author)] Address: Watanabe, K.: Email: odonet99kw@gmail.com

**26099** Yakita, R.; Watanabe, K. (2025): The first record of *Zyxomma obtusum* Albarda, 1881 from Ismgaki-jima Island, Okinawa Prefecture. Tombo 68: 112-113. (in Japanese, with English summary) ["*Z. obtusum* is widely distributed in SE Asia. It is recorded from the Daito Islands and Yaeyama Islands of the Ryukyu Islands in Japan. In 2024, we newly found this species on Ishigaki-jima Island. It inhabited, including oviposition, a small puddle and artificial waterway in the city." (Authors)] Address: Yakita, R.: Email: ry0648@icloud.com

## 2026

**26100** Abbott, J.C.; Tennessen, K.J. (2026): Description of last instar nymph of *Zoraena sarracenia* (Abbott & Hibbitts, 2011) (Odonata: Cordulegastridae) with notes on its life history. Zootaxa 5799(3): 548-558. (in English) ["The last instar (F0) nymph of *Zoraena sarracenia* (Abbott & Hibbitts, 2011) (Odonata: Cordulegastridae) is described for the first time based on 34 lab-reared and field-collected specimens from Texas and Louisiana. Diagnostic morphological characters, measurements, and setal counts are provided, and the nymph is compared with other members of the diastatops species group. Characters useful for identification include premental structure, labial dentition and setation, and setae along the posterior margin of the compound eyes. Notes on habitat, distribution, and life history are presented based on field observations and laboratory rearings. The species inhabits small, boggy rivulets and seepages, often associated with pitcher plant (*Sarracenia alata*) bogs, but also occurs in shaded seepage habitats. Laboratory rearings suggest a minimum nymphal development time of approximately two years, with some

individuals requiring three years. This description completes knowledge of nymphal morphology within the diastatops species group and facilitates identification and conservation assessment of this geographically restricted species." (Authors)] Address: Abbott, J.C., UA Museums Research & Collections, The University of Alabama, Tuscaloosa, AL, USA. Email: jabbott1@ua.edu

**26101** Abe, H.; Watanabe, R.; Sagawa, S. (2026): [Aquatic animal assemblages in the Takeno River in Toyooka, Hyogo Prefecture]. [Reintroduction into the wild] 14: 15-20. (in Japanese, with English summary) ["We conducted field surveys in main channel, secondary channel (permanent water bodies), and backwater (temporary water bodies) of the Takeno River, where flood-channel excavation had been carried out, to investigate the aquatic fauna, especially focusing on the potential as feeding sites for Oriental Storks. A total of 1503 individuals and 32 taxa were identified. The secondary channel section was inhabited by *Candidia temminckii*, *Rhinogobius flumineus* and other species which are found in main channel and irrigation channel, whereas the backwater section was inhabited by *Silurus asotus*, *Ranatra chinensis* and other species that are mainly found in paddy fields. In addition, Odonata nymphs [*Boyeria maclachlani*, *Sieboldius albardae*, *Stylogomphus suzukii*, *Davidius nanus*, *Asiagomphus* sp., *Macromia amphigena*, *Orthetrum albistylum*, *Atrocalopteryx atrata*] and amphibians, which tend to show higher species richness in floodplains with relatively low flooding frequencies, were observed frequently in the secondary channel and backwater sections. Thus, the environments of the secondary channel and backwater sections differed from that of main channel, with community composition similar to that of irrigation channels and paddy fields, respectively. Furthermore, many species found in the secondary channel and backwater sections are prey animals of Oriental Storks. Our results suggest that aquatic animal communities in the secondary channel and backwater differ from those in the main channel, thereby increasing the diversity of prey species available to storks." (Authors)] Address: Honoka Abe, H., Graduate School of Regional Resource Management, University of Hyogo, 128, Shounji, Toyooka, Hyogo 668-0814, Japan. Email: abe.honoka0318@gmail.com

**26102** Adetoro, F.A.; Jimoh, B.O.; Kemabonta, K.A.; Obideyi, E.A.; Adeniran, J.T. (2026): Dynamics in the diversity and abundance of Odonata at the University of Ibadan, Oyo State, southwestern Nigeria. *Nigerian Annals of Pure & Applied Sciences* 9(1): 18-27. (in English) ["The abundance and diversity of Odonata at the University of Ibadan, Oyo State, Nigeria, was investigated at Awolowo Hall, Fish Pond, and the Botanical Gardens. Adult dragonflies were collected using sweep net. A total of 479 individuals from 22 species (19 dragonflies and 3 damselflies) and 3 families (Coenagrionidae, Gomphidae, and Libellulidae) were collected from the survey. The family Libellulidae (76%) was the highest in terms of percentage composition and number of species (18), with *Trithemis arteriosa* being the dominant species, followed by Coenagrionidae (23.8%), which had 3 species, and the dominant species was *Ceriatagrion glabrum*. The Museum of Natural History had more Odonata species (48) than the number encountered in the survey (22). Of these 22 species, twelve (12) were generalists and were not represented in the Museum collection. The absence of some Museum Odonata species, especially those from the families Calopterygidae, Chlorocyphidae, and Aeshnidae in the recent survey, may indicate severe alteration in the environment, resulting from a combination of habitat disruption and other anthropogenic factors. All species recorded in the survey and those in the Museum are

categorized as Least Concern in the IUCN Red List of Threatened Species." (Authors)] Address: Adetoro, F.A., Dept of Zoology, Faculty of Science, University of Lagos, Akoka, Lagos State, Nigeria. Email: fadetoro@unilag.edu.ng

**26103** Alexander, M. (2026): The biomagnification of total mercury (and its methylated form) during the various life stages of dragonflies (Anisoptera) from Montegut, LA. Poster, Conference Date: Spring 4-17-2026. Retrieved from <https://repository.lsu.edu/discoverpubs/25>: (in English) [Verbatim: Dragonflies (Anisoptera) can be effective indicators of aquatic ecosystem health. As larvae (naiads), they are predators, feeding on other aquatic invertebrates and small fish. In this stage, naiads are exposed to various environmental contaminants, including mercury (Hg) and methylmercury (MeHg; a toxic form). These contaminants can bioaccumulate and biomagnify through food webs. Upon metamorphosis, newly emerged adult dragonflies enter terrestrial ecosystems, potentially transporting mercury from aquatic to terrestrial food webs. These emergent adults often serve as prey for birds, spiders, and other terrestrial predators. Despite growing research on contaminant movement from water to land, it became apparent that limited research is being conducted in the Southern United States, which led me to explore this dynamic while residing in the Region. Our project involves collecting dragonflies (Anisoptera) at all life stages, as well as fishing spiders (Pisauridae), to illustrate the introduction of mercury and its methylated form into terrestrial ecosystems from aquatic ecosystems. As well as the collection of water and sediment from local wetlands in Montegut, LA, a shrimping and crabbing community in Terrebonne Parish. In the lab, the collected water, sediments, Anisoptera, and fishing spiders (Pisauridae) are analyzed for total mercury (THg) and methylmercury (MeHg). And with leftover tissue samples, to conduct stable isotope analysis to show the flow of energy and matter in the dragonflies (Anisoptera) and fishing spiders (Pisauridae) by using carbon and nitrogen.] Address: MiKia Alexander, Louisiana State University and Agricultural and Mechanical College

**26104** Al-Musrati Ahmeida, M.F. (2026): A morphological and molecular study of RNA from the families Aeshnidae and Libellulidae (Order Odonata) in Birghu al-Balad al-Akhdar, Libya. *Alqalam Journal of Science* 2(4): 501-506. (in Arabian, with English summary) ["This study was conducted in the Ain Burgo area (Jabal Al-Akhdar, Libya) over a period of 14 months (June 2023 – July 2024) with the aim of surveying and providing morphological descriptions of dragonfly nymphs belonging to Anisoptera. The results led to the identification and morphological characterization of three species of nymphs: *Anax parthenope*, *Orthetrum coerulescens* and *Trithemis arteriosa*..." (Author)] Address: Al-Musrati Ahmeida, M.F., Dept of Plant Protection, Faculty of Agriculture, Omar Al-Mukhtar Univ., Al-Bayda, Libya. Email: mana-ji.fawzi@omu.edu.ly

**26105** Amiruddin, M.; Dwiyanto, D.; Nuranisa, N.; Jusriadi, J.; Khasanah, N.; Günther, A. (2026): Rediscovery of the endemic and threatened Jewel Damselfly *Rhinocypha togeanensis* van Tol & Günther, 2018 (Insecta: Odonata: Chlorocyphidae) in Indonesia, with notes on its habitat loss and the urgent need for conservation action. *Journal of Threatened Taxa* 18(4): 28623-28630. (in English, with Indonesian summary) ["*R. togeanensis* is endemic to Batudaka Island, Togean Archipelago, Indonesia. Since its discovery over 25 years ago, no further records of its presence have been made. This study documents its rediscovery, current distribution, and the state of the habitat of *R. togeanensis* in Sungai Tanimpo. Surveys were conducted at 12 sites, and several environmental parameters were recorded at each locality. A total of

18 individuals were observed along its type locality, Sungai Tanimpo, where the habitat comprised primary forest along the riverbank. Numerous perches were available, such as foliage and small twigs. This species prefers the stream's upper reaches in the forested area with lower air temperatures and good illumination. Since no individuals were found at the exact type locality of this species, the preliminary impression was that *R. togeanensis* has experienced habitat reduction due to deforestation and other human activity, suggesting that urgent conservation measures are needed to preserve this endangered species. According to current knowledge, it is one of the endangered damselfly species in the world." (Authors)] Address: Amiruddin, M., Agrotechnology Study Program, PSDKU Tojo Una-Una, Faculty of Agriculture, Tadulako University, Malotong, Ampana Kota, Central Sulawesi 94683, Indonesia. Email: amhyr07@gmail.com

**26106** Assandri, G.; Puff, F.; Siddi, L.; Anderle, M.; Fedrigotti, C. (2026): Multi-scale landscape composition and local factors jointly shape the occurrence patterns of declining peatland dragonflies. *Landscape Ecology* 41:102: 21 pp. (in English) ["Context: Understanding how biodiversity patterns emerge from the interplay between landscape and local factors (e.g. habitat availability and local anthropogenic impacts) across spatial scales is fundamental for designing effective conservation strategies. Anthropogenic activities are having dramatic effects on freshwater invertebrate communities; however, the role of landscape structure in shaping their occurrence remains poorly understood. Objectives: Understanding how (and at which spatial scale) landscape structure interacts with local factors in explaining the occurrence of threatened peatland odonates. Methods: We investigated the unique and joint contributions of landscape structure, geoclimatic characteristics, habitat features, and anthropogenic impacts associated with the occurrence patterns of seven peatland dragonfly species in the Italian Alps. We applied a multi-scale analysis to identify the most strongly associated scale for each landscape variable, considering 50 incremental scales (100–5000 m). Results: Local habitat features such as peatland typology explained a large and unique proportion of the total variance of occurrence for most species. However, most of them were also associated with landscape composition at spatial scales up to 5 km from reproductive sites. Occurrence patterns of *Aeshna juncea* and *Sympetrum danae* are partly explained by landscape features alone, whereas, for most other species, landscape features concurred to explain them. Conclusions: We confirmed that dragonflies are sensitive to landscape structure at broader species-specific scales than previously recognised. Our results support previous local-scale conservation recommendations for peatland dragonflies, also highlighting the need for landscape-scale conservation approaches, i.e. preserving Alpine peatland networks, maturation habitats (e.g., woodland around mires), and mitigating urbanisation impacts." (Authors)] Address: Assandri, G., Dipto di Scienze e Innovazione Tecnologica, Univ. del Piemonte Orientale "Amedeo Avogadro", 15121 Alessandria (AL), Italy

**26107** Bai, X.; Kong, K.; Liu, M.; Wang, Y.; Li, W.; Zhou, J.; Wu, H.; Yin, C.; Zhang, Y. (2026): Diversity, antibacterial and phytotoxic activities of culturable gut fungi from the insect *Anax parthenope*. *Journal of Applied Microbiology* 137(5), 1xag099, <https://doi.org/10.1093/jambio/1xag099>: (in English) ["Aims: Insect gut fungi, as specialized symbiotic microorganisms, represent a valuable source for the discovery of novel bioactive metabolites. This study aims to explore the diversity and bioactivity of culturable gut fungal communities in *Anax parthenope*. Methods and Results: A total of 53 fungal strains from the gut of *A. parthenope* were distributed across three

classes in 22 genera. Antibacterial tests showed that 10 strains exhibited antibacterial activity against at least one pathogenic bacterium. Phytotoxic tests indicated that 16 strains showed significant phytotoxic activity against *Echinochloa crusgalli* with inhibition rates exceeding 80%, and 11 strains showed potent phytotoxic activity against *Abutilon theophrasti* with inhibition rate exceeding 70%. Furthermore, four metabolites were isolated from the *Alternaria* sp. QZB-4. Compound 2 exhibited moderate antibacterial activity against *Pseudomonas syringae* pv. *actinidiae* (Psa) and *Xanthomonas oryzae* pv. *oryzae* (Xoo), with inhibition zone diameter (IZD) of 17.0 and 11.7 mm respectively, which were comparable to those of the positive gentamicin sulfate. Compound 3 also showed moderate antibacterial activity against Xoo and *Xanthomonas oryzae* pv. *oryzicola* (Xoc) with the IZD of 12.2 and 12.3 mm, respectively, which were less effective than those of positive control. In addition, at a concentration of 100 µg·mL<sup>-1</sup>, compounds 1 and 3 exhibited strong phytotoxic activity against *E. crusgalli* and *A. theophrasti*, with inhibition rates of 90% and 93%, respectively, which were slightly lower than those of the positive 2,4-Dichlorophenoxyacetic acid with the inhibition rate of 100%." (Authors)] Address: Bai, X., School of Life Science, Anhui Agricultural Univ., Hefei 230036, China

**26108** Balanay, R.; Aguilos, N.Z.; Guinancias, A.; Seronay, R.; Tangcogo, F. (2026): The socioeconomic correlates of the willingness to conserve: contextualizing the conservation of the Mt. Magdiwata watershed forest reserve in San Francisco, Agusan del Sur, Philippines. *Humanities and Social Sciences Communications* 13, 496: 14 pp. (in English) ["Mt. Magdiwata was declared a watershed and forest reserve in the 1990s to protect it from threats posed by agriculture, mining, and other human activities. This study examined the socioeconomic correlates of local residents' willingness to participate in conservation, with the aim of informing policies for sustainable watershed management. Data were collected from 185 households in Barangay Ormaca, San Francisco, Agusan del Sur, using the Socio-Economic Assessment and Monitoring System (SEAMS) questionnaire developed by the Department of Environment and Natural Resources (DENR). Descriptive statistics show that most residents are smallholder farmers with low income and limited education, who have lived in the area for over two decades. Their water use for domestic purposes is much lower than the national per capita average, while agriculture and small-scale mining were identified as the most water-intensive activities. Dependence on water and agriculture reflects their willingness to conserve, expressed through water-saving practices, openness to community-based initiatives, and recognition of the benefits of sustaining water supply. Quantile regression analysis revealed that agricultural engagement was the most consistent driver of willingness across quantiles (Q10–Q90), underscoring the centrality of farming livelihoods. Daily water consumption also showed positive effects at multiple quantiles (Q20, Q25, Q75, Q80, Q90), while awareness of local policies had a negative effect at lower quantiles (Q20, Q25), suggesting that some households view conservation as burdensome when perceived costs are high. Distance to water sources and household size were significant at higher quantiles, with closer proximity increasing willingness and larger families reducing it. Gender and household size showed context-specific effects, while mining was only marginally significant. These findings indicate that conservation willingness is strongly tied to livelihoods and resource use. Policies should highlight the water–livelihood nexus, strengthen education and awareness, and address barriers from competing land uses, supported by R&D and green financing to sustain community participation in conserving Mt. Magdiwata." (Authors)] The publication includes

references to Odonata.] Address: Aguilos, N.Z., Center for Research in Environmental Management & Ecogovernance, Caraga State University, Butuan, Philippines. Email: nzama-guilos@carsu.edu.ph

**26109** Banday, M.S.; Dubey, A.; Thakur, N.; Banday, S.; Jawla, J.; Ahmad, J.; Pérez-García, E. (2026): Insects as an alternative protein source: A sustainable approach to future food security. *Insects* 2026, 17, 655: 30 pp. (in English) ["Global demand for sustainable protein sources is increasing as food systems face growing environmental and resource constraints. Edible insects have emerged as promising alternatives because they provide high-quality protein, essential nutrients, and can be produced with lower land, water, and feed requirements than conventional livestock. This review provides an updated and integrated overview of edible insects by examining nutritional quality, protein digestibility, processing technologies, safety considerations, consumer acceptance, regulatory developments, and commercial applications. Recent advances in insect farming, nutrient-enrichment strategies, and insect-derived functional ingredients are also discussed. Although edible insects show considerable potential to support sustainable food and feed systems, challenges related to standardization, allergenicity, regulatory harmonization, and consumer acceptance remain important barriers to wider adoption." (Authors) The paper also considers Odonata, while dragonflies play a minor role as food.] Address: Banday, M.S., Division of Livestock Products Technology, ICAR–Indian Veterinary Research Institute, Bareilly 243122, India. Email: ranu-dubey443@gmail.com

**26110** Barasa, C.N.; Muse, G.S.; Khazenzi, J.A.; Gondwe, L.S.M. (2026): Influence of nutrient enrichment and temperature on aquatic invertebrate communities in a tropical riverine system in Kenya. *Journal of Watershed Ecology* 1(1), 10010; DOI: 10.70322/jwe.2026.10010: 19 pp. (in English) ["One of the major concerns in freshwater ecosystems is nutrient enrichment from human sources, which causes significant effects on aquatic biodiversity and ecological functioning. This study, therefore, investigated the order and family levels of Odonata, Diptera, and Coleoptera responses to nutrient enrichment along River Kiminini, Trans-Nzoia County, Kenya. Field sampling was conducted from July to September 2023. Duplicate water samples were taken from ten sampling stations labelled (S1–S10), twice a month for three months. The concentrations of nitrate–nitrogen and phosphate–phosphorus were measured calorimetrically using standard procedures; the Ascorbic Acid method for phosphates–phosphorus and the Brucine method for nitrates–nitrogen. A spectrophotometer was used to measure absorbance. A standard kick net was used at each station to collect the macroinvertebrates (Odonata, Diptera, and Coleoptera). Using an updated taxonomic key, the macroinvertebrate samples were sorted and identified to their family level under a dissecting microscope, and abundance counts were made. Direct field observations were used to record human activity at each station. The R programming language was used to conduct all statistical analyses. The water quality status for each station was determined using the Nutrient Pollution Index, which was calculated based on ecologically relevant nutrient thresholds. The Nutrients Pollution Index scores ranged from 9.66 (S5) to 17.2 (S3). All the stations were greater than 6, indicating very high pollution levels and a significant risk of eutrophication. At the family level, Dytiscidae, Coenagrionidae, and Lestidae were abundant in less polluted stations and fewer in highly polluted stations. For instance, Coenagrionidae had the highest numbers in station S1 (32) and declined drastically in the highly polluted station S9 (3). The same trend was

observed for Lestidae, with the highest numbers in stations S1 and S2 (21) and declining in station S9 (1). Dytiscidae also had higher numbers in the relatively less polluted station S7 (10) and lowest in the highly polluted station S3 (1). On the other hand, Chironomidae was observed to be tolerant to organic pollution. Chironomidae had their highest numbers in station S9 (30) and declined in moderately cleaner stations S5, S6, and S8, which had a similar record of 6 organisms. According to the findings, it is necessary to enhance biomonitoring and guide riverine management plans under nutrient stress and increasing water temperatures by incorporating functional and taxonomic diversity into water quality assessments."] Address: Barasa, C.N., Dept of Environmental Sciences, Univ. of Eldoret, Eldoret P.O. Box 1125-30100, Kenya

**26111** Barroso, E.; Bardera, R.; Rodríguez-Sevillano, A.A.; Matías, J.C.; Fernández, J. (2026): Nature-inspired wing geometries: A CFD study on bio-inspired airfoils for small RPAS. *Engineering Proceedings* 133(1), 204; <https://doi.org/10.3390/engproc2026133204>: 6 pp. (in English) ["Small Remotely Piloted Aircraft Systems (RPAS) are increasingly being developed with non-conventional geometries to enhance their performance, often drawing inspiration from nature. Among the most promising bio-inspired concepts are the wing geometries of dragonflies and the tubercles found on the ventral fins of humpback whales. Dragonflies are notable for their independent forewing and hindwing motion, which enable exceptional flight maneuvers and even gliding, a rare feature among insects. Their wings exhibit complex aerodynamics due to their undulating structure, which contributes to stability and lift generation. Similarly, the tubercles along the leading edges of whale fins have been shown to enhance lift and improve stall characteristics, particularly during high-agility maneuvers. This paper presents a computational analysis of the aerodynamic performance of non-conventional airfoils inspired by these natural features, comparing them with a conventional small RPA (INTA and ETSIAE-UPM). The results aim to highlight the potential benefits of employing bio-inspired airfoils in improving aerodynamic efficiency and flow control in small RPAS applications." (Authors)] Address: Barroso, Estela, Instituto Nacional de Técnica Aeroespacial (INTA), Torrejón de Ardoz, 28850 Madrid, Spain

**26112** Bedjanic, M.; Bernard, R.; Daraz, B.; Yu, K.-P. (2026): *Paragomphus matroka* sp. nov. - a new Hooktail species from the rainforests of eastern Madagascar (Odonata: Gomphidae). *Zootaxa* 5821(2): 219-235. (in English) ["*Paragomphus matroka* sp. nov. (holotype male: Madagascar, Taolagnaro district, Iaboakoho, Réserve de Ressources Naturelles de la Forêt Naturelle de Tsitongambarika, Ampasy; Lat. -24.57840°, Lon. 47.14493°; 4.xii.2024; to be deposited in RMNH, Leiden), is described as new to science. The new endemic species is known only from the holotype, the paratype deposited in the MNHN, Paris, and an additional specimen deposited in NHRS, Stockholm. It has been recorded from three localities in the eastern part of the island, scattered over a distance of 1,033 km, within the Madagascar Humid Forests ecoregion. despite the pronounced variation in the colour pattern, the three known specimens are interpreted as conspecific based on concordant diagnostic morphological characters, particularly the nearly identical structure of the secondary genitalia and cerci. The new species is related to *P. fritillarius* (Selys, 1892) and *P. sofiae* Bernard & Daraz, 2026. From these two more brightly coloured, spotted Hooktail species, *P. matroka* sp. nov. differs in its considerably darker colouration, a reduced pattern of smaller light markings on the synthorax, and clearly different secondary genitalia. The discovery of a new species underlines the need for additional intensive

odonatological studies in Madagascar, improving knowledge of species distributions, taxonomy, phenology and ecological requirements is crucial, especially in the context of threat assessments and conservation of endemic odonate fauna." (Authors)] Address: Bedjanic, M., Dept of Organisms & Ecosystems Research, National Institute of Biology, Ljubljana, Slovenia. Email: matjaz.bedjanic@nib.si

**26113** Bharati, S.K.; Pattanayak, A.; Yadav Deen, S.N.P. (2026): Rural–urban differences in Odonata diversity and population dynamics across agricultural landscapes of the eastern Gangetic Plains. *Asian Journal of Environment & Ecology* 25(3): 123-133. (in English) ["Odonates are sensitive indicators of ecological condition because their life cycle depends on the integrity of both aquatic and terrestrial habitats. Here, we compared odonate diversity, assemblage composition and seasonal population dynamics across rural and urban agricultural landscapes in the Eastern Gangetic Plains. Weekly visual surveys of adult odonates were conducted from March 2022 to February 2024 in the agricultural areas of Manpur (rural) and Gaya city (urban), spanning fields of food grains, vegetables, pulses and oilseeds. Community structure was analysed using relative abundance, species richness, Shannon diversity, evenness, dominance, Sørensen similarity, one-way ANOVA and principal component analysis. The rural landscape supported 24 species, compared with 17 in the urban landscape, and the two assemblages showed only moderate similarity (SSI = 0.571). Food-grain fields showed the strongest association with odonate community structure and had the highest richness (S = 21), abundance (N = 2239) and Shannon diversity (H' = 2.734). Seasonal effects were significant in both landscapes, with abundance peaking during the monsoon; this seasonal dependence was slightly stronger in the urban landscape (ICC = 0.426) than in the rural landscape (ICC = 0.368). These findings show that habitat heterogeneity, crop mosaics and monsoon-linked aquatic microhabitats are key determinants of odonate persistence in agricultural landscapes of the Gaya region." (Authors)] Address: Pattanayak, A., Dept of Zoology, Magadh University, Bodh Gaya, Bihar, India. Email: anindyapattanayak2@gmail.com

**26114** Bing, B. (2026): *Amphigomphus puerensis*, a new species of dragonfly (Odonata: Gomphidae) from Yunnan, China. *Zootaxa* 5839(2): 391-397. (in English) ["*Amphigomphus puerensis* sp. nov. (holotype male, Pu'er City, Yunnan Province, China) is described and illustrated. A distribution map is provided." (Author)] Address: Bing, B., Independent Researcher, Xueyuan Road Sub-district, Haidian District, Beijing 100083, China. Email: amoeba213@qq.com

**26115** Bladon, A.J.; Akite, P.; Chowdhury, S.; Riva, F.; Cooke, R.; Dyer, E.E.; Millard, J.; Outhwaite, C.L.; Rodger, J.G.; Hui, C.; Isip, J.E.; Jones, J.I.; Murphy, F.F.; Newbold, T.; Purvis, A.; Roy, H.E.; Skinner, G.; Woodcock, B.A.; Berger, I.; Chowdhury, S.U.; Morgan, W.H.; Báldi, A.; Bartlett, H.; Batáry, P.; Bihaly, A.D.; Borzée, A.; Chobot, K.; Crosier, J.; Deiner, K.; Devenish, A.J.M.; Devriese, A.; Ermakova, A.; Farooq, H.; Fedotov, A.; Gaigr, J.; Gallé, R.; Gategeko, A.; Gong, H.; Gordon, H.; Herzog, F.; Jacobson, A.; Kamath, V.; Manral, U.; Marja, R.; Martin, C.; Mpayimana, D.; Mutekanga, F.; Naskrecki, P.; Ndahayo, P.; Nkurikiyimana, D.; Nsenganeza, J.; Ntibabarira, J.P.; Poston, J.; Reynolds, C.; Ruticumugambi, J.A.; Srikanthan, P.; Török, E.; Yekwayo, I.; Isaac, N.J.B.; Dicks, L.V. (2026): Global biodiversity framework targets can drive action on insect declines, but lack robust indicators to prove their effectiveness. *Conservation Letters*, 2026; 19:e70025: 10 pp. (in English) ["Insects are the most diverse and functionally important animals on Earth. In at least some regions, terrestrial populations

are declining. Despite this, insects are often overlooked in conservation policy, and it is difficult to assess how anthropogenic threats and conservation actions affect insect populations. The Kunming-Montreal Global Biodiversity Framework (GBF) aims to reduce pressures on biodiversity, increase conservation efforts, and reverse losses. At the International Congress on Conservation Biology in 2023, we convened a round table of specialist scientists and practitioners in insect ecology and conservation to explore how well the GBF addresses insect declines. We discussed and evaluated: (1) how well GBF targets could deliver for insects, and (2) whether the indicators proposed for monitoring progress would detect changes in the status of insects. We found that although the GBF's targets can drive action for insect recovery, almost none of the indicators can effectively measure progress for insects. We propose four principles to enhance the effectiveness of biodiversity policy for insects, and recommend the establishment of a global working group to develop insect-focused indicators. If implemented effectively, such indicators could provide evidence of whether restoration and conservation actions are putting us on a path to recovery of global biodiversity." (Authors) References are made to Odonata.] Address: Bladon, A.J., Ecology & Evolutionary Biology Division, School of Biological Sciences, University of Reading, Reading, UK. Email: a.j.bladon@reading.ac.uk

**26116** Bruni, G.; Borini, A. (2026): Just found and already in danger: first observations of the Italian endemic *Coenagrion castellani* Roberts 1948 (Odonata: Coenagrionidae) in Lunigiana, northern Tuscany, with a new altitudinal record. *Natural History Sciences. Atti Soc. it. Sci. nat. Museo civ. Stor. nat. Milano* 13(1): 93-95. (in English, with Italian summary) ["The presence of the Italian endemic odonate *C. castellani* is herein reported for the first time in the province of Massa-Carrara, in two distinct areas of the Lunigiana historical region. One population was found in 2025 in the SAC IT5110002 "Monte Orsaro" and is located about 100 m from the border of the Tuscan-Emilian Apennine National Park, where the species is not reported. The second site is known for two specimens collected in 2012 in a wetland situated at 1150 m a.s.l. in the Zeri Valleys, about 15 km apart from the first site and outside any protected area. This latter observation represents the new upper altitudinal limit for the species. Unfortunately, this wetland has undergone significant habitat alteration, and the species has not been confirmed in 2025. This valuable Italian endemic species is included in the Annex II of the Habitats Directive and is classified as Vulnerable by the IUCN; however, its geographical distribution has not yet been exhaustively defined. These observations highlight the urgency of identifying unknown populations of this Species of Community interest, particularly in stations outside protected areas to protect them adequately." (Authors)] Address: Bruni, G., Viale Togliatti, 50019 Sesto Fiorentino (Firenze), Italia. Email: giacomobruni90@gmail.com

**26117** Buddhika Sampath Kumara, S.P.S.N. Ebenezer, P.; Joseph, A.; Yarlagaadda, T.; Amal Ishantha Senevirathne, S.-W.M.; Yarlagaadda, P.K.D.V. (2026): Development of uniform and hierarchical nanostructures on 2D and 3D polymeric surfaces: A colloidal lithography approach. *Results in Engineering* 30 (2026) 110762: 18 pp. (in English) ["Nanostructured surface (NSS) modifications have evolved over the last decade by mimicking natural surfaces, such as cicada and dragonfly wings. These modifications find applications in biomedical, photovoltaics, and energy storage. Despite advances in additive manufacturing, the development of polymeric NSS modifications remains limited. Current fabrication methods are complex, lack hierarchical architecture, and are

generally restricted to two-dimensional (2D) substrates. Interestingly, hierarchical structures offer significant benefits for applications requiring high bactericidal efficacy (BE), omnidirectional anti-reflective properties, improved light extraction in light-emitting diodes (LEDs), and enhanced performance in optical, optoelectronic, and electrooptical devices. In this article, we introduce a facile technique for producing uniform-periodic (UP), multiperiodic hierarchical (MPH), and random hierarchical (RH) nanostructures on both 2D and three-dimensional (3D) surfaces via moulded flat (MF), 3D printed flat (3DPF) and 3D printed curve (3DPC) polylactic acid (PLA) forms. We employed a modified Langmuir-Blodgett (LB) technique to coat polystyrene (PS) microspheres in a monolayer, serving as a mask for Colloidal Lithography (CL). Modified surfaces were characterised via Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), Drop Shape Analyser, and Fourier Transform Infrared Spectroscopy (FTIR). Using 520 nm microspheres, UP nanocones were produced, whereas 290 nm microspheres yielded UP nanowires. A 1:1 combination of both sizes resulted in MPH nanostructures on 2D surfaces and RH nanowires on 3D printed surfaces. These nanowires mimic dragonfly wing architecture, may be effective for applications with complex 3D-geometries, such as patient-specific implants, photovoltaics, optical, absorbents, sensors, microfluidics, and energy harvesting devices, although further validation is required." (Authors)] Address: Buddhika Sam-path Kumara, S.P.S.N., School of Mechanical, Medical & Process Engineering, Fac. of Engineering, Queensland University of Technology (QUT), Brisbane, QLD 4000, Australia. Email: buddhika.naidelaga@hdr.qut.edu.au

**26118** Caño, L.; Sanz, J.; Sistiaga, M. (2026): Diversity of life in school ponds. In: Jarau, S., Benkowitz, D. (eds) Sustainability Education in School Garden-Based Learning. International Explorations in Outdoor and Environmental Education, vol 18. Springer, Cham. <https://doi.org/10.1007/978-3-032-10273-716>: 223-240. (in English) ["Ponds are threatened ecosystems of high ecological value. They are associated to some 'flagship' species like amphibians or dragonflies and harbour a diverse range of organisms from different taxonomic groups. Ponds exhibit great heterogeneity that also contributes to landscape-biodiversity. The rising public awareness of ponds is reflected in an increasing interest in their use in formal education. The construction and maintenance of a school pond offers students the opportunity to gain basic ecological knowledge through a hands-on and contextualized practical learning experience, but also provides them with an emotional commitment to conservation actions. This chapter is based on our own ongoing experience at the pond of the Faculty of Education of Donostia-San Sebastian at the University of the Basque Country, within the Basque Network of School Ponds (EUS). We first present the main ecological aspects of ponds and address the diversity of organisms that can be commonly found in these ecosystems. We then highlight the educational implications, exemplifying some scientific practices and processes to engage students in scientific and sustainability competence." (Authors) Many references to Odonata are made including a list of Spanish taxa in Table 16.1.] Address: Caño, Lidia, Faculty of Education, Philosophy and Anthropology, University of the Basque Country (UPV/EHU), Donostia-San Sebastián, Spain. Email: lidia.cano@ehu.eus

**26119** Cham, S. (2026): Species review 14: *Cordulia aenea* (Linnaeus, 1758) (Downy Emerald). Journal of the British Dragonfly Society 42(1): 1-46. (in English) ["This species review provides a synopsis of the natural history and conservation of *Cordulia aenea* (Downy Emerald) in Great Britain and Ireland, examining its habitat requirements, distribution

and insights into its life cycle and behaviour. The attributes used for identification are described and compared with those of the closely related *Somatochlora metallica* (Brilliant Emerald) and *S. arctica* (Northern Emerald), with which it is sometimes sympatric in our region and with which it might be confused." (Author)] Address: Cham, S., 2 Hillside Road, Lower Stondon, Bedfordshire SG16 6LQ, UK

**26120** Christopher, J.I.; Babu, R.; Subramanian, K.A. (2026): A new species of *Mortonagrion* Fraser, 1920 (Odonata: Zygoptera: Coenagrionidae) from the Andaman Islands, India. Zootaxa 5828(3): 563-574. (in English) ["A new species of damselfly, *Mortonagrion santha* sp. nov. is described from Dasarathpur, Rangat, Andaman & Nicobar Islands, India. This species is closely similar to *M. arthuri* Fraser, 1942, from which it can be distinguished by the shape of the post-ocular spots, markings on the S9 and the unique shape of the caudal appendages. We have provided an updated identification key to the males and females of *Mortonagrion* Fraser, 1920 species known from South and Southeast Asia." (Authors)] Address: Christopher, J.I., Southern Regional Centre, Zoological Survey of India, Chennai-600028, India. Email: christopherjohnnissac@gmail.com

**26121** Coccia, C.; Andolina, C.; Cera, A.; Taurozzi, D.; Spani, F.; Di Gioacchino, M.; Sodo, A.; Vizzini, S.; Green, A.J.; Scalici, M. (2026): Relating microplastic contamination to trophic ecology of the highly invasive Red Swamp Crayfish and Eastern Mosquitofish. Freshwater Biology 71:e70205: 15 pp. (in English) ["1. The red swamp crayfish (*Procambarus clarkii*) and the eastern mosquitofish (*Gambusia holbrooki*), native to North America, are highly invasive in temperate aquatic environments worldwide, where they often coexist in a variety of habitats. 2. We used stable isotopes of carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) to examine the trophic ecology of *Procambarus clarkii* and *Gambusia holbrooki* co-existing in the same coastal wetland in Italy and explore potential relationships with microplastic (MP) ingestion. 3. *Gambusia* consistently occupied a higher trophic position than *Procambarus*, and ingested more MPs per individual. There was strong spatial variation in the degree of niche overlap (0%–70%) between habitats. 4. MPs were found in all individuals of alien species with mean concentrations ( $\pm$ SD) of  $5.1 \pm 3.2$  (items/ind) in *Procambarus* and  $5.8 \pm 3.30$  (items/ind) in *Gambusia*. MPs were also found in their potential prey (macroinvertebrates), with concentrations ranging from  $0.35 \pm 0.2$  to  $69.8 \pm 87.8$  items/ind., depending on the taxon. Similar polymer colours (mainly blue) and shape (mainly fibres) were found across all samples. Invertebrates were the primary diet items for both species, with little contribution from detritus and plants. The importance of specific invertebrate prey taxa varied between alien species, as did the percentage of MPs potentially ingested from their prey. We found little evidence of biomagnification, since MP concentration was not correlated with trophic levels, but was higher in *Gambusia*. 5. The use of stable isotopes, combined with the examination of MPs, provides valuable insights into the role of feeding ecology in MP contamination. Given that *Procambarus* and *Gambusia* are also key prey for many terrestrial and aquatic predators, they may act as vectors, facilitating the transfer of MPs across ecosystem boundaries. Further research is needed to better understand the long-term ecological impacts of microplastic contamination across various trophic levels, and to assess the potential risks to higher predators. ... *Gambusia* tend to be more reliant on carnivory (trophic level 4, Fry 1988), especially on Odonata larvae as indicated by the SIMMR model." (Authors)] Address: Coccia, Cristina, Dept Science, Univ. Rome Tre, Rome, Italy. Email: cristina.coccia@uniroma3.it

**26122** Dalavi, P.; Ingole, D.; P, K.; Mulani, S.; Shinde, P.; Sawant, S.; Adhau, A.; Kamble, M. (2026): Edible insect: Emerging non-convectional source of protein - A review. International Journal of Advanced Biochemistry Research 10(5): 732-740. (in English) ["The continuously increasing world's population along with the problems like climate change, limited land and water resource the pressure on food resources is increasing continuously. The population is now more aware about the balance diet. Due to the health benefits of protein the demand of protein rich food is increasing day by day. The consumption of meat and animal based products is increasing due to it's balance amino acid profile. The cardiovascular risk is associate with excessive meat consumption. The greenhouse gases are also emitted due to the livestock production. The vegetarian sources are deficient in the essential amino acid needed for body development. The insects are emerging as a new alternative source of protein and nutritious food and feed. The environmentally friendly and sustainable food is needed for future demand. The insect is ideal choice for the protein rich sustainable food for future demand. The edible insects are consume in Asia, Africa and some parts of Australia. The species mainly use for consumption are crickets, grasshoppers, locusts, bees, beetles, wasps, ants, cicadas, caterpillars, termites, dragonflies, and flies. The edible insect contains all the essential amino acid need for the healthy body along with the carbohydrate, vitamin and minerals. The different protein extraction methods are used to extracting protein from edible insects. The consumption of insect is associate with some food safety concerns and allergies. There are regulation regarding edible insect use in food and feed"] (Authors)] Address: Dalavi, P., Sher-eKashmir University of Agricultural Sciences & Technology of Kashmir, Jammu & Kashmir, India

**26123** Davis, D.D.; Chandler, M.; Goodman, A.; Ware, J.; Newton, L. (2026): Species distribution modeling and population genetics of *Nannophya pygmaea* (Odonata: Libellulidae). Annals of the Entomological Society of America 119(3): Pages 127-141. (in English) ["The Scarlet Pygmy *Nannophya pygmaea* Rambur, 1842, the smallest described dragonfly species, is found across the Pacific coast and along the island chains of eastern Asia. Previous research has questioned whether *N. pygmaea* is potentially a complex of multiple species. Past studies have proposed a new species, *N. koreana*, based on mitochondrial genetic data, but the *N. pygmaea* complex remains unresolved. Using increased taxon sampling, we assessed genetic differentiation across populations and reconstructed evolutionary relationships of the *N. pygmaea* complex. From 141 COI-5P sequences, we calculated genetic structure through estimation of pairwise  $F_{ST}$  values among 10 populations and constructed a haplotype network to determine genetic differentiation, which revealed extremely high differentiation between northern populations (Japan, South Korea, China, and Laos) and southern peninsula/island chain populations (Malaysia, Singapore, Indonesia, and Vietnam). Species distribution models (SDMs) showed large stretches of less suitable habitat between regions populated by *N. pygmaea*. A lack of gene flow and geographical isolation between the clades supports these highly differentiated populations being described as separate species. Additionally, our SDMs explored the prevalence of present suitable habitats and how habitat suitability may shift between now and 2070. Our paleodistribution modeling provides insight into possible land migration routes that would allow *N. pygmaea*, as a weak flyer, to have dispersed to its present-day distribution. Ordination analysis of niche divergence between the northern and southern clades found no significant levels of niche differentiation or similarity between the 2 clades."] (Authors)]

Address: Davies, D.D., 701 E University Parkway Drive, 4105 LSB, Plant and Wildlife Sciences, Provo, UT 84602, USA. Email: d.qubed9@gmail.com

**26124** Dessau, C. (2026): Habitatpotenzial unterschiedlicher Gewässertypen auf wiedervernässten Torfabbaufächen für die Zielarten *Aeshna subarctica*, *Leucorrhinia dubia* und *Leucorrhinia rubicunda*. MSc thesis, Umwelt- und Regionalplanung (Vertiefung: Naturschutz und Landschaftsplanung), Fakultät für Architektur und Landschaft, Institut für Umweltplanung, Gottfried Wilhelm Leibniz Universität Hannover: 147 pp. (in German, with English summary) ["Habitat potential of different water body types on re-wetted peat extraction sites for the target species *A. subarctica*, *L. dubia*, and *L. rubicunda* - Raised bogs are among the ecologically most valuable yet highly threatened ecosystems in Central Europe. They perform a key function as carbon sinks and host highly specialized plant and animal species that are adapted to extreme site conditions such as nutrient poverty, high water levels and acidity. However, drainage and land use conversion, especially industrial peat extraction, have severely degraded about 95 percent of Germany's original peatland area. This has not only caused substantial greenhouse gas emissions but also led to a drastic decline in raised bog specialist species and to the fragmentation of remaining populations. Rewetting former peat extraction sites is therefore a central measure to achieve both climate and biodiversity targets. In many re-wetted extraction areas, however, ecological development processes remain limited for long periods because peat extraction has destroyed the original microtopography and vegetation structure, while the diaspores potential of raised bog plant species is often low as further consequences. As a result, large homogeneous and structurally poor open water areas frequently develop, whereas *Sphagnum*-dominated pools and raised bog typical habitat structures that are crucial as developmental habitats for bog specialist insects are absent or develop only slowly. Highly specialized insect species respond particularly sensitively to these structural deficits, which often impede their recolonization and establishment under such conditions. Against this background, this master's thesis investigated the habitat potential of different waterbody types for raised bog dragonfly species in the nature reserve 'Totes Moor' in the Hanover Region. The target species were *A. subarctica*, *L. dubia*, and *L. rubicunda*, which are considered indicator species of *Sphagnum*-rich raised bog waters and represent different degrees of ecological specialization. The study was embedded in the research project 'Insekten beleben Moore' (InsMoor), which tests structure forming measures such as terrain modelling, the creation of small waterbodies and initial plantings on rewetted peat extraction sites in order to specifically improve habitat conditions for insects. In Study Part (I), conducted on the so called 'Weißtorffläche', a restoration site of the InsMoor project, it was assessed to what extent the waterbody type of artificially created and initially planted small pools provides suitable reproduction habitats for the target species compared with the waterbody type of an untreated reference polder. Morphological, vegetation structural and abiotic parameters were recorded at 16 small pools and along three transects in the reference polder, and reproductive use by the target species was quantified using standardized exuviae surveys. The artificially created small pools exhibited significantly higher structural diversity and yielded much higher numbers of exuviae of *L. dubia*, 1,194 exuviae in total, and *L. rubicunda*, 70 exuviae, than the untreated polder, which yielded two exuviae of *L. dubia* and one exuvia of *L. rubicunda*. A correlation analysis within the small pool waterbody type revealed habitat gradients, with high *Sphagnum*-cover being positive and open peat surfaces negatively

associated with the exuviae numbers of the recorded target species. *A. subarctica* was not detected in either waterbody type on the Weißtorffläche in 2025, which is interpreted in light of the early successional stages of the habitats, as highly specialized raised bog species often reach appreciable densities only once Sphagnum-dominated structures and stable hydrological conditions are established. Study Part (II) served to contextualize the rediscovery of *A. subarctica*, which had not been recorded in the Totes Moor since 2010 and was detected again in 2024 with five exuviae in a newly created and Sphagnum-initialized small pool of the InsMoor project. Two reference sites were investigated, the donor site from which the Sphagnum-material used for initialization of the small pool with the exuviae findings originated, and the Barloh area, which has been rewetted since the 1990s and shows advanced raised bog regeneration. No exuviae of *A. subarctica* were found at the donor site, whereas a total of 31 exuviae were recorded at Barloh. The waterbody structures there, characterized by floating Sphagnum, closely matched the species' habitat requirements. The rediscovery in the Totes Moor in 2024 was therefore interpreted as a natural recolonization from stabilized raised bog refugia rather than as a passive translocation of aquatic developmental stages via the donor Sphagnum. Finally, the results were used to derive practice-oriented management recommendations for the creation of waterbodies as a structural restoration measure in raised bog rehabilitation. According to the findings, the reproductive success of raised bog dragonflies was strongly determined by the targeted provision of suitable microhabitats. Key factors included the early establishment of small scale, shallowly structured pools, the promotion of Sphagnum-dominated vegetation, the maintenance of a stable hydrological regime with permanently wet refuges, and the integration of restoration sites into existing raised bog habitat networks. Active Sphagnum-initialization accelerated the development of floating Sphagnum-mats and substantially increased habitat quality. Overall, the results demonstrate that site adapted, structure-oriented measures play a key role in restoring functional habitats for highly specialized raised bog species on recently rewetted peat extraction sites.] Address: <https://repo.uni-hannover.de/items/c9179bce-fb2b-448b-af5a-95003cdc21a1>

**26125** Dias-Oliveira, T.M.; Santos, J.C.; Magalhaes de Souza, M.; Viela, D.S. (2026): Description of the F-0 exuviae of *Peristicta janiceae* Pessacq & Costa, 2007 (Odonata: Protoneuridae). *Zootaxa* 5793(2): 573-580. (in English, with Portuguese summary) ["Here, we describe, illustrate, and diagnose the F-0 exuvia of *P. janiceae*, collected in the state of Minas Gerais between May and November 2024. The larva can be separated from other congeners by a combination of morphological characters, including mandibles and premental setation." (Authors)] Address: Dias-Oliveira, T.M., Graduate Program in Entomology, University of São Paulo, Ribeirão Preto, São Paulo, Brazil. Email: [deoliveiratmd@gmail.com](mailto:deoliveiratmd@gmail.com)

**26126** Dias-Oliveira, T.M.; Koroiva, R.; Junior, E.G.S.; Jacques, G.C.; Santos, J.C.; Vilela, D.S. (2026): Integrative taxonomy reveals the larva of *Allopodagrion contortum* (Hagen in Selys, 1862) (Odonata: Megapodagrionidae) from Southeastern Brazil. *Zootaxa* 5831(3): 437-446. (in English, with Spanish summary) ["The genus *Allopodagrion* Förster, 1910 includes Neotropical damselflies distributed from southeastern Brazil to northern Argentina, with only *A. brachyurum* De Marmels, 2001 previously known in the larval stage. Here, we describe the larva of *A. contortum* (Hagen in Selys, 1862) based on specimens collected in Pico do Itambé State Park (Minas Gerais, Brazil). The relationship between the larva and the adult was confirmed through molecular analyses (COX1

gene). The larva of *A. contortum*, which can be distinguished from *A. brachyurum* by tubercles of the head, pronotum, and mouthpart morphology." (Authors)] Address: Dias-Oliveira, T.M., Graduate Program in Entom., Univ. of São Paulo, Ribeirão Preto, São Paulo, Brazil. Email: [deoliveiratmd@gmail.com](mailto:deoliveiratmd@gmail.com)

**26127** Dobrin, M.; Gathman, J.; Ivanova, S.V.; Johnson, S.; Wang, L.; Mancini, E.; Fiorino, G.E.; Grabas, G.P.; Brady, V.J.; Cooper, M.J.; Lamberti, G.A.; Uzarski, D.G.; Ciborowski, J.H. (2026): Aquatic invertebrate communities of Lake Erie coastal wetlands: taxa richness, community composition, and spatial distribution. *Aquatic Ecosystem Health & Management* 28(3): 19-34. (in English) ["Coastal wetlands are dynamic, highly diverse ecosystems that provide vital habitat for fish and wildlife. A detailed description of the composition of wetland-invertebrate communities is key baseline information that can reveal patterns that can guide further studies to improve understanding of biotic and abiotic factors influencing coastal wetlands. This 18-year study documents and describes the distribution, relative abundance and time trends of the invertebrate community in coastal wetlands bordering Lake Erie. Between 2004 and 2022, aquatic macroinvertebrates were enumerated from sweep-net samples in 71 coastal wetlands. The 83 families and 154 genera collected were numerically dominated by aquatic insects and crustaceans. Annelids, molluscs, and other taxa were present but less prevalent. The most abundant and broadly distributed groups were Amphipoda (most commonly Hyalella), Diptera (primarily Chironomidae), Hemiptera, and Odonata, respectively. Coleoptera were most diverse, followed by Hemiptera and Diptera. Even though the relative abundances varied considerably among wetlands, the frequency of occurrence of most taxa was surprisingly high. The 25 most numerically abundant taxa summed to about 80% of the cumulative relative abundance. Seven of these most abundant taxa were found in over 95% of the Lake Erie wetlands sampled, and the remainder occurred in at least 79% of samples. In contrast, approximately half of all taxa (80 genera in 43 families) were rare (represented by 25 or fewer specimens). Except for the gastropod *Bithynia tentaculata* (Bithyniidae; found in 34 wetlands), invasive species commonly found within Lake Erie proper (*Belamya* spp., *Dreissena* spp. bivalves, and amphipods *Gammarus tigrinus* and *Echinogammarus ischnus*) were uncommon in wetlands. An agglomerative hierarchical cluster analysis based on relative abundances of broadly distributed taxa distinguished five groups of wetlands, each characterized by relatively distinctive assemblages. Assemblages were only weakly associated with wetlands' location among basins and geomorphic type. Genera of Ephemeroptera, Odonata, and Amphipoda, sometimes used as indicators of good ecological condition, were so widespread that their value in diagnosing the condition of Lake Erie wetlands may be limited unless their relative abundances are considered." (Authors)] Address: Ciborowski, J.H., Department of Integrative Biology, University of Windsor, 401 Sunset Avenue, Windsor, ON Canada N9B 3P4. Email: [cibor@uwindsor.ca](mailto:cibor@uwindsor.ca)

**26128** Drake, S.A.; Bruckerhoff, L.A.; Miltner, R.; Shoobs, N.F.; Pennock, C.A. (2026): Water quality improvements correspond with increased human use and occurrence of fish, aquatic insects, and freshwater mussels. *Ecological Indicators* 188, 115034: 10 pp. (in English) Documenting species responses to ecosystem level policy and conservation actions is critical to slow or reverse the global biodiversity crisis. We quantified changes in water quality, fish and insect assemblages (1978–2023), and freshwater mussels (1970–2023) over time associated with implementation of broad environmental regulations including the Clean Water Act, Clean Air Act and other

best management practices across seven major river basins in the state of Ohio, USA. Water quality improvements were characterized by declines in zinc, nitrite, and lead across the state, and declines in ammonia and total phosphorus in most river basins. Occurrences of fish and insect species classified as intolerant to poor water quality increased across river basins, especially in large rivers. 71 fish species and 171 insect taxa increased in occurrence and few species decreased. However, freshwater mussels had mixed responses over time, with 9 species increasing and 10 decreasing in occurrence, indicating the need for continued water quality improvements and potentially conservation efforts to repatriate mussels with low dispersal capabilities. This study documents long-term improvements in water quality and increased occurrence of aquatic species that are likely associated with environmental regulations and best management practices. Our results highlight the need for regulations to remain in place to maintain conservation gains for fishes and insects and potentially expanded regulations to facilitate gains for freshwater mussels. These results are critically important as the US federal government reconsiders implementation of environmental policy and funding of agencies enforcing environmental regulations." (Authors) Odonata are listed in the supplemental material.] Address: Drake, S.A., Dept of Evolution, Ecology & Organismal Biology, The Ohio State Univ., Columbus, Ohio, 318 W. 12th Ave., 300 Aronoff Laboratory, Columbus, OH 43210, USA. Email: drake.576@osu.edu

**26129** El-Gabbas, A. (2026): A global, taxon-stratified, high-resolution sampling-effort dataset from GBIF for Bias-Aware Ecological Modelling. *Diversity and Distributions* 32(5), e70205: 20 pp. (in English) ["Introduction and Aim: Spatiotemporal and taxonomic sampling bias in biodiversity occurrence data poses critical challenges for robust ecological inference, species distribution models (SDMs), and conservation planning. Despite the exponential growth in global biodiversity records over recent decades, these biases persist. This study converts raw occurrence records from the Global Biodiversity Information Facility (GBIF) into global, publicly available, taxon-stratified, and temporally resolved sampling-effort rasters using a reproducible workflow, providing transparent and standardised measures of observation count and species richness to support bias-aware ecological analyses. Main Variables Included: Two complementary raster variables: observation count and species richness, each provided across major taxonomic groups and their descendant levels (e.g., classes, orders, families). Time Coverage: Annual and cumulative rasters span 1980–2025. Spatial Coverage: Global; four spatial resolutions (~1, 5, 10, and 20 km). Taxa: Nine major taxonomic groups: Amphibia, Arachnida, Aves (birds), Fungi, Insecta, Mammalia, Mollusca, Reptilia, and Tracheophyta (vascular plants), with descendant-level outputs. Applications: Based on ~3 billion records for > 730,000 species, this study provides annual and cumulative global rasters quantifying observation count and species richness at four resolutions, stratified by nine taxonomic groups and their descendants. At 1 km resolution, 95% of records occupy merely 0.33% of Earth's surface (0.93% of land), whilst the remaining data extend across only 1.77% (3.88% of land), leaving approximately 98% (95% of land) unsampled. This extreme concentration persists across all taxonomic groups, underscoring the need for taxon-specific bias correction. Annual data enable exploration of long-term trends in data mobilisation and sampling effort. These rasters enable bias correction in presence-only SDMs, including MaxEnt bias files, target-group backgrounds, and model-based approaches. Beyond SDMs, they can inform macroecological synthesis, biodiversity monitoring, and systematic conservation planning by identifying spatial and temporal

knowledge gaps. All data and code are openly available under FAIR principles, promoting transparent and reproducible biodiversity science." (Author) Table 1 includes an information on Odonata.] Address: El-Gabbas, A., Dept of Community Ecology, Helmholtz-Centre for Environmental Research – UFZ, Halle (Saale), Germany. Email: elgabbas@outlook.com

**26130** Emsgård, J. (2026): The effect of temperature on growth and cannibalism in dragonfly larvae. BSc thesis, Biology Education Centre and IBG, Uppsala University: 13 pp. (in English) ["Global climate change is likely to alter intraspecific competition due to changes in growth and development. An extreme form of intraspecific interaction is cannibalism which occurs in ectotherms such as dragonflies. This study investigates the effect of temperature on growth and cannibalism in larvae of *Sympetrum vulgatum*, using a laboratory experiment where larvae were raised at three different temperatures (20°C, 23°C and 26°C) for four weeks. The results show that higher temperatures increase levels of cannibalism. This pattern can be driven by higher behavioural activity and movement, leading to more encounters between individuals. Warming also accelerates growth rate of individuals both directly and indirectly through cannibalism as cannibals gain more food per capita and additional nutrients from the victims eaten. Rising temperatures, leading to increased cannibalism can have a chain of effects on food webs in ecosystems." (Author)] Address: <https://www.diva-portal.org/smash/get/diva2:2060493/FULLTEXT01.pdf>

**26131** Estberg, J. (2026): Predatorregimers påverkan på labiumform och fångstframgång hos nordamerikanska flicksländelarver - The impact of predator regimes on labial shape and capture success in North American damselfly larvae. BSc thesis, Karlstad University, Faculty of Health, Science & Technology, Department of Environmental and Life Sciences: 14 pp. (in Swedish, with English summary) ["Damselfly larvae live under strong selective pressure from both fish and larger dragonfly larvae, which has driven behavioral and morphological adaptations to balance foraging against predation risk. The larvae capture their prey using a specialized labium, a modified lower lip that functions as a protrusible prey-capture organ. This study investigated whether the labium morphology of North American damselfly larvae from the genera *Enallagma* and *Ischnura* differs between different predator regimes, and whether shape variation can be linked to capture success. Eight morphological measurements of the labium were analyzed separately for the genera *Enallagma* and *Ischnura* using principal component analysis (PCA). The first component (PC1) was interpreted as an indicator of general size, whereas PC2 and PC3 described relative shape variation. Differences in labium shape between predator regimes were analyzed with MANOVA, and capture success was examined using binomial generalized linear mixed models (GLMM). The results showed significant differences in relative labial shape between fish-lake and fish-less-lake species in both *Enallagma* and *Ischnura*, but the morphological character of these differences was genus-specific. In *Enallagma*, capture success was linked only to larger head width, a measure used to describe general size. In *Ischnura*, however, higher PC2 values were associated with significantly higher capture success. The findings provide support for the association between predator regimes and variations in labial morphology but demonstrate that both shape and capture success vary between the genera. The results suggest that factors other than predator regime play a role in variation in the prey-capture organ of damselfly larvae, such as genus-specific or behavioral differences." (Author)] Address: <https://www.diva-portal.org/smash/get/diva2:2068311/FULLTEXT01.pdf>

**26132** Fajriansyah, K.; Artayasa, I.P.; Wirajagad, G.C.; Ilhamdi, M.L. (2026): Analysis of distribution patterns and diversity of dragonflies (Odonata) in Kerandangan Nature Tourism Park. *Jurnal Biologi Tropis* 26(2): 1022-1032. (in Indonesian, with English summary) ["This research aimed to analyze the dragonfly species found in the Kerandangan Nature Tourism Park, analyze their distribution patterns, and determine their diversity level. The research was conducted in three observation blocks, namely utilization, rehabilitation, and protection blocks. Sampling in this study was conducted using the line transect method with direct field observation. Distribution patterns were analyzed using the dispersion index, while diversity was measured using the Shannon–Wiener index ( $H'$ ). The results showed that 18 dragonfly species belonging to 8 families were identified. The distribution patterns of dragonflies, both overall and within each block, tended to be clumped. The dragonfly diversity index ( $H'$ ) in the Kerandangan Nature Tourism Park was 2.12, indicating that the ecosystem is relatively stable. In addition, damselflies (Zygoptera) were only found in the utilization block, which has water sources, and were absent in the rehabilitation and protection blocks. This finding suggests that abiotic and biotic environmental factors influence the presence and distribution of dragonflies in the study area. This research is expected to contribute scientific information to support environmental management and conservation efforts in the Kerandangan Nature Tourism Park." (Authors) The list of taxa includes the European *Onychogomphus forcipatus*.] Address: Fajriansyah, K., Program Studi Pendidikan, Biologi, Universitas Mataram, Mataram, Nusa Tenggara Barat, Indonesia. Email: khunulfajriansyah2904@gmail.com

**26133** Feller, K.D.; Mierow, T.T.; Pavlik, J.; Portman, R.; Kingston, A.C.N. (2026): Conserved optical adaptations enable amphibious vision in compound eyes. *Proc. R. Soc. B* 293: 20260072. <https://doi.org/10.1098/rspb.2026.0072>: 12 pp. (in English) ["The visual systems of amphibious animals must perform in two optically distinct environments: air and water. Little is known about how diffraction-limited, arthropod compound eyes maintain optical function across the air–water interface, aside from one commonality: flat corneas. Since the external shape of a lens is only one of several properties that influence optical performance, we examined how the corneal optics of compound eyes varied with amphibious ecology across two biological transects: developmentally in one insect species and comparatively among multiple species. Both analyses revealed that flat corneas alone are insufficient to provide amphibious optical performance. The corneas of compound eyes universally combine flat external surfaces, rounded internal surfaces and inwardly expanded thicknesses to support visually guided behaviours in air and water. Conservation of these features among diverse groups provides a strong evolutionary link between the optical performance of compound eyes and the environmental medium." (Authors) Odonata (aquatic, dragonfly nymphs, Libellulidae and Aeshnidae;  $n = 4$  and  $5$ , respectively)] Address: Feller, Kathryn, Department of Biological Science, Union College, Schenectady, NY, USA. Email: fellerk@union.edu

**26134** Ferreira, N.; Sá, I.; Nogueira, C.; Fachada, I.; Coutinho Calheiros, C.S.; Antão-Geraldes, A.M. (2026): Preliminary insights into macroinvertebrate communities associated with floating islands in two rivers under contrasting anthropogenic pressures. *Environmental and Earth Sciences Proceedings* 42(1), 16: 9 pp. (in German, with English summary) ["This study provides a preliminary baseline characterization of macroinvertebrate assemblages colonizing floating islands installed in two NE Portuguese river reaches with contrasting anthropogenic and hydromorphological conditions: the urban,

weir-influenced Fervença River and the more rural, reservoir-like Cõa reach within a former dam-work area. A single campaign in February 2025 combined water characterization and macroinvertebrate sampling on islands and adjacent margins. Fervença showed higher mineralization and microbiological contamination, but a more varied assemblage dominated by tolerant taxa. Cõa showed better water quality but strong Astacidae dominance. Results indicate colonization only; robust replicated monitoring is needed before inferring ecological improvement." (Authors) Odonata are treated at family level.] Address: Ferreira, Nathália, Bragança Science Center, Rua do Beato Nicolao Dinis, 5300-130 Bragança, Portugal. Email: isabelsaccvb@gmail.com

**26135** Ferrer, R.P.; Zimmer, R.K. (2026): Allochthonous chemical cues drive predation by a top carnivore. *Functional Ecology* 40: 1698-1708. (in English) ["(1) Identifying the mechanisms by which mobile predators detect and select prey remains a central challenge in sensory biology and functional ecology. This study provides the first direct evidence that chemical cues associated with allochthonous organic matter (e.g. leaf litter) can restructure chemosensory environments and fundamentally alter consumer-resource dynamics. (2) Using a combination of remote behavioural observations, field experiments with free-ranging animals and predator inclusion/exclusion cage treatments, we examined how external organic inputs indirectly modify trophic interactions within a residential stream community. (3) As top predators, newts (*Taricha torosa*) exhibited a strong chemical attraction to patches containing terrestrially derived plant material, whereas natural substrates composed of rock cobble were used at disproportionately lower rates than predicted by availability. In fact, upon detecting waterborne cues from leaf litter, individuals abandoned cobble and moved upstream to colonize chemically enriched areas. Predator attraction was driven by compounds leaching from allochthonous plant matter, not by cues from native insect larval prey. (4) Even when prey densities were standardized experimentally across habitat types, predation rates by newts were significantly higher in leaf litter than in other substrates. (5) Such chemically mediated shifts in behaviour suggest a general mechanism by which spatial subsidies of organic matter can restructure predator–prey dynamics. By redirecting top carnivore attention and effort, infochemicals derived from non-native sources may play a fundamental role in shaping community organization and regulating energy flow across ecosystem boundaries. ... Other taxa, including odonate larvae and segmented worms (Oligochaeta) though individually more massive, were present in few lavage samples and at lower densities, contributing proportionately little (8% of total) to prey populations." (Authors)] Address: Zimmer, R.K., Dept of Ecology & Evolutionary Biology, University of California, Los Angeles, California, USA. Email: z@biology.ucla.edu

**26136** Fleck, G.; Haber, W.A. (2026): A new Phyllogomphoides Belle from Ecuador, with description of male, female and larva (Odonata: Gomphidae). *Zootaxa* 5831(4): 581-592. (in English, with Spanish summary) ["Phyllogomphoides biguttatus sp. nov., from western Ecuador, is described based on reared adults of both sexes and larvae collected in slow parts of small forest streams in hilly landscapes. This species belongs to the semicircularis-group of species and is closely related to *P. semicircularis* and *P. insignatus*. Phyllogomphoides insignatus probably represents the adelphotaxon of the new species. A differential diagnosis is given to distinguish these closely related species. The new species can be separated from all known Phyllogomphoides Belle by its unique thoracic color pattern with pleural and tergal parts of

pterothorax entirely brown to dark brown except for a pair of large yellow drop-shaped antehumeral markings." (Authors)] Address: Fleck, G., 107150 Lagorce, France. Email: fleckgunther@gmail.com

**26137** Fliedner, H. (2026): Karl Grünberg and his contribution to odonatology. International Dragonfly Fund - Report 201: 1-19. (in English, with German summary) ["Reliable information about Karl Grünberg (1878-1945) has been brought together and an overview of his life and work has been compiled followed by an explanation of the scientific names he assigned to odonate species, including currently recognized genera." (Author)] Address: Fliedner, H., Louis-Seegelken-Str. 106, 28717 Bremen, Germany. Germany. Email: H.Fliedner@t-online.de

**26138** Fliedner, H. (2026): The scientific names of Ferdinand Karsch's odonate taxa. International Dragonfly Fund - Report 200: 1-100. (in English, with German summary) ["This paper explains the scientific names given to dragonflies by the German entomologist Ferdinand Karsch (1853-1936), as well as the names given by other authors to genera, into which taxa described by him are classified presently. First Karsch's life and work are described. Following the explanation of the names, there is a discussion of the preferences evident in his naming conventions, his relationships with other scientists, and his significance for our understanding of dragonflies." (Author)] Address: Fliedner, H., Louis-Seegelken-Str. 106, 28717 Bremen, Germany. Germany. Email: H.Fliedner@t-online.de

**26139** Gabetti, A.; Bertoli, M.; Esposito, G.; Mossotto, C.; Maganza, A.; Meriardi, A.; Sala, A.; Prearo, M.; Pizzul, E.; Pastorino, P. (2026): Trophic ecology and prey selectivity of the Lake Charr (*Salvelinus umbla*) in mountain lakes of the Eastern Italian Alps. *Diversity* 18(6), 336: 22 pp. (in English) ["Understanding the trophic ecology of fish in mountain lakes is essential for interpreting their functional roles and managing these ecosystems. This study investigated the diet, population structure, and prey selectivity of lake charr (*Salvelinus umbla*) in three glacial basins of the Eastern Italian Alps: Fusine Superiore, Fusine Inferiore, and Raibl Lakes. In summer 2024, 106 fish were sampled using multi-mesh gillnets, alongside Surber sampling of littoral macrobenthos. Biometric analysis revealed populations dominated by larger size classes (>18 cm), with significant sexual dimorphism, as females were longer and heavier than males. Dietary analysis showed strong reliance on littoral Hexapoda (~90% of prey). High Schoener's overlap index values ( $a > 0.90$ ) indicated no clear ontogenetic dietary shifts in the sampled size classes, suggesting that the productive littoral zone provides a stable resource. Mew's electivity index revealed lake-specific prey selection patterns, with Hexapoda positively selected in Lake Fusine Inferiore, Bivalvia and Malacostraca positively selected in Lake Raibl, and weak or absent selectivity in Lake Fusine Superiore. *S. umbla* appears to be a broad opportunistic feeder with site-specific prey selectivity shaped by local resource structure. Given its debated native status, these findings provide an ecological baseline for assessing its potential effects on benthic communities." (Authors) In the supplemental material, *Platycnemis pennipes* is listed.] Address: Gabetti, Alice, Istituto Zooprofilattico Sperimentale del Piemonte, Liguria e Valle d'Aosta, Via Bologna 148, 10154 Torino, Italy

**26140** Gagarina, D.Y. (2026): Gogol's experience in O. Slavnikova's reception (Based on the novel "The Dragonfly, enlarged to the size of a dog"). *Russian Journal of Bakhtin Studies* 8(1): 111-123. (in Russian, with English ummary) ["Introduction.

The question of the forms in which classical heritage resides in contemporary li-terature remains a key issue in contemporary literary studies. The need to study the reception of classical traditions by contemporary Russian prose writers stems from the fact that it allows us to discover intertextual connections between modernity and the classics and to determine the degree to which the themes and motifs of great predecessors are "present" in a writer's individual practice. In this context, the works by O. A. Slavnikova, who reinterprets the classical traditions of V. V. Nabokov, F. M. Dostoevsky, and N. V. Gogol, is particularly noteworthy. Despite the diversity of works which study the writer's prose, the Gogolian layer in her works, with rare exceptions, remains outside the field of view of literary scholars. The aim of this study is to identify the specific ways in which N. V. Gogol's artistic experience is interpreted in O. A. Slavnikova's novel "A Dragonfly Enlarged to the Size of a Dog". Materials and Methods. The research material is O. A. Slavnikova's novel "The Dragonfly Enlarged to the Size of a Dog", as well as critical articles and reviews of it by the writer's contemporaries. It uses the historical-comparative method and the method of holistic analysis of literary text. The author draws on the works of M. M. Bakhtin and Yu. V. Mann, which examine the work of N. V. Gogol. Results and Discussion. The article establishes that O. A. Slavnikova perceives N. V. Gogol's artistic experience in her novel on three levels: chronotopic (the chronotope of the city, like N. V. Gogol's, is animated and symbolizes the disintegration of existence); plot-thematic (the "reification" of the world becomes a marker of the disharmony of everyday reality); and character (the image of the main character parallels the image of Plyushkin from N. V. Gogol's "Dead Souls", as the extreme form of human reification; the image of Ryabkov alludes to Chertkov from the first edition of N. V. Gogol's "Portrait"). Conclusion. The obtained results expand our understanding of the specific features of O. A. Slavnikova's novel and clarify the vector of perception of Gogol's prose by contemporary Russian writers. The research materials can be used in university courses on modern Russian literature and literary theory." (Author)] Address: Gagarina, Dana Yu., Dept of Russian & Foreign Literature, Nati. Research Mordovia State Univ., 68 Bolshevistskaya St., Saransk 430005, Russia. Email: pd-20042@mail.ru

**26141** Garcia-Moreno Marchán, J. (2026): Odonatofauna present a la conca hidrogràfica de la riera de Sant Bartomeu de Covildases (Osona). *Estudi científic. Vall de Sant Bartomeu* 2: 9 pp. (in Spanish, with English summary) ["Odonatofauna present in the basin of the Riera de Sant Bartomeu de Covildases (Osona). The present study, carried out in 2024–2025, monitored the communities of Odonata present in the basin of the Riera de Sant Bartomeu de Covildases (Osona, Catalonia). A total of 16 sampling sessions were performed in April–October, nine in 2024 and seven in 2025. Only adult individuals were counted. In all, 18 odonate species were detected, eight belonging to Zygoptera and the other 11 to Anisoptera. This species richness represents 39% of the Odonata found in Osona and 25% of those described from Catalonia. The most abundant species were *Calopteryx virgo*, *Boyeria irene*, *Cordulegaster boltonii* and *Pyrrhosoma nymphula*, present at all the sampling points. Of these species, the first three are considered good bioindicators of the quality of aquatic environments due to their ecological requirements. Based on the results obtained we therefore consider that the ecological quality of the Riera de Sant Bartomeu is very high." (Authors)] Address: Garcia-Moreno Marchán, J., Grup Oxygastra (grup d'estudi dels odonats de Catalunya), Institució Catalana d'Història Natural. Email: oxygastra.ichn@correu.iec.cat

**26142** Gjoni, V.; Glazier, D.S.; Pomeranz, J.P.F.; Junker, J.R.; Smith, A.; Woelber, J.; Reynolds, S.; Welch, T.; Wesner, J.S. (2026): Temperature and predation alter metabolic scaling without changing the size-based community structure of freshwater macroinvertebrates. *Phil. Trans. R. Soc. B* 381: 20250072. <https://doi.org/10.1098/rstb.2025.0072>: 12 pp. (in English) ["Body size is a key trait that influences ecological processes such as metabolism, abundance and species interactions. While the metabolic theory of ecology (MTE) proposes a universal scaling of metabolic rate with body mass, recent evidence shows that this relationship is not fixed. Environmental factors like temperature and predation can alter the metabolic scaling exponent, potentially reshaping size distributions. However, most research has examined these patterns within individual species, leaving open questions about how environmental drivers affect scaling at the community level. To address this, we performed a mesocosm experiment manipulating both temperature and fish predator presence in freshwater macroinvertebrate communities. We found that warming altered metabolic rates in a predation-dependent way: without fish, metabolic rates increased in large individuals but decreased in small individuals, whereas the opposite occurred with fish present. This suggests that larger individuals reduce their baseline metabolic rates under predation risk, especially at higher temperatures. Interestingly, the slope of the community size distribution remained stable across treatments, indicating that shifts in metabolic scaling occurred independently of changes in size structure. Together, these findings highlight the environmental sensitivity of metabolic scaling and suggest that links between metabolism scaling and size distributions may be more complex than MTE predicts." (Authors) Table 1. presents the relative abundance and biomass of the two most common taxa (Chironomidae and Odonata).] Address: Vojsava, Gjoni, Dept Biol., Univ. South Dakota, Vermillion, SD, USA. Email: vojsava.gjoni@unipa.it

**26143** Gonçalves, A.; Farias, A.B.S.; Pires, C.E.F.; Oliveira, T.M.D.; Ferreira, E.D.F.; Martins, H.O.J.; Martinez-Martinez, C.A.; Bartoletti, G.L.; Urso-Guimarães, M.V.; Santos, J.C. (2026): Preliminary checklist of dragonflies and damselflies (Insecta: Odonata) from the Serra do Japi Biological Reserve, Jundiá, São Paulo, Brazil, and new records for the state. *Biota Neotropica* 26(1): e20261893. <https://doi.org/10.1590/1676-0611-BN-2026-1893>: 12 pp. (in English, with Portuguese summary) ["The present study provides a preliminary Odonata inventory for the Serra do Japi Biological Reserve, an important Atlantic Forest conservation unit in São Paulo State, Brazil. We recorded 22 species, representing 7.5% of the Odonata fauna previously known for the state. Among them, three are new records for São Paulo, highlighting the potential for further discoveries in unexplored Atlantic Forest remnants. Libellulidae and Coenagrionidae were the most diverse and abundant families, a pattern similar to that observed in other studies of Atlantic Forest odonate assemblages. Species richness was similar between the lentic and lotic habitats, with some taxa exhibiting clear habitat preferences. The recorded species composition reflects the environmental heterogeneity of the SJBR and the availability of suitable microhabitats for odonates. Additionally, the presence of *Brechmorhoga goncalvensis* Vilela, Stefani-Santos & Ávila Júnior, 2021, and *Heteragrion tiradentense* Machado & Bedê, 2006, both listed as near threatened, underscores the role of the SJBR as an essential refuge for range-restricted and sensitive species. These findings reinforce the importance of Atlantic Forest reserves in maintaining regional Odonata diversity and contribute to a broader understanding of species distribution patterns." (Authors)] Address: Santos, J.C., Univ. Federal de Sergipe, Depto de Ecologia, São Cristóvão, SE, Brasil. Email: jcsantosbio@gmail.com

**26144** Gröbl, M. (2026): Libellenfauna der Moore und Altarme der Enns im steirischen Ennstal. Masterarbeit, Natur- und Umweltschutz, Institut für Biologie, Universität Graz: VIII, 68 pp. (in German, with English summary) ["This master's thesis examines the dragonfly fauna in seven selected wetlands in the Styrian Enns Valley, consisting of degraded moor remnants and former oxbow lakes of the Enns river, and evaluates their ecological quality using dragonfly parameters. The aim of the thesis was to analyse the influence of different degrees of degradation and utilisation on species composition and to highlight the importance of these habitats for endangered moorland dragonflies. Particular attention was paid to *Leucorrhinia pectoralis* and *Nehalennia speciosa*, two highly specialised and highly endangered species. The study covered the following seven study areas: Fish pond – Admont. Enns oxbow lake – Frauenberg. Panorama Lake eco-pond – Dorfleermoos. Pichlmaier Moor. Fish pond – Pichlmaier Moor. Enns oxbow lake – Hofer-Lahn. Enns oxbow lake – Niederstuttern. All study areas were visited five times between May and September 2022. The visits were carried out in the most favourable weather conditions possible (sunny, dry, little wind) and were randomised in terms of time in order to minimise distortions caused by the time of day. The dragonflies were recorded on the basis of the imagines by means of visual observation, selective net catching and photo documentation. In addition, abundance classes, criteria for soil characteristics and species-specific association types were used. Abiotic parameters (pH value and water temperature) were also recorded in order to determine the characteristics of the water bodies. A total of 29 dragonfly species were identified, which corresponds to around 45 % of the dragonfly fauna in Styria. The number of species per area was distributed as follows: Area 1 (fish pond – Admont): 12 species. Area 2 (Enns oxbow lake – Frauenberg): 20 species. Area 3 (Panoramasee eco-pond – Dorfleermoos): 15 species. Area 4 (Pichlmaier Moor): 22 species. Area 5 (fish pond – Pichlmaier Moor): 16 species. Area 6 (Enns oxbow lake – Hofer-Lahn): 20 species. Area 7 (Enns oxbow lake – Niederstuttern): 16 species. The Pichlmaier Moor (Area 4) proved to be the most ecologically valuable study area with the highest number of species and the exclusive presence of both moorland specialists (*L. pectoralis* and *N. speciosa*) in high abundance classes. This underlines the central importance of this site as a refuge for highly specialised moorland dragonflies. In contrast, these species were completely absent from waters used as fish ponds, indicating the negative impact of fish stocking, eutrophication and structural simplification. The results show that even anthropogenically used water bodies can have a comparatively high overall species diversity, but are predominantly dominated by undemanding species. The mere number of species therefore proves to be an insufficient criterion for ecological assessment, while the occurrence of specialised bog species has a significantly higher indicator value. The study confirms the high suitability of dragonflies as bioindicators for wetlands and illustrates that intact or rewetted moors play a key role in the conservation of endangered species. Against the backdrop of the European Renaturation Regulation and the Austrian Moor Strategy, the present results provide a reliable data basis for future conservation and renaturation measures in the Enns Valley." (Author)] Address: <https://unipub.uni-graz.at/obvugrhs/download/pdf/13894671>

**26145** Guo, C.; Yang, X.; Han, J.-a.; Han, S.; Zhong, J. (2026): Flow control of a diffuser cascade with bio-inspired corrugated morphology of dragonfly wings. *Aerospace Science and Technology* 176, Part D, 112551: (in English) ["Inspired by the corrugated geometric morphology of dragonfly wings, a bio-inspired non-smooth groove surface arranged

in a streamwise array is proposed and applied to a highly loaded diffuser cascade. Using an experimentally validated numerical method, the effects of different groove fillet configurations on cascade aerodynamic performance and flow-control mechanisms are systematically investigated. The results show that the bio-inspired grooves can effectively reduce the total pressure loss and enhance the diffusion capability of the cascade. Among the configurations considered, the fully filleted layout performs best, yielding a maximum reduction of 11.16% in total pressure loss coefficient and a maximum increase of 2.60% in static pressure coefficient. Within the investigated incidence range, the grooves exhibit more pronounced benefits under positive-incidence conditions, especially near stall, by effectively modulating suction-side trailing-edge separation and improving the three-dimensional corner-separation structure. Drag decomposition indicates that the grooves reduce not only pressure drag but also viscous drag. The quasi-stable periodic trapped vortices formed inside the groove cavities can continuously weaken the near-wall reverse flow and promote near-wall momentum replenishment, thereby suppressing large-scale separation and improving flow stability." (Authors)] Address: Han, J.-a., Naval Architecture & Ocean Engineering College, Dalian Maritime University, Dalian, China. Email: [hja\\_dmu@163.com](mailto:hja_dmu@163.com)

**26146** Hermann, J.; Verspui, K.; Villanueva, R.; de Win, S.; Kalkman, V.J. (2026): Identification and distribution of the Philippine endemic *Trithemis adelpha* (Odonata: Libellulidae). *International Journal of Odonatology* 29: 87-94. (in English) ["A review based on material available at Naturalis Biodiversity Center (RMNH) and images available on iNaturalist and Observation.org shows that *Trithemis adelpha*, often regarded a synonym of *T. aurora*, is a valid species and can be identified with relative ease. *Trithemis adelpha* has a more slender abdomen but is morphologically largely similar to *T. aurora*. It however differs in the general colouration of the body (red instead of purple) and the extent of black pattern on the thorax and abdomen. Based on the new records it is shown that this Philippines endemic is widespread occurring on all major islands with the exception of Palawan and Negros. Field observations indicate that this species has, compared to *T. aurora*, a preference for larger waterbodies, and is often found at slow flowing sections of larger streams." (Authors)] Address: Hermann, J., Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands. Email: [hermannjoseph@hotmail.de](mailto:hermannjoseph@hotmail.de)

**26147** Hillman, B. (2026): Odonata of high-elevation pond systems in the White Mountains of New Hampshire, USA. *Odonatologica* 55(1/2): 31-48. (in English) ["This study represents the first attempt to comprehensively survey the Odonata inhabiting high-elevation pond systems in the White Mountains of New Hampshire, USA. Several species known or suspected of occurring in these systems are of high conservation concern and their continued presence is threatened by the impacts of climate change, and, to a lesser degree, by recreation pressure. The goal of this study was to document the presence of species of concern while establishing a baseline from which to track changes to the complete species assemblage of Odonata over time. During the study period, I detected a total of 43 species and found at least one species of concern at all but one of my thirteen study sites. In addition, I documented resource damage from recreational use at several of the study sites which the United States Forest Service is working to rehabilitate." (Authors)] Address: Hillman, B., United States Forest Service, 71 White Mountain Drive, Campton, New Hampshire, 03223, USA. Email: [brett.hillman@usda.gov](mailto:brett.hillman@usda.gov)

**26148** Hollingsworth, P.M.; Fantoni, K.; Koureas, D.; Arakelyan, M.; Aravanopoulos, F.A.; Bacela-Spychalska, K.; Balasteros-Mejia, L.; Beja, P.; Bonchev, G.N.; Kharrat, M.B.D.; Bourlat, S.J.; Chkharishvili, T.; Ciampor, F.; Costa, F.O.; Csabai, Z.; Dankova, G.; Ekrem, T.; Emerson, B.; Ferreira, S.; Gadawski, P.; Gkagkavouzis, K.; Hebert, P.D.N.; Ichim, M.C.; Jelic, M.; Kaitetzidou, E.; Kalamujic, B.; Kamenova, S.; Keskin, E.; Laini, A.; Lawniczak, M.; Madesis, P.; Montagna, M.; Mutanen, M.; Peters, R.S.; Price, B.; Rewicz, T.; Rougerie, R.; Rulik, B.; Szucsich, N.; Vos, R.; Goodall-Copestake, W.P.; Triantafyllidis, A.; Grabowski, M. (2026): Species identification, discovery, and biomonitoring: Strategic priorities for DNA barcoding in Europe, set in a global context. *BioScience*, biag052, <https://doi.org/10.1093/biosci/biag052>: 11 pp. (in English) ["The International Barcode of Life (iBOL) initiative is building a globally accessible DNA-based system for species identification and discovery. This paper outlines the mission and strategic priorities for the iBOL community in Europe (iBOL Europe), set in a global context. The mission of iBOL Europe is to produce, curate, and provide access to a complete DNA barcode reference library of European eukaryotic biodiversity, catalyzing species discovery and enabling comprehensive, harmonized species identification and biomonitoring, and supporting the global iBOL program. Immediate objectives include completing reference libraries for priority taxa, democratizing access to sequencing technologies, and strengthening a distributed community of practice. Key actions identified span five thematic areas: community building, sample collection and taxonomic verification, sequencing infrastructure, data management, and mainstreaming DNA-based approaches to meet societal needs. The strategy emphasizes integration with European research infrastructures to ensure long-term sustainability and resilience for biodiversity genomics in Europe." (Authors) The paper includes a reference to Odonata.] Address: Hollingsworth, P.M., Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, United Kingdom. Email: [p.hollingsworth@rbge.org.uk](mailto:p.hollingsworth@rbge.org.uk)

**26149** Horikawa, A.; Sasaki, T.; Kambayashi, K.; Nonami, R.; Toyama, S.; Kurahashi, T. (2026): Shape optimisation of corrugated wings via a combined adjoint variable method and deep reinforcement learning. *International Journal of Computational Fluid Dynamics* 39(7): 389-404. (in English) ["This study proposes a stepwise shape optimisation method for a dragonfly-inspired corrugated wing by combining the adjoint variable method with deep reinforcement learning. The adjoint method provides a locally optimised shape using FreeFEM++, and the reinforcement learning, i.e. the Double Deep Q Network (DDQN), is used to obtain further improved solutions. Lift is defined as the objective function in the shape optimisation analysis based on the adjoint variable method, and a surrogate model, created using supervised learning, is applied to reduce the computational cost of the calculation of the lift in the DDQN. The results show that the lift force increases as a result of shape updating using the adjoint variable method and is further enhanced by DDQN. Taking the initial shape as 100%, the lift increases to 142.14% with the adjoint method and to 150.78% with DDQN, indicating an additional improvement of 8.64% over the adjoint-based result." (Authors)] Address: Horikawa, A., Mechanical Engineering, Master's Program, School of Engineering, Nagaoka University of technology, Niigata, Japan

**26150** Hunter, I.; Sutherland, L.N.; Bushnell, A.; Scribner, Y.; Bybee, S.M.; Kalkman, V.J. (2026): A new species, *Pseudagrion yalomi*, from Papua New Guinea. *International Journal of Odonatology* 29: 81-86. (in English) ["A new species of *Pseudagrion* red-group, *Pseudagrion yalomi* sp. n., is described from

northeastern New Britain, Papua New Guinea. Characters of the male holotype (Papua New Guinea, Bismarck Archipelago, northeastern New Britain Island, Yalom 1000 m, 9.v.1962, Noona Dan Exp. 61–62) are described, and affinities of the new species are discussed. Variations in paratypes and comparisons to other species within the Eastern redgroup are specified. The distribution of all 15 members of the *Pseudagrion* red-group occurring east of Lydekker's line is shown on a map." (Authors)] Address: Hunter, Isabella, Dept of Biology, Brigham Young University, 4102 LSB, Provo, UT 84602, USA. Email: ihunter6@student.byu.edu

**26151** Hutajulu, L.G.; Koneri, R.; Langoy, M. (2026): Diversity of dragonflies (Odonata) in habitat types in Palaes Village, North Minahasa Regency, North Sulawesi. *Jurnal Biologi Tropis* 26(2): 671-678. (in Indonesian, with English summary) ["Odonata are an important component of aquatic ecosystems, serving as natural predators and bioindicators of environmental quality. This study aims to identify species and analyze dragonfly diversity in three habitat types in Palaes Village, North Minahasa Regency. Dragonfly sampling was conducted using the transect method (300 m; 5 m wide on both sides) with a purposive sampling approach. The results showed that 555 dragonfly individuals were found, comprising 28 species, 18 genera, and 7 families, with Libellulidae as the dominant group. The most abundant species was *Neurothemis stigmatizans* (95 individuals; 17.12%). Diversity levels were moderate, with the highest *H'* value in plantation habitats, followed by waterfalls, and the lowest in residential areas. The highest species richness was found in waterfall and plantation habitats, while species evenness was high across all locations. The highest density was found in the waterfall area. Dragonfly diversity in Palaes Village falls into the moderate category, with community structure influenced by habitat conditions and the level of human activity pressure, particularly in residential areas." (Authors)] Address: Hutajulu, Lora Gian, Program Studi Biologi, Fak. Matematika dan Ilmu Pengetahuan Alam, Univ. Sam Ratulangi, Manado, Indonesia. Email: lorahutajulu102@student.unsrat.ac.id

**26152** Izma, G.; Mclsaac, D.; Raby, M.; Yates, A.G.; Prosser, R.; Rooney, R.C. (2026): Biofilms, bugs, and the built environment: Exploring local and landscape drivers of diatom and macroinvertebrate assemblages in urban stormwater ponds. *Water Environment Research* 98:e70463: 21 pp. (in English) ["Stormwater management ponds (SWPs) are engineered systems designed primarily for flood control and sediment capture in urban landscapes. Despite their intended function, these ponds are often colonized by aquatic biota and can contribute to urban biodiversity. We investigated the ecological condition of 21 SWPs in a highly urbanized city in southern Ontario, Canada, by assessing the composition of periphytic diatom and aquatic macroinvertebrate assemblages and relating these to water quality, pesticide contamination, physical habitat features, and surrounding land use. Assemblages were dominated by pollution-tolerant taxa. Water quality parameters were good predictors of variation in community composition for both assemblages, whereas pesticide contamination was associated with diatom relative abundances, and local vegetation cover was associated with macroinvertebrate relative abundances. Landscape variables within a 300- m buffer surrounding the SWPs were not associated with community composition or taxonomic richness for either assemblage, suggesting that site- level conditions exert stronger ecological influence. These findings highlight the importance of using multiple biological assemblages to capture different aspects of ecological condition and the value of integrating biological monitoring into stormwater infrastructure

planning. Enhancing emergent and riparian vegetation, reducing pollutant inputs, and managing contaminant pathways may improve biodiversity potential in urban SWPs." (Authors) Taxa - including Odonata - are treated at family level.] Address: Rooney, Rebecca, Dept Biol., Univ. of Waterloo, Waterloo, Ontario, Canada. Email: rooney@uwaterloo.ca

**26153** Jasmi, R.A.; Hikmah, A.N.; Nurul, A.; Oktadiansyah, R.; Farid, A.M.; Firdaus, A.F. (2026): Diversity of Odonata in natural and artificial lake habitats in Serang, Banten. *Berita Biologi* 25(1): 323-334. (in English, with Indonesian summary) ["Indonesia is recognized as one of the countries with high biodiversity, including insects from the order Odonata... However, information on Odonata biodiversity in freshwater habitats in the Serang region of Banten Province remains limited. This study aims to describe and analyze Odonata diversity and community structure in two lake habitat types, namely an artificial lake and a natural lake. Sampling was conducted over eight days using an exploratory survey and direct collection method with an insect net, with observations carried out in the morning (08:00-10:00 WIB) and afternoon (15:00-17:00 WIB). Environmental factors measured included temperature, humidity, wind speed, and surrounding vegetation. A total of 10 Odonata species comprising 189 individuals were recorded. The natural lake was strongly dominated by *Orthetrum sabina* (85.71%), whereas the artificial lake was dominated by *Agriocnemis pygmaea* (33.61%). The artificial lake showed biodiversity index values of  $D = 0.241$ ,  $H' = 1.644$ ,  $E = 0.714$ , and  $Dmg = 1.883$ , while the natural lake showed  $D = 0.7449$ ,  $H' = 0.509$ ,  $E = 0.463$ , and  $Dmg = 0.47$ . These results indicate that the artificial lake has moderate diversity with relatively even species distribution, whereas the natural lake shows strong species dominance and lower diversity. Overall, the artificial lake provides more suitable habitat conditions for supporting Odonata diversity, highlighting the importance of habitat heterogeneity in freshwater ecosystems." (Authors)] Address: Jasmi, R.A., Biol. Study Program, Faculty of Science, Sultan Maulana Hasanuddin State Islamic University of Banten, Indonesia. Email: riski.andrian-@uinbanten.ac.id

**26154** Jiménez Liébanas, L.; Céspedes, V.; Picazo, F.; Rubio, C.; Gallardo, B. (2026): Invasive aquatic species drive losses in functional diversity despite no apparent loss in taxonomic diversity. *Ecological Indicators* 188: 114937: 12 pp. (in English) ["Invasive species are a major threat to global biodiversity, yet their functional impacts on ecosystems are less studied than dispersal and establishment. These impacts are multifaceted, cascading through ecosystems via trophic interactions and indirect habitat alteration, and may intensify through interactions with other invaders. This study investigated the impacts of apple snail (*Pomacea maculata*) and blue crab (*Callinectes sapidus*) on habitat quality, and the taxonomic and functional composition of macroinvertebrate communities in the Lower Ebro River, Spain. A set of a priori hypotheses about expected effects were tested, providing a framework for future research in other invaded systems. Results show that both invaders are associated with degraded habitat quality. Suspended solids were twice as high and chlorophyll-a fourfold higher in invaded than control habitats, indicating intensified nutrient mobilization. These changes cascaded to impact community structure. While taxonomic richness, abundance, and diversity remained stable, composition shifted. Sensitive taxa like Ephemeroptera and Trichoptera declined, replaced by tolerant taxa including Coleoptera, Odonata [*Erythromma*], and Gastropoda. Functional indicators revealed strong homogenization in invaded sites, with reduced functional richness and diversity. Traits like small

body size, resistance forms, and predatory feeding were more prevalent in invaded habitats. Impacts intensified where both invaders co-occurred, supporting the invasional meltdown hypothesis. This is one of the first studies assessing ecological consequences for two co-occurring invasive species, from distinct trophic levels without shared evolutionary history. We conclude that functional indicators are more sensitive than taxonomic metrics and provide mechanistic information about the impacts of invasive species in aquatic ecosystems.] Address: Jiménez Liébanas, Laura, Geoeology, Dept Environmental Science, Univ. of Basel, 4056 Basel, Switzerland. Email: laura.jimenezliebanas@unibas.ch

**26155** Jonathan, S.; Ketut Suryana, I.; Made Suma Wirawan, I. (2026): Altered level of consciousness in metabolic disease: An emphasis on the pathomechanism of hepatic encephalopathy. *International Journal of Health and Pharmaceutical (IJHP)* 6(2): 380-385. (in English) ["The present study reports the first comprehensive study on the freshwater macroinvertebrates and its habitat preferences in Bilah River, the largest river in the Northern Sumatra. The riverside is characterized by the presence of anthropogenic and industrial activities which may alter the macroinvertebrate assemblage and biodiversity. Five months of investigation on 10 sampling stations from December 2016 to October 2017 was conducted based on the river flow in Bilah River. Principal component analysis indicated a decrease in trophic status from upstream to downstream of the river. A total of 27 taxa were recorded, with the most abundant group were members of Odonata [no details are given at any place], Gastropoda, and Decapoda. The highest density of macroinvertebrate was observed from station 1 (160 ind m<sup>2</sup>), while the lowest density was observed from station 9 (38.64 ind m<sup>2</sup>). Based on species distribution and similarity, two groups of habitats may be distinctively recognized based on the Bray-curtis similarity coefficient. Group 1 consisted of station 1, 2, 3 and 4 while group 2 consisted of station 5, 6, 7, 8, 9, and 10. Based on the diversity indices as ecological parameters, the habitat condition in Bilah River is categorized from low to moderately polluted. Spatial patterns in both environmental conditions affecting the macroinvertebrate assemblage was observed using canonical correspondence analysis (CCA) revealed the preferences from each macroinvertebrate species towards environmental conditions." (Authors)] Address: Jonathan, S., Dept of Internal Medicine, Wangaya Regional General Hospital, Bali, Indonesia. Email: stevenjosteve@gmail.com

**26156** Kang, J.; Lu, M.; Wang, Y.; Liu, X.; Zhang, Q. (2026): Closed-loop recyclable, tough, and solvent-resistant electromagnetic shielding hydrogel inspired by dragonfly. *ACS Applied Materials & Interfaces* 18(22): (in English) ["Electromagnetic shielding hydrogels have attracted much attention in stress sensing, motion monitoring, and bioelectronics. However, existing works mainly focus on improving electromagnetic shielding and sensing performance while ignoring the development of solvent resistance and material closed-loop recycling performance required for liquid-environment applications. In this work, a dragonfly-inspired solvent-resistant and closed-loop recyclable electromagnetic shielding hydrogel is successfully prepared via the biomimetic dual-network structure constructed by combining rigid polyimide (PI) with flexible poly(vinyl alcohol) (PVA). The electromagnetic shielding hydrogel features high mechanical strength and reproducible and welding capabilities. More importantly, the hydrogels demonstrate closed-loop recycling of polyimide monomers and graphene nanofillers, and the recycled monomers and graphene can be reused in the construction of solvent-resistant electromagnetic-shielding hydrogels. Furthermore,

electromagnetic shielding hydrogels are designed as stress sensors for monitoring strain and pressure signals, whether in air, water, or organic solvents. It is anticipated that the strategy of solvent-resistant and sustainable electromagnetic shielding hydrogels will provide a promising opportunity for various flexible electronics in liquid environments." (Authors)] Address: Zhang, Q., Polymeric & Soft Materials Laboratory, School of Chemistry & Life Science and Advanced Institute of Materials Science, Changchun University of Technology, Changchun 130012, China. Email: zhangqin@ccut.edu.cn

**26157** Keetapithchayakul, T.S.; Kim, J.; Phan, Q.T.; Digma, J.R. (2026): Reexamination of *Heteronaias heterodoxa* (Selys, 1878) (Odonata: Corduliidae), with larval redescription, comparative notes on Asian Corduliidae larvae, and biogeographic significance. *Zootaxa* 5777(3): 471-488. (in English) ["*Heteronaias* Needham & Gyger, 1937 is a monotypic genus represented solely by *H. heterodoxa*, a poorly documented corduliid. Based on reared specimens from Luzon, Philippines, we provide a detailed larval description, notes on adult morphology, and distributional data. Adult characters, particularly the vesica spermalis of male and female terminalia, are redescribed and illustrated. The larva is distinguished by a flattened body, 9–13 premental setae, 8–11 palpal setae, a poorly developed ligula, middorsal protuberances on abdominal segments 6–10, and a distinct episternal apophysis. Comparative analysis with Asian corduliid genera highlights diagnostic larval features valuable for taxonomy and phylogenetic studies. Larvae inhabit shaded forest streams and emerge on rock surfaces, showing rheophilic adaptations comparable to those of *Zygonyx* Selys in Hagen, 1867 (Libellulidae). Distributional records confirm that *H. heterodoxa* is endemic to the Philippines." (Authors)] Address: Keetapithchayakul, T.S., The Center for Entomology & Parasitology Research, College of Medicine & Pharmacy, Duy Tan University, 120 Hoang Minh Thao, Lien Chieu, Da Nang, Vietnam. Email: Keetapithchayakul.TS@gmail.com

**26158** Kennedy, L. (2026): Dragonfly News 89. *Dragonfly News* 89: 1-44. (in English) ["**DRAGONFLIES AND YOU:** Photos and dragonfly stories from you. From island dwelling Red-veined Darters to seeing double. Don't forget to send in your images to be featured! **THE VALUE OF VIGILANCE: NINE YEARS OF RECORDS AT MARSH WOOD POND:** Through the power of consistent recording from 2017-2025, Marsh Wood Pond, near Wallingford in Oxfordshire, offers a rare insight into year-on-year changes in local dragonfly populations. Stephen Burch **WHAT'S IN A NAME?: Broad Scarlet or Scarlet Darter?** Debating the most appropriate name for *Crocothemis erythraea* in Britain. Steve Cham **DRAGONFLIES HQ:** The latest news and updates from Team Dragonfly. Including: a summary of recording in 2025, an update to staff and trustee teams, and the latest in Colonist and Migrant News. **FIELD MEETINGS AND EVENTS:** A snapshot of some of our events and field meetings taking place this summer. For our full list of events and up to date information take a look at the events page of our website. Collated by Mike Averill **ANNUAL MEETING:** Catch up on the minutes from our 2025 AGM. Looking forward to 2026, we have updates on this year's conference and a notification of the date for our AGM. **DRAGONFLIES ON THE BOG:** An update on our exciting project restoring and conserving peatland habitat. Emma Stevens-Veitch **VOLUNTEERING AND PROJECTS SPOTLIGHT:** Highlighting volunteering, volunteer groups and current projects across the UK. **A TALE OF TWO HAWKERS:** Exploring the changes in status of two hawkers, *A. isoteles* and *A. juncea*, from a Devon perspective. Dave Smallshire **YOUTH PANEL:** Celebrating Sir David Attenborough's 100th birthday and an insight

into the beginnings of a career in conservation. Maria Giulia Checchi and Tink Swash **WINGS & WORDS: Two exciting new dragonfly books to add to your wish list this year.** Dragonfly behavior By Georg Ruppell and Dagmar Hilfert-Ruppell Field Guide to the Dragonflies & Damselflies of Great Britain and Ireland. By Steve Brooks and Steve Cham Review by Peter Mill **RECORDING SCHEME: Up to date contact information for County Dragonfly Recorders.**" (Publisher)]

**26159** Kessel, M. (2026): System transition from pine monoculture to agroforestry, a biodiversity baseline study and soil improvement method test. MSc thesis, Utrecht University: 47 pp. (in English) ["Agricultural and forestry practices wield significant influence over ecosystems, shaping landscapes and impacting biodiversity. In the Netherlands, where near 60% of land is dedicated to agriculture, centuries of agricultural practices have driven population growth but also led to environmental challenges, including methane emissions, water depletion, and a decrease in biodiversity. Mitigating these effects requires a shift towards more sustainable practices, as advocated by EU initiatives such as the Common Agricultural Policy (CAP) and the Farm to Fork Strategy. This study focuses on a 26-hectare pine production forest in Overloon, the Netherlands, on the verge of a transition to an agroforestry system, with the main goals being: Improvement of; (long-term) financial yield, biodiversity, and carbon sequestration. Through comprehensive assessments of soil characteristics, biodiversity, and carbon storage, the research aims to establish baseline data that can be used for comparison in the future, after system changes. Conducted within the pine production forest in Overloon, the study uses various methods to determine the status of the forest: GPS mapping for forest categorization, using tree density and species. Soil sampling for biological, chemical and structural analysis, and water retention ability. Biodiversity surveys employing diverse sampling techniques. Braun-Blanquet sampling for of several plots per major forest type as found in the GPS mapping. Various insect traps and DNA-analysis of caught insects. Transect sampling for Odonata [*Anax imperator*, *Orthetrum cancellatum*, *Sympetrum sanguineum*, and *S. striolatum*] and Lepidoptera. Light traps for night-active Lepidoptera. Camera traps and net sampling for vertebrate biodiversity. Carbon storage calculation based on tree size and species, sampled over several plots within the major forest types. Furthermore, any personally encountered species while in the forest were noted to include in the total species count. Additionally, 4 experimental plots were created in two forest types to test soil rejuvenation methods. Each plot was divided into 4 sections with each a different treatment. The vegetation was cut down on each section and the total treatment for 1 of the 4, of 3 out of 4 the litter layer was removed. This removal was the second treatment. One section was subsequently treated with chalk and the other with stone flour. Upcoming plant species were noted on 2 occasions when revisiting the forest after a waiting period. The forest was divided into 10 different forest types. Soil quality was found to be poor and extremely acidic across all parameters, and forest types. The research found a low floral biodiversity with only 34 plant species found in the entire forest (including mosses). A relative rich insect species count in the DNA-analysis of said traps with a minimum of 164 species over all forest types. During the transects 10 Lepidoptera species, and 4 Odonata species were encountered. The light traps caught a total of 38 night-active Lepidoptera species. The camera trap and net sampling, combined with personally encountered species, yielded 41 vertebrate species. The aboveground carbon content of the forest was estimated to be around 72.2 Mg C ha<sup>-1</sup>. Of the treatments in the experimental plots the stone flour treatment

yielded the biggest result, followed by the chalk treatment. New species not encountered in the rest of the forest germinated and covered the plots... Odonata species are not abundant in the forest. This may be due to the current structure of the forest, dense and dark. Research has found a negative correlation between shade and Odonata species (Remsburg et al. 2008). Besides logging and planting activities, there are plans to create additional bodies of water. The single waterhole has already proven important to much of the forest fauna, but the biggest beneficiaries may be the Odonata species. Man made ponds have proven to be beneficial for Odonata, as long as they have a well-developed riparian zone and plenty of aquatic vegetation (Vilenica et al. 2020)."] (Author)] Address: <https://studenttheses.uu.nl/handle/20.500.12932/51308>

**26160** Kessler, E.J.; Mui, J.M.; Dreslik, M.J. (2026): Integrating multi-scale species distribution modeling and field validation to guide conservation of the endangered Hine's Emerald Dragonfly (*Somatochlora hineana*). Journal of Insect Conservation 30, 48: 13 pp. (in English) ["*S. hineana* is a federally endangered habitat specialist in the United States occurring in disjunct populations from the Great Lakes region to southeastern Missouri. Its elusive nature and specialized habitat requirements necessitate efficient methods for locating extant populations. Our study aimed to: (1) develop a detection probability model for HED to optimize survey efforts; (2) create and field-validate a regional Species Distribution Model (SDM) for the greater Chicago region (Northern Illinois/Southern Wisconsin) to guide surveys for new populations; and (3) develop and compare SDMs for the full U.S. range, Great Lakes region, and Missouri region to investigate broad-scale and regional habitat associations. All SDMs demonstrated good predictive performance (AUCs: 0.889–0.970). Field validation of the Chicago Region SDM resulted in discovery of a novel HED locality in Will County, Illinois, in atypical habitat lacking dolomite bedrock. Key predictors varied regionally: wetland soils and vegetation type were primary predictors rangewide, elevation and vegetation type were key in the Great Lakes, and wetland soils and depth to restrictive layer were most important in Missouri. The detection probability model indicated low overall detectability, mostly influenced by temperature, time of day, day of year, and survey effort, limiting robust validation of SDM-predicted absences. Integrating SDMs with occupancy-based modeling provides an effective, objective approach for prioritizing survey locations for rare species, as demonstrated by our discovery of a previously unknown population of HED, in non-traditional habitat. Regional variation in key predictors highlights the importance of local ecological context for management. However, survey protocols must account for imperfect detection when validating predictive models. Implications for Insect conservation: Low detectability is common among imperiled insects, making surveys difficult and expensive. SDMs can reduce site-selection bias, furthering our understanding of species distributions. SDM-guided, occupancy-based surveys maximize limited conservation resources, while providing probabilistic species distribution estimates."] (Authors)] Address: Kessler, E.J., Prairie Research Institute, Illinois Natural History Survey, University of Illinois, Champaign, IL 61820, USA. Email: [ekessle2@illinois.edu](mailto:ekessle2@illinois.edu)

**26161** Kim, J.; Han, S.; Yun, J.; Lee, S.; Song, Y. (2026): Ecological structures and terrestrial insect diversity across successional stages in abandoned paddy fields. Agriculture, Ecosystems & Environment 399, 110172: (in English) ["Abandoned paddy fields (APFs) are increasing due to socio-economic changes, but their ecological characteristics across different spatial scales and taxonomic groups remain

largely unexplored. Existing studies have primarily focused on single high-value sites or plant communities, limiting our understanding of broader biodiversity patterns and successional stages. This study aims to identify the successional stages of APFs using remote-sensing based ecological indicators and to analyze how these successional stages shape terrestrial insect diversity and community composition. Since APFs exhibit considerable heterogeneity depending on their vegetation structure and moisture conditions, systematic grouping of their successional stages is essential for understanding biodiversity patterns and informing targeted ecological management. The study was conducted in Gyeonggi Province, South Korea, encompassing 2269 sites across approximately 10,171 km<sup>2</sup>, a region where agricultural areas are widely distributed while rapid urbanization is simultaneously occurring. Remote-sensing indices including NDVI, NDWI and Rao's Q diversity index, calculated from Sentinel-2 imagery, were used in principal component analysis and K-means clustering to delineate successional stages. Field surveys were conducted in May 2024 at nine sites representing three successional types. Terrestrial insects were quantitatively sampled using sweep nets. Diversity indices (Shannon and Dominance) were compared among succession stages using ANOVA and community composition was analyzed using NMDS and PERMANOVA. Based on remote-sensing data, principal component analysis and clustering grouped APFs into three ecological types: Cultivated field, Herbaceous-woody mixed APF and Woody-dominated APF. Significant differences in ecological structure were found among clusters (e.g., PC1:  $F(2,2266) = 7224$ ,  $p < 0.001$ ). Second, significant differences in terrestrial insect diversity were observed between some of the three identified successional types. Herbaceous-woody mixed APF exhibited the highest Shannon index ( $3.38 \pm 0.16$ ), while Cultivated field showed the lowest ( $2.58 \pm 0.44$ ,  $p = 0.02$ ). The Dominance index was lowest in Herbaceous-woody mixed APF ( $0.17 \pm 0.01$ ) and highest in Cultivated field ( $0.34 \pm 0.07$ ,  $p = 0.01$ ). NMDS and PERMANOVA ( $R^2 = 0.49$ ,  $p = 0.004$ ) revealed distinct insect assemblages among successional stages. Cultivated fields were characterized by a higher abundance of Hemiptera and Orthoptera, including pest-associated species, whereas woody-dominated APFs showed greater occurrence of Lepidoptera and Hymenoptera. Herbaceous-woody mixed APFs were strongly associated with predatory taxa such as Mantodea and Odonata, reflecting structurally diverse and moisture-rich environments. These results confirm the feasibility of using remote-sensing to differentiate ecological structures of APFs and show that successional stages significantly shape terrestrial insect biodiversity." (Authors)] Address: Song, Y., Dept of Environmental Design, Graduate School of Environmental Studies, Transdisciplinary Program in Smart City Global Convergence, Seoul National Univ., Gwanak-ro, Gwanak-gu, Seoul 08826, South Korea. Email: songyoung@snu.ac.kr

**26162** Knauff-Pieper, C.; Göcking, C.; Menke, N.; Lohr, M.; Conze, K.-J.; Mollmann, C.; Consul, A.; Hövelmann, T.; Linne-mann, B.; Philipp, B.; Scherber, C.; Wöllecke, J. (2026): Artenkenntnis stärken durch bundesweite Qualifizierung. Das Verbundprojekt KennArt entwickelt und erprobt ein standardisiertes Schulungs- und Zertifizierungssystem für Fachkräfte und Ehrenamtliche. *Natur in NRW* 2/2026: 31-35. (in German) ["The loss of biodiversity and species extinction represent one of the greatest crises of our time. However, targeted monitoring and the planning of conservation measures require comprehensive knowledge of species and habitats. Against this backdrop, the NABU Nature Conservation Station Münsterland and the Leibniz Institute for the Analysis of Biodiversity Change (LIB) developed a multi-level training

system—covering dragonflies, Hymenoptera (with a focus on wild bees), deadwood beetles, grasses, and mosses—as part of the "KennArt" project and piloted it at more than 20 locations across Germany. Working alongside specialist societies and experts from across the country, they created curricula defining the learning objectives for each course and proficiency level. In parallel, they designed examinations and corresponding certification requirements. The KennArt project is funded under the Federal Programme on Biological Diversity by the Federal Agency for Nature Conservation, with resources provided by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)." (Authors/Google translate)] Address: Knauff-Pieper, Claudia, NABU-Naturschutzstation Münsterland e. V. Email: c.pieper@nabu-station.de

**26163** Komposch-Holzinger, B.; Holzinger, W. E. (2026): Die Libellen Vorarlbergs (Insecta: Odonata): Verbreitung und Gefährdung. *Rote Listen Vorarlbergs* 13; Dornbirn (inatura): 173 pp. (in German, with English summary) ["A new distribution atlas of the Odonata of Vorarlberg is presented, including a reassessment of the Red List status of all 62 species. The analyses are based on data from the database of inatura Erlebnis Naturschau GmbH and the Swiss Centre for the Cartography of Fauna (CSCF), additional field surveys conducted by the authors, published literature, and online biodiversity platforms. The Red List assessments follow the methodology proposed by Holzinger (2022). To assess the current and historical situation of dragonfly habitats, various GIS datasets for Vorarlberg were consulted. A total of approximately 10,800 records is the basis of the analyses. With nearly 3,200 records, Kurt Hostettler contributed by far the largest portion of the dataset, followed by the database of the Swiss Centre for the Cartography of Fauna (SZKF = CSCF) and Paul Amann, each with more than 1,000 records. All data have been, or are in the process of being, integrated into the database of the inatura - Erlebnis Naturschau GmbH. Analyses and mapping were conducted at the grid-cell level (1×1 geographical minutes; approx. 2.35 km<sup>2</sup>). Dragonfly records exist for 486 grid-cells. On average, 22 records are available per grid-cell, with a maximum of 646 records in the grid-cell 47°29' N, 9°40' E at the confluence of the River Rhine with Lake Constance. 21 grid-cells contain 100 or more records, whereas 116 are represented by a single record only. On average, 6.8 species are reported per grid-cell, with a maximum of 44 species in the grid-cell 47°26' N, 9°41' E between Lustenau and Dornbirn; the grid-cell 47°29' N, 9°40' E ranks second with 41 species. In the grid-cell 47°18' N, 9°35' E (between Meiningen and Koblach), 40 species are recorded, and 14 further grid-cells contain at least 30 species. From 139 grid-cells, only a single species is known. The most frequently reported species is *Coenagrion puella*, followed by *Ischnura elegans*, *Aeshna cyanea*, *Anax imperator*, *Aeshna juncea* and *Libellula quadrimaculata*. *Lestes dryas* was reported only once. On average, 171 records are available per species. In comparison with the species list of Hostettler (2001a), *Leucorrhinia rubicunda* was removed and five species were newly added (*Coenagrion scitulum*, *Aeshna affinis*, *Leucorrhinia pectoralis*, *Orthetrum albistylum*, *Sympetrum meridionale*). Short species accounts are presented for all taxa, providing information on biology and local distribution and a distribution map. One-third of the species are classified as Least Concern (LC), 16 % as Near Threatened (NT), and 47 % are threatened to varying degrees (VU, EN or CR). For *Lestes dryas* and *Orthetrum albistylum*, the available records are insufficient for a status assessment (DD). Overall, 19 species were downgraded in conservation status, whereas 13 species show an increased level of threat." (Authors)] Address: Holzinger, W., ÖKOTEAM-

**26164** Koulali, K.; Bouzid, A.; Chergui, I.; Lachichi, A.; Samraoui, B. (2026): First record of the Afrotropical dragonfly *Ictinogomphus ferox* (Rambur, 1842) (Odonata, Gomphidae) from Tassili n'Ajjer National Park, Algeria. Check List 22(3): 580-588. (in English) ["We report the first occurrence of *I. ferox* in Algeria, based on material collected in Tassili n'Ajjer National Park (Central Sahara). Between 2022 and 2023, four adult males and three ultimate larval stadium exuviae were collected from six sites at two localities. To our knowledge, these records constitute the first documented occurrences of this Afrotropical species in North Africa. This finding increases the number of gomphid species recorded from Algeria to seven and from the Maghreb region to nine." (Authors)] Address: Koulali, K., Laboratoire des Bio-ressources Sahariennes (BRS): préservation et valorisation, Faculté des sciences de la nature et de la vie, Université de Ouargla, Ouargla, Algeria. Email: koulalikhaledecoa@gmail.com

**26165** Kutasi, C.S.; Kenyeres, Z. (2026): In memoriam Dr Sándor Tóth (1932-2024). Folia Musei Historico Naturalis Bakonyensis 41(2024-2026): 7-20. (in Hungarian, with English summary) ["Sándor Tóth (1932-2024) was an entomologist, museum director who began his career as a biology and geography teacher, as he taught in Tard and Hejőbába (1953-1969). In 1966, he achieved a university doctorate. He started to work as a museologist in 1970. From 1972 to 1991 he was the director of the Natural History Museum of Bakony Mountains and between 1978 and 1988 served also as county museum director. Surpassing the leading of the institution, the organization of exhibitions, regular collecting and upgrading the collection, he took part actively in the organization of the program of „Natural History of Bakony Mountains”, edited the publications of the institution and pursued widespread naturhistorical education. His scientific activity is hallmarked by 300 professional articles and 23 monographies. In these monographs he summarized Odonata-, Syrphidae-, Tachinidae-, Tabanidae-, Bombyliidae- and Culicidae fauna of Hungary and the herpetofauna of Bakony Mts. The research, educational and organizational work of Sándor Tóth was exceptional, and acclaimed with numerous awards and medals." (Authors)] Address: Kutasi, C.S., Magyar Nemzeti Múzeum Közgyűjteményi Központ MTM Bakonyi Természettudományi Múzeuma, 8420 Zirc, Rákóczi tér 3-5, Hungary. Email: kutasi.csaba@nhmus.hu

**26166** Le Merrer-Le Bot, C.; Krieg-Jacquier, R.; Charrier, R.; Hahn, J. (2026): Premières observations de *Selysiothemis nigra* (Vander Linden, 1825), en région Auvergne-Rhône-Alpes, France (Odonata: Libellulidae). Martinia 40(5): 37-50. (in French, with English summary) ["First records of *Selysiothemis nigra* in the Auvergne-Rhône-Alpes Region, France. - In June 2025, *S. nigra* was observed in the departments of Drôme and Ardèche, representing the first records of the species in the Auvergne-Rhône-Alpes region. The collection of exuviae at a site in Drôme confirms the species' autochthonous status and indicates that it had become established at least as early as 2024. The origin of the first individuals and future survey perspectives are discussed in the light of current knowledge on the species' ecology and the recent increase in observation records." (Authors)] Address: Le Merrer-Le Bot, Camille, Groupe de recherche et de protection des libellules Sympetrum – GRPLS, 14 rue Sadi Carnot, 26400 Crest, France. Email: camille.lemerrer@wanadoo.fr

**26167** Leclerc, D.; Gilliéron, J. (2026): Atlas des libellules du bassin Genevois. Éditions Faune Genève. <https://associationfaunegeneve.com>: 320 pp. ["Initiated by the Faune Genève association and several Geneva-based naturalists, the

idea of updating the 1996 atlas of dragonflies in the canton of Geneva (Oertli & Pongratz) came to fruition in 2018, and the project began in 2019 with three consecutive years of fieldwork, which enabled the collection of a wealth of data. In particular, this data has enabled a more consistent coverage of observations across the entire Geneva basin. The data collected for this book is either previously unpublished or supplements that found in nature guides, with a focus on local specificities. It highlights the conservation priorities and challenges facing those involved in nature conservation and management, given the threats facing all dragonflies in the Geneva basin and their habitats. This book, written by David Leclerc and Jacques Gilliéron, is the fifth title in a series of books dedicated to local wildlife published by the Faune Genève association. Richly illustrated, it aims to provide an overview of the biology, ecology, evolution and conservation of dragonflies in the Geneva basin. It thus serves both as a reference work and as a book for all naturalists, curious minds and nature enthusiasts wishing to learn more about the diversity of dragonflies living in our region." (Publisher) Translated with DeepL.com (free version)] (Publisher)]

**26168** Lee, A. (2026): The variation in appearance of male *Coenagrion pulchellum* (Vander Linden) (Variable Damselfly) and *Coenagrion puella* (Linnaeus) (Azure Damselfly). Journal of the British Dragonfly Society 42(1): 47-64. (in English) ["This study investigated the overlap in appearance of male *C. pulchellum* and *C. puella*. Digital photographic images of 231 male specimens of *C. pulchellum* from two sites (Paxton Pits, Cambridgeshire and Skylarks Reserve near Nottingham) and 385 male *C. puella* from seven sites in Nottinghamshire, Cambridgeshire and Hertfordshire were studied. A line between the eyespots (post-ocular spots) was more common in *C. pulchellum* (80% vs 4%), whereas no marking between the eyespots was more common in *C. puella* (87% vs 12%). Two dots between the eyespots were seen in both species at a similar frequency (*C. pulchellum* 7%, *C. puella* 9%). Broken antehumeral stripes were more common in *C. pulchellum* than *C. puella* (73% vs 0%), whereas continuous antehumeral stripes were more common in *C. puella* (100% vs 27%). A goblet marking on abdominal segment 2 (S2) was more common in *C. pulchellum* than *C. puella* (90% vs 0.5%), whereas a U-marking was more common in *C. puella* (99.5% vs 10%). In *C. pulchellum*, the proportion of the dorsal surface of S9 occupied by a black marking varied between 40% and 90% with at least 50% black in 97%, compared with between 5% and 70% in *C. puella* with less than 50% black in 92%. The width of the dorsal marking on S10 as a fraction of the diameter of S10 varied from 34% to 49% in *C. pulchellum* and from 48% to 62% in *C. puella*. The proportion of the dorsal aspect of abdominal segments S3, S4 and S5 that was black was about 20% in *C. puella*, whereas in *C. pulchellum* the percentage of the dorsal aspect that was black in S5 exceeded that in S3 by 5% or more in 55% of the specimens. The shape of the anal appendages and the posterior edge of the pronotum are reliable features to separate these two species. In this study the pronotum was a reliable discriminant in 100% of individuals examined. The anal appendages were also a reliable discriminant but were only well seen in a minority of photographs. In conclusion, there are several features that overlap between these two species. Thus, a combination of these features should be used for identification if the pronotum cannot be seen." (Author)] Address: Lee, A. 184 Musters Rd, West Bridgford, Nottingham NG2 7AL, UK

**26169** Lemcoff, T.; Alus, L.; Batushansky, A.; Fishman, Y.; Theodor, N.; Shavit, K.; Hyitner, L.; Kelber, A.; Haataja, J.S.; Oron, D.; Palmer, B.A. (2026): Damselflies overcome color

saturation barriers of photonic glasses via pigment loading and refractive index modulation. PNAS 123(23); e2527433123: 11 pp. (in English) ["Significance: Photonic glasses are a promising class of noniridescent material but suffer from weak color saturation due to particle polydispersity. Here, we reveal two strategies employed by *Ischnura elegans* to generate strikingly saturated colors from a photonic glass structure, circumventing these limitations. First, pigment doping simultaneously suppresses off-resonant scattering and enhances the local refractive index near the reflectance peak. Second, crystallinity is delicately controlled to maintain an inverse correlation between nanosphere size and its refractive index. This means that the Mie resonance scattering peak becomes nearly size independent—avoiding polydispersity-induced broadening. These strategies highlight how evolution arrives at elegant solutions to optical constraints that yield unexpected principles for producing saturated photonic glasses. Biological strategies for manipulating light have revealed new concepts in light scattering, inspiring the design of sustainable photonic materials. While iridescent optical systems have been extensively studied, many applications require noniridescent structural colors which are much more difficult to achieve. Photonic glasses, comprising randomly arranged dielectric spheres, offer a promising solution toward such structural colors. However, their intrinsic disorder and particle size polydispersity typically lead to poor color saturation. Here, we identify two strategies employed by certain damselflies to generate unexpectedly vivid, tunable angle-independent colors from a photonic glass. First, doping of transparent pteridine nanospheres with yellow pigments strengthens blue–green reflectance resonances by simultaneously absorbing off-resonant wavelengths and enhancing the refractive-index near the reflectance band. Second, the refractive index of the nanospheres is modulated, via changes in crystallinity, to be almost exactly inversely correlated with nanosphere size. Thus, variations in nanosphere size, that ordinarily broaden reflectance resonances, resulting in poor color saturation, are compensated for by a correlated change in their refractive index. This ensures that even in a polydisperse ensemble, a consistent Mie scattering size parameter is maintained, strengthening short-range correlations and Mie scattering resonances. Finally, we show how damselflies tune these structural colors during maturation by precisely modulating the average size of the nanospheres, which arises naturally during the development of the pigment cells due to the densification and crystallization of the nanospheres. These findings reveal design strategies for overcoming limitations in the saturation of disordered photonic systems." (Authors)] Address: Email: dan.aron@weizmann.ac.il

**26170** Lemke, M. (Red.) (2026): Gesellschaft deutschsprachiger Odonatologen e.V., 43. Jahrestagung vom 13. bis 15. März 2026 in Saarbrücken. Materialien zur 43. Jahrestagung der Gesellschaft deutschsprachiger Odonatologen e.V. (GdO) vom 13. bis 15. März 2026 in Saarbrücken: 48 pp. (in German or English) [Abstracts of the following lectures are documented: Göcking, C. et al.: Libellenmonitoring Deutschland - aktueller Stand. Conze, K.J.C.: Rote Liste der Libellen in NRW - Stand - Probleme - Ausblick. De Knijf, G. et al.: Monitoring dragonflies in Flanders: results after 10 years. Idilbi, I.: Ergebnisse aus dem FFH-Bericht 2025 zu den Libellen. Goertzen, D.: Von Regenwasservorfluter bis Rinnsal - Libellenvorkommen in Fließgewässern der Stadt Braunschweig. Tarkowski, A.: Park ponds in the city. Ilae, M.: Urbane Gartenteiche: Libellen im KGV Flora e.V. in Köln Nippes. Martens, A.: Anax-Larven kuscheln! Schiel, F.-J. et al.: Ortherum-Männchen mit zum Teil aufgelöster blauer Bereifung - Wie kann es dazu kommen? Waldeck J. et al.: Effekte von Beweidung und Neuanlegung auf die Libellenfauna eines

Teichgebiets. Röhner, P. et al.: Die Migrationsmuster von *Aeshna mixta* entlang der Ostseeküste. Söhnholz, J. et al.: Eientwicklung bei *Sympetrum depressiusculum*: ein Vergleich zwischen später und früher Eiablage. Brockhaus, T.: Libellen und ihre Larven - eine spannende Entdeckungsgeschichte. Zessin, W.: Die ursprünglichsten Libellen der Welt unter besonderer Berücksichtigung der saarländischen *Kohlwaldia kuehni* Guthörl, 1962 (Odonoptera: Meganisoptera: Kohlwaldiidae) Post, M.: Ein Paarungsrad mit zwei Männchen und einem Weibchen bei *Leucorrhinia albifrons*. Tanczuk, A.: The influence of anthropopressure on dragonflies (Odonata) in peat excavation on fens. Winterholler, M.: Libellen in sekundären Moorgewässern Südbayerns. Wildermuth, H.: Moorgräben - potenzielle Hotspots der Biodiversität. Krieg, R.: Populationsrückgang der Westlichen Keiljungfer (*Gomphus pulchellus*) in einem Sekundärgewässer: Mögliche Ursachen und Erhaltungsmaßnahmen. Högrevé, J.: *Sympetrum striolatum* - ein Review: Sie kann auch anders. Christiansen, J.: Vorstellung eines Prototyps zur Bestimmung von Libellenexuvien am PC.] Address: Lemke, M., Gymnasialstr. 30, 66557 Illingen, Germany. Email: malemke@gmx.de

**26171** Li, S.; Liang, F.; Yang, X.; Shih, C.; Yao, Y.; Ren, D.; Bai, M. (2026): Mass extinction constrained and redirected flight evolution in Permopsocida. Gondwana Research 153: 284-290. (in English) ["Insect flight represents a key evolutionary innovation, yet the impact of mass extinctions on wing evolution remains unclear. We reconstruct wing shape evolution in Permopsocida (Carboniferous–Cretaceous) based on morphometric approaches. The present study reveals a tri-phasic pattern: pre-extinction expansion, end-Permian bottleneck and post-extinction redirection. Despite opportunities in the Mesozoic, structurally conservative features constrained aerodynamic innovation. During the Jurassic-Cretaceous period, wings elongated convergently as compensatory adaptations, not as functional breakthroughs. Morphological disparity recovery lagged behind and was decoupled from early angiosperm radiation but synchronized with gymnosperm diversity. These findings demonstrate how extinction-induced structural constraints redirected evolution through compensatory adaptation." (Authors) The study includes a few references to Odonata.] Address: Li, S., State Key Lab. of Animal Biodiversity Conservation and Integrated Pest Management, Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China

**26172** Liébana, M.S.; Santillán, M.A.; Mallet, J.; Sarasola, J.H. (2026): Landscape structure influences prey consumption and ecosystem services of Aplomado Falcons in agroecosystems of central Argentina. Perspectives in Ecology and Conservation 24(2): 214-222. (in English) ["Agricultural expansion and land-use intensification have transformed Argentina's Pampas region, leading to biodiversity declines and ecosystem imbalance. This study examines the Aplomado Falcon (*Falco femoralis*) as a potential biological pest controller in agroecosystems of central Argentina. We evaluated how landscape structure and prey availability influenced its diet, focusing on the consumption of granivorous birds like the Eared Dove (*Zenaidura macroura*), a significant agricultural pest. Using regurgitated pellets and prey remains from 60 nesting territories, we identified 83 prey species and assessed prey abundance in the field. Results show the falcon's diet is dominated by birds, particularly Eared Doves, which constituted 94% of avian biomass consumed. Tree stands positively influenced the consumption of granivorous birds, while arthropod consumption declined in these areas. The study highlights the Aplomado Falcon's role in pest control, demonstrating its adaptability to agroecosystem modifications. These findings emphasize the ecological and economic importance of

raptors in supporting sustainable agriculture." (Authors) Pellets include remains of Odonata.] Address: Liébana, M.S., Laboratorio de Biodiversidad, Ecología y Conservación (ColBEC), Instituto de las Ciencias de la Tierra y Ambientales, Facultad de Ciencias Exactas y Naturales (FCEyN), Univ. Nacional de la Pampa (UNLPam), Avenida Uruguay 151, 6300 Santa Rosa, La Pampa, Argentina. Email: msliebana@conicet.gov.ar

**26173** Liu, B.; Chai, L.; Tian, C.; Chen, H.; Shen, H.; Qi, Q.; Fan, J.; Tang, C.; Ji, A. (2026): A multi-segmented vectoring nozzle configuration inspired by the mating wheel of damselfly. *Biomimetics* 11(6), 391; <https://doi.org/10.3390/biomimetics11060391>; 22 pp. (in English) ["Conventional thrust vector control nozzles are severely constrained by a single-pivot deflection paradigm, which induces asymmetric shock reflections and adverse boundary layer separation at large angles. Multi-segmented serial configurations offer a promising alternative to overcome these limitations by distributing the total deflection across multiple joint interfaces, thereby achieving large terminal angles and smooth flow-path curvatures. To realize such a configuration, this study draws inspiration from the abdominal bending mechanism of the damselfly *Ischnura elegans* during mating wheel formation. Real-time video recording and morphological characterizations identified abdominal segments VI and VII as critical for high-amplitude bending under load. Finite element analysis under muscular actuation elucidated the biomechanical synergy, which was rigorously verified through mesh convergence and material property sensitivity checks. Inspired by this biological system, a multi-segmented nozzle configuration incorporating discrete elastic elements and a centralized cable-driven layout was designed and evaluated using multibody dynamics and computational fluid dynamics. The nozzle achieved a continuous 61.20° deflection within 8 s under subsonic exhaust conditions, successfully stabilizing periodic supersonic shock structures and completely suppressing adverse boundary layer separation. These findings turn biological bending into a thrust vectoring method, giving insights for next-generation agile aerospace propulsion systems." (Authors)] Address: Liu, B., Laboratory of Locomotion Bioinspiration and Intelligent Robots, College of Mechanical and Electrical Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing 210014, China

**26174** Liu, W.; Liang, Y.; Tsai, D.P. (2026): Bio-inspired nanophotonics: Structural color, chirality, and resonance metasurfaces. *InfoMat*. 2026; e70142; 28 pp. (in English) ["The dazzling colors of butterfly wings and hummingbird feathers are not painted with pigments, but crafted by nature's invisible hand—nanoscale structures that sculpt light itself. This biological mastery of optics has ignited a revolution in photonics, where researchers are no longer just mimicking nature, but decoding its principles to create next-generation optical materials. We review this journey from biological blueprints to artificial metasurfaces, uncovering how natural designs for coloration, polarization control, and light confinement inspire advanced nanophotonic devices. These bio-inspired platforms transcend the limits of conventional optics, enabling breakthroughs in imaging beyond the diffraction limit, ultra-efficient radiative cooling, and novel polarization-based technologies. By bridging evolutionary wisdom with nanoscale engineering, this field charts a course toward sustainable, multifunctional optical systems for sensing, communication, and energy." (Authors) The study includes references to dragonflies.] Address: Liang, Y., Dept of Electrical Engineering & State Key Lab. Optical Quantum Materials, City Univ. of Hong Kong, Hong Kong SAR, The People's Republic of China

**26175** Long, E.C.; Iyengar, E.V. (2026): No deceleration by pond isopods (*Caecidotea communis*) in response to chemical cues of relevant invertebrate predators. *Invertebrate Biology* 144(3), (6 April 2026). <https://doi.org/10.71161/ivb.14-4.3.2025.00005>; (in English) ["While macroinvertebrates can be apex predators with dense populations, especially in fish-less ponds, few studies have examined the responses of benthic prey in ponds to a variety of these predators. We used laboratory studies to examine whether isopods (*Caecidotea communis*) altered their rate of movement and proportion of time spent moving when exposed to water with, versus without, chemical cues of a naturally-relevant suite of potential invertebrate predators. We examined isopods from a fish-less pond that were exposed to a multi-species mix of chemical cues from sympatric predators (backswimmers, water scorpions, aeshnid dragonfly larvae, diving beetles, and leeches), as well as isopods exposed to sympatric libellid dragonfly larvae where both species were collected from a pond with fish. Regardless of the collection pond, there was no significant change in the rate of movement nor in the proportion of time spent moving in response to chemical cues from the sympatric invertebrate predators. We conclude that if pond *C. communis* use chemical cues to recognize danger from proximate predators their response is not merely the typical reduced locomotory activity reported for other freshwater crustaceans. Perhaps the wide array of sympatric predatory species that use different strategies (ambush as well as active pursuit, visual and mechanoreception) renders changing movement rates ineffective, as such a response to one predator may elevate the predation risk from other taxa. Other behavioral alterations in response to predator risk such as migratory movements, shallow water acting as a spatial refuge, or use of chemical cues only when visibility is low remain possible responses that should be investigated." (Authors)] Address: Iyengar, Eika, Biology Dept, Muhlenberg College, 2400 Chew St., Allentown, PA 18104, USA. Email: erikaiyengar@muhlenberg.edu

**26176** López-Rodríguez, N.; Buchner, D. Cañedo-Argüelles, M.; Fontserè, R.; Leese, F.; Múria, C.; Bonada, N.; Ersoy, Z. (2026): eDNA metabarcoding: a non-invasive method to track temporal community dynamics in temporary rivers. *Limnética* 45(1): 75-90. (in English, with Spanish summary) ["Temporary rivers (TRs) are dynamic ecosystems that alternate between hydrological phases (i.e., flowing, disconnected pools, and dry). They are conservation refugia for aquatic species during dry seasons but are often neglected in bioassessment programs. To assess the biological quality of these ecosystems, morphological methods can be invasive, disrupting communities and diminishing their function as refugia. Environmental DNA (eDNA) metabarcoding provides a minimally invasive method, gathering community information from eDNA in water or sediment. We tested the effectiveness of eDNA methods alongside bulk DNA metabarcoding to characterize the macroinvertebrate communities and assess the biological quality of disconnected pools in TRs, comparing them with morphological methods. Additionally, we tested how the community patterns evolve over time using eDNA and how community composition shifts during disconnection. Biological quality was determined through macroinvertebrate indices widely used in Spain (i.e., IBMWP, family richness, and IASPT). eDNA samples were collected biweekly from three TRs in Catalonia, NE Spain. Macroinvertebrates were sampled during the three hydrological phases (connected, disconnecting, and disconnected pools). Macroinvertebrate samples were used to identify organisms using morphology and to sequence bulk DNA. eDNA and bulk DNA samples were analysed via DNA metabarcoding targeting the mitochondrial COI gene. Although communities determined by sediment eDNA did not

detect variations in biotic indices (i.e., IBMWP and family richness), the method was useful to detect the replacement of EPT (Ephemeroptera, Plecoptera, Trichoptera) by OCH (Odonata, Coleoptera, Heteroptera). Additionally, sediment eDNA revealed significant impacts of hydrological changes on meiofauna (Ostracoda, Cladocera, Copepoda), a group often overlooked in stream assessments. These results indicate that sediment eDNA metabarcoding can serve as a valuable tool for the bioassessment of TRs, capturing the transitions between hydrological phases while preserving ecosystem integrity." (Authors)] Address: López-Rodríguez, N., FEHM-Lab (Freshwater Ecology, Hydrology & Management), Dept de Biologia Evolutiva, Ecologia i Ciències Ambientals, Fac. Biologia, Univ. de Barcelona (UB), Diagonal 643, 08028 Barcelona, Catalonia, Spain. Email: nievesbio95@gmail.com

**26177** Ma, Y.; Zhou, Y.; Jiang, D.; He, X.; Quan, C.; Qian, K.; Yang, F. (2026): Inertial deformations of dragonfly wings: In situ measurement and inspirations for flapping-wing Micro Air Vehicle design. *Experimental Mechanics* 66(6): 1049-1062. (in English) ["Background: Dragonfly wings exhibit exceptional aerodynamic performance, largely due to their passive inertial deformations during flapping, which are crucial for lift generation and attitude control. Understanding and replicating these deformations is key to advancing the design of flapping-wing micro air vehicles (FWMAVs). However, directly measuring the inertial deformations of natural wings in situ remains a challenge. Objective: This study aims to characterize the full-field inertial deformations of entire dragonfly wings while preserving their natural constraints and posture. Method: Here we present a novel method combining base excitation with common-path electronic speckle pattern interferometry. By exciting the wing base at its first two natural frequencies, we isolate and amplify the inertial bending and torsional deformations. Results: Our results reveal that the torsional axis of the wing is coincident with the crest line of its bending deformation. Furthermore, by correlating higher-order mode shapes with the venation architecture, we find that the forewing functions analogously to a 'sail with a spar', whereas the hindwing resembles a sector of an 'umbrella'. This tandem configuration with distinct mechanical roles likely underpins the dragonfly's superior maneuverability. Conclusions: The proposed method has achieves the measurement of the inertial deformation of the dragonfly wings. The findings provide quantitative insights into the passive deformation mechanisms of dragonfly wings and offer a bio-inspired design rationale for the next generation of high-performance FWMAVs." (Authors)] Address: Ma, Y., School of Mechanical & Electronic Engineering, Nanjing Forestry Univ., Nanjing, 211189, China

**26178** MacDonald, Z.G.; Beninde, J.; Dupuis, J.R.; Gillespie, T.W.; Shaffer, H.B.; Grether, G.F. (2026): From lineage discovery to conservation prioritisation: An integrative genomic framework applied to a model damselfly system. *Molecular Ecology* 35(11), e70385: 20 pp. (in English) ["Accurate inferences of diversification and evolutionary processes depend on knowing how many independently evolving lineages exist within nominally widespread taxa. Uncertainty in lineage number and composition also limits our ability to meaningfully prioritise conservation efforts. Addressing these knowledge gaps requires frameworks that sequentially identify distinct lineages, assess mechanisms that contribute to their divergence, and quantify spatial and environmental determinants of their genomic diversity. With these goals in mind, we apply whole-genome, ecological, and morphological analyses to *Hetaerina americana*, a widespread and well-studied North American insect that has been long regarded as a single species of least conservation concern, despite some evidence

of declines across the southwestern US. Whole-genome sequencing of 136 individuals revealed three deeply divergent lineages representing distinct species. Two of these lineages are putatively endemic to the California floristic province and a third clusters with *H. americana* sensu stricto across the central-eastern US. Comparative species distribution models and morphological analyses revealed significant niche and trait divergence among lineages, suggesting adaptive variation exists among species pairs—a relatively unique result for damselfly congeners. Genome-wide heterozygosity was extremely low within both newly discovered lineages, and landscape genomic analyses suggested that isolation by resistance—reflecting connectivity among rapidly disappearing lotic habitats—structures gene flow within each. Our field resurveys corroborated accelerating population losses, particularly in southern California, reshaping conservation priorities within this species complex. Together, our analyses comprise an integrative framework that links genomic, ecological, and morphological divergence to landscape and environmental variation, enabling reliable lineage delimitation, evolutionary inference, and conservation recommendations." (Authors)] Address: MacDonald, Z.G., Dept of Entomology, Univ. of California, Riverside, California, USA. Email: zmacdona@ucr.edu

**26179** Mahesh, R.; Gopinath, R.; Joshi, G.; Upadhaya, R. (2026): First time in 110 years: sighting of *Gynacantha khasiaca* Maclachlan [sic], 1896 (Odonata: Aeshnidae) in Arunachal Pradesh, India. *Journal of Threatened Taxa* 18(5): 28982-28987. (in English) ["This communication reports the first confirmed sighting of *G. khasiaca* after 110 years at Namdapha National Park and Tiger Reserve for the state of Arunachal Pradesh, India. Also commonly called as Long-tailed Dusk-hawker, the identification was based on photographic evidence documented in the presence of forest personnel at Deban in the Tiger Reserve during October 2024, and adds to the region's biodiversity inventory. This finding emphasizes upon the importance of continuous monitoring and habitat preservation of in situ biodiversity conservation." (Authors)] Address: Mahesh, R., Kattiparambu Madam, Thekumbhagam, Tripunithura, Ernakulam, Kerala 682301, India. Email: maheshgreen96@gmail.com

**26180** Mallick, M.A.I.; Paik, S. (2026): Assessing the diversity and abundance of dragonflies and damselflies in selected sites of Saranda Forest, Jharkhand, eastern India. *Journal of Entomological and Acarological Research* 58:14860: 11 pp. (in English) ["Odonates are well studied globally, yet studies from Jharkhand remain limited. Urbanization-induced habitat modification—such as wetland loss, altered hydrology, water pollution, and removal of riparian vegetation—directly affects Odonata breeding habitats, larval development, and community composition, demonstrating their sensitivity to landscape-level disturbance. The present study documents the diversity and community structure of odonates across seven sites in Saranda Forest, Jharkhand, from March 2024 to March 2025. A total of 61 species belonging to Anisoptera (35 species; 57%) and Zygoptera (26 species; 43%), were recorded. Anisoptera dominated the assemblage, with *Brachythemis contaminata*, *Crocothemis servilia*, and *Brachydiplax sobrina* emerging as the most abundant taxa, while *Agriocnemis pygmaea* was also recorded among the dominant species. Species richness and abundance varied across sites, with Ligirda (28 species) and Karampada (27 species) supporting the highest richness, while Thalkobad (82 individuals) and Beside Koina River (75 individuals) recorded the greatest abundance. Libellulidae was the most dominant family, followed by Coenagrionidae, whereas other families such as Aeshnidae, Gomphidae, and Macromiidae were

sparsely represented. Diversity indices revealed high Shannon (2.6-3.2) and Simpson ( $>0.85$ ) values across sites, indicating well-balanced communities with low dominance. Liridae exhibited the highest diversity and evenness, while Beside Koina River showed lower evenness due to dominance by a few species. Species accumulation curves suggested sufficient sampling and revealed distinct site-level assemblages influenced by habitat heterogeneity. Analysis of variance confirmed significant variation in abundance across families, with Libellulidae significantly more dominant than other groups, whereas site-level abundance differences were statistically non-significant. The findings underscore the ecological importance of Saranda Forest as a reservoir of odonate diversity, with family-level dominance patterns and habitat heterogeneity shaping community structure." (Authors) The list of species is given in Supplementary Table 1.] Address: Mallick, M.A.I., Jamshedpur Forest Division, Jamshedpur – 831001, Jharkhand, India. Email: imranmallick708@gmail.com

**26181** Manangan, J.L.; Maceda, J.; Omandam, J.E.; Nuñez, O.; Villanueva, R.J. (2026): Forest dependency and diversity of Odonata (Arthropoda: Insecta) in Mt. Balatukan Range Natural Park, Philippines. Environmental Research Communications 8 045011: 15 pp. (in English) ["Mountain ranges host diverse species, particularly in biodiversity hotspots such as the Philippines, where habitat degradation threatens many taxa, including the insect order Odonata. This study assessed the diversity and distribution of Odonata in Kalagonoy and Lunotan, Jamboree Site, Mt. Balatukan Range Natural Park (MBRNP), Misamis Oriental, Mindanao, using opportunistic sampling across different vegetation types in October and December 2024. We recorded 363 individuals representing 42 species, 11 families, and 26 genera, with a high endemism rate of 62% (26 species). The most abundant species was the greater Mindanao gossamerwing *Euphaea amphicyana* Ris, 1930 ( $n = 44$ ). Eight endemic species were classified as species of conservation concern, including three Near Threatened [*Cyano angustior*, *Ignecnemis fulgifer*, *Rhinocypha sanguinolenta*], four Vulnerable [*Coelocicada exoleta*, *Devadatta basilanensis*, *Euphaea cora*, *Pseudagrion buenafei*], and one Endangered [*Risocnemis moroensis* Härmäläinen, 1991]. Biodiversity indices were highest in mixed agroforest sites, while species composition differed markedly between forested and agricultural areas. Multivariate and correlation analyses suggested that endemic species were closely associated with cool, humid forest habitats, whereas widespread Asian species were linked to agricultural areas with open canopies, warmer conditions, and reduced humidity. The dependence of endemic and threatened Odonata on intact forests underscores the need for strengthened conservation strategies in protected areas, including species-specific habitat protection and ecological restoration. These findings highlight the importance of maintaining forest cover, particularly in high-elevation and buffer zones, while promoting sustainable agroforestry and restoring degraded habitats to enhance habitat connectivity and conservation outcomes." (Authors)] Address: Manangan, J.L.V., Dept Biol. Sciences, Mindanao State University–Iligan Institute of Technology, Andres Bonifacio Ave., Tibanga, Iligan City 9200, The Philippines. Email: jlmanangan21@gmail.com

**26182** Mattioli, G.; Mangiacotti, M.; Vitaloni, D.; Balestrieri, A.; Sacchi, R.; Tiberti, R.; Bello, L.; Pellitteri-Rosa, D.; Gazzola, A. (2026): Fish Introductions Reshape Antipredator Sensitivity in *Rana temporaria* Tadpoles Across Alpine Lakes. Ecology and Evolution 16:e73787: 9 pp. (in English) ["Biological invasions are a major driver of biodiversity loss, particularly in isolated ecosystems such as alpine lakes. The

introduction of non-native fish into historically fishless systems can profoundly alter predator–prey interactions, potentially modifying prey perception of predation risk. In this study, we investigated whether the presence of introduced fish affects background risk and antipredator sensitivity in larvae of the common frog (*Rana temporaria*). We conducted behavioral assays on tadpoles collected from six alpine lakes in the Western Italian Alps, representing a gradient of predation contexts: fishless lakes, fishless lakes located near waterbodies with fish, and lakes currently hosting introduced fish. Tadpoles were exposed to increasing concentrations of chemical cues released by a native predator (dragonfly larvae), and their freezing response was quantified as an indicator of perceived predation risk. Tadpole responses followed a clear concentration-response pattern, with increasing freezing behavior at higher cue concentrations. However, populations associated with fish presence, either locally or in the surrounding landscape, exhibited higher sensitivity to predator cues, responding significantly even at low concentrations compared with populations from isolated fishless lakes. These results suggest that the presence of introduced fish may modify sensitivity to predation risk in amphibian larvae. Moreover, the responses observed in populations from fishless lakes located in areas with fish indicate that these effects may extend beyond directly invaded habitats. Overall, our findings highlight that biological invasions can influence not only direct predation risk but also prey behavioral responses and non-consumptive effects, with potential consequences at both population and landscape scales." (Authors)] Address: Mattioli, Giorgia, Dept of Earth and Environmental Sciences (DSTA), Univ. of Pavia, Pavia, Italy, Email: giorgia.mattioli01@universitadipavia.it

**26183** McNeish, R.E.; Macchia, M.D.; Lee, N.M.; Harrison, A.T.; Brown, A.J.; Jackson, J.K.; Wallace, J.R. (2026): Archived historical aquatic macroinvertebrate specimens suggest connections between microplastic abundance patterns, trophic traits, and land use. Insects 2026, 17, 386: 24 pp. (in English) ["Plastic pollution is ubiquitous in the environment, with microplastics (particles  $< 5$  mm) a worldwide emergent contaminant of concern; however, no studies have explored historical patterns in freshwater macroinvertebrates in connection to species traits and changes in land use. We measured microplastics in macroinvertebrates collected from 1998–2019 at six forest, urban, and agriculture dominated streams in the Schuylkill River watershed (PA, USA). We selected representative macroinvertebrates that underwent peroxide oxidation digestion and were examined for microplastics under a dissecting microscope with Rose Bengal dye to confirm microplastic identification. Microplastics were present in 134 individuals across 24 taxa and all functional feeding groups (FFGs). Abundance of microplastics in macroinvertebrates decreased through time with an increase of agriculture land use, whereas microplastics increased with an increase of urban land use. Collector-gatherer FFG had the greatest microplastic abundance, which may be linked to Elmidae and Psephenidae (Coleoptera), which tended to have the highest abundances of microplastics compared to all other taxa in some years. This relationship may be explained by the feeding mode of these families of macroinvertebrates and that gathering particles in the water column and scraping particles from biofilms may be similarly effective in the acquisition of microplastics. Overall, understanding microplastic temporal patterns and their connections to species traits and variations in land and water use is critical to developing a predictive framework for explaining microplastic abundance in the environment and interactions with aquatic biota." (Authors) A few references on family level are given for Odonata.] Address:

McNeish, Rachel, Dept Biol., California State Univ., Bakersfield, Bakersfield, CA 93311, USA. Email: rae.mcneish@gmail.com

**26184** McPherson, J.; Martin, J.G.A.; Bégué, L.; Tschirren, N.; Walsh, P.; Ringler, E. (2026): Predation risk shapes among- and within-individual variation in behavior in poison frog tadpoles. *Behavioral Ecology* 37(4): 15 pp. (in English) ["Environmental conditions during early development can considerably shape individual behavior, and laboratory studies suggest that predator presence is an important factor influencing both within- and among-individual behavioral variation. To test this under natural conditions, we studied neotropical poison frog (*Allobates femoralis*) tadpoles from pools with and without dragonfly larvae (tadpole predators) under naturally varying environmental conditions. We measured two behavioral traits, distance moved in a novel environment and time to emerge from a shelter, across four repeated trials in predator-exposed ( $n = 48$ ) and predator-naïve ( $n = 169$ ) tadpoles. Predator-exposed tadpoles moved less, emerged later in their first trial and were more unpredictable in emergence time than predator-naïve individuals. Moreover, among-individual variation in both behaviors was higher in predator-exposed tadpoles, although behavioral repeatability did not differ significantly between predator-exposed and predator-naïve groups. Predator-naïve individuals exhibited behavioral and predictability syndromes, individuals that moved more also emerged sooner, and individuals more predictable in one behavior were more predictable in the other. Despite only being significant in predator-naïve individuals, these correlations did not differ between predator-exposed and predator-naïve groups. A personality-plasticity association occurred only in predator-exposed tadpoles: individuals that initially moved less showed less behavioral change across trials. These findings demonstrate that even in naturally variable environments, predation risk shapes behavioral variation at multiple levels, thereby contributing to the emergence and maintenance of 'animal personality'." (Authors)] Address: McPherson, Josie, Inst. of Ecology & Evolution, Ashworth Laboratories, King's Buildings, Charlotte Auerbach Rd, Edinburgh EH9 3FL, UK. Email: josie.mcpherson@ed.ac.uk

**26185** Medzevicius, L. (2026): Laumžirgio sparno plasnojima atkartojancio mechanizmo tyrimas ir kurimas - Research and development of a biomimetic mechanism for dragonfly wing. MSc thesis, Kauno technologijos universitetas: 57 pp. (in Lithuanian, with English summary) ["During the work, the anatomy of a dragonfly and the principles of wing movement are first analyzed, identifying the main flapping modes and their influence on flight characteristics. An overview of existing flapping mechanisms is also performed, evaluating their design solutions, advantages, and disadvantages. Based on the analysis, a flapping mechanism was developed based on a five-bar kinematic system, which allows the generation of complex wing trajectories. To improve the performance of the mechanism, a genetic algorithm was applied to optimize the geometric parameters. During the optimization, parameters were determined that allow the mechanism to replicate the selected trajectories as accurately as possible. Experiments showed that the algorithm is able to find suitable solutions, although ideal replication of the trajectories is not achieved due to structural limitations. The results of the work show that the developed mechanism can be applied in the development of bio-inspired flying systems, and the applied optimization methods are effective in solving complex engineering problems." (Author)] Address: <https://epubl.ktu.edu/object/elaba:300036213/300036213.pdf>

**26186** Mmbaga, A.T.; Mnzava, S.T.; Mutashobya, A.; Kimaro, E.G.; Kaindoa, E.W.; Lwetoijera, D.W. (2026): Pyriproxyfen

effects on predators of *Anopheles arabiensis* larvae under semi-field setting: insights into ecosystem safety. *Total Environment Advances* 17, 200146: 12 pp. (in English) ["Larviciding forms an integral part of larval source management, a supplementary intervention for malaria vector control. However, if chemical larvicides are not thoroughly evaluated, non-target organisms in aquatic habitats may be harmed. Among these are aquatic predators, which play an important role in regulating mosquito populations. This study evaluated the effects of pyriproxyfen, an insect growth regulator, on nymph survival, adult emergence, and predatory ability of field-collected dragonfly, damselfly, and backswimmer nymphs under semi-field settings. Nymphs were exposed to 300 ppb pyriproxyfen for 21 days to assess survival, while emergence inhibition in dragonflies and damselflies was measured at 50 and 300 ppb with daily mosquito-larvae provisioning until emergence or death. Predation bioassays at 150 and 300 ppb across larval densities (3, 6, 9 larvae/200 mL) were conducted over 6-hour (every 40 min) and 9-day (daily) intervals, with larvae replenished after each count. The findings indicated that a 300 ppb did not compromise the survival of predator nymphs ( $p > 0.05$ ). In addition, 50 ppb and 300 ppb significantly inhibited damselfly emergence ( $p < 0.05$ ), without affecting dragonflies ( $p > 0.05$ ). With exception of damselflies, pyriproxyfen enhanced the predatory abilities of backswimmers and dragonflies. These findings demonstrate that pyriproxyfen exhibits a species-specific safety profile rather than uniform safety across aquatic predators. While having a higher safety margin in aquatic ecosystems harboring dragonflies and backswimmers, the observed emergence inhibition in sensitive species such as damselflies underscores the need for cautious, context-dependent application. Based on these findings, autodissemination of pyriproxyfen could be effectively integrated with existing interventions, providing a dual impact on immature mosquitoes through both the direct effects of chemicals and the enhanced predatory activity." (Authors)] Address: Mmbaga, A.T., Environmental Health and Ecological Science Dept, Ifakara Health Institute, P.O Box 53, Ifakara, Tanzania. Email: ammbaga@ihi.or.tz

**26187** Moore, B.C.; Jones, B.W.; Taylor, T.N. (2026): Selenium trophodynamics in Lahontan cutthroat trout and its aquatic and terrestrial prey from the unpolluted saline-alkaline Omak Lake. *Journal of Trace Elements and Minerals* 16, 100293: 11 pp. (in English) ["Background: Selenium (Se) is an essential micronutrient that, in excess, is toxic. In water, Se is relatively mobile, and toxicity occurs through transfers across trophic levels in food webs. Se trophodynamics in unpolluted alkaline watersheds remain understudied. Saline-alkaline lakes may expedite Se speciation, potentially facilitating its uptake and assimilation. Objective & methodology: Se was investigated in the unpolluted Omak Lake, the largest saline-alkaline lake in Washington state, U.S., which hosts Lahontan cutthroat trout (LCT, *Oncorhynchus henshawi*) sport fishery. This research aimed to: (1) explore Se across LCT's different life stages, (2) investigate Se trophodynamics in LCT, (3) examine LCT's feeding and prey habitats, potentially influencing Se transfer, and (4) explore Se-content differences between aquatic and terrestrial prey. Total-Se was assayed via ICP-MS, and stable isotope analysis ( $\delta^{15}N$ ) assigned trophic positions. Results: Se concentrations in all fish and invertebrates ( $0.01\text{--}2.54\text{ }\mu\text{g g}^{-1}$  dry weight [dw]) were below protective thresholds, as expected in unpolluted waters. Trophic transfer factors for LCT ranged from 1.17 to 1.61 (Se:  $0.1\text{--}0.69\text{ }\mu\text{g g}^{-1}$  dw) and were likely influenced by specific prey species, including fish and both aquatic and terrestrial invertebrates. For example, Sculpin (*Cottus* spp.) contained up to  $2.54\text{ }\mu\text{g g}^{-1}$  dw, odonates up to  $0.70\text{ }\mu\text{g g}^{-1}$  dw, and hymenopterans

up to 0.92  $\mu\text{g g}^{-1}$  dw. Conclusions: Se-levels in Omak Lake confirmed its unpolluted status. Se-content variability among benthic and littoral species suggested that Se-transfers were prey-specific. Terrestrial invertebrates may contribute to Se inputs into the lake. These findings provided insights into Se trophodynamics within remote, pristine, saline-alkaline lakes." (Authors) Odonata are treated at order level.] Address: Reyes-Avila, A.D., National Autonomous Univ. of Honduras (UNAH), Chemistry Dept, building I-1, Tegucigalpa, Honduras. Email: alexander.d.reyes@wsu.edu

**26188** Mukhopadhyay, A.K.; Kundu, S.S.; Mondal, B.; Roy, S.D. (2026): Effect of weather variables and guild interactions in the seasonal patterns of arthropod fauna in Solanum melongena agro-ecosystem. *International Journal of Tropical Insect Science* 46: 1039-1052. (in English) ["Crop health and pest dynamics in horticultural systems are significantly influenced by climate variability. This study investigated the seasonal patterns and ecological interactions of 73 arthropod species associated with eggplant cultivation at the Central Research Farm, Bidhan Chandra Krishi Viswavidyalaya, Gayeshpur, Nadia, West Bengal, India, over 11 consecutive cropping seasons from 2021 to 2023. Arthropods were categorized into ecological guilds: sucking, chewing, predatory, and ant groups. Key climatic factors such as temperature, humidity, and rainfall significantly impacted species abundance and interspecies relationships. For instance, mealybugs showed a significant positive correlation with rainfall (0.51) and humidity (0.53), while the brinjal shoot and fruit borer, whiteflies, and aphids exhibited higher populations under lower temperatures and humidity, with correlations of -0.44 and -0.52, respectively. Predatory species like spiders and ladybird beetles displayed both antagonistic and complementary relationships with pests depending on the season. Notably, ants showed a positive relationship with aphids (0.32), highlighting mutualistic interactions. These findings emphasize the complexity of arthropod interactions in brinjal agroecosystems and underline the importance of integrating ecological insights into adaptive, sustainable pest management strategies amidst changing climatic conditions." (Authors) *Agriocnemis femina*, *Agriocnemis pygmaea*, *Diplacodes bipunctata*, and *Trithemis pallidinervis* are listed in the supplemental material.] Address: Poy, S.D., Dept of Agriculture, School of Agriculture, Brainware University, Barasat, West Bengal, Kolkata-700125, India

**26189** Muthukrishnan, V.; Shibu, A.; Sadhasivan, V.; Balan, R.A. (2026): A preliminary checklist of dragonflies and damselflies (Insecta: Odonata) of Kanyakumari District, Tamil Nadu, India. *Journal of Threatened Taxa* 18(5): 28926-28939. (in English, with Tamil abstract) ["This study documents the Odonata diversity in Kanyakumari District, Tamil Nadu, covering forested regions, wetlands, reservoirs, and salt pans from September 2024 to January 2025. A total of 82 species were recorded, including 47 dragonflies and 35 damselflies. The highest diversity was observed at Makkadal Dam, followed by Mam-bazhathurayar Reservoir and Kannimaranthoppu stream. In contrast, Puthalam Saltpan exhibited the lowest diversity likely due to high salinity levels. Forested regions supported the greatest species richness, possibly due to their relatively undisturbed, less polluted nature. This study contributes to the documentation of regional biodiversity and supports the Biological Diversity Act (2002) of India. The findings are expected to assist in local conservation efforts and provide insights into Odonata habitat preferences in Kanyakumari District." (Authors)] Address: Muthukrishnan, V., Kanyakumari District Forest Office, Vadasery, Nagercoil, Tamil Nadu 629001, India. Email: avmkrish07@gmail.com

**26190** Mutia, R.; Satria, R.; Kardiman, R.; Pratama, S. F. (2026): A inventory of dragonfly types (Odonata) in several habitat types in the Batang Kuranji river watershed, Padang City, West Sumatra. *Microbiotech* 4(2): 449-454. (in Indonesian, with English summary) ["The Batang Kuranji River area is located near an important river flow and is part of a tourist attraction and a source of livelihood for local residents, with varying habitat conditions. The natural habitat of the unconcreted river is still maintained, while rice fields, settlements, and concrete rivers experience disturbances due to human activities. The method used in this study was a modified Visual Encounter Survey (VES) with a 20x10m plot. Collection time was carried out in the morning at 09.00–12.00 WIB and in the afternoon at 14.00–17.00 WIB. The results showed 81 dragonfly individuals consisting of 8 species, 7 genera, and 3 families. The rice field habitat had the highest number of species of 6 species, followed by unconcreted rivers with 5 species, concrete rivers with 4 species, and settlements with 5 species." (Authors)] Address: Satria, R., Biology Study Program, Dept of Biology, Faculty of Mathematics & Natural Sciences, Universitas Negeri Padang, West Sumatera, Indonesia. Email: rijalsatria@fmipa.unp.ac.id

**26191** Nguyen, M.T.; Novelo-Gutiérrez, R.; Ngiam, R.W.; Kim, J.; Phan, Q.T.; Keetapithchayakul, T.S. (2026): Taxonomic study of morphology and distribution of *Nannophya pygmaea* Rambur, 1842 (Odonata: Libellulidae) with a discussion on the possibility of cryptic diversity and larval comparison of genera in subfamily Brachydiplacinae. *Zootaxa* 5777(3): 555-573. (in English) ["A description of the adult and last instar larva of *N. pygmaea* is presented, based on reared material from Vietnam and additional specimens obtained from Peninsular Malaysia and Singapore. Adult morphology of both sexes is documented to ensure accurate species confirmation and to demonstrate consistency with previously established diagnostic characters. Updated distributional data for *Nannophya* Rambur, 1842 in Asia are synthesized from verified field records, curated online biodiversity repositories (GBIF and iNaturalist), and published literature. Diagnostic comparisons of *N. pygmaea* with *N. ko-reana* Bae, 2020 as well as with other members of Brachydiplacinae are provided. The taxonomic status and distribution of *N. pygmaea* are discussed. The essential baseline data for future systematic, biogeographic, and conservation studies are provided." (Authors)] Address: Nguyen, M.T., Institute of Green and Sustainable, Thu Dau Mot University, 06 Tran Van On, Phu Loi ward, Ho Chi Minh City, Vietnam. Email: tynm@tdmu.edu.vn

**26192** Nicvert, L.; De Krijff, G.; Bowler, D.E.; Bried, J.T.; Coulon, A.; Engel, T.; van Grunsven, R.H.A.; Jeliakov, A.; Lamouille-Hébert, M.; Jeanmougin, M.; Fontaine, C.; Schmucki, R. (2026): Linking species traits and vulnerability indicators in European Odonata. *Biological Conservation* 317, May 2026, 111786: 10 pp. (in English) ["Understanding the mechanisms and commonalities driving species' vulnerability is essential for prioritizing and guiding conservation efforts. Trait-based approaches offer a mechanistic foundation for generalizing species vulnerabilities within a taxonomic group. Here, we assess how the vulnerability of European Odonata is associated with their traits. Our aim was to (1) quantify the link between traits and vulnerability and (2) identify the most important traits in a multi-trait context. For 123 species, we linked 3 vulnerability indicators (Red List categories, distribution trends and areas of occupancy) to a dozen traits, using discriminant and redundancy analyses. We find that 48 to 64% of the variability in vulnerability indicators is explained by traits. The main traits related to vulnerability are habitat, voltinism

and thermal preferences. More specifically, vulnerable species tend to associate with oligotrophic habitats or Mediterranean streams. They also tend to have longer life cycles, but this relationship is reversed for species with a small area of occupancy. Species vulnerable because of their decreasing distribution tend to have cold thermal preferences. Vulnerable species generally show a narrow thermal range (except for species vulnerable because of their decreasing distribution). Assessing species' vulnerability is crucial to inform conservation: our trait-based approach provides clues regarding pressures responsible for species vulnerability, thus allowing to plan conservation action targeting groups of species sensitive to the same pressures, rather than focusing on individual species. Our method provides novel opportunities for predicting species' vulnerability, and paves the way for building a multi-species conservation indicator for Odonata." (Authors)] Address: Nicvert, Lisa, FRB-Cesab, Univ Montpellier, Montpellier, France. Email: lisa.nicvert@fondationfiodiversite.fr

**26193** Nur, R.A.; Putra, S.R. (2026): Desain dan optimasi propeller drone bio-inspired untuk mengurangi kebisingan dan meningkatkan efisiensi aerodinamis [Bio-inspired drone propeller design and optimization to reduce noise and improve aerodynamic efficiency]. *Jurnal Ilmiah Ilmu Teknik Mesin, Industri & Komputer (MURATEK)* 2: 52-67. (in Indonesian, with English summary) ["The increasing operation of drones in urban areas demands solutions to address noise pollution while maintaining flight efficiency. This study aims to design and optimize drone propellers using a bio-inspired approach, drawing inspiration from the flight mechanisms of animals, particularly owls and dragonflies, to reduce noise and improve aerodynamic efficiency. Through experimental methods and Computational Fluid Dynamics (CFD) simulations, several biomimetic designs were evaluated, including leading-edge cutout structures, leading-edge and trailing-edge serrations, and blade twist distributions mimicking eagle and dragonfly wings. The results indicate that bio-inspired designs can significantly reduce noise, with sound pressure level reductions of up to 6.67 dB in UAV applications and 4.18 dB in UAV propellers, particularly at mid-to-high frequencies. Design parameters such as cutout roundness, cutout length, and incision angle proved crucial in optimizing noise reduction. Although some designs showed a slight decrease in efficiency (approximately 5%) compared to conventional propellers, other designs, such as serrated sawtooth blades, successfully increased thrust by up to 3.53%. Designs mimicking eagle wings were also reported to produce 25% higher lift coefficients. The primary mechanism behind these improvements is the ability to break down large-scale vortices into smaller, lower-energy vortices, as well as modifying the laminar-turbulent flow transition on the blade surface. These findings confirm that bio-inspired propeller designs hold great potential for application in urban drones, particularly for nighttime operations, offering a balance between noise reduction and aerodynamic performance that remains acceptable for practical applications." (Authors)] Address: Nur, Rezky Amalia, Universitas Muslim, Indonesia. Email rezky.amalia@umi.ac.id

**26194** Ohata, F.; Fukuoka, M.; Okamura, Y.; Toda, N. (2026): Rediscovery of the endangered insect *Aeschnophlebia milnei* Selys, 1883, after 15 years in Nagoya City, Aichi Prefecture, Japan. *Bulletin of Nagoya Biodiversity Center* 13: 99-101. (in Japanese) ["Regarding *A. milnei*, only a single individual has ever been confirmed within Nagoya City—specifically in 2010 along the Shirai River in Moriyama Ward—and there are no other official records. Consequently, the \*Red Data Book Nagoya 2025\* posits that Nagoya City does not constitute this species' primary habitat; rather, it speculates that

the recorded individual was likely an accidental occurrence—a stray originating from upstream populations along the Shonai River. However, multiple larvae of this species were recently confirmed along the Shirai River—the same location as the 2010 record—suggesting the possibility that *A. milnei* has established a resident population within the city. It is therefore necessary to conduct continuous surveys in the future to verify the status of this establishment." (Authors/Google translate)] Address: Ohata, F., Nagoya City Inst. for Environmental Sciences, 5-16-8, Toyoda, Minami-ku, Nagoya, Aichi, 457-0841, Japan. Email: ohata@ncies.net

**26195** Ordaz-Morales, J.E.; Juárez-Jiménez, A.L.; Stand-Pérez, M.; Arce-Valdés, L.R.; Ballén-Guapacha, A.V.; Chávez-Ríos, J.R.; Boasso, O.; Rajan, N.; Cordero-Rivera, A.; Sánchez-Guillén, R.A. (2026): Alternative reproductive strategies explain asymmetries in reproductive isolation and reinforcement in two *Ischnura* damselfly species. *Heredity* 135: 358-371. (in English) ["Theoretical and empirical studies of reinforcement have advanced our understanding of speciation, yet its role in polymorphic species remains understudied. Because morphs differ in behavior, morphology, and reproductive strategies, reinforcement may act unevenly among them, generating asymmetric reproductive isolation. We tested this prediction in the polymorphic damselflies *Ischnura elegans* and *Ischnura graellsii*, in which female morphs adopt alternative reproductive strategies. These species form two independent hybrid zones where reinforcement has strengthened mechanical isolation and driven reproductive character displacement in mating-related structures. We quantified five reproductive barriers across female morphs to evaluate how color polymorphism interacts with reinforcement. We found clear asymmetry between morphs: gynochrome females of both species showed reinforced mechanical isolation, whereas androchromes did not, consistent with their contrasting reproductive strategies. Additionally, gametic barriers evolved in opposite directions between species. Fertility isolation was reinforced in *I. elegans*, while oviposition and fertility barriers relaxed in *I. graellsii*, but symmetrically between female morphs, likely reflecting gene flow and purging of incompatibilities. Reinforcement strengthened reproductive isolation in a morph-specific manner, as pre-existing differences between female morphs influenced the likelihood of heterospecific mating and therefore the strength of selection against hybridization. Future work should examine whether these asymmetric dynamics generate cascading effects within species and contribute to morph-level diversification." (Authors)] Address: Sánchez-Guillén, Rosa Ana, Red de Biología Evolutiva, Inst. de Ecología A. C., Xalapa, México

**26196** Ott, J. (2026): Die Libellenfauna des „Gänsbuckel-Gebietes“ bei Neustadt. *Pollichia-Kurier* 2/2026: 33-35. (in German) ["Around 13 kilometres east of Neustadt and nine kilometres west of Speyer lies an area of great faunal interest, the so-called NABU nature reserve known as 'Gänsbuckel'. The area, which was surveyed during several dragonfly surveys in 2024 and 2025 – see Figure 1 – forms part of a larger nature conservation and management project entitled 'Revitalisation of former irrigation ditches and floodplains in the Speyerbach area near Geinsheim' (for details, see the NABU website). In total, 21 dragonfly species were recorded in the study area during the two survey years, most of which were also identified as resident. These include just one species on the Rhineland-Palatinate Red List (Willigalla, Schlottmann & Ott 2018) and one species on the German Red List (Ott et al. 2015), as well as one species of conservation concern. However, among the other species recorded in the Neustadt area and thus potentially occurring in this region, there

are further endangered species as well as species listed in the annexes to the Fauna-Flora-Habitat Directive. Translated with DeepL.com (free version)" (Author/DeepL)] Address: Ott, J., Friedhofstr. 28, D-67705 Trippstadt, Germany. Email: ott@lupogmbh.de

**26197** Ouedraogo, J.; Gnankine, O.; Ouédraogo, T.F.X.; Séré, B.V.; Farma, J.; Sougué, E.; Dabiré, R.K.; Diabaté, A.; Müller, R.; Sawadogo, S.P. (2026): Behavioral and phenotypic responses of *Anopheles coluzzii* (Diptera: Culicidae) to the non-consumptive effects of *Anisops jaczewskii* (Hemiptera: Notonectidae) and *Pantala flavescens* (Odonata: Libellulidae) in Burkina Faso. *Journal of Medical Entomology* 63(2): 1-9. (in English) ["During their aquatic life stages, mosquitoes coexist with various organisms that may prey upon them. Beyond the direct predation risk, exposure to predators may induce stress that alters mosquito life history traits. In this study, we evaluated the non-consumptive effects of 2 aquatic predators on *Anopheles coluzzii* Coetzee & Wilkerson life history traits and the ability of gravid females to avoid predators when searching for oviposition sites. To assess the phenotypic effects of exposure to predation by *Anisops jaczewskii* and *Pantala flavescens*, 1,000 wild strain, and 1,000 laboratory strain *An. coluzzii* larvae were separately exposed to one of the predators for 72 h, after which 300 larvae from each strain were monitored until pupation and emergence. The predators, *A. jaczewskii* and *P. flavescens*, significantly prolonged the development time of both wild and laboratory *An. coluzzii*, with a more pronounced effect on the laboratory strain. Predator exposure also reduced adult size in the laboratory strain but not in the wild strain. Gravid females used various cues from predators to select oviposition sites. Our study showed that predators may have phenotypic and behavioral effects on *An. coluzzii*. Graphical abstract" (Authors)] Address: Ouedraogo, J., Direction Régionale de l'Ouest (DRO), Institut de Recherche en Sciences de la Santé (IRSS), 12 399 Avenue de la Liberté, Bobo-Dioulasso 01 BP 545, Burkina Faso. Email: judicaelo37@gmail.com

**26198** Papparotto, M.; Fonnesu, A.; Pidapa, J.K.R.; Matteotti, P.; Fambri, L. (2026): Simultaneous sampling of plastic waste and alien species in the northernmost part of Lake Garda (Italy) using seabin during winter season. *Microplastics* 2026, 5, 57: 36 pp. (in English) ["Plastic and microplastic (MP) pollution, along with alien species invasion, are of great concern for natural habitat preservation and human health, and are two important and concomitant likely causes for global biodiversity loss. In the present study, a Seabin, a device for buoyant waste collection in calm waters, was used to also characterize the waste collected in northernmost side of Lake Garda (Italy) in a period of very low anthropogenic pressure, the Winter season of 2024–2025. During the survey, 92.6 g of plastic was collected, i.e., a total of 540 pieces. About 6.9 mg of plastic per m<sup>3</sup> of water was found, corresponding to about 0.04 plastic items per m<sup>3</sup> and approximately 13 pieces of microplastics per day. Fourier-transform Infrared (FTIR) spectroscopy identification showed that the plastic was composed mainly of polyethylene (PE), polypropylene (PP), and polystyrene (PS). Microorganisms (Diatoms, Bacillariophyta) and microcrack formation with deposits of inorganic matter (mainly Si, Al, O, Ca) were also evidenced by SEM/EDX in all the observed aged MP. Qualitative evaluation of the captured biota highlighted the presence of at least five alien species, including invasive *Dikerogammarus villosus*. This study describes an easy and cost-effective novel methodology for simultaneously monitoring plastic waste and alien species presence in calm waters, which acts also as a mitigation tool for plastic pollution. The results could be of interest not only

to policymakers and scientists, but also for public health and for environmental monitoring." (Authors) One individual of *Ischnura elegans* was recorded.] Address: Papparotto, M., Department of Industrial Engineering and INSTM Research Unit, University of Trento, Via Sommarive, 9, 38123 Povo, TN, Italy. Email: marco.papparotto@unitn.it

**26199** Paul, S.; Haque, M.T.; Herberstein, M.E.; Khan, M.K. (2026): Seasonal climatic variability shapes immune responses and infection risks in the common bluetail damselfly. *Oecologia* (2026) 208:47: 11 pp. (in English) ["Understanding how a changing climate influences host-parasite interactions is important to predict disease-driven extinction risks. Insect immune responses are sensitive to seasonal climatic factors such as temperature, humidity, and rainfall, however, the influence of seasonal climatic fluctuations on insect immune responses and parasite prevalence remains poorly understood. To address this gap, we studied seasonal variation in immune response and endoparasite (protozoan gregarine) prevalence (proportion of infection) in *Ischnura heterosticta*. Damselflies may experience increased food availability during warmer seasons, providing greater energetic resources for the metabolically costly synthesis of melanin a key component of the prophenoloxidase immune response; therefore, we predicted higher melanisation and lower parasite (gregarine) prevalence in warmer than cooler months. In accordance with our prediction, we found stronger melanisation and lower gregarine prevalence in summer. We further found that melanisation increased with air temperature and decreased with rainfall and humidity while gregarine prevalence decreased with air temperature and increased with humidity and rainfall in females but not in males. Our study provided evidence that natural seasonal variation in climate can impact patterns of immune response, host-parasite interactions and infection prevalence across seasons. While short-term warming during favourable seasons may enhance host immune response, long-term or extreme climate change might disrupt host-parasite relationship by altering resource availability, humidity patterns, or insect thermal limits, thereby contributing to seasonal declines in host populations." (Authors)] Address: Paul, S., School of Natural Sciences, Macquarie Univ., Sydney NSW-2109, Australia. Email: shatabdi.paul@students.mq.edu.au

**26200** Payra, A.; Philip, J.G.; Islam, N.; Mardi, S.; Thakuria, D.; Koparde, P. (2026): Notes on the genus *Macromia* Rambur, 1842 of Assam, northeast India (Anisoptera: Macromidae). *Zootaxa* 5793(2): 481-495. (in English) ["The present paper reports *Macromia sombui* Vick, 1988 for the first time from India, almost 36 years after its first description from Royal Chitwan National Park of Nepal in 1988. *Macromia calliope flavocolorata* Fraser, 1922 and *Macromia cingulata* Rambur, 1842 are reported here for the first time from the northeast India based on specimens collected from the fringe area of Raimona National Park, Kachugaon Division, Bodo-land Territorial Council (BTC), Assam, India. In addition, this paper incorporates *Macromia cupricincta* Fraser, 1924 into the Odonata list of Assam." (Authors)] Address: Payra, A., Dept of Environmental Studies, Dr Vishwanath Karad MIT World Peace University, Pune, Maharashtra, India. Email: arapayra@gmail.com

**26201** Peng, Z.; Zheng, Y.; Chen, Y.; Han, L.; Wang, M.; Wang, B. (2026): Macroinvertebrate community responses and recovery mechanisms to extreme drought in small water bodies of eastern China. *Biology* 2026, 15, 811: 20 pp. (in English) ["Extreme summer droughts increasingly threaten freshwater biodiversity in monsoonal regions, yet community responses within heterogeneous small water bodies (SWBs)

remain poorly understood. This study evaluated how drying events influence macroinvertebrate taxonomic and functional composition across different SWB types and explored the mechanisms driving post-drought recovery. We sampled isolated ponds (IPs), stream-fed ponds (SFPs), pond-linked streams (PLSs), and non-pond-linked streams (NPLSs) in Eastern China during an extreme summer drought (2022) and a subsequent recovery year (2023). Ponds exhibited high resistance, maintaining stable taxonomic and functional richness. PLSs suffered substantial summer biodiversity declines but showed rapid post-drought recovery, possibly facilitated by spatial dispersal from nearby pond refuges. In contrast, NPLSs experienced severe, lasting biodiversity loss. Drought conditions drove overall community homogenization, with spatial dispersal playing a more important role in structuring assemblages than environmental filtering. Furthermore, functional trait analysis indicated that post-drought recovery was more closely associated with resilience-linked traits rather than resistance traits. These findings demonstrate that lateral connectivity within SWB networks buffers drought impacts by providing refugial support and enabling rapid recolonization. Preserving diverse, interconnected SWBs is a critical management strategy for maintaining metacommunity resilience under growing climatic volatility." (Authors)] Address: Wang, B., Dept of Entomology, College of Plant Protection, Nanjing Agricultural University, Nanjing 210095, China. Email: wangbeixin@njau.edu.cn

**26202** Phan, Q.T.; Keetapithichayakul, T.S.; Digma, J.R. (2026): Description of a new species *Drepanosticta minhanhiana* sp. nov. and detailed structural notes on *D. halterata* (Brauer, 1868) from Luzon, the Philippines (Odonata: Platystictidae). *Zootaxa* 5831(2): 256-266. (in English) ["*Drepanosticta minhanhiana* sp. nov. (holotype ♂: 15.26416° N, 121.35115° E; 6 m a.s.l.; deposited at Cavite State University, Philippines) is described from Luzon Island, the Philippines, based on specimens of both sexes. The new species can be distinguished from its congeners by the differential characters of the male prothorax and by the structure of anal appendages. Additional descriptive notes, as well as detailed morphological photographs and illustrations of both the male and female of *D. halterata* (Brauer, 1868), are also provided." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Research, Institute of Research & Training of Medicine, Biology & Pharmacy, Duy Tan University, Da Nang, 550000, Vietnam. E-mail: pqtoan84@gmail.com

**26203** Pinto, T.J.; Gomes, D.F.; Ogura, A.P.; Menezes da Silva, L.C.; Braga do Carmo, J.; Montagner, C.C.; Espíndola, E.L.G.; Moreira, R.A. (2026): Impacts of pesticides and vinasse on the composition and functional diversity of aquatic macroinvertebrates exposed in a mesocosm system. *Aquatic Toxicology* 292, 107724: 13 pp. (in English) ["Modern agriculture plays a significant role in the global economy. However, the continuous use of pesticides and fertilizers raises concerns about aquatic pollution and its effects on indigenous organisms. Thus, this study investigated the impact of the pesticides Regent® 800 WG (active ingredient - a.i. fipronil) and DMA® 806 BR (a.i. 2,4-D), as well as sugarcane vinasse, an ethanol industry byproduct applied in sugarcane crops as fertilizer, individually and in mixtures, on the functional diversity of benthic macroinvertebrates at a mesocosm scale. For that, open-air mesocosms were used, in which the effects of contaminants were evaluated over time (1, 7, 14, 28, 75, and 150 days after contamination). The macroinvertebrate community was monitored using colonization structures, while physicochemical parameters, metals, and pesticides were analyzed throughout the experiment. In the control and

2,4-D-treated mesocosms, collectors, predators, and scrapers were the predominant organisms. In mesocosms contaminated with fipronil and pesticide mixture, predators such as Odonata and Tanyptodinae disappeared after contamination. In the pesticide and vinasse mixture treatment, collectors, filter feeders, and scrapers predominated over time. Functional richness and diversity were reduced in the pesticide mixture. Contamination by the mixture of pesticides and vinasse reduced functional diversity, due to the disappearance of predators and tolerant organisms. Therefore, the functionality of the macroinvertebrate fauna may be affected by the application of these contaminants in areas close to sugarcane cultivation. These effects represent a risk to the balance of aquatic ecosystems, compromising trophic chains, ecological functions, and the overall health of the aquatic ecosystem." (Authors)] Address: Pereira Cotta, Carina, Lab. Ecotoxicology & Applied Ecology (LEEA), Dept of Hydraulics & Sanitation (SHS), Postgraduate Degree in Environmental Engineering Sciences (PPG-SEA), São Carlos School of Engineering (EESC), University of São Paulo, Av. Trabalhador São Carlense, 400, 13.560-970 São Carlos, SP - Brazil.

**26204** Poh, A.; Ross, P.A.; Chan, V.; McMahon, T.; Nordheim-Maestas, C.L.; Brannelly, L.A. (2026): Field survey of freshwater invertebrates reveals that several groups are potential carriers of the fungal pathogen *Batrachochytrium dendrobatidis*. *Ecology and Evolution* 16:e73513: 10 pp. (in English) ["The amphibian disease chytridiomycosis, caused by the fungal pathogen *Batrachochytrium dendrobatidis* (Bd), has devastated global amphibian biodiversity. The specific reasons for its rapid global spread, especially to pristine areas, are not well understood. Freshwater invertebrates might function as carriers of Bd, but the diversity and extent of invertebrate species that might vector Bd in the wild is unknown. Thus, broad surveys of freshwater invertebrates at known Bd-positive sites are needed to understand the potential risk and scope of these potential pathogen carriers. In this study, we aimed to identify potential invertebrate carriers of Bd in Victoria, Australia. We collected a wide variety of freshwater invertebrates from sites with vulnerable *Litoria* frog populations, batch-pooled the samples and screened them for Bd DNA presence via qPCR. We detected Bd DNA presence in 2.1% of the batch-pooled samples, from the families Chironomidae (non-biting midges), Hydrophilidae (water scavenger beetles) and Corixidae (water boatmen). The detection of Bd in field-collected invertebrates across three orders indicates that Bd might be more taxonomically widespread than previously recognised. These invertebrate taxa are ideal candidates for future vector competence studies, which are necessary to understand the implications for amphibian conservation." (Authors) Samples were determined as testing negative (NEG) for Bd DNA if the first qPCR well reaction was negative. Odonata larvae were tested negative.] Address: Brannelly, Laura, Melbourne Veterinary School, Faculty of Science, The University of Melbourne, Werribee, Victoria, Australia. Email: laura.brannelly@unimelb.edu.au

**26205** Pottier, P.; Kellermann, V.; Noble, D.W.A.; Sgrò, C.M.; Terblanche, J.S.; van Heerwaarden, B. (2026): Life cycle complexity drives variation in thermal tolerance and plasticity. *Current Opinion in Insect Science* 76, 101523: 11 pp. (in English) ["Accumulating evidence suggests that heat tolerance varies substantially across insect development, yet patterns of variation remain difficult to generalise across species. We discuss how the diversity of insect developmental strategies shapes both the intensity and predictability of thermal environments across ontogeny, and how this likely generates variation in heat tolerance, plasticity, and carry-over effects.

We hypothesise that large developmental variation is expected in holometabolous insects, and in species undergoing pronounced microhabitat or diel activity transitions. These transitions can modify heat exposure, behavioural thermoregulatory abilities, and the physiological or genetic regulatory network underlying heat tolerance, weakening correlations among life stages. We discuss when carry-over effects are likely to be adaptive, highlighting the importance of environmental predictability, ecological similarity among stages, and the balance between heat injury and repair. We argue that an ontogenetic perspective capturing the microenvironmental conditions experienced by each life stage is essential for predicting insect vulnerability to extreme heat." (Authors) References to Odonata are included.] Address: Pottier, Patrice, Dept Biol. & Environmental Sciences, Fac. Science, Univ. Gothenburg, Gothenburg, Sweden. Email: patrice.pottier@bioenv.gu.se

**26206** Priyanka, G.; Prasad, G. (2026): Larval odonate assemblage structure in a disturbed rainforest stream of the southern Western Ghats, Kerala, India. *Entomon* 51(2): 173-178. (in English) ["Larval odonate assemblages were investigated in the Kallar stream system, a perennial hill stream of the southern Western Ghats in Thiruvananthapuram District, Kerala, India. Monthly sampling was conducted at five sites (Darpha-Kalungu, Pottanchira, Kaliyikkal, Meenmutty and Main Kallar) that differed in riparian cover, land use and substrate composition. Larvae were collected from multiple microhabitats including sand, gravel, cobble, boulder and leaf-litter deposits using hand nets and direct substrate examination and were identified using standard taxonomic keys. A total of 3,090 individuals belonging to 12 families and 39 morphospecies were recorded. Dragonfly larvae dominated the assemblage, with Gomphidae showing the highest abundance. Open-canopy sites associated with settlements and plantations were mainly represented by widespread families such as Libellulidae and Gomphidae, whereas shaded forest reaches containing leaf litter and woody debris supported additional families including Platystictidae, Protoneuridae and Euphaeidae. Damselflies were more frequent in shaded stretches, while sandy reaches supported fewer individuals. The results indicate that riparian canopy cover and substrate heterogeneity strongly influence odonate larval distribution and emphasize the importance of maintaining natural riparian vegetation in Western Ghats hill streams." (Authors)] Address: Prasad, G., Department of Zoology, University of Kerala, Kariavattom, 695581, Thiruvananthapuram, Kerala, India

**26207** Rakesh, M.; Shravan, P.; Reddy, G.S. (2026): Patterns of avian diversity and ecological impacts in Suryapet, Telangana, India. *Asian Journal of Environment & Ecology* 25(6): 191-209. (in English) ["Background: Telangana supports rich bird diversity, with 443 recorded species across forests, scrublands, hills, and wetlands, including several endemic and threatened birds that serve as important indicators of ecosystem health. Aim: The aim of the study is to document the faunal diversity across various taxonomic groups in Suryapet district, Telangana, with special emphasis on avifauna. Place and Duration of Study: The present study was conducted in and around Yerkaram Village, which is located in the Suryapet District of Telangana State. The geographical coordinates are 17.2309° N latitude and 79.5707° E longitude; it falls within the semi-arid climatic zone of the Deccan Plateau Methodology: Field surveys were organized along with opportunistic sightings in order to obtain checklists of fauna of the village and around the village during the year 2020 – 2021. Point counts and opportunistic surveys were conducted for recording species

present in different locations during morning and evening sessions. Most of the time, the opportunistic observation method was used during the surveys. Field photographs were thoroughly cross-checked with the images available on the online database. Results: A total of 112 species were documented, including 81 birds, 17 butterflies, six dragonflies [no details are given], three reptiles, and one species each of amphibian, damselfly, grasshopper, moth, mushroom, spider, and wasp. ... (Authors)] Address: Shravan, P., ICFRE – Forest Research Institute, Dehradun, Uttarakhand, 248006, India

**26208** Rappocciolo, M.; Chiorino, M.; Sgarella, E.; Solazzo, D.; Spreafico, C.; Doretto, A. (2026): Inter-annual variation in Alpha and Beta diversity of benthic macroinvertebrate communities in agricultural ditches. *River Research and Applications* 42(5): 997-1010. (in English) ["Ditches are essential elements of the agricultural landscape because of their role as habitat or refuge for aquatic species, especially in homogenized and intensively cultivated areas. However, data on the biodiversity associated with agricultural ditches, and its variation over time, are underrepresented in ecological research. This study aimed at quantifying the inter-annual changes in the alpha and beta diversity of benthic macroinvertebrate communities across five agricultural ditches in the lowland, agricultural area of the Novara Province (northwestern Italy). Benthic macroinvertebrates were always sampled in October but in two different years: 2022 and 2023, respectively. These two years differed in the climate and hydrological conditions with lower precipitations and discharge in 2022 than 2023. The alpha diversity metrics, such as taxon richness, total abundance, Ephemeroptera, Plecoptera and Trichoptera richness and abundance, and Shannon index, were significantly higher in 2023 than in 2022. Moreover, these metrics were positively correlated with the water velocity, and negatively correlated with the concentration of phosphates. Benthic macroinvertebrate communities in 2022 showed higher beta diversity compared to 2023, with significant differences in the taxonomic composition. By controlling for the season, the results here obtained demonstrate that ditch macroinvertebrate communities are responsive to temporal variability in hydrological, climate, and environmental conditions with changes in the taxonomic diversity and composition driven by water velocity and nutrient enrichment. As agricultural ditches are still poorly monitored, this study provides science-based information and potential insights for their sustainable management." (Authors) Taxa - including Odonata - are treated at genus level.] Address: Doretto, A., Department for Sustainable Development and Ecological Transition, University of Eastern Piedmont, Vercelli, Italy. Email: alberto.doretto@uniupo.it

**26209** Rohman, A.; Subchan, W.; Amalia, D.A. (2026): The dragonfly (Odonata) community structure at Sukamade Resort, Meru Betiri National Park, Indonesia. *Journal of Threatened Taxa* 18(4): 28631-28643. (in English, with Indonesian summary) ["Sukamade Resort, located within Meru Betiri National Park, is a conservation management area. Dragonflies have significant diversity and extensive spread, and their presence in conservation areas is linked to the availability of ecological resources such as abundant vegetation near aquatic habitats. This study ascertained the composition of the dragonfly community in Sukamade Resort at four sampling sites to provide data for conservation area management. Of the 17 species recognized, *Orthetrum sabina* and *Pseudagrion microcephalum* had the greatest population density across all locales. The diversity index indicated a moderate level, the Margalef index demonstrated low requirements, the dominance index was low, and evenness was high. The important value index (IVI) indicates that *Neurothemis ramburii*, *Orthetrum*

sabina, and *Libellago lineata* had the highest ecological importance (IVI = 0.38). Canonical correspondence analysis indicates that *Pseudagrion microcephalum*, *Zyxomma obtusum*, *Ischnura senegalensis*, *Diplacodes trivialis*, and *Trithemis festiva* are associated with air humidity characteristics at the Great Estuary location. It is concluded that the presence of dragonflies is influenced by habitat factors such as aquatic substrate composition, abiotic parameters (light, temperature, humidity), and riparian vegetation. Protecting riparian habitats and maintaining good water quality are crucial for the conservation of dragonflies, which reflect healthy ecological conditions and support the sustainability of aquatic ecosystems." (Authors)] Address: Rohman, A., Biology Education, Faculty of Teacher Training & Education, University of Jember, Kalimantan St., No 37, Sumbarsari, Jember, East Java 68121, Indonesia. Email: abdu.fkip@unej.ac.id

**26210** Rowe, E.K.; 'Ofa Jr Vead, B.E.; Sutherland, L.N.; Rashni, B.; Xu, I.C.I.; Inoke, E.M.T.; Marinov, M.; Bybee, S.M. (2026): Description of the female of *Teinobasis fatakula* Marinov & Donnelly, 2013 (Zygoptera: Coenagrionidae) from the Kingdom of Tonga. *International Journal of Odonatology* 29: 68-71. (in English) ["An expedition in 2024 to 'Eau Island in the Kingdom of Tonga led to the collection of several female *T. fatakula*. *T. fatakula* is endemic to 'Eua and can only be found inhabiting a single river in the 'Eua National Park. Here we describe the female of this unique damselfly and expand its range." (Authors)] Address: Rowe, Emma, Dept of Biology, Brigham Young University, Provo, UT 84602, USA. Email: emma24rowe@gmail.com

**26211** Ruppell, G.; Hilfert-Ruppell, D. (2026): Unusual behavior of males of *Aeshna cyanea* (Odonata: Aeshnidae) to achieve a pairing. *International Journal of Odonatology* 29: 141-147. (in English) ["Males of *A. cyanea* employed specific behaviors to induce non-cooperative females into the mating position. Biting the female was used as a coercive behavior, thus showing a new function of biting in odonates. In two cases sitting females were caused to let go the substrate to which they latched on. A third female was bitten by a male after he had grasped her "incorrectly", i.e. not from the dorsal but from the ventral side of her head. He turned her by means of the anal appendages into the "correct" tandem position and then attempted to achieve the mating position. In another case, a male tore a non-cooperative female off the egg-laying substrate and flew with her in many curves at a height of two to three meters. The female remained stiff and showed no cooperation. The male then flew to the open water of the pond and dropped her. Just above the water surface, the male grabbed her again. This time she cooperated and formed a mating wheel with him. These observations are discussed in the context of communication signals during forced mating attempts and a prospective model for the evolution of intimidation." (Authors)] Address: Hilfert-Ruppell, Dagmar, Inst. Science Education, Bienroder Weg 82, Technical University of Braunschweig, 38106 Braunschweig, Germany

**26212** Sachse, M.; Wappler, T.; Nel, A. (2026): A new Miocene *Aeshna* from Germany (Odonata: Aeshnidae). *Palaeoentomology* 9(3): 217-220. (in English) ["The hawk dragonflies or Aeshnidae sensu stricto (excluding the Gomphaeschnidae) are diverse in the fossil record but still known only in the Cenozoic. They are rather frequent as compression fossils during the Eocene, Oligocene, and Miocene (e.g., Nel et al., 1994, 1996, 1997; Prokop & Nel, 2000; Nel & Petrulevicius, 2010; Nel et al., 2024). Among these the genus *Aeshna* Fabricius, 1775 is represented by Late Eocene, Oligocene, and Miocene species from North America, Europe, and China,

with an increasing diversity through time, with one Eocene, three Oligocene, and 11 Miocene species. The diversity of the other aeshnid genera apparently decreased during the same period in Eurasia and North America (e.g., the Eocene to Miocene genus *Olgaeschna* Piton & Théobald, 1939) (Huang et al., 2023). Fossil Cenozoic Aeshnidae are quite poorly known in the other parts of the world. Here we describe a new species of *Aeshna* from the Middle Miocene of Germany, confirming this general tendency." (Authors)] Address: Sachse, M., Dept of Natural History, Hessisches Landesmuseum Darmstadt, Friedensplatz 1, 64283 Darmstadt, Germany

**26213** Sadykova, D.; Johnson, A.C.; Qu, Y.Y.; Henrys, P.A.; Jurgens, M.D.; Keller, V.D.J.; Bachiller-Jareno, N.; Scarlett, P.M.; Hutchins, M.G.; Gecchele, L.; Sadykov, A.; Sumpter, J.P.; Jardine, E.; Gardner, E. (2026): The relative importance of multiple environmental factors on river macroinvertebrate abundance across different groups based on a nationwide dataset from England. *Water Research* 292, 125270: 13 pp. (in English) ["Many countries are concerned by and wish to arrest or reverse what is termed a biodiversity crisis in invertebrates. To understand the issues facing riverine invertebrates in England, a fully integrated dataset where macroinvertebrate monitoring sites were aligned in space and time with physical, geographic, habitat, and chemical factors from 2003 to 2018 (quantitative abundance data being universally available from 2003) was brought together for statistical analysis. Over this period the median abundance either did not change or for some groups actually increased. The aim was to identify what the principal factors were that influenced Ephemeroptera, Plecoptera, Trichoptera, Odonata, Diptera, Coleoptera, Hemiptera, and Gastropoda abundance over this 16-year period. The dataset was examined using an ensemble framework within two modelling approaches: generalised linear mixed-effects models with permutation-based variable importance, as well as non-linear generalised additive mixed models to assess the percentage of deviance explained by each variable. The range of approaches aimed to offer different perspectives on variable importance, providing a more comprehensive understanding of the data and highlighting how model selection can influence ecological data interpretation. For most groups, physical factors, such as altitude, distance from source, slope, bed substrate and flow discharge, were strong predictors of abundance, likely reflecting natural habitat preferences shaped by evolutionary history. Land cover was also influential, with seminatural areas generally supporting higher abundances and urban land cover associated with lower abundances. Some chemical and ecological factors – such as wastewater and nutrient content, were particularly important for Ephemeroptera, Plecoptera, and Trichoptera abundance. For Coleoptera, Hemiptera, Trichoptera, Diptera and Gastropoda, metal levels played a role in their abundance, whilst for Odonata, mean temperature appeared to be important. Diptera appeared to be relatively insensitive to the factors examined. This statistical examination of large monitoring datasets, with no a priori assumptions, is vital in resolving a key challenge in bio-assessment: identifying what influences invertebrate abundance when data are sparse. The results can provide policy options to improve ecological conditions, and the approach is transferable to other regions. ...Odonata abundance appeared to be most strongly associated with bed substrate (positive), which ranked highest in the GAMM models, indicating it explained a substantial proportion of variability, and also showed a high impact score in the GLMMs (both RMSE and MAE). Geographic factors also played a key role, including flow discharge (categorical, level-dependent effects), distance from source (positive), altitude and slope (both negative), with strong support across both RMSE- and MAE-based

evaluations (Fig. 4). Greater abundance was observed lower in the catchment (as indicated by distance from source) and in larger rivers (as indicated by flow discharge). While altitude and slope were selected in a large proportion of GLMM models and explained a substantial portion of the variability in GAMM results, their impact scores were lower than those of distance from source and flow discharge. In contrast, although flow discharge had the highest impact scores in GLMMs, it explained little variability in the GAMMs. Mean air temperature (positive) was another important factor for Odonata, with high impact scores, but it explained just under 10 % of the deviance in GAMMs. Maximum air temperature was also consistently selected but had lower importance scores, suggesting a weaker yet stable association. Unlike the EPT group, Odonata abundance showed a negative relationship with semi-natural land cover, which was selected in RMSE-based models (suggesting particular importance for predicting extreme values) and explained a substantial proportion of variability. Among the variables that explained >10 % of deviance were also urban land cover (negative), orthophosphate (PO<sub>4</sub>; negative), and dissolved oxygen (direction varies), highlighting their potential importance for understanding ecological patterns, even if their relationships with abundance are not clearly directional." (Authors)] Address: Sadykova, Dinara, UK Centre for Ecology and Hydrology, Wallingford, OX10 8BB, UK. Email: dinsad@ceh.ac.uk

**26214** Sajjad, S.; Saeed, K.; Khan, I.A.; Rahman, U.U. (2026): Exploring the diversity of Odonata (Dragonfly and Damselfly) fauna of Malka and Mahaban Valley District Buner, Pakistan. *The Sciencetech* 7(1): 200-222. (in English) ["The current preliminary study was conducted on Odonata fauna of Malka and Mahaban valley, district Buner during October 2019 to October 2020. In this exploration, the focus was on diversity of Odonata fauna of Malka and Mahaban valley district Buner, Pakistan. In this research, a total of 80 specimens of Dragonflies belonging to 11 species under 6 genera and 2 families similarly 70 specimens of Damselflies belonging to 7 species, 6 genera and 5 families were reported from Malka and Mahaban valley Buner. The Dragonfly families are Gomphidae and Libellulidae. The reported species are Onychogomphus bistrigatus, Trithemis festiva, Trithemis aurora, Brachythemis contaminata, Orthetrum pruinosum neglectum, Orthetrum anceps, Orthetrum triangulare triangulare, Orthetrum chrysis, Orthetrum chrysostigma louzonium, Neurothemis fluctuans and Crocothemis servilia servilia. The Damselfly families are Calopterygidae, Chlorocyphidae, Euphaeidae, Platycnemididae and Coenagrionidae. The species reported are Neurobasis chinensis chinensis, Aristocrypha quadrimaculata, Libellago lineata lineata, Bayadera indica, Copera marginipes, Pseudagrion rubriceps and Pseudagrion decorum. Among Dragonflies, family Libellulidae dominated with (5 genera and 10 species) followed by Gomphidae (1 genus and 1 species). Whereas among Damselflies, family Chlorocyphidae dominated with (2 genera and 2 species), Coenagrionidae (1 genus and 2 species), Calopterygidae, Euphaeidae and Platycnemididae (1 genus and 1 species). Important steps should be taken to save the population of endangered species and further molecular research work will be carried out in Malka and Mahaban valley district Buner Pakistan. The reported species also play active role in biological control." (Authors)] Address: Sajjad, S., Dept Zoology, Univ. of Buner, Buner 19290, Pakistan

**26215** Salhi, K.; Chelli, A.; Khelifa, R.; Yalles-Satha, A.; Amari, H.; Gana, M.; Zebba, R.; Salhi, S.; Mellal, M.K. (2026): Drivers of Odonata alpha and beta diversity across lentic and lotic habitats in northeastern Algeria. *African Journal of ecology* 64(1), e70152: 16 pp. (in English) ["Lentic and lotic habitats

support distinct aquatic communities, yet how environmental gradients and anthropogenic pressure differentially shape diversity patterns across these habitat types remains poorly understood. Here, we examined Odonata alpha and beta diversity across lentic and lotic habitats in northeastern Algeria to assess habitat-specific responses to environmental and anthropogenic drivers. We sampled adult Odonata and measured local environmental variables at 35 sites, complemented by climatic and anthropogenic data from global datasets. Alpha diversity was quantified using coverage-based Hill numbers, beta diversity was partitioned into turnover and nestedness components and environmental drivers were assessed using constrained ordination and generalised linear mixed models. We recorded 40 species, with significantly higher asymptotic richness and Simpson diversity in lotic than lentic habitats. Human Footprint Index (HFI) exhibited habitat-dependent effects on species richness (HFI × habitat:  $\beta = -0.352$ , 95% CI: -0.673 to -0.030), with lotic habitats showing negative responses to anthropogenic pressure while lentic habitats exhibited a positive association. Community composition differed significantly between habitat types and was primarily structured by altitude. Beta diversity was dominated by turnover rather than nestedness, with significantly higher total dissimilarity in lentic habitats. Our findings suggest that conservation strategies for Mediterranean Odonata diversity require a landscape approach that protects both habitat types while recognising their differential sensitivity to human impacts." (Authors)] Address: Khelifa, R., Biodiversity Research Center, University of British Columbia, 2212 Main Mall, Vancouver. B.C. V6T1Z4, Canada. Email: rassimkhefifa@gmail.com

**26216** Saliba, C.; Kahalea, R.; Maalouf, J.P.; Ashfaq, M.; El Chamy, L.; Paul D.N. Hebert, P.D.N.; Bou Dagher Kharat, M. (2026): The first DNA barcode survey of insects from Lebanon. *Genome* 69. dx.doi.org/10.1139/gen-2025-0134: 13 pp. (in English) ["diverse landscapes and rich ecological zones support a high diversity of insect species, many of which remain taxonomically unresolved. To address this knowledge gap, we conducted the first comprehensive DNA barcoding survey of Lebanese insect diversity. Specimens collected using Malaise traps deployed at four sites between 2019 and 2021 were analyzed for sequence variation in the 658 bp barcode region of the mitochondrial cytochrome c oxidase subunit I (COI) gene. The 58 123 insect specimens included representatives of 5747 Barcode Index Numbers (BINs), and 56% of them are unique to Lebanon. By integrating DNA barcoding with morphological taxonomy, we assigned each BIN to one of 20 insect orders and identified 1224 species. Most specimens (95%) belonged to five dominant orders: Diptera, Hymenoptera, Hemiptera, Coleoptera, and Lepidoptera. The high proportion of unique BINs suggests high endemism within Lebanon and the broader Levant region. By generating a foundational inventory for Lebanon's insect fauna, this study has provided baseline data critical for future biodiversity monitoring and conservation planning in the Eastern Mediterranean while also making a substantial contribution to the global DNA barcode reference library." (Authors) The set of data includes two specimens of "Odonata".] Address: Bou Dagher Kharat, Magda, Laboratoire Biodiversité et Génomique Fonctionnelle, Faculté des Sciences, Université Saint-Joseph, Campus Sciences et Technologies, Mar Roukos, Mkallès, P.O. Box 1514, Riad el Solh, Beirut 1107 2050, Lebanon. Email: magda.boudagher@efi.int

**26217** Salvan, M.G. (2026): Biodiversity and agro-biodiversity for climatic resilience promotion in rice farming. PhD thesis, *Richerca in Scienze Biologiche e Biotecnologie applicate*, Università degli Studi di Torino: 224 pp. (in English)

[“This Ph.D. thesis explores the interconnections between biodiversity and agro-biodiversity in rice agrosystems in North Western Italy (NWI) through a multi-scale and multidimensional approach. This work is the result of collaboration between the Rete Semi Rurali (RSR) and the Department of Life Sciences and Systems Biology (DBIOS) of the University of Turin. Current Ph.D. research compares organic and conventional rice farming systems in NWI, from the point of view of biodiversity and agro-biodiversity. Maintaining genetic diversity proceeds on two parallel tracks, that of biodiversity and agrobiodiversity. At an operational level it can be applied through the use of practices with reduced environmental impact, but also through the role of specific institutions such as community seed banks which support the presentation and dissemination of varieties suitable for low input and biodiversity friendly farming practices. Chapter 2 synthesizes knowledge on how rice cultivation, through varietal choices and related agronomic practices, affects wetland-associated biodiversity through a literature-verified expert original analysis. The study, through Multi Criteria Decision Aiding (MCDA) Approach and Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS), aims to identify key leverage points for biodiversity enhancement across different models of rice farming systems, developing context-specific sustainable protocols and practical decision-support tools for farmers and policymakers. In Chapter 3 particularly focus on organic rice farming, Heterogeneous Organic Materials (HOM) material with references in Article 3(18) of Regulation (EU) 2018/848 and organic rice-related farming practices results, using Pollard Transept field sampling of diurnal butterflies and dragonflies as biodiversity indicators alongside literature-based assessments on a three-level scalable approach: field, farm and landscape. Chapter 4 also examines the technical, social and economic roles of European seed banks in preserving crop diversity and supporting farmers, 5 considering three renowned European case studies. The work as a whole bridges gaps between scientific understanding, agricultural practice and policy implementation by combining analytical field research with participatory methods, also demonstrating how biodiversity, agro-biodiversity, and reduced environmental impacts are compatible overall. Ultimately, this integrated approach seeks to reconcile agricultural productivity with ecological resilience, offering scalable strategies for biodiversity-friendly rice cultivation and actionable recommendations for agri-environmental governance in Rural Development Plans. ... Dragonflies Diversity: Generally, the lack of water supply (and surface irrigation systems) up to late August 2022 severely reduced biodiversity in terms of species richness also for dragonflies. Dragonfly communities were similarly dominated by generalist lowland-still water species with a clear unique mid-summer peak (Supplementary Materials S2, Tab. 4). Regarding dragonflies, the dominant species were the very common *Sympetrum fonscolombii*, *Calopteryx splendens* and *Orthetrum albistylum*. Dragonflies' beta diversity is much more clustered than that of butterflies. This bottleneck of species is much more pronounced, and probably indicates the major impact of uniformity of cultivation and landscape practices on this taxon. Dragonflies seem much more dependent on favourable agro-environmental conditions determined to low-impact practices and, in particular, water management. They lack alternative habitats to rice fields and irrigation networks compared to butterflies (Onorati et al. 2022; Huynh et al. 2021; Giuliano and Bogliani 2019; Giuliano et al. 2018). The specific richness of both butterflies and dragonflies is much less sensitive to environmental conditions, and more closely dependent on the management practices of the embankments of the fields. In this case, a richer agro-environmental matrix is probably a key factor in explaining this phenomenon (Tibi

et al. 2024; Castellano et al. 2022; Labeyrie et al. 2021; Luppi et al. 2018; Vasseur et al. 2013).” (Author)] Address: <https://iris.unito.it/retrieve/65b4a74a-26be-4c2c-9f73-a587-7638898d/Ph.pdf>

**26218** Sarkar, M.; Modak, B.K. (2026): Assessment of dragonfly diversity in relation to conservation roles of sacred groves of Bankura district, West Bengal, India. *Uttar Pradesh Journal of Zoology* 47(9): 139-140. (in English) [“Background: Sacred grove represents one of the age-old community linked conservation traditions, in which ecological protection has been historically maintained through belief systems, ritual practices, and social restrictions on resource use. Dragonflies, being sensitive indicators of habitat and freshwater ecosystem quality, can effectively reflect the ecological health and conservation value of sacred groves in comparison to surrounding non-sacred habitats. Aim: The study tries to capture the conservation role of the sacred grove through organism diversity, using dragonflies as an indicator group. Study Design: To evaluate the conservation role of sacred groves, sampled sacred groves are compared with equivalent non-sacred control sites that are approximately similar in atmospheric conditions. Place and Duration of the Study: The study was conducted from April 2024 to March 2025 in 6 sacred groves and 6 associated control sites in six administrative blocks of Bankura district. Methodology: Species were documented through transect-walk following the line-transect principles. To compare biodiversity between the sacred grove and control sites, the Shannon–Wiener diversity index, evenness index, and Berger–Parker dominance index were calculated. To compare species richness between sacred groves and control sites, the study used rarefaction analysis. Result: The study recorded 25 dragonfly species. Among these 25 species, 18 were found in both sacred and control sites, 6 were found exclusively in sacred groves, and 1 was found exclusively on control sites. Diversity indices indicate that sacred groves support more dragonfly species than control sites, a finding supported by the rarefaction curve. Conclusion: This shows that sacred areas are more diverse in dragonfly species and provide a steady supply of food and shelter.” (Authors)] Address: Sarkar, M., Dept of Zoology, Bankura Christian College, Bankura, West Bengal, India

**26219** Sasamoto, A.; Yanagisawa, T.; Yashiro, K.; Lien, V.V. (2026): Description of a new species of *Neallogaster* Cowley, 1934 from Northern Vietnam (Odonata: Anisoptera: Cordulegastriidae). *Zootaxa* 5831(3): 352-358. (in English) [“*Neallogaster vietnamica*, is described based on a male collected from Hoang Lien National Park, Lai Chau Province, Vietnam. It can be distinguished from the other species of the genus by characteristics of body maculation and the shape of the cerci. This is the first record of the genus from Vietnam.” (Authors)] Address: Sasamoto, A., Tawaramoto-cho, Nara Prefecture, 6360345, Japan. Email: [akssmt@gmail.com](mailto:akssmt@gmail.com)

**26220** Schönberger, D.; Metz, M.; Tsuboi, M.; Bianco, G.; DeVries, Z.C.; Nord, A.; Svensson, E.I. (2026): Macroevolution of steep interspecific metabolic allometry in an old insect order. *Ecology Letters* 29(5):e70399: 14 pp. (in English) [“Endotherms exhibit metabolic allometric slopes of 0.75, which were long viewed as evolutionary constraints but which are increasingly questioned. In insects, allometric relationships between body size and metabolism are understudied. We used comparative phylogenetic methods to investigate macroevolution of metabolic allometry in Odonata, an insect group with a unique ecology and dramatic macroevolution of body size. We found an interspecific allometric slope close to one (isometry). Metabolic rates evolved gradually

with a weak pullback force and multiple shifts in metabolic optima, body size and flight behaviour. Cell size, nucleus size and body surface area did not explain this steep allometric slope. Instead, metabolic isometry likely reflects the high aerobic demands of flight and evolutionary increases in body size via cell numbers rather than cell size. Our results challenge traditional allometric theories and suggest that metabolic allometries can and do evolve, with far-reaching implications for insect size evolution." (Authors)] Address: Svensson, E.I., Dept Biology, Norwegian Univ. of Science & Technology, Trondheim, Norway. Email: erik.svensson@biol.lu.se

**26221** Schubert, T.; Hof, A.; Kaufmann, P. (2026): Assessing urban biodiversity patterns using citizen science data and a hierarchical urban habitat analysis. *Urban Ecosystems* 29, 124 (2026): 16 pp. (in English) ["Urbanisation and landscape configuration influence biodiversity, yet multi-taxonomic studies that capture the complexity of urban landscapes remain scarce. Therefore, we conducted a multi-taxonomic hierarchical urban habitat analysis based on opportunistic citizen science data (n = 117,872 records) for Salzburg City and its surroundings. We investigated species richness for nine taxonomic groups on the level of landscape types, which were calculated for 500 m hexagonal grid cells using a hierarchical cluster analysis. Suburban areas show the highest absolute species richness for most taxa, except for insects. Analysing average species richness revealed that suburban habitats harbour high biodiversity but highest average species richness for most organism groups was found at water bodies and neighbouring riparian areas. Plant species richness also peaked in highly urbanised areas, yet mostly due to non-native species. The average richness for birds and mammals is high in urbanised areas as well. Grasshoppers and reptiles show high species richness in both rural and (sub-)urban areas. In contrast, butterflies, dragonflies and amphibians are species-poorer in urbanised areas. Intensively utilised agricultural areas had a very low average richness across all taxonomic groups. In summary, highly urbanised areas seem to be species-poor, especially for insects and amphibians, but species-rich for other groups. We conclude that the presence of water bodies, riparian areas and structurally rich suburban areas play a key role in supporting high biodiversity. Moreover, agriculture should be given greater consideration in future studies on urban biodiversity. The study addresses the need for multi-taxonomic studies in urban biodiversity research and demonstrates that opportunistic citizen science data are a valuable source for analysing biodiversity." (Authors)] Address: Schubert, T., Haus der Natur, Museum für Natur & Technik, Museumsplatz 5, Salzburg, Austria. Email: Torben.schubert@hausdernatur.at

**26222** Seehausen, M. (2026): *Coenagrion aculeatum* Yu & Bu, 2007, a junior synonym of *Coenagrion daponshanensis* (Zhou & Zhou, 2007) (Odonata: Coenagrionidae). *Notulae odonatologicae* 10(7): 260-264. (in English) ["*C. aculeatum* is considered a junior synonym of *C. daponshanensis*, based on the illustrations of the original descriptions. The species is known to occur in the Chinese provinces of Anhui, Chongqing, Guizhou, Hubei, Jiangsu and Zhejiang." (Author)] Address: Seehausen, M., Zoologisches Museum der CAU zu Kiel, Hegewischstr. 3, 24105 Kiel, Germany. Email: mseehausen@zoolmuseum.uni-kiel.de

**26223** Shao, L.; Li, H.; Zhang, J.; Wang, L. (2026): Kinematic strategies of dragonfly free-fall recovery from an asymmetric body roll. *Insects* 2026, 17(5), 529; <https://doi.org/10.3390/insects17050529>: 15 pp. (in English) ["Insect aerial righting is a critical locomotor response to flight perturbations. However,

the kinematic strategy of *Pantala flavescens* free-fall recovery under asymmetric perturbations remains unclear. In this study, free-fall experiments were conducted using single-wing release to induce an initial asymmetric body roll, and three-dimensional kinematics were reconstructed using high-speed videography. The results show that the free-fall recovery process was divided into two phases based on body velocity: a free-fall phase with increasing downward velocity and a recovery phase marked by the cessation of this trend and a rise in horizontal velocity. During the free-fall phase, thorax roll developed and then attenuated, accompanied by relative abdominal and wing posture variations, without sustained wing flapping. Near the onset of recovery, hindwings initiated the downstroke earlier than forewings, forming a hindwing-leading flapping pattern. These findings indicate that dragonflies employ a phased kinematic strategy during asymmetric free-fall recovery, involving early body and wing posture adjustments followed by asymmetric wing flapping during the transition from gravity-dominated descent to maneuvering flight." (Authors)] Address: Shao, L., Institute of Plant Protection, Liaoning Academy of Agricultural Sciences, Shenyang 110161, China. Email: lingyunshao@126.com

**26224** Sharp, E.X. (2026): Resource partitioning and habitat selection in southern Appalachian *Macromia* species. *Capstone, The UNC Asheville Journal of Undergraduate Scholarship* 39(1): 18 pp. (in English) ["Odonate nymphs are considered bioindicators of lotic ecosystem health due to their sensitivity to factors including hydrology, substrate composition, and water quality. Species in the genus *Macromia* are regarded as an indicator of lotic ecosystem health, yet species-specific distribution and habitat associations in the Southern Appalachian region have been poorly described. This study aimed to characterize the distribution and resource partitioning of the three co-occurring *Macromia* nymph species present in the Southern Appalachian region: *Macromia alleghaniensis*, *Macromia illinoensis*, and *Macromia margarita*. 19 sites were selected that represented a variety of lotic habitats, ranging in stream size and environmental conditions. The environmental variables considered included drainage area, maximum elevation, slope, and watershed land coverage. *Macromia* nymphs were sampled from these sites to identify species-environment and species-species relationships as well as potential niche differentiation. Resource partitioning was evident among the three species, with drainage area being the largest contributing factor to species distribution. *M. margarita* was associated with low drainage area systems, while *M. illinoensis* was associated with high drainage area systems; *M. alleghaniensis* showed no clear association with drainage area. No co-occurrence was observed between *M. illinoensis* and *M. margarita*, indicating resource partitioning between these two species. These findings improve the understanding of habitat partitioning in *Macromia* species and enhance their ability to serve as bioindicators and aid in conservation efforts in southern Appalachian lotic ecosystems." (Author)] Address: Sharp, E., Biology Dept, The University of North Carolina Asheville, One University Heights, Asheville, North Carolina 28804 USA

**26225** Shome, A. R.; Begum, A.; Habib, M. A.; Mallick, S.; Joty, N. Z.; Biswas, D.; Omi, M. H.; Raisa, T.; Chakraborty, J.; Mishuk, S. R.; Rabbe, M. F. (2026): Impact of temporal and spatial variation on Odonata communities in northeastern trans-boundary hill streams of Bangladesh, including two newly recorded Odonata species in the country. *Bioresearch Communications* 12(2): 2162-2173. (in English) ["Globally Odonata are playing a significant ecological role as bioindicators of wetland health and as natural controller of pest and disease-vector

populations. In Bangladesh, research focus on Odonata is not sufficient specially in the transboundary areas. In the hill streams and associated aquatic ecosystems support a rich diversity of Odonata species; however, comprehensive information on their diversity, distribution, ecology, and conservation status remains limited. A comprehensive scientific ecological study of Odonata was conducted in the transboundary forest of the northeastern region of Bangladesh from July 2023 to June 2024. The study documented a total of 67 Odonata species, comprising 44 species (68%) from Anisoptera and 23 species (32%) from Zygoptera. Within Anisoptera, Libellulidae was the most diverse, accounting for 35 species (53.84%), while Coenagrionidae was the dominant family among Zygoptera, represented by 12 species (18.46%). Of the two surveyed locations, Site B (Non-disturbed) exhibited the highest species richness (56 species, 83.58%) and abundance ( $n = 1276$ ), along with the highest values for both the Shannon-Wiener diversity index ( $H = 3.20$ ) and Simpson's index ( $D_s = 0.935$ ). Seasonal analysis showed maximum species richness (63 species) and individual abundance ( $n = 1008$ ) during the rainy season, while the winter season exhibited the highest evenness ( $E = 0.608$ ). *Orthetrum pruinosum* emerged as the most dominant species overall ( $n = 289$ ), especially in Site B, whereas *Rhyothemis variegata* was most frequently observed at Site A ( $n = 179$ ). An Analysis of Similarities (ANOSIM) revealed a statistically significant variation ( $R = 0.551$ ,  $p < 0.0001$ ) in community composition between the two sites. One-way ANOVA indicated significant seasonal variation in species richness ( $F = 6.358$ ,  $df = 2$ ,  $p = 0.0043$ ) and showed significant differences in abundance ( $F = 30.198$ ,  $df = 2$ ,  $p < 0.0001$ ) between winter and the other two seasons (rainy and summer). Importantly, two Odonata species, *Phyllothemis eltoni* and *Elatoneura campioni*, were newly recorded in Bangladesh, marking the first national records for both genera, *Phyllothemis* and *Elatoneura*. These findings highlight hill stream of northeastern Bangladesh as a key Indo Burma Odonata biodiversity landscape, requiring focused research and awareness for Odonata conservation." (Authors)] Address: Shome, A.R., Dept Zoology, Univ. Dhaka, Dhaka 1000, Bangladesh. Email: shomear61@gmail.com

**26226** Siddi, L.; Cadin, M.; Brambilla, M.; Assandri, G. (2026): Conservation implications of shifting habitat use in migrating insects: Selection patterns in a threatened damselfly show that season-specific actions are needed. *Insect Conservation and Diversity* 19(4): 769-781. (in English) ["Migratory insects use different habitats during their movements, exposing them to multiple threats, whose conservation implications are rarely considered. This study explores the conservation consequences of short-range insect migration, focusing on the regionally threatened *Sympecma paedisca*. In Italy, its breeding and wintering grounds are tens of kilometres apart, and how the species moves between them is unclear. To close this knowledge gap, we investigated the effects of multi-seasonal habitat composition on species' abundance at the landscape scale and its fine-scale habitat selection. At the landscape scale, the abundance of *S. paedisca* increased with the cover of well-preserved heathland, regardless of season. In contrast, farmland cover had varying effects: positive in summer, strongly negative in autumn and winter and neutral in spring. Habitat selection analysis showed that, in summer, the species uses all habitats according to availability. In autumn, heathlands were strongly positively selected, whereas farmland grassy margins were clearly negatively selected, and these differences are further strengthened in winter. These findings support the hypothesis that the species migrates from breeding to overwintering grounds in late summer, following grassy margins throughout the agricultural matrix. Individuals

that survive the winter return in spring, likely following the same corridors. Conservation efforts should address the seasonally shifting species' needs, conserving well-preserved heathlands, crucial for overwintering, and grassy margins along crops to ensure the connectivity between breeding and wintering areas. The conservation of migrant insects requires measures targeting the different phases of their life cycle, even for short-distance migratory species." (Authors)] Address: Siddi, L., Dipto di Scienze e Innovazione Tecnologica, Università del Piemonte Orientale "Amedeo Avogadro", Alessandria, Italy. Email: leonardo.siddi@uniupo.it

**26227** Sinclair, C.A.; Eagles-Smith, C.A.; Vasta, R.; Pritz, C.F.; Garcia, T.S. (2026): Behavioral and physiological toxicity of dietary methylmercury exposure to larval dragonflies. *Environmental Toxicology and Chemistry* 45(6): 1581-1588. (in English) ["While ecotoxicology has traditionally focused on impacts to reproduction and mortality, sublethal effects on behavior can also have important consequences that impact toxicity risk. Mercury is a potent neurotoxicant with well documented effects on vertebrate behavior, though behavioral toxicity to invertebrates is understudied. Over a series of experiments, we assessed how a gradient of dietary methylmercury exposure influenced behavioral and physiological endpoints in dragonfly larvae, a widely used mercury biosentinel. Mercury exposure induced suboptimal behaviors in an artificially ideal trophic environment, suggesting potentially important impairments to prey detection and predator avoidance in larval dragonflies. For each doubling of dragonfly total mercury concentration, we estimated that dragonflies took 32 to 508 s longer to initiate foraging behavior and were 3 to 18% more active when exposed to a predation cue (95% confidence intervals). Other behavioral endpoints including prey capture rates, foraging efficiency, and refuge use under predatory threat were unaffected by mercury exposure. Physiological endpoints, including growth, body condition, molting, wingpad symmetry, and immune response, were similarly insensitive to mercury toxicity. These results help support the utility of dragonfly larvae to monitor mercury in freshwater food webs and confirm that quantifying behavioral toxicity is important to fully characterize and mitigate exposure risk." (Authors)] Address: Sinclair, C.A., Dept of Fisheries, Wildlife, & Conservation Sciences, Oregon State University, Corvallis, OR, USA. Email: cailin.sinclair@oregonstate.edu

**26228** Snelling, E.P.; Lensink, A.V.; Clusella-Trullas, S.; Welton, C.; Lehmann, P.; Terblanche, J.S.; Payne, N.L.; Harrison, J.F.; Hickey, A.J.R.; Donaldson, A.; Deschodt, C.M.; Seymour, R.S. (2026): Oxygen supply through the tracheolar-muscle system does not constrain insect gigantism. *Nature* 653: 439-443. (in English) ["The idea that atmospheric oxygen has dictated the maximum body size of insects across their evolutionary history is ingrained in popular and scientific literature. In Nature 30 years ago, the hypothesis was put forward that a limitation on oxygen diffusion at the level of the tracheoles constrains the maximum body size of insects and that increased atmospheric oxygen concentration in the late Palaeozoic permitted insect gigantism<sup>4</sup>. Here we contest this hypothesis by showing that the relative space occupied by tracheoles in the flight muscle of insects (1) increases by only 1.8-fold over a 10,000-fold body mass range (1,320 micrographs, 44 species, 10 orders), (2) is typically 1% or less in most species, and (3) that this observation holds when we extend our relationship to the long-extinct gigantic dragonfly-like *Meganeuropteris permiana* (approximately 100 g). The small space requirement and the lack of a strong increase in tracheolar investment with body size, despite clear evolutionary potential to do so, provide convincing evidence that

diffusive oxygen transport through the tracheolar–muscle system does not constrain the maximum body size of extant or gigantic prehistoric insects." (Authors)] Address: Snelling, E.P., Det of Anatomy & Physiology, & Centre for Veterinary Wildlife Research, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa

**26229** Sorrentino, J.A.; Liberty, P.R.; Gibson, B.M.; Jouault, C.; Archibald, S.B.; Laflamme, M. (2026): A comparison of insect disarticulation during simulated transport and implications for fossil preservation and identification. *Palaeoentomology* 9(2): 160-172. (in English) ["The fossil record represents a small fraction of what lived in ancient ecosystems. Transport, the carrying of organisms from their living environment to their burial environment, remains an enigmatic part of the fossilization process. We analyzed the effects of transport on the preservation potential of a wide variety of insects with different morphologies: *Camponotus* spp. (carpenter ants), *Bombus* spp. (bumblebees), *Polyommatus* spp. (butterflies), *Teleogryllus oceanicus* (oceanic house crickets), *Enallagma* spp. and *Coccinellidae* (ladybird beetles). Live specimens were placed in rotary tumblers with water and silt-sized silica sediment for 48 hours. Specimen vitality, buoyancy, and articulation were recorded every two hours to determine the relative preservation potential of these insects. We find that ants, bumblebees, crickets, and ladybird beetles are less likely to disarticulate to unidentifiable degrees—even under long transport times. In contrast, butterflies and damselflies disarticulate relatively rapidly. These results suggest that the more robust group of insects could be overrepresented in environments that would contain many transported specimens, such as fluvial, deltaic, and coastal marine." (Authors)] Address: Sorrentino, J.A., University of Toronto Mississauga, Dept of Chemical and Physical Sciences, 3359 Mississauga Road, Mississauga, ON, L5L 1C6, Canada

**26230** Stoyneva-Gärtner, M.; Grossart, H.-P.; Frenken, T.; Schmeller, D.S.; Garzoli, L.; Rasconi, S.; Wilk-Wozniak, E.; Reñé, A.; Cerbin, S.; Lepère, C.; Pires de Paula, C.C.; Loyau, A.; Kuden, A.; Gavrilovic, A.; Lønborg, C.; Walusiak, E.; Kagalou, I.; Trbojevic, I.; Jug-Dujakovic, J.; Ivanov, K.; Morales, L.; Erez, M.S.; Balode, M.; Berden Zrimec, M.; Budziak, M.; Stupar, M.; Androv, M.; Znachor, P.; Marchese, P.; Chinaglia, S.; Zlatkovic, S.; Sime-Ngando, T.; Ramshaj, Q.; Krzton, W.; Uzunov, B. (2026): Drivers of aquatic zoospore parasites in natural and artificial environments. *Aquatic Sciences* (2026) 88:57: 40 pp. (in English) ["This review, based on more than 500 scientific studies published between 1880 and 2025, summarises current knowledge on the complex relationships between aquatic zoospore parasites (AZP) and their hosts, the physical and chemical properties of the environment and the many surrounding organisms, to outline the key drivers of AZP diversity, abundance and infection success. It emphasises the urgent need to focus research on the influence of global climate and undesirable anthropogenically driven changes, such as eutrophication, pollution and biological invasions. Knowledge gaps are identified, along with research needs to decipher the diverse responses of AZP to ongoing changes in abiotic and biotic drivers. We believe that the summarised data and highlighted open research questions will benefit future research and help to better conserve natural biodiversity and manage artificial aquatic systems. ... Aquatic insects (32 species of Odonata, Hemiptera, Diptera and Trichoptera in both larval and adult stages) were identified as dispersal vectors of 28 fish and crayfish AZP in six waterbodies with different trophic statuses (Czeczuga et al. 1998b, 1999b, 2000; Czeczuga and Godlewska 2001). The highest number of fish parasites developed on the water scorpion *Nepa*

*cinerea* (16), while the lowest numbers (four species on each) were found on the larvae of *Anax imperator*, the phantom midge *Chaoborus cristallinus*, the fly *Paramormia decipiens* (Syn. *Pericoma decipiens*) and adult ground beetle *Hydroporus palustris*." (Authors).] Address: Uzunov, B., Dept of Botany, Faculty of Biology, Sofia University "St. Kliment Ohridski", 8 Blvd. Dragan Tsankov, 1164, Sofia, Bulgaria

**26231** Suaskara, I.B.M.; Joni, M.; Ginantra, I.K.; Suartini, N.M. (2026): Comparison of dragonfly species diversity in three Subak Latu rice fields and the role of nymph as protein, Badung Regency, Bali. *International Journal of Life Science and Agriculture Research* 5(4): 209-214. (in English) ["Odonata are important bioindicators of aquatic ecosystem health and play a crucial ecological role in rice field agroecosystems. This study aims to compare dragonfly species diversity across three Subak Latu rice field stations in Badung Regency, Bali, and to assess the potential role of dragonfly nymphs as a protein source. Sampling was conducted at three stations: Bendungan Latu (Station 1), Sawah Juwet (Station 2), and Sawah Latu (Station 3), using sweep netting and direct observation methods. A total of 692 individuals representing 22 species from four families (Libellulidae, Chlorocyphidae, Coenagrionidae, and Gomphidae) were recorded. Station 2 (Sawah Juwet) exhibited the highest species richness (22 species, 324 individuals), while Station 3 (Sawah Latu) showed the lowest abundance (154 individuals). Libellulidae was the dominant family, with *Pantala flavescens* (240 individuals) and *Orthetrum sabina* (212 individuals) as the most abundant species. Environmental parameters including air temperature (24–28°C), humidity (70–76%), and light intensity (2150–3555 cd) influenced species distribution and abundance. Shannon-Wiener diversity indices indicated moderate to high diversity across all stations. Dragonfly nymphs present significant protein content (45–60% crude protein), supporting their potential as an alternative protein source for aquaculture and human consumption in the context of sustainable food systems. This study provides valuable baseline data for biodiversity conservation and integrated pest management in Balinese subak agroecosystems." (Authors)] Address: Suaskara, I.B.M., Biology Study Program, Faculty of Mathematics & Natural Sciences, Udayana University, Indonesia

**26232** Sudarso, J.; Riani, E.; Ibrahim, A.; Sugiarti; Mayaningtyas, P.; Aziz, C.H.; Yamin, M.; Hermana, I.S.; Zamroni, M.; Frisca, A.; Utami, R.R. (2026): Performance of the Cumulative Biotic Index (CBI) and other biotic indices in assessing ecological health of the Upper Citarum River, Indonesia. *Water Cycle* 7: 83-98. (in English) ["The macroinvertebrate multimetric concept is widely employed to assess the ecological condition of freshwater ecosystems subjected to anthropogenic pressures. In this study, the Cumulative Biotic Index (CBI) was evaluated as a region-specific biocriteria-based tool to assess the ecological health of the Upper Citarum River, which has been heavily impacted by socioeconomic development. The objectives were to (1) assess the diversity and evenness of benthic macroinvertebrate communities, (2) identify key environmental factors influencing community structure, and (3) evaluate the sensitivity of the CBI in comparison with other established biological indices. Field surveys were conducted between September 2022 and August 2023 across 15 stations, applying rapid assessment protocols to measure water quality, habitat conditions, and benthic macroinvertebrate identifications. A total of 124 macroinvertebrate genera were identified, with diversity and evenness categorized as moderate to low ( $H' = 2.6–0.3$  nits) and stability ranging from medium to low ( $J = 0.75–0.27$ ), indicating a decline at disturbed sites. Multivariate analyses revealed that organic enrichment

(total nitrogen, total phosphorus), sedimentation (turbidity, percent embeddedness), and habitat disturbance (habitat index) were the primary factors shaping community composition. Among seven tested biological indices, the CBI demonstrated the highest sensitivity in distinguishing ecological gradients, underscoring its potential as a robust biomonitoring tool for evaluating restoration efforts in river ecosystems, particularly in Indonesia and other tropical rivers with similar conditions." (Authors)] Address: Utami, R., Research Center for Limnology & Water Resources, BRIN, Jl. Jakarta-Bogor Km. 46, Bogor, Indonesia. Email: rosetyati@retno@gmail.com

**26233** Tanczuk, A.; Kruk, Z.; Kuziora, P. (2026): Disjunctive site of Small Pincertail *Onychogomphus forcipatus* (LINNAEUS, 1758) (Odonata: Gomphidae) on Lublin Upland and new records from Sandomierz Basin. *Wiadomości entomologiczne* 45; online 1N: 1–3. DOI: 10.5281/zenodo.18324644: 3 pp. (in Polish, with English summary) ["The authors present the new site of *O. forcipatus* from Zemborzycki Reservoir in Lublin (UTM: FB07, N 51.186467 E 22.543232). It is the first record of this species on the Lublin Upland. The site is located c. 150 km north from the more compact area of the Central Beskidian Piedmont and c. 60–100 km north from scattered sites in the Sandomierz Basin and the Roztocze. There are no optimal habitats for the reproduction of the species in the place of observation and in the vicinity. The recorded imago was probably a migrant or a part of a disjunctive population, yet undiscovered, on the Lublin Upland (perhaps in the upper course of Bystra River)." (Authors)] Address: Tanczuk, Agnieszka, Katedra Zoologii i Ochrony Przyrody, Instytut Nauk Biologicznych, Uniwersytet Marii Curie-Skłodowskiej, ul. Akademicka 19; atanczuk@gmail.com

**26234** Tapia López, A.; Martínez Utrera, J.F.; Soler Pérez, J.D.; Pérez Fernández, P.J.; González-Miras, E. (2026): Odonatos de la provincia de Almería: Nuevas aportaciones y revisión del catálogo provincial. *Terramirabile Enero 2026*: 4–11. (in Spanish, with English summary) ["This article reports the first occurrence of three odonate species in Almería and provides new records of other species previously considered rare. Finally, the list of species present is reviewed. The findings aim to improve the understanding of the distribution patterns of odonates in the region." (Authors)] *Brachythemis impartita*, *Gomphus simillimus* and *Coenagrion scitulum* are documented and discussed in details and mapped together with *Calopteryx xanthostoma*, *Erythromma lindenii*, *Lestes macrostigma*, *Orthetrum nitidum*, and *Sympetrum meridionale*.] Address: Tapia López, A., Sociedad para el Estudio y Recuperación de la Biodiversidad Almeriense (SERBAL). C/Baqueira Beret 2. 04720, Aguadulce (Almería), Spain. Email: tapialo3@gmail.com

**26235** Tawa, K.; Nishihiro, J.; Ito, Y. (2026): Observing animal behavior after temporal inundation in a dried abandoned paddy field: a case study of observation with citizens. *Ecology and Civil Engineering* 28(2): 185–198. ["To achieve flood control and biodiversity conservation in Japan, attention has been given to storing floodwater in abandoned rice paddies and converting them into wetlands under non-flood conditions. However, it is not clear how terrestrial animals in abandoned rice paddies respond to flooding. We have temporarily inundated an abandoned rice paddy in Tomisato City, Chiba Prefecture, Japan, and observed animal behavior after the inundation with environmental citizen science. A total of 325 records from 20 orders and 88 taxa were collected. Arthropods represented 93% of the total taxa. The number of records was significantly higher immediately after the inundation than three hours after. It was possibly due to the completion of each

taxon's migration. Coleoptera had the largest number of records for both vertical and horizontal migration. Araneae, Orthoptera, Hemiptera, Lepidoptera, and Hymenoptera also had relatively large numbers of records for vertical and horizontal migration. Odonata, especially *Sympetrum* spp., visited the water body and some individuals showed egg-laying behavior. Behavior sometimes showed both horizontal and vertical migration, even within the same species. This result may be partly due to differences in passive or active flood avoidance behavior depending on the microenvironment where the target species was at the time of the temporal inundation or where it reached. Our survey program provided a large amount of monitoring data in a short period, and the questionnaire survey indicated that the program provided a high satisfaction level for participants and an opportunity to reflect on biodiversity." (Authors)] Address: Tawa, K., Center for Climate Change Adaptation, National Institute for Environmental Studies, 16-2, Onogawa, Tsukuba, Ibaraki 305-8506, Japan. Email: tawa.kota@nies.go.jp

**26236** Tennessen, K.J. (2026): Description of the nymphs of *Nehalennia integrigollis* Calvert and *N. pallidula* Calvert (Odonata: Coenagrionidae). *Zootaxa* 5793(2): 587–595. (in English) ["The final instars of *Nehalennia integrigollis* and *N. pallidula* are described in detail and illustrated based on specimens from Florida and Texas. *N. integrigollis* has only 1 prominent seta on each side of the prementum, same as the sympatric *N. gracilis* Morse and *N. irene* (Hagen); it differs from both those species by 1) proximal portion of epiproct and paraprocts darker than the distal part vs. not darker, and 2) posterolateral corners of head with 3–6 small spinules with dark bases vs. 10 or more spinules with dark bases or 3–6 spinules with pale bases. *Nehalennia pallidula* resembles *N. minuta* (Selys) in possessing 3 or 4 prominent setae on each side of the prementum; it differs in having a slightly larger prementum (length 1.70–2.05 mm vs. 1.60–1.65 mm, width 1.43–1.58 mm vs. 1.35–1.40 mm). Further diagnostic notes to distinguish the nymphs of the five New World species of *Nehalennia* are provided." (Author)] Address: Tennessen, K.J., Research Associate, Florida State Collection of Arthropods 125 N. Oxford St., Wautoma, WI 54982, USA. Email: tenkenneth43@gmail.com

**26237** Terzani, F.; Turrise, G.F. (2026): Ordini minori della collezione Giuseppe Ferro conservata nel Museo di Storia Naturale dell'Università degli Studi di Firenze (Odonata, Blattodea, Mantodea, Isoptera, Dermaptera, Embioptera, Raphidioptera, Neuroptera). *Onychium* 19(1): 3–9. (in Italian, with English summary) ["This paper provides a list of taxa and specimens concerning some minor orders in the Giuseppe Ferro collection held in the Museum of Natural History of the University of Florence "La Specola". The original identifications were revised, while specimens previously not studied were identified. This list includes 34 taxa, all collected in Italy." (Authors)] 14 odonate species from Sicilia and Toscana are documented dating in most cases from the 1950s.] Address: Terzani, F., Sistema Museale di Ateneo, Università degli Studi di Firenze, Museo di Storia Naturale Sede "La Specola", Via Romana 17, I-50125 Firenze, Italia. Email: libellula.ter@gmail.com

**26238** Theischinger, G.; Richards, S.J. (2026): A surprising new species of *Anax* Leach in Brewster, 1815, from Papua New Guinea (Odonata: Aeshnidae). *Odonatologica* 55(1/2): 129–143. (in English) ["A new species of dragonfly, *Anax bismarckensis* sp. nov., is described based on a male from New Britain, Bismarck Archipelago, Papua New Guinea. The new species differs from most of its New Guinean congeners by lacking an apico-lateral spike on the cerci and its abdomen

being 1.4 times as long as the hind wing. *Anax bismarckensis* sp. nov. represents the 8th species of the genus known from Papua New Guinea and is currently known only from the holotype from Vudal on New Britain, collected 03.viii.1971. It seems to coexist on New Britain with the very similar long-bodied *Anax maclachlani* Förster, 1898 (male abdomen >1.3 times length of hind wing) and *Anax guttatus* (Burmeister, 1839), a short-bodied species (male abdomen <1.3 times length of hind wing). The male of *A. bismarckensis* sp. nov. is compared with all other congeners from Melanesia. In addition, the range of *Anax insulanus*, Theischinger, Kalnins & Marinov, 2024, from the Solomon Islands is extended to include Bougainville, situated within the political boundary of Papua New Guinea." (Authors)] Address: Theischinger, G., Australian Museum, Entomology, 1 William Street, Sydney, N.S.W. 2010, Australia. Email: theischingergunther@gmail.com

**26239** Theys, C.; Decaestecker, E.; Stoks, R. (2026): Extending space-for-time substitutions: the missing role of the gut microbiome. *Evolutionary Biology* 39(7): 815-822. (in English) ["The space-for-time substitution (SFTS) approach is widely used to predict evolutionary trait responses to global warming. The current approach ignores the explicit role of the gut microbiome in shaping the future host phenotype, despite its strong influence on thermal adaptation and its ability to show more rapid adaptation than the host. We propose integrating reciprocal gut microbiome transplants into SFTS and identify a set of contrasts between treatment combinations to disentangle host and gut microbiome contributions to thermal adaptation under future warming. To illustrate our approach, we apply the proposed contrasts between treatment groups to re-interpret data on immune functioning of *Ischnura elegans* nymphs of which the gut microbiome was reciprocally transplanted between nymphs from warm-adapted low-latitude and cold-adapted high-latitude populations reared at both the cold (high-latitude) and warm (low-latitude) thermal regime. By disentangling the contributions of the host and its gut microbiome, our conceptual approach shows that gut microbiome adaptation can buffer against immune suppression in the high-latitude populations under future warming, while adaptation of the host will not. Incorporating the gut microbiome into SFTS may enhance realism in predicting species resilience to climate change and better inform conservation strategies under future climates." (Authors)] Address: Stoks, R., Lab. voor Aquatische Ecologie, K.U. Leuven, De Beriotstraat 32, 3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

**26240** Todd, L.E.; Suchoff, D.H.; Levenson, H.K. (2026): A survey of beneficial insects in Southeast USA sesame (*Lamiales: Pedaliaceae*) fields. *Environmental Entomology* 55(2): 7 pp. (in English) ["While sesame (*Sesamum indicum* L.) is one of the oldest domesticated oilseed crops, it has only recently become a new and emerging crop for the southeast USA. As little is known about the insect fauna of sesame in the United States, it will be important to document insect communities now while management programs are still being developed. Here, we provide the first survey of beneficial insects, including pollinators and potential natural enemies, for sesame in the United States. Beneficial insects within sesame fields were surveyed in 2023 at 2 locations in North Carolina, United States using 2 sampling methods: visual identification and sticky cards. During visual surveys, insects were field identified, with up to 5 physical specimens collected per species for identification verification. Pollen was then removed, identified, and quantified from collected specimens. Potential natural enemies collected on sticky cards were categorized as stilt bugs (Hemiptera: Berytidae: *Jalysus spinosus* Say), Anisoptera [no further details are given], lady beetles

(Coleoptera: Coccinellidae), and wasps (Hymenoptera: Apocrita). We found 18 bee (Hymenoptera: Anthophila) species visiting sesame flowers, with honey bees collecting the most sesame pollen per specimen. Wasps were the most abundant natural enemy category, with over 100 wasps collected at some sampling events. The information from this study can be used to ensure beneficial insect communities are protected as sesame production is expanded in the USA." (Authors)] Address: Levenson, Hannah, Dept Entomology & Plant Pathology, North Carolina State Univ., 100 Derieux Place, Campus Box 7613, Raleigh, NC 20695, USA. Email: hklevens@ncsu.edu

**26241** Tornabene, B.J.; Hossack, B.R.; Grear, D.A.; Anderson, T.L.; Glorioso, B.M.; Waddle, J.H.; Davenport, J.M.; Eagles-Smith, C.A.; Rumrill, C.T.; Smalling, K.L. (2026): Non-destructive sampling of larval amphibians shows tail tissues reflect whole-body methylmercury concentrations and trophic-related differences in bioaccumulation. *Ecotoxicology* 35:138: 10 pp. (in English) ["Mercury (Hg), and specifically methylmercury (MeHg), is a contaminant of global concern to humans and wildlife, but there is still limited understanding of its effects on many taxa. Amphibians are closely associated with water, where Hg is converted to MeHg, and high concentrations of MeHg can reduce survival of amphibians in the wild. However, limited non-lethal proxies exist for estimating MeHg bioaccumulation in amphibian larvae, which could be used to reduce destructive sampling and allow sampling of imperiled species. We evaluated whether tail clips were indicative of whole-body MeHg concentrations of larval amphibians, whether dragonflies were an effective bioindicator of Hg concentrations of larval amphibians, and compared MeHg bioaccumulation in predatory caudate (salamanders, newts) and non-predatory anuran (frogs, toads) larvae. Tail-clip and whole-body MeHg concentrations were strongly correlated, especially for caudates. There was high variability among sites and species, but caudates had higher MeHg than anurans, and MeHg concentrations of caudates and anurans were strongly correlated. Dragonflies were a weak indicator of MeHg for anurans but strong indicators for larval caudates, likely because caudates and dragonflies are carnivorous and occupy similar trophic positions. Our study revealed that sampling tails can be an effective non-destructive index of whole-body MeHg for larval amphibians and demonstrates differences in MeHg bioaccumulation related to trophic position in larval amphibians and dragonflies. All post-embryo life stages for a broad suite of amphibian species can now be sampled non-lethally for MeHg, allowing for a broader examination of population-level effects and focus on imperiled species that cannot be sampled destructively." (Authors) Odonata are documented in supplementary table S6 at family level.] Address: Tornabene, B.J., U.S. Geological Survey, Northern Rocky Mountain Science Center, Boisdahlo 83702, United States. Email: btornabene@usgs.gov

**26242** Tüven, A.; Çinkul, B. (2026): The diurnal terrestrial insect fauna in the low and mid altitude areas of Kazdaglari National Park and its surroundings (Northwest Turkey) and its importance for conservation. *Environmental Toxicology and Ecology* 6(1): 34-50. (in English, with Turkish summary) ["This study presents and evaluates the diurnal terrestrial insect (Insecta) fauna recorded from Kazdaglari National Park and its surrounding areas (Balıkesir/Çanakkale, north-western Türkiye) based on field surveys conducted between 2015 and 2020 during the April–September vegetation periods. Regular observations and sampling were carried out at 20 localities ranging from 107 to 567 m. Direct observation, sweep-netting, and standard transect methods were employed for sampling actively flying taxa such as

Lepidoptera and Odonata [*Platynemis pennipes*, *Calopteryx splendens*, *Coenagrion ornatum*, *Sympetrum striolatum*, *Onychogomphus forcipatus*, *Cordulegaster picta*], while population monitoring studies were conducted monthly throughout the vegetation season. Coleoptera and several other taxonomic groups were sampled using beating tray (Japanese umbrella) methods, hand collecting from vegetation and under-stone microhabitats, and direct observations. As a result of the surveys, a total of 10 orders, 48 families, and 187 species belonging to the class Insecta were identified. Lepidoptera was the most species-rich order with 86 species belonging to 8 families, followed by Coleoptera (36 species, 13 families), Thysanoptera (23 species, 3 families), Orthoptera (10 species, 4 families), and Hemiptera and Hymenoptera (9 species each). According to the IUCN European Red List assessment (2025-2), among the recorded taxa, 3 species were categorized as Endangered (EN), 4 as Vulnerable (VU), and 7 as Near Threatened (NT). In particular, the occurrence of the EN species ... *Cordulegaster picta*, highlights the high conservation value of the study area." (Authors)] Address: Tüven, A., Balıkesir University, Directorate of Plant Protection, Research Institute, Türkiye. Email: aylintuven@gmail.com

**26243** van der Voort, W.W.T.; Wasscher, M.T. (2026): *Tuberculobasis cornu* sp. nov., a new damselfly from Suriname and notes on its genus (Odonata: Coenagrionidae). *Odonatologica* 55(1/2): 99-111. (in English) ["*Tuberculobasis cornu* sp. nov. (holotype male: Tapatosso, Suriname, 04°04'28.844"N, 54°47'37.406"W, 06.iv.1963, leg. J. Belle; RMNH.INS.514704) is described. The diagnostic characteristics of the genus *Tuberculobasis* are slightly adapted, summarized, applied on the new species and compared to those of *Denticulobasis*. Several notes on the genus *Tuberculobasis* are presented and a new intrageneric classification is proposed." (Authors)] Address: van der Voort, W., Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands. Email: woutervandervoort@protonmail.com

**26244** Viana Pimentel, F.; Souza-Martins, T.M.M.; Lima-de-Sousa, I.K.; Docile, T.; Figueiró, R. (2026): Distribution and diversity of aquatic macroinvertebrates along a current velocity gradient. *Cadernos UniFOA* 21(56): 1-11. (in English, with Portuguese and Spanish summaries) ["Macroinvertebrates play essential ecological roles in energy flow and nutrient cycling. Their distribution and diversity in rivers are influenced by current velocity. The abundance of these organisms in fast-flowing or still water areas varies according to physiological and morphological adaptations. Furthermore, many groups depend on the current for respiration or feeding. This study aims to investigate the influence of environmental factors, such as current velocity and stream depth, on the composition and distribution of aquatic macroinvertebrates. Sampling was conducted at two sites in the upper part of Itatiaia National Park in June 2016. At each site, simple random samples were collected from five 30x30 cm quadrants. For each site, abiotic microhabitat variables such as depth and current velocity were determined, measured with a ruler using the "Head Rod" method. The collected material was stored in vials containing 70% ethyl alcohol and subsequently sorted and identified. The Shannon-Wiener diversity index was used. A total of 398 specimens were collected, distributed among the orders Trichoptera, Ephemeroptera, Plecoptera, Diptera, and Odonata [*n*=3 individuals]. Diptera was the most abundant order, with 340 individuals. The geometric regression method indicated that current velocity correlated positively with diversity (98.61%), while depth had a negative influence (79.82%). Many studies indicate a tendency for benthic organisms in lotic environments to occupy

depths closer to the water's surface. Therefore, we can observe that these animals prefer shallow waters, suggesting that stronger currents and shallower depths may determine their diversity and distribution." (Authors)] Address: Souza-Martins, Tatiana, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brasil

**26245** Vilela, D.S.; Desidério, G.R.; Da Silva, J.O.; Gonçalves, M.; Hamada, N. (2026): *Mnesarete bidentata* (Odonata: Calopterygidae), a new species from Acre State, northern Brazil. *Annales Zoologici Fennici* 63(1): 57-63. (in English) ["We describe, illustrate and diagnose a new species of *Mnesarete* based on specimens collected in Acre State, Brazil. *M. bidentata* can be separated from other congeners by the undeveloped paraprocts and a combination of characters of the cerci." (Authors)] Address: Vilela, D.S., Universidade Federal do Triângulo Mineiro (UFTM), Depto de Ciências Biológicas, Lab. of Aquatic Insect Systematics (LAIS), Uberaba, MG, 38064-200, Brazil. Email: deeogoo@gmail.com

**26246** Walsh, K.A.; Monaci, F. (2026): Disentangling mercury biomagnification in river macroinvertebrate food webs: A critical role for carbon and nitrogen stable isotopes. *Environments* 13, 390: 32 pp. (in English) ["Riverine mercury biomagnification is most frequently studied via metrics such as the trophic magnification factor (TMF), the biomagnification factor (BMF) and the trophic magnification slope (TMS). However, these metrics prove problematic in lotic systems dominated by benthic macroinvertebrates because short food chains, the frequent lack of fish, patchy basal production and marked spatial heterogeneity obscure the signal that they are meant to extract. We argue that stable isotopes of carbon and nitrogen ( $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ) are not merely optional enhancements but are a prerequisite for a mechanistic understanding of the transfer of methylmercury (MeHg). Nitrogen isotopes distinguish among trophic positions not as categories, but as gradients, whilst carbon isotopes reflect the underlying pathways increasingly seen as defining how MeHg enters food webs. Invertebrate studies, published more recently, report systematically lower magnification levels compared to community-based studies and become far more comprehensible when carbon source and trophic pathways are made explicit, with Hg isotopes ( $\delta^{202}\text{Hg}$ ,  $\Delta^{199}\text{Hg}$ ) providing supplementary data about mercury sources and processing. To be able to carry out reliable river monitoring, such frameworks require clarity in choices of background value, discrimination factors and statistical methods." (Authors) The paper includes many references to Odonata.] Address: Walsh, Kaylie Anne, Dept Life Science, Univ. Siena, Via A. Mattioli 4, 53100 Siena, Italy. Email: k.walsh@student.unisi.it

**26247** Wang, Y.; Yang, X.; Liu, Y.; Wang, J.; Tan, Q. (2026): Skin-attached ultralight and stretchable piezoelectric strain sensors for blink and eye movement monitoring. *Sensors and Actuators A: Physical* 408, 118000: (in English) ["Accurate monitoring of blinking and eye movements is crucial for medical diagnosis, fatigue assessment, and human-computer interaction. However, conventional eye-tracking methods, such as camera-based systems, infrared oculography, and electrode monitoring, remain limited due to bulky equipment, partial invasiveness, and unstable performance under strong ambient light, restricting their use in continuous wearable applications. Here, we present a tension-expansion array structure inspired by dragonfly wing contours and classical reentrant architecture, termed the Dragonfly Wing Flexible Piezoelectric Sensor (DFW). Electrospun PVDF nanofiber films in the sensor produce highly aligned fibers with enhanced  $\beta$ -phase content, yielding excellent piezoelectric responsiveness.

The negative Poisson's ratio (NPR) behavior of the DFW structure amplifies minute strains generated during blinking, ensuring sufficient deformation of the piezoelectric layer and enhanced electrical output. The NPR design also reduces localized strain and improves conformal contact with periocular skin, enhancing durability and mechanical robustness compared with conventional flexible electronic skins. Lightweight (73.4 mg), ultrathin (~0.2 mm), compact (1.39 cm<sup>2</sup>), and cost-effective, the sensor is suitable for wearable integration. Experimental results demonstrate that the DFW e-skin accurately captures blinking dynamics, multidirectional eye movements, and fatigue-related abnormal behaviors, including rapid repetitive blinking, prolonged eye closure, and semi-closed eye states. These findings highlight the strong potential of the sensor for next-generation wearable ocular-monitoring systems." (Authors)] Address: Yang, X., State Key Lab. of Extreme Environment Optoelectronic Dynamic Measurement Technology & Instrument, Key Lab. of Micro/nano Devices & Systems, Ministry of Education, North Univ. of China, Taiyuan, 030051, China. Email: cranberry134340@163.com

**26248** Watanabe, R.; Ohba, S.-y.; Sagawa, S. (2026): Seasonal and scale-dependent effects of paddy-type diversity and forest cover on aquatic insect diversity in fallow field biotopes. *Biodiversity and Conservation* 35, 121: 26 pp. (in English) ["The abandonment of paddy fields reduces biodiversity, and farmland abandonment will likely increase as rural area populations decrease and age. Fallow field biotopes are used for conserving biodiversity under these conditions. We aimed to identify effective landscape-level approaches for conserving aquatic insect diversity in biotopes. We examined how surrounding land use within multiple buffer zones influenced aquatic insect diversity (Odonata, Hemiptera, and Coleoptera) and diving beetle abundance. We surveyed 42 biotopes in Japan over four seasons. In spring, higher paddy-type diversity within a 1000 m radius increased aquatic insect diversity. In contrast, individual paddy-type cover had limited effects, suggesting that landscape heterogeneity—reflecting variation in flooding periods and agrochemical use—plays a more important role than any single management type. In autumn, aquatic insect diversity showed a hump-shaped relationship with forest cover within a 1000 m radius of the biotope, peaking at intermediate forest levels. This pattern likely reflects a balance between forest-associated resource use and open-habitat requirements. The effective spatial scales seasonally varied, supporting the hypothesis that aquatic insect communities are influenced by the wider landscape structure from spring to autumn than in winter. We also found that environmental factors, including high vegetation cover in summer and invasive predators, reduce aquatic insect diversity. Our results indicate that conservation strategies should adopt season-specific management rather than uniform annual approaches. Maintaining moderate forest cover and high paddy-type diversity within approximately 1000 m of biotopes is essential for conserving aquatic insect diversity and diving beetle populations in paddy landscapes." (Authors)] Address: Watanabe, R., Dept of Environmental Life Science, College of Life Science, Kurashiki University of Science & the Arts, 2640 Nishinoura, Tsurajima-cho, Kurashiki, Okayama, 712–8505, Japan

**26249** Wei, G.; Ren, D.; Nel, A.; Shih, C.; Wang, C.; Wang, Y. (2026): The first Chinese protolindeniid fossil (Odonata: Petaluridae: Protolindenidae) highlighting the evolution of wing hinge structures of Odonata. *Insect Systematics and Diversity* 10(2), ixag018, <https://doi.org/10.1093/isd/ixag018>: (in English) ["Homologizing the wing hinge structures of Odonata is challenging due to the coalescence of articular plates and

the relictual nature of wing pteralia in extant species. Fossil evidence is crucial for tracing the evolutionary history of wing hinges in pterygote. A new protolindeniid genus and species, *Sinoprotolindenia zhengi* Wei, Ren, Nel & Wang Y. gen. et sp. nov., from the Lower Cretaceous Yixian Formation in north-eastern China, provides exceptional preservation of wing pteralia of basal hinge line. The new species, sister to *Petaluridae*, provides new insights into the evolution of tergal wing hinge structures in Odonata. The study reveals that the SDP (semi-detached scutal plate) is a composite plate: mSDP originates from the specialized lateral margin of the prescutum, while dSDP and pSDP derive from 2 free pteralia. The scutellar process of Odonata derives from the fusion of 1 pterala to scutellum, homologous to the proxalare of A in Meganisoptera. These findings confirm that the ground plan of the tergal wing hinge in Odonata comprises 4 pteralia (dSDP, pSDP, pterala 1, and pterala 2). Most pteralia (excluding pterala 1) exhibit derived fusion with terga among Anisoptera, Anisozygoptera, Zygoptera, but *Sinoprotolindenia* + *Petaluridae* and *Gomphidae* still retain some ancestral conditions." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@mnhn.fr

**26250** Wei, G.J.; Nam, G.-S.; Liu, Y.X.; Ren, D.; Wang, Y.J. (2026): New hemeroscopid (Odonata: Hemeroscopidae) from Lower Cretaceous Jinju Formation (South Korea) illustrating variation of wing vannal region among hemeroscopids and prohemeroscopids. *Zootaxa* 5810 (2): 380-388. (in English) ["A new hemeroscopid species, *Hemeroscopus jinjuensis* Wei, Nam & Liu sp. nov., is described from the Lower Cretaceous Jinju Formation in the Jinju area of Gyeongsangnam Province, Republic of Korea based on the venational characteristics. The vannal region of wing is key for the taxonomy of Hemeroscopidae Pritykina, 1977, and compared to Prohemeroscopidae Bechly et al., 2002 the morphological variation of vannal region in Hemeroscopidae is outlined as follows: the anal loop enlarges and the MP–CuAa area expands, whereas the region between the basal and distal portions of CuAa, as well as the area between the anal loop and the anal triangle, becomes progressively reduced." (Authors)] Address: Wei, G.J., College of Life Sciences, Linyi University, Linyi, Shandong 276000, China. Email: weiguangjin@lyu.edu.cn

**26251** Wu, W.; Cui, C.; Zhu, Y.; Chen, J.; Zhuang, Q.; Wang, Y.; Liu, Z.; Gao, H.; Ou, G.-Z.; Liu, C.; Tao, M.; Chen, Y.; Pan, R.; Zhang, G.; Cai, H.; Yang, J.; Chen, X.-x.; Zhou, X.; Wang, S.; Shen, X.-X. (2026): Structural genomics sheds light on protein functions and remote homologs across the insect tree of life. *Cell Reserch* 36: 411-425. (in English) ["Protein structure bridges the sequence–function relationship, enabling deep exploration of biological processes across diverse organisms. Insects, the most diverse animal lineage, accounting for over 50% of all described animal species, provide an exceptional system for exploring sequence–structure–function relationships. Here, we reconstructed a comprehensive and well-resolved phylogeny of 4854 insects, spanning all orders. Leveraging this framework, we created an atlas of 13.29 million predicted protein structures from 824 representative species, including 11.63 million newly predicted structures. Structural clustering revealed that proteins with divergent sequences but similar structures could be effectively grouped together. Structural similarity searches against proteins with well-characterized functions yielded annotations for 7.61 million insect proteins, including up to 14% of previously unannotated proteins. We further identified 750 million remote homologs between insect proteins, many of which trace back to ancient branches of the insect phylogeny. Remarkably, despite extensive sequence divergence, cGAS-like receptors (cGLRs) were

structurally conserved across all 824 insects. Experimental assays demonstrated that these structurally identified cGLRs play a crucial role in antiviral defense in the yellow fever mosquito. Our findings highlight the significance of structural genomics for understanding protein function and evolution across the tree of life. ... The second example involves the subclass Pterygota (winged insects), in which a protein from an odonate (Odonata: *Ischnura elegans*, NCBI: LOC124170-901) clusters with one from a hen flea" (Authors)] Address: Wu, W., Zhejiang Key Lab. Biol. & Ecol. Regulation of Crop Pathogens & Insects, State Key Lab. Vegetation Structure, Function & Construction, College of Agriculture & Biotechnology, Zhejiang Univ., Hangzhou, Zhejiang, China

**26252** Xiong, R.; Li, J.; Wang, K.; Kong, H.; Dai, Z.; Wang, Y.; Zheng, R. (2026): Seasonal dietary changes drive adaptive responses in the gut microbiota and function of *Myotis chinensis*. *Ecology and Evolution* 16(3), e73281: 12 pp. (in English) ["Gut microbiota play a crucial regulatory role in host energy metabolism and environmental adaptation, with their composition and function significantly influenced by dietary shifts. This study employed high-throughput sequencing to analyze the dietary composition of *Myotis chinensis* and the seasonal dynamics of its gut microbiota, with functional predictions used to explore adaptive changes in metabolic pathways. Results indicated notable seasonal variations in dietary composition: Lepidoptera constituted the majority in spring (60.13%), and the diet transitioned to Orthoptera dominance in early summer (78.19%), with Odonata becoming the leading prey in late summer (79.99%), and Arachnida (47.93%) became the dominant taxon in autumn. Gut microbial diversity reached its maximum in late summer and was at its minimum during autumn. Functional predictions indicated significant upregulation of carbohydrate and amino acid metabolism pathways in summer, while lipid metabolism and hibernation-related pathways were enriched in autumn. These synergistic dietary and microbial functional adjustments help *Myotis chinensis* adapt to seasonal energy demands and climatic extremes. This study provided novel insights into the ecological adaptation mechanisms of insectivorous bats." (Authors)] Address: Wang, Y., College of Life Sciences, Zhejiang Normal University, Jinhua, China. Email: wangyn@zjnu.cn

**26253** Xu, P.; Zhou, Q. Luo, Z. Peng, Z. (2026): An efficient numerical framework for fluid-structure interaction based on the LBM-IBM method and its applications. *Acta Aerodynamica Sinica* 44(3): 132-144. (in English) ["To address the limitations of conventional body-fitted grid methods-such as difficulties in mesh generation, low computational efficiency, and poor robustness in complex fluid-structure interaction (FSI) simulations-this paper develops an efficient numerical framework based on the lattice Boltzmann-immersed boundary method (LB-IBM). In this framework, the lattice Boltzmann method (LBM) is employed to solve the incompressible Navier-Stokes equations, the finite difference method (FDM) is used to discretize the structural dynamics of flexible bodies, and a fourth-order hybrid linear multi-step scheme is adopted to handle rigid-body vibrations. Fluid-structure coupling is achieved through a penalty-based immersed boundary method (IBM), with the amplitude prediction error controlled within 5% in rigid-body vortex-induced vibration cases. Additionally, the framework integrates multi-block grid refinement and hybrid MPI/OpenMP parallel computing to support large-scale high-efficiency simulations. Typical benchmark tests show that the mesh count is reduced by approximately 40%, while the errors in key parameters such as the Strouhal number and drag coefficient remain below 5%. The framework is validated and applied through representative cases,

including bluff body flows, flow-induced vibrations, and bio-inspired dragonfly flapping. Results demonstrate that the proposed approach effectively overcomes the limitations of conventional body-fitted methods, exhibiting good computational efficiency, reliability, and robustness in simulating FSI problems characterized by complex geometries, large displacements, large deformations, or multi-body motions." (Authors)] Address: Xu, P., Department of Mechanics, School of Aerospace Engineering, Huazhong University of Science and Technology, Wuhan 430074, China

**26254** Yang, I.; Han, C.S. (2026): Expanded tibiae enhance male mating success in the damselfly *Platycnemis phyllopoda*. *iScience* 29(8): 18 pp. (in English) ["In insects, elaborate male secondary sexual traits have evolved through sexual selection driven by visual signals. In odonates, such displays typically feature wing pigmentation or flight behavior; however, investigations into non-wing morphological ornaments remain relatively rare. To address this gap, we investigated *P. phyllopoda*, in which males possess conspicuously expanded, white mid and hind tibiae. Our findings revealed that males perform sequential courtship displays utilizing their UV-reflective tibiae. Field monitoring demonstrated that males with larger hind tibial areas achieved significantly higher mating success; however, they exhibited lower resighting frequencies and shorter observation spans, suggesting potential survival costs or increased dispersal. Combined with positive allometry, these results indicate that the expanded tibiae may function as sexually selected ornaments. Ultimately, opposing selection acting on these structures likely constrains their evolutionary exaggeration, highlighting the complex interplay of selections shaping tibial morphology in odonates." (Authors)] Address: Han, C.S., Department of Biology, Kyung Hee University, Seoul 02447, Korea. Email: hcsapol@gmail.com

**26255** Yavorskaya, N.M. (2026): Current state of the Bolshaya Pera River zoobenthos in the Amur Gas Processing Plant construction area (Russian Far East). *Amurian Zoological Journal* XVIII(2): 403-428. (in Russian, with English summary) ["The article presents the results of long-term studies on benthic invertebrate species in the Bolshaya Pera River near the Amur Gas Processing Plant in Amur Region. A total of 236 species from 23 different taxonomic groups were identified, including Cnidaria, Plathelminthes, Nematelminthes, Annelida, Arthropoda, Mollusca. The benthic community was dominated by species typical of watercourses in the southern Amur region. Vulnerable and rare species, such as *Dahurinaia dahurica* (Middendorff), *Acanthametropus nikolskyi* Tshernova, and *Pisidium amurense* Moskvicheva were also identified. Chironomidae played a significant role in the benthic community structure, accounting for 39 % of all identified species. In terms of quantitative indicators, Ephemeroptera, Chironomidae, Trichoptera, Oligochaeta, and Odonata [*Coenagrion* sp., *Onychogomphus* sp., *Ophiogomphus* sp., Gomphidae indet. were] dominant. The average zoobenthos density was 827 individuals per square meter, and the biomass was 0.8 grams per square meter, which is typical of clean sandy soils. Throughout the study, the river ecosystem remained in good health, and the water remained clean." (Authors)] Address: Yavorskaya, Nadezhda, Institute of Water and Ecology Problems of the Far Eastern Branch of the Russian Academy of Sciences, 56 Dikopoltseva Str., 680000, Khabarovsk, Russia. Email: yavorskaya@ivep.as.khb.ru

**26256** Yudiawati, E.; Julianti, W.P.; dan Hasnelly (2026): Keanekaragaman jenis capung (Odonata) pada areal persawahan di kecamatan Jujuhan Ilir Kabupaten Bungo - Species diversity of dragonflies (Odonata) in rice field ecosystems of Jujuhan

Ilir District, Bungo Regency. *Jurnal Sains Agro* 11(1): 101-122. (in Indonesian, with English summary) ["This study aims to identify the species of dragonflies found in rice field areas and to determine the level of dragonfly diversity in Jujuhan Ilir Subdistrict, Bungo Regency. The research was conducted from January to April 2025 in four villages: Aur Gading, Sari Mulya, Bukit Sari, and Kuamang. The sampling method used was purposive random sampling, and dragonflies were captured using a sweep net during the morning when they were most active. Species identification was carried out at the Laboratory of the University of Muara Bungo using an identification guidebook. The results showed that eight species of dragonflies were found ... The identified species were *Orthetrum sabina*, *Orthetrum chrysis*, *Pantala flavescens*, *Agriocnemis femina*, *Agriocnemis pygmaea*, *Ischnura senegalensis*, *Pseudagrion pruinatum*, and *Prodasi-neura autumnalis*. The highest diversity index was found in Aur Gading Village (1.84), while the lowest was in Bukit Sari Village (1.40). The highest evenness index was recorded in Kuamang Village (0.89), and the lowest in Sari Mulya Village (0.83). The highest species richness index was found in Sari Mulya and Bukit Sari Villages (0.28), and the lowest in Aur Gading Village (0.19)."] (Authors)] Address: Yudiawati, E., Program Studi Agroteknologi Fakultas Pertanian, Universitas Muara Bungo, Jl. Pendidikan, RT.10 RW. 02 No. 10 Kelurahan Sungai Binjai. Kecamatan Bathin III. Kabupaten Bungo, Jambi 37228, Indonesia. Email: effiyudiawati1983@gmail.com

**26257** Yuliarti, R.; Rouzatul, N.; Mutiara, H.; Rizka, M. (2026): Keanekaragaman Spesies Musuh Alami pada Agroekosistem Sawah di Gampong Lampisang, Aceh Besar. *Jurnal Agroteknologi* 14(1): 9-14. (in Indonesian, with English summary) ["Rice production in Indonesia is constrained by various abiotic factors, including declining soil fertility, drought stress, and climate and weather variability. Biotic constraints involve plant-disturbing organisms (OPT), comprising insect pests, plant diseases, and weeds. Environmental changes within rice agroecosystems often lead to increased pest pressure, thereby necessitating effective and environmentally sound pest management strategies. Integrated Pest Management (IPM) prioritizes the utilization of natural enemies as a core component of biological control to maintain pest populations below the economic threshold. This study aimed to assess the diversity of natural enemy species within the rice agroecosystem of Gampong Lampisang, Aceh Besar. The research employed field surveys and morphological identification of predatory insects. The results indicated that the rice agroecosystem in the study area supports a diverse community of natural enemies. The taxa recorded included *Pantala flavescens*, *Ischnura senegalensis*, *Deinopis longipes*, *Theridion* sp., *Stethorus* sp., and *Dolichoderus* sp. The presence of these taxa reflects the substantial potential of indigenous natural enemies to support IPM implementation. These findings provide a crucial foundation for the development of sustainable pest management strategies and for reducing reliance on synthetic pesticides."] (Authors)] Address: Yuliarti, R., Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia. Email: rieniylr@usk.ac.id

**26258** Zhang, X.; Liu, P.-h.; Xin, H.; Zheng, D.-r.; (2026): A new burmacoenagrionid damselfly (Odonata: Zygoptera) from the mid-Cretaceous Kachin amber. *Palaeoentomology* 9(1): 9-12. (in English) ["The zygopteran family Burmacoenagrionidae Zheng, Nel & Wang, 2019 is endemic to the west Burma Block and occurring during the mid-Cretaceous (Zheng et al., 2019). It was considered to be a member of the Coenagrionoidea Kirby, 1890, which is the dominant group

of the extant damselflies (Dijkstra et al., 2014). Four Burmacoenagrionid genera have been previously described, including Burmacoenagrion Zheng, Nel & Wang, 2019, Burmagrion Möstel, Schorr & Bechly, 2017, Burmachistigma Zheng, Nel & Wang, 2019, and Electrocoenagrion Zheng, Nel & Wang, 2019 (Möstel et al., 2017; Zheng et al., 2019). This indicates that Burmacoenagrionidae is the most diversified zygopteran family currently recorded in the Kachin amber (Zheng, 2020)."] (Authors)] Address: Zhang, X., Henan International Joint Laboratory of Taxonomy and Systematic Evolution of Insecta, Henan Institute of Science & Technology, Xinxiang 453003, China

**26259** Zhou, T.; Zhang, H.; Wang, H.; Liao, J.; Chen, X.; Yang, N.; Han, B.; Liu, Z. (2026): Geographical patterns and key influence factors of Odonata species diversity in Guangdong Province. *Biodiversity Science* 34 (2): 25337: 11 pp. (in Chinese, with English summary) ["Aims: Guangdong Province, located at the northern boundary of the tropical climatic zone, harbors exceptionally high biodiversity due to its warm, humid climate, complex terrain, and dense river networks. However, aquatic insects, especially Odonata, have been insufficiently surveyed compared with terrestrial taxa. This study aims to elucidate species composition, zoogeographical characteristics, geographical patterns and key environmental drivers of Odonata taxonomic diversity in Guangdong Province. Methods: Redundancy analysis (RDA) combined with forward selection was used to identify key environmental variables associated with Odonata community structure. Subsequently, variation partitioning analysis (VPA) was applied to disentangle the relative contributions of climate, topography, and land-use factors to spatial variation in community composition. Results: A total of 261 species (including subspecies), belonging to 115 genera and 19 families across two suborders, were recorded. Among them, 71 species are endemic to China, representing 27.2% of the total richness. In terms of faunal composition, species with an Oriental distribution (restricted to the Oriental realm) predominate, comprising 199 species (including subspecies), followed by Palearctic-Oriental species distributed across both realms, totaling 62 species (including subspecies). Regarding zoogeographical types, the South China–Central China type is most common (90 species; 34.5%), followed by the South China type (63 species; 24.1%). Spatial analyses identified the central and northern mountainous regions as diversity hotspots, with Longmen County (Huizhou) and Zengcheng District (Guangzhou) harboring 173 and 154 species, respectively, while eastern and western Guangdong exhibited comparatively lower diversity. RDA revealed that mean annual temperature, mean annual precipitation, farmland proportion, forest proportion, water-body proportion, and elevation range are the principal environmental factors shaping Odonata community structure. VPA showed that climate, topography, and land-use jointly explain spatial variation of community composition, with climate uniquely contributing the highest independent fraction (8%). Conclusion: This study provides the first systematic assessment of the faunal characteristics and geographical patterns of Odonata diversity in Guangdong Province, identifying the key environmental drivers shaping community structure. The results fill a critical knowledge gap in aquatic insect diversity within the province and provide essential baseline information for faunal biogeography, biodiversity monitoring, conservation planning, and evaluation of management effectiveness."] (Authors)] Address: Liu, Z. Email: liuzhenyuanibh@163.com