

Odonatological Abstract Service

published by the INTERNATIONAL DRAGONFLY FUND (IDF)

Editor:

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Published in Zerf, Germany

ISSN 1438-0269

1997

26260 Madsen, H.O.R.; Nel, A. (1997): Two new fossil species of Gomphaeschna Selys, 1871 in the Paleocene/Eocene of Denmark (Odonata: Aeshnoidea). *Annales de la Société entomologique de France* (N S) 33(3): 285-293. (in English, with French summary) ["Two new species of Aeshnoidea: Gomphaeschnidae are described from the Paleocene / Eocene of Denmark: Gomphaeschna paleocenica. sp. n. and Gomphaeschna (?) danica, sp. n. A preliminary analysis of phylogenetic relationships of the four related genera Gomphaeschna, Alloeschna, Gomphaeschnoides and Oligoeschna is attempted." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, 75005 Paris, France. E-mail: anel@cimrs1.mnhn.fr

26261 Maragou, P.; Valakos, E.D.; Chondropoulos, B.P. (1997): Comparative ecology of two sympatric lizard species, *Lacerta graeca* and *Podarcis peloponnesiaca* endemic to Peloponnisos (Greece). *Proceedings of the 8th Ordinary General Meeting of the Societas Europaea Herpetologica* 23 - 27 August 1995 Bonn, Germany: 265-271. (in English) [The summer diet of *P. peloponnesiaca* included two Odonata prey items.] Address: Maragou, P., Sec. of Animal & Human Physiology, Dept. of Biology, University of Athens, GR-157 71 Athens, Greece

2000

26262 Van der Heijden, A.E. (2000): A population of Norfolk Damselflies (*Coenagrion armatum*) in The Weerribben. *Brachytron* 4(2): 16-19. (in Dutch, with English summary) ["A small population of *C. armatum* was found in the lowland mire The Weerribben in May 1999. *C. armatum* has always been extremely rare in the Netherlands. Before 1999, *C. armatum* was only observed for certain on four different occasions in the Netherlands. Because it had not been recorded since 1956 *C. armatum* was considered extinct in the Netherlands. During the survey in 1999 a total of 25 males and 11 females could be traced. During a second visit in May 2000 two males were found on the same location. As only little is known about the species habitat requirements in the Netherlands, the habitat characteristics described from abroad are discussed. The recently discovered Weerribben-population of *C. armatum* inhabits a wide, densely vegetated reed and Typha belt, which is permanently flooded with clean, shallow water. This seems to match with biotopes as described for other European locations. It is suggested that the structure of the vegetation belt is more important for *C. armatum* than the actual presence of certain plant species." (Author)] Address: van der Heijden, A., De Fintsjes 5, Rottevalle, The Netherlands. Email: odonatophilic@gmail.com

2002

26263 Janecek, B.; Moog, O.; Waringer, J. (2002): Odonata - Teil III., in Moog, O. (Ed.) (2002): *Fauna Aquatica Austriaca*, Lieferung 2002. *Wasserwirtschaftskataster*. Bundesministerium für Land- und Forstwirtschaft. Umwelt und Wasserwirtschaft. Wien: 14 pp. (in German) [Checklist of Austrian Odonata.] Address: Dr. Berthold Janecek, B., Univ. für Bodenkultur, Institut für Hydrobiologie und Gewässermanagement Max Emanuel Str. 17 A-1180 Wien, Austria. Email: berthold.janecek@botu.ac.at

26264 Landkreis Emsland (2002): *Der Landkreis Emsland. Geographie, Geschichte, Gegenwart Eine Kreisbeschreibung*. Herausgegeben im Auftrag des Landkreises Emsland von Werner Franke Josef Grave Heiner Schüpp Gerd Steinwascher. 932 pp. (in German) [Niedersachsen, Germany. Regionally typical habitats as bogs and running waters are introduced, and typical odonate species are briefly mentioned.] Address: https://www.emsland.de/kreisbuch/kreisbuch_emslan.pdf

26265 Bodley, K.T. (2003): The effects of the presence of dragonfly predators on the morphology of the Columbia Spotted Frog (*Rana luteiventris*). BSc thesis, Department of Natural Sciences at Carroll College, Helena, Montana: VI + 13 pp. (in English) ["A laboratory experiment was performed to determine the effects of predation on the morphological plasticity of *R. luteiventris*. Four treatments, each comprised of five replicates included predators, mashed conspecifics, predators and mashed conspecifics and a control group. Different morphological features were measured and a statistical analysis of these features was performed to determine the overall effect of predation. Predation, or the presence of chemical cues released from the predator or the skin of the injured amphibian, had a significant effect on muscle development. Specifically, tadpoles reared in the presence of predators or mashed conspecifics developed thicker tail musculature. This modified tail development could be advantageous in avoiding predators. This study may lead to a better understanding of the environmental dependent phenotypic plasticity of the spotted frog." (Author)] Address: <https://scholars.carroll.edu/server/api/core/bitstreams/865e1c43-7aad-4f74-99eb-02096b422755/content>

26266 Manger, R. (2003): *Vuurjuffer profiteert van tuinvijvers*. *Tussen Duin en Dijk* 2(2): 14-16. (in Dutch) ["Discussion: National data indicate that *Pyrrosoma nymphula* was scarce in North Holland prior to 1999. The 'Vuurjuffer' project has demonstrated that this beautiful spring-flying species has expanded its range significantly, particularly over the last 3

years. *P. nymphula* is not the first dragonfly species to colonize North Holland; *Anax imperator* and *Erythromma viridulum* preceded it quite recently. Climatic changes likely play a role in this process. It is difficult to reconstruct exactly how the species colonized these areas, though a northward expansion starting in 1999 is the most probable scenario. They are capable of covering great distances with favorable winds. The increase in the number of garden ponds may have facilitated the expansion of its habitat; the species' spread into the dune areas might be attributed to this. However, *P. nymphula* has not (yet) been found in all dune areas. A contributing factor may be the relatively low population density of the surrounding hinterland, resulting in too few ponds to serve as stepping stones. The question remains whether the species will be able to maintain its presence—or perhaps even expand further—in the coming years. If so, North Holland will have gained another common dragonfly species." (Author/Google Translate)] Address: Manger, R., Stoepveldsingel 55, NL-9403 SM Assen, The Netherlands

2004

26267 Neves Panitz, C.M.N. (2004): Biomonitoramento, utilizando macroinvertebrados como indicadores integrado às variáveis físico-químicas de qualidade da água: estudo de caso na sub-bacia hidrográfica do Lajeado dos Fragosos no município de Concórdia/SC-Brasil. MSc thesis, Universidade Federal de Santa Catarina: 192 pp. (in Portuguese) ["The western region of the state of Santa Catarina has been developing the agro-cattle-breeding and industrial sector based on the production of swine and fowl, serving as a model of development for other regions. However, there is also a hypothesis that this economic development may compromise the health of the environment. In order to study the environmental conflicts, a pilot system of management of swine dejections denominated #CONTROL OF THE ENVIRONMENTAL DEGRADATION DECURRENT FROM THE SWINE CULTURE IN SANTA CATARINA# was implanted, within the National Program of Natural Environment (Programa Nacional do Meio Ambiente - PNMA II) in the hydrographic sub-basin #Lajeado dos Fragosos# in the city limits of Concórdia/ SC. The PNMA II, among other actions, foresees the monitoring of the quality of the water of this sub-basin. In lajeado dos Fragosos, the monitoring is being done with the help of physical-chemical and biological indicators, using benthonic macroinvertebrate animals as bio-indicators. This paper (thesis) had the following objectives: to perform a survey of the benthonic macroinvertebrate animals, to relate the quality of the water with the macroinvertebrate animals collected through biotic indexes, to determine the existence of bio-indicators of the quality of the water in the fauna of macroinvertebrate animals in the hydrographic sub-basin Lajeado dos Fragosos. A monthly periodicity, in seven points of the river was collected, during one year (2002-2003) The macroinvertebrate animals were collected manually and in samplers of substrate of PVC tube, containing pebbles rolled from the river, fixed in 70% alcohol. Five thousand nine hundred and 46 taxons were registered, of which the most relatively Frequent and Abundant were: Baetidae, Chironomidae, Coenagrionidae, Corydalidae, Elmidae, Glossosomatidae, Hydropsychidae, Hydroptilidae Leptoplebiidae, Libellulidae, Limnidae, Oligochaeta, Perlidae, Psephenidae, Simuliidae, Trychorytidae, Glossiphoniidae, and the Isopoda and Tricladidae orders. The physical-chemical variables that were within the recommended by the Resolution of the CONAMA no 20, of June and of October of 1986 for class 2 rivers were: Turbidity, Total solids, DBO5 (with point 7, during the months of April and October/2003, surpassing the established limit), Dissolved Oxygen, NO₂, NO₃, pH. The

physical-chemical characteristics that did not show any correlation with the frequent and abundant macroinvertebrate animals during the period of 2002/2003 were: precipitation, discharge, BO5, Fecal Choliforms I and NO₂. The Oligochaeta Class presented a strong correlation with the pH, PO₄ and Conduction; and the Hirudinae Class correlated with NH₃, pH, PO₄ e turbidity. In many studies, the oligochaetas and hirudíneos, are considered indicators of anthropic impact and of deterioration of the sanitary and environmental quality of the body of water. None of the indexes used to evaluate the quality of the water in the hydrographic sub-basin Lajeado dos Fragosos through the macroinvertebrate animals arrived at values of excellent quality of water. However, the quality of waterbody oscillated a lot in every point of collection during the time period, reaching values correspondent to class 2, of the sub-basin belongs to. Invertebrate animals are excellent tools to characterize impacts over a hydrographic basin or river because of the abundance of information that they offer about the disturbances of waterbody receives, as well as also the impacts suffered on the hydrographic basin. These organisms, with their adaptations to the aquatic habitat, can complement abundantly the physical-chemical and microbiological characteristics that are routinely in studies of the aquatic habitat" (Author)] Address: <https://repositorio.ufsc.br/bitstream/handle/123456789/87985/298462.pdf?sequence=1&isAllowed=y>

26268 Popova, O.; Kharitonov, A.Yu. (2004): [Fauna of dragonflies and damselflies (Insecta, Odonata) of the forest-steppe, West Siberia]. Proceedings of the 1st All-Russian School-Seminar with International Participation "Conceptual and Practical Aspects of Scientific Research and Education in Invertebrate Zoology" (Tomsk, TSU, October 20–22, 2004): 75-79. (in Russian) ["Generalized data on the Odonata fauna of the West Siberian forest-steppe—comprising 66 species across two suborders (Zygoptera: 24 species; Anisoptera: 42 species)—are presented, along with a zoogeographical analysis and a discussion of their origins." (Authors/Google Translate)] Address: Popova, O.N., Institut Sistematiki i Zhivotnykh, 630091 Novosibirsk, Ul. Frunse 11, Russia. E-mail: pc@eco.nsc.ru

2005

26269 Fazekas, I. (2005): A komlói térség természeti és kultúrtörténeti öröksége [The natural and cultural heritage of the Komló region]. regioGRAFO, Hungary. ISBN 963 218 076 3: 123-166. (in Hungarian) [pages 143-144: "Sándor TÓTH – between 1997 and 2003 – in order to get to know the fauna as fully as possible, in addition to adult dragonflies, he also collected larvae and larval skins (exuvium) to the extent possible. During the collections and observations at the lake, he managed to detect the presence of 47 species, approximately 72% of the Hungarian fauna. The list also includes 13 protected species, which in itself confirms the valuable nature of the habitat and its conservation significance. The dragonfly fauna of the lake is characterized by the presence of a few species that are less common elsewhere in larger numbers. Among the members of Zygoptera, the very common *Ischnura elegans* and *Platynemis pennipes* can be mentioned here, as well as *Erythromma viridulum* and *Enallagma cyathigerum*. Among the species of Anisoptera, *Crocothemis servilia* [sic], *Cordulia aenea* and *Gomphus vulgatissimus* were present in relatively large numbers. In terms of the qualitative composition of the lake's dragonfly fauna, the following, so-called sporadic and rare species can be highlighted: *Anax parthenope*, *Chalcolestes viridis*, rare *Coenagrion scitulum*, *Cordulegaster heros*, *Epithea bimaculata*,

Leucorrhinia pectoralis, *Libellula fulva*, *Ophiogomphus cecilia*, *Pyrrhosoma nymphula interposita*, *Somatochlora aenea* [sic], *Somatochlora metallica*. The Illyrian, South Pannonian, and Cordulegaster heros represents the Western Balkan species group (e.g. small-flowered hellebore—*Helleborus dumetorum*, bowing toothwort—*Dentaria enneaphyllos*) that survived the last ice age in the deciduous forest refugia of the peninsula, and its main area of distribution today is limited to the mild-winter, sub-Mediterranean precipitation distribution of silver linden, hornbeam-oak, and extra-zonal beech forests. One of the least demanding species of river dragonflies, *Gomphus vulgatissimus*, is among the more common species in the region. It prefers quieter, lower sections of streams, but it can also develop in cleaner lakes. *Ophiogomphus cecilia* lives in streams with higher oxygen content and cleaner water that flow into the lake. In the highly industrialized countries of Europe, it has become critically endangered in recent decades, and is therefore protected by the so-called Bern Convention. In Hungary, its strongest populations live along the western border. *E. bimaculata*, a powerful flyer and capable of expanding, sticks to waters rich in vegetation. Its larvae are sensitive to water quality. It is a vulnerable species in decline throughout the entire Union." (Author/Google translate)] Address: https://www.researchgate.net/publication/392657779_Tajtortenet_elohelyek_novenyzetes_allatvilag_Fazekas_I_mre

2006

26270 Hepper, D. (2006): Dragonfly News 49. Dragonfly News 49: 38 pp. (in English) [Contents: Dragonfly News 49 1; Message from the President 2; From the Conservation Officer 3; BDS Diary of Events 4; Members' Day 2006 at Rothamsted 4; The Dragonfly Project - 2006 Programme 4; Field Meetings Programme 5; AquaScribe Waterproof Paper 10; The Griffin Legacy 11; From the Key Sites Project Officer 12; Field Meeting Reviews 2005 14; Titchmarsh Reserve, Northants 29th May 2005 14; Joint CCW/BDS Walk at the Newport Wetlands Reserve (Uskmouth) 14 August 2005 14; BDS / Quest for Nature: South Africa 15; Conservation & Research News 16; A first record of the Black-tailed Skimmer for Cumbria 16; Threats to Scientific Research 16; The Dragonfly Project's Third Season at Wicken Fen 17; Favourite Places: Linchborough Park Pond, Hants 18; First & Last Dates for 2005 20; Report of the Dragonfly Conservation Group 21; Members' Letters 22; Lesser Emperor at Squabmoor Reservoir, East Devon 22; The value of giving first and last dates of recorded occurrence of Odonata 23; Upside-Down in the Undergrowth - Collecting Exuviae 24; The BDS Exuviae Library 24; Books, Publications & Reviews 25; The Dragonflies of Herefordshire 25; "Dragonflies in Derbyshire" Status and Distribution 1977-2000 25 BDS Journal Delayed 26; Guides to Odonata from Various Regions of the World 26; Update on Migrants and Recent Colonists 27; Cumbrian Dragonflies on the Web 27; John Tavener 27; You Can Help! 28; Dragonflies at Light 28; Emergence Survey 28; Banded Demoiselle Survey 28; 2005 Members' Day Report 29; Changes to the Board of Trustees, Officers of the Society and Subscriptions 31; BDS Business 31; Emergence Survey "First Five" Results 32; Family Fun Word Search 32; Emergence Survey - Second Round! 33; Have you seen the Banded Demoiselle? 35; Journal Back-Issues and Publications 35; BDS Shop - new manager Lynn Curry 36]

26271 Kuprian, M. (2006): Bagger im Blauhelm-Einsatz: Schutzmaßnahmen für die seltene Helm-Azurjungfer. Naturschutzjahresbericht 2004/2005 für den Wetteraukreis: 33. [Verbatim/Google translate: Location: Ludwigsbrunnen Nature

Reserve and adjacent ditch system near Karben. Purpose of the measure: Improvement and creation of habitats for *Coenagrion mercuriale*—a species protected under the EU Habitats Directive—through the removal of scrub and clearing of vegetation, as well as ditch modification measures aimed at achieving a "favorable conservation status" for the population. Background: *C. mercuriale* is strictly protected across Europe under the EU Habitats Directive (Annex II). On the State of Hesse's Red List, it is classified as "threatened with extinction." To date, only five occurrences of this protected species are known in Hesse—three of which are in the Wetterau district. In Karben, the species has found one of its last refuges in the Ludwigsbrunnen Nature Reserve and an adjacent ditch system. However, the habitat for this small dragonfly—predominantly native to Southwestern Europe—had deteriorated in recent years. Nature and scope of the measure: Removal of scrub and clearing of vegetation in spring areas and ditches within the nature reserve (carried out by the Butzbach Forestry Office) to prevent shading by alders, willows, or other woody plants. Restoration of habitats for the species outside the protected area. Excavators were used to reshape ditch banks, clear vegetation from ditch bottoms, and remove woody plants along with their root systems over a 300-meter stretch. Parties involved: Project leads: NABU Hesse and LAG N&B, in cooperation with the Butzbach Forestry Office; Landowners: City of Karben and the State of Hesse; Planning: Matthias Gall (Graduate Geographer); Funding: Hessian Nature Conservation Foundation (Stiftung Hessischer Naturschutz), OVAG, Sparkasse Wetterau, NABU, German Federal Environmental Foundation (DBU), and the State of Hesse. Remarks: These measures are part of a state-wide species conservation project for Habitats Directive species, conducted by NABU Hesse in collaboration with nature conservation authorities and other institutions.] Address: Kuprian, M., NABU LAG Naturentwicklung & Biodiversität, Ringstraße 42., 36396 Steinau an der Straße, Germany

26272 Noordijk, J.; Ballintijn, K. (2006): Stadse Juffers en andere Libellen van Purmerend en Zaandam. Tussen Duin & Dijk 5(4): 18-22. (in Dutch) [This article discusses the dragonflies observed in Zaandam and Purmerend over the past four years. "Conclusion: This study illustrates the specific ecological significance of urban areas. In the Netherlands as a whole, only a limited number of odonate species occur more frequently in cities than in rural areas—namely *Ischnura elegans*, *Aeshna mixta*, *Chalcolestes viridis*, and *Erythromma viridulum* and *E. najas* (NVL 2002). The situation differs in the region we studied. In the Zaanstreek and Waterland areas, *Coenagrion puella*, *C. pulchellum*, *Enallagma cyathigerum*, *Aeshna cyanea*, *Brachytron pratense*, and *Libellula quadrimaculata* appear to be strictly associated with the urban environment. Other species occur there at much higher densities than in rural areas. Targeted management can make more ditches and ponds attractive to dragonflies and damselflies (see Groenendijk & Wolterbeek 2001). Measures include removing wooden bank revetments, creating narrow bank profiles, and avoiding—or staggering—the mowing of bank vegetation during periods of high dragonfly activity." (Authors/Google Translate)] Address: Noordijk, J., Van der Waalsstraat 34, 6706 JR Wageningen, The Netherlands. Email: Jinze.Noordijk@wun.nl

2007

26273 Doucet, G. (2007): Les odonates des tourbières de Haute-Saône (70): Recherche des différents cortèges et caractérisation des habitats larvaires. Exemple de la leucorrhine à gros thorax, *Leucorrhinia pectoralis* (Chapentier, 1825).

Quelle méthode pour un suivi en routine de ces milieux? Espace Naturel Comtois O.P.I.E. Franche-Comté: 61 pages + Annexes- (in French, with English summary) ["Among the dragonfly species which live in the bogs of Franche-Comté, some belong to endangered species like *Leucorrhinia pectoralis*, *L. dubia* or *Aeshna subarctica elisabethae*. Unfortunately, we don't really know the habitats required by each species for larval development. However, it's an essential information for the manager and the protector of the wetlands. «Espace Naturel Comtois » and « O.P.I.E. Franche-Comté» have decided to perform a survey in a set of 8 peat-bogs of Haute Saône in order to improve knowledge of the dragonfly community needs and to find the best way to monitor Odonata in this area. This study, based on sampling of exuviae (the larval skins left ashore after emerging), shows 3 different groups of species. Measure of different parameters allows us to characterize each group's habitat. Thanks to this method, we also discover new populations of endangered species like *Epitheca bimaculata* or *Leucorrhinia pectoralis*. Then, this study permits us to give some elements about the ecology and the biology of *L. pectoralis*. Improvement of the knowledge about larval habitats enables the manager of each bog to take efficient and suitable actions for protection. The results are encouraging, but it's necessary to carry on the survey to confirm them." (Author) <https://lorraine-entomologie.org/webobs/biblio/docpdf/Doucet2007-743.pdf>] Address: Espace Naturel Comtois O.P.I.E. Franche-Comté, 15 rue de l'Industrie Insectarium Museum d'Histoire Naturelle, 25000 Besançon La Citadelle. France. Email: cren-fc@wanadoo.fr

26274 Grand, D. (2007): *Cordulegaster boltonii* boltonii (Donovan, 1807) (Odonata, Anisoptera: Cordulegastriidae): étude comparative de sa distribution actuelle et passée dans le département du Rhône (France) et compléments biologiques. Bulletin romand d'entomologie 24: 61-76. (in French) ["For a great many insects, it is often impossible to draw a reliable comparison between their current distribution—well documented through surveys—and their past distribution, which is imperfectly known. However, for *Cordulegaster b. boltonii*, it was possible to reconstruct its presumed distribution from the mid-19th century. Communes in the Rhône department were classified according to their suitability for this dragonfly: favorable (with hill streams), marginally favorable (with lowland streams), and unsuitable (lacking watercourses). Following a meticulous survey conducted between 1987 and 2006 across the Rhône's 293 communes, a comparison between the theoretical historical distribution and the actual current distribution revealed a very high degree of similarity (97.7% overlap) over a span of a century and a half. While the current distribution of *C. b. boltonii* appears to have been little affected by agricultural activities in the Beaujolais vineyards, its long-term survival in the Greater Lyon area is threatened. When this species emerges in tunnels or under bridges, it does so in a vertical position more than 40 cm above the water. The sex ratio shows 50.95% females. The average length of the exuviae is 39.6 mm for males and 42.4 mm for females." (Author/Google translate) Details on the emergence, sex ratio, and on larval biometry are also provided.] Address: deceased

2009

26275 Damm, S. (2009): Conservation genetics, speciation and biogeography in African dragonflies. PhD thesis, Naturwissenschaftlichen Fakultät der Gottfried Wilhelm Leibniz Universität Hannover: 201 pp. ["Conservation biology aims to study the biological diversity and to protect species, their habitats and ecosystems. It integrates a variety of disciplines

providing different kinds of information from populations to species and their biogeography. The addition of molecular techniques is an important new component which effectively contributes to all disciplines to allow a better understanding of the processes of diversification in nature. The thesis covers a wide range of aspects from population genetics to speciation processes and phylogeographic analyses in African odonates with focus on the genus *Trithemis*. In the context of the different aims of this thesis new marker systems and methods were developed. For conservation genetic studies microsatellites are the state-of-the-art method. Therefore, a protocol for the isolation of microsatellite systems was developed and successfully applied on four different odonate species to address different questions concerning mating strategies (*Anax imperator* and *A. parthenope*), parthenogenesis (*Ischnura hastata*), conservation (*Orthetrum coerulescens*) and population genetic structures (*Trithemis arteriosa*). For comprehensive population genetic and phylogenetic analyses new sequence markers (ND1, COI, 16S, ITS I - II and a microsatellite flanking region) were chosen and analysed concerning their ability to identify population structures and to resolve phylogenetic relationships. Furthermore, two different approaches were tested in regard to their suitability for unambiguously identifying and discovering new species: on the one hand the newly developed character-based barcoding (CAOS barcoding) which gives the possibility to integrate traditional with genetic diagnostic characters and on the other hand the taxonomic circle, an analytical approach to test first discovery hypotheses. The geographical focus of this thesis is Namibia which is one of the most arid countries in Africa. Odonates as freshwater-associated organism with a complex life cycle composed of an aquatic larval and a terrestrial adult stage would not be expected to inhabit desert regions. Nevertheless, many species have evolved survival strategies for arid conditions. To examine the genetic and behavioural consequences of a freshwater-associated organism living in desert regions the genetic diversity, population structure and dispersal behaviour of *Trithemis arteriosa* was studied. Twelve populations from Namibia and Kenya were analysed using nine microsatellite loci, two non-coding nuclear fragments (ITS I - II; microsatellite flanking region TartR04) and the mtDNA fragment ND1. The nuclear markers revealed a high allelic and haplotype diversity in all populations with high levels of gene flow. In contrast, ND1 sequence analyses showed sub-structuring and exhibited, except of two main haplotypes, only private haplotypes. The conflicting patterns of nuclear markers versus a mitochondrial sequence marker can be explained by a male-biased dispersal. Females might be philopatric to save energy for mating and oviposition, while males disperse dependent on the environmental stability of the habitat. This study gives first direct insights into the dispersal behaviour of a desert inhabiting, strongly water dependent flying insect. A different pattern of biodiversity was observed by analysing the population genetic structure of a species with high habitat specificities. *Trithemis stictica* occurred only at two regions in Namibia. Samples from its whole distributional range in Southern Africa were included and analysed with four different sequence markers (ND1, COI, 16S and ITS I - II). Genetic results surprisingly unravelled three highly distinct but morphological cryptic clades. A corroborative approach applying the taxonomic circle by combining molecular data with ecological, morphological and geographical information supported the hypothesis of two new species. *T. stictica* is distributed throughout sub-Saharan Africa and the two new species coexist in the same geographical range, the Okavango and Zambezi floodplains, where they occupy different habitats. All characters of the different analysed disciplines were in-

corporated in an elaborated character-based barcoding matrix which allows a better identification of the two new species. Significant morphological differences were found between *T. stictica* and the two new species, *T. morrisoni* and *T. palustris*, while between the latter two no such differences were observed. All evidence confirmed the hypothesis of the discovery of the first cryptic odonate species. Molecular clock analyses date back the time of their divergence approximately 0.7 - 2.4 million years ago. Environmental changes during this time period with increasing aridity and habitat fragmentation might have forced the divergence of the two species. Assigning a specific mode of speciation is difficult, but a historical habitat shift might be a promising explanation for their divergence since both species occur in different ecological niches. In a comparative phylogenetic analysis of the species-rich genus *Trithemis* we aimed to study the influence of historical environmental changes on speciation events. We combined molecular analyses of three target genes (ND1, 16S and ITS I - II) with ecological, geographical and morphological data to reconstruct the biogeographical history of the genus. The species occupy most freshwater habitats on the African continent, from deserts to forests, from cool permanent streams to warm temporary pools. They differ in their dispersal capacity and ecological requirements and can be divided into two colour groups (red and blue/dark species). Molecular clock analyses estimate the time of the genus origin 6-9 million years ago. At this time the drastic climatic fluctuations with increasing aridification and forest fragmentation forced speciation mainly in form of allopatry and favoured dry-adapted open-land species. During a rapid radiation in the Pliocene three distinct clades of dark species evolved different habitat adaptations by colonizing (i) lowland streams, (ii) highland streams and (iii) swampy habitats to deal with the changing environmental conditions. The red-coloured species developed special adaptations to the arid climate and were therefore able to expand their ranges. Today the group of red species harbours the most widespread species of this genus." (Author) <https://edocs.tib.eu/files/e-01dh09/612929787.pdf> Address: Damm, Sandra, ITZ, Ecology & Evolution, TiHo Hannover, Bünteweg 17d, 30559 Hannover, Germany. E-mail: sandra.giere@ecolevol.de

2012

26276 Behr, H. (2012): Libellen - Einblicke in die biologische Vielfalt der Westmecklenburgischen Seenlandschaft. Naturschutzstation Zippendorf e.V. (Hrsg.). Shaker Verlag: 132 pp. (in German) ["Through 167 color photographs and concise texts, this book presents 57 dragonfly species and their habitats within the Natura 2000 areas of the Western Mecklenburg Lake District—including the Schaalsee Biosphere Reserve, the Schwerin Lakes EU Special Protection Area, and the Sternberger Seenland Nature Park. The known dragonfly fauna of the state capital, Schwerin, is also briefly described. To counter the global threat to biodiversity, it is essential—especially at local and regional levels—to monitor selected animal and plant groups over the long term and implement appropriate conservation measures. This book offers a contribution to addressing this issue by focusing on the Odonata, a group characterized by a manageable number of species, fascinating biology, and many species specialized for distinct habitat types. It provides both laypeople with an interest in natural history and experts with insights into the known diversity of dragonfly fauna in the Western Mecklenburg Lake District." (Publisher/Google Translate)] Address: <https://www.shaker.de/de/site/content/shop/index.asp?lang=de&ID=8&ISBN=978-3-8440-0728-2>

26277 Frank, M. (2012): Neue Erkenntnisse zur Verbreitung der Libellen in Mecklenburg-Vorpommern. Virgo, Mitteilungsblatt des Entomologischen Vereins Mecklenburg 15(1): 83-84. (in German) [Verbatim: The analysis was based on approximately 200 publications containing data on extant dragonfly species specifically relating to the federal state of Mecklenburg-Western Pomerania. The earliest records date back to 1855 and come from Johann Moritz Georg Fuldner, a secondary school teacher from Neustrelitz; he was the first to provide a comprehensive account of the Odonata fauna of Mecklenburg—specifically the Neustrelitz area. In addition to the majority of sources—which were journal articles—the study also took into account diploma theses, final examination papers, and research projects from colleges, universities, and institutes. The results revealed that the number of publications produced in the last 20 years was nearly double that of the entire preceding period—which spanned 135 years of publication activity regarding dragonflies. While early efforts focused almost exclusively on the Mecklenburg Lake District—including the Müritzer, the Neustrelitz Small Lakes, and the Feldberg Lakes—the picture of dragonfly-related activity across the state today is relatively balanced. Beyond confirming known species distribution ranges and frequencies, the analysis yielded several interesting new insights. For instance, the presence of *Leucorrhinia caudalis* in western Mecklenburg—including evidence of established breeding populations—was documented more than 60 years ago. Similarly, *Leucorrhinia albifrons*—originally known only from the southeastern and eastern parts of the state—was observed at several locations in western Mecklenburg as early as the mid-20th century. An analysis of the existing literature suggests that the apparent recent increase in certain rare species may be causally linked to intensified survey efforts and the initial documentation of Odonata fauna in many biotopes. However, this does not apply without exception to all dragonfly species currently found in Mecklenburg-Western Pomerania; for instance, *Crocothemis erythraea* and *Aeshna affinis* were first observed there after 1990 but have since become established residents. The analysis also revealed some new "visitors" that were previously unknown or poorly documented in the region—such as *Anax ephippiger* and *Sympetrum meridionale*, both of which have so far been recorded only as single sightings in the far west of Mecklenburg-Western Pomerania. The latter is certainly one of the most difficult darter species to identify and could well be more common than reports suggest; observers have therefore been encouraged to keep an eye out for this species as well.] Address: Frank, M., Zur Traubenmühle 5 A, 55268 Nieder-Olm, Germany. Email: mikel.frank@gmx.de

2013

26278 Davis, J.; Pavlova, A.; Thompson, R.; Sunnucks, P. (2013): Evolutionary refugia and ecological refuges: key concepts for conserving Australian arid zone freshwater biodiversity under climate change. *Global Change Biology* 19(7): 1970-1984. (in English) ["Refugia have been suggested as priority sites for conservation under climate change because of their ability to facilitate survival of biota under adverse conditions. Here, we review the likely role of refugial habitats in conserving freshwater biota in arid Australian aquatic systems where the major long-term climatic influence has been aridification. We introduce a conceptual model that characterizes evolutionary refugia and ecological refuges based on our review of the attributes of aquatic habitats and freshwater taxa (fishes and aquatic invertebrates) in arid Australia. We also identify methods of recognizing likely future refugia and approaches to assessing the vulnerability of arid-adapted freshwater biota to a warming and drying climate. Evolutionary refugia in

arid areas are characterized as permanent, groundwater-dependent habitats (subterranean aquifers and springs) supporting vicariant relicts and short-range endemics. Ecological refuges can vary across space and time, depending on the dispersal abilities of aquatic taxa and the geographical proximity and hydrological connectivity of aquatic habitats. The most important are the perennial waterbodies (both groundwater and surface water fed) that support obligate aquatic organisms. These species will persist where suitable habitats are available and dispersal pathways are maintained. For very mobile species (invertebrates with an aerial dispersal phase) evolutionary refugia may also act as ecological refuges. Evolutionary refugia are likely future refugia because their water source (groundwater) is decoupled from local precipitation. However, their biota is extremely vulnerable to changes in local conditions because population extinction risks cannot be abated by the dispersal of individuals from other sites. Conservation planning must incorporate a high level of protection for aquifers that support refugial sites. Ecological refuges are vulnerable to changes in regional climate because they have little thermal or hydrological buffering. Accordingly, conservation planning must focus on maintaining meta-population processes, especially through dynamic connectivity between aquatic habitats at a landscape scale." (Authors) The paper includes a few references to Odonata.] Address: Davis, Jenny, Australian Centre for Biodiversity, School of Biol. Sciences, Monash Univ., Clayton, VIC, Australia. E-mail: Jenny.Davis@monash.edu

26279 Faton, J.-M.; Deliry, C. (2013): *Lestes macrostigma* (Eversmann, 1836) en Camargue. Bilan des prospections 1999-2000. *Sympetrum* 17: 9-13. (in French) ["Surveys conducted in 1999–2000 showed that *L. macrostigma* is still present (a few hundred individuals south of Baisse Salée and Relongue). Unfortunately, it appears to have disappeared from Salin de Badon, where it was abundant in 1995. We hope that the management of the nature reserves will take the presence of this species into account, and we remain, of course, at the disposal of the managers to assist in establishing a monitoring program." (Authors/Google translate).] Address: Faton, J.-M., Gare des Ramières, Route de Grane - 26400 Alex, France

26280 Hendrix, R. (2013): *Beheersevaluatie en –Voorstellen voor de Kempense heidelibel (Sympetrum depressiusculum) in het vijvergebied Midden-Limburg*. Bachelorproef: 87 pp. In Dutch, with English summary. ["This study comprises a field survey conducted in the Central Limburg pond district. A selection of 31 ponds was evenly distributed across three different management types: ponds that are drained in winter, ponds that are not drained, and ponds used for fish farming. All dragonfly species present in these ponds were surveyed between 18 July and 28 August 2012. Species richness per type and the presence of *Sympetrum depressiusculum* served as metrics to determine which management type is most beneficial for dragonflies in general and the vagrant darter in particular. This European Red List species warrants significant attention due to its severe decline, not only in Flanders but across Europe. The results indicate that ponds subjected to draining exhibited greater species richness than those that were not. Furthermore, *S. depressiusculum* was frequently found at the drained ponds. However, the one-year study period was too short, and too few variables were measured during that single year, to definitively explain the relationship between this species and the drained ponds. Consequently, the conclusions should be regarded as preliminary. A literature review was also conducted to establish a link between historical pond management practices and the ecology of *S. depressiusculum*. Analysis of these sources confirms a definite connection between historical pond management and the

occurrence of this species in the Central Limburg pond district. Due to the intensification of carp farming, this management practice is gradually disappearing, as is *S. depressiusculum*. Comparing historical and current management practices allows for the identification of the causes of the species' decline. Additionally, a literature review covered other *Sympetrum* species to gain a better understanding of their ecology. Sources regarding *S. depressiusculum* were thoroughly examined to gather as much information as possible on its habitat requirements, specific behaviors, competition, and predation. This information was subsequently used to evaluate the six sites in Flanders where *S. depressiusculum* was present until recently (2011–2012). These six sites are all located in the Antwerp and Limburg Kempen regions; they were evaluated specifically in terms of their management for *S. depressiusculum*. The sites are De Most and Het Scheps in Balen, De Maat and Den Diel in Mol, Het Hageven in Neerpelt, and the Vijvergebied Midden-Limburg (Central Limburg Pond Area) in Zonhoven. Each site was visited in the company of the site managers to assess current management practices. However, the species has disappeared from some of these locations in recent years. Possible causes of the decline were identified by combining information from interviews with findings from the literature review. Based on this, management proposals have been formulated for the six sites. The study focused particularly on the Vijvergebied Midden-Limburg, as the fieldwork was conducted there. The analysis indicates that the primary cause of the decline of the *S. depressiusculum* population in the pond area is a recent change in pond management—specifically, the fact that the ponds no longer dry out during the winter. Consequently, the ponds permanently harbor large fish and other predators that prey on dragonfly larvae. In addition, the desired shallow, seasonally flooded margins and marshy zones in most ponds also disappeared. Management proposals focused primarily on restoring traditional management practices and extending this approach to the surrounding areas. This could potentially allow viable populations to re-establish in locations where currently only a few—or no—specimens of *S. depressiusculum* have been observed. Naturally, this management must also take into account other objectives pursued in the area. During the discussion of the Central Limburg Pond Area, specific objectives were compared against the requirements of *S. depressiusculum*. Most of the conservation objectives formulated for the area—specifically those targeting habitat types such as 3110 (oligotrophic waters containing very few minerals of sandy plains [*Littorelletalia uniflorae*]) and 3130 (oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletalia uniflorae* and/or *Isoëto-Nanojuncetea*), as well as species like the common spadefoot toad (*Pelobates fuscus*)—conflicted with the needs of *S. depressiusculum*; the European tree frog (*Hyla arborea*) was the exception. This study reveals a relatively large overlap between the habitat requirements of the European tree frog (*Hyla arborea*) and *S. depressiusculum*. However, this does not mean that *S. depressiusculum* is actually present wherever management measures for the tree frog have been implemented. Other species that would normally conflict with the requirements of *S. depressiusculum* might potentially coexist in the same area through the use of rotational management." (Author/Google translate)] Address: not stated.

2016

26281 Buczynski, P.; Czachorowski, S.; Stryjecki, R. (2016): What lives in polyhumic rivers? Selected groups of aquatic macroinvertebrates: Odonata, Trichoptera, and Hydrachnidia. 23rd National Benthological Workshop: Polyhumic Rivers: 6-7. (in Polish) [Verbatim/Google translate: "Polyhumic rivers

have only recently been distinguished in Poland, and—at least for the time being—few are known (though they are not numerous in general). Little is known about their macrozoobenthos; even when it has been studied, the specific nature of these watercourses was not taken into account. Three polyhumic rivers flow through the Janów Forests (Lasy Janowskie). Between 1995 and 1997, we conducted faunistic and ecological studies of aquatic invertebrates there, covering—among others—rivers that we now recognize as two polyhumic ones (the Czartosowa and the Lukawica), one intermittently polyhumic one (the lower course of the Bukowa), and several non-polyhumic ones (the middle and lower courses of the Bukowa and four other rivers). This allows for a preliminary assessment of the fauna of polyhumic rivers within a comparative context. We present this assessment based on the best-studied groups: Odonata, Trichoptera, and Hydrachnidia. At the outset of our analysis, we asked whether the specific habitat conditions of polyhumic rivers implied a unique fauna with special characteristics. In the case of the Czartosowa and Lukawica rivers, this proved not to be the case. They were inhabited by species typical of small-to-medium forest rivers—species that are also common in non-polyhumic rivers. The few species unique to these waters were collected only as single individuals, representing incidental occurrences. At the same time, the fauna of polyhumic rivers was quantitatively poorer than that of other rivers—either noticeably (dragonflies, caddisflies) or even drastically (water mites) so. Species richness was also significantly lower. Furthermore, the dominance structure was characterized by a greater prevalence of highly eurytopic species capable of withstanding adverse environmental conditions (e.g., *Aeshna cyanea*). Within the group of rheobionts and rheophiles—crucial for river ecosystems—the greatest depletion occurred among bottom-dwelling species; this was particularly evident in dragonfly assemblages, where psammophilic and lithophilic Gomphidae larvae were entirely absent, and even the pelophilic *Somatochlora metallica* was extremely scarce. In contrast, phytoreophiles occurred at levels comparable to those found in non-polyhumic rivers. Different patterns were observed only at sites associated with fish ponds—specifically, impounded sections receiving water discharge from the ponds. However, these sites hosted a fauna heavily enriched with stagnophilic species, clearly drifting downstream from the ponds or colonizing the most heavily altered, impounded stretches of the watercourse. In contrast, the fauna of the Bukowa River—which is fed by waters that are polyhumic, albeit only partially and intermittently—differed markedly from that of the Lukawica and Czartosowa rivers; it was rich in both quality and quantity, typical of the habitat (dominated by rheobionts and rheophiles), and resembled the fauna of non-polyhumic rivers. In summary, regarding the rivers of the Janów Forests and the animal groups studied, "polyhumic character" appears to act primarily as a limiting factor, impoverishing the fauna both quantitatively and qualitatively. Undoubtedly, these rivers lack significant elements found in non-polyhumic rivers, including any "valuable" species (such as those that are protected or threatened). The primary negative factor is likely the low pH, which is unfavorable for many rheobionts and rheophiles (e.g., Gomphidae and Hydroptilidae). The high concentration of humic acids, which limits light penetration, may also play a significant role. At the same time, it is evident that "polyhumic character" is merely one of many environmental factors—and not necessarily the most important one. Equally significant are parameters typical of forest rivers in general, such as shading, the presence of bankside trees, abundant detritus, and a scarcity of aquatic vegetation. The size of the watercourse is likely important as well, as demonstrated particularly by data from the diverse and

faunistically rich sites along the Bukowa. Naturally, our findings are preliminary. Polyhumic rivers require more detailed study, encompassing a greater number of sites across more areas and a broader spectrum of habitat factors. However, it seems unlikely that significantly different results would be obtained for the macroinvertebrate groups discussed here. However, it is possible that other groups respond differently to the conditions prevailing in these watercourses. Research into the functioning of the macrozoobenthos as a whole—such as its composition at higher taxonomic levels and variations in density and biomass—is also desirable.] Address: Buczynski, P., Dept of Zool., Maria Curie-Skłodowska University, Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

26282 Johansson, F.; Nilsson-Örtman, V. (2016): Flicksländor reagerar snabbt på varmare klimat [Damselflies respond quickly to warmer climate]. Yrfän 4-2016: 19-21. (in Swedish) [Verbatim/Google translate: "An increased interest in dragonflies and damselflies, among the public and researchers, has shown that they respond quickly to climate change. Some species have spread northward while others have declined or disappeared. A study of European damselflies has shown that damselflies in northern Europe can expect a more drastic change than in more southern regions as the climate warms." "One of the fastest periods of warming in the history of the Earth is currently underway. In Sweden, the average annual temperature is expected to increase by between two and three degrees over the next hundred years. This warming poses major challenges for species that have adapted to life in our northern climate. By compiling older and newer finds of Odonata, researchers have been able to see clear traces of climate change over the past half century. In most cases, these have involved species whose northern limit has gradually moved north. But they have also been able to see how species have disappeared from the southern parts of their former range. In recent years, we have studied one of our most beautiful insect groups, the damselflies, to try to understand which species and populations will be the winners and losers in a warmer world. Adaptations to climate change In general, it can be said that there are three ways for plants and animals to survive and adapt when the climate in their living environment changes. Firstly, they can migrate to areas that in the future correspond to the temperature to which they are adapted. This usually means that the distribution of species is moved north, but it can also be shifted towards higher altitudes. Secondly, an individual can change its phenotype – appearance, physiology and behaviour – so that it is better suited to the changed climatic conditions. Examples of characteristics that can be adjusted in this way are the individual's body size or enzyme composition. Such changes can occur through changes in how the individual's genes are expressed, so-called phenotypic plasticity. The genetic code does not therefore need to be changed. The third way for survival is for natural selection to select new genotypes, that is, individuals that are better adapted to the new environment. In this case, changes occur at the gene level of the species or population. However, for new, successful gene combinations to arise, it is necessary that today's populations contain sufficient genetic variation in characteristics that are important for climate adaptation. Studies of damselfly larvae In our research project, we have primarily investigated temperature plasticity, i.e. the ability to change their phenotype as a result of temperature changes, in species and populations of damselfly from southern, central and northern Europe. We have also studied how much genetic variation these species and populations have in this regard. One of the characteristics we have studied particularly intensively is how temperature changes

affect the growth rate of damselfly larvae. In northern Europe, damselfly larvae live as predatory larvae in ponds and lakes for one, two or in some cases more years before leaving the water as adult dragonflies to reproduce. The size and development time of the larva are strongly influenced by the temperature in the environments where they live, i.e. the climate. These characteristics have proven to be extremely important for how successful reproduction will be during the summer. For example, the larva must have time to develop completely during the spring, otherwise it will hatch too late to be able to reproduce before the end of the summer. Larvae that hatch just in time and are large therefore contribute more genes to future generations. Growth & temperature

The growth rate of larvae at different temperatures may be one of the most important factors for the success of the adult dragonfly. In research projects, we have asked the question: How does growth change at different temperatures? More specifically, we asked which species are temperature specialists and which are temperature generalists. A temperature generalist is a species that grows relatively well at most temperatures, while a temperature specialist is a species that grows well within a narrow temperature range but less well at higher or lower temperatures. We studied this along a gradient of 3,600 km, from southern Spain up to northern Sweden. We found that species that had a northern distribution in Europe were temperature specialists, they only grew rapidly at temperatures above 20°C, while species from southern Europe were temperature generalists, they grew relatively evenly at both lower and higher temperatures. As the climate changes, temperature generalists should fare better because they can continue to grow in roughly the same way. Species with a northern distribution, however, should be sensitive to climate change, as small changes in temperature can lead to sharp increases or decreases in their growth rate, with the result that their life cycle falls out of phase with the seasons. The situation for northern species is further worsened by the fact that they will eventually be unable to move further north once they reach the Arctic Ocean. But as none of our Nordic damselflies yet reach that far north, fortunately it will be some time before this becomes a problem. The pattern of temperature generalists in the south and temperature specialists in the north is also reflected in the species we studied. When we compared growth between populations from from the northern and southern parts of a species' range, we found the same pattern: specialists in the north and generalists in the south with regard to growth and temperature. This means that northern populations within a species are likely to be more sensitive to climate change than southern populations, even though they will experience roughly the same temperature increase over the next 100 years. Genetic variation: We have also shown that the genetic variation (variation in genetic predisposition) for growth is lower in northern species and populations of damselflies. However, this only applies to species that have a one-year life cycle. For these, our results suggest that northern species and populations have a poorer ability to respond to climate change because there is not enough genetic variation to respond to environmental change. The evolution of temperature adaptation is therefore slower in northern species and populations. For species that can vary their life cycle length, a more complicated pattern applies with regard to genetic variation in growth. The answer to the question of whether damselflies can adapt to climate change is that it depends on the species and population in question. However, based on our results, we believe that it is likely that we will see greater effects of climate change on biodiversity in northern Europe than in southern Europe in the form of changes in the number and distribution of species.] Address: Johansson, F., Dept of Ecology & Genetics, Animal Ecology, Evolutionary

Biology Centre, Uppsala University, Uppsala, Sweden. Email: frank.johansson@ebc.uu.se

26283 Renaux, A. (2016): Inventaire des Odonates, Lépidoptères et Orthoptères sur la zone humide des Piles (La Saulce, Hautes-Alpes). Faune-PACA Publication n° 58: 27 pp. (in French) ["A total of 223 data points were recorded this year for 30 surveyed species (Table 2), representing approximately one-third of the region's biodiversity. The site's species richness can be described as excellent. Overall, the site hosts the typical assemblage of species associated with freshwater ponds, represented by *Coenagrion puella*, *Ischnura elegans*, *Libellula quadrimaculata*, *Ceragrion tenellum*, and *Sympetrum striolatum*. Species characteristic of streams are also well established, such as *Calopteryx virgo meridionalis*, *Calopteryx splendens splendens*, and *Orthetrum coerulescens coerulescens*. It should be noted that none of the observed taxa have protected status, but four of them are nonetheless threatened: *Coenagrion pulchellum*, *Coenagrion scitulum*, *Sympetrum pedemontanum*, and *Sympetrum vulgatum*."] (Author/DeepL)] Address: <https://cdnfiles2.biolovision.net/www.faune-paca.org/userfiles/FPPubli/FPP58InventaireentomologiquesurlazonehumidedesPiles.pdf>

26284 Sillau, K. (2016): Caractérisation des habitats d'Odonates Gomphidae en Basse-Loire (de Montsoreau à Nantes). Mémoire de stage. Filière Ingénierie des Milieux Aquatiques, département Aménagement et Environnement, Ecole polytechnique de l'Université François Rabelais de Tours: 37 pp. (in French, with English summary) ["As part of the research program "Restauration du lit et Trajectoires Ecologiques, Morphologiques et d'Usages en Basse-Loire" (R-TEMUS) and the "Contrat pour la Loire et ses Annexes", which foresees restoration work in the Loire River bed, the following study purpose was to identify the habitats occupied by Gomphidae larvae. Two patrimonial species, *Gomphus flavipes* and *Ophiogomphus cecilia* were especially concerned. The prospections conducted on 5 sampling areas (4 are analyzed in this report) during the field sampling of September 2016 yet revealed the key importance of the side of the river groynes, slow current sedimentary depositing areas as habitats for the family and the two-targeted species, despite the few specimens obtained. Considering the restoration work lead by the "Contrat pour la Loire et ses Annexes", these areas could be potentially affected by the project. The finding of a few Gomphidae larvae, including some of *Ophiogomphus cecilia* in a slow to mid water speed coarse substratum shallow secondary channel in the witness station Saint-Mathurin allows a first approach on the larvae habitats exceeding manmade structures in the river. It should help to establish the thinking among the restoration actions. Though the results will have to be put in perspective with the following year's field sampling's results, the potential impact of the restoration program of the Loire over the larvae habitats will have to be studied precisely."] (Author)] Address: http://memoires.scd.univ-tours.fr/EPU_DA/LOCAL/2017stg_DAE4-Chinon.pdf

26285 Tarkowski, A.; Karasek, T.; Koperski, P. (2016): Co-occurrence of dragonfly larvae (Odonata) in lowland watercourses. 23rd National Benthological Workshop: Polyhumic Rivers: 50. (in Polish) [Verbatim/Google translate: Dragonflies (Odonata) are associated with aquatic environments, where they lay their eggs and live during their larval stage. They inhabit various types of aquatic environments, such as ponds, small water bodies, and rivers. Many species are associated exclusively with specific types of habitats. While dragonflies generally prefer standing water, they are also found

in flowing waters. Flowing waters constitute a dynamic environment to which organisms must rapidly adapt in response to ongoing changes. Lowland watercourses are the most common type of water body in Poland. Lowlands cover approximately 91.3% of the country and are characterized by elevations not exceeding 300 m a.s.l.; after mountainous areas, they feature the densest river network. Field studies on dragonflies were conducted within three provinces (voivodeships): Mazovian, Lublin, and Warmian-Masurian. A total of 73 dragonfly species have been recorded in Poland. The occurrence of dragonflies is influenced by numerous factors, ranging from vegetation structure, the nature of the streambed, and water flow velocity to the presence of humans altering the aquatic environment. Across all the lowland watercourses studied, an estimated 18 dragonfly species were recorded, representing approximately 25% of Poland's total odonate fauna.] Address: Tarkowski, A., Department of Zoology, Maria Curie-Skłodowska University, ul. Akademicka 19, 20-033 Lublin, Poland. Email: tarkowski890@gmail.com

2017

26286 Jablonski, P.G.; Lee, S.i. (2017): Imitating flush-pursue foraging birds: the role of pivoting body movements interspersed between hops during foraging. *The Korean Journal of Ornithology* 24(2): 51-58. (in English) ["Avian flush-pursuers exploit escape behavior in insects by using displays of spread tails and wings to visually cause insects to escape, when they are pursued by birds in aerial chases. By using simple bird models that approach insects in the bird territories we studied reactions of flies, dragonflies, and two types of moths to the previously unstudied mode of foraging movements comprising displays of the visual patterns, pivoting / pirouetting body movements performed by birds during intermittent pauses between hops along branches or trunks. The results suggest that these pirouetting movements, conspicuously present in flush-pursuing birds, may substantially help the birds to increase the number of prey flushed and available for chase." (Authors)] Address: Piotr, J., Museum and Institute of Zoology, Polish Academy of Sciences, Wilcza 64, 00-679 Warsaw, Poland

26287 Tyrrell, M. (2017): *Dragonfly News* 72. *Dragonfly News* 72: 1-32. (in English) [02: From the Chairman Brian Walker. 03: Our new Conservation Officer - Eleanor Colver Eleanor Colver. 04: Daniele Muir - Scotland Officer. 05: BDS Out & About Pam Taylor. 07: First Dates for 2017 Adrian Parr. 08: Migrant & New Colonist Update Adrian Parr. 09: Beautiful Demoiselle on the move Val Perrin. 10: A boat's eye view Mark Tyrrell. 15: The Japanese Relict Damian Pinguey. 17: White-faced Darter: life-cycle length David Clarke. 18: Common Hawkers and Black Darters in Dartmoor and Exmoor Dave Smallshire. 2:8 BDS Annual Meeting & AGM. 20: BDS Business. 20: Dragonfly hunting for the Vagrant Emperor in Almeria David Chelmick. 21: Southern Emerald Damselflies on the Isle of Wight Peter Hunt. 22: Notes & Observations Mark Tyrrell. 24: Young Naturalist's section. 26: Review.] Address: https://british-dragonflies.org.uk/wp-content/uploads/2023/03/DN72_Autumn2017_web.pdf

2018

26288 Ambrus, A.; Danyik, T.; Kovács, T.; Olajos, P. (2018): Magyarország szitakötőinek kézikönyve. Magyar Természettudományi Múzeum: Herman Ottó Intézet, Budapest: 290 pp. (in Hungarian) ["Dragonflies are rightfully among the best-known and most popular insect groups throughout Europe. A good part of their species have a spectacular appearance,

and most of them can be easily recognized in the field, even without capturing the animal, if you know the important characteristics. Their larvae are suitable for characterizing water types and their condition due to their lifestyle, and therefore they can also be used for nature conservation assessment and monitoring. Based on the above, it is definitely justified that the general public should be able to get their hands on a work that comprehensively presents the Hungarian dragonfly fauna at the current level of our knowledge, in a way that is understandable and abundantly illustrated. The publication of a Hungarian handbook was very timely. The list of species of Hungarian dragonflies needed revision due to the large number of taxonomic and nomenclatural changes, and an improvement review of Hungarian names also became necessary. The reassessment of the Hungarian dragonfly fauna from a conservation perspective was essential, and the work also fills a gap in terms of the fact that it discusses both adults and larvae in detail, publishing useful keys for both. The manual records the known occurrences of each species on a map, presents their habitats and provides instructions for field work and the practical protection of dragonflies. The great value of the work is the excellent visual material in every respect, which is a worthy addition to the similar European works in English, German and French. It is hoped that the book - similarly to publications on birds and butterflies - will popularize the observation and appreciation of natural values on an increasingly wide scale." (Publisher/Google translate)] Address: <https://commerce.nhmus.hu/productdisplay/magyarorsz%C3%A1g-szitak%C3%B6t%C5%91inek-k%C3%A9zik%C3%B6nyve>

26289 Clausnitzer, V.; Kipping, J.; Dijkstra, K.-D. B.; Carr, J.A. (2018): Chapter 6. The status and distribution of dragonflies and damselflies in the Lake Victoria Basin. Sayer, C.A., Máiz-Tomé, L. and Darwall, W.R.T. (2018). *Freshwater biodiversity in the Lake Victoria Basin: Guidance for species conservation, site protection, climate resilience and sustainable livelihoods*. Cambridge, UK and Gland, Switzerland: IUCN. xiv +226pp: 82-98. (in English) [Kenya, Uganda, Tanzania, Rwanda, Burundi; Red List assessments; Patterns of species richness; Overall species richness; Threatened species richness; Endemic species richness; Data Deficient (DD) species richness; Major threats; Habitat loss and degradation; Pollution; Climate change vulnerability; Recommended research and conservation actions; Research actions recommended; Conservation actions recommended; Species in the Spotlight: *Agriocnemis palaeforma*, *Pseudagrion kamiranzovu*; Bibliography.] Address: <https://portals.iucn.org/library/sites/library/files/documents/RL-2018-002-En.pdf>

26290 Cornelissen, I.J.M.; Vijverberg, J.; van den Beld, A.M.; Helmsing, N.R.; Verreth, J.A.J.; Nagelkerke, L.A.J. (2018): Stomach contents and stable isotopes confirm ontogenetic diet shifts of Nile perch, *Lates niloticus*, in southern Lake Victoria. *Journal of Great Lakes Research* 44(6): 1264-1272. (in English) [Tanzania, "Nile perch (*Lates niloticus*), a main target for Lake Victoria's fisheries, shifts its diet from invertebrates to fish during its ontogeny. We combined stomach contents with stable isotopes to study these diet shifts in Mwanza Gulf, southern Lake Victoria. During four seasons between 2009 and 2011 we collected and analysed 6697 stomachs and 516 stable isotope samples of Nile perch. *Caridina* shrimp and haplochromine cichlids were the major food items in Nile perch of 5-40 cm. Based on stomach contents, the shift of dominance of *Caridina* towards haplochromines in the diet varied from 6.7 cm in the southern part of the gulf, to =20 cm in the northern part, possibly related to the higher abundance of *Caridina* in the north. In general isotope-based and stomach-content-

based estimates of Nile perch diets agreed. We observed only two discrepancies: in Nile perch >20 cm, the isotope-based estimates of the contribution of haplochromines to the diet were much lower than based on stomach contents and the contribution of juvenile Nile perch to the diet were much higher in the isotope-based estimates than in the stomach based-based estimates. This discrepancy may be explained by e.g. different timespan-coverages between isotopes and stomach contents, by movements of Nile perch between the Gulf and the rest of Lake Victoria, or by the overlapping isotopic profiles of haplochromines and juvenile Nile perch. With the recent recovery of haplochromines in Lake Victoria, Nile perch appears to rely more on this prey again, as it did in the 1980s." (Authors) The diet includes odonate larvae.] Address: Cornelissen, Ilse, Wageningen Univ. & Research, Aquaculture & Fisheries Group, P.O. Box 338, 6700 AH Wageningen, The Netherlands. Email: Ilsecornelissen@hotmail.com

2019

26291 Palmer-Newton, A.F.; Clausnitzer, V.; Dijkstra, K.-D.B. (2019): The status and distribution of odonates (dragonflies and damselflies) in the Lake Malawi/Nyasa/Niassa Catchment. In: Sayer, C.A., Palmer-Newton, A.F. and Darwall, W.R.T. (eds.) (2019). Conservation priorities for freshwater biodiversity in the Lake Malawi/Nyasa/Niassa Catchment. Cambridge, UK and Gland, Switzerland: IUCN. xii +214pp: 90-107. (in English) [Malawi, Mozambique and Tanzania; Red List assessments; Patterns of species richness; Overall species richness; Endemic species richness; Threatened species richness; Major threats; Habitat loss and degradation; Pollution; Water management; Recommended research and conservation actions; Research actions recommended; Conservation actions recommended; Species in the spotlight: The threatened forest yellowwings: *Allochnemis macleeryi*, *Allochnemis montana*, *Allochnemis abbotti*; The (near) endemics of the lake: *Platycypha caligata*, *Paragomphus nyasicus*; Bibliography.] Address: <https://mozambique.wcs.org/DesktopModules/Bring2mind/DMX/API/Entries/Download?EntryId=44223&PortalId=159&DownloadMethod=attachment>

26292 Schmidt Furieri, K.; Cavassani, C.; Storari, A.P. (2019): As libélulas (Odonata: Insecta) de Conceição da Barra, Espírito Santo, depositadas na coleção zoológica norte Capixaba / CZNC. *Análise Crítica das Ciências Biológicas e da Natureza* 2: 1-9. (in Portuguese, with English summary) ["One of the greatest obstacles to the conservation of tropical biodiversity is the lack of information to prioritize and concentrate efforts on practical actions. This lack of information mainly from the absence of inventories in many areas where few groups have reasonably complete databases. The distribution of the dragonfly fauna of Brazil is little known - only 29% of the Brazilian territory presents data about the richness of Odonata. Knowledge of regional faunas is important to provide numerical data that are closer to the reality of the species in Brazil. This project, therefore, enriches the knowledge about the Odonata order for the State of Espírito Santo, contributing to the knowledge about the Atlantic forest. For this, a database was built for Conceição da Barra, municipality. The database has 60 species distributed in eleven families and 36 genera, including one species in the category insufficient data (DD) at world-class data, four species endangered at nacional level, two species critically in danger and three DD at state level. These results suggest that the fauna of the studied region deserves attention. The conservation of fragments of the Atlantic Forest and its associated ecosystems at Conceição da Barra and the increase of conectivity between them will contribute significantly for the conservation of this insect group.

... Six species had their extinction risk assessed at the global level (IUCN): *Nephepeltia phryne*, *Idioneura ancilla*, *Planiplax arachne*, *Erythrodiplax ochracea*, and *Hetaerina hebe* in the Least Concern (LC) category; and *Mecistogaster amalia* in the Data Deficient (DD) category. Four species were recorded as threatened at the national level: *Leptagrion acutum* in the Critically Endangered (CR) category; *Aceratobasis mourei* and *Leptagrion porrectum* in the Endangered (EN) category; and *Aceratobasis cornicauda* in the Vulnerable (VU) category. Five species listed on the Espírito Santo Red List were recorded: *Leptagrion acutum* and *Idiogomphoides ictinia* in the Critically Endangered (CR) category; and *Aceratobasis mourei*, *Leptagrion porrectum*, and *Perilestes fragilis* in the Data Deficient (DD) category." (Authors)] Address: Schmidt Furieri, Karina, Universidade Federal do Espírito Santo - UFES / Instituto de Pesquisas da Mata Atlântica – IPEMA, Brasil. Email: kfurieri@gmail.com

2020

26293 Forschungsstelle Rekultivierung (2020): RWE-Biodiversitätsstrategie für das Rheinische Braunkohlenrevier (BioDiS) Jahresbericht 2020. RWE Power Aktiengesellschaft, Forschungsstelle Rekultivierung: 185 pp. (in German) ["4.1 Target Species Group: Dragonflies: The project focusing on dragonflies within the context of land reclamation in the Rhenish mining region is set to launch officially in 2022. To assist in developing the project concept, baseline data were collected beforehand at the Hambach reclamation site (Sophienhöhe); these data are presented below. The preliminary study conducted in 2020 aimed to provide an overview of the dragonfly species present at water bodies of varying ages and structural characteristics on the Sophienhöhe. 19 dragonfly species were recorded, including *Erythromma viridulum*, *Erythromma lindenii*, *Coenagrion hastulatum*, *Crocothemis erythraea*, *Sympetrum vulgatum*, and *Anax parthenope*.] Address: <https://www.forschungsstellerekultivierung.de/-/media/Project/Team/Rekultivierung/documents/-biodiversitaet/berichts/jahresbericht-2020-rwe-biodiversitaetsstrategie.pdf?rev=8dc6531c73264eccbfc7f8855cb393-1&hash=45E44A3DC9DCAB8D9A51BAB2DDDE1C8F>

26294 Schwenkmezger, L.; Geske, C. (2020): Der Klimawandel hat Auswirkungen auf die biologische Vielfalt - auch in Hessen. *Jahrbuch Naturschutz in Hessen* 19: 84-88. (in German) ["Although dragonfly habitat quality can suffer from the consequences of climate change, extended growing seasons have a positive effect on the developmental rate of some members of this group. For instance, warming has been observed to enable the production of multiple generations per year (Ott 2010). In a comparative study covering 130 bodies of water in Hesse (with surveys conducted in 1986/87 and 2009/10), Hill & Stübing (2013) documented a marked increase in southern species such as *Aeshna affinis*, *Anax parthenope*, and *Sympetrum meridionale*. At the same time, Frank et al. (2020) suggest that the summer droughts of 2018 and 2019 had significant negative impacts on the breeding waters in Hesse used by various dragonfly species, such as *Aeshna juncea*, *Leucorrhinia dubia*, and *Leucorrhinia pectoralis*." (Authors)] Address: Schwenkmezger, Lisa, Hessisches Landesamt für Naturschutz, Umwelt und Geologie Abteilung Naturschutz Europastr. 10 35394 Gießen, Germany. Lisa.Schwenkmezger@hlnug.hessen.de

2021

26295 Conesa, M. (2021): ARTURO BERNAL SÁNCHEZ. Odonatos en la provincia de Cádiz. Sociedad Gaditana de

Historia Natural. 2021. ISBN: 978-84-09-33790-3. Boln. Asoc. esp. Ent. 45(3-4): 335-336. (in Spanish) [Review.]

26296 Križnar, M. (2021): Kaèji pastirji v fosilnem zapisu [Dragonflies in the fossil record]. *Trdoziv X*(2): 23-24. (in Slovene) [Verbatim: Dragonflies have a long and varied evolutionary history. Their fossil remains date from the Carboniferous to the present day, meaning that members of the order Odonata have been on Earth for over 300 million years. They have survived many extinctions and still remain the rulers of their habitat. During the Late Carboniferous and Permian, representatives of some now extinct groups of close relatives of dragonflies (Odonoptera) lived, including the meganeura or giant dragonfly. In the Triassic, the rudiments of modern forms appear, and in the Early Jurassic, fossils of multi-winged Anisoptera also appear. From the middle of the Mesozoic, the fossil record of dragonflies became a regular companion of many sites, even those from marine environments. Fossil remains of dragonflies are also known from Slovenia, and it is fitting that we present this particular find. In 2007, Tomaž Hitij and Jure Žalohar excavated approximately 12 million-year-old layers in the Tunjske grinceve near Kamnik. At the site, known for its well-preserved fossil fish, including seahorses, they often came across insect remains. A lucky blow with a hammer on a split slab of clay also revealed the remains of a dragonfly, which with some preparation revealed part of the wings. Together with the renowned German zoologist and expert on fossil dragonflies, Wolfgang Zessin, they attributed the found remains of the dragonfly to the new genus and species *Sloveniatrum robici*. The genus was named after Slovenia, and the species after the famous naturalist Simon Robic (1824–1897). Robic was among the first to systematically collect and study fossils from the Tunjice Hills in the second half of the 19th century. At the site near Tunjice, researchers found many other insects in addition to the dragonfly. They discovered the remains of various flies, beetles, ants, wasps and bees. The collections of the Slovenian Museum of Natural History also contain the remains of dragonfly wings and larvae. These fossils come from a similarly old site in Croatia near Radočaj, where many were collected by the museum's first curator, Henrik Freyer (1802–1866). However, *Sloveniatrum robici* still remains the only fossil dragonfly specimen in Slovenian paleontological collections from the territory of Slovenia.] Address: not stated

26297 Vatandoost, H. (2021): Dragonflies as an important aquatic predator insect and their potential for control of vectors of different diseases. *Journal of Marine Science* 3(3): 19-27. (in English) ["... An intensive search of scientific literature was done in "PubMed", "Web of Knowledge", "Scopus", "Google Scholar", "SID", etc Results shows that one of important environmental friendly vector control is biological control, using different predators and other microorganisms for vector and pest control. Dragonflies do eat mosquitos and serve as mosquito predators. They feed on mosquitos and reduce their number in outdoor areas. The dragonflies are scary biters, but they are dangerous to mosquitos. Worldwide results showed that dragonflies are able to control *Aedes*, *Culex* and *Anopheles* mosquito species. The artificial rearing of these predators and releasing for biological control is an appropriate measure for vector control worldwide." (Author)] Address: Vatandoost, H., Dept of Medical Entomology & Vector Control, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. Email: hvatandoost1@yahoo.com

2022

26298 Colver, E. (2022): Dragonfly News 81. Dragonfly News 81: 1-44. (in English) [10 Black Dar 03 Editor's Notes Fiona

McKenna. 04 Trustees' Report Tim Coleshaw. 06 News from you Fiona McKenna. 07 - 08 Sightings Update Adrian Parr. 10 Black Darters of the Long Mynd Andrew Fusek Peters. 13 Dragonfly Conservation Group Update Dr Pam Taylor. 14 Our Work in England Eleanor Colver. 16 News from Scotland Pat Batty and Graeme Walker. 18 Welsh Dragons Eleanor Colver. 20 Wolverhampton's Smestow Valley Local Nature Reserve Julian Cartwright. 22 Spotlight on Eleanor Colver. 24 Young Naturalist Section Dragonflies and me Dave Smallshire. 25 Working with wildlife Colin Marshall. 26 Young Reporter Amelia Bradbury. 28 Beavers Arrive at Dragonfly Hotspot Argaty Red Kites Daniele Muir. 30 Field Notes. 33 Tribute to Don Tagg Brian Spooner and Graham Vick. 34 Field Meetings Mike Averill. 37 - 38 BDS Business Update. 39 Championing Dragonflies Neil Phillips Essex County Dragonfly Recorder. 40 County Dragonfly Recorder Contact Details] Address: https://british-dragonflies.org.uk/wp-content/uploads/2023/03/DN81_Spring2022_web-1.pdf

26299 Djeilal, F.Z.; Mabrek, S. (2022): L'étude de révolution de peuplement d'odonates pour évaluer la qualité des milieux aquatique (Lac Bouarous, Oued Chiffa). Mémoire de fin d'étude en vue de l'obtention du diplôme de Master Académique Science de la Nature et de la Vie, Agroenvironnement et bio-indicateurs, Faculté des Sciences de la Nature et de la Vie Département de Biotechnologie et Agro-écologie, Université de Saad Dahlab-Buda: 94 pp. (in French, with English and Arabian summaries) ["This study was conducted during the spring of 2022 over a three-month period (April, May, and June). It examines the odonate fauna of two distinct habitats—Lake Bouarous and Oued Cliffa—within the El Hamdania sector of Chréa National Park. The results yielded a list of six species distributed across five families. Zygoptera are represented by three families: Calopterygidae (Calopteryx haemorrhoidalis), Coenagrionidae (Coenagrion caerulescens; Enallagma deserti), and Platycnemididae (Platycnemis subdilata). Anisoptera are represented by two families: Gomphidae (Onychogomphus forcipatus) and Libellulidae (Trithemis kirbyi). Analysis of the odonate fauna reveals that Oued Cliffa is richer and more diverse in odonate species than Lake Bouarous; this finding is confirmed by ecological indices, specifically the Shannon-Weaver index and the evenness index." (Authors)] Address: <http://di.univ-blida.dz:8080/jspui/bitstream/123456789/21274/1/96%20M.SP.pdf>

26300 Itac-Bruneau, R (2022): Éléments pour la mise en place d'un protocole simple de suivi d'espèces patrimoniales. Application aux libellules. Conservatoire botanique national de Franche-Comté – Observatoire régional des Invertébrés: 15 pp. + annexes- (in French) ["In Franche-Comté, 26 heritage dragonfly species listed in the Regional Action Plan for Dragonflies of Bourgogne-Franche-Comté are present. Due to the fragility of their populations and the regulatory nature of certain taxa, monitoring is essential for these species. However, such monitoring is still too limited for dragonflies in the region. To facilitate the implementation of such monitoring, this document aims to identify the essential elements to consider when developing a monitoring protocol for dragonflies, and more specifically for heritage species." (Author/Google translate) https://cbnbfco-ori.fr/sites/default/files/2025-02/51-1_Protocole-simple-suivi-odonates_2022_WEB.pdf] Address: Itac-Bruneau, Raphaëlle, 8F, rue Maurice Deslandres, 21000 Dijon, France. Email: r.itacbruneau@yahoo.fr

26301 Massin, Y. (2022): Les Odonates en Île-de-France (2015-2021) Synthèse des données collectées sur faune-iledefrance.org. LPO Île-de-France: 76 pp. (in French) [57 odonate species are presented with details to regional dis-

tribution and phenology.] Address: <https://cdnfiles1.biolovision.net/www.faune-iledefrance.org/userfiles/odonates/-SyntheseOdonatesFauneIDF2021.pdf>

26302 SHNA-OFAB; CBNFC-ORI; OPIE F (2022): Atlas des Odonates de Bourgogne-Franche-Comté. Bourgogne-Franche-Comté Nature, Hors-Série n°17: 446 pp. ["Atlas of Odonata in Burgundy-Franche-Comté Launched in 2010 for an eight-year period (running until the end of 2017), the "atlas" surveys conducted by the *Groupe Odonates Bourgogne* aim to improve regional knowledge regarding the ecology, conservation status, and distribution of Odonata species in Burgundy, and to document these findings—notably through a publication. Contemporary data cover the period from 2000 to 2017, while data from before 2000 are classified as historical (and are also included in the analyses). You can view data by municipality on the Bourgogne-nature website. The survey grid used is based on the Lambert 93 10x10 km system. Burgundy is covered by 376 grid cells. Surveys are continuing through 2017 to fill in data for cells that remain incomplete (those with fewer than 18 recorded species). Following the merger of the regions, a decision was made in 2016 to produce an Atlas for both Burgundy and Franche-Comté, mirroring the work previously carried out on butterflies. Publication of the first Atlas of Odonata for Burgundy and Franche-Comté: Writing of the book is scheduled to begin in 2017. Continuation of the inventory: The regional inventory is ongoing! Significant knowledge gaps remain, and information requires continuous updating. Currently, the *Bourgogne Base Fauna* database is populated by three main sources of information regarding amphibians: - Bibliographic data, which continue to be entered into the database. - Data from naturalist networks—particularly from volunteers—submitted mainly via the *E-observations* platform. - Data from specific OFAB programs. Current state of knowledge in Burgundy: From 01/01/2000 to 25/10/2016: - 40,793 records in the BBF - 12,457 surveys - 8,743 geolocated sites (note: data recorded at the municipality level are not geolocated) - 449 observers." (Publisher)]

2023

26303 Garcia, P. (2023): Synthèse bibliographique des connaissances de l'Aeschna azurée (*Aeshna caerulea*). France Nature Environnement Haute-Savoie: 9 pp. (in French) ["*A. caerulea* is extremely rare in France; indeed, the southern limit of its distribution range lies in Haute-Savoie. In this department, only a few sites where the species is present have been recorded, located in the upper Arve and Giffre valleys. Classified as vulnerable on the Red List of Dragonflies of Metropolitan France (updated in 2016) and included in the National Action Plan for Odonata, this species is rare because it specializes in high-altitude aquatic habitats. It cannot thrive in just any wetland or at any altitude; it requires specific conditions that match its preferred habitat. France Nature Haute-Savoie (FNE74) coordinates the National Action Plan for Odonata for the Auvergne-Rhône-Alpes (AURA) region, specifically covering the Rhône and Alpine areas. In this capacity, FNE74 plays a key role in improving knowledge about—and protecting—the dragonfly species included in the national plan, as well as their habitats. It is within this framework that the organization, supported by the Alpes Sauvage Foundation, has worked to update data on *A. caerulea* and its distribution in Haute-Savoie. The literature review presented here is part of this effort and provides an overview of the knowledge gathered to date regarding this species." (Author/Google Translate)] Address: https://www.fne-aura.org/uploads/2023-05/bibliographie_aacaerulea.pdf

26304 Gumapac, K.R.S.; Lacandula, R.A. (2023): Diversity of macroinvertebrate fauna in Nasuli Spring, Bangcud, Malaybalay City, Bukidnon. *Species* 2023; 24: e30s1520. doi: <https://doi.org/10.54905/disssi/v24i73/e30s1520>: 12 pp. (in English) ["The study assessed the diversity of macroinvertebrate fauna in Nasuli Spring, Bangcud, Malaybalay City, Bukidnon, Philippines. Specifically, the study aimed to: a) Determine the morpho-species composition of macroinvertebrates; b) determine the species diversity of macroinvertebrates; and c) assess the local status of macroinvertebrate species in the study area. The study was done during the month of March 2022 with a sampling effort of 12.5 hours per day once a week. Three different study stations were made. Station 1, the upstream, was geographically located at 8800'02.8"N 125807'36.3"E. Station 2, the midstream, was geographically located at 8800'02.8"N 125807'35.9"E and Station 3, the downstream was geographically located at 8800'03.0"N 125807'35.6"E. Dip netting, surface netting, rock rubbing, light trapping and opportunistic sampling method was employed. A total of 1,924 individuals were collected in three stations belonging to ten order and thirteen families. Common families present in all stations were the family Atyidae, Platycnemididae, Hydraenidae, Culicidae, Thiaridae and Viviparidae. Of all taxa recorded, only *Melanoides* sp. (36%), *Caridina* sp. (26%) and *Sinotaia* sp. (9%) were the most represented taxa. Overall, the diversity of aquatic macroinvertebrates in Nasuli Spring is low based on the classification scheme for the Shannon-Weiner diversity index of the Kruger scale. Signs of human disturbances were evident in the results of decreasing macroinvertebrate diversity. Berger-Parker Index showed that Station 1 is the most disturbed (69.602%), followed by station 2 (62.369%) and station 3 at 43.099%. The assumption that the aquatic macroinvertebrate diversity is high in Nasuli Spring, Bangcud, Malaybalay City is not accepted." (Authors) Odonata are treated at family level.] Address: Gumapac, Kyla Rose, Department of Biology, College of Arts and Sciences, Central Mindanao University, University Town, Maramag, Bukidnon 8710, Philippines. Email: [kylarosesalguero@gmail.com](mailto:kylarosesalguero@centralmindanao.edu.ph)

26305 Hofmann, M.; Jüttner, K.; Winte, H. (2023): Biotopverbundplanung Gemeinde Rot am See (Gemarkungen Hausen, Brettheim, Reubach) 2023. Auftraggeber: Gemeinde Rot am See, Raiffeisenstr. 1, 74585 Rot am See. Auftragnehmer: GEKOPLAN M. Hofmann, Marhördt 15, 74420 Oberrot, Germany: 103 pp. (in German) [Baden-Württemberg, Germany. The study includes measurements to improve habitats of *Coenagrion ornatum*.] Address: https://www.rotamsee.de/fileadmin/Dateien/Cross7/Startseite/Wirtschaft_%26_Leben/Umweltschutz/Biotopverbund/Bericht/Biotopverbundplanung_Rot_am_See.pdf; https://www.rotamsee.de/fileadmin/Dateien/Cross7/Startseite/Wirtschaft_%26_Leben/Umweltschutz/Biotopverbund/BVP-RotamSee-Massnahmen-174047-7064.pdf

26306 Holzinger, W.E.; Komposch, B (2023): Libellen (Insecta: Odonata). In: Komposch Ch. (Red.): Rote Liste gefährdeter Tiere Kärntens. – Naturwissenschaftlicher Verein für Kärnten, Klagenfurt: 631-641. (in German) ["The current checklist of Odonata in Carinthia comprises 64 species across 9 families. The species inventory is considered complete, and the level of faunistic survey coverage is very high. This Red List of threatened dragonflies represents the third statewide assessment of the conservation status of this group of animals. Of the 64 dragonfly species recorded in Carinthia, 26 taxa (41%) are currently classified as "Least Concern" (LC), while 9 species (14%) show signs of potential future threat ("Near Threatened" or NT). For one species (*Chalcolestes parvidens*), the available data are insufficient for classification

("Data Deficient" or DD). A total of 29 species (45%) are threatened to varying degrees: 11 species (17%) are "Vulnerable" (VU), 8 (13%) are "Endangered" (EN), and 9 (14%) are "Critically Endangered" (CR). The primary causes of the threat to Carinthian dragonflies include the structural alteration of water bodies (channelization and hydroelectric power plant construction on running waters, spring tapping, piping of small watercourses, and bank reinforcement on standing waters), fish stocking (associated with intensive pond farming and recreational fishing), the drainage of wetland habitats, the input of pollutants and nutrients into water bodies, and—in the case of bogs and alpine waters—climate change." (Authors.) Address: Holzinger, W.E., ÖKOTEAM – Institut für Tierökologie und Naturraumplanung, Bergmannsgasse 22, 8010 Graz, Austria. Email: holzinger@oekoteam.at

26307 Kennedy, L. (2023): Dragonfly News 84. Dragonfly News 84: 1-40. (in English) ["03: Editor's Notes Lauren Kennedy 04: Chairman's Report Tim Coleshaw 06: News From You Lauren Kennedy 07 - 09: Sightings Update Adrian Parr 10 - 11: Celebrating Hotspots 2023 12 Global BirdFair Pam Taylor 13 - 15: White-legged Damselfly Investigation Ellie Colver 16 - 17: News from Scotland Daniele Muir and Pat Batty 18: Restoration work with John Muir Trust Rob Cochrane 19: Solway White-faced Darters forge ahead in 2023 David Clarke 20: Spotlight on: The Gower Peninsula Ellie Thomason 21: Funding Appeal 22 - 24: Young Naturalist Section; Stover Country Park 25: Adventures at Chartley Moss Tilly 26 - 27: Field Observations 28 - 30: Celebrating 40 years of BDS Photo Competition 31 - 33: Ruary Mackenzie Dodds and Kari de Koenigswarter; Celebrating BDS 34 - 35: Bulgaria and beyond Dave Smallshire 36 - 37: AGM and Annual Meeting 38 - 39: Checklist of the Damselflies and Dragonflies of Britain and Ireland." (Publisher)] Address: <https://british-dragonflies.org.uk/wp-content/uploads/2025/01/DN2023-Autumn-Website-low-res.pdf>

26308 Muzón, J.; Lozano, F.; del Palacio, A.; Ramos, L. (2023): Odonata. Biodiversidad de Artrópodos Argentinos 5: 74-82. (in Spanish, with English summary) ["Odonata, commonly known as libélulas, helicópteros or aguaciles, make up a group of approximately 6000 species of medium to large hemimetabolous insects, with a cosmopolitan distribution. Larvae are aquatic and adults are excellent flyers. They are common in all types of wetlands, and some species even inhabit coastal marine areas such as mangroves. They are widely used as environmental health monitors. It is one of the few groups of invertebrates in which their species' extinction risk has been assessed globally, and it is the only order of insects completely categorized for the Neotropical region. Its state of systematic and biogeographical knowledge has improved remarkably in Argentina in the last two decades. To date, 285 species have been registered, grouped into 89 genera and 15 families (plus one genus incertae sedis), of which the last larval stage of 189 has been described. This contribution provides an updated list of registered species, indicating for each species if the last larval stage is described, its provincial and ecoregional records, its risk of extinction according to IUCN and recent nomenclatural changes." (Authors)] Address: Muzón, J. Laboratorio de Biodiversidad y Genética Ambiental - Universidad Nacional de Avellaneda (BioGeA - UNDAV), Mario Bravo 1460, Piñeyro, 1870 Avellaneda, Buenos Aires, Argentina. Email: jmuzon@undav.edu.ar

26309 Ohba, S.; Ogushi, S.; Goto, N.; Watanabe, R. (2023): The overwintering ecology of *Cybister tripunctatus lateralis*: Do sub-zero temperatures during winter suppress range expansion? Japanese Journal of Environmental Entomology and Zoology 34(3): 101-107. (in English, with Japanese

summary) ["As global warming progresses, overwintering success is key to the colonisation of high-latitude areas by southern-ranging insects. To better understand the overwintering ecology of *Cybister tripunctatus lateralis* (Fabricius, 1798) (Dytiscidae), whose range has expanded since 2010 approximately, we exposed individuals in water tanks to different winter temperatures in various locations across Japan and compared their survival rates. From a series of experiments, it was found that most individuals died when the temperature dropped below freezing. In addition, in an experiment with a tank placed in Nagasaki City, all individuals survived in the 2014/2015 winter season when the temperature did not go below freezing. However, in the 2015/2016 season, when the temperature dropped below freezing, all individuals died in January. Thus, the survival of this species depends on the annual winter temperatures, even in the same region. From the above, it is clear that temperatures dropping below freezing negatively impact the overwintering of this species. According to temperature data in the area where the species has been confirmed in the last 20 years, the average minimum temperature in the coldest month did not reach below freezing. This may be a contributory factor to the recent increase in the range of this species." (Authors) The paper includes a reference to *Pantala flavescens*.] Address: Ohba, S., Biological Laboratory, Faculty of Education, Nagasaki University, 1-14 Bunkyo, Nagasaki, 852-8521 Japan. Email: ooba@nagasaki-u.ac.jp

26310 Surdo, S.; Muscarella, C.; Sarà, M. (2023): Una revisione critica della check-list e della bibliografia degli Odonati della Sicilia. Libro degli Abstract, XXVII Congresso Nazionale Italiano di Entomologia, 12-16 giugno 2023, Palermo: 135. (in Italian) [Verbatim/Google Translate: "Recent fieldwork has enhanced our knowledge of the Odonata of Sicily, laying the groundwork for the creation of the first regional atlas for this group under the auspices of the National Biodiversity Future Center (NBFC - Spoke 3). A critical review of the literature is the necessary first step in this process. This paper presents a critical, annotated checklist of Sicilian Odonata based on works published between 1840 and 2022. A total of 61 species have been confirmed (including 6 retained in the list despite some uncertainty) from among those historically and currently present in Sicily. These represent 64% of the species recorded in Italy and 43% of those recorded in Europe. Various factors—such as a lack of museum specimens and past taxonomic ambiguities—intertwine to make verifying the presence of certain taxa difficult. Furthermore, the ongoing destruction of Sicily's natural aquatic habitats complicates the assessment of historical records made by naturalists prior to the 1970s, which often cited taxa now considered doubtful or synonymized in modern literature. These account for 64% of the species recorded in Italy and 43% of those recorded in Europe. A combination of factors—such as a lack of specimens in collections and taxonomic gaps from the past—makes it difficult to confirm the presence of certain entities. Complicating matters further is the ongoing destruction of Sicily's natural aquatic habitats, alongside historical observations by naturalists—dating up to the 1970s—that reported taxa now considered doubtful or synonymized in modern literature. Some species reported in the past may simply have gone extinct or resulted from transient colonizations of aquatic biotopes that are now severely degraded or lost (e.g., back-dune ponds). We hypothesize this to be the case for *Calopteryx splendens sensu lato*, *Coenagrion castellani*, the unmistakable *Libellula quadrimaculata*, and *Lestes macrostigma*; the presence of *Calopteryx virgo* and *Boyeria irene* is also considered highly doubtful. In any event, these are species

known from only a few records—often dating back to the 19th century—that have not been rediscovered during targeted surveys conducted after 2000. Beyond these six problematic cases, further investigation is required regarding the presence and distribution of *Ischnura pumilio* (observed only once since 2000) and *Chalcolestes parvidens* (for which there are also reports of hybrids with *C. viridis*). Recent decades have seen the arrival of a new wave of species, often of Afrotropical origin. The earliest records, dating to the 1970s and 1980s, involve species such as *Brachythemis impartita* and *Zygonyx torridus*; initially considered accidental visitors, they subsequently established stable populations in Sicily or on Pantelleria (e.g., *Ischnura fountainei*). Two other species (*Brachytron pratense* and *Lindenia tetraphylla*) appear to have colonized the island only in recent years. *Orthetrum chrysostigma*, *Sympetrum sinaiticum*, *Diplacodes lefebvrei*, *Tramea basilaris*, and *Trithemis kirbyi* have been recorded primarily on the islands of the Strait of Sicily, and more sporadically on the main island of Sicily during dispersal events; for the time being, they should be considered accidental occurrences. New arrivals also include the localized colonization (or possible recolonization) of *Platycnemis pennipes* at the island's extreme eastern tip (Messina)—a species previously cited but subsequently excluded from recent checklists. Finally, based on a review of the literature and biogeographical and ecological considerations, we deemed it appropriate to exclude the presence of *Sympetrum depressiusculum*, *S. flaveolum*, *S. vulgatum*, and *Somatochlora* sp.]. Address: Surdo, S., Dipto di Scienze agrarie, alimentari e forestali, viale delle Scienze, Edificio 4, 90128 Palermo, Italy. Email: salvatore.surdo@unipa.it

26311 van Grunsven, R.; Bos, G. (2023): De zwarte heidelibel verlaat de heide [*Sympetrum danae* leaves the heath]. *Vlinders* 2 2023: 10-11. (in Dutch) [Verbatim/google translate: Although the entire genus is called 'heath dragonfly', the black was the only one that really belonged on the heath. In the 1990s, *S. danae* was usually the most numerous dragonfly in fens in late summer. It is even one of the 'acid four', the four dragonfly species that can be very numerous in acidified fens: *Lestes sponsa*, *Enallagma cyathigerum*, *Libellula quadrimaculata* and *S. danae*. This was even looked down upon a bit: if there are a lot of them, it is not a good sign. That has changed now. *S. danae* is easy to recognize by its small size and the large amount of black (figure 1). Females and young males have less black, but with the wide black edge on the abdomen and black legs more than the other dragonflies in the Netherlands. A useful characteristic is the black band on the thorax with three yellow spots. This is also what the scientific name *S. danae* refers to. According to Greek mythology, Danaë was the daughter of Acrisios, the king of Argos. After her father locks her up in a bronze tower, Zeus comes through the bars in the form of a golden rain. From this, the demigod Perseus was born. You can see this golden rain as the golden yellow spots on the thorax of the black darter. The black darter has become a lot rarer in the past thirty years. At first, it seemed that it was becoming less dominant in the fens, a result of the decreasing acidification and therefore actually a good sign. But it didn't stop there: *S. danae* continued to decrease in numbers (figure 1). For example, in the Peel, where large numbers flew in the nineties, it has become a rarity. The number of observations has certainly decreased sharply in the south of the Netherlands, but things are also not going well in the east and north. Although there are of course areas where it is less dramatic, such as the Fochteloër- and Bargerveen and there are also fens where they still live in reasonable numbers, such as the Leersumse veld. In the countries surrounding us we see the same pattern: there too the black darter is decreasing sharply in numbers.

While the black darter is disappearing from the sandy soils, we see the opposite in the low moor. It never occurred here (NVL, 2002), but nowadays we see the highest numbers here. In the Woldlakebos you can now find large numbers of black darters. There are probably two things that happen at the same time, making the high sandy soils less suitable, but the low moors more suitable for the black darter. Black darters live in shallow, nutrient-poor acidic water; this used to be abundant in fens and edges of raised bogs. However, this now seems to be becoming unsuitable, possibly because these places dry up in the summer or because they become too warm for this northern species. What exactly is going on here is unclear and research is currently being conducted into this. In the low moor, these types of places were always absent, because there was a stronger influence of buffered water, it was not acidic enough. However, the hydrology of the low moor areas has changed: in many places there is no longer any groundwater influence. In the plots a little further away from the ditches, rainwater lenses can develop on top of the buffered water. Here it is acidic enough for peat moss and the growth of this can further acidify these types of places. In this way, shallow acidic water can develop for the black darter. In the low moor areas, the water level is regulated and the problems with drying out are therefore much smaller than in the fens. The only darter that was really typical for the heath is therefore also leaving the heath. The low moor may also be a suitable new habitat in the long term, certainly if development towards raised bog is permitted there.]. Address: Van Grunsven, R.H.A., De Vlinderstichting, Mennonietenweg 10, Postbus 506, 6700 AM Wageningen, The Netherlands. Email: roy.vangrunsvan@vlinderstichting.nl

2024

26312 Babor, M. (2024): Field weekend Sod 2024 - Kolpa. *Erjavceja* 39: 24-27. (in Slovenian) ["We chose the Kolpa River as the location for the second field weekend of the Slovenian Odontological Society in 2024. A total of 12 participants attended the field weekend. From 16-VIII to 18-VIII-2024, we were accommodated at the Grduni Biodiversity Experience Center, which is managed by the Kolpa Landscape Park. During the three field days, we surveyed the Kolpa River between Vukovci and Podzemlje, as well as the streams and ponds in its vicinity. In total, we surveyed dragonflies at 21 locations and recorded the presence of 18 species of dragonflies. While it was raining in most of the country during the weekend and temperatures also dropped, we still had temperatures above 35 °C in Bela Krajina. The consequences of the long-term drought were clearly visible, among other things, some streams were almost dry at the time of our visit. The Kolpa River was surveyed at 6 locations, where a total of 8 species of dragonflies were recorded: *Calopteryx virgo*, *Calopteryx splendens*, *Erythromma lindenii*, *Ischnura elegans*, *Platycnemis pennipes*, *Onychogomphus forcipatus*, *Somatochlora meridionalis* and *Orthetrum cancellatum*. The largest number (7) of species was recorded during the canoe survey on the section between Vukovci and Vinica (D96/TM: 518234, 37484). The locality where we recorded the most species during the field weekend was Kal Gornji kal in the village of Hrast pri Vinici (D96/TM: 518234, 37484), which has already provided numerous odontological surprises in the past. These include the only Slovenian data for *Lestes macrostigma* from 1995 (BEDJANIC 1996, KOTARAC 1997) and the 2008 find of *Ceragrion tenellum*, which is otherwise known in Slovenia only from the Primorska region (VINKO 2015). This time, we recorded a total of 10 species here, including *Aeshna affinis*. On the nearby Kal Kršeljivec, 200 m NE of Perudina (D96/TM: 518835, 37532), we were delighted to find *Lestes*

barbarus. In addition to the author of the article, data on the presence of dragonflies were also collected by: Ana Tratnik, Nika Tivadar, Danijel Kablar, Nina Šramel, Nina Erbida and Aljaž Kožuh." (Author/Google translate)] Address: not stated

26313 Bellebaum, J. (2024): Unterschiedliche Nahrungsversorgung junger Trauerseeschwalben *Chlidonias niger* in naturnahen Lebensräumen. *Die Vogelwelt* 141(4): 217-226. (in German, with English summary) ["The provisioning of Black Tern chicks was studied in two traditional breeding areas in northeastern Brandenburg: the Lower Oder Valley (2007–2015) and Lake Parstein (2007). Data on feeding frequency and prey type were collected through visual observations at nests containing chicks of varying ages. Prey items were identified, and the sizes of fish and tadpoles were determined relative to the adult bird's bill length. In the Lower Oder Valley, vertebrates accounted for 58% of the biomass fed to the chicks, whereas large dragonflies predominated at Lake Parstein, making up 56%. The biomass provided increased with chick age and was higher at Lake Parstein than in the Lower Oder Valley; furthermore, in the Lower Oder Valley, the biomass fed in 2014 and 2015 was lower than in 2008. Food supply likely limits breeding success in the Lower Oder Valley—at least in some years—while the provisioning of large numbers of large dragonflies at Lake Parstein enables significantly higher breeding success. These findings confirm the important role of large insects in near-natural habitats for the rearing of Black Tern chicks." (Author/Google translate)] Address: Bellebaum, J., Klosterstr. 6, 02625 Bautzen, Germany. Email: jochen.bellebaum@t-online.de

26314 Borkenstein, A.; Baumann, K. (2024): Zum 75. Geburtstag von Reinhard Jödicke. *Mitteilungen der AG Libellen in Niedersachsen und Bremen* 6: 69-70. (in German) [Niedersachsen, Germany, personalia] Address: Baumann, Kathrin, Lärchenweg 15a, 38667 Bad Harzburg, Germany. Email: alnus-k.baumann@t-online.de

26315 Fischer, C.; Niehaus, G. (2024): Funde von *Onychogomphus forcipatus* in Niedersachsen im Jahr 2023. *Mitteilungen der AG Libellen in Niedersachsen und Bremen* 6: 27-32. (in German) [Germany. 19-VIII-2023, Vechte, Landkreis Graftschaft Bertheim, Niedersachsen; 23 IX-2023, near Bleckede, Neidersachsen.] Address: Fischer, C., Eichenweg 22, 29451 Dannenberg (Elbe), Germany. Email: Christian.Fischer@e-mail.de

26316 Forschungsstelle Rekultivierung (2024): RWE-Biodiversitätsstrategie für das Rheinische Braunkohlenrevier (BioDiS) Jahresbericht 2023. RWE Power Aktiengesellschaft, Forschungsstelle Rekultivierung: 60 pp. (in German) [Odonata are treated at pages 44-46.] Address: <https://www.forschungsstellerekultivierung.de/-/media/Project/Team/Rekultivierung/documents/biodiversitaet/berichts/jahresbericht-forschungsstelle-2023.pdf?rev=549599eb701646899035552f315879b6&hash=FE8D11AA3ED0BCB4392FAD702E286662>

26317 Fukuoka, T.; Tamura, R.; Yamasaki, S.; Ohba, S. (2024): Frozen crickets are a useful prey for rearing the diving beetle *Cybister sugillatus* (Coleoptera: Dytiscidae) larvae: a growth comparison with raised on field-collected prey. *Japanese Journal of Environmental Entomology and Zoology* 35(1): 1-7. (in English, with Japanese summary) ["Populations of many of the diving beetles (Coleoptera: Dytiscidae) in Japan are declining. Effective captive breeding techniques are needed to elucidate the ecology of these species and for ex situ conservation. For the stable rearing and breeding, it is important

to provide appropriate prey for larval growth that can also be supplied continuously. In this study, we reared *Cybister sugillatus* larvae using three prey treatments: field-collected prey (Odonata nymphs and mixed Odonata nymph–tadpole treatments) and frozen crickets. We compared larval survival rates, larval periods, and body sizes of emerged adults among treatments. *C. sugillatus* larvae reared on frozen crickets showed no difference in survival rates compared to field-collected prey. Furthermore, no differences were observed in the total body length and wet weight of the emerged adults. Differences in the larval period were observed in the second instar, which were thought to be due to the effects of prey size and feeding frequency. Therefore, frozen crickets can be a useful alternative food for rearing and breeding *C. sugillatus*." (Authors)] Address: Graduate School of Integrated Science and Technology, Nagasaki University, 1-14 Bunkyo, Nagasaki 852-8521, Japan

26318 Han, D.; Shi, X.; Zheng, Y. (2024): Simulation of complex flow with a hovering dragonfly by multi-direct forcing immersed boundary method. *International Journal of Computational Methods* 23(5), 2441002 (2026): (in English) ["The aerodynamic mechanism of a flapping-wing flighter is very complicated, because of the rapid wing movement and the inherent complex vortex dynamics. In this study, the immersed boundary method, with prediction–correction multi-direct forcing scheme and smooth eddiscrete delta function, was proposed using the open source toolbox OpenFOAMversion7. In the approach, the interaction between fluids and moving rigid boundaries is realized by adding a volume forces source term to the incompressible Navier-Stokes equation. The multi-direct forcing scheme makes the boundaries better meet the no-slip boundary condition, and further, the smoothing technique for the discrete delta function was applied to suppress the non-physical oscillations of volume force. In contrast to most common insects, a dragonfly has two pairs of wings in tandem, and the interactions between forewings and hindwings play an important role in aerodynamic performance. In this study, the single-wing hover with no interaction and the tandem-wing hover with interaction are simulated and compared, the interaction effect reduces the vertical forces on the forewings and hindwings by 14% and 16%, respectively. The above effects are mainly due to the interactions among the vortex structures of tandem wings, which change the pressure distributions of the wing surfaces and the flow field near the wings. In the hovering mode, the average vertical force is equivalent to the gravity of a dragonfly, and the average thrust force is approximately zero. This study reveals the flow characteristics of dragonfly flapping wings, which provides a theoretical basis for designing a series of flapping wing robots." (Authors)] Address: Shi, X., School of Aeronautics & Astronautics, Zhejiang Univ., Hangzhou, Zhejiang 310027, P. R. China. Email Address: shix@zju.edu.cn

26319 Hostnik, M.; Erbida, N.; Šalamun, A.; Bahr, M.; Vinko, D.; Bedjanic, M. (2024): Popis velikega studencarja na območju Mestne občine Ljubljana Besedilo. *Trdoživ XIII*(1): 6-8. (in Slovene) ["Although (mostly occasional) research on Ljubljana's odonate fauna has a history of over a quarter of a millennium, there is no systematic monitoring of dragonflies, neither in Ljubljana nor in Slovenia. In order to reduce this lack of research, both in the field of nature conservation and local history, at least in the heart of the country, we at the Slovenian Odonatological Society (SOD) successfully applied for a small project in response to a call for proposals from the City of Ljubljana. As part of this year's Dragonflies of the Capital project, we are focusing, among other things, on better understanding the distribution of a species of

dragonfly that was included in the annexes of the Habitats Directive at the proposal of Slovenia upon our accession to the EU – *Cordulegaster heros*. In this article, we report on project activities related to this protected species in our country." (Authors/Google translate)] Address: <https://botanicono-drustvo.si/files/2025/03/trdoziv.pdf>

26320 Jödicke, R. (2024): Erinnerungen an Rolf Busse (09.12.1936–26.01.2024). Mitteilungen der AG Libellen in Niedersachsen und Bremen 6: 71-72. (in German) [Obituary] Address: Author deceased

26321 Klausnitzer, B. (2024): Veränderungen der Insektenfauna der Oberlausitz unter dem Einfluss der Klimaerwärmung – ein Überblick. Berichte der Naturforschenden Gesellschaft der Oberlausitz 32: 31-50. (in German, with English summary) ["Changes in the insect fauna of Oberlausitz under the influence of global warming – an overview: Examples are given of insect species originating from the Mediterranean region that, in the course of their range expansion, have reached Oberlausitz and been able to colonise successfully. Thermophilic species of the indigenous fauna have been detected much more frequently in recent decades. Reference is made to immigrations that took place earlier, around 2000 years ago. Global warming also leads to changes in voltinism and influences physiological parameters. Some species are changing their habitat preference to avoid the extreme summer conditions. Climate warming has a considerable influence on the synchronisation of individual links in biocenotic associations. For species of the greenhouse fauna, there are probably opportunities for colonisation outdoors." (Author) A brief chapter is devoted to *Crocothemis erythraea*.] Address: Klausnitzer, B., Lannerstr. 5, 01219 Dresden, Germany. Email: Klausnitzer.col@t-online.de

26322 Lieckweg, A. (2024): Erste Funde von *Coenagrion scitulum* in Niedersachsen. Mitteilungen der AG Libellen in Niedersachsen und Bremen 6: 33-36. (in German) [Detailed information on identification characteristics in the field is provided.] Address: Lieckweg, Ariane, Artillerieweg 9, 26129 Oldenburg, Germany. Email: ariane.lieckweg@web.de

26323 Sabeder, N. (2024): Work of the dragonbeat group at the student biology camp Poljane 2024. *Erjavecia* 39: 39-44. (in Slovenian) [Detailed report of the Student Biology Camp (DBT) from 4-VIII to 11-VIII-2024 in Styria/Slovenia; 35 odonate species are documented.] Address: not stated

26324 Salamun, A.; Vinko, D. (2024): BIOBLITZ 2024 – CRMOŠNJICE. *Erjavecia* 39: 44-46. (in Slovenian) ["Intensive 24-hour censuses of as many organisms as possible in a selected area are already firmly anchored in the consciousness and spring calendar of a large number of field biologists and other nature lovers, so the 8th BioBlitz Slovenia certainly does not need a special presentation. Even less so among dragonfly lovers, who are always represented in large numbers. Our society was a co-organizer of all previous BioBlitzes Slovenia, and this time, as several times before, we were the first among equals. In addition to the Slovenian Odonatological Society, the organizers were also the Herpetological Society – *Societas herpetologica Slovenica*, the Botanical Society of Slovenia and the Center for Fauna and Flora Cartography (CKFF), and this time for the second time in a row also the Environmental Agency of the Republic of Slovenia (ARSO) with the LIFE NarclS project (project LIFE19 GIE/SI/000161-LIFE NarclS), which also financially supported the event. This time, on June 7 and 8, 2024, we explored the area around Crmošnjice and the Crmošnjica stream with its tributaries,

starting from the Center for School and Extracurricular Activities (ČŠOD) Lipa in Crmošnjice. This time, we also displayed the data entry live on the CKFF website. The obtained results can be viewed on the Bioportal.si website and in the nature information system - NarclS, where data from past events are also available. More information is published on the permanent BioBlitz pages at <http://bioblitzslovenija.weebly.com>, in the 25th issue of the *Trdoživ* magazine and on the BioBlitz Slovenia Facebook page, where photos from the event are also published. Out of a hundred participants from 35 organizations or individuals, 88 enumerators contributed data by the time the *Erjavecia* bulletin was published. We collected 3,322 data on 1,199 taxa and 1,078 species. In the evening, we were also able to listen to a lecture by Urša Mežan from ARSO about the NarclS information system, which, among other things, presented to us what this emerging information system already knows about this year's selected area. For example, we learned that before BioBlitz, NarclS had included finds of 56 taxa for this year's census area. Data on dragonflies was contributed by 20 census takers. In addition to the Crmošnjica stream and the tributary Divji potok, we also examined the mud, two reservoirs, the remains of a fish farm and a pond in a quarry. The find of a dragonfly larva in the Jama v Mašlje Cave is interesting. In total, we counted 13 species [including *Thecagaster bidentata* and *Cordulegaster heros*], two finds were not determined to the species (TABLE 1). As much as a third of the data are observations of *Calopteryx virgo*, and we collected a total of 32 data at 15 localities. Only the blue dragonfly was counted twice at the same locality. We found larvae or larvae of 7 species and 2 genera. For 2 species, larvae were the only finds. No wonder, considering that the weather was traditionally rainy and cloudy for BioBlitz. Which certainly will not deter us from participating in large numbers at the upcoming BioBlitz 2025 event. Let us also add that the BioBlitz Slovenia event received a prestigious national award at the end of October 2024 - the Slovenian NATURA 2000 Award. This is organized on the model of a similar European award in the LIFE integrated project for enhanced management of NATURE 2000 in Slovenia (LIFE-IP NATURA.SI) and rewards examples of good practice in the management of NATURE 2000 areas in Slovenia with long-term effects. The event, which has been jointly organized for 8 years by the Slovenian Odonatological Society, the Botanical Society of Slovenia, the Center for Fauna and Flora Cartography and the Herpetological Society – *Societas herpetologica slovenica*, became the winner in the category of Slovenian innovative achievements of science for Natura 2000 with the entry "BIOBLITZ SLOVENIA - annual flash census of fauna, flora and fungi in a selected area by foreign and Slovenian professional public". (Authors/Google translate)] Address: Vinko, D., Slovene Dragonfly Society, Verovškova 56, 1000 Ljubljana, Slovenia. Email: damjan.vinko@gmail.com

26325 Schiel, F.-J.; Riexinger, W.; Hunger, H. (2024): Nachruf auf Bernd Kunz. *Mercuriale* 24: 1-5. (in German) [Baden-Württemberg, Germany, obituary] Address: Schiel, F.-J., Inst. Naturschutz und Landschaftsanalyse, Turenenweg 9, 77880 Sasbach, Germany. E-mail: Franz-Josef.Schiel@INULA.de

26326 Vareira, L.V. (2024): Tropical freshwater ecosystem type influences dragonfly species spatial distribution in an estuarine island. MSc thesis, Programa de Pós-Graduação em Ecologia, Instituto de Ciências Biológicas, Universidade Federal do Pará, Belém: 35 pp. (in English, with Portuguese summary) ["We examined how environmental heterogeneity (EH) and site connectivity drive dragonfly species distribution in lotic and lentic water bodies. We expected: (i) distinctive species composition and increased beta diversity in

lotic sites; (ii) an inverse relationship of beta diversity components (turnover and nestedness) with EH and (iii) connectivity. We sampled dragonfly adults and environmental variables in 23 lotic and 19 lentic water bodies within a protected area (APA Marajó), using the overland distance for connectivity assessment. Lotic and lentic water bodies exhibited contrasting environmental conditions and species composition, with several dragonfly species found in both water body types, which may be habitat generalists. The beta diversity was mainly because of turnover and was higher in lentic water bodies. EH and connectivity influenced beta diversity and turnover across the entire metacommunity, but no relationships were observed after separating sites by water body type. The environmental variation of water bodies sustains significant dragonfly diversity, providing dispersal pathways for colonization and occupancy of adequate habitats, enhancing species persistence. Sets of different freshwater ecosystems form heterogeneous networks which are shared sources of aquatic organisms, therefore, we highlight the inclusion of several freshwater ecosystems in the conservation planning of protected areas or for biodiversity monitoring." (Author)] Address: https://ppgeco.propesp.ufpa.br/AR-QUIVOS/dissertacoes/2024/Vers%C3%A3o-final%20-%20Dissertacao_Luisa_Vareira_FINAL.pdf

26327 Vaulin, D.E.; Zykov, I.E. (2024): Changes in the dragonfly fauna of small rivers of the Meshchera lowland during periods of low water. Ecological problems of natural and urbanized territories. Proceedings of the XIII International scientific and practical conference. Astrakhan, 2024: 13-15. (in Russian, with English summary) ["Data on changes in the species composition of Odonata of the rivers of the northern Meschera during periods of low water. The connection of changes in the hydrological regime with the biology of the represented species installed. The conclusion is made about the species depletion of rheophilic bottom ecosystems under the influence of climatic changes." (Authors)] Address: Vaulin, D.E., State Educational Institution of Higher Education of the Moscow Region, "State University of Humanities & Technology", Orekhovo-Zuevo, Russia

26328 Vinagre, S.F.; Calvão, L.B.; Córdoba-Aguilar, A.; Guillermo Ferreira, R.; Juen, L. (2024): Microhabitat selection and thermoregulation in Amazonian dragonflies. *Journal of Thermal Biology* 125, 103998: (in English) ["Insect eco-physiological traits are important for understanding their distribution and habitat selection especially in the face of land use change. We estimated the average temperature of the thoracic surface of 20 Odonata (Insecta) species and classified them into thermoregulation categories according to their preferences for sunny or shaded habitats to assess their temperature variation. We tested the influence of air temperature and six morphological metrics related to thorax and abdomen size. We expected that: (i) heliothermic species would have higher thoracic temperatures compared to thermoconformer species; (ii) Zygopterans, due to their smaller body size, are less efficient at maintaining a constant body temperature relative to the air when compared to anisopterans; (iii) thorax volume would cause an increase in Odonata thoracic temperature, and abdomen length would cause a decrease. The study was conducted at 18 Amazonian streams in Eastern Amazonia. We observed differences of 2.5°C in thoracic temperature between heliothermic and thermoconformer species, as predicted in the first hypothesis. Both suborders, Zygoptera and Anisoptera, use different morphological and environmental variables to control temperature. While Zygoptera thoracic temperature oscillated near and below air temperature (-1.28 ± 0.62), Anisoptera maintained temperatures

above air temperature (1.81 ± 1.96). Air temperature influenced only the increase in Zygoptera thoracic temperature, supporting our second hypothesis. The third hypothesis was corroborated for order Odonata, but partially for its suborders. Zygoptera thoracic temperature was only related to abdomen length, which was proportional to a temperature decrease. Anisoptera temperature showed a relationship only with thoracic metrics, especially thorax volume, which had a significant contribution to temperature increase. Despite the observed differences, which varied according to size, we noted exceptions in the thermal characteristics of some species that deviated from these predictions. Therefore, we emphasize the importance of considering the interaction of other eco-physiological aspects in dragonfly temperature regulation." (Authors)] Address: Vinagre, Suellen Furtado, Programa de Pós-Graduação em Ecologia Aquática e Pesca (PPGEAP), Núcleo de Ecologia Aquática e Pesca da Amazônia (NEAP), Universidade Federal do Pará (UFPA), Rua Augusto Correia, N°1, Bairro Guamá, Belém 66075-110, Pará, Brasil. Email: suellenfurtado@hotmail.com

26329 Wildermuth, H.; Kohl, S.; Hunger, H.; Schiel, F.-J. (2024): Erinnerungen an Rudolf Osterwalder (03.09.1953 - 25.01.2025). *Mercuriale* 24: 6-7. (in German) [Switzerland, obituary] Address: Wildermuth, H., Haltbergstr. 43, 8630 Rütli, Switzerland. E-mail: hansruedi@wildermuth.ch

26330 Zessin, W., Brauckmann, C.; Groning, E.; Leipner, A. (2024): New Meganisoptera (Odonatoptera) from the Piesberg quarry (Carboniferous, Westphalian) near Osnabrück, Germany. The 9th International Conference on Fossil Insects. Arthropods and Amber - April 18-25, 2024 Xi'an, China: 112- (in English) [Verbatim: The Pennsylvanian (late Carboniferous: Moscovian, Westphalian D/Asturian) insect fauna of the Piesberg quarry, N Osnabrück, Lower Saxony, Germany with hitherto nearly 1,600 registered specimens shows a great diversity. It includes more than 20 samples of Odonatoptera from several horizons. Only 4 species (belonging to four families) have been described (Brauckmann, 1983; Zessin, 2006; Zessin et al., 2021a; Zessin et al., 2021b). The research is still continuing. Beyond the majority of mainly isolated wings of imagines (Palaeoptera and Neoptera, mainly introduced by Brauckmann & Herd, 2002; 2006), also non-odonatopteran larvae were reported (Kiesmüller et al., 2019). Due to the large number of new taxa and the high diversity of the palaeontomofauna, the Piesberg site belongs to the most important localities for Pennsylvanian (Late Carboniferous) insects and has reached international scientific meaning (Leipner et al. 2021). Of special interest are Osnabrugiala seppelti Zessin, Brauckmann & Groning, 2021 (probably basal Odonatoptera) and Sowiakala perprocera Zessin, Brauckmann & Leipner 2021 (Protozygoptera). Additionally, some of the yet undescribed specimens of Odonatoptera from Piesberg are documented here for the first time.] Address: Zessin, W., Lange Str. 9, 19230 Jasnitz, Germany. E-mail: zessin@zoo-schwerin.de

26331 Zhang, K.; Su, X.; Zhao, Y. (2024): The thrust balance model during the dragonfly hovering flight. *Bioinspiration & Biomimetics* 20(1): (in English) ["In recent years, the micro air vehicle (MAV) oscillations caused by thrust imbalances have received more attention. This paper proposes a dual-wing thrust balance model (DTBM) that can solve the above problem by iterating the modified rotation angle formula. The core control parameter of the DTBM model is the α angle, which refers to the angle between the wing surface and the stroke plane at the mid-stroke position during the upstroke. For each degree change in the α angle, the range of variation in the dimensionless average thrust coefficient is between 0.0225 and 0.0268. A thrust coefficient of

0.0225 causes the dragonfly to move forward by 9.037 cm in one second, which is equivalent to 1.29 times its body length. By using DTBM, the average thrust coefficient can be reduced to below 0.001 in just a few iterations. No matter how complex the motion pattern is, the DTBM can achieve thrust balance within 0.278 seconds. Through our research, when selecting the deviation angle motion of real dragonflies, the dual-wing angles exhibit a highly linear correlation with wing spacing, called linear motion. In contrast, the nonlinear variation of the α angle appears in the hindwing of the no-deviation motion and the forewing of the elliptical deviation motion. All of the nonlinear changes are referred to as nonlinear motion. Nonlinear variation of the α angle arises from larger disturbances of the lateral force during the upstroke. The stronger lateral force is closely related to the flapping trajectory. When the flapping trajectory causes the dual-wing to closely approach each other in the mid-stroke, a continuous positive pressure zone forms between the dual-wing. The collision of the leading-edge vortex and the shedding of the trailing-edge vortex is the special flow field structure in the nonlinear motion. Guided by the DTBM, future designs of MAVs will be able to better achieve thrust balance during hovering flight, requiring only the embedding of the iteration algorithm and prediction function of the DTBM in the internal chip." (Authors)] Address: Zhang, K., School of Hydraulic Engineering, Dalian University of Technology, Dalian 116024, People's Republic of China

2025

26332 Abdisa, R. (2025): Abundance and distribution of Odonata in different land use types along stream in Jimma Zone, Southwest Ethiopia. MSc thesis, Jimma University College of Agriculture and Veterinary Medicine: VII + 38 pp. (in English) ["Aquatic ecosystem especially freshwater ecosystems are sensitive to human activities such as land use change which have significant effect on aquatic organisms. Aquatic insects such as Odonata are sensitive to environmental changes and provide essential ecological services, such as bioindicators of freshwater ecosystem health, and usually used as indicators surface water quality indicators. However, limited studies on the abundance and distribution of dragonflies and damselflies in different land uses types in Ethiopia. This study aimed to assess the distribution and abundance of Odonata along streams draining in different land uses in southwest Ethiopia. For this study adult dragonflies and damselflies were counted and sampled along streams draining in three dominant land uses namely forest, mosaic and agriculture in Jimma Zone. From a total of 958 adult Odonata specimens collected from thirty sites 425 and 533 were identified as Anisoptera and Zygoptera respectively. The estimated sex ratio was male biased for both Anisoptera and Zygoptera. The abundance of Zygoptera was significantly higher in streams draining in mosaic and agriculture as compared to forest streams while no significant difference observed for Anisoptera. In addition to catchment dominant land use, buffer local condition such as proportion of sunlight and wetland along stream buffer also significantly affected their abundance and distribution. Higher proportion of sunlight in the stream buffer favored the abundance of both Anisoptera and Zygoptera in agriculture and mosaic dominated catchments as compared to forest dominated catchments. Our study showed that catchment land use and local stream buffer condition affect the abundance and distribution of adult Odonata. Further study is important to understand the response their larvae and adult Odonata to stream water quality and substrate condition." (Author)] Address: <https://repository.ju.edu.et/bitstream/handle/123456789/9844/Rebuma%20Abdisa.pdf?sequence=1&isAllowed=n>

26333 Basyari, S.; Wibowo, N.A.A.; Suseno, Z.N. (2025): Keanekaragaman Jenis Capung (Odonata) dan Hubungannya dengan Vegetasi di Sungai Winongo, Bantul, Yogyakarta [Diversity of dragonfly species (Odonata) and their relationship with vegetation in the Winongo River, Bantul, Yogyakarta]. Jurnal Riset Daerah Kabupaten Bantul 25(1): 12-26. (in Indonesian, with English summary) ["Research on the diversity of dragonflies in the Winongo River, Bantul Regency, Yogyakarta is very important to be carried out as an effort to obtain basic data for further research. The purpose of this study was to determine the types of Odonata and the effect of vegetation on the diversity of dragonflies as bioindicators in the Winongo River, Bantul, Yogyakarta. The purposive technique was used to determine the data/sampling stations based on differences in vegetation around the Winongo River. The first location is on the banks of the river with vegetation dominated by bamboo clumps. The second location is on the edge of the river with heterogeneous vegetation. The third location on the banks of the river is a rice field. The fourth location is on the banks of the Winongo River in the form of a settlement. The study was conducted for 5 months, namely April to August 2024. The time for collecting research data was carried out in the morning at 08.00-10.00 and in the afternoon at 16.00-18.00 when the dragonflies were active. The observation data were then analyzed using qualitative descriptive techniques. The results of the study showed that there were 23 species in the Winongo River, Bantul Regency, Yogyakarta, consisting of 20 genera and 6 families from 2929 individuals that were successfully recorded. The diversity of dragonflies in the Winongo River, Bantul Regency, Yogyakarta is included in the good category with a Diversity Index of 1.93. The highest Diversity Index is found in the rice field habitat type, namely 1.94 with the largest number of dragonfly species (17 species). In habitat types with low light intensity such as bamboo groves and heterogeneous habitat types, it is dominated by *Libellago lineata*, reaching 70.41% and 41.40% respectively. In more open habitats with high light intensity such as rice fields and settlements, it is dominated by *Brachythemis contaminata*, reaching 32.51% and 63.31% respectively." (Authors) *Anax guttatus*, *Ictinogomphus decoratus*, *Macrogomphus parallelogramma*, *Paragomphus reinwardtii*, *Brachythemis contaminata*, *Crocothemis sevelia*, *Onychothemis culminicola*, *Orthetrum sabina*, *Pantala flavescens*, *Potamarcha congener*, *Rhodothemis rufa*, *Tholymis tillarga*, *Trithemis aurora*, *Zyxomma obtusum*, *Libellago lineata*, *Copera marginipes*, *Prodasineura autumnalis*, *Agriocnemis femina*, *Agriocnemis pygmaea*, *Ischnura senegalensis*, *Pseudagrion microcephalum*, *Pseudagrion pruinosum*, *Pseudagrion rubriceps*] Address: Basyari, S., SMP Unggulan 'Aisyiyah Bantul, Indonesia. Email: basyarishaim@gmail.com

26334 Bedjanic, M. (2025): Osebná izkaznica: Dristavčni Spreletavec (*Leucorrhinia pectoralis*). Trdoživ 14(1): 27- (in Slovene) [Slovenia; brief introduction into *L. pectoralis*.] Address: Bedjanic, M., Rakovlje 42a, 3314 Braslove oz. Email: mat-jaz_bedjanic@yahoo.com

26335 Borkenstein, A.; Baumann, K. (2025): Erinnerung an Wolfgang Specht (27.03.1948 – 06.08.2024). Mitteilungen der AG Libellen in Niedersachsen und Bremen 7: 95-96. (in German) [Niedersachsen, Germany, obituary] Address: Borkenstein, Angelika, Lebensborner Weg 5, 26419 Schortens, Germany. Email: angelikaborkenstein@t-online.de

26336 Borkenstein, A.; Jödicke, R. (2025): Lebensbilder von *Sympetrum depressiusculum* an den Ahlhorner Teichen. Teil 1: Frühmorgens am Schlafplatz (Odonata: Libellulidae). Mitteilungen der AG Libellen in Niedersachsen und Bremen

7: 35-48. (in German) [Verbatim/Google translate: Since discovering a roosting site of *S. depressiusculum* just a few hundred meters from the Ahlhorn fish ponds in the summer of 2014, we have repeatedly returned to witness one of the most fascinating behavioral spectacles of our native dragonfly fauna (Benken et al. 2021). The species rests in communal roosts at night. In the early morning, the males—often covered in dew—become active, cleaning themselves; with their first wingbeats, they send the dew flying around them like droplets of pearl. The colder the temperature, the more vigorously they must flap their wings to reach the necessary operating temperature before finally taking flight to couple with a female. To experience all this—and, above all, to capture it photographically—we had to rise early. The drive to Ahlhorn alone takes at least an hour and a half, and we wanted to be on-site by sunrise at the latest to survey the roosting population and scout for photo opportunities. Consequently, throughout the years since 2014, we have constantly monitored weather forecasts between mid-August and October, aiming to be on-site as often as possible under favorable conditions: cold temperatures, high humidity, and calm winds. In the early years, we marveled at the large numbers of dragonflies and were able to refine our photographic compositions. Unfortunately, the number of roosting individuals has steadily declined in recent years. Although the species continued to fly and reproduce in the pond area through 2024, the formation of tandem pairs in the morning could no longer be observed at the roosting site. We therefore feel it is all the more important to present a selection of our photographic impressions from the morning roost here. We have included an annotated photo gallery below. With the exception of Figure 1, all photos were taken at the roosting site near the "Almsweg Wasserzug" in the Oldenburg district.] Address: Borkenstein, Angelika, Lebensborner Weg 5, 26419 Schortens, Germany. Email: angelikaborkenstein@t-online.de

26337 Borkenstein, A.; Jödicke, R. (2025): Zum Vorkommen melanisierter *Sympetrum striolatum* und *S. vulgatum* in Nordwestdeutschland (Odonata: Libellulidae). *Libellula* 44(3/4): 189-198. (in German, with English summary) [On the occurrence of melanised *Sympetrum striolatum* and *S. vulgatum* in north-western Germany (Odonata: Libellulidae). A small proportion of emerging *S. striolatum* was documented being strikingly melanised, which was also true for two *S. vulgatum*. Almost all records were kept in several years at a garden pond in northwestern Germany. The degree of pigmentation differed individually. The melanised *S. striolatum* differed from the blackenig "nigrescens" morph, which was described from the north of Great Britain. The cause of the strong pigmentation is discussed but remains unexplained." (Authors)] Address: Borkenstein, Angelika, Lebensborner Weg 5, 26419 Schortens, Germany. Email: angelikaborkenstein@t-online.de

26338 Chovanec, A. (2025): Libellenkundliche Untersuchung des Naturschutzgebietes Eichkogel in Niederösterreich. Studie im Auftrag des Österreichischen Naturschutzbundes Landesgruppe Niederösterreich: 93 pp. (in German, with English summary) ["In this study, the dragonfly fauna of the Eichkogel Nature Reserve in Lower Austria is documented. The nearest aquatic habitats to this dry site are located approximately 1km away (standing waters) and just under 2km (running waters). The investigation also seeks to enhance our understanding of how Odonata use terrestrial habitats. The dataset is based on a total of 44 field excursions conducted between 2011 and 2025, with the majority of surveys taking place in 2023 (9), 2024 (10), and 2025 (15). A total of 23 dragonfly species were recorded at the Eichkogel: four species from the Zygoptera and 19 from the Anisoptera. Seven of

the nine Odonata families known to occur in Austria and Lower Austria were represented by at least one species. With ten species, the Libellulidae represented the most species-rich family, followed by the Aeshnidae with six species. The 23 species documented correspond to approximately 34 % of the currently confirmed inventory of 68 dragonfly species in Lower Austria. In 2025, fifteen surveys were conducted, covering all phenologically relevant periods from an odonatological perspective. These surveys yielded records of 22 species. The excursion with the highest number of species observed took place on 14 July 2025, with seven species recorded; on several other dates, six species were noted. Throughout the entire study period from 2011 to 2025, the majority of recorded sightings pertained to *Sympetrum striolatum*. This species was detectable within the study area during every decade of the month from the final third of July to the final third of November. Both typical lentic species and those dependent on lotic habitats were observed. Eleven species are listed in Austria's Red List of threatened dragonflies from 2006; *Sympetrum meridionale* is classified as "critically endangered." Representatives of all phenological guilds deemed relevant from an odonatological perspective were documented at Eichkogel. • Overwintering species: *Sympetma fusca*; • Spring/Early summer species: *Isoaeschna isocles*, *Gomphus vulgatissimus*, *Cordulia aenea*, *Libellula depressa*, *L. fulva*, *L. quadrimaculata*; • Early summer/Midsummer species: *Calopteryx splendens*, *C. virgo*, *Platycnemis pennipes*, *Aeshna affinis*, *Anax imperator*, *A. parthenope*, *Onychogomphus forcipatus*, *Orthetrum brunneum*, *O. cancellatum*, *O. coerulescens*; • Midsummer/Autumn species: *Aeshna cyanea*, *A. mixta*, *Sympetrum meridionale*, *S. sanguineum*, *S. striolatum*, *S. vulgatum*. The Eichkogel serves as habitat for maturation and foraging, as well as roosting and resting site for dragonflies, and in the case of *S. fusca*, as a (late) summer, autumn and winter refuge. Mating wheels (in *A. mixta*, *S. striolatum*) and a tandem formation (in *S. striolatum*) were also observed. The 21 surveyed observation areas (A) were assigned to four habitat types: "woodland-meadow ecotone" (10 A), "meadow" (5 A), "forest path" (5 A), and "small clearing" (1 A). Most species (21) were documented in the habitat type "woodland-meadow ecotone". However, the most species-rich observation area belonged to the habitat type "forest path" with twelve species recorded. In the habitat types "meadow" and "small clearing", three species were observed in each. A clear preference for specific habitat types was noted among the following taxa: • *Calopteryx* spp., *Aeshna cyanea* "forest path"; • Aeshnidae, *Sympetma fusca*, *Sympetrum striolatum* "woodland-meadow ecotone"; • *Anax imperator* both "woodland-meadow ecotone" and "meadow" *Calopteryx virgo*, *A. imperator* and *S. striolatum* were recorded in eight of the 21 observation areas; *C. virgo* and *S. striolatum* were found at least once in all four habitat types. With the exception of two species, all Odonata recorded at the Eichkogel have also been observed in recent years during systematic surveys and exploratory visits to the standing and running waters in the surrounding area." (Author)] Address: Chovanec, A., Krottenbachgasse 68, 2345 Brunn am Gebirge, Austria. Email: andreas.chovanec@bml.gv.at

26339 Conze, K.-J.; Spengler, T. (2025): In memoriam Hans-Joachim Clausnitzer (11.01.1942-19.12.2024). *Libellula* 44(1/2): 137-143. (in German) [Obituary of an odonatologist who profoundly influenced odonatology in Germany from the 1980s onwards.] Address: Conze, K.-J., Hamburger Str. 92, 45145 Essen, Germany. Email: kjc@loekplan.de

26340 Donath, H. (2025): Naturdenkmal Kiesgrube Gießmannsdorf - das erste Jahr nach der Renaturierung. Biologische Studien Luckau 53: 29-36. (in German) [Brandenburg, Germany. Between 21-III and 6-XI-2025, 24 Odonata species have been recorded.] Address: Donath, H., Caule Nr. 1, D-15926 Zieckau, Germany

26341 Donath, H. (2025): Erstnachweis für die nordwestliche Niederlausitz: Saphirauge (*Erythromma lindenii* (SELYS 1840)) bei Bornsdorf. Biologische Studien, Luckau 53: 95-96. (in German) [First record of *E. lindenii* in Brandenburg, Germany, Neue Grube Bornsdorf, 11.08.25.] Address: Donath, H., Caule Nr. 1, D-15926 Zieckau, Germany

26342 Donath, H. (2025): David gegen Goliath: Schilfradspinne erbeutet Große Königslibelle. Biologische Studien Luckau 53: 93. [Verbatim: During a visit to Lichtesee, south of Krausnick, on July 25, 2025, I attempted to photograph some insects. While doing so, I noticed a male *Anax imperator*—apparently at rest—on the western shore. Upon closer inspection, the dragonfly—which, with a body length of 8 cm, is one of the largest native insects—appeared to be in an unnatural posture. Investigating the cause, I saw that a spider had a firm grip on the insect's head. The photograph clearly shows a reed orb-weaver spider (*Araneus cornutus*). According to Bellmann (1984), this orb-weaver—which grows up to 12 mm in size—is characteristic of waterside habitats and can be found there year-round. While smaller dragonfly species likely constitute the spider's preferred prey, even the large ones are evidently not safe from its surprise attacks.] Address: Donath, H., Caule Nr. 1, 15926 Zieckau, Germany

26343 Drummond, L.O.; de Oliveira, A.C.; De Grande, S.; Nuvoloni, F.M. (2025): Microplastic bioaccumulation in Odonata larvae: Integrating evidence from experimental studies in freshwater microcosm. *Chemosphere* 2025, 390, 144716: 12 pp. (in English) ["Microplastic (MP) pollution is an emerging global threat to freshwater biodiversity, yet little is known about its biological accumulation and trophic transfer in aquatic food webs. We conducted two complementary laboratory experiments simulating bromeliad-tank ecosystems to assess MP ingestion, bioaccumulation, and ecological effects on aquatic macroinvertebrates, with particular emphasis on odonata larvae (*Bromeliagrion rehni*). First, we evaluated whether MP ingestion varies across taxonomic groups, body regions, and exposure time. In a second experiment, we tested how different exposure pathways (waterborne vs. prey-mediated) and MP concentrations influence ingestion, growth, and survival in a top predatory insect. MP ingestion occurred widely among macroinvertebrates and varied by exposure duration and body region. Prey-mediated exposure led to significantly greater MP accumulation (10-day exposure) than direct contact with contaminated water. Odonata larvae fed contaminated prey exhibited higher growth rates, potentially due to increased prey vulnerability or compensatory foraging behavior. Environmental MP concentration seems to predict particle ingestion. Prey feeding habits influenced their contamination levels, indicating functional group-specific risks. This study provides experimental evidence of MP bioaccumulation and trophic transfer among freshwater macroinvertebrates and demonstrates how exposure route modulates contaminant uptake and biological responses. Moreover, macroinvertebrates act as key vectors of MP transfer, and dietary exposure may amplify sublethal effects across trophic levels. These findings underscore the need to integrate trophic dynamics into ecotoxicological evaluations and highlight how MP pollution may subtly—but significantly—

disrupt freshwater food web structure and function." (Authors)] Address: Drummond, Luana, Centro de Formação em Ciências Ambientais (CFCAm), Universidade Federal do Sul da Bahia (UFSB), Laboratório de Ecologia Animal e Genômica Ambiental (LEGAM), Porto Seguro, Bahia, Brazil. Email: luanaodruu@gmail.com

26344 Duchet, C.; Bílková, E.; Ouamoussa, L.; Reymond, C.; Ožana, S.; Boukal, D.S. (2025): Temperature-dependent growth increments and number of moults shape temperature-size responses during larval development in the dragonfly *Sympetrum striolatum* (Odonata: Anisoptera). *Israel Journal of Ecology and Evolution* 72(3): 151-160. (in English) ["Temperature is a key driver of individual physiology and ontogeny in ectotherms, with important consequences for individual fitness and population dynamics. Freshwater ectotherms typically grow and develop faster but reach smaller adult sizes at higher temperatures, a pattern known as the "temperature-size rule" (TSR). However, temperature-size responses can vary across ontogeny. Some freshwater arthropods also adjust the number of larval moults, offering additional developmental flexibility that could modulate temperature-size responses. We investigated the temperature dependence of the larval development of *S. striolatum*, a widespread univoltine dragonfly with variable number of larval instars. Larvae were reared from egg to final larval instar at six constant temperatures (9, 13, 17, 21, 25, and 29 °C). We assessed number of moults, developmental rate and body size of selected instars, and measured the metabolic rate at the last larval instar (F0). No hatching occurred at 9 °C, and all larvae died early at 29 °C, indicating a narrow thermal window for development (< 20 °C range). Development rate increased with temperature between 13 °C and 25 °C. While early instars followed TSR expectations, with smaller size at higher temperatures, final body size increased with temperature due to more larval moults and larger size increments in later instars at higher temperatures. Metabolic rate at 21 °C was significantly lower in individuals reared at 25 °C, indicating thermal acclimation under thermal stress. These findings reveal complex, stage-specific responses to temperature and highlight the developmental plasticity of *S. striolatum*. Our results provide insights into how freshwater ectotherms with flexible development strategies may cope with climate change." (Authors)] Address: Duchet, Claire, Dept of Ecosystem Biology, Faculty of Science, University of South Bohemia, Branišovská 1760, 37005 České Budějovice, Czech Republic. Email: cduchet@prf.jcu.cz

26345 Ferreira de Souza, L.; Gonçalves Prado, R.; Rocha, C.A.; Lopes, T.M. (2025): Taxonomic diversity and functional feeding group composition of entomofauna in shallow lentic habitats. *International Journal of Fauna and Biological Studies* 12(5): 144-149. (in English) ["Around 72% of tropical lentic waterbodies smaller than one hectare remain unsampled for their insect fauna, a gap that limits our grasp of freshwater biodiversity at local and regional scales. This research documented the taxonomic composition and functional feeding group (FFG) structure of entomofauna inhabiting twelve shallow lentic habitats oxbow lakes, seasonal floodplain pools, and semi-permanent swamps in the central Amazon lowlands near Manaus, Amazonas State, Brazil. Field collections were made during the wet season (December 2022 to April 2023) and the dry season (June to September 2023) using a combination of Surber samplers, sweep nets, and emergence traps deployed at stratified random points within each habitat. In total, 6,847 individuals were identified to family level, distributed across 47 families within seven insect orders: Ephemeroptera (8 families), Odonata (11 families), Diptera (9 fami-

lies), Hemiptera (7 families), Coleoptera (6 families), Trichoptera (4 families), and Lepidoptera (2 families). Collector-gatherers were the most abundant functional group, comprising 34.7% of all individuals, followed by predators (26.3%), scrapers (16.8%), shredders (11.4%), collector-filterers (7.2%), and piercers (3.6%). Shannon-Wiener diversity ranged from 1.46 in a heavily shaded swamp with thick leaf litter to 3.21 in an open oxbow lake with diverse macrophyte cover. Wet-season samples contained 41.8% more individuals and 23.6% more families than dry-season samples, driven largely by the recruitment of short-lived Ephemeroptera and Trichoptera taxa whose emergence windows coincide with rising water levels. Non-metric multidimensional scaling ordination separated habitats along two axes that explained 73.4% of the assemblage variation, with axis one correlating most strongly with macrophyte structural complexity ($r^2 = 0.68$) and axis two with dissolved oxygen concentration ($r^2 = 0.54$). Indicator species analysis identified Baetidae and Caenidae (Ephemeroptera) as significant indicators of open, well-oxygenated lentic habitats, while Chironomidae (Diptera) and Culicidae indicated degraded or heavily shaded conditions with low oxygen. FFG ratios shifted between habitat types: collector-gatherers dominated oxbow lakes, shredders were disproportionately abundant in swamps receiving allochthonous leaf litter, and predators (mainly Libellulidae and Aeshnidae) reached their highest relative abundance in floodplain pools where prey availability peaked during receding waters. These results confirm that shallow lentic systems in the central Amazon maintain high insect diversity and distinct FFG assemblages shaped by habitat heterogeneity, vegetation structure, and seasonal hydrology. Conservation strategies for Amazonian freshwaters should recognise the ecological importance of these small, often overlooked waterbodies and incorporate them into regional biodiversity monitoring programmes." (Authors)] Address: Ferreira de Souza, Luciana, Department of Entomology and Ecology, Manaus Metropolitan University, Manaus, Amazonas, Brazil

26346 Garrison, R.W. (2025): Odonatological Bibliography of Thomas W. Donnelly. *Argia* 37(3): 28-33. (in English) [bibliography] Address: Author deceased

26347 Goodman, A.M. (2025): Systematics, biogeography, and comparative morphology of Emerald and Tigertail Dragonflies (Anisoptera: Synthemistidae & Corduliidae). Doctoral Dissertation, Fac. Biol., The City University of New York: 412 pp. (in English) ["Odonata are among the most widely recognized and charismatic insect groups, whose significance have permeated throughout artwork, culture, and religion. They are highly mobile predators, currently consisting of ~ 6,500 species, and possessing some of the complex visual color systems, visual acuity, and flight patterns on Earth. Odonata are among the earliest flying insects, with proto-odonates (Griffinflies) dating back to the Carboniferous (~360mya), with crown-odonata fossils stretching back to the Triassic (~250mya). Overall, dragonflies and damselflies are considered models of ecological and evolutionary research due to their long evolutionary history, range of habitats, and morphology. The beginnings of Odonate systematics started approximately 180 years ago, with founding figures such Edmund de Selys Longchamps, Lucien-Victor Rambur, and Hermann August Hagen laying the groundwork for modern-day classifications of families, genera, and species. Traditional taxonomy relied predominantly on intuition based on morphological traits associated with wing venation, external genitalia, and nymphs. However, such traits are highly prone to convergence, obscuring the true relatedness of lineages. The advent of Sanger sequencing provided higher resolution to

the odonate tree of life, with improved identification of phylogenetic relationships among major lineages and the ability to target specific mitochondrial and nuclear genes (such as COI and 28S) that clarified previously ambiguous or unresolved taxonomic groupings. The benefit of Sanger sequencing was partially due to its high accuracy, cost effectiveness, and integration of morphological traits, to test for convergence. However, Sanger requires fresh material, limiting the utility of museum specimens, as well as the limitedness of genes, which are prone to hybridization, incomplete lineage sorting, and codon-site saturation. High-throughput molecular sequencing has enabled cost-effective, large-scale investigations into the phylogenetics and evolutionary history of Odonates by allowing the sequencing of more loci at faster rates and making it possible to sequence even century-old specimens. The distributions of Odonata vary greatly, with the order inhabiting all continents except Antarctica. Habitats can be extremely specific, some species being single stream endemics such as *Apocordulia* only residing in the Murray Darling Basin of Australia, to transoceanic pandemics such as *Pantala flavescens* which is found on multiple continents. Odonates possess aquatic nymphs (larvae), thus connecting between freshwater and terrestrial habitats. Adults can reside in forested or non-forested areas, while the nymphs reside either in lentic (still) or lotic (running) waters, both factors correlate with species richness. Finally, odonates are considered ecosystem indicators and/or keystone species, with numerous studies citing their importance in the context of pest control, restoration and conservation. Advances in genome-wide sequencing have allowed cost effective large-scale exploration into the phylogenetics and evolutionary history of Odonata, while the advent of citizen-science databases have enabled regional-scale studies into their ranges and niches. Throughout my doctoral work at the American Museum of Natural History and the City University of New York, I have had the opportunity to publish 13 manuscripts exploring dragonfly evolution and ecology using both methodologies. For this dissertation, I focus on four chapters whose aim is to answer two key questions pertaining to odonate biology: How are odonates related and how have they evolved over time? and what environmental factors shape odonate distributions? I plan to answer the first question by exploring the evolutionary relationships of odonate families using high-throughput molecular sequencing and the second question by investigating biogeographical patterns of Odonata using species distribution modeling (SDM). How are odonates related and how have they evolved over time? The first chapter utilizes Anchored Hybrid Enrichment (AHE) high-throughput molecular sequences and comprehensive morphological scoring of specimens based on wing, body, nymphal and genital characters to propose a new taxonomic classification for the dragonfly families Corduliidae (emeralds) and Synthemistidae (tigertails). Based on our results, we propose the creation of three new families, and the revision of six. We highlight the utility of Anchored Hybrid Enrichment sequencing as our molecular phylogeny recovers strong support for familial and intrafamilial relationships. Furthermore, our morphological analyses indicate high degrees of homoplasy, with most families being unable to be classified based on a single synapomorphy. Finally, ancestral state reconstructions estimate the ancestor of the superfamily Libelluloidea to possess a compact anal loop, prominent uniform teeth on the nymphal labial palps, and a reduced ovipositor, originating in the Late Cretaceous, with most families diversifying throughout the Cenozoic. What environmental factors shape odonate distributions? The subsequent chapters provide a multifaceted approach to species distribution modeling (SDM) of odonates as well as termites, by leveraging museum occur-

rence records and citizen-science databases alongside climatic, soil, and vegetation data. Within Chapter 2, we explore habitat suitability for non-neoisopterous termite genera using a static modeling approach. Static models are a common form of SDM whereby environmental data is averaged over the course of several decades to encapsulate suitability across time. Static models are ideal for comparing distributions across species and provide not only a baseline for poorly known or rare species but can be applied for future predictions of the taxa in the face of habitat destruction and climate change. We conclude that temperature and precipitation extremes as well as soil type and pH are the predominant drivers of suitable habitat for non-neoisopterous termite species and highlights the utility of citizen-science based datasets. Within Chapter 3 we assess the impact of recent bushfires on the distribution of the endemic Swamp Tigertail dragonfly (*Synthemis eustalacta*) using a dynamic modeling approach. Dynamic models incorporate temporally matched data, in which models are generated using occurrence and environmental data from the same year. Such modeling allows for the estimation of variation in habitat suitability over time, identify temporal trends, and determines if such trends are short-term habitat shifts or anomalies, or permanent range shifting. Overall, dynamic modeling captures fine-scale response of taxa. Our results indicate that dynamic models outperform static ones, with environmental variables pertaining to figure possess minimal importance in the distribution of *S. eustalacta*. We highlight not only the efficacy of dynamic ENMs to capture spatiotemporal variables such as vegetation cover for an endemic insect species but also providing a novel approach to mapping species distributions with sparse locality records. Finally, within Chapter 4, we generate paleodistributions of the relictual dragonfly genus *Epiophlebia* to the Last Glacial Maximum. Paleoecological niche modeling (PaleoENM) projects modern-day static models onto paleoclimate layers reaching as far back as the Miocene. Such modeling can estimate historical range shifts of species, and links current distributions to past geologic events, and can provide clarity to the response of modern-day taxa to climate change over their evolutionary history. Finally, PaleoENMs can pinpoint historical refugia and niche stability, and can aid in future climate resilience predictions and potential for susceptible species. In the case of *Epiophlebia*, we estimate historical routes of gene flow, predict unsampled areas possessing the potential to harbor new populations of the genus, and more broadly highlight the utility of Paleo-ecological niche modeling (PaleoENM) in the context of odonate biogeography. Conclusions: In total, this work provides a roadmap for the synthesis of genomic and ecological analyses in the context of odonate diversification and evolutionary history. The results of my first chapter highlight the importance of combining high-throughput molecular sequencing with detailed morphological assessments to uncover phylogenetic relationships within complex and historically misclassified groups. The use of Anchored Hybrid Enrichment (AHE) enabled strong resolution of familial and intrafamilial relationships, supporting the revision of six dragonfly families and the proposal of three new ones. Morphological homoplasy was widespread, emphasizing the limitations of traditional taxonomy and the necessity of genomic tools for accurate classification. Chapters 2 through 4 demonstrate the power of species distribution modeling (SDM) to understand environmental drivers of odonate and termite distributions across temporal and spatial scales. Static models revealed that temperature extremes, precipitation, soil properties, and citizen-science data play crucial roles in defining habitat suitability for non-neoisopterous termites. Dynamic modeling in Chapter 3 showcased the effectiveness of temporally matched data in capturing fine-scale responses to recent environmental

disturbances, such as bushfires, and revealed the limited predictive power of commonly used static variables for endemic species like *Synthemis eustalacta*. Finally, PaleoENM in Chapter 4 reconstructed paleodistributions of *Epiophlebia*, linking modern ranges to historical climate events and predicting areas with potential undiscovered populations. Together, these findings underscore the complementary strengths of genomic and ecological approaches in illuminating both the evolutionary history and biogeographic patterns of Odonata. This dissertation not only enhances our understanding of odonate systematics and environmental adaptability but also offers tools and frameworks applicable to the broader study of insect biodiversity, conservation, and climate change resilience." (Author)] Address: https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=7470&context=gc_etds

26348 Guo, K.; Li, C.; Gong, C.; Li, Y.; Cheng, L.; Lu, Y. (2025): A dragonfly-inspired metamaterial device with tunable stiffness and damage sensitive dynamic response. *Virtual and Physical Prototyping* 20:1, e2567388.13 pp. (in English) ["Architected structures with embedded stimuli-responsive materials offer new opportunities for programmable vibration control. However, preserving robust modal integrity under structural damage, especially in anisotropic systems, remains a fundamental challenge. To address these limitations, we propose a dragonfly-inspired metamaterial device that integrates magnetorheological fluid (MRF), enabling dynamic stiffness modulation and real-time recovery under magnetic fields. Under quasi-static compression in-plane (Z-axis), the application of a 30 mT magnetic field increases structural stiffness by 667% and enhances energy absorption by 4 times. Under dynamic excitation out-of-plane (Y-axis), magnetic fields induce a tunable reduction in effective modal stiffness, enabling reversible, contactless frequency control. When artificial cracks are introduced, the system restores vibrational coherence through magnetic field-induced reconfiguration, effectively compensating for the damage-induced modal shifts. This structural self-healing of vibrational properties demonstrates real-time response without physical intervention. This study establishes a multifunctional, reconfigurable wing architecture with potential applications in smart aerospace structures, structural health monitoring, and adaptive vibration control." (Authors)] Address: Guo, L., Dept of Mechanical Engineering, Univ. of Hong Kong, Kowloon, People's Republic of China

26349 Haque, M.T. (2025): Impact of biotic and abiotic factors on insect thermal tolerance. PhD thesis, School of Natural Sciences, Macquarie University: 248 pp. (in English) ["Climate change, including rising temperatures and the increasing frequency of extreme events, has profound effects on organisms across the globe, particularly ectotherms, which depend on environmental temperatures for maintaining physiological functions. In my thesis, I focused on *Ischnura heterosticta* and *Xanthagrion erythroneurum*, semi-aquatic insects that are very sensitive to temperature changes and provide valuable insights into how physiological thermal limits, morphological traits, behavioural thermoregulation, and parasite and microbial associations interact to determine their climate vulnerability. I conducted a multiscale assessment to evaluate the current and future impacts of climate change on these damselflies using a combination of approaches - latitudinal, seasonal, behavioural, microbial, and colour trait analyses- in Australia. In our review article, we highlighted the significance of colour in insect climate adaptation. Melanin based colours, which are temperature sensitive, can influence thermoregulation, sexual signaling, and predator avoidance. Climate driven changes in body and wing colour may therefore alter both physiological and ecological

interactions, with potential consequences for insect survival and reproduction. In our field experimental study across eastern Australia spanning a 17° latitudinal gradient, we found that the tropical damselfly (*Ischnura heterosticta*) had a higher critical thermal maximum (CT_{max}) than their counterparts in temperate regions, yet future projections (year 2061-2080) estimate a + 2.6 °C increase, which will make the tropical species more vulnerable due to their narrower thermal safety margin. Parasite prevalence was higher in tropical latitudes, whereas body size, body condition, and sex had no effect on thermal tolerance. In our seasonal study, we found that both *Ischnura heterosticta* and *Xanthagrion erythroneurum* express thermal plasticity, as critical thermal maximum (CT_{max}) and critical thermal minimum (CT_{min}) tracked seasonal temperature shifts. A broad thermal breadth (from 33.1-42.3°C) was found in two seasons - spring and autumn whereas damselflies had a narrow thermal breadth in summer (26-35°C). Frequent and longer heat spike during the summer months increased individual vulnerability due to the narrower margin between environmental temperature and their CT_{max}. Our field observations in natural settings revealed that heatwaves significantly reduced mating frequency in *Xanthagrion erythroneurum*, although flight activity and population abundance were unaffected. If such impacts persist over longer periods, it may have negative consequences on survival and reproduction. Our study exploring the influence of host-microbe interactions on thermal tolerance showed that gregarine endoparasite did not reduce thermal tolerance in *I. heterosticta*. In fact, naturally infected males had higher thermal tolerance than non-infected males, possibly suggesting that gregarines may function as endosymbiont by enhancing thermal tolerance in damselflies. In summary, our study revealed that damselfly vulnerability to climate change depends on multiple factors, including geography, seasonality, behaviours, microbial interactions, and morphological adaptations. While plasticity, behavioural thermoregulations, and microbial benefits may provide buffers temporally, these mechanisms are not sufficient to offset the risks for individuals inhabiting warmer areas and experiencing frequent hot days and heatwaves. Conservation strategies and proper management are therefore required, integrating biological factors to identify the risks and mitigate the effects of increasing temperatures and extreme events." (Author) https://figshare.mq.edu.au/articles/thesis/Impact_of_biotic_and_abiotic_factors_on_insect_thermal_tolerance/31_593553?file=66271805 Address: Haque, M.T., School of Natural Sciences, Faculty of Science and Engineering, Macquarie University, Sydney, NSW, Australia

26350 Idilbi, I.; Ssymank, A.; Martens, A. (2025): Impacts of habitat management on larvae of the damselfly *Coenagrion mercuriale* (Coenagrionidae, Odonata) — A laboratory study. *River Research and Applications* 41(7): 1558-1566. (in English) ["Habitat management of small lotic waterbodies is essential to maintain flow and the quality of the habitats. For this purpose, aquatic plants are typically removed by authorities. This is done in a more or less disruptive manner, depending on the risk of interference with the bed. Since small lotic waterbodies are biodiversity-rich habitats, the effects of habitat management on macroinvertebrates need to be analyzed. In particular, we analyzed aquatic plant preferences, tolerance to sediment burial, and thanatosis to derive recommendations for current habitat management. A habitat choice experiment with larvae of *C. mercuriale* was conducted to identify preferences between four different aquatic plants, namely *Callitriche* spp., *Elodea canadensis*, *Phragmites australis*, and *Veronica beccabunga*, which are all typical *C. mercuriale* larval habitats. We aimed to investigate if specific aquatic

plants should be avoided when removing aquatic vegetation during habitat management. In addition, we analyzed two further habitat management scenarios on larvae of *C. mercuriale*: fine sediment burial and thanatosis (reflex immobilization), which can both be induced by management machines. The habitat choice experiment showed no significant preferences for specific aquatic plants except for the direct comparison of *V. beccabunga* and *Callitriche* spp. We found that the majority of the larvae were tolerant to sediment burial of 1 cm; tolerance to thicker layers was rare. On absorbent paper, thanatosis duration differed between in-water and out-of-water. Larvae out-of-water stayed in thanatosis for longer, increasing the risk of predation when being removed with aquatic plants during management. The present study shows that different habitat management activities have impacts on *C. mercuriale* larvae. These impacts should be considered when choosing and performing appropriate management activities in small lotic waterbodies." (Authors)] Address: Idilbi, Isabelle, Inst. Biology, Univ. of Education Karlsruhe, Karlsruhe, Germany. Email: isabelle.idilbi@t-online.de

26351 Jödicke, R.; Borkenstein, A. (2025): Fotobasierte Visualisierung der Spermaauffüllung bei männlichen *Enallagma cyathigerum* (Odonata: Coenagrionidae). *Libellula* 44(3/4): 225-238. (in German, with English summary) ["Photography-based visualisation of sperm translocation in male *Enallagma cyathigerum* (Odonata: Coenagrionidae) — Our photographs of intra-male sperm translocation in *E. cyathigerum* consistently show that the seminal vesicle at the third abdominal segment is inserted with its tip between the valves on the ninth segment. The membranous area around the vesicle opening is pressed on the rudimentary primary penis in such a way that sperm can flow via the genital pore into the vesicle. Previous accounts describe the process differently, which is discussed. A stimulatory involvement of the ligula, as described for *Calopteryx*, is unlikely based on the photographs for *E. cyathigerum* and also other coenagrionids and lestids. This contradiction points to differences in sperm transfer in the different odonate families." (Authors)] Address: Borkenstein, Angelika, Lebensborner Weg 5, 26419 Schortens, Germany. Email: angelikaborkenstein@t-online.de

26352 Jödicke, R.; Baumann, K. (2025): Erinnerung an Hans-Joachim Clausnitzer (11.01.1942 – 19.12.2024). *Mitteilungen der AG Libellen in Niedersachsen und Bremen* 7: 97-100. (in German) [Niedersachsen, Germany, obituary] Address: Baumann, Kathrin, Lärchenweg 15a, 38667 Bad Harzburg, Germany. Email: alnus-k.baumann@t-online.de

26353 Kamble, R.S.; Sontakke, G.K.; Vhanalakar, S.A. (2025): Evaluating wetland health using Odonata diversity and seasonal shifts in Tulshi Reservoir, Maharashtra, India. *Entomon* 50(3): 335-346. (in English) ["The study assesses species composition and seasonal variation of odonates at Tulshi Reservoir in Kolhapur district, northern Western Ghats, Maharashtra. Field surveys were carried out during pre-monsoon, monsoon, and post-monsoon seasons through direct observations and photographic documentation. A total of 32 species belonging to ... Libellulidae, Gomphidae, Platycnemididae, and Coenagrionidae were recorded, with Libellulidae being the most dominant. Species richness peaked in the post-monsoon season, likely due to improved water quality and enhanced aquatic vegetation. Generalist taxa such as *Trithemis aurora* and *Pseudagrion decorum* occurred throughout the year, whereas certain species, including *Amphialagma parvum*, appeared only in specific seasons. These findings emphasize the ecological importance of Tulshi Reservoir in sustaining odonate diversity and support the use of

these insects as effective indicators of wetland health." (Authors)] Address: Kamble, R.S, Dept of Zoology, Vivekanand College (Empowered Autonomous), Kolhapur 416 003, Maharashtra, India. Email: rahulkamble3470@gmail.com

26354 Kozminov, S.G. (2025): Ecology and development of dragonfly larvae *Crocothemis erythraea* (Odonata) in the Central Caucasus. *Biologiya vnutrennih vod* [Biology of Inland Waters] 18(3): 419-427. (in Russian, with English summary) ["Larvae of *C. erythraea* (Brullé, 1832) live in warm water aquatic biotopes, no more than 25 cm deep, with submerged and semi-aquatic vegetation, and a bottom with silt-detritus structure. The main factor in the onset of metamorphosis of larvae and emergence of adults is warming up the water temperature to $18 \pm 1^\circ\text{C}$. In their development, larvae go through 11 age stages, differing in a set of morphological and linear parameters. The larvae are grouped into 6 age groups with a common set of morphological characteristics. The development time of larvae, taking into account the egg phase, is 81–104 days." (Author) English version of the paper on pages 530 - 539.] Address: Kozminov, S.G., Kabardino-Balkarian State University named after H.M. Berbekov, Russian Federation, Nalchik. Email: s_g_k@mail.ru

26355 Kruspe, R. (2025): Wasseruntersuchungen an Fließgewässern im Naturschutzgebiet "Moorwald am Pechfluss bei Medingen". Veröffentlichungen des Museums der Westlausitz Kamenz, Sonderheft: 115-126. (in German) [The few mentioned taxa include *Pyrrhosoma nymphula* and *Coenagrion puella*.] Address: Kruspe, R., An der Hohleiche 2, 01458 Ottendorf-Okrilla, Germany. Email: r.kruspe@online.de

26356 Kulak, A.V.; Kitel, D.A.; Sinchuk, O.V. (Compiler) (2025): Animals: Rare and endangered wild animal species. In: Ministry of Natural Resources and Environmental Protection of the Republic of Belarus | National Academy of Sciences of Belarus RED BOOK OF THE REPUBLIC OF BELARUS, 5th edition © Minsk "Belarus" 2025: 255-257, 257-258, 258-260, 292-293, 293-294, 295-296, 349-350. (in Russian) [The following species are treated: *Coenagrion armatum* (Charpentier, 1840), *Coenagrion johanssoni* (Wallengren, 1894), *Nehalennia speciosa* (Charpentier, 1840), *Aeshna crenata* (Hagen, 1856), *Aeshna viridis* (Eversmann, 1836), *Cordulegaster boltonii* (Donovan, 1807), *Leucorrhinia caudalis* (Charpentier, 1840). Address: not stated

26357 Leshaba, E.N.; Dube, T.; Dondofema, F.; Munyai, L.F.; Keates, C.; Riddell, E.; Khosa, D.; Dalu, T. (2025): Macroinvertebrate diversity within pan wetlands in relation to geological type and hydroperiod in a protected subtropical Austral national park. *Chemistry and Ecology* 41(5): 587-609. (in English) ["Despite their small size, wetland pan systems play a crucial role as habitats for diverse aquatic biota. Macroinvertebrate diversity across 12 pan wetlands in relation to geological type (i.e. sandstone, granite, basalt and rhyolite) and hydroperiod (i.e. high, low) in a protected subtropical national park in South Africa was studied. Water temperature, pH, TDS, conductivity, phosphates and salinity showed significant differences among hydroperiods, with significant differences among geological types being observed for water temperature and ammonium. Most of the sediment variables were found to be significant across hydroperiods and geological types. 5145 macroinvertebrate individuals belonging to 41 genera and 9 orders were identified. Macroinvertebrates were diverse during the high hydroperiod and abundant during the low hydroperiod. The canonical correspondence analysis explained 35.8% of the fitted cumulative variation in the macroinvertebrate community

structure and environmental variables across different hydroperiods and geological types. This study aimed to provide a better understanding of how they are influenced by a pan geological type and hydroperiod, and this information is crucial as it aids in providing management options for refuge aquatic taxa in a protected area and for the protection of these wetlands." (Authors) Odonata: *Anax speratus*, *Pseudagrion* sp., *Pinheyschna* sp.] Address: Dalu, T., Aquatic Systems Research Group, School of Biology and Environmental Sciences, University of Mpumalanga, Nelspruit, South Africa. Email: dalutatenda@yahoo.co.uk

26358 Li, Z., Liu, F., García-Girón, J. et al. (2025): Unintended outcomes of a long-term fishing ban on river macroinvertebrates. *Reviews in Fish Biology and Fisheries* 35: 1881-1897. (in English) ["China's ten-year fishing ban (TYFB) in the Yangtze River represents one of the most extensive conservation initiatives ever implemented in the world's largest river basins. While the ban has facilitated the recovery of fish populations, its impacts on other ecologically vital but less conspicuous taxa, such as macroinvertebrates, remain largely unknown. Using a before-and-after comparison framework, we evaluated the responses of taxonomic, functional, and phylogenetic alpha and beta diversity of macroinvertebrates to the fishing moratorium in the Chishui River, an important tributary of the Yangtze River, after six years of TYFB implementation. We further assessed the relative influence of biotic (i.e., fish communities) and abiotic (i.e., environmental conditions) drivers on macroinvertebrate community composition across three fishing ban periods, and examined how the balance of ecological processes shaping community assembly shifted under the policy. Our results revealed that macroinvertebrate alpha diversity declined, whereas beta diversity increased following the TYFB. Interactions between fish and small-bodied macroinvertebrates consistently emerged as the dominant forces structuring macroinvertebrate communities, with the strength of these biotic associations intensifying over time. Moreover, the fishing ban progressively promoted a more stochastic organization of macroinvertebrate communities, likely driven by intensified predation pressure from recovering fish populations. Together, these findings provide novel insights into how human interventions can restructure community dynamics in natural ecosystems, highlighting the need to consider potential trophic cascade effects in long-term, large-scale conservation projects. Our study also challenges the notion that fishing bans invariably yields positive ecological outcomes. This awareness is particularly important as top predators are expected to expand ranges and increase populations through ongoing conservation efforts, which could potentially reshape predator-prey dynamics and ecosystem functioning worldwide." (Authors) The following odonate taxa are listed in the supplementary material: *Lamelligomphus* sp., *Gastropomphus* sp., *Macrogomphus* sp., *Stylurus* sp., *Anotogaster* sp., *Ophiogomphus* sp., *Davidius* sp., *Merogomphus* sp., *Asiagomphus* sp., *Macromia* sp., *Macromia manchuica*, *Zygonyx* sp., *Orthetrum* sp., *Euphaea* sp., *Matrona basilaris*, and *Euphaeidae* sp.] Address: Xie, Z., Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan, China

26359 Mglinets, A.V.; Bulgakova, V.S.; Kosterin, O.E. (2025): A new molecular marker including parts of conservative histone H3 and H4 genes and the spacer between them for phylogenetic studies in dragonflies (Insecta, Odonata), extendable to other organisms. *Vavilov Journal of Genetics and Breeding* 29(6): 868-882. (in English, with Russian summary) ["In spite of recent substantial progress in genomic approaches, there is still a need for molecular markers convenient for

Sanger sequencing and providing good phylogenetic reconstructions at short evolutionary distances. A new molecular marker, the histone H3–H4 region, containing partial coding sequences of the genes for histones H3 and H4 and the non-coding spacer between them, is proposed. This marker is potentially useful for molecular phylogenetic studies at the generic, species, and even intra-species level in insects and some other organisms, even from other phyla. The highly conserved histone-coding sequences ensure the universality of primers and the ease of primary alignment, while the highly variable non-coding spacer provides enough variation for analyses at short evolutionary distances. In insects, the histone genes reside in the histone repeat which is tandemly repeated in dozens to hundred copies forming the so-called histone cluster. This ensures a high concentration of the template for the marker in genomic DNA preparations. However, the order and orientation of the histone genes in the histone repeat is variable among orders, which puts some limitations on the use of the proposed marker. The marker efficacy is hereby shown for Odonata, where it provided good resolution at the family, genus and species levels. The new marker also provided an interesting pattern in the relationship of two *Sympetrum* species, *S. croceolum* and *S. uniforme*, showing the sequences of the latter as a branch nested among those of the former. The same combination of the proposed original primers should also work in Diptera." (Authors)] Address: Kosterin, O.E., Insti. of Cytology & Genetics, Siberian Branch, Russian Acad. Sciences, Lavrentiev Ave 10, 630090 Novosibirsk, Russia. E-mail: kosterin@bionet.nsc.ru

26360 Michalsky, J.; Pfeiffer, B.; White, H.; Bried, J.; Abbott, J.; Haribal, M.; Garrison, R.W.; (2025): In Memoriam: Memories of Thomas "Nick" W. Donnelly, 1932 – 2025. *Argia* 37(3): 17-28. (in English) [Obituaries of one of the most influencing American odonatologist.] Address: not stated

26361 Nakagawa, H.; Mori, T. (2025): Mesoclimate scale effects of river intermittency on aquatic insects in Seto Inland Sea watersheds, Western Japan. *Limnology* 26: 19-30. (in English) ["The responses of assemblages and ecosystems to river intermittency are often considered on large spatial scales, such as those associated with the Köppen climate classification. However, river intermittency may naturally occur even in humid regions, and the effects may differ from those where intermittency occurs throughout the area. This study aimed to examine the differences in taxonomic and trait composition of aquatic insects between intermittent rivers in the Seto Inland Sea watersheds and neighboring humid-temperate rivers in Japan using national census data. While the climate in the most part of the Japanese Archipelago is categorized as humid-temperate, and rivers are usually perennial, local climate in the Seto Inland Sea watersheds has low summer precipitation compared with that in neighboring regions, thereby resulting in river intermittency. Consistent with the previous studies in the regions where rivers are intermittent on a large spatial scale, we observed that aquatic insects with multivoltinism and/or aerial respiration notably tolerated river intermittency. In contrast, the aquatic insect fauna in Japanese intermittent rivers represented subsets of those in the humid-temperate rivers, although previous studies such in Mediterranean regions have reported high endemism and species diversity in intermittent rivers. These results highlight the importance of exploring the role of river intermittency on small to medium spatial scales, as well as on large scales, to project effects of ongoing and future climate changes on species diversity ... Although most taxa, including those with drought-resistant traits, tended to be distributed in humidtemperate rivers as frequently

as or more frequently than in intermittent rivers, several taxa with the reproductive trait of multivoltinity, such as Odonata species (*Ceragrion* spp. and *Aciagrion* spp.), and those with aerial respiration, such as hemipteran species (*Ranatra unicolor*), were characteristic to intermittent rivers." (Authors)] Address: Nakagawa, H., Aqua Restoration Research Center, Public Works Research Institute, Kasada.Machi, Kawashima, Kakamigahara, Gifu 501.6021, Japan. Email: hikarunakagawa@icloud.com

26362 Nowak, M. (2025): Verbreitung und Status von *Orthetrum ransonnetii* auf Fuerteventura, Kanarische Inseln (Odonata: Libellulidae). *Libellula* 44(3/4): 167-182. (in German, with English summary) ["Distribution and status of *Orthetrum ransonnetii* on Fuerteventura, Canary Islands (Odonata: Libellulidae) – Seven years have passed since the first observation of an immature male *O. ransonnetii* on Fuerteventura (Canary Islands) in 2018. The species is now established on the island. During 11 excursions to Fuerteventura (2016–2025), well over 100 barrancos were visited, 22 of which are considered potentially suitable for the species. From 2020 to 2025, *O. ransonnetii* was found in 11 of the 24 surveyed barrancos, or sections of them. The reproduction of the species has been proved in at least three barrancos. In addition to data on annual and daily phenology, observations on the behavior of the imagines, the choice of the emergence site, potential predators, and the habitat of the larvae are presented. Furthermore, a case of heterospecific mating between a male *Orthetrum chrysostigma* and an *O. ransonnetii* female is described." (Author)] Address: Nowak, M., Fuchseckstr. 16/1, 73114 Schlatt, Germany. Email: Nowak-Schlatt@t-online.de

26363 Odonat Grand Est (coord.) (2025): Evolution des populations d'Odonates des mares dans le Grand Est. Observatoire Grand Est de la Biodiversité: 8pp. (in French) ["Between 2023 and 2024, 96 ponds were surveyed across all the lowland natural regions of the Grand Est region using the StELi protocol (SFO & MNHN, 2011). Sampling focused on lower-altitude areas, excluding the Ardennes Massif, the Vosges Massif, and the Jura Massif, as the species assemblages associated with these natural regions are very specific. The protocol consisted of six 30-minute visits per site between May and September using a net and binoculars. A total of 2,688 data points for 51 different species were collected, including 44 of the 45 species targeted by the indicator. Only 38 species were observed in 2024 compared to 44 in 2023. Among the species not seen in 2024 were *Gomphus pulchellus*, *Leucorrhinia caudalis*, *Leucorrhinia pectoralis*, *Orthetrum brunneum*, *Somatochlora flavomaculata*, and *Sympetrum depressiusculum*. Species richness per pond (target species only) ranged from 2 to 25 (mean = 11.16 ± 5.37 ; Figure 1). This figure represents a small difference between 2023 (11.51 ± 5.63) and 2024 (10.59 ± 4.94). It should be noted that the weather conditions between the two monitoring years were contrasting, with a hot and dry late spring and summer in 2023, leading to an early drying of the ponds, and a particularly rainy spring and early summer in 2024, although temperatures were within the seasonal norms. This contrast could explain the slight difference in species richness; however, it is difficult to be certain given that the ponds monitored in 2023 and 2024 differed." (Author/Google translate)] Address: https://www.odonat-grandest.fr/telechargements/OGEB/2-024/OGEB2024_indicateur_statistique_STELI.pdf

26364 Oertel, H. (2025): Schutz der Waldmoore bei Großdittmannsdorf und Medingen - Erfolge und Herausforderungen bürgerschaftlichen Engagements. Veröffentlichungen des Museums der Westlausitz Kamenz, Sonderheft: 77-100. (in

German) [On page 78, references to a few species typical Odonata for bog (*Leucorrhinia* species, *Somatochlora arctica*) and spring-fed stream (*Cordulegaster boltonii*) habitats are made.] Address: Oertel, H., Am Wasserwerk 11, 01109 Dresden, Germany. Email: oertel@nabu-sachsen.de

26365 Pedersen, S.; Kennedy, P.J.; Thomas A. O'Shea-Wheller, T.A.; Poidatz, J.; Christie, A.; Osborne, J.L.; Tyler, C.R. (2025): Broad ecological threats of an invasive hornet revealed through a deep sequencing approach. *Science of the Total Environment* 970, 178978 (in English) [Most terrestrial invertebrates are in considerable decline, and the range expansion of the invasive hornet, *Vespa velutina* nigritorax, poses an additional threat. Although now found in much of western Europe, the full extent of the hornet's predatory activity remains unexplored. While impacts on honey bees are well-documented, evidence of a wider dietary spectrum is emerging, indicating potentially broad ecological ramifications. Here, we conduct the first large-scale study of the diet of *V. velutina*, utilising deep sequencing to characterise the larval gut contents of over 1500 samples from Jersey, France, Spain, and the UK. Our results indicate that *V. velutina* is a highly flexible predator, enabling its continued range expansion capacity. Analyses detected 1449 taxa, with greater prey richness in samples from southern latitudes, and considerable spatiotemporal variation in dietary composition. Hymenoptera, Diptera, Hemiptera, Coleoptera, Lepidoptera, and Araneae were the most frequently occurring orders predated, each characterised by high taxonomic diversity. The honey bee *Apis mellifera* was the most abundant species, being found in all sampled nests and showing greater relative read numbers with increasing apiary density and proximity, supporting concerns for the impact of *V. velutina* on apiculture. Notably, 43 of the 50 most commonly predated invertebrates were also flower visitors, including 4 common bumblebee species, indicating potentially substantial risks to wild pollinators. These data provide wide and deep evidence to support risk evaluation of this species and its potential environmental impact as it spreads across Europe." (Authors) Odonata are treated at family level.] Address: Pedersen, S., Cirad-Bios-Umr-Pvbm, Station Ligne Paradis – Pole de Protection des plantes, 7 chemin de l'IRAT, 97410 St Pierre, La Réunion. Email: s.pedersen@exeter.ac.uk

26366 Pereira, S.R.A. (2025): Influência das características morfológicas e do habitat físico sobre a capacidade de dispersão de Odonata em igarapés amazônicos. Dissertação (Mestrado em Zoologia) - Instituto de Ciências Biológicas, Universidade Federal do Pará, Museu Paraense Emílio Goeldi, Belém: 36 pp. (in Portuguese, with English summary) ["Species' dispersal capacity is directly related to their individual morphological, physiological and behavioral characteristics and to the ecological context in which they live. Species with a lower dispersal capacity tend to be more vulnerable to climate change and more intensive land use. This is due to the loss of vegetation cover and fragmentation leading to a change in habitat connectivity and thermal conditions in the environment. In this study, we investigated the factors affecting the dispersal capacity of adult Odonata in Amazonian streams, focusing on morphological traits and the effects of land use and environmental integrity. We tested the hypotheses: i) body size, thorax volume, and wing base width are positively related to dispersal capacity and wing aspect ratio is negatively related to dispersal capacity; ii) greater forest cover and habitat integrity are negatively related to dispersal capacity, as a larger canopy filters out individuals with lower flight ability. The study was conducted in 12 streams in Barcarena, Pará, Brazil. We used the mark-recapture method and analyzed

the data using structural equation modeling. We considered landscape variables (forest formation and pasture), physical habitat variables (channel cover, undergrowth, channel width, habitat integrity index, and temperature), morphological variables (total body length, thoracic volume, and wing aspect ratio) and we used dispersal capacity (distance in meters) as a response variable. 541 individuals were tagged ($n=466$ Zygoptera e $n=75$ Anisoptera). The recapture rate was 29% for Zygoptera and 1.4% for Anisoptera. Most of the individuals recaptured were males belonging to the genera *Mnesarete*, *Argia* and *Hetaerina*. Approximately 91% of the individuals moved less than 60 meters. The results, which related only to Zygoptera, partially confirmed the first hypothesis: wing aspect ratio was negatively related to dispersal capacity, suggesting that shorter and wider wings are associated with greater flight ability. However, no direct relationship was found between habitat integrity or forest formation and dispersion, but forest formation and channel width influenced the morphology of individuals' wing aspect ratio. These patterns suggest that genera occurring in forested environments, such as *Heteragrion*, which have a higher wing aspect ratio, have a lower dispersal capacity, while those adapted to higher temperatures and light availability, such as *Mnesarete* and *Hetaerina*, have a lower wing aspect ratio and greater dispersal capacity. We emphasize the vulnerability of individuals with lower dispersal capacity to changes in their aquatic habitats and changes in the surrounding terrestrial landscape due to loss of vegetation cover." (Author)] Address: <https://repositorio.ufpa.br/items/6fbd6a91-1c71-435c-a65b-d6521ed9f221>

26367 Pereira-Moura, L.; Gomes Viana, C.; Colares, L.F.; Dias da Silva, K.; Cruz da Silva, E.; Gonçalves, M.K.S.; Calvão, L.B.; Oliveira-Junior, J.M.B.; Juen, L.; Marques Couceiro, S.R. (2025): Extinctions associated with sensitivity to habitat loss promote functional homogenisation and body size increase of Odonata in Amazonian streams. *Freshwater Biology* 70(11), e70119: (in English) ["1. Extinction processes driven by habitat loss at multiple scales can lead to changes in the taxonomic and functional rarity of biological communities. However, evidence on the direction of these changes remains limited, making more accurate extrapolations about ecosystem functioning difficult. Therefore, our objective was to assess how rarity, functional groups, and species traits of adult Odonata communities change across extinction scenarios at local and regional scales. We tested the following hypotheses: (i) Functional rarity will decrease as species vulnerable to habitat loss go extinct at local and regional scales; (ii) the average body size of adult Odonata will increase as vulnerable species are lost at local and regional scales; and (iii) the loss of functional groups will occur earlier if the species more vulnerable to habitat loss go extinct, because these species are expected to perform unique ecological roles that may vanish with their disappearance. 2. We sampled a total of 128 streams in the Eastern Amazon, recording 4031 individuals representing 42 genera and 141 species. After determining the extinction risk and functional rarity of the community, we simulated three extinction scenarios at both local and regional scales (1-extinction of species more vulnerable to habitat loss, 2-extinction of species more tolerant to habitat loss, and 3-random extinction), calculated our response variables, and tested the observed differences using a nonparametric Friedman test. 3. Our results indicated that communities at local and regional scales tend to lose functional rarity as species vulnerable to habitat loss become extinct, supporting H1. At the local scale, average body size decreased as species more vulnerable to habitat loss became extinct, and at the regional scale, the opposite

occurred; that is, there was an increase in average body size as they became extinct, partially supporting our H2. We also observe the loss of multiple functional groups as species vulnerable to habitat loss become extinct, supporting our H3. 4. These results support the hypothesis that species vulnerable to habitat loss are also important in maintaining unique functions within ecosystem processes. Functional groups associated with endophytic oviposition and thermal conformer thermoregulation were the most likely to be lost, possibly due to their strong association with environments of higher ecological integrity. 5. Thus, if species vulnerable to habitat loss maintain unique functions in ecosystems and they are extirpated from a landscape, this will lead to the disappearance of entire functional groups and potentially ecosystem services (if they are not performed by other species)." (Authors)] Address: Pereira-Moura, L., Programa de Pós-Graduação em Biodiversidade e Biotecnologia (PPG-BioNorte), Laboratório de Ecologia e Taxonomia de Invertebrados Aquáticos (LETIA), Univ. Federal do Oeste do Pará, Pará, Brazil. Email: lucas-under@hotmail.com

26368 Santos Navarro, L.R.; Rodrigues, M.E.; Righetto Casano, C. (2025): Movement capacity in Zygoptera and Anisoptera (Odonata): a scientometric review. *Acta Oecologica* 129, 104125: 9 pp. (in English) ["Individual movement is a central process for the long-term viability of species, as it allows access to key resources for survival and reproduction. Movement is closely associated with the response of species to landscape changes, with more vagile species typically being less affected. In Odonata, movement capacity is strongly related to body morphology, such as wing and body size. In general, species in Anisoptera have larger wings and bodies than species in Zygoptera and are likely to move over greater distances. In this paper, we synthesize knowledge about the movement capacity of adult Odonata based on a literature review. We also assess whether travel distances differ between Anisoptera and Zygoptera, and whether these movements are consistent with the spatial scales used in landscape studies (i.e., the spatial extent at which landscape metrics are measured). We found 34 articles published between 1978 and 2025, from which we obtained movement data for 32 species (17 Anisoptera and 15 Zygoptera). Most studies were developed in the northern hemisphere, with an increase since the early 2000s. Individual movement is usually assessed by mark-recapture, but telemetry has been applied for large-bodied species. Despite the literature suggesting a higher movement capacity in Anisoptera than in Zygoptera, we observed no significant difference between the two suborders. Our results showed a median distance of 731.5 m (range: 16 to 1790 m) for Zygoptera and 224 m (range: 89 to 1910 m) for Anisoptera. Landscape studies were rare, and some spatial scales used were small compared to the maximum travel capacity of Odonata. Based on these results, we emphasize the scarcity of data on dragonfly movements, especially in tropical regions. Understanding these factors is essential to identify needs and define conservation strategies, especially for species most sensitive to anthropogenic changes, threatened and low movement capacity." (Authors)] Address: Santos Navarro, L.R., Graduate Program in Ecology and Biodiversity Conservation (PPGECB State University of Santa Cruz (UESC), 45662-900, Ilhéus, Bahia, Brazil. Email: laiseng.ambiental@hotmail.com

26369 Saxton, N.A.; Powell, G.S.; Rashni, B.; Jensen, C.R.; Beatty, C.D.; Polhemus, D.; Marinov, M.; Bybee, S.M. (2025): Rediscovery of *Melanesobasis* Donnelly, 1984 (Odonata: Coenagrionidae) in Vanuatu reveals a pattern of vicariance in insular damselflies. *Zoological Journal of the Linnean*

Society 204(3), zlaf075, <https://doi.org/10.1093/zoolinnean/zlaf075>: 15 pp. (in English) ["The Vitiāz Arc provides a compelling opportunity to examine biogeographical patterns in the South Pacific. Previously, however, many groups lacked the appropriate taxon sampling to examine this system fully. Fieldwork aimed at improving our understanding of Vanuatu insect diversity and evolution resulted in the collection of two specimens of *Melanesobasis bicellulare* Donnelly, 1984, a species previously known from a single specimen collected 40 years ago. Using a combination of morphological and molecular methods, we are able to associate the female, update distributional data, and record intraspecific variation, including the number of post-discal cells. We also use this genus, *Melanesobasis* Donnelly, 1984, found across Fiji and Vanuatu, to explore biogeographical patterns across the Vitiāz Arc. Our results provide additional evidence of the importance of the Vitiāz Arc in South Pacific damselfly biogeography and show a pattern of vicariance between the two island archipelagos." (Authors)] Address: Saxton, Natalie., Dept of Biology, Case Western Reserve Univ., 2080 Adelbert Road, Cleveland, OH 44106, USA. Email: nas229@case.edu

26370 Siregar, A.Z. (2025): Controlling pests sorghum using integrated pest management as an alternative food in northern Sumatera, Indonesia. *Jurnal Ilmu-Ilmu Pertanian* 32(1): 54-63. (in English) ["The purpose of this study was to determine the composition and comparison of species richness, diversity, and insect dominance in the phases of sorghum. This research was conducted from August to October 2021 in Lalang Village, Tebing Tinggi, at the location of a Sorghum monoculture (*Sorghum bicolor*). This study uses the purposive random sampling method, where insects are collected using 4 traps (yellow sticky trap, sweep net, pitfall trap, and light trap) installed according to standard regulations. The results showed that the insects identified in Sorghum consisted of 8 orders, 14 families (Chrysomelidae, Muscidae, Alydidae, Pentatomidae, Cicadellidae, Aphididae, Apidae, Sphecidae, Formicidae, Noctuidae, Acrididae, Gryllidae, Aeshnidae, Libellulidae) with a total of 6499 individuals. There are 27 genera detected with 5 insect functional statuses, as pollinators (13 species), predators (5 species), herbivores (5 species), parasitoids (1 species), and decomposers (3 species). Knowing the functional status of insects in sorghum cultivation, it is predicted to control pests in an integrated manner in the future. The plant extracts, variances of pheromones, and the minimal use of chemicals in the integrated pest control system can increase the productivity of sorghum." (Author)] Address: Siregar, Ameilia Zuliyanti, Dept of Agro-technology, Faculty of Agriculture, Univ. of Sumatera Utara, Sumatera Utara, Indonesia. Email: ameilia@usu.ac.id

26371 Smith, A.M. (2025): Investigating food web dynamics of Great Lakes coastal wetlands using a novel Stable Isotope approach. MSc thesis, Department of Biology, Grand Valley State University: 75 pp. (in English) ["Coastal wetlands of the Great Lakes support abundant populations of fish, invertebrates, and vegetation, though the trophic linkages connecting primary production and lower consumers is not well understood in these systems. We implemented a multiple-tracer approach, pairing traditional food web isotope tracers like carbon (δ13C) and nitrogen (δ15N) with total mercury concentrations (THg). We predicted that filamentous algae would be the dominant energy resource in the diet of lower trophic-level invertebrates in the Grand River Estuary, a network of riverine coastal wetlands adjacent to Lake Michigan. In addition, we predicted that adding THg as a tracer would improve the resolution of our food web models. Three basal energy sources were sampled (filamentous

algae, emergent macrophytes, submersed macrophytes) along with organic detritus. Aquatic invertebrates were sampled across three functional guilds to represent primary and secondary consumers (amphipods, gastropods, odonates). Our findings suggest that organic detritus is the dominant resource responsible for energetically supporting lower trophic levels in the Grand River estuary, although algae and submersed macrophytes are important secondary resources for primary and secondary consumers, respectively. THg concentrations enhanced the resolution of dietary contribution estimates in MixSIAR models applied to consumer and source data. Isotope biplots revealed that THg concentrations were a more reliable predictor of trophic position than $\delta^{15}\text{N}$ in GRE sites. This methodology has significant implications for future food web studies in complex ecosystems such as coastal wetlands and demonstrates the novel use of mercury as an ecological tracer." (Author)] Address: <https://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=2204&context=theses>

26372 Talom, D.; Rochill, I.; Muni, N.; Megu, K.; Meyer Rochow, V.B. (2025): Entomophagy and entomotherapeutic practices by members of the Galo tribe of central Arunachal Pradesh, North-East India. *Journal of Insects as Food and Feed* 12(4): 771-791. (in English) ["Arunachal Pradesh is rich in insect biodiversity. Members of different ethnic communities in this region consume a variety of insects as food and use some species therapeutically as traditional or folk medicine since time immemorial. Insects are highly nutritious and are a good source of proteins, fats, carbohydrates, minerals, and vitamins. The Galo tribes in central Arunachal Pradesh (India) utilise at least 96 species of edible insects, belonging to the orders Odonata, Blattodea (including Isoptera, i.e., termites), Orthoptera, Mantodea, Hemiptera, Coleoptera, Hymenoptera, Lepidoptera, and Diptera as food and 16 species of insects belonging to 6 orders (Blattodea, Orthoptera, Mantodea, Hemiptera, Coleoptera, Lepidoptera) as components of traditional medicines to cure diseases. Various insects also play a role in myths and superstitious beliefs such as, for example, fortune telling and making predictions. Preparation of the insect species for consumption involves using them fresh and raw, or in roasted, dry- or oil-fried form, boiled, pickled or as a steamed dish with bamboo or paste-like chutney and spicy ingredients. Adults as well as larvae of certain dung beetles (e.g. *Onthophagus* sp.) and black ants (e.g., *Pseudoneoponera* sp.), and the honey from honey bees (e.g. *Apis dorsata*) are used as both food and medicine to treat coughs, colds, stomach pains, headaches, and infections. Honey moreover has numerous applications in treating burns and minor wounds." (Authors)] Address: Megu, K., Dept of Zoology, Dera Natung Government College, Itanagar, Arunachal Pradesh, India. Email: karsingmegu@gmail.com

26373 Tamaoki, M.; Ishii, Y.; Fujino, M. (2025): Assessing biota and ecosystem services in the area surrounding the Interim Storage facilities. *Material Cycles and Waste Management Research* 36(2): 167-175. (in Japanese, with English summary) ["We conducted biological monitoring in the area surrounding the interim storage facility to assess the current state of the natural environment and evaluate changes in ecosystem services resulting from the Fukushima Daiichi Nuclear Power Plant accident. Camera-trap surveys of mammals revealed the presence of ten species in the area surrounding the facility. The frequent observation of 'satoyama' (traditional rural landscape) species, such as the Japanese raccoon dog (*Nyctereutes procyonoides viverrinus*), suggests that the satoyama environment is being maintained in this region. Additionally, the frequent sighting of *Sympetrum infuscatum* indicates that the area provides a suitable habitat for insects that

rely on water bodies. Regarding ecosystem services, an analysis of indicators related to agriculture, forestry, and fisheries (specifically paddy rice, wheat/barley and soybeans, livestock, and marine fisheries) showed significant declines both inside and outside the evacuation zones following the disaster; notably, production levels within the evacuation-instructed zones have yet to recover. In contrast, no major changes were observed in regulating services before and after the disaster." (Google translate)] Address: Tamaoki, M., Biodiversity Division, National Institute for Environmental Studies, iOnogawa 16. 2, Tsukuba, Ibaraki 305. 8506 Japan

26374 Tonczyk, G. (2025): 4. Dragonflies (Odonata). In: Jacek Wendzonka, Jerzy Błoszyk & Karolina Lubińska (eds.): *Living nature in the "Bory Tucholskie" National Park Part II – invertebrate animals*: 93-114. (in Polish, with English summary) ["The high diversity (53 species) of Odonata in the "Bory Tucholskie" National Park is associated with the high diversity of standing water habitats. Different types of lakes, including dystrophic lakes, are conducive to the development of rich Odonata communities. Several very valuable tyrphobiont species have been identified in the Park, e.g. *Nehalennia speciosa*, *Somatochlora arctica*. Despite the small share of flowing waters, dragonfly communities associated with this type of habitat are well-developed. The studies and observations conducted do not reveal any major threats to these insects. Compared to other regions of the country, there are no rapidly expanding species whose ranges in Poland are increasing in relation to climate change. Compared to other regions of the country, the Park – and, more broadly, the entire Tuchola Forest region – can be treated as a refuge of dragonfly diversity on a national and continental scale." (Author) Local distribution maps are presented: *Nehalennia speciosa*, *Ophiogomphus cecilia*, *Sympetrum depressiusculum*, *Aeshna juncea*, *Aeshna subarctica*, *Cordulegaster boltonii*, *Leucorrhinia caudalis*, *Leucorrhinia albifrons*, *Leucorrhinia pectoralis*, *Somatochlora arctica*.] Address: Tonczyk, G., Zakład Limnologii i Ekologii Bezkręgowców, Katedra Zoologii Bezkręgowców i hydrobiologii, Uniwersytetu Łódzkiego, ul. Banacha 12716, PL-90-237 Łódź, Poland. E-mail: tonczyk.grzegorz@gmail.com

26375 van Grunsven, R.; van der Heijden, A. (2025): De bijzondere levenscyclus van de houtpantserjuffer. *Vlinders* 3 2025: 18-19. (in Dutch) [Verbatim/Google translate: "The remarkable life cycle of the willow emerald damselfly. Some dragonflies simply scatter their eggs—into the water or even onto the bank. A few species, such as *Cordulegaster boltonii*, insert their eggs into the bed of a stream. However, all damselflies and hawker dragonflies typically lay their eggs within plants. There, the eggs are safely tucked away, allowing the larvae to develop or overwinter securely. While eggs are usually deposited in submerged plants, some species—such as emerald damselflies—also lay them in plants like soft rush above the water, and the migrant hawker often lays its eggs in moss on the ground. The willow emerald damselfly (*Chalcolestes viridis*) is the most extreme example; as its name suggests, it lays its eggs in the branches of trees and shrubs. Verbatim: *C. viridis* fly in late summer, particularly in August. If autumn is mild, they can be found as late as the end of October. They are common throughout the country near still water where tree or shrub branches overhang the surface. You can find them there—and observe their behavior—especially in the early afternoon. The males perch on projecting branches, keeping a lookout. When a female fly by, the male attempts to grab her and form a tandem. If the female is receptive, they form a mating wheel and mate for anywhere from five minutes to half an hour, often while perched on a branch.

Egg-laying follows. The female curves her abdomen so that the tip is positioned between her hind legs. Her ovipositor features a small saw-like structure on each half, consisting of large, hard points; she uses this to saw a small hole and deposit one or two eggs beneath the bark. This process takes about one or two minutes. She then moves a short distance forward and repeats the action, resulting in a characteristic pattern of ridges on the branch. This egg-laying process can be observed at numerous locations across the Netherlands over the coming weeks (until the end of September). They often perform this activity in groups on their chosen branches. If you approach them carefully, they rarely fly away. Naturally, what happens after the eggs are laid is harder to observe. A prolarva develops inside the egg immediately after laying; this is an intermediate stage between the egg and the larva. Once developed, they wait out the winter, easily surviving low temperatures and severe frost. In April, the prolarva emerges from the egg. At this stage, it does not yet resemble the damselfly larva we are familiar with; instead, it looks like a small worm that then drops down. If the parents have chosen a suitable branch, the prolarva lands on the water surface. Being small and water-repellent, it remains afloat. The prolarva immediately molts into a first-instar larva and dives underwater. If the prolarva lands on land or, for instance, on leaves, it attempts to reach the water using clumsy movements. Once in the water as larvae, they hunt small creatures, just like all damselfly larvae. They are very active hunters, which allows them to grow rapidly. *C. viridis* often inhabit waters containing fish, but they manage to survive by taking shelter among aquatic plants or tree roots. Using their large caudal lamellae (gills), they can also swim quickly with serpentine movements to escape. They reach maturity and emerge in July. The damselfly must then become sexually mature; it first goes hunting—for example, along forest edges—sometimes far from the water. After about a month, they return to mate and lay eggs.] Address: Van Grunsven, R.H.A., De Vlinderstichting, Mennonietenweg 10, Postbus 506, 6700 AM Wageningen, The Netherlands. Email: roy.vangrunsvan@vlinderstichting.nl

26376 van Grunsven, R. (2025): Oostelijke witsnuitlibel onverwachts succesvol [Eastern white-faced darter/*Leucorrhinia albifrons* unexpectedly successful]. *Vlinders* 4 2025: 8-11. (in Dutch) [Verbatim: "In the early 20th century, both the Eastern White-faced Darter (*Leucorrhinia albifrons*) and the Lilypad White-faced Darter (*L. caudalis*) occurred near Oisterwijk, but they disappeared from the area in 1933 and 1951, respectively. Only three sightings of *L. caudalis* were recorded during the second half of the last century. It returned in 2009 and is no longer considered very rare. Regarding *L. albifrons*, there were about ten sightings scattered across the country after 1950—involving vagrants and occasional breeding—until the species was discovered at Delleboersterheide in 2006; however, that population also persisted only until 2013. Consequently, *L. albifrons* appeared to have vanished from the Netherlands once again. 2018 Invasion: In 2018, there was an influx of *Leucorrhinia* sp. into the Netherlands, likely originating from Eastern Europe. This event brought *L. albifrons* into the country as well. By 2019, it was evident that they had bred in Overijssel, raising the question of whether the species could establish itself. That question has now been answered: since 2019, *L. albifrons* has steadily expanded its range, with new locations appearing almost every year. While the species is still far from common, there are quite a few sites scattered across the eastern Netherlands, often with signs of breeding activity. In the dune areas, however, they appear—for the time being—to be merely vagrants. Ecology of *L. albifrons*: To understand the situation, we must look at

the ecology of *L. albifrons*. It is primarily a dragonfly of small moorland pools and raised bogs; generally, species associated with this habitat—such as *Coenagrion lunulatum*, *Aeshna juncea*, *L. rubicunda*, and *Sympetrum danae*—are faring very poorly. The distribution of these species is also similar: they are found mainly in Northern Europe, and in the south, only in mountainous areas. However, *L. albifrons* is an exception; historically, it has also been quite common in Aquitaine, south of Bordeaux. This is one of the warmest regions of France—much warmer than the Netherlands—yet the other aforementioned species are absent there. *L. albifrons* thus appears less sensitive to high temperatures than other moorland-pool dragonflies. *L. albifrons* inhabit small, still bodies of clear water that range from nutrient-poor to moderately nutrient-poor. These habitats can be acidic pools with a floating fringe of *Sphagnum* moss, or sometimes pools with more calcareous water and stoneworts (*Chara* species) on the bottom. Although these are very different systems, both are nutrient-poor and feature the extensive underwater vegetation that the larvae require for shelter and hunting prey. In the Netherlands, most populations are found in pools containing *Sphagnum* moss. Pools with *Sphagnum* fringes have suffered greatly from sulfur and nitrogen deposition, which caused acidification and the loss of this essential vegetation structure. Sulfur deposition, in particular, has dropped sharply—by approximately 90%—and while nitrogen deposition remains too high in most locations, it too has been roughly halved. As a result, acidity levels have become less extreme, the *Sphagnum* moss belts have been able to recover, and the pools have once again become suitable for *L. caudalis*. During the 2018 influx, a few *L. caudalis* evidently ended up in areas that had since been restored, and from there, they colonized other sites as well. The contrast between the *L. caudalis* and other pool-dwelling Odonata is striking. About 25 years ago, we had no concerns about *C. lunulatum*, *A. juncea*, or *S. danae*, whereas the likelihood of *L. caudalis* ever appearing in the Netherlands again was considered remote. That picture has now changed completely: formerly common species are in sharp decline, while a species we thought was gone for good is increasing rapidly in numbers."] Address: Van Grunsven, R.H.A., De Vlinderstichting, Mennonietenweg 10, Postbus 506, 6700 AM Wageningen, The Netherlands. Email: roy.vangrunsvan@vlinderstichting.nl

26377 Vareira, L.; Juen, L.; Gonçalves Ortega, J.C. (2025): Freshwater environment type influences Odonata distribution on an estuarine island in the Brazilian Amazon. *Hydrobiologia* 853: 2093-2109. (in English) ["We examined how environmental and spatial distances influence Odonata distribution by comparing lentic and lotic water bodies, the latter with larger environmental gradients and spatial distances. We expected (i) distinctive species composition between lotic and lentic water bodies; (ii) higher beta diversity and turnover within lotic waters compared to lentic waters; (iii) that environmental distances would be more influential in lotic waters and spatial distances in lentic waters. We sampled Odonata adults and environmental variables in 23 lotic and 19 lentic water bodies within a protected area, using overland distance to assess spatial structure. Both water body types exhibited contrasting environmental conditions and species composition, although some species were habitat generalists. Beta diversity was predominantly due to turnover and was higher in lentic water bodies. Environmental and spatial distances influenced beta diversity and turnover across the metacommunity; however, these relationships were not observed when we analyzed each water body type separately. Our findings highlight that environmental variation sustains significant Odonata diversity, providing dispersal pathways and adequate

habitats, enhancing species persistence. Sets of different freshwater environments form heterogeneous networks, which are sources of aquatic organisms. Therefore, we recommend including several aquatic environments in conservation planning and biodiversity monitoring of protected areas." (Authors)] Address: Varella, Luísa, Programa de Pós-Graduação em Ecologia, Inst. de Ciências Biol., Univ. Federal do Pará (UFPA), Rua Augusto Corrêa, 1 - Guamá, Belém, Pará, 66075-110, Brazil

26378 Vimos-Lojano, D.; Mosquera, P.V.; Hampel, H.; Vázquez, R.F. (2025): Spatial-temporal distributions of macroinvertebrate communities in high-mountain tropical lakes of Ecuador. *Hydrobiologia* 852: 4029-4051. (in English) ["Tropical high-mountain lakes are low-temperature oligotrophic ecosystems with biological communities adapted to extreme conditions. Ecological information of these communities constitutes an important baseline, especially, facing climate change and anthropogenic activity. Hence, this study's objective was identifying environmental variables that control spatial/temporal distribution of littoral macroinvertebrate communities in quasi-pristine lakes of Ecuador. Hydro-morphological, water quality and micro-habitat variables were monitored and macroinvertebrates sampled in 202 lakes. Further, 24 environmental variables were monitored and macroinvertebrates sampled, monthly, in 10 lakes. 22 community metrics per lake were calculated. Partial Redundancy Analysis and Generalised Linear Model revealed that ecosystems response of macroinvertebrate communities to environmental variables is complex, spatially and temporally. Altitude was associated, negatively, with some richness community metrics (Total, Non-insect, Insect, Trichoptera, Odonata-Coleoptera-Heteroptera) and, positively, with the relative abundance (RA) of some taxa (Andesiops, Anomalocosmoecus, Limnophora). The RA of several taxa (Ostracoda, Metrichia, Palpomyia, Aeshna and Dixia) increased in larger lakes with alkaline pH (above 8.2); and in smaller lakes with higher ammonium concentrations (above 30 µEq l⁻¹) (Liodesus, Dixella, Rhinolaophia). Monthly macroinvertebrate community variation was not detected. However, considering three climatic phases, non-insect richness, sample RA, and the RA of Helophila, and of Ephemeroptera, Plecoptera and Trichoptera, differed." (Authors)] Address: Vázquez, R.F., Laboratorio de Ecología Acuática, Facultad de Ciencias Químicas, Universidad de Cuenca, Av. 12 de Abril S/N y Av. Loja, Cuenca, Ecuador

26379 Wagner, G. (2025): Schlupfnachweise des Spitzenflecks (*Libellula fulva* O. F. Müller, 1764) in Nassau/Lahn. *Fauna Flora Rheinland-Pfalz* 15(3): 1243-1248. (in German) [Rheinland-Pfalz, Germany "On June 7, 2023, I photographed a male *L. fulva* at the Nassau Angling Club's fish ponds in the Lahn Valley but did not identify it as that species at the time. In 2025, I discovered a female at the same location and correctly identified it. On May 20, several males and a total of five females were flying there in the sunshine along a 30-meter stretch of the bank. I also observed and photographically documented two mating pairs. Four individuals were unable to fly because their wings, although fully developed and hardened, were stuck together."] Address: Wagner, G., Windener Str. 24, 56377 Nassau, Germany. Email: g-wagner-nassau@t-online.de

2026

26380 Abbà, M.; Guareschi, S.; Gemetto, G.; Sánchez-Hernández, J.; Fenoglio, S.; Bo, T. (2026): Trophic ecology of the invasive pond loach *Misgurnus anguillicaudatus* (Cantor, 1842) in NW Italy. *ARPHA Conference Abstracts* 9: e202194. <https://doi.org/10.3897/aca.9.e202194>: 2 pp. (in English)

["Feeding selectivity analysis revealed a seasonal strong preference for benthic, relatively low-mobility prey, particularly molluscs (e.g., Valvata, Physa, Lymnaea), isopods, and dipteran larvae (e.g., Chironomidae, Simuliidae). In contrast, larger and more mobile taxa such as Ephemeroptera, Trichoptera, and Odonata were consistently avoided, suggesting that feeding was influenced by both prey preference and mouth-gape constraints. WitOMI analysis confirmed a marked and statistically significant seasonal shift in the realised trophic niche (Monte Carlo permutation test: $p = 0.001$), with a broader niche in summer indicating higher dietary diversification." (Authors)] Address: Abbà, Margherita, Dept Life Sciences & Systems Biology, Univ. of Turin, Torino, Italy. Email: margherita.abbà@unito.it

26381 Abdulsalam, H.I.; Mohammed, Y.M.; Ibrahim, U.B.; Onyemata, K.E.; Rani, A.A.; Omotosho, A.O.; Abdul-malik, A.-Q.; Ibrahim, U.F.; Haruna, A.S. (2026): Ecological health assessment of a municipal river in North-Central Nigeria using macroinvertebrate assemblages and environmental variables. *Journal of Freshwater Ecology* 41:1, 2693693. 16 pp. (in English) ["This study assessed the ecological health of Etswan River using integrated habitat quality, physicochemical characteristics and macroinvertebrate assemblages for eight months (July 2025 to February 2026). Four sampling stations were selected long the river reach and were investigated using standard ecological and statistical approaches. Qualitative Habitat Evaluation Index (QHEI) scores ranged from 54% to 68%, indicating an ecologically stressed but viable system. Most of the physicochemical parameters were spatially uniform indicating a relatively homogeneous environment except for dissolved oxygen, depth, and total hardness that showed significant difference ($p < 0.05$) between the sampling stations. A total of 659 macroinvertebrate individuals from 24 species were encountered and the most abundant group was Hemiptera, followed by Mollusca and Odonata. Diversity indices indicated that there was a moderate level of species diversity among the stations as station 4 recorded the highest (19 species) in term of number of species while station 3 recorded the lowest (16 species). Station 1 had the highest number of individuals (214) followed by station 3 (157), station 4 (151) and the lowest number of individuals (137) was observed in station 2. Canonical Correspondence Analysis (CCA) showed that the dissolved oxygen, depth and nutrient concentrations had a significant effect on the distribution of the macroinvertebrates ($p < 0.05$) with more than 85% of the total variation accounted. Our findings show that although the river still possesses certain ecological integrity, rising anthropogenic activities are gradually altering habitat structure, deterioration of water quality, changes in macroinvertebrate community structure, reduced biodiversity, and increased dominance of pollution-tolerant taxa, although there is need for continuous monitoring of the river for sustainable management of the ecosystem." (Authors) All Odonata taxa are species occurring in Europe. These stupid misidentifications are an increasing bad tradition of researchers in this country in spite the fact that there are regional odonatologists common with the Nigerian odonate fauna.] Address: Mohammed, Y.M. Dept Biology, Fac. Life Sciences, Ibrahim Badamasi Babangida Univ., Lapai, Niger State, Nigeria. yakubmohammedmanbe@yahoo.com

26382 Abrehart, T. (2026): North Thames Estuary & Marshes. Aquatic Macroinvertebrate Survey Report 2024. Natural England Commissioned Report NECR608: 92 pp. (in English) ["Abrehart Ecology Ltd was commissioned by Natural England, to update the records and status of macroinvertebrates within eight survey compartments from Tilbury Fort to north of Mucking Marshes. Additionally, the survey was used to evaluate the

conservation value of each compartment and the overall condition of the site. Samples were taken from 57 locations in May, July and August/September 2024. The eight survey compartments were: - Mucking Wetlands (Compartment A), - Mucking Church Woodland (Sub-Compartment B2), - Mucking Landfill inc. Golden Gates Lake (Enovert) (Compartment C), - Fields East of Coalhouse Battery (Compartment L), - Coalhouse Fort and surrounds (Compartment E), - Ashfields & Goshem's Farm (Compartment G), - Low Street Pit & surrounds (Compartment J) and - Tilbury Fort Marshes (Compartments TFM and K). Summary of overall biodiversity value: 1. In total, 239 taxa of aquatic invertebrates were recorded within the survey area, of these, 180 were identified to species level. Site Analysis for Freshwater Invertebrate Scoring (SAFIS) scoring indicates that all of the compartments are of a 'Very High' conservation value (Community Conservation Index (CCI) score) with up to 21 species of interest in a single waterbody. The Biological Monitoring Working Party (BMWP) score indicated that water quality was 'good' to 'excellent'. 2. 27,687 specimens were recorded. These records included 90 species of aquatic Coleoptera, 26 species of Hemiptera, six species of crustacean, 12 species of Odonata larvae, seven species of Hirudinea and 18 taxa of aquatic molluscs (14 gastropods and four bivalves)." (Authors) On pages 77-78, special emphasis is given to *Isoaeschna isoceles* (Müller, 1767).] Address: <https://publications.naturalengland.org.uk/file/6030484935802880>

26383 Adedapo, A.M.; Fagbohun, I.R.; Akindele, E.O. (2026): Description of the larva of the Banded Jewel, *Africocypha centripunctata* (Gambles, 1975) (Odonata, Chlorocyphidae) from Obudu Plateau, Nigeria with some ecological notes. *Zootaxa* 5839(3): 577-588. (in English) ["The larva of *A. centripunctata* is described from its type locality, the Obudu montane region of Nigeria. Specimens of this Nigerian-Cameroonian highland range-restricted species are compared with specimens of the more widespread *Chlorocypha* spp. from western Nigeria. The broad and blunt-tipped cerci of *A. centripunctata* is adjudged to be a reliable larval diagnostic character of the species from *Chlorocypha* spp., in addition to a greater body size (F-0, 16 mm). The montane habitat requirements of larvae of *A. centripunctata* include lotic systems with good riparian cover, coarse particulate organic matter, high dissolved oxygen saturation and low water temperature. Given the conservation importance of this endangered species, knowledge of its larval identity and ecology could aid more-informed conservation interventions. As odonate larval collections are a major part of the results of hydrobiological assessments for conservation decision makers, an in-depth study of their species-level descriptions is recommended in West Africa." (Authors)] Address: Adedapo, A.M., Department of Zoology, Obafemi Awolowo University, Ile-Ife, Nigeria. Email: abiodunadedapoau@gmail.com

26384 Ali, A.A.; Nnadozie, F.; Akamagwuna, F.C.; Chukwue-meka, V.I.; Keke, N.; Odume, O.N. (2026): Macroplastics as artificial substrates for macroinvertebrates in four subtropical river systems in the Eastern Cape, South Africa. *Hydrobiologia* 853: 4787-4800. (in English) ["The ecological implications of macroplastic accumulation in rivers, particularly their role as artificial substrates for aquatic organisms, remain poorly understood, especially in the Afrotropical streams. We investigated how macroinvertebrates colonise macroplastic substrates relative to natural substrates in four minimally disturbed headwater stream sites in the Eastern Cape, South Africa. Experimental substrate groups, including NS (100% natural substrate), NP (1:1 mix of natural and plastic substrates), and PD (100% plastic substrate), were deployed for

180 days. Macroinvertebrates colonised macroplastics and natural substrates, and overall community structure did not differ significantly amongst the substrate groups. However, the natural substrate supported higher taxonomic richness (41) than the macroplastic substrate (33). Temporal variation strongly influenced macroinvertebrate community assemblage, with colonisation significantly increasing over time, across all substrate groups. Taxon-specific preferences were also evident: macroinvertebrate taxa such as Glossosomatidae, Psephenidae, and Veliidae showed positive associations with plastic substrates, whereas Libellulidae, Tipulidae, and Tabanidae preferred natural substrates. These findings suggest that macroplastics serve as suitable artificial substrates for aquatic macroinvertebrates, but their ecological importance varies amongst taxa. Natural substrates still supported a higher number of taxa, though not statistically significant, underscoring the importance of preserving naturally occurring substrates as key habitats for freshwater biodiversity." (Authors)] Address: Ali, A.A., Institute for Water Research, Rhodes University, P.O. Box 94, Makhanda, South Africa. Email: aliandy598@gmail.com

26385 Álvarez-Álvarez, K.L.; Arenas-Villalobos, M.L.; Barragan-Ayala, J.C.; Vásquez-Ramos, J.M.; Rodríguez, J.; Molineri, C. (2026): Redescription of the larva of *Orthemis discolor* (Burmeister, 1839) (Odonata: Libellulidae). *Zootaxa* 5866(2): 367-376. (in English) ["The F-0 larva of *O. discolor* is redescribed based on reared specimens from Argentina and Colombia. Diagnostic morphological characters, including mandibular formula, labial palp armature, premental setation, abdominal sclerotization, and caudal appendages, are detailed and illustrated. The examined material confirms the identity of South American larvae and supports the reassignment of several historical records previously attributed to *O. ferruginea* to *O. discolor*. Comparative analysis within the "*ferruginea*" group reveals a unique combination of characters useful for species delimitation." (Authors)] Address: Álvarez-Álvarez, Karen Lineke, Instituto de Biodiversidad Neotropical, CONICET-Univ. Nacional de Tucumán, Fac. Ciencias Naturales e IML, San Miguel de Tucumán, Argentina. Email: karen.lineke@gmail.com

26386 Andersson Kleist, S. (2026): The increased northern range expansions of dragonflies (Odonata) in Sweden. BSc thesis, Faculty of Health, Science and Technology, Karlstad University: 16 pp. (in English, with Swedish summary) ["As the global temperature increases for every year that passes, and losses in bodies of water continues to drive its inhabitants out of their established homes, it is to no surprise that Odonata are increasingly shifting their ranges northward even in the northern regions of Sweden. This study investigates the expanding northern range of dragonflies in Sweden over the past two decades, using citizen science data from the Swedish Species Observation System; Artdatabanken, SLU (Swedish University of Agricultural Sciences). The analysis examines observational data from 2005 to 2025, focusing initially on 64 dragonfly species, to identify patterns in their northern range expansions. Using quantile regression analysis, the study analyses the median and upper 30-percentile of northbound reports. The results indicate that 64% of species with viable data had significant correlations with latitudinal shifts moving upwards, supporting the hypothesis of increasing northern range expansions. Although the findings confirm a notable increase in the average latitude of dragonflies, not all species exhibit parallel trends, with some showing unexpected declines due to a potential lack of knowledge. The implications of these findings highlight the potential for altered predator-prey dynamics and biodiversity impacts in both established and newly occupied habitats. Future studies should

explore the underlying causes of these shifts, particularly in relation to climate change and habitat preferences, to better understand the choice between expansion over adaptation of dragonflies in their race against global warming." (Authors)] Address: <https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A2075816&dswid=-7730>

26387 Arango-Quintero, S.; Bota-Sierra, C.A. (2026): Demography of the dragonfly *Rhionaeschna caligo* (Aeshnidae), a species endemic to the northwestern Andes in Colombia. *International Journal of Odonatology* 29: 169-175. (in English) ["Páramos are unique ecosystems located in the highest parts of tropical mountains. Despite harboring great biological diversity, they are also considered one of the most threatened ecosystems in the world. *Rhionaeschna caligo* is an endemic and threatened species that inhabits these ecosystems in the north of Colombia's Central and Occidental Cordilleras. This study presents the first demographic assessment for the species using the Mark-Recapture method. The population size (50 ± 15 individuals; 186 ± 27 individuals), life expectancy (11.3 days; 14.5 days), probability of survival (0.90; 0.92), and detectability (0.08; 0.1) were estimated on two climatic seasons. Activity patterns in the wetlands were recorded in both seasons, finding differences between sexes, with male activity starting around 9 a.m. and finishing around 4 p.m., and female activity beginning around 4 p.m. and finishing at around 6 p.m. at dusk. Also, the effects of size and sex on survival and detectability were tested; no statistical support was found. The demographic parameters of survival-detectability and life expectancy are like those reported in the literature for other aeshnids. A negative effect of rainy weather conditions and low water levels on survival is suggested. High mortality among larvae inhabiting the wetland was observed after days of high radiation and low cloud cover." (Authors)] Address: Arango-Quintero, S., Grupo de Entomología Universidad de Antioquia (GEUA), Medellín, Colombia. Email: sebastian.arango4@udea.edu.co

26388 Araos, C.; Wilson, R.; Maluend, R.; De los Rios-Escalante, P.R.; Esse, C.; Lopez, C. (2026): First characterisation of benthic macroinvertebrate communities in the upper and middle reaches of the Loa River, northern Chile. *Braz. J. Biol.*, 2026, vol. 86, e306221: 12 pp. (in English, with Portuguese summary) ["The Loa River is the longest river in Chile and flows through the Atacama Desert, one of the driest environments on Earth. Despite its ecological importance, knowledge of its benthic macroinvertebrate fauna remains limited. This study provides the first characterisation of benthic macroinvertebrate communities inhabiting the upper and middle reaches of the Loa River and its principal tributaries. Seven sampling sites, including four along the main river channel and three tributaries, were surveyed between April and June 2005. Community structure was evaluated using total abundance, taxonomic richness and the Margalef, Pielou, Brillouin, Fisher, Shannon and Simpson diversity indices. Spatial patterns were assessed using univariate statistical analyses, Bray-Curtis similarity and ANOSIM. A total of 50 taxa belonging to four phyla were recorded. Arthropods dominated the assemblages, particularly Trichoptera, Coleoptera and Diptera, which together accounted for more than 90% of the total abundance. Diptera exhibited the highest taxonomic richness, with 22 taxa, including 11 taxa of Chironomidae. The highest diversity was recorded at the Yanquilcha site, whereas San Pedro River and Loa before Chiu-Chiu supported the greatest macroinvertebrate abundances. Multivariate analyses revealed a clear spatial pattern associated with changes in community composition along the river system.

These findings provide the first comprehensive baseline description of benthic macroinvertebrate communities in the upper and middle Loa River and highlight the influence of environmental gradients on community structure in one of the world's most arid river systems." (Authors) Odonata: Aeshnidae, Gomphidae.] Address: Araos, C., Universidad de Antofagasta, Facultad de Ciencias del Mar y Recursos Hidrobiológicos, Depto de Ciencias Acuáticas y Ambientales, Antofagasta, Chile. Email: araos21@gmail.com

26389 Biswas, J.; Dey, P.; Jubair, T.; Sayeed, I.M. (2026): First record of *Lestes dorothea* (Odonata: Lestidae) from Bangladesh. *Notulae odonatologicae* 10(7): 237-240. (in English) ["*L. dorothea* is reported from Bangladesh for the first time on the basis of photographic evidence. An adult male was encountered and photographed during a field observation at Hazarikhil Wildlife Sanctuary, Chattogram District. This species is closely related to *Lestes decipiens* but can be readily distinguished by the structure of the paraprocts and abdominal markings." (Authors)] Address: Biswas, J., Dept Zool., Jagannath Univ., Dhaka-1100, Bangladesh. Email: joybw4067@gmail.com

26390 Biswas, J.; Karim, A.; Dey, P.; Sayeed, I.M.; Hossen, M.T. (2026): First record of *Epophthalmia frontalis* (Odonata: Macromiidae) from Bangladesh. *Notulae odonatologicae* 10(7): 251-255. (in English) ["*E. frontalis* is widely distributed from South Asia to South-east Asia. Here, we report it as a new addition to a range extension of this species and a new addition to the Odonata fauna of Bangladesh, based on a single male specimen collected from Sandwip Para area, Hathazari Upazila, Chattogram District, Chattogram Division. This species is closely allied to *E. vittata* but can be easily distinguished by the spots on superior surface of frons, and length and structure of inferior anal appendage." (Authors)] Address: Biswas, J., Department of Zoology, Jagannath University, Dhaka-1100, Bangladesh. Email joybw4067@gmail.com

26391 Boudem, T.C.R.; Nonga, T.B.; Zebaze, T.S.H. (2026): Physicochemical characteristics and macroinvertebrate communities of the crenon and potamon of the Lobo River in the rainforest zone of Cameroon. *Ecology and Evolutionary Biology* 11(3): 79-91. (in English) ["A study of the physicochemical water quality and the diversity of Benthic Macroinvertebrates (BMIs) in the Lobo River was conducted to characterize its upper and lower reaches. Sampling was carried out between May 2020 to May 2021 across four stations (two in the crenon and two in the potamon), using standard methods for physicochemical analyses. BMIs were collected with a 30-cm square, 400-µm mesh dip net over a 100-meter stretch at each station, following the multi-habitat method. Physicochemical parameters were generally low and homogeneous between the crenon and potamon ($p > 0.05$), with recorded values for dissolved oxygen ($61.23 \pm 4.37\%$), turbidity (17.43 ± 2.15 FTU), and suspended solids (16.81 ± 2.29 mg/L); nitrogen forms (0.54 ± 0.08 mg/L NH_4^+ ; 0.36 ± 0.18 mg/L NO_3^-) and orthophosphates (0.85 ± 0.37 mg/L PO_4^{3-}) being higher in the crenon (L2), whereas nitrites were lower at that zone (0.012 ± 0.004 mg/L NO_2^-). A total of 86 BMIs species belonging to 3 phyla, 5 classes, 10 orders, and 38 families were recorded. Key bioindicators recorded were: *Caridina nilotica* and *Phyllomacromia bifasciata* [= *contumax* Selys, 1879] in the crenon; *Micronecta* sp., *Tramea transmarina* [sic; a Pacific islands, northern Australia and parts of Southeast Asia species], and *Canas macateei* in the potamon. The Shannon-Weaver diversity index indicated sites with low diversity encompassing both pollution-sensitive (Atyidae and Poly-mictarcyidae) and pollution-tolerant (Libellulidae and Belosomatidae) organisms, as revealed by Principal Component

Analysis (PCA)." (Authors)] Address: Zebaze, T., Dept of Animal Biology and Physiology, University of Yaounde I, Yaounde, Cameroon

26392 Briede, A.; Springe, G.; Apsite, E.; Ozolinš, D.; Korite, I. (2026): Distinctive climate change features in Latvia and their implications for freshwater ecosystems. *Water* 2026, 18(16), 2015; <https://doi.org/10.3390/w18162015>: 17 pp. (in English) ["Climate change is increasingly affecting freshwater ecosystems across Northern Europe, yet the responses of inland waters differ according to regional climatic and environmental conditions. Latvia, located within the boreo-nemoral transition zone, provides an important case for understanding these responses. This review synthesises published evidence on climate-driven changes in Latvian inland surface waters by integrating information on climatic trends, hydrological processes, hydrochemical responses and freshwater biota. The available evidence indicates that increasing air temperature, changing precipitation patterns and more frequent hydrological extremes have altered river discharge, ice regimes, water temperature and lake processes. These hydrological changes generate cascading effects on nutrient transport, dissolved organic matter and water quality, ultimately influencing primary production, community composition, species redistribution and fish communities. The review identifies hydrology as the principal mechanism linking climatic forcing with hydrochemical and biological responses. Although the overall direction of change is consistent with observations across Northern Europe, local catchment characteristics and multiple stressors modify ecosystem responses in Latvia. The synthesis also identifies major knowledge gaps regarding ecosystem-scale processes, ecological thresholds and long-term integrated monitoring. Addressing these gaps will improve understanding of climate-driven changes in Latvian inland waters and strengthen the scientific basis for adaptive freshwater management in Latvia and comparable northern European regions." (Authors) A few references to Odonata are given.] Address: Briede, Agrita, Dept Geography, Fac. of Science and Technology, Univ. of Latvia, Raina Bulvaris 19, LV-1586 Riga, Latvia. Email: agrita.briede@lu.lv

26393 Brito, J.S.; Silva, E.C.; Cruz, G.M.; Santos Ferreira, V.R.; Bastos, R.C.; Sampaio Montele, J.; Mendoza-Penagos, C.C.; Carvalho, F.G.; Oliveira-Junior, J.B.B.; Dias-Silva, K.; Sala, T.; Michelan, T.S.; Montag, L.F.; Casatti, L.; Juen, J. (2026): Abiotic drivers of co-occurrence and diversity patterns of Calopterygidae species in Amazonian protected freshwaters. *Ecological Entomology* 51(2): 235-249. (in English) ["1. Interspecific competition, environmental conditions and spatial factors can shape species co-occurrence patterns in freshwater habitats, especially among closely related taxa. We investigated the diversity and co-occurrence patterns of damselflies from the Calopterygidae family in streams located inside protected areas (IPAs) and outside protected areas (OPAs) in the Brazilian Amazon, assessing the influence of abiotic variables. We expected that IPA streams would show greater environmental heterogeneity, stronger co-occurrences and fewer random associations than OPA streams. We also predicted that environmental variables would have a stronger influence on species diversity and co-occurrence patterns than spatial predictors. 2. A total of 359 individuals representing 10 Calopterygidae species were collected from 98 streams across 4 PAs. Contrary to our expectations, OPA streams showed higher environmental heterogeneity, potentially related to human disturbances. Negative co-occurrence prevailed in both IPA and OPA streams, but was more pronounced in IPA sites. These patterns may reflect ecological similarity among Calopterygidae

species, particularly in resource use. Canonical analyses revealed a stronger influence of broad-scale spatial variables on diversity and co-occurrence than initially predicted, with two major Amazonian rivers likely acting as dispersal barriers. Limnological and physical habitat variables were also significant predictors, likely related to the availability of exploitable resources. 3. Future research should extend this approach to other damselfly families and aquatic groups and examine the role of morphological traits in mediating species interactions." (Authors)] Address: Brito, J.S., Programa de Pós-graduação em Ecologia, Universidade Federal do Pará, Belém, Pará, Brazil

26394 Buddhika, S.K.S.P.S.N.; Ebenezer, P.; Joseph, A.; Yarlagaadda, T.; Senevirathne, A.I.S.W.M.; Yarlagaadda, P.K.D. V.; Bray, L.J.; Mathew, A. (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, absorbers, sensors, microfluidics, and energy harvesting devices, although further validation is required." (Authors)] Address: Buddhika, S., School of Mechanical, Medical and Process Engineering, Faculty of Engineering, Queensland University of Technology (QUT), Brisbane, QLD, 4000, Australia. Email: buddhika.naidelage@hdr.qut.edu.au

26395 Burgos-Camargo, C.G.; González-Trujillo, J.D.; López-Casas, S.; Rodríguez-Rocha, M.; Santana-Tobar, M.A. (2026): Macroinvertebrados acuáticos de los Andes tropicales: guía ilustrada para el monitoreo comunitario. *Wildlife Conservation Society (WCS Colombia) y Universidad Nacional de Colombia (UNAL)*: 96 pp. (in Spanish) ["Rivers, streams, and waterways harbor a wide diversity of life forms that provide clues about the health of these ecosystems. By studying the organisms inhabiting the water, it is possible to assess the conservation status of these environments and detect the impacts of human activities such as deforestation, agricultural and urban expansion, and waste discharge.

Among these organisms are aquatic macroinvertebrates—small animals visible to the naked eye that spend at least one stage of their life cycle in the water. Their presence, abundance, and diversity allow for the assessment of water quality, as some groups are sensitive to environmental changes, while others can tolerate more degraded conditions. In Colombia, Andean rivers are vital ecosystems for the well-being of numerous communities, providing water, food, and a range of environmental benefits. However, they face profound transformations that affect their ecological functioning and jeopardize biodiversity, human health, and the productive and recreational activities that depend on them. In this context, community-based monitoring has emerged as a key tool for observing, caring for, and protecting aquatic ecosystems. Active community participation strengthens local knowledge, enables the early detection of changes in rivers, and fosters their protection. This guide was developed to assist local communities in assessing ecosystem integrity through participatory monitoring using aquatic macroinvertebrates. It offers practical, accessible tools for identifying these organisms and understanding their value as indicators of Andean ecosystem health. Additionally, the guide is designed to facilitate identification at the order and family levels using a clear, easy-to-apply methodology. It is important to note that this booklet covers only the families most commonly found in Andean rivers and streams; it does not aim to encompass the full diversity present in these ecosystems. Should questions arise or organisms not described here be encountered, users are encouraged to contact the Colombian Limnology Network ("Red Colombiana de Limnología"), where experts can provide technical guidance and specialized support to accurately identify the observed organisms." (Publisher) Odonata are treated at family level on pages 58-65.] Address: https://library.wcs.org/en-us/DesktopModules/DGDataExplorer/API/Data/GetFile?tableName=WCSPROGRAMS_Publication&fieldName=SourceFile&fileName=98b20cd7-b27b-4f0f-b15a-f835a3e56a39.pdf&moduleId=44980&portalId=0-8&open=true

26396 Burkart, W.; Lohr, M.; Martens, A. (2026): Erinnerungen an Dietrich Kern (29. Juli 1934 - 8. Oktober 2025). *Libellula* 45(1/2): 1-12. (in German, with English summary) ["A brief biography, together with personal recollections and memories of Dietrich Kern is presented. Dietrich made cover drawings of odonates in high quality for the journals *Libellula* and *Libellula Supplement* in a relevant number. He played a prominent role in the study of *Gomphus vulgatissimus*, in local faunistics in agricultural areas, and in co-operation with the French odonatology. His complete odonatological bibliography is appended." (Authors)] Address: Burkart, W., Am Emel 7, D-27412 Wilstedt, Germany. Email: weguburkart@gmx.de

26397 Cai, Y.; Zhang, X.; Lian, M. (2026): Urban dragonfly habitats: Threats, ecological requirements and restoration strategies. *Biodiversity Science* 34, 26096. 17 pp. (in Chinese, with English summary) ["Aims: Urbanization has increasingly altered freshwater ecosystems and threatens the biodiversity of Odonata, a group highly dependent on coupled aquatic-terrestrial habitats. Although studies on urban dragonfly habitats have expanded rapidly in recent years, a systematic synthesis that links ecological threats, habitat requirements and restoration strategies remains scarce. This study aims to review current knowledge on urban dragonfly habitats within the context of urban ecology, urban biodiversity conservation and ecological restoration. Methods: Publications from 2005 to 2025 were retrieved from the Web of Science Core Collection using a bibliometric search strategy and screening methods.

Bibliometric and thematic analyses were combined to examine the temporal trends, geographic distribution and major research themes in dragonfly habitat studies. The ecological threats, habitat requirements and restoration approaches identified in previous studies were further synthesized and categorized. Review Results: Existing studies indicate that urban dragonfly diversity is jointly constrained by habitat fragmentation, hydrological alteration, water pollution, vegetation simplification and reduced habitat connectivity. Dragonflies rely not only on aquatic environments for larval development, but also on surrounding terrestrial habitats for foraging, dispersal, shelter and reproduction, highlighting the importance of coupled aquatic-terrestrial habitat systems. Habitat heterogeneity, riparian vegetation structure, microclimatic stability and landscape-scale connectivity were repeatedly identified as key determinants of species persistence and assemblage stability. Recent studies increasingly emphasize metacommunity dynamics, regional species pools and blue-green ecological networks in urban dragonfly conservation. Conclusion: Based on this synthesis, we summarize restoration strategies at the regional and habitat-patch scales, including enhancement of blue-green connectivity, restoration of habitat heterogeneity and adaptive management of urban freshwater habitats. Future research should strengthen empirical studies on dragonfly responses across urbanization gradients, multi-scale habitat connectivity and long-term adaptive management, in order to facilitate the transition from isolated habitat restoration toward integrated urban freshwater biodiversity governance." (Authors)] Address: Zhang, X., Beijing Acad. of Forestry and Landscape Architecture, Beijing 100102, China. Email: haeckelzxc@gmail.com

26398 Cardoso-Jaime, V.; Maya-Maldonado, K.; Powell, S.; Tikhe, C.V. (2026): Insect immune systems: same same but different but still same. *Frontiers in Immunology* 17: 1884037. 18 pp. (in English) ["Insects are the most diverse group of animals in nature, occupying nearly every ecological niche and playing central roles as pollinators, pests, and disease vectors. Despite this vast diversity, insects rely on a set of conserved yet evolutionarily adaptable immune pathways to defend against pathogens. Early studies in insect immunity have laid the foundation for human immunology, and recent advances in genomic and transgenic technologies have renewed interest in understanding how immune responses vary across insect orders. Insects are highly diverse in their immune systems; each species has unique immune responses that help fight infections from specific pathogens. Nevertheless, they share multiple aspects of recognition, regulation, and effector mechanisms. This review focuses on current knowledge of the immune systems of major insect lineages to highlight both shared signaling pathways, immune cells, and humoral factors, as well as lineage-specific responses that reflect distinct ecological pressures that have shaped the host-microbe interactions. Comparing different insect species and orders not only provides insights into the evolutionary divergences and convergences of immune system features but also offers complementary knowledge among species within the same order, helping fill existing gaps. Understanding these evolutionary patterns not only deepens our understanding of insect immunity but also informs the development of transgenic strategies to disrupt pathogen transmission in key vector species." (Authors) The study includes several references to Odonata.] Address: Tikhe, C.V., Department of Biology, Ball State University, Muncie, IN, United States. Email: ctikhe@bsu.edu

26399 Carlson, P.E. (2026): Disentangling small dam impacts: macroinvertebrate metrics reveal local stressors in

degraded agricultural streams. *Journal of Freshwater Ecology* 41:1, 2641453. 12 pp. (in English) [Sweden "Agricultural land use and dams present prevalent, interacting stressors on freshwater ecosystems across Europe and globally. This study assessed the efficacy of established, taxonomy-based macroinvertebrate metrics for detecting localized dam impacts within streams already heavily modified by agriculture. Community responses were compared between rare riffle habitats and the dominant, slow-flow habitat types within the catchments. Metrics were based on the relative species richness of sensitive and tolerant taxonomic groups (calculated as the number of species within taxonomic groups divided by the total number of species). Despite a lack of significant differences in measured single-event physical habitat parameters between the dammed and reference sites, the macroinvertebrate assemblages exhibited clear responses. Dam impacts were most strongly detected in riffle habitats, aligning with a priori expectations of a greater number of sensitive taxa in these habitats. The general degradation metrics effectively teased out the dam signal, which shifted toward tolerant taxa (Oligochaeta, Diptera). The responses were habitat specific; for instance, filter feeding Trichoptera increased below the dams, while riffle specialist Plecoptera decreased. These findings underscore the utility of indices of general degradation when applied strategically with targeted, habitat-specific sampling, highlighting that effective biomonitoring and conservation strategies must prioritize the assessment and protection of rare, highly valued microhabitats in multi-stressed river networks." (Author) Taxa are treated at order level.] Address: Carlson, P.E., Dept Aquatic Sciences & Assessment, Swedish Univ. Agricultural Scienc. Uppsala, Sweden. Email: peter.carlson@slu.se

26400 Cham, S. (2026): Drinking behaviour in flight by a female *Anax imperator* Leach (Emperor Dragonfly). *Journal of the British Dragonfly Society* 42(1): 65-73. (in English) ["An observation of a female *A. imperator*, recorded by a contiguous sequence of still photographs, showing her flying close to the water surface in a controlled manner and then imbibing water that is indicative of drinking behaviour." (Author)] Address: Cham, S., 2, Hillside Road, Lower Stondon, Bedfordshire SG16 6LQ, UK.

26401 Chovanec, A. (2026): Libellen (Insecta: Odonata) in einem gewässerlosen Hausgarten in Niederösterreich – Teil 2. *Beiträge zur Entomofaunistik* 27: 11-30. (in German, with English summary) ["Odonata in a domestic garden without water bodies in Lower Austria – Part 2. – This study supplements previously published records of Odonata from a garden without water bodies with data collected between 2020 and 2025. The number of species increased by four, reaching a total of 30, which corresponds to 44% of the species inventory recorded for the Austrian federal state of Lower Austria. Sightings of *Ischnura elegans* and *Sympetrum striolatum* together account for 62% of the 1,532 records. Among the 11 Zygoptera and 19 Anisoptera species, both limnophilic and rheophilic taxa are represented. Thirteen species are listed in one of the threat categories of Austria's Red List (2026 edition); *Sympetrum meridionale* is classified as "Critically Endangered". Particularly noteworthy is the very early observation of a young female *Sympecma fusca* on 18 June 2024. About 61% of the 236 records from 2025 relate to observations of *S. fusca*, *I. elegans*, and *Platynemis pennipes*, which used the stems of a lavender bush as perching sites for maturation, hunting, overnight roosting and – in the case of *S. fusca* – as an autumn refuge. The high species richness can be attributed primarily to the garden's structural diversity, good exposure to sunlight, abundant food resources (not least due to its nature-friendly management), and proximity to both running

and standing waters of varying characteristics and size." (Authors)] Address: Chovanec, A., Krotenbachgasse 68, 2345 Brunn am Gebirge, Austria. Email: andreas.chovanec@gmail.com

26402 Clausnitzer, V.; Uyizeye, E.; Günther, A.; Kipping, J.; Dijkstra, K.-D.B. (2026): Diversity of dragonflies and damselflies in Rwanda with a focus on Nyungwe and Akagera National Parks (Odonata). *Entomologische Zeitschrift* 136(2): 75-82. (in English) ["To date 115 species of Odonata are known from Rwanda. We have confirmed the presence of 75 dragonfly species in Akagera National Park and its immediate surroundings, especially the swampy area at the park entrance, and 52 dragonfly species in Nyungwe National Park. Data include historical information and records collected during recent surveys and the Summer Schools carried out in Nyungwe National Park in 2021 and 2022 and in Akagera National Park in 2023 as part of the project "Mind the Darwinian Shortfalls: A Graduate Summer School on Biodiversity and Collection Management in East Africa", a joint initiative of the Senckenberg Research Institute, Germany, and the Center of Excellence in Biodiversity and Natural Resource Management (CoEB) at the University of Rwanda." (Authors)] Address: Clausnitzer, Viola, Senckenberg Museum of Natural History Görlitz, Am Museum 1, 02826 Görlitz, Germany. Email: viola.clausnitzer@senckenberg.de

26403 Coelho, J.R., (2026): Insects in classical music. *Insects* 2026, 17, 959: 17 pp. (in English) ["The role of insects in classical music was investigated using online sources. The prevalence of insects in classical music was much greater than anticipated; 1018 cases of insect works and pieces were discovered. Many composers repeatedly used insects in their works. The most common groups of arthropods represented were Lepidoptera, Hymenoptera, Diptera, Orthoptera and Araneae. The vast majority of cases were published recently, rather than during the traditional age of classical music from 1750 to 1830. The greatest number of composers came from the USA, followed by France, England, Austria and Germany. A number of composers of insect pieces are ranked among the best known and most productive, though most insect-themed compositions are poorly known. The music itself often evoked insects via various effects, such as buzzing, droning, and tremolo. Many insect-themed compositions were inspired by literature featuring insects. Classical music is much like other genres of music, such as rock and folk, in that it uses the same groups of species for the same reasons—such as butterflies for aesthetic value and flies for revulsion." (Author) This compilation includes more than 50 compositions devoted to dragon- or damselflies.] Address: Coelho, J.R., Biology Program, Quincy University, 1800 College Ave., Quincy, IL 62301, USA. Email: j.coelho42@quincy.edu

26404 Conze, K.-J.; Martens, A.; Borkenstein, A.; Baumann, K.; Lohr, M.; Thomas, B.; Willigalla, C. (2026): Erinnerungen an Reinhard Jödicke (1. Juli 1948 – 25. November 2025). *Libellula* 45(1/2): 13-23. (in German, with English summary) ["A biography of Reinhard Jödicke is presented, with a special focus on his contributions to the study of Odonata in Germany and, in particular, his services to the German Society for the study of Odonata, the GdO e.V. Thanks to his initiative, the GdO became a registered association in 1991." (Author)] Address: Conze, K.-J., Hamburger Str. 92, 45145 Essen, Germany. Email: kjc@loekplan.de

26405 Cordero-Rivera, A.; Dyatlova, O.; Svensson, E.I.; van Gossom, H.; Utzeri, C. (2026): Effects of seasonal timing and latitude on body size in *Ischnura* damselflies in Europe

(Odonata: Coenagrionidae). *Odonatologica* 55(1/2): 49-67. (in English) ["In ectothermic invertebrates, high temperatures generally accelerate developmental rates and decrease adult body sizes. However, such temperature effects on body size could have contrasting fitness effects in the two sexes, as under certain circumstances in some species small males may have higher mating success, but large female insects almost invariably have higher fecundity. Here we analyse changes in body length of *Ischnura elegans* along a latitudinal gradient in Europe and throughout the year. We focus on populations in Sweden (2), Ukraine (2), Belgium (1), Spain (2), and Italy (2). Furthermore, two populations of the sympatric *I. graellsii* from Spain were also studied. The effect of latitude on size was idiosyncratic: body size decreased from Sweden to Belgium but in Ukraine the first adults to emerge were largest and their size decreased again towards Spain and Italy. The largest individuals generally were those that emerged at the beginning of the breeding season. In the south, there was a tendency for body size to increase again towards the end of summer or early autumn, which was not observed at more northerly latitudes. On average, females were larger than males. However, in Italy, seasonal size change between the sexes diverged with females, but not males, increasing in size towards autumn, and the two populations from Ukraine showed divergent trends with respect to size and season. Females of the aurantiaca morph were smaller than androchromes and infuscans. These results suggest that in addition to latitude and its global effects on temperature, local factors also shape seasonal variation of body size of *Ischnura* adults, resulting in synchronously different body sizes even between geographically close populations." (Authors)] Address: Cordero-Rivera, A., Univ. de Vigo, ECOEVO Lab, E.E. Forestal, Campus Universitario, 36005 Pontevedra, Spain. Email: adolfo.cordero@uvigo.gal

26406 Costa, J.H.A.; Selinger, A.; Vidal, T.A.; Castilho, A.G.; Pereira Souza, U.; Duarte, R.M. (2026): Filling gaps in the biology of the critically endangered killifish *Leptopanchax itanhaensis* (Aplocheilidae: Rivulidae). *Environmental Biology of Fishes* 109(127): 14 pp. (in English) ["*L. itanhaensis* is a critically endangered annual killifish endemic to temporary aquatic habitats of the Atlantic Forest in southeastern Brazil, yet its biology and ecology remain poorly known. Here, we provide preliminary natural history data based on a 14-month monitoring effort in the Preto River sub-basin, the only region where the species is currently known to occur. We monitored one temporary pool and two roadside ditches, recording a total of 32 individuals, with most captures occurring during the rainy season. The species was repeatedly detected in both natural and artificial temporary habitats, which differed in their physicochemical conditions. Critical thermal maximum values ranged from 33.3 to 37.7 °C, and the thermal safety margin was estimated at 7.41 °C. Diet analysis indicated frequent consumption of Chironomidae larvae and Ostracoda, although most food items were classified as occasional. Eight mature females were analyzed for reproductive traits, revealing low batch fecundity and a bimodal distribution of oocyte diameters, consistent with batch spawning. Female body size was positively associated with oocyte diameter, but not with fecundity. Together, these findings provide the first integrated natural history account for *L. itanhaensis* and help fill key knowledge gaps for the conservation of this highly threatened species." (Authors)] Food items found in the diet of *Leptopanchax itanhaensis* individuals sampled in the Preto River sub-basin, Itanhaém-SP, Brazil are presented in table 4. A total of 12 stomachs were analyzed. Odonata (nymphs) accounted to 8.33% of food items.] Address: Costa, J.H.A., Lab. de Biologia de Organismos Marinhos E Costeiros (LABOMAC), Santos, SP, 11045-907, Brazil. Email: jh.costa@unesp.br

26407 David, S.; Jansky, V.; Šiblová, Z. (2026): Faunistic and ecological study of dragonflies (Insecta: Odonata) of the Malé Karpaty mountains. *Entomofauna carpathica* 38(1): 101-136, Appendix. (in English) ["This study presents a comprehensive faunistic and ecological assessment of dragonflies in the Malé Karpaty Mountains, southwestern Slovakia. Based on 539 occurrence records from 166 sites collected between 1956 and 2024, we documented 43 taxa comprising 3,375 individuals. Among the eudominant species were *Aeshna affinis* (D = 29.78 %), *Cordulegaster heros* (D = 16.86 %), *Coenagrion puella* (D = 12.53 %), and *Platycnemis pennipes* (D = 12.36 %). Autochthonous reproduction of *A. affinis* was not confirmed. 17 species of conservation concern were recorded, including ten legally protected taxa such as *Coenagrion ornatum*, *Epithea bimaculata*, *Cordulegaster heros*, *Brachytron pratense*, and *Leucorrhinia pectoralis*. Reproduction was not confirmed by larvae or exuviae in 25 species. Ordination analyses revealed strong ecological structuring. Detrended Correspondence Analysis indicated a pronounced gradient in community composition (gradient length = 5.77). Canonical Correspondence Analysis confirmed significant relationships between species composition and 13 habitat types (pseudo- F = 5.7; p = 0.002), explaining 30.8 % of total variability. A simple effects analysis identified the metarhithral zone (submontane streams) as the most influential factor (10.1 % variability; pseudo- F = 18.3; p = 0.002), strongly correlated with the primary ordination axis (CorE. 1 = 0.94). Small water reservoirs explained 6.8 % of variability and were negatively associated with the main gradient (CorE. 1 = -0.67). Our findings highlight the conservation priority of maintaining natural forest streams to support stable populations of *C. heros*, which occurred at 121 sites and was the sole species at 33 sites. Small water reservoirs serve as important habitats for local biodiversity hotspots, with the highest richness (17 species) recorded at SWR Druhý rybník (Železná studnicka), despite low diversity indices (N2 = 4.82, H' = 1.97, e = 0.69) due to dominance by a few taxa. Rare habitats such as peat bogs and marshes host specialized species, including *Leucorrhinia pectoralis* and *Brachytron pratense*." (Authors)] Address: David, S., Institute of Landscape Ecology, Slovak Academy of Sciences, Štefániková 3, 814 99 Bratislava, Slovakia. Email: stanislav.david@savba.sk

26408 Díaz-Martínez, C.; Rosas-Ramos, N.; García-París, M.; López-Estrada, E.K. (2026): From discovery to extinction? Phylogeography and niche modelling of a newly described dragonfly. *Journal of Insect Conservation* 30:85: 16 pp. (in English) ["The preservation of genetic diversity is a central goal in conservation. General theoretical frameworks such as the central-marginal hypothesis (CMH) often inform conservation strategies, but species with specialized habitat requirements or restricted distributions may not fit this model, hampering the delimitation of conservation units. We studied *Onychogomphus cazuma*, a recently described dragonfly endemic to Spain and restricted to thermal springs, to define a conservation framework. We aimed to (1) identify patterns of haplotypic structure through a phylogeographic analysis based on the mitochondrial marker *cox2*, (2) assess the role of philopatry in population structure through a capture-mark-recapture experiment, and (3) evaluate population-level extinction risk using ecological niche models under different climatic scenarios. A star-like haplotype network was observed, with seven population-specific haplotypes lacking a clearly structured geographic pattern, and philopatry was not detected. Ecological niche models predicted a drastic reduction in suitable habitat under future climate scenarios. The haplotypic diversity pattern is compatible with several demographic scenarios, such as a founder effect from an extinct source

or a severe genetic bottleneck followed by population expansion. The presence of population-specific haplotypes indicates some degree of recent confinement, despite ongoing gene flow as suggested by the lack of geographic structure. The lack of clear central and peripheral population differentiation indicates that the CMH is not applicable to *O. cazuma*. Although three management units are tentatively proposed, projected habitat collapse implies that *O. cazuma* should be conserved as a single, highly vulnerable unit. Implications for insect conservation: Our results highlight the role of phylogeographic inference to design conservation strategies beyond generalized assumptions about population genetic patterns. For endemic species or those restricted to highly specific habitats, conservation efforts should prioritise preserving all populations." (Authors)] Address: Díaz-Martínez, C., Museo Nacional de Ciencias Naturales, MNCN-CSIC, José Gutiérrez Abascal 2, 28006 Madrid, Spain. cdiaz.cuenca@gmail.com

26409 Dias-Oliveira, T.M.; Simões-Silva, M.L.; Fôlha-Ferreira, E.D.; Santos, J.C.; Vilela, D.S.; Jacques, G.; de Souza, M.M. (2026): Dragonflies of Pico do Itambé State Park: diversity and composition of an Odonata community in the Espinhaço Mountains. *International Journal of Odonatology* 29: 148-158. (in English, with Spanish summary) ["The reduction and modification of the Atlantic Forest and Campo Rupestre make it urgent to conduct inventory studies that provide data on the distribution of biota. However, many areas lack information, including those within Conservation Units (CUs) considered priorities for conservation, such as the Pico do Itambé State Park (PEPI) in the Espinhaço Range, Minas Gerais, which lacks information regarding its odonatofauna. In this context, the objective of this study is to record the Odonata community in this CU. Collections were carried out from May 2024 to February 2025. A total of 59 species from 10 families were collected, including a new species of the genus *Hetaerina*, recently described, a species considered vulnerable, *Heteragrion flavovittatum*, and four new records for the state of Minas Gerais: *Limnetrus antarcticum*, *Progomphus adaptatus*, *Libellula herculea* and *Metaleptobasis selysi*. These data demonstrate the need for the protection of Campo Rupestre associated with the Atlantic Forest for the maintenance of the odonatofauna of Minas Gerais, as well as the water resources within PEPI. The recorded Odonata community justifies public investment in this Conservation Unit." (Authors)] Address: Dias-Oliveira, T.M., Graduate Program in Entomology, University of São Paulo, Ribeirão Preto, São Paulo, Brazil. Email: deoliveiratmd@gmail.com

26410 Dindo, M.L. (2026): Insects in Italian painting through time: From symbolism to naturalism. XIII European Congress of Entomology (ECE) 2026, Tours (France), 29/6/2026 - 3/7/2026 - Scientific Programme - Abstract Book: 885. (in English) [Verbatim: Insects appear less frequently in Italian painting than in Northern European traditions, yet their presence reveals a wide range of meanings and functions that shift across time, genres, and cultural contexts. This contribution explores how insects have been represented in Italian painting from the Middle Age to the early modern period, highlighting a gradual movement from symbolic and allegorical roles to increasingly naturalistic and observation-based depictions, while highlighting that the boundary between art and science is never rigid. In religious and allegorical works, insects often convey symbolic meanings rooted in ancient mythology or Christian thought. The butterfly, traditionally linked to the soul, is central in Pisanello's "Portrait of an Este Princess", where its function may range from matrimonial symbolism to an allusion to mortality. A damselfly, associated with water and spiritual transformation, appears in Tommaso Aleni's "Madonna of the Pomegranate", whereas grasshoppers signify destructive

force in Lorenzo Lotto's "Saint Jerome". Flies and bees provide contrasting associations: flies evoke decay and fragility of life, as in Jacopo Ligozzi's "Memento Mori", while honeybees signify industriousness and civic virtue in Pietro da Cortona's "Triumph of Divine Providence". With the rise of Renaissance naturalism, artists increasingly approached insects with scientific attention. Leonardo da Vinci's studies of dragonflies and beetles (with an almost engineering approach) and Caravaggio's faithful depiction of fruit pests in the "Basket of Fruit", illustrate this convergence between artistic practice and empirical observation. Early modern naturalists—including Ulisse Aldrovandi and Francesco Stelluti—deepened this connection, while still-life painters such as Fede Galizia and Giovanna Garzoni produced highly detailed, taxonomically recognisable insect portrayals. Overall, insect imagery in Italian painting—though not abundant—offers valuable insights into evolving symbolic frameworks and into the progressive integration of naturalistic and scientific observation within visual culture.] Address: <https://cris.unibo.it/handle/11585/1076171>

26411 Diwakara, D.M.T.K.; Chandrathilake, G.G.T.; Gunawardana, K.W.; Senanayake, S.A.M.A.I.K.; Wickramasinghe, S.; Fernando, M.; Gunawardana, J. (2026): A faunal inventory of the Malgasowitadeniya riverine mangrove ecosystem, Sri Lanka. *International Conference on Mangroves for Sustainability 2026 (ICMS 2026) 22nd – 25th July 2026: 18-* (in English) [Verbatim: Mangrove ecosystems function as ecotones that sustain diverse and specialized faunal communities, providing essential ecosystem services and vital habitats shaped by dynamic environmental gradients. The Malgasowitadeniya Riverine Mangrove Forest represents a critical but understudied riverine mangrove habitat requiring baseline documentation. An eight-month faunal survey was conducted from June 2025 to January 2026 using three 500m x 10m belt transects extending from the river edge to the landward zone. Visual encounter surveys were employed to document birds, mammals, reptiles, amphibians, and invertebrates, complemented by opportunistic observations and photographic records. Ichthyofauna were surveyed using drag net sampling in adjacent irrigation canals connected to the mangrove ecosystem. A total of 186 faunal species from nine taxonomic classes were documented, dominated by Insecta (59 species) and Aves (53 species). Aquatic and semi-aquatic taxa were also well represented, including Actinopterygii (29 species), Malacostraca (11 species), including 9 crab species, and Gastropoda (8 species), which serve as key ecological indicator groups. 11 endemic species were identified, and 15 nationally threatened taxa, comprising two critically endangered, seven endangered, and six vulnerable species. The presence of the endangered Fishing cat and vulnerable Eurasian otter further emphasized the high conservation value. Further classification highlighted avifauna and fish as the most diverse vertebrate groups, while vital ecological indicator groups such as butterflies (22 species) and odonates (18 species) formed a major component of the invertebrate diversity. These findings suggest that the Malgasowitadeniya riverine mangrove forest supports a rich and ecologically significant assemblage across multiple taxonomic groups. Its diverse aquatic-terrestrial interface underscores its importance as a conservation priority. The findings provide essential baseline data for future ecological monitoring, conservation planning, and habitat management initiatives.] Address: Diwakara, D., Dept of Forestry & Environmental Sciences, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka. Email: as2021286@sci.sjp.ac.lk

26412 Dolai, S.; Mallick, M.A.I.; Barua, S. (2026): Diversity and abundance of odonates (Insecta: Odonata) in selected

areas of Hooghly District, West Bengal, India: A comparative study. *Entomologia hellenica* 35(2): 124-144. (in English) ["Rapid urbanization-driven habitat loss and fragmentation pose significant threats to biodiversity at both global and regional scales. This study investigated the diversity and abundance of odonates in selected areas of Hooghly District, West Bengal, India, from January 2021 to December 2023. A total of 41 species were recorded, with the highest representation from the family Libellulidae (63%), followed by Coenagrionidae (22%), Aeshnidae (7%), Platycnemididae (5%) and Gomphidae (3%). Various diversity indices and multivariate statistical analyses were applied to evaluate community structure and ecological patterns. The results revealed high species richness and diversity, with clear variation across habitat types and seasons. This study provides essential baseline information on odonate diversity and distribution in the region and will support future ecological monitoring and conservation planning." (Authors) *Anaciaeschna jaspidea*, *Anax indicus*, *Gynacantha dravida*, *Ictinogomphus rapax*, *Acisoma panorpoides*, *Aethriamanta brevipennis*, *Brachydiplax chalybea*, *Brachydiplax farinosa*, *Brachydiplax sobrina*, *Brachythemis contaminata*, *Bradynopygia geminata*, *Crocothemis servilia*, *Diplacodes nebulosa*, *Diplacodes trivialis*, *Lathrecista asiatica*, *Macrodiplax cora*, *Neurothemis fulvia*, *Neurothemis tullia*, *Orthetrum pruinosum*, *Orthetrum sabina*, *Pantala flavescens*, *Potamarcha congener*, *Rhodothemis rufa*, *Rhyothemis variegata*, *Tholymis tillarga*, *Tramea limbata*, *Tramea basilaris*, *Trithemis pallidinervis*, *Urothemis signata*, *Zyxomma petiolatum*, *Agriocnemis kalinga*, *Agriocnemis pygmaea*, *Ceriatagion cerinorubellum*, *Ceriatagion coromandelianum*, *Ischnura rubilio*, *Ischnura senegalensis*, *Mortonagrion aborense*, *Paracercion malayanum*, *Pseudagrion rubriceps*, *Onychargia atrocyana*, *Pseudocopteryx ciliata*] Address: Mallick, M.A.I., Dept of Forest, Environment & Climate Change, Jamshedpur Forest Division, Jamshedpur – 831001, Jharkhand, India. Email: imranmallick708@gmail.com

26413 Dragonfly Conservation Europe (2026): Newsletter. Newsletter 3: 24 pp. (in English) [Contents: Winter is Cold, Science is Multivoltine 2; DCE Instagram 2; 8th European Congress on Odonatology – 23–26 June, Teresin, Poland 3; Short article on the history of dragonfly studies in Germany 9; Assessment to Plan-Report 14; A new emergence for the French dragonflies monitoring scheme (Steli): a path for a common monitoring scheme in Europe? 16; CIMaE: a project targeting high-altitude Odonata 18; Communication & Awareness 19; Upcoming conferences 20; Publications 23.]

26414 Dudek, K.; Wos, G. (2026): The transcriptomic response along an urbanization gradient is also temperature-dependent in a freshwater insect. *Molecular Ecology* 35(16), e70511: 14 pp. (in English) ["Urbanization has become one of the leading causes of habitat transformation affecting ecosystem functioning. However, the transcriptomic response to urbanization remains poorly understood. Here, we conducted a transcriptomic analysis along an urbanization gradient under different warming temperatures. We further explored the genes underlying phenotypic variation along an urbanization gradient using weighted gene co-expression network analysis (WGCNA). We collected adult females in eight ponds spanning an urbanization gradient (percentage of impervious surface) in Southern Poland and raised their larvae in growth chambers under three temperature treatments: current 22°C, + 3°C, and + 6°C above current temperature. When larvae reached the prefinal instar, they were phenotyped for traits related to development and size, and collected for a gene expression analysis. We found that 24 genes varied in expression along a continuous urbanization gradient and

were related to proteolysis, extracellular organization and perception. In addition, some genes showed a significant interaction urbanization × temperature and were associated with detection of chemical stimulus and perception. The WGCNA revealed two gene modules associated with urbanization and some phenotype traits, especially with development time. Genes associated with phenotypic differentiation along the urbanization gradient were part of many different pathways including signal transmission, cell cycle and DNA repair. In conclusion, we demonstrated that the transcriptomic response along an urbanization gradient was context-dependent, here on temperature, suggesting that some genes responding to urbanization also exhibited thermal plasticity. Our work highlights the importance of urbanization in inducing phenotypic and gene expression changes in organisms." (Authors)] Address: Wos, G., Institute of Nature Conservation, Polish Acad. Sciences, 31120 Krakow, Poland. Email: wos.gui@gmail.com

26415 Emidi, G.; Klamann, L.; Wu, B.; Spangenberg, H.J.; Kappenberg, A.; Dinh, A.G.C.; Thiele, B.; Huynh, K.; Dang, D.M.; Thu, N.N.T.; Nguyen, N.M.P.; Minh, K.C.; Weihermüller, L.; Ott, J.; O'Connor, J.J. (2026): Toward sustainable agriculture in the Mekong Delta: A multi-criteria analysis of organic and conventional rice farming systems. *Land* 15(9):1542: 31 pp. (in English) ["Sustainable agriculture is critical to sustainable development and climate resilience, yet evidence of its multidimensional environmental, social and economic benefits and trade-offs remains limited, especially in regions most vulnerable to climate change. This study addresses this gap in Vietnam's Mekong Delta (MKD), where decades of intensive rice farming has bolstered rice yields at the expense of environmental quality and farmers' health. This study presents a multi-criteria analysis (MCA) comparing organic rice (OR) and conventional rice (CR) farming systems in the MKD. We applied a weighted sum model to evaluate the environmental, social and economic performance of the two production systems. The assessment drew on quantitative and qualitative primary data collected through stakeholder engagements and field measurements from Vinh Long province between 2023 and 2025, as part of the OrganoRice project. Overall, OR farming performed cumulatively better (0.663 and 0.695) than CR farming (0.496 and 0.484). OR scores were higher across most sub-criteria, particularly "farmers' income" and "biodiversity". However, CR outperformed OR for "rice yield" and "farmers' workload". Comparable water and soil quality scores, due to the presence of pesticide residues in both systems, suggest that the environmental performance of OR farming was likely dampened due to cross-contamination from surrounding or upstream non-organic farms. The expansion of OR farming in the MKD has the potential to enhance environmental, social and economic performance of rice production in the region. However, in order to achieve the full scope of these benefits, short-term measures should aim to reduce the financial risks of conversion for farmers, ensure access to affordable organic inputs, increase farmer training, ensure reliable premium contracts for rice producers and support them in accessing organic markets. Longer-term measures must improve irrigation water management and infrastructure to minimise cross-contamination risks. Coordinated marketing campaigns are needed to develop a trusted regional brand for organic rice from the MKD to create new opportunities in international and domestic markets. Moreover, long-term monitoring of post-transition outcomes is important to capture the full impacts of conversion. As OR cultivation continues to expand across the MKD, evidence on its benefits and trade-offs is essential to guide this transition effectively. This study provides that evidence, offering a context-specific, multidimensional evaluation to inform OR policy and practice in the

region. ... 3.2.3. Biodiversity. Farm-level biodiversity was higher under organic management (0.041 and 0.089) than under conventional management (0.010 and 0.022). Farmers in Vinh Long reported an increased presence of various species, including dragonflies, spiders, butterflies, fish, and frogs. These observations were corroborated by a biodiversity assessment of dragonflies and damselflies carried out on conventional and organic fields. Odonata are valuable bio-indicators, as their abundance and species diversity are strongly influenced by the structural diversity of the landscape (variety of wetland types) and local pesticide loads. Greater diversity and abundance of Odonata were registered in the organic farms. For example, an average of 23 individual damselflies (*Agriocnemis femina*) were collected through sweep netting in organic fields, as well as two more damselfly species and five dragonfly species. In the same fields, other species were also observed, including spiders, fish, crabs and frogs. Five damselfly species and 15 dragonfly species were identified in ponds and ditches neighbouring the organic fields. These areas serve as important source biotopes, supporting the recolonisation of the paddies when rice fields are dry following harvest. Contrastingly, only two *A. femina* were found per sweep netting event in the CR fields. No species belonging to sensitive odonate genera typically found in clean running water (e.g., Calopterygidae, Gomphidae) were identified in either production system or nearby biotopes." (Authors)] Address: Ott, J., Friedhofstr. 28, 67705 Trippstadt, Germany. Email: ott@lupogmbh.de

26416 Endou, S.; Tachikawa, Y.; Nagai, R.; Yoshida, E.; Kitano, S.; Yamazaki, Y.; Tanaka, H.; Suzuki, K.; Starks, T.; Peterson, M.I. (2026): No fish no problem: Diet plasticity as an invasion driver in Japanese smallmouth bass. *Global Ecology and Conservation* 69 (2026) e04290: 11 pp. (in English) ["Diet plasticity of invasive apex predatory fish is thought to potentially amplify their negative effects on native species. Smallmouth bass (*Micropterus dolomieu*), an invasive sport fish introduced globally, are a known fish predator that have caused native fish decline in a host of invaded ecosystems. In Japan, there is currently concern as smallmouth bass continue to expand their range and predate on native fish. Although smallmouth bass diets have been studied in detail and show variability between fish, crayfish, and insect prey, an investigation of diets in severely prey-fish limited ecosystems is lacking, and the ability of smallmouth bass to persist in prey-limited ecosystems is unclear. To address this knowledge gap, smallmouth bass diets and growth rates were studied for 2-years in Lake Katsura, Japan, which is currently thought to have nearly no prey-fish availability. Smallmouth bass diets were comprised primarily of small freshwater shrimp and terrestrial insects. Only four out of 446 stomachs contained fish prey, all of which were con-specific smallmouth bass. A size influenced dietary shift was observed as smallmouth bass size showed a positive effect on terrestrial prey ratio in both years. Smallmouth bass growth rates were below the 40th percentile for all age classes and showed especially reduced growth in older fish. These results represent the first known smallmouth bass population in which prey-fish predation was not observed. This indicates that invasive smallmouth bass populations are able to shift their diet when prey-fish become scarce, and can persist in prey-fish limited environments when alternative prey is available.... In both years smallmouth bass were found to prey on a variety of aquatic and terrestrial prey items. Freshwater shrimp, identified by DNA barcoding as *Palaemon paucidens* (mean size: 2024: 20.53 mm, 2025: 26.97 mm) were the most common prey items in both years, followed by terrestrial insects such as Hymenoptera (predominantly ants), Hemiptera, Coleoptera,

Odonata, and Orthoptera." (Authors)] Address: Peterson, M.I., Faculty of Science, University of Toyama, Toyama, Japan. Email: peterson@sci.u-toyama.ac.jp

26417 Eslami Barzoki, Z.; Chase, J. (2026): Water availability and land-use shape the diversity of Odonata in the Middle East. *Insect Conservation and Diversity* 19(3): 621-633. (in English) ["The Middle East hosts a high diversity of terrestrial and freshwater biota. However, this biodiversity is under threat from climate change, overexploitation and land-use change—particularly through irrigated agriculture and urbanization. Biodiversity data for the region remain fragmented and sparse, creating significant knowledge gaps that hinder effective conservation planning. We investigated how land-use types and water availability influence multiple dimensions of freshwater biodiversity, using Odonata as bioindicators. We analysed 12,770 occurrence records for 144 Odonata species across the Middle East to estimate taxonomic (TD), phylogenetic (PD) and functional diversity (FD), applying incidence-based Hill numbers with rarefaction and extrapolation. Our results show that the availability of long-lasting water bodies significantly enhances all facets of Odonata diversity, underscoring the importance of stable aquatic habitats. Urbanization had consistently negative effects across all biodiversity dimensions, likely due to the limited availability of suitable aquatic and terrestrial habitats. Agricultural land use had a positive effect on TD and PD, possibly explained by the creation of artificial irrigation water bodies, but showed no effect on FD—suggesting a homogenization of functional traits and the dominance of species with similar ecological roles. While agricultural expansion may enhance regional biodiversity, its potential to drive functional homogenization raises concerns about ecosystem resilience. Moreover, its long-term sustainability is uncertain due to accelerating groundwater depletion and salinization across the region. These findings highlight the urgent need for region-specific research and integrated water management strategies to balance development with biodiversity conservation in arid regions." (Authors)] Address: Eslami Barzoki, Zohreh, German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Puschstr. 4, 04103 Leipzig, Germany. Email: zohreh.e.barzoki@idiv.de

26418 Fabian, S.T.; Yarger, A.M.; Chen, S.-L.; Lin, H.-T. (2026): The aerial combat strategy of dragonflies. *Journal of the Royal Society Interface* 23 (240): 20260131: 12 pp. (in English) ["Male dragonflies engage in aggressive aerial contests to establish breeding territories. Using field stereographic recordings of *Trithemis aurora*, we examined dragonfly behavioural objectives during these encounters. Unlike predatory pursuits, in which intercept trajectories minimize time-to-contact, male *T. aurora* steer to keep their opponent in a slightly elevated position within their frontal visual field, modulating speed to avoid direct collision. These contests feature frequent role reversals, with evenly matched rivals alternating between chaser and evader. The manoeuvres observed during these exchanges, including looping and spiralling flight, emerge from the underlying pursuit objectives. During territorial conflicts, males exhibit exceptional agility with centripetal accelerations up to 6g. Despite this high performance, individuals spent approximately one-third of flight time gliding in short bursts, even during close combat. These findings show that complex aerial contests can arise from simple control objectives constrained by sensorimotor limits." (Authors)] Address: Fabian, S.T., Dept of Bioengineering, Imperial College London, London, UK. Email: samuel.fabian@biology.ox.ac.uk

26419 Farias, A.B.S.; Venâncio, H.; Gomes, T.C.; Barão, K.R.; Vilela, D.S.; Santos, J.C. (2026): Odonata species and their beta diversity patterns in freshwater habitats in an Atlantic Forest of Northeast Brazil. *Diversity* 18(8), 459. 30 pp. (in English) ["The Atlantic Forest has undergone significant territorial reduction due to anthropogenic activities, adversely affecting its biodiversity. Consequently, it is imperative to identify the species constituting this megadiverse ecosystem, focusing on local diversity and, on a broader scale, regional diversity (beta diversity). This study inventories Odonata species and analyzes beta diversity patterns in the Atlantic Forest of Sergipe, northeastern Brazil. Sampling across the seven sites yielded 1468 specimens representing 66 species, including 14 new state records. Species richness did not differ significantly between lentic and lotic habitats; however, community composition varied markedly, primarily due to species turnover. Anisoptera were more abundant and diverse in lentic habitats, whereas Zygoptera preferred lotic environments with well-preserved riparian vegetation. High beta diversity at regional and local scales reflects strong environmental heterogeneity, with spatial and habitat factors shaping community structure. This study highlights the ecological distinctions between the two suborders, which are linked to their dispersal abilities and habitat specialisation. These findings emphasise the importance of conserving diverse aquatic habitats and riparian vegetation to maintain Odonata diversity, thereby supporting their role as bioindicators. This study fills a critical knowledge gap in northeastern Brazil and provides baseline data to guide conservation and management strategies in this threatened biome." (Authors)] Address: Farias, A.B.S, Programa de Pós-Graduação em Ecologia e Conservação, Universidade Federal de Sergipe, São Cristóvão 49107-230, Sergipe, Brazil

26420 Friebe J.G. (2026): Gefährdete Flugkünstler - Die Libellen 1. Thema Vorarlberg 2026-5: 37. (in German) [Red List, Vorarlberg, Austria] Address: not stated

26421 Goodman, A.M.; Tolman, E.R.; Beatty, C.D.; Blair, M.E.; Abbott, J.C.; Alfaro, D.M.; Bybee, S.; Uche-Dike, R.; Evangelista, D.A.; Frandsen, P.B.; Gamett, E.; Garcia, L.; Guralnick, R.; Hulick, C.P.; Kohli, M.K.; McCarthy, L.; Reyes, K.; Taveras, K.; Wade, V.; Zahara, A.; Ware, J.L. (2026): The Great Dividing Range as a driver of genetic divergence in a low-dispersing dragonfly. *Ecological Entomology* 51(5): 1002-1016. (in English) ["Across complex landscapes, genetic structure can arise through a combination of geographic, ecological and historical processes. In mountain systems, isolation by distance (IBD), environment (IBE) and resistance (IBR) represent three such mechanisms but are often difficult to distinguish. The Great Dividing Range (GDR) of eastern Australia provides an ideal system for evaluating their relative contributions because of its varying elevation and climatic gradients. Here, we investigate the drivers of genetic structure in the Swamp Tigertail (*Synthemis eustalacta*) using an integrative framework combining population genomics, demographic analysis, morphology and ecological data. Results showed overall low genetic differentiation and no evidence for discrete population structure. Linear mixed-effects model provided no support for IBD but instead showed IBE and IBR, in which any observed genetic differentiation was correlated with environmental gradients, particularly precipitation and temperature extremes, vegetative cover and landscape resistance. Morphological analyses revealed minimal variation among sampled sites, but several traits were sexually dimorphic, suggesting potential sex-biased dispersal. Demographic reconstructions reveal long-term population stability, with paleoniche models displaying shifts in suitable

habitat during past climatic oscillations. Together, these results highlight ecological and topographic isolation as key mechanisms shaping genetic variation in *S. eustalacta* and that montane dragonfly populations may maintain gene flow through climate cycles by tracking suitable conditions across elevational gradients rather than persisting in long-isolated refugia." (Authors)] Address: Goodman, A.M., Division of Invertebrate Zoology, American Museum of Natural History, New York, NY 10024, USA. Email: agoodman@amnh.org

26422 Gujar, V.; Kundanati, L. (2026): Dragonfly-inspired flapping wing fabrication using PVDF/CNT nanocomposite membranes and 3D-printed vein structures. *Polymer Engineering & Science* 66(9): 6993-7006. (in English) ["Insects have a thin membrane with complex venation patterns embedded within it, which provides them with exceptional stiffness, light weight, damping characteristics, and dynamic stability at low Reynolds numbers. One such example is the dragonfly, which possesses exceptional flight characteristics, such as hovering, backward flight, and long-duration travel, making it an ideal inspiration for the development of Flapping Wing Micro Air Vehicles (FWMAVs). In this study, we draw inspiration from the *Pantala flavescens* wing to develop a bioinspired wing by integrating a PVDF/CNT membrane with a 3D-printed vein architecture, aiming to mimic its mechanical and structural performance. Nanocomposite membranes were fabricated by solution casting, with the Carbon Nanotubes (CNT) content systematically varied from 0 to 2 wt%. An optimal composition (1.5 wt%) resulted in the highest reinforcing effect with Young's Modulus of 2.5 GPa and tensile strength of 55 MPa, and storage modulus exceeding 3500 MPa at 100 Hz. It exhibited a fundamental frequency of 30 Hz and showed an enhancement of 90 Hz upon integration of the vein structure. Full-field displacement fields obtained using the 3D Digital Image Correlation (DIC) closely matched those from Abaqus simulations, demonstrating the dominant first-bending mode with displacement increasing from the root to the tip. This study demonstrated the application of a PVDF/CNT nanocomposite membrane as a bioinspired membrane and the use of 3D printing to manufacture vein networks." (Authors)] Address: Kundanati, L., Dept Applied Mechanics & Biomedical Engineering, Indian Institute of Technology Madras, Chennai, India. Email: lakshminath@smail.iitm.ac.in

26423 Harahap, R.R.; Shahroni, A.M.; Syavira, R.F.; Kovács, T. (2026): First mainland record of *Nososticta dora* (Zygoptera: Platycnemididae) from the Bird Head Peninsula, Sorong, West Papua, Indonesia. *Agrión* 30(2): 5-8. (in English) ["Previously, *Nososticta dora* Kovács & Theischinger, 2016, was known only from Batanta Island, but we report a new locality from Mlawer Village, Sorong, West Papua, Indonesia, observed on 29 September 2025. Four males and one female were recorded along a small forest stream in a lowland habitat through an opportunistic survey. The individuals were confirmed based on photographic diagnostic morphological characters. This finding is a first mainland record of *N. dora* and contributes to a better understanding of its distribution in West Papua." (Authors)] Address: Harahap, R.R., Faculty of Forestry, Nusa Bangsa University, Bogor 16166, Indonesia. Email: rhamdany262@gmail.com

26424 Hasanto, R.P. (2026): Keragaman hayati berbasis capung: Inovasi pemantauan ekosistem untuk pertanian dan konservasi berkelanjutan - Dragonfly-based biodiversity: ecosystem monitoring innovation for sustainable agriculture and conservation. *Jurnal Ilmiah Populer Inovasi-Sainsphere* 1(2): 25-27. (in Indonesian, with English summary) ["Odonata

play a crucial role in both aquatic and terrestrial ecosystems. Their life cycle, which depends on water quality, makes them effective bioindicators for assessing ecosystem health. This article highlights the role of dragonflies as environmental indicators, their ecological functions in pest control and ecosystem balance, and the innovative use of community-based monitoring (citizen science) that is simple, low-cost, and practical. Furthermore, dragonflies are relevant to sustainable agriculture practices and biodiversity conservation. Through straightforward approaches, dragonflies can serve as a bridge between ecological science, farming practices, and conservation policies, thereby strengthening efforts to maintain ecosystem sustainability." (Authors)] Address: Hasanto, R.P., Pranata Laboratorium Pendidikan, Universitas Islam Negeri Mataram, Jalan Gajah Mada Nomor 100 Jempong Baru Mataram, NTB, Indonesia. Email: rizkiprimadityah@gmail.com

26425 Herrera, C.; Alemany, I.; Leza, M.; Jurado-Rivera, J.A. (2026): Diet breadth shapes gut microbiota in the invasive hornet *Vespa velutina*. *Insect Conservation & Diversity* 19(5): 1061-1071. (in English) ["1. Diet is a major driver of gut microbiota composition in insects, shaping digestive processes, metabolism, and adaptation to new environments. In invasive species such as *Vespa velutina* *nigrithorax*, trophic flexibility may be linked to microbial plasticity, potentially facilitating its ecological success. However, the relationship between diet and gut microbiota in this species remains poorly understood. 2. Here we analyse both the gut microbiota and the diet of *V. velutina* larvae from seven nests in Mallorca (Balearic Islands, Spain) using DNA metabarcoding approaches. 3. Our results reveal a significant positive correlation between diet richness and microbial diversity, suggesting that variation in prey consumption contributes to shaping gut microbial communities. Firmicutes (49.39%) and Actinobacteriota (31.72%) were the most abundant bacterial phyla inside *V. velutina* nests. Additionally, we identified 26 significant correlations between dietary and microbial components, with Actinobacteriota (9) and Lepidoptera (18) being the microbial phylum and insect order showing the highest number of significant associations. 4. These findings indicate that *V. velutina* microbiota responds dynamically to dietary inputs, potentially enhancing digestive efficiency and adaptability to novel environments. Overall, our study underscores the importance of gut microbiota–diet associations and provides new insights into microbial mechanisms that may contribute to the invasive success of *V. velutina*." (Authors) The diet includes Odonata, which are not further specified.] Address: Leza, Mar, Dept Biol. (Zoology), Univ. Balearic Islands, Ctra. Valldemossa km 7.5, Palma, Balearic Islands, Spain. Email: mar.leza@uib.es

26426 Heydarpour, P.; Meray G. (2026): Comparative analysis of organic compounds in larval habitats of *Culex pipiens* and *Culiseta longiareolata*. *Journal of Health Sciences and Management* 2: 81-89. (in Turkish, with English summary) ["Mosquitoes are vector organisms with a wide global distribution and significant ecological and public health importance. *Culex pipiens* and *Culiseta longiareolata* are two widely distributed mosquito species that have adapted to diverse aquatic habitats and complete their larval development in a range of natural and anthropogenic water bodies. The ecological characteristics of larval habitats play a central role in shaping species biology, population dynamics, and vector potential. *Culex pipiens* is generally associated with stagnant waters rich in organic matter, including polluted and eutrophic environments such as sewage systems and wastewater, whereas *Culiseta longiareolata* is more frequently reported from temporary water bodies and relatively clean or semiclean aquatic habitats. Nevertheless, accumulating evidence indicates that

both species exhibit considerable ecological plasticity, allowing them to persist under varying physicochemical and biological conditions. This review synthesizes current knowledge on the larval habitat preferences of *C. pipiens* and *C. longiareolata*, with particular emphasis on physicochemical parameters, biotic interactions, and tolerance to environmental stressors. In addition, recent advances in habitat characterization approaches, including the application of molecular and chemical profiling techniques, are discussed. Despite growing interest in this field, the relationships between the chemical composition of larval habitats and species-specific behavioral responses remain insufficiently explored. A clearer understanding of these mechanisms is essential for the development of effective and environmentally sound vector control strategies. ... 3.4.1. Effect of *Anax imperator*. In outdoor pool experiments conducted by Stav et al. (1999), a 52% reduction was observed in the number of *Culiseta longiareolata* egg rafts deposited in pools containing *A. imperator* larvae compared to predator-free controls. Laboratory tests confirmed that this reduction resulted not from the predator consuming the eggs, but from females "avoiding" these pools. Noting that *Anax imperator* is a visual predator while *Culiseta* oviposits at night, the authors emphasized that this avoidance behavior is based on chemical cues (kairomones) rather than visual ones (Stav et al., 1999). This avoidance behavior by mosquitoes may not always provide complete protection; this is where the direct predatory capacity of Odonata nymphs comes into play. A recent meta-analysis by Priyadarshana & Slade (2023), covering 31 different studies, revealed that a single Odonata nymph can consume an average of 40 mosquito larvae per day and reduce larval populations by 45% daily. The key biological factor underlying this high predatory success is the specialized hunting morphology possessed by Odonata nymphs. An analysis presented by Vatandoost (2021) highlighted that dragonfly nymphs possess a specialized mouthpart structure known as a modified labium, which can extend up to one-third of their body length to capture prey. These ambush predators are so effective that field studies conducted in Myanmar reported a single dragonfly nymph could consume approximately 133 mosquito larvae within 24 hours and achieve up to 100% success in suppressing *Culex* populations under semi-field conditions (Sebastian et al., 1990)—a finding also confirmed by recent meta-analyses (Priyadarshana & Slade, 2023)...." (Author)] Address: Meray, Gökçe, Marmara Üniversitesi, Sağlık Bilimleri Enstitüsü, Temel Sağlık Bilimleri Anabilim Dalı, Biyogüvenlik ve Biyoemniyet Yüksek Lisans Program, İstanbul, Türkiye. Email: gokce.meray@marmara.edu.tr

26427 Holuša, O.; Holušová, K. (2026): Biometric data of the female of *Cordulegaster boltonii algerica* Morton, 1916 (Anisoptera: Cordulegastridae) from Morocco with notes on subspecies occurrence. *International Journal of Odonatology* 29: 189-197. (in English) ["19 females of *C. boltonii algerica* were measured and documented in the field across seven localities in the Rif Mountains and Tazzeka Mountains in northern Morocco in June 2008, June 2015, and June 2024. Their morphological characteristics are described. The variability of body colour pattern is restricted to minor colour details." (Authors)] Address: Holuša, O., Mendel University in Brno, Faculty of Regional Development & International Studies, Tr. Gen. Píky 7, CZ-613 00 Brno, Czech Republic. Email: holusao@email.cz

26428 Holzinger, W.; Philipp, K. (2026): Die Schabrackenlibelle *Anax ephippiger* (Burmeister, 1839) neu für die Steiermark (Österreich) (Insecta: Odonata: Aeshnidae). *Entomologica Austriaca* 33: 71-76. (in German, with English

summary) ["The vagrant emperor (*Anax ephippiger*) new to Styria (Austria) (Insecta: Odonata: Aeshnidae). The first record of *A. ephippiger* from Styria was obtained on 20 April 2025 in Pirka near Graz. This brings the total number of dragonfly species known to occur in Styria to 65, with up to five further new records expected in the near future." (Authors)] Address: Holzinger, W., ÖKOTEAM-Institut für Tierökologie & Naturraumplanung Bergmannsgasse 22, 8010 Graz, Austria. Email: holzinger@oekoteam.at

26429 Holzinger, W.E.; Aurenhammer, S.; Kapus, P.; Kerschbaumsteiner, H.; Miedl, B.; Papenberg, E.; Sucher, J.; Weisinger, A.M.; Tiegerhofer, R. (2026): Insekten-Lieder zum 50. Geburtstag der ÖEG. *Entomologica Austriaca* 33: 329-334. (in German, with English summary) ["Insect songs celebrating 50 years of ÖEG. To mark the 50th anniversary of the Entomological Society of Austria, four entomological songs were written and performed by the band "The Tymbaliners" at the 50th anniversary celebration in Graz on October 18, 2025. "Die Moritat von den Insekten", "The Dying Dew", "In the Meadow" and "Käferjagd" are entomological interpretations of popular musical pieces that humorously address both the enchanting diversity and the dramatic decline of insect fauna and provide insights into the everyday life of a beetle researcher." (Authors)] Address: Holzinger, W.E., Ökoteam – Institut für Tierökologie & Naturraumplanung, Bergmannsgasse 22, 8010 Graz, Austria. Email: holzinger@oekoteam.at

26430 Hou, P.; Ma, X.; Liu, L.; Men, Y.; Wang, J.; Yang, D.; Zhang, C. (2026): Environmental DNA metabarcoding reveals diversity and spatiotemporal variations of benthic invertebrates in Hun River Basin, China. *Biology* 2026, 15, 1597: 20 pp. (in English) ["Freshwater biodiversity underpins ecosystem functioning and human well-being. As the most diverse taxonomic groups in freshwater ecosystems, benthic invertebrates are widely employed as bioindicators for aquatic monitoring and health assessment. In this study, environmental DNA (eDNA) metabarcoding was used to reveal the diversity and spatiotemporal variations in benthic invertebrates in the Hun River Basin (the middle and upper reaches). Sampling was conducted in spring, summer, and autumn, with sites arranged to cover both anthropogenic activities and watershed environmental conditions. A total of 3 phyla, 7 classes, 18 orders, 56 families, 114 genera, and 161 species were detected. Insecta was the predominant class, and the combined EPT taxa (Ephemeroptera, Plecoptera, and Trichoptera) along with Diptera accounted for 64.71%, 74.18%, and 68.75% of the total taxa in spring, summer, and autumn. Community composition exhibited variations across both seasonal and spatial scales, as reflected by differences in OTU richness, dominant taxa and their relative sequence abundances, and alpha diversity indices. The top 10 dominant genera were all regionally common taxa, among which seven belonged to Insecta (including four from Chironomidae), whereas *Sulcospira* was the most spatially widespread dominant genus. Alpha and beta diversity analyses revealed significant seasonal differentiation but no significant spatial structuring. The SIMPER analysis identified the key genera that contributed substantially to observed community dissimilarity among sampling groups. This study provides fundamental data for freshwater biodiversity conservation and validates the potential applicability of eDNA metabarcoding for benthic invertebrate monitoring, while also revealing the current limitations of this technique." (Authors) In the supplemental material the following odonate species are listed: *Indocypha catopta*, *Coenagrion lunulatum*, *Ceragrion nipponicum*, *Sinictinogomphus clavatus*, *Sympetrum striolatum*, *Calicnemis sinensis*, *Copera marginipes*] Address: Zhang, C.,

College of Life Science, Shenyang Normal University, Shenyang 110034, China. Email: chuntianzhang@aliyun.com

26431 Hou, Y.; Jin, H.; Lian, Z.; Ren, W.; Xu, J.; Tian, Y.; Yu, H. (2026): Sustainable TiO₂ hierarchical micro-/nanostructured surfaces with physical antibacterial and photocatalytic surface contaminant removal properties on titanium alloy. *Journal of Alloys and Compounds* 1080, 190845 (in English) ["Inspired by the mechano-bactericidal effects of natural nanostructured surfaces such as cicada and dragonfly wings, constructing antibacterial micro/nanostructures has emerged as a promising antibiotic-free strategy. However, current approaches still suffer from complex fabrication processes and performance deterioration caused by the accumulation of dead bacterial debris during long-term use. Herein, a facile and scalable method combining laser processing and hydrothermal treatment was developed to fabricate hierarchical micro/nanostructures composed of microscale protrusions and TiO₂ nanoneedles on Ti-6Al-4V titanium alloy. Under the selected laser-hydrothermal conditions, the resulting surface was primarily composed of anatase TiO₂ with a small amount of rutile phase and exhibited superhydrophilic wettability. Owing to the synergistic effects of the hierarchical structure and superhydrophilicity, the surface showed excellent antibacterial activity against *Escherichia coli*, achieving an antibacterial rate of 89.6% after 24h. Under ultraviolet irradiation, the TiO₂ nanostructure effectively degraded dead bacteria and organic residues with a degradation rate exceeding 80%. This photocatalytic surface contaminant removal capability continuously re-exposed the bactericidal nanoneedles, thereby sustaining the antibacterial functionality. The developed surface integrates physical antibacterial activity with photocatalytic self-renewal behavior, providing a sustainable, non-leaching, and long-lasting antibacterial strategy for biomedical titanium alloys." (Authors)] Address: Lian, Z., Ministry of Education Key Lab. Cross-Scale Micro & Nano Manufacturing, College of Mechanical & Electrical Engineering, Changchun Univ. Science & Technology, Changchun 130022, China. Email: lianzhongxu@cust.edu.cn

26432 Huo, B.; Nefti-Meziani, S.; Isakhani, H. (2026): Insect-inspired flapping-wing aerial vehicles: a review of aerodynamics, design, and control. *Bioinspiration & Biomimetics* 21(4) DOI: 10.1088/1748-3190/ae786a (in English) ["Insect-Inspired flapping-wing micro aerial vehicles (FWMAVs) have attracted significant attention due to their unique advantages in agility, manoeuvrability, low noise, and adaptability to cluttered environments. Over the past two decades, research in this field has progressed from early conceptual demonstrations to more advanced platforms capable of hovering, rapid manoeuvres and limited autonomous flight. This review summarizes the historical development of FWMAVs, highlights key unsteady aerodynamic mechanisms such as the leading-edge vortex, wake capture, clap-and-fling, rotational lift and added-mass effects, and analyses their roles in enabling lift enhancement under low Reynolds number conditions. Actuation approaches including motor-driven, piezoelectric, electromagnetic and emerging soft-material-based systems are examined, together with structural innovations in wing configurations such as two-wing, four-wing, X-wing, and multi-wing architectures. Control strategies for tailless vehicles, including wing-kinematics modulation, attitude feedback control and onboard sensing, are systematically reviewed. Despite significant progress, current FWMAVs still face major challenges in energy efficiency, endurance, lack of adaptability to different environments, environmental robustness and material limitations. Future development will require integration across disciplines such as smart materials, high-efficiency power systems, micro-fabrication and

advanced control algorithms to achieve truly autonomous, robust, and long-range bio-inspired flight." (Authors)] Address: Nefti-Meziani, Samia, Department of Mechanical Engineering, University of Birmingham, Birmingham B15 2TT, UK. Email: s.nefti-meziani@bham.ac.uk

26433 Idec, J. (2026): Harnessing large-scale image data to reveal climate, habitat, and behavioral drivers of dragonfly coloration. PhD thesis, University of Florida: 106 pp. (in English) ["In insects, color patterns can play roles in thermoregulation, camouflage, and visual signaling, yet our understanding of color variation and context-dependency is limited by lack of data spanning broad spatial, temporal, and taxonomic gradients. Community science platforms, which host millions of organismal images taken globally, can bridge this gap by providing color data at unprecedented scale. However, heterogeneous imaging conditions and heavy sampling bias necessitate robust pipelines for color extraction and careful modeling approaches that account for data unevenness. Odonata are an ideal taxon for such work, with diverse coloration serving thermoregulatory, signaling, and potentially cryptic functions, sophisticated color vision, and broad ecological and climatic variability. In chapter 2 I begin with museum specimen wing images taken under controlled conditions, honing my methodological thinking through inductive color clustering and phylogenetically-informed Bayesian modeling. I find that dark wing coloration in Nearctic odonates is strongly associated with male perchers and larger wing size, supporting a primary role in territorial signaling with limited evidence for thermoregulatory function. In chapter 3 I develop my pipeline for obtaining color data from iNaturalist using groundedSAM segmentation and feature-cluster filtering, using it to quantify body melanism from 75,000 iNaturalist field images across 159 contiguous-USA species while accounting for lighting bias using skewness. I find that phenology strongly mediates temperature effects on body darkness, with the darkest individuals occurring among early-emerging species in cold climates, providing evidence for thermal melanism and Gloger's rule operating as context-dependent selective forces. In chapter 4, I scale my iNaturalist pipeline globally to 200,000 images across 669 dragonfly species, applying species-contrastive metric learning to extract interpretable axes of broad dragonfly pattern variation. I find that a dominant axis ranging from high-contrast striped patterns to uniform coloration is strongly associated with aquatic habitat type, with lotic (flowing water) species exhibiting significantly striper patterns than lentic (still water) species, consistent with visually complex lotic environments favoring disruptive camouflage or vivid signaling. Collectively, my research advances our understanding of how behavior, phenology, and habitat shape dragonfly color evolution while demonstrating reproducible approaches for large-scale color quantification from community science imagery." (Author)] Address: <https://ufdc.ufl.edu/en/UFE0063518/00001/pdf>

26434 Ihsani, A.S.N.; Zahropi, N. (2026): Keanekaragaman spesies capung (Odonata) di kawasan taman wisata alam suranadi Lombok barat. SanteK 3(1): 35-42. (in Indonesian, with English summary) ["The objective of this study was to determine the relative abundance and diversity index of Odonata in the Suranadi Nature Recreation Park (TWA), West Lombok, West Nusa Tenggara. The sampling area was divided into six transects. This study employed a descriptive-exploratory research design. Samples were collected using insect sweep nets, with the capturing process conducted during the morning and afternoon. The observation results revealed that 15 species were recorded. These 15 species belong to four families, namely Aeshnidae, Coenagrionidae, Libellulidae, and Platycnemididae. The highest relative abundance

(RA) was found in the species *Orthetrum sabina* at 44.53%. The dragonfly diversity index (H') was 1.96." (Authors)] Address: Ihsani, A.S.N., Mahasiswa Pendidikan Biologi FKIP Universitas Mataram- Mataram, Indonesia. Email: annisa-nurihsani4@gmail.com

26435 Iswandaru, D.; Micky, H.; Sari, N.; Asnaning, A. R., Lestari, S. L., Tugiyono; Rasimeng, S.; Prasetyo, J. (2026): Exploration of bird and dragonfly diversity as bio-indicators of mining environment. *Jurnal Nusa Sylva* 26(1): 34-49. (in Indonesian, with English summary) ["Birds and dragonflies are two taxonomic groups with high potential as environmental bioindicators, particularly in andesite mining areas. Both groups are highly responsive to changes in terrestrial and aquatic environments. This study aimed to explore the species diversity of birds and dragonflies in a mining environment as a database for environmental management and biodiversity conservation efforts. Bird data were collected using the point count method, while dragonfly data were obtained through an exploratory method with purposive sampling. The results recorded 10 bird species from 7 families, namely Alcedinidae, Estrildidae, Campephagidae, Columbidae, Cuculidae, Rallidae, and Pycnonotidae, as well as 6 dragonfly species from 1 family, Libellulidae. The bioecological index of birds and dragonflies is categorized as medium for diversity index (H'), low for richness index (R), high for evenness index (E), and low for dominance index (C). The bird feeding guilds are dominated by granivores, omnivores, insectivores (30% each), and frugivores (10%). All birds and dragonflies are of Least Concern (LC), Non-Appendix (NA) status and are not protected. The presence of birds and dragonflies indicates that the andesite mining exploration area still functions ecologically as a habitat for these taxa, despite experiencing moderate levels of environmental pressure. All recorded species belong to generalist groups that are relatively tolerant of disturbance and pressure from anthropogenic activities, particularly mining. Repeated population surveys (monitoring) of birds and dragonflies, along with a strong commitment to maintaining protected areas for these taxa within the mining scope, are necessary to support biodiversity conservation." (Authors) Five odonate species are listed: *Brachythemis contaminata*, *Diplacodes trivialis*, *Orthetrum sabina*, *Brachydiplax chalybea*, *Neurothemis terminata*] Address: Iswandaru, D., Program Studi Doktor Ilmu Lingkungan, Program Pascasarjana, Universitas LampungJl. Prof. Sumantri Brojonegoro No.1 Bandar Lampung 35145

26436 Jameus, B. (2026): Assessing habitat suitability for juvenile Coho Salmon (*Oncorhynchus kisutch*) in two constructed lentic off-channels using aquatic macroinvertebrates. BSc thesis, Department of Natural Resource Sciences, Faculty of Science, Thompson Rivers University: 42 pp. (in English) [Canada, British Columbia "Off-channel habitats within river floodplains provide critical rearing and overwintering environments for juvenile coho salmon by offering lower flow velocities, increased habitat complexity, and enhanced food availability compared to mainstream channels. However, habitat suitability can be limited by water quality and predation risk, particularly in disturbed watersheds. This study compared macroinvertebrate community structure and inferred water quality between two lentic off-channel habitats in the Deadman River watershed, British Columbia: the Hatchery Channel and the Taylor Channel. Macroinvertebrate samples ($n = 5$ per channel) were analyzed using seven ecological metrics: total abundance, taxa richness, Family Biotic Index (FBI), predator abundance, percent dominance, Odonata ratio, and Corixidae ratio. The Hatchery Channel supported significantly higher taxa richness (11 - 14 families) than the Taylor Channel

(7 - 10 families). There were no significant differences between channels for any other ecological metrics. Both channels exhibited FBI values consistent with "good" water quality according to FBI standard interpretations. These results suggest that while both habitats support generally healthy macroinvertebrate communities, the Hatchery Channel may offer greater habitat complexity and biodiversity, potentially enhancing prey availability for juvenile coho salmon. However, similar water quality and predator metrics indicate broadly comparable habitat conditions. Future management actions should include invasive plant species management, the additions of overhanging vegetation, channel deepening and hydrologic connectivity, and beaver dam modification. Future research should incorporate seasonal sampling and direct physicochemical measurements to more fully evaluate habitat suitability and restoration effectiveness." (Authors)] Address: [https://www.researchgate.net/publication/412138396_Assessing-Habitat_Suitability_for_Juvenile_Coho_Salmon_Oncorhynchus_kisutch_in_Two_Constructed_Lentic_Off-Channels_Using_Aquatic_Macroinvertebrates?channel=doi&linkId=6a7b84757487b2269a1769ce&showFulltext=true](https://www.researchgate.net/publication/412138396_Assessing_Habitat_Suitability_for_Juvenile_Coho_Salmon_Oncorhynchus_kisutch_in_Two_Constructed_Lentic_Off-Channels_Using_Aquatic_Macroinvertebrates?channel=doi&linkId=6a7b84757487b2269a1769ce&showFulltext=true)

26437 Janra, M.; Fauzi, I.; Aisyah, R.; Negi, A. (2026): Community structure of Libellulidae (Insecta: Odonata) across four habitat types in Jambi Province, Indonesia. *Jurnal Bios Logos* 16(2): 8-16. (in English) ["This study aims to analyze the community structure of libellulid dragonflies at four habitats, i.e., settlement, forest, oil palm, and rubber plantations located in Jambi Province, Sumatra, Indonesia. A survey was conducted from August 2017 to February 2018 in the settlement area and at 12 plot pairs of 50×50 m in the other three habitats, using a visual survey method with a photographic approach. Community structure was analyzed using Shannon–Wiener diversity index (H'), Simpson dominance index (D), evenness index (E), and Sorensen similarity index (S). The survey recorded 36 Libellulidae species across 24 genera, with the most records at the rubber plantation (23 species) and the fewest at the settlement (11 species). The highest diversity was observed at the rubber plantation (H'=2.853), followed by the oil-palm plantation (H'=2.536), the forest (H'=2.377), and the settlement (H'=1.988). The settlement was observed to have the highest disturbances (D=0.202), while the rubber plantation was presumably the stable one (D=0.070). The libellulid individuals were most evenly distributed at the rubber plantation (E=0.910) and the forest (E=0.901). Oil palm and rubber plantations had the most similar libellulid community (S=0.711), whereas forest and rubber plantations had the least similar community (S=0.270). In this study, settlement had no typical species. This study suggests that differences in vegetation complexity and disturbance levels may influence the community structure of Libellulidae." (Authors)] Address: Janra, M., Departemen Biologi, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Andalas, Jl. Dr. Mohammad Hatta Limau Manis, Pauh, Padang, Sumatera Barat 25163, Indonesia. Email: mjjanra@sci.unand.ac.id

26438 Janra, M.N.; Aisyah, R.; Fauzi, I.; Alfajri, N. (2026): Struktur dan Komposisi Komunitas Odonata pada Aliran Sungai Hutan Primer dan Sekunder di Hutan Pendidikan dan Penelitian Biologi, Universitas Andalas. *Jurnal Ilmu Lingkungan* 24(3): 778-785. (in Indonesian, with English summary) ["Structure and composition of Odonata communities in primary and secondary forest streams at the Biology Education and Research Forest, Andalas University - ...This study aimed to assess the dynamics of Odonata communities in streams with contrasting riparian vegetation, namely secondary forest and primary forest, within the Biology Education and Research Forest (BERF) of Universitas Andalas. Field surveys were

conducted from August to November 2019 using point count transects, consisting of three surveys in secondary forest streams (Sec1, Sec2, and Sec3) and one survey in a primary forest stream (Prim). Community structure was analyzed using the Shannon–Wiener diversity index (H'), Simpson dominance index (D), evenness index (E), and Relative Abundance Index (RAI). A total of 15 Odonata species associated with stream habitats were recorded, including 11 Zygoptera species and 4 Anisoptera species. In secondary forest streams, H' values were 1.49 at Sec1, 1.53 at Sec2, and 1.40 at Sec3, with corresponding D values of 0.28, 0.30, and 0.36 and E values of 0.77, 0.67, and 0.61. Odonata communities in secondary forests were strongly dominated by *Helio-cypha angusta angusta*, with RAI values of 43.90% at Sec1, 45.45% at Sec2, and 54.70% at Sec3. In contrast, the primary forest stream exhibited H' = 1.47, D = 0.26, and E = 0.91, with *Euphaea modigliani* as the dominant species showing the highest RAI value of 35.71%. Differences in ecological indices and RAI among habitats indicate a strong influence of riparian vegetation structure on Odonata community composition, dominance patterns, and stability, highlighting the importance of primary forest streams for conserving disturbance-sensitive species and secondary forest streams as key habitats for disturbance-tolerant taxa." (Authors)] Address: Janra, M.N., Departmen Biologi, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Andalas, Padang, Indonesia. Email: mjjanra@sci.unand.ac.id

26439 Joshi, S.; Siepielski, A. (2026): Sex ratio shapes female response to sexual conflict in the wild. *Biology Letters* 22 (8): 20260193: 7 pp. (in English) ["Chronically male-biased sex ratios are predicted to intensify sexual conflict and reduce female fitness. Yet empirical tests of female responses in natural settings are rare. We tested how female reproductive performance depends on social environment in the field using two closely related sympatric damselflies that differ strikingly in adult sex ratios: one experiences consistently male-biased sex ratios (*Enallagma exulans*), whereas the other does not (*E. traviatum*). In field experiments, females from the chronically male-biased species were less sensitive to elevated male density, maintaining fertility despite increased harassment. By contrast, fertility declined under high male density in the species that naturally encounters more balanced sex ratios. Fecundity and survival remained largely unchanged, suggesting that fertility is the primary fitness component sensitive to variation in male density. Mixed-species trials showed that frequent heterospecific mating attempts imposed only modest additional costs to females. These results provide field-experimental evidence that closely related species can differ markedly in how female fertility responds to social environment under natural conditions. The correspondence between these differences and natural sex ratios is also consistent with a putative role for adaptation to persistent male bias." (Authors)] Address: Joshi, S., Dept Biological Sciences, Univ. of Arkansas, Fayetteville, AR, USA. Email: sj058@uark.edu

26440 Juárez Jiménez, A. (2026): Dinámica temporal y efectos indirectos del reforzamiento del aislamiento reproductivo en dos especies de caballitos del diablo. MSc thesis, Ciencias Biológica, Benemérita Universidad Autónoma de Puebla. <https://hdl.handle.net/20.500.12371/33464>: 97 pp. (in Spanish) ["Temporal dynamics and indirect effects of the reinforcement of reproductive isolation in two damselfly species - Reinforcement is an adaptive process in the evolution of reproductive isolation between sympatric species, driven by natural selection to avoid the costs of heterospecific mating. Recent studies have shown that this process can generate asymmetric patterns between reciprocal crosses; however,

a knowledge gap remains regarding how these asymmetries manifest over time and their indirect effects on reproductive isolation between conspecific populations. This study investigates reproductive isolation between *Ischnura elegans* and *I. graellsii*. *Ischnura elegans*, distributed from Ireland to Japan, and *I. graellsii*, found in the Iberian Peninsula and North Africa, have overlapping ranges in northern and central Spain, forming an extensive hybrid zone. In the northwestern part of this hybrid zone, reinforcement of a mechanical (pre-copulatory) barrier has been detected—particularly in crosses between *I. graellsii* males and *I. elegans* females—where the success of tandem formation (representing the initial physical contact between secondary genitalia) is significantly reduced. In contrast, the reciprocal cross—between *I. elegans* males and *I. graellsii* females—shows a relaxation of post-copulatory gametic barriers, such as those affecting oviposition, fecundity, and fertility." (Author/Google translate)] Address: <https://repositorioinstitucional.buap.mx/server/api/core/bitstreams/f9fe56e2-f388-4da2-b3b7-04154b60a0ce/content>

26441 Jung, S.W.; Kim, Y.; Ko, J.; Lee, D.H.; Son, S.B.; Lee, J.H.; Park, Y. (2026): Insect diversity and conservation importance of the Wolbong Abandoned Paddy wetland, a habitat for an endangered Korean dragonfly. *Proceedings of the National Institute of Ecology of the Republic of Korea* 7(3): 103-109. (in English) ["A comprehensive insect survey conducted in 2025 in the Wolbong abandoned paddy wetland in South Korea recorded a total of 337 insect species comprising 306 genera, 115 families, and 13 orders, indicating high taxonomic richness within a small agricultural wetland system. Lepidoptera was the most species-rich order, followed by Coleoptera, Hemiptera, and Odonata, reflecting the structural habitat heterogeneity provided by the mosaic of abandoned paddies and adjacent forest margins. Two endemic Korean species (*Cantharis soeulensis* and *Thyris fenestrella seoulensis*) and two newly recorded species in South Korea (*Eutonia satsuma* and *Japonichilo bleszynski*) were observed for the first time. Odonata showed a particularly high conservation value, with 43 species representing approximately 42% of the Korean Odonata fauna. Two endangered Class II species, *Nannophya koreana* and *Libellula angelina*, were consistently observed in both larval and adult stages. In addition, a record of over 2,000 adults of *N. koreana* suggests that this habitat may harbor the largest remaining population in South Korea. In conclusion, this study demonstrates that abandoned paddy wetlands serve as critical biodiversity refugia for endemic and conservation-priority taxa. Long term monitoring and systematic habitat management are essential to sustain insect diversity in agricultural wetland landscapes." (Authors)] Address: Jung, S.W., DARSARI Research Institute of BioResources, Daejeon, Korea. Email elmidae79@gmail.com

26442 Kalkman, V.J. (2026): *Orthetrum martensi* Asahina, 1978 is a junior synonym of *Orthetrum brunneum* (Fonscolombe, 1837) (Odonata: Libellulidae). *Notulae odonatologicae* 10(7): 241-245. (in English) ["Since its original description by Asahina in 1978 no new information has become available on *Orthetrum martensi*. The species was described based on four males and four females collected at three sites in Kashmir. Study of the original description with additional images of the holotype male and a male and female paratype kept in the Senckenberg Research Institute Frankfurt/Main showed that this species is conspecific with *Orthetrum brunneum*." (Author)] Address: Kalkman, V.J., Natural Biodiversity Center, naturalis, Postbus 9517, 2300 RA Leiden, The Netherlands. E-mail: kalkman@naturalis.nl

26443 Keetapithchayakul, T.S.; Hua, Z.S.S.; Phan, Q.T.; Ngiam, R.W.J. (2026): A larval description of *Pomothemis starrei* Lieftinck, 1948 (Odonata: Libellulidae), with notes on taxonomy, distribution, and comparisons with other Southeast Asian libelluline genera. *Zootaxa* 5866(3): 524-540. (in English) ["The larva of *P. starrei* is described for the first time based on material from Singapore reared to adulthood, representing the first larval description of the genus *Pomothemis* Krüger, 1902. The larva is characterized by a unique combination of morphological features, including a distinctive arrangement and number of premental setae and palpal setae, strongly developed middorsal spines on S3–9, and posterolateral spines on S7–9. Comparisons with other Southeast Asian genera of Libellulinae indicate that the larva is readily distinguishable from all described congeners. Additional notes on habitat, distribution, and the taxonomic status of the genus are provided. This study increases our knowledge of larval diversity within Libellulinae and contributes to a better understanding of the morphology and distribution of this poorly known Southeast Asian dragonfly genus." (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

26444 Keinath, S.; Griesbaum, F.; Sommerwerk, N.; Petzold, F.; Kühnel, K.-D.; Freyhof, J. (2026): Long-term population declines of habitat-shifting species in the city: A living planet index approach for Berlin, Germany. *Global Change Biology Communications* 1(3), e70039: 17 pp. (in English) ["Urbanisation is a major driver of global biodiversity change, affecting both terrestrial and aquatic ecosystems. To assess biodiversity change at the city scale, indicators are needed that can represent long-term population trends from heterogeneous monitoring data. The Living Planet Index (LPI) addresses policy-relevant questions such as "how much has biodiversity declined where?", while the Diversity-weighted LPI (DW-LPI) can reduce bias caused by uneven taxonomic representation. Here, we evaluate the application of both indices for long-term urban biodiversity assessment in Berlin, Germany. We analysed population trends of habitat-shifting species in Berlin waterbodies, focusing on odonates (dragonflies, damselflies) and amphibians (frogs, toads, newts). These taxa depend on both aquatic and terrestrial habitats and are therefore sensitive to urban environmental change. We compiled data from 16 waterbodies representing different habitat types across the city, spanning 60 years for odonates and 40 years for amphibians. Both taxa showed significant long-term declines, amounting to > 50% in odonates and 76% in amphibians. Amphibians declined more strongly, likely reflecting their lower mobility and higher sensitivity to habitat fragmentation and disrupted connectivity. The DW-LPI showed smaller declines than the unweighted LPI, indicating that diversity-weighting reduced the influence of uneven taxonomic representation. Our findings show that LPI and DW-LPI approaches can be applied at the urban scale and provide useful indicators of population change. However, results must be interpreted cautiously when datasets have limited temporal continuity, spatial coverage or taxonomic balance. The observed declines likely represent conservative estimates and highlight the need for structured, continuous and standardised biodiversity monitoring in Berlin." (Authors)] Address: Keinath, Silvia, Museum für Naturkunde Berlin -Leibniz Institute for Evolution and Biodiversity Science, Berlin, Germany. Email silvia.keinath@mfn.berlin

26445 Kirk, M.A.; Bradshaw-Wilson, C.R.; Pearce, K.J. (2026): Environmental patterns of establishment and early-

stage impacts from invasive round gobies in an aquatic biodiversity hotspot. *Journal of Freshwater Ecology* 41:1, 2641453. 13 pp. (in English) ["Quantifying the establishment, spread, and impacts of invasive species requires an accurate understanding of ecosystem structure and function before and after introductions. In 2014, the round goby (*Neogobius melanostomus*) invaded the LeBoeuf Creek subwatershed of French Creek, a tributary to the Allegheny River, PA, USA. We report on a decade of stream monitoring within the immediate invasion front by describing the environmental conditions associated with round goby populations and the potential impacts and resource overlap with native fish communities. First, we found no evidence of a round goby population increase since invasion, and that round goby population densities were higher during early summer and in closer proximity to Lake LeBoeuf. Second, the presence of round gobies overlapped substantially with environments of low-oxygen conditions, low native fish richness, and macroinvertebrate communities dominated by non-insect taxa, all of which are representative of lentic environments. In contrast, greater aquatic insect diversity corresponded to higher native benthic fish diversity of uninvaded reaches. Finally, there was no evidence that round gobies have induced any changes to the native fish communities within the invasion front during the past decade. While our results have indicated a relatively localized invasion from round gobies with minimal impacts to the stream habitats of French Creek, the greatest impacts are likely to be in lentic habitats near Lake LeBoeuf, where round goby populations are most established." (Authors) Odonata (Figure 5) are treated at family level.] Address: Kirk, A., Dept Environmental Science & Sustainability, Watershed Conservation Research Center, Allegheny College, Meadville, PA 16335, USA. Email: mkirk@allegheny.edu

26446 Kong, F.; Li, Z.; Shen, Y.; Zhao, Y.; Hou, Y.; Hu, Z.; Bian, S. (2026): Application of an index based on aquatic insect biotic integrity for river ecosystem health assessment in Haihe river basin, China. *Biology* 2026, 15, 1529. 15 pp. (in English) ["As critical biological components of freshwater ecosystems, aquatic insects are highly sensitive to cumulative anthropogenic disturbances and can effectively reflect long-term variations in river ecological quality, serving as ideal bioindicators for aquatic ecological monitoring and assessment. However, most existing benthic biotic integrity indices integrate diverse macroinvertebrate groups, which dilute the unique indicative value of aquatic insect communities, and few targeted evaluation systems have been independently developed for highly disturbed plain river basins in northern China. In this study, a field investigation of aquatic insect communities was conducted across 32 sampling sites in the Haihe River Basin from April to September 2023, aiming to construct a novel Aquatic Insect-based Index of Biotic Integrity (Ai-IBI) and systematically evaluate the basin's river ecosystem health status. A total of 10,267 aquatic insect individuals belonging to eight orders and 43 families were identified, with Chironomidae dominating the community and predominantly distributing in midstream and downstream reaches. Based on ecological principles, discriminant ability analysis, and redundancy analysis, four core metrics were ultimately screened out to establish the Ai-IBI system, including total taxa richness, percentage of the top three dominant taxa, density of tolerant groups, and percentage of predators. Considering the widespread background ecological degradation of the Haihe River Basin, a localized reference-site selection framework integrating water quality standards, physical habitat assessment, and field ecological surveys was adopted to determine eight minimally disturbed reference sites, which effectively improved the regional applicability of the evaluation model. The health assessment results indicated that only a small

proportion of river reaches maintained a healthy state, while most sites were classified as sub-healthy or fair, presenting a distinct spatial differentiation pattern wherein upstream mountainous reaches exhibited superior ecological integrity compared with downstream plain reaches. The constructed Ai-IBI showed high consistency with conventional physicochemical indicators and habitat evaluation results, verifying its excellent reliability and robustness. Different from traditional empirical IBI models suitable for near-natural watersheds, the Ai-IBI fully adapts to the unique ecological background of long-term water resource overexploitation, urbanization-induced habitat fragmentation, and nutrient enrichment in the Haihe River Basin. The Ai-IBI developed in this study provides a refined biological evaluation tool for quantitative diagnosis of river ecological degradation, offers empirical support for differentiated ecological protection and precise restoration strategies in the Haihe River Basin, and serves as a feasible methodological reference for ecological health assessment in other human-dominated plain river basins globally." (Authors) 23 odonate taxa were recorded, but no details are given.] Address: Kong, F., Ecological Environment Monitoring and Scientific Research Center of Haihe River Basin & Beihai Sea Area, Ministry of Ecology & Environment, Tianjin 300170, China. Email: fanqingkong@163.com

26447 Kosterin, O.E. (2026): Notes and minor updates to four of my papers on Odonata. *Notulae odonatologicae* 10(7): 246-250. (in English) ["Some comments and notes are provided for four previously published odonatological papers, concerning *Macrogomphus*, *Aeschnophlebia* and *Planaeschna*, *Rhyothemis variegata* and *R. phyllis*, and *Somatochlora sahlbergi*, which are neither corrections nor too substantial additions but which would have somewhat improved them if implemented in time." (Author)] Address: Kosterin, O.E., Institute of Cytology and Genetics, Siberian Branch, Russian Academy of Sciences, Lavrentiev Ave 10, 630090 Novosibirsk, Russia. E-mail: kosterin@bionet.nsc.ru

26448 Kovács, K.; Fekete, J. (2026): Occurrence and characteristics of the habitat of the balkan golden ring (*Cordulegaster heros* Theischinger 1979) in the Bakonyalja area. *Folia musei historico-naturalis Bakonyiensis* 41(2024-2026): 63-73. (in Hungarian, with English summary) ["*C. heros* is a strictly protected species with outstanding conservation importance in Hungary. It was first recorded in the Bakony Mts. in 2011. In this article we report new occurrence of the species with 5 larvae and 3 imago records from Bakonyalja from the years 2023 and 2024. The newly detected habitat is vulnerable due to natural and anthropogenic threats, therefore monitoring of the population structure and introduction of conservation efforts would be appropriate for the effective conservation of *C. heros*." (Authors)] Address: Kovács, K., Sokorói Tájégségi Értéktár Bizottság, 9082 Nyúl, Kossuth L. u. 46, Hungaria. Email: krik@freemail.hu

26449 Kumar, A.; Prakash, S. (2026): Biodiversity and seasonal dynamics of aquatic insects in Rani Talaab Pond, Balrampur District, Uttar Pradesh, India. *International Journal of Fauna and Biological Studies* 13(4): 83-87. (in English) ["Aquatic insects are useful indicators of freshwater ecological condition because their abundance and community composition respond to habitat structure, organic enrichment, and seasonal hydrology. This study assessed monthly variation in aquatic insect abundance in Rani Talaab Pond, Balrampur district, Uttar Pradesh, India, from July 2025 to May 2026. Standardised dip-net collections were made in three contrasting pond habitats: a vegetation-rich littoral zone, open water, and muddy margins. Specimens were preserved in 4% formalin and

identified using standard freshwater taxonomic keys. Four major orders were quantified: Hemiptera, Coleoptera, Odonata, and Diptera. Across 11 sampling months, 1,977 individuals were recorded. Diptera was dominant (710 individuals; 35.9%), followed by Hemiptera (595; 30.1%), Coleoptera (388; 19.6%), and Odonata (284; 14.4%). Total monthly abundance increased from 145 individuals in July to a maximum of 225 in October, declined to a minimum of 143 in January, and rose again during March-April. The persistent dominance of Diptera, together with lower Odonata abundance, is consistent with moderate organic enrichment, whereas the continued occurrence of Coleoptera and Odonata indicates retained habitat heterogeneity and ecological function. Because physicochemical water-quality data were not analysed alongside the insect data, this interpretation should be considered indicative rather than diagnostic. The study provides a baseline for repeated biomonitoring and supports management actions aimed at reducing waste and nutrient inputs while maintaining littoral vegetation." (Authors)] Address: Prakash, S., M.L.K. P.G. College, Balrampur, Uttar Pradesh, India

26450 Kumar, S. (2026): Butterflies and dragonflies as ecological barometers of environmental change: A critical review. *Bionature* 46(2): 160-178. (in English) ["Butterflies and dragonflies are among the most widely observed insect groups used to interpret environmental change, yet their indicator value is sometimes asserted more confidently than the evidence permits. This critical narrative review examines how butterflies, dragonflies and damselflies function as ecological barometers across terrestrial, freshwater and connected land-water systems. Butterflies are especially informative where environmental change alters terrestrial habitat quality, host-plant availability, nectar continuity, microclimate, phenology, agricultural intensity and pesticide exposure. Odonata, by contrast, integrate aquatic larval conditions with adult use of riparian and terrestrial habitat, making them useful indicators of wetland integrity, stream condition, hydrological alteration, riparian degradation and climate-driven freshwater change. The central argument is that these taxa are most valuable when treated as complementary sentinels rather than interchangeable proxies for insect biodiversity. Their strengths arise from short generation times, ectothermy, strong habitat associations, visual detectability and, in some regions, well-developed monitoring traditions. Their limitations arise from uneven detectability, biased geographic coverage, taxonomic and functional heterogeneity, lagged responses, dispersal-mediated rescue effects and the difficulty of attributing biological change to single drivers. Evidence from long-term monitoring, community science, trait-based analysis, biotic indices and distribution modelling shows that both groups can register climate warming, land-use intensification, pollution and restoration. However, the signal depends on life stage, species traits, landscape context and sampling design. Butterflies and dragonflies should therefore be embedded in multi-taxon, repeated and transparent monitoring programmes that combine abundance, occupancy, traits, phenology, breeding evidence and environmental covariates. Used in this way, they can support earlier detection of ecological change, guide habitat restoration and strengthen the accountability of biodiversity policy without reducing complex environmental change to a single charismatic indicator group." (Author)] Address: Kumar, S., Biodiversity & Conservation Lab., Ambika Prasad Research Foundation, Odisha, India

26451 Lacerda de Almeida, J.G. (2026): Something new under the sun: Assessing the relative influence of sunlight irradiance and temperature on activity patterns in a conspicuous dragonfly. *New Zealand Journal of Zoology*, 2026;

53:e70060. 11 pp. (in English) ["In tropical ectotherms, in addition to environmental temperature, sunlight is also likely a key driver of activity patterns, as increased irradiance enhances the visual efficacy of ornaments. In male *Perithemis tenera*, despite the importance of thermoregulation, sunlight intensity may be a key determinant of the performance of conspicuous wing displays during territorial contests and mating behavior. In contrast, females possess transparent wings, and their mating behavior consists mainly of brief flights into territories, which may depend directly on thermoregulation. To identify which climatic factors best predict activity patterns in this species, I tested whether sunlight is the primary driver of male territorial activity rather than environmental temperature, and whether environmental temperature is the primary driver of female mate-searching activity rather than sunlight. I measured territorial activity by males as number of males occupying mating territories and mate-searching activity as number of females entering in territories. I also collected measures of temperatures and global horizontal irradiance from open-access data sources. Contrary to my hypothesis, I found that temperature is the primary driver of male territorial activity, indicating that thermoregulation of fighting capacity traits, as thorax muscles, may be determinant on contests for territories. I also found that temperature is the primary driver of female mate-searching activity, indicating that warmer daily temperatures may enhance oviposition performance. Overall, these results highlight the importance of evaluating climatic factors directly linked to patterns of activity to improve knowledge of mating systems in Global South environments." (Author)] Address: Lacerda de Almeida, J.G., LASEXIA, Depto de Genética, Ecologia e Evolução, Instituto de Ciências Biológicas, Univ. Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil. Email: jgabriel.bio2@gmail.com

26452 Lamouille-Hebert, M.; Arthaud, F.; Besnard, A.; Reynaud, N.; Tormos, T.; Datry, T. (2026): Water permanence and connectivity are key drivers of high-mountain pond communities along altitudinal gradients in the French Alps and Pyrenees. *Hydrobiologia* 853: 1951-1974. (in English) ["High-mountain species are particularly vulnerable to the effects of climate change, such as warming, drying, and isolation. While the role of temperature and hydroperiod in structuring communities along altitudinal and connectivity gradients has been demonstrated in high-mountain lakes or rivers, very few studies have been conducted in high-mountain ponds, and the role of hydroperiod and network connectivity remains actively debated. To understand which environmental factors structure high-mountain pond communities, we investigated the relationship between three biotic groups (Odonata, Amphibia, and macrophytes) and their environment in 500 ponds in the French Alps and Pyrenees. As predicted, most communities varied along an altitudinal gradient, though not uniformly across all the alpine biogeographic regions studied. We also showed that water permanence is a key determinant of community variation in high-mountain ponds common to all the geographic zones studied. Finally, we demonstrated that connectivity between ponds should be maintained to conserve high-mountain Odonata specialist communities and mediate the effects of temperature and water permanence in the context of climate change. In order to design effective conservation measures for high-mountain pond communities, further research is needed on the drought resistance of non-permanent pond communities and on their dispersal potential between high-mountain ponds." (Authors)] Address: Lamouille-Hebert, Marie, Centre Lyon-Grenoble Auvergne-Rhone-Alpes, UR RiverLy, INRAE, 5 rue de la Doua CS70077, 69626 Villeurbanne Cedex, France. Email: marie.hebert@fne-aura.org

26453 Lapuka I.I.; Lipinskaya T.P. (2026): Zoobenthos of the transboundary rivers Neman and Chornaya Hancha. *Vestsi Natsyyanal'nai akademii navuk Belarusi. Seryya biyalagichnykh navuk* = Proceedings of the National Academy of Sciences of Belarus. Biological series 71: 227-238. (in Russian, with English summary) ["The transboundary sections of the Neman and the Chornaya Hancha rivers located on the territory of Belarus were studied. A total of 143 identified lower detectable taxa (LDT) of macrozoobenthos were recorded in quantitative samples, of which 116 were identified to the species level, and 12 LDT in qualitative samples, of which 11 were identified to the species level. The identified animals belong to three phyla of aquatic invertebrates: Mollusca – 25 LDT, Annelida – 11, and Arthropoda – 107. The highest mean values of species richness (44 LDT) and abundance (384.6 ind/m²) were recorded for the Neman River near to Mosty Levye village. Three alien species were detected (*Lithoglyphus naticoides* (C. Pfeiffer, 1828); *Dikerogammarus haemobaphes* (Eichwald, 1841)); *Faxonius limosus* (Rafinesque, 1817)). Species protected in Belarus were recorded, such as dragonflies *Anax imperator* and *Stylurus flavipes*." (Authors)] Address: Lapuka I.I., Scientific and Practical Centre of the National Academy of Sciences of Belarus for Bioresources, Minsk, Republic of Belarus

26454 Leal-Nascimento, A.C.; Ribeiro-Martins, A.; de Oliveira, A.S.; Santos da Silva, G.; Bomfim, F.F.; Dias-Silva, K. (2026): Local, spatial and land use variables, rather than forest cover, drive Odonata (Insecta) beta diversity in tropical streams. *Biodiversity and Conservation* 35, 201: 16 pp. (in English) ["Changes in land use can lead to substantial reductions in forest cover, stream environmental quality, and biodiversity. Understanding how the conversion of natural environments into different land-use types affects species replacement and richness differences, the main components of beta diversity, is therefore essential for identifying the processes structuring biological communities under intense anthropogenic pressure. Here, we evaluated the effects of land-use change, forest cover, local environmental variables, and spatial structure on the taxonomic beta diversity of adult Odonata and tested whether beta diversity components differed among land-use categories (forest, cocoa, and pasture). The study was conducted in 50 streams in the eastern Amazon distributed across forested, cocoa, and pasture landscapes. Our results showed that species replacement was identified as the most important component of total beta diversity. The spatial structure and local environmental variables, particularly stream width, were the main determinants of total beta diversity, with greater stream width associated with greater variation in species composition. Large- and medium-scale spatial structures also played a key role in explaining total beta diversity, with distinct responses among the suborders. The land uses influenced only the composition of Odonata assemblages, primarily promoting species replacement. In contrast, forest cover did not significantly affect total beta diversity or its components. Despite the absence of direct effects of forest cover on beta diversity, maintaining forest cover around streams is crucial. This practice enhances habitat quality and supports species that depend on forest-associated environmental conditions." (Authors)] Address: Dias-Silva, Karina, Programa de Pós-graduação em Ecologia, Univ. Federal do Pará, Belém, PA, Brasil. Email: carolineleal.bio@gmail.com

26455 Li, M.; Tsuboi, M.; Runemark, A.; Svensson, E.I.; Brydegaard, M. (2026): Wing membrane thickness, allometric scaling and wing interference patterns in damselflies: a target of sexual selection? *Evolutionary Ecology* 40, 48. 21 pp. (in English) ["Zygoptera have evolved highly developed

visual systems for mate recognition, flight and prey detection. Wing Interference Patterns (WIPs), which are colors generated by thin-film interference in the wing membrane, could function as visual signals and play a role in sexual selection. Because the color of these signals depends on membrane thickness, a potential conflict exists between changes in wing area and the need to maintain a consistent signal. We examined how wing membrane thickness scales with wing area in two damselfly species, *Ischnura elegans* and *Enallagma cyathigerum*. Using hyperspectral imaging, we found that while wing area was highly variable, membrane thickness showed low intraspecific variability. We found no evidence for any significant correlation between wing thickness and wing area or any support for sexual selection operating on these traits. Low intraspecific variation of the membrane thickness results in a consistent Wing Interference Signal (WIS), which is useful for species identification with remote sensing approaches." (Authors)] Address: Li, M., Dept of Physics, Lund University, Sölvegatan 14c, Lund, SE-22363, Sweden

26456 Liu, Y.; Hu, J.; Miao, R.; Qiu, S.; Feng, Z.; Dong, Z.; Zhao, H.; Zhao, J.; Mu, S.; Dong, H. (2026): Micro-texturing of high-entropy alloy surfaces via femtosecond laser: Wettability and corrosion resistance evaluation. *Optics & Laser Technology* 204, Part C, Article: 116281: (in English) ["Surgical instruments frequently come into contact with blood during clinical use, making them susceptible to adsorption of external media, which can induce corrosion and wear and consequently impair their performance. To address this issue, this study proposes a hybrid surface modification strategy inspired by dragonfly wings and natural honeycomb structures, combining femtosecond laser ablation with low-surface-energy chemical modification. By systematically comparing the wettability, corrosion resistance, and cytocompatibility of the samples before and after surface modification, the synergistic enhancement arising from the interplay between laser-induced micro-nano structures and chemical functionalization was elucidated. The results demonstrated that the optimized grid and honeycomb micro-textures exhibited uniform morphology and stable structural integrity, with surface roughness values of 2.58µm and 3.67µm, respectively. After PFDTES modification, fluorocarbon silane molecules were successfully grafted onto the alloy surface, forming a dense and continuous low-surface-energy organic layer. Consequently, both water and blood droplets (5L) exhibited static contact angles above 150°, indicating excellent hydrophobicity and anti-blood-adhesion capability. XPS analysis further confirmed the presence of fluorinated functional groups and an organic fluorosilane layer on the modified surfaces. Electrochemical measurements demonstrated a significant enhancement in the corrosion resistance after chemical modification. Specifically, the corrosion current densities of the grid and honeycomb-textured samples decreased to 6.437×10⁻⁷ A/cm² and 8.289×10⁻⁷ A/cm², respectively, which are approximately one order of magnitude lower than that of the untreated substrate (5.313×10⁻⁶ A/cm²). Correspondingly, the corrosion inhibition efficiencies reached 87.8% and 84.3%, respectively. Moreover, no noticeable cytotoxicity was observed before or after modification. Overall, the proposed hybrid surface modification strategy provides an effective technological pathway and new design perspective for corrosion-resistant, anti-fouling, and functionalized surgical medical instruments." (Authors)] Address: Liu, Y., School of Mechanical Engineering, Shenyang Univ. of Technology, NO.111, Shenhao West Road, Shenyang Economic & Technological Development District, Shenyang 110870, China. Email: liuyin_neu@163.com

26457 Lovric, A.; Ilic, K.; Marjanovic Cermak, A.M.; Pavicic, I. (2026): Bioaccumulation of metal pollutants and radionuclides in dragonflies (Odonata). *Environmental Research* 302, 124579: 10 pp. (in English) ["Inorganic pollutants released into aquatic habitats by human activity, such as metals and radionuclides, present a serious threat to biodiversity and ecosystem health. Various biomonitoring efforts were established to track their release and environmental concentrations, including sampling of bioindicator species, which can accumulate these pollutants and facilitate their detection. Odonata are considered valuable bioindicator organisms due to their relative longevity and predatory lifestyle, and have been used to assess environmental concentrations of a wide variety of pollutants. However, there is a lack of systematic effort to determine which elements are likely to be accumulated in dragonfly tissue from surrounding water, and how the concentrations of accumulated materials correlate to their environmental concentrations. In this review, studies that used dragonflies as bioindicators for metals and radionuclides in aquatic environments were analyzed, and bioaccumulation factors for each element were calculated. The highest bioaccumulation factors were obtained for U and Cs, elements with the highest numbers of bioaccumulation studies were Hg and Cu, and Se was the most consistently accumulated element in analyzed studies. The results have shown that dragonflies are suitable bioindicator organisms for a variety of different radioactive and non-radioactive elements, and calculated bioaccumulation factors provide a link between their presence in dragonfly tissue and the environmental concentrations in their habitats." (Authors)] Address: Lovric, Andrea, Univ. Hospital Centre Osijek, Croatia

26458 Mahanta, D.K.; Kumar, A.; Bhoi, T.K. (2026): Research analysis on insect as environmental pollution indicator using bibliometric progress (1973-2024) and exploring its future prospects. *Journal of Resource Insects* 1(1), 100007: 17 pp. (in English) ["Insects are increasingly recognized as sensitive bioindicators of environmental pollution due to their ecological diversity and responsiveness to contaminants. This study aims to systematically analyze the evolution of research on insects as indicators of air, water, and soil pollution from 1973 to 2024, identify major trends, and highlight future research directions. A bibliometric approach was employed using articles retrieved from the Scopus database, with statistical and network analyses performed using VOSviewer, Bibliometrix, and Biblioshiny in R. Results reveal that honeybees (Hymenoptera) are frequently used to monitor airborne heavy metals, aquatic insects such as Ephemeroptera and Odonata assess water quality, and dung beetles (Scarabaeidae) track soil contamination. Emerging pollutants, including microplastics, are gaining attention, with advanced techniques such as bioaccumulation studies and molecular biomarkers enhancing insect-based monitoring. Thematic analysis highlights integration of entomology with environmental science, toxicology, remote sensing, and citizen science. Despite progress, challenges remain, including lack of standardized methodologies, taxonomic and geographic biases, and limited understanding of long-term pollutant effects. This study concludes that multidisciplinary approaches, including genomic methods, ecological modeling, and exploration of underutilized insect taxa, are essential to advance insect-based biomonitoring and support sustainable environmental management." (Authors)] Address: Bhoi, T.K., Forest Protection Division, ICFRE-Arid Forest Research Institute (ICFRE-AFRI), Jodhpur, Rajasthan 342005, India. Email: tkbhoi@icfre.org

26459 Mahesh, R.; Gopinath, R.; Sawant, D.; Joshi, G.; Upadhyaya, R. (2026): New addition to the Odonata fauna of India: *Gynacantha basiguttata* Selys, 1882 (Odonata: Aeshnidae)

from Arunachal Pradesh - a rectification. *Journal of Threatened Taxa* 18(8): 29548-29551. (in English) ["The present study highlights the first record of *G. basiguttata* from India, and significantly indicates a range extension and extends its known geographical distribution. Also known as the Spoon-tailed Duskhawker, the species was identified by dorsal diagnostic morphological characters and spoon-shaped cerci with on-site photographs taken on 16 October 2024 alongside a road-side vegetation about the Miao-Vijaynagar road on a cloudy day at Namdapha National Park and Tiger Reserve, in Arunachal Pradesh, India. Based on photographic evidence for same date, Mahesh et al. (2026) also reported the first confirmed sighting (after 110 years) of *Gynacantha khasiaca* (McLachlan, 1896), from Arunachal Pradesh with inclusion of 3 photographs. One of the images from it is herein reassigned to *Gynacantha basiguttata* Selys, 1882, thereby indicating a self-rectification." (Authors)] Address: Mahesh, R., Kattiparambu Madam, Thekumbhagam, Tripunithura, Ernakulam, Kerala 682301, India. Email: maheshgreen96@gmail.com

26460 Makwana, H.; Patel, J.; Patel, J. (2026): Bio-inspired aerodynamics: A comprehensive review of dragonfly-mimetic drone propeller design and 3D-printed carbon-fibre manufacturing techniques. *Indian Journal of Natural Sciences* 16 (94): 106828-106847. (in Bio-inspired Design, Additive Manufacturing, Fused Deposition Modeling (FDM), Carbon Fiber Composites, Computational Fluid Dynamics (CFD), Aerodynamic Efficiency) ["This research delves into the design, construction, and operation of UAV propeller that take design cues from the corrugated wing shape of dragonflies (Anisoptera). We compare the aerodynamic efficiency of a standard baseline propeller to that of a new design with a corrugated leading edge, inspired by the unusual structural features of dragonfly wings. Fused Deposition Modelling (FDM) additive manufacturing using carbon fiber-reinforced polyamide (CF-PA) composite material ensures good strength-to-weight ratio for both propeller prototypes. Initially, flow patterns are analysed and performance parameters like thrust and torque are predicted using Computational Fluid Dynamics (CFD) models. Later on, experimental wind tunnel testing is used to confirm these computer findings. In comparison to the traditional design, the results show that the corrugated propeller inspired by dragonflies greatly improves aerodynamic performance by controlling flow separation and decreasing vorticity, which in turn increases thrust generation and overall efficiency. Findings from this study provide credence to the idea that advanced composite FDM and geometries inspired by nature may be used to create lightweight, high-performance UAV propulsion systems." (Authors)] Address: Makwana, H., Ph.D Research Scholar, Dept of Mechanical Engineering, School of Engineering & Technology, Dr. Subhash Univ., Junagadh, Gujarat, India. Email: makwanaharshil206@gmail.com

26461 Mallick, M.A.I.; Dolai, S.; Paik, S.; Prakash, M.; Bansal, M.K. (2026): First records of *Iraota timoleon* (Stoll, 1790) (Lepidoptera) and *Indothemis carnatica* (Fabricius, 1798) (Odonata) from Jharkhand, India: Additions to the Butterfly and Odonate faunal checklist of Canary Hill. *Entomologia helenica* 35(2): 109-123. (in English) ["This study reports the first records of *I. timoleon* and *I. carnatica* from Jharkhand, contributing additional records to the known lepidopteran and odonate fauna of Canary Hill. Surveys conducted across three habitat types, i.e. Plantation and Built-up Patches (PBP), Protected/Dense Forest (PDF), and Peripheral Natural Woodland/Wetland (PNW), documented a total of 68 butterfly species belonging to five families, with Nymphalidae being the most represented (26 species). Species richness was comparatively

higher in PBP (39.6%), followed by PDF (38.6%), and lower in PNW (21.8%). Conservation assessment indicated that one species is listed under Schedule I and nine species under Schedule II of the Wildlife (Protection) Amendment Act, 2022. A total of 28 odonate species were recorded, with Libellulidae representing the dominant family (18 species). Among the surveyed habitats, PNW supported the highest odonate richness (22 species), followed by PBP (15 species), whereas PDF showed comparatively lower richness (six species). Most odonate species were categorized as Least Concern according to the IUCN Red List, while one species was classified as Data Deficient. The present findings suggest that Canary Hill supports a considerable diversity of butterflies and odonates across both natural and human-modified habitats. However, considering the relatively short sampling duration and the absence of seasonal replication, the results should be interpreted as preliminary baseline observations rather than a comprehensive assessment of regional biodiversity patterns or habitat suitability. Nevertheless, the study provides useful faunistic information and highlights the need for long-term and seasonally replicated surveys to better understand the ecological significance and conservation status of the area." (Authors)] Address: Mallick, MA.I., Dept of Forest, Environment & Climate Change, Jamshedpur Forest Division, Jamshedpur – 831001, Jharkhand, India. Email: imranmallick708@gmail.com

26462 Månsson, K. (2026): Mating success of male pond damselflies is not affected by ectoparasitic water mites. BSc thesis, Karlstad University, Faculty of Health, Science and Technology (starting 2013), Department of Environmental and Life Sciences: 13 pp. (in English, with Swedish summary) ["According to the theory of parasite-mediated sexual selection, ectoparasitic water mites (*Arrenurus* sp.) parasitizing pond damselflies should have a negative impact on male damselfly mating success. Research findings, however, are inconclusive. This study looks at ectoparasitic prevalence and load on male damselflies of the species *Coenagrion pulchellum*, in order to see if there is a correlation between parasitism and damselfly mating success. No significant correlation was found. This may be because important interacting variables were not identified and incorporated in the study design, or that the effect of parasites on male mating behaviour is too weak to find with this study design, or several other reasons - including that the hypothesis may not be applicable to this study system. This study highlights the lack of sufficient understanding of i) how adult male pond damselflies are affected by ectoparasites, and ii) which factors affect the mating success of male pond damselflies." (Author)] Address: <https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A2074370&dswid=5549>

26463 Martín, D.; Cruz, J.; Franch-Marro, X. (2026): Regulation of metamorphosis in hemimetabolous insects. Current Opinion in Insect Science 76, 101532: 10 pp. (in English) ["Insect metamorphosis depends on the precise coordination of developmental timing, growth, and morphogenesis. Hemimetabolous insects, which undergo gradual postembryonic development culminating in a single terminal molt, provide a critical framework for understanding how these processes are integrated and how holometabolous metamorphosis evolved. Here, we synthesize recent advances in the regulation of hemimetabolous metamorphosis, focusing on how stage-specific transcription factors—E93, Krh1, Chinmo, and Broad—constituting the Metamorphic Gene Network, control temporal identity and determine the irreversible transition to adulthood ("the when problem"). We then highlight a parallel regulatory layer governing the growth and morphogenesis of metamorphic traits ("the how much problem"),

involving Myoglianin-dependent endocrine gating, local growth-control pathways, and transcriptional modulation of growth mode. Together, these findings reveal a modular yet integrated regulatory architecture and highlight key unresolved questions regarding how hormonal, transcriptional, and tissue-intrinsic growth pathways are mechanistically coupled to coordinate developmental timing, trait growth, and metamorphic commitment." (Authors) The study includes references to Odonata.] Address: Martín, D., Institute of Evolutionary Biology (IBE, CSIC-Universitat Pompeu Fabra), Passeig de la Barceloneta 37, 08003 Barcelona, Spain. Email: david.martin@ibe.upf-csic.es

26464 Melillo, M.C.A.; Ventura, S.P.R.; Guillermo-Ferreira, R.; Peixoto, P.E.C. (2026): When similar individuals don't attract: Absence of assortative mating by coloration in a damselfly with honest signaling. *Ethology* 132(5): 305-316. (in English) ["Ornaments are conspicuous traits used in intraspecific signaling, occurring in one or both sexes. In species with mutual ornamentation, male traits have traditionally received more attention, whereas female traits have frequently been assumed to evolve as byproducts of male ornamentation. However, other less explored processes, such as mutual mate choice, may explain ornamentation in both sexes. According to this hypothesis, when males and females prefer the same trait, selection reinforces it over generations, promoting ornament development in both sexes, especially when the trait signals individual quality. However, mate choosiness may vary according to the time available for the reproductive process to take place: the shorter the time, the lower the choosiness. We tested these patterns in a damselfly species (*Acanthagrion lancea*), in which both sexes possess blue ornamentation, and investigated two hypotheses: (i) blue coloration results from mutual mate choice, in which coloration signals quality; (ii) mate selectivity decreases over the course of the day, as time available for reproduction decreases. To investigate these hypotheses, we analyzed whether the color of male–female couples correlated, considering their visual spectrum, and whether this correlation decreased throughout the day, indicating less mate selectivity. We used lipid weight and dry body mass as indicators of quality. Coloration was positively correlated with individual dry mass. Surprisingly, a new red coloration, not visible in the human spectrum, was identified. However, there was no relationship between the colorations of couples, regardless of the time of day. These results suggest that, although coloration signals quality, it is not used in mutual mate choice, independent of the available time for reproduction." (Authors)] Address: Peixoto, P., Departamento de Genética, Ecologia e Evolução, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil. Email: pauloenrique@gmail.com

26465 Miranda-Filho, J.C.; Vinagre, S.F.; Juen, L.; Mendoza-Penagos, C.C. (2026): Description of the final instar of *Acanthagrion kennedii* Williamson, 1916 (Odonata: Coenagrionidae), with notes on reproductive behavior. *Zootaxa* 5866(2): 329-342. (in English, with Portuguese and Spanish summaries) ["The final larval instar (F-0) of *A. kennedii* is described based on specimens collected in eastern Amazonia (Pará State, Brazil) and reared in the laboratory until adult emergence to confirm species identity. The larva is assigned to Group II sensu Novelo-Gutiérrez (2009). Diagnostic comparisons are provided with morphologically similar species of Group II. Ecological observations indicate an association with macrophyte-rich habitats and describe aspects of reproductive behavior, including territoriality and oviposition mode. This study contributes to reducing the knowledge gap regarding larval stages in *Acanthagrion* Selys, 1876, for which

descriptions remain scarce." (Authors)] Address: Miranda-Filho, J.C., Programa de Pós-graduação em Zoologia - PPGZOOL, Universidade Federal do Pará - UFPA, Belém, Brazil. Email: jaifilho22pa@gmail.com

26466 Mondal, S.; Modak, B.K. (2026): Morpho-molecular Delineation of *Odonaticola nonapetalis* n. sp. (Apicomplexa: Eugregarinida: Actinocephalidae) Parasitising *Brachythemis contaminata* (Fabricius, 1793) from West Bengal, India, Including taxonomic revision of the genus *Odonaticola*. *Acta Parasitologica* 71, 93: (in English) ["Purpose: Septate gregarines are widespread in insects but remain largely unexplored in odonates, with only ~ 1% of odonate species investigated and minimal molecular or ultrastructural data available. The present study characterises a septate gregarine parasitising *Brachythemis contaminata* using modern microscopy and phylogenetic analysis to clarify its taxonomic placement and improve understanding of the genus *Odonaticola*. Methods: Fixation was performed using Schaudinn's solution, followed by staining with Heidenhain's haematoxylin; SEM involved glutaraldehyde and osmium tetroxide fixation. SSU rDNA was amplified, sequenced, and analysed using the neighbour-joining method. Results: Trophozoites are elongated ($321.12 \pm 50.63 \mu\text{m}$). Epimerite complex ($111.58 \pm 18.24 \mu\text{m}$) comprising an umbrella-shaped epimerite proper bearing nine petaloid spines and a cylindrical diamerite. Gamonts are solitary and elongated ($362.13 \pm 65.91 \mu\text{m}$), with a broadly obpanduriform protomerite featuring an elevated apical zone and a narrowly ovoid deutomerite. Nucleus broadly orbicular to ellipsoid ($45.48 \pm 5.38 \mu\text{m} \times 35.06 \pm 5.51 \mu\text{m}$), containing multiple karyosomes. Both stages exhibit longitudinal epicytic folds (~ 5–6 folds/ μm), except the epimerite proper, which has undulating ridges and grooves. Gametocysts are orbicular ($360.78 \pm 31.32 \mu\text{m}$), surrounded by a thick ectocyst, and dehiscence by simple rupture. Oocysts are tetrahedral ($7.13\text{--}8.82 \mu\text{m}$), with projections bearing terminal sucker-like structure. Phylogenetic analysis places *Odonaticola nonapetalis* n. sp. as an independently branching lineage within Actinocephalidae (bootstrap = 88%), with a long terminal branch (0.050), indicating strong divergence. Conclusion: Combined morphological and molecular data support the recognition of *Odonaticola nonapetalis* n. sp. as a novel species and justify an emended diagnosis of the genus *Odonaticola*." (Authors)] Address: Modak, B.K., Department of Zoology, Sidho-Kanho-Birsha University, Purulia, West Bengal, 723104, India

26467 Montana, K.O.; Newton, L.G.; Abbott, J.C.; Uche-Dike, R.; Abbott, K.K.; Goodman, A.M.; Bybee, S.M.; Guralnick, R.P.; Ware, J.L. (2026): Systematics, divergence time, biogeography, and trait evolution of the dragonfly genus *Erythemis* Hagen, 1861 (Anisoptera: Odonata). *International Journal of Odonatology* 29: 125–140. (in English) ["The dragonfly genus *Erythemis* Hagen, 1861, in the hyper-diverse family Libellulidae Leach, 1815, contains ten species that are found across the Americas. Species relationships have never been resolved for this group, and doing so will provide a framework to understand the considerable interspecific variation present in traits, including genital morphology, abdomen shape, and flight activity. Here, we present the most comprehensively sampled phylogenetic reconstruction for *Erythemis* based on anchored hybrid enrichment (AHE) data. Using an *Erythemis* fossil as calibration, we estimated the divergence time of the genus to be about 25 million years ago, around the transition between the Oligocene and Miocene. A reconstruction of the ancestral range of the genus revealed a likely origin in central and South America, with subsequent dispersal into the Caribbean. We also performed a

likelihood-based ancestral character state reconstruction to test morphological synapomorphies for the group. Interspecific variation in male genitalia morphology stood out, with different penis characters evolving separately. We also found notable variation in abdomen shape and size among species. Our phylogeny provides a basis for understanding evolutionary relationships of all ten *Erythemis* species, as well as the origins and timing of character innovations, set in their biogeographical context and with respect to the divergence time of the group." (Authors) E. vesiculosa, E. plebeja, E. attala, E. haematogastra, E. credula, E. carmelita, E. collocata, E. simplicicollis, E. mithroides, E. peruviana] Address: Montana, Katherine, Dept of Invertebrate Zoology, American Museum of Natural History, 200 Central Park West, New York, NY 10025, USA. Email: kmontana@amnh.org

26468 Montes-Fontalvo, J.; Cano-Cobos, Y. (2026): *Leucobasis puinave* sp. nov. (Odonata: Coenagrionidae), a new damselfly species from Colombia with updated generic characterization. *International Journal of Odonatology* 29: 176–186. (in English, with Spanish summary) ["*Leucobasis puinave* sp. nov., is described from 9 males, 2 females collected in Guainia department in eastern Colombia. This is the second known species of the genus *Leucobasis*, and it can be separated from *L. candicans* by its size and the main coloration of S7–10. We also provide some observations about the conservation status of both species." (Authors)] Address: Cano-Cobos, Yiselle, Museo de Historia Natural C.J. Marinkelle, Depto de Ciencias Biológicas, Universidad de los Andes, Bogotá, Colombia. Email: yisellecanoc@gmail.com

26469 Munyandi, E.; Cristescu, B.; Verschueren, S.; Mbdzo, M.; le Roux, N.; Marker, L.; Schmidt-Küntze, A. (2026): Mesocarnivore diet in a human-dominated landscape with abundant livestock and low large carnivore occurrence. *Wildlife Research* 53, WR26008. doi:10.1071/WR26008: 13 pp. (in English) ["Mesocarnivores are often blamed for smallstock depredation. Their diets may be influenced by food availability and competition or facilitation from large carnivores. Aims. Our objective was to investigate the diet of black-backed jackals (*Lupulella mesomelas*) on land used for raising livestock, hypothesising that smallstock species would be a primary food item because jackals are perceived responsible for the majority of depredation in the region. We assessed whether the presence of a dominant competitor, the African wild dog, may facilitate the jackal's diet by increasing scavenging opportunities. Methods. We determined the diet of black-backed jackal from genetically confirmed jackal scat collected between 2019 and 2022 in four communal conservancies of central-eastern Namibia. To explore how jackal diet may be influenced by the presence of wild dogs, we compared jackal diet within v. more than 10 km from wild dog denning areas. Key results. Insects (Coleoptera) and small mammals were the most frequently consumed items (10.4 and 10.5% respectively), whereas wild ungulates contributed the most biomass to black-backed jackal diet (48.8%). Smallstock contributed 15.9% of the total estimated biomass but appeared to be avoided on the basis of intensity of use (occupancy) estimates, given their widespread presence. Jackal diets were not affected by assumed African wild dog denning areas. Conclusions. Jackals in communal conservancies of central-eastern Namibia consume primarily wild ungulate prey and, to a lesser extent, livestock, and supplement their diet with non-mammal food sources. The lack of facilitation or competition with black-backed jackals in this region might be attributable to low density and diminished functional role of African wild dogs in this highly persecuted population. Implications. Enhancing wild ungulate populations

could decrease livestock depredation and help restore endangered large carnivores such as the African wild dog and cheetah." (Authors) 3,49% (n = 3) of food items collected from scat (n = 86) correspond to Odonata.] Address: Cristescu, B., School of Agriculture and Natural Resources Sciences, Namibia University of Science and Technology, Windhoek, Namibia. Email: bogdan@cheetah.org

26470 Nair, V.P.; Samuel, A.; George, M.; Sadasivan, K. (2026): A new species of *Lestes* Leach, 1815 (Odonata: Zygoptera: Lestidae) from the Western Ghats of Kerala, southern India. *International Journal of Odonatology* 29: 159-168. (in English) ["*Lestes paloti* sp. n. (Odonata: Lestidae) is described from Kerala on the western slopes of the Western Ghats, southern India. Although superficially resembling *L. garoensis* Lahiri, 1987 and *L. nodalis* Selys, 1891, the new taxon can be readily distinguished by the structure of the male anal appendages, particularly the form of the inner inflations of the cerci bearing a sharply pointed spine, and by the morphology of the secondary genitalia. This study also clarifies that previous records of *L. nodalis* from southern India were based on misidentifications of this new species. Notes on habitat, distribution, and ontogenetic and seasonal color variations are provided. A preliminary classification of species-groups within *Lestes* of Western Ghats is proposed, along with a diagnostic key to closely related species." (Authors)] Address: Nair, V.P., PG & Research Department of Zoology, Alphonso College, Arunapuram P.O., Pala, Kottayam, Kerala, India, PIN 686574. Email: vinayanpnair@gmail.com

26471 Newton, L.G.; Abbott, J.C.; Bybee, S.M.; Carter, P.; Frandsen, P.B.; Goodman, A.; Guralnick, R.; Hahn, B.; Idec, J.; Kalkman, V.J.; Kolhi, M.; Fomekong-Lontchi, J.; Lupiyanigdyah, P.; Onsongo, V.; Rowe, E.; Sanchez-Herrera, M.; Pinkert, S.; Sutherland, L.; Tolman, E.; Uche-Dike, R.; Barden, P.; Belitz, M.; Bota-Sierra, C.A.; Cordero-Rivera, A.; Córdoba-Aguilar, A.; Dijkstra, C.-D.B.; Dow, R.A.; Ehler, J.; Ferreira, R.G.; Hämäläinen, M.; Juen, L.; Lorenzo-Carballa, M.O.; Mauffray, B.; Nielsen, A.L.; Pessacq, P.; Pham, T.H.; Pinto, A.P.; Richards, S.J.; Salas, R.; Skevington, J.H.; Theischinger, G.; Zhang, H.; Ware, J.L. (2026): Soaring systematics: an evaluation of biogeography and flight behavior in dragonflies and damselflies (Insecta: Odonata) using phylogenomics. *Systematic Biology* 75(5): 984-1002. (in English) ["Odonata are descended from what were most likely the first winged animals, which flew ~320 million years ago (Ma). They comprise ~6400 extant species distributed across all continents except Antarctica. Examination of long-standing hypotheses regarding the role of flight behavior and wing morphology in shaping the global distribution of odonates has been limited by spatial and taxonomic scope. Here we leverage mobilized trait and distribution data derived from specimens and literature combined with a uniquely comprehensive target-enriched phylogeny (~940 loci) covering all families and 67% of recognized genera. Ancestral state reconstruction of flight behavior strategies ("flyer" vs. "percher") suggests the odonate ancestor was a flyer, spending a majority of its time when active on the wing, with multiple independent transitions to percher. Several transitions back to the flyer behavior have also occurred. Aspect ratios for forewings and hindwings showed a strong relationship between these traits and perching and flying behavioral strategies. Divergence time estimation suggests the crown age of Odonata to be 290–325 Ma. Bayesian biogeographical evolutionary analysis of nine biogeographical realms provides a preliminary biogeographical history for odonates spanning 325 Ma. Key family-level splits occurred during the Jurassic and Cretaceous, paralleling the increasing isolation of landmasses and the poleward drift

of the contemporary Australasian and Holarctic regions. Both behavioral and morphological adaptations likely facilitated the distributional success of select odonate lineages. This study lays the foundation for a revised classification of odonates and a more complete understanding of the influence of flight behavior and wing morphology in relation to evolutionary processes shaping past and current odonate diversity." (Authors)] Address: Newton, Lacie, Division of Invertebrate Zoology, American Museum of Natural History, USA. Email: lnewton@amnh.org

26472 Noda, A.; Watanabe, K. (2026): A cloakwork orange: lure and deflection effects of predator-induced bright tail coloration in Dryophytes tadpoles. *Amphibia-Reptilia* 47(2): 179-194. (in English) ["Tadpoles of some amphibian species exhibit morphological and colour changes in response to predators. In several Dryophytes species (Hylidae), dragonfly nymphs induce the development of a deep, vivid orange tail. Previous studies using clay models have demonstrated that dark tail spots can function as lures that divert predator attacks away from the body. However, whether bright orange tails have similar effects, particularly when tested on live individuals, remains unknown. Here, we exposed predator-induced (Orange) and non-induced (Normal) tadpoles of *Dryophytes leopardus* to dragonfly nymphs of *Anax nigrofasciatus* and analysed strike locations from recorded videos. We found that orange-coloured tails were attacked more frequently than bodies of Orange individuals or the tails of Normal ones. Mortality rates did not significantly differ between individual types (Orange or Normal) or body parts attacked, probably owing to the limited space for tadpoles to escape. Nevertheless, strikes to orange tails were more likely to fail and leave tadpoles uninjured than strikes to either the bodies of Orange individuals or the tails of Normal ones. These findings suggest that the orange tail functions not only as a lure but also as a potential deterrent to reduce strike accuracy, possibly via motion dazzle effects. Thus, the orange tail may serve purposes beyond being merely a disposable part. The limited occurrence of such conspicuous tail coloration among amphibians may be explained by ecological and physiological constraints, such as increased vulnerability to non-focal predators or the higher developmental costs of expressing orange colouration except under specific resource acquisition conditions." (Authors)] Address: Noda, A., Department of Zoology, Graduate School of Science, Kyoto University, Kitashirakawa8 oiwake-cho, Sakyo-ku, Kyoto 606-8502, Japan. Email: kapurira@outlook.jp

26473 Norling, U (2026): A ten-year field study of larval seasonality in *Coenagrion puella* in Sweden (58°N), with notes on seasonal regulation in the genus (Odonata: Coenagrionidae). *Odonatologica* 55(1/2): 69-98. (in English) ["The life cycle of *C. puella* was studied from 2011 to 2021 in a small shallow pond in southern Sweden (58°33'N) by regular sampling. Development was normally mixed uni-/semivoltine with variable proportions. The first winter was typically spent in a range of six stadia, up to the penultimate one. Emergence, from late May to early July, resulted from accelerated development in the four or five last overwintering stadia (>1.7 mm head width) with no apparent peak. Smaller overwintering larvae, forming the semivoltine cohort, grew slowly in their second year in a long-day induced diapause-like state preparing for winter, mostly ending in the penultimate stadium before winter like the fastest univoltines, occasionally also in the final stadium. An identical cohort split was experimentally demonstrated by manipulating spring photoperiod. Hatchlings from 2012 mainly became semivoltine, probably from late oviposition, whereas those from 2013 were mainly univoltine. In

2015 and 2017 reproduction failed, probably due to plant cover hiding the water surface during drought, combined with poor weather. In 2018, an early spring with only large larvae and a hot dry summer seems to have restricted reproduction to an early and brief period, resulting in offspring with an exceptionally synchronous univoltine development, overwintering in the penultimate stadium. The observed differences between years suggest that results from single-year studies may not be representative. A one- or two-year development with reduced overwintering in the final larval stadium seems ubiquitous in Europe, univoltinism in the Mediterranean, and surprisingly often mixed voltinism further north (48–58°N). A gradient of regulatory responses, life history and gross phenology/phenological adaptation in Swedish *C. puella*, *C. hastulatum*, and *C. armatum* is discussed." (Author)] Address: Norling, U., Dept of Urban Studies, Malmö University, SE-205 06 Malmö, Sweden. Email: ulfg.norling@gmail.com

26474 Obi, E.; Lima, M.; Amadi, K.; Abajue, M.C. (2026): Diversity and distribution patterns of insects in Nigeria: A GBIF-based appraisal. *Ecology and Evolution* 16(8), e74090: 10 pp. (in English, with summary in Nigerian Pidgin) ["Insects provide essential ecosystem services and are key indicators of ecosystem health. Their diversity in Africa is estimated to be high, but they are poorly documented in many African countries, such as Nigeria. In this study, we used insect occurrence records from the Global Biodiversity Information Facility (GBIF) database to investigate and examine insect diversity and distribution patterns across Nigeria's major biomes. We analysed 49,854 records from the GBIF and found 19 orders [including Odonata], 305 families, 2515 genera and 5880 species. However, the richness estimator analysis suggests that current records only represent ~21% of the true insect diversity in Nigeria. We also show that diversity differs between biomes and follows a latitudinal pattern. Overall, our findings reveal geographic and taxonomic gaps, and highlight the need to prioritise under-represented taxa and locations to improve biodiversity assessment and conservation planning. We suggest that the current state of Nigeria's insects reflects a dire situation that needs addressing through local and international collaboration facilitated by extensive government support." (Authors)] Address: Obi, Emelie, School of Science, Dresden University of Technology, Dresden, Germany. Email: joseph_chukwuemeli.ob@gmail.com

26475 Ordaz-Morales, J.E.; Ballen-Guapacha, A.V.; Pulido-Ríos, L.; Stand-Perez, M. (2026): Morfometría geométrica: una herramienta para estudios evolutivos y ecológicos en odonatos. *Hetaerina* 8(1): 6-16. (in Spanish) ["Morphological analysis has been a central component in the identification and classification of organisms, as well as in understanding evolutionary processes such as adaptation, speciation, reproductive isolation, and sexual selection. Although traditional morphometrics has allowed for the description of quantitative traits through linear measurements, this approach has limitations when analyzing complex structures, as it fails to adequately capture shape or precisely distinguish between shape and size variation. The incorporation of geometric morphometrics has transformed the study of phenotypic variation by quantifying shape using homologous point coordinates (landmarks and semi-landmarks), yielding variables that can be integrated into ecological and evolutionary analyses. In Odonata, geometric morphometrics has proven particularly useful for analyzing wings and reproductive structures, enabling researchers to address questions regarding taxonomy, local adaptation, species recognition, and mechanical isolation. Its integration with phylogenies expands the scope of analyses by allowing for the estimation of parameters

such as phylogenetic signal, evolutionary rates, and coevolutionary patterns, among others. Due to its resolution, versatility, and accessibility, this tool represents a valuable resource for studying morphological diversity and evolution in Odonata. In this context, we present a clear and accessible description of how geometric morphometrics works and provide basic methodological recommendations for its application in the morphological study of Odonata, with special emphasis on structures relevant to evolutionary and taxonomic analysis." (Authors/Google Translate)] Address: Ordaz-Morales, J.E., Red de Biología Evolutiva, Instituto de Ecología A. C., Xalapa, México. Email: jeoordm@gmail.com

26476 Orr, A.G. (2026): Additions and corrections to descriptions of Bornean platystictid larvae (Odonata: Platystictidae). *Notulae odonatologicae* 10(7): 256-259. (in English) ["The states of several characters relating to the legs and mouthparts in the larva of a Bornean protostictine larvae, described previously as *Platystictidae* sp. A, are corrected and augmented to facilitate accurate comparison with descriptions of other members of the family available in the literature." (Authors)] Address: Orr, A.G., Environmental Futures Research Inst., Griffith Univ., Nathan, Australia. Email: agorr@bigpond.com

26477 Orr, A.G.; Bedjanic, M. (2026): The final instar larva of the Sri Lankan endemic *Platysticta apicalis* Kirby (Odonata: Platystictidae, Platystictinae), including comparisons with known larvae of other platystictid subfamilies. *Zootaxa* 5862(3): 523-538. (in English) ["The final stadium larva of *P. apicalis* is described, based principally on a female exuvia collected in the wild, from near Deniyaya, southern Sri Lanka. Identification was by supposition, based on the proximity a teneral adult evidently recently emerged from the exuvia. Other exuviae of both sexes from the same site were also examined, judged to be of the same species, and used to augment the description. This is the first description of the larva of a member of the subfamily Platystictinae, and also describes the larval stage of the type genus of the family. In general form the larva of *P. apicalis* closely resembles all known members of the subfamilies Protostictinae and Palaemnematinae with a broad roughly heart shaped head, well tracheated saccoid gills and a flat prementum with convex lateral margins. In some details, such as the palmate molar crest of the left mandible, the moderately projected ligula and the longish well-spaced coronate setae on the margin of the ligula it most closely resembles species of the New World *Palaemnema* Selys, but despite the extreme conservatism in larval morphology exhibited by the family, it has several characters not seen elsewhere. This is in agreement with some, but not all, studies of relationships within the family based on analysis of adult DNA, which recognise Platystictinae and Palaemnematinae as sister groups." (Authors)] Address: Orr, A.G., Environmental Futures Research Institute, Griffith University, Nathan, Q 4111, Australia. E-mail: agorr@universal.net.au

26478 Ossa-Yepes, M.; Ríos-Pulgarín, M.I.; Villabona-González, S.L.; Zapata-Vahos, I.C.; Martínez, F.A.; Barletta, M. (2026): Microplastics and other anthropogenic particles contamination and their potential trophic transfer in a tropical Andean reservoir, Colombia. *Hydrobiologia* 853: 5019-5038. (in English) ["Microplastics are a threat to ecosystem health, and their impacts and effects are increasingly serious and need to be studied. This study assessed anthropogenic contamination, with emphasis on microplastics, in the water, sediment, and biota (i.e., microcrustaceans, macroinvertebrates, and fish) compartments in a tropical Andean reservoir, Antioquia, Colombia. For this purpose, sampling was carried out at three hydrological periods between 2022 and 2023. The obtained

samples were subjected to specific digestion for each environmental compartment and the identified particles were quantified and classified in size, shape, and color. Fourier transform spectrophotometry was used to analyze polymer composition. An ANOVA was used to evaluate statistical differences in particle size and quantity between sampling times for each compartment. Discriminant analysis was used to evaluate the relationship of fish feeding habits with the quantity of particles found in fish. Anthropogenic particles were found in all abiotic and biotic compartments. Blue fibers were predominant in all compartments, with omnivorous fish exhibiting the highest particle concentration. Microplastics comprised 12% of the particles, mainly polypropylene, polyester and polyethylene, the rest were rayon, cellulose and cotton. A conceptual model addressing the dynamics of pollution in Peñol-Guatapé reservoir is proposed, suggesting how anthropogenic particles transfer between environmental compartments and species.... Two orders Diptera (16 individuals) and Odonata (8 individuals) were identified in the rainy and rainy transition samplings. After digestion to extract the APs, it was found that in the rainy transition period, an average of 1.4 (± 0.5 SD) APs was found for the order Diptera, while for the order Odonata, a greater amount of particles was found with an average of 1.75 (± 0.9 SD) (Table 1). In contrast, for the rainy season, Odonata had an average at 2 (± 1.0 SD) APs, while Diptera had 1.2 (± 0.5 SD) APs. Again, blue color with 56% was the most frequent color and all the particles found in the digestion of macroinvertebrates were filaments (Fig. 3). ... Odonata are shown to be more vulnerable to consuming APs increasing the risk of consuming MPs (Fig. 6)." (Authors)] Address: Ossa-Yepes, Mariana, Grupo de Investigación Biología CES, Facultad e Ciencias Agropecuarias y Naturales, Maestría en Ciencias Biológicas, Universidad CES, 050021 Antioquia, Colombia. Email: ossay.mariana@uces.edu.co

26479 Phan, Q.T.; Keetapithchayakul, T.S.; Makbun, N.; Hopkins, P. (2026): Notes on the genus *Copera* Kirby, 1890 in Southeast Asia, with the description of *Copera phanthanhhaii* sp. nov., a neglected damselfly from Vietnam and Thailand (Odonata: Zygoptera: Platycnemididae). *Zootaxa* 5873(3): 515-530. (in English) ["Updated distribution and keys to the males and females of all known *Copera* in Southeast Asia are provided with description of *C. phanthanhhaii* sp. nov. from Vietnam and Thailand (holotype male: Dong Hoi City, Quang Tri Province, Vietnam (17.379333°N, 106.482806°E, 163 m elevation). The new species differs from *C. vittata* (Selys, 1863) by having tibiae of middle and hind legs distinctly broadened in male and the shape of posterior process on the female's prothorax." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Research, Inst. of Research & Training of Medicine, Biology & Pharmacy, Duy Tan Univ., Da Nang, 550000, Vietnam. E-mail: pqtoan84@gmail.com

26480 Pires, M-M.; Calvão, L.B.; Périco, E.; Juen, L. (2026): Spatiotemporal changes in Odonata assemblages in freshwater and coastal habitats associated with the onset of the operation of an industrial-mining complex in the eastern Amazon. *Hydrobiology* 111(2), e70042: (in English) ["Industrial-mining expansion is reshaping ecological processes across tropical landscapes at an unprecedented rate, yet its consequences to aquatic biodiversity remain insufficiently quantified. We used a before-after repeated-measures design to assess temporal changes in Odonata assemblages following the onset of operations at an industrial-mining complex in streams and mangroves along a gradient of potential spatial exposure in the eastern Amazon (State of Pará, northern Brazil). Adult Odonata were collected at three sites from each habitat type (located at increasing distances from the

industrial-mining complex) across multiple quarters of the regional dry season, both in the year preceding and in the first year of the operation of the industrial-mining complex. In streams, Odonata alpha diversity (richness and Shannon diversity) consistently decreased after the onset of the operation and was accompanied by marked and variable shifts in composition. Particularly, the abundance of disturbance-tolerant Anisoptera taxa decreased near the complex, while the abundance of specialist Zygoptera taxa decreased in all streams after the onset of operation. Across mangroves, Odonata assemblages varied primarily with spatial distance from the complex and showed weaker temporal changes in composition between operational phases. In particular, Odonata assemblages in the mangroves near the industrial-mining complex exhibited greater compositional variation than in mangroves farther away. Such responses highlight the habitat-specific sensitivity of Odonata to land-use changes, with stream assemblages appearing more vulnerable to industrial-mining impacts than mangroves. Our findings underscore the importance of incorporating multiple habitat types and explicit spatial gradients into environmental impact assessments and reinforce the value of Odonata as bioindicators of aquatic ecosystem health in tropical forest landscapes in the Global South." (Authors)] Address: Juen, L., Programa de Pós-graduação em Ecologia, Univ. Federal do Pará (UFPA), Av. Perimetral, 1, Belém, Pará 66077-830, Brazil. Email: leandrojuen@ufpa.br

26481 Prokop, J.; Danková, K.; Sampson, L.; Sroka, P. (2026): The thorax of *Eubleptus* illuminates evolutionary history of winged insects. *iScience* 29(8), 116838: 10 pp. (in English) ["The hexapod thorax represents a specialized tagma for body locomotion, and its formation was one of the crucial steps in arthropod evolutionary history. In insects, the thoracic morphology was crucial for the acquisition of wings, which was closely connected with the reinforcement of the lateral thoracic wall (pleuron). Here, we uncover the structure of the pleuron for the first time in a Carboniferous palaeodictyopteran, *Eubleptus danielsi* from the Mazon Creek Lagerstätte (Illinois, USA). We reconstructed a 3D model of *E. danielsi* and compared flight-related traits with a broad range of extant insect taxa. The thoracic pleuron is strikingly different across the main pterygote lineages. Whereas the pleura of Odonata and Ephemeroptera exhibit specialization with many autapomorphic characters, the arrangement observed in *E. danielsi* actually resembles the pattern seen in Neoptera. It is plausible that this represents a pattern close to that of the protopterygote, the hypothetical common ancestor of Pterygota." (Authors)] Address: Prokop, J., Dept Zool., Fac. Science, Charles Univ., Viničná 7, 128 00 Praha 2, Czech Republic. Email: jprokop@natur.cuni.cz

26482 Rachman, H.T.; Wardhana, P.K.; Abdullah, A.Z.; Les-tari, P.; Abdullah, F.; Nu'manuddin, M. (2026): Nusakambangan Odonata research initiative for conservation (NODRIC) project: Safeguarding two endemic Javan damselflies at risk of extinction, *Rhinagrion tricolor* and *Coeliccia lieftincki*. *Agrion* 30(2): 14-18. (in English) ["Nusakambangan Island, located off the southern coast of Central Java, Indonesia, retains one of the largest remaining lowland forest ecosystems on Java and serves as an important refuge for freshwater biodiversity. Through the NODRIC, surveys conducted in February and April 2026 focused on two endemic Javan damselflies, *R. tricolor* and *C. lieftincki*. Species Distribution Modelling (SDM) using Maximum Entropy (MaxEnt) was applied to identify priority habitats and guide field surveys. A total of 35 individuals of *R. tricolor* were recorded across seven localities, while 12 individuals of *C. lieftincki* were documented from four localities. The project was implemented in collaboration with Solusi Bangun Indonesia Company, the Ministry of Immigration and

Corrections, and the Central Java Natural Resources Conservation Agency (BKSDA). The results underline the significance of Nusakambangan as a stronghold for endemic stream-dependent damselflies and demonstrate the importance of integrating scientific research with stakeholder engagement to support long-term conservation." (Authors)] Address: Rachman, H.T., Endemic Indonesia Society, Indonesia. Email: heningtriandika@gmail.com

26483 Rawal, D.; Batra, D. (2026): A narrative review on evolution of wings in odonates. *Munis Entomology & Zoology* 21 (suppl.): 4756-4767. (in English) ["Odonates possess one of the oldest continuously documented powered-flight systems among living insects. Their wings are often described as "primitive" because they cannot be folded flat over the abdomen, yet this label obscures a long history of structural innovation. This review synthesizes evidence from fossils, comparative morphology, phylogenomics, developmental biology, materials science, structural mechanics, and aerodynamics to reconstruct how odonate wings evolved and why their design remains exceptionally effective. A narrative evidence synthesis was conducted across publications dealing with crown Odonata and the broader total group Odonoptera, emphasizing peer-reviewed studies that connect phylogeny or morphology to mechanical and aerodynamic function. The fossil record shows that giant Carboniferous-Permian forms commonly called "giant dragonflies" were stem odonatoptera rather than crown dragonflies, while successive Paleozoic and Mesozoic radiations explored a much broader wing-morphology space than is represented by living lineages. The crown-group wing emerged through the stabilization of a highly integrated venational framework, a mechanically specialized wing base, functional regionalization around the arculus, nodus, pterostigma, and anal field, and increasing differentiation between fore- and hindwings. Corrugation, graded stiffness, composite veins, flexible resilin-rich joints, and damage-arresting cross-veins transform the wing into a lightweight, passively deforming structure rather than a rigid airfoil. These properties support diverse unsteady aerodynamic mechanisms and allow the four wings to operate with substantial kinematic independence. Living disparity reflects both deep constraints and ecological diversification: Anisoptera generally emphasize broad hindwing bases and high-power flight, Zygoptera commonly emphasize petiolation and maneuverability, and Epiophlebia preserves a distinctive mosaic rather than an evolutionary intermediate condition. Important uncertainties remain concerning insect-wing origins, the homology of several venational elements, the developmental genetic basis of odonate venation, and the functional interpretation of fossil wings. Odonate wings are therefore best understood not as static relics, but as evolving, damage-tolerant, multi-functional structures shaped by more than 300 million years of interactions among phylogeny, development, materials, flight ecology, and sexual selection." (Authors)] Address: Rawal, D., Dept of Zoology, Mohanlal Sukhadia University Udaipur, India. Email: deepakrawal26@mlsu.ac.in

26484 Rawal, D.; Batra, D. (2026): Biogeography of dragonflies and damselflies across the world. *Asian Journal of Biological and Life Sciences* 15(2): 296-302. (in English) ["Odonata constitute an ancient lineage of predatory insects whose contemporary distribution reflects interactions among geological history, climatic conditions, freshwater availability, habitat heterogeneity, dispersal capacity and evolutionary diversification. Approximately 6,400 extant species are distributed across all continents except Antarctica, with the greatest richness occurring in tropical regions. Nevertheless, odonate diversity does not follow a simple latitudinal pattern. Regional

richness and endemism are influenced by water-energy availability, topography, river-basin history, forest cover, hydroperiod, elevation, island area and isolation, and the dispersal characteristics of individual lineages. The aquatic larval and terrestrial-aerial adult stages of odonates produce a distinctive dual-realm biogeography: successful colonization requires both suitable freshwater breeding habitats and terrestrial landscapes through which adults can forage, mature and disperse. Molecular phylogenies indicate that the principal odonate lineages originated deep in geological time, while many family-level radiations were shaped by the fragmentation of Pangaea and Gondwana, continental isolation and subsequent long-distance dispersal. Tropical regions such as the Neotropics, Afrotropics, Oriental Region, Sundaland, Wallacea and New Guinea contain high lineage diversity and numerous range-restricted species. Oceanic islands generally support fewer species than comparable continental areas but frequently harbour evolutionarily distinctive endemic radiations, including Megalagrion in Hawaii and Nesobasis and Melanesobasis in the Pacific. By contrast, highly dispersive dragonflies such as *Pantala flavescens* maintain almost cosmopolitan distributions through continental and transoceanic migration. Climate change, habitat modification, pollution, river regulation and deforestation are now reorganizing odonate distributions. Poleward and elevational range shifts are increasingly recorded, particularly in Europe, while tropical forest-stream and montane specialists may experience range contraction. This review synthesizes the historical, ecological and evolutionary processes underlying global odonate biogeography and identifies priorities for improving geographical databases, tropical inventories, phylogeographic sampling and conservation planning." (Authors)] Address: Rawal, D., Dept Zoology, Mohanlal Sukhadia Univ., Udaipur, Rajasthan, India. Email: deepakrawal26@mlsu.ac.in

26485 Sahu, R.; Rai, R.K. (2026): Comparative analysis of Odonata diversity across differently managed paddy fields in Raigarh District, Chhattisgarh, India. *Journal of Animal Environment* 18(2s): 1064-1072. (in English) ["The present research was performed in Raigarh district to examine how different land-use practices influence Odonata diversity, species composition, and abundance. Three different agro-wetland sites were selected for comparison: a biofertilizer and biopesticides treated paddy field, a chemical fertilizer and chemical pesticide treated paddy field, and an adjacent fallow field. The study documented highest species richness at Site_1 (23 species), followed by Site_2 (16) and Site_3 (9). Diversity indices revealed maximum diversity at Site1 ($H' = 2.91$; Simpson = 0.93) and lowest at Site3 ($H' = 2.08$; Simpson = 0.85). Margalef's index mirrored a similar pattern with values of 4.44 (Site_1), 3.56 (Site_2), and 2.30 (Site_3). Pielou's evenness (0.90–0.95) indicated uniform species distribution across sites. Beta diversity ($\beta = 0.44$) reflected moderate species turnover. These findings suggest that habitat conditions significantly influence odonate diversity in paddy ecosystems. Species such as *Orthetrum sabina* and *Pantala flavescens*, *Diplacodes trivialis* and *Ischnura aurora* were observed across all sites, indicating their adaptability to varying habitat conditions. Overall, the findings suggest that fertilizer type and land management practices strongly influence Odonata communities. Biofertilizer-based farming appears to promote higher biodiversity and may support sustainable agricultural ecosystems." (Authors)] Address: Ranjana Sahu, R., Dept Zool., K.G. Arts & Science College, Raigarh C.G. India. Email: rjm.mohan477@gmail.com

26486 Sangela, V.; De, K.; Badola, R.; Hussain, S.A. (2026): Local contribution to the beta diversity of Odonata assemblages in a subtropical alluvial river stretch. *Community Ecology*

27: 353-370. (in English) ["Understanding spatial variation in biodiversity is essential for effective conservation planning. Beta diversity describes variation in species composition across habitats and environmental gradients, while the Local Contribution to Beta Diversity (LCBD) identifies sites with unique community composition. Odonates are sensitive indicators of freshwater ecosystem health, yet their spatial diversity patterns remain poorly documented in many Indian River systems. We conducted this study to understand LCBD patterns in Odonata assemblages along the Ramganga River, identify conservation-priority sites, and determine physicochemical drivers of species richness and beta diversity components. We surveyed odonates at 19 sites along the lower Ramganga River during the summer and winter of 2023 and 2024. We analyzed species abundance to calculate LCBD based on the Ruzicka index and its components—balanced variation (LCBDRUZ.BAL) and abundance gradients (LCBDRUZ.GRA). We used Principal Component Analysis to summarize environmental gradients and applied generalized linear and beta regression models to examine relationships among species richness, LCBD, and physicochemical variables. We recorded 20 odonate species across the study sites. LCBD values varied spatially, with the middle reaches of the Ramganga River contributing disproportionately to regional beta diversity and therefore requiring priority for conservation and restoration. Species richness showed a negative relationship with LCBDRUZICKA and LCBDRUZ.BAL, while LCBDRUZ.GRA exhibited a U-shaped pattern. Conductivity, pH, nitrate, and total dissolved solids significantly influenced species richness and beta diversity patterns. This study demonstrates the value of LCBD-based approaches for identifying ecologically unique sites and highlights the importance of integrating biodiversity metrics with environmental variables to guide conservation strategies." (Authors)] Address: De, K., Dept of Life Sciences, Sri Sathya Sai University for Human Excellence, Navanihal, Okali Post, Kamalapur, Kalaburagi, Karnataka, 585313, India

26487 Schweiger, E. (2026): Dotation Lobau, begleitende ökologische Untersuchungen Halbquantitative Bestandsaufnahme der Libellen und Kartierung ihrer repräsentativen Gesellschaften in der Oberen Lobau (Wien) Erhebungen 1988 - 1989. Nationalpark Donauauen - Wissenschaftliche Reihe 93: 1-48. (in German) ["As part of the ecological monitoring for the "Dotation Lobau" water management experiment, comprehensive studies of key species groups and functional aquatic parameters were conducted in the Upper Lobau, commissioned by the City of Vienna (MA 45), starting in 1988. This report presents the results of project component "3.2: Semi-quantitative inventory of dragonflies and mapping of their representative assemblages." These investigations were carried out between 1988 and 1989 along the Mühlwasser and Tischwasser watercourses, as well as at isolated ponds and ditches in the Upper Lobau." (Author/Google translate)] Address: no stated

26488 Seba-Palacios, M.A.; Porto-Ramírez, S.L.; Caballero-Cruz, P.; Can-Balam, F.; Riaño-Ramírez, N.; Sánchez-Caballero, A. (2026): Seasonal turnover in Lepidoptera and Odonata communities in Northeastern Mexican wind farms and their environmental drivers. *Biodiversity* 27(2): 229-244. (in English) ["The effects of wind energy on flying insects remain unclear, particularly in semi-arid landscapes. This study examined seasonal patterns and environmental drivers of Lepidoptera and Odonata across three wind farms. From 372 transects surveyed between 2021 and 2023, we recorded 22,738 individuals belonging to 144 species, including four species newly documented for Mexico. Species

richness and composition of lepidopterans and odonates varied among sites and seasons, with the highest diversity in fall. Indicator analyses revealed taxa associated with specific sites and seasons, while canonical ordination indicated that temperature, wind speed, solar radiation, and humidity were the main gradients shaping community structure. Lepidoptera were consistently more abundant, dominated by migratory species in fall, whereas Odonata patterns reflected microclimatic and seasonal water availability. Overall, marked seasonal turnover and high fall abundance suggest potential interactions with migration routes, underscoring the need to integrate insect data into wind energy planning and impact mitigation." (Authors)] Address: Sánchez-Caballero, A., Engineering for the Management, Restoration & Conservation of Ecosystems, Mexico City, Mexico;c Dept Zoology, Tel Aviv Univ. (TAU), Tel Aviv, Israel. Email: adrian.sanchez@imrce.net

26489 Singhal, S.; Srivastava, A.; Srivastava, P.; Verma, J. (2026): Deciphering urban freshwater health through integrated assessment of benthic macroinvertebrate assemblage and physicochemical dynamics in artificial ponds of Prayagraj, India. *Discover Ecology* 2:5: 20 pp. (in English) ["Benthic macroinvertebrates serve as effective bioindicators for assessing freshwater ecosystem integrity due to their differential sensitivity to pollution and habitat variability. This study evaluates spatial variation, taxonomic composition, and functional traits of macroinvertebrate communities in two artificial freshwater ponds located within the Botanical Garden of CMP Degree College (S1) and the University of Allahabad (S2), Prayagraj, India. Monthly sampling was conducted over six months (November 2023–April 2024), integrating biological and physicochemical assessments. A total of ten macroinvertebrate orders belonging to Arthropoda [including Coenagrionidae], Annelida, and Mollusca were recorded, with insects contributing the highest abundance—67.33% at S1 and 75.43% at S2. Physicochemical analysis indicated organic pollution stress at both ponds, characterized by low dissolved oxygen and elevated total hardness, particularly at S2. However, biotic indices such as the Hilsenhoff Biotic Index (HBI) and Ephemeroptera–Plecoptera–Trichoptera (EPT) richness suggested relatively better ecological quality at S2 than S1, reflecting a divergence between physicochemical and biological indicators. Functional Feeding Group (FFG) composition showed the dominance of predators, scrapers, and collector-gatherers at S1, indicative of a detritus-influenced environment, whereas S2 exhibited a higher proportion of passive filter feeders, consistent with improved water clarity and circulation. Overall, neither pond was found to be critically degraded; however, the study underscores the influence of localized environmental drivers and the necessity of integrated, site-specific management approaches in urban freshwater habitats." (Authors)] Address: Verma, J., Aquatic Ecology Lab, Dept of Zool., CMP Degree College, Univ. of Allahabad, Prayagraj 211001, U.P, India. Email: diatombuster@gmail.com

26490 Sniegula, S.; Wos, G. (2026): Warming accelerates development but alters synchrony in a season-dependent manner in a damselfly. *Ecological Entomology* 51(3): 614-619. (in English) ["Developmental synchrony—the coordinated timing of life stage transitions—is a key life-history trait in temperate insects. Based on theory and previous studies, we expected that warming and late-season photoperiods would shorten development time and increase synchrony, and that their effects would interact. We investigated how environmental variables shape larval development time and synchrony in a central-core population of the univoltine damselfly *Lestes sponsa*. Larvae were reared to the penultimate instar before emergence under four independent treatments

combining early- or late-season photoperiods with ambient or elevated temperatures, using seasonally fluctuating spring or summer conditions to mimic natural environments. As expected, development time decreased under warming and late-season photoperiods. However, synchrony patterns did not fully align with predictions: warming reduced synchrony under early-season conditions, and late-season treatments showed lower synchrony at the individual level but not at the family level. These results suggest that photoperiod and temperature can shape synchrony, but not uniformly across photoperiod-temperature combinations or between individual and family levels. In central-core populations, a longer developmental window may reduce the need for tight synchrony and instead favour more variable strategies such as bet-hedging." (Author)] Address: Sniegula, S., Institute of Nature Conservation, Polish Academy of Sciences, al. Adama Mickiewicza 33, 31-120 Kraków, Poland. Email: szymon.sniegula@gmail.com

26491 Sravani, P.; Sri, I.A. (2026): Exploring arthropod composition and relative abundance in rice agroecosystems of Medak District, Telangana, India. *Archives of Current Research International* 26(9): 731-739. (in English) [139 individuals of Odonata include 87 individuals from Libellulidae and 52 from Coenagrionidae; no species details are given.] Address: Sravani, P. Dept of Entomology, Professor Jayashankar Telangana Agricultural University, Rajendranagar, Hyderabad, Telangana, India. Email: sravanipasham01@gmail.com;

26492 Stein-Deffarges, E.; Deffarges, J. (2026): Cortaderia selloana, le trancheur d'odonates. *Lettre à Selys* n°4: 14-22. (in French, with English summary) ["During naturalistic observations between 2013 and 2024 in southeastern France, several cases of severely severed odonates were observed following collisions with pampas grass (*Cortaderia selloana*). The long, very sharp leaves of this invasive plant can cause decapitations or amputations during mating or sudden maneuvers. These incidents, which are probably frequent but poorly documented, affect various species, particularly immature individuals. The article thus highlights a direct and little-known impact of this plant on insects." (Authors)] Address: <https://odonatagallica.com/pdf/Selys04.pdf>

26493 Tomita, K. (2026): Electron microscopic analysis of wing nanopillar formation in a dragonfly and a cicada. *Zoological Science* 43(5): 8 pp. (in English) ["Insect wings often bear dense arrays of nanoscale protrusions known as nanopillars that confer functions such as water repellency, self-cleaning, and antibacterial activity. However, how these cuticular nanostructures develop remains poorly understood. Here, I investigate the development of wing nanopillars in the dragonfly *Anax parthenope* and compare it with that in the cicada *Hyalessa maculaticollis*. Using electron microscopy, I examined the formation of the wing surface from early cuticle deposition to post-ecdysial stages. In the dragonfly, the wing surface remained smooth throughout cuticle formation and nanopillars appeared only several hours after ecdysis, indicating that they likely arise through physicochemical self-organization of wax-based lipids secreted onto the wing surface. In contrast, nanopillars were already present on pharate wings of the cicada, indicating that they form before ecdysis, although the precise timing and mechanism remain unresolved. These findings show that superficially similar nanostructures on insect wings can differ in developmental timing and may arise through different developmental routes, highlighting the diversity of mechanisms underlying cuticular surface patterning." (Author)] Address: Tomita, K., Technology Advancement Center, Graduate School of Agricultural and Life Sciences, The University of Tokyo, 1-1-1

Yayoi, Bunkyo, Tokyo 113-8657, Japan. Email: aktomita@e.ecc.u-tokyo.ac.jp

26494 Vega-Sánchez, Y.M. (2026): Listado preliminar de Odonata del Parque Nacional Palenque, Chiapas, México. *Hetaerina* 8(2): 6-12. (in Spanish) ["Palenque National Park, located in Chiapas, Mexico, is a protected natural area of great biological significance despite its small size. In addition to its ecological value, it safeguards an important archaeological site of the Maya culture. The state of Chiapas is notable for its high Odonata diversity—comprising 205 species—yet no specific inventory exists for this reserve. This study presents a preliminary list of species for the reserve. Sampling was conducted at seven sites within the park, yielding 94 specimens representing 17 species, including an undescribed species of the genus *Hetaerina**. Concurrently, citizen science data from the iNaturalistMX platform were reviewed. Combining these sources, a total of 41 species across nine families were identified. The results demonstrate high odonate richness, underscoring the park's importance as a biological reservoir. Finally, the study highlights the need for continued systematic sampling to improve understanding of local biodiversity." (Author/Google translate)] Address: Vega-Sánchez, Yesenia M., Depto de Zoología, Instituto de Biología, Universidad Nacional Autónoma de México. CDMX, México. Email: yvega@cieco.unam.mx

26495 Walsh, W.; Figueroa, L.L. (2026): Data deficiency, taxonomic bias, and economic interests curtail insect and arachnid conservation in the United States. *PNAS* 123(10): e2522779123: 9 pp. (in English) ["Earth is experiencing a biodiversity crisis. Among the declining taxa are insects and arachnids, which account for most of the world's animal species, and are ecologically and economically vital. Thus, understanding the factors influencing insect and arachnid conservation policies is urgently needed. Here, we review conservation assessments for 46,257 North American insect and arachnid species and examine the factors that affect state and federal legal protections for species in the United States. We find the conservation status of 88.5% of described insect and arachnid species in North America is unknown, and that unassessed insect and arachnid species are unlikely to receive protection. Of US insects and arachnids known to be at-risk throughout their range, 94.7% are not protected by any state or federal law; only 2.5% are protected nationwide under the federal Endangered Species Act compared to 27.7% of range wide at-risk US bird species. Insect and arachnid protections are taxonomically biased, favoring Odonata and butterflies and moths (Lepidoptera) while overlooking other vulnerable taxa. We find that socioeconomic factors are the strongest predictors of state-level conservation policies: states with economies more reliant on mining, quarrying, and oil and gas extraction are less likely to protect insects and arachnids. In states where protections exist, more insect and arachnid species are protected when more residents hold eco-centric values. This quantitative assessment of US insect and arachnid conservation rectifies a previous dearth of data and highlights specific, addressable issues which have left countless species vulnerable to decline and possible extinction." (Authors)] Address: Figueroa, Laura, Dep of Biology, University of Massachusetts Amherst, Amherst, MA 01003, USA. Email: llf44@umass.edu

26496 Wang, L.; You, R.; Han, B.-P. (2026): Local-regional relationships for taxonomic and functional richness complementarily reveal community assembly. *Basic and Applied Ecology* 95: 52-60. (in English) ["The classic local-regional richness paradigm is widely used to evaluate the relative influence

of regional and local processes, but it overlooks the role of functional traits. Following the Species-Pool Functional Diversity (SPFD) framework, we propose to investigate community assembly by integrating taxonomic and functional richness into the classic paradigm. We applied this integrating strategy to detect the relative contributions of regional and local processes in structuring aquatic insect communities in tropical headwater streams across multiple mountains (regions) in the Pearl River Basin, China. Unsaturated local-regional relationships for taxonomic and functional richness indicated dominant regional effects but limited local constraints for all insects as a whole. These unsaturated patterns also worked for three major functional feeding groups, highlighting the importance of regional processes. Structural equation modeling that incorporated regional and local environmental variables further revealed that annual mean temperature directly affected regional richness and indirectly influenced local richness via environmental factors (aluminum and dissolved oxygen). Trophic interactions played an important role, with prey taxonomic and functional richness positively associated with predator richness. Ultimately, integrating taxonomic and functional diversity provides a powerful approach for disentangling multi-scale drivers of community assembly." (Authors) Odonata are listed in the supplemental material, and are treated at genus level.] Address: Han, B.-P., Department of Ecology, Jinan University, Guangzhou 510632, China. Email: tbphan@126.com

26497 Weihrauch, F.; Baumann, K.; Borkenstein, A.; Cordero-Rivera, A.; Martens, A.; Orr, A.G.; Schröter, A.; Wildermuth, H. (2026): In memoriam Reinhard Jödicke (1st July 1948 – 25th November 2025). *Odonatologica* 55(1/2): 1-30. (in English) ["A brief biography, together with personal recollections and memories of Reinhard Jödicke is presented. An outline of his editorial work, nomenclatural acts executed by him and his complete odonatological bibliography is appended." (Authors)] Address: Weihrauch, F., Jägerstr. 21A, 85283 Wolnzach, Germany. Email: mail@osmylus.com

26498 Wilamowski, K.; Pawłowicz, T.; Puchlik, M.; Oszako, T. (2026): Insects associated with declining riparian Black Alder (*Alnus glutinosa*) stands: Assemblage structure, within-season patterns, and distance-zone patterns in the Utrata and Lutownia River valleys. *Insects* 2026, 17, 551: 25 pp. (in English) [Poland "Insect assemblages associated with declining riparian black alder (*Alnus glutinosa*) stands were compared at the community level between two lowland river valleys in Poland that differ in anthropogenic transformation: the near-natural Lutownia River valley within the Białowieża Forest and the urbanised Utrata River valley in the Warsaw metropolitan area. Insects were sampled using active hand sampling and Barber pitfall trapping along a shortdistance gradient from the channel during repeated monthly field campaigns in summer and early autumn. The near-natural valley supported a richer assemblage, with a stronger representation of forest-associated, saproxylic and aquatic taxa, whereas assemblages in Utrata contained a higher proportion of widespread disturbance-tolerant taxa. In both valleys, diversity was highest at an intermediate distance from the channel margin, and the between-valley contrast was more pronounced than the within-season shifts visible in the campaign summaries. The results identify a clear assemblage contrast between the two valleys, a consistent intermediate-distance diversity maximum, and only modest within-season variation in pooled campaign totals. These findings indicate that structurally complex riparian alder forests with retained dead wood are associated with richer and more taxonomically varied insect assemblages; microhabitat-related interpretations are retained

as cautious sampling-point-scale associations because tree-level attributes and individual microhabitat categories were not quantified separately." (Authors) Presence/absence-data of 16 odonate species are given in Table A1] Address: Wilamowski, K., Institute of Forest Sciences, Faculty of Civil Engineering & Environmental Sciences, Białystok University of Technology, ul. Wiejska 45E, 15-351 Białystok, Poland. Email: m.puchlik@pb.edu.pl

26499 Work, K.A.; Ray, H.A. (2026): Proximity and local ecological conditions affect odonate assemblages in Ocala National Forest ponds. *Journal of Freshwater Ecology* 41:1, 2711736. 17 pp. (in English) ["Odonates are constrained by their requirement for freshwater for reproduction, though adult stages may disperse over dry land. In this study, we tested whether odonate assemblages were more similar in closely located ponds than in more distant ponds, and whether ecological variables predicted pond assemblage structure. To evaluate this question, we collected odonates in both the adult and nymph stages at 16 ponds clustered in four groups in Ocala National Forest in the summer of 2021 and 2023. We collected adults with aerial nets and nymphs with dipnets. We also measured physical and biological characteristics of the ponds, including the presence of potential predators (fish, tadpoles, crayfish). The number of individuals collected varied widely with pond size, but species richness and diversity varied little between groups. Odonate assemblages were slightly more similar if they were within the same group, although this pattern was stronger for dragonflies than for damselflies. With respect to the ecological characteristics of the ponds, adult odonate species richness was related to the area of open water present at a pond. For the nymphs, damselfly abundance, species richness and diversity were related to pond depth, coverage with lilies and small fish presence, whereas dragonfly abundance, species richness and diversity were related to pond size, coverage with grasses and the presence of sunfish. These results suggest that both dispersal and the physical and biological conditions of the habitat determine odonate structure in Ocala ponds. Given the pressure on ecosystems due to development and the limited research on odonates in Florida, we hope that these results will contribute to the support of odonate diversity in Florida." (Authors)] Address: Work, K.A., Biology Dept, Stetson University, DeLand, FL, USA. Email: kwork@stetson.edu

26500 Xu, J.; Jiang, R.; Liu, W.; Lian, J. (2026): Drop impact behavior and wall adaptive deflection response of cantilevered dragonfly wings. *Soft Matter* 22(31): 5236-5244. (in English) ["The behavior of drop impact and the adaptive deflection response of cantilevered dragonfly wings to the wall are investigated through both experimental and theoretical studies. In addition, the directional transport behavior of the drop interface and the wall deflection response characteristics of the lightweight surface during drop impact are analyzed. Results show that the drop undergoes unidirectional transport after impacting the cantilevered dragonfly wings. During the impact phase, the drop bulge takes on a straw-hat shape, the drop forms an elongated shape during the spreading phase, and the dragonfly wings recover after reaching maximum tip deflection. Based on the Euler-Bernoulli beam theory, the inertial scenario improvement model, and the kinetic energy theorem, a deflection response model of the drop affecting the wall is established, and the proportional constant is taken according to the experimental result. Analysis shows that the drop transport time, the dragonfly wing deformation, and the energy increase with the increase of impact height. The actual tip deflection first decreases and then increases with We. The actual value is lower than the theoretical value over

part of the 20 and 25 mm ranges but remains higher at 30 mm. The theoretical transport time is less than the actual one. The maximum deformation energy of the cantilevered dragonfly wing increases from $5.2 \times 10^{-5} \mu\text{J}$ to $1.379 \times 10^{-4} \mu\text{J}$ with increasing height. Due to the fluid–structure interaction, the potential energy of the drop promotes the adaptive deformation and downward movement of the sample, and the elastic energy of the dragonfly wings is released because of the springboard effect." (Authors)] Address: Jing Xu, J., Dept of Mechanical Engineering, Hangzhou Dianzi Univ., Hangzhou, 310018, China. Email: xujing@hdu.edu.cn.

26501 Zarin, M.S.; Abdullah, S.; Attaullah, S.; Aslam, S.; Shabnem, B. (2026): Study of dragonfly fauna as bioindicator to assess water quality in District Buner, Khyber Pakhtunkhwa, Pakistan. *Arthropods* 15(3): 145-153. (in English) ["A systematic odonatological survey was conducted to evaluate dragonfly fauna as bioindicators of water quality across twelve selected localities in District Buner, Khyber Pakhtunkhwa, Pakistan. The study was carried out during the summer seasons from 2021 to 2022. Findings indicate that odonate species exhibit distinct habitat preferences closely linked to specific physicochemical water parameters. The presence of unpolluted aquatic habitats was observed to significantly enhance odonate diversity and persistence by reducing ecological disturbances. A total of 616 dragonfly specimens were collected across the study sites. These were identified as 21 species belonging to 12 genera and 4 families. The family Libellulidae was the most abundant, representing 75.16% of the collected specimens and comprising 15 species across 7 genera. This was followed by Gomphidae (15.25%, 3 species, 3 genera), Aeshnidae (9.41%, 2 species, 1 genus), and Corduliidae (0.16%, 1 species, 1 genus). *Orthetrum coerulescens* subsp. *anceps* (Schneider, 1845) was identified as the most abundant species, whereas *Macromia moorei* (Selys, 1874) was recorded as the rarest." (Authors)] Address: Abdullah, S., Dept of Zoology, Shaheed Benazir Bhutto University, Sheringal, Upper Dir, Khyber Pakhtunkhwa, Pakistan. Email: sherabdullah@gmail.com

26502 Zhang, D.; Xin, Y.; Zhang, C.; Han, Z. (2026): Dragonfly-bionic titanium-based composite for the efficient anti-icing/deicing of lunar probe via fluorine-free and facile engineering. *Materials Today Chemistry* 57, 104007: (in English) ["The demand for light-weight and high-strength material in lunar exploration satellite renders titanium alloy as indispensable structural components. Pitifully, the low-temperature environment in space readily induces surface icing, which poses a critical technical challenge, constraining the service performance. To address this issue, inspired by the natural hydrophobic conical bump structures of dragonfly wings, this study successfully engineered an environmentally friendly titanium-based superhydrophobic composite through facile fabrication, achieving the synergistic integration of passive anti-icing and photo-electrothermal active deicing. Wherein, the laser ablation helped to construct roughened micro/nano-structures, followed by the incorporation of carbon nanotubes to effectively enhance the energy response to external optical and electrical stimuli, and the fluorine-free polydimethylsiloxane enhanced the surface hydrophobicity. It revealed that the as-prepared composite exhibited the water contact angle of 151° , with steady-state surface temperature reaching to 71.9°C under 1.8 sun irradiation and 114.7°C under the low driving voltage of 1.8 V, respectively. Remarkably, the icing delay time was prolonged from 82 s to 1627 s, meanwhile the ice adhesion strength was drastically reduced to 28.85 kPa. The photothermal and electrothermal

deicing efficiencies were enhanced by 59% and 47%, respectively. After 20 consecutive cyclic tests and ultraviolet exposure, this composite still maintained robust photo/electrothermal and superhydrophobic performances, and exhibited excellent self-cleaning capability. Furthermore, COMSOL Multiphysics simulation results were in good agreement with experimental observations, collectively corroborating to the enhancements of anti-icing and deicing processes, from both experimental and numerical perspectives, and identifying the low ice adhesion strength as the decisive parameter in the process intensification. Collectively, this fluorine-free bioinspired strategy not only provides a technological foundation for the integrated passive anti-icing and active thermal deicing of titanium-based components in lunar probe, but also expands the application horizon of bioinspired engineering in the field of aerospace anti-icing/deicing, offering a new approach to overcoming the performance limitations of titanium-based anti-icing/deicing composite." (Authors)] Address: Zhang, D., State Key Laboratory of Advanced Separation Membrane Materials/ School of Chemical Engineering & Technology, Tiangong Univ., Tianjin, 300387, PR China. Email: zhangdi@tiangong.edu.cn

26503 Zheng, M.; Deng, Y.; Liang, J.; Su, G.; Pan, T.; Peng, L.; Li, Z.; Li, Q. (2026): Unsteady aerodynamic mechanisms of wing flexibility in dragonfly flapping flight. *Journal of Fluids and Structures* 140, 104471: 21 pp. (in English) ["This study investigates the effect of flexible wings on the aerodynamic performance of dragonfly flapping flight through both experimental and numerical simulations. The model experiment employed an isotropic flexible wing, and the results showed that the flexible deformation of the dragonfly wing led to a 12% increase in average lift. On the numerical side, an anisotropic flexible wing model replicating the mechanical properties of the dragonfly wing is constructed, and fluid–structure interaction (FSI) simulations are conducted. The simulation results show that the cycle-averaged lift coefficient of the flexible wing increases by 7.86% compared to its rigid counterpart. Comparative analysis of the flow field reveals three key unsteady aerodynamic mechanisms associated with wing flexibility: the chordwise camber mechanism, which stabilizes the attachment of the leading-edge vortex (LEV) to the upper surface of the wing, generating stable lift; the accelerated rotation mechanism, which increases the amplitude and speed of wing rotation and facilitates vortex accumulation; and the spanwise bending mechanism, which increases the flapping angle range and enhances lift." (Authors)] Address: Su, G., Research Institute of Aero-Engine, Beihang University, Beijing 100191, China. Email: suguantiang@buaa.edu.cn

26504 Zhou, T.; Martín-Devasa, R.; Chen, X.; Wang, H.; Tan, Y.; Liu, Z.; Han, B.-P.; Wang, L.; Liu, Z.; Soininen, J. (2026): Thermal niche breadth shapes regional elevational range sizes of tropical-like mountain stream insects: evidence for Janzen's tropical mountain passes hypothesis. *Ecography* 2026: e08715: 13 pp. (in English) ["The core of Janzen's tropical mountain passes hypothesis is that relatively stable annual temperature variation limits species' thermal tolerances breadth, which, in combination with steep elevational temperature gradients, constrains the elevational distributions of these species. In addition to thermal niche breadth, elevational ranges were shaped by species' position in thermal niche space, ecological dominance (local abundance), and functional traits. However, the relative importance of these factors and the pathways through which they jointly influence elevational ranges remain unclear. Here, we explored the determinants of regional elevational ranges of stream insects across 52 non-disturbed reaches along a 1400 m

elevational gradient in tropical-like Nanling Mountain, South China. We used phylogenetic linear regression and relevant hierarchical partitioning to determine the relative roles of niche characteristics, local abundance and functional traits, while controlling for phylogenetic effects. Environmental niches were divided into thermal and local habitat components, with their breadth and position quantified. We then performed piecewise structural equation modeling (SEM) to quantify the pathways through which niche characteristics influence local abundance and elevational ranges. We found that elevational ranges were positively associated with local abundance and niche breadth, but negatively associated with niche position. Phylogenetic hierarchical partitioning showed that niche characteristics were the primary drivers of elevational ranges, with thermal niche breadth being the most important driver. SEM analyses revealed that thermal niche breadth and position were the primary direct driver of elevational ranges, with its indirect effect mediated by local abundance being comparatively minor. Overall, our results provide support for Janzen's hypothesis in a tropical-like mountain stream system, revealing that thermal niche breadth is a primary driver of elevational ranges. This finding suggests that stream insects in these tropical-like climates are sensitive to climate change due to their narrower thermal tolerance and limited distributions, and should be conservation priorities as warming accelerates." (Authors) Stream insects (EPTO) were identified in the laboratory to the genus level (stream Odonata = 17 genera: Chlorogomphus, Davidius, Euphaea, Heliogomphus, Lamelligomphus, Macromia, Matrona, Megalestes, Ophiogomphus, Orientogomphus, Periaeschna, Planaeschna, Sieboldius, Sinolestes, Somatochlora, Stylogomphus, Trithemis). "Several stream insect genera (e.g. Baetis, Hydropsyche, Euphaea, Kamimuria and Epeorus) occurred across nearly the entire elevational range of our study region, whereas some stream insect genera (Ephacerella, Anax and Brachydiplox) were only restricted to relatively narrow elevational ranges." Address: Wang, L., Dept of Ecology, Jinan University, Guangzhou, China. Email: 15590689772@163.com

26505 Zhu, G. (2026): Novel biomimetic approach based on the main venation of the dragonfly wing for lightweight cantilever design and additive laminated manufacturing. PhD Thesis, School of Architecture, Design and Planning, The University of Queensland. <https://doi.org/10.14264/4b88a18>: 203 pp. (in English) ["This research uses dragonfly wings as the research object and focuses on the biomimetic application based on structural and material properties of the veins of dragonfly wings. The research translates the biomimetic learnings into a lightweight structural system, incorporating robotics to provide a case from design to manufacturing and verifies the feasibility of the solution through built prototypes and design projects. A combination of research methods was used in this study, including desktop literature review, generative computational design and simulation, digital design and robotic fabrication, and iterative prototyping. This research produced three phases of critical results. The first phase involves developing an algorithm to apply biomimetic structural properties to lightweight structural design by analysing the morphological features and composite materials of dragonfly wing veins. Firstly, the research collected and collated primary data and corresponding research on dragonfly wings through a desktop literature review. Through generative computational design and simulation modelling methods, finite element analysis and structural verification were conducted on the structure of the dragonfly wing veins to test the lightweight biomimetic designs and their responses to different design and loading scenarios. Then, by studying the effect of the main veins, biological growth rules and functional

characteristics, the authors proposed a four-step structural biomimetic design principle, which is used to translate from biological characteristics into lightweight architectural design principles. This generative algorithm provides a suitable morphological description of the irregularities in the main veins and reflects the intrinsic structure of dragonfly wings. The approach highlights its structural efficiency and conforms to the logic of bottom-up research methodology. The designed outcome demonstrates effective structural performance with minimal material use. Digital design and robotic fabrication methods were used to explore a novel manufacturing technique with fibrous materials in the second phase. The outcome of this research presents an additive fibre lamination manufacturing technique equipped with several innovative hardware components to improve material efficiency, system control, and productivity. Based on the high-performance composite material and its overlapping layer composition, the research investigates and reviews similar materials in the current construction industry and related manufacturing techniques. Fibre reinforced polymer [1] is hereby selected as the object of exploration. Among current construction materials, FRP, a composite material made of a polymer matrix reinforced with fibres, has lightweight properties balanced with high stiffness and strength. However, the fabrication of irregular morphologies from the biomimetic design of dragonfly wings remains a challenge when using the current manufacturing techniques. Customized moulds often require high budgets and complex construction processes. So, the research develops a novel robotic manufacturing end-effector for efficient composite fibre lamination of FRP tubular pipes and investigates the manufacturing constraints of the design. The novel robotic additive fibre lamination (AFL) manufacturing technique and the designed end-effector with real-time pre-impregnation (prepreg) expand upon the existing automated tape laying (ATL) processes. The aim is to rapidly fabricate architectural-scale linear and curvilinear tubular geometries without the traditional moulds. This manufacturing solution significantly improves the efficiency of material use, reduces the manufacturing cost of lightweight structures, and predictably ensures the high productivity for the biomimetic morphology of dragonfly wings. The outcome of the third phase tested the feasibility of the biomimetic design algorithms and the construction scheme through prototyping a design project, spanning from design to construction. The thesis presents a full-scale lightweight research pavilion design project that integrates dragonfly wings' structural morphological and mechanical principles to achieve an efficient and high-performing lightweight structure. In the project, the biomimetic learnings of dragonfly wing, serving as the structural frame and along with the strength of FRP material, ensures the stability and constructability of the project. The innovative fabrication method improves the construction process and reduces the construction costs of such structures. This innovative AFL fabrication technique opens new avenues for the application of FRP in architecture and biomimetic design." (Author)] Address: <https://espace.library.uq.edu.au/view/UQ:4b88a18>