

# Odonatological Abstract Service

published by the INTERNATIONAL DRAGONFLY FUND (IDF)

## Editor:

Martin Schorr, Schulstr. 7B, D-54314 Zerf, Germany. Tel. ++49 (0)6587 1025; E-mail: oestlap@online.de  
Published in Zerf, Germany  
ISSN 1438-0269

---

## 1990

**22094.** Chovanec, A. (1999): Die Libellenfauna (Insecta: Odonata) der Donauauen im Bereich Klosterneuburg/Kritzendorf (NÖ). Im Auftrag der Universität für Bodenkultur, Institut für Wasserversorgung, Gewässerökologie und Abfallwirtschaft Abteilung für Hydrobiologie, Fischereiwirtschaft und Aquakultur, September 1999: 17 pp. (in German) ["A total of 30 species of dragonflies were detected in 1999 (12 species from the suborder Zygoptera, 18 species from the suborder Anisoptera); This is almost 39% of the species spectrum recorded for Austria (78 species) and 44% of the species inventory recorded for Lower Austria (69 species). Of the 30 species, 13 are listed in the Red Lists for Lower Austria." (Author/Google translate)] Address: Chovanec, A., Krottenbachgasse 68, 2345 Brunn am Gebirge, Austria. Email: andreas.chovanec@bml.gv.at

## 2000

**22095.** Chovanec, A. (2000): Die Libellenfauna (Insecta: Odonata) der Donauauen im Bereich Klosterneuburg/Kritzendorf (NÖ). Erhebungen 2000. Im Auftrag der Universität für Bodenkultur, Institut für Wasserversorgung, Gewässerökologie und Abfallwirtschaft Abteilung für Hydrobiologie, Fischereiwirtschaft und Aquakultur, September 1999: 37 pp. (in German) ["A total of 34 species of dragonflies were detected in 2000 (14 species from the suborder Zygoptera, 20 species from the suborder Anisoptera); This is almost 44% of the species spectrum recorded for Austria (78 species) and 49% of the species inventory recorded for Lower Austria (69 species). Of the 34 species, 16 are listed in the Red Lists for Lower Austria." (Author/Google Translate)] Address: Chovanec, A., Krottenbachgasse 68, 2345 Brunn am Gebirge, Austria. Email: andreas.chovanec@bml.gv.at

## 2004

**22096.** Kulkarni, P.P.; Prasad, M.; Talmale, S.S. (2004): Insecta: Odonata. Conservation Area Series 20, Fauna of Pench National Park: 175-206. (in English) [During the faunistic surveys conducted by Western Regional Station of Zoological Survey of India, approximately 500 specimens of Odonates were collected from Pench National Park, Dist. Nagpur. Altogether thirty eight species were identified. Two species viz *Copera ciliata* and *Copera vittata deccanensis* form the new record for Maharashtra State. *Brachythemis contaminata* was collected most frequently and 115 individuals were identified belonging to it. Amongst the least represented species following 7 were represented by single individuals: 1. *Paragomphus lineatus*; 2. *Anax immaculifrons*; 3. *Epophthalmia vittata vittata*; 4. *Potamarcha congener*; 5. *Bradinopyga geminata*; 6. *Trithemis kirbyi kirbyi*; and *Tamea virginia*. The paper treats records of 38 species and includes descriptive notes." (Authors)] Address: Kulkarni, P.P., Western Regn. Stn, Zool. Surv. India, Vidyanagar, Sector 29, Pune. 41 1 044, Maharashtra, India

## 2005

**22097.** Chartier, A. (2005): Twin-spotted Spiketail: New sight record for Wayne County and a record late date. *Williamsonia* 9(19): 3. (in English) [*Cordulegaster maculata*, 22 Aug 2004, closed area of Lake Erie Metro Park, Wayne Co., Michigan, USA] Address: amazilial@comcast.net

**22098.** Manger, R.; Abbingh, G. (2005): Libellen in Drenthe. *Libellen werkatlas Drenthe 2005*. Assen: 123 pp. (in Dutch) ["This atlas has been compiled to represent the libarian fauna in Drenthe from 1995 to 2005. Data from the national dragonfly database was used for this. A year after the first edition of the ZC atlas, this is already the third edition. The Drenthe Dragonfly Working Group was founded in the summer of 2003. One of the objectives of the working group is to compile a distribution atlas of dragonflies in Drenthe. In preparation for this atlas we created this work atlas. The atlas is intended, among other things, for people who want to inventory dragonflies in the province of Drenthe. We therefore hope that this atlas will be an incentive for the members of the working group and volunteers in the Netherlands to map the dragonfly fauna of Drenthe in more detail. In any case, the dragonfly inventory can be carried out even better in the coming years with this new atlas. Thanks to EIS-Nederland, the Butterfly Foundation and the Dutch Association for Dragonfly Study (NVL) who made the data from the national database available and provided financial support for the first atlas. We would like to thank Vincent Kalkman (EIS-Netherlands) for creating the distribution maps and commenting on the original text. In addition, our thanks go to all observers of the Dragonfly Working Group Drenthe for reporting their observations and to Rob van der Es, Willem-Jan Hoeffna-gel, Robert Ketelaar, Renske Postuma and Ben Prins for making their photos available. Furthermore, thanks go to all observers in the Netherlands who made dragonfly observations in Drenthe." (Authors/Google translate)] Address: <https://www.dutchdragonflies.eu/wp-content/uploads/2019/11/Libellenwerkatlas-Drenthe.pdf>

**22099.** O'Brien, M. (2005): How to identify *Epithecica costalis*. *Williamsonia* 9(1): 7-9. (in English) [Keys and figures are presented to identify *E. spinigera*, *E. costalis* and *E. cynosura*] Address: O'Brien, M., Museum of Zoology, Insect DMision University of Michigan, Ann Arbor, MI 48109, USA

## 2006

**22100.** Emiliyamma, K.G.; Radhakrishnan, C. (2006): First report of *Cyclogomphus heterostylus* Selys (Odonata: Insecta) from Kerala, South India. *Records of the Zoological Survey of India* 106 (Part II): 123-124. (in English) [1 male, Kerala, India: Thiruvananthapuram district: Thenmalai urukunnu, Coll. P. T. Cherian, 5 April, 1998.] Address: Emiliyamma, K.G., Western Ghats Field Research Station, Zoological Survey of India, Calicut-670 002, Kerala, India

**22101.** Tiple, A.M.; Khurad, M., Andrew, R.J. (2008): Species Diversity of Odonata in and around Nagpur City, Central India. *Fraseria* (N.S.) 7: 45-49. (in English) ["A survey of dams, ponds, streams, and garden, fields and forests areas in and around Nagpur City, Central India was conducted from the year 2006 to 2008 to collect and record the Odonate faunal diversity and their Status. A total of 62 species belonging to 35 genera and 9 families viz., Gomphidae, Aeshnidae, Corduliidae, Libellulidae, Coenagrionidae, Platycenemididae, Protoneuridae and Lestidae were recorded. Among them, previously unrecorded 18 species were included in the check list of Nagpur. Of the total 62 species, 13 were abundant, 27 common, 17 rare and 5 very rare in occurrence. These observations indicate that in spite of ecological disturbances in and around the Nagpur city due to industrial and human activities, the odonate fauna is still much richer than previously recorded by earlier workers and the city and its surrounding forms a unique resource of odonate diversity." (Authors) New additions to the regional fauna are: *Cratilla lineata*, *Lathrecista asiatica*, *Orthetrum triangulare*, *Rhyothemis variegata*, *Rhodothemis rufa*, *Tetrathemis platyptera*, *Neurothemis intermedia*, *Aciagrion pallidum*, *Agriocnemis femina*, *Ceragrion cerinorubellum*, *Pseudagrion microcephalum*, *Gynacantha dravida*, *Anax parthenope*, *Macrogomphus annulatus*, *Copera vittata*, *Libellago lineata*, *Lestes elatus* and *Lestes umbrinus*.] Address: Tiple, A.D., Department of Zoology, RTM Nagpur University, Nagpur-440033, India. Email: aahishdtiple@yahoo.co.in

## 2009

**22102.** Borisov, S.N. (2009): Pattern of of dragonfly (Odonata) distribution in central Asia. *Zoologicheskii zhurnal* 88(1): 11-17. (in Russian, with English summary) ["There is a clear vertical differentiation of the odonotofauna of Central Asia. There are three groups of species: mountainous (24), plain (18) and eurygypsal (or lowland-mountain) (34). 7 main types of distribution of dragonflies have been established: flat, mountainous, solid boreo-montane, disjunctive boreo-montane Central Asian disjunctive, disjunctive boreo-montane Tien Shan disjunctive, Central Asian eurygypsum and Pamir-Alai eurygypsum. The leading role in the distribution of dragonflies is played by the temperature factor and the topical one. the presence of water bodies suitable for the development of preimaginal phases. The first defines the boundaries of the potential ranges of dragonflies, and the second. the actual ranges. The modern composition, structure and vertical distribution of the odonotofauna were finally formed in the historical period with the (appearance of artificial habitats of dragonflies. reservoirs of irrigation systems." (Author/Google translate)] Address: Borisov, S., Institute of Systematics and Ecology of Animals, Russian Academy of Sciences, Siberian Bran, Frunse str. 11, Novosibirsk 630091 Russia. E-mail: borisov-s-n@yandex.ru

**22103.** Dumont, H.J. (2009): A description of the Nile basin, and a synopsis of its history, ecology, biogeography, hydrology, and natural resources. *Monographiae Biologicae* 89: 1-21. (in English) ["Following a description of the Nile, the longest river of the world (ca 6,800 km) and its basin (2.9 × 106 km<sup>2</sup>), including its various "source" lakes, some brief notes on its main neighbours (Congo and Logone-Chari) and their history are given. The biota of the basin are moderately diverse, and endemism tends to be low, except in some of the "old" source lakes. The situation is complicated by the fact that at least two of these lakes (Victoria and

Tana) dried out around or slightly before the beginning of the Holocene, and thereafter, speciation (especially of cichlid fish) may have happened at an unusually great speed. In general, the Nile offers a pathway for African species to extend from the tropics to a Mediterranean climate and spill over into the Levant and Arabia. Such incursions may have happened many times across history, with some of the older "waves" using the Red Sea (before its opening to the Indian Ocean) rather than the Nile. Currently, as elsewhere in the world, invasive species in the Nile are becoming more and more common, although the oldest cases (some Ponto-Caspian cnidarians) may date back to the end of the nineteenth century. The water hyacinth *Eichhornia* has invaded the Nile basin in at least three different zones. Since early pharaonic times, man has interfered with the river and its flow regime, in an effort to control the yearly "flood of a hundred days", but large-scale damming only started in the nineteenth century, and culminated with the construction of the Aswan High Dam in the 1960s, reducing the river to a giant irrigation canal. More recent developments include the construction of the Toshka lakes diverticle to Lake Nasser, a project with an uncertain future. The river and its lakes are important fisheries resources; the various dams are generating large amounts of power, and fossil hydrocarbon deposits are under development in at least three zones of the basin. This may contribute to river pollution, which is still a local phenomenon, except in Lake Victoria, which suffers from eutrophication, and in Egypt, that combines a population explosion (almost four doublings in the last century) with a substantial industrial development." (Author) The study includes references to Odonata. For the full paper on Odonata see: [https://www.researchgate.net/publication/2511-31494\\_Aquatic\\_Insects\\_of\\_the\\_Nile\\_Basin\\_with\\_Emphasis\\_on\\_the\\_Odonata](https://www.researchgate.net/publication/2511-31494_Aquatic_Insects_of_the_Nile_Basin_with_Emphasis_on_the_Odonata)] Address: Dumont, H.J., Univ. Gent, Inst. Animal Ecology, K.L. Ledeganckstraat 35, 9000 Gent, Belgium. E-mail: Henri.Dumont@ugent.be

## 2010

**22104.** van Calmthout, M. (2010): Libellenvangen langs de Congo. *Volkskrant* of 29 June, 2010: 18-19. (in Dutch) [Verbatim: "In the run-up to the Congo expedition in which he was the only Dutchman to participate this spring, the internationally renowned Leiden dragonfly expert Klaas-Douwe Dijkstra randomly opened drawers in the depots of the Africa Museum in Tervuren. He went from one surprise to another. 'In colonial times, the Belgians literally brought everything that was loose or alive to Belgium and just piled it up in the institute. Canoes, insects, hides, plants. I'm sure after all this time I looked at some of the collections first. It was almost improbable.' Dijkstra, half-shaven, cap, wire glasses, 'KD' for friends and colleagues, is in the former Pesthuis in Leiden, which is now the entrance to the natural history museum Naturalis. There he is an unpaid guest employee. More than a week after returning home, he enjoys two months in the interior of the former Belgian colony. From the end of April, he set out on two ships up the Congo River with dozens of scientists from the Netherlands and abroad. Floating is a better word, he thinks. With a simple idea in itself: the first scientific exploration of the country in Africa, long torn by war and conflict. Biologists went along, linguists, archaeologists. anthropologists. Dijkstra: 'The river Congo, with its almost black water, is in many ways the highway through the area and also the only way to get around. In colonial times, the ends of the wet central part of the country in particular were somewhat looked at. But everything in between was still pure discovery.' The expedition was emphatically part of half a century of independence

from the Belgian colony, which dates from 29 June 1960. In this context, the Belgian government is donating the country, in addition to a new research vessel, also a new center for biodiversity. That comes to the University of Kisangani. This center receives equipment from the expedition, the ships, a few motorcycles, analytical equipment. In addition, personnel were also trained during the trip. Belgian television followed the Grand Gesture almost day by day, from a special media raft. The Flemish photographer Kris Pannecoucke traveled with the group for the entire 350-kilometre round trip, spent the night in the same tents, and watched the fieldwork and the analyzes on the research vessel. He takes hundreds of photos, some of which can be seen on [www.con.go2010.be](http://www.con.go2010.be) and at exhibitions in Tervuren. On some of them, the Dutch dragonfly man Dijkstra, standing in shallow water, swings his butterfly net like a real Prickly Leg, sometimes watched by a whole circle of curious villagers. Motorcycle In other cases, Dijkstra hired a guide with whom he went into the forest on the motorcycle he brought with him. 'I pointed: 'according to my aerial photos, there is a stream where water flows from the hinterland'. And off we went. We came to fantastic places. That's the advantage of looking for insects: you travel light and can work anywhere. In the case of dragonflies, you mainly look for water.' The local population, says Dijkstra, was invaluable, especially for the biologists on the Congo 2010 expedition. "They contribute basically anything they can find for a small fee. Plants and animals that you would otherwise never be able to collect in such a short time.' Of course, the trip did not go entirely according to plan, because it is still Africa. But it wasn't really a moment of fear, says Dijkstra. "You know: this is an area without much authority, so anyone with an opinion and a gun can do what they want." With a smile, he explains how an alleged hijacking of the media raft made the Belgian news. It soon became clear that it was a group of Congolese soldiers and their families, who saw the passing raft as an opportunity to get home faster. 162 species of dragonflies Dijkstra himself scored very well. He found no less than 162 species of dragonflies in just over a month and a half in the forest, which is intersected by the river, creeks and streams. He does not yet know how many of these are new species that are still unknown to science. About six or seven, he reckons. But numbers don't matter that much either. His real treasure, hundreds of dragonflies dried in acetone, is kept in the vault at Naturalis for meticulous scientific research. Years of work. That's what it's really about." (Google translate)]

## 2011

**22105.** Siebelink, B.; van Uchelen, E. (2011): Vlinders en libellen voor de lens. *Vlinders* 4 2011: 16-19. (in Dutch) ["Butterflies and dragonflies in front of the lens: Given the enormous popularity of nature photography, it was inevitable: the first Nature Photography Handbook from the Netherlands. In it, authors Bart Siebelink and Edo van Uchelen explain, among other things, how to approach animals and how to photograph them in a fresh, innovative way. In this article, the authors and founders of the Center for Nature Photography share their experiences." (Authors/Google Translate)] Address: <https://edepot.wur.nl/340612>

## 2012

**22106.** Meugrey, F. (2012): A new case of westward dispersal of an Afrotropical species to the West Indies: Keyhole Glider *Tramea basilaris* (Palisot, 1805) in Cuba (Greater Antilles). *Argia* 24(4): 26-27. (in English) ["Working on a small

Collection of specimens from Cuba housed in the Nantes Museum of Natural History, I was surprised to find a male *Tramea basilaris* between several *T. abdominalis* and other species including: *Ischnura ramburii*, *Telebasis dominicanum*, *Dythemis rufinervis*, *Erythrodiplax umbrata*, *Orthemis* sp. cf. *ferruginea*, and *Scapania frontalis*, collected in only two localities (Camargüey and Baracoa). The specimen is a male with both right wings damaged at the tips and labeled as follows: Cuba, Baracoa, 12.X.1984, E. Simon leg. This constitutes, to my knowledge, the first record for the Greater Antilles, the fourth from the New World, and precedes the first documented observation of this species from the New World in Suriname by Belle (1988). I've already reported the observation of *T. basilaris* from the West Indies (Meurgey, 2008; Meurgey & Picard, 2011). This afrotropical species was recorded for the first time in the West Indies from Martinique (2006) and Guadeloupe (2008) in the Lesser Antilles. In Martinique, a single male was caught near Trois-Ilets south of the Island, and additional specimens were seen egg-laying in October 2008 (four of them were caught as voucher specimens). In Guadeloupe a single male was observed near the shoreline at Pointe-dcs-Chateaux, located at the extreme east of the island in October 2009. Since that time and despite intensive searches during the wet season, no additional specimens were seen on both islands. *T. basilaris* is a highly vagrant species in Africa and swarms of hundreds of individuals can be seen during the monsoon time along the Atlantic coasts. It is not surprising that some individuals can reach the Antilles or the South American continent following the trade winds that blow from east to west in winter. This is particularly evident considering the hundreds of *Stifistocerca gregaria* (Desert Locust) observed almost every year in the Lesser Antilles. As for the Lesser Antilles, the Cuban specimen was caught during the rainy season (which is between October and December in the Lesser Antilles). This new record suggests that this species may be observed in the Southern States of the USA, especially Florida." (Author)] Address: Meurgey, F., Muséum d'Histoire naturelle de Nantes, 12, rue Voltaire, F-44000 Nantes, France. E-mail: [Francois.Meurgey@mairie-nantes.fr](mailto:Francois.Meurgey@mairie-nantes.fr)

**22107.** Nunner, A.; Bioplan Tübingen (2012): Artenhilfsprogramm Alpen-Mosaikjungfer (*Aeshna caerulea*) im Regierungsbezirk Schwaben. Gutachten im Auftrag der Regierung von Schwaben, Fronhof 10, 86152 Augsburg: 71 pp. ["Local populations and their population sizes: With regard to their location in relation to each other, the finds in the Oberallgäu can be summarized into a total of ten local populations (see Map 1 and Table 2), seven of which are currently populated. Two discovery reports contained in the ASK concern no longer confirmed individual evidence of adults in suboptimal habitats, so that no native occurrence can be derived for these areas (moor pools in Scheuenwald and Guggensee). Core habitats with probably regular reproduction can be found in the following seven areas: Strausberg moss (2 sub-habitats) Engenkopfmoore (1 sub-habitat) Lower Gottesackermauern (5 sub-habitats, of which 3 are core habitats) Piesenkopf-Ziebelmoos (4 sub-habitats, of which only 1 regularly occupied) \* Wannenkopf (4 sub-habitats, of which 2 are regularly occupied) \* Large Ochsenkopf (1 sub-habitat) \* Wilhelminenmoos (1 sub-habitat) In these moors, there was also evidence of imagines and exuvia in the 2012 survey, with the exception of Piesenkopf-Ziebelmoos (imagines only). Subsidiary habitats that are not regularly occupied are probably the following three areas (without evidence in 2012, despite multiple visits) \* Duftmoos/Schnippenalpe (2 sub-habitats) \* Moor near Aibealpe (1 sub-area) \* Moor at Toniskopf (1 sub-area) With regard to their

population size The Strausbergmoos, the Lower Gottesackermauern and the Wannenkopf are among the most important occurrences in Germany, each with an estimated 50-100 adults in favorable years. The Engenkopf moors and the Großer Ochsenkopf are also probably home to larger populations (max. 25-50 adults each per year). Smaller populations can be found in the Piesenkopf-Ziebelmoos and in the Wilhelminenmoos (each max. 10-25 adults/year). Habitat configuration The habitat configuration of all individual-rich occurrences is characterized by a diverse range of permanently water-bearing Schlenken waters (>20 Schlenken), in particular by the presence of larger bog Schlenken (>50m<sup>2</sup>) with free water surface. The regularly occupied deposits are unused and lie outside pasture areas; at the Großer Ochsenkopf the larger Schlenken waters are fenced off. Species assistance program *Aeshna caerulea* in Swabia 8 Impairments and need for action For the majority of the moors examined, the need for action with regard to the habitats of *A. caerulea* is low. Significant impairments due to cattle treading occur in the unfenced Schlenken on the Großer Ochsenkopf and the Toniskopf. Fencing off a large part of the moor area would be strongly recommended for both areas. The wallowing activity of red deer only affects individual loins in most moors, but should continue to be monitored regularly in the future so that measures can be taken if necessary. As a precautionary measure, no salt licks or feeding areas should be set up in or in the immediate vicinity of the habitat to avoid attracting deer. A greater impairment due to use as a deer wallow was found in Duftmoos (Retterschwanger Tal). The aim here was to test whether red deer can be scared away from the moor and whether, for example, they will accept alternative wallows outside the moor. Assessment of the current population situation In 2012, *A. caerulea* was confirmed at all seven larger and well-equipped habitats. Unsuccessful controls have always affected smaller deposits or non-soil deposits. The inventory development can currently be assessed as "stable". The current habitat potential in high-altitude moors in the Oberallgäu has been largely exhausted. The population situation with seven regularly occupied core habitats (three of which have large individual populations) can be assessed as good overall." (Author/Google Translate) Address: Auftraggeber: Regierung von Schwaben, Fronhof 10, 86152 Augsburg, Germany. Auftragnehmer: Bioplan Tübingen, Institut für angewandte Biologie und Planung, Grabenstraße 40, 72070 Tübingen, Germany

**22108.** Schaufelberger, S. (2012): Flinke Jägerinnen der Lüfte. *Ornis* 4/2023: 24. (in German) [Brief introduction in dragonflies in the Switzerland journal on birds and nature conservation.] Address: not stated

### 2013

**22109.** Teder, T. (2013): Sexual size dimorphism requires a corresponding sex difference in development time: a meta-analysis in insects. *Functional Ecology* 28(2): 479-486. (in English) ["The degree and direction of sexual size dimorphism (SSD) vary greatly among animal species. At the ontogenetic level, SSD may result from sex differences in birth size, growth rate and/or development time. Nevertheless, evidence concerning proximate causation of SSD is scattered, and the data used to infer ontogenetic determinants of SSD have not always been appropriate for this purpose. I use a comprehensive literature-derived database of relevant sex-specific traits on 169 species to address the significance of sex differences in larval development time (SDTD) as a proximate source of SSD in insects. In a clear

majority of species (79%), SSD and SDTD were qualitatively congruent, i.e. the larger sex had also a longer larval development. In strongly size-dimorphic species, the qualitative correspondence between SSD and SDTD was nearly universal. Consistently, in a phylogenetically diverse array of insect clades, SDTD increased with increasing SSD across species. The results indicate that the evolution and maintenance of high SSD values are rarely possible without a prolonged development of the larger sex. The role of sex differences in growth rate as the ontogenetic determinant of SSD in insects requires further studies which should ideally be based on detailed monitoring of larval growth schedules. The increase in SDTD with increasing SSD is consistent with the idea that the widespread phenomenon of protandry (the emergence of male adults before females) may primarily be an incidental by-product of other selection pressures." (Authors) The study includes data of *Coenagrion puella*, *Lestes viridis* and *Libellula depressa*.] Address: Teder, T., Department of Zoology, Institute of Ecology and Earth Sciences, University of Tartu, Vanemuise 46, Tartu, Estonia. Email: tiit.teder@ut.ee

**22110.** Wendzonka, J. (2013): Wazki (Odonata) w Nadwarciańskim Parku Krajobrazowym. *Biuk. Park. Krajobraz. Wielkopolski* 19(21): 136-141. (in Polish) ["On July 5-8, 2012, the 9th National Odonatological Symposium was held at the Nature Education Center in Lad. One of the reasons for organizing the Symposium in the Warta Landscape Park was the possibility of inventorying this poorly researched area in terms of dragonflies. The organizers were jointly the Complex of Landscape Parks of the Wielkopolska Region and the Odonatological Section of the Polish Entomological Society. The Symposium was attended by 20 people from all over the country: from scientific centers in Katowice, Łódź, Poznań and Warsaw. All data were collected by a team ...."] Address: Wendzonka, J., ul. Graniczna 17, 63-800 Gostyn, Poland. E-mail: wendzonka@wp.pl

### 2014

**22111.** Ban, X.; He, G.; Zhang, B. (2014): Numerical study of the aerodynamic performance of the dragonfly wing sections in gliding flight. *Journal of Nanchang Hangkong University (Natural Sciences)* 2014(2): 70-73+79. (in Chinese, with English summary) ["Dragonfly is considered a high performance flyer in nature because of its wing structures. A computational fluid-dynamics based study of a pleated wing section has been performed at low Reynolds numbers corresponding to the gliding flight of the dragonfly. The simulations demonstrate that the pleated wing produces high lift at wing roots, along the spanwise of the wing sections, the lift decreased gradually, until it becomes a small negative value at the wing tips, the phenomenon make the wing not bend along spanwise. In the cavities of the pleated wing, the resident vortexes make the wing have large stall angle. These ensure the stability of the dragonfly gliding flight." (Authors)] Address: Ban, X., School of Aircraft Engineering, Nanchang Hangkong University, China

**22112.** Blick, T.; Blum, E.; Burger, R.; Burkei, J.; Buse, J.; Crusan, B.; De Bruyn, U.; Duchamp, L.; Duguet, M.; Eller, O.; Entling, M.H.; Fischer, P.; Fluck, W.; Frey, W.; Fritze, M.-A.; Fuchs, L.; Genort, J.-C.; Göppel, H.; Grimm, F.; Haag, M.; Harbusch, C.; Idelberger, S.; Keller, P.; Kitt, J.; Koschwitz, U.; Ligenfelder, U.; Ludewig, H.-H.; Malec, F.; Mangin, S.; Marx, M.T.; Mörtter, R.; Müller, Y.; Muster, C.; Nickel, H.; Ochse, M.; Ott, J.; Petschner, S.; Pfalzer, G.; Pfeifer, M.A.; Oist, M.; Radtke, L.; Reder, G.; Renker, C.; Rindchen, G.; Röller, O.;

Ross, H.; Roth, N.; Schaubel, K.; Sheid, C.; Schindler, H.; Schirmel, J.; Schleich, S.; Schmidt, C.; Schmidt, T.; Schmolz, M.; Schneider, M.; Schwab, G.; Spieler, P.; Stark, C.; Strubel, J.; Walter, J.; Weber, C.; Weber, D.; Erno, A. (2014): Eine Momentaufnahme aus der Flora und Fauna im grenzüberschreitenden Biosphärenreservat Pfälzerwald. Nordvogesen. Ergebnisse des 14. GEO-Tags der Artenvielfalt am 16. Juni 2012. Ann. Sci. Rés. Bios. Trans. Vosges du Nord-Pfälzerwald — 17 (2013-2014): 29-69. (in German, with French and English summaries) ["As part of the GEO Biodiversity Day, on 16 June 2012 an assessment of the flora and fauna in the cross-border Palatinate Forest-Northern Vosges Biosphere Reserve was conducted. The Rhineland-Palatinate Nature and Environment Foundation directed the event, together with GEO magazine and the two sponsoring associations of the cross-border UNESCO Palatinate Forest-Northern Vosges Biosphere Reserve and numerous other partners. Enjoying suitable weather for field work, the nearly 100 experts invited from Germany and France ranged, according to their individual specialities, through the selected survey areas around Fischbach/Dahn (D), Eppenbrunn (D), Hirschthal (D & F) and Wingen (F). In total, they succeeded in finding evidence of 2081 species from 147 orders and 470 families. The survey revealed many vulnerable or severely endangered species, some of which are extremely rare in Germany or are subject to protection under Annexes II and IV of the European Habitats Directive. The assessment provided the first recordings of some species in the area under investigation. In total of ten new species of cicada were recorded for the state of Rhineland-Palatinate; however, in view of the low level of research so far undertaken on this group here, this was not entirely unexpected. Particularly noteworthy was the first recording in Rhineland-Palatinate of the very rare European hoverfly *Myolepta potens* (RL D: 2). For the first time, clear evidence was found for the carabid beetle *Amara infima* in Rhineland-Palatinate. In addition, the existence of the pygmy locust (*Tetrix bipunctata*) was clearly proven for the first time in the Palatinate Forest. In the French section of the biosphere reserve, the soprano pipistrelle (*Pipistrellus pygmaeus*) had not previously been documented. However, this was achieved several times on the GEO biodiversity day ... Verbatim: (Google translát): 4.8.1 Odonata – dragonflies (Jürgen Ott, Mathias Kitt, Uwe Lingenfelder and Michael Post) Dragonflies are extremely sun worshipers, and so the GEO day was rather "suboptimal" for this group of species; Because it was mostly overcast and the temperatures weren't particularly summery either. Nevertheless, a total of 28 species. eleven damselflies and 17 dragonfly species. were identified in the study areas, which corresponds to more than 40% of the entire range of dragonfly species in Rhineland-Palatinate. In addition to the typical flowing water species that occur throughout the area, such as *Calopteryx splendens* and *C. virgo*, it was also possible to find *Gomphus vulgatissimus* and *Ophiogomphus cecilia*, the latter an FFH appendix II/IV way to prove. The most remarkable, however, are the finds of three moss damsel species: not only *Leucorrhinia dubia*, which is known for the area, but also *Leucorrhinia pectoralis* and *Leucorrhinia rubicunda* flew here. The latter two species. *Leucorrhinia pectoralis* is also an FFH appendix II/IV species. appeared increasingly in Rhineland-Palatinate in 2012, although so far there has been very little evidence of the Nordic moss damsel from Rhineland -Palatinate even exists (OTT, 2012). The finds once again underline the importance of the diverse bodies of water in the area between Eppenbrunn and Fischbach for dragonfly species protection, with the swamps, intermediate moor sites and streams being particularly noteworthy as habitats. These can also be seen in connection

with similar biotopes on the French side, with which they form a composite complex.] Address: Ott, J., Friedhofstr. 28, 67705 Trippstadt, Germany. E-mail: L.U.P.O.GmbH@t-online.de

**22113.** Ghorma, R. (2014): Inventaire de l'entomofaune dans trois palmeraies de la région d'In Salah. Mémoire de fin d'études, En vue de l'Obtention du Diplôme d'Ingénieur d'Etat en Sciences Agronomiques, Faculte des Sciences et Ssiences de l'Invenieur, Departement des Sciences Agronomiques, Universite Kasdi Merbah Ouargla: 155 pp. (in French, with Arabian and English summaries) ["Inventory of insects in three farms of palms of In Salah region Summary: The inventory of insects in the In Salah region that belonged to the floor Saharan climate mild winter in three station studies and four sampling pots Barber, sweep net, plots of Orthoptera And catch live, these methods can sampled 4786 individuals distributed to 2 embrenchement one of the next Annelida and Arthropoda which gather to 4 classes Crustacea, Chailopoda, Arachnida, Insecta, the class dominated by 11 orders Podurata , Hymenoptera, Coleoptera, Homoptera, Heteroptera, Lepidoptera, Orthoptera, Blattoptera, Mantoptera, Diptera, Dermaptera, Neuroptera, Thysanoptera, Odonata. The Hymenoptera ordrer more dominance by many individuals and 41 species 1626 by 11 families with family Formicidae more important." (Author)] Address: <https://dspace.univ-ouargla.dz/jspui/bitstream/123456789/4749/3/GHORMA-%20Rekia.pdf>

**22114.** Hanauer, G.; Renner, S.; Périco, E. (2014): Inventariamento preliminar da fauna de libélulas (odonata) em quatro municípios do Vale do Taquari/RS. Revista Destaques Academicos 6(3): 36-45. (in Portuguese) [oas 72;"The objective of this study was to carry out an inventory of adult Odonata species at points located in four municipalities in the Vale do Taquari region, Rio Grande do Sul, Brazil. To this end, two collections were carried out for each point located in each municipality, and all collected material was identified in the laboratory. Using entomological nets, 90 specimens were collected, distributed across 26 species and seven families, with Libellulidae being the most dominant, followed by Coenagrionidae. The most common species were *Argia indocilis* and *Telebasis willinki*, and the suborders Anisoptera and Zygoptera showed a balance of species representation." (Authors/Google translate)] Address: Hanauer, Grazielle, Graduanda do Curso de Ciências Biológicas do Centro Universatário Univates, Brazil. Email: [grazi86@gmail.com](mailto:grazi86@gmail.com)

**22115.** Márquez Rodríguez, J. (2014): Contribución al conocimiento de la odonatofauna costera en la isla de Menorca. Nova Acta Científica Compostelana 21: 7-10. (in Spanish) [<https://dialnet.unirioja.es/servlet/articulo?codigo=4972310>: "This research provides faunal data of the order Odonata in a little-studied biotope on the island: the calcareous cliff and the coastline in the southwest of the island. It is questioned which community of odonates adapts the island cliff as a resource during the driest months of the year, and whether there are species that have been replaced by others in recent years. The possible alteration of the habitat could be influencing the population dynamics compared to the last three decades. *Sympetrum striolatum* is the most common species. *Orthetrum coerulescens* is abundant and very localized in permanent channels with reeds. *Aeshna isosceles* is now very rare and *Anax parthenope* appears to have replaced *Anax imperator*. An analysis of the quality of surface waters with aquatic macroinvertebrates is recommended to know their current status." (Author)] Address:

Joaquín Márquez-Rodríguez, J., Depto de Sistemas Físicos, Químicos y Naturales, Univ. Pablo de Olavide, de Sevilla. 41013, Sevilla, Spain. Email: jmarrod1@admon.upo.es

**22116.** Nixon, M. (2014): Photonic structures in nature: through order, quasi-order and disorder. Diss. University of Exeter: 202 pp. (in English) ["The majority of colours in the natural world are produced via the wavelength selective absorption of light by pigmentation. Some species of both flora and fauna, however, are particularly eye-catching and visually remarkable as a result of the sub-micron, light-manipulating architecture of their outer integument material. This thesis describes detailed investigations of a range of previously unstudied photonic structures that underpin the creation of the interesting visual appearances of several such species of flora and fauna. These structures were examined using a variety of methods, including optical microscopy, scanning and transmission electron microscopy, focused ion-beam milling and atomic force microscopy. This enabled detailed characterisation of the species' photonic systems. The degree of order discerned in the species' photonic structures ranged from: 'ordered' systems, where multiple layers of two materials produces metallic and often mirror-like reflections; to 'quasi-ordered' systems, where an average periodicity of the structure in all directions gives rise to diffuse, coloured scatter; to disordered systems, where no discernible order is observed, which results in a diffuse, broadband, white appearance. In addition to this, the range of systems also encompassed: periodicities in one-dimension in the form of multilayering; 'quasi-two-dimensional' structures in the form of aligned fibres; and three-dimensional structures formed from arrangements of spherical particles. Alongside this experimental characterisation, an in-depth series of supporting theoretical analyses were undertaken. For the one-dimensional systems studied here, the models' theoretical reflectance was calculated using analytical methods. For other systems, with more complex structural-geometries, theoretical simulations of their electromagnetic response to incident radiation were carried out using finite-difference-time-domain and finite-element method numerical modelling approaches. Theoretical modelling results were compared to experimental measurements of each samples optical properties. These were primarily reflectance measurements, which were taken using a range of techniques appropriate for each specific investigation. In addition to this, a synthetic sample, mimicking the white-appearance and remarkable polarisation-dependant reflectance of one insect's photonic structure, was created using polymer electrospinning. Using these experimental measurements and theoretical simulation predictions, the structural colour production mechanisms adopted by several species of flora and fauna were elucidated." (Author) In Chapter 5, the ordered photonic structures in three species of Odonata (*Matronoides cyaneipennis*, *Aristocypha iridea* and *Rhyothemis resplendens*) have been presented and discussed in detail. Address: Nixon, M.R., School of Physics, Univ. of Exeter, Exeter EX4 4QL, UK, E-mail: m.r.nixon@exeter.ac.uk

## 2015

**22117.** Brandon, A. (2015): North Wales North Wales, Dragonfly Newsletter No 82. 2nd Nov 2015. Odonata news and events from across the vice counties of Anglesey, Merionethshire, Caernarvonshire, Denbighshire and Flintshire. North Wales Dragonfly Newsletter 63: 1-3. ["Vagrant Emperor (*Anax ephippiger*) seen on Bardsey. Steve Stansfield photographed a lovely male Vagrant Emperor on Bardsey Island on the 1st November. The recent sighting has been

reported on the Bardsey tweet (<https://twitter.com/bardseyjobs>): Male *Anax ephippiger* on Bardsey, 1st November 2015. Photo Steve Stansfield. This is only the second sighting of the species for North Wales, the first also on Bardsey reported by Steve and Marion Holmes at Nant Pond on the 21st April 2011. They didn't manage to get conclusive evidence in the form of a photo but from their descriptions, and it fitting in with a pattern of mass migration into NW Europe at the time, it was accepted by the Rarities Committee. This relatively small dark emperor species does now seem to be a pretty regular migrant when conditions are right and, given the recent run of southerly winds, Adrian Parr, the BDS Migrants Officer, was half expecting one or more to turn up in the UK from southern Europe. Adrian reports that at least one individual has also been seen in Belgium in recent days. In the UK it is being seen in the cooler months with more frequency in recent years, when few or no other dragonflies are around, so it is worth looking out for, particularly around the coast. If you are planning a walk during this gorgeous weather we're having it might be best to head for the coast. The bright blue band around the top of the abdomen contrasts sharply with the remaining dark brown abdomen and the thorax. Note also its brown eyes – those of the similar Lesser Emperor (*Anax parthenope*), which breeds in the south of Britain, are green. Malcolm Watling's melanistic bluet: Malcolm Watling photographed this somewhat melanistic form of the male Common Bluet (*Enallagma cyathigerum*) at Llyn-yr-Adar [SH656479], near Blennau Ffestiniog, at an altitude of 570m OD, on the 15th July 2015. Note the particularly large pair of black spots on the 8th abdominal segment, an extra pair on the 9th, and an extra large black dorsal spot in the centre of the 4th segment. The individual is reminiscent of quite a few individuals that turned up across the UK during the summer of 2012, the most noteworthy photographed by Ian Standen in the Gwydyr Forest (see North Wales Dragonfly Newsletter No. 63; also Dragonfly News No. 62, Autumn 2012, p.24). Such forms are more common in western Ireland and Scotland and a possible cause proposed at the time was that a particularly cold spring in an upland habitat had affected larval growth in some way." (Author)]

**22118.** Heneberg, P.; Sitko, J.; Bizos, J. (2015): Integrative taxonomy of central European parasitic flatworms of the family Prosthogonimidae Lühe, 1909 (Trematoda: Plagiorchiida). *Parasitology International* 64: 264-273. (in English) ["Species of the family Prosthogonimidae are considered the most pathogenic poultry trematodes worldwide, affecting particularly low intensity farming in rural areas. Adults of *Prosthogonimus* occur mainly in the bursa of Fabricius, oviduct and cloaca of ducks, geese, fowl and other birds feeding at least occasionally on Odonata. We analyzed the central European species of the Prosthogonimidae, namely *Prosthogonimus cuneatus*, *P. ovatus*, *P. pellucidus* and *P. rarus*. We sequenced three nuclear (ITS2) and mitochondrial (CO1, ND1) DNA loci of four species isolated from *Anas clypeata*, *Anas strepera*, *Anas platyrhynchos*, *Aythya ferina*, *Passer domesticus* and *Turdus merula*. Intra- and interspecific sequence variability revealed that all four species represent distinct well-defined entities. Our data, combined with previously published studies, suggest the return of the name *Prosthogonimus rarus* Braun, 1901 for *Schistogonimus rarus* (Braun, 1901). The genus name *Schistogonimus* Lühe, 1909 is considered a junior synonym of *Prosthogonimus* Lühe, 1899. We identified the existence of two clades, one represented by *P. cuneatus* and *P. pellucidus*, and another one formed by *P. ovatus* and *P. rarus*. We also provide comparative measurements of these four central European

prosthognimids, and address their tissue specificity, host-specific prevalence (based on the extensive bird cohort examined in years 1962–2014), and for some bird hosts we address also differences in the prevalence of Prosthognimus spp. in natural and near-natural wetlands in comparison with fishponds utilized for intense carp production. We provide an updated key to European Prosthognimus spp. based on their morphological characters." (Authors)] Address: Heneberg, P., Charles University in Prague, Third Faculty of Medicine, Ruská 87, CZ-100 00 Prague, Czech Republic. Email: petr.heneberg@lf3.cuni.cz

**22119.** Joest, R.; Rödel, A.; Vierhaus, H. (2015): Entwicklung der Libellenfauna der Woeste über drei Jahrzehnte (1984-2014). ABU info 36-38: 28-35. (in German) [Ostinghausen, Landkreis Soest, Nordrhein-Westfalen, Germany "The small fen "Woeste" has a species-rich dragonfly fauna. This was already examined and documented in the 1980s. The fauna at that time can be compared with a new study from 2014. There was an increase in the number of species; the newly added species included predominantly heat-loving species." (Authors/Google translate) [https://www.abu-naturschutz.de/fileadmin/user\\_upload/Veroeffentlichungen/ABU\\_Info/2015/ABU\\_%20info\\_2015\\_geschw%C3%A4rtz.pdf](https://www.abu-naturschutz.de/fileadmin/user_upload/Veroeffentlichungen/ABU_Info/2015/ABU_%20info_2015_geschw%C3%A4rtz.pdf)] Address: Joest, R., Arbeitsgemeinschaft Biologischer Umweltschutz – Biologische Station Soest, Bad Sassendorf-Lohne. E-mail: r.joest@abu-naturschutz.de

**22120.** Joest, R.; Wrede, J.; Beckers, B. (2015): Auswirkungen der Entnahme von Fichten und der Renaturierung von Waldbächen auf die Blauflügel-Prachtlibelle und andere Libellenarten. ABU info 36-38: 36-43. (in German) ["Discussion: The results of the monitoring provide clear indications that the forest conversion and water restoration measures carried out as part of the project have had a positive impact on the dragonfly fauna. In the case of the blue-winged damselfly, a clear increase in the density of individuals was evident in the measured sections, which was compared to a constant to slight increase in the control sections of the Große Schmalenau. However, an increase in the density of individuals was also evident in the previously very isolated control sections at the source areas of the Reißmecke. This is probably due to the fact that these previously isolated areas were easier to reach for migrating individuals after the opening of the lower reaches or that individuals flew in from the now more densely populated lower sections. Due to the relatively short period of time between the implementation of the measures and the monitoring, the rapid reaction of the blue-winged damselfly to the measures is probably primarily due to the immigration of adults from the surrounding area. Apparently the exposed areas now corresponded to the habitat search pattern of the species (Stemberg & Buchwald 1999). The trend towards a balanced sex ratio after the implementation of the measures is an indication that an increasing number of females from the surrounding area came to mate and lay eggs in the more open, renatured sections. It is to be expected that egg laying and successful development of the larvae will actually occur in the newly populated, renatured sections. Observations of egg laying are also carried out here as part of monitoring. For spring damselflies, the density of individuals in the measure sections before the implementation of the measures was significantly lower than in the more natural control sections. After implementation, they achieved roughly comparable values in both sections. It can be assumed that the measures carried out as part of the LIFE project had a beneficial effect on the spring damselflies. The measures carried out on the water bodies promote the formation of areas with calm currents,

which serve as egg-laying substrates, while the promotion of deciduous forests has a positive effect on the availability of decomposer organisms as food for larvae (Heitz 2006). In detail, it is not always possible to clearly distinguish whether the effects identified are due to the removal of spruce trees and the associated opening of the areas or to the renaturation of water bodies. It is likely that both factors work together and lead to an improvement in habitat structures. The negative relationship between shading and colonization by dragonflies, which was documented for the blue-winged damselfly regardless of water measures, supports the effect of opening up the waters through the removal of spruce trees. Species-specifically, a two-stage process can probably be assumed: while clearing the waters of spruce trees initially enables individuals to spread and colonize the waters, the water engineering measures promote successful reproduction by promoting calmed sections, fine sediment deposits and aquatic plants as egg-laying substrates and larval habitats. The richly structured, open trees in the vicinity of the reproductive waters initiated by the silvicultural measures also have a function as a ripening and feeding habitat for the striped spring damselfly, for example (Tamm 2012). Orthetrum coerulescens and other dragonflies in still waters in the open country are also likely to have benefited from the measures by creating new habitats, but also by facilitating dispersion along the waters." (Authors/Google translate) [https://www.abu-naturschutz.de/fileadmin/user\\_upload/Veroeffentlichungen/ABU\\_Info/2015/ABU\\_%20info\\_2015\\_geschw%C3%A4rtz.pdf](https://www.abu-naturschutz.de/fileadmin/user_upload/Veroeffentlichungen/ABU_Info/2015/ABU_%20info_2015_geschw%C3%A4rtz.pdf)] Address: Joest, R., Arbeitsgemeinschaft Biologischer Umweltschutz – Biologische Station Soest, Bad Sassendorf-Lohne. E-mail: r.joest@abu-naturschutz.de

**22121.** Röske, W.; Armbruster, F. (2015): Gräben – ein Lebensraum der Helm-Azurjungfer. Über die wichtige und richtige Pflege der Gräben. Herausgeber: Regierungspräsidium Freiburg, Referat 56, Naturschutz und Landschaftspflege, Bissierstr. 7, 79114 Freiburg, Germany. E-mail: [www.rp-freiburg.de](http://www.rp-freiburg.de): 2 pp. (in German) [[https://pudi.lubw.de/detailseite/-/publication/75338-%C3%9Cber\\_die\\_wichtige\\_und\\_richtige\\_Pflege\\_der\\_Gr%C3%A4ben.pdf](https://pudi.lubw.de/detailseite/-/publication/75338-%C3%9Cber_die_wichtige_und_richtige_Pflege_der_Gr%C3%A4ben.pdf)] Address: Röske, W., IFÖ Bad Krozingen, Mozartweg 8, 79189 Bad Krozingen, Germany

**22122.** Simic, V.; Petrovic, A.; Erg, B.; Dimovic, D.; Makovinska, J.; Karadzic, B.; Paunovic, M. (2015): Indicative Status Assessment, Biodiversity Conservation, and Protected Areas Within the Sava River Basin. The Sava River. The Handbook of Environmental Chemistry 31: 453-500. ["The aim of this chapter is to provide the overview of the water status, state of the biological diversity, and protected areas along the Sava River as well as to underline the necessity of identification and implementation of effective conservation measures. The chapter is based on historical data on environment and recent investigation on macroinvertebrate communities (2011–2012). Ecological status of water bodies within the Sava River basin ranges from high to poor, while the ecological status of the majority of water bodies is assessed as moderate, which indicates the necessity of design and implementation of relevant mitigation measures. The assessment of water quality and ecological status of the river Sava based on the macroinvertebrates community, alongside with the use of several standard biological methods and regional biotic index BNBI indicates a high correlation of the obtained results. BNBI has proven to be a method reliable enough for both the assessment of water quality and the assessment of ecological status of large rivers. Based on the results of water status assessment, the Sava

River could be divided into three zones. The best water quality was recorded within the Slovenian stretch of the river, being within the limits of betamesosaprobic zone, while the ecological status was assessed as a good one. The middle part of the Sava River, stretching mainly through Croatia and Bosnia and Herzegovina, has a somewhat worse water quality, approaching the limit of betamesosaprobic zone, while the ecological status in this part of the flow was also determined as a "good" one. The lower parts of the Sava River flow through Serbia are by all indicators more heavily polluted; the water quality is on the border between beta. and alfamesosaprobic zones, while the ecological status is between "good" and "moderate." The biodiversity of the Sava River may be considered significant, when compared to similar water-courses of Central Europe and Balkan Peninsula. The work contains a more detailed analysis of the biodiversity of aquatic macroinvertebrates and fish of the main flow of the Sava River. Based on the condition of biodiversity of these groups, the river's ecosystem is divided into three "macrohabitats." The first macrohabitat includes the upper rhithron parts of the river through Slovenia, with a significant diversity of stenovalent groups of macroinvertebrates (larvae EPT) and salmonid species of fish (brown trout, grayling, and hucho trout). The second macrohabitat includes the parts of the flow through Croatia and Bosnia and Herzegovina with significant diversity of invertebrates from the groups Odonata, Mollusca, Hirudinea, and Chironomidae and fish from the families of Cyprinidae, Percidae, and Gobiidae. The highest number of protected species of fish has been registered in this section. The third "macrohabitat" includes the lower part of the potamon of the Sava River and mostly flows through Serbia wherein this part of the flow represents the most important habitat of the globally endangered and fishing-wise important sturgeon species of sterlet (*Acipenser ruthenus*) in this river. It is characterized by a decreased biodiversity of macroinvertebrates in the main flow of the river and a significant diversity in the flood zones. In the biodiversity of fish, the highest number of allochthonous species appears. In this section, the diversity of fish in flood zones especially as the habitat of endangered species such as *Umbra krameri*, *Misgurnus fossilis*, and *Carassius carassius* is also important. Research has shown that in order to perform a successful conservation of large river biodiversity, the ecosystem must be observed as a complex consisting of the main flow of the river, flood zone, and its tributaries." (Authors)] Address: Milacic, Radmila, Faculty of Science, University of Kragujevac, Radoja Domanovica 12, 34000, Kragujevac, Serbia. Email: Radmila.Milacic@ijs.si

**22123.** Syarifah, E.B. (2015): Diversity of dragonfly in Taman Mini Indonesia Indah (TMII) and Ragunan Zoo (TMR). BSc thesis, Department of Biology, Faculty of Science and Technology, Syarif Hidayatullah State Islamic University Jakarta: 63 pp. (in Indonesian, with English summary) ["This research was conducted using survey method on July-August 2013. The sampling was done using purposive sampling by selecting 3 habitat around the waters in Taman Mini Indonesia Indah (TMII) and another 3 habitats around the waters in Taman Margasatwa Ragunan (TMR). The line transect was made drawing a line a long 50 m in northern. 50 m in shouter, 50 m in western and 50 m in eastern of the waters or the lake which each wide was 1 meter to the left and 1 meter to the right. Based on the result of this research, the dragonfly diversity has two different families which are Libellulidae and Gomphidae": *Orthetrum sabina*, *Pantala flavescens*, *O. testaceum*, *Neurothemis terminata*, *Brachythemis contaminata*, *Ictinogomphus decoratus*. "Index value of diversity in TMII shows that the dragonfly relatively high and

TMR it's relatively low. Index value of distribution in two location is about over 0.81 it means that the distribution of dragonfly species is relatively high." (Author)] Address: [https://repository.uinjkt.ac.id/dspace/bitstream/123456789-74870/1/EVA%20BAI%20SYARIFAH\\_108095000027\\_F-ST%20v.pdf](https://repository.uinjkt.ac.id/dspace/bitstream/123456789-74870/1/EVA%20BAI%20SYARIFAH_108095000027_F-ST%20v.pdf)

## 2016

**22124.** Lamin, S.; Augustina, M.; Kamal, M.; Setiawan, D. (2016): Inventarisasi Odonata di taman wisata alam Punti Kayu, Palembang, Sumatra selatan. Prosiding Seminar Nasional Sains Matematika Informatika dan Aplikasinya IV, Fakultas MIPA Universitas Lampung 4(2): 198-211. (in Indonesian, with English summary) [Inventory of Odonata in the Punti Kayu natural tourist park, Palembang, South Sumatra: In March to April 2016, 17 odonate species have been collected: *Ictinogomphus decoratus*, *Acisoma panorpoides*, *Aethriamanta aethra*, *Brachydiplax chalybea*, *Neurothemis fluctuans*, *Orthetrum sabina*, *O. testaceum*, *Potamarcha congeneris*, *Rhyothemis phyllis*, *Tholymis tillarga* and *Zyxomma petiolatum*, *Podolestes coomansi*, *Agriocnemis femina*, *Cerriagrion auranticum*, *Onychargia atrocyana*, *Pseudagrion rubriceps*, and *Copera* ciliate. The conservation status of Odonata at Punti Kayu Nature Park based on The IUCN Red List consist of 16 species that has Least Concern status and one species [*Podolestes coomansi*] that has data deficiency status.] Address: Jurusan Biologi FMIPA Universitas Sriwijaya Indonesia. Email: [rnairsyad@yahoo.co.id](mailto:rnairsyad@yahoo.co.id)

**22125.** Manger, R.; Abbingh, G.; Schinkel, H.; Mekkes, J.J. (2016): *Libellen in Drenthe*. 2. ed. Publisher: Stichting Libellenwerkgroep Drenthe: 205 pp. (in Dutch) ["This book is the result of ten years of research conducted by volunteers into the dragonfly fauna of the Dutch province of Drenthe. The result is this richly illustrated book containing a large amount of data on the province of Drenthe. The book is not only intended as a resource for local councils and managers, but also as a source of information for dragonfly aficionados. The introductory chapters deal with dragonfly ecology and research in Drenthe. The next, in-depth chapter discusses the different biotopes and landscapes found here, and the typical dragonfly species occurring here. Specific attention is paid to the likelihoods of finding dragonflies in natural reserves and agricultural areas. The largest part of the book is dedicated to the species chapter, describing the 54 species found in Drenthe. For each species habitat, lifestyle, current distribution and expectations for the future are given. The authors per species also discuss potential threats, and any measures that could be taken to protect species and their habitats. Distribution maps are included, with nature reserves overlaid on the maps, and a table with the status of each species in both the Netherlands as a whole and Drenthe in particular, the rarity, population trend and Red List status is given. Graphics show the flight times and dates of earliest and latest observation dates. For each species, multiple colour photos have been included, often showing dragonflies in flight, as well as showing their habitat. The 2016 reprint contains an extra eight pages, contains new distribution maps including data up to 2016, new photos, and revised texts." (Authors)] Address: Manger, R., Stoepveldsingel 55, 9403 SM Assen. The Netherlands. E-mail: [rene@mangereco.nl](mailto:rene@mangereco.nl)

**22126.** Yakubovich, V.S.; Koshkin, E.S. (2016): First record of the dragonfly *Aeschnophlebia longistigma* Selys, 1883 (Odonata: Aeshnidae) from Khabarovskii Krai. *Far Eastern Entomologist* 324: 15-16. (in English, with Russian summary)



[Russia: Khabarovskii krai, central part of Khabarovsk City, 11.VII 2016, 1 female] Address: Yakubovich, V.S., Department of Biology, Far Eastern Medical University, Murav'ev-Amursky Street 35, Khabarovsk 680000, Russia. E-mail: Presid\_11@mail.ru

## 2018

**22127.** Chakraborty, D. (2018): Winged guardians of rice fields: stories of dragonflies and damselflies. *Ceiba Newsletter* 1(2): 2-5. (in English) [<https://ceibatrust.org/2018/06/winged-guardians-of-rice-fields-stories-of-dragonflies-and-damselflies/>] Address: Chakraborty, Debarati; Email: debaratichakraborty31@gmail.com

**22128.** COSEWIC (2018): COSEWIC assessment and status report on the Pygmy Snaketail *Ophiogomphus howei* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. (<http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1>). : xi + 46 pp. (in English) ["Executive Summary: Wildlife Species Description and Significance: The Pygmy Snaketail (*Ophiogomphus howei*) is a small (total length of 31–34 mm; wing length of 19–21 mm) dragonfly in the family Gomphidae, commonly referred to as the clubtails. This species is associated with clean fast-moving water. Adults are black in colour, with vivid yellow markings on the abdomen and wings, and with bright green markings on the thorax. The larvae are aquatic, small and cryptic. Distribution: *O. howei* ranges in eastern North America. It is known from two geographic areas: the Appalachian Mountains from northern New Brunswick to northeastern Georgia, and the Midwest from Minnesota, Wisconsin, Michigan, and northwestern Ontario. In Canada it is known from seven large river systems: the Saint John, St. Croix, Magaguadavic, Southwest Miramichi, Cains, and Salmon Rivers in New Brunswick, and the Namakan River in northwestern Ontario. Some snaketails are quite rare, and exuviae (castoff larval skins left behind after emergence) are the most often found evidence supporting the presence of a species. Habitat: *O. howei* larvae occur in larger, swiftly flowing, and moderate gradient rivers with unpolluted water and significant areas of fine sand or pea gravel substrate. Adults are believed to primarily reside in forest canopies near natal rivers. Searches for exuviae at many seemingly appropriate waters, and at the appropriate time of the year, have generally yielded no results for the species; suggesting that suitable habitat, including factors influencing larval success, is more narrowly defined than we currently realize. Biology: The length of time required for larvae to develop and emerge from their aquatic habitats is believed to take at least two years. In Canada, emergence occurs from late May or early June to late June and is largely associated with the synchronous emergence of other members of its genus. After emerging, adults survive for four to six weeks and are rarely encountered at water, but likely spend much of their time in the forest canopy. Population Sizes and Trends: Population estimates of abundance or trends for *O. howei* in Canada are unknown, but the US population is considered stable. Threats and Limiting Factors: Overall impact of threats to *O. howei* are considered low. Potential dam construction is a threat to the Ontario subpopulation. Invasive species can also alter the biota to the detriment of *O. howei*; however, the impact of this threat is unknown. Water pollution due to excessive nutrient input from sewage, or sedimentation due to agricultural or forestry run-off are believed to have a negligible impact on the species. Protection, Status and Ranks: *O. howei* was assessed as Special Concern by the Committee on the Status of Endangered Wildlife in

Canada (COSEWIC) in 2008, and is listed Special Concern under Schedule 1 of Species at Risk Act. It is listed as Special Concern under the New Brunswick Species at Risk Act and Endangered under the Ontario Endangered Species Act. It is ranked N2 in Canada, S1 in Ontario, and S2 in New Brunswick." (Authors)] Address: COSEWIC Secretariat, c/o Canadian Wildlife Service, Environment and Climate Change Canada, Ottawa, ON, K1A 0H3

**22129.** Fabbri, R.; Costa, M.; Cassani, G. (2018): Azioni coordinate per la conservazione di *Coenagrion mercuriale castellanii* (Roberts, 1948) in Emilia-Romagna. In: Azioni coordinate per la conservazione in Emilia-Romagna di *Osmoderma eremita* (Scopoli, 1763), *Rosalia alpina* (Linnaeus, 1758), *Coenagrion mercuriale castellanii* (Roberts, 1948), *Graphoderus bilineatus* (De Geer, 1774): 69-72. (in Italian) ["The translocation program: During the ex ante monitoring of the LIFE EREMITA project the highest number of individuals counted (n. 1513 adults in 2016; n. 1639 adults in 2017) was registered in the Natura 2000 site IT4090002. Torriana, Montebello, Fiume Marecchia in three streams in the municipality of San Leo (RN), while in the site IT4070011. Vena del Gesso Romagnola the species was found in two streams with a few dozen individuals (24 adults in 2016; 56 adults in 2017). Also during the monitoring, it emerged that within the same two sites IT4070011 and IT4090002 are the only watercourses in the region that currently present the ecological characteristics suitable for hosting the species. The Rimini population present in the IT4090002 site is fundamentally isolated from the other Romagna population present in the canals of the IT4070011 site, being at a distance of between 50 and 65 km. On the other hand, it is known that *C. mercuriale castellanii* has a low dispersal capacity and is typically a sedentary species, generally with 75% of adults not making movements greater than 100 m and 95% greater than 300 m (Watts et al., 2004; Watts et al., 2007b). Some studies demonstrate how the species can also make significant movements, over 2 km, in the open agricultural landscape (Keller et al., 2010; Keller et al., 2012; Lorenzo-Carballea et al., 2015); however, when obstacles arise, such as woods and substantial changes in altitude, its dispersion capacity decreases. In light of the historical and current distribution described, extremely reduced compared to the past, and the low dispersal capacity of the species (Watts et al., 2007a, 2007b; Keller et al., 2012), to strengthen the population present in site IT4070011 it is a translocation plan has been prepared with the aim of expanding the distribution area of the species and strengthening its population. The plan involves the movement of some adult specimens from the source site in the Rimini area (IT4090002) towards n. 6 streams present in the IT4070011 Vena del Gesso Romagnola site, following the implementation of habitat improvement and restoration interventions. The movements that will take place within the translocation plan with distances ranging from 50 to 65 km are considered transfers within the same metapopulation. It is believed that it is possible to exclude any risks of genetic pollution between different phyletic lines, as, from recent genetic analyzes (study of the mitochondrial genes COI and 16S rRNA and the nuclear genes PRMT, MLC and AgT) conducted across the entire northern European range African distribution of the species, with materials also coming from various Italian locations from Piedmont to Basilicata, including specimens collected in Romagna in the Vena del Gesso Romagnola, it is possible to state that the Italian populations belong to a single phyletic lineage (Ferreira, 2016). Even the territorial area in which we operate is ecologically similar for both sites (source and repopulation), located on low hills with withdrawal

and release heights between 110-250 m, therefore with altitudinal variations and consequently negligible phenological factors. The translocation plan involves the collection from the source site of approximately n. 170 specimens per year (with sex ratio 1:1) for a period of three years to be divided, during the release phase, among the various eligible channels on the IT4070011 site. The quantity of specimens to be released in individual sites is assessed on a case-by-case basis based on the environmental characteristics, the size of the stream, the result of ex ante monitoring activities on the size of the population and the suitability of the habitat. The translocation operations will begin in spring 2019, at the beginning of the species' activity period, and will be repeated (2 -3 times) until June of the same year. Although the species is bivoltine in Romagna, the operations will take place between April and June, when the majority of adult individuals emerge. The operations will involve the capture of adults in the stations of the IT4090002 site, which will be marked on the wings as described in the monitoring protocol of the species of the LIFE EREMITA project (Fabbri, 2017); for each specimen the size, state of health and vitality will be checked. Subsequently, the captured individuals will be placed inside a fauna box container with some plant stems and food inside (e.g. *Drosophila* sp.). The transport and release operations will take place within an estimated time frame of within two hours. Approximately 10 adults will be placed inside each fauna box and temperature checks will be carried out during the journey. The specimens will be released at the edges of the streams, in partially shaded areas not exposed to the wind. The data of the release operations will be noted on a paper sheet (date, time, environmental conditions of the release watercourse, number of specimens, etc.) and all phases of the translocation activity will be documented with photos and videos. The program developed to date must first be subjected to checks by the Ministry of the Environment and ISPRA provided for by Presidential Decree 357/97. Overall, it is expected that once the conservation plan for the species is fully implemented, in the two Natura 2000 sites in Romagna, it will occupy, at a linear estimate level, approximately 4 km of watercourses compared to the current 1.7 km." (Authors/Google translate)] Address: Fabbri, R., Museo Civico di Storia Naturale, via De' Pisis, 24. 44100 Ferrara, Italy. E-mail: r-fabbri@libero.it

**22130.** Fabbri, R.; Barbieri, C.; De Curtis, O.; Poloni, R.; Giangregorio, P.; Malavasi, D.; Monterastelli, E.; Norbiato, M.; Stefanelli, S.; Carchini, G. (2018): Aggiornamento della distribuzione di *Coenagrion mercuriale castellanii* (Roberts, 1948) in Emilia-Romagna. In: Azioni coordinate per la conservazione in Emilia-Romagna di *Osmoderma eremita* (Scopoli, 1763), *Rosalia alpina* (Linnaeus, 1758), *Coenagrion mercuriale castellanii* (Roberts, 1948), *Graphoderus bilineatus* (De Geer, 1774): 63-67. (in Italian) ["Conclusions: The presence of *C. mercuriale castellanii* in Emilia-Romagna is limited to the foothills and localized in only three stations, in separate areas of the Romagna territory. All the known populations fall within sites of the Natura 2000 network, two particularly small ones within the SCI-ZPS IT4070011 Vena del Gesso Romagnola and one, more stable and abundant, within the SCI IT4090002 Torriana, Montebello, Fiume Marecchia. The populations of site IT4070011 are separate from that of site IT4090002 as they are more than 50 km apart. The results confirm the declining trend of the species in Emilia-Romagna, also due to the fact that several reports between the 40s and 70s of the last century have no longer been confirmed recently, due to the progressive disappearance of the small sunny streams with clear and permanent waters suitable for hosting the species. The monitoring made

it possible to plan habitat improvement interventions and translocation actions aimed at strengthening the present populations. The monitoring of *C. mercuriale castellanii* represented the first application in Italy of the methods adopted by ISPRA and the Ministry of the Environment for the monitoring of species of community interest (Stoch & Genovesi, 2016). Using this method also in the ex post monitoring foreseen by the LIFE EREMITA project, for the first time there will be a time series of abundance values from which to obtain quantitative information on the population trend in Emilia-Romagna. Results: The following table shows in chronological order the previous reports (from 1877 to 2010) of *C. mercuriale* in Emilia-Romagna, extracted from the database of reports of the species, available in the archives of the Emilia-Romagna Region. In the ex ante monitoring campaigns of the LIFE EREMITA project in the two-year period 2016 and 2017, *C. mercuriale castellanii* was found to be present in the SIC-ZPS IT4070011 "Vena del Gesso Romagnola", in the province of Ravenna, and in the SIC IT4090002 "Torriana, Montebello, Fiume Marecchia", in the province of Rimini. Furthermore, a male specimen was identified, probably a wandering individual outside the Natura 2000 site, near the SCI IT4070011, in the same stream inside the site where the population is well established. site IT4090002. Torriana, Montebello, Marecchia River in three streams in the municipality of San Leo (RN). With the VES method, no. 1513 adults and in 2017 no. 1639 adults; with the CMR method, applied only in 2016, no. 375 male individuals with n. 8 recaptures (Fabbri et al., 2017). In the IT4070011 Vena del Gesso Romagnola site, n. 24 adults and in 2017 no. 56 adults. Discussion: During the ex ante monitoring, the presence of *C. mercuriale castellanii* was ascertained only in the easternmost territory of the region, despite the effort to extend the study area also to the Natura 2000 sites in the central and western Emilian sector. The species has only been found in the foothills; in particular, in two Natura 2000 sites (IT4070011 and IT4090002), located respectively in the province of Ravenna and in that of Rimini. In the IT4070011 Vena del Gesso Romagnola site the species was contacted with a few specimens only in two transects corresponding to two streams (IT4070011\_MAR\_Coe\_L8, IT4070011\_MAR\_Coe\_L5-3) in the municipality of Casola Val Senio (RA). While awaiting quantitative analyzes of the populations surveyed, the few individuals observed suggest the presence of numerically very small populations, probably due to the widespread coverage of watercourses by trees and bushes which reduce the extension of the habitat suitable for species. These two transects constitute new stations of presence of the species in Emilia-Romagna. In the same Natura 2000 site, in three other monitored transects, corresponding to three different streams, the species was not found. However, these streams present suitability characteristics that can be improved in favor of the species with appropriate and timely interventions on the habitat (thinning out and elimination of tree-shrub vegetation). The IT4070011\_MAR\_Coe\_L4 station in the municipality of Brisighella, however, is no longer suitable for the species, as for most Odonata species, following strong interference from the manager of the adjacent land, who started breeding domestic animals (poultry and other) close to the river; therefore, it was not possible to reconfirm the presence of the species in this station. In the site IT4090002 Torriana, Montebello, Fiume Marecchia the population appears to be large and stable, despite being located near the northern margins of distribution of the subspecies' range in Italy. The population is distributed in three parallel channels, ecologically connected, with discontinuous distribution, located in the Municipality of San Leo (RN). The first stream, corresponding to the IT4090002\_MAR\_Coe\_L1 transect, has the

longest low-shaded stretch and has a resurgence on the south-east side which generates a small marshy area frequented by adults of *C. mercuriale* and other species of Odonata. The third stream, corresponding to the IT4090002\_MAR\_Coe\_L3 transept, appears to be very shaded by tall trees and bushes and is also characterized, together with the second stream (IT4090002\_MAR\_Coe\_L2), by banks with numerous hedges of shrubs and brambles. However, the three streams appear to be particularly suitable for the species because they still have large stretches of their course that are not completely covered by tree-shrub vegetation. It can be assumed that, following interventions to improve the habitat for the species in the shaded stretches of streams, the population could be rapidly distributed in the new suitable stretches (Poloni, 2017). From the comparison of the results of the monitoring carried out as part of the LIFE EREMITA project with previous reports of the species in Emilia-Romagna (Table 2), it is possible to outline a fairly continuous distribution in the past in the foothills, at least between Imola and Rimini, no longer confirmed by the results of the 2016-2017 monitoring. The stations in Bologna and Modena, to which the reports of the last century refer, are no longer suitable to host the species. Other previous reports from the Romagna area were also verified in the field with negative results. The reasons for this result can be traced back to the scarcity of waterways in Emilia-Romagna with morphometric characteristics, water quality and aquatic and riparian vegetation, suitable for hosting the species. In various streams and streams there are pressure factors that reduce their suitability, such as, in order of importance: the presence of spring catchments with a reduction in flow or drying up of the stream, the abandonment of vegetation to free evolution with consequent excessive shading of the stream by shrubs and trees, the presence of civil, agricultural and industrial discharges which reduce the quality of the water, the presence of domestic animals in or close to the watercourses, the management of riparian vegetation with clear cuttings.] Address: Fabbri, R., Museo Civico di Storia Naturale, via De' Pisis, 24. 44100 Ferrara, Italy. E-mail: r-fabbri@libero.it

**22131.** Fabbri, R. (2018): Aspetti della biologia, ecologia e stato di conservazione di *Coenagrion mercuriale castellanii* (Roberts, 1948) e *Graphoderus bilineatus* (De Geer, 1774). In: Azioni coordinate per la conservazione in Emilia-Romagna di *Osmoderma eremita* (Scopoli, 1763), *Rosalia alpina* (Linnaeus, 1758), *Coenagrion mercuriale castellanii* (Roberts, 1948), *Graphoderus bilineatus* (De Geer, 1774): 56-62. (in Italian) [Verbatim] (Google translate): *C. mercuriale castellanii* (Roberts, 1948): The Mercury damselfly is a small dragonfly with a length between 2.7 and 3.1 cm and a wingspan between 2.5 and 4.0 cm. The body is slender and bright blue with black markings. The specific term mercurial derives from the helmet shape of Mercury, god of Greco-Roman mythology, from the black design on the second abdominal segment. *C. mercuriale* is a species with a predominantly West-Mediterranean geography, present from the United Kingdom and Germany to Spain and North Africa. The species is considered to be divided into three subspecies: *C. mercuriale mercuriale* present in Central Europe, *C. mercuriale hermeticum* present in North Africa and *C. mercuriale castellanii* present in peninsular Italy and Sicily (Ferreira, 2016). In light of the knowledge known so far on its distribution, the taxon *C. mercuriale castellanii* present in Italy is considered by various authors to be an endemic subspecies, while others elevate it to the rank of good species (*C. castellanii*) (Roberts, 1948; Dijkstra & Lewington, 2006; Riservato et al., 2014b; Ferreira 2016). In Italy it is reported in

all peninsular regions from Emilia-Romagna to Calabria, with the exception of Abruzzo and Molise; in the continental sector, populations located in Piedmont and Liguria are known; it is also present in Sicily, while it is not reported in Sardinia (Riservato et al., 2014b). From the historical and recent data on the presence of the species in Emilia-Romagna it is possible to outline a fairly continuous original distribution of the species in the foothills, at least between Imola and the Rimini area. Currently the species is present only in three stations included in two sites: IT4070011 "Vena del Gesso Romagnola" and IT4090002 "Torriana, Montebello, Fiume Marecchia". The species is extremely selective in the choice of breeding habitat and is ecologically demanding. *C. mercuriale* is associated with running, slow, even cold waters, in particular streams, springs and resurgences, often of a karst nature, up to 750 m above sea level. The environmental characteristics that most influence the presence and density of populations are direct exposure to sunlight from the watercourse, the constant presence of water, the presence of perennial aquatic plants for spawning, foraging and shelter, the width and depth of the stream bank and the presence of a predominantly silty substrate (Harris, 2000; Strange, 1999; Purse, 2001; Purse, 2002; Rouquette & Thompson, 2006; Rouquette & Thompson, 2007; Purse & Thompson, 2009). The adult, rather sedentary, flies from April to August and September. During the breeding season the male does not show territorial behavior; he hooks up to the female in flight, then the pair lands on the vegetation. At the end of mating, the female looks for a suitable place for oviposition, often in the company of the male and releases the eggs in the floating or partially emerged vegetation, sometimes completely immersing herself in the water; eggs take two to six weeks to hatch and development is completed in about a year (Thompson et al., 2003). Generally the species occurs monovoltine, semivoltine in Great Britain (Purse & Thompson 2003), but sometimes in the southern part of its range, such as in Southern Italy and Algeria, it behaves as a bivoltine, with two annual generations and adult activity also in September (Conci & Nielsen 1956; Dijkstra & Lewington 2006; Mahdjoub et al., 2015). This behavior was confirmed during the field activities of the LIFE EREMITA project in the Rimini site IT4090002 "Torriana, Montebello, Fiume Marecchia", where the species is present. From the first week of September to the first week of October the species had a second generation, however with a reduced number of adult individuals, around 10% compared to the number of active specimens in spring-summer, therefore with a late summer release only partial. A possible explanation could be attributable to the extension of the summer season into the first part of autumn, with mild temperatures lasting until late October (Mahdjoub et al., 2015). This has also been observed in other easily identifiable species such as *Gryllus campestris*, which in recent years has exhibited autumnal activity (Fabbri, 2015). In the northernmost Romagna site IT4070011 "Vena del Gesso Romagnola", where the species is present but with small populations, a second generation has not been ascertained. The species is included in Annex II of the Habitats Directive 92/43/EEC. In Europe, according to the IUCN, *C. mercuriale* is close to threatened (NT) and has decreasing populations (Kalkman et al., 2010; Lorenzo-Carballeda et al., 2015). The species is also considered near threatened (NT) in the Italian IUCN Red List of Odonata (Riservato et al., 2014c). The conservation status of the species, in fact, at a national level is considered favorable (Riservato et al., 2014a), while in the northern sector of Northern Italy it is considered overall inadequate due to the population trend, worsening for numerous parameters, such as range, population, habitat and future prospects (Riservato et al., 2014a, 2014b, 2014c). Even in Emilia-Romagna the conservation

status of the taxon is inadequate and has been assessed as critically endangered (CR) in the regional Red List (Agnelli et al., 2010). There is a real risk at a regional level that the species could disappear within a few years. In fact, there are numerous threats affecting the regional metapopulation; among the main ones we can list: collection and excessive extraction of water from springs for various purposes, evolution of the vegetation succession with a dense tree-shrub cover which causes the closure and shading of water courses, intensive agriculture practices from which it derives water pollution due to the percolation of pesticides and agricultural fertilizers, reorganization of small watercourses, decrease in rainfall due to climate change (Hassall & Thompson, 2008), presence of exotic animals which profoundly alter hydrophytic vegetation (e.g. *Myocastor coypus* and *Procambarus clarkii*), disturbance by domestic animals in the riverbed (ducks, geese, poultry, etc.) and, last but not least, in general the isolation of the subpopulations present, often characterized by a low number of individuals, together with the limited dispersal capacity of the species (Riservato et al., 2014a)." (Author)] Address: Fabbri, R., Museo Civico di Storia Naturale, via De' Pisis, 24. 44100 Ferrara, Italy. E-mail: r-fabbri@libero.it

**22132.** Frank, M. (2018): Auf der Suche nach der Hauben-Azurjungfer *Coenagrion armatum* in Norddeutschland (Odonata: Coenagrionidae). *Virgo* 20(1): 58-61. (in German) [Documentation of records of *C. armatum* from 15.05.2016, Schwarzberger Moor and Möwensee (region Süderlügum, Schleswig-Holstein, Germany).] Address: Frank, M., Zur Traubenmühle 5A, 55268 Nieder-Olm, Germany. E-mail: mikel.frank@gmx.de

**22133.** Frank, M.; Roland, H.-J. (2018): Ausgestorbene oder noch nicht nachgewiesene Libellenarten in Hessen — Teil 1. Libellen in Hessen 11: 57-73. (in German) ["Of 20 dragonfly species that have been identified in Germany but are either extinct in Hesse or have never been recorded, the first part presents the 11 species in more detail that may possibly occur new or repeatedly in Hesse. These are: *Ceragrion tenellum*, *Coenagrion lunulatum*, *Coenagrion ornatum*, *Aeshna subarctica*, *Anax ephippiger*, *Boyeria irene*, *Gomphus simillimus*, *Epitheca bimaculata*, *Oxygastra curtisii*, *Orthetrum albistylum*, *Sympetrum depressiusculum*." (Authors/Google translate)] Address: Frank, M., Zur Traubenmühle 5A, 55268 Nieder-Olm, Germany. E-mail: mikel.frank@gmx.de

**22134.** Patil, R.; Patil, Y.; Salunkhe, P. (2018): Diversity of Odonata (Dragon flies and Damsel flies) Fauna of Khanapur Tehsil, Dist. Sangli (M.S.) India. *International Journal of Creative Research Thoughts* 6(1): 1021-1030. (in English) [During Jan.2016 and Feb.2018, 10 stations were randomly selected as study sites. "Total 719 individuals of odonates belonging to 6 families, 23 genera and 34 species were recorded during the study period. The family Libellulidae with 17 species is the most dominant among the Anisoptera followed by Aeshnidae (3 spe.) and Gomphidae (2 spe.). Among the Zygoptera, the family Coenagrionidae with 9 species was the most dominant than family Lestidae (2 spe.) and family Platycnemididae (2 spe.). The richness index (Margalef's index) shown that the species richness is maximum in the site S1, Vita City area (5.728). Minimum richness is found in site S10, Banurgad village area (1.800). Among all the species of odonates the *Pantala flavescens* is found to be abundant (22.80%). The results are analyzed with present available literature." (Authors)] Address: Patil, R., Dept Zool., Balwant Coll., Vita. Dist. Sangli (M.S.), India

**22135.** Theis, O. (2018): Etat des lieux du patrimoine naturel des marais communaux de Camon (Vallée de la Somme). *College Sciences et Technologies de l'Energie et de l'Environnement de la Cote Basque, Université de Pau et des Pays de l'Adour. Licence Professionnelle Métiers de la Protection et de la Gestion de l'Environnement. Option Biologie Appliquée aux Ecosystèmes Exploités: 54 pp.* (in French) ["The alkaline peat marshes located in the commune of Camon are marked by ancient and current uses. Today, many users share the communal marshes of Camon (hunting, fishing, recreation, grazing, poplar groves). The Conservatory of Natural Spaces is interested in this as part of its management of sites along the Somme Valley. In agreement with the town hall, an inventory was carried out in 2018 through naturalist surveys. Amphibians, birds, odonates [*Aeshna grandis*; *Anax imperator*; *Anax parthenope*; *Calopteryx splendens*; *Ceragrion tenellum*; *Coenagrion puella*; *Coenagrion pulchellum*; *Crocothemis erythraea*; *Enallagma cyathigerum*; *Erythromma najas*; *E. viridulum*; *Gomphus pulchellus*; *Ischnura elegans*; *Libellula fulva*; *L. quadrimaculata*; *Orthetrum cancellatum*; *Platycnemis pennipes*; *Pyrrhosoma nymphula*; *Sympetrum striolatum*], flora and vegetation were the subject of inventories. The data collected could then be processed in order to understand how this site works. Despite numerous ponds, the Camon marshes are home to a limited number of heritage animal species. Few waterbirds nest and the flocks of amphibians and odonates are depleted. The inhospitable banks as well as the lack of small bodies of water without fish could explain this phenomenon. Regarding the flora, numerous heritage species have been inventoried. However, the reduced size of the stations, sometimes limited to a single individual, show that these species risk disappearing if nothing is done, particularly against brush and invasive species whose stations are sometimes very large. The vegetation is quite diverse. However, dynamics of siltation, megaphorbia and brush as well as colonization by invasive species reflect a certain degree of environmental degradation. Successive human interventions such as the digging of ponds, the construction of roads or the connection of the ponds with the Somme have profoundly modified the appearance of the marsh. However, despite these pessimistic observations, the presence of numerous species and vegetation with heritage value shows the potential of this site. With a strengthening of current grazing and mowing practices as well as hydrological developments, the communal marshes of Camon could become a privileged site for the sustainable reception of a diverse heritage fauna and flora." (Author/Google translate) <https://www.camon.fr/wp-content/uploads/2019/05/Rapport-des-Marais.pdf>] Address: Theis, Stage, Conservatoire d'Espaces Naturels de Picardie. 1 place Ginkgo. 80044 Amiens cedex 1, France

## 2019

**22136.** Askew, R.R.; Hermosilla, C.E. (2019): Species of *Aprostocetus* Westwood (Hymenoptera: Eulophidae) associated with eggs of *Lestes* Leach (Odonata). *Entomologist's Monthly Magazine* 115(3): 200-208. (in English) ["*Aprostocetus citripes* (Thomson) is recorded as an egg parasitoid of *Lestes virens* (Charpentier) in Spain, the first host record for this species. Aspects of its biology are described. Three other species of *Aprostocetus* whose larvae develop on *Lestes* eggs are discussed." (Authors)] Address: Askew, R.R., 5 Beeston Hall Mews, Beeston, Tarporley, Cheshire CW6 9TZ, United Kingdom

**22137.** Bechev, D. (2019): Some new data on dragonflies (Odonata) of Vrachanska Planina Mountains. *ZooNotes*

Supplement 7: 33-34. (in English, with Bulgarian summary) ["Records of three more species are added to the fauna of Vrachanska Planina Mts.: *Calopteryx splendens*, *Lestes dryas* and *Libellula depressa*. A list of all known species for this mountains is provided." (Author)] Address: Bechev, D., Department of Zoology, University of Plovdiv "Paisii Hilendarski", 24 Tsar Asen Str., 4000 Plovdiv, Bulgaria. Email: dbechev@abv.bg

**22138.** Brockhaus, T. (2019): Der Ural – Grenze und Leitlinie für die pleistozäne Ausbreitung paläarktischer Libellen (Odonata). *Libellula Supplement* 15: 11-33. (in German, with English and Russian summaries) ["The Ural – border and corridor for the Pleistocene spread of Palearctic dragonflies (Odonata) – In 2012 and 2017, dragonflies were observed in various regions on the European side of the Ural. With information from the literature, a total of 73 dragonfly species are known for the Ural and its European and Asian forelands. The dragonfly fauna is composed of both Western and Eastern Palearctic species. Especially noteworthy is the occurrence of *Somatochlora sahlbergi*, which is widespread in the Polar Ural. On the basis of my own fieldwork, as well as on the basis of existing faunistic knowledge, the function of the Ural Mountains is discussed as a limit for dispersal as well as a line of dispersal along existing corridors for various dragonfly species. During the Pleistocene, with its alternating cold and warm periods, areal extensions took place in both cold and warm periods." (Author)] Address: Brockhaus, T., An der Morgensonne 5, 09387 Jahnsdorf/Erzgebirge, Germany. E-mail: t.brockhaus@t-online.de

**22139.** Chai, J.-Y. (2019): Lecithodendriid-Like Flukes. *Human Intestinal Flukes*: 443-461. (in English) ["Three species of lecithodendriid-like flukes (families Lecithodendriidae and Phanerosolidae) are known to infect humans. They include *Caprimolgorchis molenkampii* (syn. *Prosthodendrium molenkampii*) which belongs to the Lecithodendriidae, and *Phaneropsolus bonnei* and *Phaneropsolus spinicirrus* which belong to the Phanerosolidae. Human infections are common in *C. molenkampii* and *P. bonnei* but rare in *P. spinicirrus*. The major source of human infections with these flukes is presumed to be aquatic naiads of dragon. or damselflies. The geographical distribution of *C. molenkampii* and *P. bonnei* extends from Indonesia to Thailand, Lao PDR, and Cambodia. The geographical distribution of *P. spinicirrus* is so far confined to northeastern Thailand." (Author)] Address: Chai, J.-Y., Dept of Tropical Medicine and Parasitology, Seoul National University College of Medicine, Seoul, South Korea

**22140.** Crucitti, P.; Brocchieri, D.; Bubbico, F.; Castelluccio, P.; Cervoni, F.; Di Russo, E.; Emiliani, F.; Giardini, M.; Pulvirenti, E. (2019): Checklist di alcuni gruppi selezionati dell'entomofauna del Parco Naturale Archeologico dell'Inviolata (Guidonia Montecelio, Roma). *XLI contributo alio studio della biodiversità della Campagna Romana a nord-este di Roma. Boll. Soc. Entomol. Ital.* 151(2): 65-92. (in Italian, with English summary) ["Checklist of selected groups of Insects from the Inviolata Natural Archaeological Park (Guidonia Montecelio, Rome). The results of a systematic survey carried out during the years 2016-2019 on selected groups of Insects belonging to Odonata, Orthopteroidae, Dermaptera, Coleoptera, Lepidoptera, Isoptera and Mecoptera, inside the Inviolata Archaeological Natural Park (Rome, Latium), are presented and discussed. The main geomorphological, climatological and vegetational features of the studied area, are described. Sampling was carried out using different methods; manual pick up, traps, light sheets, monitoring of faeces, dead animals and aquatic vegetation. The inventory

is represented by 533 taxa belonging to 101 families, all of which characterized from phenological point of view.... 28 species out of 42 mentioned were recorded in the city of Rome delimited by the GRa (Utzeri & Dell'anna, 1997), 58 in Lazio and 93 in Italy (Riservato et al., 2014) (66.6%, 48.2 % and 30.1%, respectively) included in 18 genera of 7 families. thirteen species (11 genera of 4 families) are zygoptera, 15 species (8 genera of 3 families) are anisoptera. The odonates of Inviolata were the subject of a specific contribution (Brocchieri et al., 2018), to which *Sympecma fusca* was added, observed in April 2019 at the 1st lake of Tor Mastorta (Fig. 7). Therefore, the total number of species recorded in the Roman countryside north-east of Rome amounts to 35, equal to 37.6% of the national total and 60.3% of the species known for Lazio (Brocchieri et al., 2014; Crucitti et al., 2016; Brocchieri et al., 2018). the analysis of the chorotypes allows us to note the clear dominance of elements with a wide distribution in the Holarctic region (20 species, 71.4%). The contingents of European origin (3 species, 10.7%), of Mediterranean origin (2 species, 7.2%) and of Afrotropical origin (3 species, 10.7%) are significantly lower." (Authors)] Address: Crucitti, P., Società Romana di Scienze Naturali SRSN, Campus di Villa Esmeralda, Via Fratelli Maristi 43, 00137 Roma, Italia. E-mail: info@srsn.it.

**22141.** Durand, W. (2019): Dragonfly species new or rare to the Odonata fauna of Georgia, Armenia and Azerbaijan. *International Dragonfly Fund. Report* 135: 1-22. (in English) ["During four field trips in Georgia, Armenia and Azerbaijan from 2010 to 2018, the author collected data of a total of 55 species (see Tab. 2 in Appendix). This study provides first insights into new or rare species in this ecoregion. *Ischnura fontaineae* and *Cordulia aenea* were found for the first time in Armenia. We also highlight the rediscovery of some species that were mentioned in the older literature but had not been confirmed since. An autochthonous population of *Lestes macrostigma* was discovered in Azerbaijan 16 years after the single previous record by Dumont (2004). Original information is provided on the distribution of some rare species encountered in these countries. Finally, the identification of a puzzling *Cordulegaster* sp. observed in south Armenia is discussed briefly." (Author)] Address: Durand, E., Château Vilain RN7 13410 Lambesc, France. E-mail: mr.oizo3@gmx.fr

**22142.** Feng, Y.; Zhao, M.; Ding, W.F.; Chen, X.M.; (2019): Overview of edible insect resources and common species utilisation in China. *Journal of Insects as Food and Feed* 6(1): 13-25. ["The custom and culture of entomophagy in China has been preserved since ancient times, with a history going back at least 3,000 years. Presently, more than 300 species of insects with edible value have been taxonomically classified in China. These insect species belong to the orders Lepidoptera, Coleoptera, Hymenoptera, Orthoptera, Hemiptera, Isoptera, Odonata, Megaloptera, Ephemeroptera, Diptera and Blattaria, with a majority of these species belonging to Lepidoptera, Coleoptera and Hymenoptera. The most common include silkworm, tussah, Italian honeybee, oriental honeybee, mealworm, wasps, bamboo worm, locust, cicada, diving beetle and black ant. Since 2010, the number of patent applications for these edible insects has increased rapidly, indicating that the development and utilisation of edible insects in China is ongoing. The use of common edible insects primarily involves direct consumption of the insect body. In addition to fresh insects, frozen, canned and dried insects are also sold on the market. Derived extract products, such as protein, oil, chitin and insect health foods remain in the early research and experiment stages,

and the current production scale is small. Bees, silkworm, mealworm and oriental migratory locust come from artificial farming, as farming techniques for these insects are well-developed. Although wasps, sand-crawling insects, bean hawkmoths and bamboo worms have been artificially cultured, the necessary technologies are underdeveloped. The majority of edible insects generally accepted by the public are still primarily collected from nature. In view of the current situation of utilisation, some suggestions have been put forward to strengthen the investigation and evaluation of edible insect resources, and research to focus on utilisation methods and artificial rearing technology in China." (Authors) Address: Feng, Y., Research Institute of Resource Insects, Chinese Academy of Forestry, the Key Laboratory of Cultivating and Utilization of Resource Insects of National Forestry and Grassland Administration, Kunming, 650233 Yunnan, China P.R. Email: rirify@139.com

**22143.** French, S.K.; McCauley, S.J. (2019): The movement responses of three libellulid dragonfly species to open and closed landscape cover. *Insect Conservation and Diversity* 12: 437-447. (in English) ["1. The land cover between habitats (i.e. matrix environment) can affect connectivity by impacting organismal movement. Many animals, however, have preferences for specific matrix environments, which can affect their movement through the landscape. 2. We examined how different terrestrial matrix environments impacted the fine-scale movement of adult dragonflies. Based on previous studies of adult dragonfly dispersal and larval distributions, we hypothesised that dragonflies would prefer to enter fields rather than forests and that forests would be a barrier to dragonfly movement, due to forests' structural complexity, low understory light availability, and lower air temperatures. 3. To test how adult dragonflies responded to various terrestrial environments, we released 108 *Leucorhinia intacta*, a mixture of 108 *Sympetrum rubicundulum* and *obtrusum/rubicundulum* hybrids, and 108 *Sympetrum vicinum*, at field-forest ecotones and assessed their preferences for fields or forests. Individual behavioural responses were recorded, including their probability of taking flight, their direction of movement with respect to the two matrix types, and flight time. 4. The likelihood of adult dragonflies taking flight was species-specific in response to release location. Adults moved more frequently towards fields than forests when released at a forest edge. Individuals released within forests had shorter flight times, but again this response was species-specific. 5. The presence of an open matrix (field or meadow) is likely important for facilitating movement in dragonflies; however, forests are not movement barriers for all dragonfly species. Integrating assays of matrix and habitat preferences can provide insight into how landscape connectivity can be maintained for actively dispersing species." (Authors)] Address: French, Sarah, Dept of Biology, University of Waterloo, Waterloo, ON, Canada. Email: sarahkathrynfrfrench@gmail.com

**22144.** Helebrandová, J.; Pyszko, P.; Dolný, A. (2019): Behavioural phenotypic plasticity of submerged oviposition in damselflies (Insecta: Odonata). *Insects* 2019, 10(5), 124; <https://doi.org/10.3390/insects10050124>: 12 pp. (in English) ["*Lestes sponsa* is a common species within the temperate zone, with no special need for protection. The tactic of submerged oviposition is well known from other Odonata species, but has rarely been noticed or described in *Lestes sponsa*. Our study investigated the tactics of oviposition in this species, and shows that submerged oviposition indeed occurs frequently in *Lestes sponsa*. We experimentally tested the difference in the roles of males and females during the

submerged ovipositional behaviour by combining males/females from submerging populations with males/females from non-submerging populations. We discovered that, whereas submerging males coupling with non-submerging females did not lead to submersion, the opposite combination of pairs submerged. Other patterns of submersions are discussed further in this paper. Our research led to the conclusion that damselflies have the ability to learn and react to different situations in keeping with the learning potential of insects in general." (Authors)] Address: Helebrandová, Jana, Dept Biol. & Ecology, Fac.Science, Univ. of Ostrava, 710 00 Ostrava, Czech Republic. E-mail: xaustrik@seznam.cz

**22145.** Henze, M.J.; Lind, O.; Wilts, B.D.; Kelber, A. (2019): Pterin-pigmented nanospheres create the colours of the polymorphic damselfly *Ischnura elegans*. *Journal of the Royal Society of Interface* 16: 20180785. <http://dx.doi.org/10.1098/rsif.2018.0785>: 11 pp. (in English) ["Animal colours commonly act as signals for mates or predators. In many damselfly species, both sexes go through a developmental colour change as adults, and females often show colour polymorphism, which may have a function in mate choice, avoidance of mating harassment and camouflage. In the blue-tailed damselfly, *Ischnura elegans*, young males are bright green and turn blue as they reach maturity. Females are red (rufescens) or violet (violacea) as immatures and, when mature, either mimic the blue colour of the males (androchrome), or acquire an inconspicuous olive-green (infuscans) or olive-brown (obsoleta). The genetic basis of these differences is still unknown. Here, we quantify the colour development of all morphs of *I. elegans* and investigate colour formation by combining anatomical data and reflectance spectra with optical finite-difference time-domain simulations. While the coloration primarily arises from a disordered assembly of nanospheres in the epidermis, morph-dependent changes result from adjustments in the composition of pterin pigments within the nanospheres, and from associated shifts in optical density. Other pigments fine-tune hue and brilliance by absorbing stray light. These mechanisms produce an impressive palette of colours and offer guidance for genetic studies on the evolution of colour polymorphism and visual communication." (Authors)] Address: Wilts, B.D., Adolphe Merkle Institute, Univ. Fribourg, Chemin des Verdiers 4, 1700 Fribourg, Switzerland. E-mail: bodo.wilts@unifr.ch

**22146.** Ilhamdi, M.L.; Idrus, A.A.; Santoso, D. (2019): Kekayaan jenis capung di Taman Wisata Alam (TWA) Suranadi Sebagai Bahan penyusunan buku suplemen ipa [The richness of dragonfly species in the Suranadi Nature Tourism Park (TWA) as material for preparing science supplement books]. *Prosiding Seminar Nasional SIMBIOSIS IV, Madiun, 15 Agustus 2019*. p-ISSN: 9772599121008 e-ISSN: 9772613950003: 8-14. (in Indonesian) ["The aim of this research is to determine the richness of dragonfly species in TWA Suranadi as material for preparing science supplement books. The research method uses a roaming method following an observation transect route which consists of 4 routes, namely the left edge of the forest, the middle route, the right edge of the forest and the river water route. Dragonflies were observed using binoculars and dragonflies that had not been identified were captured using insect nets and identified in the FKIP Unram biology laboratory. The research results showed that the number of dragonfly species found was 19 species. The species most commonly found is *Pantala flavescens*, the least common is the species *Gynacantha manderica*. The species found were used as material for a science supplement book with a 10-step preparation procedure ... Conclusion: Based on

the research results, it can be concluded that (1) the Odonata found in the Suranadi Natural Tourism Park area consist of 19 species belonging to 5 families with a total of 530 individuals. (2) The highest relative abundance was found in *Orthetrum sabina* (40.25%), followed respectively by *Pseudagrion pilidorsum* (23.50%), *Diplacodes trivialis* (17.75%), *Orthetrum chrysis* (13.25%), *P. pruinatum* (8.75%), *Agriocnemis femina* (8%), *Neurothemis ramburii* (6.75%), *Pantala flavescens* (4.25%), *Aethriamanta brevipennis* (3.50%), *Copera marginipes* (2.25%), *Euphaea ochracea* (1.50%), *Lathrecista asiatica* (1.25%), *Libellago rufescens* (1.25%), *Neurothemis terminata* (1%), *Tholymis tillarga* (1%), *Trithemis furva* (0.50%), *Libellago lineata* (0.50%), *Potamarcha congener* (0.50%) and *Onychothemis culminicola* (0.25%). 3) The richness of species found in TWA Suranadi can be used as material for preparing a contextual science supplement book through 10 steps in its preparation." (Authors/Google Translate)] Address: Ilhamdi, M.L., Pendidikan Biologi FKIP Universitas Mataram, Indonesia. Email: liwa\_ilhamdi@unram.ac.id

**22147.** Kleinekuhle, J. (2019): Libellenkartierung im Rahmen der Wiekensanierung im Bereich der Hookswieke und Jheringsfehnkanal 2019. Auftraggeber: Gemeinde Moormerland, Theodor-Heuss-Straße 12, 26802 Moormerland. Auftragnehmer: Diekmann • Mosebach & Partner – Oldenburger Str. 86, 26180 Rastede: 17 pp, Anlage. (in German) [Niedersachsen, Germany. 19 odonate species have been documented.] Address: [https://www.moormerland.de/fileadmin/co\\_system/moormerland/media/Editorial/Bilder/Wieken/Hookswieke/Bericht\\_Libellen\\_Hookswieke\\_Jheringsfehnkanal\\_gesamt\\_24.01.20.pdf](https://www.moormerland.de/fileadmin/co_system/moormerland/media/Editorial/Bilder/Wieken/Hookswieke/Bericht_Libellen_Hookswieke_Jheringsfehnkanal_gesamt_24.01.20.pdf)

**22148.** Kosterin, O.E. (2019): New synonyms and a new subspecies of *Macrogomphus Selys, 1858* (Odonata: Gomphidae) from continental south-east Asia. *Zootaxa* 4615(1): 57-90. (in English) ["The taxa of the genus *Macrogomphus Selys, 1858* occurring in continental south-east Asia are reconsidered. *Macrogomphus rivularis* Förster, 1914 (described from Vietnam), *M. borikhanensis* Fraser, 1933 (described from Laos), and *M. guilinensis* Chao, 1983 (described from China), are synonymised with *M. albardae* Selys, 1878. The relationship and conspecificity of the latter with *M. parallelogramma* Burmeister, 1839 are doubtful, perhaps they are bona species. Males of *M. albardae* (and seemingly of *parallelogramma* as well) are approximately trimorphic for the pale pattern of the abdominal S3–S6, being of either a 'dashed morph' (with small isolated anteriolateral spots and conspicuous middorsal streaks), or a 'ringed morph' (with broad anterior rings and less conspicuous middorsal streaks), or an 'intermediate morph'. Validity of the species *M. matsukii* Asahina, 1986 is doubted; its holotype could be an aberrant male of *M. albardae*. The main diagnostic character of *M. albardae*, *M. phalantus* Lieftinck, 1935 and probably *M. parallelogramma*, is clarified to be the structure of the cercus inner branch. *M. phalantus jayavarman* subsp. nov. is described from temporarily inundated forest at the northern bank of the great Lake Tonlé Sap of Cambodia (Siem Reap Province, 1.5 km SSW of Kampong Pluk village, 13.1956° N, 103.9725° E, 3 m a.s.l.), which is ca 1,300 km north and overseas from the presumed range of *M. phalantus phalantus*." (Author)] Address: Kosterin, O.E., Institute of Cytology & Genetics, Siberian Branch, Russian Academy of Sciences, Lavrentiev Ave 10, 630090 Novosibirsk, Russia. E-mail: kosterin@bionet.nsc.ru

**22149.** Lima, J.C.; Gazonato Neto, A.J.; Andrade, D.; Freitas, E.C.; Moreira, R.A.; Miguel, M.; Daam, M.A.; Rocha,

O. (2019): Acute toxicity of four metals to three tropical aquatic invertebrates: The dragonfly *Tramea cophysa* and the ostracode *Chlamydotheca* sp. and *Strandesia trispinosa*. *Ecotoxicology and Environmental Safety* 180: 535-541. (in English) ["Highlights: •Acute toxicity data of metals for three species from Neotropical regions are presented. •*Chlamydotheca* sp. was more sensitive to  $\text{CuSO}_4$  than *T. cophysa* and *S. trispinosa*. •Ostracoda species were more sensitive to  $\text{CdCl}_2$  than species from temperate regions. •*S. trispinosa* was the most sensitive Neotropical native ostracod species to  $\text{HgCl}_2$ . Abstract: The relatively low availability of toxicity data for indigenous tropical species has often been discussed. In addition, several taxonomic groups of invertebrates are understudied, such as dragonflies and ostracods. The aim of the present study was therefore to evaluate the acute toxicity of four metals (cadmium, Cd, copper, Cu, manganese, Mn, and mercury, Hg) to the tropical dragonfly nymphs of *T. cophysa* and two tropical ostracod species (*Chlamydotheca* sp. and *Strandesia trispinosa*). Toxicity data for other invertebrates were also mined to allow comparing the sensitivity of the three test species with that of other (temperate and tropical) invertebrates. The order of metal sensitivity was different for the three test species: *T. cophysa*:  $\text{Cu} > \text{Cd} > \text{Hg} > \text{Mn}$ , *Chlamydotheca* sp.:  $\text{Cd} > \text{Cu} > \text{Hg} > \text{Mn}$ , and *S. trispinosa*:  $\text{Cd} > \text{Hg} > \text{Cu} > \text{Mn}$ . However, manganese was the least toxic metal tested for all three species, which is hypothesized to be due to a possible metal transfer to the cuticle of the moulting test species. The sensitivity ranking of the three test species to the metals was *S. trispinosa* > *Chlamydotheca* sp. > *T. cophysa* (except for Cu for which the ranking was *Chlamydotheca* sp. > *T. cophysa* > *S. trispinosa*). Overall, the test species are concluded to be suitable test organisms for tropical toxicity evaluations. Future studies should also evaluate the chronic toxicity and include other important metal exposure routes such as sediment and food." (Authors)] Address: Lima, J.C., Post-Graduate Program of Sciences of Environmental Engineering, São Carlos Engineering School, Univ. of São Paulo, Avenida do Trabalhador São Carlense, 400, 13.560-970, São Carlos, Brazil. E-mail address: jcslima1982@usp.br

**22150.** Liu, H.; He, G.; Wang, Q. (2019): Numerical study on the aerodynamic performance of the flexible and corrugated forewing of dragonfly in gliding flight. *Chinese Journal of Theoretical and Applied Mechanics* 51(1): 94-102. (in Chinese, with English summary) ["Dragonflies are capable of carrying out dramatic flight manoeuvres, gliding flight is a common mode of flight for dragonfly, and dragonfly wings are the source of dragonflies dramatic flight manoeuvres. Unlike typical engineered airfoil, dragonfly wings are not smooth, wing cross-section are highly corrugated. It has been shown that corrugations could enhance the spanwise stiffness in the wings and influence aerodynamic performance of the dragonfly wings. Flexibility is another characteristic of the dragonfly's wings, which is mainly manifested as the flexible deformation of the wings during the flight. To explore corrugations and flexibility effect on aerodynamic performance of the dragonfly forewings in gliding flight, a computational fluid dynamics (CFD) model and a computational structural mechanics (CSD) model of the corrugated dragonfly forewing are established based on current research, and the modal analysis verified that the model has sufficient accuracy. The corrugated rigid and flexible dragonfly forewing are acquired by using CFD method and CFD/CSD coupling method respectively. The simulation indicated that flexible and corrugated forewings is subjected to aerodynamic load, which only produces bending deformation without torsion deformation in gliding flight, and the aerodynamic response



time is short. Compared with the aerodynamic performance of the rigid and corrugated forewings, the result showed that veins and cuticular membrane of flexible forewing are deformed which caused the lift coefficient and drag coefficient decrease, the leading edge vortex of flexible forewing is much higher than rigid forewings at large angle of attack because of deformed vein. The aerodynamic performance of rigid forewings is better below 10 degree angle of attack, and the aerodynamic performance of flexible forewings is better at large angle of attack as result." (Authors)] Address: Liu, H., School of Aircraft Engineering, Nanchang Hangkong University, Nanchang 330063, China

**22151.** Marinov, M.; Ashbee, M. (2019): Dragonflies and Damselflies of New Zealand. Auckland University Press: 168 pp. (in English) ["This is a natural history and field guide to New Zealand's 14 species of dragonflies and damselflies. Easy to observe around wetlands and rivers, dragonflies and damselflies are favourites of New Zealand nature lovers, and this book will be too. Key features include: (1) Expert and up-to-date information on the 14 species breeding in New Zealand. (2) Natural history of the group including an introduction to evolution, habitats, biology, behaviour, photography and conservation. (3) More than 200 new photographs and hand-drawn illustrations of dragonflies and damselflies at all life stages in their environment. (4) Authoritative text on each species covering identification, measurement, behaviour, breeding, flying period and where to observe the species. (5) Range maps for all species." (Publisher)] Address: <https://aucklanduniversitypress.co.nz/dragonflies-and-damselflies-of-new-zealand/>

**22152.** Mendes, T.P.; Benone, N.L.; Juen, L. (2019): To what extent can oil palm plantations in the Amazon support assemblages of Odonata larvae? *Insect Conservation and Diversity* 12: 448-458. (in English) ["1. The aims of the study were to identify differences in alpha and beta diversity of Odonata larvae of the suborders Zygoptera and Anisoptera found between continuous forest sites (forest) and oil palm sites with forested buffers (oil palm), and to evaluate the extent of turnover and nestedness of communities within each habitat type. 2. 29 streams were sampled, 11 in forests and 18 in oil palm sites in the eastern Amazon. Alpha diversity of Zygoptera and Anisoptera was higher in streams at oil palm sites. Variation in species composition measured by beta diversity is primarily structured by turnover. Biotic heterogeneity of Zygoptera was higher in oil palm sites, while no difference was found in Anisoptera. 3. Forested streams had more wood in the streambed, whereas oil palm sites had finer sediment, higher non-agricultural human impact, water temperature, and road proximity index. Anisoptera turnover was positively correlated with water temperature and amount of wood in the streambed; Zygoptera turnover was positively correlated with non-agricultural human impact. 4. The patterns observed in Zygoptera can be attributed to the presence of forested buffers, which may have influenced the selection of foraging sites by adults and determined larval distribution. 5. We conclude that oil palm plantations can change the environmental structure of streams and influence genus richness and turnover in Amazon streams. These results might help explain changes caused by oil palm plantations on Anisoptera and Zygoptera assemblages." (Authors)] Address: Mendes, T.P., Laboratório de Ecologia e Conservação, Instituto de Ciências Biológicas, Universidade Federal do Pará – UFPA, Augusto Correa Street, 1. Guamá, 66.075-110, Belém, Pará, Brazil. E-mail: thiagomendes-bio@gmail.com

**22153.** Minoti, M.; Le Gall, M.; Husté, A. (2019): Biometry of the large dragonfly *Anax imperator* (Odonata: Aeshnidae): A study of traits from larval development to adults. *Eur. J. Entomol.* 116: 269-280. (in English) ["Insect larval development affects adult traits but the biometric relationships are usually poorly understood, including large odonates. In this study, measurements of morphological traits of larvae, exuviae and adults of *Anax imperator* were recorded. They were used to investigate the effects of early development on adult morphology. Results showed an increase in larval length during the final instar and the length of its exuviae significantly exceeded that of the larva. Length and body mass of teneral adults were strongly related to the length of their exuviae. Adult males were significantly longer than adult females, while both had the same body mass at emergence. Length of teneral adults was negatively related to the date of emergence in both sexes. During maturation, body mass of males only increased slightly whereas that of females increased greatly. Mature specimens were also significantly longer than teneral individuals. Body mass of mature males and length of mature females were both associated with the date of capture. Wing length did not differ between sexes or from data available from Great Britain. This study underscores the importance of taking into account larval growth in order to better understand the adult traits of odonates." (Authors)] Address: Minoti, M., Université de Rouen. ECO-DIV, Bat Blondel, Place Emile Blondel, Mont-Saint-Aignan 76821, France. E-mail: marceau.minot1@univ-rouen.fr,

**22154.** Mokaria, K.; Jethva, B. (2019): Evaluation of community composition of dragonflies and damselflies (Order: Odonata) in Nalsarovar Bird Sanctuary, Gujarat, India. *International Journal of Research and Analytical Reviews* 6(2): 474-479. (in English) ["A study was carried out in Nalsarovar Bird Sanctuary to evaluate community composition of odonates in Nalsarovar Bird Sanctuary (Ramsar Site), Gujarat. Transects survey was carried out at Nalsarovar Bird Sanctuary covering all habitats. Each transect was repeatedly surveyed in all seasons. A total of 30 species of Odonata were encountered belonging to Libellulidae, Gomphidae, Aeshnidae, Coenagrionidae, and Lestidae during the entire study. During the study, percentage frequency of occurrence, abundance and density of odonates were calculated based on data collected to evaluate community composition of Odonata in Nalsarovar Bird Sanctuary. During the entire survey, the percentage frequency of occurrence of *Brachythemis contaminata*, *Pantala flavescens* and *Trithemis pallidinervis* were recorded highest. The most abundant species encountered were *Pantala flavescens* followed by *Trithemis pallidinervis*, *Brachythemis contaminata*, *Ischnura aurora* and *I. senegalensis* respectively among all species encountered during the survey. However, the density of *Trithemis pallidinervis* were highest which was further followed by *Pantala flavescens* and *Brachythemis contaminata*, *Ischnura senegalensis* and *Ischnura aurora* respectively during the entire survey. This study can be used as a benchmark for future conservation and monitoring of Odonates in state and similar wetland worldwide." (Authors)] Address: Mokaria, K., Dept of Science, The Mahatma Jyoti Rao Phoole Univ., Jaipur, Rajasthan

**22155.** Moore, M.P. (2019): Eco-physiological causes and consequences of sexually selected color variation in dragonflies. Doctor of Philosophy, Case Western Reserve University, Biology: 246 pp. (in English) ["Many animals use elaborate adult traits to attract mates and intimidate rivals. However, the development of these sexually selected traits, and the reproductive interactions that confer their benefits,



occur against a complex backdrop of environmental factors. When such features of the habitat modify the costs and benefits of displaying and developing these traits, environmental variation across space and time can shape their diversification. Likewise, sexual selection on these characters may have consequences for how organisms interact with and adapt to different ecological contexts. Here, I explore these themes by investigating the interplay between sexually selected coloration, the external environment, and physiology in dragonflies. I begin by examining the adaptive function of wing pigmentation in *Pachydiplax longipennis*, finding that this trait is intrasexually selected. Using this dragonfly system, I then document how interactions between the environment and an organism's physiological state can drive the divergence in its sexually selected wing coloration. I first show that thermal physiology causes the performance benefits of wing coloration to depend on ambient temperature, and, as a result, males in the warmest parts of North America nearly lack this trait all together. I next illustrate how improving an individual's physiological condition to develop better sexually selected coloration can harm its juvenile survival in the presence of predators. I then consider how sexual selection could feed back to influence ecological adaptation by examining links between wing coloration and immune defense. I find that, in addition to several important ecological costs of deploying immune defenses during the larval stage (e.g. predation vulnerability, delayed emergence), producing a strong immune response directly inhibits wing color development. Moreover, when comparing across species, I show that those species with more wing coloration tend to have weaker immune responses. Thus, due to proximate trade-offs with immune defense, sexual selection on wing coloration can slow ecological adaptation, or even potentially drive maladaptation, to parasites and pathogens. Overall, this work demonstrates how eco-physiology may be an important nexus for the ecological causes and consequences of sexually selected trait variation." (Author)] Address: [https://etd.ohio-link.edu/acprod/odb\\_etd/ws/send\\_file/send?accession=case-1559907185842415&disposition=inline](https://etd.ohio-link.edu/acprod/odb_etd/ws/send_file/send?accession=case-1559907185842415&disposition=inline)

**22156.** Paulson, D. (2019): *Dragonflies & Damselflies*. A natural history. Princeton University Press. Princeton and Oxford: 224 pp. (in English) ["Dragonflies and damselflies are large, colorful, active, and visible in daylight hours, so along with butterflies they have always been among the most popular insects. They are a diverse group, the order Odonata, with 6,308 described species at present, occurring on all continents but Antarctica and all islands large enough to contain fresh water. This book is about them. There are two major groups of Odonata: dragonflies and damselflies. There is potential for confusion, as "dragonfly" in some English-speaking countries is used for both groups but in others for just one group (the "true dragonflies," suborder Anisoptera). Therefore, in this book "dragonflies" will be used when referring to the Anisoptera, "damselflies" to the other suborder, Zygoptera, and odonates when referring to all of them. It should also be noted that odonate larvae are also commonly called "nymphs" and less commonly "naiads." Almost all odonates are tied to freshwater habitats, where their larvae live, although the adults roam far and wide. Along with butterflies, they are the largest insects seen by most of us. There are no microscopic species and many that are impressively large. They are typical insects, with six legs and two pairs of wings. They lay eggs, which hatch into larvae, which grow and molt and eventually make a final molt from the larval stage to the adult stage. Odonates are carnivores throughout their lives. Although they are active predators, they are thought to eat no more than about 15 percent of their body weight in

a day; they are certainly slim and trim. Both adults and larvae fit into the food web between the smaller insects and other arthropods that are their primary prey and the birds, many of which eat odonates. They are eaten by some species in all the other vertebrate groups (fishes, amphibians, reptiles, and mammals) as well. The web is complex, though; large larvae eat fish and tadpoles and an adult may take a hummingbird. They are also eaten by other insect predators and, of course, each other. Other than the mosquitoes and other biting flies that they eat, Odonata have been of little economic significance to people. They are of great aesthetic significance, however, with their dazzling colors and aerial acrobatics enthralling anyone who stops for a moment at a wetland. This same charisma has made them favorite, almost iconic, animals of artists and designers of all sorts. Their characteristic outline can be seen on an impressive variety of jewelry, pottery, metalware, and clothing. Dragonfly is a popular brand name, with Dragonfly businesses in many large cities in English-speaking countries—everything from pubs to travel agencies, book stores to beauty parlors. There are novels with Dragonfly and Odonata in their titles. There is a musical group named Dragonfly, and more than 30 other musical groups have produced albums with the title Dragonfly. Damselfly clearly does not have the same cachet; that name is used only rarely. Because odonates are such large and prominent and easily studied insects, they have also long piqued the interest of biologists, and they are of great significance to science. Their adaptations for vision, flight, display, mating, and larval life are unique and lend themselves to speculation, theorization, observation, and experimentation. The resulting research has given us invaluable insights into nature, from freshwater ecology, competition, and predation to mating strategies, metamorphosis, and migration. One of the most interesting aspects of the Odonata, revealed again and again with close study, is the diversity of their adaptations. They very often have more than one morphological or behavioral way to accomplish a particular goal, and learning of these variations has given us an ever-growing appreciation of the special nature of these insects. But beyond this, odonates have caught the attention of amateur naturalists everywhere. Acting as citizen scientists, these dedicated amateurs are in the field day after day documenting populations of these animals by collection, observation, and photography, and often entering their data into ever-growing online databases of greater and greater value as the record of the current status of the group. This book embarks on a journey through the Odonata, peering into every aspect of the lives of these complex animals. In the first chapter, we learn about the evolutionary background of one of the oldest insect groups. When did they first appear? How much have they changed? What do they look like now? Where do they live? To understand their lives, we must know something about their variation in size, structure, and coloration. But it is their behavior that is especially interesting, and the second chapter elaborates on their predatory behavior: what they eat and how they capture prey, what eats them, and how they avoid their predators. Their superb vision and unsurpassed flight abilities are what makes them both great predators and challenging prey, and those aspects of being an odonate will be emphasized throughout the book. The third chapter delves into odonate reproductive biology. The complexity of their sex lives is notoriously interesting to biologists, as odonate reproduction contains behaviors found nowhere else in the animal kingdom. There are many dichotomies in odonate sexual behavior: elegant courtship or quick sex, copulating in flight or at rest, mating very briefly or taking inordinate time, laying eggs in or out of plants, ovipositing in flight or at rest,

and other ways in which they vary a surprising amount. Odonates are above all adaptable, their facultative behavior having allowed them to survive so well into the present. In the fourth chapter we see what goes on underwater during their extended larval life, as they are as much aquatic as they are aerial. Species breed in still or running waters, from large lakes and rivers to tiny seeps and puddles, and even containers of water well above the ground. The larvae are streamlined for fast swimming or flattened to hide among bottom detritus. They detect their prey by sight or by touch. Their emergence from the water and from their larval skin is one of the miniature spectacles of nature. What do people have to do with odonates? That is the subject of the fifth chapter. Dragonflies have sinister reputations in some cultures and are greatly admired in others. They are wonderful organisms for research and education, and they are common in representational art, both two- and three-dimensional. Although they may be more resilient to extirpation than many other freshwater organisms, their populations are still being threatened worldwide, and strong efforts are being made and must continue to be made to preserve the wetlands that they need for life. Finally, we would be surprised if there was not a great amount of diversity in a group with more than 6,000 species, and indeed there is. The sixth chapter explains a bit about how this diversity has come about and in addition presents the broad diversity of the group by featuring an introduction to the 39 families that make up the order Odonata. But it is the species themselves, the endpoints of evolution, that are really the representatives of the Odonata that we all encounter. The book features profiles of 55 of them, appending the first five chapters. For each species, the family name, average total length of males, distribution, and habitat are indicated. The species accounts are often used to make points about odonate biology not covered elsewhere in the text. After the main text, there is an extensive glossary that explains the unfamiliar terms presented about these insects, followed by lists of books and further resources, especially websites, to learn still more about them." (Author)] Address: Paulson, D.R., Slater Museum, Univ. of Puget Sound, Tacoma, WA 98416, USA. E-mail: dennispaulson@comcast.net

**22157.** Peterson, T. (2019): Trollsländor på Lidingö. Resultat av 20 års inventering. Contracting authority: Lidingö City, Environment and City Planning Office: 80 pp. (in Swedish, with English summary) [Dragonflies on Lidingö. Results of 20 years of inventory: "During 20 years of study terminated in and including 2018, 33 species of dragonflies [Insecta: Odonata] are reported from the island of Lidingö, including the archipelagos of Björkskär and Lilla Nassa, of the 52 species known from the province of Uppland. This information is collected in a data base comprising 2489 observations including imagos, aquatic larvae and exuviae. In the general part the natural history, biology, ecology, systematics and interaction with humans, nature protection, possible future species on Lidingö as well as recent observations of species is briefly presented. In the specific part the species are presented with scientific names and popular names in nordic languages and in English and German together with distribution maps covering Lidingö, Sweden and Europe. Size, key characters, similar species and frequency as well as observed flying period on Lidingö is briefly presented. The general part and the species part is illustrated with photos showing different aspects of dragonfly behaviour and different species characters. 3 species of the 33 reported are not approved in this study for reasons justified in the species headings in page 72. In three appendices a synopsis of known species of dragonflies from Lidingö is compared with the

neighbouring municipalities of Stockholm, Danderyd, Vaxholm and Nacka; a list of dragonfly species from European countries and the red list criteria of IUCN widely used in a national and international level. 10 of the species of dragonflies extant on Lidingö are nominated by Linnaeus 1758." (Author)] Address: [https://www.trollslandeforeningen.se/wp-content/uploads/2019/11/Trollsl%C3%A4ndor-p%C3%A5-Liding%C3%B6\\_slutversion.pdf](https://www.trollslandeforeningen.se/wp-content/uploads/2019/11/Trollsl%C3%A4ndor-p%C3%A5-Liding%C3%B6_slutversion.pdf)

**22158.** Roberts, D.; Al-Alawi, N.; Al-Gharibi, M. (2019): Effect of alarm chemicals and predator kairomones on the behaviour of two species of mosquito larvae. *Sultan Qaboos University Journal for Science* 24(1): 18-22. ["Mosquito larvae have developed a variety of responses to reduce the risk of predation, but this requires them to be able to identify the different species of predators and respond accordingly. We investigated the behavioural response of two mosquito species to three chemical signals: kairomones from two predators, and also to alarm semiochemicals from killed mosquito larvae. *Culex perexiguus* mosquito larvae are primarily surface filter-feeders. In response to all three chemical signals, they significantly reduced feeding by the high-risk active bottom scraping of biofilms in favour of the less active (and so lower predator-detection risk) surface filter feeding. Active escape swimming (instead of feeding) also increased for all three signals, but was much less for dragonfly nymph kairomones. Dragonflies are almost entirely bottom feeders and so are a much lower danger to surface feeding mosquitoes compared with damselfly nymphs, which feed at all depths. *Culiseta longiareolata* mosquito larvae normally have a high level of bottom-feeding. This was significantly reduced to all three chemical signals, but escape swimming only occurred for dragonfly kairomones (which are natural predators for the bottom-feeding larvae)." (Authors)] Address: Roberts, Derek, College of Science, Department of Biology, Sultan Qaboos University, P.O. Box 36, PC 123, Al-Khod, Muscat, Sultanate of Oman

**22159.** Robertson, L.A. (2019): Was Antoni van Leeuwenhoek secretive? His experiments with insect corneas. *FEMS Microbiology Letters*, fnz194, <https://doi.org/10.1093/femsle/fnz194>: 6 pp. (in English) ["It is often claimed that Antoni van Leeuwenhoek was secretive about his methods. However, closer examination of his letters suggests that this reputation was not always deserved. Some letters were not published in the Royal Society Proceedings, and others were edited. This paper describes the repetition of his experiments with the eyes of bees and dragonflies using Van Leeuwenhoek's own account of his experiments, despite the fact that only one of the four letters was published in the Proceedings." (Author)] Address: Robertson, L.A., Delft Science Centre, Mijnbouwstraat 120, 2628 RX Delft, The Netherlands. E-mail: l.a.robertson@tudelft.nl

**22160.** Schultz, B.; Koprivnikar, J. (2019): Free-living parasite infectious stages promote zooplankton abundance under the risk of predation. *Oecologia* 191(4): 411-420. (in English) ["Free-living parasite infectious stages, such as the cercariae of trematodes (flatworms), can represent substantial biomass in aquatic ecosystems, yet their interactions with other planktonic fauna are poorly understood. Given that cercariae are consumed by various aquatic predators, sometimes even preferentially over zooplankton, their presence may decrease predation pressure on free-living organisms within similar trophic niches by serving as alternate prey. Here, we experimentally examined how the presence of cercariae (*Plagiorchis* sp.) affected the population dynamics of common freshwater zooplankton (*Daphnia* sp.) in the

presence of a predator (the larval dragonfly, *Leucorrhinia intacta*) known to consume both. After seeding 48 mesocosms with starting populations of *Daphnia*, we used four treatments (12 replicates each) representing a factorial combination of the absence/presence of both cercariae and dragonfly larvae and tracked *Daphnia* populations over 4 weeks. We found a significant interaction between the presence of cercariae and predators on *Daphnia* population size. When faced with predation pressure, *Daphnia* reached ~50% higher numbers when accompanied by cercariae than without, suggesting a "protective" effect of the latter by acting as substitute prey. Within aquatic ecosystems, an abundance of trematodes may prove advantageous for zooplankton communities that share common predators, but further studies will be needed to determine how this varies depending on the predator, trematode, and zooplankton taxa involved." (Authors)] Address: Koprivnikar, Janet, Dept of Chemistry and Biology, Ryerson Univ., 350 Victoria Street, Toronto, ON, M5B 2K3, Canada

**22161.** Shanmugam, A.R.; Sohn, C.H. (2019): Numerical investigation of the aerodynamic benefits of wing-wing interactions in a dragonfly-like flapping wing. *Journal of Mechanical Science and Technology* 33(6): 2725-2735. ["Numerical simulations are performed to investigate the aerodynamic benefits of wing-wing interactions on a dragonfly-like flapping wing while hovering, at a value of Reynolds number  $Re$  set to 630. The local phase shift  $\psi$  and wing spacing  $L^*$  ( $L/c$ ) are varied to observe their influence on aerodynamic performance. The results show that the aerodynamic benefits due to interactions are strongly dependent on both  $\psi$  and  $L^*$ . The wing-wing interactions are beneficial for the in-phase stroking pattern at  $\psi = 0^\circ$  when  $1.2 \leq L^* \leq 2.3$ , while it is extremely detrimental for the counter stroking pattern at  $\psi = 180^\circ$  when  $1.2 \leq L^* \leq 2.3$ ; these benefits and drawbacks are dependent on the timing of the interactions. The best case, when  $\psi = 0^\circ$  and  $L^* = 2.1$ , can increase the time-averaged vertical force coefficient  $C_v$  up to ~10 % in comparison to the without-interaction case. Two unsteady flow features namely the "enhanced dipole structure" and the "in-sync of wake capture and wing-wing interactions" are observed that increase the vertical force generation in hovering dragonflies. The overall downward momentum imparted by the wing is larger for  $\psi = 0^\circ$  in comparison to  $\psi = 180^\circ$  as the wake has high vertical velocities due to the constructive role played by wing-wing interactions." (Authors)] Address: Shanmugam, A.R., School of Mechanical Engineering, Kyungpook National Univ., Daegu, Korea

**22162.** Soldati Lacerda, D.S.; Machado, A.B.M. (2019): The damselfly genus *Mecistogaster* (Odonata: Pseudostigmatidae) from the Brazilian Atlantic Forest with a description of three new species and a neotype designation for *M. amalia* (Burmeister, 1839). *Zootaxa* 4668(2): 207-228. (in English) ["*Mecistogaster Rambur*, 1842 is a genus of Pseudostigmatidae with five species distributed from Mexico to Argentina. Four of these occur in Brazil, two of which were recorded on the Atlantic Forest, *M. amalia* (Burmeister, 1839) and *M. linearis* (Fabricius, 1776). After examining 140 specimens of *Mecistogaster amalia* it was possible to conclude that it is a complex of species and three new species are described, *M. kesselringi* sp. nov., *M. mielkei* sp. nov. and *M. nordestina* sp. nov. The males differ from each other mainly by the presence or absence of alula, the area occupied by the reddish-brown color of the mesepimeron and penis structure. The females differ mainly by the region occupied for the pale apical area of wing and epiproct shape. The problem of Burmeister's type of *M. amalia* is discussed and a

neotype is erected for it. Distribution and phenology data are provided. A key for males recorded from Brazilian Atlantic Forest is presented." (Authors)] Address: Soldati Lacerda, Déborah, Laboratório de Sistemática de Insetos, Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Caixa Postal 486, 31270-901, Belo Horizonte, Minas Gerais, Brazil. E-mail: desoldati@gmail.com

**22163.** Strobl, K. (2019): Evaluating restoration success of rewetted peatlands: Recovery potential, temporal dynamics and comparison of monitoring approaches. PhD thesis, Fakultät Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt der Technischen Universität München: 79 pp. (in English, with Germany summary) [Bavaria, Germany "Ecological restoration has great potential for counteracting global losses in biodiversity and ecosystem functioning caused by unsustainable human land use. It aims at assisting the recovery of degraded ecosystems. Many restoration projects focus on peatlands, because of the significance of these ecosystems for adaptation and mitigation of climate change. Intact peatlands provide important ecosystem services like storage of water and carbon, and offer habitats for rare and endangered species, while they are highly threatened by drainage, peat extraction and afforestation. Peatland restoration supports biodiversity and ecosystem functions by creating near-natural habitat conditions, mostly through rewetting. While most meta-analyses report an incomplete short-term recovery of restored ecosystems, their longterm dynamics remain largely unknown. Peatland recovery is commonly monitored shortly after restoration, but peatlands develop slowly and initial trends may not continue. Moreover, restored peatlands are expected to provide multiple ecosystem services. This makes their assessment and evaluation of success challenging and requires novel monitoring approaches. Thus, the goals of this thesis are (1) to contribute to the scientific understanding of peatland recovery and its temporal dynamics, and (2) to improve monitoring indicators and analytical methods. For this purpose, I established a chronosequence of 18 years after rewetting in 14 peatlands in a mountainous region in Central Germany comparing three drained, 19 restored and one near-natural peatland transect. Peatlands in the study region had been previously drained and afforested, and from 1998 onwards were rewetted by damming, filling of drainage ditches and removing of trees. For monitoring several ecosystem properties (i.e. water table, peat decomposition, water holding capacity, nutrient level) and characteristic peatland biodiversity (plants, dragonflies and butterflies) were assessed. I also set up a field experiment on phytometer plants in seven restored peatlands and an associated greenhouse experiment. In the first article of the PhD thesis, temporal trends of plant, dragonfly and butterfly diversity were analysed and related to restored habitat conditions. It showed that, rewetting improved habitat conditions, vegetation structure and species diversity. Plants and dragonflies benefitted most from rewetting, while no specialized butterfly species were found within two decades after rewetting, and also generalists increased only temporarily. This is most likely due to poor regional connectivity of the (restored) peatlands. Dragonflies colonized immediately, once suitable bog pools were present in restored sites. Plants more slowly developed towards reference conditions, and mostly depended on undegraded peat with a high water holding capacity. These findings suggest, that recovery is not complete after 18 years and that the three species groups are complementary indicators for restored peatlands. The second article studied the responses of three characteristic

peatland plants (*Drosera rotundifolia*, *Eriophorum vaginatum*, *Vaccinium oxycoccos*) to restored environmental conditions by measuring various fitness traits in two phytometer experiments. While all three species are indicators for intact peatlands, their responses to rewetting were species-specific. *E. vaginatum* performed best, since all individuals survived under field conditions. The development of *D. rotundifolia* and *V. oxycoccos* was less successful, but also those species locally found suitable habitat conditions. These results highlight that local site limitation occurs, but also point at dispersal limitation. Among all measured fitness traits, many growth traits were partly redundant, and survival provided the most conclusive results for species adapted to stressful habitats. Generally, the most suitable fitness trait depends on the growth form of the respective species. The third article analyses the simultaneous recovery of multiple peatland properties with time since restoration using different multifunctionality approaches. As a reference, an optimum level was defined as the mean of the eleven highest values, while the intact peatland was excluded from the analysis. Nine out of 13 studied properties as well as the combined index significantly improved with time since restoration. Most important changes were observed within the first five years, inside the rewetted ditches, and at low or intermediate levels of functioning. A simultaneous recovery of multiple properties at high levels of functioning was not observed. These results highlight, that heavily degraded peatlands show considerable improvements in the first years after restoration, while they cannot fully recover within two decades. The general discussion compares the main findings in order to derive overall conclusions and recommendations for future monitoring and peatland management. New approaches like the use of phytometers or multifunctionality approaches are promising, but differ in their degree of comprehensiveness and explanatory power and therefore need to be carefully selected according to project goals. Indicators (ecosystem properties, taxonomic groups, species traits) differ in their response to the same treatment and therefore have to be thoroughly chosen. Restored peatlands need to be surveyed even longer than two decades in order to understand if full recovery is possible. Finally, additional management measures (dam reinforcement, repeated tree removal, improved connectivity, species introduction) should be further explored in order to advance peatland restoration to its best.] Address: <https://mediatum.ub.tum.de/doc/1484-578/1484578.pdf>

**22164.** Uniyal, A.; Prakash, C.; Upadhyay, V.; Nautiyal, B. (2019): Diversity of Odonata in the region of Doon Valley, Uttarakhand. *International Journal of Entomology Research* 4(1): 5-8. (in English) ["The present study revealed occurrence of 19 species of Odonata in Doon valley. Species from the family Libellulidae was observed to be the most dominant in Doon valley. *Orthetrum pruinosum* is the most common species found in the selected area. The present study provided the diversity and distribution of Odonata in Doon valley which would be helpful for future research." (Authors)] Address: Uniyal, A., College of Bio-Medical Sciences & Hospital, Dehradun, Uttaranchal, India

## 2020

**22165.** Abbati, M.A.; Usman, U.F.; Alkali, A. (2020): Distribution and abundance of benthic macroinvertebrate in Lande stream, Tumu, Gombe State, Nigeria. *International Journal of Current Research* 12(1): 9178-9181. (in English) ["Three sampling sites (A, B, and C) were selected. Macroinvertebrates sampled fortnightly for three months (September-

November, 2019) ... Simpson's index was employed to determine the abundance in each sampling station. The results showed a total of 189 individual species of Macroinvertebrate in 7 families among the five invertebrates taxa of Plecoptera, Coleoptera, Hemiptera, Odonata and Mollusca. The taxa abundance of Lande Stream arranged in descending trend as Mollusca > Odonata [Aeshnidae, Gomphidae] > Coleoptera > Hemiptera > Plecoptera with respective total invertebrates values of 37.73%, 25.4%, 20.63%, 8.47% and 7.94%. The Simpson's Species diversity index for the three sampling stations of A, B and C were 0.922, 0.9004 and 0.8613 respectively... while the Dominance index of A, B and C were 0.078, 0.0996 and 0.1387 respectively." (Authors)] Address: Abbati, M.A., Department of Biological Sciences, Federal University of Kashere, Gombe, Nigeria

**22166.** Aditya, S. (2020): Institutional ground serves as a safe haven for birds, butterflies and odonates – A case study from Kolkata. *International Journal of Advancement in Life Sciences Research* 3(4): 9-16. (in English) ["The objective of the present review is focussed on the assessment of the diversity of butterflies, birds and odonates with vegetation composition of habitat and conservation priorities in a college campus. A combination of direct search and opportunistic sighting methods were applied to record... 23 different Odonata species (18 Anisoptera and 5 Zygoptera) from the study area during the period 2014-2016. Our observation emphasizes that the institutional campus fulfils an environment favourable for harbouring a rich and diverse fauna. This study aims to focus on creation of a comprehensive biodiversity management program to properly monitor the diverse flora, fauna as well as the habitat in and around the college ground." (Author)] Address: Soma Aditya (Bandyopadhyay), Department of Zoology, Sarojini Naidu College for Women, 30, Jessore Road, Dum Dum, Kolkata – 700 028, West Bengal, India. Correspondence E-mail: [somaadityabandyopadhyay@gmail.com](mailto:somaadityabandyopadhyay@gmail.com)

**22167.** Bazan Carranza, D (2020): Determinación de la calidad del agua de los Humedales de Eten utilizado macroinvertebrados Odonata, Coleoptera, Diptera y Hemiptera durante Septiembre 2019 – Abril 2020. *Universidad de Lambayeque*: 81 pp. (in Spanish, with English summary) ["The "Eten Wetlands" is an ecosystem that has great ecological importance, declared an Ecological Area of Regional Interest, however, it faces various environmental problems thanks to different anthropic pressures. Over time, different investigations have been carried out in the area, however, it is important to have more information about its biological components using biotic integrity indices, these relate biological, environmental variables and human activities, which is why the main objective of The research was to determine the water quality of the Eten Wetlands using macroinvertebrates of the order Odonata, Coleoptera, Diptera and Hemiptera as bioindicators, for which 5 sampling stations were established, in 2 study periods, with a lower water level (September 2019) and higher water level (April 2019), where the environmental and physicochemical characterization of the water was performed, resulting in an „Good“ environmental state and an average water temperature of 24.24°C, an average pH of 8.1, conductivity electric of 11853 µS / cm, a BOD5 of 125 mgO<sub>2</sub>/L and dissolved oxygen of 5.33 mgO<sub>2</sub>/L., and using the quantitative collection method Using a Surber network, 11,552 individuals were collected, of which 13 macroinvertebrate species grouped into 9 families and 4 orders were identified. The environmental characterization was carried out and the biological metrics of Shannon Wiener, BMWP / Col, ASPT and SWAMPS were used to determine

the water quality of the Eten wetland, resulting in water with a high degree of contamination." (Author)] Address: <https://core.ac.uk/download/389312615.pdf>

**22168.** Bonometto, L. (2020): Le libellule del Cadore. Le specie gli habitat, il loro declino, le tutee possibili. Parco Naturale Regionale delle Dolomiti d'Ampezzo (ed.): 195 pp. (in Italian) [<https://www.dolomitiparco.com/Materiali/Testi/LibelluleCadore-compresso.pdf>] Address: Regole d'Ampezzo, Via Mons. P. Frenademez, 1 32043 Cortina d'Ampezzo, Italia

**22169.** Buczyński P.; Bojar, P.; Buczyńska, E.; Góral, N.; Tańczuk, A.; Tarkowski, A. (2020): Dragonflies (Odonata) of the Nowiny Nature Reserve (Roztocze Upland, south-eastern Poland). *Rocznik Muzeum Górnosląkiego w Bytomiu Przyroda* 26(online 012): 1-14. (in Polish, with English summary) ["In 2020 the fauna of dragonflies was studied in the Nowiny Nature Reserve comprising of 5 midforest land depressions with strongly hydrated transitional and raised bogs, some with water bodies. 33 species were recorded (46% of the national fauna), 29 of which were autochthonous or probably autochthonous. In these depressions, 14 to 24 species were recorded. The fauna was dominated by stenotopic species of peat bogs and eurytopic species. Moreover, individual species indicating the drying process of some of the sites (*Lestes dryas*) as well as instability of assemblages (*Libellula depressa*) were recorded. A limnophilous species *Anax parthenope* was recorded on the site with the largest water body (0.27 ha). In the summer, the high number and high breeding activity of thermophilous *Aeshna affinis* were observed. In general, the Nowiny Nature Reserve is an important area for the protection of peat bog fauna because of the odonate assemblages and the occurrence of such species as *Aeshna subarctica* and *Somatochlora arctica*. However, the absence of some expected species (e.g. *Aeshna juncea* and *Leucorrhinia dubia*), low number of some specialists (e.g. *Leucorrhinia rubicunda*) as well as intensive colonization of the researched area by *Aeshna affinis* may suggest the change of its fauna. It is not resulted from the degradation of habitats, but rather from the climate warming which is unfavourable for Siberian dragonflies *sensu* St. Quentin (1960) and favourable for thermophilic ones. Probably in the southern part of Poland, stronger decline of species from the first group is in progress with the simultaneous expansion of species from the second one. These two processes involve not only geographical ranges, but also extending the habitat base. It may intensify the problem with protection of tyrphobionts and tyrphophiles, a part of which is already endangered." (Authors)] Address: Buczyński, P., Dept of Zool., Maria Curie-Skłodowska University, Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

**22170.** De, K.; Ali, S.Z.; Dasgpta, N.; Uniyal, V.P.; Johnson, J.A.; Hussain, S.A. (2020): Evaluating performance of four species distribution models using Blue-tailed Green Damselfly *Anax guttatus* (Insecta: Odonata) as model organism from the Gangetic riparian zone. *Journal of Threatened Taxa* 12 (14): 16962-16970. (in English) ["In this paper we evaluated the performance of four species distribution models: generalized linear (GLM), maximum entropy (MAXENT), random forest (RF) and support vector machines (SVM) model, using the distribution of the *Anax guttatus* in the Gangetic riparian zone between Bijnor and Kanpur barrage, Uttar Pradesh, India. We used forest cover type, land use, land cover and five bioclimatic variable layers: annual mean temperature, isothermality, temperature seasonality, mean temperature of driest quarter, and precipitation seasonality to build

the models. We found that the GLM generated the highest values for AUC, Kappa statistic, TSS, specificity and sensitivity, and the lowest values for omission error and commission error, while the MAXENT model generated the lowest variance in variable importance. We suggest that researchers should not rely on any single algorithm, instead, they should test performance of all available models for their species and area of interest, and choose the best one to build a species distribution model." (Authors)] Address: De, K., Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand 248001, India. E-mail: kritish.de@gmail.com

**22171.** Grill, M. (2020): Vorkommen und Lebensräume der Quelljungfern (*Cordulegaster* spp.) im Inneren Salzkammergut. Diplomarbeit, Karl-Franzens-Universität Graz: 81 pp. (in German, with English summary) ["Occurrence and habitats of the dragonfly genus *Cordulegaster* spp. (Insecta: Odonata) in the Inner Salzkammergut. The occurrence and habitats of the dragonfly genus *Cordulegaster* spp. (Insecta: Odonata) was recorded in the inner Salzkammergut, in the areas of Bad Ischl, Bad Goisern, Hallstatt, Obertraun and Gosau. First, potential habitats were identified by remote reconnaissance using the "Austrian Map" of the BEV. Subsequently, mostly in the period from September to October, field work was carried out, looking for the presence of larvae in 64 potential habitats. In addition, habitat parameters such as altitude, flow speed, water temperature, width of the water and the pH value were noted. Specimens of the *Cordulegaster* spp. could be found at eleven locations. Larvae of *C. bidentata* and *C. boltonii* were found at a total of nine sampling sites. Adults were only found in two of the study areas. *C. heros* could not be found. The habitats of *Cordulegaster* spp. were then evaluated according to the categories "population", "habitat quality" and "impairments". The studies of the habitat parameters showed that *C. boltonii* and *C. bidentata* larvae in the Salzkammergut prefer to develop in slow-flowing, one to two meter wide streams at an altitude of 500 to 600 meters. However, there were also finds at around 800 meters above sea level. Both *Cordulegaster* species require an at least partially wooded bank and a fine gravel / sandy to muddy brook bed." (Author)] Address: <https://unipub.uni-graz.at/obvu-grhs/download/pdf/5564974?originalFilename=true>

**22172.** Hobson, K.A.; Jinguji, H.; Ichikawa, Y.; Kusack, J.W.; Anderson, R.C. (2020): Long-distance migration of the Globe Skimmer Dragonfly to Japan revealed using stable hydrogen ( $\delta^2\text{H}$ ) isotopes. *Environmental Entomology*, nva147, <https://doi.org/10.1093/ee/nvaa147>: 9 pp. (in English) ["*P. flavescens* is a long-distance migrant, well adapted to exploiting ephemeral waterbodies. This species occurs in Japan every summer, but overwintering has only been recorded on subtropical Ishigaki Island. It is not known from where the summer immigrants originate, nor what proportion of the globe skimmers seen in Japan are of local origin. We analyzed stable hydrogen isotope ( $\delta^2\text{H}$ ) composition of wings of 189 *P. flavescens* captured at six sites in Japan from August to September in 2016 (n = 57) and from April to November in 2017 (n = 132). We determined that the majority of individuals were immigrants. Individuals of probable Japanese origin occurred only later in the year and were of lower mass on average than immigrants. Immigrants potentially originated from a broad area as far west as northern India and the Tibetan Plateau and, especially late in the season, as near as northcentral China and the Korean peninsula. However, for April samples, the most parsimonious interpretation suggested southern origins, in northern Myanmar to southern China, or possibly Borneo-Sulawesi. Our

investigation underlines the power of combining stable isotope data with other information such as wind speed and direction, arrival dates, and body mass to estimate origins and to understand the life history of this and other insects." (Author)] Address: Hobson, K., Department of Biology, University of Western Ontario, 1151 Richmond Street, London, ON N6A 5B7, Canada. Email: khobson6@uwo.ca

**22173.** Meza-Salazar, A.M.; Guevara, G.; Gomes-Dias, L.; Cultid-Medina, C.A. (2020): Density and diversity of macroinvertebrates in Colombian Andean streams impacted by mining, agriculture and cattle production. *PeerJ* 8: e9619 <http://doi.org/10.7717/peerj.9619>: 26 pp. (in English) ["Background. Mining, agriculture and cattle production are activities that threaten the quality and quantity of water resources in the Colombian Andes. However, many drainage basins in this region have not been subjected to simultaneous evaluation of the impact these activities have on the density, diversity and composition of aquatic macroinvertebrates (AMI). The first two of these ecological variables are expected to decrease drastically from zones with no apparent impact towards areas with anthropogenic activity, which areas with mining will present the most impoverished AMI community. Methods. We evaluated the density, diversity and composition dissimilarity of AMI in streams impacted by gold mining, agriculture and cattle production. Two reference streams were also studied. Six benthic samplings were conducted bimonthly (Feb 2014–Feb 2015) using a Surber net. Water samples were taken in order to make environmental evaluation among the aforementioned streams, including hydrological, physicochemical and bacteriological parameters (HPCB). Diversity was evaluated as the effective number of RTUs—recognizable taxonomic units—by comparing the richness, typical diversity, and effective number of the most abundant RTUs. Compositional dissimilarity was examined with nMDS and CCA analysis. Results. A total of 7,483 organisms were collected: 14 orders, 42 families and 71 RTUs. Our prediction regarding the density and diversity of AMI (Reference > Cattle production > Agriculture > Mining) was partially fulfilled, since the agriculture-dominated stream presented a more impoverished AMI community than that of the gold mining stream. However, these streams presented lower diversity than the cattle production and reference streams, and the AMI density only differed significantly between one reference stream and the agriculture stream. The AMI composition in the agriculture-dominated stream clearly differed from that of the other streams. How to cite this article Meza-Salazar AM, Guevara G, Gomes-Dias L, Cultid-Medina CA. 2020. Density and diversity of macroinvertebrates in Colombian Andean streams impacted by mining, agriculture and cattle production. Discussion. The observation of a more impoverished AMI community in agricultural production areas compared to those with mining or cattle production may reflect the importance of the remaining riparian vegetation, which was scarce at the stream with agricultural activity. Moreover, the low diversity, and mainly the reduced AMI richness, in the agriculture stream coincided with the absence of insect genera are intolerant to deterioration of the biological and physicochemical conditions of the water (e.g. Anacroneria). Conclusions. The results suggest that the local impact of agricultural activities may be of equal or greater magnitude than that of mining in terms of AMI density, diversity and composition, in the Colombian Andean riverscape. Future studies should systematically evaluate, throughout the annual cycle, the relative effects of the productive land use, the remaining native vegetation cover and the consequent changes in the HPCB parameters of the water on AMI communities in Colombian

Andean basins." (Authors) Calopterygidae, Libellulidae] Address: Meza-Salazar, Ana M., Facultad de Ciencias Exactas y Naturales, Grupo de Investigación BIONAT, Universidad de Caldas, Manizales, Caldas, Colombia

**22174.** Román-Heracleo, J. (2020): Diversidad de libélulas (Insecta: Odonata) en ambientes lénticos con diferente grado de alteración antropogénica. Tesis de maestría, Ciudad Universitaria "Rodrigo Facio", Costa Rica: 105 pp. (in Spanish or English) ["Costa Rica is the Central American country where the dragonfly fauna is best known. However, studies have been focused mainly on lotic environments, generating an information gap in lentic environments. The increase in urbanization impacts freshwater ecosystems, generating changes in the landscape and is one of the most significant anthropogenic impacts that threatens biodiversity. This research was carried out for a year in six lagoons: two urban (La Sabana and La Paz), two semi-urban (Lankester and Doña Ana), and two rural (CATIE and El Rodeo). The objective was to evaluate the dragonfly assemblages and relate them to the environmental parameters of each site, as well as to raise larvae in order to associate the larva-adult stages for the species found. The capture of adults was carried out using an entomological net, with a total sampling effort of 5 hours (9:00-14:00pm). For data analysis, a Principal Component Analysis (PCA) was performed to identify the patterns in the lakes using the environmental variables and a similarity test (ANOSIM) was performed to determine the significance of the groups. formed. Finally, a Canonical Correspondence Analysis (CCA) was performed to determine the relationship between the taxa collected in each of the lagoons and the data on the environmental variables. In total, 644 adult specimens from 6 families, 29 genera and 51 species were collected. The families with the greatest richness were Libellulidae with 53% (29 spp.), followed by Coenagrionidae with 25% (15 spp.). The families with the least richness were Lestidae and Gomphidae with one species each. The most diverse genera were Micrathyrina (Libellulidae) with 10% (5 spp.), followed by Argia, Erythemis, Erythrodiplax with 8% of the total species richness (4 spp. each). The ANOSIM confirmed that the assembly of groups is statistically different ( $R=0.68$ ,  $p=0.001$ ). The CCA showed the effect of four physicochemical variables on the assembly of the Odonata ( $\chi^2 = 0.54$ ,  $F=2.58$ ,  $p=0.001$ ). The first two dimensions of the CCA have a significant effect: CCA1 ( $\chi^2 = 0.23$ ,  $F=4.44$ ,  $p=0.001$ ), CCA2 ( $\chi^2 = 0.15$ ,  $F=2.82$ ,  $p=0.008$ ) and we observe the formation of four groups. From the larvae raised in the laboratory, species from the families Aeshnidae, Libellulidae and Coenagrionidae were associated. Of which three species: Acanthagrion speculum, A. trilobatum, Anisagrion allopterum were associated and described for the first time and the redescription of Neoerythromma cultellatum was carried out, these species belong to the family Coenagrionidae. Our results show a high importance of urban aquatic environments for the conservation of species. A good design in the arrangement of lakes with good water quality can serve as a corridor connecting species between the urban and rural landscape, and in this way help not restrict their distribution. Furthermore, this study demonstrated that the protection and management of urban lagoons is essential to maintain the diversity of organisms." (Author/Google translate)] Address: <https://www.kerwa.ucr.ac.cr/bitstream/handle/10669/81905/Tesis%20Jareth%20Rom%c3%a1n-Heracleo.pdf?se%20sequence=1&isAllowed=y>

**22175.** Saikim, F.H.; Nordin, N.M.; Zakaria, M.Z.; Anas, N.I.; Ismail, N.; Rahman, A.A.A.; Hamdin, M.S.; Ismail, A.; Yusah, K.M.; Dawood, M.M.; Le, G.; Hamzah, Z. (2020): Tourists'

perceptions of insects as the determinants of insect conservation through entomological ecotourism. *Journal of Tropical Biology and Conservation* 17: 79-95. (in English) [oas 72: "Insects are commonly featured in recreation and tourism around the world, despite the generally negative public perception surrounding them. Many people enjoy watching butterflies in insectarium gardens, observing and collecting dragonflies, and admiring the light displays of fireflies. In many cases, activities like these are becoming increasingly popular and these positive interactions with insects encourage public appreciation of insects, but vary acutely in their forms and approaches. Thus, understanding the pattern of insect appearances in recreation and tourism activities in a variety of discernments can provide important insights into effective ways of promoting insect conservation through ecotourism, which is often overlooked in biodiversity conservation strategies. However, these types of interdisciplinary studies are relatively new and remain limited in both entomology and tourism sciences. A field survey was carried out at Kangkawat Research Station, Imbak Canyon Conservation Area, where a 1 kilometre entomological ecotourism trail was designed and developed to incorporate insects in enhancing ecotourism at the reserve. Insects that can be found along the 1 kilometre trail were recorded and the collection was conducted using baited traps and sweep netting. Based on the insects survey, the Shannon Diversity Index (H') of Kangkawat is 4.60 while Simpson Index is 176.72 with Fisher Alpha Index at 313.3 that concludes Kangkawat Research Station insect richness to be the second highest after the Crocker Range. In addressing the knowledge gaps between insect conservation and ecotourism, a survey on attitudes towards insects was designed and then completed by 384 tourists around Kota Kinabalu City. The standardized questionnaire known as the Personal Meaning of Insects Map (PMIM) was administered to tourists and their responses were elicited prior to and after observing insect photos. The results shows that "spider" had the 100% connectivity in response to the most detested insect based on their previous encounters with insects. This result shows that there is an existing entomology knowledge gap among the respondents, indicating the need for further interventions in terms of nature interpretation. Therefore a quality guided nature interpretation as an educational tool should take into account how the general public understands (or misunderstands) insects further and where interpretive information could be better applied if we are to develop management and educational tools that address human-insect encounters." (Authors)] Address: Saikim, F.H., Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia. Email: fiffy@ums.edu.my

**22176.** Tanczuk, A. (2020): Recenzja — Review. SMALLS-HIRE D., SWASH A. *Europe's Dragonflies. A Field Guide to the Damselflies and Dragonflies.* Princeton University Press, Princeton, New Jersey 2020, 360 s.. *Odonatrix* 1612 (2020): 3 pp. (in Polish, with English summary) ["The field guide is devoted to 140 species of European dragonflies and damselflies, including 13 endemic to Europe, divided into 16 major groups: 7 of damselfly and 9 of dragonfly recorded up to 2018. It is equipped with useful tools making the book easy to follow and to work with. It contains information concerning conservation status, legislation, general status, distribution maps, flight period, short identification tips in bold inside the text about each species, aspects of behaviour, breeding habitats and measurements of adult individuals. The international symbols are used as well as the English and scientific names of species based on up-to-

date nomenclature. Good-quality photos, comparing tables and look-alikes sections within the family of dragonflies and damselflies help in identification of the similar species. Photographic images were carefully selected to present both sexes and immature or old individuals colour forms and geographical variations." (Author)] Address: Tanczuk, Agnieszka, ul. Przasniczki 2/40, 20-838 Lublin, Poland. Email: atanczuk@gmail.com

**22177.** Štih, A.; Koren, T.; Frankovic, M. (2020): New data and checklist of dragonflies (Odonata) of Lastovo Island, Croatia. *Libellula* 39(3/4): 179-192. (in English, with German summary) ["In this paper we report the first overview of dragonfly fauna of Lastovo Island, southern Croatia, based on published literature data and recent surveys conducted in 2014 and 2018. So far 16 species have been recorded on the island. The following five species were detected for the first time for the island within this survey: *Ischnura elegans*, *Aeshna isocetes*, *Anax parthenope*, *Sympetrum sanguineum*, and *Selysiotthemis nigra*. Of the recorded species the most important is the record of *S. nigra*, an endangered species according to the Red book of Odonata of Croatia, known only from a handful of localities across the coastal parts of the country. On the island, small ponds represent the only source of freshwater habitats suitable for dragonfly development. Most of the visited ponds are in favourable condition and some were also recently cleared of the surrounding vegetation and partially restored." (Authors)] Address: Štih, Ana, Association Hyla, Lipovac I no. 7, 10 000 Zagreb, Croatia. Email: ana.stih2@gmail.com

## 2021

**22178.** Brady, P.C. (2021): Three-dimensional measurements of animal paths using handheld unconstrained GoPro cameras and VSLAM software. *Bioinspiration & Biomimetics* 16 026022: (in English) ["I present the system PATMOS (Paths And Tessellated Meshes from ORB\_SLAM2) for measuring three-dimensional paths of animals in situ using two handheld GoPro cameras and a small spatial reference object. Animal paths were triangulated from mobile camera positions obtained from a modified version of ORB\_SLAM2, an open-source visual simultaneous localization and mapping software package. In addition to path calculation, this process provided a virtual three-dimensional surface approximation to the environment from which path to environment distances can be quantified. PATMOS can also fit a tranquil water's surface to an analytic plane if there are a sufficient number of visible objects intersecting the water's surface and can track objects over the water's surfaces with a single camera by measuring the object with its reflection. This technology was highly portable, could follow moving animals, and gave comparable spatial and temporal resolutions to fixed camera systems that use commercial cameras. An investigation of falling objects yielded a gravitational constant measurement of  $978 \pm 40$  cm/s<sup>2</sup>. I demonstrated PATMOS's utility in terrestrial and aquatic environments by quantifying dragonfly flight characteristics and the inter-spatial distances between substrate and damselfish." (Author)] Address: Brady, P.C., Dept of Integrative Biology, University of Texas at Austin, Austin, Texas 78712, USA. Email: ParrishBrady@utexas.edu

**22179.** Cham, S. (2021): Ovipositing behaviour, egg positioning and egg set size of *Chalcolestes viridis* (Vander Linden) (Willow Emerald Damselfly) at a new site in Britain. *J. Br. Dragonfly Society* 37(1): 14-39. (in English) ["Females of *C. viridis* oviposit into the branches of woody plant species



above water or wet ground, a behaviour that is different to any other British odonate species with endophytic oviposition. At some new sites, populations of *C. viridis* can quickly build up to reach high densities. During 2020 high numbers of tandem pairs were observed at a site in Bedfordshire, England, where the availability of suitable oviposition substrates was at a premium, resulting in branches being covered by oviposition scars. These oviposition scars are in lines and each one is the result of a single oviposition event in which a set of eggs is laid. The terminology is discussed. The structure of the ovipositor and the process of oviposition are described." (Author)] Address: Cham, S., 2 Hillside Road, Lower Stondon, Bedfordshire SG16 6LQ, UK. Email: stevecham1@aol.com

**22180.** Cham, S. (2021): Egg hatching, prolarvae and larval development time of *Chalcolestes viridis* (Vander Linden) (Willow Emerald Damselfly) in Britain. *J. Br. Dragonfly Society* 37(1): 40-59. (in English) ["*C. viridis* was first recorded in Britain in 2007. The female behaviour of ovipositing into the branches of willows and other woody plant species is different to any other British species with endophytic oviposition. Egg hatching and larval development times have so far not been studied in UK populations and are the subject of this paper. The results of the study indicate that the hatching period for eggs of *Chalcolestes viridis* is between seven and nine days. Eggs predominantly hatched at night or by 06.00 BST. The viable prolarval stage, when out of water, could last for at least 1 hour 30 minutes. The distance prolarvae propel themselves could be at least 50 mm, confirming the observations of other researchers. The second stadia larvae, which are 3 mm long at transition, need to be on a horizontal water surface to extricate themselves from the prolarval sheath. Observations show the sheath to be composed of hydrophobic droplets, which assist this process." (Author)] Address: Cham, S., 2 Hillside Road, Lower Stondon, Bedfordshire SG16 6LQ, UK. Email: stevecham1@aol.com

**22181.** Clarke, D. (2021): The last populations of *Leucorhinia dubia* (Vander Linden) (White-faced Darter) at Claife Heights, Windermere, Cumbria? *J. Br. Dragonfly Society* 37(1): 60-68. (in English) ["A small native population of *L. dubia* is known to have survived for nearly a century on Claife Heights, Windermere. Its history is outlined, including the recent apparent attempts to colonise alternative sites in the area and its ultimate decline and probable extinction following low population levels. The potential of the area for future use by the species is considered." (Author)] Address: Clarke, D., Burnfoot, Cumwhitton, Brampton CA8 9EX, UK

**22182.** Deregnaucourt, I.; Wappler, T.; Anderson, J.M.; Béthoux, O. (2021): The wing venation of the Protomyrmeleontidae (Insecta: Odonoptera) reconsidered thanks to a new specimen from Molteno (Triassic; South Africa). *Historical Biology* 33(3): 306-312. (in English) ["Wing venation homologies of the Protomyrmeleontidae, a widespread group of damselfly-like stem-Odonata during the Triassic, are debated. The two main interpretations essentially disagree on the identification of RP branches. Indeed, Protomyrmeleontidae display a very complex wing venation necessarily involving, in a way or another, fusions of the concave RP branches with the convex intercalary veins. As a consequence, vein elevations in the radial area are challenging to interpret. Here, we present a new Triassic specimen from the Molteno Formation (Karoo Basin, South Africa), *Moltenagrion koningskroonensis* gen. et sp. nov. It displays a unique venation pattern supporting a new, alternative interpretation involving

a pair of supplementary intercalaries. The systematic implications of this wing venation interpretation are then discussed. The new species is assigned to the new family Moltenagrionidae fam. nov., itself considered sister-group of the family Protomyrmeleontidae, as previously delimited, both composing the super-family Protomyrmeleontoidea. Diagnoses of these taxa are revised according to our new interpretation." (Authors)] Address: Deregnaucourt, Isabelle, Centre de Recherche sur la Paléontologie – Paris (CR2P), Sorbonne Université, MNHN, CNRS, Paris, France. Email: deregnaucourt.isa@gmail.com

**22183.** Díaz Martínez, C.; Esteban Resino, J. (2021): Nuevas localidades de *Paragomphus genei* (Selys, 1841) (Odonata, Gomphidae) en el centro de la península ibérica (Castilla-La Mancha, España). *Boletín de la Asociación española de Entomología* 45(1-2): 107-112. (in Spanish) [This note reports recent observations of *P. genei* in four new localities in Castilla-La Mancha (Fig. 2), corresponding to flooded quarry holes and resulting from 2020.] Address: Díaz Martínez, Cecilia, Sociedad Entomológica y Ambiental de Castilla-La Mancha, C/ Londres, 7. 45003 Toledo. Spain. Email: cdiaz.cuenca@gmail.com.

**22184.** Endersby, I. (2021): *The Distribution of Australian Dragonflies*. Busybird Publishing: 332 pp. (in English) ["This book comprises three sections: Distribution maps for 325 species of Australian Odonata derived from nearly 60,000 records. Checklists and flight times for each of the 89 Interim Biogeographical Regions of Australia (IBRA7) Checklists and flight times for each of the 27 Köppen Climate Zones of Australia" (Author)] Address: Endersby, I., 56 Looker Rd, Montgomery, Victoria 3094, Australia. E-mail: endersby@pacific.net.au

**22185.** Gassmann, D. (2021): Der Ruf der Libelle – ein Expeditionsbericht. *Science Notes* 6: 18-25. (in German) [Report of the following expedition: Nakanai Mountains, Rapid Biodiversity Assessment, New Britain, Papua-Neuguinea, Rapid Assessment of odonate diversity across three altitude levels, 2.-27. April 2009, Conservation International, Arlington] Address: Gassmann, D., Arachnida Section, Zoological Research Museum Alexander Koenig, Bonn, Germany. Email: d.gassmann@leibniz-zfmk.de

**22186.** Guo, M.; Zheng, G. (2021): Stigma as two degrees of freedom energy sink for flutter suppression. *Journal of Sound and Vibration* 515, 22 December 2021, 116441: (in English) ["Highlights: • A novel explanation on the aerodynamic function of dragonfly stigma is proposed. • Microstructures show that the stigma can be simplified as a two degrees of freedom-energy sink. • The stigma can increase flutter speed and suppress limit cycle oscillations of the dragonfly wing. • The energy sink structure of the stigma has advantages on flutter suppression over conventional sinks. Abstract: This paper presents a novel explanation on the aerodynamic function of the dragonfly stigma, which is a pigmented spot with heavier masses near the tip of a dragonfly's wing. Dynamic modeling based on the micro-structures shows that the stigma can be simplified as two lumped masses connected by a massless beam, and installed on the primary structure by two tow springs. This model works as a two degrees of freedom (2DoF) energy sink. Theoretical modeling and numerical simulations prove that the stigma is capable to suppress flutter – a self-excited vibration. The flutter velocity of a system with the stigma is increased by 15.8% comparing to the case without the stigma, while this increase is only 3.7% if the stigma is merely considered as



a counterweight. The limit cycle oscillations (LCOs) of wing's pitch motion are also significantly reduced. A comparison in the discussion further reveals that this energy sink structure of the stigma has advantages over conventional energy sinks, which is worthy of follow-up bionic research." (Authors)] Address: Guo, M., School of Aerospace Engineering, Tsinghua University, Beijing, 100084, China.

**22187.** Horváth, G.; Egri, A.; Meyer-Rochow, V.B.; Kriska, G. (2021): How did amber get its aquatic insects? Water-seeking polarotactic insects trapped by tree resin. *Historical Biology* 33(6): 846-856. (in English) ["Amber contains numerous well-preserved adult aquatic insects (e.g., aquatic beetles, water bugs, dragonflies, caddisflies, mayflies, stone flies). Since amber is fossilised resin of terrestrial conifer trees, it is an enigma how aquatic insects have ended up in the resin. Based on field studies in a Hungarian forest along a freshwater creek we suggest that tree resin traps water-seeking flying polarotactic aquatic insects because of its property to polarise reflected light. The sticky tree resin was modelled by a water-proof, transparent, colourless insect-monitoring glue laid on vertical and horizontal fallen tree trunks next to the creek. Adults of various polarotactic aquatic insect species were trapped only by the horizontal sticky trunk. In earlier field experiments we showed that these insects find water by means of the horizontal polarisation of water-reflected light, and therefore are attracted to and land on all surfaces which reflect horizontally polarised light. Using imaging polarimetry, we revealed the criterion of polarisation-based trapping by resinous tree trunks. According to our observations, flying aquatic insects can be trapped by sticky (resinous) regions of fallen tree trunks that reflect horizontally polarised light and thus attract polarotactic species. The resin continues to flow out of the trees even when fallen over or fractured in a storm. Our findings support and complement an earlier hypothesis, according to which amber-preserved adult aquatic insects have been trapped by resinous bark when they dispersed over land.... The sticky vertical barks reflected light with directions of polarisation far from the horizontal, thus these surfaces were not attractive to water-seeking aquatic insects. After emergence, mayfly subimagos usually search any kind of nearby object to land on and moult into an imago. Consequently, their trapping on the vertical sticky trunks could happen incidentally without any motivation related to polarotaxis or seeking water surfaces. This case could be similar for *Alopteryx virgo* nymphs that crawled out from the creek directly onto the sticky surface and then become trapped in the middle of the act of emergence (Figures 6(b), 7(b), 9(a)) just like it has been found in real amber (Bechly & Wichard 2008; Wichard et al. 2009)."] (Authors)] Address: Horváth, G., Environmental Optics Laboratory, Dept Biol. Physics, ELTE Eötvös Loránd, Uni., Pázmány sétány 1, Budapest 1117, Hungary. Email: gh@arago.elte.hu

**22188.** Kosterin, O.E.; Onishko, V. (2021): *Dragonflies of Russia: Illustrated Photo Guide*. Phytos XXI. ISBN: 97859068-11912: 479 pp. (in Russian, with scientific nomenclature) ["The book offers the first detailed description of the appearance, life history, distribution and diagnostic characteristics of all 156 species of dragonflies and damselflies (Odonata) known to date from the territory of the Russian Federation, based on the authors' extensive experience and scientific literature. Each species is illustrated with original natural photographs of both sexes as well as examples of intra-species variation. Additionally, for each species there are short descriptions of the imagos of both sexes, and its change with age are given. Many recently revealed facts are published here for the first time. There are no distribution maps as the

actual range of Odonata borders in Russia remain unknown to a large extent. As is usual in guides based on illustrations, there are no identification keys but diagnostic differences between similar species are provided instead. The introduction leads a reader through the structure, life cycle, habits and classification of dragonflies. The combination of thorough descriptions of differences between similar species, rich illustrations and a detailed introduction allows readers to identify dragonfly species without keys or any specialized knowledge. This book unites the features of a popular atlas with an academic work and fills the gap existing in Russian literature concerning such a conspicuous and attractive group of flying insects as the dragonflies. The book is aimed at a broad range of nature lovers but, as a compilation of all existing knowledge of dragonflies of the country, it will be useful for entomologists as well." (Publisher)]

**22189.** Mauersberger, R. (2021): Zum Vorkommen submerser Vegetation an Fortpflanzungshabitaten von *Leucorrhinia pectoralis* in NO-Deutschland (Odonata: Libellulidae). *Libellula* 40(1/2): 57-76. (in German, with English summary) ["On the occurrence of submerged vegetation at reproductive habitats of *Leucorrhinia pectoralis* in NE Germany (Odonata: Libellulidae) – Using a large data set compiled in a period of three decades showed that favourable reproductive habitat waters of *Leucorrhinia pectoralis* in the lake landscapes of NE Germany were always structured by under water plants. Also 92% of the habitats with lower quality were covered by submerged vegetation, mostly consisting of e.g. *Utricularia* spp., *Ceratophyllum* spp., *Stratiotes aloides*, *Lemna trisulca*, Charophytes or submerged mosses. During a monitoring survey on dragonfly emergence of a very small shallow lake in northern Brandenburg with a usually low density of *L. pectoralis*, it was observed that a large occurrence of *Utricularia vulgaris* appeared for one summer. In the following year the abundance of exuviae of *L. pectoralis* was about 30 times higher than before, two years later still 5 times higher and three years later on the low level again as it was before. The author concludes that especially young larval stadia of this species are especially benefitted by the presence of submerged vegetation." (Author).] Address: Mauersberger, R., Petersdorfer Str. 23, 17268 Templin, Germany. Email: rue.mau@web.de

**22190.** Medina-Espinoza, E. (2021): Análisis del ensamblaje adulto de Odonata (Insecta) en cuerpos de agua de la estación biológica Los Amigos, Madre de Dios. Tesis para Optar el Título Profesional de Bióloga, Facultad de Ciencias, Universidad Nacional Agraria La Molina: 80 pp. (in Spanish, with English summary) ["Freshwater ecosystems are one of the most polluted environments worldwide. Madre de Dios is one of the Peruvian departments that harbors a great diversity of species and one of the main threats it faces is the loss of forests due to gold mining, which has negative effects on its water bodies. Little ecological information is known about Peruvian Odonata, which are freshwater insects. The present study analysed the adult odonate assemblage diversity in three aquatic environments within the Los Amigos biological station (a blackwater pond, an oxbow lake and a stream) in May and October of 2018. A total of 46 species were recorded, belonging to 25 genera and six families. The most represented families were Libellulidae and Coenagrionidae. The assessment sites showed similar diversity values using Hill numbers. However, differences were found in the species composition in the three water bodies assessed, including between lakes. This was because, although they shared a considerable number of

species, the relative abundances of each species varied depending on the assessment site. Therefore, dragonfly assemblages in the Los Amigos biological station change according to the body of water where they are found. This highlights the importance of knowing the taxa that are part of the assemblages of the different types of freshwater environments in order to better understand the changes that might occur in these types of ecosystems." (Author) <https://repositorio.lamolina.edu.pe/bitstream/handle/20.500.12996/51-29/medina-espinoza-emmy-fiorella.pdf?sequence=1&isAllowed=y> Address: Medina-Espinoza, Emmy, Depto de Entomología, Museo de Historia Natural de la Universidad Nacional, Mayor de San Marcos, Av. Arenales 1256, Jesús María, Lima, Peru. E-mail: efme.04@gmail.com

**22191.** Pix, A. (2021): Tagfalter und Libellen im Reinhardswald der Klimawende und der „Fichtendämmerung“. Jahrbuch Naturschutz in Hessen 20: 68-72. (in German) [[https://www.naturschutz-hessen.de/downloads/JNH\\_20/einzelartikel/JB\\_20\\_14\\_Tagfalter\\_und\\_Libellen\\_im\\_Reinhardswald.pdf](https://www.naturschutz-hessen.de/downloads/JNH_20/einzelartikel/JB_20_14_Tagfalter_und_Libellen_im_Reinhardswald.pdf)] Address: Pix, A., Mönchehofstr. 1, 34127 Kassel, Germany. Email: Andreas.Pix@t-online.de

**22192.** Shackleton, M.E.; Dafforn, K.A.; Murphy, N.P.; Greenfield, P.; Cassidy, M.; Besley, C.H. (2021): How does molecular taxonomy for deriving river health indices correlate with traditional morphological taxonomy? Ecological Indicators 125, 107537: 15 pp. (in English) ["Macroinvertebrate surveys are commonly used for assessing the health of freshwater systems around the world. Traditionally, surveying involves morphologically identifying the families, and sometimes genera, present in samples. Biological indices, derived from taxonomic lists, provide convenient ways to summarise community data and may be fairly insensitive to species-level changes in community compositions. In recent years, molecular techniques for identifying taxa have become increasingly popular and metabarcoding approaches that offer the ability to identify species from mixtures of whole animals (bulk-samples) or from environmental samples have gained much attention. However, generating accurate species lists from metabarcode data is challenging and can be impacted by sample type, choice of primers, community composition within samples, and the availability of reference sequences. This study compares the performance of molecular data extracted from bulk-samples against morphological data in calculating two biological indices (the Stream Invertebrate Grade Number Average Level 2 (SIGNAL2), which is calculated from family-level data, and a genus-level equivalent of this index, SIGNAL\_SG) and one biological metric (taxon richness). Further, molecular indices and metrics derived from global, local or mixed reference DNA libraries and with varying degrees of filtering processes applied to them, are compared with respect to the strength of their relationships with morphological indices and metrics. Molecularly derived SIGNAL2 and SIGNAL\_SG scores correlated strongly with morphologically derived scores, and were strongest when using a reference library containing a mix of local and global data. Molecularly derived richness metrics were moderately correlated with morphological taxa richness; however, the strongest correlations were observed when taxa that could not be assigned SIGNAL grades were omitted from analyses. This study highlights the utility of using molecular data as an objective and sensitive alternative to traditional freshwater biological assessment using macroinvertebrates.... The Odonata were the most family diverse taxa and performed relatively well in terms of F1 cores, with scores ranging from 0.67 to 0.92. The notable exception in the Odonata was the family Synthetistidae,

which returned a null F1 score despite being as prevalent as Gomphidae." (Authors)] Address: Shackleton, M.E., Centre for Freshwater Ecosystems, La Trobe University, Australia. Email: m.shackleton@latrobe.edu.au

**22193.** Vorstand der Gesellschaft deutschsprachiger Odonatologen (2021): Diese Ausgabe erscheint zu Ehren von Ulrike Krüner. Libellula 40(3/4): o.P. (in German) ["The "Grand Dame" of the GdO celebrated her 75th birthday this year! Ulrike (Krüner) is an honorary member of our society and has helped to determine and strongly promote the development of the association through her special energy and hands-on nature. She has been the manager for many years taken over and who among us doesn't own one of the beautiful dragonfly accessories that Ulrike offered us at the conferences. Dear Ulrike, On behalf of the entire membership, we warmly congratulate you and wish you all the best! The board"] Address: Conze, K.-J., Hamburger Str. 92, 45145 Essen, Germany. E-mail: kjc@loekplan.de

**22194.** Watt, T. (2021): Changes in the zygopteran populations at Castle Fraser, Aberdeenshire with particular reference to *Coenagrion hastulatum* (Charpentier) (Northern Damselfly). J. Br. Dragonfly Society 37(1): 1-13. (in English) ["The population of *C. hastulatum* has been surveyed at the Flight Pond at Castle Fraser for ten years but, since 2013, its numbers have declined. The other zygopterans present have shown a similar trend with the exception of *Enallagma cyathigerum*, the population size of which has increased in recent years. These results are discussed in the light of changes in the vegetation around the Flight Pond and the arrival of *Coenagrion puella* in 2009. The creation of a second 'New Pond' has so far had a positive effect on the zygopteran populations at Castle Fraser." (Author)] Address: Watt, T., 7 Myrtle Terrace, Portlethen, Aberdeen, AB12 4SZ, UK

## 2022

**22195.** Acquah-Lamptey, D. (2022): Large scale patterns of African and European Odonata; The importance of functional traits. Dissertation, Fachbereich Biologie der Philipps-Universität Marburg: 199 pp. (in English) ["Biodiversity patterns, community composition, and ecological dynamics are linked to species' responses to climatic conditions, biotic interactions, and dispersal limitations. Climate change has led to shifts in species ranges to higher altitudes and latitudes, changes in species population trends, and changes in species phenology. That makes climate change a fundamental concern for biodiversity conservation and makes understanding the effect of climate change on biodiversity a central theme in ecology. A promising approach to understanding the mechanisms shaping species distribution and community composition is linking physiological processes, functional traits, and the climatic environment. Two ubiquitous features of animals of great functional importance are body size and body colour. For instance, both traits influence the temperature excess of species and thereby have significant consequences on species distributions, abundances, activities, and development. However, thus far, support for the importance of body size and body colour is sparse for insects, particularly at larger spatial and taxonomic scales. In addition, the effects of both traits on community composition and species' responses to environmental changes remain poorly understood. Whereas it is difficult to monitor species populations across entire ranges, the IUCN established criteria that allow taxon experts to broadly categorize the threat status of species. However, only 1 % of the insects described so far have been assessed, with 26 % of these

categorised as data deficient. Especially in tropical regions and for tropical taxa, we lack an understanding of the drivers associated with threatened insect species. The overall objective of this PhD thesis was to investigate the importance of interactions between environmental factors and species' functional traits across Europe and Africa. My work focused on damselfly and dragonflies (Odonata) because of their ecological importance and exceptional natural history record among insects. With this, I aim to improve our understanding of the mechanistic processes underlying biogeographical patterns and species extinction risk and ultimately improve forecast of the ecological consequences of climate change. In one chapter of this thesis, I quantified the colour lightness and body volume of European Odonates and combined these traits with survey data for local assemblages across Europe. Based on this continent-wide yet spatially explicit dataset, I tested for effects of temperature and precipitation on the colour lightness and body volume of local assemblages and assessed differences in their relative importance and strength between lentic and lotic assemblages. I show that the colour lightness of assemblages of Odonates increased, and body size decreased with increasing temperature. My results demonstrate that the mechanisms underlying colour lightness and body size variations scale to local assemblages. Together with previous studies on larger spatial scales, these results underline the general importance of colour- and size-based thermoregulation in insects. Both size- and colour-based thermoregulation were of similar importance for species preferring lentic and lotic habitats (standing vs. running water), but the higher dispersal ability of lentic species seems to allow them to better track their thermal optimum. In another chapter, I integrated trait-based models with environmental factors to investigate the mechanistic underpinnings of species' extinction risk for 489 African and European Odonates. Using body size, wing load, and habitat preference, I incorporate current theoretical and empirical support for single effects of environmental variables on species traits into structural ecological models. Specifically, I tested whether species are generally larger in colder environments; whether species adapted to less stable habitats and with lower wing loads have smaller ranges; and finally, the extent to which these trait-environment relationships translate into a higher extinction risk of species. The results of this chapter demonstrate that species adapted to lotic habitats as well as smaller species and species with high wing loads have smaller range sizes. In addition, larger species and those with lower wing loads had more northern distributions and inhabited colder climates. Species with smaller ranges and those occurring in colder and more northern regions had a higher extinction risk. I thereby demonstrate that strong links between intrinsic traits (body size, wing load, and habitat preference) and extrinsic traits (range size, thermal preference, and latitudinal position) can explain a substantial part of the variation in species' extinction risk. However, in contrast to models of extrinsic traits alone, I emphasize that the mechanisms underpinning species' extinction risk are important to consider for understanding which species are particularly threatened and why. Thereby, trait-based models have a high potential to forecast and mitigate the negative impacts of environmental changes and other threats to species. In another chapter, I investigated the potential of Odonates as biological control predators of mosquito larvae under almost natural conditions. I found that the widespread dragonfly *Brachytrichia strachani* is capable of breeding in and naturally colonising water storage containers used in typical rural homes, which are breeding grounds for mosquitoes. My mesocosm experiments show that the presence of *B. strachani* resulted in a drastic reduction of mosquito larvae density, especially in sunlit containers. My

results confirm that dragonfly larvae are effective biological control agents of the disease-causing vector, with great benefits to the livelihood of people. In summary, I demonstrate the importance of the mechanistic links between colour lightness and body size with the temperature regime which shapes the biogeographical patterns of European Odonates using spatially explicit survey data. The consistency of this reiterates the general importance of thermal melanism and Bergmann's rule for ectotherms at the local assemblage scale. However, besides highlighting the essential role of traits involved in thermoregulation in shaping the distribution of Odonates, the greater dispersal ability of lentic species in combination with the climatic history seems to have allowed them to better cope with the historical climatic changes. Furthermore, my results highlight the importance of functional traits in species extinction risk assessments. Body size, habitat preference, and wing load explain why some species are particularly threatened and may thus serve as a red flag for threat assessment in conservation, even for species that lack distribution data. These integrative trait-based analyses are particularly relevant for providing links between ecology and conservation, which are important for completing and predicting species threats. These results underline the ecological importance of Odonates and highlight a great potential for integrating interactions of morphological traits with species phylogenetic data and proxies of dispersal ability, into trait-based models to improve our understanding of biological responses to environmental changes and other potential threats. The importance of the functional traits of species and the generality of their impact on ecological dynamics stress that mobilization of trait data provides an important future avenue to improve baseline predictions and the information basis for large scale conservation of insect diversity." (Author)] Address: Acquah-Lamptey, D., Fac. Biol., Dept of Ecology–Animal Ecology, Philipps Univ. Marburg, Karl-von-Frisch-Str. 8, 35043 Marburg, Germany

**22196.** Al-Shamry, A.S.H.H.; Mizhir, A.H. (2022): Diversity of aquatic insects in the euphrates River/Najaf province-Iraq. *International Journal of Health Sciences* 6(S7): 3464-3476. (in English) ["Five locations were sampled with three duplicates from each throughout the course of a six-month period, from November 2021 to April 2022, in order to assess the biodiversity of crustaceans. Water was also included in the samples. Certain chemical and physical characteristics of water are measured. the overall density of aquatic insects varied from (1–257) individuals/L, the month of April had the greatest density. According to the findings of the isolation and identification of water insects, Chironomidae larvae were the most numerous throughout the research period, followed by Chironomide pupa, Zygoptera nymph, Odonata larvae, and *Belostoma corodofanum*. According to the relative abundance index for aquatic insects, the Zygoptera nymph species was most prevalent in the first location, whereas Chironomidae larvae were more prevalent in the other sites. The constancy species index (S) of aquatic insects, Chironomidae larvae and Chironomide pupa, were the most constancy across all research locations and throughout the course of the study period. The values of the species richness index ( $D^*$ ) ranged from 0-3.84. While the Shannon-Weiner index ranged between 0-1.361 bit/ind. While the values of the species uniformity index (E) ranged between 0-0.845." (Authors)] Address: Al-Shamry, A., Dept of Ecology and Pollution College of Science, University of Kufa, Najaf, Iraq. Email: salamaliraqii14@gmail.com

**22197.** Altieri, P.D. (2022): Estudio de las tramas tróficas de macroinvertebrados en bañados de desborde fluvial del

área pampeana con diferentes usos del suelo. PhD thesis, Facultad de Ciencias Naturales y Museo Universidad Nacional de La Plata: 175 pp. (in Spanish, with English summary) [Argentina; the thesis includes references on Odonata at the genus level.] Address: [http://sedici.unlp.edu.ar/bitstream/handle/10915/147152/Documento\\_completo.pdf-PDFA.pdf?sequence=1&isAll owed=y](http://sedici.unlp.edu.ar/bitstream/handle/10915/147152/Documento_completo.pdf-PDFA.pdf?sequence=1&isAll owed=y)

**22198.** Association Bourgogne-Franche-Comté Nature (2022): Atlas des odonates de Bourgogne-Franche-Comté. Revue scientifique Bourgogne-Franche-Comté Nature, Hors-série n°17: 446 pp. (in French) [France "A long-term project initiated in 2010 by the Natural History Society of Autun – Burgundy Wildlife Observatory, the National Botanical Conservatory of Franche-Comté – Regional Invertebrate Observatory and OPIE Franche-Comté, and carried out thanks to with the support and involvement of numerous volunteers, allows us to deliver this atlas which, we hope, will amaze you and interest you even more in dragonflies. The work This work aims to present to you the diversity of dragonflies in our region and to share the knowledge acquired throughout these years. Through its 446 pages, the atlas illustrates in detail the 75 species present in the region, their distribution, their biology, and the threats weighing on them. Around twenty chapters complement the monographs, all of which are richly illustrated. This atlas aims to present to you the diversity of dragonflies in our region in a pleasant way and to share the knowledge acquired throughout these years. Finally, let us not forget that nature is constantly in motion and that a work of this type presents an image frozen over a window of time. It will evolve with the populations of odonates, influenced by modifications of natural environments and climate changes, but also by the knowledge we have of them. Authors: Natural History Society of Autun – Burgundy Wildlife Observatory, the National Botanical Conservatory of Franche-Comté – Regional Invertebrate Observatory and OPIE Franche-Comté." (Publisher/Google Translate)] Address: <https://cbnfc-ori.org/espace-documentation/atlas-des-odonates-de-bourgogne-franche-comte>

**22199.** Ayayee, P.A.; Wesner, J.S.; Ouellette, S.P. (2022): Geography, taxonomy, and ecological guild: Factors impacting freshwater macroinvertebrate gut microbiomes. *Ecology and Evolution*. 2022;12: e9663.: 15 pp. (in English) ["Despite their diversity, global distribution, and apparent effects on host biology, the rules of life that govern variation in microbiomes among host species remain unclear, particularly in freshwater organisms. In this study, we sought to assess whether geographic location, taxonomy (order, family, and genus), or functional feeding group (FFG) designations would best explain differences in the gut microbiome composition among macroinvertebrates sampled across 10 National Ecological Observatory Network's (NEON) freshwater stream sites in the United States. Subsequently, we compared the beta diversity of microbiomes among locations, taxonomy (order, family, and genus), and FFGs in a single statistical model to account for variation within the source microbial community and the types of macroinvertebrates sampled across locations. We determined significant differences in community composition among macroinvertebrate orders, families, genera, and FFGs. Differences in microbiome compositions were underscored by different bacterial ASVs that were differentially abundant among variables (four bacterial ASVs across the 10 NEON sites, 43 ASVs among the macroinvertebrate orders, and 18 bacterial ASVs differing among the five FFGs). Analyses of variations in microbiome composition using the Bray–Curtis distance matrix revealed FFGs as the dominant source of variation (mean standard

deviation of 0.8), followed by stream site (mean standard deviation of 0.5), and finally family and genus (mean standard deviation of 0.3 each). Our findings revealed a principal role for FFG classification in insect gut microbiome beta diversity with additional roles for geographic distribution and taxonomy.... Wollbachia was most abundant in aquatic Coleoptera (70.28%), followed by Odonata (20.08%) [Cordulegaster, Gomphidae], Trichoptera (17.28%), Plecoptera (8.20%), and Ephemeroptera (0.15%)." (Authors)] Address: Ayayee, P.A., Dept of Biology, Univ. of Nebraska at Omaha, Omaha, Nebraska, USA. Email: [payayee@unomaha.edu](mailto:payayee@unomaha.edu)

**22200.** Chacón Ramos, E. (2022): Utilización de macroinvertebrados en el monitoreo de la calidad de los recursos hídricos. Revisión Sistemática 2022. Tesis para obtener el título profesional de: Ingeniera Ambiental, Universidad César Vallejo, Fac. de Ingeniería y Arquitectura, Escuela Profesional de Ingeniería Ambiental: 76 pp. (in Spanish, with English summary) [The thesis includes references on Odonata, in most cases at the family level.] Address: [https://repositorio.ucv.edu.pe/bitstream/handle/20.500.12692/103703/Chac%C3%B3n\\_RE-SD.pdf?sequence=1&isAllowed=y](https://repositorio.ucv.edu.pe/bitstream/handle/20.500.12692/103703/Chac%C3%B3n_RE-SD.pdf?sequence=1&isAllowed=y)

**22201.** Dimitrov, D.A.; Bechev, D.N. (2022): Odonata of the City of Plovdiv and its Surroundings. *Bulletin of the Natural History Museum. Plovdiv*, 2022, Supplement 2: 61-63. (in English) ["Updated list of the dragonflies (order Odonata) of the city of Plovdiv and its environs contains 26 species from 7 families: Aeshnidae (4), Libellulidae (9), Gomphidae (4), Calopterygidae (2), Coenagrionidae (3), Lestidae (3) and Platycnemididae (1)."] (Authors)] Address: Dimitrov, D.A., University of Plovdiv "Paisii Hilendarski", Department of Zoology, 24 Tzar Assen Str., BG-4000 Plovdiv, Bulgaria. Email: [dbechev@abv.bg](mailto:dbechev@abv.bg)

**22202.** Grabowski, N.T.; Abdulmawjood, A.; Acheuk, F.; Barragán Fonseca, K.; Chhay, T.; Costa Neto, E.M.; Ferri, M.; Franco Olivas, J.; González Aguilar, DG., Keo, S., Lertpatarakomol, R., Miech, P.; Piofczyk, T.; Proscia, F.; Mitchathai, J.; Guerfali, M.M.; Sayed, W.; Tchibozo, S.; Plötz, M. (2022): Review: Insects — A source of safe and sustainable food? — "Jein" (yes and no). *Front. Sustain. Food Syst.* 5:701797. doi: 10.3389/fsufs.2021.701797: 17 pp. (in English) ["For almost a decade, edible insects have become promoted on a wider basis as one way to combat world hunger and malnourishment, although attempts to do so have a longer history. Contemporary researchers and consumers, particularly those without an entomophagous background, have been rising safety and sustainability concerns. The present contribution seeks a substantiated answer to the question posed above. The possible answer consists of different factors that have been taken into consideration. First, the species and its life cycle. It is mandatory to realize that what is labeled as "edible insects" stands for more than 2,140 animal species, not counting other edible, non-crustacean arthropods. Their life cycles are as diverse as the ecological niches these animals can fill and last between some days to several years and many of them may — or may not—be reproduced in the different farming systems. Second, the level of knowledge concerning the food use of a given species is important, be it traditional, newly created by research, or a combination of both. Third, the existence of a traditional method of making the use of the insect safe and sustainable, ideally from both the traditional and themodern points of view. Fourth, the degree of effectiveness of these measures despite globalization changes in the food-supplying network. Fifth, farming conditions, particularly housing, feeding (type, composition, and contaminants), animal health

and animal welfare. Sixth, processing, transport, and storage conditions of both traditional and novel insect-based foodstuffs, and seventh, consumer awareness and acceptance of these products. These main variables create a complex web of possibilities, just as with other foodstuffs that are either harvested from the wild or farmed. In this way, food safety may be reached when proper hygiene protocols are observed (which usually include heating steps) and the animals do not contain chemical residues or environment contaminants. A varying degree of sustainability can be achieved if the aforementioned variables are heeded. Hence, the question if insects can be safe and sustainable can be answered with "jein," a German portmanteau word joining "yes" ("ja") and "no" ("nein")." (Authors) The paper includes references to Odonata.] Address: Grabowski, N.T., Inst. Food Quality & Food Safety, Hannover Univ. for Veterinary Medicine, Foundation (TiHo), Hanover, Germany. Email: nils.grabowski@tiho-hannover.de

**22203.** Gusenleitner, F.J.; Schwarz, M. (2022): 17. Oberösterreichische Entomologen einst und jetzt. Entomofauna – M4: 209-281. (in German) [The paper contains biographic notes of Austrian or regionally active odonatologists.] Address: Schwarz, M., Biologiezentrum Linz, J.-W.-Klein-Straße 73, 4040 Linz, Austria. Email: martin.schwarz@oelkg.at

**22204.** Harvey, J.A.; Tougeron, K.; Gols, R.; Heinen, R.; Abarca, M.; Abram, P.K.; Basset, Y.; et al. (2022): Scientists' warning on climate change and insects. Ecological Monographs e1553. <https://doi.org/10.1002/ecm.1553>: 37 pp. (in English) ["Climate warming is considered to be among the most serious of anthropogenic stresses to the environment, because it not only has direct effects on biodiversity, but it also exacerbates the harmful effects of other human-mediated threats. The associated consequences are potentially severe, particularly in terms of threats to species preservation, as well as in the preservation of an array of ecosystem services provided by biodiversity. Among the most affected groups of animals are insects — central components of many ecosystems — for which climate change has pervasive effects from individuals to communities. In this contribution to the scientists' warning series, we summarize the effect of the gradual global surface temperature increase on insects, in terms of physiology, behavior, phenology, distribution, and species interactions, as well as the effect of increased frequency and duration of extreme events such as hot and cold spells, fires, droughts, and floods on these parameters. We warn that, if no action is taken to better understand and reduce the action of climate change on insects, we will drastically reduce our ability to build a sustainable future based on healthy, functional ecosystems. We discuss perspectives on relevant ways to conserve insects in the face of climate change, and we offer several key recommendations on management approaches that can be adopted, on policies that should be pursued, and on the involvement of the general public in the protection effort." (Authors) The paper includes a few references to Odonata resp. *Anax imperator*.] Address: Harvey, J.A., Dept of Terrestrial Ecology, Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, The Netherlands. Email: j.harvey@nioo.knaw.nl

**22205.** Hevers, J.; Martin, P. (2022): Nachruf auf Klaus Böttger – 14. Januar 1934 bis 7. Oktober 2020 - Obituary of Klaus Böttger. 14 January 1934 until 7 October 2020. Faunistisch-Ökologische Mitteilungen 11: 7-17. (in German) [K. Böttger was a leading expert in Hydrachnellae, Acari, with special reference to Odonata. Regrettably, most of its papers have been published in German language which

made them difficult to access for the global scientific community.] Address: Hevers, J., Germersheimstr. 16, 38112 Braunschweig, Germany. Email: j.hevers@t-online.de

**22206.** Holly, F.; Bronnhuber, W. (2022): Ecknachtal – Libellen (Odonata). Ecknachtalkartierung. Im Rahmen des Erfolgsmonitorings BayernNetzNatur-Projekt „Ecknachtal“. LBV-Report 2022: 4-17. (in German) [In 2021, in Landkreis Aichach-Friedberg; Bayern; Germany, 29 odonate species were documented, including *Coenagrion scitulum* and *Ophiogomphus cecilia*. For details see: <https://sa0e76b775810b-3a8.jimcontent.com/download/version/1675592924/module/12016415428/name/LBV-Report-2022.pdf>]

**22207.** Kohl, S.; Wildermuth, H. (2022): "Der Greifensee": Libellen und Heuschrecken. Neujahrsblatt 2022 der Naturforschenden Gesellschaft in Zürich: 157-168. (in German) ["Of the approximately 80 dragonfly species identified in Switzerland, 58 are known from the Greifensee area. The relatively high number of species is due to the fact that different, sometimes rare types of standing and flowing water occur in the area. In addition to the largely undeveloped lake shore, these include ponds of various sizes and depths inside and outside the reed areas, former peat ditches and fen ditches, ponds and ponds in gravel pits, spring outflows and spring outflows, as well as the Glatt, the Aabach, the Mönchaltorfer Aa and some smaller streams as tributaries to the lake. These waters must be at least partially sunny for dragonflies. All dragonflies regularly observed in the Greifensee area are summarized here in an overview. Table 1 lists 45 species. We know little about the remaining 13 species. Two of them are extinct: *Nehalennia speciosa*, which was only discovered in 1974 in the Rällikon lake meadows and was last recorded in 1983, and *Leucorrhinia pectoralis*, which develops in peat waters and has not been observed at Greifensee since 1990. In the nearby Pfäffikersee area, she was able to hold on to peat cuttings thanks to care measures. Since dragonflies can fly very far, they sometimes appear as solitary animals in places where they almost certainly did not evolve. These rare guests include *Lestes barbarus* and *L. virens*, *Ophiogomphus cecilia*, *Leucorrhinia dubia*, *Symptetrum pedemontanum*, *S. flaveolum* and *S. meridionale*. The rare *S. depressiusculum* is shown on the cover photo. Recently, in special weather conditions, *Anax ephippiger* and *Aeshna affinis* also occasionally appear in our region. *Coenagrion scitulum* has only been seen once so far, but will probably become established in the future. On the other hand, *Aeshna juncea* and *S. danae* have virtually disappeared as losers from climate change. (Authors/Google Translate)] Address: Wildermuth, H., Haltbergstr. 43, 8630 Rütli, Switzerland. E-mail: hansruedi@wildermuth.ch

**22208.** Mauersberger, R. (2022): Zur Haltbarkeitsdauer der Exuvien von *Aeshna mixta* (Odonata: Aeshnidae) am Schlupfsubstrat. *Libellula* 41(1/2): 69-76. (in German, with English summary) ["Stability duration of exuviae of *Aeshna mixta* at the emergence site – The study site was a reed belt of a small shallow lake in the north of Brandenburg (Germany) consisting of *Phragmites australis* and *Typha angustifolia* with a very high emerging abundance of *A. mixta* in the year 2021 where exuviae of this species were counted recurrently from the main emergence period onwards to the disappearance of all specimens. The number of traceable exuviae was decreasing exponentially. After two weeks less than one third of the exuviae could be observed again, 19% were still detected after 30 days, the last one was found after 136 days. The average duration was 16,3 days." (Author)]

Address: Mauersberger, R., Petersdorfer Str. 23, 17268 Templin, Germany. Email: rue.mau@web.de

**22209.** Mouchet, S.R.; Verstraete, C.; Bokic, B.; Mara, D.; Dellieu, L.; Orr, A.G.; Deparis, O.; Van Deun, R.; Verbiest, T.; Vukusic, P.; Kolaric, B. (2022): Revealing natural fluorescence in transparent insect wings by linear and nonlinear optical techniques. *Journal of Luminescence* 254(Part B), 119490; doi: 10.1016/j.jlumin.2022.119490: 16 pp. (in English) ["For most natural organisms, the physical, chemical and biological aspects of fluorescence emission are poorly understood. For example, to the best of our knowledge, fluorescence from the transparent wings of any of the 3000 known species of cicadas has never been reported in the literature. These wings are known to exhibit anti-reflective properties arising from quasi-periodic arrays of nipples. Our study, using linear and nonlinear optical techniques, including spectrofluorimetry, two-photon fluorescence spectroscopy and Second Harmonic Generation (SHG), reveals the fluorescence properties in the wings the grey and the common cicadas (*Cicada orni* and *Lyristes (Tibicen) plebejus*, respectively), as well as the broad-bordered bee hawkmoth (*Hemaris fuciformis*). The study suggests that fluorescence would be more widespread in transparent insect wings than what was previously believed. Comparing this result to the fluorescence emission from the wings of the Bornean damselfly (*Vestalis amabilis*), we inferred that this emission probably arises from resilin, a protein reported to enhance wing flexibility. Moreover, the nonlinear optical investigation of the insects' wings provided further insight into wing structure, indicating that multiphoton techniques add valuable information for the analysis of insect integuments. The strong SHG signal detected from the wing veins implies that these veins are materially organised in a non-centrosymmetric and hence non-random fashion.] Address: Mouchet, S.R., School of Physics, Univ. Exeter, Stocker Road, Exeter EX4 4QL, UK. Email: s.mouchet@exeter.ac.uk

**22210.** Ng, Y.H.; Rahman, A.A.A.; Zainal, M.-Z.; Abdul-Latif, M.A.B. (2022): First record of insects in Pulau Tinggi, Johor, Malaysia. *Journal of Sustainability Science and Management* 17(1): 99-109. (in English) ["Species assembly of insects in Pulau Tinggi was extensively studied to obtain the first checklist of insect fauna on the island. Samples were collected from forested areas in Pulau Tinggi on three occasions (20-30 April, 1-10 May and 20-30 June 2019) .... Three families from the order Odonata were recorded in Pulau Tinggi. Notable species include *Agrionoptera insignis* and *Neurothemis fluctuans* which have also been recorded in the forest of Pulau Pangkor (Farizawati et al., 2014), Pulau Tioman (Choong et al., 2017) and in more than eight localities in Johor mainland (Abdul Aziz et al., 2018). It is worth noting that Pulau Tioman is also part of the Seribu Archipelago. Being a generalist species, *N. fluctuans* is more widespread, with additional records in Pulau Carey, Pulau Langkawi and Pulau Pinang (Farizawati et al., 2014). In Pulau Tinggi and Pulau Sibul, *Orthetrum testaceum* and *N. fluctuans* were the most abundant species from the Libellulidae family (Azmi & Haris-Hussain, 2019). *O. testaceum* and *N. fluctuans* have also been reported in three National Parks in Sarawak (Kubah National Park, Lambir Hills National Park and Similajau National Park) (Dow et al., 2013). Members from the Libellulidae family are regularly found as the most dominant in tropical and subtropical forests. Additionally, their distribution is common in various habitats due to their ability to breed in open and disturbed habitats (Azmi & Haris-Hussain, 2019)."] (Authors) *Anax guttatus*, *O. testaceum*, *O. glaucum*, *Lathrecista asiatica*, *N.*

*fluctuans*, *Neurothemis* sp., *Trithemis festiva*, *Agrionoptera insignis*, *Argiolestidae* sp.] Address: Rahman, A.A.A., Department of Technology and Natural Resources, Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia (Pagoh Campus) 84600 Muar, Johor, Malaysia. Email: aqilah@uthm.edu.my

**22211.** Pan, Y. Zhang, Z.; Dong, H. (2022): Computational study on the gliding flight of a damselfly. *AIAA Science and Technology Forum and Exposition, AIAA SciTech Forum 2022-0728*: (in English) [Verbatim: Gliding flight is commonly accepted to be a valuable energy-saving mechanism used by natural flyers. In this work, the gliding flight of a damselfly undergoing was filmed in a large flight enclosure by using three orthogonally arranged and synchronized high-speed cameras. Using a 3D subdivision surface reconstruction methodology, the damselfly's wing deformation and kinematics were modeled and reconstructed from the high-speed videos. An immersed-boundary-method-based Navier-Stokes equation solver is then employed to compute the aerodynamic performance of damselfly in gliding flight. A comparison between the aerodynamics of solitary wings and the fore-hind wing system suggests that wing-wing interactions can reduce the drag of the forewing and improve its gliding performance. Three Euler angles are employed to define the orientation of the wings in gliding. Parametric studies on these angles are implemented to obtain the optimal orientation of the wings in gliding flight. It is found that the wings with the orientation directly obtained from the experiments achieve the optimal gliding performance among all cases. In addition, vortex structures and surface pressure are also compared and analyzed to better understand the gliding aerodynamics, which can be used for the flight control of flapping-wing micro air vehicles.] Address: not stated

**22212.** Parr, A.J. (2022): Migrant and dispersive dragonflies in Britain during 2022. *J. Br. Dragonfly Society* 39(2): 1-13. (in English) ["In Britain, the year 2022 started dramatically, with the country's second-ever record of *Sympecma fusca* being made near Hedge End, Hampshire, on 5 May; despite the species' current rarity, it may be a potential future colonist. Later highlights included the continuing rapid internal spread of *Aeshna isoceles*, with an apparent new breeding colony being found at Slapton Ley in Devon and with wandering individuals being noted in Somerset, Wiltshire, north Hampshire and, remarkably, near Wigan in south Lancashire. The discovery of a male *Crocothemis erythraea* at Minsmere, Suffolk, on 28 July, and the sighting of a male *Sympetrum flaveolum* at Kilnsea Wetlands near Spurn, East Yorkshire, on 5 September, were also of considerable interest. The record of *S. flaveolum* is the first in Britain for nearly a decade. Meteorologically, summer 2022 was notable for periods of high temperatures and drought over large parts of western Europe. This clearly had an impact on events in the dragonfly world, with seemingly both positive and negative consequences for migration. All of our commoner recent 'traditional' migrants such as *Aeshna affinis*, *Anax parthenope*, *Anax ephippiger* and *Sympetrum fonscolombii* apparently showed influxes during the year, though the growing strength of resident populations of the former two species here made detailed analysis difficult. The numbers of individuals seen were, however, generally unspectacular with the exception of *A. parthenope*, which had a record-breaking season. Much of this good showing by *A. parthenope* seemingly reflected good local breeding, though there were several unexpected records, particularly from northern England and Scotland, that imply that some

long-distance movement also took place." (Author)] Address: Parr, A.J., 10 Orchard Way, Barrow, Bury St Edmunds, Suffolk, IP29 5BX, UK

**22213.** Saha, P.D.; Gaikwad, S.M. (2022): Seasonal variation and species assemblage of Odonates (Class. Insecta) in different habitats of Pune district, Northern Western Ghats, Maharashtra, India. *International Journal of Entomology Research* 7(3): 145-158. (in English) ["68 localities from Pune district, Maharashtra, India were surveyed for diversity, assemblage and seasonal distribution of Odonata along three different habitats viz. agricultural land, forest and wetlands, and urban. The present investigation is based on extensive survey of all three habitats during three major seasons (pre-monsoon, post-monsoon and winter). A total of 4,268 individuals belonging to 68 species in 39 genera under 9 families were recorded during the study period (December 2011-December 2015). Family Libellulidae (44%) was the most dominant and widely distributed in different sampling sites in all the three habitats. The most dominant species was *Pantala flavescens* (18.35 %). Across the three land-use types, there was a difference between the species composition with forest being the most diverse followed by urban habitat and agricultural land, though, the abundance of species were much more in urban habitat. Clustering analysis showed that urban and agricultural lands are more similar forming the same clusters whereas forest forms a different one. Species richness and abundance varied with seasons, post-monsoon being highest in richness as well as abundance. Variation in rainfall patterns has been reported to be one of the important factors. During the present investigation, a total of 52 species were reported from Bhimashankar Wildlife Sanctuary (WLS), and out of which 40 species were new records from the area. A total of 37 species was documented from Ujani Wetland, out of which 21 species have been recorded first time. Thus the present work aims to document the Odonate diversity of the Pune district along with their habitat selection and seasonal variations which provides baseline data that can be used for their conservation strategies." (Authors)] Address: Saha, P.D., Dept of Zoology, Modern College of Arts, Science and Commerce, Shivaji Nagar, Pune, Maharashtra, India

**22214.** Schwarz, M. (2022): Entomologie in Oberösterreich – Geschichte und aktuelle Situation. 16.7. Libellen (Odonata). *Entomofauna Monographie* 4: 160-162. (in German) [This is a brief introduction into the faunistics and study of Odonata in the Federal State Oberösterreich/Austria. For more details see: [https://www.zobodat.at/pdf/ENT\\_M4\\_0001-0604.pdf](https://www.zobodat.at/pdf/ENT_M4_0001-0604.pdf)] Address: Schwarz, M., Biologiezentrum Linz, J.-W.-Klein-Straße 73, 4040 Linz, Austria. Email: martin.schwarz@ooelkg.at

**22215.** Seehausen, M. (2022): Europäische Libellen (Odonata) in der Sammlung des Zoologischen Museums der Universität Greifswald. *Libellula* 41(1/2): 77-88. (in German, with English summary) ["European Odonata in the collection of the Zoological Museum of the University of Greifswald – The European Odonata of the collection in the Zoological Museum of the University Greifswald were registered and determined. Altogether 389 European specimens were evaluated. The largest part is from the 19th century and attributed to the former director C.E.A. Gerstaecker. Localities in Germany are in Mecklenburg-Western Pomerania, Brandenburg, Bavaria and Thuringia. Further specimens were collected in Poland, Italy, Austria, and Switzerland. Current specimens were collected during a study in 1996 and 1997 in Greifswald. Concerning Mecklenburg-Western Pomerania,

Bavaria, Berlin, Brandenburg, and Thuringia some blank Plane survey sheets of distribution were completed. Of seven species the earliest known collected specimens from Brandenburg are held in the collection. The historical collection of Emil von Bernuth is mentioned but the specimens lack locality data, thus they are not evaluable." (Author)] Address: Seehausen, M.; Fährhofstr. 11, 18439 Stralsund, Germany. Email: m.seehausen@gmx.de

**22216.** Silva-Hurtado, J.D.; Márquez, J.; Escoto-Moreno, J.A. (2022): First state records of odonates (Insecta: Odonata) from the Sierra Norte de Puebla, Mexico. *Proceedings of the Entomological Society of Washington* 124(4): 805-813. (in English) ["During collections made in 2019 and 2020 at different localities in the Sierra Norte de Puebla (Northern Sierra of Puebla), Mexico, some odonate specimens, representing new state records of three genera and 16 species, were captured. Among the new records there are little known species such as *Erpetogomphus erici*, *E. liopeltis* and *Phyllocyca breviphylla*. Furthermore, new localities are recorded for uncommon species, such as *Paraphlebia zoe*, *Argia percellata* and *Erpetogomphus viperinus*. These records add to the already known species richness of the state of Puebla, increasing it from 110 to 126 species. As a result, the state of Puebla is now in tenth place nationally in terms of species richness." (Authors)] Address: Silva-Hurtado, J.D., carretera Pachuca-Tulancingo Km. 4.5, colonia Carboneras, 42184, Mineral de la Reforma, Hidalgo, México. Email: jodsilhur@gmail.com

**22217.** Stevens, S.; Reading, R.P. (2022): Rearing and assessing populations for the Hudsonian emerald (*Somatochlora hudsonica*), Mountain emerald (*Somatochlora semicircularis*), and American emerald (*Cordulia shurtleffii*) at Delefony Ponds, Boulder County, Colorado. 2022 Report. *Butterfly Pavilion*: 6 pp. (in English) [<https://assets.bouldercounty.gov/wp-content/uploads/2022/12/dragonfly-rearing.pdf>] Address: Butterfly Pavilion, 6252 East 104th Avenue, Westminster, CO 80020, USA. Email: rreading@butterflies.org

**22218.** Suhling, F. (2022): Libellen. Gewinner und Verlierer in Niedersachsen. In: *Facettenreiche Insekten: Vielfalt, Gefährdung, Schutz*. Publisher: Haupt Verlag: 100-101. (in German) [[https://www.researchgate.net/publication/3593-12040\\_Libellen\\_-\\_Gewinner\\_und\\_Verlierer\\_in\\_Niedersachsen](https://www.researchgate.net/publication/3593-12040_Libellen_-_Gewinner_und_Verlierer_in_Niedersachsen)] Address: Suhling F., Inst. Geoökologie, TU Braunschweig, Langer Kamp 19c, D-38102 Braunschweig, Germany. E-mail: f.suhling@tu-bs.de

**22219.** Tesar, D.E. (2022): Digging for information: Investigating the efficacy of tracking and augmenting *Lacunicambarus nebrascensis* for endangered dragonfly conservation. MSc. thesis, Department of Biology, Conservation and Biodiversity Specialization Program In the Graduate School The University of South Dakota: 109 pp. (in English) ["Restoration and preservation of habitat for threatened and endangered species can proceed in many ways. Augmentation strategies can be used to supplement threatened and endangered populations or the species and resources on which those imperiled species depend. Comprehensive knowledge of species movement and home range is necessary to formulate effective augmentation plans. For freshwater burrowing crayfish, this type of information is generally lacking. The studies reported here were designed to acquire detailed information that is essential for augmentation of the plains devil crayfish, *Lacunicambarus nebrascensis* (formerly, *Cambarus diogenes*). Although *L. nebrascensis* populations are not considered threatened, this crayfish provides vital refuge for the endangered (*Somatochlora hineana*). Because



the burrows created by *L. nebrascensis* are used by *S. hineana* to survive seasonal drying and overwintering periods; there is potential to enhance *S. hineana* habitat through *L. nebrascensis* augmentation. We tested the use of mobile and stationary PIT telemetry technology to track the movements of *L. nebrascensis* within *S. hineana* habitat (Chapter 1). This work demonstrated that *L. nebrascensis* could be tracked above and below ground and that the use of both stationary and mobile tracking equipment was necessary to recapture *L. nebrascensis* within different microhabitats. We investigated methods for the introduction of *L. nebrascensis*. In the laboratory, providing *L. nebrascensis* with a starter hole significantly decreased burrow initiation time (Chapter 2). This informed our field release trials where pit-tagged *L. nebrascensis* were released with a starter hole and a 24-hour acclimation period. Introduction treatment did not significantly impact the number of crayfish that relocated from their introduction point, and 64% of released *L. nebrascensis* burrowed within 3m of their introduction point. This indicated that a successful release into *S. hineana* habitat was possible. Our work establishes the functionality of PIT telemetry technology for tracking a primary burrowing crayfish species. We present a methodology that can be applied to introducing and tracking of other elusive fossorial species, which can aid in their own conservation or allow them to be used to improve available refuge space for other species that use their burrows." (Author)] Address: <https://red-library.usd.edu/diss-thesis/91/>

**22220.** Trájer, A.; Trájer, J. (2022): Effect of weather fronts on mosquito (Diptera: Culicidae) number based on a 90-days-long trapping and weather observation. *Acta entomologica slovenica* 30(1): 32-52. (in English, with Slovene summary) ["Mosquitoes are the cause of summer nuisance and vectors of several pathogens. Their activity and abundance are determined by meteorological factors. We performed a 90-days-long mosquito trapping and parallel measuring of temperature, air pressure, and precipitation values in Felsőörs, Hungary. The aim of the study was to find a correlation between the changing weather conditions and the trapped mosquito numbers and the four most abundant mosquito species. A total of 1716 mosquito individuals was trapped, and 19 mosquito species were identified. *Aedes cinereus*, *Aedes vexans*, *Anopheles maculipennis*, *Culex pipiens* formed the 87% of the mosquito material. The regionally rare species, *Ochlerotatus excurtians* was also collected. The theoretical threshold of mosquito activity in the study was 11°C. Based on the multiple regression analyses, mean, maximum and minimum temperatures had a moderately strong positive effect, precipitation had a very weak positive effect and air pressure had a very weak negative effect on the number of caught mosquitoes. In the case of the four most abundant mosquito species, similar correlations were found. The statistical analysis of meteorological variables and mosquito numbers showed that higher mean daily temperatures 1 day prior to trapping had the most significant positive effect on mosquito numbers. Lower than average mosquito catches occurred mainly during or 1-2 days after the front passages, and the average mosquito catches generally were associated with front-free periods. It was concluded that weather fronts have a negative effect on mosquito activity ... For example, large dragonflies prefer to quest for prey after the passage of cold fronts (Russell et al. 1998). Swarming, starting immediately before the arrival of cold fronts, could be beneficial for breeding mosquitoes. The predation of dragonflies during swarming could cause notable losses for mosquito populations. This influence is so strong that it affects the timing of swarm

initiation and swarm site selection (Yuval & Bouskila 1993)."] Address: Trájer, A., Univ. of Pannonia, Sustainability Solutions research Lab, H-8200 egyetem utca 10, Veszprém, Hungary. Email address: [attilatrajer@gmail.com](mailto:attilatrajer@gmail.com)

**22221.** Tyrrell, M. (2022): On the success of *Chalcolestes viridis* (Vander Linden) (Willow Emerald Damselfly) and the decline of *Lestes sponsa* (Hansemann) (Emerald Damselfly) at Finedon Pocket Park, Northamptonshire. *J. Br. Dragonfly Society* 39(2): 14-24. (in English) ["The small pond at Finedon Pocket Park, Northamptonshire was the first in the County to be recorded with a colony of *C. viridis*. The species was discovered by the author in 2017, and has been the subject of several papers (Tyrrell, 2019a, Tyrrell, 2020). The pond hosts a strong colony of *Lestes sponsa* which the author has monitored, along with all other species recorded for the past 15 years. Since 2017, the colony of *C. viridis* has increased, with maximum counts in 2022 close to 100 adults while, over the same period, the colony of *L. sponsa* has declined from a maximum of approximately 75 to 5 adults, and adults have now become very hard to find even in their traditional areas. During the same period, the pond has seen several floods (that killed some willow trees) and has had droughts. This review considers the factors that could contribute to the decline in *L. sponsa*, and how the behaviour of *C. viridis* might contribute to its success and the decline in *L. sponsa*, including inter-species competition, egg mortality during winter floods and natural extinction events." (Author)] Address: Tyrrell, M., 8 Warwick Close, Raunds, Northants, NN9 6JH, UK. Email: [mark.p.tyrrell@gmail.com](mailto:mark.p.tyrrell@gmail.com)

**22222.** Varadinova, E.D.; Georgieva, G.G.; Ihtimanska, M.K.; Vidinova, Y.N.; Evtimova, V.V.; Tyufekchieva, V.G.; Todorov, M.T. (2022): Macrozoobenthos in mountain standing water bodies in Bulgaria. *Acta Zool. Bulg.*, Supplement 16: 1-13. (in English) ["A survey of macrozoobenthos in selected standing water bodies situated in mountain areas of Bulgaria was carried out. The study was conducted in the summer of 2020 (July-August) at one lake (Trevisto Lake – Rhodopes Mts.) and eight reservoirs (Ognyanovo – Sredna Gora Mts.; Bebresh, Hristo Smirnenki and Yovkovtzi (two sites) – Balkan Mts.; Belmeken – Rila Mts.; Batak, Golyan Beglik and Shiroka Polyana (two sites) – Rhodopes Mts.). These water bodies are classified as mountain type of water bodies according to the Bulgarian National Typology and are situated in two ecoregions, i.e. Ecoregion 7 (Eastern Balkans) and Ecoregion 12 (Pontic Province). Totally, 120 taxa have been identified. The macroinvertebrate communities were specific to lentic waters and were dominated by oligochaetes and chironomid larvae. Larvae of dragonflies, mayflies and caddisflies as well as aquatic beetles, freshwater gastropods and mussels were also present with great taxonomic diversity. The influence of the environmental factors on the formation of the macroinvertebrate communities in the studied lentic ecosystems was analysed." (Authors) The following taxa are listed: *Aeshna* sp., *Anax imperator*, *Calopteryx splendens*, *Coenagrion puella*, *Coenagrionidae* gen. sp., *Corduliidae* gen. sp., *Enallagma cyathigerum*, *Gomphus* sp., *Ischnura elegans*, *Libellulidae* gen. sp., *Onychogomphus forcipatus*, *Orthetrum cancellatum*, *Platycnemis pennipes*.] Address: Varadinova, Emilia, Department of Geography, Ecology and Environmental Protection, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski", 66 Ivan Michailov Street, 2700 Blagoevgrad, Bulgaria. E-mail: [emily.varadinova@gmail.com](mailto:emily.varadinova@gmail.com)

**22223.** Wilkening, J.; Locher, M.; Flanagan Pritz, C.; Nelson, S.; Willacker, J.; Eagles-Smith, C. (2022): A quest for



Dragonflies to uncover an invisible threat. A unique project uses dragonfly larvae as biosentinels for mercury bioaccumulation on protected lands. *The Wildlife Professional* 16(2): 36-41. (in English) [[https://www.researchgate.net/publication/360631184\\_Using\\_dragonfly\\_larvae\\_as\\_biosentinels\\_on\\_protected\\_lands](https://www.researchgate.net/publication/360631184_Using_dragonfly_larvae_as_biosentinels_on_protected_lands)] Address: Eagles-Smith, C.A., United States Geological Survey, Forest and Rangeland Ecosystem Science Center, Corvallis, Oregon 97330, United States. E-mail: ceagles-smith@usgs.gov

## 2023

**22224.** Abdel-Galil, F.A.; Morsy, S.M.; Farghal, A.I.A.; Abdel-Naser, M.A.; Moharram, A.M.M.; Mousa, S.E. (2023): Highlights on Insects and Fungi Associated with Mosquitoes Inhabiting Agricultural Drain Water in Different Areas of Assiut Governorate, Egypt. *Assiut Journal of Agricultural Sciences* 54(4): 196-211. (in English) ["The objective of the study was to determine the species composition of mosquitoes and their associated insects and fungi inhabiting drain water in different agricultural areas of Assiut governorate, Egypt. During 72 inspection visits and 164 examinations of drain water pools in seven areas of Assiut governorate, results indicated the presence of six identified mosquito species. *Culex pipiens* is considered the most frequent mosquito species with the highest Incidence Area Weight value IAW21. All six identified mosquito species were encountered in El-Badary area with an Incidence Species Weight ISW value of 14. Nine insect species belonging to five orders were recorded. *Pantala flavescens* is considered the most frequently associated insect species in all areas. Incidence Area Weight IAW for each identified species indicated that *P. flavescens* had the maximum value of IAW 14. Also, the maximum value of Incidence Species Weight was ISW 22 in El-Badary area. Twenty-four fungi species were identified from agricultural drain water pools. Aquatic fungi were twenty-two species inhabiting agricultural drain water and Nine fungi species were isolated from the associated insects. Some of these species recorded as entomopathogenic fungi for mosquitoes including *Fusarium oxysporum*, *F. solani*, and *F. incarnatum*. The incidence values of all fungi species isolated reached the maximum of 17 in Spring. So, the associated insect species and fungi with mosquitoes in the present study can play an active role as biological control agents in Integrated Pest Management (IPM) approach. This contributes to achieving the Sustainable Development Goals (SDGs)."] (Authors) Additional odonate species included into the analysis are *Anax ephippiger*, *Ischnura senegalensis* and *Trithemis aurora*.] Address: Abdel-Galil, F.A., Plant Protection Dept, Faculty of Agriculture, Assiut University, Assiut, Egypt. Email: faagalil@aun.edu.eg

**22225.** Ait Taleb, L.; Chelli, A.; Djamila, S.A.A.; Abdelheq, Z.; Zinette, B.; Houhamdi, M.; Zebza, R. (2023): Survey and repartition of Odonatofauna in the lotic and lentic waters of the Djurdjura and Soumman regions of Kabylia (North Central Algeria). *Ekológia* 42(3): 230-238. (in English) [oas 72;"The aim of this study is to examine the Odonata fauna structure and composition in Kabylia's wetlands (central north Algeria) by sampling 36 potential sites (16 wadis and 20 water reservoirs) in the two main departments of this region, namely, the Kabylia of Djurdjura (Tizi Ouzou) and the Kabylia of Soummam (Bejaia). This region has one of the most important hydrographic systems in Algeria and a wide range of exceptional wetlands due to its important rainfall regime. A lack of studies, especially in the western part of the region (Tizi Ouzou), prompts a specific inventory and ecological analysis of the Odonata population over a period

of 6 months (from April to September 2021). Forty species of Odonata have been recorded in Kabylia, of which *Pyrhosoma nymphula* represents a new record for Algeria, raising the reference list to 64 species. There are four northern African endemic species and among these, we report on the rediscovery of the critically endangered (KN) *Calopteryx cuxl* in Algeria, recorded in the 19th century and deemed to have been extinct after an absence of more than a century; *Gomphus lucasii* is assessed as vulnerable (VU) and *Enallagma deserti* and *Platycnemis subdilatata* are judged as least concern (LC)."] (Authors) [[https://www.researchgate.net/publication/374553599\\_Ait\\_Taleb\\_et\\_al\\_2023](https://www.researchgate.net/publication/374553599_Ait_Taleb_et_al_2023)] Address: Ait Taleb, Lamia, 1PSEMRVC Laboratory, Dept of Biology, Faculty of Biological Sciences and Agronomical Sciences, Mouloud Mammeri University, Tizi-Ouzou, 15000, Algeria. Email: lamia.aittaleb@ummto.dz

**22226.** Appel, E.; Michels, J.; Gorb, S.N. (2023): Resilin in insect flight systems. *Advanced Functional Materials* 2023, 2215162: 30 pp. (in English) ["Compared to wingless insects, pterygote insects profit from numerous wing-related benefits including a wider distribution range, the exploitation of various food resources and the escape from water. or land-confined predators. In order to maintain the wings' functionality, the wing design and resistance to material fatigue are of key importance. This is even more essential for survival when considering that wings are used for millions of wing beat cycles but cannot be repaired and do not contain inner muscles so that their aerodynamic performance is mainly based on passive, structure-based wing deformations. One of the components serving this purpose is the endowment of certain wing components with the elastomeric protein resilin building stable and complex material composites with the tanned cuticle. Resilin endows the respective structures with, e.g., higher flexibility and compliance and enables elastic energy storage. In this study, the occurrence of resilin in the insect flight system is reviewed based on previous studies of several insect orders including Odonata [*Sympetrum vulgatum*], Orthoptera, Hymenoptera, Coleoptera, Dermaptera, and Diptera, and the function of resilin is discussed with reference to the respective structures."] (Authors)] Address: Appel, Ester, Functional Morphology and Biomechanics, Zoological Institute, Kiel University, Am Botanischen Garten 1-9, D-24118 Kiel, Germany. Email: e-appel@zoologie.uni-kiel.de

**22227.** Aristizábal-Botero, A.; Snoeks, J.; Realpe, E.; Vanschoenwinkel, B. (2023): Conductivity and water level modulate developmental plasticity and explain distribution patterns in a diverse neotropical Odonata assemblage. *Freshwater Biology* 68: 1558-1571. (in English) ["The rock pools are located on the summit of two inselbergs inside Bojonawi Nature Reserve (Vichada, Colombia.... Developmental plasticity can help organisms to survive in temporally variable environments. However, it is not well understood how variation in life history plasticity helps species coexist in heterogeneous environments. Here, we investigate the extent to which life-history plasticity explains species distributions in a diverse assemblage of odonates in a tropical freshwater rock pool system characterized by substantial variation in pond permanence. Some Odonata can accelerate their development to leave the water before their habitat dries. However, how they sense habitat drying is poorly understood. Here, we experimentally tested the extent to which elevated concentrations of salts in water or reductions in water level can be used as cues for developmental acceleration in a neotropical Odonata assemblage from granite rock pools. Libellulidae were found along the permanence gradient and

accelerated their growth in response to elevated dissolved salts (measured as conductivity). *Anax amazili* was also found in all environments and did the same in response to lower water levels. In turn, larvae of *Telebasis simulata* were restricted to deeper long-lived pools and did not respond to the tested cues. Differentiation in life-history strategies can contribute to niche differentiation in this diverse predator assemblage. Developmental plasticity triggered by different cues helps odonates avoid mortality and exploit short-lived habitats. The global acceleration of freshwater salinisation due to human activities might disrupt the delicate links between low levels of dissolved salts and life-history responses and represent a significant threat to these ecosystems and their biodiversity." (Authors)] Address: Aristizábal-Botero, Ángela, Dept Biol., Univ.de Los Andes, Bogotá, 111711, Colombia. Email: [angela.aristizabal.botero@vub.be](mailto:angela.aristizabal.botero@vub.be)

**22228.** Arya, M. K.; Chandra, H.; Verma, A. (2023): Spatial insect diversity paradigms and related ecosystem services in the protected Nandhour Landscape of India. *Journal of Insect Biodiversity and Systematics* 9(1): 115-138. (in English, with Arabian summary) ["The Nandhour Landscape located in an eco-fragile biodiversity rich Terai Arc Landscape of India is protected in the form of a wildlife sanctuary and is least explored in terms of insect diversity and functions. Therefore, this study aimed to provide baseline information on the biodiversity of insects and their ecological functions in tropical to sub-tropical forest ecosystems which is important for the successful long-term provisioning of ecosystem functions and services in the protected landscape. Using standardized sampling techniques, the present study examined the structure and composition of insect assemblages in terms of their comparative diversity and richness across a range of habitat types in the Nandhour Landscape. Besides, the present study also evaluated the ecological significance of insect fauna. A total of 230 insect species belonging to 47 families and nine orders were recorded from various habitats and Lepidoptera was the most dominant insect order in terms of both richness and abundance, followed by Coleoptera, Hymenoptera, Odonata [*Acisoma panorpoides*, *Aethriamanta brevipennis*, *Brachythemis contaminata*, *Crocothemis servilia*, *Orthetrum glaucum*, *O. prunosum*, *O. sabina*, *O. taeniolatum*, *O. triangulare*, *Palpopleura sexmaculata*, *Pantala flavescens*, *Rhodothemis rufa*, *Trithemis festiva*, *T. pallidinervis*, *Ceriagrion coromandelianum*, *Ischnura rubilio*, *Pseudagrion australasiae*, *P. rubriceps*, *Neurobasis chinensis*, *Aristocypha fenestrella*, *A. quadrimaculata*, *Paracypha unimaculata*] and others. Species diversity and richness were the highest in dense moist and open dry riverine forests, while the least in plantation forest and agricultural land. The heterogeneous structure and composition substantiated the importance of overall spatial heterogeneity and natural forests in sustaining and maintaining the rich insect diversity. Conservation of insect diversity is highly important as several species provide crucial ecosystem services and aid in the functioning of various ecologically fragile habitats of the landscape." (Authors)] Address: Chandra, H., Department of Zoology, D.S.B. Campus, Kumaun University, Nainital-263002, Uttarakhand, India. Email: [hemchandra5593@gmail.com](mailto:hemchandra5593@gmail.com)

**22229.** Aziza, E.P.N.A.; Satria, R. (2023): Keanekaragaman Jenis Capung (Odonata) di Blok Silayang Maninjau. *Jurnal Serambi Biologi* 8(3): 329-333. (in Indonesian, with English summary) ["The Silayang block area is one of the conservation areas in the Maninjau Nature Reserve that is have natural river basin. While this area have lacks information about its diversity of the dragonflies. The present

study aims to determine the diversity of Odonata in the Silayang block area. The method used in this study is entomological handnet and photography. Analysis of dragonfly data this study using the diversity index, using the Shannon Wiener index. In this study, six species of dragonfly were obtained from three families and two suborders. The dragonfly species obtained were *Diplacodes trivialis*, *Neurobasis chinensis*, *Neurothemis fluctuans*, *Orthetrum chrysis*, *O. sabina*, and *Rhinocypha bisignata*. The results of this study indicate that the index of diversity of Odonata in the Maninjau Nature Reserve, Silayang Block, is moderate." (Authors)] Address: Satria, R., Dept of Biology, Fac. of Mathematics & Natural Sciences, Uni. Negeri Padang, West Sumatera, 35171, Indonesia. Email: [rjalsatria@yahoo.co.id](mailto:rjalsatria@yahoo.co.id)

**22230.** Baranovski, S.V.; Lin, Z.Y. (2023): Design of a structurally optimized bioinspired structural arrangement of a polymer composite regional aircraft tail fin. *E3S Web of Conferences* 413, 02003 (2023) <https://doi.org/10.1051/e3sconf/202341302003>: 9 pp. (in English) ["Aircraft frame elements are highly responsible elements. They are subject to stringent requirements for strength, stability, resource. Often these requirements contradict each other, especially if it is necessary to ensure the minimum mass of the product. However, it is necessary to improve the characteristics of aircraft. Nevertheless, the optimization of the frame has almost exhausted itself. The power frame consists of longitudinal and transverse elements. It is possible to improve the characteristics of structural arrangement by using polymer composite materials based on glass and carbon fibers. This will improve the design characteristics due to high specific properties. In addition, one of the directions is the development of new bioinspired structural layout based on natural analogues. The work is devoted to the actual task of searching and choosing new structural arrangement for the aircraft tail. The paper considers five variants of structural layout, including the classical original design. The advantage of the bioinspired variant in terms of mass and displacement is shown." (Authors) Bioinspired structural layout are based on insect wings; main considered species were the wings of the Odonata.] Address: Baranovski, S.V., Bauman Moscow Technical University, ul. Baumanskaya 2-ya, 5/1, 105005 Moscow, Russia. Email: [serg1750@mail.ru](mailto:serg1750@mail.ru)

**22231.** Bártová, K. (2023): Vliv kvality prostředí na kondici larev vážek. Effect of habitat quality on the body condition of dragonfly larvae. BSc. thesis, Faculty of Environment, Czech Agrary University in Prague: 45 pp. (in Czech, with English summary) ["Individual species choose their habitats according to certain criteria. If they meet these criteria, the habitat becomes attractive to them. This bachelor's thesis focuses on the topic of ecological traps. Habitats may become such a trap if they are attractive to individuals and yet represent a poor-quality place for them to live. These traps are mostly created by human activities. The aim of this study was to investigate the effect of environmental quality on the fitness of *Sympetrum vulgatum* larvae, which inherit their habitat from their terrestrial mother during oviposition. The evaluation was based on the number of immune cells in their haemolymph. The theoretical section of this work summarizes that the main factors affecting the fitness of larvae are predation, lack of food, pollution and stress, which is both a consequence of these factors and a cause of reduced immune function. The invertebrate immune system is based on both humoral and cellular mechanisms, which are based on cells called hemocytes. Hemocytes are investigated in the experimental section of this thesis, specifically their con-

centration in the haemolymph of larvae coming from different environments. Ten sites in the Sokolov region were selected for the research, 5 of which were natural and 5 were reclaimed sites after lignite mining. The amount of hemocytes and granulocytes in the haemolymph of larvae from both types of habitats collected on two dates was identified in the laboratory. The results of my work confirmed the assumption that larvae from natural sites possess a greater number of immune cells, especially granulocytes, than larvae from reclaimed habitats. In addition, larvae from reclaimed habitats were of smaller size. These differences were particularly evident in the second measurement. From this study, I conclude that environmental quality has a significant effect on the fitness of dragonfly larvae, and this effect increases with the prolonged duration of exposure to a given environment. Understanding similar mechanisms in nature is critical for the conservation of animals and their environment. Building on this knowledge, it is possible to mitigate the impact of human activities through appropriate measures and habitat management. In addition, data concerning invertebrate immunity can contribute to the development of medicine and pest control." (Author)] Address: Bártová, Katerina: <https://theses.cz/id/fnt9i6/23687107>

**22232.** Bastian, H.-V.; Bastian, A. (2023): Specialist or opportunist — the diet of the European bee-eater (*Merops apiaster*). *Journal of Ornithology* 164(4): 729-747. (in English, with German summary) ["*M. apiaster* is considered a foraging specialist for large flying insects, 80% or more of which are Hymenoptera, mainly bumblebees and other bees, including honeybees. Observations of bee-eaters foraging give rise to doubts about an almost one-sided Hymenoptera diet, as Lepidoptera, Odonata, large Diptera or Heteroptera are also regularly and frequently preyed upon and fed to nestlings and brood mates. In a meta-analysis of 56 studies on the bee-eater's diet, a total of 130,624 prey items from 115 food samples were evaluated. Total of 85 samples (74%) with 83,953 items (72%) came from Southern, Eastern and Central Europe; however, studies from North Africa, Central Russia, Ukraine, Turkmenistan, Uzbekistan, Saudi Arabia and South Africa were also included in the analyses. The collection methods significantly influence the results of the dietary composition. In studies of pellet and stomach contents, the diet was less diverse. It consisted of about 90% Hymenoptera and Coleoptera overall, whilst other arthropods were rarely detected. Studies based on direct observation or photo documentation showed that the diet was more diverse, and Hymenoptera were not always the most abundant, but could also include Odonata, Lepidoptera, Tabanidae, Syrphidae, Saltatoria, Heteroptera or Hemiptera in significant amounts. The proportion of Hymenoptera in these studies was 49%, about a third (20%pts – 30%pts) lower than in the pellet and stomach content studies, and the proportion of Coleoptera (13%) about a quarter lower. We assume that bee-eaters completely digest weakly sclerotised prey and that these are, therefore, not detected in pellets and stomachs, or only in low numbers. This means that 81% of published studies on the bee-eater's diet are based on methods that lead to quantitatively and qualitatively unrepresentative results and thus do not provide precise results of diet compositions. Observational and photographic methods have only been used to study the nestling diet. Therefore, a reliable statement about what adult bee-eaters eat themselves and how the diet is composed quantitatively is currently not possible. The diet of adult and juvenile birds could only be compared based on the poorly representative pellet and stomach content analyses. This analysis is limited to the abundance of Hymenoptera and Coleoptera, which

are well detectable in pellets and stomachs. Hymenoptera were significantly more abundant in the nestling diet, whilst coleopterans were more abundant in the adult diet. The diet also varied regionally. Bumblebees, because of their sluggish flight and because they are already active at relatively low ambient temperatures, are important food animals in climatically less optimal and oceanic areas at the northern edge of the range. In other regions, Hymenoptera occur less frequently and less regularly, whilst Coleoptera, Odonata, Lepidoptera, large Diptera, Saltatoria, Isoptera or Hemiptera may occur locally in significant numbers as prey. The extent to which diet varies seasonally could not be clearly proven. Only one of five studies shows weakly significant changes in diet composition over the breeding season. This study is based on direct observation of prey fed to nestlings, whilst the other studies examined prey remains in pellets. Although the pellet studies also showed different food compositions over the course of the brood, trends between studies were inconsistent and not significant overall. We hypothesise that local influences (weather, habitats) affected diet composition. Further analysis is needed to determine whether food supply or demand changes during the breeding season. In addition to analysing the food composition, also the food supply must be surveyed, which has rarely been done so far. The opportunistic use of food resources can support the successful colonisation of breeding areas and is probably an important factor in the current successful expansion of the European bee-eater." (Authors)] Address: Bastian, H.-V., Geschwister-Scholl-Str. 15, 67304, Kerzenheim, Germany

**22233.** Bazzi, G.; Galimberti, A.; Fogliani, C.; Bani, L.; Bazzi, L.; Bonvicini, P.; Brembilla, R.; Brigo, M.; Cavenaghi, A.; Colombo, G.; Della Pietà, C.; Galliani, C.; Guarnaroli, E.; Larroux, N.; Monti, A.; Orioli, V.; Ornavi, F.; Pilon, N.; Pirota, G.; Radaelli, G.; Tessa, G.; Assandri, G. (2023): Odonate diversity of a highly urbanised region: An annotated checklist of the damselflies and dragonflies (Insecta, Odonata) of Lario and Brianza (Lombardy, N Italy). *Biodiversity Data Journal* 11: e111358: 34 pp. (in English) ["Given their sensitivity to environmental alterations, odonates act as reliable bioindicators to assess the effects of changes in freshwater ecosystems and associated terrestrial habitats. The region comprised between Lario and Brianza (Provinces of Como, Lecco and Monza and Brianza, Lombardy, N Italy) is one of the most urbanised of the Italian peninsula and large parts of its territory have been heavily altered, especially at low elevation. Despite this pervasive anthropogenisation, the area is still characterised by a considerable variety of freshwater habitats, possibly harbouring rich odonate communities, which, however, have been never thoroughly investigated. This study aimed to produce the first commented checklist of the Odonata of this region, accompanied by distribution maps. The work is based on 12,093 records spanning from 1981 and 2022, derived from literature (289), revision of collections (42), citizen-science projects (1249) and unpublished data from the authors and their collaborators (10,513). Overall, fifty-five species occur or occurred in the past in the study area (20 Zygoptera and 35 Anisoptera). One species, *Erythromma najas*, was confirmed exclusively before 1978, while seven species (*Lestes barbarus*, *Coenagrion scitulum*, *Aeshna affinis*, *Anax ephippiger*, *Somatochlora arctica*, *Sympetrum meridionale* and *Trithemis anulata*) have been recorded only after 2000. Records referring to *Chalcolestes parvidens* and *Sympetrum flaveolum* were considered questionable and excluded from the checklist. A list of species for each protected site is additionally provided. This work highlighted the importance for odonates of Lario and Brianza Regions from a national perspective,

in particular for species of conservation priority/interest, such as *Symplocma paedisca*, *Oxygastra curtisii* and *Sympetrum depressiusculum*." (Authors)] Address: Galimberti, A. Università degli Studi di Milano-Bicocca, Dipartimento di Biotecnologie e Bioscienze, Milano, Italy. Email: andrea.galimberti@unimib.it

**22234.** Berta, J.L.; Mott, C.L. (2023): Leaves of an invasive shrub induce mass mortality of an amphibian apex predator and its macroinvertebrate prey. *Biological Invasions* 25: 3277-3291. (in English) ["Studies of plant invasions have primarily focused on effects within shared habitats of native and invasive species. However, secondary compounds produced by terrestrial invasive plants can cross terrestrial-aquatic boundaries via senesced leaves, leading to altered patterns of aquatic biodiversity and ecosystem functioning. Impacts of phenolic compounds from senesced leaves have been characterized among relatively lower trophic groups, but effects on keystone species, such as apex predators, should have disproportionately larger effects on aquatic food webs. Using a widespread invasive species (Amur Honeysuckle, *Lonicera maackii*), we employed experimental mesocosms to examine effects of honeysuckle leaf litter addition on survival of apex predators (larval spotted salamanders, *Ambystoma maculatum*), their zooplankton and macroinvertebrate prey, indicators of primary productivity and decomposition, and abiotic variables influenced by phenolic compounds. Despite previous laboratory observations suggesting *A. maculatum* might exhibit resistance to *L. maackii* leachates, we observed near complete loss of both *A. maculatum* and benthic macroinvertebrates in experimental mesocosms, while zooplankton abundance was unaffected. Mortality was likely associated with precipitous declines in dissolved oxygen following rapid decomposition of *L. maackii* leaves, and these conditions facilitated nearly 15-fold increases in larval mosquito abundance. Our results highlight how experimental venue and methodology may alter outcomes of investigations involving senesced leaves of invasive plants. Losses of amphibian predators under quasi-natural invasion conditions indicate important influences on terrestrial-aquatic nutrient exchange, and we highlight phenological patterns of leaf senescence and breeding by aquatic organisms as important avenues for further investigation in characterizing the consequences of plant invasions.... Many invertebrate taxa colonized mesocosms independently; however, three snails and three larval Coenagrionidae were added to each mesocosm prior to introduction of amphibian larvae, since it appeared unlikely these groups." (Authors)] Address: Mott, C.L., Dept Biol. Sciences, Eastern Kentucky Univ., Richmond, KY, 40475, USA

**22235.** Bethoux, O.; Anderson, M (2023): New light shed on Triadophlebiomorpha wing morphology and systematics (Insecta: Odonata). *Geodiversitas* 45(17): 479-496. (in English, with French summary) ["The systematics of the Triadophlebiomorpha, a group of often large-sized stem-Odonata, essentially Triassic, is reconsidered based on new data on some of the known species and on new material from the Molteno Formation (South Africa). New data on *Reisia gelasii* (Reis, 1909) (Anisian; Muschelkalk basin, Germany) and 'Triadotypus' *guillaumei* Grauvogel & Laurentiaux, 1952 (Anisian; Grès à Volt zia, France) allowed reconsidering the delimitation of the corresponding genera, *Reisia* Handlirsch, 1912 and *Triadotypus* Grauvogel & Laurentiaux, 1952, the latter regarded as a junior synonym of the former. Thanks to its pristine preservation of the wing three-dimensional structure, the material of *Piroutetia liasina* Meunier, 1907, re-illustrated, provides further insights on wing venation homologies in the

group. These new data, coupled with new ones on known and new material from Molteno (Carnian; Karoo Basin, South Africa), led us to corroborate the placement of *Triassologus biserialatus* Riek, 1976 to the Triadophlebiomorpha, and to recognize '*Reisia*' *rieki* Deregnacourt, Wappler, Anderson & Béthoux, 2017 as its junior synonym. In turn, it is argued that the sub-contemporaneous species *Iverya aveyri* Béthoux & Beattie, 2010, from Australia, is to be assigned to *Triassologus* Riek, 1976 (and the genus *Iverya* Béthoux & Beattie, 2010 considered its junior synonym), further emphasizing similarities between South African and Australian Triassic insect faunas. A subset of the Triadophlebiomorpha possesses a CuP+AA stem splitting into CuA and CuP+AA (as opposed to Cu and AA). This trait is present in *Nototriadophlebia pritykinae* n. gen., n. sp., an addition to the Triadophlebiomorpha from Molteno." (Authors)] Address: Béthoux, O., CR2P (CNRS, MNHN, Sorbonne Université), Muséum national d'Histoire naturelle, case postale 48, 57 rue Cuvier, 75231 Paris cedex 05, France. Email: obethoux@mnhn.fr

**22236.** Betsi, W.C.N.; Menbohan, S.F.; Lactio, N.L.; Tchouapi, Y.L.; Temgoua, M.A.Z.; Mbia, D.L.N.; Nhiomock, S.R.G.; Nwaha, M.; Ngon, E.B.B.A.; Dzavi, J.; Mboyé, B.R.; Nola, M. (2023): Comparative approach of the fauna diversity of benthic macroinvertebrates in a stream on ferrallitic soil and equatorial climate at 2 seasons in Cameroon (Central Africa). *World Journal of Advanced Research and Reviews* 19(1): 254-264. (in English) ["In order to determine the structure of benthic macroinvertebrates fauna in relation with some environmental factors, a study was carried out in the Esoa river at Nkongsamba in the Littoral region of Cameroon from January 2021 to January 2022. Physico-chemical parameters were measured according to APHA and Rodier recommendations, while benthic macroinvertebrates sampling was done out according to the multihabitat approach at a monthly frequency. The physico-chemical analyses revealed very good oxygenation of the water, a tendency of neutrality for the pH (7.79±0.8 UC) and a low and constant temperature (22.61±1.83 °C). The BMI count showed 3732 individuals, including 4 phyla, 6 classes, 14 orders and 69 families and over 80 species. Besides, the class of insects, and in particular the order of Odonata, supplanted the benthic fauna. The Esoa 2 and Esoa 3 stations recorded the highest relative abundance of BMI (37.43% and 36.99% respectively) with a predominance of pollutant taxa, notably the families of Chironomidae, Physidae, Tubificidae and Lumbricidae. On the other hand, the Esoa 1 station, with low relative abundance (25.56%), was more diversified and dominated by polluosensitive taxa, including Ephemeroptera, Plecoptera and Trichoptera. The high values of the Sørensen similarity index (65.62%) showed a high faunal similarity of the Esoa 2 and Esoa 3 stations. The high values of the Shannon and Weaver diversity index (4.6 bits/ind) indicated a high diversity of benthic macroinvertebrates reflecting the good ecological status of the waters of the Esoa stream ... The abundance of Odonata (of 28.65% relative abundance) is linked to the strong riparian vegetation that borders the watercourse and the bridges present downstream of certain stations that considerably reduce the speed of the current and favour their settlement." (Authors)] Address: Betsi, Wilfreid Christiane Noel, Lab. of Hydrobiology and Environment, Fac. Science, University of Yaoundé I, P.O. BOX 812, Yaoundé, Cameroon.

**22237.** Bezmaternykh, D.M.; Vdovina, O.N. (2023): Composition, structure and formation factors of macroinvertebrate communities in low-mountain lakes of the Russian Altai. *Acta Biologica Sibirica* 9: 433-449. (in English) ["Recent

data suggests a significant difference in physical and biological properties between low-mountain lakes and high-mountain or lowland water bodies. However, the taxonomic composition and structure of bottom invertebrates in low-mountain lakes of Altai remain unknown. Due to climate change and growing anthropogenic impact, studying the composition and structure of macrozoobenthos in these lakes is becoming increasingly urgent. In 2022, a study was conducted on macrozoobenthos from foothill lakes of the Russian Altai, specifically Kireevo in the Krasnogorsk region, Aya (Aiskoye) in the Altai region, Koksha and Svetloye in the Soviet region, Kolyvanskoye in the Zmeinogorsk region, and Belye in the Kuryinsky region of Altai Krai. The study identified 152 species from 9 classes, including Turbellaria (1), Nematoda (1), Oligochaeta (17), Hirudinea (5), Bivalvia (2), Gastropoda (8), Arachnida (10), Crustacea (2), and Insecta (106). Of the insects, the order Diptera (69 species, including 59 chironomids) had the greatest species diversity. Additionally, the orders Trichoptera (16), Coleoptera (7), Ephemeroptera (5), Odonata (4), Heteroptera (4), and Megaloptera (1) were identified. Most of the studied lakes in the Russian Altai (Aya, Belye, Kireevo, and Kolyvanskoye) had a taxonomic composition of macrozoobenthos similar to lowland lakes. Two lakes (Koksha and Svetloye) had a combination of features from both lowland and high-mountain lakes. The content of organic substances and their decomposition products in water, as well as substrate type, were the most significant factors determining the development of macroinvertebrate communities in the studied lakes." (Authors) No species details are given.] Address: Bezmaternykh, D.M., Institute for Water & Environmental Problems, Siberian Branch Russian Acad. Sciences (IWEP SB RAS), 1 Molodezhnaya st. Barnaul, 656038, Russia. Email: bezmater@mail.ru

**22238.** Bicker, R. (2023): Tireragan dragonflies. June 2023 Survey. <https://british-dragonflies.org.uk/wp-content/uploads/2023/08/Tireragan-Dragonfly-report-June-2023.pdf>: 29 pp. (in English) ["Tireragan is located on the south-west tip of the Ross of Mull, Scotland (UK National Grid Map Reference NM 337 188). A survey of Odonata was completed along four linear waterbodies and associated pools at the Tireragan peatbog site, during late June 2023. We confirmed eight species of Odonata using the site: Calopteryx virgo, Ischnura elegans, Lestes sponsa, Pyrrhosoma nymphula, Sympetrum striolatum, Libellula quadrimaculata, Cordulegaster boltonii, and Orthetrum coerulescens. The most abundant species on site was O. coerulescens. The area with the highest number of species, highest abundances and the most breeding evidence was Transect 1 (the dammed ditch). Transects are to be walked a minimum of 3 times over the dragonfly survey season (May to September). A second survey should be carried out toward the end of July/ early August, and a final walk in late September ..."] (Authors)] Address: <https://british-dragonflies.org.uk/wp-content/uploads/2023/08/Tireragan-Dragonfly-report-June-2023.pdf>

**22239.** Borges, R.P.; Lima, T. (2023): Uso de diferentes tipos de lâmpadas em armadilhas luminosas para a captura de insetos em ambiente urbano. Acta Biológica Catarinense 10(3): 34-40. (in Portuguese, with English summary) ["Use of different types of lamps in light traps to capture insects in an urban environment: The collection of insects with a light trap has been used in several studies on entomofauna. In the present work, the effectiveness of low-cost light traps in urban environments influenced by artificial light was evaluated. Light traps ... were installed in an urban area with three different types of light: fluorescent lamp white light 15W, 127V, incandescent lamp yellow light 15W, 127V and

UV lamp 15W, 220V ultraviolet (black) light. As a result, the collection of 1382 insects was verified, distributed in seven different Orders: ... Odonata [n=3 at yellow light trap only]. The highest number of insects collected was verified in UV light, followed by yellow light. The trap with less efficiency was represented by white light. In this way, it was possible to observe that, even in urban areas, with the interference of artificial light, the use of light traps is an effective tool for capturing insects." (Authors)] Address: Borges, Rebeca, Univ. Federal de Mato Grosso do Sul (UFMS), campus de Aquidauana, Rua Trindade de Barros, n. 740, bairro da Serraria – CEP 79200-000, Aquidauana, MS, Brasil. Email: rebecapborges@gmail.com.

**22240.** Bota-Sierra, C.A.; Tennessen, K.J. (2023): Diaphlebia richteri Bota-Sierra, 2015 is a junior synonym of Zonophora nobilis Belle, 1983 (Gomphidae: Odonata). International Journal of Odonatology 26: 103-107. (in English, with Portuguese summary) ["Diaphlebia richteri is shown to be a junior synonym of Zonophora nobilis. The confusion started by a generic misplacement due to the failure to observe the subalar carina spine which is present in Zonophora but not in Diaphlebia. Therefore, Z. nobilis is officially recorded for the first time in Colombia; we present a distribution map with the known localities for this rare Amazon species. Also, we made a comparison between our female specimens and the original description of the female from Cerro de la Neblina (Venezuela), including the first photographs of diagnostic characters of a female specimen." (Authors)] Address: Cornelio A., Grupo de Entomología Universidad de Antioquia (GEUA), Universidad de Antioquia, Medellín 50010, Colombia.

**22241.** Boyqobil kizi, N.Z.; Yusupovich, R.A.; Doniyor ogli, B.O. (2023): Preliminary information about dragonflies fauna distributed in Kashkadarya region. Middle European Scientific Bulletin 42: 78-83.[Uzbekistan. Records of Calopteryx samarcandica, Sympetrum pedemontanum, Anax imperator, Orthetrum brunneum and Ophiogomphus reductus are figured. The record of Calopteryx virgo is questionable. Additional species are listed in a table: Orthetrum albistylum, O. cancellatum, Sympetrum vulgatum, S. meridionale, Sympecma fusca] Address: Norkobilova Zarina Boyqobil kizi, Senior Lecturer, Department of Zoology Karshi State University Karshi, Uzbekistan.

**22242.** Burwell, C.J.; Power, N.R.; White, D. (2023): Is Agriocnemis rubricauda Tillyard, 1913 (Coenagrionidae) another parthenogenetic species of Odonata? Australian Entomologist 50(3): 206-220. (in English) ["Parthenogenesis, reproduction by females via unfertilised gametes, is widespread in insects but there is only one documented example among the Odonata. Ischnura hastata (Say) (Coenagrionidae) reproduces sexually across its wide range in the Americas from southern Canada to Brazil but has parthenogenetic populations comprising only females in the Azores islands in the eastern Atlantic Ocean. Recent circumstantial evidence suggests that the Australian damselfly Agriocnemis rubricauda Tillyard may also have sexual and parthenogenetic populations. The distribution of A. rubricauda was mapped and the monthly occurrence of males and females of A. rubricauda collated based on specimens in collections, our own photographic records and collections from extensive searches in south-eastern Queensland and north-eastern New South Wales and other photographic records submitted to iNaturalist. There appears to be a substantial gap in the range of A. rubricauda in coastal Queensland, with northern records from the Top End of the Northern Territory

and Queensland wet tropics, and southern records from southern Queensland and north eastern New South Wales. Male *A. rubricauda* are known only from the northern part of the range where there are similar numbers of records of males and females. Only females are known from the southern range where there are records of more than 320 individuals including 41 specimens in museum collections. Despite an estimated 96 person-hours of search effort across eleven locations in south-eastern Queensland and north-eastern New South Wales we encountered only females. In the northern and southern parts of the range, *A. rubricauda* adults have been recorded across most and all months of the year, respectively. We explore several explanations for the lack of males in the southern range and suggest that the most plausible explanation is that southern females are able to reproduce via parthenogenesis." (Authors)] Address: Burwell, C.J., Biodiversity and Geosciences Program, Queensland Museum, P.O. Box 3300, South Brisbane, Qld 4101, Australia. Email: [chris.burwell@qm.qld.gov.au](mailto:chris.burwell@qm.qld.gov.au)

**22243.** Carreira, B.; Kolár, V.; Chmelová, E.; Jan, J.; Adasevic, J.; Landeira-Dabarca, A.; Vebrová, L.; Poláková, M.; Horká, P.; Otáhalová, S.; Musilová, Z.; Borovec, J.; Tropek, R.; Boukal, D.S. (2023): Bioaccumulation of chemical elements at post-industrial freshwater sites varies predictably between habitats, elements and taxa: A power law approach. *Science of the Total Environment* 901 (2023) 165794: 14 pp. (in English) ["Elevated environmental levels of elements originating from anthropogenic activities threaten natural communities and public health, as these elements can persist and bioaccumulate in the environment. However, their environmental risks and bioaccumulation patterns are often habitat-, species- and element-specific. We studied the bioaccumulation patterns of 11 elements in seven freshwater taxa in post-mining habitats in the Czech Republic, ranging from less polluted mining ponds to highly polluted fly ash lagoons. We found nonlinear, powerlaw relationships between the environmental and tissue concentrations of the elements, which may explain differences in bioaccumulation factors (BAF) reported in the literature. Tissue concentrations were driven by the environmental concentrations in non-essential elements (Al, As, Co, Cr, Ni, Pb and V), but this dependence was limited in essential elements (Cu, Mn, Se and Zn). Tissue concentrations of most elements were also more closely related to substrate than to water concentrations. Bioaccumulation was habitat specific in eight elements: stronger in mining ponds for Al and Pb, and stronger in fly ash lagoons for As, Cu, Mn, Pb, Se, V and Zn, although the differences were often minor. Bioaccumulation of some elements further increased in mineral-rich localities. Proximity to substrate, rather than trophic level, drove increased bioaccumulation levels across taxa. This highlights the importance of substrate as a pollutant reservoir in standing freshwaters and suggests that benthic taxa, such as molluscs (e.g., *Physella*) and other macroinvertebrates (e.g., *Nepa*), constitute good bioindicators. Despite the higher environmental risks in fly ash lagoons than in mining ponds, the observed ability of freshwater biota to sustain pollution supports the conservation potential of post-industrial sites. The power law approach used here to quantify and disentangle the effects of various bioaccumulation drivers may be helpful in additional contexts, increasing our ability to predict the effects of other contaminants and environmental hazards on biota." (Authors)] Address: Carreira, B., cE3c – Centre for Ecology, Evolution and Environmental Changes, Faculty of Sciences of the University of Lisbon, Edifício C2, Campo Grande, 1749-016 Lisbon, Portugal. Email: [bmcarreira@fc.ul.pt](mailto:bmcarreira@fc.ul.pt)

**22244.** Castellano, S.; Falbo, F.; Seglie, D.; Friard, O. (2023): Anti-predator behavior in two brown frogs: differences in the mean behaviors and in the structure of animal personality variation. *Behavioral Ecology and Sociobiology* 77, Article number: 98 (2023): 15 pp. (in English) ["Predation is a major source of selection and prey are known to modify their behavior depending on their past experiences and the current perceived risk. Within a species, variation in experience and in the response to perceived risk combine to explain variation in personality and individual plasticity. Between species, variation in personality and plasticity might also be the evolutionary consequence of different selective regimes. In this study, we describe the anti-predator behavior of two closely related brown frogs, *Rana dalmatina* and *Rana latastei*, and compare their structures of personality variation. We raised tadpoles in a common garden experiment with either fish, dragonfly larvae [*Aeshna* sp.], or no predators. Tadpoles were then repeatedly tested in the presence of the three acute stimuli and their behavioral variation was described in terms of quantity and quality of movements and of path sinuosity. In these tests, tadpoles of both species and ontogenetic treatments responded flexibly to predators by moving less, faster, and with more tortuous movements, and tadpoles raised with predators tended to move even faster. Independent of the acute treatment, *R. dalmatina* moved more and faster than *R. latastei* and the differences were larger without than with predators, demonstrating its higher plasticity. At the individual level, the two species showed qualitatively similar but quantitatively different structures of personality variation. *R. dalmatina*, more active, faster, and more plastic than *R. latastei*, showed also higher repeatability and a larger behavioral variation both among and within individuals. Significance statement: Predators are a major source of selection and preys have evolved the ability to flexibly respond to them. These responses often vary among species, because of their different evolutionary histories, and among individuals, because of their different experiences. We analyzed both these sources of behavioral variation in two closely related brown frogs, *Rana dalmatina* and *R. latastei*. We raised tadpoles either with or without predators and tested them in open field trials both with and without predators. The effects of the raising environment were similar in the two species, whereas the effects of the testing arena differed. Both species decreased activity and increased speed and sinuosity with predators, but *R. dalmatina* moved always more and faster than *R. latastei* and it showed higher plasticity, larger variation among and within individuals, and relatively higher values in repeatability." (Authors)] Address: Castellano, S., Dept of Life Science and Systems Biology, University of Turin, Via Accademia Albertina 13, 10123, Turin, Italy

**22245.** Chalmers, P.; Melchers, G.; Tikka, K.; Richardson, J.S. (2023): Distribution of the grappletail dragonfly (*Octogomphus specularis*), a lake outlet stream specialist at its northern range limit. *Fundamental and Applied Limnology* 197(1): 1-8. (in English) ["*O. specularis* reaches the northern end of its range in Canada and has only seven known occurrences within British Columbia, where its larvae are known only from lake outlet streams. Lake outlet streams provide a unique lotic environment with water from lakes providing high quality seston to filter feeders, favourably warmer water in summer, buffering from variation in discharge, and more stable substrates, in comparison to streams uninfluenced by lakes. We investigated factors that might explain why the distribution of larval grappletails appears to be restricted to lake outlet streams. We sampled the larvae from two outflow streams over one summer to determine

their number of age classes and estimate their abundances relative to distance from the lake outlets. We characterized the thermal regime of each lake outlet stream, and quantified the temperature differences between lake outlets and inflow streams. The two lake outlet streams were on average 37 % warmer (4.4 °C and 7.2 °C) higher than the inflow streams. We found three groupings of larval sizes, indicating a life cycle of three years. In one stream, larval abundance decreased with increasing distance from the lake, but in the other stream there was no pattern of decrease. Our results are consistent with the theory that warmer thermal conditions throughout summer at lake outflow streams provide sufficient degree-days to support development of this species' larvae at the northern end of their global range." (Authors)] Address: Richardson, J.S., Department of Forest and Conservation Sciences, The University of British Columbia, Vancouver, Canada V6T 1Z4. Email: john.richardson@ubc.ca

**22246.** Choong, C.Y. (2023): A preliminary study of dragonflies and damselflies (Odonata) of Batu Caves, Selangor, Malaysia. *Malayan Nature Journal* 75(1): 149-153. (in English) ["More than 250 species of Odonata are known to occur in Peninsular Malaysia. However, there is still no published record of Odonata from Batu Caves, Selangor. Hence, a series of field surveys were conducted from April to August 2019. A total of 25 species from four families were recorded, representing 10% of species known to Peninsular Malaysia. Of these, 19 species belong to the family Libellulidae, four species to family Coenagrionidae, and one species each from families Platycnemididae and Gomphidae. Notable records were *Ceragrion auranticum* and *C. chaoi*, and *Camacinia gigantea*. *C. auranticum* is a new record for the state of Selangor. Though its coverage area is small with limited aquatic habitats, Batu Caves still holds a substantial number of Odonata species." (Author)] Address: Choong, C.Y., Centre for Insect Systematics, Univ. Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia. E-mail: cychoong@ukm.edu.my

**22247.** Chovanec, A.; Fischer, I.; Kargl V.; Schaufler, K. (2023): Die Libellenfauna eines Stillgewässers in Niederösterreich unter besonderer Berücksichtigung seiner Salinität. *Libellula* 42(1/2): 1-26. (in German, with English summary) ["Odonata at a stagnant water body in Lower Austria with special reference to its salinity – A standing water body with a size of about 1,500 m<sup>2</sup> was subject of an odonatological survey from 2021 to 2022. Due to heterogenic habitat conditions, 36 odonate species were found with 15 of them autochthonous (e.g., *Coenagrion scitulum* and *Sympetrum meridionale*, both "threatened with extinction" according to the Austrian Red List). In the case of 13 spp. successful development was proven by records of teneral and exuviae and two spp. were classified as autochthonous because of high abundances in both years. The identification of exuviae was performed using DNA barcoding technique. The results of the study confirm the tolerance of many Central European dragonfly and damselfly species towards salinity. A maximum of 1.8 PSU (Practical Salinity Units) was calculated for the investigated water body due to increased chloride and sodium concentrations. Based on the results obtained in this study, the published tolerance limits of some species have to be raised. Only verbally described plasticity towards salinity in other species is now confirmed by precise values of chloride and sodium. Desiccating parts of the water body in 2022, due to low precipitation and groundwater levels, probably had an important impact on the Odonate community." (Authors)] Address: Chovanec, A., Krottenbachgasse 68, A-2345 Brunn am Gebirge, Austria. Email: andreas.chovanec@bml.gv.at

**22248.** Darkin, J. (2023): The first record of a viviparous lizard *Zootoca vivipara* predated a blue-tailed damselfly *Ischnura elegans*. *The Herpetological Bulletin* 163: 41. (in English) ["On 13 July 2022, I visited Foulshaw Moss Nature Reserve, Cumbria, England (54° 14'39" N, 2° 50'03" W). This reserve is a raised peat bog habitat, situated on the southern tip of the English Lake District covering an area of 3.5 km<sup>2</sup>. It is an ideal habitat for *Z. vivipara* and the northern viper *Vipera berus*. At 12:07 h, when the weather was partly cloudy with an approximate air temperature of 17 °C, a male *Z. vivipara* was observed basking on the edge of the Foulshaw Moss boardwalk close to the peat moss and near a peat pool. It was here the damselfly alighted only to be grasped by the lizard (Fig. 1). I recorded the lizard taking approximately one minute to ingest the damselfly, during which time the lizard shook the damselfly from side to side, dragging it backwards across a portion of the boardwalk to force it into its mouth, eventually swallowing the entire damselfly (BHS video, 2023). Following ingestion, the lizard resumed basking with its mouth agape. The Foulshaw Moss Nature Reserve has an abundance of both damselflies and dragonflies, including the endangered white-faced darter *Leucorrhinia dubia*, as well as a diverse array of other invertebrate prey for *Z. vivipara*." (Author)] Address: Darkin, J., Faculty of Science and Engineering, University of Wolverhampton, Wulfruna Street, Wolverhampton, West Midlands WV1 1LY, UK. Email: joshuadarkin0@gmail.com

**22249.** David, J.; et al., (2023): Atlas des libellules de la Bretagne à la Vendée. Collectif Bretagne Vivante & Atlas entomologique régional. ISBN 978-2-36833-452-2: 324 pp. (in French) ["The product of a collective work of 29 authors, it compiles, in a beautiful 324-page book, (1.4 kg) all of the current knowledge on dragonflies from the six departments of the study. From 2000 to 2020, nearly 2,000 observers mobilized to collect more than 165,000 data, to which were added 25,000 historical observations. Each of the 68 species present in the territory is presented in a monograph which includes its general distribution, its history and its biology in the study area, its status and abundance, the results of the survey and the perspectives concerning it. Distribution maps covering the two periods, phenology graphs and around 250 photos enrich the monographs, as well as a history of Latin and French names. A documented review of the evolution of habitats over the centuries, an analysis of the distribution by watershed and the conservation status of dragonfly populations complete this important work. The book also looks at other original themes such as the history of the study of dragonflies and that of their presence in popular traditions. The recently created Breton names are published for the first time. Finally, a photographic key to the 68 species will allow beginners or experienced naturalists to have a synthetic document to identify them in situ or a posteriori." (Publisher/Google Translate)] Address: <https://www.bretagne-vivante.org/produit/atlas-des-libellules-de-la-bretagne-a-la-vendee-frais-denvoi/>

**22250.** de Haro Guijarro, S. (2023): Primer caso de teratología abdominal en *Platycnemis acutipennis* (Selys, 1841) (Odonata: Platycnemididae). *Boletín de la SEA* 72: 181-182. (in Spanish, with English summary) ["For the first time, a case of abdominal teratology for a young male of the damselfly *Platycnemis acutipennis* is reported." (Author) "06-16-2022 a young male of *P. acutipennis* was photographed perched in the riverside vegetation between the Sarón-Ontañeda greenway and the Pisueña river, a tributary of the Pas, as it passes through the town of La Penilla, TM de Santa María from Cayón (UTM WGS84 30T 429070 4796492;"]



Address: de Haro-Guijarro, S., Asociación para el Estudio y la Conservación de la Naturaleza-La Enea (AECN-La Enea), C/ El Ferial 7, 1ºF, 39620, Sarón (Cantabria,), Spain. Email: asociacionlaenea@gmail.com

**22251.** Deacon, C.; Samways, M.J.; Pryke, J.S. (2023): Interplay between pond size and matrix extent drives odonate diversity patterns in a fragmented landscape. *Biodiversity and Conservation* 32: 4767-4785. (in English) ["Landscape fragmentation impacts freshwater habitats and their quality, affecting aquatic insect assemblages. Adjacent terrestrial areas are important secondary habitats where amphibiotic insects mature, feed, find mates, and move to locate aquatic breeding habitats. Using a factorial design with 27 small and large ponds within small and large natural patches in an exotic tree plantation-fragmented landscape of South Africa, and odonates as model organisms, we investigated (1) how pond size/natural terrestrial patch size interaction affects odonate diversity patterns versus habitat quality variables, and (2) determined whether anisopterans and zygopterans respond differently to landscape fragmentation. Species richness was similar among ponds. However, odonate abundance was highest in large ponds regardless of natural terrestrial patch size. Zygopteran functional richness and diversity was driven by pond and natural patch size, suggesting that zygopterans are sensitive to landscape fragmentation. In contrast, anisopterans were more resilient to fragmentation and more likely to select suitable habitats following water chemistry and vegetation characteristics. Overall, large ponds were occupied by different odonate assemblages compared to small ponds, and occupancy was strongly associated with mobility traits. These findings emphasize that ponds in both small and large natural terrestrial patches have conservation value. A pondscape that represents various pond sizes is important for maintaining regional odonate diversity. Pond conservation needs to be considered in the wider terrestrial context, which host a range of important secondary habitats. Adjacent natural terrestrial habitats also connect nearby aquatic habitats, which enable insects to move across the landscape in response to natural and artificial drivers." (Authors)] Address: Deacon, C., Department of Conservation Ecology and Entomology, Faculty of AgriSciences, Stellenbosch University, Stellenbosch, South Africa. Email: charldeacon@sun.ac.za

**22252.** Delithalia, M.; Mahatma, R. (2023): Dragonfly inventory and active time in Kasang Kulim Zoo area, Riau, Indonesia. *Bioeksperimen* 9(2): 32-39. (in English) ["Dragonflies have an important role in ecosystem balance as biological control agents and environmental bioindicators because they are sensitive to changes in water quality. Community activities at the Kasang Kulim Zoo can cause changes to water quality. When habitat conditions change, Odonata (dragonfly) will also changes, both in distribution and diversity. This study aims to identify, invent and determine the activity time of dragonflies found in the Kasang Kulim Zoo area. Research was conducted at the end of March to mid-April 2023. Sampling used exploration method by using insect nets. The results obtained a total of 152 individuals belonging to 14 species, four families ... The Libellulidae family are active from 08.00 am to 05.00 pm, while dragonfly species from the Gomphidae family and the Zygoptera suborder are active from 08.00 am to 03.00 pm. Dragonfly activity is influenced by air temperature, air humidity and sunlight intensity." (Authors)] Address: Delithalia, Miranda, Dept of Biology, Faculty of Mathematics and Natural Sciences, Riau University, Pekanbaru 28293, Indonesia. Email: miranda.delithalia2163@student.unri.ac.id

**22253.** Dharan, D.T.; Greeshma (2023): Preliminary studies on the diversity and abundance of odonates in the selected sites of southern Kerala. *Asian Journal of Conservation Biology* 12(1): 82-89. (in English) ["Biodiversity forms the foundation of the vast array of ecosystem that critically contributes to human well-being. Odonates are considered to be indicator of ecological balance and are commonly seen in and around water bodies. The present study was carried out to assess the Diversity and Abundance of Odonates in the selected sites of Kollam and Trivandrum districts, Kerala, India in 2020-2021. A total of 25 species belonging to 16 genera and 6 families were recorded during the entire study. Suborder Anisoptera was represented by the families Libellulidae, comprising 10 species and Gomphidae, with 1 species; and the suborder Zygoptera was represented by the families Calopterygidae, with 2 species; Platycnemididae, with 3 species; Coenagrionidae, with 8 species; and Chlorocyphidae, with 1 species. Libellulidae was the dominating family with 40% of the total observations, followed by Coenagrionidae family. The only way to save the Odonata fauna and its habitats is creating awareness among the people. In this context, knowledge of Odonata fauna of a region is the first step towards conservation." (Authors)] Address: Dharan, Divya, Postgraduate & Research Dept of Zoology, Sree Narayana College, Kollam-691001, Kerala, India. Email: divyashilji83@gmail.com

**22254.** Dreger, J.; Kampmeier, F.; Grabow, K.; Martens, A. (2023): Die Zebra-Muschel *Dreissena polymorpha* als Aufsitzer der Larve von *Anax imperator* (Bivalvia: Dreissenidae; Odonata: Aeshnidae). *Libellula* 42(1/2): 79-83. (in German, with English summary) ["A zebra mussel *Dreissena polymorpha* epizoic on a larvae of *Anax imperator* (Bivalvia: Dreissenidae; Odonata: Aeshnidae) – One *Dreissena polymorpha* was reported from an exuviae of a male *A. imperator* collected from a stake at the northern shore of Lake Starnberg near the efflux into the River Würm at Starnberg, Germany, on 20 July 2023." (Authors)] Address: Dreger, Juliana, Durlacher Allee 21, 76131 Karlsruhe, Germany. Email: juliana.d@gmx.net

**22255.** Edegbene, A.O.; Elakhame, L.A.; Arimoro, F.O.; Osimen, E.C.; Edegbene Ovie, T.T.; Akumabor, E.C.; Ubanatu, N.C.; Njuguna, C.W.; Sankoh, A.A.; Akamagwuna, F.C. (2023): How do the traits of macroinvertebrates in the River Chanchaga respond to illegal gold mining activities in North Central Nigeria. *Frontiers in Ecology and Evolution* 11: 15 pp. (in English) ["Africa harbours about a third of the world's largest natural resource reserves of mineral such as gold and diamonds. These vast mineral reserves in Africa are essential to the continent's development and modern industrial society. However, these minerals, including gold, are often illegally mined by locals which leads to biodiversity loss and groundwater and surface water contamination. In the present study, we assess the impact of illegal gold mining (i.e., panning) and other anthropogenic activities on the distribution patterns of macroinvertebrate traits in the River Chanchaga, North central Nigeria. Anthropogenic activities including urban development, agricultural activities, household activities and gold mining are impacting the Chanchaga stream sites samples in Nigeria. We selected four sampling stations (i.e., reaches), denoting increasing disturbance order; Station 1 < Station 2 < Station 4 < Station 3. Four macroinvertebrate traits, body size, mode of respiration, mode of locomotion, and body shape, were selected and categorized into 19 attributes. The trait attributes were assigned to taxa using the fuzzy coding method. The relative abundance of traits in the study river showed that very



large body size (>40–80 mm) macroinvertebrates dominated Stations 1 and 2 while large body size (>20–40mm) dominated Station 3. The relative abundance of macroinvertebrates possessing an integument for oxygen diffusion dominated Station 4. The RLQ model showed that traits such as medium body size (>10–20 mm), gills as mode of respiration, and streamlined and spherical body shapes were positively associated with Stations 1 and 2. Conversely, small (>5–10 mm) and very large (>40–80 mm) body sizes, spiracle: vegetative respiration using plant stems, climbing mode of locomotion, and sprawling mode of locomotion were positively associated with Stations 3 and 4. The fourth-corner test revealed that macroinvertebrates with very small (<5mm) and medium body sizes (>10–20 mm), spiracles mode of respiration and climbing mode of locomotion were positively associated with at least one of the following physico-chemical variables: 1) electrical conductivity [EC ( $\mu\text{S cm}^{-1}$ )], 2) biological oxygen demand [BOD 5 ( $\text{mg l}^{-1}$ )], 3) sulphate ( $\text{mg l}^{-1}$ ), 4) nitrate ( $\text{mg l}^{-1}$ ) and 5) phosphate ( $\text{mg l}^{-1}$ ). These traits were classified as resilient traits to pollution in our study. On the other hand, macroinvertebrates that possess gills and can swim actively were positively associated with dissolved oxygen and were deemed vulnerable to pollution. Based on our findings, we concluded that anthropogenic activities, especially illegal gold mining, alter the distribution patterns of macroinvertebrates traits and, in turn, the ecological balance of the ecosystem. To forestall further damage to the ecological health of the River Chanchaga, the government should regulate the activities of gold miners." (Authors) Taxa. including Odonata. are treated at family level; from the Gomphidae a figure is published, claimed to be an *Ictinogomphus*.] Address: Edegbene, Augustine, Dept of Biological Sciences, Federal Univ. of Health Sciences, Otuokpo, Nigeria. Email: ovieedes@gmail.com

**22256.** Ehling, J.; Zitzmann, F.; Diekmann, L.; Reich, M. (2023): Eine Paludikultur mit Schilf und Rohrkolben in der Etablierungsphase als Lebensraum für Libellen. *Libellula* 42(1/2): 27-47. (in German, with English summary) ["A paludiculture with reed and cattail in the establishment phase as habitat for dragonflies – In order to reduce greenhouse gas emissions from drained peatlands, extensive rewetting activities are required. In this context, paludiculture could play a key role, as it combines climate protection and agricultural production. The establishment of these crops creates novel habitats for fauna and flora. The aim of this work was to assess the habitat potential of a recently established paludiculture with reed and cattail for dragonflies (Odonata). For this purpose, surveys were carried out on a paludiculture pilot site and in different reference habitat types in the district of Oldenburg (NW-Germany). The results show that the investigated paludiculture was of great importance for the dragonfly fauna of the study area in the second year after its establishment. In comparison to the comparatively species-poor reference habitats, the highest total species numbers were recorded (including the endangered pioneer species *Ischnura pumilio*), the detected species had comparatively high abundances, and the highest number of species with reproductive behaviour was found. The high attractiveness of the site probably resulted from the combination of shallow water levels, full-area sun exposure, and a high structural diversity, which simultaneously provided suitable conditions for species with different demands. However, these habitat characteristics are limited to the establishment phase of the crops. Further growth of reed and cattail towards dense stands is expected to rapidly reduce the habitat quality for dragonflies. Since paludicultures with reed and cattail are novel land-use systems and our investigation covered only

a short period of time, there is a considerable need for research on the further succession of the dragonfly fauna as the cultures age, on the effects of harvesting on different dragonfly species, and on potential measures to promote dragonflies and other species groups in paludicultures." (Authors)] Address: Ehling, Jana, Leibniz Universität Hannover, Institut für Umweltplanung, Arbeitsgruppe Naturschutz und Landschaftsökologie, Herrenhäuser Str. 2, 30419 Hannover, Germany. Email: ehling.jana@gmail.com

**22257.** Eraghi, S.H.; Toofani, A.; Guilani, R.J.A.; Ramezanzpour, S.; Bijma, N.N.; Sedaghat, A.; Yasamandaryaei, A.; Gorb, S.; Rajabi, H. (2023): Basal complex: a smart wing component for automatic shape morphing. *Communication Biology* 6:853 | <https://doi.org/10.1038/s42003-023-05206-1>: 9 pp. (in English) ["Insect wings are adaptive structures that automatically respond to flight forces, surpassing even cutting-edge engineering shape-morphing systems. A widely accepted but not yet explicitly tested hypothesis is that a 3D component in the wing's proximal region, known as basal complex, determines the quality of wing shape changes in flight. Through our study, we validate this hypothesis, demonstrating [by using *Sympetrum vulgatum*, *Calopteryx splendens*, *Ischnura elegans*] that the basal complex plays a crucial role in both the quality and quantity of wing deformations. Systematic variations of geometric parameters of the basal complex in a set of numerical models suggest that the wings have undergone adaptations to reach maximum camber under loading. Inspired by the design of the basal complex, we develop a shape-morphing mechanism that can facilitate the shape change of morphing blades for wind turbines. This research enhances our understanding of insect wing biomechanics and provides insights for the development of simplified engineering shape-morphing systems." (Authors)] Address: Rajabi, H., Mechanical Intelligence (MI) Research Group, South Bank Applied BioEngineering Research (SABER), School of Engineering, London South Bank University, London, UK. ty, London, UK. Email: rajabijh@lsbu.ac.uk

**22258.** Erlita, M. (2023): Asosiasi Serangga Predator dengan Tanaman Refugia di Kebun Botani Desa Solok Kecamatan Kumpeh Ulu. S1 thesis, biologi, Jurusan Matematika dan Ilmu Pengetahuan Alam, Fakultas Sains dan Teknologi, Universitas Jambi: XIV, 69 pp. (in Indonesian) ["Predatory insects are natural enemies that often visit honey and nectar producing plants as an alternative source of feed. Refugia is a plant of several types of plants that provide shelter, provide a source of food or a source of nutrition, tend to have bright petal colors or flowers with striking colors that aim to attract natural enemy insects. This research is a quantitative descriptive research with the sampling point applied, namely the planting pattern on the edge of the land plot. Sampling was carried out by sweep net technique, direct observation and branch beating. Sampling of predatory insect species in the morning at 06.00–08.00 WIB and in the afternoon carried out 15.30–17.30 WIB. Predatory insects associated with refugia plants number 24 species from 5 orders, namely Coleoptera, Hymenoptera, Diptera, Mantodea, and Odonata [*Orthetrum sabina*, *Rhyothemis fenestrina*, *R. phyllis*]. The association of predatory insects with *Tagetes* sp plants has a low category association index value. Predatory insects associate with plants *Celosia* sp. *Eumenes coronatus* species with an association scale value of 0.95, *Delta campaniforme* species with an association scale value of 0.76 are species with a very high association index value. The diversity of predatory insects found in refugia plants in Solok village, Kumpeh Ulu district, is in the medium category. The evenness value is included in the high category,

while the dominance value is no dominant species." (Authors)] Address: <https://repository.unja.ac.id/57339/3/Skripsi%20mira%20erlita%20nim%20F1C417010%20full.pdf>

**22259.** Fadel, A.; Guerrieri, F.; Pincebourde, S. (2023): The functional relationship between aquatic insects and cyanobacteria: A systematic literature review reveals major knowledge gaps. *Total Environment Research Themes* 8, December 2023, 100078: 18 pp. (in English) ["Cyanobacteria and aquatic insects are major components of food webs in freshwater ecosystems. However, the functional relationship between cyanobacteria and aquatic insects has been poorly studied. The blooms of cyanobacteria are more likely to intensify with rising temperatures, such that climate warming may influence this relationship. To improve our understanding of this relationship, we performed a systematic literature review (SLR) and analyzed 104 peer-reviewed research articles published between 1985 and 2020. The articles were categorized into three themes: the role of cyanobacteria as food source and habitat for aquatic insects, the impact of cyanotoxins on aquatic insects, and the use of *Bacillus thuringiensis* (Bt) expressing transgenic cyanobacteria to control Diptera, mainly mosquitoes. Major findings on each of these themes were summarized and research gaps and opportunities were highlighted. Major gaps include the lack of ecological modelling studies that describe or model this relation, the absence of studies of cyanotoxins' impact on key aquatic insects like dragonflies, the impact of Bt larvicidal engineered cyanobacteria on biological indicators like Chironomidae, the lack of studies on climate change impacts on the functional links between cyanobacteria, aquatic insects and other organisms. These gaps and research opportunities should be addressed in future research to increase the understanding of the relationship between cyanobacteria and aquatic insects and therefore the biology of freshwater ecosystems." (Authors)] Address: Fadel, A., Institut de Recherche sur la Biologie de l'Insecte, UMR 7261, CNRS. Univ. de Tours, 37200 Tours, France. Email: [ali.fadel@univ-tours.fr](mailto:ali.fadel@univ-tours.fr)

**22260.** Fernandez-Nicolas, A.; Machaj, G.; Ventos-Alfonso, A.; Pagone, V.; Ohde, T.; Daimon, T.; Ylla, G.; Belles, X. (2023): Reduction of embryonic E93 expression as a hypothetical driver of the evolution of insect metamorphosis. *Proceedings of the National Academy of Sciences* 120 (7) e2216640120: 7 pp. (in English) ["Significance: Insect metamorphosis is classified into hemimetaboly and holometaboly, which derives from the former. Hemimetabolans nymphs are similar to the adult, whereas in holometabolans embryogenesis produces a larva that differs from the adult, being vermiform in extreme cases. The embryo of the hemimetabolans *Blattella germanica* expresses the gene E93 at high levels. In all insects, E93 triggers adult morphogenesis in the last juvenile stage, but in *B. germanica*, E93 is also crucial for embryogenesis. Intriguingly, E93 expression is high in the embryo of hemimetabolans, but very low in holometabolans. We hypothesize that E93 determines the nymphal genetic program, and that the reduction of embryonic E93 expression has been instrumental for the formation of the larva and the evolution of holometabolans metamorphosis. Abstract: The early embryo of the cockroach *Blattella germanica* exhibits high E93 expression. In general, E93 triggers adult morphogenesis during postembryonic development. Here we show that E93 is also crucial in early embryogenesis in the cockroach, as a significant number of E93-depleted embryos are unable to develop the germ band under maternal RNAi treatment targeting E93. Moreover, transcriptomic analysis indicates that E93 depletion results in important gene expression changes in the early embryo,

and many of the differentially expressed genes are involved in development. Then, using public databases, we gathered E93 expression data in embryo and preadult stages, finding that embryonic expression of E93 is high in hemimetabolans species (whose juveniles, or nymphs, are similar to the adult) and low in holometabolans (whose juveniles, or larvae, are different from the adult). E93 expression is also low in Thysanoptera and in Hemiptera Sternorrhyncha, hemimetabolans with postembryonic quiescent stages, as well as in Odonata, the nymph of which is very different from the adult. In ametabolans, such as the *Zygentoma domestica*, E93 transcript levels are very high in the early embryo, whereas during postembryonic development they are medium and relatively constant. We propose the hypothesis that during evolution, a reduction of E93 expression in the embryo of hemimetabolans facilitated the larval development and the emergence of holometaboly. Independent decreases of E93 transcripts in the embryo of Odonata [*Ischnura senegalensis*], Thysanoptera, and different groups of Hemiptera Sternorrhyncha would have allowed the development of modified juvenile stages adapted to specific eco-physiological conditions." (Authors)] Address: Ylla, G., Laboratory of Bioinformatics and Genome Biology, Faculty of Biochemistry, Biophysics and Biotechnology, Jagiellonian University, Kraków 30-387, Poland. Email: [guillem.ylla@uj.edu.pl](mailto:guillem.ylla@uj.edu.pl)

**22261.** Fischer, I.; Kargl, V.; Chovanec, A. (2023): 2022 – Jahr der Libellen. AÖE (Arbeitsgemeinschaft Österreichischer Entomologen) News 5: 7-20. (in German) ["In 2022, dragonflies (Odonata) were at the center of the activities of the Association of Austrian Entomologists (AÖE). The year before, the focus was on wild bees. A workshop, lectures and excursions were held under the umbrella of the dragonflies. Traditionally, a poster was also dedicated to the animal group of the year (Fig. 1). An article on the Austrian "Year of the Dragonflies" was published in the "Dragonfly News" published in Germany, the communications of the Society of German-Speaking Odonatologists (GdO) (CHOVANEK 2022a)." (Authors)] Address: Chovanec, A., Krottenbachgasse 68, 2345 Brunn am Gebirge, Austria. Email: [andreas.chovanec@bml.gv.at](mailto:andreas.chovanec@bml.gv.at)

**22262.** Fliedner, H. (2023): The scientific names of Erich Schmidt's odonate taxa. *International Dragonfly Fund. Report* 181: 1-92. (in English, with German summary) ["This paper offers an explanation of the 113 scientific names for Odonata which were given by the German odonatologist Erich Walther Schmidt (1890-1969), as well as those given by other authors in which taxa named by him are now classified. Before that, the life and work of this scientist are described. After that there is an analysis of the types of names he preferred, a look at important character traits and an attempt to deduce his intentions in naming dragonflies." (Author)] Address: Fliedner, H., Louis-Seegelken-Str. 106, 28717 Bremen, Germany. Email: [H.Fliedner@t-online.de](mailto:H.Fliedner@t-online.de)

**22263.** Frank, M. (2023): Zum aktuellen Vorkommen der Gemeinen Keiljungfer (*Gomphus vulgatissimus*) an der Stepenitz im Landkreis Nordwestmecklenburg (Odonata: Gomphidae). *Virgo. Mitteilungsblatt des Entomologischen Vereins Mecklenburg* – 26: 28-41. (in German, with English summary) ["A little more than 30 years after the discovery of the population of *Gomphus vulgatissimus* (Linnaeus, 1758) on the Stepenitz in the district of Northwest-Mecklenburg, a systematic survey of the species was carried out in 2021 on selected sections of this lowland river. The presence of the species was proven by exuviae collections at 11 of the 20

examined sections over a length of approx. 15 km. The highest density of exuviae was determined to be 5.2/m over a length of 100 m. The EM50 value was determined there with approx. 7 days, the sex ratio (female/male) with 1.08:1. The two tributaries of the Stepenitz, the Maurine and the Rade-gast, were also investigated on a random basis, whereby an occurrence already known on this river could be confirmed on two new sections of the Rade-gast. Neither imagines nor exuviae were found on the Maurine." (Author)] Address: Frank, M., 55268 Nieder-Olm, Zur Traubenmühle 5A, Germany. Email: mikel.frank@gmx.de

**22264.** Gayathri, M.; Anand, P.P.; Shibu Vardhanan, Y. (2023): Wing size, shape, and asymmetry analysis of the wandering glider, *Pantala flavescens* (Odonata: Libellulidae) revealed that hindwings are more asymmetric than the forewings. *Biologia* 78: 2749-2762. (in English) ["The present study aimed to determine the wing asymmetry and sexual asymmetry of *P. flavescens* collected from a paddy field. *P. flavescens* is known as the longest migratory insect species and the morphological architecture of their hindwing aids in long-distance gliding. In our study, we collected F1 generation of male and female *P. flavescens* and used for geometric morphometric study to investigate wing asymmetry. We observed no difference in wing size between sexes from the study, but there are significant ( $p < 0.05$ ) shape differences. The female population was more asymmetric than male population, with a high shape-related fluctuation asymmetry (FA). Discriminant function analysis was used to validate wing asymmetry (right-left) and sexual asymmetry of *P. flavescens*. Canonical variant analysis discriminated the forewings and hindwings of *P. flavescens* both sexes in a distinct morphospace. The PC's warp shape analysis proved that, when compared to forewings, the highest amount of shape variations was observed in hindwings, especially in anal lobe regions. Based on the results, pesticide and fertilizer used in the paddy fields are the primary reason for the high level of FA, and the morphological variations observed in the hindwings may influence the migratory behaviour of *P. flavescens*." (Authors)] Address: Anand, P.P., Biochemistry and Toxicology Division, Department of Zoology, University of Calicut, Thenhipalam 673 635, Kerala, India. Email: anandpp633@gmail.com

**22265.** Giberson, D.J.; Harding, R.W.; Curley, R. (2023): Paul Brunelle's legacy in PEI: The dragonflies and damselflies of Prince Edward Island. *Newsletter of the Biological Survey of Canada* 42(1): 24-36. (in English) [[https://www.researchgate.net/publication/373360440\\_Paul\\_Brunelle's\\_Legacy\\_in\\_PEI\\_The\\_Dragonflies\\_and\\_Damselflies\\_of\\_Prince\\_Edward\\_Island](https://www.researchgate.net/publication/373360440_Paul_Brunelle's_Legacy_in_PEI_The_Dragonflies_and_Damselflies_of_Prince_Edward_Island)] Address: Giberson, D.J., Dept. Biol., Univ. of Prince Edward Island, Charlottetown PE, Canada

**22266.** Golovatyuk, L.V.; Nazarova, L.B.; Kalioujnaia, I.J.; Grekov, I.M. (2023): Taxonomic composition and salinity tolerance of macrozoobenthos in small rivers of the southern arid zone of the East European Plain. *Biology* 2023, 12, 1271. <https://doi.org/10.3390/biology12091271>: 20 pp. (in English) ["Simple Summary: Climate-related salinization of inland waters is observed in many regions of the world as a major environmental problem affecting natural processes in aquatic ecosystems. In order to better predict and control these changes, it is important to study the responses of aquatic fauna to increasing salinity. Macrozoobenthic fauna, which includes mollusks, small crustaceans, and insect larvae, constitutes the main food base for fish and water birds. Due to their relatively short life cycles, large species diversity, and high abundance, macrozoobenthos are the best indicators

of changing water salinity. To determine the species richness, distribution, and salinity tolerance of macrozoobenthos, we investigated 17 small rivers with different water salinity in the southern arid region of the East European Plain. The study shows that the species richness gradually decreases with an increase in water salinity in the rivers. In freshwater rivers, the macrozoobenthos fauna includes more than 100 species, whereas, in hypersaline rivers with salinity comparable to seawater, only 10 species were found. A total of 5 of the 156 invertebrate species can be used as indicators of water salinization in rivers of the arid regions of Europe. Abstract: This study investigated the species composition, distribution, and salinity tolerance of macrozoobenthos in 17 small rivers in the southern arid region of the East European Plain, which are characterized by a small channel gradient, slow-flowing or stagnant water bodies, and a wide range of water salinity, varying between 0.18 and 30 g L<sup>-1</sup>. In total, 156 taxa were found, among which 66 were Diptera species. The study revealed that the formation of benthic communities in the rivers is influenced by natural factors of the catchment basins, including the flat landscape with sparsely developed relief differentiation, climate aridity, and the widespread occurrence of saline soils and groundwater, largely related to the sedimentation of the ancient Caspian Sea and modern climate changes. These conditions are favorable for the occurrence of lacustrine macrozoobenthic species in freshwater, euryhaline, and halophilic ecological groups. The investigation revealed a decrease in species richness in response to an increase in water salinity. The five identified halophilic species *Tanytarsus kharaensis*, *Glyptotendipes salinus*, *Cricotopus salinophilus*, *Chironomus salinarius*, and *Palpomyia schmidti* can be used as indicators of river ecosystem salinization.... Dragonfly larvae showed high diversity and were mainly found in the overgrown areas of the rivers. Among dragonflies, the species *Sympetma fusca* and *Enallagma cyathigerum* were the most common (7% and 5%, respectively)." (Authors) Species composition of macrozoobenthos in the investigated small rivers: *Anax imperator*, *Enallagma cyathigerum*, *Erythromma najas*, *Ischnura elegans*, *Lestes sponsa*, *Orthetrum cancellatum*, *Sympetma fusca*, and *Sympetrum depressiusculum*] Address: Golovatyuk, Larisa, Papanin Institute for Biology of Inland Waters, Russian Academy of Sciences, Borok, Nekouzsky District, 152742 Yaroslavl Oblast, Russia. Email: gollarisa@mail.ru

**22267.** Gómez-Anaya, J.A.; Brug-Aguilar, B.; Vázquez-Hurtado, G.; Novelo-Gutiérrez, R. (2023): Diversity and distribution of Odonata (Insecta) larvae in a subtropical lagoon with different land uses in Veracruz, Mexico. *Revista Mexicana de Biodiversidad* 94: e945158: 17 pp. (in English, with Spanish summary) ["Impacts caused to freshwater reservoirs by human activities have increased in tropical and subtropical regions in the last decades. We studied the effects of land use on the physicochemical properties of water and their effects on larval Odonata diversity in a subtropical lagoon. During 1 year, physicochemical variables were measured, and Odonata larvae were collected in 8 sites (4 in the urbane zone and 4 in the more conserved rural zone) with different land uses that cover the entire periphery of the lagoon. Physicochemically, no clustering of samples from urban and rural zones or by site was observed, rather clustering reflected temporal patterns. A total of 28 species were found and some of them showed a differential distribution between both zones, and between the 8 sites and collectings. The highest diversity was recorded in the rural zone. The site with domestic waste discharges had the lowest diversity and it showed high concentrations of nitrates and

ammonium. We conclude that the effect of land use in this lagoon is still incipient on Odonata diversity. The diversion and treatment of urban waters and proper land management are recommended to ensure the maintenance of Odonata diversity." (Authors)] Address: Novelo-Gutiérrez, R., Instituto de Ecología, A. C., Red de Biodiversidad y Sistemática, Carretera Antigua a Coatepec 351, Col. El Haya, 91073 Xalapa, Veracruz, Mexico. Email: rodolfo.novelo@inecol.mx

**22268.** Góral, N.; Daraz, B.; Makhkamov, T.; Dabert, M.; Bernard, R. (2023): Taxonomic status of the Central Asian damselfly *Calopteryx samarcandica* Bartenev, 1912 (Odonata: Calopterygidae). *International Journal of Odonatology* 26: 180-189. (in English) ["The taxonomic status of the Central Asian damselfly *C. samarcandica* was determined on the basis of molecular and phenotypic data from the Kugitang Mountains, SE Uzbekistan. Molecular analyses (COI and 18S rDNA, ITS1-5.8S rDNA-ITS2) revealed that *C. samarcandica* forms part of a clade that includes taxa treated in the literature as subspecies of *Calopteryx splendens* and/or related species. However, both mitochondrial and nuclear DNA confirmed that *C. samarcandica* deserves separate species status. The COI distance to *C. splendens* (including *C. xanthostoma*) is moderate (3.47%, K<sub>2</sub>P), but much greater than the internal distances between the sequences qualified in *C. splendens* (0.4%); this difference is supported by the low values of the barcoding gap in this genus. The rather distant separation of *C. samarcandica* from both *C. splendens* (*ancilla*, *taurica*, *intermedia*) and *C. orientalis* and the length of the *samarcandica*-branch recognisable in nuclear rDNA strengthen the independent position of the first species. The phylogenetic position of *C. samarcandica* in the genus *Calopteryx* remains unclear due to the low variability of nuclear rDNA markers and insufficient and partly incomparable data for other taxa. The molecular data support the phenotypic and ecological specificity of *C. samarcandica*, defined by a diagnostic combination of its traits (male and female wing colours and large size and basal diffusion of the wing spot in males) and the conservative association with groundwater-fed natural watercourses in the mountains and foothills fringing the vast Central Asian mountain block." (Authors)] Address: Bernard, R., Laboratory of Nature Education & Conservation, Fac. Biol., Adam Mickiewicz Univ. in Poznan, Poland. Email: rbernard@amu.edu.pl

**22269.** Gouvêa, T.P.; Almeida, J.A.M.; Shimamoto, C.Y.; Barbado, N.; Souza, M.M. (2023): Registro de libélulas (Odonata) predadas por aranhas (Araneae) na Mata Atlântica, no Sul do Brasil. *Entomological Communications*, 5, ec05025. <https://doi.org/10.37486/2675-1305.ec05025>: 4 pp. (in Portuguese, with English summary) ["Dragonflies are insects that act as predators and prey, both in freshwater and associated terrestrial ecosystems, which makes the understanding of trophic relationships established by these insects important. In this sense, the present study aimed to report the predation of Odonata by Araneae in areas of seasonal semi-deciduous forest, phytogeography of the Atlantic Forest at the Iguazu National Park (PARNA Iguazu), and in the Bela Vista Biological Refuge (RBBV). The records occurred at random in 2021 from December 13 to 21, and in 2022 from January 4 to April 22. Five individuals of three species and two morphospecies of Odonata preyed upon by three morphospecies of spiders were recorded. Predation of Odonata by spiders seems to be frequent in different ecosystems, but further studies are required to understand the impact of this predation on the size of dragonfly communities in the Brazilian Atlantic Forest biome." (Authors)] *Argia mollis*, *A. reclusa* and *Oxyagrion terminale* were found trapped in suspended

webs of *Tetragnatha* sp., located approximately 2 meters above the ground and 50 cm from the bank of a stream within the dense forest. A predation of *Anax* sp. by an undetermined species of Trechaleidae (immature specimen) that was active and recorded on the soil inside the forest, during twilight. Low light can trigger conditions favorable to the predator, as Trechaleidae spiders are active ambush hunters on the ground and common in environments close to water. *Argia mollis*, *A. reclusa* and *Oxyagrion terminale* are species that explore different ecosystems and occur in different locations in Brazil (Souza et al. 2013; Calvão et al. 2018). These three species of Odonata were found trapped in suspended webs of *Tetragnatha* sp., located approximately 2 meters above the ground and 50 cm from the bank of a stream within the dense forest. Spiders of this taxon commonly inhabit the banks of water bodies, such as rivers and lakes, which may favor the passive capture of adult dragonflies, as they are also considered the most widespread and abundant orb-web spiders in the world (Levi 1981), being found in tropical and temperate climates, and even on oceanic islands (Aiken & Coyle 2000; World Spider Catalog 2023). Predation of *Anax* sp. by an undetermined species of Trechaleidae (immature specimen) was active and recorded on the soil inside the forest, during twilight (Fig. 2), close to the source of the Manoel Gomes River, municipality of Céu Azul (25°09'13.5" S 53°50'43.7"W), Paraná, Brazil. This condition can be explained by the fact that dragonflies are diurnal insects (Corbet 1999), therefore, low light can trigger conditions favorable to the predator, as Trechaleidae spiders are active ambush hunters on the ground (Dias et al. 2009), common in environments close to water (Carico 1993), where Odonata are frequent, because they spend their initial life in freshwater aquatic ecosystems (Costa et al. 2012).] Address: Shimamoto, Carolina, Instituto Federal de Educação, Ciência e Tecnologia, do Sul de Minas Gerais, Campus Inconfidentes, Inconfidentes, MG, Brasil. Email: carolina.shimamoto@ifpr.edu.br

**22270.** Guellaf, A.; Kassout, J.; Boselli, V.A.; Bennis, N.; El Alami, M.; Errochdi, S.; Kettani, K. (2023): Short-term responses of aquatic ecosystem and macroinvertebrate assemblages to rehabilitation actions in Martil River (North-Western Morocco). *Hydrobiology* 2023, 2, <https://doi.org/10.3390/hydrobiology2030029>: 446-462. (in English) ["This study aimed to evaluate the effects of the Martil River rehabilitation project and recently constructed dam infrastructures to reduce flood risks and to promote local socio-economic development on the ecological integrity of the river. The assessment focused on changes in fluvial landforms over time and the evaluation of aquatic ecosystems based on six physicochemical parameters (temperature, pH, electrical conductivity, dissolved oxygen, biochemical oxygen demand, and chemical oxygen demand), morpho-hydrological variables (stream width, water depth, and current speed), habitat indices (QBR, IHF, and MQI), and macroinvertebrate assemblages of EPT, OCH, and Chironomidae (Diptera) at five stations from autumn 2015 to spring 2018 (prior to and during the rehabilitation actions). The results showed that the river rehabilitation project led to profound changes in Martil River's ecosystem and water quality over time. Physicochemical and habitat measurements at the rehabilitated sites revealed a major change in macroinvertebrate communities due to changes in fluvial landforms in relation to flow-sediment regimes. As a result, some typical species of lentic habitats disappeared, while alien, opportunistic, and lotic species appeared." (Authors)] The following odonate taxa are listed: *Lestes barbarus*, *L. viridis*, *Calopteryx* sp., *C. exul*, *Erythromma lindenii*, *Ischnura graellsii*, *Aeshna mixta*, *Anax parthenope*, *Anax* sp., *Onychogomphus forcipatus*

unguiculatus, *Paragomphus genei*, *Cordulegaster boltonii algerica*, *Crocothemis erythraea*, *Sympetrum fonscolombii* and *Triethemis annulata*.] Address: Guellaf, A., Lab. Ecology, Systematics & Conservation of Biodiversity (LESCB), URL-CNRST N°18, FS, Abdelmalek Essaadi University, Tetouan 931000, Morocco. Email: achraf1949@gmail.com

**22271.** Gurung, M.M.; Phan, Q.T. (2023): Description of *Protosticta samtsensis* sp. nov. (Odonata: Zygoptera: Platystictidae) from Samtse district, Bhutan. *Zootaxa* 5352(1): 137-144. (in English) ["*Protosticta samtsensis* sp. nov. (holotype male: Bhutan, Samtse District, Norgaygang gewog (Bara), 27.142670°N, 88.835228°E; altitude 1,264 m, 12-viii-2022), is described from a holotype male and a female paratype and compared with *P. himalaica* Laidlaw, 1917." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Research, Institute of Research & Training of Medicine, Biology & Pharmacy, Duy Tan University, Da Nang, 550000, Vietnam. E-mail: pqtoan84@gmail.com

**22272.** Habel, J.C.; Ulrich, W.; Segerer, A.H.; Greifenstein, T.; Knubben, J.; Morinière, J.; Bozicevic, V.; Günter, A. (2023): Insect diversity in heterogeneous agro-environments of Central Europe. *Biodiversity and Conservation* 32: 4665-4678. (in English) [Pfaffenhofen, Bayxern, Germany. "Insect diversity has been decreasing significantly during the past decades. A main driver causing this negative trend is agricultural intensification, which causes habitat destruction and a deterioration of habitat quality. We caught flying arthropods with 28 Malaise traps and two light traps across a heterogeneous Central European agro-environment in southern Germany over a period of four years. The arthropods captured with Malaise traps were assigned to barcode index numbers (BINs) based on metabarcoding. Lepidoptera caught with light traps and light towers were identified based on morphological characters. Within the four years study, a total of 11,984 insect operational taxonomic units (OTUs) related to unique BINs on BOLD (>95% similarity) were recorded across this agro-environment. 7835 of them could be assigned to insect order and the vast majority of them represent different species. Different estimates of the total species richness ranged between 8188 and 11,512 OTUs (a proxy for species). This number corresponds to about 26–36% of the total German insect fauna. Light trapping also yielded a high species diversity and returned 502 Lepidoptera species (compared to 784 species captured with Malaise traps). The overlap between light and Malaise traps was less than 45%. The Malaise trap catches showed that insects are more diverse along forest edges than in the centre of meadows. Our findings underline the high value of heterogeneous agro-environments for biodiversity, and the high value when combining data collected with different sampling techniques.... Only orders such as Trichoptera, Thysanoptera, Ephemeroptera, Odonata, and Psocoptera were less species rich than expected. Trichoptera, and Ephemeroptera, and to a lesser extent Odonata, are hygrophilous and were not expected to occur in high numbers in the Malaise traps set in meadows." (Authors)] Address: Habel, J.C., Evolutionary Zoology, Dept of Environment & Biodiversity, University of Salzburg, Salzburg 5020, Austria. Email: Janchristian.habel@plus.ac.at

**22273.** Hämäläinen, M. (2023): A domineering dragonfly? – Notes on *Anax imperator* Leach, 1815 from 19th century England and considerations on the etymology of its name. *Agrion* 27(2): 46-52. (in English) ["Evidence is presented to support the hypothesis that William Elford Leach's (1815) genus and species names (both referring to a sovereign or a commander) for the dragonfly species *Anax imperator*,

discovered in England, were based on the impressive size of this large and robust species. The alternative view, suggesting that the dominant, aggressive territorial behaviour of *Anax imperator* male inspired the names, is ruled out by the fact that Leach almost certainly never saw this species in the field. William Kirby's early observations on the aggressive and voracious behaviour of this species are reproduced. Details of the early taxonomy and nomenclature of *A. imperator* are presented, and the growth of the knowledge of this species in Britain and continental Europe is briefly discussed." (Author)] Address: Hämäläinen, M., Naturalis Biodiversity Center, Leiden, the Netherlands. Email: matti.hamalainen@helsinki.fi

**22274.** Hamzaraj, E.; Lazo, P.; Papparisto, A.; Parllaku, B. (2023): Using bacteria and benthic macroinvertebrates as water quality parameters in Mat River, Albania. *AQUA — Water Infrastructure, Ecosystems and Society* Vol 00 No 0, 1 doi: 10.2166/aqua.2023.081: 15 pp. (in English) ["Highlights: • Assessment of the water quality of Mat River in Albania, using bacteria and benthic invertebrates as biological quality indicators. • The results of our study highlight a deterioration of the water quality of Mat River from the upper reaches to the lower reaches, mainly due to anthropogenic pressure. • The number of benthic macroinvertebrates reflects water quality and organic pollution. Abstract: This research examines the quality of Mat River water to control and reduce the level of environmental pollution in accordance with national rules and regulations. The focus of this study was the assessment of river water quality by using bacteria and benthic macroinvertebrates, as biological markers of stream water quality. The research was conducted from June 2018 to June 2019 at five sampling sites along the Mat River, with monthly sampling for chemical-physical and microbiological parameters and seasonal sampling for benthic macroinvertebrates. The investigated data for the studied parameters were statistically analysed using MINITAB 19 software. The variation in spatial and temporal trends of the investigated parameters showed differences in water quality among different sampling sites. As expected, the bacterial load was found to be higher near urban areas, and the pollution increased with the course of the river. The same tendency in water quality showed up even in the benthic macroinvertebrates population. Pearson correlation coefficients (p. 0.05) between the water quality data revealed the similarity and the associations between parameters. Cluster analysis of the investigated parameters revealed the classification of Mat River water quality and the possibility of using microbiological parameters and/or benthic macroinvertebrates for the assessment of water quality." (Authors) "*Gomphidae*"] Address: Hamzaraj, Eteleva, Faculty of Natural Sciences, Tirana University, Blvd. 'Zog I', Tirana, Albania. Email: etleva.hamzaraj@fshn.edu.al

**22275.** Happle, R.; Eyerich, k. (2023): Autosomal dominant inheritance with sex-limited manifestation: An unusual mode of transmission in humans and animals. *Am J Med Genet.* 191(3): 684-689. (in English) ["Autosomal dominant, sex-limited inheritance is a distinct mode of transmission that should not be conflated with X-linked inheritance. From animal studies, we know that sex-limited inheritance implies the chance to "turn off" some genes in either males or females, in order to meliorate the phenotype, for example, by improving the fecundity. In this way, sex-limited genes play an important role in the evolution of diverse species of animals. In human genetics, however, the biological significance of sexlimited genes is unknown until today. When screening the literature, we found, thus far, three human examples of

sex-limited transmission. Autosomal dominant, malelimited inheritance has meticulously been studied in a particular form of precocious puberty. Limitation to females was described in autosomal dominant lymphedema of the CESLR1 type, being underpinned by convincing molecular findings. Another example is white lentiginosis of Grosshans that shows clinical evidence of such mode of transmission although molecular findings are lacking as yet. In the animal kingdom, autosomal dominant sex-limited inheritance is a well-established phenomenon that has extensively been studied in various species such as butterflies, damselflies [*Ischnura senegalensis*], fish (cichlids), and birds. Hence, at this point in time, it seems likely that other human examples of this mode of inheritance have previously been reported or will be published in the future." (Authors)] Address: Happle, R., Dept of Dermatology, Medical Center, University of Freiburg, Freiburg, Germany. Email: rudolf.happle@uniklinik-freiburg.de

**22276.** Harabiš, F. (2023): Post-mining areas as the last area for the expansion of the declining Siberian Winter damselfly (Odonata: Lestidae). *Journal of Insect Conservation* 27: 707-715. (in English) ["The regionally threatened *Sympecma paedisca* is one of the few Central European dragonfly species included is considered as Near Threatened in the European Red list. The major threats to this species remain unclear. This species has a unique life history and several adaptations to enabling survival even in semidesert areas, such as overwintering in the adult stage. However, the closely related, more thermophilic species *Sympecma fusca* has undergone a major range expansion in Europe. Based on data from 129 sites and combining several analytical approaches, I found the following: 1. According to local freshwater conditions, *S. paedisca* is a typical habitat generalist occupying a wide range of habitats. 2. It requires a wide range of terrestrial habitats to complete its life cycle. 3. An analysis of the land used by both species clearly indicates that both species avoid intensive agricultural areas; however, *S. fusca* can also occur in suburban areas, where *S. paedisca* is absent. 4. Projections of the Least Cost Path analysis indicate that the only localities where the species is currently spreading are habitats arising as a consequence of mining activities. The example of *S. paedisca* is clear evidence of a freshwater species that responds very negatively to the homogenization of the terrestrial environment, even when its natal habitat is not significantly affected. The frequent occurrence of species in postmining areas suggests that species with complex habitat requirements can find suitable secondary habitats where they can prosper in the long term. Implications for insect conservation: Even semi-aquatic groups like damselflies can be very sensitive to gradual changes in surrounding land use. Species with very complex habitat requirements also require comprehensive conservation strategies affecting all habitats utilized by the species. However, the return of some landscape features requires a reduction in the area of production areas in favor of hedgerows and ruderals. Such restoration management requires long-term planning and close cooperation with farmers." (Author)] Address: Harabiš, F., Faculty of Environmental Sciences, Czech University of Life Sciences Prague, Kamýcká 129, Prague-Suchdol, 165 00, Czech Republic

**22277.** Herlings, A.; Veling, K.; Wever, R. (2023): Op zoek naar vlinders en libellen. Mooie vlinder. en libellengebieden in Nederland. De Vlinderstichting. ISBN 9789050119269: 128 pp. (in Dutch) ["In Search of Butterflies and Dragonflies takes you to beautiful butterfly and dragonfly areas in the Netherlands. From the dunes in the west to the peatlands in the east and from the Sint-Pietersberg in South Limburg

to the Lauwersmeer in the north: all provinces are covered. A brief description of each area is included and the butterflies, moths and dragonflies that occur there are discussed. You will discover rare, endangered and protected species, as well as the common species that you may encounter during a walk. An ideal starting point for a beautiful walk. This book was made possible by the Prins Bernhard Cultuurfonds and De Vlinderstichting." (Editor/Google translate).] Address: not stated

**22278.** Hermans, J.T. (2023): The White-faced darter (*Leucorrhinia dubia*) in the Dutch Province of Limburg (Odonata: Libellulidae): Severe decline of a characteristic species of bog pools. Part 1: Phenology and distribution. *Natuurhistorisch Maandblad* 112(10): 256-266. (in Dutch, with English summary) ["This rather tiny dragonfly is a specialist of bog pools and is seen in spring and early summer. Both sexes have creamywhite fronts and small black wing-bases; the male is black with red markings, the female is patterned like the male, but in yellow. *L. dubia* is found in Europe and eastwards to Japan and Kamchatka. The species is common in central and northern Europe. In the Netherlands, the White-faced darter is largely restricted to acidic, oligotrophic habitats on Pleistocene soils. It occurs more rarely in raised peat-bog remnants. Since 2007, the species has declined in the Netherlands (and in neighbouring Belgium and Germany), due to eutrophication and acidification caused by high emissions of nitrogen compounds, and desiccation of its habitat (the latter worsened by climate change). This decline has happened more rapidly in the province of Limburg than in other Dutch regions. *L. dubia* formerly had around seven temporary and six stable populations in Limburg. All temporary populations have vanished, and only three of the six stable populations have so far survived, in the Griendtsveen/Mariapool, Groote Peel and Ravenvenen areas. It is likely that even long-standing populations (known since the 1970s and 1980s) have now become extinct at the Beegderheide and Meinweg areas, the main causes being changes in the vegetation and frequent drying up of the reproduction sites." (Author)] Address: Hermans, J.T.; Hertestraat 21, 6067 ER Linne, The Netherlands. E-mail: j.hermans@triangel-linne.nl

**22279.** Hochkirch, A.; Bilz, M.; Ferreira, C.C.; Danielczak, A.; Allen, D.; Nieto, A.; et al. (2023): A multitaxon analysis of European Red Lists reveals major threats to biodiversity. *PLoS ONE* 18(11): e0293083. <https://doi.org/10.1371/journal.pone.0293083>: 14 pp. (in English) ["Biodiversity loss is a major global challenge and minimizing extinction rates is the goal of several multilateral environmental agreements. Policy decisions require comprehensive, spatially explicit information on species' distributions and threats. We present an analysis of the conservation status of 14,669 European terrestrial, freshwater and marine species (ca. 10% of the continental fauna and flora), including all vertebrates and selected groups of invertebrates and plants. Our results reveal that 19% of European species are threatened with extinction, with higher extinction risks for plants (27%) and invertebrates (24%) compared to vertebrates (18%). These numbers exceed recent IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services) assumptions of extinction risk. Changes in agricultural practices and associated habitat loss, overharvesting, pollution and development are major threats to biodiversity. Maintaining and restoring sustainable land and water use practices is crucial to minimize future biodiversity declines." (Authors) The study includes references to Odonata.] Address: Hochkirch, A., Dept of Biogeography, Trier, University, Trier, Germany. Email: hochkirch@uni-trier.de

**22280.** Hogreve, J.; Suhling, F. (2023): Development of *Sympetrum striolatum* and *S. vulgatum* (Odonata: Libellulidae) in brackish water. *International Journal of Odonatology* 26: 190-196. (in English) ["*S. striolatum* and *S. vulgatum* are two closely related Libellulidae that are widespread and common in Central Europe. The idea for this research originates from normally using saltwater shrimps for rearing young larvae, the observations of *Sympetrum* species laying eggs in seawater and the suggested ability of *S. striolatum* to colonize brackish water habitats. This topic will also be of rising relevance for dragonfly populations as in the future due to climatic changes or anthropogenic activity the salinization of freshwaters will likely increase. The experiments presented in this study served to find out whether eggs and larvae of both species can develop in brackish water. For this purpose, eggs of both species were kept at four different salinities from 0.5-1.5% and the development duration, hatching curves and growth rates as well as mortality were recorded and compared to respective data from an earlier experiment conducted in tap water. It was possible to investigate whether embryonic development, the hatching behaviour and larval growth are disturbed by different salinity levels compared to rearing in freshwater. We found for both species that the eggs can develop at different salt concentrations up to 1.5% and the larvae survive and grow in the brackish water. Especially for *S. striolatum* a slightly increased salinity even seems to be advantageous compared to rearing in tap water shown by high hatching and survival rates. The results of this study add some knowledge about the influencing effects of salt on both species. It seems that low salt concentrations seem to be well tolerated by both species or become even beneficial for *S. striolatum*. Furthermore, the results provide methodological aspects about the rearing of young dragonfly larvae." (Authors)] Address: Suhling F., Inst. Geoökologie, TU Braunschweig, Langer Kamp 19c, 38102 Braunschweig, Germany. E-mail: f.suhling@tu-bs.de

**22281.** Homberg, U.; Kirchner, M.; Kowalewski, K.; Pitz, V.; Kinoshita, M.; Kern, M.; Seyfarth, J. (2023): Comparative morphology of serotonin-immunoreactive neurons innervating the central complex in the brain of dicondylar insects. *J Comp. Neurol.* 531(14): 1482-1508. (in English) ["Serotonin (5-hydroxytryptamine) acts as a widespread neuromodulator in the nervous system of vertebrates and invertebrates. In insects, it promotes feeding, enhances olfactory sensitivity, modulates aggressive behavior, and, in the central complex of *Drosophila*, serves a role in sleep homeostasis. In addition to a role in sleep-wake regulation, the central complex has a prominent role in spatial orientation, goal-directed locomotion, and navigation vector memory. To further understand the role of serotonergic signaling in this brain area, we analyzed the distribution and identity of serotonin-immunoreactive neurons across a wide range of insect species [including *Leucorrhinia pectoralis*, *Aeshna cyanea*]. While one bilateral pair of tangential neurons innervating the central body was present in all species studied, a second type was labeled in all neopterans but not in dragonflies and firebrats. Both cell types show conserved major fiber trajectories but taxon-specific differences in dendritic targets outside the central body and axonal terminals in the central body, noduli, and lateral accessory lobes. In addition, numerous tangential neurons of the protocerebral bridge were labeled in all studied polyneopteran species except for Phasmatodea, but not in Holometabola. Lepidoptera and Diptera showed additional labeling of two bilateral pairs of neurons of a third type. The presence of serotonin in systems of columnar neurons apparently evolved independently in dragonflies and desert locusts. The data suggest distinct evolutionary changes

in the composition of serotonin-immunolabeled neurons of the central complex and provides a promising basis for a phylogenetic study in a wider range of arthropod species." (Authors)] Address: Homberg, U., Dept of Biology, Animal Physiology, Philipps-Universität Marburg, 35032 Marburg, Germany. Email: homberg@biologie.uni-marburg.de

**22282.** Hu, F.-S. (2023): Record of *Tamea virginia* (Rambur, 1842) (Odonata: Libellulidae) from the West Pacific Ocean. *Taiwanese Journal of Entomological Studies* 8(3): 80-81. (in English) ["This paper provides a photo of a male *T. virginia* taken from the West Pacific Ocean, approximately 30 km east of the nearest land. This photo serves as a migration record, and the paper also briefly discusses the migration behavior of the genus *Tamea* Hagen, 1861." (Author)] Address: Hu, F.-S., Dept of Biological Sciences, National Sun Yat-sen University, 70 Lienhai Rd., Kaohsiung 80424, Taiwan. Email: fangshuo\_hu@smail.nchu.edu.tw

**22283.** Huber, E.; Aurenhammer, S.; Bauer, H.; Borovsky, R.; Borovsky, V.; Degasperi, G.; Denner, M.; Friedlmayer, J.; Frieß, T.; Fröhlich D.; Gergely D. M.; Glatzhofer, E.; Gorfer, B.; Gunczy, J.; Gunczy, L.W.; Heimburg, H.; Ivenz, D.; Koblmüller, S.; Kogler, M.; Komposch, C.; Kraker, F.; Klug, M.; Kunz, G.; Messner, S.; Moser, A.; Niedringhaus, R.; Lorber, L.; Oswald, M.; Oswald, T.; Paill, W.; Ploner, S.; Schattaneck-Wiesmair, B.; Schattaneck-Wiesmair, P.; Schoder, S.; Schönplflug, V.; Schütz, A.; Sonnleitner, M.; Staudinger, V.; Strohiegl, K.; Szucsich, N.; Trattnik, E.; Volkmer, J.; Witzmann, M.; Zechmeister, T.; Zweidick, O. (2023): Bericht über das achte ÖEG-Insektencamp: Die verborgenen Schätze der Weinviertler Klippenzone (Naturpark Leiser Berge, Niederösterreich). *Entomologica Austriaca* 30: 155-246. (in German, with English summary) ["Report on the eighth Insect Camp of the Austrian Entomological Society: hidden treasures of the Weinviertler cliff zone (Lower Austria, Austria). The eighth Insect Camp of the Austrian Entomological Society took place in the Nature Park Leiser Berge from 23 to 26 June 2022. A large number of taxonomic specialists and entomological and arachnological students attended the camp and/or supported the post-processing of samples. During the camp, the participants had the opportunity to experience field research, different trapping, identification and preparation methods. A network of specialist and people of nature conservation and biodiversity is important for biological work. The camp offers the chance to enter this network and gather knowledge on how to conduct scientific work. The study area included 28 different localities in the Nature Park Leiser Berge with different habitats, from water bodies to dry grassland. In total, 1,497 species of 23 orders were recorded: ... 7 of Odonata [*Aeshna cyanea*, *Calopteryx splendens*, *Coenagrion ornatum*, *C. puella*, *Ischnura elegans*, *Sympecma fusca*, *Platycnemis pennipes*], ... (Authors)] Address: Borovsky, R., Unterhollerbach 164, 8171 St. Kathrein am Offenegg, Austria. Email: borovskyroman@gmail.com.

**22284.** Ilhamdi, M.L.; Ivansyah, A.R.; Syazali, M. (2023): Exploration of the species richness of butterfly [sic] (Hexapoda: Odonata) in the rice field ecosystem of Perian village, Montong Gading, East Lombok. *Jurnal Biologi Tropis* 23(4): 744-751. (in English) ["Several Odonata studies on Lombok Island still focus on forest and river habitat types. This causes the diversity of this insect group to be unknown in other habitats such as rice fields. This research aims to explore the richness of dragonfly species in the rice field ecosystem of Perian village, Montong Gading subdistrict, East Lombok district. Sample collection was carried out in May – June 2022. Dragonfly searches were carried out in the morning



from 08.00 – 12.00, and in the afternoon from 14.00 – 18.00 on two transects determined purposively. The odonata found were documented using a digital camera, and captured using insect nets. Samples that were successfully collected were identified to the species taxon. The total Odonata we found were 2 suborders, 5 families and 11 species. [...] Of the 11 species that we found, 1 species is endemic, namely *Euphaea lara lumbokensis*. Compared with the results of previous research conducted in Suranadi and Batu Bolong River, there are 5 species which are new records. The five species are *Copera ciliata*, *Rhinocypha bisignata*, *Ischnura senegalensis*, *I. heterosticta*, and *Brachythemis contaminata*. The results of this study indicate that there are more species from the Odonata order on Lombok Island compared to previous reports." (Authors)] Address: Ilhamdi, M.L., Program Studi Pendidikan Biologi, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Mataram, Mataram, Nusa Tenggara Barat, Indonesia. Email: liwa\_ilhamdi@unram.ac.id

**22285.** Isworo, S.; Oetari, P.S. (2023): Diversity of vegetation, birds, dragonflies and butterflies at coal mining reclamation sites in South Kalimantan, Indonesia. *Biodiversitas* 24(10): 5376-5390. (in English) ["Coal mining can help the country's economy, but it can also be detrimental to the environment, especially due to the reduced biodiversity in mining areas. Recovery efforts are therefore needed to reclaim post-coal mining land. The aim of the research is to identify the biodiversity of plants, birds, dragonflies, and butterflies in the coal mining reclamation area in Banjar and Tapin regencies, South Kalimantan Province, Indonesia. A biodiversity survey was conducted on eight sites representing various reclamation conditions and histories. Based on vegetation studies in the reclamation area, 136 species belonging to 101 families were found. Zone TAJ1-4 had the highest diversity index (H') at the tree, stake and sapling strata with the index of 0.96, 1.06 and 1.71, respectively. The highest diversity index at the pole stratum was recorded in the TAJ1-3 zone with 0.6. Zone TAJ5-8 had the highest diversity index at the herbaceous vegetation, with 2.33. The Fabaceae family dominates all observation sites. The species with the highest importance index for the tree stratum was *Acacia mangium*, the pole stratum was *Albizia chinensis*, *Hevea brasiliensis* and *Vitex pinnata*, the stake stratum was *A. chinensis*, the sapling stratum was *A. mangium*, and the herbaceous stratum was *Ottocloa nodosa*. The Sorensen Similarity Index fell into the low category (10.00% to 57.78%), showing varying directions of vegetation succession. There were 21 birds, 10 dragonflies [*Anotogaster sieboldii*, *Diplacodes trivialis*, *Neurothemis ramburii*, *Neurothemis terminata*, *Orthetrum chrysis*, *O. glaucum*, *O. sabina*, *Pantala flavescens*, *Potamarcha congener*, *Rhyothemis phyllis*], and 15 butterflies recorded across the observation sites. According to the IUCN Red List of Threatened Species, no recorded species is listed as protected. The results of this study might be used for the management of post-mining reclamation areas, especially in South Kalimantan.] Address: Isworo, S., Dept of Environmental Health, Universitas Dian Nuswantoro. Jl. Imam Bonjol 207, Semarang 50131, Central Java, Indonesia. Email: slamet.isworo@dsn.dinus.ac.id

**22286.** Jaballah, S.; Fernandez Garcia, G.; Martignac, F.; Parisey, N.; Jumel, S.; Roussel, J.-M.; Dézerald, O. (2023): A deep learning approach to detect and identify live freshwater macroinvertebrates. *Aquatic Ecology* 57: 933-949. (in English) ["The study of macroinvertebrates using computer vision is in its infancy and still faces multiple challenges including destructive sampling, low signal-to-noise ratios, and the complexity to choose a model algorithm among multiple

existing ones. In order to deal with those challenges, we propose here a new framework, dubbed 'MacroNet,' for the monitoring, i.e., detection and identification at the morphospecies level, of live aquatic macroinvertebrates. This framework is based on an enhanced RetinaNet model. Pre-processing steps are suggested to enhance the characterization propriety of the original algorithm. The images are split into fixed-size tiles to better detect and identify small macroinvertebrates. The tiles are then fed as an input to the model, and the resulting bounding box is assembled. We have optimized the anchor boxes generation process for high detection performance using the k-medoid algorithm. In order to enhance the localization accuracy of the original RetinaNet model, the complete intersection over union loss has been integrated as a regression loss to replace the standard loss (a smooth l1 norm). Experimental results show that MacroNet outperforms the original RetinaNet model on our database and can achieve on average 74.93% average precision (AP), depending on the taxon identity. In our database, taxa were identified at various taxonomic levels, from species to order. Overall, the proposed framework offers promising results for the non-lethal and cost-efficient monitoring of live freshwater macroinvertebrates." (Authors)] Address: Jaballah, S., ESE, Ecology & Ecosystems Health, INRAE, Agrocampus Ouest, 35042, Rennes, France

**22287.** Janssen, S.E.; Kotalik, C.J.; Eagles-Smith, C.A.; Beaubien, G.B.; Hoffman, J.C.; Peterson, G.; Mills, M.A.; Walters, D.M. (2023): Mercury isotope values in shoreline spiders reveal the transfer of aquatic mercury sources to terrestrial food webs. *Environmental Science & Technology Letters* 10(1): 891-896. (in English) ["The transfer of aquatic contaminants, including mercury (Hg), to terrestrial food webs is an often-overlooked exposure pathway to terrestrial animals. While research has implemented the use of shoreline spiders to assess aquatic to terrestrial Hg transfer, it is unclear whether Hg sources, estimated from isotope ratios, can be successfully resolved to inform site assessments and remedy effectiveness. To examine aquatic to terrestrial Hg transfer, we collected shoreline spiders (*Tetragnatha* spp.) and aquatic insect larvae (suborder Anisoptera) across a mosaic of aquatic and shoreline habitats in the St. Louis River and Bad River, tributaries to Lake Superior. The fraction of industrial Hg in sediments was reflected in the d202Hg values of aquatic dragonfly larvae and predatory fish, connecting benthic Hg sources to the aquatic food web. Shoreline spiders mirrored these aquatic Hg source signatures with highly positive correlations in  $\delta^{202}\text{Hg}$  between tetragnathids and dragonfly larvae ( $r^2 = 0.90$ ). Further assessment of different spider taxa (i.e., araneids and pisaurids) revealed that differences in prey consumption and foraging strategies resulted in isotope differences, highlighting the importance of spider taxa selection for Hg monitoring efforts." (Authors)] Address: Eagles-Smith, C.A., United States Geological Survey, Forest and Rangeland Ecosystem Science Center, Corvallis, Oregon 97330, United States. E-mail: ceagles-smith@usgs.gov

**22288.** Jiang, B.; Yao, Y.; Mauersberger, R.; Mikolajewski, D.J. (2023): Allometry of defense: Predator shift alters ontogenetic growth patterns in an antipredator trait. *Insects* 2023, 14(8), 712; <https://doi.org/10.3390/insects14080712>: 10 pp. (in English) ["Predators drive prey trait diversification and promote ecological speciation. The impacts of predation are not only on the final state of antipredation traits, but also on the development of antipredation traits. Species of the dragonfly genus *Leucorrhinia* are distributed in both habitats



dominated by predatory fish (fish lakes) and habitats dominated by predatory invertebrates (invertebrate lakes). In larval dragonflies, the spine is one of the most efficient traits deterring gape-limited fish predators. However, the spine is not useful in invertebrate lakes. In this study, we compared the developmental patterns of spines in both habitats. We constructed the scaling relationship between spine length and body size and compared the inflexion point on those curves in five species of *Leucorrhinia* dragonfly larvae. Here, we found that fish-lake *Leucorrhinia* species kept a higher spine growth rate than species from invertebrate lakes, and *Leucorrhinia* species from fish lakes displayed accelerated spine growth rate at larger body size compared to invertebrate-lake species. Our results highlight that development patterns, as well as the final states of antipredator traits, are essential to understanding predator–prey interactions. Abstract: Predation is a major factor driving prey trait diversification and promoting ecological speciation. Consequently, antipredator traits are widely studied among prey species. However, comparative studies that examine how different predators shape the ontogenetic growth of antipredator traits are scarce. In larval dragonflies, abdominal spines are effective traits against predatory fish in fish lakes, which prefer larger prey. However, defensive spines increase mortality in habitats dominated by invertebrate predators (invertebrate lakes), which prefer smaller prey. Thus, species from fish lakes may accelerate spine growth at a later body size compared to species from invertebrate lakes when growing into the preferred prey size range of predatory fish. In this study, we constructed the allometric relationship between spine length and body size and compared the inflexion point of those growth curves in five species of *Leucorrhinia* dragonfly larvae. We found that fish-lake *Leucorrhinia* species accelerated spine growth at a larger body size than congeners from invertebrate lakes. Further, rather than extending spine length constantly through development, fish-lake species rapidly accelerated spine growth at a larger body size. This is likely to be adaptive for avoiding invertebrate predation at an early life stage, which are also present in fish lakes, though in smaller numbers. Our results highlight that comparative studies of ontogenetic patterns in antipredator traits might be essential to develop an integrated understanding of predator–prey interactions." (Authors)] Address: Jiang, B., Anhui Provincial Key Laboratory for Conservation & Utilization of Important Biological Resources, College of Life Sciences, Anhui Normal Univ., Wuhu 241000, China. Email: bin.jiang@ahnu.edu.cn

**22289.** Khandelwal, P.C.; Zakaria, M.A.; Socha, J.J. (2023): A year at the forefront of gliding locomotion. *Biology Open* (2023) 12, bio059973. doi:10.1242/bio.059973: 6 pp. (in English) ["This review highlights the largely understudied behavior of gliding locomotion, which is exhibited by a diverse range of animals spanning vertebrates and invertebrates, in air and in water. The insights in the literature gained from January 2022 to December 2022 continue to challenge the previously held notion of gliding as a relatively simple form of locomotion. Using advances in field/lab data collection and computation, the highlighted studies cover gliding in animals including seabirds, flying lizards, flying snakes, geckos, dragonflies, damselflies, and dolphins. Altogether, these studies present gliding as a sophisticated behavior resulting from the interdependent aspects of morphology, sensing, environment, and likely selective pressures. This review uses these insights as inspiration to encourage researchers to revisit gliding locomotion, both in the animal's natural habitat and in the laboratory, and to investigate questions spanning gliding biomechanics, ecology, sensing, and the evolution of animal flight." (Authors)] Address: Khandelwal, P.C., Max Planck

Institute for Intelligent Systems, Stuttgart 70569, Germany. Email: pranav@is.mpg.de

**22290.** Khedre, A.M.; Ramadan, S.A.; Ashry, A.; Alaraby, M. (2023): Ingestion and egestion of microplastic by aquatic insects in Egypt wastewater. *Environmental Quality Management* 33(1): 135-145. (in English) ["Microplastics (MPs) are frequently regarded as environmental and biota contaminants. Yet, research on the accumulation of MPs in living entities, particularly aquatic insects that serve as food resources in the aquatic food chain, is limited. This study to investigate the accumulation of MPs in aquatic insects from water and sediment in an Egyptian wastewater basin. Four typical freshwater insect groups were used. The highest MP load per gram wet weight was reported by collector-gatherers (*Chironomus* sp. and *Hydrophilus* sp.), followed by collector-filterers (*Culex* sp.) with the second highest MP load. However, Predators (*Aeshna* sp.) had the lowest values. Also, the present results showed a reduction in the number of MPs in all insect taxa tested after a 24 h depuration time, with differences in the observed egestion ability. The mean number of MPs per individual significantly reduced after 24 h in both *Chironomus* sp. and *Culex* sp. larvae, where 53% and 40% of MPs particles were ejected from them, respectively. However, the ability of MP egestion decreases in *Aeshna* sp. nymph (25%), and the lowest proportion of ejection was observed in *Hydrophilus* sp. adults (9%). Polyethylene terephthalate fibers were the most abundant type of MP in both sediment and water, followed by fragments (polyethylene and polypropylene). Yet, only polyester fibers were detected in the various insect species. The average length of fibers in the various insects was somewhat shorter than in the surrounding environment. The current study reveals that MP ingestion by aquatic insects is not always related to levels of pollution in the environment, since other factors such as feeding strategies may play a role in MP ingestion. Based on these observations, further studies should be carried out on studies on toxicological impacts of MPs on freshwater/aquatic biota." (Authors)] Address: Ashry, A., Entomology & Environmental toxicology group, Zoology Dept, Fac. Science, Sohag Univ., Sohag, Egypt. Email: ali.ashry@science.sohag.edu.eg

**22291.** Koene, E. (2023): Langzeitstudie 2016–2022 mit Populationsschätzungen von *Cordulegaster bidentata* und *C. boltonii* an sechs kleinen Bächen bei Bern (Schweiz) (Odonata: Cordulegasteridae). *Libellula* 41(3/4) (2022): 155-177. (in German, with English summary) ["Long-term study 2016–2022 with population estimates of *Cordulegaster bidentata* and *C. boltonii* in six small streams near Bern (Switzerland) (Odonata: Cordulegasteridae) – In the municipality of Wohlten near Bern, situated on a southern slope, many small, unobstructed streams flow into the River Aare or the dammed Lake Wohlensee. They start in old mixed forests and flow through extensive grassland in the lower part. In an area of about 5 km<sup>2</sup>, 445 *Cordulegaster bidentata* males and 2,062 *C. boltonii* males were marked during 820 hours in sunny weather from 2016 to 2022. Daily catches were recorded and visualised in diagrams. The annual number of males per species varied greatly, both in each stream from year to year and between individual streams in the same year. The ratio of the two syntopic species to each other also changed. Both species are widespread in the area. Using the MARK programme, male population sizes were estimated from the catch-recapture data and plotted in annual graphs for each stream. At high flight frequencies, the estimate was two to three times the number marked. For 2022, a very high total of 360 *C. bidentata* and 1,200 of *C. boltonii* males was estimated." (Author)] Address: Koene, Elisabeth,

Schlossmatte 51, CH-3032 Hinterkappelen, Switzerland.  
Email: elisabeth.koene@gmx.ch

**22292.** Iamin, S.; Agus, M.; Kamal, M.; Hanafiah, Z. (2023): Inventarisasi Odonata di Taman Wisata Alam Punti Kayu, Plamebabg, Sumatra Selatan. Prosiding Seminar Nasional Sains Matematika Informatika dan Aplikasinya IV, Fakultas MIPA Universitas Lampung 4(2): 198-211. (in Indonesian, with English summary) ["This study aims to determine the species and conservation status of Odonata contained at the Punti Kayu Nature Park, Palembang, South Sumatra. This research has been conducted from March to April 2016. The determination of the location of sampling using purposive sampling method based on the conditions and the type of habitat. Sampling was conducted using the method of cruising at each sampling location. The sampling technique is Direct Sweeping using insect nets. The results show the species of Odonata at the Punti Kayu Nature Park consists Ictinogomphus decoratus, Acisoma panorpoides, Aethriamanta aethra, Brachydiplox chalybea, Neurothemis fluctuans, Orthetrum sabina, O. testaceum, Potamarcha congeners, Rhyothemis phyllis, Tholymis tillarga and Zyxomma petiolatum, Podolestes coomansi, Agriocnemis femina, Ceriagrion auranticum, Onychargia atrocyana and Pseudagrion rubriceps, and Copera ciliata. The conservation status of Odonata at Punti Kayu Nature Park based on The IUCN Red List consist of 16 species that has Least Concern status and one species that has data deficiency status." (Authors)] Address: Lamin, Syafarina, urusan Biologi FMIPA Universitas Sriwijaya, Email: rinairsyad@yahoo.co.id

**22293.** Lencioni, F.A.A. (2023): Analysis of Telebasis Selys, 1865—Part I. (Odonata: Coenagrionidae). Zootaxa 5239(4): 500-520. (in English, with Portuguese summary) ["All species of Telebasis Selys, 1865 are analyzed and Telebasis sensu lato is redefined, Helveciagrion Machado, 1980 is removed from synonym and revalidated based on morphological characters and a new genus (Juenagrion gen. nov.) and a new species (Juenagrion nanae spec. nov. — Brazil: Mato Grosso: Querência, córrego transição, 13° 03' 35" S & 52° 12' 03" W) are erected. Diagnostic illustrations are presented." (Author)] Address: Lencioni, F.A.A., Rua Aníbal, 216—Jd. Coleginho, Vila Zezé, Jacareí, CEP (ZIP) 12310-780, São Paulo, Brazil. Email: lencioni.odonata@gmail.com

**22294.** Let, M.; Grabicová, K.; Ložek, F.; Bláha, M. (2023): Bioconcentrations, depuration, shift in metabolome and a behavioural response in the nymphs of the dragonfly *Aeshna cyanea* (Müller, 1764) to environmentally relevant concentrations of Methamphetamine. *Aquatic Toxicology* 259, June 2023, 106479: 11pp. (in English) ["Methamphetamine (MEA) is commonly detected in municipal wastewater. It causes imbalances in the system of neurotransmitters as well as several other adverse effects on human health. The aim of this study was to investigate bioconcentration and depuration rates at an environmentally relevant concentration of  $1 \mu\text{g}\cdot\text{L}^{-1}$  in *A. cyanea* nymphs exposed to MEA for six days followed by three days of Depuration. The metabolomes from nymphs sampled during Exposure and Depuration were compared using non-targeted screening. Concurrently, a behavioural experiment was run to evaluate the effect of MEA on movement. Since most samples were below the limits of quantification (LOQs) – MEA was quantified in only four out of the 87 samples and only during the first 24 hours of Exposure at concentrations at LOQs level – we estimated the maximal possible bioconcentration factor (BCF) on 0.63 using the LOQs. An MEA metabolite – amphetamine – was not detected in any sample at levels above their LOQs. Numbers

of significant down. and/or up-regulated signals ( $p = 0.05$ ) in metabolomes calculated for particular sampling times possibly correlated to the resulted size of the effect on movement recorded at the same times. In the MEA treatment, movement was not significantly greater during Exposure ( $p > 0.05$ ) but was significantly lower during Depuration ( $p < 0.05$ ). This study shows how MEA acts on dragonfly nymphs, an ecologically important group of aquatic insects with a high trophic level." (Authors)] Address: Let, M., Zátíší 728/II 389 25 Vodňany Czech Republic. Email: mlet@frov.jcu.cz

**22295.** Lin, P.; Wang, C.; Liu, Y.; Ren, L.; Zhang, Z. (2023): Study of a bioinspired rigid-flexible coupling structure based on dragonfly wing by optical/electron microscopy and finite element analysis. *Micron* 174:103534: (in English) ["In this work, mechanical properties of veins and membrane of dragonfly [*Pantala flavescens*] wing were studied by means of optical/electron microscopy, tensile test and nano-indentation. It indicates that veins exhibit significantly higher strength and elastic modulus, as compared with membrane. Furthermore, finite element analysis (FEA) demonstrates that the fluctuation of Von Mises stress and displacement between varying models is undermined, due to presence of the membrane, indicating higher stability. Consequently, according to FEA of varying models involving presence of membrane, the membrane in dragonfly wing not only provides the capability to fly, but also improves obviously the strength and stability of wing structure, despite of its significantly low strength and elastic modulus. It is found that based on proper biomimetic design, bioinspired rigid-flexible coupling structure exhibits superior strength and stability, as compared with conventional rigid structure, which will provide great potential to make novel, smart, and functional structures." (Authors)] Address: Zhang, Z., Key Laboratory for Engineering Bionics of China Ministry of Education, Nanling Campus of Jilin University, Changchun, Jilin Province, 130025, P.R. China. Email: zhzh@jlu.edu.cn

**22296.** Lozano, F.; Muzón, J.; Del Palacio, A.; Ramos, L. (2023): Larvas de Odonata. In: Lucía E. Claps, Sergio Roig-Junent & Juan J. Morrone (eds.): *Biodiversidad de Artrópodos Argentinos*, Vol. 5: 8-40. (in Spanish, with English summary) ["The order Odonata is composed of aquatic insects with hemimetabolous cycles and aquatic or secondarily terrestrial larvae. The larval stage is exopterygote and is characterized by having the hypertrophied labium modified in a mask with which they catch their prey. Odonata larvae have two Baupläne based on their locomotion: Zygoptera have caudal lamellae of various shapes, which allow them to move forward by means of serpentine movements; whereas Anisoptera have an anal pyramid that they use to propel by jet propulsion. All of these structures derive from the epiproct and the paraproct. In Argentina, 285 species gathered in 89 genera have been registered. This chapter provides an illustrated key for the identification of the last larval stage of the genera and information on the state of knowledge of the Argentinean families." (Authors)] Address: Lozano, F., Laboratorio de Biodiversidad y Genética Ambiental -Universidad Nacional de Avellaneda (BioGeA-UNDAV), Mario Bravo 1460, Piñeyro, 1870 Avellaneda, Buenos Aires, Argentina. Email: flozano@undav.edu.ar

**22297.** Mahdjoub, H.; Zebza, R.; Amari, H.; Bensouilah, S.; Zouaimia, A.; Youcefi, A.; Khelifa, R. (2023): Potential fitness consequences of roosting spatiotemporal selection in an endangered endemic damselfly: conservation implications. *Frontiers in Ecology and Evolution* 11 doi: 10.3389/fevo.2023.1267705: 10 pp. (in English) ["Understanding habitat

requirements of species of conservation concern is central for their conservation and the management of their habitat. Although much of the research attention has been focused on reproductive sites, the understanding of roosting behavior and microhabitat selection, and their potential fitness consequences is also crucial. Here, we assess the roosting behavior of an endangered endemic damselfly *Calopteryx exul* Selys in a lotic habitat of Northeast Algeria. Based on marked individuals, we specifically investigated their vertical and horizontal distribution at roosting sites, as well as the timing of roosting and its correlation with lifespan (as a measure of fitness). We found that individuals were philopatric to roosting sites and less so to vertical stratification. Roosting sites were used for both foraging and roosting. Individuals that occupied lower strata in roosting sites had longer lifespans and ceased roosting earlier. Average temperature of the day affected the timing of roosting such that on warm days roosting started later and ended earlier. Individuals with longer lifespans roosted earlier, suggesting potential scramble competition for roosting sites. Our results suggest that *C. exul* individuals show variability in the vertical and horizontal location as well as the timing of roosting, and these choices potentially have fitness consequences. This study highlights the importance of bank vegetation as roosting sites for lotic insects, and emphasizes the benefits of protecting these sites and including them as integral parts of the conservation plans of species." (Authors)] Address: Khelifa, R., Concordia Univ., Montreal, H3G 1M8, Quebec, Canada. Email: rassim.khelifa@concordia.ca

**22298.** Marinov, M.; Rashni, B. (2023): Contribution to the Odonata of Kadavu, Fiji with erection of three new species (Insecta: Odonata). *Faunistic Studies in Southeast Asian and Pacific Island Odonata* 41: 1-34. (in English) ["Updated information on the Odonata fauna of Kadavu Island, Fiji is presented. The new data are provided for proposing three new hypotheses for erecting the following taxa: *Nesobasis baidamuensium* sp. nov., *N. nedeltshvae* sp. nov. and *Nikoulabasis ilievae* sp. nov. as well as the first record of the female *Melanesobasis simmondsi* (Tillyard, 1924) which is described and illustrated below. Morphological description of the male *M. simmondsi* has been updated as well." (Authors)] Address: Rashni, Bindiya, Univ. of the South Pacific, Discipline of Biological & Chemical Sciences, School of Agriculture, Geography, Environment, Ocean and Natural Sciences, Laucala Campus. Fiji. Email diyarash@gmail.com

**22299.** Martínez-Darve Sanz, P.; García Pérez, J. (2023): Confirmación de la reproducción de *Pantala flavescens* (Fabricius, 1798) (Odonata, Libellulidae) por primera vez en las Islas Canarias y en España. Confirmación of the breeding of *Pantala flavescens* for the first time in the Canary Islands and Spain. *Boletín de la Asociación española de Entomología* 47(1-2): 83-86. (in Spanish) ["On November 9, 2022, above some bushes in the South Park of Maspalomas (UTM 10X10 28RDR47), a group of five dragonflies was observed hunting insects on the vegetation. The specimens were visually identified as belonging to the species *P. flavescens*. Subsequently, on November 15, 2022, several groups of four to five individuals were again located feeding in open areas far from water in the same park. During the visit, several isolated individuals were identified that stopped in the vegetation, perching hanging in a vertical position, a rare behavior among European dragonulids, but typical of this taxon (DIJKSTRA et al., 2020). These specimens attracted attention due to their fairly uniform yellowish color, their glassy and shiny wings, without apparent damage, and their pale yellow pterostigmas, instead of reddish as seen in adults.

All these characteristics, together with the absence of south/southeast winds in the previous days, seemed to indicate that these were young individuals that had not arrived from Africa, but had probably emerged on the island of Gran Canaria itself. On November 18, 2022, the area was visited again to try to locate the place of origin of the young specimens. During sampling, in a stony section of the nearby Barranco de Fataga (UTM 10X10 28RDR47), a series of small, practically dry pools were found in which twenty exuviae of *P. flavescens* were collected. All of them were found at a low height above the ground, indifferently on large rocks and dry vegetation. They were recent, as evidenced by the good state of conservation of their thoracic tracheas. Subsequently, on December 29, 2022 and in successive visits in January (days 4 and 13) of 2023, a breeding habitat was discovered in a section of ravine with shallow water next to the Betancores dam in which copulations, laying tandems and larvae in their final stages of development. Finally, during the month of February 2023, up to five newly emerged specimens were found hanging from their own exuvia in the same breeding area, as well as teneral individuals that frequently stopped on the vegetation near the temporary watercourse." (Authors/google transl)] Address: Martínez-Darve Sanz, P., C/ Concejal García Feo N.º12, 4ºH, 35011, Las Palmas de Gran Canaria, Spain. Email: pmarsan79@gmail.com

**22300.** Mataba, G.R.; Clark, N.W.; Kweka, E.J.; Munishi, L.; Brendonck, L.; Vanschoenwinkel, B. (2023): Interactive effects of dragonfly larvae and *Bacillus thuringiensis* var. israelensis on mosquito oviposition and survival. *Ecosphere* 14(9), e4653: 17 pp. (in English) [Magugu village located at 3°59'05.6" S and 35°46'02.5" E in Manyara region in northern Tanzania. "The biological larvicide *Bacillus thuringiensis* var. israelensis (Bti) is used worldwide to control reproduction of mosquitoes in freshwater habitats. However, its impact on the ecosystem including nontarget species is often unclear. In addition, it is unknown how Bti larvicide may interact with local mosquito predators to shape oviposition site selection of mosquitoes. We used an outdoor mesocosm experiment to investigate the effects of realistic concentrations of the bio-larvicide Bti on *Culex* oviposition, larval density, survivorship, and on densities of nontarget species. We also manipulated the complexity of the community by manipulating the presence of dragonfly larvae [*Pantala flavescens*] as a predator. *Culex* oviposition was unaffected by Bti but the larvicide effectively reduced larval density and survivorship in all treatments. Bti did not affect nontarget insects but stimulated phytoplankton density at the expense of lower herbivore density. The presence of dragonfly larvae in mesocosms did not reduce *Culex* oviposition or larval sensitivity to Bti. We conclude that Bti may effectively reduce the density and survivorship of *Culex quinquefasciatus* mosquitoes in this part of East Africa, but possibly at the cost of higher phytoplankton densities. Bti-treated mesocosms were not more or less attractive for mosquitoes, suggesting that its application would not alter their oviposition behavior in the field." (Authors)] Address: Mataba, G.R., School of Life Sciences & Bioengineering, The Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha, Tanzania. Email: gordpawa@hotmail.com

**22301.** Mehdi, H.; Kumar, S.; Gupta, P. (2023): Aerodynamic performance of the corrugated airfoil in gliding mode at ultra-low Reynolds numbers? *AIP Conf. Proc.* 2933, 020014 (2023) <https://doi.org/10.1063/5.0174587>: 9 pp. (in English) ["A micro air vehicle can be as small as 6 cm. Development is driven by military, research, and commercial purposes,

with insect-sized aircraft that may be used in the future. The small aircraft allows for remote observation of hazardous environments, aerial photography, and robotics contests. The CFD simulation of fluid flow and aerodynamic performance of the dragonfly (*Aeshna cyanea*) wing section was examined using FLUENT software at low Reynolds numbers (1000, 1250, and 1500) with various angles of attack (AOA) (0°, 5°, 10°). The numerical solver was based on the SIMPLE algorithm with Green-Gauss Node velocity pressure coupling. With increasing AOA, the mean lift coefficient increased while the drag coefficient decreased, resulting in improved propulsive performance. As the AOA rises, the gliding ratio increases in lockstep. The drag formation has some exciting outcomes. Because viscous effects are more significant at lower Re values, leading skin friction to be the primary contributor to drag reduction, the average drag coefficient in each case drops as the AOA increases." (Authors)] Address: Mehdi, H., Department of Mechanical Engineering, Meerut Institute of Engineering and Technology, Meerut, India. Email: husain.mehdi@miet.ac.in

**22302.** Meilani, I.A.; Nugroho, A.S. (2023): Keanekaragaman capung (Odonata) pada area Kali Pertambakan desa Bakaran Kulon kecamatan juwana kabupaten Pati [Diversity of dragonfly (Odonata) in the areas of rivers at Bakaran Kulon Village, Juwana sub-district, Pati District]. Webinar biofair pendidikan biologi Universitas PGRI Semarang: 241-251. (in Indonesian) ["Dragonflies have a very important role as aquatic bioindicators. Disruption of the dragonfly's natural habitat causes the dragonfly population to change due to human activity. The purpose of this study was to determine the diversity of dragonflies (Odonata) in the fishpond area of Bakaran Kulon Village. Data collection for dragonflies (Odonata) used the edge roaming method in the pond area. Data collection was carried out by walking at the end of transect 1 to the other end and recording the dragonflies found. Based on the research that had been conducted for 3 days, it was found that 110 individuals of dragonflies were found belonging to two suborders, namely Suborder Zygoptera and Suborder Anisoptera. Suborder Anisoptera found 107 individuals, namely Libellulidae including *Crocothemis erythraea* species with 30 individuals, *Pantala flavescens* 68 individuals, *Orthetrum sabina* 8 individuals, *Diplacodes trivialis* only found 1 individual, Suborder Zygoptera only found one family, namely Family Coenagrionidae found 1 species with a total of 3 individual. The most abundant dragonflies were from the *Pantala flavescens* species." (Authors/Google translate) <https://conference.upgris.ac.id/index.php/biofair/article/view/4196>] Address: Ifa Ana Meilani, Ary Susatyo Nugroho Program Studi Pendidikan Biologi Universitas PGRI Semarang Email: \*ifaana1612@gmail.com

**22303.** Miralles-Núñez, A.; Conesa-García, M.A.; Pino, P.L.; Giral, G.J.; Ortega i Colet, P.; Bosquet Muncunill, A. (2023): *Brachythemis impartita* (Karsch, 1890) (Odonata: Libellulidae) en Aragón y Cataluña (noreste de España). Boletín de la Sociedad Entomológica Aragonesa (S.E.A.) 72: 185-187. (in Spanish, with English summary) ["*B. impartita* in Aragon and Catalonia (northeast of Spain). *B. impartita* is recorded for the first time in the provinces of Teruel and Tarragona, also corresponding to the first observations of the species in the Autonomous Communities of Aragon and Catalonia, the most north-eastern regions of the Iberian Peninsula. The species has been detected sporadically. It has not been possible to confirm its establishment in the two provinces, so its possible origin is discussed." (Authors)] Address: Miralles-Núñez, Adrià, Servicio de Fauna y Flora. Departamento de Acción Climática, Alimentación y Agenda

rural. Generalitat de Catalunya, Barce lona, Spain. Email: amiralles10@gmail.com

**22304.** Miralles-Núñez, A.; Conesa García, M.A.; Pino, P.L.; Giral, G.J.; Ortega Colet, P.; Bosquet Muncunill, A. (2023): *Brachythemis impartita* (Karsch, 1890) (Odonata: Libellulidae) en Aragón y Cataluña (noreste de España). Boletín de la SEA 72: 185-187. (in Spanish, with English summary) ["*B. impartita* is recorded for the first time in the provinces of Teruel and Tarragona, also corresponding to the first observations of the species in the Autonomous Communities of Aragon and Catalonia, the most north-eastern regions of the Iberian Peninsula. The species has been detected sporadically. It has not been possible to confirm its establishment in the two provinces, so its possible origin is discussed." (Authors)] Address: Miralles-Núñez, Adrià, Servicio de Fauna y Flora. Depto de Acción Climática, Alimentación y Agenda rural. Generalitat de Catalunya, Barcelona Spain. Email: amiralles10@gmail.com.

**22305.** Momin, S.G.; Pale, M.; Sarkar, P.; Ahmed, G.; Bhat-tacharya, A. (2023): Prey selection by Pitcher Plant, *Nepenthes khasiana* in Meghalaya, India. Uttar Pradesh Journal of Zoology 44(13): 115-130. (in English) ["*Nepenthes khasiana*, an endangered pitcher plant endemic to Meghalaya and southern Assam, India seems to develop a pitcher for trapping small animals as their prey to supplement the nutrient deficiency which occurs in the soil. A study on the enigmatic meat-eating choice of *N. khasiana* is scarce. Hence, this study was conducted to find out their prey species covering all three hills of Meghalaya, India. A total of 90 pitcher samples (30 from each hill) were collected randomly and preserved in 70% alcohol which was further identified at the lower taxa level. A total of 71 species were identified up to the species level while another five were identified up to their genus level. Among this, 90.8% of species were insects (69 species) while the remaining 9.2% (7 species) were non-insect species. All these seven non-insect species belonged to single order Arachnida. The majority of them (71.1%, 54 species) were capable of flying while the remaining 28.9% (22 species) were incompetent to fly. Those species which were incompetent to fly belonged to orders Araneae, Dermaptera, Diptera, Hemiptera, Lepidoptera, and Odonata. The prey constituted the highest 23 species belonging to the order Hymenoptera followed by 11 species under Coleoptera, 9 species under Diptera, 7 species under Araneae, 6 species each under Hemiptera and Blattodea, 5 species each under Orthoptera and Lepidoptera, 2 species under Odonata and 1 species each under Mantodea and Dermaptera. The orders Hymenoptera and Diptera together contributed 83.3% of the total feeding spectrum. This further indicates the sustainable management of biodiversity securing the abundance of animal prey species for the conservation of pitcher plants in this landscape." (Authors)]

**22306.** Monnerat, C. (2023): Situation actuelle de *Leucorrhinia albifrons* (Burmeister, 1839) en Suisse (Odonata: Libellulidae). Entomo Helvetica 16: 9-25. (in French, with English and German summaries) ["Status of *Leucorrhinia albifrons* (Burmeister, 1839) in Switzerland (Odonata: Libellulidae). A synthesis of the data on *Leucorrhinia albifrons* collected since 2000 documents its reproduction as certain in six localities (two of which are no longer in existence) and probable in a seventh, while single males have been recorded in eight other localities. In the cantons of Aargau, Jura and Graubünden, the species was recorded for the first time, while in the cantons of Bern and Zurich it was seen again after half a century of absence. The data presented

confirm the high dispersal capacity of *L. albifrons*, from several dozen to over 100 kilometers, which has allowed this species to colonise a revitalised high marsh, water bodies created after 1990 and even a natural site in the subalpine zone. However, the number of occupied sites is still very small and they are far apart, which reduces the probability of regular exchanges between sites and increases the risk of extinction. The increased availability of suitable bodies of water through revitalization measures and the creation of new habitats is essential to maintaining sustainable populations of this highly demanding species in Switzerland." (Author)] Address: Monnerat, C., info fauna, Bellevaux 51, 2000 Neuchâtel, Switzerland. Email: christian.monnerat@infofauna.ch

**22307.** Morris, R.K.A.; Welch, M.D. (2023): Is invertebrate conservation in Great Britain best achieved by policies that increase species protection? *Journal of Insect Conservation* 27: 527-531. (in English) ["We discuss proposals to extend the list of protected insect species in Great Britain and question whether existing species protection measures are appropriate for insects whose ecology is substantially unknown. We highlight the practicalities of applying such measures to very poorly known taxa, whose identification depends upon highly experienced specialists and a tiny pool of relevant expertise. We propose a seven-point plan that would strengthen invertebrate conservation in Great Britain. Our proposals could be applied to other countries with a protected sites network and a desire to improve habitat-based insect conservation measures. Implications for insect conservation: Our analysis suggests that insect conservation will not be improved by legislation that restricts the potential for ad hoc surveillance that currently provides almost all the data used to monitor rare and threatened insects. We highlight the need for improvements in the understanding of insect micro-habitat requirements amongst conservation managers. Our proposed seven-point plan provides a structured approach to insect conservation that should improve identification of important insect sites, site management and landscape-scale conservation measures." (Authors) The British terrestrial arthropods protected under the Wildlife and Countryside Act (1981) include two not further specified. Odonata species.] Address: Morris, R.K.A., Scientific Associate, Diptera Section, Natural History Museum, London SW7 5BD, UK. Email: syrphid58@gmail.com

**22308.** Mozhui, L.; Kakati, L.N.; Ao, B.; Kezo, V.; Meyer-Rochow, V.B. (2023): Socio-economic analysis of edible insect species collectors and vendors in Nagaland, North-East India. *Journal of Insects as Food and Feed* (2023); DOI: 10.1163/23524588-20230082: 18 pp. (in English) ["In Nagaland insects like the Eri silkworm *Samia cynthia ricini* and the Indian honey bee *Apis cerana indica* are reared for commercial purposes rather than just household uses. Of the marketed edible insects in India, Hymenoptera contribute 34% followed by Orthoptera (25%), Coleoptera (16%), Hemiptera (12%), and Lepidoptera (9%) while Odonata and Blattodea contribute 2% each. The present study estimates that an insect seller may earn Rs. 600-800 (US \$7.51-10.01) per kg from various types of insects such as grasshoppers, crickets, katydid, water and diving beetles, ants, stink bugs and tent caterpillars. For 1 litre of honey an insect seller may earn Rs. 532-1600 (US \$6.66-20.02) and for 1 kg of wood larvae (largely beetle larvae), carpenter "worms" (= *Cossus* spp. moth larvae) and hornets the vendor can demand Rs. 3,300-3,750 (US \$41.29-56.31). The contribution of the edible insect sector towards the socio-economy and livelihood improvement of the people in both rural and urban communities is highlighted and discussed. Given the insect bio-resource

in the region, the consumption of edible insects, coupled with mass production, processing, and marketing (as successfully implemented in countries like Thailand, Vietnam, and some African countries like Cameroon and Nigeria), can be a boon to Nagaland." (Authors)] Address: Kakati, L.N., Fac. of Science, Assam, Down Town University, Panikhaiti, Guwahati-26, Guwahati, Assam, India. Email: lakhmi-kakati1956@gmail.com

**22309.** Müller, O.; Schneider, T.; Ikemeyer, D.; Brochard, C. (2023): Description of last instar larva of *Cordulegaster kalkmani* (Odonata: Cordulegasteridae). *International Journal of Odonatology* 26: 108-113. (in English) ["The final instar larva of *C. kalkmani* described and illustrated based on one female exuvia collected in Alakabük, Bitlis province, Turkey, in July 2022. The exuvia of *C. kalkmani* is compared with the exuviae of members of the "boltonii-group" in the eastern part of the Western Palaearctic: *C. vanbrinkae*, *C. picta*, and *C. heros*. The exuvia of *C. kalkmani* shows no clear distinction in comparison to the other members of the eastern "boltonii-group""] (Authors)] Address: Müller, O., Birkenweg 6d, 15306 Libbenichen, Germany. Email: mueller.ole@gmail.com

**22310.** Mukherjee, A.; Mahato, S.; Samanta, S. (2023): First record of Cascader *Zygonyx torridus* Kirby, 1889 dragonfly from West Bengal, India. *Bionotes* 25(1/2): 10-13. (in English) ["During an opportunistic survey on 24 October 2022, the authors photographed an adult *Z. torridus* at around 11:14 a.m. from the Ajodhya Hills of Purulia district, West Bengal, India. During the period of observation, the specimen was flying rapidly & tirelessly 100–200 m away from a river surrounded by streams, rocks and sand banks. The authors didn't observe the specimen in a resting position during the 10–15 minutes when the dragonfly was observed." (Authors)] Address: Mukherjee, A., Dept Information Technology, Maulana Abul Kalam Azad University of Technology (MAKAUT), Haringhata, Nadia, West Bengal, India, 741249, India. Email: adarsha8158@gmail.com

**22311.** Mun, C.K. (2023): A riverhawk dragonfly, *Onychthemis testacea*, at Yishun Central. *Nature in Singapore* 16: e2023091: 1 p. (in English) [Singapore Island, Yishun Central, Khoo Teck Puat Hospital; 29 May 2023; 1302 hrs. Habitat: Urban. In the basement of a concrete building. A dead example with a body length of about 8 cm was found indoors on the ledge of a glass window.] Address: Email: simonchan268@yahoo.com.sg

**22312.** Naim, M.H.R.; Shalauddin, M.; Antu, D.R. (2023): Confirmatory report of damselfly (Odonata) Pixie dartlet, *Ischnura nursei* (Morton, 1907) from Bangladesh. *Bangladesh J. Zool.* 51(1): 129-133. (in English) ["During a regular Odonata survey at Harirampur Upazila of Manikganj district in 05 July 2020 at 07:30 h (GMT+6), a male *I. nursei* was observed and photographed as basing on a flower cluster of *Leptochloa chinensis* (L.) in a flooded crop field (23°45'50.-976"N, 89°56'20.328"E)"] (Authors)] Address: Antu, D.R., Department of Zoology, Jagannath University, Dhaka 1100, Bangladesh. Email: durjoyantu@gmail.com

**22313.** Nakamura, F.; Isoshima, T.; Kimura-Suda, H.; Yamaguchi, M. (2023): Characterization of dragonfly wing membranes using FTIR imaging and IR dichroism imaging. *Molecular Crystals and Liquid Crystals* 761(1): 112-119. (in English) ["We characterized dragonfly wings from three species, *Sympetrum frequens*, *Orthetrum albistylum speciosum*, and *Sympetrum infuscatum*, collected in Chitose City using Fourier transform infrared (FTIR) imaging and infrared (IR)

dichroism imaging. In the FTIR images, the distribution of amide I and II bands derived from the chitin was observed across the entire vein domain; however, strong absorption for the amide bands was observed in the thicker vein domain membrane: approximately 23% of the total vein domain membrane in the wing. IR dichroism images indicated that the chitin in the thinner vein domain membrane was oriented along the primary vein." (Authors)] Address: Kimura-Suda, Hiromi, Department of Applied Chemistry & Bioscience, Chitose Institute of Science & Technology, Chitose, Hokkaido, Japan. Email: kimurasu@photon.chitose.ac.jp

**22314.** Nel, A.; Palazzo, G.J.; Aase, A. (2023): A new damselfly from the Lower Eocene Green River Formation (Odonata, Dysagrionidae). *Palaeoentomology* 6(4): 336-339. (in English) ["The Eocene Green River Formation in the USA is well known as a Konservat-Lagerstätte, and has yielded an enormous number of beautifully preserved fossil insects from the Parachute Creek Member of Lake Uinta in Colorado and Utah, USA (Grande, 1984) where insects dominate the fauna. In Fossil Lake deposits, fish dominate the fauna with insects a minor component. This formation spans a 5-my-long period between ca. 53.5 and 48.5 Ma (Smith et al., 2003) in three distinct basins containing lacustrine sediments. Many of these fossils are in an exquisite state of preservation, occasionally even with soft tissues and colour patterns preserved (e.g., Bechly et al., 2020). As this entomofauna is one of the most diverse for the Early Eocene, increasing its knowledge is crucial for the understanding of the evolution of the insects at that time. This is especially the case for the Odonata, a clade that remains poorly known for the Paleocene and early Eocene (Nel & Jouault, 2022). Bechly et al. (2020) provided a first revision of the damselflies from the Green River Formation, but continuing excavation produces new specimens. The specimen described herein was recently discovered while excavating fossil fish in the Fossil Lake deposits of the Green River Formation in southwest Wyoming. This new species of Zygoptera from the Fossil Lake deposits further demonstrates its impressive diversity of Odonata." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@mnhn.fr

**22315.** Noda, R.; Liu, X.; Hefler, C.; Shyy, W.; Qiu, H.H. (2023): The interplay of kinematics and aerodynamics in multiple flight modes of a dragonfly. *Journal of Fluid Mechanics* 967: (in English) ["This paper presents the effects of wing kinematics on both normal forward flight and escape flight of a dragonfly. A Navier–Stokes-based numerical model has been adopted, and results have been substantiated by experimental data. The wing kinematics of tethered specimens and the prescribed wing morphology of a free-flying dragonfly were used in the simulation. To shed light on the interplay between kinematics and aerodynamics, a parametric study of the kinematics has been conducted. It is found that in escape flight, the dragonfly generates additional lift while the thrust reduces and the overall efficiency drops. Compared with normal forward flight, the escape mode produces larger lift force peaks. When the kinematics change to facilitate escape flight, the aerodynamic forces are affected by not only the flapping kinematics but, in the case of the hindwing, the varied wing–wing vortex interactions. The direction of the resultant force on each wing changes according to the change of the mean of pitching angle and stroke plane angle. We found that in the studied configurations, the varied phasing of the wings has a marginal effect on the aerodynamics of the dragonfly. It reduces lift and increases thrust, and this force modulation is slightly more efficient when the local angle of attack also changes.

On the other hand, the change of angle of attack played a major role in leading-edge vortex formations and directing the resultant forces of the wings. The results can be useful in developing flight control strategies for micro air vehicle design." (Authors)] Address: Shyy, W., Department of Mechanical and Aerospace Engineering, The Hong Kong University of Science & Technology, Hong Kong SAR, China. Email: weishyy@ust.hk, meqiu@ust.hk

**22316.** Nunes, L.F.; Santamaría, T.; Casanueva, P.; Sánchez-Sastre, L.F.; Ferreras-Romero, M.; Romero, A.; Campos, F.; Hernández, A. (2023): Patterns of variation in wing venation of Iberian *Cordulegaster boltonii* (Donovan, 1807) (Odonata: Cordulegastridae). *International Journal of Odonatology* 26: 164-171. (in English) ["Some structural characters, such as wing venation, have been used in odonates to differentiate taxa. In *C. boltonii*, a species widely distributed throughout the western Palaearctic, the main characteristics of its wing venation have not been quantified until now. A six-variable analysis of wing venation (number of antenodal and postnodal cross-veins, number of cells in the anal triangle and in the anal loop) in specimens from several European countries was carried out. The results showed that: (a) females had a greater number of transversal veins and cells in the anal loop than males; (b) the values of these four variables were significantly lower in males from the Iberian Peninsula than in those from elsewhere; (c) within the Iberian Peninsula two groups of populations can be distinguished: one covers the north and the other the rest of the peninsula, the latter with two subgroups, one in the centre and one in the south and east. The number of cells in the anal loop is a valid variable for analyzing geographic differences in this species." (Authors)] Address: Nunes, Luisa, Instituto Politécnico de Castelo Branco – Escola Superior Agrária. Qta Sra Mercúles, 6000-900 Castelo Branco, Portugal

**22317.** Oelmann, Y.; Fiedler, D.; Michaelis, R.; Leivits, M.; Braun, A.; Gschwind, P.; Neidhardt, H.; Willigalla, C. (2023): Autumn migration of the migrant hawkler (*Aeshna mixta*) at the Baltic coast. *Movement Ecology* 11(Article number: 52): 9 pp. (in English) ["Background: Migratory insects are important for the provision of ecosystem services both at the origin and destination sites but – apart from some iconic species – the migration routes of many insect species have not been assessed. Coastlines serve as a funnel where migrating animals including insects accumulate. Migratory behaviour and captures of dragonflies in bird traps suggest autumn migration of dragonflies along coastlines while the origin and regularity of this migration remain unclear. Methods: Dragonfly species were caught at the bird observatory Kabil at the Baltic coast in Estonia in 2009, 2010 and 2015. For the 2015 data set, we used a stable hydrogen (H) approach to trace the potential natal origin of the migrant hawkler (*Aeshna mixta*). Results: 1079 (2009), 701 (2010) and 88 (2015) *A. mixta* individuals were caught during the study periods (35, 37 and 11 days in 2009, 2010 and 2015, respectively). The migration period lasted from end of August to end of September. Based on the results from our stable isotope analysis, we identified two populations of *A. mixta*: One (range of isotope signatures of non-exchangeable H [ $\delta^2\text{Hn}$  wing]: -78‰ to -112‰) had a local likely origin while the other ( $\delta^2\text{Hn}$  wing: -113‰ to -147‰) migrated from northerly directions even in headwind from the South. The former showed an even sex ratio whereas the actively migrating population was dominated by males. Conclusions: Our results suggest a regular southbound autumn migration of *A. mixta* along the Baltic coast. However, nearly half of the sampled individuals originated from the surroundings

suggesting either no, partial or "leap-frog" migration. Contrary to our expectation, *A. mixta* did not select favourable wind conditions but continued the southbound autumn migration in the flight boundary layer even in case of headwinds. The dominance of males might indicate migration as a result of competition for resources. Further repeated, large-scale studies along the Baltic coast are necessary to pinpoint the migratory pattern and the reason for migration of *A. mixta*. Such studies should also comprise locations north of the known species range of *A. mixta* because of the rapid climate-change induced range expansion." (Authors)] Address: Oelmann, Yvonne, Geoecology, Department of Geosciences, University of Tübingen, 72070 Tübingen, Germany. Email: yvonne.oelmann@uni-tuebingen.de

**22318.** Omary, R.R.; Lalika, M.C.S.; Nguvava, M.; Mjimwa, E. (2023): Macroinvertebrates as bio indicators of water quality in Pinyinyi River, Arusha Tanzania. *Journal of Water Resource and Protection* 15(8): 393-412. (in English) ["This study used macroinvertebrates to assess the impact of anthropogenic activities on the Pinyinyi River during dry and wet season. Abundance of macroinvertebrates, average score per taxon and Shannon Weiner Species Diversity Index were used to state the ecological status of Pinyinyi River. Because the abundance of macroinvertebrates can be affected by change in water quality, some of the physicochemical parameters were also measured. A macroinvertebrates hand net is used to collect the macroinvertebrates per sampling point. DO, temperature, pH, turbidity and TDS were measured in-situ using HI-9829 Multiparameter and BOD was measured in the laboratory using Oxydirect levibond method. A total of 164 macroinvertebrates were collected and identified from Pinyinyi River during dry and wet season. They belong to 13 families. The most abundant taxa were mosquito larva, Diptera (41.07%) and aquatic caterpillar, Lepidoptera (23.21%) during dry season representing about 64.28% of the total macroinvertebrates whereas the least abundant taxa were pouch snail (16.07%) and dragonflies, Odonata (19.64%) during dry season representing about 35.72% of the total macroinvertebrates. The most abundant taxa collected during wet season were aquatic earthworm, haplotaxida (19.44%), midges, Diptera (17.59%), black flies, Diptera (15.74%) and creeping water bugs, Hemiptera (12.96%) whereas the least abundant were pigmy back swimmers, Hemiptera (2.78%), snail (3.7%), predacious diving beetle (4.63%) and coleopteran (4.63%). Average Score per taxon of Pinyinyi River during dry season was 5.25 and 3.6 during wet season. The Shannon Weiner Species Diversity Index was 1.318 during dry season and 2.138 during wet season. Based on the score, Pinyinyi River is moderately polluted during dry season and seriously polluted during wet season. Based on index, Pinyinyi River has low diversity of macroinvertebrates during dry season and highly in diversity of macroinvertebrates during wet season. Moreover, it was found that, agricultural activities, livestock keeping, bathing and washing alter physicochemical parameters of Pinyinyi River and hence change the abundance of macroinvertebrates as well as the quality of water. The study, therefore, recommends that the source of pollutants should be controlled and the river regularly monitored by the relevant authorities." (Authors)] Address: Omary, R.R., Dept of Geography & Environmental Studies, College of Natural & Applied Science (CoNAS), Sokoine Univ. of Agriculture, Morogoro, Tanzania

**22319.** Orondo, P.W.; Zhou, G.; Ochwedo, K.O.; Wang, X.; Ondeto, B.M.; Lee, M.-C.; Nyanjom, S.G.; Atieli, H.; Githeko, A.K.; Kazura, J.W.; Yan, G. (2023): Effect of predators on

*Anopheles arabiensis* and *Anopheles funestus* larval survivorship in Homa Bay County Western Kenya. *Malaria Journal* (2023) 22:298: 9 pp. (in English) ["Background: The rise of insecticide resistance against malaria vectors in sub-Saharan Africa has resulted in the need to consider other methods of vector control. The potential use of biological methods, including larvivorous fish, *Bacillus thuringiensis israelensis* (Bti) and plant shading, is sustainable and environmentally friendly options. This study examined the survivorship of *Anopheles arabiensis* and *Anopheles funestus* larvae and habitat productivity in four permanent habitat types in Homa Bay county, western Kenya. Methods: Predator densities were studied in a laboratory setup while habitat productivity and larval survivorship was studied in field setup. Results: Fish were observed as the most efficient predator (75.8% larval reduction rate) followed by water boatman (69%), and dragonfly nymph (69.5%) in predation rates. Lower predation rates were observed in backswimmers (31%), water beetles (14.9%), water spiders (12.2%), mayflies (7.3%), and tadpoles (6.9%). Increase in predator density in the field setup resulted in decreased *Culex* larval density. Larval and pupa age-specific distribution was determined and their survivorship curves constructed. Combined larvae (Stage I-IV) to pupa mortality was over 97% for *An. arabiensis* and 100% for *An. funestus*. The highest larval stage survival rate was from larval stages I to II and the lowest from larval stage IV to pupa. Stage-specific life tables indicated high mortality rates at every developmental stage, especially at the larval stage II and III. Conclusion: Determination of the efficiency of various larval predators and habitat productivity will help with the correct identification of productive habitats and selection of complementary vector control methods through environmental management and/or predator introduction (for instance fish) in the habitats." (Authors)] Address: Pauline Winnie Orondo: Email: paulineorondo@gmail.com

**22320.** Ott, J. (2023): Hat *Sympetrum fonscolombii* (Selys, 1840) am Kranichwoog bei Hütschenhausen (Rheinland-Pfalz, Landstuhler Moomiederung) als Larve überwintert (Odonata: Libellulidae)? *Libellula* 42(1/2): 69-78. (in German, with English summary) ["Did *S. fonscolombii* overwinter in the larval stage in the Kranichwoog near Hütschenhausen (Rheinland-Palatinat, Landstuhler Moomiederung)? – The article reports on an overwintering population of larvae of *Sympetrum fonscolombii* in the Kranichwoog near Hütschenhausen (Rheinland-Palatinat, Landstuhler Moomiederung). The adults emerged at the beginning of June 2023. Taking into account the known time of their larval development, phenological evidence of the migration of the species and the available weather data, it is deduced that these adults must have emerged from overwintered larvae. This can be considered as another effect of climate change on the dragonfly fauna." (Author)] Address: Ott, J., L.U.P.O. GmbH, Friedhofstr. 28, 67705 Trippstadt, Germany. Email: ott@lupogmbh.de

**22321.** Ott, J. (2023): Libellen am Kranichwoog: Erstaunliche Vielfalt nach kurzer Zeit. *Heimatjahrbuch Landkreis Kaiserslautern* 2024: 71-74. (in German) [General on the odonate fauna of a pond in Landkreis Kaiserslautern, Rheinland-Pfalz, Germany] Address: Ott, J., Friedhofstr. 28, 67705 Trippstadt, Germany. E-mail: ott@lupogmbh.de

**22322.** Pantke, C. (2023): Die Verbreitung der Kleinen Zangenlibelle (*Onychogomphus forcipatus*) in Niederbayern. *Der Bayerische Wald* 36(1-2): 66-73. (in German) ["*O. forcipatus* has been spreading increasingly in Bavaria since the 1990s. This is most likely due to several causes: the improvement of water quality through the construction and expansion of



sewage treatment plants, a more nature-oriented water management and global warming. This is exemplified by the population trends of *O. forcipatus* in Lower Bavaria." (Author/DeepL)] Address: Pantke, Christa, Wasserwirtschaftsamt Degendorf, Dienstort Gaishofen, Fischerstr. 17a, 94575 Windorf, Germany

**22323.** Patten, M.A.; Benson, B.R. (2023): A broader flight season for Norway's Odonata across a century and a half. *Oikos* 2023: e09882. doi: 10.1111/oik.09882: 11pp. (in English) ["As global climate continues to change, so too will phenology of a wide range of insects. Changes in flight season usually are characterised as shifts to earlier dates or means, with attention less often paid to flight season breadth or whether seasons are now skewed. We amassed flight season data for the insect order Odonata, the dragonflies and damselflies, for Norway over the past century-and-a-half to examine the form of flight season change. By means of Bayesian analyses that incorporated uncertainty relative to annual variability in survey effort, we estimated shifts in flight season mean, breadth, and skew. We focussed on flight season breadth, positing that it will track documented growing season expansion. A specific mechanism explored was shifts in voltinism, the number of generations per year, which tends to increase with warming. We found strong evidence for an increase in flight season breadth but much less for a shift in mean, with any shift of the latter tending toward a later mean. Skew has become rightward for suborder Zygoptera, but not for Anisoptera, or for the Odonata as a whole. We found weak support for voltinism as a predictor of broader flight season; instead, voltinism acted interactively with use of human-modified habitats, including decrease in shading (e.g. from timber extraction). Other potential mechanisms that link warming with broadening of flight season include protracted emergence and cohort splitting, both of which have been documented in the Odonata. It is likely that warming-induced broadening of flight seasons of these widespread insect predators will have wide-ranging consequences for freshwater ecosystems." (Authors)] Address: Patten, M.A., Ecology Research Group, Faculty of Biosciences & Aquaculture, Nord Univ., Steinkjer, Norway. Email: michael.a.patten@nord.no

**22324.** Payra, A.; Chandran, R.; Deshpande, A.; Koparde, P. (2023): Description of *Protosticta armageddonia* sp. nov. (Odonata: Zygoptera: Platystictidae) from the Western Ghats of India. *International Journal of Odonatology* 26: 93-102. (in English) ["A new species of *Protosticta* Selys, 1885 is described based on specimens collected from Kerala, northeast of Thiruvananthapuram, in the southern parts of the southern Western Ghats of India. *Protosticta armageddonia* sp. nov. is compared with all other known *Protosticta* species of the Western Ghats to provide comprehensive differential diagnosis. The new species is distinguished from its congeners by a combination of characters, including a marking on the ventral side of thorax, structure and colour of the prothorax, markings on the 8th abdominal segment, and the structure of caudal appendages and genital ligula. Furthermore, we provide preliminary information on the ecology and natural history of the new species." (Authors)] Address: Payra, A., Dept of Environmental Studies, Dr. Vishwanath Karad MIT World Peace Univ., Kothrud, Pune, Maharashtra 411038, India

**22325.** Pellet, J. (2023): Planning insect surveys in alpine ecosystems. *Alpine Entomology* 7: 201-204. (in English) ["Most biological survey programs rely on multi-species inventories (e.g. birds, amphibians, butterflies, dragonflies). These programs usually rely on multiple visits during pre-defined time windows. The implicit goal of this popular approach is

to maximize the observed species richness. Here, we present a novel method to optimize the timing of survey windows using a framework maximizing the detectable species pool. We present a proof of concept using 20 years of entomological records in Switzerland using butterflies, dragonflies, and grasshoppers. The general framework presented can potentially be applied to a wide range of biological survey schemes. It offers a new practical tool for adaptive entomological monitoring under climate change." (Authors)] Address: Pellet, J., n+p wildlife ecology, Place St-François 6, 1003 Lausanne, Switzerland. Email: jerome.pellet@nplusp.ch

**22326.** Pyo, J.-Y.; Kim, S.-S.; Park, J.S.; Kim, J.-M.; Song, Y.-K.; Kim, I. (2023): Identification of *Sympetrum depressiusculum* Selys, 1841 in South Korea (Odonata: Libellulidae) according to morphology and genetic markers. *Insects* 2023, 14(9), 733; <https://doi.org/10.3390/insects14090733>: 20 pp. (in English) ["Simple Summary: Two species of *Sympetrum*, namely *S. depressiusculum* and *S. frequens*, have been documented in South Korea. However, the distinction between these two species and their identity within South Korean populations has been a longstanding point of contention. To solve this issue, morphology, two mitochondrial genes, and one nuclear region were analyzed for *S. depressiusculum* samples from The Netherlands and Russia and *S. frequens* samples from Japan, as well as samples of *Sympetrum* from South Korea. Further, available public sequence data for the two species were included. Morphology, sequence divergence, and phylogenetic results all consistently suggest that South Korean populations form a single species. Analyses of haplotype network and gene pool distribution patterns in a nuclear region conducted to better explain the current taxonomic implications indicated changes in the dominant gene pool from The Netherlands and Russia to South Korea and Japan. However, such divergence and subdivision could be explained within the context of within-species diversification patterns, suggesting that South Korean populations constitute one species, *S. depressiusculum*, by applying the senior name. Abstract: In South Korea, both *S. depressiusculum*, which is distributed throughout Europe and from Russia to the Korean Peninsula, and *S. frequens*, which is endemic to Japan, are recorded. However, the identity of South Korean populations and the validity of listing the two species have not yet been settled. In this study, we collected 74 individuals of *Sympetrum* species from South Korea (five localities), Russia, The Netherlands, and Japan. These samples were examined for morphology and sequenced for partial COI, 16S rRNA, and a nuclear internal spacer (ITS) region, after which these molecular data were combined with available public data from Russia, Japan, and The Netherlands. Major morphological characters that have been used to distinguish the two species and phylogenetic, network, and structure analyses all consistently suggest that South Korean populations form a single species. Consequently, it could be valid to treat South Korean populations as one species, *S. depressiusculum*, by applying the senior name. Nevertheless, the validity of maintaining each as an independent species in other countries may need additional study considering that our samples were focused more on South Korea and limited for Europe, Russia, and Japan." (Authors)] Address: Kim, I., Dept of Applied Biology, College of Agriculture & Life Sciences, Chonnam National University, Gwangju 61186, Republic of Korea. Email: ikkim81@chonnam.ac.kr

**22327.** Qi, P.; Nel, A.; Xiao, C.; Zheng, D. (2023): Revision of *Sinomesuropetala daohugensis* Boudet, Nel & Huang, 2023 (Odonata: Aeshnoptera: Mesuropetalidae). *Zootaxa* 5375(1): 103-110. (in English) ["The mesuropetalid dragonfly



*Sinomesuropetala daohugensis* Boudet, Nel & Huang, 2023, is here revised based on a new well-preserved dragonfly from the Haifanggou Formation of Inner Mongolia, northeastern China. The new specimen allows us to complete the following characters of this species, showing the close relationship of *Sinomesuropetala* Boudet, Nel & Huang, 2023 with *Mesuropetala* Handlirsch, 1906. The mesuropetalid dragonflies are currently recorded from the Late Jurassic and Lower Cretaceous deposits of east Asia, East Central South Europe, and southern America, indicating the wide distribution and the possible long-distance migration ability of some basal aeshnopteran dragonflies during these epochs." (Authors)] Address: Qi, P., School of GeoSciences, Yangtze Univ., Wuhan, 430100, China

**22328.** Qureshi, A.A.; Syeed, S.; Ganaie, A.A.; Javaid, M. (2023): *Ischnura senegalensis* (Rambur, 1842) (Senegal golden dartlet, tropical bluetail), (Odonata: Coenagrionidae), a new record from Kashmir Himalayan region of Indian Himalayas. *Munis Entomology & Zoology* 18(2): 1787-1789. (in English) [Between April 2020 and September 2021, in the Kashmir Himalayan Region of Indian Himalayas, *I. senegalensis* was proofed for 27 localities. Flight season was restricted to June to October.] Address: Qureshi, A.A., Biodiversity, Biosystematics & Climate Change (B2C2) Research Lab, Mantaqi Centre for Science & Society, and Nature Interpretation Centre, Biodiversity Park, Islamic University of Science & Technology, Awantipora, Kashmir, India. Email: draijazphd@gmail.com

**22329.** Raghunandan, K.S.; Anusha V.S.; Prasanna, K.S. (2023): A preliminary checklist on odonates in and around Lingambudhi lake, Mysuru, Karnataka. *Journal of Applied Entomologist* 3(4): 6-11. (in English) ["Odonates are amphibiotic, well-known dominant groups of freshwater and terrestrial insects. A field study was conducted to find out to prepare a checklist of odonates in and around Lingambudhi lake, Mysuru, Karnataka during June to August, 2023. Sampling was done by Direct Encounter Method and Identification of Odonates as per the Standard field guides. Biodiversity indices values were formulated for the observed data. A total 18 Odonate species has been identified, belonging to Anisoptera (n=12) and Zygoptera (n=6) suborders having 7 families. The Libellulidae contribute highest number of Odonate species. It was observed that more anthropogenic activities lead to disturbance of odonates in study area. The study highlights the importance of odonates and provides data which would be useful in future biodiversity conservation." (Authors) The list includes *Lestes dryas*, a misidentification as can be seen from the specimen documented on plate 1 as fig. L.] Address: Raghunandan, K.S., Guest Faculty, Postgraduate Dept of Applied Zoology, Maharani's Science College for women, Autonomous, JLB Road, Mysuru, Karnataka, India

**22330.** Rahong, P.; Techakijvej, C.; Phalaraksh, C. (2023): Predators as biocontrol agents of mosquito larvae in small and large habitats in Chiang Mai, Thailand. *J. of Vector Ecology* 48(2): 78-88. (in English) ["Controlling mosquito-borne disease is a major global challenge due to the rise of insecticide-resistant mosquitoes. In response, we conducted a study in Chiang Mai Province, Thailand, which is one of the largest and the most popular cities for tourists in Southeast Asia, to explore the potential of local species as biological control agents for mosquito larvae. Mosquito larvae and aquatic predators were sampled from large and small habitats, while relevant physico-chemical parameters were measured. The study identified 560 predators and 1,572 mosquitoes, with most mosquito species belonging to the genus

*Culex*. Additionally, the study identified 16 predator taxa, including four fish taxa and 12 taxa of predatory aquatic insects belonging to four orders: Coleoptera, Hemiptera, Odonata, and Diptera. The study found that several locally occurring predator species, namely *Poecilia*, *Laccophilus*, *Lutzia*, *Toxorhynchites splendens*, *Agrionoptera*, and *Pseudagrion*, shared habitats with mosquitoes, indicating their potential as effective biological control agents for mosquito control. Conductivity, dissolved oxygen, and pH were the important physico-chemical parameters that affect both predators and mosquito larvae. Consequently, promoting native predators and reducing mosquito larvae through habitat management would be a sustainable and ecologically friendly approach in large habitats where it is not possible to remove mosquito oviposition sites. In smaller habitats, releasing local aquatic predators and removing oviposition sites may be a suitable strategy." (Authors)] Address: Rahong, P., Environmental Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand

**22331.** Rajapaksha, K.A.T.; Hettiarachchi, D.K. (2023): A preliminary assessment of odonate (Insecta: Odonata) diversity and abundance in Mihintale lake and Kaludiyapokuna in Mihintale, Anuradhapura. *Proceedings of the International Conference on Applied and Pure Sciences (ICAPS 2023-Kelaniya)* Volume 3, Faculty of Science, University of Kelaniya Sri Lanka: 46. (in English) [Verbatim: The odonates of Sri Lanka comprise with 129 known species, including 67 species belongs to 12 families where 56 species (43%) are known to be endemic to the country. These organisms are currently threatened due to increase in human population and activities, climatic change, intensive agricultural practices and pollution and in need of conservation. Having less diversity, richness, abundance and distribution surveys is one of the key obstacles in conservation. There have been less surveys of odonates in dry zone areas. This study intended to prepare an inventory of odonates that inhabit two lotic ecosystems in dry zone. Four sample sites were selected from each lotic habitat. Visual observations of adult odonates were conducted by walking along belt transect of 100 x 3m that are adjacent to the water bodies in all four sample sites in the selected two lotic ecosystems. Observations were taken from 0900 h to 1100 h in the morning and 1500 h to 1600 h in the evening for six months from Kaludiya pokuna and Mihintale lake visiting three times per month to each site. The observed individuals were photographed. A total of 3,343 of individual odonates were recorded. A total of 22 species identified using standard field guides, belong to three families, Coenagrionidae (25.90%), Gomphidae (3.26%) and Libellulidae (70.83%), two vulnerable species *Aciagrion occidentale* and *Ceriagrion cerinorubellum*, two endemic species *Cyclogomphus gynostylus* and *Pseudagrion rubriceps ceylonicum* where one was considered as critically endangered and three nearly threatened species *Orthetrum glaucum*, *Hydrobasileus croceus* and *Rhodothemis rufa* were recorded. The diversity of odonates and abundance was higher in Mihintale lake because Shannon – Weiner diversity index (2.267) and Simpson's diversity index (0.854) and Evenness (0.817) were high for Mihintale lake. The highest number of individuals that observed was *Brachythemis contaminata* in both study sites as a total but in Kaludiya pokuna number of individuals that was observed from this species was higher than Mihintale lake. This study shows odonate diversity is high in both lotic habitats that were studied and in Mihintale lake it is higher than Kaludiya pokuna. This study needs to be further expanded taking micro-habitat parameters, water quality parameters and expanding it over time and area. Further, both lotic and lentic habitats

can be considered with and without/less anthropogenic activities.] Address: Hettiarachchi, D.K., Dept of Biological Sciences, Fac. Applied Sciences, Rajarata Univ. of Sri Lanka, Mihintale, Sri Lanka. Email: dilanikh@as.rjt.ac.lk

**22332.** Raut, A.M.; Banu, A.N.; Akram, W.; Nain, R.S.; Singh, K.; Wahengabam, J.; Shankar, C.; Shah, M.A. (2023): Impact of pesticides on diversity and abundance of predatory arthropods in rice ecosystem. Applied and Environmental Soil Science Volume 2023, Article ID 8891070: 10 pp. (in English) ["Rice (*Oryza sativa*) is one of the most important cereal crops with a diverse set of pests and natural enemies. Rice fields often support a high diversity of arthropods which contribute significantly to productivity. This diversity is frequently threatened due to indiscriminate applications of pesticides. Our aim was to emphasize on the predator diversity in agrochemical exposed rice field as well as on the impact of surrounding vegetation on beneficial insect diversity. Natural enemies' data were recorded from randomly selected 10 quadrates by visual observation from each treatment. A total of 5,590 individuals of predators were observed during the study period which included 27 species belonging to 16 families from five orders of arthropods during the kharif season of rice. Statistically, there were no significant differences between the population of general natural enemies such as Odonata, Coleoptera, Hymenoptera, and Araneae in plots with insecticide and control during the different growth stages of rice cultivation. Diversity indices were almost similar in fields where pesticide was sprayed and not sprayed. Our study concluded that natural enemies are conserved by ensuring crop heterogeneity, growing insect-friendly plants (with high levels of nectar and pollen) as border crops, and judicious application of granule insecticide like cartap hydrochloride in a rice agro-ecosystem." (Authors)] Address: Raut, A.M., Dept of Entomology, School of Agriculture, Lovely Professional University, Jalandhar, Punjab, India. Email: ankushento@gmail.com

**22333.** Rüppell, G.; Hilfert-Rüppell, D. (2023): Double function of flight in *Calopteryx splendens* (Odonata: Calopterygidae) males. International Journal of Odonatology 26: 172-178. (in English) ["Different flight manoeuvres of males of *Calopteryx splendens* were analysed by means of slow-motion filming. The wingbeat frequencies of males flying in tandem were higher than those of single flying males. A male exhibited the highest frequencies when carrying a Blue Featherleg [*Platynemis pennipes*] tandem over a distance of 20–25 cm. The widest range of variability of values of wingbeat frequencies were recorded in threatening flight, probably due to the simultaneous communicative function of the wings during that behaviour. The upstroke/downstroke ratio of the wings allows to draw conclusions on their aerodynamic effect. It was low in pursuing flight, which is when more thrust is needed, and it was high in flight with an additional load (a Featherleg tandem) when a lot of lift was necessary. Both sexes exhibited wing standstills during forward flight. In males, the variability of the duration of wing standstills was widest, probably due to the communicative function of their blue wings. Because males engage in threatening displays their flight was very irregular and unsteady. In contrast, females were much more regular in their flight, which may explain why they win most pursuit races with males." (Authors)] Address: Rüppell, G., An der Wasserfurche 32, Cremlingen, Germany. Email: georg.rueppell@protonmail.com

**22334.** Sadasivan, K.; Nair, V.P.; Pulikkal, S.; Janaki, S.; Samuel, A. (2023): Taxonomic notes on *Davidioides martini* Fraser, 1924 (Odonata: Gomphidae) and description of its

female from Western Ghats, Peninsular India. International Journal of Odonatology 26: 114-123. (in English) ["A note on the rare dragonfly *Davidioides martini* Fraser, 1924, is provided with an update of its distribution range, status, ecology, and the description of its so far unknown female. This species is endemic to the Western Ghats of Peninsular India and seems to be a rare one as is indicated by the paucity of published records, some of which are shown to be doubtful and in need of corroboration." (Authors)] Address: Sadasivan, K., Travancore Nature History Society, Mathrubhumi Road, Vanchiyoor P.O., Thiruvananthapuram, Kerala, India, PIN 695035. Email: kaleshs2002in@gmail.com

**22335.** Salsabila, N.; Pramudya Kurniawan, A. (2023): Diversity of Anisoptera in Cisuru village, Cilacap Regency, Central Java. Jurnal Biologi Tropis 23(4B): 185-192. (in Indonesian, with English summary) ["This study aims to study the abundance and diversity of Anisoptera species, as well as environmental parameters in Cisuru Village, Cilacap, Central Java. Data retrieval using the point count method. The results of the study found 19 species of Anisoptera from 3 families (Aeshnidae, Gomphidae, Libellulidae). The most common species is *Orthetrum sabina* (Settlements: 153 individuals/0.5 ha; Rice fields: 225 individuals/0.5 ha; and Rivers: 126 individuals/0.5 ha). Anisoptera diversity index ( $H'$ ) values in all three habitats were classified as medium category (Settlement: 2.06; Rice fields: 1.29; and River: 1.63). Anisoptera is mostly found in light intensity conditions of  $26,309 \pm 17,117$  lux; air humidity  $37.85\% \pm 6.2\%$ ; and wind speeds of  $0.75 \pm 0.34$  m/s." *Gynacantha subinterrupta*, *Ictinogomphus decoratus*, *Agrioptera insignis*, *Brachydiplax chalybea*, *Brachythemis contaminata*, *Crocothemis servilia*, *Hydrobasileus croseus*, *Lathrecista asiatica*, *Neurothemis ramburii*, *Neurothemis terminata*, *Orthetrum sabina*, *Pantala flavescens*, *Potamarcha congener*, *Rhodothemis rufa*, *Rhyothemis phyllis*, *Tetrathemis irregularis*, *Tholymis tillarga*, *Zyxomma obtusum*, *Zyxomma petiolatum*] Address: Salsabila, Novi, Program Studi Biologi, Fakultas Sains dan Teknologi, Universitas Islam Negeri Sunan Kalijaga, Yogyakarta, Indonesia. Email: salsabilanovi07@gmail.com

**22336.** Samanta, T.; Giri, A.; Chatterjee, L.; Chatterjee, L.; Roy, A.B. (2023): Odonata diversity in the Egra and its adjoining blocks of Purba Medinipur District, West Bengal, India. Journal of Threatened Taxa 15(8): 23778-23785. (in English) ["The research was carried out over a three-year period, spanning from March 2020 to March 2023, with the aim of examining the status and diversity of Odonata fauna across a range of natural and anthropogenic habitats situated in Egra, Purba Medinipur District, located in the state of West Bengal. In total, 42 odonata species from 31 genera and seven families were identified throughout the study period from the study region. There were 28 (67%) species in Anisoptera, and 14 (33%) species in Zygoptera: Aeshnidae (10%), Gomphidae (2%), Libellulidae (53%), and Macromiidae (2%), Coenagrionidae (24%), Lestidae (2%), and Platynemididae (7%). According to the relative estimate of abundance, 38% of the species were classified as not rare (NR), 31% very common (VC), 14% common (C), 14% rare (R), and 3% as very rare (R). In addition, the IUCN red data list indicates that 41 species have been classified as Least Concern (LC), while a solitary species has been categorised as Data Deficient (DD). The identification of Odonata is a critical factor in determining the ecological well-being of an ecosystem.] Address: Roy, A.B., Nature Mates-Nature Club, 6/7 Bijoygarh, Kolkata, West Bengal 700032, India. Email: pakhibitan2019@gmail.com

**22337.** Sánchez-Campaña, C.; Múrria, C.; Hermoso, V.; Sánchez-Fernández, D.; Tierno de Figueroa, J.M.; González, M.; Millán, A.; Moubayed, J.; Ivkovic, M.; Murányi, D.; Graf, W.; Derka, T.; Mey, W.; Sipahiler, F.; Paøil, P.; Polášková, V.; Bonada, N. (2023): Anticipating where are unknown aquatic insects in Europe to improve biodiversity conservation. *Diversity and Distributions* 29: 1021-1034. (in English) ["Aim: Understanding biodiversity patterns is crucial for prioritizing future conservation efforts and reducing the current rates of biodiversity loss. However, a large proportion of species remain undescribed (i.e. unknown biodiversity), hindering our ability to conduct this task. This phenomenon, known as the 'Linnean shortfall', is especially relevant in highly diverse, yet endangered, taxonomic groups, such as insects. Here we explore the distributions of recently described freshwater insect species in Europe to (1) infer the potential location of unknown biodiversity hotspots and (2) determine the variables that can anticipate the distribution of unknown biodiversity. Location: The European continent, including western Russia, Cyprus and Turkey. Methods: Georeferenced information of all sites where new aquatic insect species were described across Europe from 2000 to 2020 was compiled. In order to understand the observed spatial patterns in richness of recently described species, spatial units were defined (level 6 of HydroBASINS) and associated with a combination of a set of socioeconomic, environmental and sampling effort descriptors. A zero-inflated Poisson regression approach was used to model the richness of newly described species within each spatial unit. Results: Nine hundred and sixty-six recently described species were found: 398 Diptera, 362 Trichoptera, 105 Coleoptera, 66 Plecoptera, 28 Ephemeroptera, 3 Neuroptera, 2 Lepidoptera and 2 Odonata. The Mediterranean Basin was the region with the highest number of recently described species (74%). The richness of recently described species per spatial unit across Europe was highest at mid-elevation areas (between 400 and 1000 m), latitudes between 40 and 50° and in areas with yearly average precipitation levels of 500–1000 mm, a medium intensity of sampling effort and low population density. The percentage of protected areas in each study unit was not significantly related to the richness of recently described species. In fact, 70% of the species were found outside protected areas. Main conclusions: The results highlight the urgent need to concentrate conservation efforts in freshwater ecosystems located at mid-altitude areas and out of protected areas across the Mediterranean Basin. The highest number of newly described species in those areas indicates that further monitoring efforts are required to ensure the aquatic biodiversity is adequately known and managed within a context of growing human impacts in freshwater ecosystems." (Authors)] Address: Sánchez-Campaña, Carlota, FEHM-Lab (Freshwater Ecology, Hydrology & Management), Dept de Biologia Evolutiva, Ecologia i Ciències Ambientals, Facultat de Biologia, Univ. Barcelona, Diagonal 643, Barcelona 08028, Spain. Email: [sanchezcc@ub.edu](mailto:sanchezcc@ub.edu)

**22338.** Sentis, A.; Kaunisto, K.; Chari, L.; Morrill, A.; Popova, O.; Pomeranz, J.; Boukal, D.; Tüzün, N.; Stoks, R. (2023): Odonata trophic ecology. In: *Dragonflies and Damselflies*. Second Edition. Edited by A. Córdoba-Aguilar, C.D. Beatty and J.T. Bried, Oxford University Press. 219-232. (in English) ["Trophic interactions are at the core of several key ecological processes and theories as they determine the flow of material and energy within and across communities and habitats. Odonates provide a rich and diverse taxonomic group with several features (e.g. trophic position, hunting behavior, olfaction) that make them a very interesting biological model for the study of trophic interactions in aquatic

and terrestrial habitats. Moreover, odonates undergo incomplete metamorphosis with aquatic larvae and terrestrial adults, which provides opportunities to investigate ontogenetic diet variation and trophic links between aquatic and terrestrial systems. They are also important predators regulating prey populations and mediating community processes such as trophic cascades. Finally, recent studies on odonates have pioneered whether local adaptation and phenotypic plasticity can counterbalance the negative impacts of global change on resource acquisition and fitness. This chapter reviews recent studies investigating the trophic features and role of odonates in aquatic and terrestrial ecosystems as well as their importance for investigating the impact of global change on trophic ecology, local adaptation, and community processes. Many of the insights highlighted in this chapter go beyond odonates and have helped to advance key concepts in trophic ecology." (Authors)] Address: Stoks, R., Laboratorium voor Aquatische Ecologie, K.U.Leuven, De Beriotstraat 32, B-3000 Leuven, Belgium. E-mail: [robby.stoks@bio.kuleuven.ac.be](mailto:robby.stoks@bio.kuleuven.ac.be)

**22339.** Silva, B.; Souza, F.N.; Santos, F.B.; Cardoso da Silva, D.; Sousa, D.L.; Silva, L.R.; Santos Guimarães, I.D. (2023): Odonatas predadores de larvas do mosquito *Aedes aegypti*, no sudoeste da Bahia. In: *XXI Encontro de Zoologia do Nordeste*. Universidade Federal de Pernambuco, Recife-PE, 2023. Disponível em: <https://www.doity.com.br/anais/resumosezn2023/trabalho/310953>. Acesso em: 04/11/2023 às 13:49: 4 pp. (in Portuguese) ["Studies to control the *Aedes aegypti* vector are important to reduce the incidence of Dengue, Zika and Chikungunya, responsible for thousands of deaths in Brazil. This study investigated the potential for biological control of the *Ae. mosquito. aegypti* by nymphs of the order Odonata, aiming to combat these diseases. The third and fourth instar larvae of *Ae. aegypti* were obtained from the Natural Insecticide Research Laboratory (LAPIN) of the State University of Southwest Bahia (UESB), Itapetinga Campus, and bred from eggs of the Rockefeller strain, provided by the Toxicology Research Laboratory of the Federal University of Pernambuco (UFPE). The Odonata nymphs were collected in a UESB reservoir on the Vitória da Conquista campus, using an entomological net and placed in containers containing 2 liters of treated and dechlorinated water, where they remained for 24 hours without food before the experiments. These were conducted in the laboratory, using nymphs from the Aeshnidae, Libellulidae and Coenagrionidae families. In the first experiment, nymphs from the Aeshnidae family preyed on 56 *Ae. aegypti* over 9 hours. In the second, nymphs from the Libellulidae family preyed on all 150 *Ae. larvae. aegypti* in 12 hours, while nymphs from the Coenagrionidae family preyed 25. In the third experiment, nymphs from the Libellulidae family preyed 68 *Ae. aegypti*, highlighting the influence of the amount of water on predation. Results support the effectiveness of Odonata nymphs to control *Ae. aegypti*, especially the Aeshnidae and Libellulidae families, offering an economical and sustainable approach to reducing mosquito-borne diseases. However, it is essential to consider ecological factors for the success of biological control. This study highlights the importance of innovations in the fight against *Ae. aegypti* to protect public health and prevent these diseases." (Authors/Google translate)] Address: <https://doity.com.br/media/doity/submissoes/artigo-c34304-2fcfb23b67e0c12aab10deac321739e659-arquivo.pdf>

**22340.** Staentzel, C.; Schlumberger, O.; Barillier, A.; Valentini, A.; Boyer, F.; Beisel, J.N. (2023): Trophic impact of *Neogobius melanostomus* in a restored site on the Old Rhine

River (France). Aquatic Sciences volume 85, Article number: 46: 15 pp. (in English) ["Habitat changes induced by restoration can favour invasive species, thereby thwarting the main biological objectives of restoration and possibly limiting a project's success. Here, we focus on a study site located along the Old Rhine River that was being restored in 2013 by controlled bank erosion and implementation of artificial transverse groynes. In the Upper Rhine (Franco-German border), the first reports of the bighead goby (*Ponticola kessleri*, Günther 1861) and round goby (*Neogobius melanostomus*, Pallas 1814) were 2010 and 2011, respectively. As the round goby largely dominates the overall goby assemblage, we asked about the consequences of its presence on the restored site. Electrofishing was carried out from 2013 to 2021 in parallel to a benthic macroinvertebrate monitoring conducted from 2014 to 2019. In 2015/2016, we looked at goby's predation by studying their stomach contents through macroscopic visualisation and eDNA metabarcoding analysis. For results, gobies were found in large densities dominated by *N. melanostomus*, increasing over time to the detriment of local fish species. No predation was observed on native fish species but *N. melanostomus* cannibalism reached 9%. Round goby's predation was opportunistic, based on the most abundant benthic macroinvertebrates: (i) low trophic level taxa, and (ii) invasive amphipod crustaceans. If round gobies fed on some insects, they did not prevent the colonization of new taxa on the habitats that appeared after restoration. We stress that the high abundance of *N. melanostomus* has led to profound changes in the food web structure and species interactions in the Old Rhine River, but it is unlikely that it masked the restoration consequences on macroinvertebrates 6 years after the restoration. These results support (i) the importance in carrying out long-term monitoring to confirm that a stronger trophic impact is not ultimately delayed, and (ii) the diversification of habitats as an option for limiting the invasion by gobies." (Authors) Odonate taxa are treated at family level."] Address: Staentzel, Cybill, Université de Strasbourg, UMR 7362 CNRS LIVE, 3, rue de l'Argonne, F-67000 Strasbourg, France. E-mail: cybill.staentzel@live-cnrs.unistra.fr

**22341.** Stahl, L. (2023): How does temperature and resource level affect competition in two species of dragonfly larvae? MSc. thesis, Uppsala University, Disciplinary Domain of Science and Technology, Biology, Biology Education Centre.: 23 pp. (in English) ["In the wakes of climate change, the phenology of many species is shifting. This can have many implications for inter-specific competition. In this thesis I studied how temperature affected the larval competition between two species of Odonata, dragonfly: *Lestes sponsa* and *Sympetrum vulgatum*. In addition, I studied how this competition was affected by food resource availability. To do this I performed a laboratory experiment on larvae at two different temperatures (21°C and 24°C) and two different resource densities (low and high). I estimated egg hatching rate, growth rate and survival. Larval competition (growth rate and survival) was studied in sympatry in small containers mimicking a natural environment at a density of 5 individuals of each species during a 10-week period. The results showed that eggs of both species hatched at a slightly higher rate at 24°C, and that *S. vulgatum* started hatching about one day in advance of *L. sponsa*. In general, growth rate was higher: (1) at 24°C compared to 21°C, (2) at high compared to low resource densities, and (3) in *L. sponsa* compared to *S. vulgatum*. Interestingly, at 24°C the higher growth rate of *L. sponsa* was accentuated at the high resource level compared to the low resource level. Hence resource levels affected competition differently depending on

temperature. There was a negative relationship between growth rate and survival suggesting that the higher growth rate of larva was to some degree driven by interspecific predation and/or cannibalism. The results from this thesis suggest that resource levels interact with temperature and cause difference in strength of competition between species. Such effects should be considered in theory predicting changes in species distribution in the light of climate change." (Author)] Address: Stahl, Lisa, Dept of Ecology and Genetics, Animal Ecology, Evolutionary Biology Centre, Uppsala University, Uppsala, Sweden. Email: frank.johansson@ebc.uu.se

**22342.** Swaegers, J.; De Cupere, S.; Gaens, N.; Lancaster, L.T.; Carbonell, J.A.; Sánchez Guillén, R.A.; Stoks, R. (2023): Plasticity and associated epigenetic mechanisms play a role in thermal evolution during range expansion. *Evolution Letters*, qrac007pp. (in English) ["Due to global change, many species are shifting their distribution and are thereby confronted with novel thermal conditions at the moving range edges. Especially during the initial phases of exposure to a new environment, it has been hypothesized that plasticity and associated epigenetic mechanisms enable species to cope with environmental change. We tested this idea by capitalizing on the well-documented southward range expansion of the damselfly *Ischnura elegans* from France into Spain where the species invaded warmer regions in the 1950s in eastern Spain (old edge region) and in the 2010s in central Spain (new edge region). Using a common garden experiment at rearing temperatures matching the ancestral and invaded thermal regimes, we tested for evolutionary changes in (thermal plasticity in) larval life history and heat tolerance in these expansion zones. Through the use of de. and hypermethylating agents, we tested whether epigenetic mechanisms play a role in enabling heat tolerance during expansion. We used the phenotype of the native sister species in Spain, *I. graellsii*, as proxy for the locally adapted phenotype. New edge populations converged toward the phenotype of the native species through plastic thermal responses in life history and heat tolerance while old edge populations (partly) constitutively evolved a faster life history and higher heat tolerance than the core populations, thereby matching the native species. Only the heat tolerance of new edge populations increased significantly when exposed to the hypermethylating agent. This suggests that the DNA methylation machinery is more amenable to perturbation at the new edge and shows it is able to play a role in achieving a higher heat tolerance. Our results show that both (evolved) plasticity as well as associated epigenetic mechanisms are initially important when facing new thermal regimes but that their importance diminishes with time." (Authors)] Address: Swaegers, J., Lab. of Evolutionary Stress Ecology & Ecotoxicology, University of Leuven, Charles Deberiotstraat 32, Leuven B-3000 Belgium. Email: janne.swaegers@kuleuven.be

**22343.** Zahn, A.; Burbach, K. (2023): Schnelle Reaktion der Libellenfauna auf Hitzesommer. *ANLiegen Natur* 452: 21-24. (in German) ["In 2017 and 2020, the dragonfly fauna was recorded in the Isental in southeastern Bavaria. The years between the two surveys were warmer than average and dry. It turned out that the reaction of the dragonfly fauna to high temperatures and low rainfall can be very clear in just a few years. Many populations have declined, particularly the occurrence of swamp and fen species. Heat-loving species have increased." (Authors)] Address: Burbach, K., Kirchenweg 4, D-85354 Freising, Germany. E-mail: k-burbach@web.de