

# 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

## 1997

**20791.** Feenstra, H. (2000): Succesvolle broedgevallen van Grauwe Vliegenvangers *Muscicapa striata* in kanariekastjes. Drentse Vogels: 89-92. (in Dutch) ["Successful breeding of Spotted Flycatchers *Muscicapa striata* in nest-boxes: In 2000, two pairs of *M. striata* were observed from arrival till after fledging at a farm in the province of Friesland (Netherlands). Nest-building took three days; egg-laying started one day after the nests were finished. Incubation lasted 13 days and nestlings fledged at ages between 15 and 16 days old (Table 2). The feeding frequency roughly doubled in the second part of the nestling stage (Table 1). Declines in feeding rate were apparently compensated by providing larger prey items. Of identified prey items, Diptera (n=213) were most common, followed by Odonata (n=45), Lepidoptera (n=27), Coleoptera (n=9) and caterpillars (n=4)." (Author)] Address: Feenstra, H., Fochtelooërveen 10, 8428 RR Fochteloo, Netherlands.

## 2006

**20792.** Ternois, V.; Gautier, C. (2006): L'évaluation du patrimoine entomologique des étangs piscicoles de Champagne humide (Odonates, Orthoptères et Lépidoptères rhopalocères). *Courrier Scientifique du Parc Naturel Regional de la Forêt d'Orient* 30: 47-62. (in French) ["Conclusion: With odonate 40 species contacted in 2004, including one new species for the Aube department, the odonatological study carried out on the 13 fish ponds of the PNRFO must be considered satisfactory even if it does not allow an exhaustive census for each of the sites studied. The protocol used nevertheless allows a comparison of the sites between them since the survey effort was more or less the same for all the ponds. It is therefore possible to rank the ponds according to their odonatological heritage. The diversity and richness of dragonflies vary greatly from one pond to another. Several elements have been put forward to explain this disparity, such as the general nature of the environment (forest pond, open pond, dry pond, etc.), the diversity and mosaic of the environments present, the impact of fish farming management, whether it be stocking, the nature of the population or the management of water levels. These elements are also at the origin of the patrimonial interest of fishponds for the conservation of dragonflies. Of the 63 known species in Champagne-Ardenne, the ponds of Champagne Humide are home to 54 species, of which thirty or so are remarkable because of their rarity, their degree of threat or their protected status. Some Odonata are dependent on fishponds and their conservation depends largely on the management in place. It would seem that for most owners, fish farming is the primary concern. They therefore allow the peripheral vegetation to develop naturally. However, this spontaneous development towards closed hygrophilous woodland is a limiting factor for the development of Odonata. These require

the presence of hygrophilic border vegetation (rushes and sedges) which allows the emergence of larvae and the maturation of imagos. Management of the entire water body is therefore essential to maintain sufficient biodiversity. Two parameters now seem to be essential to ensure the conservation of Odonata: extensive management of the fish population. This involves favouring the stocking of carnivorous fish while limiting burrowing fish such as carp and tench, in order to limit the turbidity of the water bodies, which is harmful to the larval development of odonates, but also to favour the development of aquatic grass beds, environments used for egg-laying or for the development of larvae. the management of the edges of the ponds to create a mosaic of environments, which is essential for the reproduction and development of the imagos. Floristic diversity will also be ensured by maintaining a natural summer tidal range, which is essential for the development of specific threatened species: *Lestes barbarus*, *L. virens vestalis*, etc." (Authors / DeepL) *Sympecma fusca*; *Lestes barbarus*; *L. dryas*; *L. virens vestalis*; *Coenagrion mercuriale*; *C. pulchellum*; *C. scitulum*; *Cercion lindenii*; *Ischnura pumilio*; *Anax parthenope*; *Brachytron pratense*; *Aeshna isoceles*; *A. affinis*; *A. grandis*; *Somatochlora metallica*; *S. flavomaculata*; *Oxygastra curtisii*; *Epithea bimaculata*; *Gomphus vulgatissimus*; *Onychogomphus forcipatus*; *Cordulegaster boltonii*; *Libellula fulva*; *Orthetrum albistylum*; *O. brunneum*; *O. coerulescens*; *Crocothemis erythraea*; *Sympetrum danae*; *S. fonscolombii*; *S. flaveolum*; *S. meridionale*; *S. vulgatum*; *Leucorrhinia caudalis*; *L. pectoralis*] Address: E-mail: [bonjour@pnrfo.org](mailto:bonjour@pnrfo.org). Site internet: [www.pnr-foret-orient.fr](http://www.pnr-foret-orient.fr)

**20793.** Karsch, A. (2006): Naturschutzfachliches Rahmenkonzept für das Westliche Dachauer Moos. Grundlagenplanung für ein Projekt im BayernNetz Natur. Diplomarbeit. Hochschule Anhalt (FH), Abteilung Bernburg: 204 pp. (in German) [Bayern, Germany; "In this diploma thesis, a nature conservation framework concept for the BayernNetz Nature Project "Westliches Dachauer Moos" is developed, which is understood as basic planning for the further implementation of the project. First of all, the planning basis is determined, which deals with the location, the natural classification, the abiotic conditions, the history and the current situation of the planning area. This is followed by a description of the status of the area in terms of nature conservation. It describes the stock of biotopes and species of selected animal groups and vascular plant species in the planning area. On this basis, a nature conservation assessment is carried out in which significant species and biotopes are identified. Subsequently, suitable areas for compensation measures are identified and existing and possible conflicts are explained. Finally, the concept of objectives and measures compiles proposals for the development of the area in terms of nature conservation .... The dragonfly findings (n=31 species) are mainly distributed among the still waters and ditches in Eschenrieder and Graßfinger Moos and the landscape lake at the Schinderkreppe. The most frequently

recorded species include common and undemanding species such as *Aeshna cyanea*, *Coenagrion puella*, *Platycnemis pennipes* and *Pyrrhosoma nymphula* (see Tab. 5). These are primarily stillwater species with low requirements for the quality of the water bodies and their environment. The only species inhabiting only flowing waters in the PG with relatively many records is *Calopteryx splendens*. There are only a few records or isolated findings of more demanding species such as *Aeshna juncea*, *Coenagrion mercuriale*, *Lestes barbarus* and *Sympetrum flaveolum*. The only more demanding species of which there are several records from different years is *Orthetrum coerulescens*. The species was observed at several ditches in the Eschenrieder Moos and at the landscape lake. At the landscape lake it is also 37 Insensitive to major fluctuations in environmental factors (cf.: DROSDOWSKI 1997, p. 240). The species is thus able to colonise a variety of different habitats." (Author/DeepL) Address: not stated

## 2077

**20794.** Brettfeld, R.; Bellstedt, R.; Nixdorf, F. (2007): Zur Gewässerfauna der Rodach in Südthüringen. Veröffentlichungen, Naturhistorisches Museum Schloss Bertholdsburg Schleusingen 22: 93-106. (in German) ["The Rodach in southern Thuringia runs through the hilly landscape of the Grabfeld between Thuringia and Upper Franconia. In its course, semi-natural and semi-natural, formerly developed sections alternate. Since 1989, the Thuringian section has been studied with regard to aquatic fauna. A total of 176 species of invertebrates, fish and aquatic bird species have been recorded. Above all, the occurrence of aquatic insects: Mayflies, stoneflies and caddisflies, dragonflies and water beetles. The special features of the Rodach are the close succession of rhithral and potamal biocoenoses of coarse and fine material-rich, carbonate streams and rivers on only about 25 km of course. The Rodach is a refuge of rare and endangered species of Thuringia's stream and river landscapes. A total of four species new to Thuringia were found in the Rodach. Another species lost in Thuringia was rediscovered in the Rodach. More than 35 animal species are listed in Thuringia's red lists (TLUG 2001)." (Authors) Translated with www.DeepL.com/Translator (free version)] Address: Brettfeld, R., Bockstadter Mühle/Werra, 98673 Bockstadt, Germany

**20795.** Xu, Q.-h. (2007): Studies on classification of Fujian odonates, China. Dissertation for Master Degree of Fujian Agriculture and Forestry University: III + 54 pp. (in Chinese, with English summary) ["All the odonate specimens collected from Fujian Province in recent years were studied and identified. 1 new species and 1 new subspecies were described and illustrated, and 14 species were firstly recorded in Fujian. The new species and new subspecies are *Periaeschna zhangzhouensis* sp.nov. and *Planaeschna ishigakiana fujianensis* subsp. nov. The newly recorded species are: *Rhinocypha chaoi* Wilson, *Agriomorpha fusca* May, *Rhipidolestes janetae* Wilson, *Aciagrion olympicum* Laidlaw, *Platycnemis foliacea* Selys, *Anax immaculifrons* Rambur, *Lamelligomphus hainanensis* (Chao), *Merogomphus paviei* Martin, *Phaenandrogomphus chaoi* Zhu et Liang, *Stylurus kreyenbergi* (Ris), *Macromia unca* Wilson, *Macromidia hangzhouensis* Zhou et Wei, *Onychothemis lestacea tonkinensis* Martin and *Zygonyx iris insignis* (Kirby). Based on all the literature records of Fujian odonates and Davies and Tobin system (1984, 1985) of Odonata classification, Fujian odonates were sorted out and revised thoroughly, 16 families, 102 genera and 247 species (subspecies) were

found, which included 233 known species (or subspecies) belonging to 101 genera, 16 families. In the checklist of Fujian odonates, every species was enumerated with relative literature records, amounts of specimens, collected locations and collected times, and distribution. Based on the current methods of entomo-geographical division and the distribution records of 233 known odonates, the faunal analysis of Fujian odonates was conducted. The result showed that the fauna of Fujian odonates belongs to typical Oriental Region, the elements of Oriental Region of Fujian odonate fauna arc dominated by the constituents of Southern Chinese origin. The faunal compositions of Fujian odonates reflect the region characteristics which are obviously discrepant between South-Eastern Fujian and North-Central Fujian which were divided according to entomo-geographical division of agriculture and forestry in Fujian. The gomphid dragonflies of Fujian have an obvious tendency to spread outwards from Indo-Chinese Subregion, which seems to be a center of abundance of the gomphid dragonfly fauna." (Author) Address: Xu, Qi-han, Zhangzhou Education College 363000, Fujian, China. E-mail: qi-hanx@yahoo.com.cn

**20796.** Xu, Q.-h. (2007): *Periaeschna zhangzhouensis* spec. nov. from Fujian, China (Anisoptera: Aeshnidae). *Odonatologica* 36(3): 315-318. In English. ["The new species is described, illustrated and compared with the congeners (holotype male, China, Fujian, Huaan co., 3-VIII-2004; deposited at Zhangzhou Education College, China). It is similar to *P. flinti* Asahina, from which it is distinguished by longer inferior appendages, an obtusely tipped dentigerous plate and by different colour patterns of the synthorax and abdomen." (Author)] Address: Xu, Qi-han, Zhangzhou Education College 363000, Fujian, China. E-mail: qi-hanx@yahoo.com.cn

## 2010

**20797.** Goergen, G.; Dupont, P.; Neuenschwander, P. (2010): Etat actuel de la biodiversité animale: 7.2 Biodiversité des insectes / Current state of animal biodiversity: 7.2 Insect biodiversity. In: Sinsin, B. & D., Kampmann (Eds) *Atlas de la Biodiversité de l'Afrique de l'Ouest (BIOTA)*, Tome I: Bénin / Biodiversity Atlas of West Africa, Volume I: Benin. Cotonou & Frankfurt/Main, ISBN 978-3-981-393330, 726 pp: 346-355. (in French) [The paper includes a figure and reference of *Ceragrion citrinum* Champion 1914.] Address: unknown

**20798.** Hense, J. (2010): *Phänologie der Libellen (Insecta, Odonata) an jungen Pioniergewässern*. Diplomarbeit. Universität Köln: 65 pp. + Anhang. (in German) ["In the context of this study, the phenology of dragonflies (Odonata, Insecta) was recorded in the first flight season at six newly created pioneer waters or waters that had been moved into an early succession stage by maintenance measures in the Kranenburger Bruch NSG on the Lower Rhine, Nordrhein-Westfalen, Germany. The waters were sampled eight times over a period of 14 months, during which, in addition to recording the Odonata imagines, the vegetation development and some water chemistry parameters were recorded, exuviae were collected and larvae were caught. A total of 2523 individuals from seven families and 26 species were recorded, which were used to illustrate the phenological distribution, as well as to evaluate the implemented conservation measures from an odonatological perspective. For most Zygoptera, a later maximum in the number of full insects was observed due to the emergence of the first larval generation developed in the water body in midsummer. Shifts in the

number of Anisoptera were mainly due to interspecific competition and the species-typical migration behaviour. In addition, under the special conditions in a pioneer water body." (Author/DeepL) Coenagrion puella, Enallagma cyathigerum, Ischnura elegans, I. pumilio, Erythromma najas, Aeshna grandis, A. cyanea, A. juncea, Anax imperator, Brachytron pratense, Cordulia aenea, Libellula depressa, Libellula quadrimaculata, Orthetrum cancellatum, Sympetrum sanguineum, S. vulgatum, S. striolatum, S. fonscolombii] Address: not stated

## 2011

**20799.** Hanějková, B. (2011): Migration of dragonflies and damselflies (Odonata). Ekologická a evoluční biologie, Přírodovědecká fakulta, Univerzita Karlova v Praze: 37 pp. (in Czech, with English summary) ["This study is aimed at the phenomenon of migration, which is not still fully explored and which, by different circumstances, undergo several species of dragonflies (Odonata). Only for a few species from several tens of migrants generally, their migration route and strategies are explored. These case studies are described and I am also dealing with those species of dragonflies for which migration is not fully explored, and I am pointing out the other possible fields of research. One of the aims of my work is the comparison of different attributes and strategies of migration in dragonflies with other migrants from insect as well as the migratory birds." (Author)] Address: not stated

**20800.** Esch, A. (2011): Die Libellen der Fließgewässer und ihre Begleitfauna im FFH-Gebiet Kottenforst bei Bonn (Insecta: Odonata). Diplomarbeit. Rheinische Friedrich-Wilhelms-Universität Bonn: VIII + 62 pp + Anhang. (in German) ["Summary: In the context of this diploma thesis, the dragonfly fauna of the flowing waters of the FFH area Kottenforst southwest of Bonn was investigated with regard to its dragonfly spectrum and the accompanying aquatic fauna. The aim of the work was to obtain an overview of the frequency and distribution of the typical dragonfly species of smaller, natural flowing waters. The investigation of the aquatic accompanying fauna should provide information about possible predators, but also about the available food supply for dragonflies and their larvae. A comparison with historical data allowed a temporal overview of the spectrum of stream dragonflies in the Kottenforst and a classification in a longer period. From May to October 2010, six streams were examined for dragonfly occurrence and accompanying aquatic fauna at a total of ten survey points, each with six inspections. Both headwater regions, medium stream sections of large and small streams and a relatively newly constructed sand trap were selected as survey points. The inspections were equally distributed over the different times of day. Eleven species were detected during the surveys in 2010. The most species-rich spectrum of dragonflies was observed at the sand trap of the Annaberg stream. Nine of the eleven species recorded in this study were recorded here. Except for one record of *Calopteryx splendens*, these were dragonfly species typical of still waters. At the other study sites, an average of two dragonfly species were recorded at each stream. A negative exception was the Kluffer Bach, where no dragonflies were recorded between May and October 2010. With *Cordulegaster bidentata*, *C. splendens* and *C. virgo*, three of the four species of small streams occurring in this region could be detected. Only *Cordulegaster boltonii* was absent from the study area. Due to the known populations of this species in very similarly shaped forests in the area of the Rhine-Sieg district on the right

bank of the Rhine, the Rhine seems to be the current distribution limit of *C. boltonii* in this region as well. In contrast, *Cordulegaster bidentata*, which is rare in NRW and classified as critically endangered, was found to be present on the ground at several study sites. It can be regarded as a special feature of the streams in the Kottenforst. The historical data of the NRW dragonfly study group also prove stable occurrences of *C. bidentata* with simultaneous absence of *C. boltonii*. In the Kottenforst, the striped damselfly partially colonises stream sections which, compared to previous literature data, are more in line with the known larval habitats of *C. boltonii*. Whether there is therefore a direct competitive situation between the two damselfly species in the study region, in which *C. bidentata* has possibly displaced *C. boltonii*, or whether the Two-striped damselfly has simply not developed the Kottenforst as a habitat so far, remains open. The two damselfly species occurring in the Bonn urban area could only be proven for the Kottenforst through observations of male imagines. Historically, too, only isolated records have been found. This is partly due to the fact that the important requirements of both species for a breeding water, sunny shore sections and lush riparian vegetation, are usually lacking in a forest area. It is therefore not surprising that two of the three records were made outside the actual forest on adjacent streams. Nevertheless, the observations can be interpreted as indications of the occurrence of the two damselflies in the region around the Kottenforst. The accompanying aquatic fauna was mostly dominated by the crayfish *Gammarus* sp. A special feature was the detection of the crayfish *Orconectes limosus* in the Katzenloch, which is also a potential predator of dragonfly larvae." (Author)] Address: not stated

## 2014

**20801.** Billqvist, M (2014): Om exotiska trollsländor i Sverige. fauna & flora 109(1): 10-13. (in Swedish) ["That exotic dragonflies are found in various ways in connection with aquariums, greenhouses, fish farms and similar is known for a long time, and there are quite abundant finds of different species in almost Europe. But what is the situation in Sweden? Here are the three finds that I know of, but there is most likely a large number of unknowns: *Agriocnemis pygmaea* (Rambur, 1842), *Crocothemis servilia* (Drury, 1770) and an undetermined species which resembles the genus *Ischnura* but probably belongs to something of the genera *Aciastrion*, *Xiphiastrion* or *Amphiallagma*." (Author) [https://www.trollslandeforeningen.se/wp-content/uploads/2015/0-1/Exotiska\\_trollsl%c3%a4ndor.pdf](https://www.trollslandeforeningen.se/wp-content/uploads/2015/0-1/Exotiska_trollsl%c3%a4ndor.pdf)] Address: E-mail: [magnus.billqvist@gmail.com](mailto:magnus.billqvist@gmail.com)

**20802.** Kalnins, M. (2014): Resnvedera purvuspares Leucorrhinia caudalis (Charpentier, 1840) sugas aizsardzības plans. Biedriba "Zala upe", Sigulda. <http://www.slitere.gov.lv/upload/File/DOC/SAPResnvederaPurvuspare-14LV.pdf>: 1-71. (in Latvian, with English summary) ["Lilypad Whiteface (*L. caudalis*) is one of the species of dragonflies occurring in Latvia, which is considered to be endangered and is included in the regulatory enactments of different levels of conservation of the species. In accordance with the report of Article 17 (FFH Directive), the conservation status assessment of Lilypad Whiteface is adverse; and a negative trend of the conservation status has been found. The assessment of a number of parameters included in the report is based on the grounds of an opinion of an expert or there is no data at all (e.g. as to the hydro-chemical parameters of the microhabitats and habitats of the species). The natural data management system "OZOLS" of Nature Conservation Agency

contains only a few, including inaccurate entries on the fields of the species; therefore it is not possible to plan and carry out appropriate conservation of the fields of the species. When planning the measures of freshwater habitat management, the coastal habitat needs are not assessed in connection of the conservation of Lilypad Whiteface (and other specially protected species of dragonflies). Lilypad Whiteface most commonly is found in eutrophic lakes, less often in diseutrophic lakes and old riverbeds in Latvia. The vegetation in the fields of Lilypad Whiteface in eutrophic lakes and old riverbeds are usually visually moderately abundant to abundant, diverse and rich in species. Typically all zones of aquatic plants – the surface, floating-leaf and submerged – are well-developed. Currently Lilypad Whiteface is found throughout the territory of Latvia. Comparing the historical and contemporary data of the distribution of the species it can be concluded that the number of observations of the species has decreased, which could indicate the decrease of the population of the species in Latvia. The uneven distribution of the species is more referable to the uneven level of research than to the actual distribution of the species. The influencing factors of the population of Lilypad Whiteface are the following: their natural enemies and non-native species, collecting, extreme weather conditions, toxic substances in the environment and the minimum size of the population. However, all these factors hold an unknown or low to medium risk. The non-native species and the minimum size of the populations can be a high risk factor too. The loss of a habitat of the species is a medium risk factor, because it has been established only in some specific places. The fragmentation of habitats (isolation of fields), habitat management (cleaning of water bodies) and mismanagement of habitats of coastal zone (overgrowing) are assessed similarly. However, the combination of these factors can have a major impact on the status of the species' population in Latvia. The protection plan of the species contains a description of the conservation measures of Lilypad Whiteface in the following areas: legislation and conservation planning, conservation of the species and habitats of it, research and monitoring, as well as information and education. A part of the described measures are attributable to the protection of invertebrates or even species and habitats as a whole." (Author)] Address: Kalniņš, M., The Entomological Society of Latvia, Dzervenu iela 9-12, LV-2150, Sigulda, Latvia. E-mail: martins.kalnins@biology.lv

**20803.** Robin, K. (2014): Zwergtaucher erbeutet Anax-Larve. *Mercuriale* 14: 67. (in German) [Verbatim: In a harbour area in Schmerikon, at the eastern end of the Zurich Obersee/Switzerland, I spotted two Little Grebes (*Tachybaptus ruficollis*) next to a boathouse and in front of a thin fringe of reeds on 29.11.2013, about 12:30 CET, one of them diving repeatedly. This bird attracted my particular attention because it held a small prey in its beak, but it did not glisten like a wriggling little fish, but seemed immobile and resembled a small branch or piece of reed. The Little Grebe, with its head tilted, kept hitting the surface of the water as if to brush something off. As soon as it had removed this "something" from its beak, it immediately continued diving, and the whole thing was repeated. I managed to photograph the scene several times. I realised that the prey was a large dragonfly larva. After a few minutes and several recaptures, the Little Grebe finally managed to swallow the prey, obviously scratching its throat, because the bird had to gag violently while swallowing with its neck stretched vertically upwards. An analysis of the images showed that the dragonfly larva had temporarily clung to the upper beak. Because of this, the Little Grebe had repeatedly and very forcefully struck its

beak on the water surface. To identify the dragonfly larva, I asked H. Wildermuth and S. Kohl for their assessment. Both experts came up with *Anax* and added that it was most probably *Anax* imperator. Dragonfly larvae as prey of Little Grebes are known (Bandorf 1970: 50), but so far it has only rarely been possible to document this behaviour and to identify the prey with certainty down to the genus level." (Author) Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: Robin, K., Im Freudmoos 7, CH-8730 Uznach, Switzerland. Email: klaus.robin@robin-habitat.ch

**20804.** Robin, K. (2014): Graukranich erbeutet Vierfleck (*Libellula quadrimaculata*). *Mercuriale* 14: 68. (in German) [Verbatim: In the Linth Plain, between Lakes Zurich and Walen, lies the Kaltbrunner Riet, a Swiss fen, amphibian spawning area and waterbird and migratory bird reserve of national importance and in the international context of Ramsar Site CH-7. The area is considered an odonatological (Wildermuth et al. 2005) and ornithological (Geisser et al. 2010) hotspot. Among the more than 200 bird species that have been recorded here in recent years is the Grey Crane (*Grus g. grus*), which in the recent past has increasingly been resting in small groups, but then usually moves on. In exceptional cases, individual birds remain into the breeding season or appear for a few days and depart again, as in the present case. The adult bird appeared on 30 May 2014 in the immediate vicinity of the Kaltbrunner Riet on a former *Molinia*-meadow, which had been drained in the 1960s and is currently used as a mowing meadow. I spotted the bird there at 16:30 h CET and observed it foraging. Bending forward, it walked slowly through the tall vegetation, dipping its head low from time to time. When his head came up again, I could often see him holding an earthworm in his beak. A few times, however, I noticed that it paused for a moment and did not aim at the ground, but at an object on a stalk in the tall grass. The crane then snapped its head forward and grabbed the object with its beak. After snapping at it several times, it hurled it into its beak and finally swallowed it. I was able to document this process photographically. Already in the field I recognised that the crane was eating dragonflies. At maximum magnification, I identified the photographed prey as a four-spotted imago (*Libellula quadrimaculata*). It is well known that cranes eat invertebrates and insects (Makatsch 1970). In the present case, the crane's breeding season stay and the seasonal availability of the four-spotted as food for this individual are remarkable. Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: Robin, K., Im Freudmoos 7, CH-8730 Uznach, Switzerland. Email: klaus.robin@robin-habitat.ch

**20805.** Sharma, G. (2014): Studies on Odonata and Lepidoptera fauna of foothills of Aravalli Range, Rajasthan. *Rec. zool. Surv. India, Occ. Paper* 353: 1-104. (in English) [2.3. Results: Species diversity: The studies on Odonata fauna of Aravalli Range of Rajasthan reveals that so far 46 species belongs to 8 families under 2 suborders were recorded, in which 12 species are new records from Rajasthan state i.e. *Pseudagrion microcephalum* (Rambur, 1842), *Disparoneura quadrimaculata* (Rambur, 1842), *Neurobasis chinensis* (Linnaeus, 1758), *Anax immaculifrons* Rambur, 1842, *A. parthenope* (Selys, 1839), *Neurothemis fulvia* (Drury, 1773), *N. tullia* (Drury, 1773), *Tholymis tillarga* (Fabricius, 1798), *Tramea basilaris burmeisteri* Kirby, 1889, *T. limbata* (Rambur, 1842), *T. virginia* (Rambur, 1842) and *Trithemis kirbyi* Selys, 1891 (Table 1). The study reveals that *Ceragrion coromandelianum* (Fabricius, 1798), *Brachythemis contaminata* (Fabricius, 1793), *Bradinopyga geminata* (Rambur, 1842), *Crocothemis servilia* (Drury, 1770), *Ischnura aurora* (Brauer,

1865), *Pseudagrion rubriceps* Selys, 1876, *Orthetrum glaucum* (Brauer, 1865), *O. prunosum neglectum* (Rambur, 1842), *O. sabina* (Drury, 1770), *Pantala flavescens* (Fabricius, 1798) and *Trithemis aurora* (Burmeister, 1839) were the dominant species of Odonates of Aravalli Range of Rajasthan. The mass emergence of *P. flavescens*, a migratory species was recorded from May to October in different localities of Aravalli Range of Rajasthan during 2008-11. Annotated checklist of Odonata of Aravalli Range of Rajasthan prepared, followed by detailed systematic account species wise (Table 1).] Address: Sharma, G., Zoological Survey of India, M-Block, New Alipore, Kolkata. 700 053, India

**20806.** Whatley, M.H.; van Loon, E.E.; Vonk, J.A.; van der Geest, G.; Admiraal, W. (2014): The role of emergent vegetation in structuring aquatic insect communities in peatland drainage ditches. *Aquatic Ecology* 48: 267-283. (in English) ["Availability of macrophyte habitat is recognized as an important driver of aquatic insect communities in peatland drainage ditches; however, eutrophication can lead to the decline of submerged vegetation. While emergent vegetation is able to persist in eutrophicated ditches, vegetation removal, carried out during ditch maintenance, can reduce the availability of this habitat. In this study, we applied the landscape filtering approach to determine whether the absence of emergent vegetation is a habitat filter which structures aquatic insect communities in peatland drainage ditches under different trophic conditions. To this end, a field study was carried out in one mesotrophic (Naardermeer) and one eutrophic (Wormer and Jisperveld) peatland in the province of North Holland, The Netherlands. We assigned life history strategies to insect species and applied linear mixed models and redundancy analyses to taxonomic and functional aquatic insect community data. Our results indicate that while differences between peatlands primarily determine the species pool within each wetland, emergent vegetation acted as a secondary filter by structuring functional community composition within ditches. The eutrophic peatland was dominated by insects adapted to abiotic extremes, while species with good dispersal abilities were strongly related to emergent vegetation cover. This study demonstrates the applicability of life history strategies to provide insight into the filtering of species due to availability of emergent macrophyte habitat. To ensure greater diversity of insect communities in ditch habitats, it is recommended that some vegetation be spared during maintenance to leave patches from which insect recolonization can occur." (Authors) The paper includes references to Odonata.] Address: Whatley, M.H., Aquatic Ecology & Ecotoxicology, Inst. for Biodiversity and Ecosystem Dynamics (IBED), Univ. of Amsterdam, P.O. Box 94248, 1090 GE Amsterdam, The Netherlands. E-mail: m.h.whatley@uva.nl

## 2016

**20807.** Amann, P. (2016): Die Libellenfauna am Stutzberg bei Frastanz (Odonata / Voralberg. Österreich). *inatura* – Forschung online, Nr. 29: 5 pp. (in German) ["Over a period of two years (2014-15), the dragonfly fauna at potential sites was recorded for the Frastanz Stutzberg. Bazora (Austria) nature monograph. The species occurring there are described, and special features are pointed out. Six dragonfly species (*Phyrrhosoma nymphula*, *Aeshna cyanea*, *Aeshna juncea*, *Anax imperator*, *Cordulegaster bidentata*; *Crocothemis erythraea*) were recorded in the study area, of which *Cordulegaster bidentata* is classified as critically endangered according to Hostettler (2001). Five dragonfly species were observed regularly and are therefore considered to be

native to the area. For the Stutzberg / Bazora area, the small-scale fens with their headwaters and rivulets are to be considered absolutely worth protecting from a dragonfly-specific point of view." (Author) Translated with www.DeepL.com/Translator (free version)] Address: Amann, P., Wiesenbachweg 8, 6824 Schlins, Austria. Email: p.amann@aon.at

**20808.** Borisova, N.V. (2016): About the finding of the White-Fronted Dragonfly (*Leucorrhinia albifrons* (Burmeister, 1839) (Odonata: Anisoptera: Libellulidae) in the Chuvash Republic. *Natural Science Research in Chuvashia* 3: 122-125. (in Russian) ["The message contains information about the discovery of a new for Chuvashia species – white-fronted dragonfly (*Leucorrhinia albifrons* (Burmeister, 1839). collection, proposed measures for the protection of the species on the territory of the Chuvash Republic. ... Material. Yalchik section of the state reserve "Prisursky" (near the village of Eshmikeevo, Yalchik district), 5.VI.2015, edge of poplar-birch planting, 1 female; lake "Two lakes" (near the village of Lutscoe, Komsomolsk region), 29.V.2016, 1 male, 2 females; 17.VI.2016, 2 males, 1 female; 4.VII.2016, 3 males. ... The main enemies of young, newly hatched dragonflies of this species are spiders (*Larinioides cornutus*), as well as larger four-spotted dragonflies (*Libellula quadrimaculata*)."] (Author)] Address: Borisova, N.V. Russia, Cheboksary, FSBI "Prisursky State Reserve", Chuvash Branch of the Russian Entomological Society, Russia. E-mail: nat-borisova18@yandex.ru

**20809.** Davidovich, H.; Ribak, G. (2016): Flying with eight wings: inter-sex differences in wingbeat kinematics and aerodynamics during the copulatory flight of damselflies (*Ischnura elegans*). *The Science of Nature* 103:65: 8 pp. (in English) ["Copulation in the blue-tailed damselfly, *Ischnura elegans*, can last over 5 hours, during which the pair may fly from place to place in the so-called "wheel position". We filmed copulatory free-flight and analyzed the wingbeat kinematics of males and females in order to understand the contribution of the two sexes to this cooperative flight form. Both sexes flapped their wings but at different flapping frequencies resulting in a lack of synchronization between the flapping of the two insects. Despite their unusual body posture, females flapped their wings in a stroke-plane not significantly different to that of the males (repeated-measures ANOVA,  $F_{1,7} = 0.154$ ,  $p = 0.71$ ). However, their flapping amplitudes were smaller by  $42 \pm 17\%$ , compared to their male mates ( $t$  test,  $t_7 = 9.298$ ,  $p < 0.001$ ). This was mostly due to shortening of the amplitude at the ventral stroke reversal point. Compared to solitary flight, males flying in copula increased flapping frequency by 19%, while females decreased flapping amplitude by 27%. These findings suggest that although both sexes contribute to copulatory flight, females reduce their effort, while males increase their aerodynamic output in order to carry both their own weight and some of the female's weight. This increased investment by the male is amplified due to male *I. elegans* being typically smaller than females. The need by smaller males to fly while carrying some of the weight of their larger mates may pose a constraint on the ability of mating pairs to evade predators or counter interference from competing solitary males." (Authors)] Address: Ribak, G., Dept of Zoology, Room 228, Sherman Building, Tel Aviv University, Tel Aviv, Israel. E-mail: gribak@post.tau.ac.il

**20810.** Gangadoo, S.; Chandra, S.; Power, A.; Hellio, C.; Watson, G.S.; Watson, J.A.; Greend, D.W.; Chapman, J. (2016): Biomimetics for early stage biofouling prevention:

templates from insect cuticles. *Journal of Materials Chemistry B* 4: 5747-5754. (in English) ["A biomimetic antifouling material study was carried out utilising superhydrophobic cicada and dragonfly wings replicated with a polymer (epoxy resin). They were tested in a marine biofouling study for up to 1 week in addition to biofouling assays of protein, carbohydrate and DNA absorption. The materials were compared against a commercial antifouling paint and a polymeric smooth surface constituting a control sample. The replicated surfaces demonstrated superior antifouling properties in comparison to the control and similar efficiency in DNA (10% reduction), protein and carbohydrate adsorption (15%) to the commercial anti-fouling paint. As the fabricated surfaces have roughness at the nanometre scale it is probable that the low adsorption properties, at least in the early stages, may be related to air trapped at the surface. Interestingly the most disordered replicated surface (dragonfly wing replicate) demonstrated the lowest values of absorption." (Authors) *Rhyothemis graphiptera*, Australia] Address: Chapman, J., School of Medical & Applied Sciences, CQ Univ., Australia. E-mail: j.chapman@cqu.edu.au

**20811.** Huang, Y.-T.; He, C.-S.; Hsiao, W.-F. (2016): Survey of Lepidoptera and Odonata of Lantan reservoir trail. *Journal of Agriculture and Forestry, National Chiayi* 13(1): 51-61. (in Chinese, with English summary) ["Survey of Rhopalocera and Odonata insect of Lantan reservoir trail were conducted from September, 2011 to September, 2012. The purposes will to provide the basic information for leisure activities for parent and children. Five sampling sites were selected and each sampling site stayed for 30-40 minutes for counting. We used vision method and sweeping to record the numbers of encounter lepidopterans and Odonata insects. Results have indicated that the peak period of insects was from April to September. [...] Libellulidae (15 species), Platycnemididae (2 species), Coenagrionidae (2 species), Gomphidae (1 species) and Cordulegasteridae (1 species). [...] Among Odonata, *Orthetrum glaucum* (n=48) is dominant species and followed by *Trithemis aurora* (n=35) and *Pantala flavescens* (n=35), *Neurothemis ramburii* (n=33), and *Pseudothemis zonata* (n=28). The above results were able to provide basic information for ecotourism activity in the future." (Authors)] Address: Hsiao, W.-F., FUJI Environmental Service CO., LTD., Saitama, Japan. Email: wfhsiao@mail.ncvu.edu.tw

**20812.** Huda, N.; Anwer, S.F. (2016): The effects of leading edge orientation on the aerodynamic performance of dragon fly wing section in gliding flight. Chapter: Fluid Mechanics and Fluid Power – Contemporary Research. Part of the series Lecture Notes in Mechanical Engineering: 1433-1441. ["In this work, we investigate the aerodynamic characteristics and spatio-temporal dynamics of a wing cut section of dragon fly (*Aeshna cyanea* [sic]) at ultra-low Reynolds number corresponding to the gliding flight of this dragon fly. The simulations employ an unstructured triangular mesh based on finite volume discretization. A critical assessment of the computed results is performed. Numerical simulations are performed at ultra-low Reynolds number of 10,000 at different angles of attack. Three insect wing sections are modeled with different orientation of the leading edge. It is shown that among all profiles, Profile LEU has largest gliding ratio at higher angles of attack. The larger gliding ratio is due to the fact that the overall drag coefficient is smaller as compared to other Profiles LES and LED. The smaller drag coefficient is due to the presence of large negative shear regions present in the flow. The negative shear regions are because of vortices formed attached to the leading edge or

inside the pleats. The presence of vortices attached not only reduces the contribution of shear drag but pressure drag also." (Authors)] Address: Anwer, S.F., Department of Mechanical Engineering, ZHCET, AMU, Aligarh, India

**20813.** Hushtan, K.V. (2016): The methodological approaches for allocation of dragonfly's larvae ecomorphs categories (Insecta: Odonata). *Notes of the State Natural History Museum, Lviv* 32: 83-91. (in Ukrainian, with Russian and English summaries) ["We have proposed to use as the main – morphometric method for the allocation of dragonfly's larvae ecomorphs categories. Also, it is proposed to take into account environmental (spatial niche), ethological (type of movement, behavioral characteristics) and morphological criteria (overall shape of the body, the type of mouthparts, the structure of the sense organs and legs). Twenty dimensional characteristics for 15 genera of Ukrainian Carpathians dragonflies larvae [*Aeshna juncea*, *Anax parthenope*, *Brachytron pratense*, *Calopteryx splendens*, *Coenagrion puella*, *Cordulegaster bidentata*, *Cordulia aenea*, *Epitheca bimaculata*, *Gomphus vulgatissimus*, *Lestes barbarus*, *Libellula quadrimaculata*, *Ophiogomphus cecilia*, *Onychogomphus forcipatus*, *Platycnemis pennipes*, *Sympetrum flaveolum*] is studied. Of these, 17 characters are allocated indices reflecting the most complete contact between the larvae and environmental condition. On the basis of the proposed methods first developed a hierarchical classification of dragonfly larvae ecomorphs for the territory of the Ukrainian Carpathians. Were singled out: 3 types, 6 classes and 7 subclasses." (Author)] Address: Email: Katerina-an-tonyuk@yandex.ru

**20814.** Juslén, A.; Pykälä, J.; Kuusela, S.; Kaila, L.; Kullberg, J.; Mattila, J.; Muona, J.; Saari, S.; Cardoso, P (2016): Application of the Red List Index as an indicator of habitat change. *Biodiversity and Conservation* 25(3): 569-585. (in English) ["For the first time ever, the International Union for Conservation of Nature Red List Index for habitat types was calculated for an entire country, Finland. The RLIs were based on species threat assessments from 2000 and 2010 and included habitat definitions for all 10,131 species of 12 organism groups. The RLIs were bootstrapped to track statistically significant changes. The RLI changes of species grouped by habitats were negative for all habitat types except for forests and rural biotopes which showed a stable trend. Trends of beetles and true bugs were positive in rural and forest habitats. Other 16 observed trends of species group and habitat combinations were negative. Several trends observed were in accordance with studies focusing on particular taxa and habitats, and drivers for their change. This study demonstrates the usefulness of the RLI as a tool for observing habitat change based on species threat assessment data." (Authors) The paper includes references to Odonata.] Address: Juslén, A., Finnish Museum of Natural History, University of Helsinki, P.O. Box 17, 00014 Helsinki, Finland. E-mail: aino.juslen@helsinki.fi

**20815.** Kalkman, V.J.; Orr, A.G. (2016): A description of the larva and discussion of radiation in the phytotelm breeding damselfly genus *Papuagrion* in New Guinea (Odonata: Zygoptera: Coenagrionidae). *International Journal of Odonatology* 19(3): 169-182. (in English) ["The larva of *Papuagrion marijanmatoki* Orr & Richards, 2016 is described and illustrated for the first time based on two specimens collected near Goroka, Papua New Guinea. The larvae were identified by matching the mitochondrial marker COI with that of an adult specimen collected at the same locality. The larvae were found in the leaf axils of *Pandanus* trees which

agrees with earlier observations that adults are often encountered away from water, in the vicinity of Pandanus. Larvae collected from water pooled in the leaf bracts of several Pandanus trees in the Muller Range (PNG) are also thought to belong to the genus *Papuagrion*. Based on these records and further observations it is considered likely that all species of *Papuagrion* live in phytotelmata and that most or even all are found in Pandanus trees. *Papuagrion* is derived from a Papuan radiation of the genus *Teinobasis*, members of which inhabit standing or slow-flowing and often muddy waters, where the larvae probably develop, suggesting that the colonisation of phytotelmata offered by Pandanus trees has led to the radiation of *Papuagrion*, possibly because of the discrete and scattered nature of suitable habitats. The larvae show little difference morphologically from the few known *Teinobasis* larvae. The colonisation of phytotelmata as a larval habitat sometimes followed by an extensive radiation seems to have occurred independently several times within *Coenagrionidae*." (Authors)] Address: Kalkman, V.J., European Invertebrate Survey, Nederland, p/a Nationaal Natuurhistorisch Museum, naturalis, Postbus 9517, 2300 RA Leiden, Netherlands. E-mail: [kalkman@naturalis.nl](mailto:kalkman@naturalis.nl)

**20816.** Kiany, M.; Sadeghi, S. (2016): Odonata from south-west of central desert of Iran with occurrence notes on *Isochnura intermedia* Dumont, 1974. *Iranian Journal of Animal Biosystematics* 12(1): 67-76. (in English) ["Karizes (Qanat) prepare a part of fresh water sources in main desert of Iran. The arid regions in deserts have isolated suitable aquatic habitats as strong barriers, thus only a few places with surface waters have remained accessible for water. related insects. This paper represents the results of only study on dragonfly species of Karizes. We identified 10 species of typical desert dragonflies of four different families that were collected in summer 2013. Some traits allow Odonata to exist in deserts; hence they may reveal some differences with those in non-desert regions. No endemic species was found in this part of the desert. we concluded that there are typical opportunistic species with special adaptations that could colonize in Karizes as a type of aquatic habitats. We reported *Isochnura intermedia* here as a new record for Iran and noted some of its differences with the type specimen." (Authors)] Address: Kiany, M., Department of Biology, College of Sciences, Shiraz University, Shiraz, I.R. of Iran

**20817.** Kiany, M.; Sadeghi, S.; Ehteshami, F. (2016): New record of *Platynemis kervillei* and *Lestes dryas* (Odonata: Platynemididae & Lestidae) from Iran. 19th National and 7th International Congress of Biology, 30 Aug-1 Sep 2016, University of Tabriz, Iran: 94. (in bilingual in Farsi and English) [Verbatim: *Platynemis kervillei* (Martin, 1909) and *Lestes dryas* (Kirby, 1890) are reported for the first time from North-Western part of Iran. *P. kervillei* also has previously recorded in Iraq and Turkey countries. *L. dryas* is a holarctic widespread species. *P. kervillei* specimens were collected from warm spring near Sarein and river near Namin (Ardabil province) and *L. dryas* specimens were collected from Daylaman (Guilan province). Previous reports of *P. kervillei* from Turkey and Iraq is about 1000 and 500 km far from the Iranian collecting site respectively. With this report extends range of *P. kervillei* to the north. western part of Iran and we can propose that this species replaced with *P. dealbata* in the lowland parts of Caspian marginal zone. This species is distinguishable from other related species with blue pruinosity in the most part of body in fully adult males and no swollen tibia. *L. dryas* also is recognizable with lack of blue pruinosity in apical third of dorsal abdominal segment and more robust abdomen from similar species. Relative abundance

of this species distinctly was lower than other species of the genus in the locality.] Address: Email: [ssadeghi@shirazu.ac.ir](mailto:ssadeghi@shirazu.ac.ir)

**20818.** Kulshrestha, R.; Jain, N. (2016): A note on the biodiversity of insects collected from a college campus of Jhalawar District, Rajasthan. *Biosci. Biotech. Res. Comm.* 9(2): 327-330. (in English) ["The study of biodiversity of insects was conducted in the college campus which covers around half square kilometer area. One boundary of college campus is along NH12. The major vegetation of college campus is neem, banyan, Asoka and amalatas trees and some ornamental and medicinal plants. The main objective of the study was to determine the insect diversity and the relative abundance of the insect species in the campus. The collection of insects was carried out by using sweep nets, hand picking and beating tray in the month of Feb.-March and Sept-Oct in the year 2012. Species diversity and abundance of insects were investigated in college campus and we recorded insects belonging to 7 orders 16 families and 38 species. The largest number of insect identified were of Lepidoptera followed by Hymenoptera, Odonata, Hemiptera, Orthoptera, Coleoptera and Neuroptera. Anthropogenic activities influenced the abundance of insect orders. Thus, greater numbers of insects were observed in small gardens with a greater proportion of bare soil relative to concrete pathways and places with human interference. The study revealed the higher abundance of butterflies among the insects identified. A total 38 different insect species were recorded giving an indication of the species diversity of the college campus." (Authors) *Orthetrum taeniolatum*, *Neurothemis intermedia intermedia*, *Brachythemis contaminata*, *Ceriagrion coromandelianum*] Address: Kulshrestha, R., Department of Zoology, Government Post Graduate College, Jhalawar and Department of Zoology, Government Post Graduate College, Kota, Rajasthan India

**20819.** Lesch, V.; Kinoshita, A.; Shibata, Y.; Bouwman, H. (2016): Perfluorinated substances in dragonflies (Odonata): an aerial invertebrate predator. Conference: DIOXIN 2016: 1 p. (in English) ["Perfluoroalkyl substance (PFASs) residues have been found globally in both abiotic and biotic media. However, relatively little is known of these compounds in invertebrates, particularly in terrestrial invertebrates. We analysed dragonflies collected from six sites in South Africa, and analysed them individually for perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluoroundecanoic acid (PFUnA) and perfluorododecanoic acid (PFDoA). We found quantifiable PFOS in all individuals, with the other analytes occurring less frequently. The more remote (further away from industries) northern sites had significantly lower concentrations than the southern sites that were closer associated with industrial areas. The mean PFASs was 0.19 ng/g wet mass for the northern sites. The mean concentration was 9.0 ng/g wm for the southern sites. All PFASs except PFOS occurred at similar mean concentrations at all sites, but PFOS dominated the southern samples. One sample had a concentration of 20 ng/g wet mass. This is the same site where very high concentrations of PFOS were found in bird eggs. The effects of these concentrations and substances on invertebrate aerial predators are not well known, but it may affect aquatic and associated terrestrial ecosystems due to the predation of dragonflies on pollinators. More studies are needed to elucidate the distribution pattern and effects." (Authors) [https://www.researchgate.net/publication/307606682\\_Perfluorinated\\_substances\\_in\\_dragonflies\\_Odonata\\_an\\_aerial\\_invertebrate\\_predator](https://www.researchgate.net/publication/307606682_Perfluorinated_substances_in_dragonflies_Odonata_an_aerial_invertebrate_predator)]

Address: Lesch, Velesia, Research Unit for Environmental Sciences & Management, North-West University, Potchefstroom, South Africa. E-mail: velesialesch1@gmail.com

**20820.** Machado, A.B.M.; Lacerda, D.S.S. (2016): Redescription of the holotype of *Mecistogaster pronoti* Sjöstedt, 1918 (Zygoptera: Pseudostigmatidae). *International Journal of Odonatology* 19(1-2): 63-68. (in English) ["*M. pronoti* was described based on a female holotype deposited in the Naturhistoriska Riksmuseet, Stockholm, collected in the state of Espírito Santo, Brazil. The original description has no illustrations, which makes its identification very difficult. Herewith we redescribe and illustrate this holotype. The species is red listed and considerations regarding its conservation are made." (Author)] Address: Lacerda, Déborah, Depto de Zoologia, Pós-Graduação em Zoologia, Univde Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil

**20821.** Meadows, A.J. (2016): Lethal and non-lethal effects of predators on *Culex* mosquitoes: Implications for pathogen transmission. Ph.D. thesis, Department of Entomology, Washington State University: XI + 122 pp. (in English) ["Diversity loss, especially at higher trophic levels, can degrade critical ecosystem services such as disease regulation. Predators play pivotal roles in regulating ecosystem services by impacting the abundance, distribution, physiology, condition, and behaviour of their prey. Previous work shows the ecological consequences arising from single-predator nonconsumptive effects (NCEs) can be just as significant as those resulting from actual predation, yet the study of NCEs within naturally-diverse communities is relatively underdeveloped. This dissertation seeks to examine how larval-stage predator community structure influences mosquito (*Culex pipiens*) traits that are relevant to pathogen transmission. When developing mosquito larvae are exposed to predation risk, this stress may produce lasting effects throughout mosquito ontogeny that can influence such key traits as longevity and immune function. The work presented here provides several key findings. First, an examination of how naturally-diverse larval-stage predator communities influence mosquito condition throughout their ontogeny revealed that the presence of *Aeshna* dragonfly naiads, which were limited to the most diverse field predator communities, significantly muted the NCEs evident in mosquitoes. Mosquitoes emerging from *Aeshna* communities experienced increased survival through development, but decreased adult longevity compared to no-*Aeshna* communities. This trend occurred across natural variation in predator community composition, density, and evenness. We designed a follow-up experiment that exposed developing mosquitoes to factorial manipulations of predator diversity and tested adult mosquitoes for variation in phenoloxidase investment (an important component of arthropod innate immunity) and for susceptibility to the fungal pathogen *Beauveria bassiana*. We found that when presented with *Aeshna* cues, mosquitoes had lower phenoloxidase levels than mosquitoes reared in the presence of other predators; however, these negative impacts on mosquito immune investment were offset when mosquitoes were exposed to *Aeshna* in combination with other predators. These results imply that diverse predator communities, in addition to their capacity to suppress vector densities through predation, may lower disease risk by offsetting negative NCEs imposed by less-diverse communities that would otherwise increase vector competence. This dissertation ends with a review and synthesis paper that broadly explores the role of arthropod and mammalian predators in regulating other critical ecosystem services such as biodiversity maintenance." (Authors)] Address: not stated

**20822.** Minot, M. (2016): Étude des odonates de Saül. *Les cahiers scientifiques du Parc Amazonien de Guyane* 3(1): 21-38. (in French) ["The present study carried out in the town of Saül and its paths during the year 2014-2015 consists of a monitoring of 9 plots based on a precise inventory protocol. Seven visits to Saül were made from October to April, at a rate of one per month, with an additional visit in July. A total of 104 taxa were recorded as adults, using all methods, and 7 additional taxa were collected as larvae or exuviae. Of these species, 2 are new to science, 3 are new to French Guiana and 20 had never been recorded in Saül. The total odonatological diversity is estimated at 150 species and estimates for each plot have been made. A classification of the major types of environment studied was carried out and their associated species assemblages were identified. The study did not show a phenology of life cycles. An experiment on altitude preferences for egg-laying in Pseudostigmatidae was conducted using bamboo containers placed at different heights in the canopy. It collected 14 larvae and did not show any height preference for oviposition." (Author) Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: Minot, M., Société Entomologique Antilles-Guyane (SEAG), Cayenne, Guyane. E-mail: m.minot@hotmail.fr

**20823.** Mishra, Y. (2016): Studies on insect fauna collected in light trap during Kharif season at Jabalpur. M.Sc. thesis, Department of Entomology, College of Agriculture, Jabalpur 482004, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, India: 89 pp. (in English) ["Rice (*Oryza sativa* L.) is an important cereal crop in the world provides a staple food for nearly half of the global population. Over 100 insect pest species attack paddy crop at various stages of its growth of which 20 species cause the economic damage (Pathak & Dhaliwal, 1981). In India average losses in paddy production due to insect pests are 25-30% (Dhaliwal and Arora, 2010) and in Madhya Pradesh about 40-100 % losses were observed (Dhamdhare, 1990). Light trap is an important tool for minimizing the insect pests damage without any toxic hazards (Sharma et al., 2004). Other than this light trap has been used to supplement the knowledge of pest fauna of given locality, geographical distribution and their seasonal activity etc. (Verma & Vaishampayan, 1983 and Sharma et al., 2010). Light trap is also useful to know the effect the weather factors on species abundance (Jonason et al 2014b). Therefore the present research work on "Studies on insect fauna collected in light trap during kharif season at Jabalpur" was under taken with following objectives. 1. Incidence and identification of insect fauna collected in light trap during kharif season at Jabalpur. 2. Study on seasonal incidence of insect pest species of paddy collected through light trap. For the taxonomic documentation, the light trap was operated every night and collection was observed on the next day morning. Total insect fauna was observed and sorted out on the basis of 3 major categories of economic importance: I) Harmful insects. as crop pests. II) Beneficial insects. as bio-control agents (Predators and parasites). III) Beneficial insects. as commercially important. Seasonal incidence study of insect pest species was done by operating the light trap during kharif season of 2015. A insect pest of paddy and predator & parasite was observed on daily basis. In order to study the seasonal incidence, daily trap catch was converted into weekly total and mean per day per week (weekly mean/day). 1. Incidence and identification of insect fauna collected in light trap during Kharif season at Jabalpur. Taxonomic analysis revealed that these 62 insect species belonging to 11 orders and 34 families were recorded throughout the season (kharif 2015).



Based on number of species collected, largest collection was represented by order Lepidoptera 19 species (30%) followed by order Coleoptera 13 species (21%), Hemiptera 12 species (20%), Orthoptera 5 species (8%) and Hymenoptera 5 species (8%) in descending order respectively. Orders of minor significance are represented by Odonata [2 taxa] and Neuroptera having 2 species each while Isoptera, Diptera, Dermaptera and Dictyoptera were represented by one species only. [...] (Author)] Address: Mishra, Y., Department of Entomology, College of Agriculture, Jabalpur 482004, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, India

**20824.** Moratin, R. (Coord) (2016): Atlas préliminaire des Odonates d'Alsace. Faune-Alsace documents n°2: 95 pp. (in French) [[http://www.odonat-grandest.fr/telechargements/FauneAlsace/FAdocuments/FAdoc2\\_2016\\_atlas\\_odonata-.pdf](http://www.odonat-grandest.fr/telechargements/FauneAlsace/FAdocuments/FAdoc2_2016_atlas_odonata-.pdf)]

**20825.** Naka, H.; Hashimoto, H. (2016): E-1-1 Relationship between deformation of wings and feathering motion on dragonfly flight. Conference on Information, Intelligence and Precision Equipment: IIP 2016, "E-1-1-1"- "E-1-1-4", 2016-03-14: 4 pp. (in Japanese, with English summary) ["Dragonfly wing is passively deformed in the tip side from nodus flapping flight. Wing deformation is thought to correspond to feathering motion. However, dragonfly perform a feathering motion actively. In this study, the effect of passive deformation of the wing on aerodynamic force in flapping flight with feathering motions was investigated using fluid-structure interaction analysis. In this analysis, nodus wing models, which can deform passively, and rigid wing model, which cannot deform, are used. Feathering angle is three types: 0, 20, 40 deg. As a result, when the feathering angle is 20 deg or less, the nodus wings reduce drag force by deformation of Wing during downstroke. However, when the feathering angle is 20 deg or more, overlarge deformation of wing decreases lift force. Therefore, the wing with the appropriate level of flexibility can reduce drag force without wasting energy of feathering motion." (Authors)] Address: Naka, H., Graduate School of Science and Technology, Tokai University 4-1-1 Kitakaname, Hiratsuka-shi, Kanagawa 259-1292, Japan. E-mail: [hiromu@keyaki.cc.u-tokai.ac.jp](mailto:hiromu@keyaki.cc.u-tokai.ac.jp)

**20826.** Palita, S.K.; Jena, S.K.; Debata, S. (2016): Odonate diversity along different habitats of Koraput district, Odisha, India. *Journal of Entomology and Zoology Studies* 4(3): 40-47. (in English) ["Odonates are considered to be indicator of ecological balance. An inventory was carried out to document the over looked odonate diversity in four habitat types (hill stream, river, reservoir and pond) of Koraput district, southern Odisha, India. The study recorded 64 species representing 45 genera under 9 families. Family Libellulidae was the dominant group representing 32 species. Maximum species (n=58, 90.6%) were recorded along hill streams. Forty-one species were recorded from single habitat type, of which 37 species were confined to hill streams. A decreasing trend in species diversity was observed from the water bodies in the forested areas to human dominated landscapes indicating human impact on odonate species diversity. *Brachythemis contaminata* was most frequently sighted in the water bodies near human habitations, indicating highly polluted water not suitable for human consumption, whereas species like *Ictinogomphus rapax* and *Paragomphus lineatus* were only recorded along hill streams, indicating unpolluted water." (Authors)] Address: Palita, S.K., Dept of Biodiversity & Conservation of Natural Resources Central Univ. of Orissa, Koraput, Odisha. 764021, India

**20827.** Patel, R.K.; Ghetiya, L.V.; Patel, S.R. (2016): Odonates of South Gujarat: An Inventory. *Advances in Life Sciences* 5(21): 9952-9958. (in English) ["A study on general inventory of odonates in south Gujarat, India was carried out in south Gujarat by the Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India. Odonates are commonly found darting and dancing actively near pond, pool, river streams, seashore, plains, hills, agroecosystem, forest ecosystem, muddy places and also in sewage and effluents water. Some species of odonates were recorded perching at different height on plants and trees/buildings considerably away from the water and the dense forest. The survey was conducted in different localities of south Gujarat, which consist of seven districts i.e. Bharuch, Narmada, Surat, Tapi, The Dangs, Navsari and Valsad during 2014-15. Total 37 species of odonates belongs to 28 genera, from eight families of two sub-orders were recorded during study period. Among which 28 species were belongs to sub-order Anisoptera under the families Libellulidae (23), Aeshnidae (2), Gomphidae (2) and Macromiidae (1), whereas remaining 9 species were belongs to sub-order Zygoptera under families Coenagrionidae (6), Platycnemididae (1) Protoneuridae (1) and Lestidae (1). Out of total record, 20 species were reported for first time from south Gujarat. However, Four species namely, *Rhodothemis rufa*, *Tramea limbata*, *Zyxomma petiolatum* and *Gynacantha dravida* were reported first time from Gujarat state." (Authors)] Address: Patel, R.K., Dept of Agricultural Entomology N. M. College of Agriculture Navsari Agricultural Univ. Navsari, Gujarat, India. E-mail: [patelrk1692@gmail.com](mailto:patelrk1692@gmail.com)

**20828.** Poulouse, G.; Raki Radhakrishnan, J.P.J.; Pious, N. (2016): A study on the diversity of dragonflies of Irinjalakuda. *Vistas* 5(1): 29-43. (in English) ["Odonates are among the ideal taxon for the investigation of the impact of environmental warming and climate change due to its tropical evolutionary history and adaptations to temperate climates. The study identified 12 species of dragonflies in Irinjalakuda. Species diversity, which is the measure of the diversity within an ecological community that incorporates both species richness and the evenness of species' abundances, was found to be high for dragonflies. A high species diversity index points to the stability in the ecosystem. The identified Libellulidae, in the area can serve as an ecological indicator of the area. From the study, it was observed that the institution campus fulfils an environment favourable for dragonfly diversity." (Authors)] Address: Poulouse, G., Dept Zool., St. Joseph's College, Irinjalakuda, Thrissur-680121, India. E-mail: [gigijmj@gmail.com](mailto:gigijmj@gmail.com)

**20829.** Saito, V.S.; Valente-Neto, F.; Rodrigues, M.E.; Roque, F.; Siqueira, T. (2016): Phylogenetic clustering among aggressive competitors: evidence from odonate assemblages along a riverine gradient. *Oecologia* 182(1): 219-229. (in English) ["Studies on phylogenetic community ecology usually infer habitat filtering when communities are phylogenetically clustered or competitive exclusion when communities are overdispersed. This logic is based on strong competition and niche similarity among closely related species—a less common phenomenon than previously expected. Odonata are good models for testing predictions based on this logic because they behave aggressively towards related species due to mistaken identification of conspecifics. This behaviour may drive communities toward phylogenetic overdispersion if closely related species frequently exclude each other. However, phylogenetically clustered communities could also be observed if habitat filtering and/or competitive asymmetry among distantly related species are major

drivers of community assembling. We investigated the phylogenetic structure of odonate assemblages in central Brazil in a watershed characterized by variations in stream width, vegetation cover, aquatic vegetation, and luminosity. We observed general clustering in communities according to two indices of phylogenetic structure. Phylogenetic beta diversity coupled with Mantel tests and RLQ analysis evidenced a correlation between the riverine gradient and phylogenetic structure. Larger rivers with aquatic vegetation were characterized by anisopterans, while most zygopterans stayed in small and shaded streams. These results indicate niche conservatism in Odonata habitat occupancy, and that the environment is a major influence on the phylogenetic structure of these communities. We suggest that this is due to clade-specific ecophysiological requirements, and because closely related species may also have competitive advantages and dominate certain preferred habitats." (Authors)] Address: Victor S. Saito, V.S., Programa de Pós-Graduação em Ecologia e Recursos Naturais, Universidade Federal de São Carlos, Rod. Washington Luiz km 235, 13565-905, São Carlos, São Paulo, Brazil. E-mail: victor.saito@gmail.com

**20830.** Sanmartín-Villar, I.; Cordero-Rivera, A. (2016): The inheritance of female colour polymorphism in *Ischnura genei* (Zygoptera: Coenagrionidae), with observations on melanism under laboratory conditions. *PeerJ* 4: e2380 <https://doi.org/10.7717/peerj.2380>: 19 pp. (in English) ["Current research on female colour polymorphism in *Ischnura damselflies* suggests that a balanced fitness trade-off between morphotypes contributes to the maintenance of polymorphism inside populations. The genetic inheritance system constitutes a key factor to understand morph fluctuation and fitness. *Ischnura genei*, an endemic species of some Mediterranean islands, has three female colour morphs, including one androchrome (male-coloured) and two gynochromes. In this study, we reared two generations of *I. genei* under laboratory conditions and tested male behavioural responses to female colour morphs in the field. We recorded ontogenetic colour changes and studied morph frequency in three populations from Sardinia (Italy). Morph frequencies of laboratory crosses can be explained by a model based on an autosomal locus with three alleles and sex-restricted expression, except for one crossing of 42 families with unexpected offspring. The allelic dominance relationship was androchrome > infuscans > aurantiaca. Old individuals reared in the laboratory exhibited different levels of melanism in variable extent depending on sex and morph. Results of model presentations indicate a male preference for gynochrome females and the lack of recognition of androchromes as potential mates. *Aurantiaca* females were the most frequent morph in the field (63–87%). Further studies in other populations and islands are needed to understand the maintenance of this polymorphism." (Authors)] Address: Cordero Rivera, A., Depto de Ecología e Biología Animal, Unive de Vigo, E.U.E.T. Forestal, Campus Universitario, 36005 Pontevedra, Spain. E-mail: acordero@uvigo.es

**20831.** Santos, E.S.A.; Machado, G. (2016): Sexual dichromatism in wing pigmentation of New World dragonflies follows Rensch's rule. *Journal of Evolutionary Biology* 29(7): 1447-1454. (in English) ["Many animal taxa that display sexual size dimorphism (SSD) exhibit a positive allometric relationship in which the degree of dimorphism increases with body size. This macroevolutionary pattern is known as Rensch's rule. Although sexual selection is hypothesized to be the main mechanism causing this pattern, body size is influenced by several selective forces, including natural and

sexual selection. Therefore, by focusing exclusively on SSD one cannot ascertain which of these selective forces drives Rensch's rule. If sexual selection is indeed the main mechanism underlying Rensch's rule, we predict that other sexually selected traits, including colouration-based ornaments will also exhibit interspecific allometric scaling consistent with Rensch's rule. We tested this prediction using wing pigmentation of 89 species of dragonflies. Studies show that male wing pigmentation is generally under strong intra- and intersexual selection, so that sexual dichromatism in this trait should follow Rensch's rule. Conversely, the available evidence suggests that male body size is usually not sexually selected in dragonflies, so we do not expect SSD to follow Rensch's rule. First, we found that sexual dichromatism in wing pigmentation was consistent with Rensch's rule. The phylogenetic major axis regression slope was significantly greater than one. We also showed that the allometric slope for SSD was not different from unity, providing no support for Rensch's rule. Our results provide the first evidence that a trait which appears to be under strong sexual selection, exhibits a pattern consistent with Rensch's rule." (Authors)] Address: Santos, E.S.A., BECO do Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo, São Paulo, SP, Brazil.

**20832.** Schneider, T.; Ikemeyer, D. (2016): Dragonflies of Oman – a revised illustrated checklist (Odonata). *Entomologische Zeitschrift* 126(3): 137-147. (in English, with German summary) ["38 of the 44 dragonfly species known to Oman could be detected on two visits to the region; one to the North in April 2012, and another to the Southern region in March 2016. Two species, *Urothemis thomasi* and *Azuragrion somalicum* were found at new locations extending their distribution in Oman southward near to the border with Yemen. The status of *Acisoma panorpoides* complex was clarified for Oman as *Acisoma variegatum*. Breeding sites of *Macrodiplax cora*, *Urothemis edwardsii*, and *Rhyothemis semihyalina* were detected in different coastal areas in Dhofar including at sea lagoon near Mughsay (W-Dhofar). With this report we provide an illustrated check list of currently known species of Oman to facilitate determination." (Authors)] Address: Ikemeyer, D., Billerbecker Str. 6, 48329 Havixbeck, Germany. E-Mail: DKJlkemeyer@t-online.de

**20833.** Showalter, A.M. (2016): The impact of environmental conditions, food resources, and ecological stoichiometry in structured populations. Doctor of Philosophy, Miami University, Ecology, Evolution and Environmental Biology: XI + 140 pp. (in English) ["In this dissertation, I explore how population structure and the characteristics of individuals within structured populations respond to changes in environmental conditions that affect the quantity and quality of food resources. Chapter 1: For bluegill sunfish, individual size and population size-structure is affected by factors that alter prey availability, including primary productivity, sediment-feeding gizzard shad, and intraspecific competition. In a ten-month study, I manipulated productivity and gizzard shad in experimental ponds with bluegill populations that varied in density, and I used AIC model comparisons to identify the factors most associated with bluegill response variables. Density-dependence, probably driven by resource competition, was the most consistent factor associated with individual bluegill biomass. None of the models I examined were significant in explaining adult/juvenile density or the proportion of adults. Chapter 2: I investigated how elemental imbalance between an individual's diet and its needs varies with ontogenetic diet shifts. I examined ontogenetic changes in stoichiometry in the bluegill sunfish, which undergoes an

ontogenetic diet shift from zooplankton to benthic invertebrates, and I compared imbalance between diet elemental content and organism needs before and after diet shifts. Elemental imbalance estimates indicated potential carbon limitation in all size-classes of bluegill, and the diet shift tended to reduce C imbalance relative to P. My results provide stoichiometrically-explicit support for previous findings that energetics is an important driver of bluegill diet shifts. As a consequence of the need to satisfy carbon requirements, N:P imbalance is exacerbated. Thus, ontogenetic diet shifts can produce trade-offs in elemental imbalance between elemental ratios. Chapter 3: I examined how light and nutrient conditions experienced in larval stages of the damselfly *Enallagma aspersum* affected development time, mass at emergence, and adult body composition. I reared larval damselflies to adulthood in outdoor mesocosms under high and low light and nutrient conditions. Light level consistently affected damselflies by altering temperature and producing temporal changes in food availability. Damselflies reared in high light had faster development times, but did not differ in mass at emergence. In addition, temperature can explain most patterns adult elemental content, although male and female C:P differed in response to light. Overall, differences in light-driven temperature effects appear to be a major factor affecting damselfly life history traits and stoichiometry." (Author)] Address: not stated

**20834.** Sisson, M.S.; Santamaria, C.A.; Smith-Herron, A.J.; Cook, T.J.; Cook, J.L. (2016): Geographical color pattern of *Argia apicalis* (Odonata: Coenagrionidae) in the absence of molecular variation. *Florida Entomologist* 99(3): 355-362. (in English, with Spanish summary) ["*Argia apicalis* Say, is an ecologically vagile species inhabiting both pond and stream environments of the eastern United States. Variation in color pattern in *A. apicalis* occurs between a southeastern United States morph and a south Florida morph. Southeastern populations often are described as "typical" with a predominantly bright blue pterothorax and narrow black humeral stripe, whereas the southern Florida populations are "atypical," with a bright blue pterothorax and larger, wider black humeral stripes. Variability in color pattern has caused some researchers to question the true identity of the Florida morph. This study used color pattern and mitochondrial cytochrome b sequences to test the species identity of the 2 *A. apicalis* geographical color morphs. Mitochondrial cytochrome-b gene sequences showed that there is a single haplotype, showing no divergence between individuals, populations, or regions. This study is the first to test if color pattern variation is correlated with molecular characters within this species." (Authors)] Address: Sisson, Melissa, Texas Invasive Species Inst., Sam Houston State Univ., Huntsville, Texas 77341, USA. E-mail: melissa.sisson@und.edu

**20835.** Sivasankaran, P.N.; Ward, T.A.; Viyapuri, R.; Johhan, M.R. (2016): Static strength analysis of dragonfly inspired wings for biomimetic micro aerial vehicles. *Chinese Journal of Aeronautics* 29(2): 411-423. (in English) ["This article examines the suitability of fabricating artificial, dragonfly-like, wing frames from materials that are commonly used in unmanned aircraft (balsa wood, black graphite carbon fiber and red prepreg fiberglass). Wing frames made with Type 321 stainless steel are also examined for comparison. The purpose of these wings is for future use in biomimetic micro aerial vehicles (BMAV). BMAV are a new class of unmanned micro-sized aerial vehicles that mimic flying biological organisms (like flying insects). Insects, such as dragonflies, possess corrugated and complex vein structures that are

difficult to mimic. Simplified dragonfly-like wing frames were fabricated from these materials and then a nano-composite film was adhered to them, which mimics the membrane of an actual dragonfly. Finite element analysis simulations were also performed and compared to experimental results. The results showed good agreement (less than 10% difference for all cases). Analysis of these results shows that stainless steel is a poor choice for this wing configuration, primarily because of the aggressive oxidation observed. Steel, as well as balsa wood, also lacks flexibility. In comparison, black graphite carbon fiber and red prepreg fiberglass offer some structural advantages, making them more suitable for consideration in future BMAV applications." (Authors)] Address: Ward, T.A., Dept of Mechanical Engineering, Univ. Malaya, Kuala Lumpur 50603, Malaysia. Email: DrTomWard@um.edu.my

**20836.** Tichanek, F.; Tropek, R. (2016): The endangered damselfly *Coenagrion ornatum* in post-mining streams: population size, habitat requirements and restoration. *Journal of Insect Conservation* 20(4): 701-710. (in English) ["*C. ornatum* represents a threatened species of lowland headwater streams. Although the species is threatened in Western and Central Europe, it is known at a system of post-mining drainage ditches in the Radovesicka spoil heap (northwestern Bohemia, Czech Republic). This study aimed to estimate its population size in this post-mining stream system, and to explore habitat preferences of both its larvae and adults with respect to various environmental factors. The adults were captured-recaptured along 5.2 km of the ditches in June 2012; larvae were sampled in 64 study sites (i.e., 27-meter-long sections of the same ditches) in April 2012. The adult population size was estimated via log-linear models with the robust design on 4544 individuals (1560 ± 391 females and 2983 ± 298 males). Larvae were present in a third of the sections. GLMs revealed that both larvae and adults required emergent vegetation with a high proportion of *Eleocharis* spp. plants. The adults preferred the slow-flowing and shallow streams with 2-meter-high banksides covered by intermediately tall vegetation (~40 cm), whereas the larval abundance was supported by a high in-stream vegetation heterogeneity and a patchy cover of rocks on the streambeds. These results indicate that the post-mining streams could represent a valuable secondary habitat for the complete life cycle of this relatively large population of the endangered headwater specialist. Therefore, we recommend consideration of the conservation potential of such ditches during post-mining sites restoration and their subsequent management." (Authors)] Address: Tichanek, F., Institute of Entomology, Biology Centre, Czech Academy of Sciences, Branisovska 31, 370 05 Ceske Budejovice, Czech Republic. E-mail: f.tichanek@gmail.com

**20837.** Tsukamoto, T.; Kondo, H.; Shigehisa, S.; Nishimura, T.; Yamamoto, M. (2016): The verification of environmentally conscious rice farming on biodiversity conservation in Shiga Prefecture, Japan. *Annual Report of The Kansai Plant Protection Society* 58: 119-122. (in Japanese, with English summary) ["The aim of this survey was to evaluate the effects of environmentally conscious farming (ECF) on the conservation of biodiversity by comparison with conventional farming (CF) in rice plant fields. In this survey, biodiversity was measured by using environmental indicator organisms. Water beetles, pond frogs (*Pelophylax*) and wolf spiders (*Lycosidae*) were more abundant in the ECF fields. However, The abundance of damselflies and web spiders (*Tetragnatha*) were not clear differences between in the ECF fields and in

the CF field. In conclusion, it became clear that higher biodiversity was maintained in the ECF fields than in the CF field. This is the first verification that demonstrates the efficacy of ECF in Shiga Prefecture assessed using indicator organisms." (Authors)] Address: not stated

**20838.** Van Dinh, K.; Janssens, L.; Stoks, R. (2016): Exposure to a heat wave under food limitation makes an agricultural insecticide lethal: a mechanistic laboratory experiment. *Global Change Biology* 22(10): 3361-3372. (in English) ["Extreme temperatures and exposure to agricultural pesticides are becoming more frequent and intense under global change. Their combination may be especially problematic when animals suffer food limitation. We exposed *Coenagrion puella* larvae to a simulated heat wave combined with food limitation, and subsequently to a widespread agricultural pesticide (chlorpyrifos) in an indoor laboratory experiment designed to obtain mechanistic insights in the direct effects of these stressors in isolation and when combined. The heat wave reduced immune function (activity of phenoloxidase, PO) and metabolic rate (activity of the electron transport system, ETS). Starvation had both immediate and delayed negative sublethal effects on growth rate and physiology (reductions in Hsp70 levels, total fat content, and activity levels of PO and ETS). Exposure to chlorpyrifos negatively affected all response variables. While the immediate effects of the heat wave were subtle, our results indicate the importance of delayed effects in shaping the total fitness impact of a heat wave when followed by pesticide exposure. Firstly, the combination of delayed negative effects of the heat wave and starvation, and the immediate negative effect of chlorpyrifos considerably (71%) reduced larval growth rate. Secondly and more strikingly, chlorpyrifos only caused considerable (ca. 48%) mortality in larvae that were previously exposed to the combination of the heat wave and starvation. This strong delayed synergism for mortality could be explained by the cumulative metabolic depression caused by each of these stressors. Further studies with increased realism are needed to evaluate the consequences of the here identified delayed synergisms at the level of populations and communities. This is especially important as this synergism provides a novel explanation for the poorly understood potential of heat waves and of sublethal pesticide concentrations to cause mass mortality." (Authors)] Address: Stoks, R., Lab. Aquat. Ecol., K.U.Leuven, De Beriotstraat 32, 3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

**20839.** Wieczorek, M.V.; Bakanov, N.; Stang, C.; Bilancia, D.; Lagadic, L.; Bruns, E.; Schulz, R. (2016): Reference scenarios for exposure to plant protection products and invertebrate communities in stream mesocosms. *Science of The Total Environment* 545-546: 308-319. (in English) ["Highlights: •Using uranine to describe hydrological conditions during exposure scenarios •Mimicking of several realistic exposure scenarios (peak-, hour- and day-scale) •Establishment of invertebrate communities within stream mesocosms •Pre-experimental period and choice of macrophytes determine invertebrate abundance. •MDD classes III and IV were found for several sensitive invertebrate species. Abstract: Higher tier aquatic risk assessment for plant protection products (PPPs) is often based on pond-like mesocosm studies in which transient and dynamic PPP exposure scenarios as observed in lotic systems are hardly achievable. Thus, the present study presents dynamic PPP exposure scenarios at different time scales under flow-through conditions as typical for streams in agricultural landscapes. The stream mesocosm setup allows testing the influence of spatial gradients of exposure over the length of

the mesocosms. The use of the fluorescent tracer uranine revealed the hydraulic processes generally underlying peak- and hour-scale exposure scenarios and demonstrated an optimized application technique to achieve stable day-scale exposures. Furthermore, to account for potential reactions of invertebrates to PPP exposures in streams (e.g. avoidance behavior and drift), the present study thus aimed at a comprehensive evaluation on how PPP exposure and the establishment of invertebrates can be advanced within stream mesocosm testing. For both, peak- and hour-scale exposure as well as the experiments considering the establishment of invertebrates, the presented compilation of experiments was able to highlight the influence of aquatic macrophytes within stream mesocosms. Since the field relevance of the higher tier aquatic risk assessment for PPPs relies qualitatively on the presence of potentially sensitive or vulnerable species, those species were especially considered. Thus, the establishment of aquatic invertebrates in non-dosed streams was evaluated with respect to (i) the presence of different aquatic macrophytes and (ii) the duration of the pre-experimental period. The present study highlights the beneficial influence of complex-structured macrophytes and prolonged pre-experimental periods on the abundance of invertebrate taxa. Furthermore, population dynamics were evaluated statistically by simulating PPP-related declines of 30, 50 and 70%. Thereby, minimum detectable difference (MDD) classes of mostly = III were found for 12 out of 15 taxa for at least two consecutive sampling dates." (Authors) [*Ichnura elegans*] Address: Wieczorek, M., Inst.Environmental Sciences, Univ. Koblenz-Landau, Fortstr. 7, 76829 Landau, Germany. E-mail: wieczorekm@uni-landau.de

## 2017

**20840.** Bazzanti, M.; Mastrantuono, L.; Pilotto, F. (2017): Depth-related response of macroinvertebrates to the reversal of eutrophication in a Mediterranean lake: Implications for ecological assessment. *Science of the Total Environment* 579: 456-465. (in English) ["Highlights: • We studied macroinvertebrates of Lake Nemi during its recovery from eutrophication. • Communities inhabiting the different depth-zones responded differently. • Infralittoral community showed the largest taxonomic and functional responses. • The ecological status was correctly assessed by communities belonging to each zone. A better management of nutrient inflows into lakes has led to an improvement in their conditions (i.e. reversal of eutrophication) and the effects of this on macroinvertebrate communities that inhabit different lake-depth zones is largely unknown. This paper reports a comparison of macroinvertebrate communities living in the eulittoral, infralittoral and sublittoral/profundal zones of Lake Nemi (Central Italy) before and after its natural recovery from eutrophication following the deviation of domestic wastewater. The infralittoral zone responded more rapidly than the other two depth-zones to the improved ecological conditions, as shown by larger differences in community composition between the two periods. In the eulittoral sand, the combined effects of hydromorphological pressures and reversal of eutrophication hindered the biotic response. In the eulittoral and infralittoral zones, typical taxa of mesotrophic waters appeared or increased their abundances after the eutrophication reversal. Benthic invertebrate response was slower in the sublittoral/profundal zone due to deoxygenation that continued to prevail in the deepest area of the lake during summer. However, both tolerant and more sensitive taxa were collected there for the first time. After the reversal of eutrophication, the percentage of molluscan + large crustaceans increased in the infralittoral zone,

whereas the oligochaete/chironomid ratio decreased in both sublittoral/profundal and infralittoral zones. Functional feeding metrics (percentages of filter-feeders, collector-gatherers-miners and scrapers/grazers) differently tracked the reversal of eutrophication in the three depth-zones probably according to the effects of the reduction of nutrients on food-web structure influencing macroinvertebrates. Biological Monitoring Working Party (BMWP) and the Average Score Per Taxon (ASPT) seemed to respond to eutrophication reversal only in the sublittoral/profundal zone, where deoxygenation plays a major role as a structuring agent of the community. Our results suggest that the effects of reversal of eutrophication can be better assessed by examining the response of the communities belonging to each zone individually." (Authors) *Erythromma lindenii*, Anisoptera undet., *Trithemis annulata*, *Ischnura elegans*, *Coenagrion*.] Address: Bazzanti, M., Dept. of Environmental Biology "Sapienza", University of Rome, Viale dell'Università 32, 00185 Rome, Italy. E-mail: marcello.bazzanti@uniroma1.it

**20841.** Hämäläinen, M.; van Tol, J. (2017): Obituary: Roland A. Müller (1936-2016). *Agrion* 21(1): 10-15. (in English) ["Roland Albert Müller died in St Gallen, Switzerland on 17th July 2016 at the age of 80 years following a long illness. From 1985 to 1998 he made an outstanding contribution to the science of odonatology by amassing a very large collection of dragonflies from the Philippines. This collection has greatly increased our knowledge of the rich diversity of the Philippine odonate fauna with its high proportion of endemic species. Roland Müller also participated in publishing some of the results of his collecting work, authoring or co-authoring the descriptions of five of the numerous new odonate species present in his collections." (Authors)] Address: Matti [matti.hamalainen@helsinki.fi] & Jan van Tol [jan.vantol@naturalis.nl]

**20842.** Hatami, R.; Paul, W.; Soofianib, N.M.; Asadollah, S. (2017): Rapid bioassessment of macroinvertebrate communities is suitable for monitoring the impacts of fish farm effluents. *Aquaculture* 468(1): 19-25. (in English) ["Highlights: • Three methods for biomonitoring of fish farm effluents and receiving waters were compared, ranging from rapid qualitative methods to more time-consuming quantitative methods. • The study was conducted at four sites within each of three trout farms of varying production capacities, and across three seasons. • PERMANOVA was used to analyze the multivariate macroinvertebrate data, and all three biomonitoring methods detected statistically significant main effects and interactions among the farm, site, and season factors. • These results indicate that rapid bioassessment is an effective and cost efficient means for monitoring trout-farm process waters and effluent receiving waters, and as such can improve the economic and environmental sustainability of trout farms. Abstract: Development of the fish farming industry in Iran in an environmentally and economically sustainable manner requires an effective and low-cost means of regularly monitoring receiving environments. Biomonitoring using macroinvertebrates is known to be effective for assessing water quality. The problem, however, is that biomonitoring can be labour intensive and analyses can have a long turnaround time. Rapid bioassessment methods have been developed to overcome these limitations, but it is not known whether they are as sensitive to changes in water quality as are their more time-consuming counterparts. To answer this question, we compared three methods for sampling and measuring macroinvertebrates. We refer to these as the quantitative method, semi-quantitative method, and qualitative method respectively. The quantitative method

was a single habitat method with taxonomic identification of macroinvertebrates to genus level that counted all taxa. The semi-quantitative method involved multi-habitat sampling with identification to family level and quantification as relative abundance. The qualitative method was the same as the semi-quantitative method except that incidence (presence / absence) was recorded instead of abundance. The study was carried out at three fish farms in Iran with sampling done once per season for a year from the outfall of each farm as well as from the receiving rivers, with one sample taken upstream of the effluent discharge and two samples downstream. Analysis by permutational multivariate analysis of variance (PERMANOVA) revealed that the effects of three variables of season, farm, and site on macroinvertebrate communities were significant for all three methods. Qualitative sampling was the only method that showed a statistically significant interaction between farm and season as well as a difference among the sites within each farm. Although the results of a BEST (Bio-Bio) analysis showed that different families were responsible for the differences between the sites, all three methods were able to detect the differences between the sites within each farm. However, pairwise comparisons between sites within farms indicated some differences between the three methods. The quantitative method revealed fewer differences than did the other two methods. The qualitative method did not lose any important information and had the added advantage of saving considerable time and effort in sampling and enumerating. These results suggest that rapid bioassessment could be used to effectively monitor the receiving waters of fish farm effluents. Statement of relevance: This manuscript compares three methods of sampling which are quantitative, semi-quantitative and qualitative methods in order to find the most efficient and cost-effective method of sampling. There is no apparent consensus on the appropriate method of collecting and measuring macroinvertebrates, in particular for investigating the effect of fish farms on the rivers. Our manuscript revealed that rapid bioassessment method as a cost-efficient and effective method can be used in order to develop aquaculture in a sustainable manner, both environmentally and economically. Therefore, authors believe that this manuscript is appropriate for publication by the Journal of Aquaculture." (Authors) Gomphidae, Calopterygidae] Address: Hatami, R., Dept of Ecol., Environment & Evol., La Trobe Univ., Albury-Wodonga Campus, Victoria, Australia

**20843.** Hinchliffe, C.M.; Atwood, T.; Ollivier, Q.; Hammill, E. (2017): Presence of invasive *Gambusia* alters ecological communities and the functions they perform in lentic ecosystems. *Marine and Freshwater Research* 68: 1867-1876. (in English) ["By acting as novel competitors and predators, a single invasive species can detrimentally affect multiple native species in different trophic levels. Although quantifying invasive effects through single-species interactions is important, understanding their effect on ecosystems as a whole is vital to enable effective protection and management. This is particularly true in freshwater ecosystems, where invasive species constitute the single greatest threat to biodiversity. Poeciliid fishes of the genus *Gambusia* are among the most widespread invasive species on earth. In the present study of lentic ecosystems (i.e. lakes), we first showed that *Gambusia* alter zooplankton community composition and size distribution, likely through size-selective predation. Second, we demonstrate that benthic macroinvertebrate communities significantly differ between sites with and without invasive *Gambusia*. The presence of *Gambusia* appears to reduce leaf-litter decomposition rates, which is likely an indirect effect of reductions in detritivore abundances. Reductions in

decomposition rates found in the present study suggest that through trophic cascades, invasive *Gambusia* is able to indirectly alter ecosystem functions. The study has highlighted that the widespread effects of invasive aquatic species are able to permeate through entire ecosystems, being more pervasive than previously recognised." (Authors) Fig. 3. (a) demonstrates the abundance of odonates at sites with *Gambusia* present and *Gambusia* absent.] Address: Hammill, E., School of Life Sciences, Univ. Technology Sydney, Ultimo, NSW 2007, Australia. Email: edd\_hammill@hotmail.com

**20844.** Jones, D.K.; Hintz, W.D.; Schuler, M.S.; Yates, E.K.; Mattes, B.M.; Relyea, R.A. (2017): Inducible tolerance to agrochemicals was paved by evolutionary responses to predators. *Environ. Sci. Technol.* 51(23): 13913-13919. (in English) ["Recent research has reported increased tolerance to agrochemicals in target and non-target organisms following acute physiological changes induced through phenotypic plasticity. Moreover, the most inducible populations are those from more pristine locations, far from agrochemical use. We asked why do populations with no known history of pesticide exposure have the ability to induce adaptive responses to novel agrochemicals? We hypothesized that increased pesticide tolerance results from a generalized stressor response in organisms, and would be induced following sublethal exposure to natural and anthropogenic stressors. We exposed larval wood frogs (*Lithobates sylvaticus*) to one of seven natural or anthropogenic stressors (predator cue (*Anax* spp.), 0.5 or 1.0 mg carbaryl/L, road salt (200 or 1000 mg Cl-/L), ethanol-vehicle control, or no-stressor control) and subsequently tested their tolerance to a lethal carbaryl concentration using time-to-death assays. We observed induced carbaryl tolerance in tadpoles exposed to 0.5 mg/L carbaryl and also in tadpoles exposed to predator cues. Our results suggest that the ability to induce pesticide tolerance likely arose through evolved anti-predator responses. Given that anti-predator responses are widespread among species, many animals might possess inducible pesticide tolerance, buffering them from agrochemical exposure." (Authors)] Address: Jones, D.K., Dept of Biol. Sciences, Rensselaer Polytechnic Institute, 1W14 Jonsson-Rowland Science Center, 110 Eighth Street, Troy, NY 12180-3590, USA. Email: devin.k.jones@gmail.com

**20845.** Navas-Bolanos, A.; Sanchez-Guillien, R.; Munguía-Steyer, R.; Cordoba-Aguilar, A. (2017): Isolation barriers and genetic divergence in nonterritorial *Argia* damselflies. *Biological Journal of the Linnean Society* 120: 804-817. (in English) ["Isolation barriers work at different instances during the mating process in odonate insects. In territorial damselflies, heterospecific interactions are mainly precluded by sexual (visual) isolation, while in non-territorial damselflies, heterospecific interactions are mostly precluded by mechanical isolation and sexual (tactile) isolation. In this study we investigated the strength of three premating barriers (visual, mechanical and tactile), genetic divergence and degree of sympatry (on their entire distribution) between four non-territorial *Argia* damselflies (*A. anceps*, *A. extranea*, *A. oenea* and *A. tezpi*). Our results are explained in the light of learned mating preferences and Kaneshiro's hypothesis. We detected a strong reproductive isolation between all pairs of species by the joint action of the three studied barriers [visual (90.6%), mechanical (8.7%) and tactile (0.7%)]. Sexual (visual) isolation was the most important barrier, perhaps driven by learned mating preferences. One of the studied species, *A. extranea*, which is the most derived of the studied species, showed a highly asymmetric isolation in reciprocal crosses, which is consistent with Kaneshiro's hypothesis.

Moreover, we detected a negligible ecological niche differentiation between the studied species (70% of shared distribution). Our results suggest that sexual (visual) selection may be an important force driving speciation in non-territorial species." (Author).] Address: Navas-Bolanos, Angela, Departamento de Ecología Evolutiva, Instituto de Ecología, Universidad Nacional Autónoma de México, Apdo. Postal 70-275, Ciudad Universitaria, 04510, México, D.F., México

**20846.** Phan, Q.T.; Kompier, T.; Karube, H. (2017): Description of two new *Calicnemia* from Vietnam and central Laos with notes on their congeners in Vietnam (Odonata: Platycnemididae). *Zootaxa* 4232(3): 409-420. (in English) ["Descriptions are given of two new species of *Calicnemia*: *C. akahara* sp. nov. from central and southern Vietnam and *C. hamata* sp. nov. from central Laos. *C. soccifera* Yu & Chen, 2013, and *C. haksik* Wilson & Reels, 2003, are recorded for the first time from Vietnam; *C. uenoi* Asahina, 1997, is redescribed with new illustrations provided of its anal appendages and genital ligula; and the occurrence of *C. mortoni* (Laidlaw, 1917) in Vietnam is discussed." (Authors)] Address: Phan, Q.T., Entomology & Parasitology Lab., Center for Molecular Biology, Institute of Research and Development, Duy Tan University, K7/25 Quang Trung, Da Nang, Vietnam. E-mail: pqtoan84@gmail.com

**20847.** Shkëmbi, E.; Pepa, B.; Misja, K.; Paparisto, A. (2017): *Calopteryx xanthostoma* (Odonata, Zygoptera) present in the southernwest areas of Albania. *Balkan Journal of Interdisciplinary Research* 3(2): 201-206. (in English) [This must be a misidentification as *C. xanthostoma* is not occurring in Albania. "The occurrence of *C. xanthostoma* is confirmed for the first time in Albania. Our findings represent a new Odonata specie for the odonatofauna of Albania. Our results add to the data of *C. xanthostoma* in Western and Southern European countries such as Spain, Portugal, France and Italy. In this way, the eastern boundary of this specie extends to Europe, to the eastern Adriatic coast. The lack of data for this specie until now can be explained by the introgression of *Calopteryx splendens* in the habitats where these two species are encountered together. Molecular investigation is needed for future evaluation of *C. xanthostoma* populations in Albania." (Authors)] Address: Shkëmbi, E., University of Tirana, Fac. Nat. Science, Dept Biology

**20848.** Zheng, D.; Nel, A.; Chang, S.-C. (2017): A well-preserved true dragonfly (Anisoptera: Gomphidae: Burmagomphidae fam. nov.) from Cretaceous Burmese amber. *Journal of Systematic Palaeontology* 16(10): 1-9. (in English) ["Amber inclusions have been studied for several centuries, but true dragonflies are extremely rare, with only several poorly preserved wings recorded. In Burmese amber, odonates are relatively diverse, but true dragonflies are still rare. An excellently preserved true dragonfly, *Burmagomphidae electronica* Zheng, Nel & Wang gen. et sp. nov., representing the new family Burmagomphidae Zheng, Nel & Wang fam. nov., is described here from Cretaceous Burmese amber. This is the first well-preserved true dragonfly with complete wings in this amber. It is attributed to the clade Oligophlebiata because it has symmetrical RP branches at the midfork and a well-developed trigonal planate as in the clade Hagenioidea, and the vein CuAa distinctly shortened with reduced pectinate branching as in *Brevicubitalia*; it differs, however, from the latter two in having a narrow hind wing base." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@mnhn.fr

**20849.** Carvalho, F.G.; de Oliveira Roque, F.; Barbosa, L.; de Assis Montag. L.F.; Juen, L. (2018): Oil palm plantation is not a suitable environment for most forest specialist species of Odonata in Amazonia. *Animal Conservation* 21(6): 526-533. In English. ["Oil palm monoculture is the most rapidly increasing large-scale crop in Amazonia due to favourable environmental conditions and incentives from executives and governing authorities. In this study we assessed the effects of oil palm plantations on Odonata assemblages in Amazonia streams. We hypothesized that (1) the expansion of oil palm plantations over the natural landscape affects the habitat structure and physicochemical properties of streams at different scales (50 m, 500 m and 1000 m) and (2) oil palm plantations affect the species composition of Odonata assemblages, leading to the replacement of forest specialist species by non-forest specialists. A total of 22 streams were sampled which were distributed throughout a landscape comprising areas of oil palm plantations *Elaeis guineensis* Jacq. to streams located inside large forest remnants. The expansion of oil palm monoculture affected the physicochemical properties of the water and habitat of the streams. A larger amount of woody debris was observed within streams surrounded by a greater amount of forest, whereas streams with a greater area of surrounding oil palm had higher pH values and anthropogenic infrastructures (e.g. roads). As expected, the Odonata community was affected by a replacement of forest specialist species with non-forest specialist species. To mitigate this impact, we suggest increasing the area of native riparian corridors along streams that flow through oil palm plantations." (Authors)] Address: Carvalho, F.G., programa de Pós-graduação em Ecologia, Univde Federal do Pará - UFPA. Rua Augusto Correia, N 1 Bairro Guamã, Cep: 66.075-110, Belém, Pará, Brazil. Email: fernandogeraldocarvalho@gmail.com

**20850.** Tapetado, D.G.; López Collar, D.; Garcia, D.R. (2018): Primera cita de *Sympetrum sinaiticum* Dumont, 1977 (Odonata, Libellulidae) en la ciudad de Madrid y observaciones sobre su dispersión. *Boln. Asoc. esp. Ent.* 42(3-4): 467-473. (in Spanish, with English title) [First record of *S. sinaiticum* in the city of Madrid (Spain) and comments about its dispersion. (Authors) 8-IX-2016, Royal Botanical Garden Alfonso XIII, Moncloa Campus of the Complutense University of Madrid, Spain: 30N 438494.7E 4477594.6N (40.446732, -3.725288), altitud 636 m a.s.l.] Address: Tapetado, D.G., Universidad Complutense de Madrid, Depto Biodiversidad, Ecología y Evolución. Grupo de Seguimiento de Biodiversidad UCM. Calle José Antonio Novais, 12, 28040 Ciudad Universitaria, Madrid, Spain. E-mail: diego.gil@ucm.es

**20851.** Tüzün, N. (2018): Effects of urbanisation on the ecology and evolution of a damselfly. Dissertation presented in partial fulfilment of the requirements for the degree of Doctor of Science (PhD): Biology: 225 pp. (in English) ["The rate of urbanisation is increasing on a global scale. Compared to rural areas, cities are warmer, more polluted by chemicals, and more fragmented. Although biodiversity is clearly impacted by this anthropogenic activity, there are large gaps in our understanding on the effects of urbanisation at the population and individual levels. In this thesis, I tested whether urban and rural populations of *Coenagrion puella* differed in their responses to higher temperatures, increased contamination, and more intense habitat fragmentation. For this, I mostly applied a common garden experimental approach, either in the laboratory or in semi-natural outdoor conditions, allowing the identification of genetic adaptation.

To also test the outstanding question whether urbanisation influences sexual selection regimes, I additionally did an experiment with field-collected adult damselflies. All study populations were situated in Flanders, Belgium. I found strong divergence between urban and rural populations in responses to each of the three studied urbanisation-related stressors, suggesting evolutionary responses to urbanisation. The higher temperatures in urban areas influenced the life history of urban damselflies by altering growing season length, yet did not affect behavioural traits. With regard to contamination, damselfly larvae from urban habitats showed different behavioural responses to pesticides when compared to rural larvae. Furthermore, pesticide exposure differently affected behavioural correlations in urban and in rural larvae. Interestingly, several responses to urban-related stressors strongly depended on the sex of the damselfly, as well as the life stage at which they were exposed to the stressor. Finally, the more fragmented habitats in urban areas seem to have selected for better flyers by influencing the dispersal ecology of damselflies, which was further strengthened by sexual selection for a higher flight performance in urban populations. In conclusion, I found clear effects of urbanisation on the evolution and ecology of a damselfly. My findings suggest that differential selection was imposed by the here tested urbanisation-related stressors. Importantly, these stressors were acting in different life stages, highlighting the need for a full life cycle approach when studying the effects of urbanisation.] Address: Tüzün, N., Evolutionary Stress Ecology & Ecotoxicology, Univ. of Leuven, Deberiotstraat 32, 3000 Leuven, Belgium. E-mail: nedim.tuzun@kuleuven.be

**20852.** Gärtner, F. (2019): Qualitative Erfassung von Quelljungfern (*Cordulegaster boltonii* und *Cordulegaster bidentata*) an ausgewählten Gewässern im FFH-Gebiet Arnsberger Wald mit Hinweisen für Schutzmaßnahmen. Bachelorarbeit, Geographisches Institut, Stadt. und Landschaftsökologie, Ruhr-Universität Bochum: 79 pp. (in German) ["By examining streams in the Arnsberg Forest for *Cordulegaster* larvae and imagines, it could be shown that the two species (*C. boltonii* and *C. bidentata*) are widespread in the study area and have not become rarer compared to 2003/04. There were clearly more records of *C. boltonii* than *C. bidentata*. No larvae were found on 52 % of the segments examined. The study area is characterised by old spruce stands, with mixed and deciduous forests becoming more frequent, especially near the lower reaches. Potential disturbances such as forestry work, needle litter, forest roads, piping and drought were found on 38 % of the 223 stream segments surveyed. Drought accounted for the largest share of potential disturbances with 14 % of 223 stream segments. In total, five out of 13 streams showed dryness. *C. bidentata* in particular is threatened by habitat loss. The predicted negative water balance may lead to the drying out of springs, on which this species is highly specialised. No clear distribution could be established showing that the larvae of *C. bidentata* colonise the spring area or upper reaches and *C. boltonii* the stretch below. Compared to the 2003/04 survey, one or both species were newly detected on seven of the 13 streams. *C. bidentata* could only no longer be found on one stream. The calculation of habitat preferences showed that *C. bidentata* avoids open land, young forests, wildlife hollows, needle litter and piping, while the species prefers coniferous forests, fine sediment, disturbance by forestry operations and forest roads. Both *Cordulegaster* species prefer influences by forestry as well as the presence of stream fleas. A lot of needle litter and dryness were clearly avoided by both species.

Conservation measures such as the renaturation of water-courses are helpful for the preservation or improvement of the species population. Especially against the background that precipitation cannot be influenced, the (re)creation of near-natural flowing waters is particularly important. In order to be able to better record further population changes, it is recommended to set up monitoring, especially for *C. bidentata*." (Author) Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: Gärtner, F., Hasenbrede 12, 32689 Kalletal, Germany. Email: [gaertner.f@icloud.com](mailto:gaertner.f@icloud.com)

**20853.** Leeuwen, J. van (2019): Fotogids Libellen. Jeugdbondslijtgeverij 2019: 48 pp. (in Dutch) ["The water-rich Netherlands is a good country for dragonflies: some 70 species are found there! You can find them wherever there is fresh water. This photo guide makes it easier than ever before to recognise them. Most of the Dutch species -but not the very rare ones. are covered in very accessible descriptions, handy drawings and beautiful photos. This little guide is made especially for learning to recognise dragonflies in the field!" (Publisher/DeepL)]

**20854.** Louboutin, B.; Cherpitel, T. (2019): Utilisation de plantes invasives par des insectes aquatiques: les libellules à ponte endophytique (Odonata). *Martinia* 34(1/2): 35-55. (in French, with English summary) ["Invasive plants used by some aquatic insects: the dragonflies with endophytic oviposition (Odonata) – Alien plants, some of which are highly invasive, are increasingly found in natural aquatic habitats. Odonata are closely related to these habitats and their associated vegetation, and therefore frequently face these exotic species. Our study reviews some observations made in metropolitan France together with literature references to endophytic egg laying behaviours in alien plant species in Europe. Nine non-native plant species in Europe are used, likely successfully, by at least 15 species of Zygoptera and three species of Anisoptera: Aeshnidae. We dissected stem sections of *Ludwigia peploides* to check whether some eggs had been successfully inserted. We also checked with two different rearing experiments in aquarium that larval hatching and development of *Erythromma lindenii* and *Platynemis* sp. were possible from eggs laid in *L. grandiflora* and *L. peploides*. These observations show that endophytic dragonflies can use alien plants, which are sometimes the sole egg laying material at their disposal. This also shows that endophytic dragonflies are able to lay eggs in a wider diversity of aquatic plants than the literature suggested. We encourage launching more general studies on the effect of alien aquatic plant invasion on the dragonfly communities." (Authors)] Address: Cherpitel, T., Groupe d'Étude des Invertébrés Armoricaïns, antenne Pays de la Loire, 5, rue du Général Leclerc, F-44390 Nort-sur-Erdre, France. Email: [t.cherpitel@gretia.org](mailto:t.cherpitel@gretia.org)

**20855.** Rivière, T. (2019): Le Gomphe à pattes jaunes *Stylurus flavipes*, nouvelle espèce pour le département de la Gironde (Odonata: Gomphidae). *Martinia* 34(1/2): 33-34. (in French) [France, 21-VII-2016, Parc Floral, Bordeaux, Garonne, 44,89942 N; 0,54536° E.] Address: Rivière, T., 10, rue de la Petite Plaine, F-37230 Fondettes, France. Email: [river.thibaut@gmail.com](mailto:river.thibaut@gmail.com)

**20856.** Suartini, N.M.; Sudatri, N.W. (2019): Species of dragonflies (Odonata order) for rice plantations in some rice fields around Denpasar, Bali. *Simniosis* VII(1): 23-28. (in Indonesian, with English summary) ["Dragonfly is an insect which belongs to the Odonata order and consists of the Anisoptera suborder (dragonflies) and Zygoptera suborder

(damselflies). Its habitat is very wide including in the rice field. Dragonflies and Damselflies are predatory insects, both in the form of nymphs and adults, so their role is very important in maintaining the balance of the ecosystem. The research was conducted to finding out the dragonfly species found in rice plantations in rice fields around the Denpasar area. Sampling was done by catching using insect nets on rice plantations, in the morning from 08.00 to 11.00 WITA, and in the afternoon from 15.00 to 17.00 WITA. Dragonfly samples obtained were then preserved to be identified by observing the morphological characters based on Hanum et al. (2013), and Sigit et al. (2013). Dragonfly species found in rice plantations areas in several rice fields around Denpasar are as many as 8 species which are included in 2 suborder, namely Anisoptera suborder (5 species) and Zygoptera suborder (3 species), Species of Anisoptera suborder (*Potamarcha* congener) only found in rice plantations in East Denpasar." (Authors)] Address: Suartini, N.M., Laboratorium Taksonomi Hewan Jurusan Biologi Fakultas MIPA Universitas Udayana, Indonesia. Email: [made\\_suartini@unud.ac.id](mailto:made_suartini@unud.ac.id)

## 2020

**20857.** Assandri, G.; Bazzi, G.; Maggioni, D.; Galimberti, A.; Kunz, B. (2020): Distribution, autecology, genetic characterization, and conservation of the Western Mediterranean endemic dragonfly *Orthetrum nitidinerve* (Selys, 1841): insights from Italy. *International Journal of Odonatology* 23(4): 405-422. (in English) ["Aquatic macroinvertebrates are a primary component of freshwater ecosystems and one of the most threatened by anthropogenic pressures. Among them, dragonflies are a charismatic group of growing scientific and social interest. However, little is known about the natural history of several species. One paradigmatic example is the declining *Orthetrum nitidinerve*, a Western Mediterranean endemic anisopteran. We reviewed published and new data on this species, addressing distribution, autecology, and conservation (with a focus on Italy), and provide its first genetic characterization and phylogenetic placement within the genus. In Italy, the species is known from 50 sites so far (only 17 breeding populations) located in Sardinia and Sicily (1841–2019, only 22 from 1990 onward). Records from continental Italy are due to misidentification. The flight period in Italy spans between May and September. Habitat consists of permanent freshwater (mostly helocrene sources, seepages, and small brooks), slow-flowing, shallow, with muddy bottom deposits at elevation from the sea level up to 1000m asl. All the breeding populations are found in open and sunny landscapes, almost invariably in extensive pasturelands. The species has strongly declined in Sicily, whereas several large populations still occur in Sardinia. The major threats identified so far are agriculture and grazing intensification or abandonment and drought/source desiccation determined by water overexploitation and climate change. The first ever provided mitochondrial COI barcode and ITS nuclear sequences allowed a first tentative phylogenetic placement of the species as a sister group of the *O. brunneum*/*O. lineostigma* lineage." (Authors)] Address: Assandri, G., Area Per L'Avifauna Migratrice (BIO-AVM), Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Ozzano dell'Emilia, Italy. Email: [giacomo.assandri@gmail.com](mailto:giacomo.assandri@gmail.com)

**20858.** Assandri, G. (2020): Anthropogenic-driven transformations of dragonfly (Insecta: Odonata) communities of low elevation mountain wetlands during the last century. *Insect Conservation and Diversity* 14(1): 26-39. (in English) ["1.



Freshwater environments are experiencing high rates of species extinction due to human impacts, with aquatic insects thought to be strongly threatened by these changes; however, long-term research on this topic is scant. Among aquatic insects, dragonflies are considered valuable indicators of human disturbance at multiple scales. 2. This study addresses transformations of odonate communities of low elevation mountain wetlands in the Alps over the last century, comparing historical and present assemblages based on past records derived from scientific collections or literature and present data derived from site resurveys. 3. About 32.6% of species have been extirpated or strongly declined in the area (mostly temporary lentic and lotic water specialists, or cold-adapted species). Conversely, only 12.2% of species were new or considerably increased (mostly permanent lentic specialists and warm-adapted species). Nearly half of historical populations have been lost. The great majority of species which disappeared from all the study sites also disappeared (or strongly declined) at the regional scale. 4. Although gamma species richness was higher in the historical period compared with the present, mean alpha species richness does not significantly differ between the two, likely suggesting homogenisation of communities from historical to the present period. 5. Present communities of dragonflies show a significantly higher community temperature index compared with historical ones. 6. These patterns are putatively explained by the joint effects of land-use change (drainage and reclamation), land-use intensification or abandonment, environmental pollution, and anthropogenic-driven climate warming." (Author)] Address: Assandri, G., Area Per L'Avifauna Migratrice (BIO-AVM), Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Ozzano dell'Emilia, Italy. Email: giacomo.assandri@gmail.com

**20859.** Bauerheim, M.; Chapin, V. (2020): Route to chaos on a dragonfly wing cross section in gliding flight. *Physical Review E* 102(1): 1-6. (in English) ["The route from linear towards non-linear and chaotic aerodynamic regimes of a fixed dragonfly wing cross-section in gliding flight is investigated numerically using Direct Navier-Stokes simulations (DNS). The dragonfly wing consists in two corrugations combined with a rear arc, which is known to provide overall good aerodynamic mean performance at low Reynolds numbers. First, the three regimes (linear, non-linear and chaotic) are characterized, and validated using two different fluid solvers. In particular, a peculiar transition to chaos when changing the angle of attack is observed for both solvers: the system undergoes a sudden transition to chaos in less than  $0.1^\circ$ . Second, a physical insight is given on the flow interaction between the corrugations and the rear arc, which is shown as the key phenomenon controlling the unsteady vortex dynamics and the sudden transition to chaos. Additionally, aerodynamic performances in the three regimes are given, showing that optimal performances are closely connected to the transition to chaos." (Authors)] Address: Bauerheim, M., ISAE-Supáero, 10 avenue Edouard Belin, 31400 Toulouse, France. Email: michael.bauerheim@isae-supero.fr

**20860.** Bergmann, M.; Graça, M.A.S. (2020): Bioaccumulation and dispersion of Uranium by freshwater organisms. *Archives of Environmental Contamination and Toxicology* 78: 254-266. (in English) ["Uranium is the heaviest naturally occurring element on Earth. Uranium mining may result in ground and surface water contamination with potential bioaccumulation and dispersion by aquatic invertebrates with aerial stages. We investigated the effects of uranium contamination at community level in terms of abundance, richness,

the composition of invertebrate communities, and functional traits. We also investigated uranium mobility across aquatic food webs and its transfer to land via the emergence of aquatic insects. We sampled water, sediment, biofilm, macrophytes, aquatic invertebrates, adult insects, and spiders in the riparian zone across sites with a gradient of uranium concentrations in stream water (from 2.1 to 4.7  $\mu\text{g L}^{-1}$ ) and sediments (from 10.4 to 41.8  $\mu\text{g g}^{-1}$ ). Macroinvertebrate assemblages differed between sites with a higher diversity and predominance of Nemouridae and Baetidae at the reference site and low diversity and predominance of Chironomidae in sites with the highest uranium concentration. Uranium concentrations in producers and consumers increased linearly with uranium concentration in stream water and sediment ( $p < 0.05$ ). The highest accumulation was found in litter ( $83.76 \pm 5.42 \mu\text{g g}^{-1}$ ) and macrophytes ( $47.58 \pm 6.93 \mu\text{g g}^{-1}$ ) in the most contaminated site. Uranium was highest in scrapers ( $14.30 \pm 0.98 \mu\text{g g}^{-1}$ ), followed by shredders ( $12.96 \pm 0.81 \mu\text{g g}^{-1}$ ) and engulfer predators ( $7.01 \pm 1.3 \mu\text{g g}^{-1}$ ) [*Cordulegaster* sp.]. Uranium in adults of aquatic insects in the riparian zone in all sites ranged from 0.25 to 2.90  $\mu\text{g g}^{-1}$ , whereas in spiders it ranged from 0.96 to 1.73  $\mu\text{g g}^{-1}$ , with no differences between sites ( $p > 0.05$ ). There was a negative relationship between  $\delta^{15}\text{N}$  and uranium, suggesting there is no biomagnification along food webs. We concluded that uranium is accumulated by producers and consumers but not biomagnified nor dispersed to land with the emergence of aquatic insects." (Authors)] Address: Bergmann, Melissa, MARE – Marine and Environmental Sciences Centre, Dept Life Sci., Univ. Coimbra, 3001-456, Coimbra, Portugal. Email: mbergmann@student.uc.pt.

**20861.** Borisova, N.V.; Karolinsky, E.A. (2020): Annotated list of dragonflies (Insecta: Odonata) of the Prirsursky State Nature Reserve and its buffer zone. Part 2. Scientific proceedings of the Prirsursky State Nature Reserve 35: 104-109. (in Russian, with English summary) ["A list of 45 species of Odonata belonging to 8 families from the Prirsursky State Nature Reserve and its buffer zone based on original and literature data obtained in 2010-2020 is given. 7 species. *Ischnura pumilio*, *Aeshna juncea*, *Aeshna viridis*, *Ophiogomphus cecilia*, *Somatochlora flavomaculata*, *Leucorhinia caudalis*, *Sympetrum pedemontanum*. are registered in this territory for the first time." (Authors)] Address: Karolinsky E.A., Ukraine, Kharkov, Kharkiv National University V.N. Karazin, Russia. Email: kharkov.but@gmail.com

**20862.** Chen, P.-Y.; Lin, C.-T.; Yam, R.S.W.; Yuan, H.-W. (2020): Influences of physical vegetation management on Odonata abundance in urbanized ecosystem: a case study in northern Taiwan. *Wetlands* 40: 2061-2070. (in English) ["Physical vegetation management has shown deep and diverse impacts on fauna diversity and abundance. However, it is still unclear to what degree management influences Odonata in urbanized ecosystems. In order to understand the crucial factors among Odonata (adults and larvae) and physical vegetation management in a highly urbanized environment, this study investigated the response of Odonata abundance and species richness to riparian and emergent aquatic vegetation management in artificial ponds. Our results showed that physical management of emergent macrophytes did have a significant effect on larval abundance. However, adult abundance and species richness did not show clear differences between different levels of riparian vegetation coverage. Water temperature, water pH value and the presence of emergent macrophytes were also crucial drivers of larval abundance though macrophytes had a stronger effect as compared to water quality. Overall, this

study highlights the importance of marginal vegetation, especially emergent macrophytes, in highly urbanized environments. Our study suggests key management considerations for plant management in urban ponds which, when implemented, would work to enhance Odonata population and overall ecological value of artificial wetlands in cities." (Authors)] Address: Yuan, H.-W., School of Forestry & Resource Conservation, National Taiwan University, No. 1, Sec. 4, Roosevelt Rd., Da'an Dist., Taipei, 10617, Taiwan

**20863.** Erickson, R.J. (2020): A morphological phylogeny of Odonatoptera: Examining missing data in a group with a lot of "Naturally" Missing Data". PhD, thesis, Department of Biology, Brigham Young University: VII + 79 pp. (in English) ["Odonatoptera exhibit a wide diversity of morphologies for an ancient group of winged insects. A morphological matrix of 463 characters is compiled for 347 extant and fossil representatives used in parsimony analyses, implemented in TNT, to document arrangements of taxonomic groups above the family level. Missing data and other challenges approaches implemented and interpretation of the results. We employ a novel approach to testing monophyly relative to quantities of missing data for each taxon. Phylogenetic reconstructions recover patterns of monophyly and trends based on missing data. We discuss the implications of our findings on missing data as well as limitations to systematics in general for Odonatoptera." (Author)] Address: not stated

**20864.** Liashenko, V.A. (2020): Water quality assessment in the Vorskla River within the Hetmanskyi national natural park in terms of macrozoobenthos organisms. Biodiversity, ecology and experimental biology, 2020(2): 53-59. (in Ukrainian, with English summary) ["The article considers the results of the first field study of the structural characteristics of macrozoobenthos in the Vorskla River within the Hetmanskyi national natural park at ten observation stations that was conducted for the first time in June 2020. Representatives of 36 lower identified taxa of benthic macroinvertebrates were identified in this nature conservation object. The Class Gastropoda (7 species) and the Order Odonata (6 species) predominated in the studied biota in terms of species richness and abundance. Representatives of the two leading taxonomic groups make up 36% of the total number of species and 56% of the total abundance at all observation stations. It is worth paying attention to the presence of *Anax parthenope* species in all of the Vorskla River studied areas. It is a common species of dragonflies in the south of Ukraine, which is gradually appearing in the northern regions. Based on the indicators of species richness and species diversity, a biological indication of surface water quality was conducted. The following widely used biotic indices were calculated: the Trent Biotic Index, the Belgian Biotic Index, the Biological Monitoring Working Party Index. To assess the level of organic pollution, the Zelinka-Marvan saprobity index was calculated. The species diversity of benthic invertebrates was assessed by the Shannon index, and the similarity of species composition was assessed by the Jacquard index with further cluster analysis. At most of the observation stations, biotic indicators point out the high water quality of the Vorskla River. The water quality classes are characterized mainly as 'good' and 'excellent'. Station 8, located near the village of Lutyshche, is characterized by the worst results in all indicators used. The worst values of the Shannon and Jacquard indices were also recorded at this station. It is also worth noting the decline in species richness between stations 9 and 10, separated by a dam across the Vorskla River. We assume that the decrease in species richness of the above-mentioned sections of the river is caused by the

anthropogenic influence. The calculated values of the Zelinka-Marvan saprobity index point out a low level of organic pollution of the Vorskla River. The predominance of oligotrophic (by number)  $\alpha$ -oligosaprobic and  $\beta$ -mesosaprobic waters was established at all observation stations." (Authors)] *Anax parthenope*, *Libellula fulva*, *Cordulia aenea*, *Sympetma fusca*, *Gomphus vulgatissimus*, *Calopteryx splendens*] Address: Lyashenko, V.A., Taras Shevchenko Nat. Univ. of Kyiv, Ukraine. E-mail: Liashenko@univ.net.ua

**20865.** LoScerbo, D.; Farrell, M.J.; Arrowsmith, J.; Mlynarek, J.; Lessard, J.-P. (2020): Phylogenetically conserved host traits and local abiotic conditions jointly drive the geography of parasite intensity. *Functional Ecology* 34(12): 2477-2487. (in English) ["1. The role of biotic interactions in shaping species distributions is a cornerstone of biogeographic theory; yet, it remains elusive. Such interactions are more likely to have an influence on organisms with obligate associations, such as hosts and their parasites. Whereas abiotic conditions may affect the abundance and distribution of parasites in ways similar to free-living species, attributes of the host could also play a part. 2. Here, we focus on parasitic water mites and their dragonfly and damselfly hosts, and use a hierarchical Bayesian model to examine the relative influence of the abiotic environment and biotic factors such as local host community structure and individual host characteristics on parasite intensity along a broad-scale environmental gradient. Specifically, we assessed how climate, surrounding vegetation, water chemistry, host community structure as well the relative abundance and body mass of host species affected the intensity of parasitism on individual hosts along a latitudinal gradient. 3. We found that water chemistry and body mass of the host were the best predictors of variation in parasite intensity among hosts. High parasite intensity was observed in hosts sampled from lakes with high pH, dissolved oxygen, and conductivity. Additionally, we found that the intensity of parasitism was strongly influenced by host species identity. In particular, body mass, which shows strong phylogenetic signal, was negatively related to parasite intensity. It may be that larger species, or individuals within species, are more immune to high level of parasitism and/or body mass is correlated with other traits of the host which relate to immunity. 4. Considering both the abiotic environment and attributes of host species is necessary to understand why certain host individuals and locations exhibit more intense parasitism. Amid widespread decline of insect populations worldwide, some of which are attributed to pathogens and parasites, models predicting rates of parasitism in space and time could become an essential tool for guiding management and conservation efforts." (Authors)] Address: Lessard, J.-P., Dept Biol., Concordia Univ., Montréal, QC, Canada. Email: jp.lessard@concordia.ca

**20866.** Minot, M. (2020): Biological traits and environmental factors shaping local movements and dispersal of dragonflies (Insecta, Odonata) in pond networks. PhD thesis, *Écologie, l'Université de Rouen Normandie*: XII + 231 pp. (in English) ["During the last decades, the number of ponds decreased by more than 50 % in European countries, occasionally reaching up to 90 % in some regions. Their decline in number has led to a strong loss of connectivity between waterbodies. Yet, these small and scattered ecosystems are essential for the life cycle of a high diversity of freshwater species. Land use policies like the creation of Greenways and Blueways in France aim to improve ecological continuities to allow maintenance of existent biological populations and exchanges between them. However, the connectivity between ponds must be considered according to

the dispersal abilities of freshwater species and this information often lacks to guide restoration measures. In the present work, we studied the dispersal abilities of dragonflies on several spatial scales and investigated the biological traits and environmental factors that shaped their movements. In the first part, we evaluated the colonization of 20 ponds in Normandy by dragonflies during three years after pond restoration or pond creation. The results highlight high colonization rates during the first year and no difference in species richness was found between newly created or restored ponds. This suggests that restoration of ponds after complete drought should not always be prioritized over pond creation in management strategies. We found that generalist species were more present in the first year after pond creation or restoration, whereas the occurrence of forest specialists increased with the age of the pond. The results also highlighted that the landscape context around ponds (i.e. forest vs. open lands) had an effect on the composition of dragonfly communities. Finally, the total abundance of odonate species was related to the density of other ponds in the surroundings. This result emphasizes that highly connected ponds can support larger populations than isolated ones and thus, be more resilient to perturbations. The second part provides insights into the larval development of *Anax imperator* and the relationship between morphological traits of larvae and adults. The results suggest that the survival of this species might depend on its body length during the maturation period. We also tried to study the natal dispersal by marking 87 individuals at emergence, but only two males were resighted after the maturation period. Finally, the effect of two water pollutants (i.e. Round-up and DEET) at different concentrations was also investigated on the larval development and adults of *Aeshna cyanea*. Larvae were reared under laboratory conditions and exposed to concentrations up to 30 mg L<sup>-1</sup> of the two pollutants. No effect of the pollutants was detected on the morphological conditions of larvae or teneral adults, suggesting that *A. cyanea* is tolerant to potential water pollution of ponds. The level of HSP70 stress protein was also similar according to the different treatments, but teneral adults presented higher levels of stress than larvae, suggesting that emergence induced a high stress in the individuals. The third part focuses on the dispersal of *A. imperator*. We first assessed the local movements within a pond network in the Normandy region. Several movements between ponds were recorded, showing that individuals were able to use several ponds during their lifetime. Especially, we found that females used a larger home range than males and were more mobile in the terrestrial surroundings of ponds. We also highlighted the importance of trees used as resting sites in the vicinity of the ponds. The genetic structure of *A. imperator* populations was also investigated at both the regional and the European scales. Results indicate a high gene flow between populations in Normandy, confirming the high movement rates of *A. imperator* at the regional scale. No isolation by distance was found at the European scale. However, a genetic structure was found and Bayesian clustering analyses showed three distinct clusters (i.e. UK, France, eastern European countries). Results suggest that the English Channel may act as a barrier to gene flow. Overall, this study provides quantifications of dragonfly dispersal abilities and insights into the biological traits and factors that could influence them at different scales. It also provides information on terrestrial habitat use by dragonflies. We finally give some recommendations for management policies to better sustain dragonfly populations in pond networks." (Author)] Address: Minot, M., UNIROUEN, INRAE, ECODIV, Normandie Univ, Rouen, France. Email: m.minot@hotmail.fr

**20867.** Paulson, D.R.; Landeira-Dabarcá, A.; Haave-Audet, E. (2020): First nocturnal roosting aggregations of dragonflies reported from the New World tropics. *Notulae Odonatologicae* 9(6): 263-268. (in English) ["Two species of *Orthemis* (Libellulidae) were found in roosting aggregations in Costa Rica and Ecuador, the first such aggregations reported from tropical America. These observations provide information to facilitate further tests of hypotheses to explain such roosts." (Authors)] Address: Paulson, D.R., Slater Museum of Natural History University of Puget Sound Tacoma, WA 98416 USA. Email: dennispaulson@comcast.net

**20868.** Paulson, D.R. (2020): *Perithemis mooma* Kirby, 1889, is a synonym of *P. tenera* (Say, 1840). *Bulletin of American Odonatology* 13(1): 1-5. (in English, with Spanish summary) ["The two taxa are identical structurally and overlap widely in color-pattern characters that were said to distinguish them." (Author)] Address: Paulson, D.R., Slater Museum of Natural History University of Puget Sound Tacoma, WA 98416 USA. Email: dennispaulson@comcast.net

**20869.** Perneckner, B.; Mauchart, P.; Csabai, Z.; (2020): What to do if streams go dry? Behaviour of Balkan Goldenring (*Cordulegaster heros*, Odonata) larvae in a simulated drought experiment in SW Hungary. *Ecological Entomology* 45, 1457–1465. (in English) ["1. In case of dryings, the hyporheic zone is one of the most important refugia for stream macro-invertebrate communities, including the few Odonata species living in these habitats, such as *Cordulegaster* species. There is no information on the desiccation resistance strategies and methods of any members of the genus, including *C. heros*. 2. We hypothesised that the larvae use burrowing behaviour to survive droughts. In this study, beyond recording the survival rates of the larvae, we tested the effects of the sediment particle size and the body size of the larvae on burrowing behaviour in a 3-week-long simulated drought experiment in an indoor artificial stream system. 3. Eighty larvae were involved in the experiment, from which 60 were treated with drought, and 20 served as controls. Larvae were put into flowing water, into separate special compartments; 1 day later, the flow was ceased, and then, the water level was gradually decreased for 3 weeks. 4. Approximately 15% of larvae could survive the 3 weeks of drying. The survival probability of drought-treated larvae was significantly increased if animals burrowed into the sediment. In addition, the survival probability was higher in case of fine substrate material. Size of the larvae only affected the depth of the burrowing, not the survival rate. 5. However, two-thirds of the larvae did not dig into the sediment, which implies that surviving via burrowing is not the only mechanism of the species to withstand dry periods." (Authors)] Address: Perneckner, B., Dept of Hydrobiology, Institute of Biology, Faculty of Sciences, University of Pécs, Ifjúság útja 6, Pécs, 7624, Hungary. Email: perneckb@gamma.ttk.pte.hu

**20870.** Ruslan, H. (2020): Keanekaragaman capung (Odonata) di sekitar kawasan cagar biosfer Giam Siak Kecil. Bukit Batu Riau [Diversity of dragonflies (Odonata) around the Giam Siak Kecil biosphere reserve. Bukit Batu Riau]. *BIOMA* 16(1): 31-42. (in Indonesian, with English summary) ["Dragonflies are known as bioindicator of clean water. Aim of this study is to record dragonfly biodiversity in Reserve Biosphere of Giam Siak Kecil Bukit Batu Area Riau. This study was performed in May 5th -11th, 2018 with scan sampling using insect nets and camera. Study was done in core zone (secondary forest), industrial plant forest (IPF) and transition zone. We found as many as 48 individuals of 15 species from 3 families in core zone, 19 individuals of 4 species from 1

family in IPF and 31 individuals of 8 species from 2 families in transition zone. The same species were not found in three locations. Diversity index in core zone and transition zone was moderate while diversity index in IPF was low. Evenness index in three places are high. *Orthetrum sabina* was found to have the high index of importance value (IIV) among all three locations. *Rhyothemis phyllis* had the highest number in transition zone. Abiotic factors were similar in all locations, except light was higher in core zone. ... Conclusion: The composition of dragonflies in the core zone is 3 families composed of 15 species with a total of 48 individuals, in the HTI zone there is 1 family composed of 4 species with a total of 19 individuals, in the transition zone there are 2 families composed of 8 species with a total of 31 individuals. The similarity index at the HTI and Transitional locations showed a similarity in species composition (>50%), while the core and Transitional zones, and the core and HTI locations showed no similarity in species composition (<50%). The diversity index of dragonflies in the core and transition zones is moderate, while in the HTI zone it is low. Dragonflies in the secondary forest and HTI zone were found with a high number of individuals on *Orthetrum sabina*, while in the transition zone they were found on *Rhyothemis phyllis*. *Orthetrum sabina* was found to be dominant at all three locations based on IVI values. The abiotic factors at the three locations were almost the same, except that the brightness was higher in the secondary forest compared to the HTI and transition zones." (Author)] Address: Ruslan, H., Fakultas Biologi Universitas Nasional Jakarta, Indonesia. E-mail: hasni.ruslan@gmail.com

**20871.** Ul Islam, S.; Lin, W.; Islam, W.; Qasim, M.; Ali, H.; Ali, H.; Khan, K.A.; Ghramh, H.A.; Du, Z.; Wu, Z. (2020): Molecular identification of seven new Zygopteran genera from South China through partial cytochrome oxidase subunit I (COI) gene. *Meta Gene* 25, September 2020, 100739: (in English) ["Highlights: • There are 51 sequences of damselflies (Zygoptera), comprising four families, seven genera and ten species in the present study. \*Coenagrionidae family and genus *Ischnura* had dominated in the entire collection. \*Cytochrome oxidase subunit I (COI) gene was used for whole molecular work. Abstract: The study was carried out in eight provinces of China, with 16 different localities. A total of 150 adult damselflies were collected for the study from the area. Mitochondrial (COI) was the target gene to sequence from all 51 representative samples of the entire collection. From the resulted sequences, ten species belonging to seven genera and four families were identified. The families are Calopterygidae, Coenagrionidae, Chlorocyphidae and Devadattiade. After alignment through BioEdit v6, MEGA7 was used for phylogenetic tree construction as well as the calculation of genetic divergence, whereas genetic diversity was calculated by DnaSP v5. All species from the respective families had clustered together within the groups, but divided into sub-groups. Maximum genetic divergence (9.31%) was found in the genus *Rhinocypha*, followed by *Hetaerina* with (8.23%), while, minimum divergence was observed for the genus *Ceriagrion* (0.32%) followed by *Ischnura* (0.48%). However, significant genetic diversity was found for all sequences at 346 mutations confirmed by two tests, Tajima's D and Fu's Fs. Maximum genetic diversity among genera was also observed, the genus *Hetaerina* has maximum genetic diversity (181 mutations) followed by *Rhinocypha* (68 mutations) while minimum genetic diversity was observed for the genus *Ceriagrion* followed by *Ischnura*. The presented results showed a higher diversity of damselflies in the south China regions." (Authors) Address: Ul Islam, S., Fujian Province Key Lab. of Plant Virology, Plant Protection College,

Fujian Agriculture and Forestry University, Fuzhou 350002, PR China For a comment of this paper see: [https://www.researchgate.net/publication/342715393\\_Comment\\_on\\_Molecular\\_identification\\_of\\_seven\\_new\\_Zygopteran\\_genera\\_from\\_South\\_China\\_through\\_partial\\_cytochrome\\_oxidase\\_subunit\\_I\\_COI\\_gene](https://www.researchgate.net/publication/342715393_Comment_on_Molecular_identification_of_seven_new_Zygopteran_genera_from_South_China_through_partial_cytochrome_oxidase_subunit_I_COI_gene)]

**20872.** Valeriano, W.W.; Andrade, R.R.; Vasco, J.P.; Malachias, A.; Almeida Neves, B.R.; Guimarães, P.S.S.; Rodrigues, W.N. (2020): Mapping the local dielectric constant of a bio-nanostructured system. *Beilstein Journal of Nanotechnology* 12: 139-150. (in English) ["The aim of this work is to determine the varying dielectric constant of a biological nanostructured system via electrostatic force microscopy (EFM) and to show how this method is useful to study natural photonic crystals. We mapped the dielectric constant of the cross section of the posterior wing of the damselfly *Chalcopteryx rutilans* with nanometric resolution. We obtained structural information on its constitutive nanolayers and the absolute values of their dielectric constant. By relating the measured profile of the static dielectric constant to the profile of the refractive index in the visible range, combined with optical reflectance measurements and simulation, we were able to describe the origin of the strongly iridescent wing colors of this Amazonian rainforest damselfly. The method we demonstrate here should be useful for the study of other biological nanostructured systems." (Authors)] Address: Valeriano, W., Depto de Física, ICEx, Univde Federal de Minas Gerais, Av. Antônio Carlos 6627, 31270-901 Belo Horizonte, MG, Brazil. Email: wesclevaleriano@gmail.com

## 2021

**20873.** Al-Saffar, H.H.; Augul, R.S. (2021): Survey of insects in some southern Iraqi marshes. *Bull. Iraq nat. Hist. Mus.* 16(4): 571-621. (in English, with Arabian summary) ["This study included a survey and review of the scientific names of the marsh insects (aquatic and surrounding it) for the purpose of unifying and updating the database. The survey reveals 109 species under 77 genera that belong to 32 families and 7 orders as follow: Coleoptera (44 species), Diptera (7 species) Ephemeroptera (2 species), Hemiptera (14 species), Hymenoptera (11 species), Lepidoptera (2 species) and Odonata with 29 species. Information of specimens' collection for each species, synonyms and geographical distribution were provided." (Authors) Among others: *Lindenia tetraphylla*, *Brachythemis fuscopalliata*, *Diplacodes lefebvrei*, *Selysiotthemis nigra*, *Sympetrum arenicolor*, *Sympetma paedisca*, *Anormogomphus kiritshenkoi*, *Onychogomphus flexuosus*] Address: Augul, R.S., Iraq Natural History Research Center and Museum, University of Baghdad, Iraq. E-mail: razzaqshalan@gmail.com

**20874.** Arana Maestre, J.; Carrasco Badajoz, C.; Coayla Peñaloza, P.; Rayme Chalco, C.; Sánchez Peña, M. (2021): Aquatic macroinvertebrates of arid and semi-arid ecosystems of Peru. *Frontiers in Environmental Science* 9:658940. doi: 10.3389/fenvs.2021.658940: 14 pp. (in English) ["Peru is one of the megadiverse countries worldwide, displaying a great diversity of ecosystems due to its tropical location, marine currents, and complex relief, which jointly define environments differentiated by altitude and climatic conditions. The arid and semi-arid ecosystems comprising xeric and Andean shrublands, coastal deserts, and coastal hills, illustrate this diversity of ecosystems; these stretch over 177 358 km<sup>2</sup>, representing 13.8% of the Peruvian territory. Several studies on aquatic macroinvertebrates are being conducted in these ecosystems; although not so numerous

yet, have shown a rise in recent years. The objective of this work was to determine the composition and distribution of aquatic macroinvertebrates in the arid and semi-arid ecosystems of Peru. To this end, we conducted a literature survey; the articles and theses found were reviewed and analyzed. The following keywords were used: macroinvertebrates, macrozoobenthos, bioindicators, diversity of aquatic organisms, and water quality; we used the Google Academic search engine, Scopus, Web of Science, ResearchGate and the thesis repositories of Peruvian universities, additionally a thesis from the University of Barcelona. Of a total of 53 sources of information, 38 are theses and 15 are scientific articles conducted from 1992 to 2020, referring to studies conducted at elevations ranging from 0 to 3,831 m asl. Most studies were conducted at the Lima and La Libertad departments, resulting in 20 and 10 publications, respectively. The topics addressed most frequently were bioindication, biodiversity, taxonomy, and distribution. Most theses were carried in the Universidad Nacional de Trujillo and the Universidad Nacional Mayor de San Marcos, with 12 and 10 theses, respectively. The period 2011–2020 records the largest number of publications (40). According to the type of aquatic ecosystem, rivers (38) were the systems most intensively studied, followed by coastal wetlands (14) and lagoons (2); to note, one thesis studied two types of ecosystems. Specimens were collected mainly with the Surber and D nets; as a result, seven phyla, 10 classes, 39 orders, and 118 families were reported. The highest richness of families corresponds to rivers (110), followed by coastal wetlands (57), and lagoons (12). The western hydrographic slope recorded the highest richness at phylum, class, order, and family levels, likely because most investigations were conducted in this slope. On the other hand, the phyla Cnidaria, Nematoda, and Nematomorpha were not recorded in the eastern slope, which showed fewer orders (19) relative to the western slope (39). A similar trend is observed at the family level: of the 118 families recorded, 59 were reported for the eastern slope. The most common families at both sides were Chironomidae, Baetidae, Simuliidae, Elmidae, Hydrophilidae, Libellulidae, Physidae, Dytiscidae, Ceratopogonidae, Coenagrionidae, Hydroptilidae, Hydropsychidae, and Tipulidae. Separately, the most common families in all types of aquatic ecosystems were Chironomidae, Baetidae, and Dytiscidae. It is recommended to further promote studies on macroinvertebrates living in the eastern slope, addressing taxonomic, and ecological topics, as well as broadening the approach to an integral ecosystem view. Finally, the biotic indices should be calibrated and validated for the main hydrographic basins. This work is an initial effort to review, systematize, analyze, and gather the results of studies on aquatic macroinvertebrates in Peru, particularly in arid and semi-arid ecosystems." (Authors)] Address: Arana Maestre, J., Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Perú

**20875.** Bowler, D.E.; Eichenberg, D.; Conze, K.-J.; Suhling, F.; Baumann, K.; Benken, T.; Bönsel, A.; Bittner, T.; Drews, A.; Günther, A.; Isaac, N.J.B.; Petzold, F.; Seyring, M.; Spengler, T.; Trockur, B.; Willigalla, C.; Bruelheide, H.; Jansen, F.; Bonn, A. (2021): Winners and losers over 35 years of dragonfly and damselfly distributional change in Germany. *Diversity and Distributions* 27(8): 1353-1366. (in English) ["Aim: Recent studies suggest insect declines in parts of Europe; however, the generality of these trends across different taxa and regions remains unclear. Standardized data are not available to assess large-scale, long-term changes for most insect groups but opportunistic citizen science data are widespread for some. Here, we took

advantage of citizen science data to investigate distributional changes of Odonata. Location: Germany. Methods: We compiled over 1 million occurrence records from different regional databases. We used occupancy-detection models to account for imperfect detection and estimate annual distributions for each species during 1980–2016 within 5 × 5 km quadrants. We also compiled data on species attributes that were hypothesized to affect species' sensitivity to different drivers and related them to the changes in species' distributions. We further developed a novel approach to cluster groups of species with similar patterns of distributional change to represent multispecies indicators. Results: More species increased (45%) than decreased (29%) or remained stable (26%) in their distribution (i.e. number of occupied quadrants). Species showing increases were generally warm-adapted species and/or running water species, while species showing decreases were cold-adapted species using standing water habitats such as bogs. Time series clustering defined five main patterns of change—each associated with a specific combination of species attributes, and confirming the key roles of species' temperature and habitat preferences. Overall, our analysis predicted that mean quadrant-level species richness has increased over most of the time period. Main conclusions: Trends in Odonata provide mixed news—improved water quality, coupled with positive impacts of climate change, could explain the positive trends of many species. At the same time, declining species point to conservation challenges associated with habitat loss and degradation. Our study demonstrates the great value of citizen science and the work of natural history societies for assessing large-scale distributional change." (Authors)] Address: Bowler, Diana, German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Puschstraße, 04103 Leipzig, Germany. Email: diana.e.bowler@gmail.com

**20876.** Chuirazzi, C.; Ocampo, M.; Takahashi, M.K. (2021): Influence of prey diet quality on predator-induced traits in wood frog tadpoles (*Lithobates sylvaticus*). *Amphibia-Reptilia* 42(3): 331-341. (in English) ["Diet quality and predation are two critical factors in determining the growth and development of organisms. Various anurans are susceptible to phenotypic changes influenced by these factors. Yet, few studies examined prey diet quality as potential influence over predator-induced traits. Using wood frog tadpoles (*Lithobates sylvaticus*) as a model species, we investigated the effects of three diet compositions (plant-based, animal-based, omnivorous) crossed with presence or absence of chemical cues from predatory dragonfly larvae (*Aeshnidae*). After 35 days, we recorded 11 morphological measurements, Gosner stage, and intestinal length of tadpoles to assess phenotypic changes under the six different experimental conditions. Our results showed the additive effects of both diet quality and predator chemical cue without detection of interactions between the two. Tadpoles receiving the omnivorous diet grew and developed faster with wider denticle rows than those receiving the plant or animal diets. The growth and development of tadpoles receiving only the animal diet were significantly hindered. These results emphasize the importance of diet quality in the growth and development of larval wood frogs. Chemical cues from predators significantly reduced tadpole body size but, in contrast to previous findings, did not affect tail size. Our experimental procedure of providing water containing predator and injured conspecific chemical cues on a weekly basis likely provided relatively weak predation risk perceived by tadpoles compared to previous studies using caged predators. The predator environment in our experiment, however, represents

one ecologically relevant scenario in which predation risk is not urgent." (Authors)] Address: Chuirazz, Catherine, Dept Biology, Bucknell Univ., Lewisburg, PA 17837-2005, USA

**20877.** Cordero-Rivera, A. (2021): *Forcipomyia paludis* (Diptera: Ceratopogonidae) on the wings of *Ischnura elegans* (Odonata: Coenagrionidae) in Minorca (Balearic Islands). *Boletín de la Sociedad Entomológica Aragonesa* 69: 212-213. (in Spanish, with English summary) ["*Forcipomyia paludis* is reported for the first time for the island of Minorca, Spain, from two coastal wetland systems, parasitising imagines of *I. elegans* in summer 2021. Infestation rate was low (0.04-0.2%) and restricted to early summer." (Author)] Address: Cordero Rivera, A., Depto de Ecología e Biología Animal, Univde Vigo, E.U.E.T. Forestal, Campus Universitario, 36005 Pontevedra, Spain. E-mail: acordero@uvigo.es

**20878.** Dar, S.A.; Bashir, F.; Sabha, I.; Bhat, S.U.; Ali, M.N.; Bhat, G.A.; Ali, A.; Gojree, B.A.S.; Bhat, M.A.; Ud Din Bhat, S.M.; Aziz, A.; Kattoo, P.A. (2021): Insect fauna with special emphasis on their abundance and diversity in different habitats of Kashmir Valley. *J. Himalayan Ecol. Sustain. Dev.* 16: 106-119, Appendix. (in English) ["An assessment of aerial entomofauna is of utmost significance which offers inputs as part of the understanding for conservation and management of biodiversity. This study provides insights into aerial entomofauna dynamics in different habitats of Kashmir Himalaya. A random sampling design over line transects of 100 m were used for entomofauna collection. Overall, 188 species were collected from 10 different habitats/ecosystems, belonging to 13 orders and 63 families. Among the species collected from the various ecosystems, the order Lepidoptera was the most diverse in number (60 species), followed by Hymenoptera (28 species), Coleoptera (25 species), Diptera (24 species), Odonata (18 species), Orthoptera (12 species), Hemiptera (10 species), Homoptera (3 species), Trichoptera (3 species), Neuroptera (2 species), Heteroptera (1 species), Phasmatodea (1 species), and Mantodea (1 species). The highest number of individuals was recorded in habitats like protected forest areas (127 in Dachigam), followed by aquatic ecosystems (126 in Nigeen and 73 in Dal Lake), and the lowest in high altitude forests (12 in Dhara). Cluster analysis revealed the formation of two main clusters with Gulmarg being a riparian/transitional ecosystem type forming a separate cluster I, while the other 9 habitats forming the II cluster. Shannon-Wiener's diversity indices showed highest diversity of 3.83 at Gulmarg and low diversity of 2.2 at Dhara. The ordination of the abundance data using non-metric multidimensional scaling (NMDS) at stress value 0.11 in 2D space resulted in a clear separation between the locations of the sampled habitats." (Authors) Some of the taxa are quite obscure] Address: Bhat, S.U., Dept of Environmental Science, University of Kashmir, Srinagar-190006, Jammu and Kashmir, India. Email: samiullahbhat11@gmail.com

**20879.** Delsinne, T. (2021): Inventaire et suivi des Lépidoptères, Odonates et Orthoptères du marais d'Ours (Puy-en-Velay, 43). Etude réalisée par la SHNAO pour le CEN Auvergne, avec le support financier de la DREAL AURA: 57 pp. + annexes. (in French) ["The Ours marsh is a 13-hectare wetland acquired by the State as a compensatory site during the construction of the Puy-en-Velay eastern bypass on the RN88. Its management has been entrusted to the CEN Auvergne since 2011. Monitoring of lepidopterans, odonates and orthopterans was set up in 2012. Repeated in 2016 with an identical protocol, it has also been renewed in 2021 in order to assess the impact of restoration work and management practices on insect populations. Lepidoptera

are identified and counted along 7 transects totalling 1143 metres. Odonates were surveyed at 4 points and 1 transect (30 minutes/point). Orthopterans are identified by sight and hearing and an abundance index is assigned to the species detected. In 2021, this protocol was carried out during five survey days (10 and 26 June, 19 July, 26 August and 27 September). During the monitoring, 39 lepidopteran species were counted along the transects. Ten additional species were observed outside the protocol. Twelve of these are first records for the site. In total, 53 species (49 rhopalocerans and 4 zygens) have been reported at least once since 2010. The cumulative number of species is on average  $16 \pm 4$  per transect, double the values obtained in 2012 ( $8 \pm 3$ ). An increase of a more or less similar order of magnitude was obtained for the number of individuals counted in total (676 in 2021 vs. 372 in 2012), the average number of individuals per transect ( $75 \pm 41$  vs.  $33 \pm 20$ ), the average number of species per 100 linear metres ( $13 \pm 5$  vs.  $7 \pm 3$ ) and the average number of individuals per 100 linear metres ( $61 \pm 28$  vs.  $29 \pm 18$ ). The sectors where the number of species and individuals increased the most were those with flowers (hay meadows, megaphorbia, etc.). For odonates, 16 species were observed during the surveys, including 6 species mentioned for the first time. The inventory of dragonflies counts 19 species since 2010. The most attractive area is the northern pond, which has a sunny open water surface and is surrounded by, among other things, cattails. In 2021, 22-23 species of orthopterans were contacted, including at least 16-17 new ones, resulting in a list of 25-26 taxa for the site since 2012 (the uncertainty is caused by the delicate identification of *Tetrix* spp.) This high contribution of new taxa is partly explained by a targeted search for tree and hedgerow associated orthopterans, carried out for the first time. Similarly, the embankment of the RN88, which is now vegetated, was surveyed for the first time, which brought in species associated with dry herbaceous vegetation. Heritage species linked to wetlands were discovered: *Lycaena dispar* and *Satyrion w-album* for lepidopterans, *Aeshna isoceles* and *Aeshna mixta* for odonates and *Tetrix bolivari/ceperoi* for orthopterans. However, evidence of autochthony was only obtained for *Lycaena dispar* (egg laying). The results of the monitoring and inventories carried out in 2012, 2016 and 2021 unambiguously demonstrate the effectiveness of the restoration measures that were put in place when the site was acquired, with a gradual increase in the specific richness and abundance of the three insect groups studied. However, we believe that the situation can still improve, as some potential species for this type of environment have not been observed. Management recommendations and future studies are proposed." (Author/DeepL)] Address: Delsinne, T. c/o Société d'Histoire Naturelle Alcide-d'Orbigny – SHNAO, 57, rue de Gergovie, 63170 Aubiere, France. Email: tdel-sinne@shnao.eu

**20880.** Evtimova, V.; Tyufekchieva, V.; Varadinova, E.; Vidinova, Y.; Ihtimanska, M.; Georgieva, G.; Todorov, M.; Soufi, R. (2021): Macroinvertebrate communities of sub-Mediterranean intermittent rivers in Bulgaria: Association with environmental parameters and ecological status. *Ecologia Balkanica, Special Edition* 4: 49-64. (in English) ["Intermittent rivers and ephemeral streams drain more than 50% of the land surface on Earth. Yet, their ecology remains insufficiently understood. In Bulgaria, temporary rivers are typically small, or medium-sized rivers (national type R14), flowing in areas with sub Mediterranean climate. We present the first data focused explicitly on macrozoobenthos from intermittent rivers in four Bulgarian river basins within the drainage of the Aegean Sea. We identified 114 taxa from

nine rivers (5±33 taxa/site), with abundance varying between 61 and 994 ind/m<sup>2</sup>. The most common were taxa of Ephemeroptera and Chironomidae, followed by the crab *Potamon ibericum*. There were considerable differences among macroinvertebrates at different sites at taxon level, with similarities among samples increasing when using lower taxonomic resolution. The distinctness of communities was likely a reflection of the high variability in environmental conditions and local human impacts. Redundancy analysis identified key groups for the sites with fast flow (e.g. Ephemeroptera, Trichoptera, Plecoptera, Coleoptera and Diptera *Varia*, taxa associated with altitude and the higher share of stone substrata). Most of the river sites were classified as having high ecological status according to the Bulgarian legislation. Only the sites in the Vrabcha and Dereorman Rivers were with moderate status; these were the sites with the lowest taxon richness. We could speculate that the structuring of the benthic community was affected by other factors that have not been accounted for in the present study, i.e. great annual fluctuations in river flow, characteristic for R14, or by loading with nutrients or other pollutants." (Authors) The following odonate taxa are listed: *Anax imperator*, *Calopteryx splendens*, *Calopteryx* sp., *Cordulegaster* sp., *Gomphus* sp., *Ophiogomphus* sp., *Onychogomphus* sp.] Address: Tyufekchieva, Violeta, Department of Aquatic Ecosystems, Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 1 Tsar Osvoboditel Blvd., 1000 Sofia, Bulgaria. Email: vtyufekchieva@yahoo.com

**20881.** Golab, M.J.; Sniegula, S.; Antol, A.; Brodin, T. (2021): Adult insect personality in the wild — *Calopteryx splendens* as a model for field studies. *Ecology and Evolution*. 2021; 11: 18467-18476. (in English) ["Animal personality has received increasing interest and acknowledgement within ecological research over the past two decades. However, some areas are still poorly studied and need to be developed. For instance, field studies focused on invertebrates are currently highly underrepresented in the literature. More studies including a wider variety of traits measured and species tested are needed to improve our understanding of trait-correlation patterns and generalities. We studied nine behavioral traits, in *C. splendens*, from an array of three experiments: (i) courtship, (ii) aggressiveness, and (iii) boldness, and calculated their repeatability. The behaviors were measured twice in two different contexts: (i) undisturbed territory and (ii) partially deteriorated territory. Traits related to courtship and boldness were all repeatable across the two contexts. Among aggressive behaviors, only one trait (number of hits) was repeatable. This work demonstrates, for the first time, the presence of within-population personality differences in an adult damselfly in the wild. We further propose *C. splendens* as a promising model species for testing personality in the wild under highly controlled environmental conditions." (Authors)] Address: Brodin, T., Dept Wildlife, Fish & Environmental Studies, Swedish Univ. Agricultural Sciences, 901 83 Umeå, Sweden. Email: tomas.brodin@slu.se

**20882.** Hedges, B.A.; Austin, A.D.; Conran, J.G.; Taylor, G.S.; Madden, C.P.; Weinstein, P. (2021): A likely association of damselflies with the habitat heterogeneity provided by the freshwater swamp lily, *Ottelia ovalifolia*, in Eyre Peninsula granite rock-holes, with a review of potential threats to this ephemeral habitat. *Transactions of the Royal Society of South Australia* 145(8): 1-16. (in English) ["The granite rock-holes (sometimes called gnammas) across northern Eyre Peninsula (EP), South Australia, are a unique but poorly studied ephemeral freshwater habitat containing a complex invertebrate community. Macroinvertebrate predator occurrence

is often sporadic, both spatially and temporally. We aimed to determine if environmental conditions might predict predator occurrence in EP rock-holes. A total of 14 rock-holes were sampled across five granite outcrops along the Eyre Highway. Extensive dip-net sampling was undertaken and nymphs of three damselfly species were recorded from the rock-holes: *Austrolestes annulosus* (Lestidae), *Ischnura aurora*, and *Xanthagrion erythroneurum* (both Coenagrionidae), all in a single rock-hole at Pildappa Rock. This sole rock-hole contained a prominent floating-leaved, rooted aquatic macrophyte: the swamp lily, *Ottelia ovalifolia* (Hydrocharitaceae), which forms a complex, three-dimensional vegetative structure. Damselflies were hypothesised to be associated with the presence of *O. ovalifolia*, possibly as a result of the plant providing both suitable oviposition sites for the adults and habitat for nymphs throughout the water column, opportunities not afforded by the aquatic vegetation present in shallow rock-holes. Our findings contribute to the limited ecological information regarding EP rock-holes. We also briefly review potential threats to these ecosystems, an understanding of which will be critical to their management and conservation." (Authors)] Address: Hedges, B.A., Australian Centre for Evolutionary Biology and Biodiversity, School of Biological Sciences, The University of Adelaide, SA, Australia. Email: brock.hedges@adelaide.edu.au

**20883.** Hyseni, C.; Heino, J.; Bini, L.M.; Bjelke, U. Johansson, F. (2021): The importance of blue and green landscape connectivity for biodiversity in urban ponds. *Basic and Applied Ecology* 57: 129-145. (in English) [The negative impact of urbanization on biodiversity can be buffered by blue (e.g., rivers, ponds) and green (e.g., parks, forests) spaces. However, to prevent biodiversity loss and reduce the risk of local extinctions, blue and green spaces need to be connected by corridors, so that organisms may disperse between sites. Landscape connectivity affects local community composition and metacommunity dynamics by facilitating dispersal. The goal of this study was to test the relative roles of pond environmental properties, spatial structure, and functional landscape connectivity on differentiation of invertebrate metacommunities in urban ponds in the city of Stockholm, Sweden. We characterized functional connectivity as blue connectivity (distance to water bodies), green connectivity (land use), and combined blue-green connectivity. We estimated functional connectivity by using electrical circuit theory to identify dispersal corridors. Interestingly, while circuit theory is often used in single-taxon studies, this method has rarely been applied to multiple taxa forming a metacommunity, as we have done in this study. Indeed, our study contributes toward an increased focus on the role of dispersal at the metacommunity level. We determined that functional connectivity was the most important factor in explaining community differentiation, with the local environment contributing comparatively little, and spatial structure the least. Combined blue-green functional connectivity had a major influence on structuring urban pond communities, explaining 7.8% of the variance in community composition across ponds. Furthermore, we found that increased functional connectivity was associated with an increase in the number of species. In summary, our results suggest that to preserve biodiversity in urban ponds, it is important to enhance functional connectivity, and that open green spaces could augment blue corridors in maintaining functional connectivity in urban pond metacommunities. To generalize these findings, future urban biodiversity studies should compare how functional connectivity affects metacommunities across multiple major cities." (Authors)] Address: Hyseni, Chaz, Department of Ecology and Genetics, Animal Ecology, Uppsala

University, Norbyväagen 18D, SE 75236, Uppsala, Sweden. Email: chaz.hyseni@aya.yale.edu

**20884.** Kathan, B.; Willigalla, C. (2021): Terrestrische Habitatnutzung von *Sympecma fusca* über Jahreszeiten und Generationen hinweg (Odonata: Lestidae). *Libellula* 40 (3/4): 143-160. (in German, with English summary) ["Terrestrial habitat use of *Sympecma fusca* across seasons and generations (Odonata: Lestidae) – A capture-mark-recapture (CMR) study was conducted on *Sympecma fusca* at Spitzberg near Tübingen from 04 March 2018 to 15 February 2019. Further follow-up controls took place in 2020. Including the reproductively active specimens, 267 individuals of the 2017/18 generation were detected at Spitzberg, which used the entire area differentially in both spring and autumn. Of 105 individually marked specimens, 20 could be recaptured several times before the start of the reproductive phase over a maximum of three weeks, always at a short distance from the initial capture point. At a terrestrial habitat 730 m away from the nearest reproductive water body, several individuals were regularly encountered over the years. Out of 62 individuals observed between July and October 2018, only one (1.6%) was encountered at a distance of less than 10 m from a reproduction water body in the forest area of the Spitzberg, all other individuals (98.4%) were recorded further away from a water body. In principle, however, the distribution of the two generations on the Spitzberg differed little from each other, i.e. overlaps of the sites used in spring and summer or autumn were present except for the immediate vicinity of the water bodies and the southern slopes of the "Ödenburg" NSG. Rarely were only single animals found within a habitat structure in spring as well as in autumn, mostly small groups of two to more than ten animals were found in close spatial proximity to each other." (Authors)] Address: Kathan, B., Loysstr. 9/1, 88299 Leutkirch im Allgäu, Germany. Email: bastiankathan@web.de

**20885.** Kuhn, J.H.; et al. (2021): Taxonomic update of phylum Negamaviricota (Riboviria: Orthomavirae), including the large orders Bunyavirales and Mononegavirales. *Archives of Virology* 166: 3513-3566. (in English) ["In March 2021, following the annual International Committee on Taxonomy of Viruses (ICTV) ratification vote on newly proposed taxa, the phylum Negamaviricota was amended and emended. The phylum was expanded by four families (Aliusviridae, Crepuscuviridae, Myriaviridae, and Nataviridae), three subfamilies (Alpharhabdovirinae, Betarhabdovirinae, and Gamma-rhabdovirinae), 42 genera, and 200 species. 39 species were renamed and/ or moved and seven species were abolished. This article presents the updated taxonomy of Negamaviricota as now accepted by the ICTV.... Genus Odonatavirus was created for species Odonate mivirus, which was moved from Chuviridae: Mivirus and renamed Odonatavirus fabricii. Two new species were created: o Odonatavirus draconis for odonatan chu-related virus 137 (OCrV-137), discovered by HTS in Austroargiolestes icteromelas (Selys, 1862) sampled in Uriarra State Forest, Australian Capital Territory, Australia [49]; and o Odonatavirus odontis for odonatan chu-related virus 136 (OCrV-136), discovered by HTS in *Diphlebia lestoides* (Selys, 1853) sampled in Gibraltar Creek, Australian Capital Territory, Australia;"] (Authors) For additional details see: <https://pubmed.ncbi.nlm.nih.gov/34463877/> Address: Kuhn, J.H., Integrated Research Fac. Fort Detrick, Nat. Inst. Allergy & Infectious Diseases, National Institutes of Health, Frederick, MD, USA. kuhnjens@mail.nih.gov.

**20886.** Lubis, R.; Herlina, M.; Rahmi; Maharani, I. (2021): Diversity and distribution of dragonflies in the meadow area,

Bingin Rupit Ulu village, Rupit district. *Simbiosis* 10(1): 32-40. (in Indonesian, with English summary) [Indonesia; "Dragonflies have a very important function for the environment, because they can maintain the balance of the ecosystem, thus the diversity of dragonflies can be used as bioindicators of the health of an area. This study aims to determine the diversity and distribution of dragonflies in the grassland area in Bingin Rupit Ulu Village, Rupit District. This study uses a direct survey method to the research location with the roaming method. The area of the research site is  $\pm 1$  ha. Based on the results of the study found 12 species of dragonflies belonging to 5 families, [...] were found, namely: *Ictinogomphus decoratus*; *Lathrecista asiatica*, *Rhodothemis rufa*, *Diplacodes trivialis*, *Crocothemis servilia*, *Orthetrum sabina*, *Neurothemis ramburii*, *Orthetrum glaucum*; *Agriocnemis femina*, *Ceriagrion praetermissum*; *Prodasinieura autumnalis*; *Copera marginipes*. The dragonfly diversity index obtained a value of 0.884 and was included in the low category ( $H' > 1$ ). The distribution of dragonflies in grassland areas includes clusters (11 species) and uniform distribution patterns (1 species)." (Authors)] Address: Lubis, R., M.Pd., Program Studi Pendidikan Biologi, Universitas Muhammadiyah Bengkulu, Jalan Bali Kota Bengkulu, Indonesia. Email: rukiah2507@umb.ac.id

**20887.** Martynov, A.V.; Vasilenko, D.V.; Perkovsky, E. (2021): First Odonata from Upper Eocene Rovno amber (Ukraine). *Historical Biology* 34(11): 2182-2187. (in English) ["*Pulchrairina electra* gen. et sp. nov. is the first recorded Odonata in Upper Eocene Rovno amber (Ukraine). This new damselfly is described from Kovel (Ukraine) and is the fourth named fossil arthropod from Volyn Region. It is described mainly based on wing morphology. It belongs to Coenagrionoidea, but cannot be placed in any family because of incompletely preserved wings. Short comparisons with genus *Balticoagrion* known from Baltic amber are given. Both genera could belong to stem or crown groups of Coenagrionoidea." (Authors)] Address: Martynov, A.V., National Museum of Natural History, National Academy of Sciences of Ukraine, Kyiv, Ukraine. Email: martynov\_av@ukr.net

**20888.** Minot, M.; Aubert, M.; Husté, A. (2021): Pond creation and restoration: patterns of odonate colonization and community dynamics. *Biodiversity and Conservation* 30: 4379-4399. (in English) ["Ponds are lentic waterbodies with a high conservation value for biodiversity that have long been overlooked by management policies. Recent initiatives aimed to promote the conservation of these ecosystems by restoring or creating new ponds throughout Europe. Therefore, studying responses of aquatic invertebrates to local pond characteristics and connectivity between them is determinant to understand community dynamics and colonization processes of these scattered ecosystems. We studied larval communities of odonates in 20 created or restored ponds to assess their colonization during the first 2 or 3 years. Community dynamics in relation to pond vegetation, landscape context and connectivity with other ponds were also investigated. No difference in species richness was found between restored and created ponds. Most species colonized the ponds during the first year, but a different pattern in colonization was observed between Anisoptera and Zygoptera. Community composition was related to the landscape context of ponds and the time since pond creation or restoration. Abundances were positively related to pond connectivity, especially in the suborder Zygoptera. No relationship was found between vegetation and Anisopteran larvae, while Zygoptera seem more sensible to the vegetation structure due to their endophytic oviposition. This work



confirms the high colonization capacity of odonates and shows that creation of new ponds could be as efficient as pond restoration to enhance the conservation of freshwater species. It also highlights that landscape characteristics and connectivity between ponds are determinant to support higher abundances and a posteriori increase population viability at the landscape scale." (Authors)] Address: Minot, M., UNIROUEN, INRAE, ECODIV, Normandie Univ, Rouen, France. Email: m.minot@hotmail.fr

**20889.** Miya, M.S.; Gautam, D.; Neupane, B.; Chhetri, A. (2021): Species diversity and abundance of Odonata in Sishaghat of Tanahun district, Nepal. *Journal of Animal Diversity* 3(3): 45-55. (in English) ["Odonata are one of the most ancient, well studied and fascinating insect orders considered as bio-indicators of aquatic ecosystems. Studies on Odonata have been carried out in many parts of Nepal, but no specific study has been performed in Tanahun. Hence, a study was conducted to determine the species diversity and abundance of Odonata in the Sishaghat of Tanahun district, Nepal from June to August 2020. A transect survey method was used for data collection. A total of six transects (three in each habitat type: agricultural lands and forest streams), each with a length of 200 m were laid out randomly and each transect was surveyed three times. Data were pooled and analyzed with SPSS. A total of 629 individuals of 26 Odonata species from 20 genera and 7 families were recorded. The overall Shannon-Wiener diversity index was  $H = 2.25$ , Shannon Equitability was  $E = 0.69$  and Margalefs' richness index was  $R = 3.88$ . Anisoptera was more diverse ( $H = 1.94$ ) and more abundant ( $n = 545$ ) than Zygoptera ( $H = 1.31$ ,  $n = 84$ ). However, species richness was higher and evenness lower in Zygoptera ( $R = 2.26$ ,  $E = 0.55$ ) than Anisoptera ( $R = 2.22$ ,  $E = 0.72$ ). Anisoptera comprised 15 species within 10 genera from two families and Zygoptera comprised 11 species within seven genera from five families. The family Libellulidae represented the highest species richness ( $R = 1.75$ ). *Neurothemis fulvia* and *Orthetrum prunosum* were the most abundant species ( $RA = 23.21$  and  $21.78$  respectively). Of the recorded Odonata, 25 species are included under the least concern and one under the vulnerable category of the IUCN. A higher number of species was found in agricultural lands (nine species); hence, the water bodies around this habitat should be preserved to conserve the Odonata." (Authors)] Address: Neupane, B., Tribhuvan Univ., Institute of Forestry, Pokhara Campus, Pokhara, 33700, Nepal. Email: bneupane@iofpc.edu.np

**20890.** Moura de Souza, A.G.; Neto, V.; Pereira Júnior, A. (2021): Revisão integrativa sobre biologia, qualidade da água e a ordem Odonata. Integrative review on biology, water quality and the order Odonata. Revisión integrativa sobre biología, calidad del agua y orden Odonata. *Research, Society and Development* 10(9), e24910917605: 18 pp. (in Portuguese, with Apanish and English summaries) ["Sciences such as biology generate information about ecosystems, such as aquatic ecosystems, and promote integration with ethnic knowledge associated with botany. The objective of this work was to carry out an integrative review about the interrelationship of biology with various environmental areas, under two aspects, conservation, and balance, to investigate the relationship between biology and research on water quality and the use of the order Odonata as bioindicator of the environmental quality of water bodies. The research method was deductively associated with a quantitative and qualitative approach of a basic nature. The data obtained and analyzed indicated that the biological terms are present in most of the selected literature ( $n = 46.2\%$ );

regarding water quality, there was a small reduction ( $n = 30.8\%$ ); the use of the order Odonata as bioindicators of water quality is still scarce ( $n = 22.9\%$ ). As for the use of descriptors in the analyzed research, the following citations were identified: "Biological terms and water quality" ( $n = 65.8\%$ ); "Odonata and water quality" ( $n = 21.1\%$ ); "Biological terms and Odonata" ( $n = 13.2\%$ ). The order Odonata, as a bioindicator, is evolving ( $\Sigma = 33.3\%$ ) and with high frequency ( $fr > 50\%$ ) when compared to the application of Biological Terms and Water Quality. So, the application of biology is already effective in environmental areas such as water quality analysis. However, the use of Odonata as bioindicators of water quality is not used very often yet. Thus it is recommended that there is a greater appreciation by researchers of this relationship, which can contribute to the qualification and monitoring of this natural resource more comprehensively and effectively." (Authors)] Address: Pereira Júnior, A., Universidade do Estado do Pará, Brasil. E-mail: antonio.junior@uepa.br

**20891.** Mykitchak, T.; Kozlovskyy, V.; Mateleshko, O. (2021): Invertebrate hydrobiont fauna transformation in the Dombrovskiy pit lake during the period of 2014-2018. *Visnyk of the Lviv University. Series Biology* 84: 94-104. ["The aquatic invertebrate community of Dombrovskiy pit lake was investigated during 2014–2018. 25 species were recorded there. The only permanent component of plankton in the community is rotifer *Brachionus plicatilis* Müller, 1786; of benthos and neuston is hemipteran *Sigara lateralis* (Leach, 1817), beetle *Hydrobius fuscipes* (Linnaeus, 1758), flies *Aedes* sp., *Ochlerotatus lepidonotus* (Edwards, 1920), *Culicoides salinarius* Kieffer, 1914, *Ephydra glauca* Meigen, 1830 are permanent components of benthos and neuston. The main diversity of invertebrates is concentrated in littoral zone up to 2 m of depth. This is primarily due to the desalination of these areas by surface runoff. Over the last decade the mineralization of the surface water layer has decreased from 120–138 to 25–28 g/l. Combined with the desalination of water, the increase of species diversity of aquatic invertebrates was noticed in spring seasons (from 7 to 17 taxa). The freshwater taxa, which are not tolerant even to low water salinity, appeared in the community in 2018 (7–25 % of the species diversity), among them *Hydrometra stagnorum* (Linnaeus, 1758), *Rhyacophila tristis* Pictet, 1834, *Coelambus impressopunctatus* (Schaller, 1783), *Enochrus coarctatus* (Gredler, 1863), *Hydrophilus caraboides* (Linnaeus, 1758). The role of freshwater taxa, which are tolerant to low water salinity (up to 5 g/l), increased from 0–10 % of the species diversity in 2014–2015 to 22–35 % in 2018. Among them *Eucyclops serrulatus* (Fischer, 1851), *Candona* sp., *Cypris pubera* O. F. Müller, 1776, *Cloeon dipterum* (Linnaeus, 1760), *Libellula depressa*, *Sympecma fusca*, *Paracorixa concinna* (Fieber, 1848) was noted in 2018 for the first time. On the contrary, the number of saltwater taxa decreased from 20–29 % (2014–2015) to 5–14 % (2018). The saltwater aquatic invertebrate community of this pit lake has transformed into brakish-freshwater one over time. 83 % taxa of aquatic invertebrate communities from freshwater puddles near reservoir coast are noted in the Dombrovska reservoir. The introduction of species from protective canals of the reservoir is unlikely, as only 5 % of taxa from there are marked in it. The main way of the forming communities of invertebrates in this reservoir is the periodical flooding of freshwater coastal puddles." (Authors)] Address: Mykitchak, T., Institute of Ecology of the Carpathians, NAS of Ukraine, 4, Kozelnytska St., Lviv 79026, Ukraine. E-mail: tarasmykitchak@yahoo.com

**20892.** New, T.R. (2021): Book Review: Günther Theischinger and John Hawking: The complete field guide to dragonflies of Australia. 2nd edn (with colour illustrations by Albert Orr). CSIRO Publishing, Melbourne, 2021, Paperback, Au \$49.99, ISBN 9781486313747, 424 pp. *Journal of Insect Conservation* 25: 553-554. (in English) [Verbatim: The first edition of this pioneering field guide proved both useful and popular, as attested by several reprintings since it appeared in 2006. It was also a catalyst for further exploration of Australia's unique and remarkable odonate fauna, and these recent discoveries are here incorporated into this welcome second edition, so bringing the most recent practical perspective to what will assuredly be a wide and appreciative readership. Indeed, one recent discovery (the tiny Artesian Pygmyfly, *Nannophya fenshami*) was described only after the deadline for this revised text, and is treated in the introductory species guide rather than in the 'text proper'. Altogether, seven new species have been described, and several other additions to the Australian fauna recorded since 2006. Collectively, 333 species are treated, an increase from 324. Some anomalies and challenges remain: the Newaustralian Emerald (*Hemicordulia armstrongi*) has not been verified in Australia by adult specimens, with its identity based on photographs and larval features. Its relationship to the widespread *H. australiae* is still somewhat unclear, and is discussed by Rowe (2019). The first edition of this book (reviewed in this journal: New 2008) was heralded as the first major field guide to the regional fauna, and this revision follows closely on the very user-friendly format established there with text and illustrations integrated well. An introduction sets a perspective for the book, noting the high level of endemism among Australian Odonata, and summarising their life histories, ecology and major habitats. The brief mention of conservation has not been updated. As in the first edition, the major section of the book, the 'species guide' (pp. 11–315) has text on the left-opening page, providing recognition and diagnostic notes and habitat comments on two or three species, and including (where available) comments on the larva, together with line drawings of key structural features and colour pattern to aid identification, and a distribution map. The facing right-hand page presents colour photographs of adults and, when available, larvae. Many of the photographs of living adult insects have been replaced with new images, and will greatly aid recognition in the field. The systematic arrangement has been updated to reflect recent consensus over family limits in the Odonata and brings Australian family allocations ('for better or worse' as noted in the preface!) in line with those used elsewhere. Modifications are tabulated carefully but, in summary, the Australian Zygoptera now comprise representatives of 10 families (previously 12) and the dragonflies proper of eight families (previously 18) plus 11 genera that are treated as incertae sedis. Families and genera are also characterised succinctly within the main text, and non-specialists will welcome the informative illustrated glossary. This is followed by series of keys to families and some genera and species, as a valuable confirmation of identifications suggested by the main text. Similar illustrated keys to larvae, and several comparative plates of larval habitus drawings ensure that a high proportion of both adult and larval Odonata can be identified. As a field guide, this new edition succeeds admirably. It concludes with sections on 'studying dragonflies', a checklist of species, references and further reading, and indices to scientific and common names. A significant addition to this book is the series of magnificent colour paintings of 40 species prepared by Albert Orr, himself a leading dragonfly expert and entomological illustrator. These plates alone will help to increase appreciation of our remarkable and largely endemic Odonata, and endorse

awareness of their diversity and their values as flagship taxa and tools in evaluating the quality of Australia's inland water ecosystems.] Address: New, T.R., Dept of Ecology, Environment & Evolution, La Trobe University, Bundoora, VIC 3086, Australia. Email: T.New@latrobe.edu.au

**20893.** Reyes-Márquez, I.; Gómez-Vargas, S.; Carrillo-Muñoz, A.I.; López-García, K.; Serrano-Meneses, M.A. (2021): Patterns of sexual dimorphism in flight agility in territorial and non-territorial Odonata. *Journal of Ethology* 39: 129-134. (in English) ["Adult Odonata are amongst the most accomplished flying insects on the planet. The main functions of spatial displacement by flight in these insects are well understood (e.g., escape from predators, foraging, reproduction, thermoregulation), but whether males and females exhibit different degrees of flight agility across species—and why—is by contrast, poorly understood. This is important because flight agility may differ between males and females due to the costs imposed on females by the high levels of sexual selection and sexual conflict observed in certain species. Here we used a wing parameter to estimate sexual dimorphism in flight agility in 63 Odonata taxa. We then used a phylogenetic comparative method to investigate whether sexual dimorphism in flight agility differed between (i) Anisoptera and Zygoptera, and (ii) mating systems (non-territorial, territorial). Our results first show that the distribution of sexual dimorphism in flight agility between Odonata families is non-random. Second, our results suggest that whereas sexual dimorphism in flight agility is not different between non-territorial and territorial Anisoptera, in Zygoptera it is predominantly female-biased in non-territorial species, and male-biased in territorial ones. There may be important behavioural and mating differences between Anisoptera and Zygoptera which explain the different needs of agility observed between suborders and mating systems." (Authors)] Address: Serrano-Meneses, M.S., Depto de Ciencias Químico-Biológicas, Univ. de las Américas Puebla, San Andrés Cholula, C. P. 72810, Puebla, Mexico

**20894.** Shakya, M.; Silvester, E.; Rees, G.; Stitz, L.; Holland, A. (2021): Spatial variation in the amino acid profile of four macroinvertebrate taxa along a highly polluted river? *Environmental Pollution* Volume 284, 1 September 2021, 117536: 9 pp. (in English) ["Highlights: • River affected by acid mine drainage (AMD) from mine 30 years after closure. \*AMD altered community structure and amino acid (AA) profile of macroinvertebrates. \*Inter and Intra-specific variations in AA profiles were detected among four taxa. \*Strongest changes in AA profile were observed within the family Chironomidae. AA profiling offers a new tool for assessing the environmental impact of AMD. Abstract: Acid mine drainage (AMD) is one of the major environmental problems impacting aquatic ecosystems globally. We studied changes in the community composition of macroinvertebrates and amino acid (AA) profiles of dominant taxa along an AMD contamination gradient within the Dee River, Queensland, Australia to understand how AMD can affect the biomolecular composition of macroinvertebrates. Taxa richness and community composition of macroinvertebrates changed widely along the AMD gradient with significantly lower taxa richness recorded at the polluted sites compared to upstream and downstream sites. The Dipteran families: Chironomidae and Ceratopogonidae, the Odonata family Gomphidae, and the Coleoptera family Dytiscidae were the only families found at all sampling sites and were used here for AA analysis. There were significant variations in the AA profiles among the studied taxa. The AA profile of each taxon also varied among upstream, polluted and downstream sites

suggesting that contamination of a river system with acid mine drainage not only alters the overall macroinvertebrate community composition but also significantly influences the AA profile of organisms that are tolerant to AMD. This study highlights the potential of using AA profiling to study the response of aquatic organisms to contamination gradients such as those associated with AMD." (Authors)] Address: Shakya, Manisha, La Trobe Univ., School of Life Sciences, Dept Ecology, Environment & Evolution, Centre for Freshwater Ecosystems, Albury/Wodonga Campus, VIC, 3690, Australia. E-mail: M.Shakya@latrobe.edu.au

**20895.** Tsane, C.R.B.; Moanono, P.G.T.; Tang, B.N.; Dongmo, R.N.; Nangou, P.B.S.; Kayo, R.P.T.; Togouet, S.H.Z. (2021): Influence of the Mekin hydroelectric dam on the distribution of benthic macroinvertebrates of the Dja stream: South Cameroon region. *World Journal of Advanced Research and Reviews* 12(2): 63-77. (in English) ["This work was conducted with the aim of studying the biodiversity of benthic macroinvertebrates in the Dja River and determining the effect of the Mekin hydroelectric dam on their population in relation to the physico-chemical quality of the water. The study ran from May to October 2020 and samplings were carried out on a monthly basis in four different sampling stations located upstream and downstream of the dam. The physico-chemical analyses were done according to standard methods, while the benthic macrofauna was collected using a turbid net of 400 µm mesh size over a total area of about 6 m<sup>2</sup> per station. Physico-chemical analyses revealed a decreasing evolution from upstream to downstream of the dam of nitrogen forms (NO<sub>3</sub>. (1.67mg/L-0.41mg/L); NH<sub>4</sub><sup>+</sup> (0.31 mg/L-0.21 mg/L) with p>0.05); Electrical Conductivity (21.45µS/Cm-17.1µS/Cm with p<0.05) and Suspended Solids (11.10mg/L-6.57mg/L with p<0.05); while Dissolved Oxygen (49.82%-78.23% with p<0.05) and velocity (0.04m/s-0.23m/s) increased. Organic Pollution Index revealed that the water was moderately polluted (3-4). In total, 1894 individuals, of which 1044 belonging to 2 phyla, 2 classes, 6 orders, 27 families and 47 genera/species were collected upstream; and 850 belonging to 3 phyla, 4 classes, 8 orders, 28 families and 45 genera/species were collected downstream. Odonata was largely abundant and highly represented *Trithemis dorsalis* (96.05%); while downstream, *Heteroptera* was largely abundant and highly represented by *Poissonia* sp1. (79.78%). These results revealed that restoration of the upstream of the dam impacted by organic pollution and physical degradation of the environment is recommended." (Authors) The list of taxa includes European species, not occurring in Africa.] Address: Togouet, S.H.Z., Laboratory of Hydrobiology & Environment (LHE), Fac. Sciences, Univ. of Yaoundé I, P.O.Box: 812 Yaounde. Cameroon. Email: zebasehu@yahoo.fr

## 2022

**20896.** Adekolurejo, O.A.; Floyd, M.; Dunn, A.M.; Kay, P.; Dean, A.P.; Hassall, C. (2022): Combined effects of increased water temperature and cyanobacterial compounds exert heterogeneous effects on survival and ecological processes in key freshwater species. *Oecologia* 200: 515-528. (in English) ["Climate change is increasing water temperature and intensifying the incidence of cyanobacterial blooms worldwide. However, the combined effects of increased temperature and microcystin concentrations as co-stressors on survival and ecological processes in freshwater species are unclear. Here, using purified MC-LR and crude extract of toxigenic *Microcystis aeruginosa*, we tested the individual and combined effects of three water temperatures (15, 20,

25 °C) and a range of environmentally relevant concentrations of dissolved microcystin and crude extract (0.01–10 µg·L<sup>-1</sup>) on survival, growth inhibition, grazing and predation rates in three freshwater species: phytoplankton (*Scenedesmus quadricauda*), zooplankton (*Daphnia pulex*), and an invertebrate predator (*Ischnura elegans*). Purified MC-LR exerted a higher growth inhibitory effect on *S. quadricauda* compared to crude extract with the same concentration of MC-LR, while neither treatment affected its chlorophyll-a content or survival of *D. pulex*. Crude extract reduced grazing and survival of *D. pulex* and *I. elegans*, respectively. The combined effect of higher temperature and crude extract reduced *I. elegans* survival by 50%. Increased temperature reduced prey handling time in *I. elegans* by 49%, suggesting a higher predation rate. However, warming together with higher concentrations of crude extract jointly increased zooplankton grazing and reduced damselfly predation. Taken together, these results suggest crude extract, and not necessarily microcystin, can affect survival and productivity in freshwater species, although these effects may vary unevenly across trophic levels. Our findings highlight the importance of complex ecological mechanisms by which warming can exacerbate toxic effects of cyanobacterial bloom extracts on survival and functions among species in eutrophic freshwaters." (Authors)] Address: Hassall, C., School of Biology, Faculty of Biological Sciences, University of Leeds, Leeds LS2 9JT, UK. Email: c.hassall@leeds.ac.uk

**20897.** Amer, N.R.; Lawler, S.P.; Zohdy, N.M.; Younes, A.; ElSayed, W.L.; Wos, G.; Abdelrazek, S.; Omer, H.; Connon, R.E. (2022): Copper exposure affects anti-predatory behaviour and acetylcholinesterase levels in *Culex pipiens* (Diptera, Culicidae). *Insects* 2022, 13, 1151. <https://doi.org/10.3390/insects13121151>: 14 pp. (in English) ["Simple Summary: Interaction between natural and anthropogenic stressors, such as contaminants and predators, could jointly account for potential ecological risk to organisms. This study quantified the combined effect of copper and/or predation cues (non. consumptive predation) on the anti-predatory behaviour of *Culex pipiens* larvae (swimming distance and speed). As well, we tested the ability of mosquito larvae to escape predation by dragonfly larvae. We also measured the long-term effect of copper on an enzyme important to the nervous system, acetylcholine esterase (AChE) for two successive generations. Copper reduced the movement and velocity of *Cx. pipiens* larvae, even at levels regarded as environmentally safe. Interestingly, copper showed some stronger effects in the second generation than the first one. Copper acted as an AChE inhibitor at 500 µg L<sup>-1</sup>. There was no significant effect of copper on the ability of larvae to escape from the direct predation of dragonflies in the laboratory, where most were consumed rapidly. However, the behavioural and neurological changes documented could result in *Cx. pipiens* larvae being more vulnerable to predation in natural habitats. Copper likely bioaccumulated and was passed on in eggs, and/or had other maternal or gene expression effects, resulting in harmful effects on offspring. Abstract: Copper is an essential metal that occurs chronically in the environment and affects the development and physiology of aquatic insects. In excess amounts, it can impair their nervous system and behaviour. We tested the anti-predatory behaviour of *Cx. pipiens* larvae after seven days exposure with several concentrations of copper up to 500 mg L<sup>-1</sup>. We measured responses to non. consumptive (predation cues) and consumptive predation (dragonfly larvae) across two generations. We also tested the accumulated effect of copper on AChE enzyme activity. We exposed half of treated and control larvae to predation cues (water with

predator odour and crushed conspecifics) and the other half to water without predation cues. We evaluated total distance moved and velocity. Copper reduced the distance moved and velocity, with stronger effects in the second generation. Copper had no significant effect on larvae eaten by dragonflies. Copper inhibited the AChE enzyme across both generations at 500 µg L<sup>-1</sup>. Copper can affect the nervous system directly by inhibiting AChE activity, and possibly also by impairing the olfaction sensors of the larvae, resulting in larval inability to detect predation cues." (Authors)] Address: Amer, N.R., Entomology Department, Faculty of Science, Cairo University, Giza 12613, Egypt

**20898.** Appel, E.; Michels, J.; Gorb, S.N. (2022): Chapter 2: Native Resilin: Properties, Occurrence and Biological Functions of a Remarkable Bio-elastomer. In: Namita Roy Choudhury, Julie C Liu, Naba K Dutta (eds.): Biomimetic Protein Based Elastomers: Emerging Materials for the Future Editors: 8-44. (in English) ["Resilin is an elastomeric protein that occurs in arthropod exoskeletons and stands out for its almost perfect resilience of 92–97%, the reason why it is often called a rubber-like protein. It consists of long, randomly oriented proline- and glycine-rich polypeptide chains of high mobility and little secondary structure, which are covalently linked by dityrosine and trityrosine cross-links. This structure endows resilin with a low stiffness, high long-range deformability, and outstanding resilience. Resilin often forms composites with chitin via its chitin-binding domain and with other proteins. Based on the amount and purity of resilin, the direction of the embedded chitin fibres, the specific structure of resilin's polypeptide chains, and the ratio of di- and trityrosine cross-links, resilin shows divergent mechanical responses to different directions and types of applied force. So far, resilin has been found in various exoskeleton systems, including leg and wing joints, vein joints and membrane areas, tarsal setae, tendons, sensory organs, and specialised structures like food-pumps, sound production organs, extensible abdominal cuticles, and transparent optical elements. Amongst others, resilin serves the generation of deformability and flexibility, the elastic energy storage, the adaptability to uneven surfaces in contact, and the reduction of material fatigue in these exoskeleton systems. ... 2.3 Conclusion: Resilin occurs in a large variety of exoskeleton systems. This intrinsically disordered protein stands out for its high flexibility, resilience, and long-range deformability and exists in either virtually pure form or as a composite, the latter combining diverse properties and advantages of the involved materials. This allows resilin-supplemented systems to efficiently fulfil a broad range of different, highly specialised functions, ranging from the acceleration of catapult-like jumps and the increase in the transparency of compound eyes or the improvement of tarsal attachment ability to the sealing of wounds and the overall reduction of material fatigue and damage. The extraordinary properties of resilin and resilin composites have probably been the basis for the evolution of such highly diverse resilin-supplemented systems in arthropods and are nowadays the reason for the development of resilin-like polypeptide-based biomaterials and resilin-inspired engineering applications." (Authors)] Address: Michels, J., Dept Functional Morphology & Biomechanics, Institute of Zoology, Christian-Albrechts-Univ. zu Kiel, Am Botanischen Garten 1–9, 24118 Kiel, Germany. Email: jmichels@zoologie.uni-kiel.de

**20899.** Armadan, A.; Badrun, Y.; Gesriantuti, N. (2022): Analysis quality of the river environment on different land use based on macrozoobenthos diversity in Imbo Putui indigenous forest. *Simbiosis* 11(2): 101-109. (in Indonesian,

with English summary) ["River pollution is an environmental problem that often occurs. Community activities and different land uses are strongly suspected of causing pollution. The purpose of this study was to determine the diversity of macrozoobenthos in different land uses and the quality of the aquatic environment in the Petapahan River of the Imbo Putui Indigenous Forest based on the macrozoobenthos diversity index. This study uses 2 indicators, namely macrozoobenthos as a biological indicator and environmental indicators including temperature, brightness, pH, depth, and current velocity. Sampling was carried out at 4 stations with 2 repetitions using the Surber net. The results showed that the macrozoobenthos found came from the order Odonata with the families Gomphidae and Libellulidae and the order Coleoptera with the family Dytiscidae. The diversity index value obtained ranges from  $H' = 0.58-0.67$ , the index value shows the diversity of animals is classified as low with uneven or low uniformity ( $E = 0.53-0.61$ ) and the dominance that occurs is classified as moderate ( $C = 0.52-0.61$ ). The results of the measurement of environmental parameters showed that the temperature at each station was 28°C with a brightness to the bottom of the waters and a depth of 37-56 cm, current speed ranged from 6.56-12.25 m/s and water pH ranged from 4.9-7.9." (Authors)] Address: Armadan, A., Fakultas Matematika Ilmu Pengetahuan Alam dan Kesehatan, Universitas Muhammadiyah Riau, Indonesia. Email: 180202004@student.umri.ac.id

**20900.** Asensio, R. (2022): Primera cita de *Lestes dryas* Kirby, 1890 (Odonata, Lestidae) para Bizkaia (País Vasco, España). First record of *Lestes dryas* Kirby, 1890 (Odonata, Lestidae) from Bizkaia (Basque Country, Spain). *Munibe, Cienc. nat.* 70: 5 pp. (in Spanish, with English and Basque summaries) [Basque Country, Spain, "L. dryas is reported, at an unusual altitude for the species (< 200 m a.s.l.), in Güeñes (Enkarterri). With this first record, there are 47 species (21 Zygoptera and 26 Anisoptera) that make up the catalogue of Odonata in Bizkaia." (Author)] Address: Asensio, R., CUESTASENSIO S.C. Antonio de Trueba, 8-5º 48012, Bilbao, Spain. Email: cuestasensio@gmail.com

**20901.** Bacal, S.; Tuguleva (Hacina), C.; Busmachiu, G. (2022): Impactul antropoc asupra entomofaunei (Lepidoptera, Coleoptera, Odonata, Hemiptera) în municipiul Chisinau. In: Evaluarea și reglementarea impactului antropoc asupra stabilității ecosistemelor urbane și rurale din Regiunea de Dezvoltare Nord a Republicii Moldova. 7 noiembrie 2022, Chisinau. Chisinau, Republica Moldova: Institutul de Ecologie și Geografie, 2022, pp. 99-105. ISBN 978-9975-3586-0-6: 99-105. (in Romanian, with English summary) ["The paper includes the results of the study of the anthropogenic impact on the insect biodiversity of the green spaces of Chisinau Municipality. A total of 99 species of insects were identified in the urban ecosystems, between them 73 species of butterflies, 14 beetles, 9 dragonflies and 3 bedbugs, including 7 pest species and 10 rare species. The anthropogenic environment negatively influences the insect diversity, but is tolerant of harmful invasive species." (Authors) *Anax imperator*, *A. parthenope*, *Aeshna affinis*, *Calopteryx splendens*, *Ischnura elegans*, *Orthetrum albistylum*, *O. cancellatum*, *Sympetrum striolatum*, *S. sanguineum*] Address: not stated

**20902.** Balua, R.; Dutta, N.K.; Choudhury, N.R. (2022): Chapter 5: Resilin-mimetic polypeptides and elastomeric modular protein polymers: Amino acid sequence, conformational ensemble, and stimuli responsiveness. In: Namita Roy Choudhury, Julie C Liu, Naba K Dutta (eds.): Biomimetic

Protein Based Elastomers: Emerging Materials for the Future: 108-143. (in English) ["5.7 Conclusions: In summary, the largely unordered structure of RLPs originates from high glycine and proline amino acid content (430%) similar to that of elastomeric IDPs, and the presence of a large fraction (30%) of recurring P-X<sub>n</sub>-G motifs (where X is the other amino acid apart from P and G, and n varies from 0 to 4) repeating every 4 to 9 residues in the primary sequence. The intrinsically disordered structure of RLPs and RLP-based modular protein polymers has also been experimentally established using techniques, such as CD spectroscopy, FTIR, NMR, and SAS, which reveal an ensemble of random coil secondary structure with the coexistence of small fractions of turns and PPII conformation in equilibrium. The multistimuli responsiveness and self-assembly of RLPs originate from their unique amino acid sequence, hydrophilic composition, and dynamic architecture, where the dual-phase transition behavior comes from the fusion of a putative LCST motif (APGGGN) and a UCST motif (GRPSD-SYG) in the primary sequence. The critical solution temperature behavior of RLPs is related to unfavorable solvent entropy, where the polypeptides collapse into amorphous coacervates and their LCST can be modulated by either altering the hydrophobicity of amino acids or their charge. Moreover, the UCST behavior of RLPs is considered to originate from a set of sequence-specific features, such as the overall fraction of charged residues, arginine and aromatic residues, and net charge per residue. The self-assembly (soluble, micellar, fibrillar, and coacervates) of RLPs and RLP-based modular protein polymers are substantially influenced by the RLP chain length, sequence, and hydrophobicity of copolypeptides, their overall composition, and solvent pH. The highlighted key information shall provide fundamental knowledge and understanding of RLPs for improved rational design and development strategies of resilin protein-based smart biomaterials." (Authors) References to dragonflies are made.] Address: Balu, R., Chemical and Environmental Engineering, School of Engineering, RMIT University, Melbourne, Victoria 3000, Australia. Email: namita.choudhury@rmit.edu.au

**20903.** Barbosa, H.M.; Ferreira, H.L.M.; Virgilio, L.R. (2022): Insetos aquáticos bentônicos em ambientes florestados e não florestados em rios do Vale do Juruá. *Biotemas* 35(4): 1-13. (in Portuguese, with English summary) ["Benthic aquatic insects in forested and non-forested environments in rivers of the Juruá Valley. Fresh water ecosystems have been constantly threatened by anthropogenic stressors, placing a burden on benthic aquatic insect community structures. Hence, the aim of this study is to evaluate aquatic insect diversity in a gradient of forested and non-forested areas between the dry and rainy seasons in rivers of the Juruá Valley. 675 individuals were collected, 70.63% were collected during the dry season and 29.37% were collected during the rainy season, distributed among the orders Diptera, Ephemeroptera, Odonata e Trichopteran. There was greater abundance of the order Diptera when compared to the other taxons. Significant differences between the forested and non-forested environments in both seasonal periods were observed with greater diversity and equitability found in forested environments. Family richness and diversity presented a relation to oxygen levels dissolved in water and chlorophyll concentrations in forested environments during the dry season, and all environments sampled presented a slightly acidic pH, close to neutral. The study demonstrated there was a large incidence of generalist organisms whose characteristics are adaptive to negative changes, thus demonstrating that impacts caused to the localities

alter aquatic insect composition." (Authors) Taxa are treated at family level.] Address: Barbosa, Hilaritssa Moura, Universidade Federal do Acre, Campus Floresta, Laboratório de Ecologia Aquática CEP 69.980-000, Cruzeiro do Sul – AC, Brasil. Email: hilaritssa@gmail.com

**20904.** Belmont, J.; Miller, C.; Scott, M.; Wilkie, C. (2022): A new statistical approach for identifying rare species under imperfect detection. *Diversity and Distributions* 28(5): 882-893. (in English) ["Aim: Species rarity is often used as a measure to assess the risk of extinction of species, and thus, different methods have been developed to describe the composition of rare species in biological communities. These methods usually depend on species attributes that are not always available and very often ignore imperfect species detection. In this work, we developed a new method to characterize species rarity in a community when species are detected imperfectly. Our modelling framework is based on Bayesian occupancy models to estimate species distributions under imperfect detection using presence-absence data. Innovation: We propose a finite mixture occupancy model to identify rare species based on their occupancy and class-membership probabilities. Here, we explored a two-class finite mixture model to distinguish between rare and common species classes and presented the general modelling framework for a problem with more than two classes. By using simulations, we were able to compare our model results under different scenarios obtaining a high classification performance across all of them. Additionally, we applied our model to a data set of Odonata occurrence records that were partially observed due to imperfect detection and quantified the proportion of rare species on a national scale across waterbodies in the United Kingdom. Main conclusions: Nowadays, biodiversity conservation involves monitoring programmes that target multiple species within a community where individual species responses may vary widely. This high variability makes the task of identifying the ecological processes that drive distributions of rare species difficult. Thus, our method represents a new approach to characterize the composition of a community in terms of species rarity while correcting for detectability bias. Our modelling framework also suggests lines of research and future developments for the understanding of how species rarity can be measured in a wide range of scenarios." (Authors)] Address: Belmont, J., School of Mathematics & Statistics, Univ. of Glasgow, University Place, G12 8QQ Glasgow, UK. Email: j.belmont-osuna.1@research.gla.ac.uk

**20905.** Bensakhri, Z.; Bensouilah, S.; Zebba, R.; Youcefi, A.; Amari, H.; Zouaimia, A.; Lazli, A.; Houhamdi, M.; Khelifa, R. (2022): Trends to adaptation of the Sahara frog (*Pelophylax saharicus*) larvae across an environmental gradient. *Biologia* 77: 2857-2866. (in English) ["Species adjust their behavior and life-history to adapt to local environmental conditions. Species with a broad ecological niche often show signatures of local adaptations to different environment, particularly in extreme ones. Here, we investigate local adaptation in different populations of the North African Sahara frog (*Pelophylax saharicus*) living in various environmental conditions that vary mostly in temperature, precipitation, and elevation by mean of common garden experiment aiming to estimate the growth rate under two predation treatments (absence or presence of non-lethal cues of dragonfly larvae). First, we found an elevational cline in the reproductive phenology where, from low to high elevation, the reproductive season shifts to later dates, whereas that in arid environment was later than all other populations. We suggest that geographic differences in temperature and rainfall

(in arid areas) explain this phenological pattern. Second, hatching success was overall high but showed a slight decline across elevation. Third, growth rate was generally faster in low and intermediate elevation populations, but slower in high elevation and arid environment populations. Populations in low and intermediate elevation responded to predation by reducing growth rate and the size at metamorphosis, but no predatory responses were recorded in high elevation and arid environment populations. Our study shows some life history signatures of local adaptation of *P. saharicus* in Northeast Algeria, which does not go in line with recent genetic analysis showing low population differentiation in the region." (Authors)] Address: Bensouilah, S., Dept Biol., Fac. Sciences, Amar Telidji Laghouat Univ., Laghouat, Algeria

**20906.** Brinet, A.; Ziar, A. (2022): Les macroinvertébrés benthiques bioindicateurs de la qualité écologique des milieux lotiques: cas d'Oued Cherf et affluents Nord. Est d'Algérie. MSc. thesis, Faculté des Sciences de la Nature et de la Vie, Sciences de la Terre et de l'Univers, Université 8 Mai 1945 Guelma: VIII + 68 pp. (in French, with English and Arabian summaries) ["This work focuses on the inventory and characterization of the diversity of benthic macroinvertebrates along the Cherf wadi, from samples taken monthly between February and May 2022. Five (5) stations carefully chosen on the longitudinal profile of the course of characterized by temporary to permanent flow regimes often affected by a very high inter-annual variability. The investigation of macroinvertebrates was made during the wet season according to the sampling protocol of the standardized global biological index (IBGN). Thus, a "Surber" with a unit surface of 1/20 m<sup>2</sup> and a mesh size of 100 µm was used at the level of the five stations for the harvesting of macroinvertebrates. Before sampling, ten (10) physico-chemical parameters (temperature, pH, conductivity, water salinity, redox potential, dissolved oxygen concentration, total dissolved solids, resistivity, atmospheric pressure, transparency and depth) were measured at each station. The fauna identified during this study consists of 2794 individuals corresponding to 14 Families belonging to 4 main faunal groups (insects, Molluscs, Annelids and crustaceans). The number of benthic populations showed that Diptera, Ephemeroptera and Trichoptera are the most numerically inventoried. Molluscs, Achètes, Odonates and Crustaceans constitute only a small fraction of the total fauna. The results of the index (IBGN) revealed that the waters of Cherf are of average quality. The preponderance of these three families of pollution-sensitive macroinvertebrates attests to the average quality of this watercourse. The diversity indices indicate that the macroinvertebrate community of Cherf is unbalanced and not very diversified. The intense human activities in this part have resulted in average organic pollution, which results in a proliferation of polluo-sensitive macroinvertebrates to the detriment of polluo-resistant ones. The purpose of this report is to give a first overview of the springtime diversity of benthic macroinvertebrates present, as well as the information they can provide as bioindicators of local contexts." (Authors)] Address: not stated

**20907.** Brockhaus, T. (2022): Die Verwandlung der Libellen. lange Zeit ein Mysterium in der Entomologie (Odonata). Teil 1. Entomologische Nachrichten und Berichte 66: 102-111. (in German, with English summary) ["The metamorphosis of dragonflies. a long-time mystery in entomology (Odonata). Part 1. Insect development cycles have been the focus of nature observation since ancient times. Initially, utility consideration were a driving force behind these observations. Aristotle developed the thesis of spontaneous

generation in many insects (genesis automates). The scientific knowledge of Aristotle and Pliny the Elder also shaped the world of thought in medieval scholasticism. Since dragonflies were of no direct benefit for humans, they were for a long time not in focus of observations. Although dragonflies were in early modern times known as flying insects (with more than one name), and their larvae as "water worms" but there was no evidence that these animals belonged together it was not until the 17th and the beginning of the 18th century that naturalists discovered the relationships between larval stages and adults through observation of nature and the use of the microscope. Worth mentioning here are Conrad Gessner, Johannes Goedaerd, Leonhard Baldner, Jan Swammerdam, Johann Leonhard Frisch, Maria Sibylle Merian, August Johann Rösel von Rosenhof and Rene-Antoine Ferchault de Reaumur. During this time dragonflies and damselflies and their larval stages were also included in collections of natural objects, and were listed in their catalogs. The work of Maria Sibylle Merian and August Johann Rösel von Rosenhof ensured the rapid dissemination of this knowledge. This was made possible by the rapid development of the art of printing and painting. Research on the development cycles of various species of dragonflies is still relevant to this day." (Author)] Address: Brockhaus, T., An der Morgensonne 5, D-09387 Jahnsdorf, Germany. E-mail: T.Brockhaus@t-online.de

**20908.** Buczynski, P.; Buczynska, E.; Hunger, H.; Wildermuth, H. (2022): Ein ungewöhnlicher Schlupfunfall bei der Falkenlibelle *Cordulia aenea* (Odonata: Corduliidae). Mercuriale 22: 83-88. (in German, with English summary) ["An unusual emergence accident in *Cordulia aenea*. – In Mai 2022, a "sandwich" consisting of two exuviae and an incompletely emerged imago of *C. aenea* stuck between them was found and photographically documented near Lublin (Poland). Obviously, the abdominal tip of the emerging dragonfly remained stuck in the exuvia because a second larva, ready to emerge, climbed onto the incompletely emerged imago at the same moment. The imago was trapped and could therefore not finish its emergence procedure while the wings unfolded without hindrance. This is the first record of a previously undescribed cause of death in dragonflies during emergence." (Authors)] Address: Buczynski, P., Dept of Zool., Maria Curie-Skłodowska University, Akademicka 19, 20-033 Lublin, Poland. Email: pawbucz@gmail.com

**20909.** Büsse, S.; Wildermuth, H.; Gorb, S.N. (2022): Morphological adaptations of the mouthparts to the ectoparasitic lifestyle of the biting midge *Forcipomyia paludis* (Diptera: Ceratopogonidae), specialized in Odonata. Zoomorphology 141: 307-314. (in English) ["Damselflies and dragonflies are well-known hosts of the West Palearctic biting midge *Forcipomyia paludis*. Females of this ectoparasitic dipteran mainly cling to the host's wings, sucking hemolymph from the wing veins. The midges are firmly attached to the wing surface with specialized tarsi, thus not being flung away during the host's flight maneuvers. As for another ceratopogonid—*F. odonatophila* from New Guinea—had been suggested, we assumed that in *F. paludis*, the attachment would be reinforced by the mouthparts during the suction action. In the present study, we used behavioral field observations, scanning electron microscopy (SEM) and high-resolution micro-computed tomography (µCT), to study the mouthparts of *F. paludis*. We focused on the mouthpart configuration post sucking and thus on the contact with the host's wing as well as on the piercing process into the wing veins. We foster our understanding of *F.*

paludis being a parasite of Odonata by showing proof of the piercing and therefore the sucking of hemolymph from the wings. Additionally, the mouthparts clearly show contamination with odonate wing wax after the sucking procedure. Furthermore, we discuss probable additional functions of the piercing process for the firm attachment to the flying host of *F. paludis*." (Authors)] Address: Büsse, S., Dept Functional Morphology & Biomechanics, Inst. Zoology, Kiel University, Am Botanischen Garten 9, 24118, Kiel, Germany

**20910.** Cancellario, T.; Miranda, R.; Baquero, E.; Fontaneto, D.; Martínez, A.; Mammola, S. (2022): Climate change will redefine taxonomic, functional, and phylogenetic diversity of Odonata in space and time. *npj Biodiversity* (2022) 1:1; <https://doi.org/10.1038/s44185-022-00001-3>: 14 pp. (in English) ["Climate change is rearranging the mosaic of biodiversity worldwide. These broad-scale species re-distributions affect the structure and composition of communities with a ripple effect on multiple biodiversity facets. Using European Odonata, we asked: i) how climate change will redefine taxonomic, phylogenetic, and functional diversity at European scales; ii) which traits will mediate species' response to global change; iii) whether this response will be phylogenetically conserved. Using stacked species distribution models, we forecast widespread latitudinal and altitudinal rearrangements in Odonata community composition determining broad turnovers in traits and evolutionary lineages. According to our phylogenetic regression models, only body size and flight period can be partly correlated with observed range shifts. In considering all primary facets of biodiversity, our results support the design of inclusive conservation strategies able to account for the diversity of species, the ecosystem services they provide, and the phylogenetic heritage they carry in a target ecosystem." (Authors) Supplementary information: <https://www.nature.com/articles/s44185-022-00001-3#Sec25>] Address: Cancellario, T., University of Navarra, Biodiversity and Environment Institute BIOMA, Irunlarrea 1, 31080 Pamplona, Spain. Email: [tcancellari@alumni.unav.es](mailto:tcancellari@alumni.unav.es)

**20911.** Carvalho, F.G.; Duarte, L.; Seger, G.D.S.; Nakamura, G.; Guillermo-Ferreira, R.; Cordero-Rivera, A.; Juen, L. (2022): Detecting Darwinian shortfalls in the Amazonian Odonata. *Neotropical Entomology* 51: 404-412. (in English) ["Among the oldest winged insects, odonates are a monophyletic order that have become important models for ecological studies because of their highly diverse reproductive behaviors and their role as top predators and bioindicators. However, knowledge on evolutionary relationships within the order is still scarce compared to other taxa, and this situation is even more complicated in areas with high biodiversity, such as in the Amazon. Here, we sought to identify knowledge gaps on Amazonian Odonata regarding three main aspects: (i) how the inclusion of Amazonian taxa affects our interpretation of the evolutionary relationships of Zygoptera and Anisoptera; (ii) the position of Amazonian taxa in the existing supertree of the Odonata; (iii) dating evolutionary divergence between nodes using fossil records; (iv) assessing whether more species-rich basins (e.g., Amazon basin) have a larger phylogenetic gap when compared to basins with lower richness in South and Central America; and (v) in the light of our knowledge, we discuss diversification patterns found in the most predominant clades of Amazonian taxa. We built a supertree from currently available phylogenetic information of Odonata. The results show that there is no genetic information for 85% (n: 503) of the Amazonian species and that family level relationships are unknown for 17 genera. After compiling the data, we observed

that clades belonging to Neotropical lineages are the most poorly resolved, with large polytomies. This problem was identified in many Anisoptera genera, such as *Macrothemis*, *Dasythemis*, *Elasmothemis*, and *Erythrodiplax*. Our results also suggest that not always the richest basins have the greatest phylogenetic gaps. As expected, we found important gaps in the existing Odonata phylogenies, especially in clades that include Amazonian representatives, that are also those less known from ecological and conservation perspectives." (Authors)] Address: Carvalho, F.G., Lab de Ecologia e Conservação, Instituto de Ciências Biológicas, Univ Federal Do Pará. UFPA, Belém, Pará, Brazil. Email: [fernandogeraldocarvalho@gmail.com](mailto:fernandogeraldocarvalho@gmail.com)

**20912.** Cetinic, K.A.; Grgic, I.; Previšić, A.; Rožman, M. (2022): The curious case of methylparaben: Anthropogenic contaminant or natural origin? *Chemosphere* 294, May 2022, 133781: 9 pp. (in English) ["Highlights: • Methylparaben both endocrine disrupting compound and naturally produced metabolite. \*In situ and microcosm experiments assessed natural presence and transfer of methylparaben. \*Methylparaben was detected in all biota across sites unimpacted by contamination. \*Methylparaben may have a natural origin and function in moss and invertebrates. \*Our findings suggest methylparaben may not be solely a harmful anthropogenic contaminant. Abstract: The widespread use of methylparaben as a preservative has caused increased exposure to natural aquatic systems in recent decades. However, current studies have suggested that exposure to this compound can result in endocrine disrupting effects, raising much concern regarding its environmental impact. In contrast, methylparaben has also been found to be part of the metabolome of some organisms, prompting the question as to whether this compound may be more natural than previously assumed. Through a combination of field studies investigating the natural presence of methylparaben across different taxa, and a 54-day microcosm experiment examining the bioaccumulation and movement of methylparaben across different life stages of aquatic insects (order Trichoptera), our results offer evidence suggesting the natural origin of methylparaben in aquatic and terrestrial biota. This study improves our understanding of the role and impact this compound has on biota and challenges the current paradigm that methylparaben is exclusively a harmful anthropogenic contaminant. Our findings highlight the need for further research on this topic to fully understand the origin and role of parabens in the environment which will allow for a comprehensive understanding of the extent of environmental contamination and result in a representative assessment of the environmental risk that may pose." (Authors)] Address: Cetinic, Katarina, Ruder Bošković Institute, Zagreb, Croatia. Email: [kcetic@irb.hr](mailto:kcetic@irb.hr)

**20913.** Cezário, R.R.; Gorb, S.N.; Guillermo-Ferreira, R. (2022): Camouflage by counter-brightness: the blue wings of Morpho dragonflies *Zenithoptera lanei* (Anisoptera: Libellulidae) match the water background. *Journal of Zoology* 317(2): 92-100. (in English) ["Bright iridescent colours are widespread in several aquatic and terrestrial animal taxa and are usually involved in intraspecific communication and/or predator avoidance. Camouflage by iridescence may be one strategy to avoid predators when the animal exhibits bright colours that match the brightness of its surroundings. Hence, animal structural colouration may have a "brightness matching" or "counter-brightness" function when observed against bright or glossy backgrounds. Here, we addressed the role of such counter-brightness effect of the iridescent wings of the Morpho dragonfly *Zenithoptera lanei*

for avoiding detection. We hypothesized that the bright reflectance of the dragonfly wings is cryptic against the bright water surface and the glossy vegetation where they naturally occur, protecting the dragonfly from visually oriented predators, deceiving prey and signalling to conspecifics when desired. We addressed whether (1) the iridescent colours of *Z. lanei* wings function as a visual strategy to reduce their wing detectability by brightness matching the background and (2) the detectability of wings against vegetation and water varies according to the observer. For this, we modelled how conspecifics, dipteran prey and predatory birds see the odonate wings against the vegetation of the Neotropical Savannah and against the water surface where the dragonflies perch. Our results suggest that *Z. lanei* dragonflies can avoid detection by predators, prey and conspecifics when perched on their natural habitats (i.e., ponds) against the bright background of the water surface. Here, we add evidence to the multifunctionality of structural colours in animals and the function of iridescence in camouflage. The bright iridescence and ultraviolet reflective nanostructures of *Z. lanei* wings when coupled with striking behavioural displays may provide a dynamic and safe intraspecific communication channel." (Authors)] Address: Guillermo-Ferreira, R., Department of Biological Sciences, Universidade Federal do Triângulo Mineiro, Uberaba, MG, Brazil. E-mail: rhainerguillermo@gmail.com

**20914.** Chainthong, D.; Boonsoong, B. (2022): Taxonomy and distribution of the gomphid dragonfly *Orientogomphus minor* (Laidlaw, 1931) (Odonata: Gomphidae) in Thailand. *Diversity* 2022, 14(4), 291; <https://doi.org/10.3390/d14040291>: 12 pp. (in English) ["The taxonomy and distribution of *Orientogomphus minor* (Laidlaw, 1931) were investigated in Thailand. Gomphid nymphs were collected from 28 sampling sites in streams in eastern, western, and southern Thailand. The nymph of *O. minor* is described for the first time and the male is re-described and illustrated based on a reared specimen. The taxonomic characteristics of the nymphs of the genus *Orientogomphus* are discussed. The nymph of *O. minor* differs from that of *O. armatus* Chao & Xu, 1987, the only other *Orientogomphus* species with a described nymphal stage, by the presence of lateral spines on abdominal segments six to nine and by a slender, stick-shaped third antennal segment. Multivariate analyses revealed a strong correlation between the distribution of *O. minor* and other three gomphid species with restricted distribution in Thailand (*Nychogomphus duaricus* (Fraser, 1924), *Onychogomphus louissiriusi* Fleck, 2020 and *Stylogomphus thongphaphumensis* Chainthong, Sartori & Boonsoong, 2020). Those species were recorded solely in streams in the western part of the country. Nymphs of *O. minor* were predominantly associated with stony substrates." (Authors)] Address: Chainthong, D., Animal Systematics and Ecology Speciality Research Unit (ASESRU), Department of Zoology, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand. Email: damrong.cha@ku.th

**20915.** Chakradhari, S.; Tiwari, R. (2022): Insect diversity of the Mukundpur Tiger reserve, Satna (M.P.). *Journal of Entomology and Zoology Studies* 10(2): 110-114. (in English) ["An inventory of species diversity of insects of the Mukundpur Tiger Reserve, Satna (M.P.). Small insects with soft body were collected by hand with the help of a fine camel hair brush and forceps, and then preserved in 70% alcohol by dipping the soft brush in to the medium. Sweeping nets were used to collect the insect from plants. A long stick was used for beating the plants harbouring insects. A big size cloth spread over the ground to collect the falling insects.

Total recorded aquatic insect sp. distribution was expressed in higher to lower order as Coleoptera (36), Hemiptera (22), Odonata (11), Diptera (6), Ephemeroptera (4), and Trichoptera (2). Aquatic insect Order as per the comparative evaluation Coleoptera was found in utmost count compared through Hemiptera, Odonata, Diptera, Ephemeroptera, and Trichoptera. The order Coleoptera consist (45%), Hemiptera (27.16%), Odonata (13.58%) [n=10 taxa], Diptera (7.40%), Ephemeroptera (4.90%), and Trichoptera (2.46%) from observed aquatic insect species. MKPTSR is a well-distinguished place intended for the affluence of coleopteran fauna." (Authors)] Address: Tiwari, R., Department of Zoology, Govt. P.G. College, Satna, Madhya Pradesh, India

**20916.** Chavez Cruz, R.A. (2022): Evaluación de la calidad del agua mediante la bioindicación de macroinvertebrados acuáticos, en un tramo del río Toribio, cienega Magdalena, Colombia. Water quality evaluation through bioindication of aquatic macroinvertebrates, in a section of the Toribio river, cienega Magdalena, Colombia. *Ciencia e Ingeniería* 9(2): 14 pp. (in Spanish, with English summary) ["The main purpose was to assess water quality by identification of aquatic macroinvertebrates in a stretch of the Toribio River. The macroinvertebrates collection was carried out with a Surber network at the points chosen from the Toribio River. A total of 1126 individuals were collected; 642 in the dry period and 484 in the rainy period; a total of 36 morphofamilies were observed (24 in the dry season and 26 in the rainy season). The insecta class was the most abundant 32 morphs; the Odonata order was the most representative with 7 morphs. Regarding the families, only four (4) registered more than one morph: Coenagrionidae (5) [Gomphidae, Libellulidae], Chironomidae (3), Leptophlebiidae (2) and Tricorythidae (2). According to the results of the BMWP and EPT indices, the quality of the water in the monitored section of the Toribio river varies between points and sampling times, establishing that the general condition of this section is "critical to doubtful". Based on the composition and structure of aquatic macroinvertebrates observed, we can say that the studied section of the Toribio River presents some degree of disturbance." (Authors) Taxa are treated at family level] Address: Chavez Cruz, R.A., Universidad Internacional Iberoamericana, Colombia, Ciencia e Ingeniería, Univd de La Guajira, Colombia. Email: richardchavezacruz@gmail.com

**20917.** Chovanec, A. (2022): Reaktion der Kleinen Pechlibelle, *Ischnura pumilio* (Charpentier, 1825) (Odonata: Coenagrionidae), auf sich verändernde Lebensraumbedingungen. *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen* 74: 21-54. (in German, with English summary) ["Response of the Scarce Blue-tailed Damselfly, *Ischnura pumilio* (Charpentier, 1825), to changing habitat conditions (Odonata: Coenagrionidae). – A groundwater-fed, sunny, and shallow wetland with a size of 1.200 m<sup>2</sup> in Maria Enzersdorf (Lower Austria) was subject of an odonatological study carried out from 2016 to 2021. The water body was situated in an overflow and seepage reservoir created in 2014. A high number of observation days (236) within the six years allowed analyses of phenological features, flight periods, etc. *Ischnura pumilio* was recorded at the study site from 2016 to 2019. In each year, teneral and juvenile specimens were found. In 2016, small open water areas and low amphibious vegetation characterised the wetland. In that year, *I. pumilio* was the most abundant species within the odonate community comprising 27 species. It was bivoltine with higher numbers of specimens in the second generation: The spring/early summer generation comprised about 100 individuals, the midsummer generation about



250. In the following years, the rapid expansion especially of *Typha latifolia* led to a complete and dense coverage of the water body. The response of *I. pumilio* to deteriorating habitat conditions was a significant decline in the number of individuals: 2016 – total number 350; 2017 – 30; 2018 – 18; 2019: 5. In contrast to the population structure in 2016, the second generation in 2017 was smaller than the first. In 2018 and 2019, *I. pumilio* was represented by only one generation. The second generation of 2017 and the single generations of 2018 and 2019 occurred during a shorter time compared to the species-specific flight period. Furthermore, a decline of reproduction behaviour was apparent: In 2016, at 23 of the 31 days with records of *I. pumilio* copulae and/or tandems were observed, which corresponds to 74 %. This percentage decreased to 55 % in 2017, and 10 % in 2018. In 2019, no reproduction behaviour was recorded at all." (Author)] Address: Chovanec, A., c/o Umweltbundesamt, Spittelauer Lände 5, 1090 Wien, Austria. E-mail: chovanec@ubavie.gv.at

**20918.** Cozzer, G.D.; Rezende, R. de S.; Lara, T.S.; Machado, G.H.; Magro, J.D.; Albeny-Simões, D. (2022): Predation risk effects on larval development and adult life of *Aedes aegypti* mosquito. *Bulletin of Entomological Research* 113(1): 29-36. (in English) ["Biological control is one of the methods available for control of *Aedes aegypti* populations. We used experimental microcosms to evaluate the effects of actual predation and predation risk by dragonfly larvae (Odonata) on larval development, adult longevity, and adult size of *Ae. aegypti*. We used six treatments: control, removal, variable density cues (Cues VD), fixed density cues (Cues FD), variable density predator (Predator VD), and fixed density predator (Predator FD) (n = 5 each). Predator treatments received one dragonfly larva. Cue treatments were composed of crushed *Ae. aegypti* larvae released into the microcosm. For the FD treatments, we maintained a larval density of 200 individuals. The average mortality of *Ae. aegypti* larvae in the Predator VD treatment was used as the standard mortality for the other treatments. Mosquitoes from the Predator VD and Cues VD treatments developed faster, and adults were larger and had greater longevity compared to all other treatments, likely due to the higher food availability from larval density reduction. High larval density negatively affected larval developmental time, adult size, and longevity. Males were less sensitive to density-dependent effects. Results from this study suggest that the presence of predators may lead to the emergence of adult mosquitoes with greater fitness, causing an overall positive effect on *Ae. aegypti* population growth rates." (Authors)] Address: Cozzer, G.D., Community Univ. of the Chapecó Region. Postgraduate Program in Environmental Sciences. Lab. of Ecol. Entomology, Chapecó, SC, Brazil.

**20919.** Czerniawska-Kusza, I. (2022): Assessing benthic macroinvertebrates in relations to environmental variables and revitalisation works. *Ecological Chemistry and Engineering S* 29(1): 99-110. (in English) ["Macroinvertebrates of two ex-manor ponds located in Chroscina, Opole Region (Poland) were studied from 2015 to 2018 to investigate their community composition and diversity and evaluate the heterogeneity of communities on spatial and temporal scale referring to environmental variables and revitalisation work. A total of 32 taxa were recorded (at the family level, except Oligochaeta), 13 of which were Ephemeroptera, Odonata and Trichoptera, recognised as sensitive groups in lentic ecosystems. Macroinvertebrate richness and diversity varied considerably, especially in spring and summer. It was found that habitat heterogeneity influenced benthic invertebrates

more than basic water parameters. However, the environmental variables together accounted for only 38 % of the observed variations. Thus, other factors, such as fish predation, may have played a leading role in community shaping. The distinct differences between pond communities, four years after the revitalisation works, resulted more from different habitat features than from the previous sediment removal." (Author) *Ischnura elegans*, *Coenagrion* sp., *Platycnemis pennipes*, *Aeshna cyanea*, *Orthetrum cancellatum*, and *Somatochlora metallica* are listed.] Address: Czerniawska-Kusza, Izabela, Institute of Biology, Faculty of Science and Technology, University of Opole, ul. Oleska 22, 45-052 Opole, Poland. Email: kuszaiz@uni.opole.pl

**20920.** De Knijf G. 2022. First records of Orange-winged Dropwing (*Trithemis kirbyi*) from Belgium. *Brachytron* 23: 28-32. In Dutch, with English summary. [T. kirbyi was observed twice in southern Belgium in the summer of 2022, being a new species for the Belgian fauna. This afro-tropical species was first observed in Europe in 2003. Since then in less than 10 years it colonized much of Spain and was first observed in France in 2017. On 22 July and 2 August 2022 two males of T. kirbyi were photographed at the river Semois in the villages of Chassepierre and Lacuisine (Forenville) in southern Belgium. These are the most northern records for this species. The occurrence of this species in Belgium coincides with the heat wave at the end of July, when temperatures as high as 38,1°C were recorded. Not only Belgium, but most of western Europe was hit by this heat wave. Most likely warm winds from the south helped the dispersal of some individuals of T. kirbyi so far north.]" (Author) Address: Knijf, G. de, Research Institute for Nature and Forest (INBO), Havenlaan 88 bus 73, 1000 Brussels, Belgium. E-mail: geert.deknijf@inbo.be

**20921.** Deliry, C.; Noally, L.; Ulmer, A.; (coord.); Faton, J.M.; Gillard, A.; Kévin, M.-L.-H.; Souvignet, N.; Tailland, L. (2022): *Libellules et Demoiselles de la Loire. Atlas des Odonates du département de la Loire. Groupe Sympetrum et FNE Loire*: 256 pp. (in French) ["This Atlas of the Dragonflies and Damselflies of the Loiret is the result of a joint effort by two nature protection associations, France Nature Environnement Loire and the Groupe Sympetrum, the regional association for the study and protection of dragonflies in Rhône-Alpes. This work was only possible with the help of more than 320 observers who have collected more than 58,900 odonate observation data in more than 40 years. As a result, the Loire department is one of the best surveyed in France. Wild nature, our marshes, ponds and rivers, our ponds and peat bogs are more than ever threatened by pollution from agricultural pesticides and by the summer warming of almost 3°C in 60 years in the Loire. In wetlands that are sometimes dry all year round, damselflies are more vulnerable than ever. To save the environment, and to save ourselves at the same time, we hope that this book will help motivate citizens and decision-makers to protect and manage wetlands." (Publisher) Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: <http://sympetrum.fr/?p=84>

**20922.** Dharmawan, D.P.R.; Subhan, W.; Rohman, A.; Prihatin, J.; Susilo, V.; Ariyunita, S.; Nurhara B. (2022): Diversity of Dragonflies (Odonata) at Pancur Resort Alas Purwo National Park, Indonesia. *Borneo Journal of Resource Science and Technology* 12(2): 57-62. (in English) ["Alas Purwo National Park is one of the conservation areas located in the east of the island of Java. Dragonflies are crucial to the ecosystem's equilibrium as predator, bioindicator, and vector for disease control. The sensitivity and presence

of dragonflies affect the diversity of dragonflies in a habitat. This inventory can assist the Alas Purwo National Park with additional data and be a basis for making conservation policies. The study aimed to determine the type and diversity index of the dragonflies in this park. The sample location was determined using purposive sampling, and the sample conducted utilised road sampling. This research observed seven species: *Orthetrum glaucum*, *O. chrysalis*, *Lathrecista asiatica*, *Potamarcha congener*, *Copera marginipes*, *Prodasineura autumnalis*, and *Nososticta insignis*. The Libellulidae family had the most species; on the other hand, the Protoneuridae family had the fewest Shannon-Wiener diversity index ( $H' = 1.6$ ). Based on the criteria, the diversity index demonstrated moderate results. Pancur Resort Alas Purwo National Park provided a good environment and supported the survival of dragonflies." (Authors)] Address: Rohman, A., logy Education, Faculty of Teacher Training & Education, University of Jember, 68121, Indonesia. Email: abdu.fkip@unej.ac.id

**20923.** Dimitrov, D.A.; Mollov, I.A. (2022): Effect of the urban heat island in Plovdiv city (Bulgaria) on the species composition and distribution of the dragonflies (Insecta: Odonata). *Ecologia Balkanica* 14(2): 113-121. (in English) ["the current paper researches the impact of the urban heat island effect on the species composition and distribution of dragonflies (Insecta: Odonata) along the Maritsa River in the city of Plovdiv, Bulgaria. The study was conducted on imaginal and larval forms of the species, and the studied area was divided into 3 sub-areas (urban, suburban and rural) according to the proximity to the city center. Along the urban gradient from the rural to the urban zone, an increase in air, water and soil temperature by  $\sim 1-2^{\circ}\text{C}$  was observed. Differences were found also in the dissolved oxygen in the water, which had the highest values in the rural area (10.70 mg/l) and decreased towards the urban area, where it was 9.03 mg/l. Four dragonfly species were confirmed for the study area, and 2 new species were recorded. The most species were found in the urban zone, probably due to the higher temperatures compared to the other two areas, while at the same time, no larvae were found there, due to the lower amount of dissolved oxygen in the water. The current paper gives a better understanding of the impact that the urban heat island effect has on dragonflies in cities and aims to contribute for timely measures and decisions for the management of wetlands around urban areas." (Authors)] Address: Dimitrov, D.A., Univ. Plovdiv "Paisii Hilendarski", Fac. Biol., Dept of Ecology & Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv, Bulgaria. Email: d.dymytrow@gmail.com

**20924.** Doucet, G.; Itrac-Bruneau, R. (2022): Première mention d'*Aeshna isocles* (Odonata: Aeshnidae) dans le Territoire de Belfort. *Martinia* 36 (6): 44-48. (in French) [17-V-2022; first record of *A. isocles* in the Territoire de Belfort] Address: Doucet, G., 8F rue Maurice Deslandres, F-21000 Dijon, France. Email: guillaume.doucet@yahoo.fr

**20925.** Dow, R.A.; Singa, H. (2022): Previously unpublished Odonata records from Sarawak, Borneo, part IX: More Odonata from Limbang Division, including the first records from Gunung Buda National Park. *International Dragonfly Fund. Report* 173: 1-32. (in English) ["Records of Odonata made in Limbang Division in Sarawak during three surveys in 2021-2022 made possible by funding from the International Dragonfly Fund are reported. All locations surveyed are within Limbang District and are grouped into two categories: locations surveyed on day trips from Limbang Town and

locations in the Sungai Mendalam area further inland. All locations are in the lowlands of the division. The lowlands of Limbang Division had not been well studied for Odonata and the results presented here include 50 first records for Limbang Division, bring the total number of species known from the division to 173. In fact slightly more species were recorded during the 2021-2022 surveys than had been recorded from the division prior to 2021. Three of the new additions for Limbang are also first records for Sarawak (*Libellago phaethon*, *Rhinocypha humeralis* and *Oligoaeschna platyura*). The discovery of a large population of *Macrogomphus phalantus* not far from Limbang town is another significant result of the 2021-2022 surveys and is discussed in some detail. Other notable records include *Dysphaea lugens*, *Coeliccia kenyah*, the black form of *Copera vittata*, *Argioconemis rubescens rubeola*, *Teinobasis cryptica*, *Macrogomphus* sp., *Chlorogomphus* sp., the true *Pornothemis serrata* and *P. starrei*. This report includes the first records of Odonata from Gunung Buda NP (a checklist is given in the appendix), where 76 species have been found so far." (Authors)] Address: Dow, R.A., Institute of Biodiversity & Environmental Conservation, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia. Naturalis Biodiversity Centre, P.O. Box 9517, 2300 RA Leiden, The Netherlands. Email: rory.dow230@yahoo.co.uk

**20926.** Dow, R.A.; Wahyudi, D.; Lupiyaningdyah, P. (2022): Odonata from the Loa Buluh Field Station area in East Kalimantan, Indonesia. *Faunistic Studies in Southeast Asian and Pacific Island Odonata* 39: 1-17. (in English) ["The results of a survey of the Odonata in the Loa Buluh Field Station area in Kutai Kartanegara Regency, East Kalimantan, Indonesia, conducted in 2009, are reported. The history of odonatological activity in East Kalimantan is briefly summarised and the primary types of Odonata that originate from the province are listed. Details of the locations at which the 2009 survey took place are given. Sixty-six species were recorded during the survey but because it was not possible to export specimens, so that identifications were made with a hand lens in the field, there is uncertainty over the identity of some of the taxa concerned. Nevertheless, as far as we are aware there are no previously published records of six of the species recorded during the survey (*Elatoneura aurtiaca* (Selys, 1886), *Prodasineura dorsalis* (Selys, 1860), *Prodasineura verticalis* (Selys, 1860), *Archibasis incisura* Lief tinck, 1949, *Mortonagrion* sp. cf *aborensis* (Laidlaw, 1914) and *Macrogomphus decemlineatus* Selys, 1878) from East Kalimantan before. The need for further work on the Odonata of East Kalimantan to be conducted sooner rather than later, especially given the large changes that will occur in the province due to the planned construction of the new Indonesian capital there, is discussed briefly. Previously undocumented variation in *Prodasineura tenebricosa* Lief tinck, 1937 is discussed in the context of one of the species of uncertain identity found during the 2009 survey." (Authors)] Address: Dow, R.A., Institute of Biodiversity & Environmental Conservation, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia. Naturalis Biodiversity Centre, P.O. Box 9517, 2300 RA Leiden, The Netherlands. Email: rory.dow230@yahoo.co.uk

**20927.** Ellenrieder, N. von (2022): *Metaleptobasis daiglei* sp. nov. from Panama (Odonata: Coenagrionidae). *Zootaxa* 5196(3): 433-442. (in English, with Spanish summary) ["*Metaleptobasis daiglei* sp. nov. (Holotype male: PANAMA, Colón Province, Portobelo District, palmetto/ banana swamp, west side of Río Piedras near town of María Chiquita, 10 am ( $9^{\circ}27'4''\text{N}$ ,  $79^{\circ}44'18''\text{W}$ , 10 m), 2 June 2022, Jerrell J.

Daigle leg., in FSCA) is described, figured, and distinguished from other species. Both male and female can be recognized from all congeners by the presence of a lateral pit rimmed by an external ridge between anterior and middle lobes of pronotum on each side, and the male also by the presence of a well-developed ventral spur on cercus, which supports the placement of the genus in the *Teinobasini* sensu De Marmels (2007)." (Author)] Address: Ellenrieder, Natalia von, Plant Pest Diagnostics Center, California Department of Food & Agriculture, 3294 Meadowview Road, Sacramento, CA 95832-1448, USA. Email: natalia.ellenrieder@gmail.com

**20928.** Eloranta, A.P.; Kjærstad, G.; Power, M.; Lakka, H.-K.; Arnekleiv, J.V.; Finstad, A.G. (2022): Impacts of piscicide-induced fish removal on resource use and trophic diversity of lake invertebrates. *Science of The Total Environment* 835: 12 pp. (in English) ["Highlights: • Lake benthic invertebrate taxa showed contrasting responses to rotenone treatment. \*Predatory invertebrates increased while grazers and collectors decreased in abundance. \*A partial niche expansion by benthic invertebrates in two out of three treated lakes. \*Holistic understanding of ecosystem impacts of chemical treatments are urgently needed. Abstract: Chemical eradication of non-native species has become a widely used method to mitigate the potential negative impacts of altered competitive or predatory dynamics on biodiversity and natural ecosystem processes. However, the responses of non-target species can vary from rapid full recovery to delayed or absent recolonization, and little is known about the potential shifts in resource use and trophic diversity of native species following chemical treatments. We used a before-after-control-impact approach to study the effects of rotenone piscicide treatment on abundance and trophic niche of benthic invertebrates in three untreated and three treated lakes in central Norway, the latter group hosting non-native roach (*Rutilus rutilus*) and pike (*Esox lucius*) prior to rotenone treatment. Based on community composition data, the relative abundance of invertebrate grazers and collectors decreased while that of predators increased following fish removal in the treated lakes. The stable isotope data indicated minor shifts in resource use of, and trophic diversity among, benthic invertebrate communities. While the predatory dragonfly larvae (Odonata) and grazer snails (Lymnaeidae) showed increased  $d^{13}C$  values indicating increased reliance on littoral benthic algae, the collector mayfly larvae (*Leptophlebia*) showed decreased  $d^{13}C$  values following fish removal in treated lakes. Grazer snails also showed a shift to a lower trophic position, while the predatory dragonflies and collector mayflies showed no changes in  $d^{15}N$  values following fish removal. The community-level isotopic niches of benthic invertebrates showed no consistent changes, although the sample-size corrected and Bayesian estimates of standard ellipse areas (SEAC and SEAB) slightly increased in two of the three treated lakes due to an increased range in  $d^{15}N$ . In conclusion, our study findings indicate some changes in species assemblages but minor shifts in the resource use and trophic diversity of benthic invertebrate communities following fish removal in rotenone treated lakes." (Authors)] Address: Eloranta, A.P., Department of Biological and Environmental Science, University of Jyväskylä, P.O. Box 35, FI-40014, Finland. Email: antti.p.eloranta@jyu.fi

**20929.** Eriksen, T.E.; Jacobsen, D.; Demars, B.O.L.; Brittain, J.E.; Søli, G.; Friberg, N. (2022): Effects of pollution-induced changes in oxygen conditions scaling up from individuals to ecosystems in a tropical river network. *Science of*

*the Total Environment* 814 (2022) 151958: 11 pp. (in English) ["Highlights: \*O<sub>2</sub> regulation capacity (ORC) of tropical aquatic ectotherms was studied in Myanmar. \*River reach diel O<sub>2</sub> deficits were investigated using oxygen loggers. \*Eutrophication/organic pollution induced O<sub>2</sub> deficits in rivers. \*Closed-chamber studies used to derive ORC for riverine macroinvertebrates (MI) \*Individual ORC scaled up to ecosystem MI composition mirroring O<sub>2</sub> deficits. Abstract: Anthropogenic inputs of nutrients and organic matter are common in tropical lowland rivers while little is known about the pollution-induced changes in oxygen availability and respiratory performance of ectotherms in these high temperature systems. We investigated the effects of agriculture and urban land-use on river water oxygen levels (diel measurements), decomposition rates (Wettex) and macroinvertebrate assemblages (field studies), as well as the oxy-regulatory capacity of eight riverine macroinvertebrate taxa (laboratory study) from a tropical lowland river network in Myanmar. The highest decomposition rates (0.1.5.5 mg Wettex degree day.<sup>-1</sup>) and oxygen stress (.91% saturation deficits) were found in reaches draining degraded catchments with elevated concentrations of nutrients. All individual macroinvertebrate taxa investigated were to some extent able to regulate their respiration when placed under oxygen stress in the laboratory (regulation value of 0.74.0.89). The oxy-regulation capacity of macroinvertebrate assemblages in the river network were, as predicted, inversely related to diel oxygen stress (maximum deficit;  $lm$ ,  $R^2 = 0.69$ ), where taxonomic richness and pollution sensitivity (ASPT metric) also declined sharply ( $lm$ ,  $R^2 = 0.79$ ). Our study shows that eutrophication and organic pollution induce oxygen deficits in tropical rivers but stimulate decomposition rates, which may further deplete oxygen levels. Furthermore, macroinvertebrate oxyregulatory capacity predicts assemblage composition along gradients in oxygen stress at the ecosystem-level. Our findings suggest that tropical lowland river systems could be highly sensitive to pollution by nutrients and organic matter leading to substantial impacts on ectotherm community composition and ecosystem functioning." (Authors)] Address: Eriksen, T.E., Norwegian Institute for Water Research (NIVA), Gaustadalléen 21, 0349 Oslo, Norway. Email: Tor.Erik.Eriksen@niva.no

**20930.** Everling, S.; Johansson, F. (2022): The effect of temperature and behaviour on the interaction between two dragonfly larvae species within the native and expanded range. *Ecological Entomology* 47(3): 460-474. (in English) ["\* Studies on interaction between species are needed to observe and predict the effects of climate change on species distributions. Here we studied intra- and interspecific competition and behaviour in larvae of a native and a northward expanding dragonfly species, *Sympetrum vulgatum* and *Sympetrum fonscolombii*, respectively. We estimated growth, mortality, and behaviour (prey capture success, activity, and boldness) at 20°C and 23°C. \*The northward expanding *S. fonscolombii* had a higher growth rate and a higher survival compared with the native *S. vulgatum* in interspecific competition. In intraspecific conditions, there was no significant difference between species in mortality and growth. Temperature had no significant effect on growth and survival of *S. fonscolombii*, but *S. vulgatum* showed both a higher growth rate and a higher mortality at 23°C under intraspecific conditions. There was a correlation between growth and mortality, suggesting that cannibalism and intraguild predation caused the growth differences between treatments in the competition experiments. \*Temperature had no significant effect on any of the behaviours. There were very few significant correlations between any of

the behaviours and the life-history traits survival and growth and there were also very few significant correlations between any of the behaviours. Repeatability of behaviours over ontogeny was low. \*The results of the present study suggest that the range expanding *S. fonscolombii* has the potential to outcompete the native species, but that this competition advantage does not seem to be driven by the temperature effects explored in this study." (Authors)] Address: Fohansson, F., Dept Ecology & Genetics, Animal Ecol., Evolutionary Biology Centre, Uppsala University, Uppsala, Sweden. Email: frank.johansson@ebc.uu.se

**20931.** Feindt, W.; Hadrys, H. (2022): The quality of sequence data affects biodiversity and conservation perspectives in the Neotropical damselfly *Megaloprepus caerulatus*. *Diversity* 14(12):1056: 19 pp. (in English) ["Ideally, the footprint of the evolutionary history of a species is drawn from integrative studies including quantitative and qualitative taxonomy, biogeography, ecology, and molecular genetics. In today's research, species delimitations and identification of conservation units is often accompanied by a set of — at minimum — two sequence markers appropriate for the systematic level under investigation. Two such studies re-evaluated the species status in the world's largest Odonata, the Neotropical damselfly *Megaloprepus caerulatus*. The species status of the genus *Megaloprepus* has long been debated. Despite applying a highly similar set of sequence markers, the two studies reached different conclusions concerning species status and population genetic relationships. In this study, we took the unique opportunity to compare the two datasets and analyzed the reasons for those incongruences. The two DNA sequence markers used (16S rDNA and CO1) were re-aligned using a strict conservative approach and the analyses used in both studies were repeated. Going step by step back to the first line of data handling, we show that a high number of unresolved characters in the sequence alignments as well as internal gaps are responsible for the different outcomes in terms of species delimitations and population genetic relationships. Overall, this study shows that high quality raw sequence data are an indispensable requirement, not only in odonate research." (Authors)] Address: Feindt, Wiebke, Division of Ecology & Evolution, Univ. Veterinary Medicine Hannover, Bünteweg 17d, 30559 Hannover, Germany. Email: wiebke.feindt@ecolevol.de

**20932.** Gänßler, R. (2022): Tandem aus *Pyrrhosoma nymphula* und *Platycnemis pennipes* (Odonata: Coenagrionidae, Platycnemididae). *Mercuriale* 22: 105-106. (in German, with English summary) [Germany, Baden-Württemberg "On 11 June 2022, a heterospecific tandem between *Pyrrhosoma nymphula* and *Platycnemis pennipes* was observed and photographed." (Author)] Address: Gänßler, R., Talstraße 231, 72250 Freudenstadt, Germany. Email: roland@roland-gaenssler.de

**20933.** Gärtner, F. (2022): Monitoring der Libellenfauna (Odonata) „Auf dem Mörth“ im FFH-Gebiet Schwalenberger Wald (Kreis Lippe, NRW). Masterarbeit, Geographisches Institut, Stadt- und Landschaftsökologie, Ruhr-Universität Bochum: 92 pp. (in German, with English summary) ["Monitoring of the Odonata fauna on the "Mörth" in the Special Area of Conservation (SAC) Schwalenberger Wald (Lippe, North Rhine-Westphalia) – In 2022, the dragonfly fauna was surveyed at eight peatland ponds in the "Mörth"-area in the Special Area of Conservation Schwalenberger Wald, district Lippe, North Rhine-Westphalia. The results were compared with a survey of the same ponds by Mathias Lohr from 2014.

A total of 24 dragonfly species were found, of which 18 are definitely or probably established. Except for *S. danae*, the peatland species *Coenagrion hastulatum*, *Lestes virens*, *Aeshna juncea*, *Leucorrhinia dubia*, *L. pectoralis* and *Symptetrum danae* were found to be definitely or probably established. *C. hastulatum* and *L. pectoralis* are "critically endangered" in North Rhine-Westphalia. Compared to 2014, five species could no longer be found. Seven species have been added. Despite this increase in dragonfly species overall, the peatland species *Aeshna subarctica* and *Leucorrhinia rubicunda* could no longer be observed in 2022. In both 2014 and 2022, two ponds had the highest dragonfly diversity in general and also most peatland species. For these ponds, a loss of four established peatland species could be determined. The changes in occurrences can be explained by global warming, the resulting change in vegetation, and biotic homogenization. In another pond, three peatland species could no longer be detected as established, for which the introduced Goldfish (*Carassius gibelio forma auratus*) could be responsible. While *C. hastulatum*, *L. dubia* and *S. danae* show a negative trend nationwide, these species could be observed in the study area in 2014 as well as in 2022. The occurrence of *L. pectoralis* in 2022 is to be rated as very positive, since one of the largest occurrences of the species in North Rhine-Westphalia was found in 2014 at a pond in the study area. It was shown that, despite a slight deterioration in the occurrence of peatland species since 2014, the ponds in the Mörth-area represent an important habitat for many of the endangered peatland dragonfly species for the Weserbergland and North Rhine-Westphalia." (Authors)] Address: Gärtner, F., Hasenbrede 12, 32689 Kalletal, Germany. Email: gaertner.f@icloud.com

**20934.** García-Ríos, R.; Moi, D.A.; Melo, A.S.; Mormul, R.P. (2022): Insect dispersal ability is crucial to overcome limitations in patch colonization of *Eichhornia crassipes* floating meadows. *Limnology* 23(2): 287-298. (in English) ["Dispersal is a pivotal process in ecology since it determines species presence across patches in landscapes. Therefore, understanding dispersal may be critical in light of current environmental changes. Here, we conducted an experiment to evaluate how richness, density, and beta-diversity of insects with strong and/or weak aquatic and aerial dispersal abilities are influenced by colonization limitation of aerial and aquatic patches of a floating macrophyte. We used nets to isolate the aquatic (by roots) and aerial (by leaves) routes by which insects may colonize floating macrophytes. We found that strong aquatic and aerial dispersers were not affected by colonization limitation, since the richness and density of these groups did not decrease with limited colonization. Conversely, limited colonization resulted in a strong decrease in the richness and density of weak aquatic and aerial dispersers. Also, the beta diversity of weak dispersers strongly increased with limited colonization, whereas strong dispersers produced more homogeneous communities (low beta diversity). Our findings illustrate that increasing habitat fragmentation and destruction should have stronger impacts on weak dispersers as they are not able to overcome the habitat scarcity. Consequently, only strong dispersers may persist, leading to high community similarity." (Authors) Odonata = 'Aeshnidae, Libellulidae, Coenagrionidae'] Address: García-Ríos, P., Graduate Program in Ecology of Inland Water Ecosystems (PEA), Dept Biology (DBI), Center Biological Sciences (CCB), State University of Maringá (UEM), Maringá, Brazil. Email: raul.dynamo@gmail.com

**20935.** Gomes, D. (2022): Non-consumptive killing of a con-specific dragonfly. *Frontiers in Ecology and the Environment*

20(9): 530. (in English) [Verbatim: Intraspecific competition for resources, such as food, mates, or territory, is widespread across the animal kingdom. Larval dragonflies (*Epithea cynosura*), for example, commonly cannibalize each other (Ecology 1996; doi.org/10.2307/2265668); however, larval damselflies (*Megaloprepes coerulatus*) are sometimes killed but not consumed by conspecifics (Oecologia 1994; doi.org/10.1007/bf00317138), which can reduce competition for food. Adult dragonflies, as in the case of *Perithemis tenera*, are known to defend breeding territories near water, whereby they fight off intruding conspecifics (Ethology 2004; doi.org/10.1046/j.1439-0310.2003.00942.x). On occasion, a territorial male may even catch a competitor, in which case that competitor would likely end up as food. Here, I observed a female western pondhawk (*Erythemis collocata*) chase and kill, but not consume, another female conspecific that had recently emerged. The attacking *E. collocata* chewed through the pronotum (a cover of the thorax) of the attacked *E. collocata*, which stopped moving immediately. The aggressor then departed to the shore of the pond, with no signs of returning to its victim. Occasionally predators kill "surplus" prey that they do not immediately eat, but may later consume (J Zool 1972; doi.org/10.1111/j.1469-7998.1972.tb04087.x). Yet certain taxa have been found to non-consumptively kill members of their own species, as observed with the black-capped chickadee (*Poecile atricapillus*) (J Field Ornithol 2012; doi.org/10.1111/j.1557-9263.2012.00377.x) and the Australian dingo (*Canis familiaris*) (Ethol Ecol Evol 2018; doi.org/10.1080/03949370.2017.1316522). It is unclear just how widespread non-consumptive killing of conspecifics is across the tree of life.] Address: Gomes, D., Cooperative Inst. for Marine Resources Studies, Oregon State Univ., Newport, OR, USA

**20936.** Gómez-Anaya, J.A.; Novelo-Gutiérrez, R. (2022): Richness and structure of an Odonata larval assemblage of a cloud forest stream in western Mexico. *Odonatologica* 51(3/4): 225-246. (in English) ["Cloud forest in Mexico is an ecosystem largely fragmented and reduced in recent decades by human influence. In this type of vegetation, ravine streams generally contain a particular odonate species composition. We describe the structure, composition, and temporal changes of the Odonata larval assemblage from El Colorín ravine stream in the cloud forest of Chinicuil-Coalcomán region, Michoacán, based on a bi-seasonal sampling 1-year cycle. The assemblage parameters were related to some physicochemical water properties. In total, 17 species were recorded (9 Zygoptera, 8 Anisoptera). Zygoptera was more diverse at supraspecific level with four families vs two of Anisoptera. Six species of Libellulidae were recorded with four species belonging to Brechmorhoga. However, the dominant species throughout the year was the calopterygid *Hetaerina capitalis*. Although there were changes in water temperature, pH, conductivity, and oxygen throughout the year, the structural changes of the odonate larval assemblage were more related to seasonality. Also, the Odonata adult assemblage of El Colorín was compared to other adult assemblages from eastern and central Mexico. We propose sub-assemblages of Brechmorhoga, *Hetaerina*, and *Archilestes* species as potential indicators of well-conserved conditions of mountain streams." (Authors)] Address: Novelo-Gutiérrez, R., Red de Biodiversidad y Sistemática, Inst. de Ecol., A.C., AP 63, 91073, Xalapa, Veracruz, México. Email: rodolfo.novelo@inecol.mx

**20937.** Gómez-Tolosa, M.; González-Soriano, E.; Penagos-García, F.E.; López, S. (2022): Odonata (Insecta) species list from two natural protected areas of state of Chiapas and

first state record of *Argia gaumeri*. *Revista Mexicana de Biodiversidad* 93 (2022): e934992: 8 pp. (in Spanish, with English summary) ["We carried out a study to know the fauna of adult odonates in 8 sites of 2 natural protected areas of the state of Chiapas, in rivers of the Lacandona rainforest. This work was carried out in the localities of Puerto Bello Metzabok, and Naha, which are particular areas for flora and fauna conservation within the Mexican federal system. A total of 437 adult individuals belonging to 7 families were collected, corresponding to Coenagrionidae, Gomphidae, Heteragrionidae, Lestidae, Libellulidae, Protoneuridae, and Polythoridae; with 17 genera and 36 species. The highest species richness was obtained in Puerto Bello Metzabok. The dominant species was *Hetaerina occisa*, present at all sites. In addition, the species *Argia gaumeri* is registered for the first time in Chiapas." (Authors)] Address: Gómez-Tolosa, María, Universidad de Ciencias y Artes de Chiapas, Instituto de Ciencias Biológicas, Libramiento Norte-Poniente 1150, 29039 Tuxtla Gutiérrez, Chiapas, México. Email: malugomeztolosa@hotmail.com

**20938.** Gorb, S.N.; Wildermuth, H.; Kohl, S.; Büsse, S. (2022): Tarsal attachment structures of the biting midge *Forcipomyia paludis* (Diptera: Ceratopogonidae), a specialized ectoparasite of Odonata imagines. *Zoomorphology* 141: 297-306. (in English) [Switzerland "The female of the biting midge *Forcipomyia paludis* is a dipteran ectoparasite of West Palaearctic damselflies and dragonflies, sucking haemolymph mainly from wing veins of their hosts. This tiny midge remains firmly attached to the wings even during fast flight and aerial flight maneuvers as shown in the present paper by field studies of the large dragonfly, *Cordulegaster boltonii*. Since individuals of *F. paludis* firmly attach themselves to the challenging wing surface of their host and can successfully withstand drag and vibrations during flight, we assume that this midge species has specific microstructural adaptations on its legs for attaching to the wing surface. In our morphological study, we used scanning electron microscopy (SEM) and confocal laser scanning microscopy (CLSM), to study the structure of *F. paludis* tarsi, as well as the micro morphology of the wing surfaces of their host. Additionally, for the first time, we were able to show attachment devices of the midges dried out in contact with the host's surface. The spatulae of the plantar setae and especially the empodial setae, are capable of replicating nanoscale wax crystals of the super hydrophobic wing coverage of the dragonfly wing membrane, in order to increase an effective contact area and therefore adhesion. This ability requires extremely soft materials of the spatula, which seems to be rather unique even in comparison to the leg attachment devices of other dipterans and other insect taxa in general." (Authors)] Address: Büsse, S., Dept of Functional Morphology and Biomechanics, Institute of Zoology, Kiel University, Am Botanischen Garten 9, 24118, Kiel, Germany

**20939.** Grames, E.M.; Montgomery, G.A.; Boyes, D.H.; Dicks, L.V.; Forister, M.L.; Matson, T.A.; Nakagawa, S.; Prendergast, K.S.; Taylor, N.G.; Tingley, M.W.; Wagner, D.L.; White, T.E.; Woodcock, P.; Elphick, C.S. (2022): A framework and case study to systematically identify long-term insect abundance and diversity datasets. *Conservation Science and Practice* 2022:e12687: 19 pp. (in English) ["Biodiversity is in crisis, and insects are no exception. To understand insect population and community trends globally, it is necessary to identify and synthesize diverse datasets representing different taxa, regions, and habitats. The relevant literature is, however, vast and challenging to aggregate. The Entomological Global Evidence Map (EntoGEM)

project is a systematic effort to search for and catalogue studies with long-term data that can be used to understand changes in insect abundance and diversity. Here, we present the overall EntoGEM framework and results of the first completed subproject of the systematic map, which compiled sources of information about changes in dragonfly and damselfly (Odonata) occurrence, abundance, biomass, distribution, and diversity. We identified 45 multi-year odonate datasets, including 10 studies with data that span more than 10 years. If data from each study could be gathered or extracted, these studies could contribute to analyses of long-term population trends of this important group of indicator insects. The methods developed to support the EntoGEM project, and its framework for synthesizing a vast literature, have the potential to be applied not only to other broad topics in ecology and conservation, but also to other areas of research where data are widely distributed." (Authors)] Address: Elphick, C.S., Ecology and Evolutionary Biology, University of Connecticut, 75 North Eagleville Rd, Storrs, CT 06269, USA. Email: [chris.elphick@uconn.edu](mailto:chris.elphick@uconn.edu)

**20940.** Guignard, Q.; Allison, J.D.; Slippers, B. (2022): The evolution of insect visual opsin genes with specific consideration of the influence of ocelli and life history traits. *BMC Ecology and Evolution* (2022) 22:2: 9 pp. (in English) ["d: Visual opsins are expressed in the compound eyes and ocelli of insects and enable light detection. Three distinct phylogenetic groups of visual opsins are found in insects, named long (LW), short (SW) and ultraviolet (UV) wavelength sensitive opsins. Recently, the LW group was found to be duplicated into the LW2b and the LW2a opsins. The expression of LW2b opsins is ocelli specific in some insects (e.g., bees, cricket, scorpion flies), but the gene was not found in other orders possessing three or less ocelli (e.g., dragonflies, beetles, moths, bugs). In flies, two LW2b homologs have been characterised, with one expressed in the ocelli and the other in the compound eyes. To date, it remains unclear which evolutionary forces have driven gains and losses of LW opsins in insects. Here we take advantage of the recent rapid increase in available sequence data (i.e., from insect genomes, targeted PCR amplification, RNAseq) to characterize the phylogenetic relationships of 1000 opsin sequences in 18 orders of Insects. The resulting phylogeny discriminates between four main groups of opsins, and onto this phylogeny we mapped relevant morphological and life history traits. Results: Our results demonstrate a conserved LW2b opsin only present in insects with three ocelli. Only two groups (Brachycera and Odonata) possess more than one LW2b opsin, likely linked to their life history. In flies, we hypothesize that the duplication of the LW2b opsin occurred after the transition from aquatic to terrestrial larvae. During this transition, higher flies (Brachycera) lost a copy of the LW2a opsin, still expressed and duplicated in the compound eyes of lower flies (Nematocera). In higher flies, the LW2b opsin has been duplicated and expressed in the compound eyes while the ocelli and the LW2b opsin were lost in lower flies. In dragonflies, specialisation of flight capabilities likely drove the diversification of the LW2b visual opsins. Conclusion: The presence of the LW2b opsin in insects possessing three ocelli suggests a role in specific flight capabilities (e.g., stationary flight). This study provides the most complete view of the evolution of visual opsin genes in insects yet, and provides new insight into the influence of ocelli and life history traits on opsin evolution in insects." (Authors)] Address: Guignard, Q., Department of Zoology and Entomology, Forestry and Agricultural Biotechnology Institute, University of Pretoria, Pretoria 0002, South Africa. Email: [quentin.guignard@fab.up.ac.za](mailto:quentin.guignard@fab.up.ac.za)

**20941.** Hettige, N.D.; Hashim, R.; Kutty, A.A.; Ash'aari, Z.A.; Jamil, N.R. (2022): Using benthic macroinvertebrate distribution and water quality as organic pollution indicators for fish farming areas in Rawang Sub-basin, Selangor River, Malaysia: A correlation analysis. *Journal of fisheries and environment* 46(1): 180-197. (in English) ["Fish farming activities are essential to the economy of many countries. However, the discharge of fish farm effluents into nearby rivers can negatively impact benthic macroinvertebrates and water quality. In Malaysia, the correlation between water quality and benthic macroinvertebrates in areas impacted by fish farming has not been discussed comprehensively. Hence, this research investigated the connection between benthic communities and water quality in the Rawang sub-basin of the Selangor River using several statistical methods. Based on ease of accessibility and proximity to freshwater fish farms, and by using a random sampling method, seven sampling sites in six rivers were chosen including one reference site. Sampling of benthic macroinvertebrates and river water was carried out between April 2019 and March 2020. Principal Component Analysis (PCA) revealed that fish farming operations influence various water quality parameters such as dissolved oxygen (DO), biochemical oxygen demand (BOD5), chemical oxygen demand (COD), total suspended solids (TSS), pH, and ammonia-nitrogen. Canonical Correspondence Analysis (CCA) revealed that families Aeolosomatidae, Chironomidae, Lumbriculidae, Naididae, Planorbidae, and Tubificidae are tolerant to organic pollution. Their abundance was correlated with high BOD5, COD, turbidity, TSS, and ammonia-nitrogen. On the other hand, the families Caenidae, Gomphidae, Aytidae, Leptophlebiidae, Thiariidae, and Viviparidae are sensitive to organic pollution and were correlated with DO concentration. This research revealed that the correlation between benthic macroinvertebrate communities and water quality in the area is affected explicitly by fish farms." (Authors)] Address: Hashim, R., Faculty of Forestry and Environment, Department of Environment, Universiti Putra Malaysia, Selangor, Malaysia. Email: [rohasliney@upm.edu.my](mailto:rohasliney@upm.edu.my)

**20942.** Hlaing, N.; Htoo, H. (2022): Occurrence and species composition of some freshwater insects in Min Hla Lake, Thazi Township, Mandalay Region. *Yadanabon University Research Journal* 12(2): 247-256. (in English) ["A total of 284 individuals, representing 14 species from 14 genera, ten families and three orders were recorded from Min Hla Lake, Thazi Township. The species of freshwater insects were identified Odonata (five species), Hemiptera (seven species), Coleoptera (two species). Out of these the most abundance freshwater insect species was Order Hemiptera and the least species number was observed in order Coleoptera. In Order Odonata, ... Anax junius and Ictinogomphus rapax ... and ... Orthetrum sabina, Pantala flavescens and Trithemis aurora ...." (Authors)] Address: Htoo, H., Department of Zoology, Kalay University, Myanmar

**20943.** Hochkirch, A.; Casino, A.; Penev, L.; Allen, L.; Tilley, L.; Georgiev, T.; Gospodinov, K.; Barov, B. (2022): European Red List of Insect Taxonomists. Luxembourg: Publication Office of the European Union: 41 pp. (in English) ["Insects play a significant role in the functioning of healthy ecosystems and human well-being. By providing vital services such as pollination, matter decomposition, and bio-control, they greatly influence the living world. Our ability and expertise to recognise insect species and biodiversity are fundamental for their conservation. However, there is increasing concern regarding our capacity to identify insects and describe and name new insect species. This capacity has

traditionally been provided by taxonomists, working in museums, institutes or universities. This European Red List of Insect Taxonomists provides the first assessment of the status of taxonomic expertise capacity in Europe. Based upon a quantitative analysis of taxonomic papers published in scientific journals during the last decade as well as an online questionnaire, a detailed overview is given of the taxonomic capacity for each insect order and for each EU country. This European Red List of Insect Taxonomists is a call to the community of experts to bring their expertise into the public focus, and a call to society at large to acknowledge the role of taxonomy and support its sustainability in the long term. Overall, taxonomic capacity is threatened or eroded for 41.4% and 34.5% of the insect orders at the European and EU levels, respectively. The degree of erosion of taxonomic capacity is calculated as a Red List Index following Butchart et al. (2007), ranging between 0 (taxonomic capacity fully eroded) and 1 (all taxa covered by adequate capacity). There is substantial variation in the number of insect orders covered by taxonomists among countries: the highest Red List Index RLI is found in Czechia, followed by Germany and Russia. The lowest RLI is found in Albania, Azerbaijan and Belarus, and among the EU countries, Luxembourg, Latvia, Ireland and Malta. The number of insect orders covered by taxonomic expertise in each country correlates well with the Red List Index. The four largest insect orders (Coleoptera, Diptera, Lepidoptera, Hymenoptera) were all covered by >80% of the countries (in the case of Coleoptera and Lepidoptera even (by >90%)), but Adequate Capacity is only attained in 26% (Coleoptera) to 58% (Hymenoptera) of all countries. Three sets of recommendations – on strategic actions, science and societal engagement, are provided, with the aim of ensuring the long-term sustainability of taxonomic expertise in Europe. Strategic recommendations providing the framework to foster taxonomy: a. Provide targeted and sustainable funding specifically directed at increasing taxonomic capacity across Europe; b. Integrate the valuable role of taxonomists into policy formulation and implementation at the EU and national level. Science recommendations reinforcing the far-reaching impact of taxonomy: c. Ensure the continuous overview of the available taxonomic capacity, for example, by periodic reassessment of the Red List of Taxonomists. Expand the approach to other biodiversity groups. d. Increase the taxonomic capacity through dedicated knowledge exchange, education, training and development opportunities for professional taxonomists. e. Promote networking among taxonomists by maximising the use of modern technologies in research, publishing and knowledge exchange. Societal recommendations engaging society in taxonomy: f. Increase the recognition and awareness of the importance of taxonomic expertise by using effective means of communication with the public. g. Engage with citizen science initiatives to maximise the synergies between their efforts and taxonomic expertise in efficient research and monitoring of biodiversity." (Authors) In the case of Odonata each for Europe and European Community the situation is assessed as "Adequate Capacity".] Address: Pensoft Publishers, Prof. Georgi Zlatarski Street 12, 1700 Sofia, Bulgaria. Email: info@pensoft.net

**20944.** Housecroft, C.E. (2022): Dragonflies that change colour: Nature's hidden redox chemistry. *Chimia* 76(10): 869-870. (in English) ["The colour distinction between male and female, and between young and mature male dragonflies of the genera *Crocothemis* and *Sympetrum* arises from simple redox chemistry. This natural phenomenon has inspired the development of a class of electrochromic device]

Address: Housecroft, Catherine, Department of Chemistry, University of Basel, BPR 1096, Mattenstr. 24a, 4058 Basel, Switzerland. E-mail: catherine.housecroft@unibas.ch

**20945.** Isworo, S.; Oetari, P.S. (2022): Flora and fauna in the areas around artisanal gold mining in Selogiri Sub-district, Wonogiri, Indonesia. *Biodiversitas* 23: 6600-6618. (in English) ["Artisanal or small-scale gold mining has devastating impacts on the environment due to negligence of the principles of good environmental management. In particular, the mining activities often involve vegetation clearing and topsoil removal, which affect the biotic elements of the mined landscape. Selogiri Sub-district, Wonogiri District, Central Java Province, has a gold mineral resource that drives many traditional mining activities that have an indirect impact on the ecosystem's species diversity and community structure. This research aimed to investigate the diversity of flora and fauna in Selogiri Sub-district by comparing the area where the artisanal gold mining occurred (the inside area) and the areas surrounding the mining (the outside area). Six groups of taxa were observed in this study, including the plant group using the plot method, avifauna (birds) using Indices Ponctuels d'Abondance method, Odonata (dragonflies) and Lepidoptera (butterflies) both using visual encountering survey (VES) method, micromammals (Rodentia) using traps, VES, and camera traps and herpetofauna (amphibians and reptiles) using VES method. The diversity values of each taxa group in the inside and outside area were calculated and Sorensen's Coefficient Similarity Index formula was analyzed to see the community similarity between the two areas. A total of 243 species were found, consisting of Lepidoptera (35%), flora taxa (29%), avifauna (16%), herpetofauna (9%), Odonata (7%), and mammals (3%). The avifauna and Odonata had higher diversity values in the outside area than in the inside area. Similarly, the outside area had a higher diversity value for mammalian taxa documented using the VES method. Meanwhile, using the trap method, the taxa of Lepidoptera, herpetofauna, and mammals had higher diversity value in the inside area than in the outside. Nonetheless, the two areas had moderate similarity in the composition of flora and fauna species, with a community similarity value of less than 60% for all taxa studied. Conservation activities and off-site tree planting are solutions for restoring ecosystem structure and function to support ecological stability and biodiversity." (Authors)] Address: Isworo, S., Departement of Environmental Health, Universitas Dian Nuswantoro. Jl. Imam Bonjol 207, Semarang 50131, Central Java, Indonesia. Email: slametisworo512@gmail.com

**20946.** Jamil, M.; Noman Latif, Jaweria Gul, Muhammad Kashif, Arsalan Khan, Mubarik Ali, Norina Jabeen, Muhammad Shehzad Khan, Imran Qazi, & Namat Ullah. (2022): A review: An insight into the potential of biological control of ticks in domestic and wild Animals. *Abasyn Journal of Life Sciences* 5 (Issue 2): 51-67. (in English) ["Ticks are hematophagous arthropods that transmit pathogens to humans, animals and poultry birds, mostly in tropical and subtropical regions globally, causing considerable economic and health losses by serving infectious vectors. In endemic locations of the world, tick-borne diseases have become a public health issue. Ticks biting causes anemia in animals and also impair their hide quality. Therefore, the current review article focused on the biological control of ticks. Ticks, like any other creature, are susceptible to various infectious agents (*Anaplasma phagocytophilum*, *Babesia bigemina*, *B. gibsoni*, *Hepatozoon canis*, *H. americanum*, *Theileria annulate*, *T. taurotragi* etc). Ticks can become infected with rickettsia,

spirochetes, viruses, bacteria, and fungi. Some protozoans and worms infiltrate ticks and reproduce inside them, killing them. Fungus (*Metarhizium anisopliae*, *Verticillium lecanii*, *Beauveria bassiana*), bacteria (*Bacillus*), nematodes (*Steinernema glaseri*, *S. carpocapsae*), and parasitoids (*Ixodiphagus* species.) have proved effective biological agents to control ticks. Insects are also a type of natural tick enemy. Ticks that are engorged with blood and while moulting are the most vulnerable to insect predation and eaten by spiders, ants, beetles, dragonflies, and wasps (*Ixodiphagus*). Ticks are also preyed upon by amphibians and reptiles. Birds such as yellow-billed oxpecker (*Buphagus africanus*), helmeted guineafowl and Galliformes are good predators of ticks. Biological agents affect only target pests (ticks), do not destroy beneficial natural enemies and are safer for the ecosystem and humans. By keeping in view, the significance of biological agents, we highly recommend them in integrated tick management program that could minimize the tick population." (Authors) In spite the fact the authors name dragonflies as predators of ticks, I could not find any literature source where this behaviour is document.] Address: Jamil, M., PARC Arid Zone Research Centre, Dera Ismail Khan-29050-Pakistan. Email: jamilmatrah@parc.gov.pk

**20947.** Jödicke, R.; Borkenstein, A. (2022): Matutinal and vespertine reproductive behaviour in *Cordulia aenea* (Odonata: Corduliidae). *Notulae odonatologicae* 9(10): 473-481. (in English) ["A survey of crepuscular activities in *Cordulia aenea* was carried out at a site in north-western Germany (52.9° N) with an abundant population; this was during the optimal flight season, in favourable weather conditions under a clear sky. Diel activity commenced before sunrise and ceased after sunset. The species therefore belongs to the small group of species exhibiting both matutinal and vespertine activity. Activity during the diurnal period between dawn and dusk never ceased, resulting in a duration of daily flight activity of up to 17 h and 41 min in mid-June. In both twilight periods we predominantly saw patrolling males but also ovipositing females and formation of mating wheels. In the evening, males sometimes briefly interrupted their patrol flight for foraging and feeding. The primary utilization of dawn and dusk for reproductive activities, as occurred in *C. aenea*, is limited among European dragonflies to a small number of aeshnids and corduliids. A 24-hour rhythm of flight activity under the midnight sun, north of the Arctic Circle, is discussed." (Authors)] Address: Jödicke, R., Am Liebfrauenbusch 3, D-26655 Westerstede, Germany. E-mail: reinhard.joedicke@magenta.de

**20948.** Josten, B.; Gorb, S.N.; Büsse, S. (2022): The mouthparts of the adult dragonfly *Anax imperator* (Insecta: Odonata), functional morphology and feeding kinematics. *Journal of Morphology* 283(9): 1163-1181. (in English) ["Insects evolved differently specialized mouthparts. We study the mouthparts of adult *Anax imperator*, one of the largest odonates found in Central Europe. Like all adult dragonflies, *A. imperator* possesses carnivorous-type of biting-chewing mouthparts. To gain insights into the feeding process, behavior and kinematics, living specimens were filmed during feeding using synchronized high-speed videography. Additionally, the maximum angles of movement were measured using a measuring microscope and combined with data from micro-computed tomography ( $\mu$ CT). The resulting visualizations of the 3D-geometry of each mouthpart were used to study their anatomy and complement the existing descriptive knowledge of muscles in *A. imperator* to date. Furthermore, CLSM-projections allow for estimation of differences in the material composition of the mouthparts'

cuticle. By combining all methods, we analyze possible functions and underlying biomechanics of each mouthpart. We also analyzed the concerted movements of the mouthparts; unique behavior of the mouthparts during feeding is active participation by the labrum and distinct movement by the maxillary laciniae. We aim to elucidate the complex movements of the mouthparts and their functioning by combining detailed information on (1) in vivo movement behavior (supplemented with physiological angle approximations), (2) movement ability provided by morphology (morphological movement angles), (3) 3D-anatomy, and (4) cuticle composition estimates." (Authors)] Address: Büsse, S., Dept of Functional Morphology and Biomechanics, Institute of Zoology, Kiel University, Am Botanischen Garten 9, 24118 Kiel, Germany. Email: sbuesse@zoologie.uni-kiel.de

**20949.** Jouault, C.; Nel, A.; Perrichot, V.; Legendre, F.; Condamine, F.L. (2022): Multiple drivers and lineage-specific insect extinctions during the Permo-Triassic. *Nature Communications* | (2022) 13:7512: 17 pp. (in English) ["The Permo-Triassic interval encompasses three extinction events including the most dramatic biological crisis of the Phanerozoic, the latest Permian mass extinction. However, their drivers and outcomes are poorly quantified and understood for terrestrial invertebrates, which we assess here for insects. We find a pattern with three extinctions: the Roadian/Wordian (~266.9 Ma; extinction of 64.5% insect genera), the Permian/Triassic (~252 Ma; extinction of 82.6% insect genera), and the Ladinian/Carnian boundaries (~237 Ma; extinction of 74.8% insect genera). We also unveil a heterogeneous effect of these extinction events across the major insect clades. Because extinction events have impacted Permo-Triassic ecosystems, we investigate the influence of abiotic and biotic factors on insect diversification dynamics and find that changes in floral assemblages are likely the strongest drivers of insects' responses throughout the Permo-Triassic. We also assess the effect of diversity dependence between three insect guilds; an effect ubiquitously found in current ecosystems. We find that herbivores held a central position in the Permo-Triassic interaction network. Our study reveals high levels of insect extinction that profoundly shaped the evolutionary history of the most diverse non-microbial lineage." (Authors)] Address: Jouault, C., Inst. de Systématique, Évolution, Biodiversité (ISYEB), Muséum national d'Histoire naturelle, CNRS, Sorbonne Univ., EPHE, Université des Antilles, CP50, 57 rue Cuvier, 75005 Paris, France. Email: jouaultc0@gmail.com

**20950.** Kadadevaru, G.G.; Hosamani, M.B. (2022): Reproductive ecology of Narrow mouthed frog *Microhyla ornata*. *International Journal of Ecology and Environmental Sciences* 48(5): 597-602. (in English) ["Abstract: Reproductive ecology of Narrow mouthed frog *Microhyla ornata* was studied at selected breeding sites around Dharwad, Karnataka India during the wet periods between May 2017 and December 2018. The breeding activity varied depending upon the amount of rainfall. It was higher during monsoon when there was higher rainfall, whereas, when rainfall was scanty less activity was observed. Males begin the calling activity in the evening after the sunset at 1098min reaching its peak at around 1200min and extend till the early morning of the next day. Gravid females arrive at the breeding site one to one and half hour after the calling was initiated in the early pre-monsoon and monsoon period and amplexus took place soon after the arrival of females within one hour during peak calling days. Size assorted matting was observed in *M. ornata* and showed significant positive correlation. The female body size was positive correlation with clutch



size. However, there was no significant correlation between female body size and egg size. Breeding activity of *M. ornata* spanning for seven months suggest that, this species is a prolonged breeder. The eggs and larvae of *M. ornata* were under constant threat by the predatory larva of the aquatic insects like dragonfly and water beetle. Few clutches during non rainy period faced the risk of desiccation. The breeding sites of many anurans are affected by urbanization and habitat fragmentation. There is a need to adopt the strategy to conserve the habitats to protect the species." (Authors)] Address: Hosamani, M.B., Dept of Zoology, Karnatak University, Dharwad, Karnataka, India. E-mail: hosamanimb16@gmail.com

**20951.** Kesti, P.; Hiltunen, M.; Strandberg, U.; Vesterinen, J.; Taipale, S.; Kankaala, P. (2022): Lake browning impacts community structure and essential fatty acid content of littoral invertebrates in boreal lakes. *Hydrobiologia* 849: 967-984. (in English) ["Many lakes in the northern hemisphere are browning due to increasing concentrations of terrestrial dissolved organic carbon (DOC). The consequences of lake browning to littoral invertebrates, however, are not fully understood. We analyzed community structure and fatty acid (FA) profiles of littoral invertebrates in humic (DOC-rich) and clear-water lakes in Eastern Finland. We found higher abundance of chironomids (Diptera: Chironomidae) in humic compared to clear water lakes, whereas stoneflies (Plecoptera) and mayflies (Ephemeroptera: Baetidae) were more abundant in clear-water lakes. Taxon explained 65% of the differences in the FA composition of littoral invertebrates. However, the proportion and content of polyunsaturated FAs of several taxa were significantly higher in clear-water lakes compared to humic lakes. Our results reveal differences in both community structure and nutritional quality of littoral invertebrates for fish between humic and clear-water lakes." (Authors)] Address: Kesti, P., Department of Environmental and Biological Sciences, University of Eastern Finland, Joensuu, Finland

**20952.** Khan, M.K.; Herberstein, M.E. (2022): Parasite-mediated sexual selection in a damselfly. *Ethology* 128(8): 572-579. (in English) ["Sexual selection can improve population fitness and purge deleterious mutation from the gene pool by promoting condition-dependent mate selection. One ecological factor that reduces individual condition is parasitism. Parasitism tends to increase hosts' mutation load and likely indicates inferior host genetic quality. Parasite-mediated selection, therefore, should favour the mating success of parasite-resistant individuals over parasitised individuals. We tested this hypothesis in male *Agriocnemis pygmaea* damselflies, which are parasitised by *Arrenurus* water mites. We calculated frequency (i.e. the proportion of parasitism) and intensity (i.e. the number of parasites per parasitised individual) of parasitism in free-flying males and males in copula in seven natural populations. We predicted that males observed mating will be less likely to be parasitised than expected based on the frequency of parasitism in the population. We further predicted that parasite intensity would be lower in males caught in copula than single males. We found that parasitised males were significantly less likely to be found in copula than non-parasitised males, independent of their occurrence frequency. However, there was no difference in the average parasite load between males captured in copula or free-flying males. Our study shows that in addition to natural selection, sexual selection is a strong agent against parasitism and implies that it could promote local adaptation to counteract parasite driven extinction risks." (Authors)] Address: Khan, M.K., School of Natural

Sciences, Macquarie University, Macquarie Park, New South Wales, Australia. Email: bmbkawsar@gmail.com

**20953.** Khan, S.U.; Mehmood, S.A.; Ali, H.; Waqas, W.; Rahbar, B. (2022): The role of selected odonate nymphs in biological control of *Culex quinquefasciatus* larvae, and effect of glyphosate herbicide on their predatory performance. *Journal of Tropical Insect Science* 42(2): 1859-1864. (in English) ["Mosquitoes are potent vectors of many diseases such as malaria, dengue, yellow fever, and filariasis. Mosquitoes are controlled by various traditional methods including the widespread uses of synthetic chemicals. These applications have led to environmental degradation and loss of beneficial species. However, biological control, an ecofriendly control of mosquitoes through potential predators, is the key interest of today's researchers. During the current research, predatory performance of three selected odonatan nymphs (*Pantala flavescens*, *Trithemis aurora*, *Libellula fulva* [sic]) was investigated against mosquitoes' 3rd instar larvae. Furthermore, the effect of glyphosate herbicide on the predatory performance of these nymphs was also assessed. Results indicated higher larval consumption by *P. flavescens*, followed by *T. aurora* while less consumption by *L. fulva* during 24-h study. The difference among their predatory performance was not significant ( $p > 0.05$ ). The predatory performance of *P. flavescens* was significantly reduced compared to the control by 1.0, 2.5 and 5.0 ppm glyphosate, that of *T. aurora* by 2.5 and 5.0 ppm glyphosate while that of *L. fulva* by 5.0 ppm glyphosate. Thus, the performance of all the nymphs decreased with increasing glyphosate concentration. The study concluded that odonatan species play a vital role in control of mosquito larvae. However, anthropogenic activities such as excessive use of herbicides in agriculture pose a real threat to these natural predators." (Authors)] Address: Ali, H., Environmental Chem., Ecotoxicology & Applied Ecology Lab., Dept of Chemistry, Univ. of Malakand, 18800 Chakdara, Dir Lower, Khyber Pakhtunkhwa, Pakistan. Email: hazratiali@uom.edu.pk

**20954.** Koren, T.; Koller Šaric, K.; Kelava, L. (2022): The first records of *Trithemis annulata* (Palisot de Beauvois, 1807) (Odonata: Libellulidae) in Croatia. *Nat. Croat.* 31(2): 293-302. (in English, with Croatian summary) ["In August 2022 the first individuals of the dragonfly species Violet dropwing, *Trithemis annulata* (Palisot de Beauvois, 1807), were observed in Croatia, at three localities in southern Dalmatia. Two males were observed at the Peracko Blato lake, while both males and females were recorded at two localities at the Bacinska Lakes. At the Bacinska Lakes, more than 10 individuals were observed indicating a possible established population. The nearest known reproducing population is located about 160 km to the south, in Montenegro. Due to the species expansion in Europe, and recent records as north as Slovenia, additional records and established populations are to be expected in Croatia. As the species is now known from Croatia, we propose a vernacular name for this species, "ljubicasta skitnica" meaning purple tramp, referring to its coloration, wandering behavior and dispersal potential." (Authors)] Address: Koren, T., Ass. Hyla, Lipovac I, n. 7, 10 000 Zagreb, Croatia. Email: toni.koren@hhdhyla.hr

**20955.** Kosterin, O.E. (2022): Data on dragonflies and damselflies (Odonata) of the Katon-Karagai National Nature Park, Altai Mts, Kazakhstan. *Proceedings of Katon-Karagai State National Nature Park* 2: 175-187. (in English, with Russian and Kazakh summaries) ["Katon-Karagai State National Nature Park is situated in the most elevated part of the Altai Mts so its territory is in general hostile for

Odonata. Fifteen species of those were registered on three author's week-long trips to the Park in 1987, 2010 and 2012. Of them, findings of *Sympetrum meridionale* were remarkable as this species occurs in the most elevated part of Altai Mts but for some reason was not found in low levels, as well as on the plains of Siberia. Three more species are known from the park territory from literature, with the record of *Somatochlora exuberata* currently being the westernmost one of the species." (Author) (*Lestes barbarus*, *L. dryas*, *Sympetma paedisca*, *Coenagrion hastulatum*, *C. hylas*, *Enallagma cyathigerum risi*, *Ischnura pumilio*, *Aeshna caerulea*, *A. juncea*, *Cordulia aenea*, *Somatochlora arctica*, *S. exuberata*, *S. graeseri*, *Leucorrhinia orientalis*, *L. rubicunda*, *Sympetrum danae*, *S. flaveolum*, *S. meridionale*)] Address: Kosterin, O.E., Institute of Cytology & Genetics, Siberian Branch, Russian Acad. Scien., Lavrentiev Ave 10, 630090 Novosibirsk, Russia. E-mail: kosterin@bionet.nsc.ru

**20956.** Kozina, A. (2022): Distribution and potential endangerment of dragonflies and damselflies (Odonata) of the Bloke plateau. MSc. thesis, Univerza v Ljubljani, Biotehniška Fakulteta Studij Ekologije in Biodiverzitete: 72 pp. (in Slovene, with English summary) ["The Bloke Plateau is one of the better odontologically studied areas in Slovenia, however, most of the data were obtained at the end of the last century. The purpose of the master's thesis was to investigate the current distribution of dragonflies in the area and to check for their possible endangerment. We conducted 29 field days in 2021, which were planned to cover different parts of the adult dragonfly flight season. Larvae and exuvias were also sampled during the surveys. The presence of dragonflies was recorded at 48 study sites, of which 27 were surveyed first time during our survey. We recorded 35 species of dragonflies. We confirmed the reproduction of 26 dragonfly species at Bloke plateau. During the survey, Green emerald damselfly (*Chalcolestes viridis*) and Dainty bluet (*Coenagrion scitulum*) were recorded for the first time in the area. In total, we recorded six threatened and two protected species of dragonflies. Ornate bluet (*Coenagrion ornatum*) and Balkan goldenring (*Cordulegaster heros*) are listed in the Annexes of the Habitats Directive. The highest number of species (23) were recorded at the site Fishponds 500 m south of Godicevo. During the survey, we did not record the Common hawkler (*Aeshna juncea*), which was a common species at the Bloke plateau in the past, but today it seems to be endangered or even locally extinct. Dragonflies on the Bloke plateau are threatened by the loss of a suitable habitat due to the drying up and overgrowing of bog habitats, as well as the development of mass tourism and excessive introduction of fish into some water bodies." (Author)] Address: not stated

**20957.** Kroth, N.; Rezende, R.; Magro, J.D.; Albeny-Simões, D. (2022): Top-down effects on aquatic communities in subtropical lentic microhabitats. *Austral Ecology* 47(5): 1006-1015. (in English) ["Natural lentic microhabitats are important for aquatic invertebrate communities in subtropical aquatic systems, which are usually dominated by mosquitoes, predators and zooplankton. Subtropical lentic microhabitats might be strongly affected by top-down effects of predators. We evaluated the predator effects on aquatic macroinvertebrate and zooplankton communities by using black plastic buckets (10 L) to simulate lentic microhabitats, which were divided into four treatments: predator absence and presence, and initial (on experiment start) and final (on experiment end) community controls. Large top predators (Odonata) had a stronger effect on community structure by their sit-and-wait predatory behaviour. The richness of total

macroinvertebrates, *Culex* genus (most abundant organism), and zooplankton was highest in predators' absence. On the other hand, the sit-and-wait behaviour increased the density of organisms by selective predation on macroinvertebrates that feed in the bottom of the system. Also, the sit-and-wait behaviour increased the density of gathering and filtering collectors (top swimmers) by differences in space preference. We observed a positive species-specific relationship between *Culex* and predators. We concluded that predators' presence contributes to the balance of lentic microhabitat in subtropical lentic microhabitats by top-down control." (Authors)] Address: Kroth, Nádia, Laboratório de Entomologia Ecológica, Programa de Pós Graduação em Ciências Ambientais, Univ. Comunitária da Região de Chapecó, Servidão Anjo da Guarda, nº 295-D, Bairro Efapi, Chapecó, Brazil. Email: nadia.kroth@unochapeco.edu.br

**20958.** Lee, C.Y.; Kim, M.K.; Kim, D.-G. (2022): Ecological responses of *Nannophya koreana* (Odonata: Libellulidae) to temperature: Following converse Bergmann's Rule. *Biology* 2022, 11(6), 830; <https://doi.org/10.3390/biology-11060830>: 16 pp. (in English) ["Simple Summary: Bergmann's rule explains the phenomenon where populations and species of larger sizes are found at higher latitudes and colder environments, whereas populations and species of smaller size are found at lower latitudes and in warmer regions. In insects, adult sizes tend to be smaller in warmer environments than at cooler temperatures and higher latitudes; the response is called the temperature-size rule. *Nannophya koreana* is an endangered species in Korea and represents a flagship species for wetland conservation. We found that the body size of the larvae was smaller in a cold-water-temperature region than in a warm-water-temperature area, which is contrary to the rules mentioned above. The two regions were geographically close to each other, with no differences in air temperature and precipitation. We identified the reasons for the difference in water temperature between the two regions and established the relationship between temperature and body size in *N. koreana*. In addition, we analyzed how *N. koreana* compensated for low water temperature to maintain its life cycle, which is known as univoltine. Abstract: Ecological rules such as Bergmann's rule and the temperature-size rule state that body-size decline is a universal response to warm temperatures in both homeotherms and poikilotherms. In the present study, we investigated the biological responses of *Nannophya koreana*, an endangered dragonfly species in Korea, by comparing body size in two habitats with large differences in water temperature, Mungyong-si (MG, terraced paddy fields) and Muui-do (MU, a mountainous wetland). To conserve the dragonfly populations, the collected larvae were photographed and released, and their head widths and body lengths were measured. There was no difference in the annual mean air temperature and precipitation between the two sites; however, the annual mean water temperature was substantially lower in MU than in MG. There was little difference in larval head width between the two sites; however, body length in the MU population was smaller than that in the MG population. Larval growth rate per 100-degree-days was 0.75 mm for MG and 1.16 for MU. The relationship between temperature and body size of *N. koreana* larvae showed opposite trends to Bergmann's rule and the temperature-size rule. Since the larval growth period during a year in MU was shorter than that in MG, the MU population potentially exhibits a higher growth rate as a mechanism of compensating for the low water temperature. Our study established the relationship between temperature and body size of *N. koreana* in two wetlands that had

an obvious difference in water temperature despite being geographically close. The results highlight the importance of considering detailed factors such as habitat type when studying the temperature–size responses of organisms." (Authors)] Address: Lee, C.Y., Institute of Environmental Ecology, Sahmyook University, Seoul 01795, Korea. Email: ishursain@gmail.com

**20959.** Lehka, Z.; Hrivnak, M. (2022): Dragonfly research (Insecta, Odonata) in the Muránska Lehota fishponds. *Entomofauna carpathica* 34(2): 65-74. (in Slovakian, with English summary) ["The research of dragonflies was carried out in 2017 – 2022 in the Muránska Lehota fishponds. 19 species of dragonflies were Zygoptera. Endangered species at the locality were represented by were *Ischnura pumilio*, *Anaciaeschna isosceles*, *Anax parthenope* and *Crocothemis erythraea*. The results suggest high potential of the fishponds for occurrence and conservation of many dragonfly species. Anthropogenic water reservoirs increase the diversity of the landscape and provide a suitable habitat for a rich species spectrum of dragonflies." (Authors)] Address: Lehká, Zuzana, Výskumný ústav vodného hospodárstva, Nábřežie armádneho generála Ludvíka Svobodu 5, 812 49 Bratislava, Slovakia. Email: zuzana.lehka@vuvh.sk

**20960.** Leung, T.K.C.; So, K.Y.K.; Shum, B.T.W.; Hau, B.C.H. (2022): Optimal mowing regime in enhancing biodiversity in seasonal floodplains along engineered channels. *Sustainability* 2022, 14(7), 4002; <https://doi.org/10.3390/su14074002>: 16 pp. (in English) ["The vegetation grown on grasscretes along channelized rivers have been regularly mown in Hong Kong. However, no baseline information on the relationship between different mowing regimes and the biodiversity of such riverbed vegetation is available. We therefore carried out a manipulative experiment along a channelized river to test the effect of mowing frequency and intensity on the abundance and species richness of terrestrial biodiversity. We conducted point counts and transect counts to survey birds, butterflies and Odonates, night surveys for amphibians and reptiles, quadrat surveys for vegetation and sweep net and pan traps for other macroinvertebrates. The results from Generalized Linear Mixed Models (GLMMs) showed a taxon-specific effect of mowing regime. Bird species richness was significantly suppressed in plots mown with high frequency. Both butterfly abundance and species richness were greatly enhanced by low intensity and low frequency mowing. Odonate abundance, and the abundance and species richness of other macroinvertebrates remained high whenever a portion of vegetation was retained as refuge. Amphibians and reptiles did not prefer to utilize the vegetation grown on grasscretes, and thus showed no impact from different mowing regimes. The overall species richness of vegetation was not affected by mowing regimes, but the domination of tall invasive *Brachiaria mutica* was suppressed by any mowing activity. To cater for the need of most taxa, we propose a mosaic mowing regime, in which most parts along the channelized river could be mown infrequently to 600 mm tall while some of the patches remain unmown.... 3.4. The Effects of Mowing Regimes on Odonates A total of 501 individual Odonates were recorded from the point and transect count surveys. The monthly mean abundance for each treatment (including the control) ranged from 0 to 7.1, while that of the mean richness ranged from 0 to 2.2. The results of the GLMMs suggested that the abundance of Odonates was significantly higher for Treatment B, D and Control than Treatment A (GLMMs: A–B: t.ratio = –4.237,  $p < 0.001$ ; A–D: t.ratio = –4.296,  $p < 0.001$ ; A–Control: t.ratio = –4012,  $p < 0.001$ . Table 3). Species richness

of Treatment B and D were significantly higher than Treatment A (A–B: t.ratio = –3.693,  $p = 0.002$ ; A–D: t.ratio = –3.291,  $p = 0.010$ ), but were not significantly different from those of Control and Treatment C (Figure 2 and Table 3). No interaction was detected between the effects of treatment and season." (Authors)] Address: Leung, T.K.C., Division of Ecology & Biodiversity, School of Biological Sciences, Univ. of Hong Kong, Pok Fu Lam, Hong Kong. Email: u3527523-@connect.hku.hk

**20961.** Luan, S.; Cao, H.; Deng, H.; Zheng, G.; Song, Y.; Gui, C. (2022): Artificial hyper compound eyes enable variable-focus imaging on both curved and flat surfaces. *ACS Appl. Mater. Interfaces* 2022, 14, 40, <https://doi.org/10.1021/acsmi.2c15489>: 46112-46121. (in English) ["The artificial compound eye (ACE) with zoom imaging requires complex power sources. Meanwhile, its curved substrate makes it difficult for the ACE to realize the zoom imaging on flat surfaces. To realize a wide field of view and a zoom function on both curved and flat surfaces simultaneously, a novel ACE is proposed, which is a bionic design inspired by an ancient creature, trilobite. Compared with a dragonfly, photosensitive units of a trilobite's compound eye are composed of ommatidia with different focal lengths. By learning from this concept, an artificial hyper compound eye (AHCE) was fabricated. Its basic components are five microlenses with different curvatures, and they are capable of being treated as five ommatidia with different focal lengths. Five ommatidia form a photosensitive unit to realize a zoom function. AHCE is capable of variable-focus imaging on curved surfaces. With the information share function, we found that the AHCE not only images on curved surfaces but also has a zoom-imaging function on flat surfaces. The results confirm that the AHCE demonstrates an advanced imaging capability, a variable-focus imaging function on both curved and flat surfaces, which may open new opportunities in developing advanced micro-optical devices." (Authors)] Address: Luan, S., School of Power & Mechanical Engineering, Wuhan University, Wuhan 430072, China

**20962.** Ludányi, M.; Peeters, E.T.H.M.; Kiss, B.; Gáspár, A.; Roessink, I.; Magura, T.; Müller, Z. (2022): The current status of *Pacifastacus leniusculus* (Dana, 1852) and their effect on aquatic macroinvertebrate communities in Hungarian watercourses. *Aquatic Invasions* 17: (in English) ["The freshwater crayfish *Pacifastacus leniusculus* is among the most widespread invasive crayfish species in Europe. *Pacifastacus leniusculus* invaded Hungary around 1998 and here we investigated the recent expansion of this species and its impact on other aquatic macroinvertebrates. The colonization of watercourses throughout Europe by the signal crayfish resulted in negative impacts on the present aquatic communities. Our investigation (i.e. in Rába, Pinka, Gyöngyösstream, Répce, Arany-stream and Strém systems) revealed that the distribution range of signal crayfish is still in expansion in the western part of Hungary and in all likelihood impacting the aquatic communities in these watercourses. Our results obviously demonstrated that signal crayfish densities were highest in habitats with gravel or coarse particulate organic matter, which seems to reflect a species-specific habitat preference. Our investigation proved that the presence of *P. leniusculus* had negative effects on a number of protected species such as *Calopteryx virgo* and *Onychogomphus forcipatus* next to a significant negative effect on the Odonata and Trichoptera species richness as well as on the abundances of Ephemeroptera, Odonata and Trichoptera. Our study in Hungary supports the notion of the significant negative impact of signal crayfish on native freshwater invertebrate

communities throughout Europe. In order to assess whether these impacts are restricted to fast flowing waters only, an adequate monitoring plan providing more knowledge on this species with respect to biotic and abiotic preferences and aquatic macroinvertebrate composition is required.... Impact on protected species: In order to assess the potential impact of *P. leniusculus* on protected species, the occurrences of these species were compared between the invaded Gyöngyös-stream and the non-invaded Kerca stream. Despite the invasion of *P. leniusculus*, the Gyöngyös-stream still harboured many protected species comprising *Agnatina elegantula*, *Aquarius najas*, *Calopteryx virgo*, *Cordulegaster bidentata*, *C. heros*, *Gomphus vulgatissimus*, *Macronychus quadrituberculatus*, *Oligoneuriella rhenana*, *Onychogomphus forcipatus*, *Ophiogomphus cecilia* and *Unio crassus*. In the Gyöngyös-stream concerned, the relative abundance of *Calopteryx virgo* ( $2.94 \pm 1.08$  ind./m<sup>2</sup>  $\pm$  S.E.), *G. vulgatissimus* ( $4.32 \pm 1.66$  ind./m<sup>2</sup>  $\pm$  S.E.) and *O. cecilia* ( $5.58 \pm 1.57$  ind./m<sup>2</sup>  $\pm$  S.E.) was the highest. *C. virgo*, *C. heros*, *G. vulgatissimus*, *O. forcipatus*, *O. cecilia* and *U. crassus* occurred in the crayfish affected Gyöngyös and crayfish free Kerca as well. However, due to the low abundances of most of these protected species, a proper comparison was only possible for *C. virgo*, *G. vulgatissimus* and *O. forcipatus*. According to the GLM analysis, the relative abundance of *C. virgo* and *O. forcipatus* was significantly lower in the presence of *P. leniusculus*, while the relative abundance of *G. vulgatissimus* did not show significant relationship with the crayfish occurrence (Figure 4, Table 3).] " (Authors)] Address: Ludányi, Mercédesz, BioAqua Pro Ltd. 4032 Debrecen, Soó Rezső utca 21, Hungary. Email: ludanyimercedesz@gmail.com

**20963.** MacLeod, N.; Price, B.; Stevens, Z. (2022): What you sample is what you get: ecomorphological variation in *Trithemis* (Odonata, Libellulidae) dragonfly wings reconsidered. *BMC Ecology and Evolution* (2022) 22:43: 29 pp. (in English) ["Background: The phylogenetic ecology of the Afro-Asian dragonfly genus *Trithemis* has been investigated previously by Damm et al. (in *Mol Phylogenet Evol* 54:870–882, 2010) and wing ecomorphology by Outomuro et al. (in *J Evol Biol* 26:1866–1874, 2013). However, the latter investigation employed a somewhat coarse sampling of forewing and hindwing outlines and reported results that were at odds in some ways with expectations given the mapping of landscape and water-body preference over the *Trithemis* cladogram produced by Damm et al. (in *Mol Phylogenet Evol* 54:870–882, 2010). To further explore the link between species-specific wing shape variation and habitat we studied a new sample of 27 *Trithemis* species employing a more robust statistical test for phylogenetic covariation, more comprehensive representations of *Trithemis* wing morphology and a wider range of morphometric data-analysis procedures. Results: Contrary to the Outomuro et al. (in *J Evol Biol* 26:1866–1874, 2013) report, our results indicate that no statistically significant pattern of phylogenetic covariation exists in our *Trithemis* forewing and hindwing data and that both male and female wing datasets exhibit substantial shape differences between species that inhabit open and forested landscapes and species that hunt over temporary/standing or running water bodies. Among the morphometric analyses performed, landmark data and geometric morphometric data-analysis methods yielded the worst performance in identifying ecomorphometric shape distinctions between *Trithemis* habitat guilds. Direct analysis of wing images using an embedded convolution (deep learning) neural network delivered the best performance. Bootstrap and jackknife tests of group separations and discriminant-function stability confirm that our results are not artifacts of

overtrained discriminant systems or the “curse of dimensionality” despite the modest size of our sample. Conclusion: Our results suggest that *Trithemis* wing morphology reflects the environment’s “push” to a much greater extent than phylogeny’s “pull”. In addition, they indicate that close attention should be paid to the manner in which morphologies are sampled for morphometric analysis and, if no prior information is available to guide sampling strategy, the sample that most comprehensively represents the morphologies of interest should be obtained. In many cases this will be digital images (2D) or scans (3D) of the entire morphology or morphological feature rather than sparse sets of landmark/semilandmark point locations." (Authors)] Address: MacLeod, N., School of Earth Sciences & Engineering, Nanjing Univ., 163 Xianlin Avenue, Nanjing 210023, Jiangsu, China. Email: NMacLeod@nju.edu.cn

**20964.** Makbun, N.; Wongkamhaeng, K.; Keetapithchayakul, T.S. (2022): *Anax aurantiacus* sp. nov., a new dragonfly from mainland Southeast Asia (Odonata: Aeshnidae). *Odonatologica* 51(3/4): 301-339. (in English) ["A new species of the genus *Anax*, *A. aurantiacus*, is described and illustrated based on adults of both sexes and exuviae from Thailand. This new species was previously considered by several authors to be a form of *A. immaculifrons* Rambur, 1842, but was never officially described. *Anax aurantiacus* sp. nov. is differentiated from *A. immaculifrons* based on coloration and morphological differences in the adults and larvae. Two species delimitation analyses (ABGD and bPTP) were also carried out, from which can be inferred that *A. aurantiacus* and *A. immaculifrons* were different Molecular Operational Taxonomic Units. Material and images available on internet and literature show the species to be present in Cambodia, Laos, China, Hong Kong, Thailand, and Vietnam, with *A. immaculifrons* occurring in South Asia and further west. *A. immaculifrons* therefore needs to be deleted from the checklists from Cambodia, Laos, China, Hong Kong, Thailand, and Vietnam, replaced by *A. aurantiacus* sp. nov." (Authors)] Address: Tosaphol Saetung Keetapithchayakul, T.S., 2 Department of Zoology, Faculty of Science, Kasetsart University, 50 Ngam Wong Wan Rd, Lat Yao, Chatuchak, Bangkok, Thailand. Email: Keetapithchayakul.TS@gmail.com

**20965.** Maldonado, M.A.; Manara, E.; Martín, P.R. (2022): Macroinvertebrates in the diet of the Apple snail *Pomacea canaliculata* in its native range. *Malacologia* 65(1-2): 59-69. (in English) ["The study of diet and how a species obtains food is relevant to understand its role within natural environments. The apple snail *Pomacea canaliculata* (Lamarck, 1822) is a freshwater dweller that primarily consumes aquatic macrophytes and detritus but also incorporates resources of animal origin in its diet. Our aim was to investigate the ingestion of macroinvertebrates by *P. canaliculata* in four watercourses from its native range by analyzing its digestive contents. The frequency of occurrence of animal remains in the digestive contents of *P. canaliculata* snails was 68.50% across different seasons, with values of more than 50% in each of the watercourses studied. The spring-summer contents showed high frequencies of animal remains, whereas in autumn they were recorded only in 10% of the contents from one of the watercourses. The macroinvertebrates ingested belonged to six different insect orders, crustaceans, mites, bivalves, and gastropods. The frequencies of occurrence were higher for arthropods than for mollusks in two watercourses and similar in the other two. In two watercourses, the relative abundances of mollusks were higher than those of arthropods and the opposite was true in the other two. The number of individuals ingested by an average *P.*

canaliculata was highest for the snail *Heleobia parchappii*, followed by arthropods, *H. parchappii* eggs, and the snails *Physella acuta* and *Chilina parchappii*. Most ingested macroinvertebrates were small, slow or with little or no mobility, such as snails and case-bearing insects. Arthropods able to swim or to swiftly escape, such as Amphipoda and nymphs of Odonata and Ephemeroptera, were not detected at all in the digestive contents. Ingestion of macroinvertebrates appears to be opportunistic and even accidental and probably depends more on their microhabitats or behavior than on preferences of *P. canaliculata*. Notwithstanding, the high frequency of ingestion observed on some species of snails could have a significant negative effect on the abundance of their populations." (Authors)] Address: Martín, P.R., INBIOSUR (Univd Nacional del Sur – CONICET) & Lab. de Ecología, Departamento de Biología, Bioquímica y Farmacia (Univd Nacional del Sur), San Juan 670, (8000) Bahía Blanca, Argentina. Email: pablorafaelmartin@gmail.com

**20966.** Maneechan, W.; Vitheepradit, A.; Prommi, T.O. (2022): Nutritional compositions of aquatic insects living in rice fields, with a particular focus on odonate larvae. *Insects* 2022, 13, 1131. <https://doi.org/10.3390/insects13121131>: 13 pp. (in English) ["Simple Summary: Food security concerns are growing due to the rapid increase in the world population. From this perspective, insects are a possible sustainable food source because of their nutritional value and the sustainability of their production system. Although the human consumption of edible insects has been a culturally long-standing practice, the nutritional literature on aquatic insects is not complete. Thus, the aims of the present study were to: (1) confirm the nutritional characteristics of odonate larvae (*Libellulidae*: *Pantala* sp.), including quantifying the bioaccumulation; and (2) investigate the microplastic accumulation in odonate larvae living in rice fields. The results show that odonates such as *Pantala* sp. are a good source of protein, minerals, essential amino acids, and long-chain polyunsaturated fatty acids. However, although the odonates seem to be a good source of nutrition, they may typically contain bioaccumulation, including microplastics, from their diets and habitats. Abstract: Although the human consumption of aquatic insects is prevalent in many regions, the nutritional composition of the insects has not been comprehensively determined. The proximate composition of *Pantala* sp. was shown to be a good source of protein ( $49.45 \pm 0.32$  g/100 g DW), as well as of minerals such as sodium, calcium, potassium, phosphorus, zinc, and iron. All nine essential amino acids are present in this species, with valine being the most abundant. The major fatty acids are palmitic acid ( $1.19 \pm 0.02$  g/100 g DW), oleic acid ( $0.63 \pm 0.02$  g/100 g DW), and linoleic acid ( $0.55 \pm 0.01$  g/100 g DW). Lead (Pb), arsenic (As), and cadmium (Cd) showed a value of  $0.18 \pm 0.01$  mg·kg<sup>-1</sup>,  $3.51 \pm 0.12$  mg·kg<sup>-1</sup>, and  $0.17 \pm 0.00$  mg·kg<sup>-1</sup>, respectively. Furthermore, microplastic (MP) contamination in odonate larvae (419 individuals belonging to three identified families) was found in varying shapes, e.g., fibers, fragments, and rods. FTIR analysis revealed the following MP polymers, polyethylene terephthalate, polyvinyl acetate, bis(2-ethylhexyl), polybutadiene, poly(methyl methacrylate-co-methacrylic acid); P(MMA-co-MA), poly(ethylene glycol) tetrahydrofurfuryl ether, poly(acrylonitrile-co-butadiene), and polypropylene glycol. The results of this work could be a nutritional reference for food security and the risk of eating insects." (Authors)] Address: Prommi, T.O., Dept of Science, Faculty of Liberal Arts & Science, Kasetsart University, Kamphaeng Saen Campus, Nakhon Pathom 73140, Thailand. Email: faastop@ku.ac.th

**20967.** Manger R.; De Knijf, G. (2022): Mass reproduction of the Vagrant Emperor (*Anax ephippiger*) in Belgium and the Netherlands in the summer of 2019. *Brachytron* 23: 7-21. In Dutch, with English summary. ["From 7 June 2019 onwards, an invasion of *A. ephippiger* was observed in much of Belgium and the Netherlands with not less than 482 individuals and 1744 individuals being observed respectively. Ovipositing behavior was found at 31 locations. In August and September 2019 exuviae and freshly emerged imagoes were found at 1 site in Belgium and 6 sites in the Netherlands. More than 1000 exuviae or teneral were found in an urban city pond of Antwerp (Belgium) and at Millingerwaard, in the river valley of the river Waal near Nijmegen (the Netherlands), being the two most important sites. First emergences of *A. ephippiger* were noticed on 23 August in the Netherlands and on 29 August in Belgium, resulting in a larval development time of respectively 78 and 81 days. Reproduction habitat consisted mainly of partially drying ponds characterized by high water temperatures in the summer of 2019. Those habitats were situated in diverse landscape configurations such as an urban area, dune ecosystems, fens in heathland, and ponds in a river valley ecosystem. Emergence took place during the night and maiden flight only occurred just before the onset of the sun and lasted not much more than 10 minutes. Most of the exuviae were found on aquatic plant stems and leaves above the water. At 80% of the locations where ovipositing of *A. ephippiger* was observed in June 2019, successful reproduction of *Sympetrum fonscolombii* was found later summer." (Authors)] Address: Knijf, G. de, Research Institute for Nature & Forest (INBO), Havenlaan 88 bus 73, 1000 Brussels, Belgium. E-mail: geert.deknijf@inbo.be

**20968.** Martynov, V.; Nikulina, T.; Shokhin, I.V.; Terskov, E.N. (2022): Contributions to Fauna of Invasive Insects of Astrakhan Region and Republic of Kalmykia. *Field Biologist Journal*, 4(4): 329–343: 329-343. (in Russian, with English summary) ["The paper presents results of field surveys conducted in 2022 in the territory of the Astrakhan region and the Republic of Kalmykia. In the course of our study, 13 species of invasive insects from 5 orders (Odonata, Mantodea, Hemiptera, Coleoptera, Diptera) were registered ... Verbatim (GoogleTranslate): "Order Dragonfly. Odonata Family Gomphidae 1. *Lindenia tetraphylla* Vander Linden, 1825. Material: 10, erik Shushay, 06/28/2022. A species of Mediterranean origin with a Mediterranean-Central Asian modern range. In recent decades, it has shown a tendency to expand its range. On the territory of Russia, it is known from Rostov, Volgograd, Astrakhan regions, Stavropol Territory, the Republics of Crimea, Kalmykia, Dagestan, Kabardino-Balkaria, Chechnya [Sobolev, Volkova, 2017], North Ossetia [Onishko, 2019] and Krasnodar Territory [Onishko, Kosterin, 2021]. On the territory of the Astrakhan region, it was first recorded in 2007 (Sobolev, Volkova, 2017). Currently common in Kalmykia and Astrakhan region [Sobolev, Volkova, 2017; Onishko and Kosterin, 2021]. Family Libellulidae 2. *Selysiothemis nigra* (Vander Linden, 1825). Material: 10, erik Shushai, 06/28/2022; 11, 07/03/2022. Distributed in all Mediterranean countries of Europe and North Africa, as well as in most countries of the Middle East, Transcaucasia and Central Asia, isolated populations are known in India and Pakistan [Skvortsov, 2010; Martynov et al., 2015]. In recent decades, it has shown a tendency to expand its range. In the European part of Russia, it was first recorded in 2000 in the Southern Urals, in 2005 it was recorded for the Central Caucasus [Zalikhonov, 2005], in 2007 it was identified in the Yashkuly and Chernozemelsky regions of the Republic of Kalmykia [Skvortsov,

Kuvaev, 2007], it was recorded for the Astrakhan region [Onishko and Kosterin, 2021]. Currently, it is widely distributed in the Sea of Azov (Krasnodar Territory, Crimea) [Martyanov et al., 2015] and Ciscaucasia (Aldygea, Karachay-Cherkessia, Kabardino-Balkaria, North Ossetia, Dagestan [Onishko, 2019, 2021, Ketenchiev et al., 2020; Shapovalov, 2020]. In the Astrakhan region, the species is common on drying eriks and lakes (Fig. 2a: "– drying erik – a place of mass population of *Selysiotthemis nigra* (Astrakhan region, neighbourhood of Kurchenko village)".) Address: Nikulina, Tatyana, Donetsk Botanical Garden, 110 Illicha Ave, Donetsk 283059, Donetsk People's Republic [sic!], Russia [sic!]. E-mail: nikulinatanya@mail.ru

**20969.** Masih, S.C.; Pathak, R.K. (2022): Odonate ecology and diversity. A review. *International Journal of Entomology Research* 7(12): 150-152. (in English) ["One of the most prevalent insects flying over forests, fields, meadows, lakes, and streams are dragonflies and damselflies, which are collectively known to as odonates. The number of living species worldwide is about 6,000. With more over 500 species currently known, India is very diversified. One of the oldest groups of insects is the Odonata. It first originated along with mayflies during the Carboniferous era, some 250 million years ago (Ephemeroptera). Monsters include up the Odonata group from the Carboniferous period; for instance, *Meganeuropsis americana* from that time had wingspan of 71 cm, which is almost as long as a pigeon. Ancient insect species like dragonflies and mayflies were some of the first to acquire wings and take to the air. Dragonflies have perfected the art of flight and are still skilled acrobats. The order Odonata is divided into three categories depending on morphology: the Anisozygoptera, the Zygoptera, and the dragonflies (Anisoptera). *Epiophlebia laidlawi*, one of the two species mostly in suborder Anisozygoptera, is documented from Darjeeling. In the field, dragonflies and damselflies are easily distinguished. Although their morphologies are very different, they have similar overall life histories." (Authors)] Address: Masih, S.C, Dept of Zoology, Ewing Christian Post Graduate College, Allahabad, Uttar Pradesh, India

**20970.** Maslo, B.; Mau, R.L.; Kerwin, K.; McDonough, R.; McHale, E.; Foster, J.T. (2022): Bats provide a critical ecosystem service by consuming a large diversity of agricultural pest insects. *Agriculture, Ecosystems & Environment* Volume 324, 1 February 2022, 107722: 11pp. (in English) ["Highlights: • Bats consumed at least 160 known agricultural pests or disease vectors. \*Big brown bats greatly expand their consumption of pest species in late June. \*Bats serve as comprehensive samplers of flying insects. \*DNA metabarcoding of guano is equivalent to broad-spectrum, non-specific insect monitoring methods (i.e. blacklight traps). Abstract: Biodiversity directly influences the delivery of multiple ecosystem services, most notably within agriculture. Projected future global demands for food, fiber and bioenergy will require enhancement of agricultural productivity, but favoring biodiversity-based ecosystem services generally remains underutilized in agricultural practice. In addition, agricultural intensification is a key driver of biodiversity loss. A significant obstacle preventing the adoption of ecologically sensitive practices is a lack of knowledge of the species delivering the services. Insectivorous bats have long been suggested to regulate insect pest populations and may be a critical component of biodiversity-based ecosystem services. Bats may also serve as agents of insect pest surveillance through environmental DNA (eDNA) monitoring approaches. However, the biological and economic importance of bats to agriculture remains under-quantified.

Here we catalogued the dietary niche of two North American bats, little brown bat (*Myotis lucifugus*) and big brown bat (*Eptesicus fuscus*), through DNA metabarcoding of guano collected from seven roosting sites over a 26-week period. We measured the frequency of occurrence of known pest species in guano samples, compared interspecific differences in diet, and examined seasonal patterns in prey selection. Overall, we detected 653 unique prey species, 160 of which were known agricultural pests or disease vectors. Species diversity of prey species consumed varied by bat species and across the season, with big brown bats accounting for the majority of arthropod diversity detected. However, little brown bats consumed relatively more aquatic insects than big brown bats, suggesting that increased bat species richness in a landscape can amplify their net pest regulation service. Further, we hypothesized that detection probabilities of target insect pests would be higher in guano samples than in conventional survey methods. Multi-survey occupancy modeling revealed significantly lower detectability in bat guano than in conventional monitoring traps, however, highlighting important tradeoffs in selection of survey methods. Overall, the results presented here contribute to a growing evidence base supporting the role bats play in the provisioning of biodiversity-based ecosystem services." (Authors) Classification of taxonomically identified amplicon sequence variants (ASVs) in the diets of big brown bats (*Eptesicus fuscus*) and little brown bats (*Myotis lucifugus*) in New Jersey, 2017: only one species of "Odonata" was sampled] Address: Maslo, Brooke, Department of Ecology, Evolution and Natural Resources, Rutgers, The State University of New Jersey, New Brunswick, NJ, USA. Email: brooke.maslo@rutgers.edu

**20971.** McEachin, S.; Drury, J.; Anderson, C.; Grether, G. (2022): Mechanisms of reduced interspecific interference between territorial species. *Behavioural Ecology* 33(1): 126-136. (in English) ["Interspecific territoriality has complex ecological and evolutionary consequences. Species that interact aggressively often exhibit spatial or temporal shifts in activity that reduce the frequency of costly encounters. We analyzed data collected over a 13-year period on 50 populations of rubyspot damselflies (*Hetaerina* spp.) to examine how rates of interspecific fighting covary with fine-scale habitat partitioning and to test for agonistic character displacement in microhabitat preferences. In most sympatric species, interspecific fights occur less frequently than expected based on the species' relative densities. Incorporating measurements of spatial segregation and species discrimination into the calculation of expected frequencies accounted for most of the reduction in interspecific fighting (subtle differences in microhabitat preferences could account for the rest). In 23 of 25 sympatric population pairs, we found multivariate differences between species in territory microhabitat (perch height, stream width, current speed, and canopy cover). As predicted by the agonistic character displacement hypothesis, sympatric species that respond more aggressively to each other in direct encounters differ more in microhabitat use and have higher levels of spatial segregation. Previous work established that species with the lowest levels of interspecific fighting have diverged in territory signals and competitor recognition through agonistic character displacement. In the other species pairs, interspecific aggression appears to be maintained as an adaptive response to reproductive interference, but interspecific fighting is still costly. We now have robust evidence that evolved shifts in microhabitat preferences also reduce the frequency of interspecific fighting." (Authors) *Hetaerina americana*, *H. semproniana*, *H. vulnerata*, *H. cruentata*, *H. miniata*, *H. capitalis*, *H.*

occisa] Address: Grether, G.F., Department of Organismic Biology, Ecology and Evolution, University of California, 621 Charles E Young Drive South, Los Angeles, CA, 90095. USA. E-mail: ggrether@oabee.ucla.edu

**20972.** Mendoza-Penagos, C.C.; Juen, L.; Muzon, J., Viela, D.S. (2022): *Psaironeura jeronimoi* (Odonata: Zygoptera: Coenagrionidae) sp. nov. from the Brazilian Amazon rainforest, with a key for species of tenuissima group, and discussion on the significance of the genital ligula to the taxonomy of the group. *Zootaxa* 5196(2): 291-300. (in English, with Spanish summary) ["*Psaironeura jeronimoi* sp. nov. is described based on seven males (Holotype: male (LABECO, N° 10002717), BRAZIL, Amazonas, Alto Maués Ecological Station, (-5.9852, -59.3182, 114 m asl, 12.v.2019) collected in the state of Amazonas (near Alto Maués Ecological Station) and Pará (municipality of Belterra). This new species fits into the tenuissima group but presents differences in color pattern and shape of the apex cerci. Main morphological characters are figured and compared with those of *P. tenuissima* (Selys, 1886) and *P. bifurcata* (Sjöstedt, 1918). Key to males and comments on genital ligula of the species of the group are provided. Finally, comments on the conservation status of the species are presented." (Authors)] Address: Mendoza-Penagos, C.C., Programa de Pós-graduação em Zoologia. PPGZOO, Univde Fed. do Pará, Belém, Brazil. Email: cristian.penagos@icb.ufpa.br

**20973.** Mendoza-Penagos, C.C.; Silva-Gonçalves, M.K.; Vilela, D.S. (2022): *Perilestes juveni* (Zygoptera: Perilestidae), new species from Amazonas State, Northern Brazil. *Zootaxa* 5219(6): 576-582. (in English, with Spanish summary) ["*Perilestes juveni* sp. nov. (Brazil, Amazonas State, São Gabriel da Cachoeira, Ponto 8 (0.165, -67.007, 92 m asl), 2.xii.2021, C.C. Mendoza-Penagos M. Silva-Gonçalves & S. Da Silva Ribeiro leg.) is described based on one male collected in a remote area of the Brazilian Amazon Forest. The new species is separated from congeners based on cercus morphology." (Authors)] Address: Mendoza-Penagos, C.C., Laboratório de Ecologia e Conservação. LABECO, Universidade Federal do Pará, Instituto de Ciências Biológicas, Rua Augusto Correia, No. 1 Bairro Guamá, CEP 66.075-110 Belém, Pará, Brazil. Email: cristian.penagos@icb.ufpa.br

**20974.** Mola, L.M.; Vrbová, I.; Tosto, D.S.; Zrzavá, M.; Marec, F. (2022): On the origin of neo-sex chromosomes in the Neotropical dragonflies *Rhionaeschna bonariensis* and *R. planaltica* (Aeshnidae, Odonata). *Insects* 2022, 13(12), 1159; <https://doi.org/10.3390/insects13121159>: 14 pp. (in English) ["Simple Summary: Odonata are very interesting insects from a cytogenetic point of view. Their chromosomes do not have a typical centromere and their meiosis process differs in some respects from the canonical meiosis process. Sex in Odonata is usually determined by two X chromosomes in females and only one X chromosome in males (a Y chromosome is not present). In this work, we studied sex chromosome evolution in two dragonfly species of the genus *Rhionaeschna* that have a derived sex chromosome system: neo-XX in females and neo-XY in males. This variation is the result of chromosome rearrangements. In *R. planaltica*, meiotic analysis and fluorescence in situ hybridization with a ribosomal DNA probe revealed that the original X chromosome was inserted into the smallest autosome, giving rise to the neo-X chromosome, while the homologous autosome became a neo-Y chromosome. In contrast, the neo-X chromosome in *R. bonariensis* evolved by a terminal fusion of the original X chromosome with the largest autosome, whose homolog became the neo-Y chromosome.

Our results suggest an independent origin of neo-sex chromosomes in these dragonfly species and contribute to our understanding of the distinct mechanisms of sex chromosome evolution. Abstract: Odonata have holokinetic chromosomes. About 95% of species have an XX/X0 sex chromosome system, with heterogametic males. There are species with neo-XX/neo-XY sex chromosomes resulting from an X chromosome/autosome fusion. The genus *Rhionaeschna* includes 42 species found in the Americas. We analyzed the distribution of the nucleolar organizer region (NOR) using FISH with rDNA probes in *Rhionaeschna bonariensis* ( $n = 12 + \text{neo-XY}$ ), *R. planaltica* ( $n = 7 + \text{neo-XY}$ ), and *Aeshna cyanea* ( $n = 13 + X0$ ). In *R. bonariensis* and *A. cyanea*, the NOR is located on a large pair of autosomes, which have a secondary constriction in the latter species. In *R. planaltica*, the NOR is located on the ancestral part of the neo-X chromosome. Meiotic analysis and FISH results in *R. planaltica* led to the conclusion that the neo-XY system arose by insertion of the ancestral X chromosome into an autosome. Genomic in situ hybridization, performed for the first time in Odonata, highlighted the entire neo-Y chromosome in meiosis of *R. bonariensis*, suggesting that it consists mainly of repetitive DNA. This feature and the terminal chiasma localization suggest an ancient origin of the neo-XY system. Our study provides new information on the origin and evolution of neo-sex chromosomes in Odonata, including new types of chromosomal rearrangements, NOR transposition, and heterochromatin accumulation." (Authors)] Address: Mola, Liliana, Laboratory of Cytogenetics and Evolution, Faculty of Exact and Natural Sciences, University of Buenos Aires, C1428EGA Buenos Aires, Argentina. Email: lilimola@yahoo.com.ar

**20975.** Molina Rodríguez, J.; Hernández Minguillón, A.; Ferreras-Romero, M. (2022): Biometric differences across three populations of *Boyeria irene* from the southern Iberian Peninsula (Odonata: Aeshnidae). *Odonatologica* 51(3/4): 247-262. (in English) ["*B. irene* is mainly a West Mediterranean species. The instar distribution during winter is that of a 'summer species' sensu Corbet (1964). Little is known about how the geographical location of the population may affect the biometric peculiarities of *B. irene* larvae. Eight biometric variables were studied in male and female larvae belonging to three southern Iberian populations, with the objective of ascertaining whether there are differences between populations. The southernmost population (Los Alcornocales) shows the largest sizes for most of the variables measured, while the northernmost population (Sierra Madrona) shows the smallest sizes for most of the variables. Winter water temperatures may be the cause of the size divergences, due to a longer arrest in time of larval growth in the northernmost population." (Authors)] Address: Molina Rodríguez, Jennifer, C/ La Cruz, 1, 04860 Olula del Río, Almería, Spain

**20976.** Mossioli de Souza, Y.C.; Annibale, F.S.; Carneiro, L.G.; Vasconcelos, T.S.; Rossa-Feres, D.C. (2022): Differential behavioral responses of benthic and nektonic tadpoles to predation at varying water depths. *Canadian Journal of Zoology* 100: 526-538. (in English) ["Predators influence microhabitat selection and activity level of tadpoles, but it is still unclear how such responses to predators differ among species and how water column's depth influences this predator-prey interaction. Here, we experimentally tested whether the presence of Odonata water-nymphs influenced spatial use and activity of benthic and nektonic tadpoles in different food availability contexts. Benthic tadpoles occupied and consumed more food at the bottom level, irrespective

of predator's presence. However, when predators were at bottom, benthic tadpoles remained close to the cages, suggesting a typical "stay-still" defensive behavior known for *Physalaemus nattereri* (Steindachner, 1863). Nektonic tadpoles occupied shallower depths on predator's presence, and they also consumed less food and avoided predator by selecting food sources far from it. When predator was at bottom level and food was available, the distance of tadpoles to the cage tended to be smaller. *Scinax fuscovarius* (Lutz, 1925) tadpoles were more active when food was absent regardless of predator's presence. When food was available, these tadpoles generally occupied and consumed more food at bottom level. Tadpoles' responses depended not only on predator's presence, but on a complex net of factors, which include tadpoles' habit, anti-predatory behavior, availability and location of food." (Authors)] Address: Mossioli de Souza, Yasmim Caroline, UNESP, 28108, Department of Biological Sciences, São José do Rio Preto, SP, Brazil. Email: mossioli.souza@unesp.br

**20977.** Muneer, P.K.; Madhavan, M.; Chandran, A.V. (2022): Report of *Euphaea pseudodispar* Sadasivan & Bhakare, 2021 (Insecta: Odonata) from Kerala, India. *Journal of Threatened Taxa* 14(6): 21327-21330. (in English) [Material examined: CC.G & ES.O12, 1 male, Thirunelly (11.911°N 75.993°E, 850 m), 31.x.2021, coll. Muneer P.K.] Address: Muneer, P.K., Ferns Nature Conservation Society, PB No. 28, Mananthavady, Wayanad, Kerala 670645, India. Email: muneerputhukudy@gmail.com,2

**20978.** Nakanishi, K.; Usio, N.; Yokomizo, H.; Takashima, T.; Hayashi, T.I. (2022): Chlorantraniliprole application differentially affects adult emergence of *Sympetrum* dragonflies in rice paddy fields. *Paddy and Water Environment* 20: 177-183. (in English) ["Rice paddy fields are important habitat for many dragonfly species. In Japan, populations of dragonflies inhabiting rice paddies, in particular *Sympetrum* (Odonata: Libellulidae), have decreased greatly in the last few decades. A major cause of the decline has been suggested to be the use of systemic insecticides (e.g., phenylpyrazole and neonicotinoid) in nursery boxes of rice seedlings. In this study, we examined the effects of chlorantraniliprole (CAP), a novel anthranilic diamide insecticide, on adult emergence of *Sympetrum* dragonflies in ten rice paddy fields by counting their exuviae remaining on the rice plants as an abundance index. Our results suggest that CAP is a potential factor that reduced the emergence rate of *S. infuscatum* but not of *S. frequens*. This difference may be due to differential sensitivity to CAP, different lengths of the nymphal stage, or different effects of bottom-up controls via reduction of prey organisms that are highly sensitive to CAP." (Authors) *Sympetrum infuscatum*, *Sympetrum frequens*] Address: Nakanishi, K., Health & Environmental Risk Division, National Institute for Environmental Studies, Onogawa 16-2, Tsukuba, Ibaraki 305-8506, Japan. Email: nakanishi.kosuke@nies.go.jp

**20979.** Neff, F.; Komer-Nievergelt, F.; Rey, E.; Albrecht, M.; Bollmann, K.; Cahenzli, F.; Chittaro, Y.; Gossner, M.M.; Martínez-Núñez, C.; Meier, E.S.; Monnerat, C.; Moretti, M.; Roth, T.; Herzog, F.; Knop, E. (2022): Different roles of concurring climate and regional land-use changes in past 40 years' insect trends. *Nature Communications* 13, 7611 (2022). <https://doi.org/10.1038/s41467-022-35223-3>: 12 pp. (in English) ["Climate and land-use changes are main drivers of insect declines, but their combined effects have not yet been quantified over large spatiotemporal scales. We analysed changes in the distribution (mean occupancy of

squares) of 390 insect species (butterflies, grasshoppers, dragonflies), using 1.45 million records from across bioclimatic gradients of Switzerland between 1980 and 2020. We found no overall decline, but strong increases and decreases in the distributions of different species. For species that showed strongest increases (25% quantile), the average proportion of occupied squares increased in 40 years by 0.128 (95% credible interval: 0.123–0.132), which equals an average increase in mean occupancy of 71.3% (95% CI: 67.4–75.1%) relative to their 40-year mean occupancy. For species that showed strongest declines (25% quantile), the average proportion decreased by 0.0660 (95% CI: 0.0613–0.0709), equalling an average decrease in mean occupancy of 58.3% (95% CI: 52.2–64.4%). Decreases were strongest for narrow-ranged, specialised, and cold-adapted species. Short-term distribution changes were associated to both climate changes and regional land-use changes. Moreover, interactive effects between climate and regional land-use changes confirm that the various drivers of global change can have even greater impacts on biodiversity in combination than alone. In contrast, 40-year distribution changes were not clearly related to regional land-use changes, potentially reflecting mixed changes in local land use after 1980. Climate warming however was strongly linked to 40-year changes, indicating its key role in driving insect trends of temperate regions in recent decades." (Authors)] Address: Neff, F., Agroecology and Environment, Agroscope, Reckenholzstr. 191, 8046 Zürich, Switzerland. Email: mail@felixneff.ch

**20980.** Nelsen, J.A.; Yee, D.A. (2022): Mosquito larvicides disrupt behavior and survival rates of aquatic insect predators. *Hydrobiologia* 849: 4823-4835. (in English) ["Understanding the environmental effects of chemicals used in pest control on aquatic systems is crucial to ensure the conservation of beneficial non-target organisms. Mosquito larvicides are commonly applied to aquatic habitats; however, their non-target effects are not well understood. Our goal was to determine lethal and behavioral effects of insect growth regulators (IGRs) and surface films (SFs) on predaceous diving beetle adults and larvae, and damselfly [*Ichnura* sp.] and dragonfly [*Pachydiplax longipennis*] nymphs in roadside ditch habitats. Behavioral effects were determined via bioassays quantifying predator movement, location, and larval mosquito predation. Using Principal Components Analyses, correlated behaviors were determined for each taxa, and compared within SF and IGR treatment levels. Surface films were lethal to beetle adults in the genus *Laccophilus* (Dytiscidae) at recommended and high concentrations. *Laccophilus* adult behavior changed in response to IGRs, those exposed to recommended and high concentrations were more active than controls. Larval *Laccophilus* mosquito consumption varied between SFs and IGRs. We conclude that SFs can harm aquatic organisms that require atmospheric oxygen, and both larvicides may have sublethal effects on hunting behaviors of aquatic insects. Future studies should focus on different larvicides, and a wider variety of aquatic taxa that interact with mosquito larvae." (Authors)] Address: Nelsen, J.A., Biology Department, Clark University, Worcester, MA, 01610, USA

**20981.** Ngiam, R.; Ng, M. (2022): A Photographic Field Guide to the Dragonflies & Damselflies of Singapore. John Beaufoy Publishing Ltd: 340 pp. (in English) ["Photographic Field Guide to the Dragonflies & Damselflies of Singapore is a fully comprehensive field guide to the 136 species of dragonfly and damselfly found in Singapore. With stunning, close-up photographs from the authors, each species is illustrated with multiple variants. The general introduction



provides a comprehensive overview of dragonfly anatomy, feeding habits, courtship and reproduction; also dragonfly research and conservation in Singapore, plus the best places for dragonfly watching in Singapore. Detailed coverage of every species includes key features for field identification; telling apart similar species; habitat and habits; presence in Singapore; etymology; wider distribution; national and IUCN conservation statuses; and larval features. Additionally, a QR code links to detailed larvae images from the Lee Kong Chian Natural History Museum website. The final section gives a checklist of the country status and conservation status of all of Singapore's odonates." (Authors)] Address: John Beaufoy Publishing Limited, 11 Blenheim Court, 316 Woodstock Road, Oxford, OX2 7NS, UK

**20982.** Niehuis, M. (2022): Gerd Reder (\*21. Oktober 1946) zum 75. Geburtstag. *Fauna und Flora in Rheinland-Pfalz* 14(4): 1637-1660. (in German) [Rheinland-Pfalz, Germany. Brief report on the vita of a very well known regional entomologist, including his odonatological activities and a bibliography.] Address: Niehuis, M., Im Vorderen Großthal 5, 76857 Albersweiler, Germany. Email: niehuis@t-online.de

**20983.** Ogidiaka, E.; Ikomi, R.B.; Akamagwuna, F.C.; Edegbene, A.O. (2022): Exploratory accounts of the increasing pollution gradients and macroinvertebrates structural assemblage in an afrotropical estuary. *Biologia* 77: 2103-2114. (in English) ["Forcados Estuary is a key water body in Delta State, Nigeria, serving various purposes such as fishing and oil exploration sites. However, the ecological health integrity of the estuary is seriously degrading due to crude oil and gas production, as well as run-off from surrounding communities. In this study, we investigated the structural assemblage of macroinvertebrates of the estuary to provide an exploratory account of the water quality status of the estuary. Physico-chemical variables and macroinvertebrates were sampled in five stations for 24 months between April 2012 and March 2014. Physico-chemical variables collected in the estuary classified the sampling stations into potential ecological categories, reflecting an increasing pollution gradient, with Stations 1 and 2 classified as heavily polluted stations. There was a relatively high mean concentration of iron ( $39.7 \pm 20.71 \text{ mg L}^{-1}$ ), copper ( $12.22 \pm 5.33 \text{ mg L}^{-1}$ ) and lead ( $2.97 \pm 1.98 \text{ mg L}^{-1}$ ) in Station 1 compared to the remaining four stations. Whereas the highest mean zinc concentration was recorded in Station 2 ( $23.12 \pm 11.96 \text{ mg L}^{-1}$ ). Principal Component Analysis (PCA) conducted for both wet and dry seasons showed that season played a key role in the pollution gradient of the estuary. A total of 14,685 macroinvertebrate individuals were recorded in the entire study period. *Pachymelania fusca* (freshwater snail) was the most preponderant taxa with 2,095 individuals recorded during the study period, followed by *Tympanotonus fuscatus* (brackish water snail) with 2,011 individuals. *Coenagrion pulchellum* (damselfly) was the least represented taxa, with only one taxon recorded throughout the study period. The non-metric multi-dimensional scaling (NMDS) showed no distinct cluster for macroinvertebrates collected in both wet and dry seasons. Canonical correspondence analysis (CCA) revealed differential responses of macroinvertebrates to physico-chemical variables, with species such as *Callinectes latimanus* and *Macra nitida* increasing the non-disturbed Stations 4 and 5, whereas *Corixa punctata* and *Thias callifera* dominated the disturbed Stations 1 and 2. Overall, the study provided useful information on the ecological pollution status of the Forcados Estuary and this will serve as a baseline for future research on the assessment of the ecological integrity of the estuary." (Authors) *C. pulchellum* is an

European species not occurring in Africa.] Address: Edegbene, Augustine Ovie, Institute for Water Research, Rhodes University 6140, Makhanda (Grahamstown), South Africa

**20984.** Okude, G.; Moriyama, M.; Kawahara-Miki, R.; Yajima, S.; Fukatsua, T.; Futahashi, R. (2022): Molecular mechanisms underlying metamorphosis in the most-ancestral winged insect. *PNAS* 119(9), e2114773119: 12 pp. (in English) ["Significance: As caterpillars metamorphose to butterflies, insects change their appearance dramatically through metamorphosis. Some insects have an immobile pupal stage for morphological remodeling (homometaboly). Other insects, such as cockroaches, have no pupal stage, and the juveniles and adults are morphologically similar (hemimetaboly). Notably, among the most-ancestral hemimetabolous insects, dragonflies drastically alter their appearance from aquatic nymphs to aerial adults. In dragonflies, we showed that transcription factors Kr-h1 and E93 are essential for regulating metamorphosis as in other insects, while broad, the master gene for pupation in holometabolous insects, regulates a number of both nymph-specific genes and adult-specific genes, providing insight into what evolutionary trajectory the key transcription factor broad has experienced before ending up with governing pupation and holometaboly. Abstract: Insects comprise over half of the described species, and the acquisition of metamorphosis must have contributed to their diversity and prosperity. The order Odonata (dragonflies and damselflies) is among the most-ancestral insects with drastic morphological changes upon metamorphosis, in which understanding of the molecular mechanisms will provide insight into the evolution of incomplete and complete metamorphosis in insects. In order to identify metamorphosis-related genes in Odonata, we performed comprehensive RNA-sequencing of the blue-tailed damselfly *Ischnura senegalensis* at different developmental stages. Comparative RNA-sequencing analyses between nymphs and adults identified eight nymph-specific and seven adult-specific transcripts. RNA interference (RNAi) of these candidate genes demonstrated that three transcription factors, Krüppel homolog 1 (Kr-h1), broad, and E93 play important roles in metamorphosis of both *I. senegalensis* and a phylogenetically distant dragonfly, *Pseudothemis zonata*. E93 is essential for adult morphogenesis, and RNAi of Kr-h1 induced precocious metamorphosis in epidermis via up-regulation of E93. Precocious metamorphosis was also induced by RNAi of the juvenile hormone receptor Methoprene-tolerant (Met), confirming that the regulation of metamorphosis by the MEKRE93 (Met-Kr-h1-E93) pathway is conserved across diverse insects including the basal insect lineage Odonata. Notably, RNAi of broad produced unique grayish pigmentation on the nymphal abdominal epidermis. Survey of downstream genes for Kr-h1, broad, and E93 uncovered that unlike other insects, broad regulates a substantial number of nymph-specific and adult-specific genes independently of Kr-h1 and E93. These findings highlight the importance of functional changes and rewiring of the transcription factors Kr-h1, broad, and E93 in the evolution of insect metamorphosis." (Authors)] Address: Okude, G., Dept of Biological Sciences, Graduate School of Science, The University of Tokyo, Tokyo 113-0033, Japan. Email: orgentaokude@gmail.com

**20985.** Oliveira-Junior, J.M.B.; Rocha, T.S.; Vinagre, S.F.; Miranda-Filho, J.C.; Mendoza-Penagos, C.C.; Dias-Silva, K.; Juen, L.; Calvão, L.B. (2022): A bibliometric analysis of the global research in Odonata: Trends and gaps. *Diversity* 2022, 14, 1074. <https://doi.org/10.3390/d14121074>: 16 pp. (in English) ["Insects of the order Odonata have been used

as indicators of environmental quality in different aquatic systems around the world. In this context, we conducted a bibliometric analysis to understand the general patterns of research on Odonata published in the past decade (2012–2021). We extracted literature from the Web of Science (WoS) in the advanced search option and used search terms related to Odonata plus search strings for each term. A total of 2764 Odonata publications were identified. The journals with the most published articles on Odonata were *Zootaxa*, *International Journal of Odonatology* and *Odonatologica*. The countries with the most Odonata publications were the USA, Brazil and China. Most studies were conducted on streams, ponds and rivers. Ecology, taxonomy and behavior were the main study topics. Of the total articles on Odonata, 982 involved Zygoptera and 946 Anisoptera. Another 756 studies were focused on both suborders. The increase in ecological and taxonomic studies of Odonata reflects the dynamic characteristics of this order, and its relatively well-defined systematics, especially in the case of adults. Despite the recent increase in the number of publications, there are still many gaps related to topics such as biogeography, parasitism, competition within and between species, evolutionary and phylogenetic relationships, as well as studies of the eggs (e.g., their development) and larval exuviae (e.g., their morphological features)." (Authors) Frankly spoken: This publication has ignored the complete set of regional odonatological journals published in Europe such as *Libellula*, *Martinia*, *Brachytron*, *Gomphus*, and the journals of IDF...] Address: Oliveira-Junior, J.M.B., Programa de Pós-Graduação em Sociedade, Natureza e Desenvolvimento (PPGSND), Programa de Pós-Graduação em Sociedade, Ambiente e Qualidade de Vida (PPGSAQ), Programa de Pós-Graduação em Biodiversidade (PPGBEES), Instituto de Ciências e Tecnologia das Águas (ICTA), Universidade Federal do Oeste do Pará (UFOPA), Rua Vera Paz, s/n (Unidade Tapajós) Bairro Salé, Santarém 68040-255, Pará, Brazil. Email: jose.mbo@ufopa.edu.br

**20986.** Olsen, K.; Svenning, J.-C.; Balslev, H. (2022): Climate change is driving shifts in dragonfly species richness across Europe via differential dynamics of taxonomic and biogeographic groups. *Diversity* 2022, 14, 1066: 22 pp. (in English) ["Understanding how changes in species richness pattern correlate with range changes in different taxonomic and biogeographic groups is important for conservation because it allows for generalizations about which species are at greatest risk. Here, we assessed whether changes in species richness patterns result from generalized range shifts across taxonomic and biogeographic groups or from changes in specific subsets of species. Using data from 1988 and from 2010, we studied changes in distributional range of European dragonfly species, using outline distribution maps for all dragonflies combined and separately for taxonomic suborders (Zygoptera and Anisoptera) and biogeographic groups (Boreo-alpine, Eurasian, Mediterranean, and Tropical). The results demonstrated differing range dynamics for Zygoptera and Anisoptera, with Anisoptera driving local turnover in species richness to a greater extent than Zygoptera. The distributional range of Tropical and Mediterranean species had expanded to a much greater extent than that of Eurasian and Boreo-alpine species. Large-scale changes in species richness arose from several divergent, group-specific processes. Overall, local diversity especially declined in parts of southern and south-eastern Europe, reflecting local losses in multiple species rather than major range contractions among Mediterranean or Eurasian species. In fact, among the biogeographic groups, overall range declines were most prominent among Boreo-alpine species,

highlighting the particular threat from climate change to this group." (Authors)] Address: Olsen, K., Research & Collections, Natural History Museum Aarhus, Wilhelm Meyers Allé 10, DK-8000 Aarhus, Denmark. Email: kent@nathist.dk

**20987.** Oopath, S.V.; Baji, A.; Abtahi, M.; Luu, T.Q.; Vasilev, K.; Truong, V.K. (2022): Nature-inspired biomimetic surfaces for controlling bacterial attachment and biofilm development. *Advanced Materials Interfaces* 2022, 2201425: 17 pp. (in English) ["The use of antibacterial and antifouling materials is widely being investigated to combat the increasing risk associated with bacterial infections and the evolution of drug-resistant bacteria. Efficient antibacterial materials can be fabricated by mimicking the topography found on the surface of natural antibacterial materials. Natural materials such as the wings of cicadas and dragonflies have evolved to use the structural features on their surface to attain bactericidal properties. The nanopillars/nanospikes present on these natural materials physically damage the bacterial cells that settle on the nanostructures resulting in cell lysis and death. This article reviews the role of nanostructures found on the surface of some of these natural antibacterial and antifouling materials such as lotus leaf, cicadas and dragonflies wings, shark skin, and rose petals. These natural structures provide guidelines for the design of synthetic bio-inspired materials. This review article also presents some novel fabrication techniques used to produce biomimetic micro- and nano-structures on synthetic material surfaces. The role of size, shape, aspect ratio, and spacing between the micro/nano-structures on the bactericidal properties is also discussed. Finally, the review is finished with the author's view on the future of the field." (Authors)] Address: Oopath, S.V., Department of Engineering, La Trobe University, Bundoora, VIC 3086, Australia. Email: a.baji@latrobe.edu.au

**20988.** Palacino-Rodríguez, F.; Martínez-Falcón, A.P.; Córdoba-Aguilar, A. (2022): A country-scale species richness assessment suggests that the inventory of Colombian Odonata species is far from being complete. *International Journal of Tropical Insect Science* 42: 2035-2039. (in English) ["Although collections of odonate insects have increased in recent years in Colombia, it is unknown whether the inventory list is complete for this country. Thus, we have investigated whether odonate species richness for Colombian endemic and total species by department and natural region, are complete using sample- and coverage-based rarefaction curves. This analysis indicated rarefaction curve values of completeness of 99% for the whole country, 87% all departments, 73% for region, and 99% for endemic patterns. Collections are scarce for Arauca, Casanare, Guaviare, Vichada, Nariño, Guajira, Norte de Santander, San Andrés, Sucre and Vaupés departments. Conversely, the departments with more collections were Antioquia, Cundinamarca, Magdalena and Meta. Regionally, odonates have been more collected in the Andes and Orinoquia, followed by the Caribbean and Pacific. We encourage odonate sampling especially in protected areas and poorly sampled localities. This sampling should be accompanied by habitat management and conservation plans." (Authors)] Address: Córdoba-Aguilar, A., Depo de Ecología Evolutiva, Instituto de Ecología, Universidad Nacional Autónoma de México, Apdo. Postal 70-275, Ciudad Universitaria, 04510, México, D. F., México. E-mail: acordoba@ecologia.unam.mx

**20989.** Parr, A.J. (2022): Migrant and dispersive dragonflies in Britain during 2021. *J. Br. Dragonfly Society* 38(2): 100-112. (in English) ["The 2021 reporting year was a relatively

eventful one for migrant and dispersive species in Britain. *Anax ephippiger* continued its recent run of autumn influxes, with well-documented records from nearly 20 localities between 9 September and 22 November, and with several 'possibles' also being reported. *Sympetrum fonscolombii* showed well during spring and early summer, with all but one individual being fully mature when first discovered, rather implying that most individuals were immigrants rather than locally bred. Perhaps surprisingly there were, however, few autumn records of the species, implying that both the emergence of a locally bred second generation and also any late season immigration had been limited. Of our other traditional migrant species, *Anax parthenope* and *Aeshna affinis* were both widely reported during the year, but the growing strength of local breeding populations that have become established over the last decade or so made detailed analysis of migration difficult, particularly in the case of *A. parthenope*. In addition to conventional migrants, *Aeshna isoceles* continued its recent range expansion, with a sighting at Wykeham Lakes in North Yorkshire on 20 July being of particular note. At least some of this expansion may be being driven by immigration from the Continent, but increased internal dispersal must be a major factor. During 2021 there was also evidence for significant mid- to long-distance dispersal within Britain by several other species. *Calopteryx virgo*, for example, appeared on the Isles of Scilly during late August, some 45 kilometres away from the nearest known breeding sites on the Cornish mainland. A male *Orthetrum cancellatum* was also recorded from Scilly during the year, this being only the second record for the islands. Finally, it is worth noting that *Chalcolestes viridis*, one of Britain's recent colonist damselflies, had yet another successful season with considerable range expansion, particularly in a north westerly direction. An individual seen near Wolverhampton on 23 September represents the new "most westerly" sighting for Britain while, further south, three records in the general area of the New Forest are also of note." (Author) Additional species treated: *Lestes barbarus*, *L. dryas*, *Coenagrion scitulum*, *Erythromma viridulum*, *Ischnura pumilio*, *Aeshna mixta*, *Sympetrum striolatum*, *S. danae*.] Address: Parr, A.J., 10 Orchard Way, Barrow, Bury St Edmunds, Suffolk, IP29 5BX, UK

**20990.** Peck, R.; Nash, S. (2022): Characterization of a Small Population of the Orangeblack Hawaiian Damselfly (*Megalagrion xanthomelas*) in Anchialine Pools at Kaloko-Honokohau National Historical Park, Hawai'i Island. *Proceedings of the Hawaiian Entomological Society* 54: 93-109. (in English) ["The endangered *M. xanthomelas* is a lowland inhabitant of freshwater and brackish wetland environments. Formerly one of the most widely distributed native insects in Hawai'i, it now appears restricted to small populations on the islands of O'ahu, Moloka'i, Maui, and Hawai'i. On Hawai'i island, anchialine pools provide important habitat for *M. xanthomelas*, and Kaloko-Honokohau National Historical Park (Park) supports one of only a few documented populations on the western side of the island. This study aimed to estimate the population size of *M. xanthomelas* at this Park, characterize its habitat, and identify substrates on which females oviposit eggs. We conducted visual surveys for adult *M. xanthomelas* at anchialine pools during June 2016–August 2017. On average, the observed population was 10.7 individuals per month (range = 5–20; standard error = 1.3). Males were observed 6.1 times more frequently than females, likely reflecting the less cryptic nature of males compared to females. Females exhibited oviposition behavior on a variety of substrates, but small branches were used most frequently. Factors restricting this population are

poorly known, but invasive fish may limit its distribution across the Park. Removal of invasive fishes from anchialine pools and 'Aimakapa Fishpond may restore much habitat for this rare species in the Park." (Authors)] Address: Peck, R., Hawai'i Cooperative Studies Unit, University of Hawai'i at Hilo, P.O. Box 44, Hawai'i National Park, HI 96718, USA. Email: bwpeck@usgs.gov

**20991.** Pereira de Gouvêa, T.; Dias de Oliveira, T.M.; Ferreira, E.D.F.; Jacques, G.; Teófilo-Guedes, G.; Vilela, D.S.; Magalhães de Souza, M. (2022): Response of Odonata communities to dry season in a deciduous forest in the northern Minas Gerais, Brazil. *Entomobrasilia* 15: e1020: 9 pp. (in English) ["Odonata sampling effort in the state of Minas Gerais has intensified throughout the 21st century. However, research on these insects in some regions and ecosystems such as the Deciduous Forest are incipient, and the effect of prolonged dry periods over these insects is still unknown. This study thus aimed to assess changes in adult Odonata species composition over one year in a Brazilian Deciduous Forest and the Odonata species richness in the Mata Seca State Park in the Manga and Itacarambi municipalities in the Northern region of the state of Minas Gerais State, Brazil. Twenty-four days of sampling were distributed in February, May, July and November, adopting an active search through entomological nets close to lentic environments (Lagoa Angical, Lagoa Comprida, Lagoa Encantada, Lagoa da Prata and two wetlands of Lajedo da Lua); lotic environments (São Francisco river) and in associated terrestrial ecosystems. In total, 55 species were collected. Rainy and dry periods altered Odonata communities' composition but did not affect species richness and abundance due to the presence of permanent lagoons associated with the São Francisco river. This study shows the importance of the Mata Seca State Park for preserving Odonatofauna in the state of Minas Gerais and for protecting those permanent lagoons." (Authors)] Address: Pereira de Gouvêa, T., Instituto Federal de Educação Ciência e Tecnologia do Sul de Minas Gerais, Inconfidentes, Minas Gerais, Brazil. Email: taiguaragouvea.bio@gmail.com

**20992.** Phan, Q.T., Keetapithchayakul, T.S.; Ngo, Q.P. (2022): New records *Podolestes pandanus* Wilson & Reels, 2001 (Zygoptera: Argiolestidae) and notes on *Risiphlebia guentheri* Kosterin, 2015 (Anisoptera: Libellulidae) from the swamp cypress nature reserve in the Central Highlands of Vietnam. *International Dragonfly Fund. Report* 172: 1-7. (in English) ["New records of *Podolestes pandanus* Wilson & Reels, 2001 for Vietnamese fauna and confirms the occurrence of *Risiphlebia guentheri* Kosterin, 2015 in the Central Highlands of Vietnam." (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: pqtoan-84@gmail.com

**20993.** Piña, A.E.; Lougheed, V.L. (2022): Macroinvertebrate community composition in wetlands of the desert southwest is driven by wastewater-associated nutrient loading despite differences in salinity. *Wetlands* 42(128): 15 pp. (in English) ["The relatively rare freshwater ecosystems in the arid southwestern United States serve as biodiversity hotspots, yet they remain among the most threatened systems in the world due to human impacts and climate change. Globally, arid region wetlands remain understudied with respect to their ecology, making assessments of quality or restoration efforts challenging. To address these needs, this project aims to better understand the factors that drive

water quality and macroinvertebrate community composition of wetlands of the US desert Southwest. Water quality and macroinvertebrate data were collected over three years from 14 different wetland and riparian sites spanning across West Texas, New Mexico and Arizona. Principal Component Analysis (PCA) indicated that salinity related variables such as chloride, sulfate and conductivity were the greatest drivers of environmental variance (32%) among sampled desert wetlands. Nutrients such as nitrate and phosphate described a second axis, with 22% of variation in environmental data explained, where we found a clear distinction between wastewater and non-wastewater wetlands. Nutrients were shown to have the greatest impact on macroinvertebrate communities with wetlands receiving wastewater showing more uneven distribution of functional feeding groups and lower Simpson Index scores. These sites were dominated by filter feeders and had lower relative abundances of predator and collector-gatherer taxa. There was also a significant decrease in metrics related to diversity and environmental sensitivity such as % Ephemeroptera-Odonata-Trichoptera (EOT) within high nutrient sites. Increased salinity levels were also shown to correlate with lower Simpson Index scores indicating that increased salinity resulted in a decline in macroinvertebrate diversity and evenness. Overall, the nutrients within effluent water have shown to significantly alter community composition especially in desert wetlands where macroinvertebrates may be more adapted to high salinity. Though macroinvertebrate communities in wastewater sites may not fully resemble those of natural wetlands over time, creation of these sites can still benefit landscape level diversity." (Authors)] Address: Piña, Anna Elisa, Dept Biol. Sciences, Univ. of Texas at El Paso, 79968, TX El Paso, USA. Email: aepina@miners.utep.edu

**20994.** Ponomareva, N.M.; Popova, O.N.; Yurlova, N.I. (2022): Odonata (Insecta) larvae as the second intermediate hosts of the trematodes of genus *Plagiorchis* in the basin of Chany Lake, Western Siberia. *Contemporary Problems of Ecology* 15: 631-641. (in English) ["Trematodes of the genus *Plagiorchis* are widespread endoparasites with a life cycle involving several hosts. The second intermediate hosts of the trematodes of genus *Plagiorchis* are studied for the first time in the basin of Lake Chany in the forest-steppe zone of Western Siberia, which is crossed by the migration way of many species of aquatic and near-water birds—final hosts of these trematodes. This study was conducted in 2014–2015 in the reed beds of Lake Fadikha, which is a habitat of the first intermediate hosts of plagiorchids: snails. Invertebrates from classes Insecta, Malacostraca, and Gastropoda, as possible second intermediate hosts of the Plagiorchidae trematodes, are studied for the prevalence and intensity of trematode infection. Metacercariae (larvae inhabiting the second intermediate hosts) of genus *Plagiorchis* (*P. elegans* and *P. multiglandularis*) are found only in the insects from order Odonata. The largest portion among infected larvae is comprised of larvae of *Sympetrum vulgatum* (68%), followed by *S. flaveolum* (18%), *S. sanguineum* (9%), and *Aeshna serrata* (5%). The prevalence of the metacercariae of the detected trematode species for the four Odonata species during the study years varied from 3.3 to 45.5%; the intensity of infection varied from 2 to 4 trematodes per 1 odonate larva. Infection with metacercariae increases with the age of odonate larvae. A trend towards a positive correlation between the infection (prevalence) of the first (snails) and the second (odonate larvae) intermediate hosts is identified. A significant relationship is identified between the prevalence of metacercariae of the odonate larvae and their population density, which varies throughout

the season. Seasonal changes in the infection of odonates with metacercariae of the trematodes of genus *Plagiorchis* are associated with the phenology of these insects. Periods of increased infection are registered just prior to the mass emergence of odonates, when the abundance of odonate larvae in the water body is the highest, and vice versa, periods of decline in infection are registered after the mass metamorphosis of odonates." (Authors)] Address: Ponomareva, N.M., Institute of Systematics and Ecology of Animals, Siberian Branch, Russian Academy of Sciences, 630091, Novosibirsk, Russia

**20995.** Puniamoorthy, J, Hussin, SMB, Sani, MAB, Ang, Y, Pohl, S & Tan, EJ (2022): Biodiversity Record: First record of the damselfly, *Agriocnemis pygmaea*, on Sentosa. *Nature in Singapore*, 15: e2022143. DOI: 10.26107/NIS-2022-0143: 2 pp. (in English) ["2 males, white pan trap sample, Singapore, Sentosa Island, Tanjong Beach Road at 1°14'40.4"N 103°49'31.3"E; 17–18 March 2022.] Address: Puniamoorthy, J., Yale-NUS College, National University of Singapore, Singapore 138527, Republic of Singapore. Email: j.punia@nus.edu.sg

**20996.** Qian, P.; Quais, M.K.; Zhou, W.; Ye, J.; Wang, G.; Wu, M.; Zhong, J.; Chen, M.; Yuan, X.; Zhu, J.; Feng, J.; Zhu, Z.R. (2022): Effects of integrated rice-duck farming on weed pressure, herbivore-predator interactions and economic benefits. *Biocontrol Science and Technology* 32(6): 715-730. (in English) ["This study was conducted to evaluate whether conventional farming can be replaced by a lower chemical pollution farming system, integrated rice-duck farming in a suburban agricultural area in northern Zhejiang, Southeast China. We comprehensively assessed the impacts of integrated rice-duck farming on weeds and herbivorous insects along with their natural enemies during the rice-growing season. We found that the rice-duck system effectively controlled weeds within the paddy fields. Nevertheless, the abundance of herbivores, particularly planthoppers and leafhoppers was increased in the duck-roaming paddy fields compared to the control and conventional fields, indicating the inefficiency of the rice-duck system in the control of rice main herbivore pests. Rice-duck farming significantly reduced the abundance of predators, especially spiders and dragonflies, therefore an 'enemy-free space' was created for herbivores which might be responsible for the observed herbivore increase in the rice-duck fields. Despite the inefficiency of rice-duck farming in the control of rice main herbivore pests, the net income of the rice-duck treatment with an organic certification was 7.6 and 1.4 times higher compared to the conventional and control treatments, respectively. In the view of the favourable results obtained in this study, the integrated rice-duck farming system might be suggested as a high economic return organic farming method suitable for modern farmers." (Authors)] Address: Qian, P., Inst. Insect Sci., Zhejiang University, Hangzhou, China

**20997.** Qin, M. (2022): Design and research of dragonfly robot under the background of artificial intelligence. *Wireless Communications and Mobile Computing* Volume 2022, Article ID 1727965: 7 pp. (in English) ["Simulating the flight of dragonflies has always attracted scientists' interest. This paper studies the theory and method of the transmission mechanism of dragonfly robot, establishes the relationship function model between wing swing angle and geometric parameters, and designs a kind of gear and rod mechanism transmission chain, including a pair of wing angle turnover mechanism, so that the wings swing smoothly, no jam phenomenon occurs, and improves the lift ratio. In this paper,

the dynamic principle of Bionic Flapping Wing robot was analyzed, and the design scheme of driving mechanism is put forward; the project realizes the three-dimensional design of robot parts, the virtual digital prototype and simulation, and 3D printing of the prototype robot. During the design and manufacture, the lightweight design and processing of the fuselage and wings are carried out to reduce its weight. The drive circuit and algorithm are designed with 8051 chip as the CPU; the balance and attitude control methods are proposed." (Authors)] Address: Qin, M., Dept of Computer Science and Software Engineering, Xi'an Jiaotong-Liverpool University, Suzhou 215123, China. Email: minchuan.qin18@student.xjtlu.edu.cn

**20998.** Ranjana, S. (2022): A survey study on Odonata in Rabo Dam Area, Raigarh, Chhattisgarh, India. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)* 27(6): 1-7. (in English) ["An extensive study provides current status, species richness and distribution pattern of Odonate diversity in Rabo dam area. Rabo Dam is constructed on the Kurkut River a tributary of the river mand in Bagbhara area, District Raigarh, (Chhattisgarh) India. The geographical location of the Rabo Dam area provides suitable environmental conditions for Odonatan's habitat and diversity. An observation on Odonata diversity was carried out during the period from March 2021 to February 2022. Three study sites were selected to assess the diversity of Odonatan species. A total 41 of Odonata species were identified [...]. Zygoptera contributed 18 species under 5 families and Anisoptera with 23 species under 3 families. Zygoptera and Libellulidae was most dominant family by contributing 18 species but Libellulidae was the most common species found in all three study sites. Chlorocyphidae was least common species which restricted to only one study site. In the present study 10 species of Coenagrionidae, 3 species of Gomphidae, 3 species of Protoneuridae, 2 species of Platycnemididae, 2 species of Lestidae, 2 species of Aeshnidae were recorded. The observation showed the interesting perching 'Obelisk pose, in species *Trithemis pallidinervis*. Observation also showed 'tandem position, in species *Copera marginipes*. In this area the odonate diversity is still unexplored hence the present study will provide the current status and base line data of Odonata diversity for further attention and research activities." (Author)] Address: Ranjana, S., Department of Zoology, K.G. Arts and Science College, Raigarh, India

**20999.** Rebassa, M.; Canyelles, X. (2022): Actualització de l'estatus dels odonats de les Illes Balears. Un repàs a la seva situació des de començaments del segle XX fins a l'actualitat. *Bolletí de la Societat d'Història Natural de les Balears* 65: 97-115. (in Catalan, with English summary) ["Update on the status of the Odonata of the Balearic Islands. A review of its situation from the beginning of the 20th century to the present day. This paper presents, for the first time, a complete catalogue of all species of Odonata (Zygoptera and Anisoptera) mentioned in the Balearic Islands since the beginning of the twentieth century, including those that today are considered the result of past identification errors. Data were collected from 41 species, 31 of which are considered valid. For each species, its status is indicated for each of the 4 islands (Mallorca, Menorca, Ibiza, Formentera), as well as its population trend. The Balearic catalogue is compared with other catalogues from nearby regions, discussing its main differences." (Authors)] Address: Rebassa, M., Societat d'Història Natural de les Balears, carrer Margalida Xirgu, 16, baixos, 07011, Palma, Spain. Email: escarbatdaurat@gmail.com

**21000.** Ribeiro, C.; Rodrigues, M.E.; Sahlén, G.; Roque, F. (2022): Dragonflies within and outside a protected area: a comparison revealing the role of well-preserved atlantic forests in the preservation of critically endangered, phytotelmatous species. *Journal of Insect Conservation* 26: 271-282. (in English) ["Understanding the interactions between protected areas and the surrounding landscape has become a central issue to conservation of biodiversity. The important role of protected areas in the preservation of biodiversity in tropical hotspots is widely recognized, but the role of the landscape surrounding those hotspots is poorly understood, particularly with regard to insects. In this study, we evaluated the species richness, composition, and beta diversity of Odonata assemblages inside and in the surroundings of a protected area in the Atlantic Forest hotspot. Sampling was carried out in the Private Reserve of Natural Heritage Veracel Station and its surroundings in the southern region of Bahia. Forty sites were sampled, 22 within the reserve and 18 in the surrounding areas. We found both a greater total species richness, and a greater richness with regard to the suborder Anisoptera in the surrounding areas. In addition, the species composition differed less between the sampling sites inside the protected area. Some of the species found inside the protected area did, however, make a greater contribution of the individual species to beta diversity (SCDB). Our study suggests that the surroundings of a protected area can contribute to the maintenance of regional diversity of dragonflies, but the protected areas play a vital role in supporting critically endangered species and populations of forest specialists, e.g., phytotelmatous species. Implications for insect conservation: Our results show that the composition of the odonate species assemblages may provide a means to assess the importance of protected areas to Odonata communities. Our study also highlights the importance of PAs to the maintenance of the regional Odonata species pool, especially to forest specialist species and to threatened species." (Authors)] Address: Ribeiro, Cintia, Laboratório de Organismos Aquáticos, Depto de Ciências Biológicas, Universidade Estadual de Santa Cruz (UESC), Ilhéus, BA, Brasil

**21001.** Rochas, P.; Minot, M.; Mézière, N.; Renoult, J.; Uriot, Q.; Uriot, S.; Foxonet, H.; Cerdan, A.; Juillerat, L. (2022): Check-list of Odonata from French Guiana with notes on their distribution, ecology, and new state records. *Odonatologica* 51(3/4): 175-224. (in English) ["This publication documents the diversity of odonates found in French Guiana and discusses their distribution and ecology. The check-list was created by compiling information from available publications and databases. A total of 292 species belonging to 14 families and 94 genera are listed from the territory. Of these, one family, three genera and 48 species are new records. Four species are considered endemic to French Guiana, and seven known species remain undescribed. For species listed, occurrence by municipality, ecoregion, and known aquatic and terrestrial habitats are noted." (Authors)] Address: Rochas, P., Kourou, French Guiana. Email: paul.rochas85@gmail.com

**21002.** Rodríguez Esteban, M.; Hernández Alonso, D.; Martín Diego, M. (2022): Nuevas citas y revisión de la distribución de *Macromia splendens* (Pictet, 1843) (Macromiidae), *Oxygastra curtisii* (Dale, 1834) (Inc. Sed.) y *Gomphus graslinii* (Rambur, 1842) (Gomphidae) en la provincia de Salamanca (centro-oeste ibérico) (Odonata). *Bolletín de la SEA* 70: 344-353. (in Spanish, with English summary) ["New data on distribution, abundance, and reproduction of Community interest species *Macromia splendens*

(Pictet, 1843), *Oxygastra curtisii* (Dale, 1834) and *Gomphus graslinii* (Rambur, 1842) is given for Salamanca's province (Castilla y León, Western Spain). Subsequently they are discussed together with bibliographic records to analyse their current situation and trend in this area." (Authors)] Address: Rodríguez Esteban, M., Avenida S. Agustín, 44. Portal 1.1° A. 37005. Salamanca (Salamanca), Spain. Email: elomitoblog@hotmail.com

**21003.** Romero, F. (2022): Inventario preliminar de insectos acuáticos en la provincia de San Juan, Argentina: distribución y ecología. *Acta zoológica lilloana* 66(1): 10-44. (in Spanish, with English summary) ["A preliminary inventory of the aquatic insects of the Province of San Juan (Argentina) is provided based on its own collections and previous bibliographic records of species belonging to the orders Plecoptera, Ephemeroptera, Trichoptera, Odonata, Hemiptera, Coleoptera, Lepidoptera and Diptera. Our objective was to obtain a list and distribution of the aquatic insects of a province with little information on the subject. For this, various types of environments, mainly rivers, were surveyed in 28 localities and 12 localities were also included from bibliographic records. A total of 46 families of insects, 107 genera and 148 species were recorded, of which 22 families, 65 genera and 82 species are new records, 17 new localities are also indicated for some species. Of the taxa recorded, 90% of the genera correspond to Neotropical distribution groups, 6% Cosmopolitan and American, while only 4% of the species have an Andean distribution." (Author) The following species are listed in table 2: *Rhionaeschna absoluta*, *R. bonariensis*, *R. pallipes*, *R. variegata*, *Andinagrion peterseni*, *Argia joergenseni*, *Ischnura fluviatilis*, *Oxyagrion rubidum*, *Progomphus joergenseni*, *Brechmorhoga vivax*, *Erythrodiplax atroterminata*, *E. connata*, *E. corallina*, *Macrothemis hanneli*, *Orthemis nodiplaga*.] Address: Romero, Fátima, Fundación Miguel Lillo, Miguel Lillo 251, T4000JFE. San Miguel de Tucumán, Tucumán, Argentina. Email: vfromero@lillo.org.ar

**21004.** Santamaria, T.; Torres, A.; Hernandez, A.; Casanueva, P.; Sanchez-Sastre, L.F.; Campos, F. (2022): Some characteristics of the wings of *Cordulegaster boltonii* (Donovan, 1807) (Odonata: Cordulegasteridae) from central Spain. *J. Br. Dragonfly Society* 38(2): 113-126. (in English) ["Wing characteristics in the Odonata have been widely analysed given their significance in the ecology of the species and their importance for flying patterns. However, until now very little is known about wing morphology in *C. boltonii*. In this work, six variables are examined in males of this species, in relation to fore-wing and hind-wing venation and their correlation to wing length, wing area and aspect ratio. The number of ante-nodal and post-nodal cross-veins and the number of cells in the anal triangle and anal loop are shown to be the more suitable variables for wing study in this species." (Authors)] Address: Hernandez, Maria Angeles, Univd Católica de Avila, Calle Canteros s/n, 05005 Avila, Spain, 2 Calle Jose M. Pereda 3, 1C, 28806 Alcalá de Henares, Madrid, Spain. Email: mahermin@unav.es

**21005.** Schneider, T.; Ikemeyer, D.; Müller, O.; van Pelt, G.J. (2022): Notes on *Cordulegaster kalkmani* in East Turkey (Odonata: Cordulegasteridae). *Odonatologica* 51(3/4): 289-300. (in English) ["Populations of *Cordulegaster kalkmani* Schneider et al., 2021 were found in the Kars and Bitlis provinces of East Turkey (i.e., western Armenian Highlands), in July 2022. This species was found at elevations from 1 800 to 2 200 m a.s.l. in six localities. One female, 15 males and one exuvia were collected for closer examination. The special feature of the inferior appendage, which is

broader than long so that the distal pointed lobes can be seen from above, was confirmed for all males. Variation in abdominal colour markings, some biometrical data and habitat features are reported. *Cordulegaster kalkmani* seems to be restricted to a geographic region limited by the Anatolian Diagonal in the west, the Pontic Mountains in the north, the Lesser Caucasus in the east, and is roughly confined to the western Armenian Highlands in the centre and the eastern Taurus in the south. This region is characterised by cold winters with significant snow cover." (Authors)] Address: Schneider, T., Arnold-Knoblach-Ring 76, 14109 Berlin-Wannsee, Germany. Email: thomas.rs@gmx.de

**21006.** Schneider, T.; Plyushch, I.G. (2022): *Rhyothemis variegata* (Odonata: Libellulidae) new to Afghanistan. *Notulae odonatologicae* 9(10): 469-472. (in English) ["In recent decades little has been added to the Odonata fauna of Afghanistan. This is mainly due to inaccessibility resulting from ongoing conflict in the country. Nevertheless, a few Ukrainian scientists have recently visited the country mainly to study Lepidoptera and Coleoptera. During one expedition in the Kabul valley near Jalalabad about a dozen individuals of *Rhyothemis variegata* were observed and three voucher specimens were captured." (Authors)] Address: Schneider, T., Arnold-Knoblach-Ring 76, 14109 Berlin-Wannsee, Germany. Email: thomas.rs@gmx.de

**21007.** Senadeera, G.K.A.T.; Weerakoon, K.C.; Ekanayake, E.M.S.H.K.; Lasxhman, B.Y.N. (2022): Abundance and diversity of adult Odonates in Dunumadalawa forest reserve, Kandy. *Proceedings of FARS2022*: 21. (in English) [Sri Lanka; Verbatim: Species richness and abundance of adult Odonates in Dunumadalawa forest reserve in Kandy, were observed. The samplings of Odonates were carried out by visual encounter surveys by walking within the area on hourly basis in a period of one year. A total of 91 Odonates species represented by 45 dragonfly and 46 damselfly with two endemic species, *Euphaea splendens* and *Paragomphus henryi* have identified. The suborder Anisoptera which comprises with 45 species belonging to two families contributed 49% of total odonates were recorded. Among the Zygoptera, the family Calopterygidae was widely distributed with high percentage 27% (n=14) while the family Platycnemididae and Lestidae both were equally distributed with a percentage composition of 11% (n=10). The observed distribution of the families of Coenagrionidae and Euphaeidae were 9% (n=8) and 4% (n=4) respectively. Highest relative abundance values showed 9% *Orthetrum triangulare* belongs to family Libellulidae in suborder Anisoptera followed by *Lestes elatus* belongs to family Lestidae with 7%. Highest Sorenson coefficient value (0.43) indicated locations near "Roseneath Tank" in the middle of the site and the fresh water streams nearby it have high overlapping of similarity of Odonates. The highest species diversity (Shannon index 0.85) is found in the locations near the "Dunumadalawa weva" area. The highest species richness observed in the same locations as with the highest Margalef's index (3.67). The lowest diversity was observed with a Shannon index (0.10) in the forest area with no water bodies.] Address: Senadeera, G.K.A.T., Dept Zool., The Open University of Sri Lanka, Sri Lanka. Email: ayeshasena9634@gmail.com

**21008.** Shapovalov, M.I.; Korotkov, E.A. (2022): Species composition of aquatic and amphibiotic insects in the Kuban River basin (Northwestern Caucasus). *Study of Water and Terrestrial Ecosystems: History and present. Abstracts of*

the II International scientific-practical conference. Sevastopol, 2022. Publisher: Federal State Budgetary Institution of Science Federal Research Center "Institute of Biology of the Southern Seas named after A.O. Kovalevsky RAS" (Sevastopol): 72. (in Russian) [Verbatim (Google translate): Order Odonata includes 8 families: Libellulidae (6 genera, 17 species), Coenagrionidae (6 genera, 12 species), Aeshnidae (4 genera, 9 species), Lestidae (3 genera, 8 species), Gomphidae (2 genera, 5 species), Calopterygidae (1 genus, 2 species), Corduliidae (2 genera, 2 species) Platycnemididae (1 genus, 1 species).] Address: Shapovalov M.I., Adyghe State University, Maikop, Russia. Email: shapmaksim2017@yandex.ru

**21009.** Shapovalov, M.I.; Korotkov, E.A.; Saprykin, M.A. (2022): Additions to dragonfly (Odonata) fauna of the Republic of Adygea (North-Western Caucasus). Russian Entomological Journal 31(3): 213-217. (in English, with Russian summary) ["The article provides data on new findings of 10 species of dragonflies on the territory of the Republic of Adygea. *Anax ephippiger*, *Pantala flavescens* and *Selysiothemis nigra* were recorded as new to the fauna of this region. For *Coenagrion ornatum*, *Ischnura pumilio*, *Pyrrhosoma nymphula*, *Anaciaeschna isoceles*, *Gomphus schneiderii*, *Libellula fulva*, and *Orthetrum cancellatum* that were previously known from single findings, we identified new collection points. The findings of exuviae of larvae of *S. nigra* in the coastal parts of the water bodies of the city of Maykop indicate the reproduction of this species in the region." (Authors)] Address: Shapovalov, M.I., Lab. Bioecological Monitoring of the Invertebrate Animals of Adygheya, Research Institute of Complex Problems, Adyghe State University, Gagarina str. 13, Maykop 385000, Adygheya Republic, Russia. E-mail: shapmaksim2017@yandex.ru

**21010.** Sharma, M.; Oli, B.R. (2022): Odonates (Insecta: Odonata) associated with rice ecosystems in Sunwal municipality, central Nepal. Journal of Natural History Museum 32(1): 35-48. (in English) ["This paper aims to list the odonates fauna associated with rice fields and to study their behaviour in Sunwal, Central Nepal. Research was conducted from June to November 2019 in a rice field by establishing three study plots of (50×50) m<sup>2</sup> each. A total of 33 Odonata species (11 damselflies and 22 dragonflies) from six families were recorded. Six of them were sporadic, while the rest were common. Territorial behaviour of Odonates was observed and the reproductive behavior of 11 species was thoroughly investigated. The copulatory period varied between species, ranging from two seconds to 49 minutes. Females attempted to mate up to three times. The second and third mating were both brief. Homing behaviour [dormitory] was observed in *Orthetrum sabina*. In this research, we noticed odonates to be predatory as well as prey species." (Authors)] Address: Oli, B.R., Central Department of Zoology, Tribhuvan University, Kirtipur, Kathmandu, Nepal. Email: buddhiramoli.2049@gmail.com

**21011.** Shin, I.-C.; Kim, M.-H.; Eo, J. (2022): Analysis of community stability and characteristics of macroinvertebrates in paddy fields by cultivation method. Ecology and Resilient Infrastructure 9(1): 15-23. (in Korean, with English summary) ["This study was conducted to investigate in relation to characteristic of macroinvertebrates in conventional and organic paddy fields. The investigation was conducted five times a year for Suwon, Ansong, Boeun, Gunsan, Gimje, Hamyang, divide into conventional paddy fields and organic paddy fields from 2009 to 2011. The macroinvertebrates collected from the surveyed between conventional

and organic paddy fields belonged to 84 species, 47 families, 16 orders, and 6 classes in 3 phyla. In the habitat oriented groups, climbers, swimmers and sprawlers were considerably occupied in conventional and organic paddy fields. In relation to the functional feeding groups, predators such as Odonata, Coleoptera, and Hemiptera were only the highest in paddy field ecosystem, regardless of cultivation method. As a result of community stability analysis, organic paddy fields has been identified much as species high resistance and resilience to environmental change in paddy field ecosystem. Species belonging to the I groups is considered to be important in organic paddy field such as *Stemolophus rufipes*, *Hydrochara affinis*, *Helochares nipponicus*, which has high mobility. In conclusion, it was found that the introduction of coleoptera as a food source was higher than that of conventional paddy fields in organic paddy field where primary consumers were abundant such as Chironomidae spp. and Dixidae sp.." (Authors)] Address: Eo, J., Climate change Assessment Division, National Institute of Agricultural Science, Wanju 55365, Korea. Email: eojoy@korea.kr

**21012.** Shome, A.R.; Alam, M.M.; Roy, R.C.; Sultana, S.; Rabbe, M.F.; Naser, M.N.; Islam, M.M.; Biswas, D.; Jaman, M.F. (2022): First confined record of *Platygomphus dolabratus* Selys, 1854 (Odonata: Anisoptera) in Bangladesh. Bangladesh J. Zool. 50(1): 135-139. (in English) ["Jamalpur and Dinajpur district, Bangladesh (Fig. 1B). On 21 June 2020, a specimen of *Platygomphus dolabratus* spotted from a nearby ditch of Jamalpur and collected with an insect net. Other species of dragonflies observed around the ditch (e.g., *Crocothemis servilia*, *Orthetrum Sabina*, *Neurothemis fulvia*, *N. tullia* and *Brachythemis contaminata*). On 22nd June 2020, the second individual was sighted and collected from Birganj, Dinajpur. These specimens were observed and identified carefully using a literature available in Fraser (1934). Photographs of the specimens were taken using a SAMSUNG A50 mobile phone camera and deposited the photographic vouchers to Professor Md. Kazi Zaker Husain Museum at the Department of Zoology, University of Dhaka, Bangladesh." (Authors)] Address: Md. Mahabub Alam, Dept Zool., Univ. of Dhaka, Dhaka-1000, Bangladesh. Email: mahabub.zoo@du.ac.bd

**21013.** Sidra, S.; Mahmood, A.; Moavia, M.; Saadaat, H.B. (2022): Anisopteran diversity in two riverine habitats of southern Punjab, Pakistan. Inland Water Biology 15: 361-367. (in English) ["Dragonflies are an important indicator species for freshwater ecosystems. While their diversity in Pakistan has been well studied in the northern areas of the country, odonate diversity in the southern, warmer areas is still not well documented. The current study determined the Anisopteran diversity and abundance along two riverine tracts of Southern Punjab for a duration of five months. The collected specimens (n = 725) belonged to three families; Aeshnidae, Gomphidae, and Libellulidae. Anisopteran fauna was dominated by Libellulidae family represented by thirteen species out of total sixteen species identified from the study area. *Crocothemis erythraea* was the most abundant species (Relative Abundance – R.A = 14%) followed by *Braconopyga geminata* (R.A = 10%). The Shannon wiener diversity index value (H = 2.74) indicated a moderate level of Anisopteran biodiversity in the area. Since the dragonflies prefer warmer humid climates, species diversity was highest during the summer season with no odonates found during the colder month of December." (Authors)] Address: Sidra, S., Wildlife and Ecology, University of Veterinary and Animal Sciences, Lahore, Pakistan

**21014.** So, K.S.; Won, C.G. (2022): The first 'Megapodagrionidae' (Odonata, Zygoptera) from the Lower Cretaceous of Democratic People's Republic of Korea. *Cretaceous Research* 130, February 2022, 105054: (in English) ["Highlights: • *Phyonganpodagrion ryonsangae* sp. nov. is firstly described from the Sinuiju Formation, Sinuiju Group. \*The remarkable taxon belongs to the family 'Megapodagrionidae' (Insect: Odonata). \**Phyonganpodagrion* expands the geographic distribution of the family 'Megapodagrionidae'. Abstract: A new fossil genus and species, *Phyonganpodagrion ryonsangae* sp. nov. ('Megapodagrionidae') is described from the third member, the Sinuiju Formation, Barremian–Aptian, Lower Cretaceous, Ryonsang-dong, Sinuiju City, North Phyongan Province, DPRK. The new species distinctly differs from *Cretapodagrion sibelleae* Huang et al., 2018 in postnodal area with only 17 postnodal crossveins; a single row of cells (partly with two rows of cells) between IR1 and RP1; distal side of discoidal cell not oblique; base of RP3/4 well basad of subnodus; base of IR2 aligned with subnodus." (Authors)] Address: So, K.S., Dept Paleontology, Fac. of Geology, Kim Il Sung Univ., Pyongyang, Democratic People's Republic of Korea. E-mail: ks.so@ryongnamsan.edu.kp

**21015.** Susanto, M.A.D. (2022): Diversity and composition of dragonfly (Odonata) at the Punden Sumur Bumi area, Surabaya, East Java. *International Journal of Applied Biology* 6(2): 43-55. (in English) ["The Sumur Bumi Punden is a location used for spiritual tourism. The Punden Sumur Bumi area has a stagnant aquatic ecosystem type and a low level of disturbance and pollution. Therefore, the Punden Sumur Bumi area has the potential to be a natural habitat for dragonflies. This study aims to determine the diversity and composition of the dragonfly community in Sumur Bumi Punden. This study uses the visual day-flying observation technique modified by the transect method. The Punden Sumur Bumi area has a moderate diversity index value, with a value of  $H' = 2.57$ . In the Sumur Bumi Punden area, 17 species were found with a total of 124 individuals, including the species with the highest relative abundance, namely *Brachythemis contaminata*. Meanwhile, the species with the lowest relative abundance was *Diplacodes trivialis*. The composition of dragonflies showed that the swamp location had the highest species richness and abundance values, namely 16 species and a total of 79 individuals. Meanwhile, the grassland location has the lowest species richness, namely only 5 species." (Author)] Address: Susanto, M.A.D., Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya, Malang, Indonesia. Email: muhammadazmidwi@gmail.com

**21016.** Tennessen, K.J. (2022): Nymph Cove: Identification to genus: Gomphidae (Part 2). *Argia* 34(4): 39-41. (in English) ["In this installment of Nymph Cove, we continue with gomphid genera that present greater challenges for identification than those we diagnosed in the last issue of ARGIA. These genera next up are *Arigomphus*, *Dromogomphus*, *Gomphurus*, *Hylgomphus*, *Phanogomphus*, *Phyllogomphoides*, *Stenogomphurus*, and *Stylurus*." (Author)] Address: Tennessen, K., 125 N. Oxford St, Wautoma, WI 54982, USA. E-mail: ktennessen@centurytel.net

**21017.** Thomas, C.N.; Gijo, A.H. (2022): Species composition and relative abundance of insects in Niger Delta University and environs of Amassoma community in Bayelsa State, Nigeria. *IIARD International Journal of Geography and Environmental Management* 8(1): 16-24. ["The composition and relative abundance of insects inhabiting the ecosystems of the Niger Delta University and surroundings of

Amassoma community was studied from May 15 – October 15, 2020 to have a baseline data for purposes of research and environmental impact assessment. Five (5) methods used to collect samples from four sites included the sweep nets, aerial nets, pit fall traps, light traps and direct collection by hand. A total of 7,225 individual species of insects were collected and identified into 8 orders, 24 families and 32 species. The most abundant insects were the *Anopheles* species (Diptera: Culicidae) constituted 58.74%; *Dorylus* species (Hymenoptera: Formicidae) constituted 26.12%. There were low numbers of six (6) species of insects which included *Libellula pulchella* [sic; a North-American species]; (...) ranged between 1.24%-1.68% in abundance. [...] This preliminary study confirmed the rich composition of insect species in the environs of Niger Delta University need there are threats factors in the environment that are driving the insects towards extinction were needed to be investigated." (Authors)] Address: Thomas, C. N., Dept Biol. Sciences, Niger Delta Univ., Wilberforce Island Bayelsa State, Nigeria

**21018.** Tsalkatis, A.; Martens, A. (2022): Reproductive behaviour, phenology, and reproductive lifespan of *Chalcolestes parvidens* at an intermittent stream on a Greek island (Odonata: Lestidae). *Odonatologica* 51(3/4): 263-287. (in English) ["At a summer-dry stream on the Aegean island of Lesbos, a population of *Chalcolestes parvidens* (Artobolevski, 1929) was studied during the reproductive period from late August to November 2018. Mediterranean intermittent streams display unique characteristics with a seasonal sequence of abiotic and biotic regulation and provide valuable habitats for *C. parvidens*. Abundance at the breeding water and perching positions on plants of males, females and pairs were recorded, and a mark-recapture study with 412 males was conducted. The damselflies perched mostly on dry plant parts of *Salix fragilis* and *Nerium oleander* that dominated the site. Males perched mainly on exposed twig tips near or over the water and some individuals were quite philopatric. A minimum adult male life span of 30 days after maturation was determined. Oviposition was observed exclusively in branches of *S. fragilis*. Differences in reproductive behaviour between *C. parvidens* and its sister species *C. viridis* appear to be very small or not distinguishable at all." (Authors)] Address: Tsalkatis, Annika, Institute of Biology, Univ. of Education Karlsruhe, Bismarckstr. 10, 76133 Karlsruhe, Germany. Email: tsalkatis@posteo.de

**21019.** van Nieuwenhoven, R.W. (2022): Mechanical bactericide by biomimetics of the nanopillars on insect wings. Diplomarbeit, Institut für Angewandte Physik, Fakultät für Physik der Technischen Universität Wien: 93 pp. (in English, with German summary) ["The antibacterial properties of cicada wings originate from hexagonal pillar-like nanostructures with species-dependent heights of approximately 330 nanometers and a tip spacing of about 188 nanometers. These multi functional nanostructures are also superhydrophobic and selfcleaning. This diploma thesis presents investigations of two New Zealand cicada species *Am. phipsalta cingulata* and *Kikihia scutellaris*, the Austrian dragonfly *Sympetrum striolatum* as well as an US American cicada species *Magiccicada septendecim* with various methods such as Atomic Force Microscopy, Scanning Electron Microscopy, and bacterial tests with live-dead staining. The surfaces investigated comprise the cicada wings themselves, negative replicas of the wings made with the molding material Polyvinyl siloxane and positive replicas in various resins. The main focus lies in establishing low-cost bioreplication techniques for the transfer of the antibacterial properties to man-made surfaces such as hospital surfaces, medical instruments,



smartphone displays and door handles. A recent publication of Senevirathne and co-workers support my findings where I see challenges in using the nanopillars as bactericides." (Author)] Address: not stated

**21020.** Vasconcelos, B.D.; Brandao, R.A. (2022): Predation on *Tamandua tetradactyla* (Pilosa: Myrmecophagidae) by *Caiman latirostris* (Crocodylia: Alligatoridae) in a highly seasonal habitat in Central Brazil. *North-Western Journal of Zoology* 18(2): 218-221. (in English) ["*Caiman latirostris* is an opportunistic predator found in rivers, mangroves, and wetlands throughout eastern South America. We report here the predation of *Tamandua tetradactyla* by *Caiman latirostris* in an old cattle dam in the Serra da Bodoquena National Park, Brazil. The adult caiman was accompanied by its hatchlings that fed on the lacerated parts of the Lesser anteater and possibly the insects attracted by the carcass. Although *Caiman latirostris* acts as a fundamental organism for the balance of ecosystems, most of the species' diet records are anecdotal, making this record relevant for understanding the ecology of the species." (Authors) In Table 1, prey items are compiled for *C. latirostris* from studies carried out in nature in South America and including Corduliidae and Libellulidae larvae.] Address: Vasconcelos, Beatriz, Laboratory of Fauna and Conservation Units, Department of Forestry Engineering, University of Brasilia, Brasilia, Brazil. Email: beatrizdiogov@gmail.com

**21021.** Vaughn, S.N.; Jackson, C.R. (2022): Evaluating methods of preserving aquatic invertebrates for microbiome analysis. *Microorganisms* 2022, 10, 811. <https://doi.org/10.3390/15pp>: 15 pp. (in English) ["Research on the microbiomes of animals has increased substantially within the past decades. More recently, microbial analyses of aquatic invertebrates have become of increased interest. The storage method used while collecting aquatic invertebrates has not been standardized throughout the scientific community, and the effects of common storage methods on the microbial composition of the organism is unknown. Using crayfish and dragonfly nymphs collected from a natural pond and crayfish maintained in an aquarium, the effects of two common storage methods, preserving in 95% ethanol and freezing at -20 °C, on the invertebrate bacterial microbiome was evaluated. We found that the bacterial community was conserved for two sample types (gut and exoskeleton) of field-collected crayfish stored either in ethanol or frozen, as was the gut microbiome of aquarium crayfish. However, there were significant differences between the bacterial communities found on the exoskeleton of aquarium crayfish stored in ethanol compared to those that were frozen. Dragonfly nymphs showed significant differences in gut microbial composition between species, but the microbiome was conserved between storage methods. These results demonstrate that preserving field-collected specimens of aquatic invertebrates in 95% ethanol is likely to be a simple and effective sample preservation method for subsequent gut microbiome analysis but is less reliable for the external microbiome." (Authors)] Address: Vaughn, Stephanie. Dept of Biology, Univ. of Mississippi, University, MS 38677, USA

**21022.** Voinov, I.O. (2022): The first record of *Orthetrum sabina* (Drury, 1770) (Odonata: Libellulidae) in Russian Federation. *Amurian Zoological Journal* 14(4): 616-619. (in English, with Russian summary) ["The paper reports the results of the odonatological examination of ponds in the Natural Ornithological Park in the Imeretinskaya Lowland in Adler (43°24'1"N; 39°58'22"E) carried out on 22 July 2020. In total, we found 12 Odonata species, including *Orthetrum*

*sabina* (Drury, 1770) that was recorded on the Russian territory for the first time. The found specimens correspond exactly to the subspecies *Orthetrum sabina nigrescens* (Bartenev 1929; Bartenev 1930) described by Bartenev from Lake Inkit. The current status of the subspecies is discussed. Including this discovery, the dragonfly fauna of the Russian Federation comprises 157 species." (Author)] Address: Voinov, I.O., 141707, Dolgoprudny, Russia. Email: djet.100@yandex.ru

**21023.** Wasahlan, A.; Kurnia, I. (2022): Keanekaragaman jenis capung pada berbagai tipe habitat di desa Cipeuteuy Kecamatan Kabandungan Kabupaten Sukabumi [The diversity of dragonfly species in various types of habitats in Cipeuteuy Village, Kabandungan District, Sukabumi Regency]. *Jurnal Biosolampari: Jurnal Biologi* 5(1): 67-80. (in Indonesian, with English summary) ["Dragonflies are insects that mostly live as nymphs and are related to aquatic habitats and act as bioindicators of environmental quality. The purpose of the study was to identify the diversity of dragonflies in various habitat types in Cipeuteuy Village. This study uses the line transect method measuring 100 meters with a width of 20 meters right and left and the duration of observation is 15 minutes per each observation line. The study was conducted in nite habitat types from 52 locations. The total dragonfly found were 13 species from four families. The highest dragonfly richness was found in the rice field habitat as many as 12 species and the lowest species was found in the citrus garden habitat as many as three species. The dominant species of dragonfly found in all habitat types is *Rhodothemis rufa*. The overall dragonfly diversity index was 2.56 and ranged from 1.10 to 2.48, and the evenness index ranged from 0.57 to 0.90." (Authors)] Address: Wasahlan, A., Alumni, Program Studi Ekowisata, Sekolah Vokasi, IPB Univ., Jl. Raya Pajajaran, Kota Bogor, Jawa Barat, 161282, Indonesia. Email: insankurnia@apps.ipb.ac.id

**21024.** Wildermuth, H. (2022): Libellenkadaver als Nahrung. und Rendezvousplatz (Odonata). *Mercuriale* 22: 89-99. (in German, with English summary) ["Dragonfly carcasses as foraging and rendezvous sites. – Based on photographic documents it is shown how carcasses of dragonflies are used by scavengers. Dead dragonflies floating on the water surface are food for aquatic insects such as diving beetles (Dytiscidae) and water striders (Gerridae). Some terrestrial insects also use them as food, and in the case of scorpionflies, as mating sites. Museum specimens are often infected by bacon beetles thus being destroyed. A simplified diagram focusing on dragonflies shows the material cycle in living nature." (Author)] Address: Wildermuth, H., Haltbergstr. 43, CH-8630 Rüti, Switzerland. E-mail: hansruedi@wildermuth.ch

**21025.** Wildermuth, H. (2022): Zur Bedeutung des Teufelsabbiss *Succisa pratensis* Moench (Caprifoliaceae) für Insekten und Spinnen (Insecta, Arachnida). *Entomo Helvetica* 15: 73-90. (in German, with English and French summaries) ["Insects and spiders associated with the Devil's bit *Succisa pratensis* Moench. In litter meadows of the eastern Swiss Plateau, *S. pratensis* is the only plant species that blooms profusely in late summer and early autumn. At this time of year, it constitutes the only abundant source of food for many insects in the vicinity of intensely used agricultural land and dense forests. Based on this fact, all macroinvertebrates associated with *S. pratensis* found from late August to late September 2021 in selected litter meadows in the southeastern region of the canton of Zurich

were photographically documented. Altogether, 48 insect and 6 spider spp. were recorded. Flower and fruit heads were exploited by 9 bee spp., 13 fly spp., 9 butterfly spp. and 4 bug spp., whereas 8 orthopteran spp. mainly used the leaf rosette of the plant as a hiding place, for thermoregulation and food. The foliage served as an oviposition site and a source of larval nourishment for the oligophagous Marsh Fritillary *Euphydryas aurinia*. Spiders used the flower heads as a site to ambush their prey and employed the whole plant to fasten cobwebs and for shelter. The complex interactions between *S. pratensis* and their arthropod visitors are discussed and illustrated by a few examples. ... *Succisa* was used in two cases by a female *Sympetrum fonscolombii* as a perch for hunting flights. On several occasions, *S. sanguineum* males were observed flying erratically between stalks and stems in vegetation with dense *Succisa* stands in search of females, but they never sat down." (Deepl/Author)] Address: Wildermuth, H., Haltbergstr. 43, CH-8630 Rütli, Switzerland. E-mail: hansruedi@wildermuth.ch

**21026.** Yavorskaya, N.M. (2022): Quantitative zoobenthos characteristics of the Udyl Lake basin (Udyl Nature Reserve, Khabarovsk Region). *Amurian Zoological Journal* 14(4): 594-615. (in Russian, with English summary) ["The article reports the results of the study on zoobenthos in the wetlands of Lake Udyl and its 12 tributaries (the Lower Amur, Udyl Nature Reserve) during the 2021 summer flood. Except for the Bichi River, benthic communities of the rivers and streams in the Lake Udyl basin were studied for the first time. The study found that the composition, structure and quantitative characteristics of the bottom communities of Udyl Lake and the Bichi salmon river differed from the previous results obtained in the 1930s–1940s and the 1990s. The results revealed a rich taxonomic composition of invertebrates (19 groups), low values of density and biomass in the water bodies of the reserve. The zoobenthos was dominated by amphibiotic insects (57% of the total density and 43% of the total biomass). We established that oligochaetes and chironomids in the Udyl Lake basin differed in the highest quantitative indicators. The quality of water was determined using classical (GW, TBI, IB, ND/Nex, NCh/Nex) and modified (IPM, TBIM) bioindicative indices and metrics. The results show that, in general, the ecosystem of Lake Udyl and the watercourses flowing into it is in a relatively satisfactory condition." (Author) The author considers Odonata at order level.] Address: Yavorskaya, Nadezhda M., Institute of Water & Ecology Problems, Far Eastern Branch of the Russian Acad. of Sciences, 56 Dikopoltseva Str., 680000, Khabarovsk, Russia. Email: yavorskaya@ivep.as.khb.ru

**21027.** Yu, X.; Li, L., Gu, H. (2022): *Ophiogomphus tibeticus* sp. nov. from Sichuan, China (Anisoptera: Gomphidae). *Zootaxa* 5213 (5): 569-577. (in English) ["A new gomphid species, *Ophiogomphus tibeticus* sp. nov., from Zoige alpine Wetland, Sichuan is described and illustrated. Assignment to the genus *Ophiogomphus* Selys, 1854 is based on both morphological and molecular analyses. This new species differs from other known *Ophiogomphus* mainly in the shape of the caudal appendages." (Authors)] Address: Yu, X., College of Life Sciences, Chongqing Normal Univ., Chongqing, 401331, China. Email: lannysummer@163.com

**21028.** Yuditaningtyas, M.; Hadi, M.; Tarwotjo, U. (2022): Struktur komunitas dan habitat Odonata di Kawasan Wisata Waduk Jatibarang Semarang. *Bioma: Berkala Ilmiah Biologi* 24(1): 73-79. (in Indonesian, with English summary) ["Jatibarang Reservoir is a freshwater dam in Semarang

which has different habitat types. The different of habitat types can affect biodiversity, including dragonflies (Odonata). Dragonflies are insects that have an important function as a bioindicator of water quality and play a role in maintaining the balances of tropic levels in the food chain. The study aims to determine the abundance, diversity, evenness, similarity and distribution of dragonflies and to determine the abiotic and biotic factors of each habitat type in Jatibarang Reservoir tourist area. The study used Point Count method. The results showed that there were 22 types of dragonflies consisting of 7 different families. The dragonfly which has the highest abundance in the total number of individuals is *Eupahea variegata* with an index of 16.77%. Diversity of dragonflies in low and medium categories. The evenness level of dragonfly species is evenly. The similarity of species has a low to high degree of similarity. The distribution of dragonflies are clumped and regular. The differences in abiotic and biotic conditions in each habitat affect the structure of dragonfly community." (Authors)] Address: Yuditaningtyas, M., Dept Biologi, Fak. Sains dan Matematika, Universitas Diponegoro, Indonesia. Email: megayudita@gmail.com

**21029.** Zebsa, R.; Mahdjoub, H.; Khelifa, R. (2022): Similar response of a range expanding dragonfly to low and high-elevation predators. *Diversity* 2022, 14, 302. <https://doi.org/10.3390/d14040302>: 12 pp. (in English) ["Recent range expansion of many species northward and upward in elevation suggests that the expanding species are able to cope with new biotic interactions in the leading edge. To test this hypothesis, we used a common garden experiment expanding the elevation range of an obligatorily univoltine dragonfly (*Sympetrum striolatum*) to investigate whether the growth, behavioral (food intake), and morphological (8th and 9th abdominal lateral spine) responses differed when confronted with dragonfly predators that dominate low-elevation (*Aeshna cyanea*) and high-elevation (*A. juncea*) lentic freshwater systems under two temperature treatments (20 °C and 24 °C). Growth rate and growth efficiency increased at higher temperature. Overall, low and high-elevation predators induced a similar increase in growth rate and growth efficiency but a decrease in food intake at 24 °C. Lateral abdominal spines were longer only in low-elevation dragonflies at 18 °C. Our study suggests that range-expanding species may have been successful in colonizing new areas at higher elevations because they respond to dominant high-elevation predators in a similar way to the more familiar low-elevation predators." (Authors)] Address: Zebsa, R., Laboratoire Biologie, Eau et Environnement (LBEE), Université 8 Mai 1945, Guelma 24000, Algeria

**21030.** Zhong, H.; Qiu, J.G.; Pan, Y.Q.; Yang, J., Lin, D.; Ouyang, B.; Jiang, K. (2022): Investigation of Odonata insect resources in Jinggangshan Nature Reserve. *Biotic Resources* 44(5): 461-466. (in Chinese, with English summary) ["In order to clarify the species resources and community characteristics of Odonata insects in Jinggangshan Nature Reserve, and provide a theoretical basis for the protection and rational utilization of Odonata resources, dragonfly resources were investigated in Changguling (470 m above sea level), Dajing (930 m above sea level) and Huangyangjie (1200 m above sea level) of Jinggangshan from 2018 to 2021. Shannon-Wiener diversity index, Pielou evenness index, Berger-Parker dominance index and Simpson dominance concentration index were used to analyze the diversity of dragonflies in three sampling sites. A total of 483 specimens were collected and identified, belonging to 23 species, 16 genera, 8 families, 2 suborders. Among them, Libellulidae occupied an absolute advantage,

and the numbers of genera and species accounted for 37.50% and 56.52% of the total, respectively. There was no significant difference in community structure index between Dajing and Huangyangjie ( $P > 0.05$ ). The diversity index and evenness index of Dajing and Huangyangjie were significantly higher than those of Changguling ( $P < 0.05$ ), while the dominance index and dominance concentration index were significantly lower than those of Changguling ( $P < 0.05$ ). This indicates that the diversity of Odonata community is low in Changguling, which is at a lower altitude in Jinggangshan Nature Reserve, but the dominant species are more prominent." (Authors)] Address: Jiang, K., School of Life Sciences, Jinggangshan University, Ji'an 343009, Jiangxi, China. Email: 9920180022@jgsu.edu.cn

**21031.** Zieritz, A.; Lee, P.S.; Eng, W.W.H.; Lim, S.Y.; Sing, K.W.; Chan, W.N.; Loo, J.S.; Mahadzir, F.N.; Ng, T.H.; Yeo, D.C.; Gan, L.X.; Gan, J.Y.; Gibbins, C.; Zoqratt, M.Z.H.; Wilson, J.-J. (2022): DNA metabarcoding unravels unknown diversity and distribution patterns of tropical freshwater invertebrates. *Freshwater Biology* 67(8): 1411-1427. (in English) ["1. Tropical freshwater invertebrate species are becoming extinct without being described, and effective conservation is hampered by a lack of taxonomic and distribution data. DNA metabarcoding is a promising tool for rapid biodiversity assessments that has never been applied to tropical freshwater invertebrates across large spatial and taxonomic scales. 2. Here we use DNA metabarcoding to comprehensively assess the benthic freshwater invertebrate fauna of the Perak River basin, Malaysia. Specific objectives were to: (1) assess performance of two DNA metabarcoding protocols; (2) identify gaps in reference databases; (3) generate new data on species diversity and distribution; and (4) draw conclusions regarding the potential value of DNA metabarcoding in tropical freshwater conservation. 3. Organisms were collected by hand and net at 34 sites and divided into small (retained in 0.5-mm but passing through 1-mm mesh) and large (retained in 1-mm mesh) fractions, and a 313-bp cytochrome c oxidase subunit I fragment amplified and sequenced using general Metazoa primers. 4. Bioinformatic analysis resulted in 468 operational taxonomic units (~species) from 12 phyla. Only 29% of species could be assigned binominal names through matches to public sequence libraries, indicating varying levels of library completeness across Orders. Extraction of small-fraction DNA with a soil kit resulted in a significantly higher species count than with a general kit, but this was not even across taxa. 5. Metabarcoding (amplification) success rate, estimated via comparison to morphological identifications of the large-fraction specimens, was high in most taxa analysed but low, for example, in ampullariid and viviparid gastropods. Conversely, a large proportion of species-site records for Decapoda and Bivalvia came from metabarcoding only. Species richness averaged  $29 \pm 16$  species per site, dominated by Diptera, Annelida, and Odonata, and was particularly high in tributaries of the mountainous Titiwangsa Range. At least eight species are new records for Malaysia, including the non-natives *Ferrissia fragilis* (Gastropoda) and *Dugesia notogaea* (Platyhelminthes). 6. Our study showed that DNA metabarcoding is generally more effective in detecting tropical freshwater invertebrate species than traditional morphological approaches, and can efficiently improve knowledge of distribution patterns and ranges of native and non-native species. However, current gaps in reference databases, particularly for bioindicator taxa, such as the Plecoptera, Ephemeroptera, and Coleoptera, need to be addressed urgently. tributaries of the mountainous Titiwangsa Range. At least eight species are new records for Malaysia,

including the non-natives *Ferrissia fragilis* (Gastropoda) and *Dugesia notogaea* (Platyhelminthes)." (Authors)] Address: Zieritz, Alexandra, Univ. of Nottingham, Sir Clive Granger Building, University Park, NG7 2RD Nottingham, UK. Email: alexandra.zieritz@nottingham.ac.uk

## 2023

**21032.** An, C.-H.; Cheon, K.-S.; Jang, J.-E.; Lee, H.-G. (2023): Complete mitochondrial genome of *Macromia manchurica* Asahina, 1964 (Odonata: Macromiidae). *Mitochondrial DNA Part B Resources* 8(1): 10-12. (in English) ["We describe the first time sequencing and assembly of the complete mitochondrial genome of *Macromia manchurica* Asahina, 1964 (Odonata; Macromiidae; *Macromia*). The mitochondrial genome of *M. manchurica* was found to be 15,560 bp. It contains thirteen protein-coding genes (PCGs), 22 transfer RNAs (tRNAs), two ribosomal RNAs (rRNAs), and AT-rich region. The overall base composition of *A. japonicus* is A-38.6%, C-17.0%, G-12.5%, and T-31.9%. A phylogenetic analysis of 14 species within the order Odonata and order Ephemeroptera suggested that *Macromia amphigena* is most closely related to *M. manchurica*." (Authors)] Address: Lee, H.-G., Dept Biological Science, Sangji Univ., Wonju, South Korea. Email: morningdew@sangji.ac.kr

**21033.** Culler, L.E.; Ohba, S.-y.; Crumrine, P. (2023): Predator-prey ecology of Dytiscids. In: Yee, D.A. (eds) *Ecology, Systematics, and the Natural History of Predaceous Diving Beetles (Coleoptera: Dytiscidae)*. Springer, Cham. [https://doi.org/10.1007/978-3-031-01245-78\\_373-399](https://doi.org/10.1007/978-3-031-01245-78_373-399). (in English) ["Dytiscids are top invertebrate predators in most freshwater habitats, particularly in lentic systems such as wetlands and ponds. Adult and larval dytiscids are often considered to be generalists, feeding on zooplankton, aquatic macroinvertebrates, larval amphibians, and fish; however, some species selectively feed on certain prey types relative to others and many engage in cannibalism and intraguild predation. These predator-prey interactions cause a variety of consumptive and non-consumptive effects on prey abundance and community composition in freshwater habitats. Dytiscids are also notable predators of mosquito larvae and thus explored as biological agents for mosquito suppression, particularly in areas where mosquitoes are vectors of diseases and in northern areas. Dragonfly nymphs, fish, amphibians, reptiles, birds, and mammals are known predators of dytiscids, although the extent to which these organisms rely on dytiscids for food remains unclear. Given the prominent role of dytiscids in freshwater food webs, future research should be aimed at improving basic knowledge of dytiscid feeding ecology, using dytiscids to test predator-prey and trophic theory, describing the potential for dytiscids in conservation biological control, and examining how environmental change affects the role of dytiscids as predators of vector and nuisance species." (Authors)] Address: Culler, Lauren E., Dartmouth College, Hanover, NH, USA

**21034.** Darshetkar, A.; Patwardhan, A.; Koparde, P. (2023): A comparison of four sampling techniques for assessing species richness of adult odonates at riverbanks. *Journal of Threatened Taxa* 15(1): 22471-22478. (in English, with Marathi summary) ["Members of the insect order Odonata are known as good ecological indicators. Many are sensitive to habitat modifications and are easily monitored for use in environmental assessment studies. Rapid assessments rely on efficient sampling techniques. However, there is limited information available on sampling techniques for adult odo-

nates, and protocols require evaluation. To do this, we standardized counting methods during sampling of odonates from August to November 2016 at the Mula River, Pune, India. We used four counting techniques; full-width belt transect (FWBT), full-circle point count (FCPC), half-width belt transect (HWBT), and half-circle point count (HCPC). For HWBT and HCPC areas facing the river were sampled, and for each technique we took multiple temporal replicates. We compared species detected per unit time, species detected per unit area, new species detected per unit time, and new species detected per unit area. Additionally, we compared species estimates. With HCPC we detected the maximum number of species and new species per unit area, whereas FWBT returned maximum coverage of recorded species. We recommend our proposed techniques be considered in the future across various habitats to decide the most suitable sampling strategy for the different habitats or situations." (Authors)] Address: Darshetkar, Apeksha, 230/12/4, Atharva Apartment, Shukrawar Peth, Pune, Maharashtra 411002, India. Email: adarshetkar25@gmail.com

**21035.** Gerstle, V.; Manfrin, A.; Kolbenschlag, S.; Gerken, M.; Mufachcheri Islama, A.S.M.; Entling, M.H.; Bundschuh, M.; Brühl, C.A. (2023): Benthic macroinvertebrate community shifts based on Bti-induced chironomid reduction also decrease Odonata emergence? *Environmental Pollution* 316 (2023) 120488: 8 pp. (in English) ["Highlights: • Bti ( $2.88 \times 10^9$  ITU/ha) was applied three times per year over two years. • In treated floodplain pond mesocosms (FPM), chironomid larvae were reduced by 41%. • Community shift was explained by fewer chironomid, Libellulidae and Coenagrionidae. • Emergence of Libellulidae was reduced by 53% in Bti-treated FPMs. • Aquatic effects may propagate to terrestrial food webs via reduced insect emergence. Abstract: Chironomid larvae often dominate aquatic macroinvertebrate communities and are a key food source for many aquatic predators, such as odonate larvae. Changes in aquatic macroinvertebrate communities may propagate through terrestrial food webs via altered insect emergence. *Bacillus thuringiensis israelensis* (Bti)-based larvicides are widely used in mosquito control but can also reduce the abundance of non-biting chironomid larvae (Diptera: Chironomidae). We applied the maximum field rate of Bti used in mosquito control three times to six mesocosms in a replicated floodplain pond mesocosm (FPM) system in spring for two consecutive years, while the remaining six FPMs were untreated. Three weeks after the third Bti application in the first year, we recorded on average a 41% reduction of chironomid larvae in Bti-treated FPMs compared to untreated FPMs and a shift in benthic macroinvertebrate community composition driven by the reduced number of chironomid, Libellulidae and Coenagrionidae larvae (Odonata). Additionally, the number of emerging Libellulidae (estimated by sampling of exuviae in the second year) was reduced by 54% in Bti-treated FPMs. Since Odonata larvae are not directly susceptible to Bti, our results suggest indirect effects due to reduced prey availability (i.e., chironomid larvae) or increased intraguild predation. As Libellulidae include species of conservation concern, the necessity of Bti applications to their habitats, e.g. floodplains, should be carefully evaluated." (Authors)] Address: Gerstle, Verena, Inst. Environmental Sciences, iES Landau, Univ. of Koblenz-Landau, Fortstraße 7, 76829, Landau, Germany. Email: gerstle@uni-landau.de

**21036.** Koch, W.; Hogeweg, L.; Nilsen, E.B.; O'Hara, R.B.; Finstad, A.G. (2023): Recognizability bias in citizen science photographs. *R. Soc. OpenSci.* 10: 221063. <https://doi.org/10.1098/rsos.221063>. 8 pp. In English. [„Citizen science

and automated collection methods increasingly depend on image recognition to provide the amounts of observational data research and management needs. Recognition models, meanwhile, also require large amounts of data from these sources, creating a feedback loop between the methods and tools. Species that are harder to recognize, both for humans and machine learning algorithms, are likely to be under-reported, and thus be less prevalent in the training data. As a result, the feedback loop may hamper training mostly for species that already pose the greatest challenge. In this study, we trained recognition models for various taxa [including Odonata], and found evidence for a 'recognizability bias', where species that are more readily identified by humans and recognition models alike are more prevalent in the available image data. This pattern is present across multiple taxa, and does not appear to relate to differences in picture quality, biological traits or data collection metrics other than recognizability. This has implications for the expected performance of future models trained with more data, including such challenging species." (Authors)] Address: Koch, W., Dept of Natural History, Norwegian Univ. of Science & Technology, 7491 Trondheim, Norway. Email: wouter.koch@artsdatabanken.no

**21037.** Kriska, G. (2023): Dragonflies and Damselflies: Odonata. A Field Guide. In: *Freshwater Invertebrates in Central Europe*: Springer, Cham. [https://doi.org/10.1007/978-3-030-95323-2\\_14](https://doi.org/10.1007/978-3-030-95323-2_14): 263-288. (in English) ["Odonata comprise one of the eldest orders of insects; moreover, their appearance remained almost unaltered for as many as 150 million years. They have about 5000 species inhabiting the terrestrial habitats all over the world except for the arctic regions. These insects play a significant role in the cycle of materials both in aquatic and terrestrial ecosystems. Feeding of these carnivorous animals is aided by their tough jaws and densely toothed maxillae, what is also reflected by their scientific name ('Odonata' = 'toothed') (Fig. 14.1)." (Publisher)] Address: Kriska, G., Group for Methodology in Biology Teaching, Biological Institute, Eötvös Loránd University, Budapest, Hungary

**21038.** La Porta, G.; Landi, F.; Leandri, F.; Assandri, G. (2023): The new Checklist of the Italian Fauna: Odonata. *Biogeographia – The Journal of Integrative Biogeography* 2023, 38 (1): ucl009: (in English) ["17 years after the publication of the last checklist of the Odonata found in Italy, an updated list has been compiled. This list reports 95 species belonging to 10 families and 38 genera and includes 2 national endemic and 1 sub-endemic species. Compared to the previous checklist, three species were removed, two subspecies were granted species status, and 10 species were added as new taxa for Italy. The checklist summarizes the current state of the knowledge on the geographical distribution of the Italian species with a regional detail. After the online publication of this dataset on the LifeWatch Italy website in 2021, some minor updates will be included in future releases. The newly discovered species are the result of increased exploration of the national territory combined with some possible range shifts, especially of Libellulidae species of Afro-Asiatic origin. This increased coverage of the country is the result of the efforts of many contributors. It stems from the rapidly growing interest in this zoological group, also enhanced by the activation of a nationwide citizen science project promoted by the Italian Society for the Study and Conservation of Dragonflies (Odonata.it)." (Authors)] Address: La Porta, G., Società Italiana per lo Studio e la Conservazione delle Libellule ODV, Via Elce di Sotto, 8, 06123 Perugia (PG), Italy. Email: gianandrea.laporta@unipg.it