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1997

19516. Kaye Brewer, S.K. (1997): The foraging behavior of *Anax junius* (Odonata: Aeschnidae) and its potential as a behavioral endpoint in pesticide testing. PhD thesis, Iowa State University: VI + 86 pp. (in English) ["I examined the foraging behaviour of the green damer dragonfly nymph, *Anax Junius*, to assess the suitability of odonate foraging behaviour as a sensitive endpoint for monitoring contaminant exposure. Odonates are potentially excellent organisms for work in biomonitoring programs because: 1) they have complex foraging strategies that tightly couple sensory cues and mechanical responses: 2) their ecology is well-studied: and 3) they are often the dominant invertebrate predator in fishless systems. Thus they have the potential to structure communities through predation. I tested 1) the possibility that nymphs may regulate populations through frequency-dependent foraging and 2) the relationship between head capsule cholinesterase (ChE) levels in nymphs exposed to an organophosphorus insecticide and subsequent foraging behaviour. Functional response models were developed for nymphs fed exclusively midges or amphipods and for nymphs fed mixed prey. Nymphs fed only midges exhibited a sigmoidal type III response (a prerequisite for frequency-dependent foraging): nymphs fed only amphipods exhibited a hyperbolic type II response. These results were reversed in mixed prey trials. Regardless of densities of prey offered, a higher percentage of midges were eaten compared to amphipods. Dragonflies did follow a simplified optimal foraging model based on energy maximization but they did not consistently exhibit frequency-dependent selection. ChE levels were slightly elevated in treated nymphs and foraging behaviours between treated and control groups were not statistically significant, most likely because of high variability in ChE activities within the control group and across treated groups. My results suggest that certain animals may be unsuitable for routine pesticide monitoring and prior to incorporating any species into a biomonitoring program, careful consideration of the species' sensitivity to the contaminant needs to be considered. Further work is needed to determine other factors that may influence ChE levels in species as well." (Authors)] Address: not stated

19517. McNamara, D. (1997): Dragonfly Spotting. The Bulletin of the Amateur Entomologists 56: 251. (in English) [Verbatim: In the Denham area on the 9th September 1987 it

was a typical "quality" British summer's day - blue skies, fresh but warm, little wind, and plenty to look at. Denham has a series of waterways, the River Colne in particular, the Frays, Alderbourne, and Misbourne, lots of ponds and lakes - some natural and others the result of gravel extraction (which still goes on in parts), streams and drainage ditches. Even the Grand Union Canal contributes to the flora and fauna of the area, its sedentary flow being a much cleaned-up act compared to ten years ago. This is a splendid area for dragonflies. The main problem with identification is the variability of adult insects and in particular the various colour stages they go through - new emergers being in some cases quite unlike older ones. Also there are similarities between close relatives. However, with a novice's luck and a good guide book, four species were identified with reasonable confidence: *Calopteryx splendens*, *Enallagma cyathigerum*; *Aeshna mixta*, *Sympetrum striolatum*. [...] Reference: McGeeney, A. (1986). A Complete Guide to British Dragonflies. Jomthsin Cope.] Address: McNamara, D., 6 Fnlham Close, Hillingdon, Uxbridge, Middlesex UBIO OSU, UK

19518. Robinson, J.V.; Novak, K.L. (1997): The relationship between mating system and penis morphology in ischnuran damselflies (Odonata: Coenagrionidae). Biol. J. Linn. soc. 60(2): 187-200. (in English) ["Zygopterans belonging to the genus *Ischnura* are unusual amongst damselflies because of the variety of mate guarding techniques employed by males of different species. The lack of post-copulatory guarding combined with lengthy copulations in one group of ischnuran species suggest that these males guard females in copula. An examination of the accessory penes of species in this group indicates that all but one species have considerable microspination on the distal end (the flagella) of their penes that can function in sperm displacement. The flagella of these species are long and thin compared to those of other ischnurans. This is likely an adaptation to gain access to the spermatheca of the female. Two species tandem guard their mates during ovipositing. These species are the only ischnurans missing a stout pair of basal spines on the penultimate segments of their penes. They have considerable microspination over much of their penes but their flagella are of only moderate length and stout. Ischnurans that do not mate guard have short, stout flagella and most species examined from this group (5 of 7) have little microspination on their flagella tips. It is proposed that females of these species mate only once and therefore their males do not displace sperm. The relationship between mating system

and penis morphology in ischnuran damselflies (Odonata: Coenagrionidae)." (Authors)] Address: Robinson, J.V., Dept of Biology, Box 19498, I& Universi& of Texas at Arlington, Arlington, Texas 76019, USA

19519. Stoks, R.; Knijf, G. de; Jannis, G. (1997): De status van *Lestes barbarus* in België. *Gomphus* 13(1-2): 8-13. (in Dutch, with French summary) ["Before 1994 *Lestes barbarus* appeared very rarely and sporadically in our country. Since then the number of observations has increased dramatically (especially in 1995, with 100 contacts at 71 sites). The paper analyses the data by demonstrating breeding in several sites by the presence in consecutive years, by early periods of presence in sites known from the previous year (while in other sites the observations were made later in the season) and by direct evidence such as findings of larvae and neonates. With regard to the environments frequented, the almost constant presence of *Juncus effusus* and the drying out of many observation sites are noted; the diversity of physiognomy of the latter is however very high. The author concludes with a discussion on the chances of sustainability of these populations and the possible competition with *Lestes sponsa*." (Authors/DeepL)] Address: Knijf, G. de, Research Institute for Nature and Forest (INBO), Havenlaan 88 bus 73, 1000 Brussels, Belgium. E-mail: geert.deknijf@inbo.be

19520. Walia, G.K.; Sandhu, R. (1997): Karyotypic studies on five species of *Ischnura*. *Fraseria* (N.S.) 4: 9-12. (in English) ["Male germ cell complements of five species of genus *Ischnura* (Coenagrionidae) have been described and illustrated. *I. inarmata*, *I. senegalensis* and *I. rufostigma* possess the diploid numbers 27, while the remaining two species, *I. aurora aurora* and *I. forcipata* reveal diploid number 25. The m chromosomes are present only in *I. inarmata* and *I. senegalensis*. All these species possess XO-XX type sex-determining mechanism. *I. inarmata* has been studied cytologically for the first time." (Authors).] Address: Walia, Gurinder Kaur, Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India

1998

19521. Grell, H.; Grell, O.; Voß, K. (1998): Erfolgskontrolle von biotopgestaltenden Maßnahmen im Agrarbereich; Kleingewässer. Auftraggeber: Landesamt für Natur und Umwelt: 64 pp + Annex- (in German) [From April to October 1998, 100 shallow waters were studied in the north and east of Schleswig-Holstein. The waters are located in the outwash plains (22), in the young moraine (47) and on the Baltic Sea coast (31). Their bottom consists of clay, fen, anemic bog or sand. The size of the water bodies varies between 60 sqm and 9 ha. The water depth usually does not exceed one metre, and many water bodies have extensive alternating water zones. The small water bodies are mainly dug water bodies, while the large water bodies are almost exclusively the result of damming measures or rewetting. At least 85 of the water bodies are biotope creation measures carried out by various agencies. The vegetation and flora of the water bodies were studied, as well as the animal groups birds, reptiles, amphibians, grasshoppers, dragonflies and water beetles. Between 4 and 12 inspections of the water bodies were carried out. In addition, the loud calling amphibian species tree frog, fire-bellied toad, natterjack toad and green toad were surveyed in 7 areas. 204 specific plant species of the water bodies and banks were recorded, including 46 species of the Schleswig-Holstein Red List (hereafter "RL"). Furthermore, 36 breeding bird species (RL: 12), 4 reptile

species (RL: 3), 10 amphibian species (RL: 5), 5 specific grasshopper species (RL: 3), 32 dragonfly species (RL: 12) and 52 water beetle species (RL: 12) were recorded. All groups of organisms studied, with the exception of the water beetles which were only sampled at random, colonised the large water bodies significantly better than the small water bodies. The preference for large water bodies was particularly pronounced in the case of birds and reptiles. Furthermore, with the exception of the water beetles, all the organism groups studied showed a significantly higher species richness as well as a stronger occurrence of endangered species in the water bodies that were in an early to middle stage of succession. In contrast, species diversity was generally significantly lower in the more silted-up, shaded waters. In many older water bodies, extensive use, especially extensive riparian use, resulted in the long-term maintenance of early and intermediate successional stages. The water bodies showed marked natural differences with regard to their floristic and faunistic colonisation. Specific, often endangered species could be identified from several organism groups for all soil types or the corresponding natural areas. Even water bodies, which were heavily impaired by former intensive use and fertilisation, sometimes had a species-rich and/or rare colonisation, especially with regard to their bird, dragonfly and water beetle fauna. It is suggested that in future the creation of large, shallow backwaters with extensive alternating water zones should be promoted. To ensure the long-term preservation of early and middle succession stages, the water bodies should be extensively grazed." (Authors/DeepL)] Address: Landesamt für Natur & Umwelt, Hamburger Chaussee 25, 24220 Flintbek, Germany

19522. Oonk, M.M.A.; Giesen, T.G. (1998): Reproductietoets voor libellen in de Overasseltse en Hatertse Vennen. Opdrachtgever Staatsbosbeheer Regio Gelderland Arnhem. Giesen & Geurts, Ulf: 78 pp. (in Dutch) [Objective: In 1995 and 1996, commissioned by Staatsbosbeheer Regio Gelderland, it was investigated which of the dragonfly species, observed as exuvium in 1985 and 1986 in the Overasseltse en Hatertse Vennen, are still reproducing today. The aim of the study is to show whether the dragonfly population has been maintained since 1986. Possible changes in the population could be related to applied or neglected management, and possibly be translated into advice. In addition, the requirements of the present dragonflies (larvae) to the structure and vegetation of the banks as an ideal place for the larvae to hatch can be determined. For the management of ponds and banks it is also important to find out where on the bank the dragonflies hatch. Finally, by extrapolating the numbers of exuvia found in relation to the vegetation type, an overall estimate can be made of the quantities of dragonflies present. Method 64 permanent quadrats were set out in 17 fens to be studied in such a way that a sample area of the most important bank types was obtained. These PQs were thoroughly searched for exuviae a number of times. Results When ponds that were examined for exuviae in both '85/'86 and '95/'96 are compared, it appears that the number of species in five of the 13 ponds to be compared has increased. For the remaining ponds, there is a moderate to strong decrease in the number of species found. The most significant decline took place in Roelofsven, Oriolusven and Ketelven. Two species were not found, namely *Somatochlora metallica* and *Erythromma najas*. Strong decline was observed in *Leucorhinia dubia*, *L. rubicunda*, *Aeshna juncea* and *Pyrrosoma nymphula*. The data of each plot were extrapolated to exuviae per 10m² and plotted against the attractiveness of the plots (determined

on the basis of factors important to dragonflies). This gave rise to a significant correlation. Finally, for each species found, specific biotope requirements were described and related to the fens studied. Management in general it can be said that if the management in the fen area is aimed at maintaining stable dragonfly populations, it is essential to make the ponds as varied as possible without losing the characteristics of the individual ponds. Large-scale development measures, such as plowing, grubbing up and cleaning up after long periods of 'doing nothing', do not provide sufficient buffering or escape possibilities for species that do not benefit from these changes in the landscape in the short term. It would benefit most species if the management carried out was small-scale, with all ponds in the area being dealt with in a kind of rotation system in the longer term. This prevents every fen from having the same layout and being at the same stage of succession." (Authors/Deepl.) Address: Giesen & Geurts, Biologische Projekten, 't Goor 9, 7071 PC Ulf, The Netherlands

19523. Rambach, P.; Buchwald, R. (1998): Limnologische und vegetationskundliche Untersuchungen von Grundwasserbächen der südlichen Oberrheinebene. I. Riedkanal bei Wasenweiler (Freiburger Bucht, Südbaden). Mitt. bad. Landesver. Naturkunde u. Naturschutz N.F. 17(1): 59-84. (in German) ["The Riedkanal, a groundwater-influenced watercourse of the Upper Rhine Plain in Baden, runs in the channel system of the former East Rhine, which flowed through the low terrace between Kaiserstuhl and Tuniberg during the Würm Ice Age. As part of a diploma thesis at the Albert-Ludwigs-Universität Freiburg i.Br., the watercourse was investigated from May to October 1993 at four sites with regard to its physico-chemical factors and colonisation by macrozoobenthos; in addition, the Neugraben was analysed at two sites as a tributary polluted by wastewater. At the same time, the vegetation of these two watercourses was surveyed at a total of 18 sampling sites. Similarities and differences to typical lowland streams according to Braukmann (1987) were identified. The animal population largely consists of typical representatives of lowland streams such as *Asellus aquaticus*, *Gammarus pulex*, *G. roeseli*, *Polycelis ni gra*, *Polycelis tenuis*, *Dendrocoelum lacteum* and *Sialis lutaria*. Similarly, the strong dominance of crustaceans is characteristic of lowland streams. However, clear differences to lowland streams were also found, which can be attributed to the influence of groundwater. The cold stenothermy, which is not only limited to the narrow source area, and the constant oxygen deficit are unusual features for lowland streams. These milieu factors also characterise the animal and plant biocoenosis and distinguish the Riedkanal as a representative of the type "groundwater stream" according to Carbiener et al. (1987, 1990) or the "groundwater-dominated lowland stream" according to Timm (1994). Thus, groundwater macrophytes such as *Sium erectum*, *Nasturtium officinale*, *Veronica anagallis-aquatica* and *Callitriche obtusangula* colonise the entire longitudinal course of the watercourse studied. The occurrence of spring brook species such as *Arrenurus cylindratus*, *Hygrobatas prosiliens*, *Hygrobatas fluviatilis*, *Lebertia fimbriata*, *Lebertia sparsicapillata*, *Elmis aenea*, *Gammarus fossarum*, *Sericostoma personatum* and *Silo nigricornis* not only in the vicinity of the spring is a special feature of groundwater-dominated streams. The "dampening" influence of groundwater streams on the load of surface inflowing water is shown by the example of the tributary Neugraben. The study points to the necessity of typifying lowland streams not only according to geochemical conditions, but on a second level additionally with the help of the respective hydrological situation - e.g.

degree of groundwater influence. The macrophytes of the two study waters were related to a chain of plant communities which - following Carbiener et al. (1987, 1990) - was established for the natural area of the Upper Rhine Plain in southern Baden in a sequence of increasing trophic levels. While for the Riedkanal there was a slight shift from B-C to C in the longitudinal course, a sequence from (E-)D to (D-)C could be determined for the eutrophic Neugraben." (Authors/Deepl.) *Calopteryx virgo*, *Chalcolestes viridis*] Address: Buchwald, R., Institut für Biologie & Umweltwissenschaften, Carl von Ossietzky Univ. Oldenburg, Oldenburg, Germany

2000

19524. Dawson, M.J.; Hemmings, J. (2000): Sardinia 1999. Bulletin of the Amateur Entomologists' Society 59: 15-17. (in English) [Other insects seen: *Calopteryx splendens*, *C. virgo*, *C. haemorrhoidalis*, *Libellula fulva*, *Crocothemis erythraea*, *Sympetrum striolatum*] Address: Dawson, M.J., 66 Tivoli Crescent, Brighton BN1 5ND, UK.

19525. Hirose, Y. (2000): The molecular evolutionary genetic analysis of Japanese Odonata by mitochondrial DNA sequence. Tombo 42. 2-13. (in Japanese, with English summary) ["The classification of Insecta has been made mainly by the morphological differentiation. In the case of Odonata, the cadual appendages, the vein structure and the form of thorax and abdominal macula are assumed to be the important discernible characters. These morphological properties, however, could be subtly varied by their geographical and environmental conditions. So the detail classification between species and subspecies has been confusing by researcher's various opinions. Specially, the species classified in Cordulidae which inhabit in the area from Japan to Europe shared so many similarities in their morphologies that many of them could not be positioned clearly in terms of taxonomy. As to Cordulidae in Japan, the seven genera, twenty species and two subspecies are being recorded by Ishida (1988). According to him, the *Somatochlora graeseri aureola* and the *Somatochlora graeseri graeseri* which distribute in Hokkaido are classified in subspecies but there is no differentiation in their form of the cadual appendages which seemed to be the standard classificina points of Odonata. The differentiation in female abdominal macula and fulvid in the base of wing are the only differentiation. Moreover, according to past studies, both subspecies were collected in the same area so it was thought to be contradiction to divide them on subspecies in terms of taxonomy. In Ishida's classification, Asahina (1950) classified the *Macromiinae* which belongs to Cordulidae as an independent family. These studies shows the classification done is not adequate method and it is necessary to review the morphological classification with adding some supplementary technique in classifying Cordulidae. On the other hand, in Insecta, all base sequence of mitochondrial DNA of *Drosophila yakuba* was defined by Lansman (1985) from 1983 to 1985. Since Lansman's study, a series of studies seeking genetic distance by using the DNA base sequence came to be done. In the area of the fishes for which a lot of studies has done, Maya et al. (1996) defined the mt DNA 12 region and 866 base of 16 S rRNA region to clarify the relationship of interspecies for Cyclothone in which the relatives of the line had not been cleared. This ribosomal RNA region is higher in preservability than the other protein coding region of mtDNA so that it is recognized as the effective region as the genetic marker to study mass genetics and evolutionary researches (Nei, 1990) of interspecies. From the mutation comparison of the base sequence in this region, it is expected

to establish the adequate phylogenetic systematics. This study focused on Corduliidae to which a lot of problems were pointed out on the morphological classification and analyzed mt DNA 12 and 16S rRNA region. Moreover, the relationship between each group was clarified based on the obtained result to assume a new criterion of the morphological classification, and the problem in the classification was also clarified. In addition, it was tried to elucidate the process of speciation at the present age by adding ten genera and eleven species of Odonata from Japan and by using the base sequence of mtDNA 12..16 S rRNA region to estimate the divergence times. In analyzing the base sequence, after amplifying the both regions of mtDNA-12 and 16S rRNA by the PCR (Polymerase Chain Reaction) method then processing the direct sequence for the obtained PCR product by the Dye terminator method, the base sequence was defined. As a result, 355 bases for 12S rRNA region and 514 bases for 16S rRNA region were estimated as the base sequence, then the genetic distance and the phylogenetic tree were made by substituting the difference of the base among groups in the Kimura's genetic distance formula. [The Clustal W (Multiple alignment and molecular phylogenetic Tree-making software) in National Institute of Genetics was used.] Comparing the phylogenetic tree obtained by analyzing the base sequence of mtDNA, with the current morphological classification, the obtained findings of each problem were brought together and described as follows. 1) As to the classification of *Somatochlora graeseri aureola* and *S. graeseri graeseri* which was assumed to be in the relation of subspecies under the current morphological classification, the comparison of the base sequence of mtDNA, there was no difference at all between them so they were seemed to be in the identical species. 2) Considering the relationship of *Somatochlora graeseri aureola* and *Somatochlora uchidai* which was defined as different species, the base sequence of mtDNA was also so high compared with other species that it was presumed that they were species which had differentiated the most recently in the Cordulidae genus. 3) As for the relationship of Cordulidae and the Macromiinae in which the definition in the morphological classification differed by each researcher and was not clarified, it was found from the base sequence in mtDNA that the Macromiinae had diverged from the ancestral strain first then the Libellulidae diverged secondly. As a result, it seemed to be questionable to classify Macromiinae which had diverged before Libellulidae did as a subfamily and preferable to classify it as an independent family. It is uncertain why the result shown above was obtained at this point. In addition to the result above, to estimate the divergence time of Anisoptera from the ancestral strain, in which Cordulidae belongs, the amino acid substitution rate (2.0×10^{-8}) of 12 and 16S rRNA and the difference of the base between the both species were calculated by substituting these figures in Kimura's formula (1980). Consequently, it was found that the group from the Zygoptera average to Anisozygoptera diverged about two hundred and million years ago and the group from Anisozygoptera to the Anisoptera average about a hundred and seventy million years ago. Although the fossil *Epiphlebia superstes* of which the estimated time was three hundred and million years ago was found, the divergence times of Odonata after this was completely unknown. It seemed to be very meaningful to be able to presume the concrete divergence times. Finally, in this research, it was realized to reexamine the problems of the morphological classification as a traditional method by using the biochemical genetic index and show the clear relationship of the groups which had not been so clarified. Moreover, by analyzing the DNA base sequence, new findings which differed from the

traditional classification could be obtained." (Author)] Address: Email: ezotombo9@yahoo.co.jp

2002

19526. Suga, C.; Tsukiji, K., Takeda, S. (2002): Effects of pesticides on rate of emergence of dragonfly larva. Annual reports of the society of plant protection of north Japan 53: 155-157. (in Japanese) ["Results and discussion The first hatching of dragonflies was observed on 6 August, and the development of dragonfly hatching shells continued until the end of October. The number of dragonfly larvae in June and July is shown in Fig. 1. The number of dragonfly larvae in the insecticidal zone was lower than in the other zones, but the analysis of variance did not show any significant difference (5% risk rate). The number of dragonfly larvae in the herbicide and fungicide plots was lower than that in the other plots. The number of hatched eggs in the herbicide and fungicide plots was almost the same as that in the control plot (Fig. 2). This suggests that the herbicides and fungicides had no effect on dragonfly larvae, but the insecticides either indirectly reduced the number of dragonfly larvae by acting on their prey organisms or directly affected their growth. However, it was not possible to determine which of the two was the main cause in this study. In addition to dragonfly larvae, several other aquatic organisms were observed in the insecticide treatments (Table 2). The occurrence of dragonfly larvae in this study was about one month later than that in normal paddy fields. The reason for this delay is that the hatching of dragonflies was delayed because the waterlogging started later than the usual flooding of rice fields, and the growth of dragonflies was delayed because they were not fed with food. The density of adult dragonflies in the control site was 76.3 dragonflies/m², which was much higher than the reported density of hatchlings (8 dragonflies/m²)(3) in untreated paddy fields. However, this value is considered to be reasonable because the test was conducted in paddy soils that were judged to have produced many eggs in the previous year. In the fungicide-treated area, the hatching period was later than in the control area (Fig. 3). Since dragonflies hatch in a uniform manner, we tested the emergence rate of hatching shells at the end of August and found $61.7 \pm 12.6\%$ in the fungicide-treated plots, which was not significantly different from $85.5 \pm 12.6\%$ in the control plots (risk rate 5%). Since only about 5 adults hatched very late and the experimental system was inadequate, it can be assumed that this is within the margin of error. However, unlike actual paddy fields, the present study was conducted under conditions where there was no water runoff or infiltration into the ground by waterways, etc., and no organisms that prey on dragonfly larvae were present." Translated with www.DeepL.com/Translator (free version)] Address: Suga, C., Iwate Agricultural Research Center, Narita, Kitakami, Iwate, 024-0003 Japan

19527. Wells, F.; Metzeling, L.; Newall, P. (2002): Macroinvertebrate regionalisation for use in the management of aquatic ecosystems in Victoria, Australia. Environmental Monitoring and Assessment 74(3): 271-294. (in English) ["The development of a broader, more holistic approach to aquatic ecosystem management has been called for in recent years. Physical and chemical objectives alone are no longer considered sufficient for the protection of aquatic ecosystems and should be supplemented with biological objectives. The ubiquitous and sedentary nature of macroinvertebrates [including Aeshnidae], combined with their measurable response to environmental conditions, favour their use as important indicators in environmental policies.

To establish biological objectives, there is a need for a regional framework to limit the variability between ecosystems. Past studies have demonstrated that an a posteriori regionalisation approach may be more useful than an a priori approach in explaining single component (e.g. macroinvertebrates) patterns across ecosystems. This is particularly important as aquatic resource management agencies often focus on one or two components of the ecosystem to assess environmental health. This study uses an a posteriori method to delineate and describe biological regions based on edge and riffle macroinvertebrate data. The regionalisation will provide a framework for setting biological objectives, based on the range of reference conditions measured within each separate region. The objectives will include regional checklists for taxa and biotic indices. Predictive modelling in the style of RIVPACS or AUSRIVAS will also be used within each region to develop objectives, incorporating local, regional and systematic features as predictor variables." (Authors)] Address: Wells, F., Dept of Geospatial Science, Royal Melbourne Institute of Technology, Melbourne, Victoria, Australia. E-mail: peter.newall@epa.vic.gov.au

2003

19528. Buchwald, R. (2003): Vegetationskundliche und ethologische Aspekte bei der Habitatwahl von Libellen, dargestellt am Beispiel der Glänzenden Binsenjungfer und der Gefleckten Heidelibelle in den Karst-Hochebenen Mittelitaliens. *Berichte der Reinhold-Tüxen-Gesellschaft* 15: 89-104. (in German, with English and Italian summaries) ["The present long-year study deals with investigations on habitat choice of two dragonfly species with special reference to the importance of floristic composition and vegetation structure. Some karst plateaus of Central Italy possess a large number of standing waters which differ predominantly in hydrological conditions and vegetation. Due to these differences I separated four vegetation types in the permanent and temporary waters. The Odonata species *Lestes dryas* and *Sympetrum flaveolum* showed marked differences in abundance and frequency in these four vegetation types. In particular, dragonflies of both species failed to appear or occurred only in low numbers when the waters dried up early in the reproductive season. Using a floristic-phytosociological and a hydrological-structural approach, more detailed analyses on some parameters of the vegetation, the morphology, the soil and the hydrological conditions of the waters pointed out that abundance and frequency of both species are correlated mainly with the following factors: aspect (physiognomy) of the vegetation, vegetation height in the peripheral and central parts of the waters, vegetation colour, and the degree of steepness at the margin of the aquatic habitat. The imagoes of both species preferred permanent or temporary waters with flat shore and vegetation which was dominated by green (to brown or yellow) stands of the growth forms "large sedge" and "rush(-like)"; the minimum height of the vegetation was (30-)35 cm (for *L. dryas*) respectively 20 cm (for *S. flaveolum*) in the peripheral parts and 35 cm (for *L. dryas*) respectively 25 cm (for *S. flaveolum*) in the central parts of the waters. The present study reveals that both the floristic-phytosociological and the hydrological structural approach give important information about the specific bond to vegetation and the habitat choice of the dragonfly species investigated here. Additional eco-behavioural studies should be carried out to verify and understand the present results by other approaches and methods." (Author)] Address: Buchwald, R., Institut für Biologie und Umweltwissenschaften, Carl von Ossietzky Universität Oldenburg, Oldenburg, Germany

19529. Burtch, M. (2008): The effects of algae leaf coverage and flow rate on oviposition choice in *Calopteryx maculata*. Report, UMBS Evolution 390, University of Michigan, Ann Arbor, MI: 16 pp. (in English) ["Female *Calopteryx maculata* are endophytic egg layers; they place their eggs within floating aquatic vegetation. In this study artificial oviposition leaf patches were created and placed in different sites along the Maple River near Pellston, MI. The varying flow rates were recorded and after 48 hours the leaf patches were collected. The egg number or oviposition sites were counted on each leaf along with the percent algae leaf coverage. The effect of algae leaf coverage and flow rate on oviposition preference were statistically measured; algae leaf coverage did not affect oviposition frequency ($p > 0.05$) and intermediate stream flow was preferred over slower and faster flow rates as oviposition sites ($p < 0.05$). The reason for this correlation is unknown, however, it could relate to the optimal conditions for egg growth and development. It is impossible to know whether oviposition flow/rate preference is the result of the male or female's choice. More research of egg development and observational data would provide more insights into the reasoning for intermediate flow oviposition preference." (Author)] Address: not stated

19530. Heitkamp, U. (2008): Zur Wirbellosenfauna des NSG „Denkershäuser Teich“ in Süd-Niedersachsen. Kommentierte Artenliste. *Naturkundliche Berrichte Fauna Flora Süd-Niedersachsen* 13: 65-107. (in German) ["The data material of this publication on the invertebrates of Denkershausen Pond was collected between 1984 and 1987 and between 1999 and 2005. The limnofauna with the macrobenthos fauna of the tributaries as well as the small crustaceans and the other invertebrates including the insects of the pond and ditches were recorded. Complete data are available on the turbellarians, molluscs and odonates, while those of the other groups had to remain more or less incomplete due to the survey methodology. As far as recorded, the current situation of the species is compared with that of the 1980s and KRUEL's (1940) results from the early 1930s. From the terrestrial area, especially the group of hay ticks is documented in detail. In addition, data material on the web spiders, isopods, short-winged beetles and day butterflies was evaluated. Altogether, the work represents a documentation of the faunistic state of the pond area from different historical periods. It completes previous publications on ground beetles, ground-dwelling spiders and weavers as well as vertebrates (excl. birds) of the Denkershausen pond. ... In the 2000s and 1984-86, 21 dragonfly species were recorded at the pond, 13 of which were indigenous species (Table 7). The most common species were the Great Skylark and the Horseshoe damselfly. KRUEL (1940) identified three further species, the Southern rush damselfly, the bat damselfly and the large pomegranate, which no longer occur at the pond. The 21 species correspond to approx. 31 % of the dragonfly species recorded so far in Lower Saxony." (Author/DeepL)] Address: Heitkamp, U. Bergstr. 17, 37130 Gleichen-Diemarden, Germany

19531. McMunn, M. (2008): Oviposition preference in the Dark-Winged Damselfly (*Calopteryx maculata*). Report, Joint project for Evolution and Natural History (BIO 390), University of Michigan, Ann Arbor, Michigan: 13 pp. (in English) ["Our study investigated preference of oviposition in *Calopteryx maculata*, the dark-winged damselfly. Artificial damselfly territories were created using several leaves of *Sparganium americanum* fixed in place in a river, at known

flow rates for 48 hours. On each leaf total eggs were counted and algal coverage was measured. We found that *C. maculata* oviposits more frequently in areas of intermediate flow rate, approximately 0.2-0.4 m/s. We also found that algal coverage was more common in this flow rate range, suggesting that damselflies oviposition choice is not affected by the presence of algae and that there is a relatively narrow window of optimum flow rate for oviposition." (Author)] Address: not stated

2009

19532. Bradley, T.J.; Briscoe, A.D.; Brady, S.G.; Contreras, H.L.; Danforth, B.N.; Dudley, R.; Grimaldi, D.; Harrison, J.F.; Kaiser, J.A.; Merlin, C.; Reppert, S.M.; VandenBrooksk, J.M.; Yanoviak, S.P. (2009): Episodes in insect evolution. *Integrative and Comparative Biology* 49(5): 590-606. (in English) [oas 63; "Synopsis: This article derives from a society-wide symposium organized by Timothy Bradley and Adriana Briscoe and presented at the 2009 annual meeting of the Society for Integrative and Comparative Biology in Boston, Massachusetts. David Grimaldi provided the opening presentation in which he outlined the major evolutionary events in the formation and subsequent diversification of the insect clade. This presentation was followed by speakers who detailed the evolutionary history of specific physiological and/or behavioral traits that have caused insects to be both ecologically successful and fascinating as subjects for biological study. These include a review of the evolutionary history of the insects, the origins of flight, osmoregulation, the evolution of tracheal systems, the evolution of color vision, circadian clocks, and the evolution of eusociality. These topics, as covered by the speakers, provide an overview of the pattern and timing of evolutionary diversification and specialization in the group of animals we know as insects." (Authors) The paper includes references to Odonata.] Address: Bradley, T.J., Dept Ecology & Evolutionary Biology, University of California Irvine, Irvine, CA 92697-2525, USA. E-mail: tbradley@uci.edu

2012

19533. Aliyev, P.; Hajiyev, B.; Akhundov, M.A. (2012): The hydrofauna of the Sarysu Lake. 22(1): 159-162. (in Russian) ["Studies on the hydrofauna of the Sarysu Lake on the right bank of the Kura River were conducted in 2011. As a result of studies there are registered 33 species and 2 hybrids of fishes, 34 species of zooplankton and 84 species of macrobenthic organisms belonging to 11 taxonomic groups. Maximum development of organisms was recorded in spring and summer." (Authors) Odonata listed are: *Lestes sponsa*, *L. barbarus*, *L. dryas*, *Enallagma cyathigerum*, *Calopteryx virgo*, *Sympetrum fusca*, *Platycnemis pennipes*, *Coenagrion puella*, *C. scitulum*, *Anax imperator*, *Sympetrum flaveolum*, *S. danae* and *S. striolatum*.] Address: Hajiyev, B., Ministry of Ecology and Natural Resources of Azerbaijan. E-mail: alisaleh@rambler.ru

19534. Mazza, G.; Aquiloni, L.; Bellavita, M.; Cianfanelli, S.; Cianferoni, F.; Orioli, G.; Palombi, A.; Piazzai, M.; Rpcchi, S.; Terzani, F.; Gherardi, F. (2012): Ricerche faunistiche negli habitat stagnatili (trosce) della Riserva Naturale Monte Rufeno (Lazio, Italia Centrale). *Studi Trent. Sci. Nat.* 92: 21-32. (in Italian, with English summary) [Faunistic researches in wetlands (known as "trosce") of Monte Rufeno Nature Reserve (Latium, Central Italy) - During 2010-2011, 13 wetlands, locally called "trosce", were investigated in Monte Rufeno Nature Reserve and surroundings. 14 odonate taxa

were recorded] Address: Mazza, G., Dipartimento di Biologia Evoluzionistica, Università degli Studi di Firenze, Via Romana 17, 50125 Firenze, Italia. Email: giuseppe.mazza@unifi.it

19535. Partridge, R. (2012): A swarming of Migrant Hawkers. *Bulletin of the Amateur Entomologists' Society* 71: 181. (in English) [Verbatim: On the evening of Sunday the 2nd of September 2012, after a long day in the garden, my wife and I decided to go for a walk around one of our local gravel pits in Block Fen, Cambridgeshire. It was a very fine evening, warm, calm and still sunny at 19-00 hours. Dragonflies were much in evidence, particularly Common Darters, *Sympetrum striolatum*, *S. sanguineum*, *Aeshna grandis* and *A. mixta*. As we rounded a corner in one of the most overgrown parts of the bank, we could see immediately some unusual behaviour amongst a group of dragonflies; they were very low to the ground, just a foot or two above the vegetation, and flying madly back and forth in the tightest of circles. When we approached for a closer look, they took no notice of us – we were able to stand within a yard of all the activity. A dozen or fifteen dragonflies were involved, all were *A. mixta* as far as I could tell, and all appeared to be males. We could now see what they were so intent upon. A large anthill was here and there were many flying ants coming up out of it, climbing the grass stems and taking off. These weakly-flying, and probably quite juicy, insects were an easy target for the Hawkers, and they must have taken hundreds of them if the feeding frenzy continued for any length of time. I am sure that this has been observed many times before but I have not yet come across an account of it in the literature that I have.] Address: Partridge, R., 11 New Rd, Mepal, Ely, Cambridgeshire CB6 2AP, UK. Email: rpartridge3@aol.com

19536. Probert, M. (2012): Damselfly with two abdomens (Odonata: Coenagrionidae) [sic]. *Bulletin of the Amateur Entomologists' Society* 71: 200-202, Plate 2. (in English) [An *Erythromma najas* female "with two abdomens is photographed. Two possibilities are considered: whether it was a mutant, or a pair in tandem attacked by a predator." (Author)] Address: Probert, M., 55 Higher Compton Road, Hartley, Plymouth PL3 5JA, UK

2013

19537. Lambertz, M.; Geissler, P. (2013): Zum Vorkommen des Großen Granatauges, *Erythromma najas* (Hansmann, 1823) (Zygoptera: Coenagrionidae), an Mittelrhein und Siegmündung bei Bonn. *Decheniana* 166: 73-77. (in German, with English summary) [*E. najas* "has not been documented in the Greater Bonn area (including the mouth of the Sieg) since 1959. During May and June 2012, two suitable breeding spots in the Rhine flood plain of Bonn ("Freizeitpark Rheinaue") and at the mouth of the Sieg have repeatedly been examined for this species. Both localities yielded specimens, including a freshly emerged one and adults in copula. This leads us to the conclusion that the large redeye today again is native to the Greater Bonn area." (Authors)] Address: Lambertz, M., Institut für Zoologie, Rheinische Friedrich-Wilhelms-Universität Bonn, Poppelsdorfer Schloss, 53115 Bonn, Germany. Email: lambertz@uni-bonn.de

2014

19538. Fan, T.; Zhang, R.; Fan, F.; Liu, Z.; Xiong, J. (2014): A water surface small target detection approach inspired by

dragonfly vision mechanism. WIT Transactions on Engineering Sciences 94: 151-157. (in English) [oas 63; "Weak and small target detection technique is widely used in military and industry applications. The targets are weak and small in the image when targets are far from the imaging system. Under this complex condition, the image has very low SNR and it is difficult to detect the targets On this situation, a weak and small target detection approach based on dragonfly compound eye is proposed in this paper. Dragonfly compound eye has obvious characteristics of polarized light, and it can detect the surface of water and the targets on water accurately The new method uses the polarization characteristics of dragonfly compound eye to get the polarization image of targets, and then completes the weak small target detection. The experimental data shows that this new target detection method has advantages of high precision and small false alarm rate." (Authors)] Address: Fan, T., School of Information Engineering, Natnchang Institute of Technology, Natnchang, China

19539. Winkler, C. (2014): Die Heuschrecken- und Libellenfauna im Umfeld des Winderatter Sees - Erfassungen in den Jahren 2013 und 2014. Auftraggeber: Winderatter See-Kielstau e.V., Förderverein für Natur und Umwelt, Willfried Janßen, Osterdorf 2, 24975 Ausacker. Auftragnehmer und Bearbeitung: Christian Winkler, Faunistische Gutachten, Bahnhofstr. 25, 24582 Bordesholm, Germany: 48 pp. (in German) [Schleswig-Holstein, Germany; "In 2013 and 2014, surveys of the dragonfly and grasshopper fauna were carried out in the area of Lake Winderatt. In addition to the lake, the approximately 100-hectare study area also included adjacent semi-open pasture landscapes belonging to the Schleswig-Holstein Foundation for Nature Conservation, a forest area, two wooded areas and the westernmost part of the Hadeby depression, which is characterised by wet grassland fallows. The dragonflies were recorded on the basis of the imagines at 11 shore sections of Lake Winderatt and at 23 small water bodies. All survey waters were checked on six dates between 20.06. and 01.10.2013 and on 26.05.2014. A total of 28 dragonfly species were recorded, 26 of which were classified as potentially native. *Lestes virens* and *Coenagrion lunulatum* (potentially native) are classified as "critically endangered" throughout the country. The latter is listed as "threatened with extinction" in the nationwide Red List. Furthermore, two "declining" species were found: *Aeshna juncea* and *Sympetrum flaveolum*. *Sympecma fusca* is another species that is very rare in the region. [...] Finally, from the point of view of dragonfly and grasshopper protection, deficits of the study waters and sample areas are pointed out and protection and development measures are presented (Tables 6 and 7). Deficits related to the current grazing management can only be identified at certain points and are not classified as serious at the level of the study area and its sub-areas." (Author/DeepL)] Address: Winkler, C., Faunistische Gutachten, Bahnhofstr. 25, 24582 Bordesholm, Germany

2015

19540. Adriaens, T.; van Grunsven, R. (2015): Schemerlibel. *Brachytron* 17(2): 126-129. (in Dutch) [Introduction into ecology and biology of *Boyeria irene*, including habitat photographs from its locality at the Oertze in Celle, Niedersachsen: "a river with a lot of structure, a substrate of gravel and sand, and a river bank with overhanging tree roots and branches, especially of alder."] Address: Adriaens, T., Research Institute for Nature and Forest (INBO), Kliniekstraat 25, B-1070 Brussels, Belgium. E-mail: im.adriaens@inbo.be

19541. Alygizakis, S. (2015): [Biology, ecology and evolution of the order Odonata of Crete]. MSc thesis, School of plant and food technology, Department of gene technology, Heraklion: 80 pp. (in Greece) [General introduction into dragonfly evolution and biology, with few remarks to the odonate fauna of Crete (Greece). <https://apothesis.lib.hmu.gr/handle/20.500.12688/31>] Address: not stated

19542. Bagheri, Z.M.; Wiederman, S.D.; Cazzolato, B.S.; Grainger, S.; O'Carroll, D.C. (2015): Robustness and real-time performance of an insect inspired target tracking algorithm under natural conditions. *Computational Intelligence, 2015 IEEE Symposium Series* : 97-102. (in English) ["Many computer vision tasks require the implementation of robust and efficient target tracking algorithms. Furthermore, in robotic applications these algorithms must perform whilst on a moving platform (ego motion). Despite the increase in computational processing power, many engineering algorithms are still challenged by real-time applications. In contrast, lightweight and low-power flying insects, such as dragonflies, can readily chase prey and mates within cluttered natural environments, deftly selecting their target amidst distractors (swarms). In our laboratory, we record from 'target-detecting' neurons in the dragonfly brain that underlie this pursuit behavior. We recently developed a closed-loop target detection and tracking algorithm based on key properties of these neurons. Here we test our insect-inspired tracking model in open-loop against a set of naturalistic sequences and compare its efficacy and efficiency with other state-of-the-art engineering models. In terms of tracking robustness, our model performs similarly to many of these trackers, yet is at least 3 times more efficient in terms of processing speed." (Authors)] Address: Wiederman, S.D., Adelaide Medical School, The University of Adelaide, Adelaide, SA 5005, Australia.

19543. Boda, R. (2015): A kétcsíkos hegyiszitaköto (*Cordulegaster heros* Theischinger, 1979) életciklusának vizsgálata hegyvidéki vízfolyásokban: lárvális fejlődés, élőhelypreferencia és kirepülési viselkedés. PhD thesis, School of Biology and Sports Biology, Ecology Program, University of Pécs: 126 pp. (in Hungarian, with English summary) ["Studies on the life history of the Balkan Goldenring (*Cordulegaster heros* Theischinger, 1979) in mountain streams: larval development, habitat preference and emergence behaviour. - The main aims of our work were to provide well-based basic information on life cycle (including larval development and emergence period), habitat preference, spatiotemporal microdistribution of the Balkan Goldenring, a charismatic dragonfly species with special importance for nature conservation, and to explore the role of the environmental factors determining all of these aspects, as detailed as possible. Our basic results may encourage the development of specific nature conservation action and successful species conservation programme. In order to explore the whole life cycle of the species, we used two different sampling procedures, which are both recommended for Odonates: 1) Quantitative samplings of larval assemblages were performed at eight sampling sites throughout a year with monthly intervals 2) Quantitative collection of exuviae were conducted at two sites in the emergence periods in two consecutive years. In parallel with samplings, morphometrical measurements were also performed on every captured individual, and local (water chemistry, streambed morphology, hydrology, habitat structure), vegetational (litoral vegetation types, naturalness, presence/absence of plant species, vegetation structure) and regional (climatic features and stream network position) factors were also measured

and/or determined. New scientific results have been achieved, as follows: 1. We provided new faunistic data for the species from 69 sampling sites. We detected the occurrence of the species from 19 streams for first time. Thus, we contributed significantly to the clarification of the Balkan Goldenring distribution in the South-Transdanubian region. 2. We determined the numbers of the last larval instars and the time which the larvae spent in each instar. Based on the spatiotemporal microdistribution of the larval stages we described larval development processes and determined the duration of the larval development: in the Mecsek Mountains, larval development of the species lasts at least three, but at last four years depending on the biotic and abiotic characteristics of the habitat and the weather conditions. 3. We explored the emergence dynamics and its schedule: the emergence period of the species in the Mecsek Mountains was prolonged and less synchronized. 4. We proved that beyond the differences among the streams the variation in the type and microhabitat structure of the mesohabitats plays important role in forming spatiotemporal microdistribution of the species. 5. We confirmed that the distribution of the larval stages within a stream section, because of the mesohabitat preference with different strength in different larval stages, is affected in different degree by the riffle-pool structure. This refined and supplemented our knowledge on the multilevel habitat preference of the species. 6. We described in detail the distances travelled by the larvae from the water margin to the emergence site. We found significant differences in these distances between streams and sides of a given stream. We clearly explained these differences with different composition and structure of the littoral vegetation of the habitats. We found that the larvae must leave the ground/water surface and climb vertically before the beginning of the emergence process, and emergence always happens in upright position. 7. We described in detail the emergence substrate selection process and proved that the most important emergence substrate is the tree trunk, regardless of its current cover. The variation in emergence substrate choice increases with increasing of the variation in available substrate types, but the domination of the tree trunks is remained throughout. The distribution of the available substrate resources affect, but not significantly define, the emergence-substrate selection.] Address: not stated

19544. Cserecsa, A.; Boz'ki, T.; Krasznai, E.A.; Ficsór, M.; Várbiro, G. (2015): Contribution to the aquatic macroinvertebrate fauna of the Eger-patak (Eger stream) in Northern Hungary. *Folia historico-naturalia Musei Matraensis* 39: 5-16. (in Hungarian, with English summary) ["During the quantitative sampling of the Eger-patak in 2014 altogether 99 taxa were identified which belong to 10 higher taxonomical groups: Bivalvia: 2, Coleoptera: 15, Crustacea: 6, Diptera: 7, Ephemeroptera: 11, Gastropoda: 15, Heteroptera: 2, Hirudinea: 4, Odonata: 9, Trichoptera: 28, among which 45 aquatic macroinvertebrate taxa were new to the fauna of the stream." (Authors) *Calopteryx splendens*, *Platynemis pennipes*, *Ischnura elegans*, *Gomphus flavipes*, *Gomphus vulgatissimus*, *Onychogomphus forcipatus*, *Orthetrum brunneum*, *O. cancellatum*, *Orthetrum* sp.] Address: Cserecsa, A., Dept of Tisza River Research, MTA Centre for Ecological Research, Bem tér 18/c, 4026 Debrecen, Hungary. Email: cserecsa.andras@okologia.mta.hu

19545. El Souki, M.; Blanco-Belmonte, L.; Lasso, C.A.; Mora-Day, J.; Magalhães, C.; Pisapia, D.; Mora, A.; Lasso-Alcalá, O.F.M. (2015): Composición y distribución de la comunidad de insectos acuáticos en un gradiente espacial del alto río Cuyuní, Guayana venezolana. *Mem. de la Fund. La*

Salle de Cienc. Nat. 2015 ("2011"), 71(175–176): 79-103. (in Spanish, with English summary) ["Composition and distribution of the community of aquatic insects in a spatial gradient of the Cuyuní River, Venezuelan Guayana: Richness, composition and distribution of the communities of aquatic insects were estimated along a longitudinal gradient of the Cuyuní River and its tributary (Uey River), basin of the Essequibo. Samplings were carried out for 13 days in January 2008 in 36 sampling stations distributed in five focal areas (AF) to cover the heterogeneity of habitats. Species richness was higher in the high basin of the Uey, least disturbed area. The composition of species in the gradient appears to be related with changes in transparency, depth, temperature, and total solids in suspension. The higher and media basin of river Uey corresponded to black, transparent and less deep waters with the majority of the species belonging to the orders Plecoptera, Trichoptera and Ephemeroptera. In the low river Uey and Cuyuní River stations, the main species corresponded to the orders Odonata, Hemiptera and Coleoptera, associated with higher temperatures, deeper and less transparent waters and where this change in species composition was probably influenced by the disruption caused by the mining activity observed and reflected in the increase of dissolved and suspended material." (Authors)] Address: El Souki, M., Instituto de Zoología y Ecología Tropical. Facultad de Ciencias Universidad Central de Venezuela. Apartado Postal 47072, Caracas 1041-A. Venezuela. Email: mayidae.elsouki@ciens.ucv.ve

19546. Gies, M.; Sondermann, M.; Hering, D.; Feld, C.K. (2015): Are species distribution models based on broad-scale environmental variables transferable across adjacent watersheds? A case study with eleven macroinvertebrate species. *Fundam. Appl. Limnol.* 186/1–2: 63-97. (in English) ["Species distribution models (SDMs) allow the prediction of the spatially explicit presence and absence of species based on environmental predictors that reflect the species' habitat requirements. In river macroinvertebrates, the habitat is often defined at very fine scales spanning one to several tens of square meters (e.g., substrate preferences). Such habitat information, however, is usually not available for entire river networks at the large scale, which limits the application of SDMs in conservation ecology. In this study, we present SDMs of eleven lotic macroinvertebrate species based on two broad-scale environmental variable groups: land use (derived from ATKIS high resolution land cover map) and physical habitat structure (derived from regional surveys in Germany). The actual species distributions were scanned through a field survey at 225 sites in two adjacent watersheds in a mountainous region (river Ruhr and Lenne, Federal State of North Rhine-Westphalia, Germany). The aim of this study was, first, to test the usefulness of broad-scale variables in SDMs using measures of model goodness-of-fit and predictive power. Second, local habitat variables (physico-chemistry and meso-scale substrates) were included in SDMs to examine model improvement. Third, we tested the transferability of models of the same species between the two watersheds. Due to the similar environmental characteristics of both watersheds, we hypothesized concordant SDMs for both watersheds. Overall, we found a reliable performance and predictive power of models of *Dinocras cephalotes* in both watersheds. Models of several other species performed fair in the Ruhr (*Leuctra geniculata*, *Silopiceus*, *Siphonurus lacustris*) but not in the Lenne system or vice versa (*Hydropsyche instabilis*). Broad-scale SDMs included predictors on physical habitat quality as well as riparian land use at a similar extent. Only for five models the

SDMs including fine-scale predictors (e.g., physico-chemistry, microhabitat distribution) outperformed those models with broad-scale predictors only (AUC > 0.70). We suggest that species specifically distributed in upstream reaches explicitly respond to fine-scale variables due to stronger dependency of their occurrences on local conditions. Model transferability from one watershed to another was low (transferability index < 0.6), thus revealing SDMs not only to be species-specific but also variable across adjacent watersheds. We suggest that the transferability was limited not only by actual environmental differences between both watersheds, but also by legacy land use effects that may continue to affect the recent distribution of macroinvertebrates." (Authors) Calopteryx virgo] Address: Sondermann, M., Centre of Water & Environmental Research, University of Duisburg-Essen, Universitätsstr. 5, 45141 Essen, Germany. E-mail: martin.sondermann@uni-due.de

19547. Golfieri, B.; Surian, N.; Hardersen, S.; Maiolini, B. (2015): Towards a MORE comprehensive assessment of river ecological conditions: application of a new dragonfly-based index in northern Italy. REFORM. D7.5 Conference proceedings 'Novel approaches to assess and rehabilitate modified rivers': 109-115. (in English) ["In this study we analysed the relationships between the Morphological Quality Index (MQI) and three biotic indices that are based on different riverine organism groups (dragonflies, diatoms and benthic macroinvertebrates). The study was carried out in fifteen river reaches in the alluvial plains of northern Italy. Benthic macroinvertebrates and diatoms are good indicators of water quality, but seem not to be sensitive to hydro-morphological degradation, while dragonflies provide information about the ecological integrity and habitat heterogeneity of both the aquatic breeding sites and the surrounding terrestrial areas, due to their amphibious life cycle and their well known ecological requirements. Starting from a dragonfly-based assessment system proposed in Austria, we developed a multimetric index, the Odonate River Index (ORI), which assesses the conditions of the whole river corridor, because also secondary channels and ponds in the floodplain are sampled. MQI and ORI turned out to be highly correlated, while no significant relationships were found between MQI and the indices that are based on diatoms (i.e. ICMi) and benthic macroinvertebrates (i.e. STAR_ICMi). These results suggest that dragonflies are good indicators of the ecological integrity of river corridors at reach scale, also reflecting morphological quality, and that the ORI provides information on the ecological condition of rivers not covered by the other bioindicators." (Authors)] Address: Golfieri, B., Dept of Geosciences, University of Padova, Via G. Gradenigo 6, Padova, 35131, Italy

19548. Ileperuma Arachchi, I.S.; Wickramasinghe, S. (2015): Resource partitioning and niche Overlap in three sympatric species of dragonflies (Anisoptera: Libellulidae) in Anuradhapura District, Sri Lanka. Proceedings of the International Forestry and Environment Symposium 2015 of the Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka: (in English) [Verbatim: "Resource partitioning in ecological communities bears profound connection with the coexistence of closely related species. As a mechanism, it assists species with similar characteristics to thrive in the environments where they can utilise resources in different levels in spatial and temporal scale via niche partitioning. As ecologically important insects, dragonflies are well-studied in many aspects globally but poorly assessed locally. The current study was conducted under the main objective of identifying the

mechanism of resource partitioning in three sympatric most common skimmer species; *Brachythemis contaminata*, *Crocothemis servilia servilia* and *Rhyothemis variegata variegata* in two tank ecosystems in Anuradhapura district, Sri Lanka. The study was conducted from May-August 2014 simultaneously in Nabadagaswewa tank (NW) and Mihintale tank (MT). Data collection was carried out 08:00 to 10:00 hrs in the morning and 13:00 to 15:00 hrs in the evening. Land-water interface at the tank was used for the study in both sites. Scan sampling was used to obtain data on resource utilisation by the three skimmer species. Randomly selected individuals were observed for 30 seconds in each observation point. Vegetation variables (bank vegetation density and height, aquatic vegetation density and height) were measured using two belt transects (25×1 m²) in both habitats. The three species were more active in the morning hours (08:00 to 10:00 hrs) and shows different levels of perch and fly heights in the morning and evening hours. *R.v. variegata* was recorded using heights of <100 cm in both habitats. *B. contaminata* and *C.s. servilia* showed high spatial niche overlap (Oij=0.716) in NW and in MT highest spatial niche overlap was observed between *C.s. servilia* and *R.v. variegata* (Oij=0.473). The broadest niche breadth was exhibited by *C.s. servilia* (B=0.46) in NW while *B. contaminata* showed the highest (B=0.23) in MT. *R.v. variegata* showed the lowest niche breadth in both habitats (NW: B = 0.39, MT: B=0.09). Relationship between the species abundance and vegetation heights and densities shows that vegetation height and bank vegetation densities were negatively correlated with the abundance of the three skimmer species. This study depicts ways of resource partitioning among the three sympatric skimmer species minimising interspecific competition and favoring their co-existence. Further, it highlights the extent of spatial niche overlap is influenced by the habitat characteristics especially the vegetation structure and resource availability." (Authors)] Address: Ileperuma Arachchi, Ilesha S., Dept of Biological Sciences, Rajarata University, Sri Lanka. Email: sandunikaileperuma@gmail.com

19549. Kolozsvári, I.; Szabo, L.J.; Dévai, G. (2015): Occurrence pattern analysis of dragonflies of dragonflies (Odonata) on the river Tisza between Vilkok and Huszt based on exuviae. Applied ecology and environmental research 13(4): 1183-1196. (in English) ["Dragonfly exuviae were collected between 2010 and 2013 in the following sections of River Tisza: Vilkok (Tiszaujlak), Nove Szelo (Tiszaujhely), Tiszobikeny (Tiszabokeny), Vinohragyiv (Nagysz.l.s) and Huszt (Huszt). Based on the examination of the 1965 exuviae, collected from 13 main channel sections, 6 dragonfly species were identified [*Gomphus vulgatissimus*, *G. flavipes*, *Onychogomphus forcipatus*, *Ophiogomphus cecilia*, *Calopteryx splendens*, *Platycnemis pennipes*]. Summing up the collected exuviae, the two most frequent species were *G. vulgatissimus* (57.3%) and *O. forcipatus* (39.08%), however significant assemblages of *O. cecilia* (1.93%), *G. flavipes* (1.17%), *C. splendens* (0.36%) and *P. pennipes* (0.15%) could be found as well. In compliance with the Mantel test the channel and riverbank characteristics show a significant correlation with the composition of dragonfly assemblages (R=0.309, p=0.024). According to the canonical correspondence analysis (15 habitat characteristics) the exuviae data of *G. vulgatissimus* are connected with the extent of plant coverage, the closure of foliage and the characteristics of riverbanks; the exuviae data of *O. forcipatus* are associated with water depth, channel deepening tendency, water temperature and type of plant coverage on the river bank." (Authors)] Address: Kolozsvári, I., Ferenc Rákóczi II. Transcarpathian Hungarian Institute, István Fodor Research Institute

Kossuth square 6, Beregove 90202, Ukraine. E-mail: ko-
lozsvaros@gmail.com

19550. Kloskowski, J.; Trembaczowski, A. (2015): Fish reduce habitat coupling by a waterbird: evidence from combined stable isotope and conventional dietary approaches. *Aquatic Ecology* 49: 21-31. (in English) ["Aquatic consumers can function as habitat couplers by using allochthonous subsidies of prey that migrate across ecosystem boundaries. We examined the relative use of allochthonous (invertebrates—terrestrial or living on littoral vegetation; immigrating amphibians) versus autochthonous (aquatic invertebrates, fish) resources by the red-necked grebe *Podiceps grisegena*, a generalist predator, on fishless ponds versus ponds stocked with common carp *Cyprinus carpio*. We combined conventional methods of diet estimation with stable carbon and nitrogen analyses of egg yolks and putative prey of grebes. Pre-laying grebes were observed to take mainly adult amphibians on fishless ponds and fish on stocked ponds. Alimentary tract analyses gave more weight to invertebrate prey, especially leaf beetles *Donaciinae*, apparently picked off water or emergent plants. Bayesian isotopic mixing models did not reveal predominance of a single food source but indicated that in the presence of fish grebes received relatively less energy for egg formation from amphibians and leaf beetles. Overall, our results show that grebes relied more on allochthonous resources (range of means 50–97 % of the biomass contribution estimated by different assessment methods) in the absence than in the presence of fish (8–23 %). We suggest that habitat coupling by waterbirds may be controlled by fish, which can suppress external prey subsidies, apart from being an attractive food for piscivorous birds." (Authors) The study includes "Odonata".] Address: Kloskowski, J., Dept of Nature Conserv., Institute Biol., Maria Curie-Skłodowska Univ., Akademicka 19, 20-033 Lublin, Poland. Email: januszkl@hektor.umcs.lublin.pl

19551. Kruse, A. (2015): Entwicklung von landesweiten Prioritäten zur Umsetzung von Erhaltungsmaßnahmen für Lebensräume und Arten mit besonderer Verantwortlichkeit Brandenburgs. *Naturschutz und Landschaftspflege in Brandenburg* 24(3-4): 34-49. (in German) [In a first step the natural habitat types with special responsibilities and high needs for action in Brandenburg (Germany) have been identified, leading to the identification of key areas for the implementation of conservational measures. Measures are supposed to be taken primarily in these key areas, to improve the conservation status of the species and natural habitats. The existent management plans have been analysed to identify concrete habitats for measures. Following a short introduction about methods, the results will be depicted exemplarily with one species and one habitat type, both in text and on map. In a forecast, further possibilities of use of the results for the planning of measures will be mentioned. This selection has been followed in 2014/2015 by some reports, which determined the core areas of management for reaching the aim of a favourable conservation status of these protected habitat types and species. Existing management plans were analysed to obtain precise and possible areas for measures. After a short introduction the methods of the reports are explained. The results are illustrated for one habitat type or species of each report. The future prospects of using the results for realising management measures are discussed." (Author) *Nehalennia speciosa*, *Aeshna viridis*, *Leucorrhinia albifrons*] Address: Kruse, Anne, Arten- und Biotopschutz, Seeburger Chaussee 2, 14476 Potsdam, Germany. E-mail: Anne.Kruse@lugv.brandenburg.de

19552. Le Naour, A. (2015): Etude de l'occupation de l'espace et des déplacements de deux espèces utilisées pour la cohérence nationale des Trames Verte et Bleue: *Leucorrhinia caudalis* et *Emys orbicularis*. Structure d'accueil, A.N.E.P.E. Caudalis, 9 Rue du Nouveau Calvaire, 37100 Tours: 41 pp. (in French, with English summary) ["Biodiversity is suffering a major crisis of extinction. The "Trames verte et bleue" policy aims to curb this erosion. In this context, displacement and site occupancy in two species associated with both aquatic and terrestrial environment: the lilypad whiteface (*Leucorrhinia caudalis*) and European pond turtle (*Emys orbicularis*). Both are considered as "national coherence" species and were studied in the south of Indre-et-Loire, France. The lilypad whitefaces were equipped and monitored using passive transponders (Recco System) during their maturation phase, and European pond turtles were equipped with i-GotU GT-120 GPS data loggers at the beginning of spring. The results show that lilypad whitefaces disperse more and more from their emergence site over time, and they are not found on water. During this period, they don't select any terrestrial habitat in particular. For the European pond turtle, home range includes several types of habitats, and areas with tussocks of sedge and willow flooded and marshy woodlands are selected by individuals. Crops areas are used as egg-laying habitat, which may cause conservation issues. Very few large dispersal events occurred in both species in this study, suggesting that such movements remain rare. Results suggest that *L. caudalis* progressively colonize the canopy, and then are undetectable with the Recco technology. For European pond turtle, marshy woodlands have been clearly identified as corridors. Thanks to innovative monitoring technologies, the study highlights the importance of habitat diversity for the life cycle and is therefore a challenge for the conservation of both species." (Author)] Address: Le Naour, A., Université d'Angers Faculté des Sciences, 2 boulevard Lavoisier, 49045 Angers, France

19553. Lehmann, A.W.; Nüß, J.H.; Nüß, R.I. (2015): Libellen. Bestimmungsschlüssel für Nord- und Mitteleuropa. Deutscher Jugendbund für Naturbeobachtung. 6. Auflage 2015: 202 pp. (in German) ["This identification key describes all dragonfly species in Northern and Central Europe. To reflect the spread of species due to climate warming, the key has been extended to northern Spain, northern Italy and the Istrian peninsula. It now comprises 115 species and subspecies, which are presented in short sections with their most important characteristics, distribution maps, flight times, habitat requirements, occurrence and endangerment status. For identification, preference is given to comparing morphological characteristics, including genitalia, which are constant over the entire life span. Thus, the key can be used in the field, in the collection and for the assessment of photographs. The number of illustrations has again been significantly increased for the 6th edition, most of the over 700 illustrations are drawn from live photographs. Also new are many illustrations showing the dragonflies in typical postures and life situations, as well as a scaled overview of the genera." (Authors)] Address: Deutscher Jugendbund für Naturbeobachtung, Geiststr. 2, 37073 Göttingen

19554. Li, K.-Q.; Wang, Y.-Z.; Dong, D.-Z.; Zhang, L.-K. (2015): Catalog of insect type specimens preserved at the Kunming Institute of Zoology, Chinese Academy of Science with corrections of some specimens. *Dongwuxue Yanjiu / Zoological Research* 36(5): 263-284. ["This article presents a list of insect types preserved in Kunming Natural History Museum of Zoology (KNHMZ). As of March, 2015, 3412

type specimens belonging to 266 species/subspecies of 37 families in 9 orders (Odonata, Isoptera, Mantodea, Orthoptera, Hemiptera, Coleoptera, Diptera, Hymenoptera and Lepidoptera) are included. Information corrections of some specimens are provided in this article." (Authors) (1) *Bayadera nephelopennis* Davies et Yang, 1996 (2) *Bayadera serrata* Davies et Yang, 1996 (3) *Bayadera strigata* Davies et Yang, 1996 (4) *Schmidtphaea yunnanensis* Davies et Yang, 1996 (5) *Anisogomphus nitidus* Yang et Davies, 1993 (6) *Anisogomphus resortus* Yang et Davies, 1996 (7) *Davidius davidi yunnanensis* Yang et Davies, 1996 (8) *Lamelligomphus laetus* Yang et Davies, 1993 (9) *Merogomphus chaoi* Yang et Davies, 1993 (10) *Stylogomphus lawrenceae* Yang et Davies, 1996.] Address: Zhang, L.-K. , Kunming Natural History Museum of Zoology, Kunming Institute of Zoology, Chinese Academy of Sciences. Kunming Yunnan 650223, China. E-mail: lkzhang@mail.kiz.ac.cn

19555. Lin, Y.-q. (2015): Design of new vortex-based flow chips to capture particles. Department of Mechanical and Electrical and Mechanical Engineering Master Program Thesis Tamkang University; 2015 (2015/01/01), P1 - 78: (in English) ["This work presents the design of a new flow chip to capture particles. A dragonfly wing blocks along the centerline of a microchannel to generate multiple vortex in the corrugated grooves streamwisely. These multiple vortex in the dragonfly wing are used to capture more particles. Different from the conventional vortex-based flow chips with rectangular grooves along the both sides channel wall, the dragonfly wing grooves here in is designed to capture central -part particles novelly. The chord length of the dragonfly wing is 806 μm and thickness ratio is 7.5 %. Through the CFD simulation result (by COMSOL or FEMLAB), the inlet velocity of 0.52m/s can induce obvious vortex pattern in the corrugated dragonfly wing inserted in a microchannel of 200 μm wide. The inclined angle of 50° at the channel entrance can provide enough initial vorticity strength beneficial to the particle capture rate of 4% per dragonfly wing structure. This work also tried two dragonfly structure cascadedly connected together. When the thickness ratio of the dragonfly wing double, the cascaded two-wing case can increase the capture ratio up to 6%. These simulation message reveals the usefulness of increasing the particle capture ratio of flow array design. It's also good for the integration and application in tumor cell capture, sorting and separation in the future.] Address: not stated

19556. Maples, M.J. (2015): An investigation of the effect of malathion on adaptive plasticity of *Pseudacris sierra*. MSc thesis, Faculty of California Polytechnic State University, San Luis Obispo: XI + 56 pp. (in English) ["This thesis is composed of two chapters. Chapter one reviews what is known about adaptive plasticity in response to predators, describes the physiological systems involved in such plasticity, and outlines the evolutionary consequences of adaptive plasticity. Chapter two describes a scientific experiment that investigates how malathion may impact adaptive plasticity in the Sierran Treefrog, *Pseudacris sierra*. Anuran tadpoles suffer high mortality rates due to predation. In response to strong selective forces relating to these high predation rates, tadpoles evolved the ability to adaptively respond to predators through morphological and behavioral plasticity. The morphological and behavioral responses are varied and depend on the hunting strategy of the predator, and the adaptive responses may be influenced by other biotic and abiotic factors. Tadpoles detect alarm cues released from tadpoles being eaten and kairomones that are released by predators. Tadpoles respond to these signals by

changing tail and body shape along with a reduction of activity level, which enables tadpoles to escape predators more effectively. These changes in morphology can occur within a week, and behavioral changes can occur within 15 minutes. The adaptive responses are critical for increasing survival rates of tadpoles to metamorphosis and may have important evolutionary consequences for anurans. Amphibians are in decline worldwide, and pollutants are considered to be a major contributor to these declines. Every year 5.2 billion pounds of active ingredients of pesticides are applied worldwide, and these application rates have led to ubiquitous low-level contamination of aquatic ecosystems. How low-level contamination of pesticides directly and indirectly affect how tadpoles respond to their predators is poorly understood. One potential indirect effect of pesticides is the inhibition of adaptive plasticity. Pesticides have been shown to modulate corticosterone levels in tadpoles. Corticosterone is the most likely mediator of the physiological response that results in adaptive morphological change. If the physiological system of tadpoles relies on corticosterone as the mediator of adaptive response, and pesticides can modulate corticosterone levels, then pesticides may inhibit or negatively impact adaptive responses to important biotic factors, like predators. Pesticides have been shown to weaken immune systems, affect developmental and physiological pathways that lead to malformations, and cause direct mortality in anurans. Little research has investigated the effect of pesticides on adaptive morphological and behavioral plasticity in response to predators. Adaptive phenotypic responses to predators increase survival rates to metamorphosis and are important in stabilizing amphibian populations through time. If pesticides influence the ecological interactions of tadpoles and their predators, this could play a part in amphibian declines. In the experiment explained in Chapter two, I tested the hypothesis that malathion at a concentration of 0.1 mg/L inhibits anti-predator morphological and behavioral responses of *Pseudacris sierra* to the predatory dragonfly larvae *Anax junius*. The results of this experiment show that malathion alone caused the tail muscle depth to increase to the same magnitude as tadpoles that only experienced a predator's presence. Malathion also caused a significant increase in tail depth, demonstrating that malathion directly causes morphological change. The experiment did not support the hypothesis that malathion inhibits adaptive plasticity, and malathion had no impact on behavioral plasticity. The results from this experiment give evidence that an ecologically relevant concentration of malathion can influence morphological components that are critical in escaping depredation events, which could affect predator-prey interactions." (Author)] Address: not stated

19557. Mischiati, M.; Lin, H.-T.; Herold, P.; Imler, E.; Olberg, R.; Leonardo, A. (2015): Internal models direct dragonfly interception steering. *Nature* 517: 333-338. (in English) ["Sensorimotor control in vertebrates relies on internal models. When extending an arm to reach for an object, the brain uses predictive models of both limb dynamics and target properties. Whether invertebrates use such models remains unclear. Here we examine to what extent prey interception by dragonflies (*Plathemis lydia*), a behaviour analogous to targeted reaching, requires internal models. By simultaneously tracking the position and orientation of a dragonfly's head and body during flight, we provide evidence that interception steering is driven by forward and inverse models of dragonfly body dynamics and by models of prey motion. Predictive rotations of the dragonfly's head continuously track the prey's angular position. The head-body angles established by prey tracking appear to guide systematic rotations of the

dragonfly's body to align it with the prey's flight path. Model-driven control thus underlies the bulk of interception steering manoeuvres, while vision is used for reactions to unexpected prey movements. These findings illuminate the computational sophistication with which insects construct behaviour." (Authors)] Address: Mischiati, M., Janelia Research Campus, Howard Hughes Medical Institute; 19700 Helix Drive, Ashburn, Virginia 20147, USA.

19558. Murugan, K.; Sanoopa, C.P.; Madhiyazhagan, P.; Dinesh, D.; Subramaniam, J.; Panneerselvam, C.; Roni, M.; Suresh, U.; Nicoletti, M.; Alarfaj, A.A.; Munusamy, M.A.; Higuachi, A.; Kumar, S.; Perumalsamy, H.; Ahn, Y.-A.; Benelli, G. (2015): Rapid biosynthesis of silver nanoparticles using *Crotalaria verrucosa* leaves against the dengue vector *Aedes aegypti*: what happens around? An analysis of dragonfly predatory behaviour after exposure at ultra-low doses. *Natural Product Research: Formerly Natural Product Letters* 30(7): 826-833. (in English) ["*Aedes aegypti* is a primary vector of dengue, a mosquito-borne viral disease infecting 50–100 million people every year. Here, we biosynthesised mosquitocidal silver nanoparticles (AgNP) using the aqueous leaf extract of *Crotalaria verrucosa*. The green synthesis of AgNP was studied by UV–vis spectroscopy, SEM, EDX and FTIR. *C. verrucosa*-synthesised AgNPs were toxic against *A. aegypti* larvae and pupae. LC50 of AgNP ranged from 3.496 ppm (I instar larvae) to 17.700 ppm (pupae). Furthermore, we evaluated the predatory efficiency of dragonfly nymphs, *Brachydiplax sibirina*, against II and III instar larvae of *A. aegypti* in an aquatic environment contaminated with ultra-low doses of AgNP. Under standard laboratory conditions, predation after 24 h was 87.5% (II) and 54.7% (III). In an AgNP-contaminated environment, predation was 91 and 75.5%, respectively. Overall, *C. verrucosa*-synthesised AgNP could be employed at ultra-low doses to reduce larval population of dengue vectors enhancing predation rates of dragonfly nymphs." (Authors)] Address: Murugan, K., Division of Entomol., Dept of Zoology, School of Life Sciences, Bharathiar University, Coimbatore, India

19559. Muzón, J.; Lozano, F.; del Palacio, A.; Ramos, L.S.; Lutz, A. (2015): Odonata from the Lower Delta of the Paraná River, Argentina. *Agrion* 20(2): 68-72. (in English) ["During the past 20 years several field trips to Lower Delta of the Paraná River (DP) has increased the species inventory for this area to 43; the Libellulidae family with most new records. The biogeographical relationship of DP with Humid Chaco and Paranaense Forest is validated with these additions. In fact, except for six species, *Andinagrion saliceti*, *Cyanallagma bonariense*, *Staurophebia bosqui*, *Phyllocycla vesta*, *Erythrodiplax corallina* and *Erythrodiplax cf pallida*, the remaining 37 (90%) species have also been recorded from Paranaense Forest. Out of 25 genera recorded from DP (36%) *Telebasis*, *Peristicta*, *Staurophebia*, *Triacanthagyna*, *Aphylla*, *Progomphus*, *Diastatops*, *Nepheloptia*, and *Oligoclada* have not been recorded from the Pampas. There are several species that have not been recorded since Ris and Navás' papers, some probably due to chance (e.g., *Phyllocycla argentina*, *Erythrodiplax corallina*, and *Orthemis cultriformis*) or misidentifications (e.g. *Tauriphila argo*). *Andinagrion saliceti*, is a rare species known from very few records mainly from the Pampas eco-region; it was originally described by Ris from San Isidro, an area closely related to DP, but it has not been collected or seen in DP since Ris' description." (Authors)] Address: Muzón, J., Laboratorio de Biodiversidad y Genética Ambiental, Depto. Ciencias Ambientales, UNDAV, Mario Bravo 1460 esq. Isleta, Piñeyro, Buenos Aires, Argentina. E-mail: jmuzon@gmail.com

19560. Nitzany, E. (2015): Local motion signals - Prevalence, responses and interactions. Ph.D. thesis of Computational Biology, Cornell University: XI + 125 pp. (in English) ["Extraction of local motion signals is crucial for our survival. Lack of information from local motion signals will significantly reduce our ability to discriminate objects from background, avoid obstacles, and navigate. Despite the apparent effortlessness with which we perceive visual motion, there are indications that the underlying neural computations are complex. Three kinds of local motion signals have been distinguished, based on the kinds of spatiotemporal correlations that generate them: Fourier (F), based on 2-point correlations [1]; non-Fourier (NF), based on 4-point correlations [2]; and glider (G), based on 3-point correlations [3]. G signals have two subtypes, expansion and contraction, associated with objects that are looming and receding, respectively. Detection of isolated G and NF signals cannot be mediated by a purely multiplicative cross-correlator or a purely quadratic motion energy model. G signals have recently attracted substantial attention, following the demonstration that a wide range of species (human [3], macaque [4, 5], zebrafish [6], dragonfly [5], and fruitfly [7]) respond to them in similar ways suggesting that there are advantages to using these signals in visual tasks. This work expands the above lines of research in several respects. First, our computational work shows that these motion signals appear in natural scenes and characterizes the basic statistical relationships between them [8]. Second, we report neurophysiological recordings in two distinct visual-specialist species (macaques and dragonflies) that demonstrate that at the neuronal level, cells response in a similar manner to motion signals in many respects, although there are subtle differences in responses between the species. This convergence at the algorithmic and neural-implementation levels indicate the fundamental biological importance of using the many kinds of motion signals to guide behaviour. Finally, we carried out a psychophysical experiment to probe human ability to use multiple kinds of local motion signals simultaneously to solve simple directional task. We found that humans can combine different kinds of motion signals to solve this task, and, interestingly, that sensitivity to different kinds of motion signals is context-dependent." (Author)] Address: Nitzany, E., Department of Computational Biology and Statistics, Cornell University, Ithaca, NY, USA

19561. Noskovic, J.; Rakovská, A.; Porhajasová, J.; Babosová, M.; Ceryová, T. (2015): Assessment of impact of agroecosystems on macrozoobenthos communities of important protected areas in southwestern part of the Slovak Republic. *Research Journal of Agricultural Science* 47(1): 111-119. (in English) ["Macrozoobenthos as an important component of all aquatic habitats is very diverse community of aquatic invertebrates, which are either throughout its life, or during the developmental stages bound to the water. Representatives of this community are extremely sensitive to environmental conditions in which they live, but especially to the qualitative properties of water. They are suitable bio-indicators of any characteristics changes of their habitat. Therefore, permanent occurrence, but, for the majority of the representatives of the benthic fauna, relatively long development cycle conducted in water, can significantly influence not only natural factors, but also human activities. In this work we present results of the occurrence of macrozoobenthos communities in two nature reserves in southwestern part of the Slovak Republic: Žitavský luh and Alluvium Žitavy, while also evaluate the potential impacts of agricultural activities on the species and numerous representations in the monitored habitats. In 2006 and 2007, we are

on each monitored aquatic habitats, in six sampling sites at regular quarterly intervals collected total of 48 water samples, together with biological material. In Nature Reserve Žitavský luh we recorded in 24 taken samples 25, 966 individuals, determinate to be 135 species of benthic fauna. In Nature Reserve Alluvium Žitavy by collecting of 24 samples of water we obtained only 12, 708 individuals, 126 species of this ecological group of individuals. Determined species were included in the 15 systematic groups: Turbellaria, Gastropoda, Bivalvia, Oligochaeta, Hirudinea, Isopoda, Amphipoda, Ephemeroptera, Odonata, Heteroptera, Megaloptera, Coleoptera, Trichoptera, Diptera (without Chironomidae) and Chironomidae. Of these, the numerically and percentage the most involved on the structure of macrozoobenthos community Gastropoda, Isopoda, Ephemeroptera and individuals of families Chironomidae. The contrary, the lowest share in numerous, species and percentage representation had Megaloptera, Turbellaria and Odonata. From the total number of 177 determined species of benthic fauna in the territory of Slovakia is 23 species protected by law under the legislation of the State Nature and Landscape Conservation, included primarily to the species categories: VU - vulnerable and LR: nt - near threatened. In the monitored period were structure and biodiversity of macrozoobenthos communities of Nature Reserve Žitavský luh compared with structure and biodiversity of Nature Reserve Alluvium Žitavy richer and more balanced. Significant negative impact of agriculture on the macrozoobenthos community in that period in monitored aquatic habitats was not recorded." (Authors)] Address: Noskovic, J., Dept Environmental Science & Zool., Fac. Agrobiolgy & Food Resources, Slovak Univ. Agriculture in Nitra, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic. Email: Jaroslav.Noskovic@uniag.sk

19562. Prunier, F.; Brotóns, M.; Cabana, M.; Campos, F.; Casanueva, P.; Chelmick, D.; Cordero Rivera, A.; Díaz Martínez, C.; Evangelio, J.M.; Gainzarain, J.A.; García-Moreno, J.; Lockwood, M.; Mañani, L.J.; Mezquita-Aramburu, I.; Muddeman, J.; Ocharan, F.J.; Pérez, F.O.; Prieto-Lillo, E.; Requena, C.; Ripoll, J.; Luque, F.R.; Rodríguez, P.; Romeo, A.; Salcedo, J.; Vilariño, V.S.; Sánchez Balibrea, J.; Gómez, R.T.; Torralba-Burrial, A.; Tovar, C.; Winter, P.; Zaldívar, R. (2015): Actualización del inventario provincial de Odonatos de España peninsular e Islas Baleares. Boletín Rola nº 6, segundo semestre 2015: 59-84. (in Spanish, with English summary) ["Checklists of dragonflies for each Spanish province (mainland and Balearics Islands) are updated through the revision of literature, the query of online biodiversity databases and inquiries to local specialists. The maps are based on the distribution information in an estimated 140.000 records gathered for 79 species." (Authors)] Address: E-mail: aeaebosqueanimado.info@gmail.com

19563. Rahaman, M.M.; Islam, K.S.; Jahan, M.; Mamun, M.A.A. (2015): Relative abundance of stem borer species and natural enemies in rice ecosystem at Madhupur, Tangail, Bangladesh. J. Bangladesh Agril. Univ. 12(2): 267-272. (in English) ["The relative abundance of different stem borer species and their natural enemies with interaction effects were studied at three growth stages of irrigated Boro rice at Madhupur under the district of Tangail, Bangladesh during January to April, 2013. Five stem borer species viz; Yellow stem borer (*Scirpophaga incertulas*), Pink stem borer (*Sesamia inferens*), Dark headed stem borer (*Chilo polychrysus*), Stripped stem borer (*C. suppressalis*), White stem borer (*Scirpophaga innotata*), and nine different natural enemies were collected from the rice fields and recorded. The population of stem borers and natural enemies was highest

in tillering stage and lowest in seedling stage. The relative abundance of stem borer species under investigation showed ranking order; yellow stem borer >dark headed stem borer>pink borer>white borer>stripped stem borer and natural enemies as ladybird beetle >long jawed spider>wolf spider>damsselfly>carabid beetle>green mirid bug>lynx spider>dragon fly>ear wig. Populations of all five stem borers were positively correlated with ladybird beetle, wolf spider, long jawed spider, lynx spider, damsel fly, dragon fly, green mirid bug and negatively correlated with carabid beetle and earwig." (Authors)] Address: Rahaman, M. M., Department of Entomology, Bangladesh Agricultural Univ., Mymensingh-2202, Bangladesh. E-mail address: m_rahaman06@yahoo.com

19564. Rezende, R.; Marques Leite, G.F.; De-Lima, A.K.S.; Filho, L.A.; Costa Chaves, C.V.; Holler Prette, A.C.; Spriger Freitas, J.; Gonçalves Júnior, J.F. (2015): Effects of density and predation risk on leaf litter processing by *Phylloicus* sp.. Austral Ecology 40(6): 693-700. (in English) ["The allochthonous detritus that accumulates in the substrate of streams is used by aquatic invertebrate shredders for shelter and food. Shredders are considered rare in tropical systems, and little information is available about the role of density effects and predation risk (associated with the perception of predators by prey) in relationship to the resources used by these organisms. The aim of this study was to examine experimentally the effects of increased predation risk and of the density of *Phylloicus* sp. [Trichoptera] (i.e. of two types of biological relationships) on the processing of the leaf litter of *Nectandra megapotamica* (Spreng.) Mez. *Phylloicus* sp. can use leaf litter for case building and as a food resource. The density effect was measured using four treatments that differed only in the number of individuals (one, two, three or four). A second experiment with five treatments was performed to test the risk of non-lethal predation on detritus consumption (shelter and food) by *Phylloicus* sp. (T1: Caddisfly; T2: Mayfly; T3: *Asytanax* sp./fish; T4: Damselflies; T5: Stonefly). A single *Phylloicus* and one other organism (a potential predator blocked with 0.5?mm fine mesh) were placed in each tank (0.002?m3 volume). We observed a negative effect of density on per capita litter consumption (experiment 1). The low density of *Phylloicus* may be a natural factor that decreases intraspecific competition. In the presence of fish, *Phylloicus* showed the lowest amount of litter processing observed in the experiment, indicating top-down control (experiment 2). In treatments that involved the presence of invertebrates (non-predatory and predatory), *Phylloicus* showed the highest amount and an intermediate amount of leaf litter processing, respectively (experiment 2). This observation also suggests that the predation effect is more probable for specific predator-prey pairs. Population density and predation risk in *Phylloicus* may be important factors controlling leaf litter processing." (Authors)] Address: De-Lima, A.K.S., Depto de Ecologia, Instituto de Biologia, Universidade de Brasília, 70910-900 Brasília, Brazil. Email: renanrezende30@gmail.com

19565. Rizal, S.; Hadi, M. (2015): Inventarisasi Jenis Cacing (Odonata) Pada Areal Persawahan Di Desa Pundenarum Kecamatan Karangawen Kabupaten Demak. Bioma 17(1): 16-20. (in Indonesian, with English summary) ["Paddy fields is one of the important ecosystem that support human life because here produced rice that is the main food to the human. Besides, paddy field ecosystem also have many diversity of insect, including dragonfly (Odonata). Odonata is one of the insect that used to be a predators to the pests in the paddy fields, such as *Chilo* sp and

Nilaparvata lugen. The study on dragonfly was conducted in Pundenarum village, Karangawen, Demak. The objectives of this study is to identify the odonata specieses that lived in paddy field. Inventory of Odonata species done with field by field method and direct catch using insect net. The result of this study is that 5 species of Odonata were identified in paddy field, i.e: Orthetrum sabina, Crocothemis servillia, Pantala flavescens, Agriocnemis femina and A. pygmea. The Odonata species that identified is part of 2 family, i.e: Libellulidae and Coenagrionidae. It is also found that all species is part of the suborder Anisoptera and Zygoptera." (Author)] Address: Rizal, S., Jurusan Biologi Universitas Diponegoro, Jl. Prof. Soedarto, SH, Kampus Tembalang, Semarang 50275, Indonesia. E-mail: rizalz1092@gmail.com

19566. Robin, J. (2015): Les libellules du Tarn-et-Garonne. Synthèse fin 2014. Bulletin de la Société des sciences naturelles de Tarn-et-Garonne N° Spécial 2: 146 pp. (in French) ["For a long time, the Tarn-et-Garonne was a department [France] that was little surveyed by odonatologists. Since 2005, several local naturalists have launched various inventory campaigns. They culminated in 2007 with the preliminary atlas of the odonates of Tarn-et-Garonne. This work had the advantage of presenting a departmental distribution of these insects for the first time and updating the list of known species in the department. This new summary is based on a larger number of observations and bibliographical sources, presents the location of the species more precisely and provides new information on the habitats used by these insects in our department. It allows us to conclude that 51 species are currently reproducing on a permanent basis, 2 are occasional migrants and at least 5 species need to be confirmed (doubtful indigenous species and/or old citations). Two taxa could still be discovered in our department. However, many surveys still need to be encouraged to ensure homogeneous coverage of the whole of our territory and to establish a more precise conservation status for each species." (Authors/DeepL)] Address: Robin, J., 3 Bis rue de la ville, 31620 Fronton. France. E-mail: robin-jerome@voila.fr

19567. Sokolov, L.V.; Shapowal, A.P. (2015): [Ornithological studies in the Curonian Spit]. In: Alekseev F.E., Sokolov L.V., Shapowal A.P., Kalina A.A., Poltavskaya L.G., Shiplovskaya Ju.A., Rilkov O.V., Bulgakov D.B., Sokolov A.A., Napreenko M.G. Nature of the Kaliningrad District. Key natural complexes. Istok, Kaliningrad: 110-125. (in Russian) ["Even more massive movements on the Curonian Spit are observed in dragonflies. The results of their capture by stationary traps are presented in the table. More than 225 thousand 52 species of dragonflies were caught during 2007-2013. Small dragonfly species that are poor flyers (Families Calopterygidae, Lestidae, Coenagrionidae) are caught relatively rarely (singly or up to a dozen individuals). Relatively large dragonflies (Aeshnidae (Aeshna grandis, A.junceae, A.mixta, A.viridis) and medium-sized ones (Libellulidae family). Libellulidae (genera Leucorrhinia, Sympetrum). One of the most common species on the Curonian Spit (as well as on the vast territory of Europe and Northern Asia) is the four-spotted dragonfly (Libellula quadrimaculata). It is caught every year in the thousands, and sometimes even tens of thousands. An unprecedented migration of this species on the spit took place in 2013 (over 75 thousand were caught during the season) and especially on 29 May (over 32 thousand dragonflies were caught)."] (Autors/DeepL)] Address: not stated

19568. Sonawane, A.; Khandagale, A. (2015): Taxonomy

and diversity of damselflies (Zygoptera) from Daund Tehshil Pune District (Maharashtra: India). Journal of Basic Sciences, 2015, Special Issue on BiolPPF: 1-9. (in English) ["The present study describes occurrence of damselfly species from Daund Taluka of Pune district from two lentic (stagnant water) and two lotic (flowing water) ecosystems. Survey was carried out from year 2012 to 2014. Collection was done in summer, winter and monsoon seasons. Insects were collected using insect collection net and given acetone treatment for prior preservation. Few specimens were sent to Zoological Survey of India (ZSI) at Kolkata & Pune (A-kurdi-44) for identification. All four sites displayed a good diversity and revealed some bio-geographically, important species. In overall studies 10 species of Damselflies belonging to 5 genera representing Family: Coenagrionidae were found in the study area. This family which showed higher occurrence of Pseudagrion decorum (Rambur, 1842), Ischnura senegalensis (Rambur, 1842) followed by Ceriagrion coromandelianum which again showed their finding in the large amount. In Daund Taluka Pseudagrion hypermelas Sely, 1876 which showed new occurrence newly occurred species with rare amount. Overall work based on the diversity based study." (Authors)] Address: Sonawane, A., Shri J.J.T. University, Rajasthan and Dept of Zoology, Subhash Baburao Kul Science College, Kedgaon-412003 (M.S.) India. E-mail: amolsonawane7139@gmail.com]

19569. Sonawane, A.; Khandagale, A. (2015): Taxonomy and diversity of Ceriagrion coromandelianum (Fabricius, 1798) (Zygoptera) of Pune district (Maharashtra: India). Journal of Basic Sciences, 2015, Special Issue on BiolPPF: 102-106. (in English) [Abdomen of males (n=12): length 28.5-30 mm and 29.5- 32 mm in females (n=8).] Address: Sonawane, A., Shri J.J.T. University, Rajasthan and Dept of Zoology, Subhash Baburao Kul Science College, Kedgaon-412003 (M.S.) India. E-mail: amolsonawane7139@gmail.com

19570. Swan, T.S. (2015): Distribution, occurrence, and identification of mosquito species in the Tongatapu Island Group, Kingdom of Tonga. MSc. thesis, Water Resource Management, University of Canterbury: 129 pp. (in English) ["Mosquitoes pose a serious threat to the economy, health status, and biosecurity of countries around the world. Mosquitoes kill an average of 700,000 people per year. The global expansion of air, sea, and land transport networks has greatly enhanced the spread of mosquitoes internationally. In the Pacific, the number of mosquito-borne diseases occurring has been on the rise in recent years, possibly as a result of human-mediated dispersal of larvae and adult mosquitoes. The Kingdom of Tonga has had numerous outbreaks of dengue fever and chikungunya virus in recent years. Previous research has catalogued species occurrences and distributions throughout Tonga. However, it is unknown whether new species have arrived in Tonga, and if distribution of previously found species has changed since the last comprehensive survey in 2006. Present research aims to update the literature by conducting a mosquito survey at 84 sites across the four islands of Tongatapu, Pangaimotu, 'Oneata, and 'Eua to record the distribution and occurrence of mosquito larvae. Nine mosquito species were collected: Aedes aegypti Linnaeus, A. albopictus Skuse, A. tongae Edwards, A. horrescens Edwards, A. vexans nocturnus Theobald, Culex annulirostris Skuse, C. albiverticillatus Edwards, C. quinquefasciatus Say and C. sitiens Wiedemann. The collection of A. albopictus is the second time that this species has been recorded in Tonga. Moreover, the spatial extent of this species throughout Tonga was

far greater than previously recorded. A major outcome of this survey has been the creation of an identification key for the mosquito larvae species of Tonga. This key should increase the accuracy of positive mosquito larvae identifications in Tonga. Mosquitoes were more frequently collected in artificial (e.g., used car tyres, fuel drums, containers) than natural (e.g., pools, ponds, tree holes) habitats. Car tyres, water containers, fuel drums, fridges, washing machines, and ponds were the most common habitats in which mosquito larvae were found. *Aedes aegypti*, *A. albopictus*, and *C. quinquefasciatus* were the three most common mosquito species collected, whereas *A. tongae*, *A. horrescens*, *A. vexans nocturnus*, *C. annulirostris*, *C. sitiens*, and *C. albinervis* were less frequently found. Multiple logistic regression analyses indicated that habitat volume had a significant positive effect on the presence of *A. albopictus* and *A. tongae*, whereas conductivity had a significant positive effect on the presence of *C. annulirostris*. Additionally, the volume by temperature interaction was a significant predictor of species presence for *A. aegypti*, *A. albopictus*, and *C. annulirostris* (as habitat volume increases, the effect of temperature went from neutral to negative). This suggests that larger, cooler habitats favour colonisation by these species. The number of artificial habitats (particularly used car tyres) present may have significantly increased since previous studies. Management should therefore focus on implementing community-run mosquito projects aimed at reducing the number of artificial habitats capable of being colonised by mosquito larvae. Covering, tipping out water, and infilling these habitats with soil to prevent mosquito oviposition is a pragmatic and straightforward mosquito control solution. This should immensely reduce the abundance of mosquitoes and help prevent disease outbreak in Tonga." (Author) The study includes references to Odonata.] Address: Swan, T.S., School Biol. Sciences & Waterways Centre for Freshwater Management, Univ. of Canterbury, Christchurch, New Zealand

19571. Vieira, V.; Cordero-Rivera, A. (2015): *As Libélulas dos Açores e Madeira*. Edição: Amigos dos Açores - Associação Ecológica: 122 pp. (in Spanish) [This book "Is a contribution to the knowledge of biodiversity of the Azores and Madeira, aimed at the general public, and focusing on the Odonata of the islands. The book provides comprehensive information, in an accessible but scientifically rigorous language, trying to be useful for a large audience, including amateur and professional odonatologists, but also any person with an interest on nature. The information provided includes the relationship between dragonflies and the freshwater ecosystems of the Azores and Madeira (lakes, ponds and rivers), and highlights the relevance of odonates for human society, as agents of biological control of insect pests, and its role in conservation biology and evolution. The damselfly *Ischnura hastata* is presented as a gemstone of the Azorean islands, because it is the only case known of parthenogenesis in the order Odonata. The book is richly illustrated with pictures and describes the different stages of development of dragonflies, and includes data about their habitat, their occurrence in the islands and geographic distribution. The authors transmit their enthusiasm for dragonflies, looking to attract young readers to the fascinating world of biodiversity and natural history of the two Atlantic archipelagos." (Publisher) *Ischnura hastata*, *I. pumilio*, *Anax ephippiger*, *A. imperator*, *A. parthenope*, *Sympetrum fonscolombii*, *Sympetrum nigrifemur*] Address: Cordero Rivera, A., Depto de Ecología e Biología Animal, Univ. de Vigo, E.U.E.T. Forestal, Campus Universitario, 36005 Pontevedra, Spain. E-mail: acordero@uvigo.es

19572. Wagner, H.C.; Komposch, C.; Volkmer, J.; Degasper, G.; Frei, B.; Korn, R.; Wiesmair, B.; Kerschbaumsteiner, H.; Kunz, G.; Schwab, J.; Aurenhammer, S.; Platz, A.; Pfeifer, J.; Arthofer, P.; Urach, K.; Lanzer, M.; Morchner, D.; Pass, T.; Holzer, E. (2015): Bericht über das erste ÖEG-Insektencamp: Faunistische Erfassungen im Lafnitztal (Oststeiermark, Südburgenland). *Entomologica Austriaca* 22: 185-233. (in German, with English summary) ["Report on the first insect camp of the ÖEG in the Lafnitz valley (Eastern Styria, Southern Burgenland): In order to counteract the loss of taxonomists and people with species-specific knowledge of the native invertebrate fauna, an "insect camp" was held by the Entomological Society of Austria from 21.-27.07.2014. All in all, 40 people with sincere interest(s) in nature and zoology took part. Nine recognized experts specializing on different groups of arthropods gave talks and guided the participants through 16 research areas. Taxonomic determination of the collected material was mostly done by the participants and experts during the event. A total of 472 species was identified and is presented here: 5 Ephemeroptera, 14 Odonata (including *Ophiogomphus cecilia*), 34 Auchenorrhyncha, 39 Heteroptera, 1 Mantodea, 22 Orthoptera, 148 Coleoptera, 100 Lepidoptera, 1 Diptera, 34 Hymenoptera, 1 Isopoda, 45 Araneae, 10 Opiliones, 1 Bivalvia and 17 Gastropoda species." (Authors)] Address: Wagner, C., Ökoteam – Institut für Tierökologie und Naturraumplanung, Bergmannsgasse 22, 8010 Graz, Austria. E-Mail: heriwagner@yahoo.de

19573. Zeyghami, S.; Dong, H. (2015): Study of turning takeoff maneuver in free-flying dragonflies: effect of dynamic coupling. *Fluid Dynamics (physics.flu-dyn)* Cite as: arXiv:1502.06858 [physics.flu-dyn]: (in English) ["Turning takeoff flights of several dragonflies were recorded during which a dragonfly takes off while changing the flight direction at the same time. Center of mass was elevated about 1-2 body lengths. Five of these maneuvers were selected for 3D body surface reconstruction and the body orientation measurement. In oppose to conventional banked turn model, which neglects interactions between the rotational motions, in this study we investigated the strength of the dynamic coupling by dividing pitch, roll and yaw angular accelerations into two contributions: one from aerodynamic torque and one from dynamic coupling effect. The latter term is referred to as Dynamic Coupling Acceleration (DCA). The DCA term can be measured directly from instantaneous rotational velocities of the insect. We found a strong correlation between pitch and yaw velocities at the end of each wingbeat and the time integral of the corresponding DCA term. Generation of pitch, roll and yaw torques requires different aerodynamic mechanisms and is limited due to the other requirements of the flight. Our results suggest that employing DCA term gives the insect capability to perform a variety of maneuvers without fine adjustments in the aerodynamic torque." (Authors)] Address: Dong, H., Mechanical and Aerospace Engineering, University of Virginia, VA, 22902

19574. Zeyghami, S.; Dong, H. (2015): Coupling of the wings and the body dynamics enhances damselfly maneuverability. *Fluid Dynamics arXiv:1502.06835v1 [physics.flu-dyn]* : 10pp. (in English) ["In flapping flight, motion of the wings through the air generates the majority of the force and torque that controls the body motion. On the other hand, it is not clear how much effect the body motion imposes on the wings. We investigated this connection via analyzing fast yaw turns of three different species of damselfly. In this combined experimental and theoretical study, we show that

the dynamics of the wings and the body are coupled together in low frequency flapping flight. As a result, damselflies benefit from a passive mechanism for enhancing the bilateral wing pitch angle asymmetry to sustain the body rotation. A physics-based model derived from this mechanism is proved valid for linking morphology, kinematics and dynamics of the wing and the body of the flying insects in fast turning maneuvers." (Authors)] Address: Zeyghami, S., Mechanical and Aerospace Engineering, University of Virginia, Charlottesville, VA, 22904, USA

19575. Zhao, H.; Meng, Q.; Li, Y. (2015): On diversity of Odonata in the west of Jilin province. *Journal of Beihua University (Natural Science)* 15(6): 821-825. (in Chinese, with English summary) ["The resources of Odonata in the west of Jilin Province were investigated randomly from May 2011 to September 2013. There were 47 species of dragonfly which belong to 9 families and 28 genera among which Gomphidae, Libellulidae, Coenagrionidae and Lestidae were dominant species in west of Jilin. The individuals and species number of Sympetrum were the most abundant in Libellulidae, Trigomphus are the most in Gomphidae Ischnura is the most in Coenagrionidae but the individuals and species number had no significant difference among genera in Lestidae. Diversity index of dragonfly showed an obvious rising trend with temperature rising and richness of nutrition levels in Spring and reached the peak in July and then diversity index decreased. Evenness index wasn't changed greatly the dominant concentration index was appeared in May and had a slight fluctuation later." (Authors)] Address: Zhao, H., College of Forest, Beihua Univ., Jilin 132013 China

19576. Zhao, H.; Meng, Q.; Zhao, H. (2015): Community structure and adult seasonal dynamics of Odonata in western Jilin. *Journal of Northeast Forestry University* 43(1): 107-109-113. (in Chinese, with English summary) ["A successive investigation on the resource of Odonata was conducted in western Jilin. There are 47 species of Odonata in the western region of Jilin, belonging to 9 families and 28 genera. Among them, the levels in the Anisoptera are significantly higher than those in the Zygoptera, the genus number and species number are maximum in Libellulidae, and Gomphidae, Libellulidae, Coenagrionidae and Silk Coenagrionidae are the dominant groups in the region. The evolution of Odonata adult communities in the western region of Jilin changes with the seasons. In May, the number of dragonfly communities increases slowly, significantly from June to July, and both the number of species and the number of individuals show a declining trend from August to September, and the dominant species is different in May to September." (Authors)] Address: Zhao, H., Beihua University, Songjianghe Experimental Primary School, China

19577. Zhou, Z.; Sorensen, S.; Zeng, H.; Hawrylycz, M.; Peng, H. (2015): Adaptive image enhancement for tracing 3D morphologies of neurons and brain vasculatures. *Neuroinformatics* 13: 153-166. (in English) ["It is important to digitally reconstruct the 3D morphology of [dragonfly] neurons and brain vasculatures. A number of previous methods have been proposed to automate the reconstruction process. However, in many cases, noise and low signal contrast with respect to the image background still hamper our ability to use automation methods directly. Here, we propose an adaptive image enhancement method specifically designed to improve the signal-to-noise ratio of several types of individual neurons and brain vasculature images. Our method is based on detecting the salient features of fibrous structures, e.g. the axon and dendrites combined with

adaptive estimation of the optimal context windows where such saliency would be detected. We tested this method for a range of brain image datasets and imaging modalities, including bright-field, confocal and multiphoton fluorescent images of neurons, and magnetic resonance angiograms. Applying our adaptive enhancement to these datasets led to improved accuracy and speed in automated tracing of complicated morphology of neurons and vasculatures. ... Particularly, as shown in Figure 7b, our enhanced image has captured and enhanced both dendrites and axons while other approaches failed. We tested 30 confocal images of dragonfly neurons which have smaller scales and better SNR (Gonzalez-Bellido et al. 2013)" (Authors)] Address: Peng, H., Janelia Farm Research Campus, Howard Hughes Medical Institute, Ashburn, Virginia 20147, USA. E-mail: hanchuanp@alleninstitute.org

2016

19578. Khan, J.; Saifullah; Zia, A. (2016): Biodiversity of dragonflies and their life threatening factors in Tehsil Chamla and Daggar of district Buner, Khyber Pakhtunkhwa, Pakistan. *Pakistan Journal of Zoology* 48(4): 1077-1082. (in English) ["The study was aimed at determining species composition, relative abundance and habitat preference of adult dragonflies in relation to increasing aquatic and air pollution in Tehsils Dagger and Chamla of district Buner, Khyber Pakhtunkhwa. For this, surveys were conducted during May to October, 2013 and eleven species with seven genera were recorded. Among these, three species (*Trithemis festiva*, *Orthetrum prunosum neglectum* and *Trithemis aurora*) were found constant, while three (*Orthetrum anceps*, *Sympetrum commixta* and *Orthetrum triangulare*) were observed to be moderate and two (*Onychogomphus bistrigatus* and *Palpopleura sexmaculata*) were found to be infrequent in their occurrence. Perennial riverine habitats represented four species, seasonal streams with inhabiting three species and springs with only two dwelling species. Only one species was recorded from crop fields and ponds. For seasonal occurrence, 119 dragonflies were observed in July while seven in October. The aquatic and air pollution from huge number (n=600) of marble factories in Daggar and more use of pesticides in Chamla were observed to affect drastically the dragonfly population in the area. Present study therefore emphasizes conservation of Odonata fauna by implanting proper treatment plant for marble and pesticidal wastes." (Authors)] Address: Khan, J., Dept of Zoology, Abdul Wali Khan University, Mardan, Buner Campus, Khyber Pakhtunkhwa, Pakistan

19579. Wan, Y.-q.; Zhang, H.-j. (2016): Summary on the family Platycnemididae study (Odonata Zygoptera) in China. *Journal of Shaanxi University of Technology (Natural Science Edition)* 32(2): 70-74. (in Chinese, with English summary) ["The family of Platycnemididae is a species relatively few in number. The researchers can only rely on identification and classification of the morphological features to conduct relevant studies. This paper has overviewed the research history and domestic research status of Platycnemididae as well as the classification errors or disputes. The paper proposed that *Platycnemis pierrati* Navas, *Copera tokyoensis* Asahina and *Platycnemis foliosa* Navas is the junior synonym of *Copera marginipes* Rambur, *Copera rubripes* Navas and *Platycnemis foliacea* Selys, respectively. The classification of *Coellicia cyanomelas* Ris, *Coellicia didyma* Selys, and *C. sexmaculatus* Wang should be promoted for further study." (Authors)] Address: not stated in English

19580. Zhao, Y.; Wang, D.; Tong, J.; Sun, J. (2016): Nano-mechanical behaviour of the membranous wings of dragonfly *Pantala flavescens* Fabricius. *Journal of Bionic Engineering* 13: 388-396. (in English) [The dragonfly has excellent flying capacity and its wings are typical 2-dimensional composite materials in micro-scale or nano-scale. The nanomechanical behavior of dragonfly membranous wings was investigated with a nanoindenter. It was shown that the maxima of the reduced modulus and nanohardness of the in-vivo and fresh dragonfly wings are about at position of 0.7L, where L is the wing length. It was found that the reduced modulus and nanohardness of radius of the wings of dragonfly are large. The reduced modulus and nanohardness of Costa, Radius and Postal veins of the in-vivo dragonfly wings are larger than those of the fresh ones. The deformation, stress and strain under the uniform load were analyzed with finite element simulation software ANSYS. The deformation is little and the distribution trend of the strain is probably in agreement with that of the stress. It is shown that the main veins have better stabilities and load-bearing capacities. The understanding of dragonfly wings' nanomechanical properties would provide some references for improving some properties of 2-dimensional composite materials through the biomimetic designs. The realization of nanomechanical properties of dragonfly wings will provide inspirations for designing some new structures and materials of mechanical parts." (Authors)] Address: Zhao, Y., The College of Mechanical and Power Engineering, Henan Polytechnic University, Jiaozuo 454000, China

19581. Zia, A. (2016): Zygoptera in Himalayan Foot Hills of Pakistan. IDF-Report 96: 1-60. (in English) ["In 2014, 56 localities in four provinces of Lesser Himalaya in Pakistan were studied. A total of 28 species have been recorded. A female of the data deficient, threatened species *Coelliccia vacca* was recorded from Charhaan. The record of *Drepanosticta carmichaeli* is a new addition to the list of Odonata of Pakistan, and expand the range of this species further to the west. The taxonomical status of *Ischnura aurora aurora* – considered common in Pakistan, following baseline literature of Fraser (1933) – now turns out to be *Ischnura aurora rubilio*." (Author)] Address: Zia, A., National Insect Museum, National Agriculture Research Centre, Islamabad – Pakistan. Email: saiyedahmed@gmail.com

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19582. Fischer, I.; Chavanec, A. (2017): Bewertung des Erhaltungszustandes der Großen Quelljungfer, *Cordulegaster heros* (Theischinger, 1979), im Natura-2000-Gebiet Lainzer Tiergarten. Land Wien: 23 pp. (in German) ["In 2017, 15 sites at six streams in the Natura 2000 site Lainzer Tiergarten were surveyed as part of the project: "The dragonfly fauna of Vienna: surveys and recording using DNA barcoding". *C. heros* was found at four of six streams and a total of eight of 15 sites. This means that it occurred in 53% of the water-course sections investigated. At six of these sites it was assessed as "probably" or "possibly" native. For the assessment of the conservation status of *C. heros*, in accordance with the requirements of the Habitats Directive according to the criteria "population status", "habitat quality" and "impairments", the assessment scheme developed by ÖKOTEAM (2016a) was modified and adapted. Based on the data, the conservation status of *C. heros* in the Lainzer Tiergarten was assessed as "B" and thus favourable." (Authors/ DeepL)] Address: Fischer, Iris, Naturhistorisches Museum Wien, Zentrale Forschungslaboratorien, Burgring 7, 1010 Wien, Austria. Email: iris.fischer@nhm-wien.ac.at

19583. Naraoka, H. (2017): Diurnal activity and reproductive behavior of *Platycnemis echigoana* Asahina, 1955 in Aomori prefecture (Odonata: Platycnemididae). *Tombo* 59: 85-95. (in Japanese, with English summary) ["Diurnal activity and reproductive behavior of a Japanese endemic damselfly, *Platycnemis echigoana* was observed at Rokkasho Village in Aomori Prefecture, Japan during 2011-2016, and was compared with the populations of central Honshu. The adult season of the Rokkasho population was from June to August. Adult were active in sunny areas on weeds of a forest floor during 8:00-18:00 h and most individuals rested on a tree at night. But, some individual spent the night on the forest floor. Mate searching flights were long (mean: 16.7s) by males that flew about in a wave-like pattern over weeds and shrubs, seen from 8:00-16:00 h with a peak from 9:00-12:00 h. On the other hand, the flights for feeding and shift were short (mean: 2.5s and 3.6s, respectively) and were seen all day. Copulation was seen from 8:00-15:00 and divided into three stages (Miller & Miller, 1981; mean duration I: 39m33s, II: 1m33s, III: 10s). Oviposition occurred from ca. 9:00-16:00 at pools, small ponds and water courses. Eggs were laid into the tissue of plant on and in the water. The adult season and most reproductive behavior of the Rokkasho population were almost the same as that of central Honshu. But, the long duration of mate searching flight by males and the resting on the forest floor at night were behavior that was seen in the Rokkasho population only." (Authors)] Address: Naraoka, H., 36-22, Motoizumi, Fukunoda, Itayanagi-cho, Kita-gun, Aomori Prefecture, 038-3661, Japan. E-mail: sbnkq127@ybb.ne.jp

19584. Ortega-Salas, H. (2017): Sistemática y distribución del género *Paraphlebia* Sélys in Hagen (Odonata: Thaumatoeuridae) en México y Centroamérica. MSc thesis, Universidad Nacional Autónoma de México: 131 pp. (in Spanish) ["For more than a century the genus *Paraphlebia* has remained one of the least known in Mexico and Central America. The use of wing colouration and the relative position of the RP3 vein have been, until now, the only diagnostic characters available to separate the species of this genus. This paper provides a taxonomic revision of the genus including the redescription of *P. zoe*, *P. hialina*, *P. quinta* and *P. duodecima*; the formal synonymy of *P. abrogatata* with *P. quinta*; as well as the description of 10 new species distributed in Mexico, Guatemala, Honduras and Nicaragua. New diagnostic characters and a dichotomous key for the identification of males of the known species are proposed, maps with the known distributions of all species are presented, and finally, the first phylogenetic hypothesis for the genus is presented based on the 12S, 16S, 28S and CO1 genes, where two clades are differentiated and found to be congruent with the morphology of the fences." (Author/DeepL) Also see: Ortega-Salas, H.; Gonzalez-Soriano, E.; Jocque, M. (2022): Untangling the waterfall damselfly: a review of the Mesoamerican genus *Paraphlebia* Sélys in Hagen, 1861 (Odonata: Thaumatoeuridae) with descriptions of 11 new species. *Zootaxa* 5089(1): 1-66.] Address: Ortega-Salas, H., Departamento de Zoología, Instituto de Biología, UNAM, Apartado Postal 70-153, México. E-mail: hector_os@ciencias.unam.mx

19585. Sakai, M.; Suda, S.; Okeda, T.; Washitani, I. (2017): Identifying priority habitats and monitoring species for conservation and restoration of lentic Odonata habitats: assemblage nestedness on Amami-Oshima Island, Japan. *Ecological Research* 32(5): 693-702. (in English) ["We investigated Odonata faunal and habitat characteristics (fo-

rest cover, emergent, submerged, floating-leaved and floating plant covers, pond area, NO₃⁻, chemical oxygen demand, and presence/absence of a nonnative fish) in 10 ponds on Amami-Oshima Island. In total, 26 species of six odonate families were found, and we detected significant nestedness of species composition among the ponds (22 species in the most species-rich pond, and 8 species in the most species-poor pond). Species found only in the most species-rich ponds were: *Anax nigrofasciatus nigrofasciatus*, *Acisoma p. panorpoides*, *Agriocnemis famina oryzae*, *Rhyothemis severini*, *Anaciaeschna martini*, *Hemicordulia okinawaensis*, *Lyriothemis elegantissima*, and *Hydrobasileus croceus* (hereafter referred to as the rare species). These rare species are generally known to preferentially inhabit ponds with lush emergent plants and/or to prefer cooler habitats shaded by forest cover, such as *Anax nigrofasciatus nigrofasciatus*, *Anac. martini*, *He. okinawaensis*, and *L. elegantissima*. In contrast, the common species also found in species-poor ponds were: *Ischnura senegalensis*, *Pantala flavescens*, *Anax parthenope julius*, *Ictinogomphus pertinax*, and *Tramea virginia*, which are known to prefer an open water surface as spawning habitat. These differences in habitat preference between the rare and common species may be among the major reasons for the significant positive effects of percent forest cover and emergent plants on Odonata species richness. These results suggest that nestedness helped identify precise habitat characteristics and rare species that should be considered for conservation and restoration of lentic habitats on Amami-Oshima Island." (Authors)] Address: Sakai, M., Faculty of Science and Engineering, Chuo University, 1-13-27 Kasuga, Bunkyo-ku, Tokyo 112-8551, Japan. Email: boundary.0008@gmail.com

19586. Trapero-Quintana, A.; Reyes-Tur, B. (2017): Emergence patterns of Odonata (Insecta) from a lotic habitat in Eastern Cuba. *Revista de Biología Tropical* 65(2): 807-818. (in Spanish, with English summary) ["The emergence patterns of tropical odonates (dragonflies and damselflies) are scarcely known. We studied the emergence patterns of odonates in a freshwater lotic system in Giro, Northern Santiago de Cuba, between January and December 2008. We visited the locality between 09:00 and 14:00, on a weekly basis, and collected exuviae from a fixed section (8 x 1 m²) offshore, along the riparian vegetation. We collected data on species composition and, for each species, abundance, relative biomass and emergence pattern. We collected 443 exuviae belonging to 22 species: seven Zygoptera and 15 Anisoptera. Half of the annual Odonata emergence took place in the dry season (December to March) with the highest value in February (25 %). For species for which we found seven or more exuviae per month, *Enallagma coecum* and *Macrothemis celeno* tended to be a synchronal emergence. We also found temporal segregation of the emergence pattern between *M. celeno* and *Protoneura capillaris*, *Neoneura maria*, *Progomphus integer* and *Scapanea frontalis*. These differences were probably related to the highest annual fluctuations of temperature, relative humidity and number of rainy days per month. We concluded that there is an asynchrony and heterogeneity in Odonata emergence times in the studied freshwater lotic system." (Authors)] Address: Trapero-Quintana, A., Depto de Biología, Universidad de Oriente. Ave. Patricio Lumumba s/n. Santiago de Cuba 90500, Cuba. trapero76@gmail.com

19587. Vilaça, Z.A.S. (2017): Distribuição espacial da riqueza de Odonata (Fabricius, 1793) em relação às ecorregiões neotropicais: determinantes ambientais e restrições à

dispersão. Dissertação (Mestrado em Biodiversidade Animal) - Universidade Federal de Goiás, Goiânia: 214 pp. (in Portuguese, with English summary) ["The distribution of biological diversity is one of the major questions for science. Several theories were proposed in attempt to understand the patterns and process that regulate the richness of extant species: species-energy theory, metabolic theory of ecology, habitat heterogeneity, and tropics as museum, cradle or casino. Terrestrial ecoregions are land units that contain similar biotic and abiotic factors, what makes them more alluring and efficient for conservation planning and land use than using geopolitical divisions, still used by several conservation institutions and governments. Odonata is one of the oldest orders of insect, belonging to the clade Paleoptera. Those insects, for being tightly related to environmental conditions and vegetation structure, are widely utilized as bioindicators and in studies of spatial patterns. In this thesis, we evaluated the lack of knowledge around Odonata geographic distribution in the Neotropical region and the way that its species composition is affected by both climate and space." (Author) <https://repositorio.bc.ufg.br/tede/bitstream/tede/6983/5/Disserta%20a7%20a3o%20-%20Zander%20Augusto%20Spigoloni%20Vila%20-%20202017.pdf>] Address: not stated

19588. Vilenica, M. (2017): Ecological traits of dragonfly (Odonata) assemblages along an oligotrophic Dinaric karst hydrosystem. *Ann. Limnol. - Int. J. Lim.* 53 : 377-389. (in English) ["Ecological traits of dragonfly larvae in tufa-depositing habitats of the Dinaric karst were studied monthly over a one-year period (2007–2008). The study encompassed various lotic karst habitats (springs, mountainous rivers, streams, tufa barriers) and microhabitats (angiosperms, mosses, cobbles, sand, silt with leaf litter). The aims of the study were to identify dragonfly composition, abundance and spatial distribution, their habitat and microhabitat preferences, and to determine the most important environmental factors explaining dragonfly assemblages in the studied hydrosystem. The dragonfly fauna was composed of eight species, *Onychogomphus forcipatus* (Linnaeus, 1758) was the most widespread and the most numerous. Water temperature, ammonium and oxygen concentrations had the highest influence on dragonfly assemblages. The most favorable habitat type were tufa barriers, less favorable were lower lotic habitats, while dragonflies were almost completely absent from upper lotic habitats and their springs. Dragonfly larvae preferred microhabitats with inorganic substrates (i.e. cobbles and sand) and slower water velocity, while they mostly avoided mosses associated with the strongest current. This study provides an important contribution to the knowledge of dragonfly ecology in lotic habitats of the Dinaric karst." (Author)] Address: Vilenica, Marina, Univ. of Zagreb, Faculty of Teacher Education, Trg Matice hrvatske 12, 44250 Petrinja, Croatia. E-mail: marina.vilenica@gmail.com

2018

19589. Baeta, R.; (ANEPE CAUDALIS) (2018): Suivi diachronique des populations ligériennes de *Stylurus flavipes* et d'*Ophiogomphus cecilia* en région Centre Val-de-Loire (Saison 2018 – Quatrième année de suivi à l'échelle régionale). Association Naturaliste d'Étude et de Protection des Écosystèmes CAUDALIS / Agence de l'Eau Loire Bretagne: 13 pp. (in French) ["In 2018, the 45 grids surveyed were spread over nearly 300 km of the Loire and corresponded to a cumulative length of 38 km of banks surveyed, all sessions combined. The regional database for the 2018 season thus contains information on 3,800 exuviae collected

and identified (Fig. 2). At the scale of the grids, *Onychogomphus forcipatus* was contacted on 42 of the 45 grids surveyed, *Ophiogomphus cecilia* on 38 and *Stylurus flavipes* on 12, i.e. a very clear decrease for the latter species compared to 2017. The differences between species are even more marked if we look at the transects. Thus, only 14 of 331 transects (4%) were validated for *Stylurus flavipes*, whereas 117 were validated for *Ophiogomphus cecilia* (35%) and 239 for *Onychogomphus forcipatus* (72%). However, these relative abundances vary between departments (Fig. 3) and depend on the upstream-downstream position of the surveyed grids (see maps in the appendix). A summary of the raw data collected by ANEPE Caudalis on the 8 grids monitored in Indre-et-Loire in 2018 is available in the appendix in the form of 2 tables (Tab. SI & SII). All the data have been transferred in SINP format to the DREAL Centre Val de Loire. In 2018, the Loire was relatively dry at the beginning of the season, with two small peaks in mid-May and mid-June. (Fig. 4). It was only from 17 June onwards that the levels of the Loire began to fall more steadily, reaching a low water level around mid-July. The absence of a particularly high flood and the random distribution of the 45 meshes monitored thus made it possible in 2018 to carry out the protocol on meshes with varied facies representative of the banks of the Loire River in our region (Fig. 5). 1. Phenologies of emergence: Although the first surveys were carried out slightly before 15 May (first pass on 30 April) and slightly after 15 August (last pass on 30 August), the surveys generally followed the dates defined in the protocol (Fig. 6). Harvesting was thus carried out on 100 different dates. The implementation of exuviae collections during this period allowed the peak of *Onychogomphus forcipatus* emergence to be well integrated, but it seems that the emergence of *Ophiogomphus cecilia* was already well underway during the first exuviae collections (Fig. 7). Finally, the very low number of *Stylurus flavipes* exuviae collected in 2018 does not allow us to model an emergence phenology. However, based on a direct visualization of the raw data, it seems that the peak of emergence was well taken into account and took place from mid-June to the end of July (Fig. 7). 2. Effects of biotic and abiotic variables: A global statistical analysis was carried out in 2017 on all the data collected in the Centre - Val de Loire since the monitoring protocol for the Loire gomphs (Baeta, 2017). It therefore does not seem appropriate to relaunch an analysis of this type this year with only one more year of data. An analysis of all the data produced over the first five years of deployment of this monitoring will be carried out in 2019. This will take into account all the data produced in the Loire basin and not just the data relating to the Centre - Val de Loire region. IV. OUTLOOK: Deployed in the Centre - Val de Loire region for four years now and active in the four major regions through which the Loire flows, this protocol is one of the great successes of the National Action Plan for Odonates. With a clearly basin-oriented scope, the objective for the coming years will be to ensure the continuity of this monitoring on this scale as well as to optimise the analysis of the data produced and the exploitation of the results through presentations at various conferences related to the monitoring of biodiversity in the Loire and/or the implementation of monitoring protocols." (Authors/DeepL)] Address: Baeta, R., Association Naturaliste d'Etude et de Protection des Ecosystèmes (ANEPE) CAUDALIS 1, rue de la Mairie 37520 La Riche, France

19590. Heijden, A. van der; Vliegthart, A. (2018): A dragonfly trip report: Western Andalusia, June 2017. Boletín Rola nº 11, primer semestre 2018: 25-36. (in English, with Spanish summary) ["Odonata records collected during a

field trip to Western Andalucía in June 2017 are presented. In ten field days, 42 species of Odonata were observed, which represents two-thirds of the Andalusian odonata-fauna." (Authors)] Address: van der Heijden, A., Nederlandse Vereniging voor Libellenstudie. Email: Contact: odonatophilac@gmail.com

19591. Pitcher, K.A.; Soluk, D.A. (2018): Fish presence and inter-patch connectivity interactively alter the size of emergent insects in experimental enclosures. *Ecosphere* 9(3):e02118. 17 pp. (in English) ["Structural habitat complexity (SHC) and functional habitat connectivity (FHC) are the basic components that make up the physical architecture of an ecosystem, and can have substantial impacts on predator-prey interactions. These structural components influence animal behaviors such as inter-patch movement, foraging, and competition, and can impact community structure/dynamics in terrestrial and aquatic ecosystems. The effects of SHC and FHC on predator-prey dynamics within an ecosystem may also have important cascading effects on neighboring ecosystems by altering the movement of individuals across ecosystem boundaries. For example, when aquatic insects emerge as adults, they enter terrestrial ecosystems where they become an important food resource for terrestrial predators. Using a multiple patch, predator enclosure design in ponds, we tested whether altering intra-patch plant stem densities (SHC) and inter-patch distances (FHC) would influence the impact a predatory fish has on the biomass, quality, and trophic composition of emergent insects. As expected, fish significantly reduced emergent insect biomass (33% \pm 7.6, mean \pm SE). Intra-patch stem densities (SHC) did not significantly alter fish effects; however, inter-patch distance (FHC) did significantly alter the impact of fish on the size of some emergent insects. Damselflies that emerged in treatments with fish present and shorter inter-patch distances were significantly larger, 4.1 \pm 0.1 mg/m² compared to 3.3 mg/m² \pm 0.1 in the long/fish treatments. In fish treatments, this effect on damselfly size resulted in greater reductions in total emergent insect biomass in long inter-patch distance treatments (47.3% \pm 6.9) compared to short inter-patch distance treatments (20.5% \pm 12.4). Our results suggest that physical components of a habitat, such as inter-patch distances, have important impacts on predator-prey dynamics within habitats. These altered predator-prey dynamics can then have cascading effects on adjacent habitats by influencing the abundance, trophic composition, and quality of exported trophic subsidies." (Authors)] Address: Pitcher, K.A., Dept of Biology, Univ. of South Dakota, 414 E. Clark Street, Vermillion, South Dakota 57069 USA. E-mail: kristopher.pitcher@usd.edu

19592. Reiss, M.; Chiffard, P. (2018): Different forest cover and its impact on eco-hydrological traits, invertebrate fauna and biodiversity of spring habitats. *Nature Conservation* 27: 85-99. (in English) ["Headwater springs in the German Low Mountain Ranges are local ecotone habitats and biogeographical islands embedded in and interlinked with their adjacent landscape. The structure of forests reflects the eco-hydrological conditions in substrate type occurrence, micro-habitat richness and biodiversity in forest springs. This study considers effects from different forest land cover by comparing spring habitats in deciduous beech forests and coniferous spruce forests on eco-hydrological structures and biodiversity. Study areas include six different forest landscapes in the Low Mountain Ranges in Central Germany in Hesse and Thuringia. Hydro-morphological structure mapping and invertebrate sampling was executed within a multi-habitat

sampling regime, which involves sampling plots being allocated according to the cover ratio of the occurring substrata. Aquatic and terrestrial spring zones are considered with respect to an ecotone approach. Some in situ measurements were implemented, such as pH values, to assess the acidity of the spring water. Results show obvious differences in acidity, substrate type cover ratios and biodiversity in deciduous and coniferous forest springs. Conifer forest springs were found tending to acidification while deciduous forest springs were slightly alkaline. Deciduous forest springs had higher cover ratios of organic microhabitats as well as a higher biodiversity in species richness and total number of individuals. Although it was not possible to clearly distinguish one direct key factor of fauna assemblages, negative effects from forest management practices (e.g. monoculture plantations of conifer forest) on spring habitats can be concluded." (Authors)] Address: Reiss, M., Dept of Geography, Philipps-Universität Marburg, Deutschhausstr. 10, 35037 Marburg, Germany. Email: reissm@geo.uni-marburg.de

2019

19593. Adámek, Z.; Mikl, L.; Šlapanský, L.; Ludik, J.; Ha-lačka, K (2019): The diet of predatory fish in drinking water reservoirs – how can they contribute to biomanipulation efforts?. *Folia Zoologica* 68(4): 215-224. (in English) ["Efforts to positively influence ecological processes and water quality by manipulating the fish community (biomanipulation) are of particular importance in drinking water reservoirs. One of the principle measures employed is to increase the abundance of predatory fish species as a means of reducing planktonophagous and benthophagous cyprinids. However, there is little information available on the effectiveness of different predatory fish in biomanipulation exercises. We examined the diet of the five dominant predatory species (pike *Esox lucius*, zander *Sander lucioperca*, asp *Leuciscus aspius*, European catfish *Silurus glanis*, and perch *Perca fluviatilis*) in five representative reservoirs in the Morava River drainage basin (Czech Republic). Fish prey made up 75 % of total food intake, with undesirable small cyprinids dominant by biomass (40 %). European catfish and asp were not taken as prey and showed no sign of cannibalism. On the other hand, predation on conspecific predatory species (including cannibalism) was relatively high in perch, pike and zander, thereby reducing their net benefit overall. This little-considered aspect of predatory feeding needs to be taken into consideration in future biomanipulation stocking strategies. ... Invertebrate dietary items comprised zooplankton; water bugs; mayfly, Gomphidae nymphs; caddisfly and chironomid larvae; and water beetle (Dytiscidae) larvae." (Authors)] Address: Mikl, L., Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic, Kvetná 8, 603 65 Brno, Czech Republic. E-mail: li-bor.mikl@seznam.cz

19594. Guliyeva, A.S. (2019): Species composition and quantitative distribution of larvae of dragonflies (Odonata) in the new ecological conditions of the lake Mehman. 37th International Scientific Conference on Economic and Social Development – "Socio Economic Problems of Sustainable Development" - Baku, 14-15 February 2019: 985-988. (in English) ["The paper presents new data on species composition, number and distribution of the larvae of dragonflies (Odonata) in new environmental conditions of the different habitats of in the lake Mehman. Field works conducted in 2015 - 2017 in the lake Mehman resulted in the rearings of 25 species and forms of dragonfly larvae. Seven of these L.

dryas, *S. fusca*, *E. viridulum*, *I. pumilio*, *O. cancellatum*, *L. depressa*, *L. quadrimaculata*, *Cordulia* sp. are new to the lake. Species *Lestes virens*, and *I.elegans*, were found in winter, spring and autumn of 2015 and winter and autumn of 2017; *C.scitulum* winter and autumn of 2015; *C.hastulatum* - winter, spring and autumn of 2017; *E. fatime* in winter and autumn of 2015 - 2017; in winter and spring of 2015 - 2017. Species *C. mercuriale*, *C. scitulum*, *L. virens*, *I. elegans*, *C. puella*, *E. najas*, *O. albistylum* are observed in the lake in all seasons and are dominated by widespread. It should be noted that the decrease in the number of larvae of dragonflies in the summer, especially at depths of up to 0.5 m is due to their intensive consumption by fish and water birds and emergence of adult dragonflies which leave the lake. On the other hand, in summer period, the volume of oxygen in shallow water of the lake Mehman greatly reduced, and as a result of evaporation of water, the amount of salts in water is increased. In such circumstances, the probability of occurrence of freshwater organisms in the benthos is naturally decreased. The study of the distribution of larvae of dragonflies on specific habitats of the lake revealed their maximum development on plant and silty habitats, and the minimum - on black silty sand. Changes in biomass of benthic organisms as well as larvae of dragonflies, which developed very poor is analyzed. Poor development of dragonfly larvae in the lake Mehman characterized, on the one hand with their intensive consumption by fish and water birds and on the other hand - the steady worsening of the environmental conditions of the lake." (Author) Some of the taxa are in need of re-examination.] Address: Guliyeva, Sanubar A., Azerbaijan State Univ. of Economics (UNEC), Azerbaijan. Email: Sama2013@bk.ru

19595. Hess, M. (2019): Mercury concentrations in aquatic insects of two Maine coastal streams: Temporal patterns of mercury in aquatic insect biosentinels and implications for methylmercury flux. MSc. thesis, Ecology and Environmental Sciences, The University of Maine: XIII + 111pp. (in English) ["Mercury (Hg) is a widespread water quality concern because it is a potent neurotoxin that biomagnifies through food webs, posing risk to biota higher in the food chain. Aquatic insects are effective for characterizing relative Hg risk in freshwater food webs because they live and forage in aquatic habitats where Hg is present and converted to its more toxic bioavailable form, methylmercury (MeHg). Specifically, dragonfly nymphs (Odonata) are increasingly being used as a Hg bioindicator. Therefore, I (Chapter 1) conducted a systematic review of the literature to evaluate the utility of dragonflies as biosentinels for Hg. Dragonfly nymphs have been used throughout the world to provide baseline Hg concentrations within waterbodies, analyze factors affecting bioaccumulation in invertebrates, and determine Hg concentrations within food webs. Dragonfly adults have been used for monitoring Hg concentrations as vectors into and among terrestrial habitats and food webs. There has been an increase in the use of dragonflies for Hg monitoring in the last 10 years, with more than half of the studies in the review conducted after 2009. However, research evaluating temporal Hg variability in dragonfly nymphs is limited, which can have important implications for monitoring programs and risk assessment because risk to wildlife may be under- or overestimated due to sample timing asynchrony with representative life-history events or body burden variation. Thus, I (Chapter 2) assessed the temporal variation in total mercury (THg) concentrations in similar aged cordulegastrid dragonfly nymphs from two coastal Maine streams over the course of one year. When we accounted for stream, there was no overall temporal pattern in dragonfly

THg concentrations throughout the year. We found that the two streams had similar annual mean THg concentrations; however, within stream variation of THg among months was high and differed among months. Therefore in temperate streams, multiple collections, ideally in different seasons, could be warranted to obtain a robust estimate of Hg concentrations within a lotic ecosystem. Besides dragonfly nymphs, other aquatic insects also serve as an important link in the MeHg pathway in that they transfer MeHg from single-celled organisms to larger predators in the aquatic environment. Additionally, emergent aquatic insects make up a substantial proportion of the diet of many riparian terrestrial consumers and are a primary mechanism by which MeHg is incorporated into terrestrial systems. Therefore, I (Chapter 3) aimed to determine taxonomic composition, biomass, temporal trends, MeHg concentrations, and MeHg flux of emerging aquatic insects in two coastal streams in Maine using weekly emergence trap collections. Different stream reaches harbored different aquatic insect communities and thus, yielded differences in cross-ecosystem subsidies biomass and temporal flux with respect to aquatic insect emergence. These differences shed light on which organisms were vectors for MeHg and the timing of MeHg pulses to the terrestrial environment in natural systems. My research indicate that remote protected natural streams, such as those in Acadia National Park, can yield high MeHg concentrations in biota and thus, large amounts of MeHg flux to the terrestrial environment and predators." (Author)] Address: not stated

19596. Kury, D. (2019): Libellen schützen, Libellen fördern im Kanton Basel-Landschaft. Kurzbericht 2019. Gewässerschutz Nordwestschweiz, Greifengasse 7 4058 Basel, Switzerland. <http://gewaesserschutz-nw.ch/index.php/aktivitaeten/libellen>: 9 pp. (in German) ["In the first phase of the project to protect and promote dragonflies in the Canton of Basel-Landschaft, a total of 20 and 89 water bodies were visited in 2018 and 2019 respectively. *Coenagrion puella*, *Anax imperator* and *Libellula quadrimaculata* were the most common species, as expected. Pleasant surprises were the detections of threatened and rare species such as *Epitheca bimaculata*, *Gomphus pulchellus*, *Orthetrum albistylum* and *Sympetrum pedemontanum*. The results of the surveys are used to develop enhancement and maintenance measures for the upkeep of standing water bodies and watercourse stretches." (Author/DeepL)] Address: Kury, D., Life Science AG, Greifengasse 7, CH-4058 Basel, Switzerland. E-mail: daniel.kuery@lifescience.ch

19597. Oliveira-Junior, J.M.B.; Juen, L. (2019): The Zygoptera/Anisoptera ratio (Insecta: Odonata): a new tool for habitat alterations assessment in Amazonian streams. *Neotropical Entomology* 48(4): 552-560. (in English) ["The accumulation of scientific knowledge is far outstripped by the rate of environmental disturbance from human activities in aquatic habitats. This highlights the need to develop effective proxy measures of aquatic biodiversity that can demonstrate changes in communities associated with human activities. We evaluated whether the relative abundance and species richness of Anisoptera and Zygoptera can be used as a tool to measure environmental impacts on Amazonian streams. Adult of Anisoptera and Zygoptera were sampled in 50 Amazonian streams, in the municipality of Paragominas (Pará state), Brazil, using an entomological handnet. The physical features of each stream were evaluated using an index of environmental integrity (HII). We collected a total of 1769 Odonata specimens, representing 97 species (56 were Zygoptera and 41 were Anisoptera). Habitat

modification resulted in an inversion in the proportional abundance and species richness of Anisoptera and Zygoptera, where Zygoptera diversity decreased with the loss of habitat integrity, whereas Anisoptera diversity increased with habitat disturbance. A decline of 0.1 in the habitat integrity index score resulted in an increase of approximately 13 individuals and 11 species of Anisoptera, with the exact opposite effect observed for the Zygoptera. In summary, the Odonata proved to be a useful model for the assessment of Amazonian streams, with sites where more than 54% of the Odonata species were Zygoptera being classified as preserved, and those dominated by Anisoptera species (>?59%) being considered degraded. This approach has clear applications for environmental impact assessments, as it reduces the influence of sampling effort and collector experience on assessment outcomes, and does not rely upon specialist knowledge, given that members of the two suborders are easily distinguished from one and other in the field." (Authors)] Address: Juen, L., Lab de Ecologia e Conservação, Instituto de Ciências Biológicas, Univ Federal do Pará, Belém, Brasil

19598. Olthoff, M. (2019): Untersuchung der Libellenarten *Leucorrhinia pectoralis* (FFH Anh. II), *Aeshna subarctica* und *Somatochlora arctica* in Mooregebieten des Kreises Borken - Bewertung durchgeführter und geplanter Wiedervernässungsmaßnahmen in den NSG „Burlo-Vardingholter Venn“ und „Hündfelder Moor“ anhand ausgewählter Indikatorarten. Im Auftrag der Stiftung Natur und Landschaft Westmünsterland: 17 pp. (in German) ["In 2019, the nature reserves Burlo-Vardingholter Venn and Hündfelder Moor (district of Borken) were surveyed for selected species of Odonata (*Leucorrhinia pectoralis*, *Aeshna subarctica*, *Somatochlora arctica*) threatened with extinction in North Rhine-Westphalia. Fortunately, the FFH Annex II species *Leucorrhinia pectoralis* was found to be present on the ground in both bogs. With over 50 individuals, the Burlo Vardingholter Venn is one of the most numerous occurrences of this species in the country. In the Hündfelder Moor, the species was found on the ground for the first time. The species has benefited in particular from the rewetting measures in the fen edge areas, which have led to an increased supply of mesotrophic fen waters. While *S. arctica*, which has been known to occur on the ground for 20 years, was confirmed in the Burlo-Vardingholter Venn, (potential) evidence of its presence on the ground was found for the first time in the Hündfelder Moor. This species has also benefited from the rewetting measures carried out in both moor areas. The habitats preferred by *S. arctica* had sufficient water flow - despite the extreme (summer) drought in 2018 and 2019. The occurrence of *Aeshna subarctica* in the Hündfelder Moor, known since 2010, was confirmed in 2019. However, several bog waters where the species was recorded a few years ago could no longer be confirmed as habitats of the species due to insufficient water levels. The species was only observed at a few peat pits in the south of the Hündfelder Moor. In particular, the detection of the first two species in the rewetted areas of both moorlands is considered a success of the nature conservation measures implemented. Further rewetting measures planned in the Hündfelder Moor are welcomed from the point of view of dragonfly protection. In future measures, the known breeding waters should be preserved and under no circumstances filled in. Furthermore, it is recommended to create new water bodies in the area of dry peat bodies that are less important from a nature conservation point of view, following the example of old peat diggings. These should ideally be small-scale and have shallow banks and no contact with the mineral subsoil. In

addition to the species studied in this project, numerous other endangered damselflies (e.g. *Coenagrion lunulatum*, *Ceragrion tenellum*, *Aeshna juncea*, *Leucorrhinia rubicunda*, *L. dubia*) would benefit from this." (Author/DeepL)] Address: Olthoff, M., Waldweg 66, 48163 Münster, Germany

19599. Richter, R.; Endersby, I. (2019): Dragonflies and Damselflies of Victoria and Tasmania. Printed by: Impact Digital Pty Ltd, Unit 3-4, 306 Albert Street, Brunswick, VIC 3056: 174 pp. (in English) [Reiner Richter and Ian Endersby have put together a book of the 81 species of Dragonflies and Damselflies of Victoria and Tasmania. There are 81 species all up and each one has a double page spread. There are images of the male and female, distribution maps, flight time data with notes on habitat, behaviour and information on ID details. ISBN: 978-0-6483592-1-0] Address: Impact Digital Pty Ltd, Unit 3-4, 306 Albert Street, Brunswick, VIC 3056

19600. Schiedewitz, S. (2019): Untersuchungen zur Diversität der Tagfalter und Libellen in der Hägebachaue nördlich von Samswegen. *Naturschutz im Land Sachsen-Anhalt* 56: 27-60. (in German) ["Between 2018 and 2020, 43 dragonfly species were recorded in the project area. The high total number of dragonfly species is due to the diverse biotope structures as well as the successful embedding of the water bodies in large-scale, insect-rich grasslands. The current mosaic of marshy alder swamp forest, large open water areas, dense and loose reed beds, sunny and shaded riparian zones with abundant deadwood, floating and diving leaf vegetation, silted-up and water-bearing ditch sections, strongly warmed shallow water areas and peat moss-covered marsh zones produces a variety of ecological niches so that dragonflies with a wide range of demands on their aquatic and terrestrial habitats can coexist. In total, eight of the nine endangered, rare or declining dragonfly species found in the area colonise the water bodies within the year-round pasture. The high species diversity along the dammed ditch system indicates that the integration of water body sections into near-natural grazing areas with low stocking density has a positive effect especially on those species that colonise open, sunny shallow waters with sparse riparian vegetation and would disappear from the water bodies as succession progresses. The cattle gently take over regular, spatially-temporally staggered mowing of lowland moorland ditches, as recommended in the literature, in order to counteract the decline of certain dragonfly species. The migration of *Coenagrion mercuriale* into the project area is an example of how the natural development of vegetation along watercourses, while at the same time gently keeping the riparian zones open by large grazing animals, can create new habitat structures that are being lost in many places through other practices. While intensive grazing of watercourse margins usually has a negative impact on existing biotope structures and thus also on existing populations, extensive grazing in the riparian zone creates valuable micro-biotopes that are warmed to varying degrees by the sun and can thus be important for the larval development of thermophilic dragonfly species. The shifting of soil material along the edges of the banks can also lead to the formation of fish-free margins, which reduces the predation pressure on dragonfly larvae. The occurrence of various, partly rare bog dragonflies indicates that the renaturation of the fen also promotes specialised species that have declined or disappeared elsewhere due to impairment or loss of important biotopes. The natural development of the marsh zones in the ditches particularly promotes species whose larvae develop in loose, moist peat moss cushions, protected

from enemies, where they can also survive temporary drying out of the water bodies. Since, in addition to the grazed riparian zones, there are also extensive stretches of water where the growth is only temporarily browsed or not browsed at all, sufficient habitat structures are preserved for the species that are bound to sunny reed belts and abundant riparian vegetation. The described deformation of certain watercourse margins by cattle footfall and browsing is distributed over several, mostly widely spaced watering points and is thus limited to only small-scale "disturbance points" in relation to the total bank length of all integrated ditches. The obviously positive effects of extensive grazing of riparian zones presented here are by no means a recommendation for the integration of water bodies into "conventional" standing pastures, which are intensively overgrazed in high stocking density due to a superficial economic benefit. On such areas, nutrient inputs (supplementary feeding), the complete loss of riparian vegetation and massive trampling damage usually lead to impairment of the aquatic and terrestrial habitats of dragonflies and other species." (Author/DeepL.)] Address: Schiedewitz, Susen, Biodiversitätsanalysen, Pflege- und Entwicklungskonzepte, Öffentlichkeitsarbeit Fortuna 1, 38704 Liebenburg, Germany. E-Mail: natur@susenschiedewitz.de

2020

19601. Baaloudj, A.; Ouarab, S.; Kerfouf, A.; Bouriach, M.; Hussein, A.A.; Hammama, C.; Djénéba, H.N. (2020): Use of macro invertebrates to assess the quality of Seybouse River (North-East of Algeria). *Ukrainian Journal of Ecology* 10(4): 60-66. (in English) ["The theme is based on the determination and the impact of pollution on the aquatic fauna of Seybouse River in the Wilaya de Guelma. This study aimed to evaluate the physicochemical properties of water, to determine the macro-benthic invertebrates of this ecosystem. The money samples of water are taken (November - May) at three stations at different depths, including a very polluted one at downstream of the Wadi. Several physicochemical parameters were measured (pH, electrical conductivity, turbidity, BOD5 MES, water temperature and salinity). The Bi-monthly sampling of macro invertebrates revealed the existence of 40 taxa, divided into 4 branches (amphibians, molluscs, arthropods, and annelids), made up of 2344 identified individuals, and distributed according to the bathymetry, where the majority are Arthropods with 95.38%. The annelids represent 3.71%, collected mainly at the level of the strongly anthropized site C. Therefore, the distribution of the macrobenthic fauna depends on the physico-chemical parameters, on the geographical position. Maintaining a standard water quality in this aquatic ecosystem requires continuous monitoring of its physicochemical characteristics." (Authors) Taxa are treated family wise.] Address: Baaloudj, Affef, Laboratory of Biology, Water and Environment, Faculty SNV-STU, Univ. of Guelma, Guelma 24000, Algeria. Email: bafef@yahoo.fr

19602. Cham, S. (2020): Observations of male aggression in *Calopteryx splendens* (Harris) (Banded Demoiselle) and territorial behaviour at high population density. *J. Br. Dragonfly Society* 36(2): 44-66. (in English) ["*C. splendens* favours slow to medium flowing rivers and streams, where males can be observed defending territories in areas that are most likely to attract females. At high population densities, male territorial behaviour changes and becomes more aggressive, with biting used in an attempt to displace tandem males. This paper describes territorial behaviour and male strategy observed during the summer of 2018, when

high numbers of *C. splendens* were increasingly concentrated into small areas of a stream due to lowering water levels.] Address: Cham, S., 2 Hillside Road, Lower Stondon, Henlow, SG16 6LQ, UK. Email: stevecham1@aol.com

19603. Chelmick, D.; Boudot, J.-P. (2020): An identification guide to the genus *Ischnura* (Insecta, Odonata, Zygoptera, Coenagrionidae) in the Middle East, with emphasis on the Arabian Peninsula. *Tribulus* 28: 4-18. (in English) ["Seven species of damselflies of the genus *Ischnura* are found in the Middle East. The species can be hard to identify and show considerable variation within individuals. The purpose of this paper is to provide identification for these species with particular reference to those from Oman and the United Arab Emirates. Simply relying upon colour patterning, which can be variable, is insufficient for accurate identification. The paper provides illustrations of all criteria that need to be examined. In addition to identification, this paper details variations, using photographs, that are likely to be encountered in Oman and the UAE, the most notable of which can be summarised: (1) *Ischnura senegalensis*, a common, essentially coastal insect, has specimens from Salalah (Oman) with a completely black abdominal segment 2. This has not been recorded from any other locality in this extremely widespread species; (2) *Ischnura evansi*, the region's second most common species, has a much wider range of colour forms than previously described.] Address: Jean-Pierre Boudot, J.-P., Immeuble Orphée, Apt 703, 78 rue de la Justice, 54710 Ludres, France. Email: jeanpierreboudot54@gmail.com

19604. Chu, Y.J.; Ganesan, P.B.; Ali, M.A. (2020): Fluid-structure interaction simulation on flight performance of a dragonfly wing under different pterostigma weights. *Journal of Mechanics* 37: 216-229. (in English) ["The dragonfly wings provide insights for designing an efficient biomimetic micro air vehicle (BMAV). In this regard, this study focuses on investigating the effect of the pterostigma weight loading and its spatial location on the forewings of dragonfly by using the fluid-structure interaction simulation. This study also investigates the effect of change in the wing elasticity and density on the wing performance. The forewing, which mimics the real dragonfly wing, is flat with a 47.5mm span and a 0.4mm thickness. The wing was set to cruise at 3 m/s with a constant flapping motion at a frequency of 25 Hz. This study shows that a small increase of pterostigma loading (11% of wing weight) at the tip of the wing significantly improves the lift to drag ratio, CL/CD, which has 129.16% increment in comparison with no loading. The lift to drag ratio depends on the pterostigma location, pterostigma loading, elastic modulus and density. The results of this study can be used as a reference in future BMAV wing optimization design." (Authors)] Address: Chu, Y.J., Dept of Mechanical Engineering, Fac. of Engineering, University of Malaya, Kuala Lumpur, Malaysia. Email: poo_ganesan@um.edu.my

19605. Derbuch, G. (2020): Folgekartierung der Libellenfauna im Nationalpark Gesäuse (Monitoring, EZ), Endbericht, November 2020. Auftraggeber: Nationalpark Gesäuse GmbH, Fachbereich Naturschutz & Forschung, Mag. Alexander Maringer, Weng 2, A-8913 Admont, Austria: 46 pp. (in German) ["In 2019 and 2020, the objective of this project was to map selected dragonfly species first recorded by Russ (2010) around 10 years ago at various water bodies in the Gesäuse National Park and just outside it. Russ was able to identify 30 species, whereas the present study identified 20. This considerable difference is due to the fact that two species-rich water bodies in the valley have either lost

a great deal of their value (Paltenspitz) or no longer exist (pond near Gstatterboden). The majority of species are widespread and common species. No species of the Annexes of the Habitats Directive were found. It is gratifying to note the presence of the endangered species *Leucorrhinia dubia* on the Gscheideggkogel, *Somatochlora flavomaculata* on the Paltenspitz and *Coenagrion hastulatum* in the Haselkar. In addition, the almost endangered *Somatochlora alpestris* is found on the bogs of the Drahbank, the Gscheideggkogel and the Neuburgmoos. With 11 species, the Life project pond on the Paltenspitz has proved to be the richest in species - 10 years ago, however, there were 24 there (!), and the qualitative decline is also evident. The pond must be rehabilitated, opened and dredged. The small water bodies on the Haselkaralm currently have 8 species, but only in water bodies that are protected from cattle and have natural siltation vegetation. Six species fly at Sulzkarsee, in significantly higher individual densities than 10 years ago - an indication that the control of minnows and nutrient input has been successful. The small peaty mire waters in the Neuburgmoos, the Drahbank and at the Gscheideggkogel are constant in terms of dragonfly fauna, with isolated occurrences of stenotopic and nature conservation-relevant species (*L. dubia*, *S. alpestris*). The pond at the Weidendom and the Hechtlacke also show no qualitatively or quantitatively relevant changes. change - they are generally species-poor. No dragonflies were found at three of the selected sites (Lettmairau, Brucksattel, Gstatterboden pond). There is an increased need for action at the Paltenspitz (dredging) and the Neuburgmoor (fencing). It has been shown that two surveys are not sufficient to provide a representative insight into the local dragonfly population. of the local dragonfly populations. In comparison, the RVS species protection for environmental planning issues provides for 4-6 inspections per year, depending on the type of water body." (Author/DeepL)] Address: Auftragnehmer & Bearbeitung: derbuchcoaching, Georg Derbuch, Jägerweg 29, A-8054 Seiersberg, Austria. www.derbuchcoaching.at

19606. Enss, J., Joest, R.; Lorenz, A. (2020): Libellenzönsen renaturierter und nicht-renaturierter Abschnitte der Ruhr und der Lippe, zweier großer Fließgewässer in Nordrhein-Westfalen. *Libellula* 39(3/4): 149-171. (in German, with English summary) ["In this paper dragonfly and damselfly communities in restored and non-restored stretches of the rivers Ruhr and Lippe are compared. From May to September 2017 a total of 52 transects were visited monthly to record adult dragonflies and damselflies and to collect exuviae with a standardised protocol. The data set contains 3,248 records of 23 species from eight families (14 % Exuviae). Remarkable are records of *Onychogomphus forcipatus* at restored stretches of the Ruhr and *Ophiogomphus cecilia* mostly at restored stretches of the Lippe. Both species were on the verge of extinction in North-Rhine-Westphalia. At the lowland river Lippe the number of species and the number of individuals were higher compared to the lower mountain river Ruhr. Both species richness and number of individuals were generally, if not always significantly, higher in restored stretches compared to non-restored stretches of both rivers. The higher species richness is mostly due to a higher number of species typical of standing waterbodies which profit from this type of habitat in the floodplains created by the restoration measures. The number of explicitly riverine species did not differ in restored and non-restored stretches of the Lippe while there was one more riverine species in restored stretches of the Ruhr. However, the number of individuals of explicitly riverine species was higher in restored

stretches of both rivers. Due to low detection rate, the recording of exuviae only gave convincing results for the Lippe which correspond to observations from studies by other authors. River restoration measures lead to an increase in both number and abundance of dragonfly and damselfly species and therefore is judged favourably. Due to their positive reactions Odonata can therefore be used as indicators for river restoration measures." (Authors)] Address: Enss, J., Universität Duisburg-Essen, Fakultät für Biologie, Aquatische Ökologie, Universitätsstr. 5, 45141 Essen, Germany. Email: julian.enss@googlegmail.com

19607. Fait, P.; Demierre, E.; Ilg, C.; Oertli, B. (2020): Small mountain reservoirs in the Alps: New habitats for alpine freshwater biodiversity? *Aquatic Conservation: Marine and Freshwater Ecosystems* 30(4): 617-630. (in English) ["1. Today, aquatic biodiversity suffers from many pressures linked to human activities, including climate change, which particularly affects alpine areas. Many alpine freshwater species have shifted their geographical distribution to colder areas, but a reduced availability of suitable habitats is also forecasted. New artificial water bodies could provide habitat enhancement opportunities, including small mountain reservoirs built to overcome a lack of snow during winter. 2. To investigate the role of reservoirs as a habitat for freshwater invertebrates, a case study was conducted on eight reservoirs in the Swiss Alps. The study aimed to compare the water quality and freshwater biodiversity of the reservoirs with those of 39 natural and newly excavated ponds. Data were collected on physico-chemistry, freshwater habitat structure, and aquatic insects (dragonflies and aquatic beetles). 3. The study showed that the mountain reservoirs investigated did not differ from natural ponds in terms of surface area, conductivity, and trophic level. Similarly to natural ponds, reservoirs showed signs of impairment owing to surface runoff carrying pollutants linked to ski tourism. They presented a low diversity of mesohabitats, and in particular lacked vegetation. Compared with natural ponds, the species richness in reservoirs was lower for dragonflies but not for beetles. At the regional scale, the community from the reservoirs was a subset of the natural ponds community, supporting 38% of the regional species richness for these two insect groups. 4. The results suggest that mountain reservoirs are likely to be important for biodiversity in alpine areas, both as habitats and as stepping stones for species shifting their geographical range. These water bodies can be enhanced further by some nature-friendly measures to maximize benefits for biodiversity, including margin revegetation or the creation of adjacent ponds. Ecological engineering needs to be innovative and promote freshwater biodiversity in artificial reservoirs." (Authors)] Address: Oertli, B., HES-SO//GE, University of Applied Sciences and Arts Western Switzerland, 150 route de Presinge CH-1254 Jussy, Geneva, Switzerland. Email: beat.oertli@hesge.ch

19608. Gauci, C. (2020): Emergence of seven odonate species, based on exuviae collection, from four small artificial ponds at Ghadira Nature Reserve, Malta. *J. Br. Dragonfly Society* 36(2): 109-130. (in English) ["The Ghadira Nature Reserve, Malta is a saline marshland. The construction of three small fresh water ponds in the early nineteen nineties, together with the addition of a fourth in 2017, attracted a number of odonate species. Seven species reproduce regularly in them, with another two ovipositing sporadically. The regular collection and counting of exuviae provides an accurate count of the numbers and species emerging. For this purpose, in 2019, exuviae were collected twice weekly from mid-March to mid-December. The most numerous

species emerging from each of the four ponds was *Crocothemis erythraea*. Most, if not all, of the seven species had two (in some cases three) generations annually. Birds were the main predators of larvae, both during the growth period and at emergence, and of teneral; [a kingfisher - *Alcedo atthis* - is documented preying on a teneral *C. erythraea*]. Spiders and possibly Painted Frogs took what appeared to be an insignificant number of teneral." (Author)] Address: Gauci, C., 28 Triq il-Kissier, Mosta, Malta MST1822, Malta

19609. Kamarajan, B.P.; Muthusamy, A. (2020): Survival strategy of *Pseudomonas aeruginosa* on the nanopillar topography of dragonfly (*Pantala flavescens*) wing. *AMB Expr* (2020) 10:85: 12 pp. (in English) ["Discovery of nanopillars on the surface of the insect wings had led to the understanding of its bactericidal property. Nanopillar topography is deterrent to only those bacteria that are attached, or in close contact with the nanopillars. The present study investigated the variation in the viability of *Pseudomonas aeruginosa* strains PAO1 (virulent) and ATCC 9027 (avirulent) on the wing surface of dragonfly (*Pantala flavescens*). Viability study indicated that only 0.2% ATCC 9027 survived when incubated with wing for 48 h in Phosphate buffered saline, while under the same conditions 43.47% PAO1 survived. Enumeration of *Pseudomonas* attached to wing surface suggested that, the number of PAO1 attached on the wing surface was three times lesser than ATCC 9027. Propensity of attachment of *P. aeruginosa* strains PAO1 and ATCC 9027 on the wing surface investigated using scanning probe microscope indicated that *P. aeruginosa* ATCC 9027 showed adhesion to 88% of regions and, PAO1 showed adhesion to only 48% regions tested on wing surface. PAO1 survived the bactericidal effect of wing surface by evading attachment. Three clinical isolates tested which showed viability similar to PAO1 strain, also showed lower propensity to attach to wing surface. Transcriptional level analyses using RT-PCR suggested that flagellar genes (*fliE* and *fleS*) were downregulated and genes responsible for reversible to irreversible attachment (*gcbA* and *rsmZ*) were upregulated in ATCC 9027 than PAO1 on wing surface, indicating relatively higher attachment of ATCC 9027 on wing surface. The study suggests that virulent strains of *P. aeruginosa* may evade attachment on wing surface. The results gain significance as bioinspired surfaces are being created towards developing antibacterial medical implants and other antibacterial surface applications." (Authors)] Address: Muthusamy, A., Dept of Biotechnology, PSG College of Technology, Coimbatore, TamilNadu, India. Email: biosubramanian@gmail.com

19610. Lim-Franco, G.; Trapero-Quintana, A. (2020): Diversidad y patrón de emergencia de libélulas en un hábitat léntico del Jardín Botánico Nacional de Cuba. *Revista del Jardín Botánico Nacional* 4: 119-130. (in Spanish, with English summary) ["The transference of biomass to terrestrial ecosystems is carried out in part by the adults of aquatic insects after their emergence from water, as it is in the case of odonates. The aim of this study is to characterize the emergence pattern of an odonate assemblage in an artificial lentic habit at of the National Botanical Garden of Cuba, from the harvest of exuviae. Fifty two samplings were carried out with a frequency of once a week, and an interval of seven to nine days, in four transect of 8 m². To characterize the emergence, the seasonal climate model was considered: rainy, poorly rainy and transition seasons. The change in climatic variables and habitat characteristics was registered, and was related to the emergence pattern. The variation in the use of resources during emergence was

described. The emergence with a constant volume of water turned out to be asynchronous, with a predominance of accidental species and unequal abundance distribution. The rainy period was the season with the highest percentage of emergence, in which rainfall and relative humidity were the factors that most influenced the emergence pattern. The plants were the most used emergence substrate, and the decrease in vegetation cover corresponded to the alternative use of other substrates." (Authors)] Address: Lim-Franco, Gabriela, Departamento Curatorial, Museo Nacional de Historia Natural, Calle Obispo # 61 entre Oficinas y Baratillo, Habana Vieja, La Habana, Cuba. CP: 10100. E-mail: limi23773@gmail.com

19611. Moura, L.P.; Marques Couceiro, S.R.; Juen, L.; Silas Veras, D. (2020): Congruence of the composition of Odonata between dry and rainy seasons in the Maranhense Cerrado. *International Journal of Odonatology* 23(4): 305-314. (in English, with Spanish summary) ["In tropical streams, seasonality has a strong influence on heterogeneity, altering available resources and affecting the carrying of organisms, substrate and organic matter. This causes changes in the limnological variables, as well as in the species composition. The aim of our study was to evaluate the response of the congruence of the Odonata community in two seasons in streams of the transition between Cerrado and Caatinga. Ten tributary streams of the river Itapecuru in Caxias, in eastern of Maranhão, were sampled from July to December 2017 (lowest precipitation) and from January to June 2018 (highest precipitation). A total of 386 specimens were collected, 160 in the season with the lowest precipitation and 226 in the season with the highest precipitation. There was no congruence of response for the order Odonata between the seasons; however, if the suborders are treated separately, Zygoptera presented a high congruence of larvae, but not Anisoptera. Thus, in environments that face strong water stress and due to the ecophysiological differences of the suborders, the sampling of only one seasonal period does not provide consistent data on the species composition (Zygoptera showed similarity in the composition between drought and rainy seasons, but not Anisoptera), losing important information about local diversity. If the focus is on biodiversity, the use of suborders can establish patterns of diversity and adaptation between seasons, in view of the existing ecophysiological differences." (Authors)] Address: Moura, L., Programa de Pós-graduação em Biodiversidade (PPGBEES), Universidade Federal do Oeste do Pará, Laboratório de Ecologia e Taxonomia de Invertebrados Aquáticos, Santarém, Pará, Brazil. Email: lucas.moura@acad.ifma.edu.br

19612. Nardi, G.; Spada, L. (2020): Odonata, Libellulidae, *Brachythemis impartita* (Karsch, 1890). *Bollettino dell'Associazione Romana di Entomologia, Nuova Serie* 1(1-4): 173-177. (in Italian) [Sicilia, Italy. Siracusa, Isola di Ortigia, Piazzetta San Rocco, 13 m, 37°03'28"N; 15°17'36"E, 4.IX.2019, L. Spada & G. Nardi leg., 1 male (CLS).] Address: Nardi, G., Centro Nazionale Carabinieri Biodiversità "Bosco Fontana", Strada Mantova, 29 - I-46045 Marmirolo (Mantova), Italy. E-mail: l_nardi@hotmail.com

19613. Parr, A.J. (2020): Migrant and dispersive dragonflies in Britain during 2019. *J. Br. Dragonfly Society* 36(2): 67-83. (in English) ["The year 2019 was a truly impressive one for migrant dragonflies in the UK, featuring alongside the heady days of 1995 and 2006. It was thus a record year for sightings of both *Anax ephippiger* and *A. parthenope*. The former species saw three separate influxes - during late

winter/early spring, during summer and again during the autumn. The summer influx was notable for the presence of multiple individuals at several sites, and breeding behaviour was reported on several occasions, though no progeny were positively identified later in the season. *Anax parthenope* appeared at over 80 sites in the UK during summer, these sightings including only the third-and fourth-ever records for Scotland. Although there was clearly a major influx, records were received from many sites that had also recorded the species over the previous few years, and it seems that breeding populations in Britain may now at last be becoming more widespread. In addition to the impressive arrivals of *A. ephippiger* and *A. parthenope*, *Sympetrum fonscolombii* also appeared in near-record numbers, with reports from almost 150 sites during the year. At Drift Reservoir in Cornwall, some 120 individuals were present during the second week of July, though most of these then rapidly moved on. Successful breeding was noted at a number of sites, with emergences occurring from late August onwards. However, given the size of the early season influxes, the number of such breeding sites seemed smaller than might perhaps have been expected. Other highlights of 2019 included the sighting of two male *Crocothemis erythraea* (Scarlet Darter) along the south coast during high summer. One site - Longham Lakes in Dorset - had also recorded the species in 2017, which could just be a coincidence, but might hint at the presence of an undiscovered breeding colony nearby. Good numbers of *Aeshna affinis* (Southern Migrant Hawker) were seen away from their Thames Estuary strongholds for the second year in succession, with records coming from many of the areas that had reported the species during 2018, as well as from new areas such as coastal south Wales. This species now seems to be becoming increasingly widespread in southern Britain. *Aeshna isocetes* (Norfolk Hawker) also continued its range expansion in south-east England, with a record even from Medmerry RSPB Reserve in West Sussex. The expansion of both *A. affinis* and *A. isocetes* may be linked to a combination of both internal dispersal and immigration from the Continent. Amongst our recent colonist damselflies, both *Chalcolestes viridis* and *Erythromma viridulum* showed substantial range expansion during 2019, particularly along the east coast. The most northerly site in Britain for *C. viridis* is now in North-east Yorkshire, while *E. viridulum* was recorded as far north as County Durham." (Author)] Address: Parr, A.J., 10 Orchard Way, Barrow, Bury St Edmunds, Suffolk, IP29 5BX, UK

19614. Riva-Murray, K.; Bradley, P.M.; Brigham, M.E. (2020): Methylmercury—total mercury ratios in predator and primary consumer insects from Adirondack streams (New York, USA). *Ecotoxicology* 29: 1644-1658. (in English) ["Mercury (Hg) is a global pollutant that affects biota in remote settings due to atmospheric deposition of inorganic Hg, and its conversion to methylmercury (MeHg), the bioaccumulating and toxic form. Characterizing biotic MeHg is important for evaluating aquatic ecosystem responses to changes in Hg inputs. Aquatic insects possess many qualities desired for MeHg biomonitoring, but are not widely used, largely because of limited information regarding percentages of total mercury (THg) composed of MeHg (i.e., MeHg%) in various taxa. Here, we examine taxonomic, spatial, and seasonal variation in MeHg% of stream-dwelling predator and primary-consumer insects from nine streams in the Adirondack region (NY, USA). Predator MeHg% was high (median 94%) and did not differ significantly among five taxa. MeHg% in selected dragonflies (the most abundant predators, Odonata: Aeshnidae and Libellulidae)

exhibited little seasonal and spatial variation, and THg concentration was strongly correlated with aqueous (filtered) MeHg (FMeHg; $r_s = 0.76$). In contrast, MeHg% in primary consumers—shredders (northern caddisflies [Trichoptera: Limnephilidae]) and scrapers (flathead mayflies [Ephemeroptera: Heptageniidae]), were lower (medians 52% and 35%, respectively), and differed significantly between taxa, among sites, and seasonally. Correlations of THg with FMeHg were weak (shredders, $r_s = 0.45$, $p = 0.09$) or not significant (scrapers, $p = 0.89$). The higher MeHg% of predators corresponded with their higher trophic positions (indicated by nitrogen stable isotopes). Results suggest obligate predators hold the most promise for the use of THg as a surrogate for MeHg biomonitoring with aquatic insects within the Adirondack region." (Authors)] Address: Riva-Murray, Karen, U.S. Geological Survey, 425 Jordan Road, Troy, NY 12180, USA. Email: krmurray@usgs.gov

19615. Röbelen, F.; Schütte, K. (2020): Atlas der Libellen Hamburgs. Arbestand, Verbreitung, Gefährdung, Schutz. Behörde für Umwelt, Klima, Energie und Agrarwirtschaft, Abteilung Naturschutz: 160 pp. (in German) [distribution atlas of the odonata fauna of the city of Hamburg, Germany. https://www.hamburg.de/contentblob/14973706/075d3db15-61cbc97baadb4292b4c359d/data/atlas-libellen-20_20.pdf] Address: Herausgeber: Freie und Hansestadt Hamburg, Behörde für Umwelt, Klima, Energie und Agrarwirtschaft, Amt für Naturschutz, Grünplanung & Energie, Abteilung Naturschutz, Neuenfelder Str. 19, 21109 Hamburg, Germany

19616. Satterfield, D.A.; Sillett, T.S.; Chapman, J.W.; Altizer, S.; Marra, P.P. (2020): Seasonal insect migrations: massive, influential, and overlooked. *Frontiers in Ecology and the Environment* 18(6): 335-344. (in English) ["During seasonal changes around the globe, trillions of insects are on the move. Many insect populations, including butterflies, moths, hoverflies, and dragonflies, make repeated seasonal migrations each year. It is only during the past century that biologists have come to accept the concept of insect migration, and new research using radar, citizen science, and stable isotopes has revealed unexpected insights about this phenomenon. Drawing on these findings, we demonstrate how seasonal insect movements are both massive and ecologically influential, with consequences for food webs, nutrient transport, pollination, and infectious disease. Responding to environmental changes, some mobile insect populations are declining or shifting the timing and extent of their journeys. We suggest research and policy priorities for investigating and protecting insect migrations. Outcomes from such work could transform strategies for agricultural pest control and wildlife conservation, and could help preserve the ecological functions performed by migratory insects." (Authors) The paper includes references to *Anax junius* and *Pantala flavescens*.] Address: Satterfield, Dara, Migratory Bird Center, Smithsonian Conservation Biology Institute, National Zoological Park, Washington, DC, USA. Email: dara.satterfield@gmail.com

19617. Thompson, D.J. (2020): Distinguishing early larval instars of Britain's two commonest damselflies, *Ischnura elegans* (Bluetailed Damselfly) (Vander Linden) and *Coenagrion puella* (Azure Damselfly) (Linn.). *J. Br. Dragonfly Society* 36(2): 131-134. (in English) ["A simple plot of hind tibia length against head width gives a clear distinction between the early larval instars of *I. elegans* and *C. puella*, Britain's two commonest damselflies." (Author)] Address: Thompson, D.J., Dept of Evolution, Ecology and Behaviour, Institute of Integrative Biology, Univ. of Liverpool, Liverpool,

L69 3BX, UK. Email: d.j.thompson@liv.ac.uk

19618. Wang, Z. (2020): Dragonflies and Damselflies of Northeastern China. China Forestry Publishing House: 242 pp. (in Chinese, Latin name) ["In order to raise awareness of their conservation and to provide basic information on dragonfly knowledge, the author presents the results of research on dragonflies in northeastern China in four chapters, using the natural landscape of northeastern China as a display surface. Chapter 1 deals with the status of dragonflies in biology, their biological and ecological characteristics (Chap. 2) and the significance of understanding dragonflies in general (Chap. 3). The fourth chapter is devoted to pictures of the ecology of adult damselflies, with textual notes. Of these, 26 species of damselflies, 20 species of flies and 38 species of dragonflies cover 80% of the known dragonfly species in the Northeast." (Publisher)]

2021

19619. Adedire, C.O.; Adeyemi, J.A.; Owokoniran, G.O.; Adu, B.W.; Ileke, K.D. (2021): Effects of application of copper-based fungicides in cocoa plantations on the abundance and diversity of macroinvertebrates in adjacent rivers in Southwestern Nigeria. *Ife Journal of Science* 23(2): 13 pp. (in English) ["This study investigated the relationship between the levels of fungicide pollution and the abundance and diversity of macroinvertebrate fauna in three river systems: Aponmu, Oruwo, and Owena in south-western Nigeria, which are in close proximity to cocoa plantations. For each river, three sites were selected for the collection of water and sediment samples from April to July, 2018. Prior to sample collection, the physicochemical parameters (electrical conductivity, total dissolved solutes, pH, temperature, and dissolved oxygen) were determined. Also, aquatic macroinvertebrates were collected, and were identified to generic level, where possible. The levels of copper and sulphate in the samples were determined following standard procedures. The range of mean values for the physicochemical parameters were: 0.07-0.20 mS/cm, 60.00 – 154.00 ppm, 24.60 – 28.13 °C, 6.97 – 7.43, and 0.87 – 2.87 mg/L for electrical conductivity, total dissolved solutes, temperature, pH, and dissolved oxygen respectively. The range of mean values for copper and sulphate in sediment samples were 30.58 – 56.63 mg/Kg and 787.12 – 978.33 mg/Kg respectively while those for the water samples were 2.86 – 6.93 mg/L and 476.6 – 685.58 mg/L respectively. A total of nineteen (19) macroinvertebrate genera comprising Insecta (14), Gastropoda (3), Crustacea (1), and Bivalvia (1) were recorded. Taxa richness and species diversity were higher in river Owena in comparison to rivers Aponmu and Oruwo. The high abundance of the taxa: Potamididae, Gerridae, Notonectidae, Libellulidae, and Platycnemididae in the sampled rivers notwithstanding the pollution levels is an indication that these taxa are capable of thriving in polluted aquatic systems." (Authors) Odonata identified are a mixture from American and Asian species.] Address: Adeyemi, J.A., Department of Biology, School of Sciences, Federal University of Technology, P.M.B. 704, Akure, Ondo State, Nigeria. E-mail: jaadeyemi@futa.edu.ng;

19620. Aguilera, V.; Silva, C. (2021): The names for dragonflies in the linguistic atlas of Brazil: A study on the motivation of signs. *Alfa: Revista de Linguística* 65 13455: 25 pp. (in English) ["The names attributed to the libélula (dragonfly) – long, thin body insect, with four transparent wings, which flies and hits the rear in the water –, Question 85 of the semantic-lexical questionnaire (QSL in Portuguese) of

the Linguistic Atlas of Brazil, exemplify the complex variational system of the lexicon of Brazilian Portuguese (BP), reflecting facts from the socio-history of each region and, even, each location and each individual. The variants registered in ALiB, in the state capitals, suggest that the insect's name is, in general, of metaphorical basis, motivated by its physical aspect, sound, movements and, equally, through mental associations/analogies with similar ones, resulting, in most cases, in transparent signs. In order to ratify or, perhaps, rectify the results of the capitals, in this work, we analyzed the data collected through the country's hinterlands from 900 informants, totaling 225 locations. With the support of this corpus, guided by the theoretical and methodological principles of Lexicography and Semantics, we aim to: (i) verify the dictionary entries of the forms obtained; (ii) describe the variants in terms of morphological aspects; and (iii) analyze these denominations from the perspective of motivational semantics." (Authors)] Address: Aguilera, V., Universidade Estadual de Londrina (UEL). Londrina – PR, Brazil. email: vanderci@uel.br

19621. Akhmedova, M.Sh.; Medetov, M.J.; Abdullayev, I.I. (2021): Fauna of dragonflies (Odonata: Anisoptera, Zygoptera) In Khorezm oasis, Uzbekistan. *Nat. Volatiles & Essential Oils* 8(6): 1792-1798. (in English) ["The article presents the results of odonatafauna of the Khorezm oasis in the north - western part of Uzbekistan for 2020-2021. Observations were made at seven points in different biotopes of the oasis. Observations were made in the spring-summer-autumn seasons, when the temperature rose above +20 C. According to the results, 23 species of odonatafauna belonging to 5 families and 8 subfamilies were identified. They are divided into three groups according to their dominance: D = dominant, SD = subdominant R = rare species. Accordingly, dominant species account for 17%, subdominant species for 22%, and rare species for 61%. There are 11 palearctic species (47.8%), 7 cosmopolitan species (30.4%), 2 holarctic and transpalearctic species each (8.7%), and 1 Australia-Asian species (4.3%)."] (Authors)] Address: Akhmedova M.Sh, Khorezm Mamun Academy, 220900, Khiva, Markaz Str., 1, Uzbekistan

19622. Al Mousa, M.A. (2021): Studies on the Odonata and Trichoptera of high-elevation lakes of northern Colorado and Southern Wyoming. MSc thesis, Colorado State University, Fort Collins, Colorado: VIII + 178 pp. (in English) ["Freshwater biodiversity loss is a major concern, and global warming is already causing a significant role in species extinctions. The main goal of this research was to provide a baseline for specific aquatic insect species distributions at high-elevation lentic habitats in Northcentral Colorado and Southern Wyoming. I provided occurrence records of the Hudsonian Emerald dragonfly (*Somatochlora hudsonica*, HED) in Northcentral Colorado and Southern Wyoming. The HED is the only Colorado dragonfly listed as threatened by the US Forest Service. It was ranked as critically imperiled in Colorado and vulnerable in Wyoming. I used Maxent (Maximum entropy), a machine learning program that uses species presence data and environmental variables to predict the potentially suitable habitat for species. Maxent was used to plot a map of the potentially suitable habitats of HED. Temperature seasonality, mean temperature of wettest quarter, precipitation of warmest quarter, precipitation of driest quarter, and precipitation seasonality were the key environmental factors for predicting the occurrence of HED in appropriate high-elevation lakes of Northcentral Colorado and Southern Wyoming with an accumulated contribution of 91%. Results of this study provided baseline data for the US

Forest Service to assist to evaluate the conservation status of HED and potentially initiate protection plans in two national forests (The Arapaho & Roosevelt National Forest and the Medicine Bow & Routt National Forest) in Colorado and Wyoming. I report adult caddisflies from 136 montane and alpine lentic habitats, primarily lakes, of seven northern Colorado counties for the first time. My objective was to provide species records of adult and larval caddisflies from high-altitude lentic habitats that are not generally well sampled. These lakes may be potentially impacted by current and future global climate change scenarios. Field collection of adults and rearing of larvae were included with available unpublished and published records, resulting in 541 confirmed records of caddisfly species. Forty-nine species, representing 24% of all known Colorado caddisflies are documented. Seven families and 24 genera are represented. The Limnephilidae comprised 76% of the 49 recorded species. The other six families were usually represented by only one to four species. Distribution maps are presented for the six families and the most common limnephilid species. Montane and alpine lakes are vulnerable ecosystems likely to be impacted by climate change. Comprehensive faunal surveys are key to understanding long-term biodiversity changes and establishing conservation needs and priorities. In addition, species lists of taxa are important to monitor future faunal biodiversity changes." (Author)] Address: not stated

19623. Augustine, B.; Eo, J.; Kim, M.-H.; Kim, M.-K.; Choi, S.-K.; Yeob, S.-J.; Bang, J.-H.; Danquah, O. (2021): Effects of temperature and water management in rice fields on larval growth of *Pantala flavescens* (Odonata: Libellulidae). *Korean Journal of Environmental Biology* 39(4): 536-541. (in English) ["*P. flavescens* is a dominant Odonata species in the rice fields in Korea. To determine the effects of different temperatures on its larval growth and emergence, field and laboratory experiments were conducted. Larval growth was also monitored in mono-cropping and double-cropping rice fields. The growth of larvae was monitored every week by measuring the head width. In the field experiment, no difference was found in larval growth and emergence between the control temperature and +1.9°C of the control temperature. The larval growth was greater at 23°C than at 20°C laboratory temperatures, and no emergence was recorded at either temperature after eight weeks of monitoring. There was a quadratic relationship between larval growth and temperature in an incubator at five temperature regimes of 15, 20, 25, 30, and 35°C. Midseason water drainage caused the extinction of the existing individuals and newly hatched larvae dominated after re-watering in the rice fields. Larval size was greater in double-cropping fields than in mono-cropping fields in late July but the tendency was reversed in early August. The results of this study suggest that temperature warming will directly promote the larval growth of *P. flavescens* and indirectly influence seasonal growth via changes in water management in rice fields." (Authors)] Address: Eo, J., National Institute of Agricultural Sciences, Wanju 55365, Republic of Korea. E-mail. eo.jiny@korea.kr

19624. Basooma, A.; Teunen, L.; Semwang, N.; Bervoets, L. (2021): Trace metal concentrations in the abiotic and biotic components of River Rwizi ecosystem in Western Uganda, and the risks to human health. *Heliyon* 7(11): e08327: 13 pp. (in English) ["Highlights: • Surface waters at Katenga and Kayanja were contaminated with gold and mercury. • Concerning metals the surface water was generally safe for human consumption at most sites. • The sediment trace metal levels posed no ecological risks to the benthic biota. • Arsenic and mercury concentrations in *Brycinus sadleri*

muscle posed a potential human health risk. Abstract: The distribution of metals in the Rwizi River ecosystem was investigated and human health risks were assessed. Samples of water, sediment, damselfly larvae (*Ceriatrigon glabrum*) and fish species (*Brycinus sadleri* and *Barbus altianalis*), were collected at six sites. In all samples the trace elements As, Al, Au, Cd, Co, Cu, Fe, Hg, Mn, Pb, Zn, were quantified. Sediment samples near the gold mine had significantly higher concentrations of Hg, Fe and Al although all the concentrations were below the probable effect concentrations (PEC). The dissolved concentrations of trace metals were within the European standards and WHO drinking water guidelines. However, Fe and Mn concentrations exceeded the standards at three sites. The damselfly larvae were good indicators of local metal pollution. The fish species accumulated metal levels in the order gills>liver>muscle for most metals except for Hg. Multiple regressions between accumulated metals in damselfly with environmental metal levels showed only for Au and Cd significant positive relationships. Relating environmental metal levels and physico-chemical characteristics to the levels in the invertebrates, only for Cu and Pb significant relationships were found. With respect to the measured metals, the fish were safe for human consumption in most cases although *Brycinus sadleri* posed a potential health risk due to a As hazard quotient (HQ) of 2.2 that exceeded the critical value of 1. Similarly, the maximum edible risk-free quantity (Q) for As in *Brycinus sadleri* was 1.5 g (95 % CI), less than the minimum risk free quantity of 31.5 g. In conclusion, the river water was safe for drinking but the extraction of gold using Hg should be replaced with an environmentally friendly method or an effective wastewater treatment should be instituted. People should be cautioned from consuming *Brycinus sadleri* to avoid potential health hazards." (Authors)] Address: Bervoets, L., Department of Biology, Laboratory of Systemic, Physiological and Ecotoxicological Research, University of Antwerp, Groenenborgerlaan, 171 2020, Antwerp, Belgium. Email: lieven.bervoets@uantwerpen.be

19625. Behr, H. (2021): Fotonachweis von *Stylurus flavipes* (Odonata: Gomphidae) in Schwerin. *Virgo* 24: 79. (in German) [On 15 August 2020, a photo record (Fig. 1) of a female of *S. flavipes* was made in the former Wüstmark gravel pit near Schwerin in Mecklenburg-Western Pomerania, Germany. This site is far away (at least 60 km) from the previously known larval habitats on the Elbe in this federal state. Especially female imagines of this stenotopic species were relatively rarely observed close to the breeding water. In the literature, records at distances of up to 25 km (Wildermuth & Martens 2019) or 35 km (Menke et al. 2016) from the nearest river have been described. Mauersberger (2013) also reports colonisation of suboptimal water bodies, smaller rivers and canals, as well as individual finds in Brandenburg that cannot be assigned to any reproductive habitat. Overall, the species, which is protected throughout Europe under Annex IV of the Habitats Directive, appears to have been recolonising suitable habitats at the western limit of its distribution since the 1990s, following considerable population declines on large rivers in Central and Western Europe (Wildermuth & Martens 2019). From Mecklenburg-Western Pomerania, observations of this stream valley species are so far only available from the Elbe region (Bönsel & Frank 2013)."] (Author/DeepL)] Address: Behr, H., Herrengrabenweg 57, 19061 Schwerin, Germany. Email: hauke-behr@web.de

19626. Beukema, J.J. (2021): Upstream and downstream movements in adults of stream-dwelling Odonata. *Odonatologica* 50(3/4): 239-250. (in English) ["Based on data from

the literature on along-stream movements of adult stages of Odonata, comparative preference for upstream or downstream movement is evaluated. The great majority of publications reported upstream movement. Upstream migration was reported particularly in species of Calopterygidae and Gomphidae. Upstream movements are potentially functional: they compensate for downstream larval drift. The mechanism behind the net directed movements, however, is unknown and controversial. Movements in general may be largely undirected, but, in the presence of downstream drift by larvae an innate tendency either to move upstream or to stay at upstream locations is expected." (Author)] Address: Beukema, J.J., Linieweg 19, NL 1783 BA Den Helder, The Netherlands. Email: jan.beukema@outlook.com

19627. Blow, R.; Willink, B.; Svensson, E.I. (2021): A molecular phylogeny of fork-tail damselflies (genus *Ischnura*) reveals a dynamic macroevolutionary history of female colour polymorphisms. *Molecular Phylogenetics and Evolution* 160 (2021) 107134: 12 pp. (in English) ["Colour polymorphisms are popular study systems among biologists interested in evolutionary dynamics, genomics, sexual selection and sexual conflict. In many damselfly groups, such as in the globally distributed genus *Ischnura* (fork-tails), sex-limited female colour polymorphisms occur in multiple species. Female-polymorphic species contain two or three female morphs, one of which phenotypically matches the male (androchrome or male mimic) and the other(s) which are phenotypically distinct from the male (heterochrome). These female colour polymorphisms are thought to be maintained by frequency-dependent sexual conflict, but their macroevolutionary histories are unknown, due to the lack of a robust molecular phylogeny. Here, we present the first time-calibrated phylogeny of *Ischnura*, using a multispecies coalescent approach (StarBEAST2) and incorporating both molecular and fossil data for 41 extant species (55% of the genus). We estimate the age of *Ischnura* to be between 13.8 and 23.4 millions of years, i.e. Miocene. We infer the ancestral state of this genus as female monomorphism with heterochrome females, with multiple gains and losses of female polymorphisms, evidence of trans-species female polymorphisms and a significant positive relationship between female polymorphism incidence and current geographic range size. Our study provides a robust phylogenetic framework for future research on the dynamic macroevolutionary history of this clade with its extraordinary diversity of sex-limited female polymorphisms." (Authors)] Address: Blow, Rachel, Department of Zoology, University of Cambridge, Cambridge, UK

19628. Bota-Sierra, C.A.; Flórez-V, C.; Escobar, F.; Sandoval-H., H.; Novelo-Gutiérrez, R.; Londoño, G.A.; Cordero-Rivera, A. (2021): The importance of tropical mountain forests for the conservation of dragonfly biodiversity: A case from the Colombian Western Andes. *International Journal of Odonatology* 24: 233-247. (in English) ["Forests have been widely recognized as key habitats for odonate (dragonflies and damselflies) biodiversity, but the importance of forests for holding odonate biodiversity remains understudied in tropical mountains, one of the most diverse ecosystems on the planet. Here we describe the odonate assemblage composition along the elevation gradient in the Tamá Mountains (Colombian Cordillera Occidental). We analyzed the effects of elevation, habitat, and suborder on species richness and endemism. We found that the richest assemblage occurred in the foothills between 300 and 600 m, where the biotas of the Chocó biogeographic region and

the Tropical Andes converge. Anisoptera richness was higher in open habitats, that of Zygoptera higher in forests. Richness and endemism decreased with elevation, and no relation between habitat and richness was found. However, the number of endemic species was strongly related to forests, which harbored 25 out of 28 endemic species. Also, forest odonates had narrower elevation ranges than open-habitat odonates. These patterns can be explained because tropical mountains were historically covered by forests, while open habitats derived from human activities (i.e., pastures) that have flourished in the past centuries. The forest odonate assemblages at different elevations have been evolving for millions of years, in relatively stable ecological conditions, which could promote the high number of forest endemics in the tropical mountains. Our results emphasize the role of tropical mountain forests in the conservation of Odonata diversity." (Authors)] Address: Bota-Sierra, C.A., Red de Biodiversidad y Sistemática, Instituto de Ecología, A.C., Xalapa, México, Email: corneliobota@gmail.com

19629. Brito, J.S.; Michelan, T.S.; Juen, L. (2021): Aquatic macrophytes are important substrates for Libellulidae (Odonata) larvae and adults. *Limnology* 22: 139-149. (in English) ["Understanding the role of abiotic and biotic factors on biological communities is a challenge for ecologists. Individuals of the order Odonata have a close connection with these factors, which can influence the establishment of each stages of life. This study evaluated the relationship between habitat complexity and limnological variables on the diversity of Libellulidae larvae and adults. Our hypotheses were that (i) limnological variables would have a greater influence than habitat complexity on larvae and (ii) habitat complexity would influence more adults. Forty-six sampling sites were evaluated in the Brazilian Amazon region. Our results indicated the effects of limnological variables and habitat complexity on both life stages, with higher influence of the first on larvae and the second on adults, mainly for species composition. The abundance of the *Eichhornia azurea*, which has enormous morphological plasticity, together with the presence of a range of other macrophyte species provides different habitat architectures, with more suitable microhabitats for different odonates. The habitat complexity metrics had combined effects on the larvae, presumably because of the greater availability of refuges from predators and food sources. In contrast, in the adults, the relationship with habitat complexity is associated with the availability of ovipositing sites and perches." (Authors)] Address: Brito, J.S., Lab. of Ecology & Conservation, Institute of Biological Sciences, Universidade Federal Do Pará, Belém, Pará, Brazil

19630. Brockstedt, M.; Joest, R.; Schukys, H.; Seehausen, M. (2021): Schlupf von *Neurothemis ramburii* in einem Göttinger Aquarium – erster Nachweis für Europa. *Libellula* 40 (3/4): 173-178. (in German, with English summary) ["On March 26th, 2020 (possibly also on the 25th) two individuals of *N. ramburii* (1 ♂, 1 ♀) emerged from an aquarium in Göttingen, Germany. The specimens were handed over to the natural history collections of the Museum Wiesbaden. This is the first record of this species in Germany and Europe. It increases the number of exotic dragonflies found in Germany to ten species. As with most of the exotic dragonfly species found in German aquariums so far, *N. ramburii* is an Asian species with a broad ecological amplitude." (Authors)] Address: Seehausen, M.; Fährhofstr. 11, 18439 Stralsund, Germany. Email: m.seehausen@gmx.de

19631. Büsse, S.; Tröger, H.-L.; Gorb, S.N. (2021): The toolkit of a hunter – functional morphology of larval mouthparts

in a dragonfly. *Journal of Zoology* 315(4): 247-260. (in English) ["The diversity of mouthpart specializations in insects is staggering. As a direct consequence thereof, the knowledge about the mouthpart geometry, muscle attachment and feeding kinematics is incomplete for the vast majority of insect taxa – as it is for dragonflies. The adult dragonflies catch their prey in flight, while the aquatic larvae prey under water – both life stages being key predators in their biotopes. To gain insights into the functional morphology of the biting-chewing mouthparts of larval *Anax imperator*, we combined results from micro computed tomography (μ CT), confocal laser scanning microscopy (CLSM) and high-speed videography. *Anax imperator* larvae were filmed during the feeding process to describe the movement and coordination of the mouthparts. These results, together with μ CT-data, allowing for a comprehensive visualization of the 3D-geometry and corresponding musculature of each mouthpart. The material composition of the cuticle strongly influences the strength, mobility and durability of the cuticular components of the mouthparts. With this paper, we elucidate the anatomy, geometry and material composition of *A. imperator*'s larval mouthparts in the light of the feeding process. Furthermore, we try to lay a foundation for functional morphological comparisons of mouthparts (1) between dragonfly species belonging to different eco-types according to their food preferences and feeding habits or even (2) between different insect groups." (Authors)] Address: Büsse, S., Dept of Functional Morphology & Biomechanics, Inst. Zool., Kiel University, Am Botanischen Garten 9, 24118 Kiel, Germany. E-mail: sbuesse@zoologie.uni-kiel.de

19632. Buskirk, J. van; Smith, D.C. (2021): Ecological causes of fluctuating natural selection on habitat choice in an amphibian. *Evolution* 75(7): 1862-1877. (in English) ["We estimated natural selection targeting three traits related to habitat choice in a frog (*Pseudacris maculata*) breeding in pools on the rocky shores of Isle Royale, Michigan, over 16 years. Our aim was to identify the form and ecological causes of annual variation in directional and correlational selection as expressed in the survival and growth of tadpoles. We found directional selection favoring early breeding, but pool choice was under weak stabilizing selection. However, the form of stabilizing selection and the position of the optimum trait value shifted among years with the severity of disturbance and the intensity of biotic interactions. In years when wave wash and pool desiccation were severe, selection shifted to favor tadpoles in habitats where these risks were less pronounced. If predatory dragonfly larvae [*Aeshna juncea*] were abundant, selection favored tadpoles in small pools where dragonflies did not occur. When intraspecific competition was strong, selection favored early broods within a broader range of pool types. The agents of selection in this study-biotic interactions and disturbance-are common to many ecological systems and frequently exhibit temporal variation; this suggests that fluctuating selection may be widespread in natural populations." (Authors)] Address: Buskirk, J. van, Institute of Zoology, Univ. of Zürich, 8057 Zürich, Switzerland. E-mail: jvb@zool.unizh.ch

19633. Cardo-Maeso, N.; Díaz-Martínez, C.; Requena-Valcuende, M. (2021): Nuevos registros de *Oxygastra curtisii* (Dale, 1834) (Odonata: incertae sedis) en Castilla-La Mancha (centro-este de España). Article in *Boletín de la Sociedad Entomológica Aragonesa* 69: 214-216. (in Spanish, with English summary) ["New records of *O. curtisii* in Castilla-La Mancha (east-center of Spain) Abstract: In Castilla-La Mancha, *O. curtisii* was only reported from two sites in the province of Cuenca. Here we communicate three new

localities that are the first records of this species for the provinces of Guadalajara, Toledo and Albacete; and allow us supposing that it could occur throughout the administrative region, since the lagoons of Ruidera, apart from Albacete, are also located in the province of Ciudad Real. The importance of the study of larvae in faunistics is highlighted." (Authors)] Address: Cardo-Maeso, Nuria, Sociedad Entomológica y Ambiental de Castilla-La Mancha, C/ Londres, 7, 45003 Toledo, Spain. Email: cmvega@gmail.com

19634. Chandran, R.; Chandran, A.V. (2021): Dragonflies and damselflies (Insecta: Odonata) of Aryanad Grama Panchayat, Kerala, India. *Journal of Threatened Taxa* 13(14): 20153-20166. (in English) ["A year-long study to document the diversity and seasonality of odonates was conducted at Aryanad Grama Panchayat, Thiruvananthapuram district, Kerala, southern India. A total of 93 species (56 dragonflies and 37 damselflies) belonging to 12 families were recorded. Twenty-four species of odonates recorded are endemic to the Western Ghats, three to peninsular India and one to India. Small streams showed the highest species richness, hosting 69 species and ponds the lowest with 59 species. Species richness showed a peak during the southwest monsoon season and a dip in winter. The study highlights the importance of biodiversity documentation at regional level." (Authors)] Address: Chandran, R., Society for Odonate Studies, Vellooparampil, Kuzhimattom PO, Kottayam, Kerala 686533, India

19635. Chen, Y.-H.; Chen, H.-Y.; Lai, C.-J.; Hsu, J.-H.; Li, K.-Y.A.; Yang, H. (2021): Tunable omnidirectional antireflection coatings inspired by inclined irregular nanostructures on transparent Blue-Tailed Forest Hawk dragonfly wings. *Langmuir* 37(31): 9490-9503. (in English) ["Randomly arranged inclined irregular nanostructure-covered blue-tailed forest hawk dragonfly wings are highly transparent for wide viewing angles. Inspired by the dragonfly wings, monolayer silica colloids are self-assembled on shape memory polymer-coated substrates and utilized as plasma etching masks to pattern disorderly arranged inclined irregular conical structures. The structures build gradual refractive index transitions at various angles of incidences, resulting in omnidirectional antireflection performance over the whole visible wavelength region. In comparison with a bare substrate, the optimized structure-covered substrate presents 10% higher optical transmission at 0° and even 41% higher optical transmission at an angle of incidence of 75°. Importantly, by manipulating the structural configuration of the shape memory polymer-based structures, the corresponding antireflection characteristics can be instantaneously and reversibly eliminated and recovered after drying out of common household liquids or applying contact pressures in ambient environments. The tunable omnidirectional antireflection coatings are prospective candidates for realizing optical modulation, which exhibits an enormous application value in smart windows, intelligent display screens, optical components, and novel optoelectronic devices.] Address: Chen, Y.-H., Dept Chemical Engineering, Nat. Chung Hsing Univ., 145 Xingda Road, Taichung City 40227, Taiwan

19636. Cho, S. (2021): Korean Odonata - Adult and Larva. Kwangil Publishing Co. ISBN: 978-89-86752-76-2 96490: 404 pp. (in bilingual English/Korean) ["A detailed guide for those who want to look over and be able to identify the dragonflies of Korea and East Asia. This book contains photographs of all 94 South Korean species with high-resolution photos of adults in dorsal, lateral, and anterior view, together with caudal appendages, larvae, teneral (by in-house

breeding & emerging for the purpose of correctly identifying larva species), distribution maps, and distinction of adults & larvae in a family or a genus. The appendix includes dragonflies in the Northern half of the Korean peninsula as well as migration records.]

19637. Chovanec, A. (2021): Variationen der Bereifung beim Großen Blaupfeil, *Orthetrum cancellatum* (Linnaeus, 1758) (Odonata: Libellulidae). *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen* 73: 1-17. (in German, with English summary) ["Variations of pruinescence in the black-tailed skimmer, *Orthetrum cancellatum* (Linnaeus, 1758) (Odonata: Libellulidae). – The present paper deals with strong pruinescence in male and female *Orthetrum cancellatum* (Linnaeus, 1758) specimens documented in Lower Austria near Vienna in 2016. Even in middle-aged males, the thorax was wax-covered to a degree known particularly from the southern parts of the species' distribution range. Moreover, frontes, veins at the wing base, second abdominal segments and femora were also covered with wax. A mature middle-aged female was characterised by intense pruinescence on the ventral surface of the abdomen. The clinal phenotypic variation of this species is discussed for the first time on the basis of specimens recorded in Austria. Key word s: *Orthetrum cancellatum*, Libellulidae, pruinosity, thermoregulation, clinal variation." (Author)] Address: Chovanec, A., Krotenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-Mail: andreas.chovanec@bmlrt.gv.at

19638. De, K.; Sharma, S.; Singh, A.P.; Uniyal, M. (2021): Checklist of Odonata (Insecta) of Doon Valley, Uttarakhand, India. *Journal of Threatened Taxa* 13(14): 20167-20173. (in English) ["In this communication, we have collated a checklist of 97 species of odonates from Doon valley, Uttarakhand by reviewing the literature. These species are distributed across 13 families, 58 genera, and eight superfamilies. Of these species, 60 were Anisoptera and 37 were Zygoptera. Among the odonates reported from the Doon valley, three dragonflies namely *Anormogomphus heteropterus* Selys, 1854, *Burmogomphus sivalikensis* Laidlaw, 1922, and *Hylaeothemis gardeneri* Fraser, 1927 and two damselflies *Agriocnemis corbeti* Kumar & Prasad, 1978 and *Calicnemia doonensi* Sangal & Tyagi, 1984 are endemic to India. This checklist updates existing knowledge on insect diversity in the Doon valley and will aid conservation management of wetlands in the region." (Authors)] Address: De, K., Department of Life Sciences, Sri Sathya Sai University for Human Excellence, Navanihal, Karnataka 585313, India. Email: kritish.de@gmail.com

19639. De, K.; Sarkar, A.; Singh, K.; Uniyal, V.P.; Johnson, J.A.; Hussain, S.A. (2021): Diversity of aquatic insects and biomonitoring of water quality in the upper Ganga River, a Ramsar site: a preliminary assessment. *Journal of Threatened Taxa* 13(13): 20011-20018. (in English) ["Monitoring of freshwater habitats through aquatic insects is widely used. A study was carried out in March, 2019 at 14 sites in the Upper Ganga River between Brijghat and Narora, a riverine Ramsar site in India, to document the diversity of three major aquatic predatory insect groups—Odonata, Coleoptera, and Hemiptera—and determine their biomonitoring potential. The study recorded three species of Coleoptera, four Hemiptera, 14 dragonflies, and eight damselflies. The Shannon diversity index (H') ranged from 2.465 to 2.782, Pielou's Evenness index (J') from 0.841 to 0.894, and Berger-Parker index of dominance (d) from 0.122 to 0.243. Families Libellulidae (Odonata), Coenagrionidae (Odonata) and Gerridae (Hemiptera) had high relative abundance and

dominant status. The stream invertebrate grade number-average level (SIGNAL2) score (for family) ranged from 2.316 to 3.174, lying within quadrant 2 of the SIGNAL2 (family) quadrant diagram. This suggested that the water in the area is likely to have high levels of turbidity, salinity, or nutrients, caused naturally or by anthropogenic activities, and the water has low levels of most toxic chemicals." (Authors)] Address: De, K., Department of Life Sciences, Sri Sathya Sai University for Human Excellence, Navanihal, Okali Post, Kamalapur, Karnataka 585313, India

19640. De Knijf, G.; Wils, C.; Maes, D. (2021): IUCN Rode Lijst van de libellen (Odonata) in Vlaanderen. Rapporten van het Instituut voor Natuur- en Bosonderzoek 2021 (59): 58 pp. (in Dutch, with English summary) ["The Red List criteria of the International Union for Conservation of Nature (IUCN) are intended to be an easily and widely understood system for classifying species at high risk of extinction. However, while the Red List may focus attention on those taxa at the highest risk, it is not a means of setting priorities for conservation measures for their protection. These Red List criteria recommend revising Red Lists every ten years. The previous Red List dated from 2006. Because many new data have become available and the status of several species has changed since then, the current state of dragonflies in Flanders was assessed according to the international IUCN Red List criteria. For this, we used four of the five possible IUCN-criteria, namely changes in distribution (IUCN criterion A), the area size (IUCN criterion B) and the estimated population size (IUCN criteria C and D). In total, 59 species were evaluated against these criteria and then assigned to the corresponding IUCN Red List category. Some new species have recently colonised Flanders (*Coenagrion scitulum*, *Aeshna affinis*, *Anax parthenope* and *Sympetrum meridionale*) and are now classified as resident species, due to their rapid expansion. A total of: „* 5 species are Regionally Extinct in Flanders: *Coenagrion mercuriale*, *Nehalennia speciosa*, *Aeshna subarctica*, *Epitheca bimaculata* and *Oxygastra curtisii*; „* Seven species are Critically Endangered: *Coenagrion hastulatum*, *C. lunulatum*, *Somatochlora arctica*, *Leucorrhinia caudalis*, *L. pectoralis*, *Sympetrum depressiusculum* and *S. flaveolum*; „* Four species are Endangered: *Aeshna juncea*, *Cordulegaster boltonii*, *Leucorrhinia rubicunda* and *Sympetrum danae*; „* Four species are Vulnerable: *Gomphus vulgatissimus*, *Leucorrhinia dubia*, *Sympetrum pedemontanum* and *S. vulgatum*; „* One species is Near Threatened: *Gomphus pulchellus*; „* The remaining 43 species are of Least Concern. We discuss the IUCN-criteria used per species and compare the new Red List with the previous Red Lists by means of the so-called Red List Index. Overall, dragonflies and damselflies in Flanders are doing better than in previous decades. This is mainly due to species of nutrient-rich waterbodies that are doing markedly better than in the past as a result of habitat restoration, creation of new ponds (e.g. garden ponds) and waters in an urban or industrial context, and to species that benefit from climate warming. The group of 'southern' species enabled to successfully colonize Flanders also contributed to an increase in the number of Least Concern species. However, species from nutrient-poor waterbodies (fens, peatbogs and other oligotrophic waters) continue to perform poorly and deserve special attention in nature policy and nature management. Populations of several species decreased dramatically in the last 5 years. Those species are negatively affected by still too high nitrogen deposition in Flanders, increased warm weather and extreme drought events leading to (partially) desiccation of these kinds of waters, and in many cases from too intensive management of

their terrestrial habitat, resulting in the cutting of shrubs and trees near their reproductive biotopes. The drawing up of one or more Species Protection Plans is therefore more than urgently needed if we do not want to have these species disappear permanently from Flanders.] Address: Knijf, G. de, Research Institute for Nature and Forest (INBO), Havenlaan 88 bus 73, 1000 Brussels, Belgium. E-mail: geert.deknijf@inbo.be

19641. de Vries, R.; Middelbos, R. (2021): A minor invasion of the Yellow-winged darter (*Sympetrum flaveolum*) in the Netherlands in 2020. *Brachytron* 22(1/2): 3-12. (in Dutch, with English summary) ["An invasion of *S. flaveolum* reached the Netherlands in August 2020. The first observation was made on 12 August, and on 14 August at least 40 individuals were observed on the island of Terschelling. Observations were made during August and September from 18 localities in the northern half of the Netherlands, including 37 individuals on 21 August in Eemshaven. Aggregations of dozens of individuals had not been observed in the Netherlands since 2008. Both recent aggregations were only seen on one day and consisted solely (Terschelling) or in large majority (Eemshaven) of males. The contemporary arrival of wandering individuals of *S. danae* at both locations corresponds with observations of this species during earlier influxes of *S. flaveolum* in Western Europe. Like earlier invasions, this influx occurred after persistent eastern winds coming from northern Germany, Poland and countries further eastwards. It is thus likely that the Dutch invasions of *S. flaveolum* originated in these countries. The number of *S. flaveolum* that reached the Netherlands in 2020 was only a fraction of the size of previous invasions. This strong decline is most probably a reflection of the strong decline of this species in Germany and Poland, and possibly even more countries in Central and Eastern Europe." (Authors)] Address: Reinier de Vries: vries.reinier@gmail.com

19642. Dey, A.; Khan, P., Barik, S.; Mishra, A.K.; Sundi, P. (2021): Aquatic fauna of Suleipat reservoir, Mayurbhanj, Odisha, India. *e-planet* 19(2): 134-141. (in English) ["This survey was conducted to analyse the diversity of aquatic fauna at Suleipat reservoir. The distribution and diversity of aquatic fauna, and physical, parameters of Suleipat reservoir were studied in the latitude and longitude of 22.122541° N and 86.237750° E. In the study area 4 sites were sampled. Fauna and water variables were randomly collected 8-10 times. This study focused the diverse assemblage of both vertebrate and invertebrate indices. Overall, 87 species were recorded from the study site. Among the aquatic fauna collected from the reservoir, the order Odonata and Agnatha were the most dominant orders varies impressive numbers. The highest Simpson and Shannon index of diversity was 0.64325 and 1.382375, and the evenness index was 0.671875. The high species diversity and evenness in all the sites indicated a good quality of water. There was no back record found about the aquatic diversity of Suleipat reservoir near Bareservoiripahar, Rairangpur forest division in Mayurbhanj district, hence this study was undertaken." (Authors) Identifications of the Odonata should be treated with caution as some species are of European origin and don't occur in India.] Address: Sundi, P., Dept of Wildlife & Biodiversity Conservation, Maharaja Sri Ram Chandra Bhanja Deo University, Takatpur, Baripada, Odisha, India. Email: prabhasinisundi123@gmail.com

19643. Dossi, F.; Leitner, P.; Graf, W. (2021): Age matters: substrate-specific colonization patterns of benthic invertebrates on installed large wood. *Aquatic Ecology* 54: 741-

760. (in English) ["Large wood (LW) is an indispensable element in riverine ecosystems, especially in lower river parts. The presence of LW significantly shapes local hydraulics, morphology, the nutrient budget; promotes overall river dynamics; and additionally presents a unique habitat for numerous benthic invertebrate species. Therefore, LW is recognized as valuable asset for river restoration measures. Experiences from previous projects show that ecological responses on LW implementation measures vary greatly. That complicates comparisons and estimations on the success of planned measures. Methodological inconsistencies and thus reduced transferability of the results is one major issue. Additionally, wood quality aspects are suspected to be important factors affecting benthic invertebrate colonization patterns. The focus of this study is therefore to consistently assess the ecological significance of installed LW and concrete samples of similar size and shape in terms of benthic invertebrate colonization and to further test, if the condition of wood affects the benthic invertebrate colonization. Our results show that (1) installed LW serves as an abundantly and heterogeneously colonized habitat, (2) the state of decay of LW pieces significantly affects benthic invertebrate colonization in terms of density and diversity and (3) even rare or threatened taxa closely associated to LW were abundantly present on the installed logs, emphasizing the suitability of the chosen approach." (Authors) *Platycnemis pennipes*, *Calopteryx* sp., *Onychogomphus* sp., *Gomphus vulgatissimus*, *Ophiogomphus cecilia*] Address: Dossi, F., IHG – Inst. of Hydrobiology and Aquatic Ecosystem Management, BOKU - University of Natural Resources and Life Sciences, Gregor-Mendel-Str. 33, 1180 Vienna, Austria. Email: florian.dossi@boku.ac.at

19644. Esposito, C.; Nardi, G. (2021): Primo caso di riproduzione di *Ischnura elegans* (Vander Linden, 1820) nelle Isole Ponziane (Odonata, Coenagrionidae). *Bollettino dell'Associazione Romana di Entomologia, Nuova Serie* 2(1-4): 1-13. (in Italian, with English summary) ["A successful breeding of *I. elegans* in the Pontine Islands (Odonata, Coenagrionidae). - The authors reports the first record of *I. elegans* successfully breeding in Ponza Island (Tyrrhenian Sea). They underline that the year of publication of its subspecies described by Erich Schmidt is 1939 and not 1938. They discuss a bibliographic record of *Anax imperator* for this island and, finally, summarize the current knowledge on the Odonata of the Ponziane Islands, where the presence of seven species of Anisoptera and one of Zygoptera has so far been ascertained." (Authors)] Address: Esposito, C., Via della Necchia est, 31 - 00049 Velletri (Roma), Italy. Email: esposito-carm@tiscali.it

19645. Florez-Abreu, S.; García, A.G.; Cuervo, A.M.G. (2021): Descripción histológica de la organización neuronal en el cerebro de *Argia* (Odonata: Coenagrionidae), *Stilpnochlora* (Orthoptera: Tettigoniidae) y *Pepsis* (Hymenoptera: Pompilidae). *Boletín de la SEA* 69: 106-110. (Spanish, with English summary) ["Histology is a tool that allows us to understand the tissue characteristics of organs, but its application goes beyond a simple description. Here we describe the histology of the brain of an odonate, an orthopteran and a hymenopteran, organisms with behavioral variation and differences in their evolutionary history, and compare their histological makeup. This research shows the relationship between neuronal characteristics and insect behaviour, showing the link between the morpho-neuronal aspects of hexapods and their phylogenetic origin." (Authors)] Address: Flórez-Abreu, S., Grupo de investigación en Biología evolutiva neotropical ECOBIT. Departamento de Biología,

Universidad Incca de Colombia, Bogotá, Colombia

19646. Fontenla, J.L.; Fontenla, Y. (2021): Mariposas (Papilionoidea) y libélulas (Odonata) de humedales al sur de las provincias de Artemisa y Mayabeque, Cuba. *Poeyana* 512: 1-12. (in Spanish, with English summary) ["Species composition and spatial patterns of butterflies and dragonflies are determined and interpreted in six areas of wetlands South of Artemisa and Mayabeque provinces, Western Central Cuba. Four sites were located along the South Dam. There were observed 41 butterflies and 20 dragonflies species. In relation to the total Cuban species in each group, local proportion was 22 % and 23 %, respectively. Butterflies exhibited spatial connectance (47 %) higher than the dragonflies' (35 %). Dissimilarity species composition among sites was high in both groups. The road to Mayabeque Beach was the most connected locality in butterflies and the stretch of the South Dam associated to Majana Beach was the most connected locality in dragonflies. The spatial pattern in butterflies was significant nested and in dragonflies did not differ from random. There was a distinct core in butterflies of habitat generalist species. The most abundant butterfly species were *Anartia jatrophae*, *Ascia monuste* y *Phoebis sennae*. It is worth to mention among dragonflies to *Pantala flavescens* and *Miathyria marcella* as abundant species, *Erythrodiplax berenice* as habitat specialist, and *Telebasis dominicana* as uncommon species." (Authors)] Address: Fontenla, J.L., Depto de Zool., Inst. de Ecología y Sistemática, Carretera de Varona No. 11835 entre Oriente y Lindero, Reparto Parajón, Municipio Boyeros, La Habana 19 C.P. 11900, Cuba. Email: fontenla@ecologia.cu

19647. Garrido-González, C.; Navarrete-Medina, Y.; Vera-Sánchez, A. (2021): Descripción del último estadio larval de *Phyllopetalia apicalis* (Odonata: Austropetaliidae). *Revista Mexicana de Biodiversidad* 92 (2021): e923798: 12 pp. (in Spanish, with English summary) ["The last larval instar of *Phyllopetalia apicalis* (Selys, 1858) is described. Based on male and female specimens reared until emergence under laboratory conditions; the specimens were collected in the Andes mountains range of Central Chile. The morphological study has been made with optical microscopy and SEM. Additionally, a regional taxonomic key adaptation is proposed." (Authors)] Address: Vera-Sánchez, A., Universidad Metropolitana de Ciencias de la Educación, Facultad de Ciencias Básicas, Departamento de Biología, Avenida José Pedro Alessandri 774, Ñuñoa, Santiago de Chile, Chile. Email: alejandro.vera@umce.cl

19648. Gassmann, D. (2021): Libellenbeobachtungen am Bonner Rheinausee. *Koenigia* 15(2): 53-63. (in German, with English summary) ["Miscellaneous observations on the dragonfly fauna of Rheinaue Lake, an inner-city artificial lake situated close to the Rhine River in Rheinaue Leisure Park and established 1979 in Bonn, Germany, are reported. 12 species in total were recorded, among them six Anisoptera (*Aeshna mixta*, *Anax imperator*, *Crocothemis erythraea*, *Libellula quadrimaculata*, *Orthetrum cancellatum*, *Sympetrum sanguineum*), and six Zygoptera (*Chalcolestes viridis*, *Enallagma cyathigerum*, *Erythromma najas*, *E. viridulum*, *Ischnura elegans*, *Lestes sponsa*). The records of *E. najas* and *L. quadrimaculata* originate from 2019 only. The biology and ecology of selected species is discussed. Both future systematic monitoring of local dragonfly species and environmental education of park visitors are recommended." (Author)] Address: Gassmann, D., Sektion Arachnida, Stiftung Zoologisches Forschungsmuseum Ale-

xander Koenig, Adenauerallee 160, D-53113 Bonn, Germany. EMail: d.gassmann@leibniz-zfmk.de

19649. Gefen, E.; Matthews, P.G.D. (2021): From chemoreception to regulation: filling the gaps in understanding how insects control gas exchange. *Current Opinion in Insect Science* 48: 1-6. (in English) ["The study of how insects control their gas exchange and ventilatory patterns has long been hampered by a general lack of information on the location and behavior of their central and peripheral respiratory chemoreceptors. However, the molecular insights gleaned from *Drosophila* larvae and their behavioral responses to ambient O₂ could provide a way forward. Firstly, whether td neurons do indeed function as peripheral respiratory chemoreceptors in *Drosophila* should be demonstrated directly through electrophysiological investigation. Identifying the same or similar neurons expressing aSGCs and/or Grs in the central and peripheral other insects, particularly locusts and cockroaches, would then allow the role of these putative chemoreceptors to be further investigated in a well-studied model for insect gas exchange regulation. In particular, determining how these respiratory chemoreceptors integrate with CPGs, and thus how they are involved in regulating episodic and continuous gas exchange patterns, will require investigations using insects known to display these patterns. But given the diverse neuroanatomy of different insect groups, the configuration in *Drosophila* is unlikely to be universal. Thus, the location and number of respiratory chemoreceptors is expected to differ between insect groups, just as vertebrates show a diversity of internally and externally oriented respiratory receptors. For example, the deaf-ferented thoracic ganglia of a locust can sense and respond to hypoxia and hypercapnia, indicating that, in these insects at least, peripheral td neurons are not necessary for respiratory chemoreception. While this could indicate that neurons expressing aSGCs and CO₂-sensitive Gr receptors are present within the locust's thoracic ganglia, peripheral respiratory chemoreceptors are likely to still play a modulatory role in the intact insect. Moreover, the substantial developmental plasticity of neural elements associated with density-dependent polyphenism, bimodal breathing and holometabolous metamorphosis suggests that extrapolating the mechanistic underpinning of gas exchange in a specific life stage in one insect order to all insects in general may hinder the quest for a general explanation for the adaptive value of variation in gas exchange patterns in insects." (Authors) The paper includes a reference to Odonata.] Address: Gefen, E., Department of Biology and Environment, Faculty of Natural Sciences, University of Haifa- Oranim, Tivon, 3600600, Israel

19650. Gómez-Llano, M.; Germain, R.M.; Kyogoku, D.; McPeck, M.A.; Siepielski, A.M. (2021): When ecology fails: How reproductive interactions promote species coexistence. *Trends in Ecology & Evolution* 36(7): 610-622. (in English) ["That species must differ ecologically is often viewed as a fundamental condition for their stable coexistence in biological communities. Yet, recent work has shown that ecologically equivalent species can coexist when reproductive interactions and sexual selection regulate population growth. Here, we review theoretical models and highlight empirical studies supporting a role for reproductive interactions in maintaining species diversity. We place reproductive interactions research within a burgeoning conceptual framework of coexistence theory, identify four key mechanisms in intra- and interspecific interactions within and between sexes, speculate on novel mechanisms, and suggest future research. Given the preponderance of sexual reproduction

in nature, our review suggests that this is a neglected path towards explaining species diversity when traditional ecological explanations have failed." (Authors) The paper includes references to Calopteryx and Enallagma.] Address: Gómez-Llano, M., Department of Biological Sciences, University of Arkansas, Fayetteville, AR 72701, USA. Email: magomezl@uark.edu

19651. Guimarães, A.T.B.; Rodrigues, A.S.; Pereira, P.S.; Silva, F.G.; Malafaia, G. (2021): Toxicity of polystyrene nanoplastics in dragonfly larvae: An insight on how these pollutants can affect benthic macroinvertebrates. *Science of The Total Environment* 752, 141936: 8 pp. (in English) ["Highlights: • Polystyrene nanoplastic (PS NPs) represent an ecological risk to benthic macroinvertebrates. • PS NPs cause REDOX imbalance in *Aphylla williamsoni* larvae. • Larvae exposed to PS NPs show decreased acetylcholinesterase activity (neurotoxic effect). • PS NPs can accumulate in dragonfly larvae. Abstract: Although nanoplastics (NPs) are known to be toxic to several groups of animals, the effects of such a toxicity on freshwater benthic macroinvertebrate communities remain unknown. Thus, the aim of the current study is to test the hypothesis that polystyrene nanoplastics (PS NPs) (34µg/L - 48h of exposure) lead to biochemical damage in *Aphylla williamsoni* larvae. Data have evidenced high bioaccumulation factor in the analyzed individuals; this finding indicates that, similar to sediments, water is also part of aquatic systems and favors PS NPs retention in dragonfly larvae. Despite the lack of evidence about the interference of these pollutants in the nutritional status of the analyzed animals, their bioaccumulation was associated with REDOX imbalance featured by concomitant increase in the number of evaluated oxidative stress biomarkers (nitric oxide and lipid peroxidation) and antioxidants (antioxidant activity against the DPPH radical and the superoxide dismutase enzyme). On the other hand, the reduced acetylcholinesterase activity observed in larvae exposed to PS NPs has suggested the neurotoxic effect of these pollutants, with potential impact on their nerve and neuromuscular functions. Therefore, the current study is pioneer in showing that PS NPs can affect the health of the investigated larvae, even at small concentrations, for short exposure-time; this outcome reinforces the ecotoxicological risk of these pollutants for freshwater benthic macroinvertebrates." (Authors)] Address: Malafaia, G., Biological Research Laboratory, Goiáno Federal Institution, Urutaí Campus, Rodovia Geraldo Silva Nascimento, 2,5 km, Zona Rural, Urutaí, GO, Brazil. Email: guilhermeifgoiano@gmail.com

19652. Höttinger, H. (2021): Kartierung ausgewählter Schmetterlings- und Libellenarten der FFH-Richtlinie im Rahmen des Interreg-Projektes "Vogelwarte Madárvárta 2" im Neusiedler See-Gebiet, östliches Österreich (Insecta: Lepidoptera, Odonata). *Beiträge zur Entomofaunistik* 22: 227-257. (German, with English summary) ["Within the Interreg project "Vogelwarte Madárvárta" ten target species of butterflies and dragonflies were mapped on 33 days in the years 2018 and 2019 in the area of lake Neusiedl in Burgenland. Four species of dragonflies and six butterfly species were treated, all except *Phengaris alcon* mentioned in the Habitats Directive. Except *Gomphus flavipes* and *Parnassius mnemosyne* all species were found in the investigation period. [...] Dragonflies: The small populations of *Coenagrion ornatum* at a ditch in Podersdorf and at the Golser channel were confirmed. New records of some single specimens succeeded in Tadten (ditches near the wastewater treatment plant) and at the Parndorfer brook. Recom-

recommendations for maintaining ditches were elaborated. An until yet unknown population of *Ophiogomphus cecilia* has been found at a 1200 m long section at the Wulka river. The high nature conservation value of this section is strengthened by the presence of *Gomphus vulgatissimus* and *Oncyhogomphus forcipatus*. *Leucorrhinia pectoralis* was detected at seven sites at the eastern side and western side of lake Neusiedl as well. Population densities were generally small. 2019 no records were made because of desiccation of many waterbodies due to lack of rain. There is still limited information about the larval habitats of the species." (Author)] Address: Höttinger, H., Siebenbrunnengasse 46/1/4, 1050 Wien, Austria. E-Mail: helmut.hoettinger@gmail.com

19653. Höttinger, H. (2021): Kartierung ausgewählter Libellen- und Schmetterlingsarten der FFH-Richtlinie im Rahmen des Interreg-Projektes "WeCon" im mittleren und südlichen Burgenland, Österreich (Insecta: Odonata, Lepidoptera). Beiträge zur Entomofaunistik 22: 87-115. (German, with English summary) ["Within the Interreg project "WeCon" - development of the ecological network of wetlands in the Austrian-Hungarian border region - eleven target species of dragonflies and butterflies were mapped on 33 days in 2019 in middle and southern Burgenland near the border to Hungary. Four species of dragonflies and seven butterfly-species were treated, all mentioned in the Habitats Directive. Except *Leucorrhinia pectoralis* all species were found in the investigation period. 147 records of the target species from the years 2017-2019 were collected in a data bank and used for evaluation and GIS-application. Dragonflies: *Coenagrion ornatum* has been recorded in ditches and brooks in the area of ten villages in the district of Oberpullendorf. Recent findings in southern Burgenland are situated at the Neugraben (Unterbildein, Oberbildein, Holl and Deutsch Schutzen), Hoppachbach (Eitendorf), Limbach and Haselgraben near Urbersdorf and in the flooding area and at the Lahnbach in Heiligenkreuz. *Cordulegaster heros* has been found at brooks in woods in the area of eight villages in the district of Oberpullendorf and in the district of Jennersdorf (Neumarkt an der Raab). *Ophiogomphus cecilia* has been mapped in the area of eleven villages, besides Hammer and Glashütten near Langeck particularly at the rivers Rabnitz (Frankenau), Guns (Lockenhaus), Pinka (Woppendorf, Oberbildein, Gaas, Moschendorf) and Raab (Rax, Neumarkt an der Raab, Welten). [...] Recommendations concerning conservation and management of the habitats, monitoring and cross-border conservation corridors of the target-species are given." (Author)] Address: Höttinger, H., Siebenbrunnengasse 46/1/4, 1050 Wien, Austria. E-Mail: helmut.hoettinger@gmail.com

19654. Hu, F.-S.; Chen, S.-L.; Song, R.-B.; Yeh, W.-C. (2021): Variation in *Fukienogomphus prometheus* (Liefstinck, 1939) reveals *Stylurus takashii* (Asahina, 1966) as a junior synonym, with discussion on the status of *F. choifongae* Wilson & Tam, 2006 (Odonata: Gomphidae). Zootaxa 5072(1): 23-33. (in English) ["We investigate variation of body pattern in *Fukienogomphus prometheus* (Liefstinck, 1939) and notice the similarity of its female to *Stylurus takashii* (Asahina, 1966), an enigmatic species whose male is still unknown. We then review the taxonomic history of *S. takashii* and compare its holotype female with the female *F. prometheus*. Our results show *S. takashii* is a junior synonym to *F. prometheus*. We elucidate the intraspecific variation of *F. prometheus* and provide information for its ecology and distribution in Taiwan. We also discuss the similarities between the adults of *Fukienogomphus choifongae* Wilson & Tam, 2006 and *F. prometheus* which in future studies may

prove to be conspecific and will require to synonymise the two names. Finally, we confirm the genus *Stylurus* Needham, 1897 is not distributed in Taiwan." (Authors)] Address: Hu, F.S., Dept of Entomology, National Chung Hsing University, 145 Xingda Rd., Taichung, 40227, Taiwan. Email: fangshuo_hu@smail.nchu.edu.tw

19655. Ishak, M.; Norhisham, A.R.; Thomas, S.M.; Nurhidayu, S.; Ghazali, A.; Azhar, B. (2021): Physicochemical properties as driver of Odonata diversity in oil palm waterways. *Frontiers in Forests and Global Change* 4:613064: 13 pp. (in English) ["Large-scale oil palm agriculture has caused deforestation in the tropics, but also degrades stream water quality and reduces aquatic biodiversity. Though the outcomes of industrial-scale oil palm plantations for biodiversity have been explored extensively, the consequences of small-scale oil palm agriculture for freshwater macroinvertebrate fauna are poorly understood. Here, we explored the impacts of small-scale oil palm agriculture on aerial adult Odonata, which, due to their inherent sensitivity to habitat degradation, represent useful indicators of wider ecosystem health. We surveyed riparian corridors of man-made waterways in natural habitats converted into agricultural lands in both peat swamp and mangrove forest, comprising a total of 60 sampling units across a region of Peninsular Malaysia where such small-scale agricultural practices are widespread. We hypothesized that physicochemical water quality of oil palm waterways together with riparian vegetation influence Odonata species richness and composition. Our results revealed that Odonata species richness increased with dissolved oxygen, water temperature and vegetation cover, but decreased with water level, pH, and total dissolved solids. Species composition was influenced by both dissolved oxygen and pH. The present study provides valuable insights into the effects of small-scale oil palm agriculture for water quality of associated aquatic habitats, and subsequent responses of adult Odonata. Therefore, smallholders should reduce the use of chemical pesticides and fertilizers to improve the conservation value of oil palm waterways for both Odonata and aquatic fauna more generally, in order to be certified as biodiversity-friendly agriculture." (Authors)] Address: Norhisham, A.R., Inst. of Tropical Forestry & Forest Products, Universiti Putra Malaysia, Serdang, Malaysia. Email: Norhisham_razi@upm.edu.my

19656. Ivinskis, P.; Rimšaitė, J. (2021): Data on Odonata, Orthoptera and Mantodea from Lithuania, Report of 2021. *Bulletin of the Lithuanian Entomological Society* 5(33): 5-8. (in English, with Lithuanian summary) [New odonate data collected in 2021 in Lithuania are presented: *Chalcolestes viridis*, *Pyrrhosoma nymphula*, *Nehalennia speciosa*, *Anax parthenope*, *Ophiogomphus cecilia*, *Leucorrhinia albifrons*, *L. pectoralis*, *Orthetrum brunneum*.] Address: Ivinskis, P., Nature Research centre, Akademijos 2, Vilnius Lithuania, E-mail: entlab@gmail.com

19657. Japir, J.; Momin B.; John, L.Y.; Chung, A.Y.C. (2021): Insect diversity of Sungai Serudong Forest Reserve, Sabah, Malaysia. *Serangga* 26(2): 1-15. (in Malaysian, with English summary) ["Insect diversity of Sungai Serudong Forest Reserve in Sabah was investigated under the Heart of Borneo programme in Sabah. The nocturnal insect diversity was evaluated by using light-trap from 7:00 p.m. until 9:00 p.m. for three consecutive nights. Diurnal insects were sampled using sweep net. A total of nine insect orders were recorded namely Coleoptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Neuroptera, Odonata, and Phasmida. [...] The mean Shannon Index was 4.00,

Simpson Index was 47.76 and Fisher Alpha Index was 83.64. The diversity is considered high, however moderate when compared to other forest reserves in Sabah, Malaysia. This study was able to identify insect communities inside the reserve. It was also able to identify the potential threats affecting the insect diversity. The documented data can serve as baseline information to be used in forest management plan and other relevant research." (Authors)] Address: Japir, R., Forest Research Centre, Sabah Forestry Dept, P.O. Box 1407, 90715 Sandakan, Sabah, Malaysia. Email: razy.japir@sabah.gov.my

19658. Khelifa, R. (2021): Observations on the response of dragonflies to the British Columbia 2021 historic heat wave. *Argia* 33(3): 13-14. (in English) ["I studied dragonflies in 20 experimental ponds (15×25 m) at the University of British Columbia (UBC) in 2020 and 2021. My work in 2020 was quite extensive. I made daily visits to the site from late May to September, which helped me to have good knowledge of which species live there and how they commonly behave. I documented 17 species (12 dragonflies and five damselflies), including *Anax junius*, *Rhionaeschna multicolor*, *Aeshna interrupta*, *Libellula forensis*, *Libellula quadrimaculata*, *L. julia*, *Sympetrum illotum*, *S. corruptum*, *S. vicinum*, *Pachydiplax longipennis*, *Erythemis collocata*, *Pantala hymenaea*, *Enallagma carunculatum*, *E. boreale*, *Ischnura cervula*, *I. perparva*, and *Lestes disjunctus*. These species are quite common in the Vancouver region. In the early season of 2021, I saw a similar dragonfly assemblage to that of 2020 with comparable abundances and behavior, a sort of déjà vu situation. Up until the heat wave in late June 2021, I observed a few unexpected changes in the composition and the behavior of the assemblage. First, the diversity increased. I saw two new species that I had not seen at the ponds or within a 5 km radius — *Libellula julia* and *Pantala hymenaea*. While the first species exists in lower British Columbia, the latter has rarely been observed in the entirety of British Columbia. In fact, this is the third historical record of the species in British Columbia. The first record of *P. hymenaea* goes back to 1986 by Robert A. Cannings who wrote that, "with climate warming, the species will be observed more often (Cannings 2002)." Besides that, I noticed an abrupt decline in the flight activity of *Rhionaeschna multicolor* during midday; a species that used to stay active during the entire day. This species is probably the most abundant and one of the most visible dragonflies at the site (Khelifa 2021). So it was easily noticeable when it was not detected. Searching the surrounding bushes and trees, I found individuals perched in shaded areas during the hottest period of the day and they became active again later in the afternoon. Such behavior was not observed in 2020. Interestingly, I observed an increase in the frequency of bathing behavior in different species where individuals quickly drop on the water surface and splash their bodies a few times. This display allows dragonflies to cool down and drink water. Seeing this frequent bathing behavior reminded me of dragonflies in North Africa where temperatures are often extreme throughout the summer (Khelifa 2015). Additionally, there was an increase in the abundance of *Libellula quadrimaculata* and *Erythemis collocata* during the heatwave, probably due to the recent immigration from other sites." (Author)] Address: Khelifa, R., Biodiversity Research Center, University of British Columbia, 2212 Main Mall, Vancouver. B.C. V6T1Z4, Canada. Email: rassimkhelifa@gmail.com

19659. Khelifa, R.; Deacon, C.; Mahdjoub, H.; Suhling, F.; Simaika, J.P.; Samways, M.J. (2021): Dragonfly conservation in the increasingly stressed African Mediterranean type

ecosystems. *Front. Environ. Sci.* 9:660163. 16 pp. (in English) ["Freshwater habitats worldwide are experiencing many threats from environmental and anthropogenic sources, affecting biodiversity and ecosystem functioning. In Africa, particularly in Mediterranean climate zones, rapid human population growth is predicted to have great impact on natural habitats besides naturally occurring events such as unpredictable drought frequency and severity. Here, we analyze the potential correlation between odonate assemblage conservation priority (measured with the Dragonfly Biotic Index: DBI) and the magnitude of climate change and human perturbation in African regions with a dominant Mediterranean climate, namely Northern (NAR: Morocco, Algeria and Tunisia) and Southern African region (SAR: South Africa). Using a compilation of studies assessing odonate assemblages in lotic and lentic habitats of both regions (295 sites in NAR and 151 sites in SAR), we estimated DBI, temporal change in average annual temperature (T), annual precipitation (P), and human footprint index (HFI) in each site, then we tested whether sites with different levels of DBI were associated with different magnitudes of climatic and anthropogenic change. We estimated past (between 1980–1999 and 2000–2018) and future changes (between 1980–1999 and 2081–2100) in T and P based on three CMIP6 scenarios representing low (SSP126), moderate (SSP245), and high emission (SSP585), as well as the change in HFI from 1993 to 2009. We found that assemblages with higher DBI (i.e. higher conservation priority) encountered lower increase in T and slightly greater decrease in P than assemblages with lower DBI (i.e. lower conservation priority) in NAR during 1980–2018, but are projected to experience higher increase in T and lower decrease in P in future projections for 2081–2100. In SAR, the increase in T was mostly similar across assemblages but the decline in P was higher for assemblages with higher DBI during 1980–2018 and 2081–2100, suggesting that assemblages of higher conservation priority in SAR are threatened by drought. While HFI showed an overall increase in NAR but not in SAR, its temporal change showed only minor differences across assemblages with different DBI levels. We discuss the importance of management plans to mitigate the effects of climatic and anthropogenic threats, so improving conservation of odonate assemblages in these regions." (Authors)] Address: Khelifa, R., Biodiversity Research Center, University of British Columbia, 2212 Main Mall, Vancouver. B.C. V6T1Z4, Canada. Email: rassimkhelifa@gmail.com

19660. Khelifa, R.; Mahdjoub, M.; Samways, M.J. (2021): Combined climatic and anthropogenic stress threaten resilience of important wetland sites in an arid region. *Science of the Total Environment* 806, 150806: 11 pp. (in English) ["Highlights: • Protected wetlands are heavily affected by climate change and anthropogenic perturbation. • These changes are detrimental in regions where the climate is already extreme and variable. • North African Ramsar sites witnessed alarming changes in climate and human influence. • Climate change is projected to be severe in areas with high conservation value. Abstract: Climate change and anthropogenic perturbation threaten resilience of wetlands globally, particularly in regions where environmental conditions are already hot and dry, and human impacts are rapidly intensifying and expanding. Here we assess the vulnerability of Ramsar wetlands of six North African countries (Western Sahara, Morocco, Algeria, Tunisia, Libya, and Egypt) by asking three questions: (1) what are the recent anthropogenic changes that the wetlands experienced? (2) what are the projected future climatic changes? (3) how wetlands with different conservation priorities and globally

threatened species are impacted by anthropogenic pressures? We used climatic data (historical and future projections) from World Clim 2, drought index (SPEI), and human footprint index (HFI for 2000 and 2019) to estimate anthropogenic pressures, as well as waterbird conservation value (WCV: a metric indicating conservation priority of sites) and the breeding distribution of three threatened waterbird species (*Aythya nyroca*, *Marmaronetta angustirostris*, and *Oxyura leucocephala*) to understand how biodiversity is impacted by anthropogenic pressure. We found that temperature, precipitation, drought, and human footprint index (HFI) increased during earlier decades. Interestingly, areas with high HFI are projected to encounter lower warming but more severe drought. We also found that WCV was positively correlated with the magnitude of current HFI, indicating that sites of high conservation value for waterbirds encounter higher levels of anthropogenic pressure. The breeding range of the three threatened species of waterbirds showed a marked increase in HFI and is projected to experience a severe increase in temperature by 2081–2100, especially under the high emission scenario (SSP8.5) where environmental temperature becomes closer to the species critical maximum. Our results highlight the importance of integrating new conservation measures that increase the resilience of North African protected wetlands to reduce extinction risk to biodiversity." (Authors) The paper includes references to Odonata.] Address: Khelifa, R., Biodiversity Research Center, Univ. of British Columbia, 2212 Main Mall, Vancouver, B.C. V6T1Z4, Canada. Email: rassimkhalifa@gmail.com

19661. Korichi, R.; Almi, A.; Hammadi, Z.; Zehani, A.; Zinat, H.; Bouzid, A. (2021): Ecologie et diversité de la communauté d'odonates dans quelques habitats du Sahara Nord-Algérien. *Algerian journal of arid environment* 11(2): 22-40. (in French, with English summary) ["Odonata diversity is examined in the northeastern region of the Algerian Sahara by sampling 12 potential sites (one chott, 7 palm groves and 4 lakes) on a 470 km transect. This region of the lower Sahara is endowed with the most important oases and several wetlands, a geomorphology with a south-north slope involving a drainage network and an altitude gradient. A lack of updated studies in this region prompts a specific inventory and ecological analysis of the odonate stand over a 22 months period between 2012 and 2020 to determine the variables and scales that maintain this stand. The odonatafauna recorded corresponds to 21 species divided into 7 Zygoptera and 14 anisoptera (52.4% Libellulidae; 33.3% Coenagrionidae and 14.3% Aeshnidae). The distribution type indicates that accidental category represents 66.7% of the population. The accessory species correspond to 23.8% while 4.7% are ubiquitous and constant respectively. At low elevation sites (-100 m), the Shannon-Weaver diversity index shows its highest value (2.70 bits). The lowest value ($H' = 1.35$ bits) is noted at altitude above 300 m. The spring migration of *Anax ephippiger* is observed in Ouargla (south-east of Algeria) towards the north. Spring and summer are the richest in species, with 2 and 15 species respectively. The breeding status indicates that for the most part the species are indigenous whose reproduction is probable to certain (*Crocothemis erythraea*) in the drains in palm groves. The IUCN status reveals that 2 species are endangered (*Coenagrion mercuriale* and *Acisoma panorpoides ascalaphoides*). The species *Enallagma deserti* is endemic to North Africa." (Authors)] Address: Korichi, R., Laboratoire Protection des écosystèmes en zones arides et semi-arides, Faculté des sciences de la nature et de la vie, Université Kasdi Merbah, Ouargla 30000, Algeria. Email: korichkov@hotmail.fr

19662. Korotkov, E.A.; Shapovalov, M.I.; Saprykin, M.A. (2021): Rare and protected species of dragonflies (Odonata) of the North-West Caucasus. Ministry of Science and higher Education, Russian Federation, Federal State Budgetary, educational institution of higher education, North Ossetian State University, named after Kosta Levanovna Khetagurov"; Problems water entomology Russia and related territories. Materials of the VIII All-Russian Scientific Symposium with international participation on amphibiotic and aquatic insects, dedicated to the 95th anniversary of the famous Russian scientist Lydia Andreevna Zhiltsova: 194-201. (in Russian, with English summary) ["For the territory of the North-Western Caucasus, 12 species of dragonflies are need of protection. A list of dragonflies recommended for inclusion in the third edition of the Red Book of the Republic of Adygea is given: *Chalcolestes parvidens*, *Pyrrhosoma nymphula*, *Onychogomphus flexuosus*, *Gomphus schneideri*, *Anax imperator*, *Brachytron pratense*." (Authors)] Address: Korotkov, E.A., Adyge State University, Maykop, Russia

19663. Landmann, M.; Schilling, M.; Landmann, A.; Steiner, F.M.; Schlick-Steiner, B.C. (2021): Isolation and characterization of 10 polymorphic microsatellite loci in the rarest European damselfly, *Coenagrion hylas* (Odonata: Coenagrionidae). *International Journal of Odonatology* 24: 227-232. (in English) ["Within Europe, the damselfly *Coenagrion hylas* has a very limited distribution and is regarded as a vulnerable species. For studying migration and population connectivity in the Central European populations, 10 microsatellite markers were developed for this species. The loci were screened on 24 individuals collected at Lech valley, Tyrol, Austria. The values for expected and observed heterozygosity ranged from 0.192 to 0.802 and from 0.208 to 0.917, respectively. All developed markers were polymorphic." (Authors)] Address: Landmann, Molinia, Molecular Ecology Group, Department of Ecology, University of Innsbruck, Technikerstrasse 25, Innsbruck, Austria. Email: molinia.landmann@chello.at

19664. Lee, D.J.L.; Matthews, P.G.D. (2021): How insects transition from water to air: Respiratory insights from dragonflies. *Comparative Biochemistry and Physiology, Part A* 253 (2021) 110859: 6 pp. (in English) ["The transition of animal life from water onto land is associated with well-documented changes in respiratory physiology and blood chemistry, including a dramatic increase in blood pCO₂ and bicarbonate, and changes in ventilatory control. However, these changes have primarily been documented among ancestrally aquatic animal lineages that have evolved to breathe air. In contrast, the physiological consequences of air-breathing animals secondarily adopting aquatic gas exchange are not well explored. Insects are arguably the most successful airbreathing animals, but they have also re-evolved the ability to breathe water multiple times. The juvenile life stages of many insect lineages possess tracheal gills for aquatic gas exchange, but all shift back to breathing air in their adult form. This makes these amphibiotic insects an instructive contrast to most other animal groups, being not only an ancestrally air-breathing group of animals that have re-adapted to life in water, but also a group that undergoes an ontogenetic shift from water back to air across their life cycle. This graphical review summarizes the current knowledge on how blood acid-base balance and ventilatory control change in the dragonfly during its water-to-air transition, and highlights some of the remaining gaps to be filled." (Authors)] Address: Lee, D.J., Dept of Zoology, Univ. of British Columbia, Vancouver, BC, V6T 1Z4, Canada

19665. Lee, S.-D.; Back, S.-J.; Kang, H.-K. (2021): Analysis of the correlation between ecological status and location environment by cultivated land restoration type of Geumgang riverine ecobelt. *J. People Plants Environ* 24(4): 389-401. (in English) ["Background and objective: The purpose of this study is to investigate the ecological status of six areas around Geumgang River that used to be farmlands before they were restored as a riverine ecobelt. This study aims to analyze the correlation between the location environment and ecological status of the sites to identify the environmental factors affecting them. Methods: The sites are classified into four types according to restoration: terraced paddy fields, flat paddy fields, artificial wetland, and landscape forest. The survey items were divided into land use status, plant ecology, and animal ecology. Results: In terms of plant ecology, terraced paddy fields showed favorable naturalness with the rate of native species above 90% and the naturalization index below 10%. In terms of animal ecology, the total number of species found in these areas was biggest in terraced paddy fields, followed by flat paddy fields, artificial wetland, and landscape forest. Regarding species diversity, terraced paddy fields also showed abundant species with an average of 1.05 to 1.09. The results of the correlation analysis showed that the forest area around the sites had the most significant effect on species diversity. The grassland and open water area showed a positive correlation with the total number of animal species and the number of dragonflies, confirming that the marshy grassland had a positive effect. As the cultivated land and urbanized area around the sites increased, it had a negative effect on the distribution of native species and the number of animal species that appeared, and a positive effect on the naturalization index. Conclusion: It is necessary to establish preemption and restoration plans for sites such as grasslands adjacent to the forest and terraced paddy fields in order to promote resilience of the diverse species returning to the purchased lands." (Authors)] Address: Kang, H.-K., Dept. of Green Smart City, Sangmyung University, Cheonan 31066, Korea. Email: hkkang@smu.ac.kr

19666. Lemke, M. (2021): Hinweise auf eine erfolgreiche Entwicklung von *Chalcolestes viridis* (Vander Linden, 1825) in der subalpinen Höhenstufe (Odonata: Lestidae). *Libellula* 40(3/4): 161-172. (in German, with English summary) ["Indication of a successful development of *Chalcolestes viridis* (Vander Linden, 1825) in subalpine terrain (Odonata: Lestidae) - In summer 2019, egg-clutches typical for *Chalcolestes viridis* were found on an alder bush in subalpine terrain, on a moor pond in the Allgäu at around 1,737 m a.s.l. At the same time, maiden flights of large Lestidae could be observed, which were identified as *Chalcolestes* cf. *viridis*. This constitutes one of the most significant pieces of evidence of the species in the German-speaking area, and it is the highest evidence indicating successful development of the species within its range. The record is discussed with regard to its recent northern expansion as well as its altitude distribution. This article is also intended to encourage the search for the species-typical egg-clutches on each water, through which an occurrence of the species can also be determined outside its flight period." (Authors)] Address: Lemke, M., Am Grüneberg 37, 66557 Illingen, Germany. Email: malemke@gmx.de

19667. Mamat, N.; Abu, A.; Yusoff, N. (2021): Classification and morphology of *Rhinocypha* spp. (Odonata): a comprehensive taxonomic study within the females. *Zoological Studies* 60:47. doi:10.6620/ZS.2021.60-47. 21 pp. (in English) ["Studies on Odonata have gained attention worldwide as

well as locally in Malaysia. Although there is a wealth of data available to be utilized for solving taxonomic problems, ecological and behavioural research areas are more favoured than taxonomy and systematics. Thus, there are confusions over how to correctly identify closely related and sympatric species, especially in female odonates. One such example is in the genus *Rhinocypha*. Consequently, the present study focuses on taxonomic work, employing multi-approaches in the form of morphological (morphological diagnostics, Field Emission Scanning Electron Microscope (FESEM) and geometric morphometric analysis), applying the molecular technique. Seventeen morphological characteristics were created to differentiate between the females of *Rhinocypha* spp. A FESEM was used on the female's ovipositor to focus on the anal appendages and sheathing valve (V3). Also, the phylogenetic patterns expressed by COI and 16S rRNA genes, and canonical variate analysis for the wing geometric morphometric revealed three clusters that supported the distinction of the *Rhinocypha* group. In summary, this study effectively developed an integrated approach of classic morphological and trendy molecular, combined with FESEM microscopy techniques, which provided corroborative evidence and resolved taxonomic uncertainties." (Authors)] Address: Mamat, N., Institute of Biological Science, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia. E-mail: nhidayahm@um.edu.my

19668. Marinov, M. (2021): A taxonomic and biogeographic discussion on *Rhyothemis regia* (Brauer, 1867) from Samoa and neighbouring islands with introduction of *Rhyothemis regia uveae* subsp. nov. (Odonata: Libellulidae). *Faunistic Studies in Southeast Asian and Pacific Island Odonata* 35: 1-33. (in English) ["Records of *R. regia* from its eastern distribution range (Swains Island excluded) are reviewed and specimens compared morphologically and by wing colouration to congeners of newly obtained material collected in the field or deposited in entomological collections. The origin of the female holotype of *R. r. chalcoptilon* (Brauer, 1867) has been investigated with new hypotheses of the collector, locality and the probable sampling dates proposed. The holotype was probably mislabelled as from Samoa, while the most likely type locality was Niuafo'ou Island, Tonga. New nomenclature changes are suggested which: assigns *R. r. chalcoptilon* to the population from Niuafo'ou Island, reinstates *R. r. armstrongi* Fraser, 1956 for individuals from Samoan archipelago and introduces a new nomen *R. r. uveae* subsp. nov. for Wallis Island. Biogeography of the species within the investigated area is reviewed and the possible origin of current populations hypothesised. Future hypotheses testing is necessary involving a larger sample size from within the entire species range and comparing them morphologically and molecular to other congeneric from the region, such as *R. phyllis* (Sulzer, 1776) and *R. princeps* Kirby, 1894. The latter two species are briefly discussed in relation to the working hypotheses but due to lack of sufficient material final conclusions are not proposed." (Author)] Address: Marinov, M., Biosecurity Surveillance & Incursion Investigation Plant Health Team, Ministry for Primary Industries, 14 Sir William Pickering Drive, Christchurch 8544, New Zealand Email: milen.marinov@mpi.govt.nz

19669. Marinov, M.; Krieg-Jacquier, R.; Duvernay, J.-M.; Fleck, G.; Vincent-Gorlier, J.; Mary, M.; Doscher, C.; Le Bail, F.; Jourdan, H.; Theuerkauf, J. (2021): An update of the Odonata fauna of Wallis & Futuna (Insecta: Odonata). *Faunistic Studies in Southeast Asian and Pacific Island Odonata* 35: 35-67. (in English, with French, Wallisian and

Futunan summaries) ["Odonata fauna of the islands of Wallis and Futuna has been investigated during a two week field trip in 2020 and occasional observations in 2007/2012. Updated species checklist and faunistic information following nomenclature changes, new taxonomic information and distribution data are proposed. Presently, 15 species are known from Wallis & Futuna. They are presented with photos of live individuals and exuviae (where available) which is hoped to facilitate easy identification in the field by professionals and general nature lovers." (Authors)] Address: Marinov, M., Biosecurity Surveillance & Incursion Investigation Plant Health Team, Ministry for Primary Industries, 14 Sir William Pickering Drive, Christchurch 8544, New Zealand Email: milen.marinov@mpi.govt.nz

19670. Medina Espinoza, E.F. (2021): Análisis del ensamblaje adulto de Odonata (Insecta) en cuerpos de agua de la estación biológica Los Amigos, Madre de Dios. Universidad Nacional Agraria La Molina. Facultad de Ciencias. Depto Acad. de Biología: IV + VI + 70 pp. (in Spanish, with English summary) ["Freshwater ecosystems are one of the most polluted environments worldwide. Madre de Dios is one of the Peruvian departments that harbors a great diversity of species and one of the main threats it faces is the loss of forests due to gold mining, which has negative effects on its water bodies. Little ecological information is known about Peruvian Odonata, which are freshwater insects. The present study analysed the adult odonate assemblage diversity in three aquatic environments within the Los Amigos biological station (a blackwater pond, an oxbow lake and a stream) in May and October of 2018. A total of 46 species were recorded, belonging to 25 genera and six families. The most represented families were Libellulidae and Coenagrionidae. The assessment sites showed similar diversity values using Hill numbers. However, differences were found in the species composition in the three water bodies assessed, including between lakes. This was because, although they shared a considerable number of species, the relative abundances of each species varied depending on the assessment site. Therefore, dragonfly assemblages in the Los Amigos biological station change according to the body of water where they are found. This highlights the importance of knowing the taxa that are part of the assemblages of the different types of freshwater environments in order to better understand the changes that might occur in these types of ecosystems." (Author)] Address: not stated

19671. Mey, W. (2021): Eine Eintagsfliege (Ephemeroptera) als Libellenbeute (Odonata). Entomologische Nachrichten und Berichte 65(2): 109. (in German) [Sachsen, Germany; 19. Juli 2017, Ephemera sp. as prey of *Calopteryx splendens*] Address: Wolfgang Mey, W., Großglockner Straße 3, 01279 Dresden, Germany

19672. Mola, L.M.; Fourastié, M.F., Agopian, S.S. (2021): High karyotypic variation in *Orthemis* Hagen, 1861 species, with insights about the neo-XY in *Orthemis ambinigra* Calvert, 1909 (Libellulidae, Odonata). *CompCytogen* 15(4): 355-374. (in English) ["The American dragonfly genus *Orthemis* Hagen, 1861 is mainly found in the Neotropical region. Seven of 28 taxonomically described species have been reported from Argentina. Chromosome studies performed on this genus showed a wide variation in chromosome number and a high frequency of the neoXY chromosomal sex-determination system, although the sexual pair was not observed in all cases. This work analyzes the spermatogenesis of *Orthemis discolor* (Burmeister, 1839), *O. nodiplaga* Karsch, 1891 and *O. ambinigra* Calvert, 1909 in individuals

from the provinces of Misiones and Buenos Aires, Argentina. *Orthemis discolor* has $2n=23$, $n=11+X$ and one larger bivalent. *Orthemis nodiplaga* exhibits the largest chromosome number of the order, $2n=41$, $n=20+X$ and small chromosomes. *Orthemis ambinigra* shows a reduced complement, $2n=12$, $n=5+neo-XY$, large-sized chromosomes, and a homomorphic sex bivalent. Fusions and fragmentations are the main evolutionary mechanisms in Odonata, as well as in other organisms with holokinetic chromosomes. *Orthemis nodiplaga* would have originated by nine autosomal fragmentations from the ancestral karyotype of the genus ($2n=22A+X$ in males). We argue that the diploid number 23 in *Orthemis* has a secondary origin from the ancestral karyotype of family Libellulidae ($2n=25$). The complement of *O. ambinigra* would have arisen from five autosomal fusions and the insertion of the X chromosome into a fused autosome. C-banding and DAPI/CMA3 staining allowed the identification of the sexual bivalent, which revealed the presence of constitutive heterochromatin. We propose that the chromosome with intermediate C-staining intensity and three medial heterochromatic regions corresponds to the neo-Y and that the neo-system of this species has an ancient evolutionary origin. Moreover, we discuss on the mechanisms involved in the karyotypic evolution of this genus, the characteristics of the neo sex-determining systems and the patterns of heterochromatin distribution, quantity and base pair richness." (Authors)] Address: Mola, Liliana María, Lab. de Citogenética y Evolución – Depto de Ecología, Genética y Evolución, Inst. de Ecología, Genética y Evolución (CONICET-UBA), Fac. de Ciencias Exactas y Naturales, Univ. de Buenos Aires, Buenos Aires, Argentina. Email: lilimola@yahoo.com.ar

19673. Monnerat, C.; Wildermuth, H.; Gonseth, Y. (2021): Rote Liste der Libellen. Gefährdete Arten der Schweiz. Umwelt-Vollzug Nr. 2120: 70 pp. (in German, with French and Italian summaries) ["The Red List of dragonflies in Switzerland 2021 is based on the criteria and endangerment categories of the IUCN (2001, 2017). Of the 75 species assessed, 27 (36 %) are threatened: 3 (4 %) are extinct in Switzerland (RE), 4 (5 %) are Critically Endangered (CR), 9 (12 %) are Endangered (EN) and 11 (15 %) are Vulnerable (VU). 6 (8 %) species are potentially threatened (NT). Nearly half of the Red List species (13) inhabit fens and raised bogs, habitats that are threatened at all altitudes. The proportion of endangered species is lower in other habitat types: springs, small watercourses and ditches (4), rivers and lakeshores with wave action (6), small stillwaters (6). These three habitat types also each harboured a species that was already extinct in Switzerland. The present Red List replaces that of Gonseth & Monnerat (2002). The number of species in the endangerment categories (RE, CR, EN, VU) is very similar: the 2002 list contained 26, the revised version includes 27 species. In the meantime, a third species has become extinct in Switzerland. The situation of several species formerly threatened with extinction or highly endangered (CR, EN) has improved thanks to revitalisation measures of upland moors, rivers and streams. In addition, specific species promotion measures have contributed to the improvement of the situation. Thanks to these measures to promote dragonflies, the calculated Red List indices show a positive trend. For the non-endangered species, the balance is also positive, as their populations are mostly stable or have sometimes even increased. The species that depend mainly on fens and other habitats with naturally fluctuating water levels, or the boreoalpine species that depend on raised bogs and acidic fens, are suffering from the ongoing deteri-

oration of habitat quality. Moreover, prediction models suggest that their endangerment will continuously increase with climate change in the coming decades" (Authors/DeepL)] Address: Monnerat, C., Info fauna, Bellevaux 51, 2000 Neuchâtel, Switzerland. E-mail: christian.monnerat@unine.ch

19674. Morrill, A.; Kaunisto, K.M.; Mlynarek, J.J.; Sippola, E.; Vesterinen, E.J.; Forbes, M.R. (2021): Metabarcoding prey DNA from fecal samples of adult dragonflies shows no predicted sex differences, and substantial inter-individual variation, in diets. *PeerJ* 9:e12634 <https://doi.org/10.7717/peerj.126>: 20 pp. (in English) ["Sexes often differ in foraging and diet, which is associated with sex differences in size, trophic morphology, use of habitats, and/or life history tactics. Herein, strikingly similar diets were found for adult sexes of *Leucorrhinia intacta*, based on comparing 141 dietary taxa identified from the metabarcoding of mitochondrial DNA archived in feces. Arthropods in > 5% of samples included five species of dipterans, two hemipterans, two spider species and one parasitic mite. The mite was not traditional prey as its presence was likely due to DNA contamination of samples arising through parasitism or possibly via accidental consumption during grooming, and therefore the mite was excluded from diet characterizations. Common prey species were found with statistically indistinguishable frequencies in male and female diets, with one exception of an aphid more often found in male diets, although this pattern was not robust to corrections for multiple statistical tests. While rare prey species were often found in diets of only one sex, instances of this were more frequent in the more oft-sampled females, suggesting sampling artefact. Sexes did not differ in the mean prey species richness in their diets. Overall, sexes showed statistically indistinguishable diets both on a prey species-by-species basis and in terms of multivariate characterizations of diet composition, derived from presence-absence data of prey species analyzed via PERMANOVA and accumulation curves. Males and females may have similar diets by being both opportunistic and generalist predators of arthropods, using the same foraging habitats and having similar sizes and flight abilities. Notably, similarities in diet between sexes occur alongside large interindividual differences in diet, within sexes. Researchers intending on explaining adaptive sex differences in diet should consider characteristics of species whose sexes show similar diets." (Authors)] Address: Morrill, A., Department of Biology, Carleton University, Ottawa, Ontario, Canada. Email: andre_morrill@carleton.ca

19675. Motte, G.; Dufrière, M.; Mayon, N.; Goffart, Ph.; Barbier, Y.; Cors, R.; Ghilain, B.; Kever, D.; Lafontaine, R.-M.; Patemoster, T.; Schaezen, R. de; Schott, O.; Smits, Q.; Vandevyvre, X. (2021): Liste rouge 2021 des Libellules de Wallonie. *Les Naturalistes belges* 102(3): 1-21. (in French, with German, English and Dutch summaries) ["This paper describes the update of the red list of dragonflies in Wallonia 20 years after the previous assessment. The analysis is based on a dataset of nearly 200,000 observations from more than 1700 observers as well as on trend analyses carried out in the framework of complementary studies. The revision of the status of the 67 Walloon dragonfly species shows that, among the assessed species, 2 are extinct (3.3%), no species is critically endangered, 5 are endangered (8.3%), 10 are vulnerable (16.7%), 4 are near threatened (6.7%) and 39 are currently not threatened (65%). In comparison with the previous red list, the status of dragonfly species in Wallonia is more favourable. However, this positive evolution may be uncertain in view of the ongoing climate changes." (Authors)] Address: Dufrière, M., Service Public Wallon

(SPW) - Direction Générale Opérationnelle (DG03) - Dépt de l'Etude du Milieu naturel et agricole (DEMna), Av. Maréchal Juin, 23, B-5030 Gembloux, Belgium. E-mail: Marc-Dufrene@spw.wallonie.be

19676. Müller, J. (2021): Endbericht Artenschutzprojekt „Biotop- und habitatgestaltende Maßnahmen am Platten- teich, Lebensraum der Mond-Azurjungfer“. <https://www.lpv-oberlausitz.de/5201/240734.html>: 11 pp. (in German) ["Over a three-year period, measures to promote the conservation of a dragonfly species were carried out. The focus was on mowing, reed removal and the removal of woody plants in the vicinity of the watercourse. In order to ensure long-term success against the invasive neophytes, it is absolutely necessary to continue the measures." (Author/DeepL)] Address: Jörg Müller. Email: JoergMueller78@web.de

19677. Mulyaningsih, B.; Ummiyati, S.R.; Hadisusanto, S.; Edyansyah, E. (2021): Fauna associated with Malayan filariasis transmission in Banyuasin, South Sumatra, Indonesia. *Veterinary World* 14(7): 1954-1959. (in English) ["Background and Aim: *Brugia malayi* is known to be zoonotically important because it can be transmitted from animals (mammals and primates) to humans or from humans to humans through mosquito vectors. This study was conducted to explore the fauna associated with Malayan filariasis transmission in Sedang village, Suak Tapeh District, Banyuasin Regency, South Sumatra Province, Indonesia. Materials and Methods: A cross-sectional research design with an observational and analytical approach was applied in this study, and it was conducted in May 2018. Mosquitoes were collected twice using human bait both inside and outside the house from 6:00 p.m. to 6:00 a.m. The presence of competitors, predators, and reservoir hosts in the areas of five breeding habitats of *Mansonia* spp. was observed. The presence of microfilaria was confirmed under a microscope in night blood samples of inhabitants and cats. The presence of infective larvae (L3) of *B. malayi* was identified microscopically and based on the polymerase chain reaction method in female *Mansonia* mosquitoes. Results: A total of 12 mosquito species were found, among which *Mansonia univittata* was the dominant mosquito, and the predominant competitor was *Mansonia annulifera*. Dragonflies, as predators were found in two breeding habitats and fish were found in one breeding habitat. The L3 of *B. malayi* were not identified in the mosquitoes, and the microfilariae of *B. malayi* were not found in the blood samples of inhabitants and cats. Conclusion: Although *Mansonia* mosquito population was abundant in Banyuasin Regency, the mosquito was not confirmed as an intermediate host of *B. malayi*, and the cat was not confirmed as a reservoir of *B. malayi* in the location." (Authors)] Address: Mulyaningsih, B., Department of Parasitology, Faculty of Medicine Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia. Email: Budi Mulyaningsih

19678. Nakanishi, K.; Yokomizo, H.; Hayashi, T.I. (2021): Population model analyses of the combined effects of insecticide use and habitat degradation on the past sharp declines of the dragonfly *Sympetrum frequens*. *Science of The Total Environment* 787, 147526: 10 pp. (in English) ["Highlights: • Populations of *Sympetrum frequens* in rice fields declined sharply in the late 1990s. • We analyzed causes of the declines by numerical simulations using a population model. • The model reproduced well the past sharp population declines. • Habitat degradation and highly toxic insecti-

cides greatly affected population decline. • Our results suggested the sharp declines were caused by the combined effects of both. Abstract: In recent decades, many dragonfly species have become threatened with extinction. For example, populations of *Sympetrum frequens*, one of the most common dragonflies in rice paddy fields in Japan, decreased sharply around the late 1990s in many regions. Although previous studies suggested that the use of systemic insecticides (particularly fipronil) was likely a major cause of the decline, agronomic factors other than insecticide use and the combined effects of both have been not examined. Here, we developed an *S. frequens* population model using survival rate parameters associated with the farmland consolidation rate, midsummer drainage, area of crop rotation and abandoned rice paddies, insecticide use, and summer temperature and analyzed the effects of each factor on population dynamics by numerical simulations. Our population models substantially reproduced the past sharp population declines of the dragonfly in three regions. Numerical simulations using hypothetical parameters did not always suggest that the use of systemic insecticides is a sufficient cause of the sharp population declines, as the declines did not occur if the farmland consolidation rate remained at lower levels (before the 1980s). On the other hand, our findings suggest that the use of insecticides with high toxicity is a necessary cause of the sharp population declines, as the declines did not occur when simulated toxicity levels were lower than those actually used. Overall, our numerical simulations suggest that the sharp population declines of *S. frequens* around the late 1990s were caused by the combined effects of insecticide use and farmland consolidation, in which rice paddies are converted to well-drained paddy fields. Conservation planning for dragonflies needs to account for the combined effects of habitat degradation and use of insecticides." (Authors)] Address: Nakanishi, K., National Institute for Environmental Studies, Onogawa 16-2, Tsukuba, Ibaraki 305-8506, Japan. Email: nakanishi.kosuke@nies.go.jp

19679. Noor, S.; Rafiq, N.; Akbar, P.; Zehri, S.; Wali, S.; Shahwani, F. (2021): A preliminary study on aquatic insect diversity and abundance in relation to fluctuating physicochemical parameters of an artificial pond. *Serangga* 26(4): 175-188. (in English) ["This preliminary study was conducted from April to October 2019, and hold the first account to outline the diversity of aquatic insects with influence to the fluctuating physicochemical parameters in the pond of Sardar Bahadur Khan Women's University Quetta, Pakistan. The collection of 722 individuals in total presented four orders (Hemiptera, Ephemeroptera, Diptera and Odonata) and seven families. These individuals were labeled to generic level as *Gerris* sp., *Notonecta* sp., *Anopheles* sp., *Thaumatococcus* sp., *Sympetrum* sp., *Orthetrum* sp. and *Heptagenia* sp. Shannon-Weininger diversity and Simpson's diversity index revealed greater values for backswimmers and mayflies (*Notonecta* and *Heptagenia* sp.). Additionally, Margalef's richness index was also recorded highest (1.163) for backswimmers. Amongst physicochemical parameters, water temperature was ordinated in Gaussian's species packing model. This ordination illustrated wider curve for *Notonecta* sp. and narrower curve for *Anopheles* sp., suggesting the maximum and minimum tolerance (temperature) range for these species in this specific pond community. Water pH of the pond also altered slightly and ranged from 9.13-10.3 during April to August. As of the total dissolve solids (TDS), this study observed a raised from 253.16 mg/L to 432.11 mg/L till the end. Since aquatic insects play vigorous role in the stability of aquatic ecosystems, more relevant studies

are required to be conducted to evaluate the broader range of these insects." (Authors)] Address: Noor, Sabina, Dept of Zoology, Sardar Bahadur Khan Women University, 87300 Quetta, Pakistan. Email: sabina.noor15@yahoo.com

19680. Onishko, V.V.; Kosterin, O.E.; Emelyanov, E.G. (2021): *Anax nigrofasciatus* Oguma, 1915 (Odonata, Aeschnidae): A new addition to the fauna of Russia. *Amurian Zoological Journal* 13(4): 516-519. (in English, with Russian summary) ["South East and East Asia. On 19 June 2021, its mature male was caught by E. Emelyanov in Nadezhdino District of Primorskiy Kray, Russia, at an artificial fire pond near the Sadko Garden Non-Commercial Fellowship (43.4171 N, 131.9327 E). This is the first record of this species in the Russian Federation, increasing the number of Odonata species currently known from Russia to 157." (Authors)] Address: Onishko, V.V., Moscow Zoo, 1 Bolshaya Gruzinskaya Str., 123242, Moscow, Russia. E-mail: werwolf999@yandex.ru

19681. Opie-odonates (2021): Liste de référence des Odonates de France métropolitaine. *Martinia* 35(5): 23–26, annex- (in French) [Odonatology, like all disciplines in the natural sciences, is in constant evolution. The discovery of new taxa or the observation of taxa in geographical areas where they were not previously known, progress in genetics and phylogeny require the regular updating of species lists. In this context, Opie-odonates has decided to update the previous reference list of Odonata of metropolitan France of the French Odonatological Society (Boudot & Dommanget, 2015). For the editors, it is neither a question of doing something new at all costs nor of remaining stuck in the past, but of making well-founded choices that follow the progress of knowledge such as changes in the geographical distribution of taxa or their phylogenetic position. Furthermore, the growing recognition of Odonata in environmental policies - as in the previous national action plan for Odonata (Dupont, 2010) and the new national action plan for dragonflies (Houard et al., 2020), as well as their better understanding by the general public through awareness-raising activities, for example - requires the establishment of common reference systems, which also requires the common use of a well-defined lexical field and vocabulary. We therefore felt it necessary to review the French names associated with scientific binoms. Taxa The updating or not of the name of certain taxa in the list is based on the relevance of the taxon. Some subspecies have been deleted (e.g. *Calopteryx splendens* and *Cordulegaster boltonii*) where there is a broad consensus in recent literature that they are invalid. Others, such as *Orthetrum coerulescens* *anceps*, have been retained because further studies are needed (Mauersberger, 1994). Species that have not been observed or rarely observed for a long period of time have nevertheless been retained, as they belong, according to the current state of knowledge, to the metropolitan Holocene fauna. For example, *Sympecma paedisca*, which has probably disappeared since 1962 from its only known site in Isère, is considered as "unrecorded" in mainland France since 1970, but remains on the list. Indeed, the rediscovery of *Nehalennia speciosa* in France in 2007 (Dehondt et al., 2009) or the return of certain species to geographical areas from which they were presumed to have disappeared, such as *Stylurus flavipes* and *Ophiogomphus cecilia* in the Rhône river basin for example (Grand et al, 2011; Lambert et al., 2012), encourage us to be cautious about the notion of extinction and to keep the record of presumed extinct species, in the light of our current knowledge. Of course, the arrival of new spe-

cies, such as *Trithemis kirbyi* or *Selysiothemis nigra* (San- nier, 2015; Polette et al., 2017; Lohr, 2021), also justified the updating of this list. French names The Opie-odonates, in the continuity of the French Society of Odonatology, underlines that the scientific names (governed by the International Code of Zoological Nomenclature) must be used as a priority by all odonatologists, be they professionals or amateurs, specialists, naturalists in all texts intended to be disseminated to interested persons or to be published. The use of French names is indicated in the context of awareness-raising and popularisation operations (essentially for the general public). There are no vernacular names (from the Latin *vernaculus*, "of the country, indigenous, national", names derived from popular tradition) in the proper sense in France for the various species of Odonata. There is also no list of standardised names as for ornithology (Lepage, 2021). All French names are taken from the literature and therefore vary from one author to another. Savard (1987) presents the differences between the names given to taxa outside the binominal scientific nomenclature, i.e. between vernacular names and vulgar names. The French names proposed here are, as far as possible and with minor modifications, those published by Robert (1958). This author was the first to use French names wisely in a 20th century publication, partly based on the writings of Selys-Longchamps (1850). We have chosen not to introduce new names, as these are likely to create new difficulties, except when the taxon had no French name, such as *Trithemis kirbyi*, or when we wished to simplify it, as with *Lestes macrostigma*, by retaining the epithet group "à grand stigmas", which is shorter and more in keeping with the binominal name. We also chose not to follow the translation of Philippe Jourde (Dijkstra & Lewington, 2007; Dijkstra, Schröter & Lewington, 2021) for the sake of consistency with previous publications of the French Odonatological Society. Furthermore, only taxa from mainland France are included in this list. The question of assigning a French name that could be superimposed on the binominal name arose during the drafting of this updated list. The binominal name is the reference for all writings of a scientific nature (publications, reports, studies, proceedings, etc.). As mentioned above, scientific names should be used as a priority. Consequently, the use of French names remains marginal and should be favoured in communication to the general public. In this context, the excessive complexity of French names, such as the systematic differentiation of genera, or the traceability of names according to the evolution of scientific names, does not seem very relevant for a name intended for neophytes. A similar logic can be found in other naturalist disciplines. For example, in botany, French names have retained their vernacular and folkloric character. For example, in botany, French names have retained their vernacular and folkloric character, as can be seen from the 24 different French names of plants of various species and families used in botany, including the word rose (Rose, 2021). Or, in ornithology and the French names of birds, it should be remembered that the swallows of mainland France are grouped together under the French name Hirondelle in different genera. On the other hand, between the different editions of the Guide Ornitho (Mullamey et al., 1999 and reissues) or on the Avibase website (Lepage, 2021), the French genus name of the different tits has not followed the changes in the genus of the scientific names. For this reason, we have not retained the differentiation or grouping of genera in French. Thus, the *Calopteryx* remain *Calopteryx* and most of the *Coenagrionidae* and *Platynemididae* remain *Agrionidae*. The only exception to this method is Vander Linden's *Agrion*, *Erythromma lindenii*, which we have renamed *Naiad* in

order to be consistent with the other two species of our metropolitan fauna of the genus *Erythromma*. This exception is explained by the evocation of an imaginary associated with the term *Naiad* (i.e. a female divinity of rivers and springs) which is interesting in the odonatological context and which may also resonate with the general public. On the other hand, the genus name *Dragonfly* has been used and reused for taxa that are not of the genus *Libellula*. It seemed to us that *Scarlet Dragonfly* and *Globetrotting Dragonfly* were more evocative names and easier to remember than *Crocothemis* or *Pantale* for the general public. The same reasoning was applied to the *Aeschnidae*, of which only the French genera *Aeschna* and *Anax* were retained. The successive revisions of the place of *Macromia* and *Oxygastra* (at one time in the *Libellulidae*, then in the *Corduliidae*, now in a separate family or *incertae sedis*) did not seem to us to require a different French genus from the widely used *Cordulie*. Perenniality of French names: As we mentioned in the introduction, the discovery of new taxa or the observation of taxa in geographical areas where they were not known, as well as progress in genetics and phylogeny, require the regular updating of species lists with their binominal names. What consequences can be drawn from this for French names? As mentioned above, a modification could be envisaged when a change occurs in the nomenclature, but it can be assumed that this continuous instability would only confuse the public for which these names are intended. The idea, let us remember, is not to propose a French name that replaces the scientific name, but a name that the general public (and thus outside naturalists) can appropriate, and ensure a certain durability. For example, on an information panel for river restoration work, the *Agrion de Mercure* will be easily adopted by the general public, without having to consider renaming it the day that, after a hypothetical scientific study, its binominal name changes. The French name would thus retain a status equivalent to the *nomen protectum* of taxonomy. Moreover, since French names are only to be used for popularisation, they are not intended to be given to species not present in territories where French is used. The example of Askew (2004), who, in his book on European fauna, only mentions English names for species present in the United Kingdom, should be noted. This seems to us to be a reasonable limit to the attribution of French names. One can only regret the Anglo-American tendency to attribute English names to all species of the globe¹ and to generalise their use in exchanges where the binomial name is not always mentioned. It even happens that the same English name covers several different species². In essence, these elements become inaccessible to the reader who is not initiated into the odonotofauna of the geographical area in question." Translated with www.DeepL.com/Translator (free version)] Address: Opie-odonates, BP 30, 78041 Guyancourt, France; odonates@insectes.org

19682. Ostrowskii, A.M. (2021): Rare Insects of the Gomel region. Belarusian Entomological Society, National Academy of Sciences of Belarus State, Scientific and Production Association "Scientific Centre for Bioresources of the National Academy of Sciences of Belarus, Department of Biology Belarusian State University, Institute of Plant Protection, National Academy of Sciences of Belarus, State Nature Reserve "Berezinskiy Biosphere Reserve P. M. Masherov Vitsebsk, State University, Republic of Belarus P.M. Masherov State University Yanka Kupala State University of Grodno, the Republic of Belarus Yanka Kupala State University of Grodno. Results and Perspectives of Entomology Development in eastern Europe. Collection of papers

The IV International Scientific and Practical Conference dedicated to the memory Terioshkin Alexander Mikhailovich (1953-2020) December 1-3, 2021 Minsk Republic of Belarus Minsk Publisher A.N. Varaksin 2021: 245-259. (in Russian, with English summary) [During 2016-2021 monitoring of rare and protected insects on the territory of Gomel region [Belarus] was conducted to identify their habitats, as a result of which findings of 60 species belonging to 32 families and 7 orders were registered." (Author) The list includes *Sympecma paedisca*, *Anax imperator*, *Stylurus flavipes*, and *Ophiogomphus cecilia*.] Address: Ostrovsky, A.M., EE "Gomel State Medical University", Gomel, Belarus. Email: Arti301989@mail.ru

19683. Peng, X.; Gao, Y.; Song, X.; Du, Y. (2021): Characterization and phylogenetic analysis of the complete mitochondrial genome of *Neurothemis fulvia* (Odonata: Anisoptera: Libellulidae). *Mitochondrial DNA Part B* 2021 6(2): 620-621. (in English) ["*Neurothemis fulvia* is a dragonfly of wet forests and usually perches on fallen logs and shrubs. In this study, we sequenced and analyzed the complete mitochondrial genome (mitogenome) of *N. fulvia*. This mitogenome was 15,459bp long and encoded 13 protein-coding genes (PCGs), 22 transfer RNA genes (tRNAs), and 2 ribosomal RNA unit genes (rRNAs). The nucleotide composition of the mitogenome was biased toward A and T, with 70.5% of A + T content (A 38.8%, T 31.7%, C 16.6%, and G 12.9%). Gene order was conserved and identical to most other previously sequenced Libellulidae dragonflies. Most PCGs of *N. fulvia* have the conventional start codons ATN (six ATG, three ATT, and two ATC), with the exception of *cox1* and *nad1* (TTG). Except for four PCGs (*cox1*, *cox2*, *cox3*, and *nad5*) end with the incomplete stop codon T—, all other PCGs terminated with the stop codon TAA or TAG. Phylogenetic analysis showed that *N. fulvia* got together with *Tramea virginia* with high support value. Libellulidae had a close relationship with Corduliidae, the relationships ((*Hydrobasileus* + *Brachythemis*) + (*Orthetrum* + (*Acisoma* + (*Neurothemis* + *Tramea*)))) were supported in Libellulidae." (Authors)] Address: Yimin Du, Y., School Life Sciences, Gannan Normal Univ., Shiyuan South Rd 1, Ganzhou, Jiangxi 341000, PR China. Email: yimin28@126.com

19684. Pestana, G.C.; Mateus-Barros, E.; Brasil, L.S.; Guillermo-Ferreira, R. (2021): A scientometric analysis on pre- and post-copulatory traits in Odonata. *International Journal of Odonatology* 24: 215-226. (in English) ["In the last decades, studies on sexual selection in odonates have shown a relationship between mating success and costly sexual ornaments, mainly male characters. Here, we conducted a scientometric analysis to assess the state of art of studies on sexual selection in odonates, especially on the role of male ornamentation (pre-copulatory traits) and sperm competition (post-copulatory traits). We found 51 papers focused on sexual ornamentation and 34 on sperm competition. Only one study simultaneously addressed both pre- and post-copulatory traits, nevertheless without an integrative approach. Results show that calopterygids are extensively studied regarding pre-copulatory traits (i.e., male wing pigmentation), while libellulids are mostly studied in post-copulatory traits (e.g., sperm competition) focused research. These preferences seem to be related to characteristics like presence of ornamentation and territoriality, large body size, variation and complexity of sperm removal structures, respectively. For the post-copulatory traits, sperm removal is frequently addressed, but few other strategies, like the investment in sperm quality and quantity, are investigated. Finally, we demonstrate that it is necessary to conduct studies

focused on addressing the relationship between pre- and post- mating sexual traits." (Authors)] Address: Pestana, Gabrielle Cristina, Dept Hydrobiol., Federal Univ. of São Carlos, São Carlos, Brazil. E-mail: jpestana@ua.pt

19685. Petrulevičius, J.F. (2021): First coenagrionid damselfly (Odonata: Zygoptera) from the late Palaeocene of northwestern Argentina. *Life: The Excitement of Biology* 9(1): 6-15. (in English) ["A new coenagrionid zygopteran, *Marado marado* n. gen. and n. sp., is described from the late Palaeocene of Maíz Gordo Formation, Jujuy province, Northwest Argentina. The new genus is characterised by wing characters such as the subnodus aligned with the base of IR2; postnodal crossveins aligned with rows of crossveins below forming several pseudo-transverse veins; only two primary antenodal crossveins Ax1 and Ax2 retained; distal discoidal vein MAb very oblique, so that the anterior side of the discoidal cell is much shorter than the posterior one; very short petiole; RP2 nearly three cells distal to subnodus; and a RP3+4 two cells (and with one crossvein to MA) basal to subnodus. This is the first fossil for South America of the well represented family Coenagrionidae." (Author)] Address: Petrulevičius, J.F., Consejo Nacional de Investigaciones Científicas y Técnicas & División Paleozoología Invertebrados, FCNyM – Fac. de Ciencias Naturales y Museo, UNLP – Univ. Nacional de La Plata. Paseo del Bosque s/n, La Plata (1900), Argentina. Email: levicius@fcnym.unlp.edu.ar

19686. Petzold, F. (2021): Abschluss der Basiserfassungen für ein landesweites Libellenmonitoring in Thüringen. *Landschaftspflege und Naturschutz in Thüringen* 57(1): 11-18. (in German, with English summary) ["Between 2010 and 2018, the basic surveys for the establishment of a Thuringia-wide network of dragonfly monitoring waters were carried out. 700 water bodies were surveyed and 58 dragonfly species were detected. In total, more than 21,000 additional data sets were made available for the state's species recording programme. For the first time, up-to-date data collected according to a uniform methodology are now available for the entire area of Thuringia. The diversity of the dragonfly fauna in the individual districts is primarily determined by the landscape features, the availability of water bodies and the intensity of use. The most species-rich dragonfly fauna was found in the Altenburger Land district. Excavation waters, unused ponds and small reservoirs were the water body types with the highest species diversity. The results of the baseline surveys are an important basis for stock and endangerment assessments and thus form a sound basis for planning measures to conserve or improve biodiversity in the sense of the Thuringian Strategy for Biodiversity Conservation. In addition, they Supplement the data collected in the FFH monitoring sample plots and thus enable re-liable Statements to be made on the development of populations and the distribution of FFH appendage species over the entire area. In addition, they Supplement the data collected in the FFH monitoring sample plots and thus enable reliable Statements to be made on the development of populations and the distribution of species listed in the Appendix of the EU Habitats Directive over the entire area. By comparing the data with those of subsequent monitoring rounds, well-founded Statements can be made on population developments, which is of particular interest against the background of changes in climate and land use." (Author)] Address: Petzold, F., Lutherstr. 130, 07743 Jena, Germany. E-mail: falk_petzold@web.de

19687. Pimenta, P.M.; Vilela, D.S.; Pelli, A. (2021): Urbanization promotes the local extinction of odonatas in veredas

from Minas Gerais/Brazil. *International Journal of Hydrology* 5(6): 296-300. (in English) ["The order Odonata is one of the most fascinating among insects, with an estimated 6,000 described species. Little is known about the Odonata fauna in many regions of Brazil; including Vereda's areas. This unique plant formations occur only in Brazil. Despite being considered a preservation area, for over 70 years; there are a continuous degradation of this unique formation. The aim of this study was to survey the species of Odonata that occur in four areas of Veredas, within the urban perimeter of Uberaba/Minas Gerais. Two points were selected in the central region and two peripheral points. Four collections were carried out on sunny days, with two people intercepting the flight with entomological nets in May, September, December 2018 and March 2019. The total number of adults captured was 163. In the central points of the city we find generalist species, while in the peripheral points we find individuals endemic to Veredas and indicators of preserved environments. Data indicate that the Veredas have been severely abandoned by the Government and damaged by urbanization, and that the Odonata are an appropriate group to monitor the integrity of this type of environment, which gives rise to several important rivers in the region." (Authors)] Address: Pelli, A., Instituto de Ciências Biológicas e Naturais. Universidade Federal do Triângulo Mineiro. Av. Frei Paulino, 30. Uberaba/MG CEP 38025-180, Brazil.

19688. Powell, E.C.; Painting, C.J.; Hickey, A.J.; Machado, G.; Holwell, G.I. (2021): Diet, predators, and defensive behaviors of New Zealand harvestmen (Opiliones: Neopilionidae). *The Journal of Arachnology* 49(1): 122-140. (in English) ["The Neopilionidae is a highly diversified harvestman family in New Zealand, comprising eight genera and 28 species. Although individuals of many species are abundant in the field, basic information on their natural history is absent. Here we describe the diet, predators, and defensive behaviors of 13 species across three genera, *Forsteropsalis* Taylor, 2013, *Mangatangi* Taylor, 2013, and *Pantopsalis* Simon, 1879. Using three years of field observations, we first identify food items for this family, finding that New Zealand neopilionids are opportunistic, generalist foragers with a diet composed of a wide variety of prey and scavenged soft-bodied invertebrates, including worms, amphipods, species from nine orders of insects [including Odonata, Anisoptera], and two orders of arachnids (including conspecifics). We then describe the first known invertebrate predators of New Zealand harvestmen, including seven spider species, and conduct a review of the literature to collate a list of 32 species of native and non-native vertebrates (frogs, lizards, fish, birds, and mammals) that prey on harvestmen, including neopilionids. Finally, we describe the defensive behaviors of neopilionids, providing the first reports of autotomy and thanatosis in the family. In general, the diet of New Zealand neopilionids is similar to other harvestman species, and the list of predators includes mostly insectivorous taxa known to feed on harvestmen elsewhere. The defensive repertoire of neopilionids includes behaviors recorded for other species of Eupnoi, such as leg autotomy, but also unique behaviors that are only known for species of Dyspnoi and Laniatores, such as thanatosis." (Authors)] Address: Powell, E.C., School of Biological Sciences, University of Auckland, 3a Symonds St. Auckland Central, New Zealand 1010. E-mail: erin.powell94@gmail.com

19689. Pruvot, Y.Z.M.; Rene de Roland, L.A. (2021): Food habits of the Malagasy Pond Heron (*Ardeola idae*) during the breeding season in northern Madagascar. *Journal of Heron Biology and Conservation* 6:1 [online]: 12 pp. (in

English) ["We studied the diet of the endangered Malagasy Pond Heron (*Ardeola idae*) at a monospecific colony in Sofia Lake, in northern Madagascar during one breeding season from November 2018 to March 2019. Two complementary methods were used: 1) the collection of pellets followed by a laboratory analyses and 2) the direct observation of prey taken by the species. Based on 4,062 identified prey items from the 193 pellets, the diet of the Malagasy Pond Heron was composed of invertebrates including insects (81.34%), spiders (4.68%), crustaceans (1.90%), gastropods (0.86%), and vertebrates such as fishes (5.59%), frogs (3.40%) and lizards (2.24%). A large variety of insect families was identified, of which Tenebrionidae (13.47%), Hydrophilidae (11.05%), Acrididae (9.35%), Libellulidae (8.39%) and Dytiscidae (6.92%) were the most dominant. Three species of fish (*Cyprinus carpio*, *Channa* sp. and *Tilapia* sp.) and two species of frogs (*Boophis* sp. and *Rana* sp.) were also identified. The main prey items varied significantly through the five months of the breeding season. Coleopterans (Tenebrionidae and Hydrophilidae) were the most abundant group in all months and their consumption was greatest in March. Orthopterans (Acrididae) and Odonatans (Libellulidae) were consumed mainly in November and February, respectively. The consumption of fish was greatest in February and March. Frogs were captured most frequently in February. These results confirm that the Malagasy Pond Heron is a generalist and opportunistic in its feeding habitats. Conservation measures for this endangered heron should not only take place at nesting sites, but also in foraging areas surrounding the nesting colonies." (Authors)] Address: Pruvot, Yverlin, The Peregrine Fund Madagascar Project, BP 4113, Antananarivo, Madagascar. Email: yverlinpruvot@yahoo.fr

19690. Rechulicz, R.; Plaska, W. (2021): The diet of non-indigenous *Ameiurus nebulosus* of varying size and its potential impact on native fish in shallow lakes. *Global Ecology and Conservation* 31, November 2021, e01881: 10 pp. (in English) ["The brown bullhead (*Ameiurus nebulosus*) is a non-native, invasive fish species in Europe, and since it is sometimes present in high numbers in aquatic ecosystems, it may affect their functioning. The aim of the study was to determine the composition of the diet of *A. nebulosus* depending on its body size; the body size at which the brown bullhead becomes a predator and what share of its diet consists of fish. We determined the diet composition, frequency, and biomass of individual food types for 260 *A. nebulosus* individuals belonging to three classes in two shallow lakes. Analysis of the diet of *A. nebulosus* showed that it was highly varied, which manifested as a wide range of food types (15 types) as well as changes in its composition depending on the size of the fish. The nature of the habitat may influence the composition of the diet of *A. nebulosus*, which was most evident in the smallest individuals (total length <135 mm). Our observations showed that in Central European conditions, *A. nebulosus* with a length of more than 135 mm is able to feed on fish, and the share of fish in the food biomass increased with its total length, reaching even an 80% share of the biomass. In newly invaded areas, *A. nebulosus* can affect various groups of organisms by feeding on them. It can also compete with native fish species for food, but its main effect may be predation." (Authors) The study includes "Odonata".] Address: Rechulicz, R., Dept of Hydrobiology and Protection of Ecosystems, University of Life Sciences in Lublin, Dobrzańskiego 37 str., 20-262 Lublin, Poland. Email: jacek.rechulicz@up.lublin.pl

19691. Ribeiro, C.; Juen, L.; Rodrigues, M.E. (2021): The

Zygoptera/Anisoptera ratio as a tool to assess anthropogenic changes in Atlantic Forest streams. *Biodiversity and Conservation* 30: 1315-1329. (in English) ["The changes in land use caused by human activities have directly impacted aquatic ecosystems, making these environments some of the most threatened places on the planet. It is increasingly necessary and urgent to develop tools to identify and assess the effects of human impacts on ecosystems and biodiversity. This study aimed to evaluate whether the Zygoptera/Anisoptera ratio can be an effective tool to measure ecological changes in Atlantic Forest streams. Adult Odonata were collected in 42 streams. An environmental integrity index was used as a measure of environmental change. The Zygoptera/Anisoptera ratio was efficient in classifying the state of preservation of streams; therefore, habitats with a proportion equal to or greater than 67 and 52% of richness and abundance of the suborder Anisoptera can be considered altered. Meanwhile, streams representing a proportion of 54 and 67% of richness and abundance of the suborder Zygoptera can be considered little altered or preserved. The proportions of responses were close to the proposals for streams in the Amazon rainforest region. The ease of identifying the specimens in the different suborders of Odonata is practical, enabling the implementation of participatory monitoring with quick responses for monitoring in the aquatic ecosystems assessed in the region. It is important to test the Zygoptera/Anisoptera ratio for a broader validation in biomes where this evaluation has not yet been carried out. In the future, this will enable the implementation of networks for monitoring the integrity of aquatic environments quickly, effectively and at a low cost." (Authors)] Address: Rodrigues, M.E., Laboratório de Organismos Aquáticos, Departamento de Ciências Biológicas, Universidade Estadual de Santa Cruz (UESC), Ilhéus, BA, Brazil

19692. Rivas-Torres, A.; Rashni, B.; Waqa-Sakiti, H.; Tuiwawa, M.; Lorenzo-Carballa, M.O.; Beatty, C.D.; Cordero-Rivera, A. (2021): *Nesobasis rito* sp. nov. (Zygoptera: Coenagrionidae), a new species of forest damselfly from Vanua Levu, Fiji. *Zootaxa* 5082(2): 101-117. (in English) ["*Nesobasis rito* sp. nov. (Holotype male, Fiji, Vanua Levu, Drawa, 31 v 2018, A. Rivas-Torres leg.) from the comosa group is here described, illustrated, diagnosed, and compared with morphologically close species of the genus. *Nesobasis rito* can be distinguished from its related congeners by the shape of the caudal appendages and the ligula. The most similar species are *N. comosa* and *N. heteroneura*, which, like *N. rito*, have the caudal appendages covered by dense setae (especially the first species), but the shape differs clearly in lateral view, with *N. rito* having longer and more slender appendages, and a basal tooth clearly seen in dorsal view, absent in other members of the comosa group. The specific status of the collected specimens is also supported by the results of genetic analyses, where *N. rito* appears as a well-supported monophyletic clade. *Nesobasis rito* also has a distinct distribution from its most similar congeners: it is found on Vanua Levu, while *N. comosa* is found on Viti Levu and the closely related *N. heteroneura* is found on Viti Levu and Ovalau. All species of this group are found in streams with native forest riparian vegetation on their respective islands." (Authors)] Address: Cordero-Rivera, A., Universidade de Vigo, ECOEVO Lab., Escola de Enxeñaría Forestal, Campus Universitario, 36005 Pontevedra, Spain. Email: adolfo.cordero@uvigo.gal;

19693. Sanpapao, P.; Ponza, S.; Tawong, W.; Phongchaisit, P.; Pongpadung, P. (2021): Diversity of macrobenthic fauna and its relationship with environmental factors in the

Yom River. *Wichcha Journal* 40(2): 118-132. (in Thai, with English summary) ["Studies on the diversity of macrobenthic fauna and environmental factors were carried out to assess the quality of water resources and investigate the correlation of environmental factors with macrobenthic fauna in the Yom River. The field surveys were conducted at 16 sampling stations. Samples were collected in the winter season (January 2018), summer season (April 2018), and the rainy season (July 2018). The results showed that 47 families from 3 phyla of macrobenthic fauna were identified. The dominant benthic fauna group were Unionidae (10.67%) Viviparidae (10.46%) Chironomidae (8.22%) and Tubificidae (7.44%). The Shannon-Wiener diversity index Magalef index and Evenness index were 2.07 ± 0.07 , 0.67 ± 0.09 , and 1.87 ± 0.09 , respectively. Canonical correspondence analysis revealed that Diptera, Haplotoxida, and Lumbriculida showed a positive correlation with some parameters such as pH, water temperature, turbidity, BOD, chlorophyll a, ammonia, nitrite, nitrate, and total organic matter, while Hemiptera, Odonata, Decapoda, Trichoptera, and Ephemeroptera showed the positive correlation with total dissolved solids, conductivity, alkalinity and transparency. After assessing the water quality using the ASPT value (mean value of 5.11 ± 0.85) and comparing it with the standard index of surface water quality, it was concluded that water quality reached mesotrophic status and surface water quality CLASS 3. These results can be beneficial in monitoring water quality and controlling effluents from various activities to conserve the water resources in the Yom River." (Authors) Odonate taxa are treated at family level.] Address: Pongpadung, P.: Email: piyawatp@nu.ac.th

19694. Sarashina, M.; Yoshida, T. (2021): Diet composition of the invasive American Bullfrog (*Lithobates catesbeianus*) in Onuma Quasi-National Park, Hokkaido, Japan. *Current Herpetology* 40(1): 77-82. (in English) ["An invasive alien species American bullfrog (hereafter, 'bullfrog') is found in freshwater lakes in Onuma Quasi-National Park, Hokkaido, Japan. Bullfrog commonly feeds on red swamp crayfish in many areas. However, red swamp crayfish has not been confirmed in Komuna Lake, Onuma Quasi-National Park. The purpose of this study is to examine the trend of predation on native biomes in areas without crayfish presence. We detected the dietary composition of bullfrogs. The stomach contents of 469 individuals were analyzed and classified. The stomach contents of adult frogs accounted for 67.4% of volume were vertebrates including Actinopterygii and Amphibia such as Japanese crucian carp, topmouth gudgeon, bullfrog juveniles, bullfrog tadpoles and Japanese common toad. Further, aquatic animals were preyed more than terrestrial animals in volume (60.0%) and frequency (90.0%). From these results, bullfrogs in Onuma Quasi-National Park used most conspicuous alien aquatic species such as alien fish and frogs of the same species as food resources and further revealed that these alien aquatic species function as a substitute food for the crayfish. While the majority of bullfrog food resources are alien aquatic species, several rare aquatic animals were also preyed on. In the future, it will be necessary to investigate the predation pressure of bullfrogs on local biodiversity." (Authors) Taxa including Odonata are treated at order level.] Address: Sarashina, M., Link-us, 1-25, Toyohira 2-jo 7-chome, Toyohira, Sapporo, 062-0902, Japan

19695. Schneider, T.; Vierstraete, A.; Müller, O.; van Pelt, G.J.; Caspers, M.; Ikemeyer, D.; Snegovaya, N.; Dumont, H.J. (2021): Taxonomic revision of Eastern part of western Palearctic Cordulegaster using molecular phylogeny and

morphology, with the description of two new species (Odonata: Anisoptera: Cordulegasteridae). Diversity 2021, 13, 667. <https://doi.org/10.3390/d13120667>: 50 pp. (in English) ["Taxonomy of the genus Cordulegaster Leach in Brewster, 1815 in the Eastern part of the Western Palaearctic is poorly resolved. A two-step approach was applied: sequences of mitochondrial and nuclear DNA fragments were used to sort specimens; poorly known or new taxa with their phenotypic variation were described. The existence of two traditional groups (boltonii- and bidentata group) was confirmed. Cordulegaster coronata Morton, 1916, however, belongs to a different group. Molecular-analysis supported three known and one new species (C. heros Theischinger, 1979, C. picta Selys, 1854, C. vanbrinkae Lohmann, 1993, and C. kalkmani sp. nov.) in the boltonii-group. In the bidentata-group, all specimens from West-Turkey belonged to C. insignis Schneider, 1845, all specimens further east to a complex of four closely related species, which we name charpentieri complex (C. amasina Morton, 1916, stat. rev., C. mzymtae Bartenev, 1929 C. charpentieri (Kolenati, 1846), stat. rev. and C. cilicia sp. nov.). The following taxa: C. insignis nobilis Morton, 1916, syn. nov., C. nachtschevanica Skvortsov & Snegovaya, 2015, syn. nov. C. plagionyx Skvortsov & Snegovaya, 2015, syn. nov. and the Caucasian subspecies C. insignis lagodechica Bartenev, 1930, syn. nov., were synonymized with C. charpentieri. Finally, we provide a key for all Western Palaearctic Cordulegaster." (Authors)] Address: Schneider, T., Arnold-Knoblach-Ring 76, 14109 Wannsee, Germany. Email: thomas.rs@gmx.de

19696. Shin, S.; Jung, K.S.; Kang, H.G.; Dang, J.-H.; Kang, D.; Han, J.E.; Kim, J.H. (2021): Northward expansion trends and future potential distribution of a dragonfly *Ischnura senegalensis* Rambur under climate change using citizen science data in South Korea. Journal of Ecology and Environment 45(33): 15 pp. (in English) ["Citizen science is becoming a mainstream approach of baseline data collection to monitor biodiversity and climate change. Odonata have been ranked as the highest priority group in biodiversity monitoring for global warming. *I. senegalensis* has been designated a biological indicator of climate change and is being monitored by the citizen science project "Korean Biodiversity Observation Network." This study has been performed to understand changes in the distribution range of *I. senegalensis* in response to climate change using citizen science data in South Korea." (Authors)] Address: Kim, J.H., Department of Biological Resources Utilization, National Institute of Biological Resources, Incheon 22689, Republic of Korea. Email: birdkr@korea.kr

19697. Shivaraju; Venkateshwarlu, M (2021): Faunal diversity of Durgadahalli Lake of Tumakuru, Karnataka State, India. Journal of Environmental Studies 7(1): 6 pp. (in English) ["The aquatic organisms are the good indicators of health of an aquatic ecosystem and represent the balanced ecosystem. The present study was conducted to understand the current status of faunal diversity in Durgadahalli Lake, located in the North-East of Tumakuru district, at distance of 15 km from Tumakuru city in Karnataka. It lies at 13° 13' 56" N latitude and 77° 25' 30" E longitude. It receives water mainly from rain-fall with an average of 620 mm and from Jayamangalli river. The Lake comparatively smaller with rich aquatic faunal diversity and recorded 20 species of zooplankton, 9 species of aquatic insects belonging to Hemiptera, Coleoptera, Odonata and Diptera, One molluscan shell, 2 amphibia species (frog) and one reptilian species (turtle). The water collected and analyzed from five selective sampling stations of the Lake from 2016 to 2019. Not many

reports are available on Durgadahalli Lake with respect to faunal diversity. Keeping it in mind, we have selected Durgadahalli Lake for the present study on ecology and aquatic faunal diversity." (Authors) The following odonate species are said to occur: *Libellago andamanensis* (Fraser, 1924), *Gomphidia kodaguensis*, Fraser, 1923, and *Tramea transmarina*, Brauer, 1867] Address: Shivaraju, Dept of Studies and Research in Applied Zoology, Jnana sahyadri, Shankaraghatta, Kuvempu Univ., Shivamogga-577, 451, Karnataka, India; Email: 1993shivarajugiri@gmail.com

19698. Suchitra, G.; Chethan, B.K. (2021): Occurrence and relative abundance of dragonflies in Mysuru city, Karnataka, India. Journal of Entomology and Zoology Studies 9(6): 180-183. (in English) ["A field study was conducted to find out the status, occurrence and relative abundance of dragonflies in Mysuru city, Karnataka during April 2020 to May 2021. Sampling was done by line transect method, collected data from 4 study areas were subjected to estimate relative abundance of species. A total of 28 species under 3 families were recorded. Family Libellulidae was found to be most dominated with 26 species followed by Aeshnidae and Gomphidae with 1 species respectively. Based on the relative abundance 18% of species were very common while, 36% were common and 46% were uncommon. The study revealed occurrence of 5 very common species of dragonflies in all the study areas. The results of this study provide baseline data of dragonfly diversity of Mysuru city for research on their biology and conservation." (Authors)] Address: Suchitra, G., Dept of Zoology, Maharani's Science College for Women, Mysuru, Karnataka, India

19699. Takahashi, M.; Okude, G.; Futahashi, R.; Takahashi, Y.; Kawata, M. (2021): The effect of the doublesex gene in body colour masculinization of the damselfly *Ischnura senegalensis*. Biology Letters 17: 20200761. 6 pp. (in English) ["Odonata species display a remarkable diversity of colour patterns, including intrasexual polymorphisms. In the damselfly (*Ischnura senegalensis*), the expression of a sex-determining transcription factor, the doublesex (*Isdsx*) gene is reportedly associated with female colour polymorphism (CP) (gynomorph for female-specific colour and andromorph for male-mimicking colour). Here, the function of *Isdsx* in thoracic coloration was investigated by electroporation-mediated RNA interference (RNAi). RNAi of the *Isdsx* common region in males and andromorphic females reduced melanization and thus changed the colour pattern into that of gynomorphic females, while the gynomorphic colour pattern was not affected. By contrast, RNAi against the *Isdsx* long isoform produced no changes, suggesting that the *Isdsx* short isoform is important for body colour masculinization in both males and andromorphic females. When examining the expression levels of five genes with differences between sexes and female morphs, two melanin-suppressing genes, black and ebony, were expressed at higher levels in the *Isdsx* RNAi body area than a control area. Therefore, the *Isdsx* short isoform may induce thoracic colour differentiation by suppressing black and ebony, thereby generating female CP in *I. senegalensis*. These findings contribute to the understanding of the molecular and evolutionary mechanisms underlying female CP in Odonata." (Authors)] Address: Takahashi, M., Graduate School of Life Sciences, Tohoku University, 6-3 Aramaki, Aoba, Sendai 980-8578, Japan

19700. Tavakol, M.R.; Tooski, M.Y.; Jabbari, M.; Javadi, M. (2021): Effect of graphene nanoparticles on the strength of sandwich structure inspired by dragonfly wings under low-

velocity impact. *Polymer Composites* 42(10): 5249-5264. (in English) ["Dragonfly's wings are highly specialized flying organs that are well adapted to the flying behavior of each dragonfly, mainly consisting of veins and membrane. The effect of graphene nanoparticles on a novel foam-based sandwich panel structure inspired by microstructural features of dragonfly wings has been investigated under low-velocity impact. Composite and nanocomposite sandwich veins are made of E-glass/epoxy layers, in which different percentages of graphene nanoparticles are combined with its resin. Polyurethane foam was also used for its core. According to the performance of the samples made after testing and cutting the samples in transverse and longitudinal directions, the internal structure of the vein was examined. Sandwich panels with this type of structure under impact can prevent damage propagation in the vein. The sandwich structure with 0.3% nano indicated more stable behavior in energy absorption and impact resistance than other samples." (Authors)] Address: Mehdi Yarmohammad Tooski, Department of Mechanical Engineering, Islamic Azad University South Tehran Branch, Tehran, Iran. E-mail: m_yarmohammadi@azad.ac.ir

19701. Thiele, V.; Blumrich, B.; Berlin, A.; Kasper, D. (2021): Erfassung und Bewertung der Libellen-, Heuschrecken- und Großschmetterlingsfauna des Siebendorfer Moores in Mecklenburg (Odonata, Orthoptera, Lepidoptera). *Virgo* 24: 3-16. (in German) ["In the year 2020, the Siebendorfer Moor was examined for the occurrence of dragonflies, butterflies and moths and grasshoppers. 10 species of damselflies and 17 species of dragonflies were found in the project area, including the FFH species large white-faced darter (*Leucorrhinia pectoralis*). The dragonfly fauna (n=27 species) of the study area was dominated by species whose larvae show a clear preference for stagnant to poorly flowing water (limnophilic), plant substrates, moor-like conditions and constantly water-bearing rivers. The most optimal settlement exists in the central fen area near the peat cuttings. The butterfly and moth fauna was relatively poor in species. 77 moths and 22 day-flying species were detected. The biocenosis was characterized by taxa from the swamp forests, reeds, herbaceous vegetation and mixed deciduous forests, with a gradient from east (peat cuttings) to west (grassland areas). Many species already reflect hygrophilic to mesophilic conditions, which can be seen as positive for the development of the fen. 14 species of grasshoppers have been identified. The currently detected grasshopper species mainly belong to the mesophilic to hygrophilic or hygrophilic taxa, which allows the conclusion that the habitats are already well suited for the typical wet meadow species. These associations can be found particularly on the areas adjacent to the peat cuttings and smaller bodies of water in the central area of the Siebendorfer Moor." (Authors)] Address: Thiele, V., biota – Institut für ökologische Forschung und Planung GmbH, Nebelring 15, 18246 Bützow, Germany. E-Mail: volker.thiele@institut-biota.de

19702. Tochiewa, F.T.; Tochiev, T.Y. (2021): Ecological and faunal analysis of dragonflies (Odonata) of suborders Zygoptera, Caloptera in Republic of Ingushetia. *E3S Web of Conferences* 265, 01033 (2021): 7 pp. (in English) ["In this work, we adhere to the systematics proposed by the school of odonatologists B.F.Belyshev, that is, the order is subdivided into three suborders: Anisoptera, Zygoptera and Caloptera. In this article, we first characterize the suborders Zygoptera, Caloptera. The article provides a systematic composition and an overview of taxa common in the RI. [one]. On the basis of literature sources, brief characteristics of

suborders, families and genera are given, and the problems of taxonomy and nomenclature of individual species and basic information on the distribution of taxa found in the study area are discussed. Analysis of the existing stream of literary information on dragonflies indicates that there are still problems, the solution of which requires close attention. First of all, this is the lack of research on the Caucasian regional odonatofaunas." (Authors)] Address: Tochiewa, Fatima, Ingush State University, Republic of Ingushetia, Magas, Russia. E-mail: fatimatociewa7@gmail.com

19703. Tochiewa, F.T.; Tochiev, T.Yu.; Izmailova, M.A.; Dudarova, Kh.Yu. (2021): Influence of hydrological regimes on the ecological balance of the environment: case study of the Republic of Ingushetia. *IOP Conf. Ser.: Earth Environ. Sci.* 867 012111: 5 pp. (in English) ["Dragonflies are amphibious insects whose existence is associated with water bodies that are necessary for the development of larvae. Different types of dragonflies differ in the requirements for the choice of habitats. In mountain species, preferences depend on the height of the habitat. The analysis of the existing flow of literary information on dragonflies indicates that there are still problems that require close attention. First and foremost, this is insufficient study of Caucasian regional odonata faunas. Of all the unique Caucasian regions, the territories of the Dagestan and Chechen Republics were the least studied with regard to dragonflies. This is caused by the acute shortage of specialists and the difficulties of studying the group of animals of this original and unique region, which is located at the biogeographic crossroads of various faunas. Siberian, European, Mediterranean, Ethiopian, Central and East Asian dragonfly species fly together within these territories. A significant number of scientific articles are devoted to Caucasian dragonflies, testifying to the unique fauna of dragonflies in the region. At the same time, there are many unresolved issues of the taxonomic nature of some dragonfly species, their propagation, distribution over high-altitude zones, life cycles of ontogenesis, and some environmental issues, in particular, the phenology of the group in the peculiar and unique physical, geographical and landscape conditions of the Republic of Ingushetia. There is a relatively extensive literature on the dragonflies of the Caucasus, while there is no purposeful summary of the ecological-faunal, ecological-geographical and zoogeographic features of this group of insects in the Republic of Ingushetia. Another problem that has not yet been solved is the establishment of patterns of dragonfly propagation along the altitude gradient, as well as the peculiarities of the formation of odonotocomplexes in various high-altitude zones of the Republic of Ingushetia." (Authors)] Address: Tochiewa, Fatima, Ingush State University, Republic of Ingushetia, Magas, Russia. E-mail: fatimatociewa7@gmail.com

19704. Trapero-Quintana, A.; Casenave-Cambet, A.C.; Lim-Franco, G. (2021): Diversidad y patrones de emergencia de libélulas (Odonata: Insecta) en Chutines, Guantánamo, Cuba. *Boletín de la Sociedad Entomológica Aragonesa* 69: 217-226. (in Spanish, with English summary) ["Emergence is the process by which larvae of aquatic insects emerge from the water and enter the air as adults. Little is known about the emergence patterns for tropical odonates. The purpose of this study is to characterize the emergence pattern of an odonate assemblage in a permanent lentic habitat of Chutines, Guantánamo, from the collect of exuviae. 30 samplings were carried out with a frequency of once a week and seven to nine days apart, in four transects of 8m². To characterize the emergence, the seasonal climate model of: rainy, dry and transitional periods

was considered. Changes in climate variables and habitat characteristics were recorded and related to the emergence pattern. The study shown that the emergence pattern in a constant water volume is asynchronous, with a predominance of accidental species and uneven abundance distribution. The stage with the highest percentage of emergence was the dry season, from which temperature and relative humidity were significantly correlated parameters." (Authors)] Address: Trapero-Quintana, A., Depto de Biología Animal y Humana, Facultad de Biología de la Univ. de la Habana, Calle 25 # 455 entre J e I, Vedado, La Habana, Cuba. CP: 10400. Email: trapero76@gmail.com,

19705. Van Passel, B.; Cornells, F.; De Beuckeleer, H.; De Buyzer, C.; Kiefer, M.; Vermeulen, T. (2021): The dragonfly and damselfly fauna of Stropersbos. *Brachytron* 22(1/2): 26-47. (in Dutch, with English summary) ["Intensive monitoring from 2016 to 2020 has provided a systematic overview of the Odonata fauna of the Stropersbos. This site has an Odonata fauna which more closely resembles that of the Kempen, rather than that of the more western areas on the Flemish sand ridge. After the restoration works of 2015, *Sympetrum vulgatum* and *Ischnura pumilio* showed pioneer behaviour. In the more sparse areas of the Stropersbos, high densities of *Lestes barbarus* and *Lestes dryas* were observed. In the more sheltered mixed-landscape areas, a stable population of *Lestes virens* was discovered. Due to the drying out of their reproductive waters in 2018-2020, relict populations of *Sympetrum danae* and *Ceriatrigon tenellum* have recently decreased strongly, while *Sympetrum meridionale* has expanded during the same period." (Authors)] Address: Email: Vermeulen, T.: tomvermeulen@proximus.be

19706. Vandamme, I. (2021): Predation of the robber fly *Eutolmus rufibarbis* on *Sympetrum danae*. *Brachytron* 22(1/2): 48-51. (in Dutch, with English summary) ["Robber flies are known predators of other Diptera, even those larger than themselves, but very little is known about their preying on dragonflies. On 5 July 2018, while on monitoring round in Grenspark de Kalmthoutse Heide, Belgium, I observed predation of *Eutolmus rufibarbis* on *Sympetrum danae*. A short inquiry provided only very few other images of Robber flies preying on dragonflies. It seems to be fairly rare." (Author)] Address: Email: igor.vandamme@skynet.be

19707. Vinko, D.; Salamun, A. (2021): First record of Violet Dropwing *Trithemis annulata* (Palisot de Beauvois, 1807) (Odonata: Libellulidae) in Slovenia. *Natura Sloveniae* 23(2): 25-37. (in English, with Slovene summary) ["One adult male *T. annulata* was recorded at Lake Vogršček in the Vipava Valley (W Slovenia) during the Biological Students Research Camp – Otlica 2021. This first record for the country is presented and the species' distribution in Europe outlined. Behavioural observations and data on the accompanying Odonata fauna are included. This widespread Afrotropical species has rapidly expanded its range in south and south-western Europe in the recent two decades, with global warming apparently being the main driver of this expansion. Hence, 73 Odonata species belonging to 29 genera and nine families are now reported for Slovenia. *Trithemis* is the seventh genus to be added to the family Libellulidae for the country. The discovery of *T. annulata* in the Vipava Valley in Slovenia is significant for the fact of being the northernmost observation on the Balkan Peninsula to date." (Authors),] Address: Vinko, D., Slovene Dragonfly Society, Verovškova 56, SI-1000 Ljubljana, Slovenia. E-mail: damjan.vinko@gmail.com

19708. Wasscher, M.; Dijkshoorn, D.; de Vries, R.; Kloen, J.-F. (2021): Does the dragonfly biting midge *Forcipomyia paludis* co-occur with the Great fen-sedge *Cladium mariscus* in the Netherlands and Belgium?. *Brachytron* 22(1/2): 13-25. (in Dutch, with English summary) ["An overview is given of the localities where the dragonfly midge (*Forcipomyia paludis*) has been found in the Netherlands and Belgium. Following the hypothesis that the distribution of this species corresponds with the occurrence of the Great fen-sedge (*Cladium mariscus*), we searched for new localities of the species by checking thousands of photos of dragonflies for the presence of the midge on their wing veins. This resulted in nine new locations in the Netherlands and one in Belgium, which brings the total numbers of locations of *F. paludis* to 24 (the Netherlands) and 7 (Belgium). *Cladium mariscus* occurs on 21 and 4 of these locations respectively. The most important locations of *F. paludis* in both countries are locations where *C. mariscus* grows extensively. Incidentally, *F. paludis* was found at locations where *C. mariscus* is not locally present but is found at a distance up to 25 km. These observations might refer to midges attached to the wings of their dispersing hosts. The larva of *F. paludis* has not yet been described, but might be found in the thick litter layer between *C. mariscus* plants." (Authors)] Address: Wasscher, M., Minstraat 15bis, 3582 CA Utrecht, The Netherlands. Email: marcel.hilair@12move.nl

19709. Wasscher, M.; de Vries, R.; Dijkshoorn, D.; Kloen, J.-F. (2021): Co-occurrence of the dragonfly biting midge *Forcipomyia paludis* and the Great fen-sedge *Cladium mariscus* in Europe. *Libellula* 40(1/2): 1-17. (in English, with German summary) ["The dragonfly biting midge *Forcipomyia paludis* (Diptera: Ceratopogonidae) has been found in many parts of Europe and adjacent countries such as Morocco, Turkey and Georgia, but has a remarkably scattered distribution, with at most a few dozen localities in the countries where it occurs. Its presence appears to be strongly concurrent with the presence of the Great fen-sedge *Cladium mariscus*, a marsh plant with a wide but scattered distribution within Europe. Both species co-occur across the entire known range of *F. paludis*. However, *F. paludis* was also found on a few localities where the Great fen-sedge has not been reported. In most cases these localities are within a limited distance of Great fen-sedge localities, or refer to incidental observations in which *F. paludis* might have been attached to dispersing dragonflies. A probable discrepancy between the two species was found in the southwest of Baden-Wuerttemberg. This overlap in distribution suggests that the presence of *F. paludis* is linked to that of the Great fen-sedge. It is therefore probable that the larvae of *F. paludis* develop in Great fen-sedge stands, where a humid litter layer of dead leaves is formed. This habitat presents similar conditions as those preferred by many other Ceratopogonid larvae. However, the concurrence that is described here does not prove a decisive ecological link while we did find a few exceptions. Additionally, first records for Estonia, Denmark, Portugal and Turkey are reported here." (Authors)] Address: Wasscher, M., Minstraat 15bis, 3582 CA Utrecht, The Netherlands. Email: marcel.hilair@12move.nl

19710. Yu, X.; Hämäläinen, M. (2021): Longinos Navās's Odonata species from China: Notes on three synonymies in Platycnemididae, including the synonymy of *Pseudocopera tokyoensis* (Asahina, 1948). *Odonatologica* 50(1/2): 115-129. (in English) ["Based on the study of the relevant type specimens and other material, the following synony-

mies in Platycnemididae are established: *Pseudocopera tokyoensis* (Asahina, 1948) is a junior synonym of *Pseudocopera rubripes* (Navās, 1934) (comb. nov.), *Platycnemis foliosa* Navās, 1932 is a junior synonym of *Platycnemis phyllopoda* Djakonov, 1926, and *Platycnemis pierrati* Navās, 1935, is a junior synonym of *Copera marginipes* (Rambur, 1842). The present taxonomic Status of the 30 new Odonata species and one variety described by Longinos Navās from China is presented in a table and briefly discussed, pointing out a few poorly known, or dubious taxa in need of further study." (Authors)] Address: Yu, X., College of Life Sciences, Chongqing Normal Univ., Chongqing, 401331, P.R. of China. Email: lannysummer@163.com

19711. Zayeid, Y.M.; Altaib, A.N. (2021): Taxonomic study on Libellulidae species (Odonata: Anisoptera) in Al-Marj region Libya. *Al-Mukhtar Journal of Sciences* 36(4): 353-362. (in Arabian, with English summary) ["The study was aimed to identify some species of Odonata on Al-Marj area in Aljabal Alakder. The study carried out from January 2018 to December 2019 in Al Jabal Al Akhdar region which aimed to identify the species of the suborder Anisoptera, family Libellulidae in twelve sites. Four species of this family were recorded, *Crocothemis erythraea* (Brulle, 1832), *Orthetrum anceps* (Schneider, 1845), *Sympetrum fonscolombii* (Selys, 1840), and *Trithemis arteriosa* (Burmeister, 1839), endemic to the study area. Their identification was based on the external morphology of the adults." (Authors)] Address: Zayeid, Y.M., Department of Plant Protection, Faculty of Agriculture, Omer Al-Mukhtar University, Al-Bayda, Libya. Email: ymzaied@yahoo.com ,

19712. Zia, A. (2021): Noteworthy records of damselflies (Odonata: Zygoptera) housed at National Insect Museum, Pakistan (Damselflies of Pakistan: Part II). *International Dragonfly Fund - Report 164*: 1-21. (in English) ["Damselflies recorded before the administrative partition of the Indian Subcontinent and now housed at National Insect Museum (NIM), Islamabad were reviewed and catalogued. This collection is the divided part of National PUSA Collection (NPC) transferred to the Pakistan during 1947. Data for this collection had never been available or published. A record of 104 taxa is reported herein. Few of the species were found double named, misidentified and not updated as per valid classification. Some of the specimens were found unidentified. All such issues were resolved by following regional literature." (Authors)] Address: Zia, A., National Insect Museum, NARC – Islamabad, Pakistan. Email: saiyedahmed@gmail.com

2022

19713. Archibald, S.B.; Cannings, R.A.; Greenwalt D.E. (2022): *Kishenehna prima*, a new genus and species of darner dragonfly (Odonata, Aeshnidae, Gomphaeschninae) from the early middle Eocene Kishenehn Formation of Montana, USA. *Zootaxa* 5099(4): 496-500. (in English) ["We describe the darner dragonfly *Kishenehna prima* n. gen. and sp. (Odonata, Aeshnidae, Gomphaeschninae) based on a well-preserved, nearly complete female hind wing from the Lutetian Coal Creek Member of the Kishenehn Formation, northwestern Montana, USA. *Kishenehna* is morphologically close to the late Paleocene genus *Alloaeschna* Wighton & Wilson of Alberta, Canada. This is the first dragonfly (Anisoptera) described from the Kishenehn Formation and the first from the Lutetian of the Western Hemisphere." (Authors)] Address: Archibald, S.B., Dept Biol. Sciences, Simon Fraser Univ., 8888 University Drive, Burnaby,

British Columbia, V5A 1S6, Canada. Email: sba48@sfu.ca

19714. Baaloudj, A.; De los Ríos-Escalante, P.R.; Esse, C. (2022): Benthic community ecology for Algerian river Seybouse. *Brazilian Journal of Biology* 84, e251566: 12 pp. (in English, with Portuguese summary) ["The Seybouse is the second largest river basin in Algeria, hosting an important biodiversity and providing various ecosystem services. This watershed is highly influenced by agricultural and industrial activities, which threaten its biodiversity and ecosystem integrity. The use of benthic macroinvertebrates as biological indicators has a long tradition in developed countries and integrated into all assessments of the ecological quality of river systems. However, the macroinvertebrates of many North African regions are still not well studied, including those of the Seybouse river. The aim of this study is to assess the inventory and ecological role of benthic macroinvertebrates in inland waters of the Seybouse River and determine the impact of pollution on their spatial distributions. We sampled the benthic macrofauna of Wadi Seybouse and its affluents using regular surveys in three sites, of which one was in the upper Seybouse Bouhamdane in Medjez Amar and two in the middle Seybouse. Between December 2019 and May 2020, 10 physico-chemical parameters (pH, EC, OD, water speed, NO₃, Salinity, NO₂, MES, turbidity, depth) were measured in order to establish a health state diagnosis of these aquatic ecosystems. The complementary biological approach by the analysis of populations of macroinvertebrates identified 7482 individuals and 40 taxa divided into five classes: Crustaceans which were the most dominant, insects with the main orders (Ephemeroptera, Diptera, Trichoptera, Heteroptera and Odonata), Molluscs, Nematodes and Annelids. The physico-chemical analyzes and the application of the organic pollution indices indicated a strong to excessive pollution for all sites, especially in Seybouse upstream." (Authors) Odonata are treated a sub-order level.] Address: Baaloudj, A., University of 8 May 1945 Guelma, Faculty SNV-STU, Laboratoire de Biologie, Eau et Environnement, Guelma, Algeria. Email: bafef@yahoo.fr

19715. Bowles, D.E.; Kleinsasser, L.J. (2022): Environmental determinates of distribution for dragonfly nymphs (Odonata: Anisoptera) in urban and non-urban East Texas streams, USA. *Hydrobiology* 1(1): 67-88. (in English) ["We collected environmental and habitat data for nymphs of 12 dragonfly species (Odonata: Anisoptera) from 91 stream sites throughout eastern Texas, including urban and non-urban locations. Understanding the relationship of dragonflies to habitat structure and other environmental variables is crucial for the purpose of conserving these insects and better using them as predictive tools for water quality assessments, and refining tolerance values. The objectives of this study were to determine the key environmental variables influencing the diversity and distribution of dragonflies in eastern Texas streams, and further determine if differences in those factors could be observed between urban and non-urban sites. We collected samples separately from benthic habitats and woody snag habitats. Significantly fewer sites were observed to have dragonfly species on snag habitat (mean = 1.25) compared to benthic samples (mean = 14.67) (t-test, p = 0.001). The number of dragonfly species collected among non-urban streams (mean = 9.83) was not significantly different than urban streams (mean = 6.08; t-test, p = 0.07). Detrended correspondence analysis of benthic and snag habitat data collected from non-urban and urban locations showed that most of the species are oriented most closely to benthic habitats in non-urban streams. Snag

habitat was shown to be poorly ordinated for all of the species. A canonical correspondence analysis of 29 water quality and habitat variables as environmental determinants of dragonfly diversity and distribution showed that distributional relationships among species are complex and often described by multiple environmental factors." (Authors)] Address: Bowles, D.E., Dept of Biology, Missouri State University, 901 South National Avenue, Springfield, MO 65897, USA. Email: davidbowles@missouristate.edu

19716. Buczynski, P.; Tonczyk, G. (2022): Polish and dedicated to Poland odonatological papers. 20. The year 2021 and additions to the years 2019-2020. *Odonatrix* 181 (2022): 5 pp. (in Polish, with English summary) ["The authors present a list of 33 Polish and dedicated to Poland odonatological publications that appeared in the year 2021, and two MSc theses. Six papers from 2020 and three papers from 2019 are also given to supplement the previous lists." (Authors)] Address: Buczynski, P., Dept of Zool., Maria Curie-Skłodowska University, Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

19717. Chen, R.-Y.; Lai, C.-L.; Chen, J.-C.; Wu, M.-X.; Yang, H. (2022): Omnidirectional / unidirectional antireflection-switchable structures inspired by dragonfly wings. *Journal of Colloid and Interface Science* 610: 246-257. (in English) ["Randomly arranged irregular inclined conical structure-covered dragonfly wings, distinguished from periodic conical structure-covered cicada wings, are with high optical transparency for wide viewing angles. Bioinspired by the antireflective structures, we develop a colloidal lithography approach for engineering randomly arranged irregular conical structures with shape memory polymer-based tips. The structures establish a gradual refractive index transition to suppresses optical reflection in the visible spectrum. By manipulating the configuration of structure tips through applying common solvent stimulations or contact pressures under ambient conditions, the resulting unidirectional antireflection and omnidirectional antireflection performances are able to be instantaneously and reversibly switched. The dependences of structure shape, structure inclination, structure arrangement, and structure composition on the switchable antireflection capability are also systematically investigated in this study." (Authors)] Address: Chen, R.-Y., Dept of Chemical Engineering, National Chung Hsing University, 145 Xingda Road, Taichung City 40227, Taiwan

19718. Chitsaz, N.; Siddiqui, K.; Marian, R.; Chahl, J.S. (2022): Numerical and experimental analysis of 3D Micro-Corrugated Wing in gliding flight. *Journal of Fluids Engineering* 144(1): 11 pp. (in English) ["In this study, computational fluid dynamics analysis was performed on a three-dimensional model of a Libellulidae wing to determine aerodynamic performance in gliding flight. The wing is comprised of various corrugated features alongside the spanwise and chordwise directions, as well as twist. The detailed features of real 3D dragonfly wing models, including all the corrugations through both span and chord, have not been considered in the past for a detailed aerodynamic analysis. The simulations were conducted by solving the Navier-Stokes equations to demonstrate gliding performance over a range of angles of attack at low Reynolds numbers. The numerical model was validated against experimental data obtained from a fabricated corrugated wing model using particle image velocimetry. The numerical results demonstrate that bio-inspired wings with corrugations compared to flat profile wings generate more lift with lower drag, trapping the vortices in the valleys of wing corrugation leading to

delayed flow separation and delayed stall. The experimental and numerical results demonstrate that the methodology presented in this study can be used to measure bio-inspired 3D wing flow characteristics, including the influence of complex corrugations on aerodynamic performance. These findings contribute to the advancement of knowledge required for designing an optimized bioinspired micro air vehicle." (Authors)] Address: Chitsaz, Nasim, UNISA STEM, Australian Research Centre for Interactive and Virtual Environments, University of South Australia, University Boulevard, Mawson Lakes, South Australia, 5095, Australia. E-mail: nasim.chitsaz@mymail.unisa.edu.au

19719. Dawn, P. (2022): Dragonflies and damselflies (Insecta: Odonata) of West Bengal, an annotated list of species. *Oriental Insects* 56(1): 81-117. (in English) ["An updated checklist of Odonata known so far from the state West Bengal is presented here consisting 239 species belonging to 114 genera and 17 families. Eight species viz. *Megalestes irma*, *Lestes garoensis*, *Calicnemia nipalica*, *Chlorogomphus mortoni*, *Somatochlora daviesi*, *Cephalaeschna viridifrons*, *C. triadica*, *Lyriothemis mortoni*, are recorded for the first time from the state; and last two species are recorded for the first time from India. This paper indicates a prominent rise in the number of species than the previous published checklist, as many isolated species distribution records were lying undocumented. This paper also reflects the data from citizen science platforms and social media groups. Reference for the original descriptions, type locality and information of specimen repository of the recorded species are provided. Some doubtful identification and distribution records are also discussed here." (Authors)] Address: Dawn, P., Dept Zool., Shyampur Siddheswari Mahavidyalaya, Howrah, India. Email: prosenjit.dawn@gmail.com

19720. Dow, R.A. (2022): Previously unpublished Odonata records from Sarawak, Borneo, part VIII: New records from Kapit Division. *International Dragonfly Fund Report* 169: 1-13. (in English) ["Odonata recorded during two brief sampling trips to the Kapit Town area in Kapit Division, Sarawak in 2020 are reported on. Seventy nine species were recorded, of which at least six (*Onychargia atrocyana* Selys, 1865, *Ischnura senegalensis* (Rambur, 1842), *Pseudagrion lalakense* Orr & van Tol, 2001, *Megalogramphus borneensis* (Laidlaw, 1914), *Agrionoptera insignis* (Rambur, 1842) and *Hydrobasileus croceus* (Brauer, 1867)) are first records for the division, bringing the total number of Odonata known from the division to 160. Notable records include *Coeliccia kenyah* Dow, 2010, *Teinobasis laidlawi* Kimmins, 1936, *Burmagomphus insularis* Laidlaw, 1914, *Leptogomphus* sp. cf. *coomansi* Laidlaw, 1936 and *Macromia callisto* Laidlaw, 1922. Remarks are made on the habitat preferences of *Agrionoptera insignis* and *Camacinia gigantea* (Brauer, 1867). A highly atypical population of *Neurothemis* Brauer, 1867 (species unclear at present) is reported." (Author)] Address: Dow, R.A., Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia. Email: rory.dow230@yahoo.co.uk

19721. Encarnación-Luévano, A.; Escoto-Moreno, J.A.; Villalobos-Jiménez, G. (2022): Evaluating potential distribution and niche divergence among populations of the world's largest living damselfly, *Megaloprepus caerulatus* (Drury, 1782). *Diversity* 2022, 14, 84. 16 pp. (in English) ["*M. caerulatus* is a Neotropical species with a highly specialised niche, found from Mexico to Bolivia, primarily in mature tropical forests lower than 1500 masl. It is also the damselfly with

the largest wingspan in the world. Recent studies found strong genetic isolation among populations of *M. caerulatus*. Further studies found genetic and morphological divergence, but ecological divergence was not tested. Here, we test for ecological divergence by evaluating niche differences among populations of *M. caerulatus* in Los Tuxtlas (Mexico), Corcovado (Costa Rica), Barro Colorado (Panama), and La Selva (Costa Rica). We used Ecological Niche Modelling (ENM) to compare potential distribution ranges, and we estimated the breadth and overlap of the ecological niche using equivalence and similarity tests. The potential distributions estimated with ENM were heavily fragmented and we found no geographic overlap of potential distributions among populations. However, we found geographic correspondence between populations with a close phylogenetic relationship. Even though all similarity tests were non-significant, the results of the equivalence tests suggest niche divergence between Corcovado and the other three populations, but also between Barro Colorado (Panama) and La Selva. These results show evidence of strong ecological divergence in Corcovado and Barro Colorado populations." (Authors)] Address: Villalobos-Jiménez, Giovanna, Colección Zoológica, Departamento de Biología, Centro de Ciencias Básicas, Universidad Autónoma de Aguascalientes, Av. Universidad #940, Ciudad Universitaria, Aguascalientes C.P. 20131, Ags., Mexico. Email: villalobos.giovanna@gmail.com

19722. Felker, A.S. (2022): Dragonflies of the family Kennedyidae (Odonata: Archizygoptera) from the mid-upper Triassic of Kyrgyzstan. *Paleontological Journal* 1/2022: 75-84. (in Russian, with English summary) ["Two new species of Kennedyidae: *Kennedyia madygensis* sp. nov. and *K. ferganensis* sp. nov. are described from the Middle-Upper Triassic deposits Dzhayloucho (Madygen) locality in Kyrgyzstan based on the new material collected 2007 and 2009. *K. carpenteri* Pritykina, 1981 is redescribed and variation in its discoidal and other structures is demonstrated. Structure and transformation of the Nodus in Kennedyidae is discussed." (Author)] Address: Felker, A.S., Borisyak Paleontological Institute, Russian Academy of Sciences, Moscow, Russia

19723. Fletcher, D.E.; Lindell, A.H.; Stankus, P.T.; Fulghum, C.M.; Spivey, E.A. (2022): Species- and element-specific patterns of metal flux from contaminated wetlands versus metals shed with exuviae in emerging dragonflies? *Environmental Pollution* 300, 118976. (in English) [Highlights: • 9 metals evaluated in emerging dragonflies and their exuviae from contaminated wetland. • Larger amounts of some metals (Cu, Zn, and Mg) were retained in the emergent dragonflies. • Some elements (Al, Fe, Mn, Pb) were largely shed with exuviae. • Metals shed in exuviae can moderate metal export from wetlands. • Importance of factors influencing metal flux differed among species. Abstract: Dragonfly adults and their aquatic immature stages are important parts of food webs and provide a link between aquatic and terrestrial components. During emergence, contaminants can be exported into terrestrial food webs as immature adults fly away or be shed with their exuviae and remain in the wetland. Our previous work established metals accumulating in dragonfly nymphs throughout a contaminated constructed wetland designed to regulate pH and sequester trace metals from an industrial effluent line. Here, we evaluated the concentration and mass of metals leaving the wetland in flying emergents versus remaining in the wetland with the shed exuviae in 10 species of dragonflies belonging to 8 genera. Nine elements (Cu, Zn, Cd, Mn, V, Mg, Fe, Al, Pb)

were evaluated that include essential and nonessential elements as well as trace and major metals. Metal concentrations in the emergent body and exuviae can differ by orders of magnitude. Aluminum, Fe, Mn, and Pb were largely shed in the exuviae. Vanadium and Cd were more variable among species but also tended to be shed with the exuviae. In contrast, Cu, Zn, and Mg showed a higher tendency to leave the wetland with an emerging dragonfly. Metals shed in dragonfly exuviae can moderate the transport of metals from contaminated wetlands. Taxonomic- and metal-specific variability in daily metal flux from the wetland depended upon concentration accumulated, individual body mass, and number of individuals emerging, with each factor's relative importance often differing among species. This illustrates the importance of evaluating the mass of metals in an individual and not only concentrations. Furthermore, differences in numbers of each species emerging will magnify differences in individual metal flux when calculating community metal flux. A better understanding of the variability of metal accumulation in nymphs/larvae and metal shedding during metamorphosis among both metals and species is needed." (Authors)] Address: Fletcher, D.E., Savannah River Ecology Laboratory, University of Georgia, P. O. Drawer E, Aiken, SC, 29802, USA. Email: fletcher@srel.uga.edu

19724. George, S.D.; Duffy, B.T.; Baldigo, B.P.; Skaros, D.; Smith, A.J. (2022): Condition of macroinvertebrate communities in the Buffalo River Area of concern following sediment remediation. *Journal of Great Lakes Research* 481: 183-194. (in English) ["The lower 10 km of the Buffalo River, a tributary to Lake Erie, was designated as an Area of Concern (AOC) in 1987 through the Great Lakes Water Quality Agreement because sediment contamination and habitat alteration from past industrialization caused several Beneficial Use Impairments (BUIs). Extensive remediation efforts conducted between 2011 and 2015 removed approximately 688,100 cubic meters of contaminated sediment from the Buffalo River AOC, and subsequent chemical analysis of sediments indicated that most remedial goals had been achieved. Benthic macroinvertebrate communities and sediment toxicity were evaluated in the AOC and an upstream reference area in 2017 and 2020 to determine whether remediation has improved benthic conditions sufficiently that the benthos BUI designation can be removed. Community condition was characterized using the New York State multi-metric index of biological integrity and bed sediments were used for 10-day toxicity tests with *Chironomus dilutus* and *Hyalella azteca*. Macroinvertebrate communities were classified as moderately to slightly impacted at most AOC sites compared to slightly impacted at most reference sites, but toxicity tests did not identify any evidence of toxicity in sediments from the AOC. A linear mixed effects model indicated that total organic carbon concentration in sediments, distance upstream from the river mouth, and the relative dominance of zebra mussels *Dreissena polymorpha* were the primary predictors of macroinvertebrate community condition. These findings are consistent with those from other AOCs in New York which indicate that contemporary benthic communities are generally shaped by legacy habitat alterations rather than AOC-specific sediment contamination and toxicity." (Authors) Taxa include Odonata, and are treated at order level.] Address: George, S.D., U.S. Geological Survey, New York Water Science Center, 425 Jordan Road, Troy, NY 12180, USA

19725. Goertzen, D.; Schneider, A.-K.; Eggers, T.O.; Suhling, F. (2022): Temporal changes of biodiversity in urban running waters – Results of a twelve-year monitoring

study. *Basic and Applied Ecology* 58: 74-87. (in English) ["Freshwater biodiversity underlies severe threats, mainly suffering from habitat degradation by anthropogenic land use, in particular by urbanisation. However, recent long-term studies indicate recovery of stream macroinvertebrate diversity due to improved water quality at least in North America and Europe. We monitored macroinvertebrates at 56 urban stream sites over a 12-year period (2009–2020) in Braunschweig, a German urban district. We utilised these data to investigate spatio-temporal changes in taxon richness and assemblage structure as well as factors potentially affecting the resulting patterns. Overall taxon richness was increasing over the study period, comprising both all taxa and taxa being indicators for healthy stream conditions. 53.6% of the sites had significant positive trends becoming most eminent since 2014, despite decelerating since 2018, the beginning of an extra-ordinary dry period. Only 10.7% of the study sites had negative trends. Assemblage structure was shaped by environmental factors like stream width and water quality. Over-average taxon richness including positive trends and higher numbers of indicator taxa of healthy stream conditions was found in streams with higher flow velocity, good saprobic conditions and more natural streambed structure. In contrast, low taxon richness and predominance of tolerant taxa were found in streams with more degraded conditions. Most of the environmental conditions having positive effects on taxon richness were improved by various programs set up by the environmental authorities. We therefore conclude, if urban stressors like organic pollution and structural degradation can be mitigated by revitalisation and water quality improvement, urban streams can have good potential for increasing biodiversity and improving ecological functioning." (Authors)] Address: Goertzen, Diana, Technische Universität Braunschweig, Institute of Geocology, Langer Kamp 19c, Braunschweig 38106, Germany. Email: d.goertzen@tu-braunschweig.de

19726. Hawke, T.; Bino, G.; Shackleton, M.E.; Ross, A.K.; Kingsford, R.T. (2022): Using DNA metabarcoding as a novel approach for analysis of platypus diet. *Scientific Reports* volume 12, Article number: 2247. 10 pp. ["Platypuses (*Ornithorhynchus anatinus*) forage for macroinvertebrate prey exclusively in freshwater habitats. Because food material in their faeces is well digested and mostly unidentifiable, previous dietary studies have relied on cheek pouch assessments and stable isotope analysis. Given DNA metabarcoding can identify species composition from only fragments of genetic material, we investigated its effectiveness in analysing the diet of platypuses, and to assess variation across seasons and sexes. Of the 18 orders and 60 families identified, Ephemeroptera and Diptera were the most prevalent orders, detected in 100% of samples, followed by Trichoptera, Pulmonata, and Odonata (86.21% of samples). Caenidae and Chironomidae were the most common families. Diptera had a high average DNA read, suggesting it is an important dietary component that may have been underestimated in previous studies. We found no variation in diet between sexes and only minimal changes between seasons. DNA metabarcoding proved to be a highly useful tool for assessing platypus diet, improving prey identification compared to cheek pouch analysis, which can underestimate soft-bodied organisms, and stable isotope analysis which cannot distinguish all taxa isotopically. This will be a useful tool for investigating how platypus prey diversity is impacted by habitat degradation as a result of anthropogenic stressors." (Authors)] Address: Hawke, T., Centre for Ecosystem Science, School of Biological, Earth & Environmental Sciences, UNSW, Sydney, NSW 2052, Australia.

Email: t.hawke@unsw.edu.au

19727. Herrmann, A.; Grabow, K.; Martens, A. (2022): The invasive crayfish *Faxonius immunitus* causes the collapse of macroinvertebrate communities in Central European ponds. *Aquatic Ecology*. (in English) ["The invasive crayfish *Faxonius immunitus* is regarded as a threat to amphibians and macroinvertebrates in the Upper Rhine Valley, Germany, eradicating macrophytes and establishing high-density populations in stagnant waters. This study investigates the macroinvertebrate community structure of five conservation ponds south of Karlsruhe, Germany, to identify effects caused by this invasive crayfish. Two of the ponds had a high population density of *F. immunitus*, two were expected to have lower crayfish densities as they had been habitat modified with gravelled water beds as a crayfish management approach, and one pond was known to be free of crayfish but contained fish. The macroinvertebrate communities were analyzed considering their species richness and composition. The relative density of *F. immunitus* within the samples was regarded as a representative indicator for crayfish population density and tested for its influence on the ordination along with habitat composition and abiotic factors using distance-based redundancy analysis. *F. immunitus* was identified as a driving factor of the macroinvertebrate communities of sampled ponds. Additionally, this study indicates that gravelled ground beds as a management method for invasive burrowing crayfish species does not significantly influence the community composition but can minimize indirect effects caused by *F. immunitus*." (Authors)]

19728. Hopkins, I.; Farahnak, A.; Gill, A.; Newman, L.P.; Danaher, J. (2022): Australians' experience, barriers and willingness towards consuming edible insects as an emerging protein source. *Appetite* 169, 1 February 2022, 105832: 9 pp. (in English) ["Increasing global populations and limitations on the natural resources required in food production such as land and water will place further pressure on an already strained food production system. To meet the future food production requirements, it is essential to find viable alternatives to current food sources, without the high resource challenges. Protein production is of particular concern and insects are a nutritious and sustainable source yet, despite a rich history in parts of the world, Australians have been reluctant to adopt the practice as a societal norm. This study aimed to explore Australian consumers' experiences with edible insects, identify barriers to consumption, and explore possible factors that may motivate Australians to consume insects. A total of 601 participants (23.8% male, 76.2% female), completed an online survey using a variety of open-ended questions; 5- or 7-point Likert scales and check-all-that-apply questions. Consumer willingness was measured through self-reporting willingness-to-try insects or insect-based foods. Results indicated 35.4% of participants had previously consumed insects, with Orthoptera (crickets, grasshoppers) the most commonly consumed order (60.1%). Participants with no previous experience consuming insects cited 'lack of opportunity' as the main reason (57.2%). 'Increased accessibility' (56.6%) and 'increased nutrition knowledge' (56.6%) were identified as major factors that may increase the likelihood of future insect consumption. Participants reporting that they were willing to try insects were most likely to accept 'insect-based flour' (65.6%) and 'chocolate-covered ants' (52.1%). By providing increased opportunity, accessibility and education of insect-based food products, a higher pro-

portion of Australians may be willing to eat insects, particularly if presented in indistinguishable forms (i.e. flour). This may lead to a greater acceptance of insects as an alternative, more sustainable protein source than previously anticipated....'Odonata (dragonflies)' were the least consumed with 1.4% of participants reporting previous consumption." (Authors)] Address: Danaher, Jessica, DINE Lab, School of Science, STEM College, RMIT University, Bundoora West Campus Victoria, 3083, Australia. Email: jessica.danaher@rmit.edu.au

19729. Itrac-Bruneau, R.; Doucet, G. (2022): Somatochlora arctica (Odonata: Corduliidae) dans le Massif du Morvan: découverte d'une station majeure pour la Bourgogne-Franche-Comté et comparaison avec d'autres stations. Martinia 36(1): 1-12. (in French, with English summary) ["S. arctica in Morvan Massif: discovery of a major station for Bourgogne-Franche-Comté region and comparison with other stations. - In 2021, eight stations (three of the four historical and five potential) were prospected searching for S. arctica in the Morvan Massif in Burgundy. The species was found in only two stations: a historical station, updating data of almost 30 years old located in Roussillon-en-Morvan (Saône-et-Loire department) and a second one, new, on a small bog of about 0,64 ha located in the town of Arleuf (Nièvre department). With 23 exuviae collected from the 492 m² of favorable larval habitat in two passages and a remarkable density for the region of 467/ha, the latter seems important in terms of taxon conservation. This synthesis also shows that only two stations shelter the species permanently (historic station of Saint-Agnan (Nièvre department) and the station discovered in 2021). Thus, at the scale of the Morvan Massif, only one station can be considered in good state of conservation and is home to a viable population. The others are either severely degraded requiring restoration actions or only support the species sporadically". (Authors)] Address: Itrac-Bruneau, R., 8F, rue Maurice Deslandres, 21000 Dijon, France. Email: r.itracbruneau@yahoo.fr

19730. Lozano, F.; del Palacio, A.; Ramos, L.S.; Granato, L.; Drozd, A.; Muzón, J. (2022): Recovery of local dragonfly diversity following restoration of an artificial lake in an urban area near Buenos Aires. Basic and Applied Ecology 58: 88-97. (in English) ["Urban lakes are environments prone to severe environmental deterioration if an effective management policy is not carried out by local governments. However, management aimed only at facilitating access and recreation for citizens can negatively affect the environmental health of these ecosystems since the pristine ecosystem structure is not recovered. In this paper we present early results of a governmental restoration program based on pond cleaning and native vegetation recovery at an artificial lake of the city of Avellaneda (Saladita Norte Reserve), part of the Metropolitan Area of Buenos Aires, one of the largest urban areas with the highest concentrations of inhabitants of the world. We used odonates as indicators because of their quick response to changes in environmental quality. Besides, we tested if the NDVI can be used as a surrogate to monitor changes in dragonfly diversity in managed areas. Since the intervention was carried out during the winter and there were no previous data on the richness or diversity of odonates, we analyzed their response to the intervention comparing it with a lake of similar origin and characteristics but with a different use and management (Saladita Sur Reserve). We recorded in Saladita Norte 81% of the regional diversity, including three newly recorded species, while the lake Saladita Sur, only amounted to 21% of the regional

diversity. The NDVI did not reflect the observed changes in the structural complexity of the vegetation and therefore could not be used as a surrogate. These early results indicate that management practices such as the increase of native vegetation on the banks (especially in grassland areas), keeping a diverse floating vegetation and the cleaning and removal of wastes from the water, promote a significant and rapid increase in the levels of biodiversity." (Authors)] Address: Muzón, J., Inst. Limnol. "Dr. R.A. Ringuelet", C.C. 712, AR-1900 La Plata, Argentina. E-mail: jmuzon@undav.edu.ar

19731. Maneechan, W.; Prommi, T.O. (2022): Occurrence of microplastics in edible aquatic insect Pantala sp. (Odonata: Libellulidae) from rice fields. PeerJ 10:e12902 <http://doi.org/10.7717/peerj.12902>: 13 pp. (in English) ["Background. Microplastic (MP) contamination has been discovered in aquatic systems throughout the world. They are well known as contaminants in aquatic species, but there is a gap in understanding about pathways of MP contamination into humans (i.e., through aquatic animals). The goal of this study is to assess MP contamination in an edible aquatic insect (Pantala sp.) living in rice fields. Methods. Pantala sp. was tested for MPs. The study concentrated on three distinct anatomical compartments (whole body, gastrointestinal tract, and body without gastrointestinal tract), each of which was examined separately. For the physical identification and chemical analysis of MPs, a stereomicroscope and a Fourier transformed infrared spectroscope (FT-IR) were used, respectively. Results and Discussion. The microplastics content was 121 in the whole body, 95 in the gastrointestinal tract, and 66 in the body without the gastrointestinal tract, with an average of 1.34 1.11, 1.06 0.77, and 0.73 0.51 abundance/ individual, respectively. The most common MPs discovered during this study were fragments, followed by fibers and rods. The chemical analysis by FT-IR confirmed three different polymers, including polymethyl methacrylate (PMMA), polyethylene terephthalate (PET), and polypropylene (PP). There was no significant difference in MP abundances among the sample types (Kruskal-Wallis chi-squared D 2.774, df D 2, p D 0:250). The findings suggest that eating an edible aquatic insect (Odonata: Pantala sp.) could be one way for humans to ingest MPs." (Authors)] Address: Prommi, T.O., Department of Science, Faculty of Liberal Arts and Science, Kasetsart University, Kamphaeng Saen Campus, Nakhon Pathom, Thailand

19732. Minot, M.; Husté, A. (2022): Genetic diversity and structure of Anax imperator Leach, 1815 populations (Odonata: Aeshnidae) in ponds at regional and European scales. Diversity 2022, 14, 68. <https://doi.org/10.3390/d14020068>: 17 pp. (in English) ["Anthropogenic activities cause loss and fragmentation of natural habitats and have strong effects on population maintenance by increasing their isolation. Pond ecosystems are scattered waterbodies that can interact as a network connected by dispersal events of freshwater organisms. Identifying local genetic differentiations and understanding how gene flow occurs across these networks is essential to prevent risks associated with environmental perturbations. This study aimed to investigate genetic diversity and structure of Anax imperator Leach, 1815 populations at both regional and European scales using seven microsatellites markers. Seven populations of A. imperator were sampled in northwestern France and four populations were sampled in Italy (Sicily), Czech Republic, Switzerland and United Kingdom (U.K.). French populations presented a low genetic differentiation indicating a high gene flow and

confirming dispersal events of this species between ponds at regional scale. No pattern of isolation by distance was found at the European scale. The populations presented a low genetic differentiation and no pattern of isolation by distance, suggesting historical or current movements of individuals. Only the U.K. population presented a significant genetic differentiation from other European populations, suggesting that the English Channel might act as a barrier to gene flow for *A. imperator*. However, Bayesian analysis showed that some dispersal events could occur between the U.K. and France (Normandy), probably facilitated by prevailing winds." (Authors)] Address: Minot, M., ECODIV-INRAE, Department of Biology, UFR Sciences et Techniques University of Rouen-Normandy, 76000 Rouen, France. Email: m.minot@hotmail.fr

19733. Morales, J.; Negro, A.I.; Lizana, M. (2022): Patterns of odonata assemblages in lotic and lentic systems in the Sanabria glacial lake complex in Sierra Segundera (NW Spain). Diversity and biogeographical analysis. Bol. R. Soc. Esp. Hist. Nat., 116: 23-39. (in Spanish, with English summary) ["We studied the community of odonates on the southern watershed of the Sierra Segundera glacial lake complex, from the valley area (Tera river and Sanabria lake, 1000 m.a.s.l.) to the high mountain lakes and peat bogs (>1500 m.a.s.l.). The maximum richness was detected at the source of the River Tera from the lake, while on the east coast and part of the south coast there are no Odonata populations or breeding and emergence habitats; this is due to the tourist pressures on the shoreline. Eighteen taxa were found to reproduce in the lake, including the endangered species *Macromia splendens*. Only *Sympetrum flaveolum*, *Aeshna juncea* and *Enallagma cyathigerum* were located exclusively at altitude mountain range. The specific turnover among ecosystems is from 30 to 14, in a 700 m gradient from the valley to the lake complex. Adults were captured in flight between weeks 18 and 44 of the calendar year. The circum-mediterranean biogeographical component dominates with species of mediterranean-western, franc-iberian and ibero-maghreb distribution, but with euro-siberian, holarctic and palaeartic species distribution; and all the holarctic chorotype species known in Spain were recorded. No African migratory dragonflies in meridional drift were found in the three summers sampled." (Authors)] Address: Morales, J., Áreas de Biología Animal y Ecología. Universidad de Salamanca. E-37007. Salamanca, Spain. mormarja@usal.es

19734. Nicolas, V. (2022): Description d'une nouvelle libellule de Mayotte: *Zygonyx constellatus* n. sp. (Odonata Libellulidae). Plume de Naturalistes 6: 15-26. (in French) ["*Zygonyx constellatus* n. sp. is described and illustrated on the basis of several dozen specimens and exuviae collected over the last fifteen years on the island of Mayotte (Comoros archipelago). It is a species close to the Malagasy endemic *Z. elisabethae* Lieftinck, to which it is compared. Its ecology and distribution are also detailed." (Author/DeepL)] Address: Nicolas, V.: Email: harmonia.coccinellidae@yahoo.fr

19735. Nitzsche, K.N.; Wakaki, S.; Yamashita, K.; Shin, K.-C.; Kato, Y.; Kamauchi, H.; Tayasu, I. (2022): Calcium and strontium stable isotopes reveal similar behaviors of essential Ca and nonessential Sr in stream food webs. Ecosphere 13(2) e3921. 19 pp. (in English) ["Recent studies showed the potential of stable isotopes of the macronutrient calcium ($\delta^{44/40}\text{Ca}$) and nonessential strontium ($\delta^{88/86}\text{Sr}$) as new trophic level indicators in terrestrial vertebrates and marine teleost fishes. In this study, we tested whether similar Ca and

Sr isotopic fractionation trends existed in macroinvertebrate-dominated stream food webs compared to vertebrates despite their physiological differences. We have determined the $\delta^{44/40}\text{Ca}$ and $\delta^{88/86}\text{Sr}$ values as well as the $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of stream macroinvertebrates and small gobies and their potential metal sources (stream water, periphyton, and terrestrial plant litter) in upper and lower reaches of two streams in the Lake Biwa catchment, central Japan. The $^{87}\text{Sr}/^{86}\text{Sr}$ ratios revealed that stonefly nymphs, crustacea, and gobies mostly relied on aquatic Sr sources. Higher $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of some crane fly and caddisfly larvae, mayfly, dobsonfly, and dragonfly nymphs [Gomphidae] indicated greater terrestrial contributions via plant litter. Positive correlations between the $\delta^{44/40}\text{Ca}$ and $\delta^{88/86}\text{Sr}$ values implied that similar Ca and Sr sources existed, and that Ca and Sr stable isotopes underwent similar fractionation trends although Sr was not essential. The $d^{44/40}\text{Ca}$ and partly the $\delta^{88/86}\text{Sr}$ values were positively correlated with Sr/Ca ratios and negatively with $\delta^{15}\text{N}$ values indicating trophic effects on Ca and Sr stable isotopes. The enrichment of ^{44}Ca and ^{88}Sr in large filter-feeding caddisfly larvae was a notable exception from these trophic trends. Our data confirm that the trophic ^{44}Ca and ^{88}Sr depletion observed for marine teleost fishes and terrestrial vertebrates also applied to macroinvertebrate-dominated stream food webs despite their different physiologies indicating that shared mechanisms of Ca and Sr isotopic fractionation may exist at the cellular or molecular level between these taxa." (Authors)] Address: Nitzsche, K.N., Biogeochemistry Research Center, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), 2-15 Natsushima-cho, Yokosuka, Kanagawa 237-0061, Japan. Email: kai.nitzsche@jamstec.go.jp

19736. Ogunwa, T.; Abdullah, E.; Chahl, J. (2022): Modeling and control of an articulated multibody aircraft. Applied Sciences 2022, 12, 1162. 36 pp. (in English) [Hemicordulia australiae (Rambur 1842); "Insects use dynamic articulation and actuation of their abdomen and other appendages to augment aerodynamic flight control. These dynamic phenomena in flight serve many purposes, including maintaining balance, enhancing stability, and extending maneuverability. The behaviors have been observed and measured by biologists but have not been well modeled in a flight dynamics framework. Biological appendages are generally comparatively large, actuated in rotation, and serve multiple biological functions. Technological moving masses for flight control have tended to be compact, translational, internally mounted and dedicated to the task. Many flight characteristics of biological flyers far exceed any technological flyers on the same scale. Mathematical tools that support modern control techniques to explore and manage these actuator functions may unlock new opportunities to achieve agility. The compact tensor model of multibody aircraft flight dynamics developed here allows unified dynamic and aerodynamic simulation and control of bioinspired aircraft with wings and any number of idealized appendage masses. The demonstrated aircraft model was a dragonfly-like fixed-wing aircraft. The control effect of the moving abdomen was comparable to the control surfaces, with lateral abdominal motion substituting for an aerodynamic rudder to achieve coordinated turns. Vertical fuselage motion achieved the same effect as an elevator, and included potentially useful transient torque reactions both up and down. The best performance was achieved when both moving masses and control surfaces were employed in the control solution. An aircraft with fuselage actuation combined with conventional control surfaces could be managed with a modern optimal

controller designed using the multibody flight dynamics model presented here." (Authors)] Address: Ogunwa, T., UniSA STEM, University of South Australia, Adelaide 5095, Australia. Email: titilayo.ogunwa@mymail.unisa.edu.au

19737. Ortega-Salas, H.; Gonzalez-Soriano, E.; Jocque, M. (2022): Untangling the waterfall damselflies: a review of the Mesoamerican genus *Paraphlebia* Selys in Hagen, 1861 (Odonata: Thaumtoneuridae) with descriptions of 11 new species. *Zootaxa* 5089(1): 1-66. (in English) ["A review of the Mesoamerican genus *Paraphlebia* Selys in Hagen, 1861 is presented, including diagnoses, illustrations of diagnostic characters, and distribution maps for all species. A key to the known males and females is provided. Eleven new species are described: *P. akan* Ortega-Salas & González-Soriano sp. nov., *P. chaak* Ortega-Salas & González-Soriano sp. nov., *P. chiarae* Ortega-Salas sp. nov., *P. esperanza* Ortega-Salas & González-Soriano sp. nov., *P. flinti* Ortega-Salas & González-Soriano sp. nov., *P. hunnal* Ortega-Salas & González-Soriano sp. nov., *P. itzamna* Ortega-Salas, Jocque & González-Soriano sp. nov., *P. ixchel* Ortega-Salas & González-Soriano sp. nov., *P. kauil* Ortega-Salas & González-Soriano sp. nov., *P. kinich* Ortega-Salas & González-Soriano sp. nov., and *P. kukulkan* Jocque & Ortega-Salas sp. nov." (Authors)] Address: Ortega-Salas, H., Departamento de Zoología, Instituto de Biología, UNAM, Apartado Postal 70-153, México. Email: hector.ortegasalas@naturalis.nl

19738. Pan, Y.; Long, Y.; Hui, J.; Xiao, W.; Yin, J.; Ya, L.; Li, D.; Tian, X.; Chen, L. (2022): Microplastics can affect the trophic cascade strength and stability of plankton ecosystems via behavior-mediated indirect interactions. *Journal of Hazardous Materials*, Available online 4 February 2022, 128415: (in English) ["Highlights: • PE microplastics reduced heart rate and hopping frequency of grazers. • PE microplastics reduced grazing rate of grazers. • Microplastics increased the positive impacts of damselflies on algal growth. • PE microplastics reduced reproductive capacity for grazer species. • PE microplastics reduced the stability and persistence of a plankton ecosystem. Abstract: The negative effects of microplastics on the normal growth of aquatic organisms have been well studied, but relatively little is known about their potential adverse effects on the function and stability of aquatic ecosystems. We investigated here the effects of polyethylene (PE) microplastics on several aspects of plankton ecosystems, including *Daphnia magna* behavior, the grazing rate of *D. magna* on *Chlorella vulgaris* cells, trophic-cascade effects in the *C. vulgaris*-*D. magna*-larval damselfly food chain, the life-history of *D. magna*, and the stability and persistence of the *D. magna*-larval damselfly system. PE microplastics decreased the *D. magna* grazing rate as a result of reductions in their heart rate and hopping frequency. In the trophic-cascade experiment, PE microplastics increased the foraging success of larval damselflies on grazers due to hopping inhibition in grazers, which ultimately strengthened the trophic-cascade effect on algal growth. Long-term exposure to PE microplastics reduced the stability and persistence of the grazer population via increased predation risk and reduced reproductive capacity for grazer species. This study provides evidence that microplastics can affect the trophic cascade strength and stability of plankton ecosystems via behavior-mediated indirect interactions, suggesting that microplastics have more extensive impacts on aquatic ecosystems than presently recognized. Environmental implication: The massive production and environmental releasing of microplastics have become ubiquitous in the global environment. The

negative effects of microplastics on the normal growth of aquatic organisms have been well studied, but little is known about potential adverse effects on the function and stability of aquatic ecosystems. Here, we found that microplastics increased the positive impacts of larval damselflies on algal growth, and reduced the stability and persistence of plankton ecosystems via a behavior-mediated indirect interaction. To our knowledge, this is the first systematic study assessing the effects of microplastics on the community-level characteristics of a freshwater ecosystem. Synopsis: PE microplastics affect trophic cascade strength and reduce the stability and persistence of plankton ecosystems via behavior-mediated indirect interactions." (Authors)] Address: Chen, L., Institute of International Rivers and Eco-security, Yunnan Key Laboratory of International Rivers and Trans-Boundary Eco-security, Yunnan University, Kunming, 650091, People's Republic of China. Email: chenlq@ynu.edu.cn

19739. Pelealu, G.V.E.; Nangoy, M.J.; Tarore, D. (2022): Keanekaragaman capung di Sungai Rayow, Desa Kembes, Kecamatan Tombulu, Kabupaten Minahasa. *Zootec* 42(1): 25-32. (in Indonesian, with English summary) ["Dragonflies are a group of insects belonging to the phylum Arthropoda and belonging to the order Odonata. The diversity of dragonflies in the ecosystem has a big role, such as: as a component of biodiversity that plays an important role in the food chain, as natural enemies, and as an indicator of the quality of the aquatic environment. The Rayow River is one of the dragonfly habitats. This river is located in Kembes village, Minahasa regency, North Sulawesi province. This study aims to identify and analyze the diversity of dragonflies in the Ralow river, Kembes, Minahasa. The research procedure used includes surveying the research site, determining the point of sampling, taking samples, and identification in the laboratory using an identification book. The research in the field used purposive random sampling method. Data analysis includes abundance (N), species richness index (R), species diversity index (H'), and evenness index (E). species diversity index using the Shannon-Wiener index. The results of the study found an abundance of dragonflies found in the Rayow river as many as 1002 individuals, consisting of 2 sub orders, 6 families, 13 genera, and 21 species of dragonflies. The highest diversity index of dragonflies was found in rivers in secondary forest areas at 2.67, followed by rivers in plantation areas at 2.57, and the lowest diversity index was found in rivers in residential areas at 2.28. The conclusion is based on the research of dragonflies found in the Ralow river, Kembes, Minahasa consisting of 21 types of dragonflies. The highest dragonfly diversity index was found at station 1, namely in the secondary forest ecosystem river 2.67 followed by the plantation area river 2.57 and the lowest was found in the residential area river 2.28. The diversity index of dragonflies in the river Ralow, Kembes, Minahasa is categorized as moderate diversity." (Authors)] Address: Pelealu, G.V.E., Program Studi Entomologi, Universitas Sam Ratulangi, Manado, 95115, Indonesia. Email: vindapelealu@gmail.com

19740. Rattanachan, K.; Sangpradub, N.; Keetapithchaya-kul, T.S. (2022): Description of the larva of *Vestalis gracilis* (Rambur, 1842) (Zygoptera: Calopterygidae) from Thailand. *International Journal of Odonatology* 25: 1-6. (in English) ["*V. gracilis* is a forest stream damselfly belonging to the family Calopterygidae. Its last-stadium larvae and exuviae are described and illustrated based on laboratory-raised specimens from Thailand, and observations of agonistic behavior

are provided. The taxonomical characters of *V. gracilis* larvae are similar to those of *V. amoena*. They exhibit synapomorphic characters such as posterolaterally directed protuberances on the postocular lobes, posterior margin of median lamella obliquely truncate, and two setae on labial palps. *Vestalis gracilis* and *V. luctuosa* bear eight antennal segments whereas seven antennal segments are found in *V. amoena*. The most significant difference between *V. gracilis* and *V. luctuosa* is that *V. luctuosa* has posterolaterally directed protuberances on the postocular lobes and an obliquely truncate posterior margin of the median lamella." (Authors)] Address: Rattanachan, K., Forest and Plant Conservation Research Office, Department of National Parks, Wildlife and Plant Conservation, Bangkok 10900, Thailand. Email: Keetapithchayakul.TS@gmail.com

19741. Ribeiro-Brasil, D.R.G.; Brasil, L.S., Veloso, G.K.O.; Pio de Matos, T.; Silva de Lima, E.; Dias-Silva, K. (2022): The impacts of plastics on aquatic insects. *Science of the Total Environment* 813 (2022) 152436: 11 pp. (in English) ["Highlight: • Agriculture with black macroplastics is harmful to aquatic insects. • Aquatic insects contribute to the degradation of plastic during digestion. • Aquatic insects with abundant food consume less microplastic. • MPs accumulate in the Malpighian tubule excretory system. • Aquatic insects prefer to oviposit on plastic surfaces. Abstract: Environmental contamination by plastics and its negative effect on biodiversity have been well-documented in several types of organisms, especially in marine environments. Therefore, it is necessary to assess the impacts of plastic on other organisms such as aquatic insects, which predominantly inhabit freshwaters. It is widely known that these organisms are sensitive to environmental change, especially by contamination. Therefore, this study aimed at testing the hypothesis that aquatic insects are impacted by plastic contamination. We made a systematic search for international papers related to plastics and aquatic insects in databases such as Google Scholar, Web of Science, and Scopus. We obtained 1217 studies of which 40 discussed the impacts of contamination by plastics on aquatic insects. We identified two main impacts: the first one is caused by the use of black macroplastic to protect crops from contact with the soil in agriculture. These black macroplastics attract tons of adult aquatic insects (terrestrial stage) that mistake the plastic surface for water because they select oviposition sites through phototaxis or polarotaxis. The second one comes from water contamination that can originate from the inadequate disposal of plastics, which harms young aquatic insects (aquatic phase) when they feed, reproduce, and construct shelters. Our results show the negative impacts of plastics on both larvae and adult aquatic insects. Despite the large knowledge gap regarding the impacts of plastic on aquatic insects, the evidence above is sufficient to consider these organisms important in global discussions regarding the impacts of plastic on biodiversity." (Authors) Searching results in Odonata are poor, and omit relevant studies.] Address: Ribeiro-Brasil, Danielle, Ecology & Conservation Lab. (LABECO), Institute of Biological Sciences (ICB), Federal Univ. of Pará (UFPA), Augusto Corrêa Street, n° 01, 66075-110, Guamá, Belém, PA, Brazil. Email: rgrdani@gmail.com

19742. Rochlin, I.; White, G.; Reissen, N.; Martheswaran, T.; Faraji, A. (2022): Effects of aerial adulticiding for mosquito management on nontarget insects: A Bayesian and community ecology approach. *Ecosphere* 13(1), e3896: 15 pp. (in English) ["Diseases transmitted by mosquitoes are emerging across the globe in a broad range of urbanized, rural, and natural environments inhabited by their vector

species. Because applications of insecticides remain the most effective, and often the only available tool to prevent or control mosquito-borne disease outbreaks, their use and scope continue to expand. However, the effects of multiple insecticide applications targeting adult mosquitoes on nontarget insect communities remain poorly characterized. To remedy this knowledge gap, we conducted an evaluation of five aerial insecticide applications on insect communities in a natural environment near Salt Lake City, Utah. Employing a before–after–control–impact approach, we assessed abundance and community composition changes over the study period utilizing Bayesian and community ecology analytical methods. We observed no discernible effects on most insect taxa, and there were no changes in the overall insect community composition. The abundance of Diptera, Coleoptera, and Hemiptera declined in control and treatment sites, Odonata increased over the period of the study, and Hymenoptera and Lepidoptera remained similar, suggesting seasonal trends rather than treatment effects. The only consistently detectable treatment effect was on nonbiting midges (Diptera: Chironomidae), that are closely related to mosquitoes taxonomically and have similar body size and diel activity. Midge abundance declined by 79.9% (95% credible interval: 58.4–91.9). Overall posttreatment abundance decline of 62.2% (95% credible interval: 22.5–87.8) was also detected for leafhoppers (Hemiptera: Cicadellidae), but, these declines were inconsistent and may be attributed to natural variability rather than the treatment effect. Treatment frequency, location, life-stage targeting, and application techniques may mitigate the effects of mosquito control on nontarget insects to allow protecting human health while limiting environmental impacts." (Authors)] Address: Faraji, A., Salt Lake City Mosquito Abatement District, Salt Lake City, Utah, USA. Email: ary@slcmad.org

19743. Rodríguez, C.; Jurado, Y.; Rodríguez, V. (2022): Structure of drifting aquatic insects and its relationship with the benthos aquatic insect community, in a section of the Zarati River, Province of Coclé, Panama. *Tecnociencia* 24(1): 45-71. (in Spanish, with English summary) ["Sampling was conducted to determine the numeric structure of drifting aquatic insects and their relationship with the benthic insect numeric structure, in a section of the Zarati River, Coclé, Panama. Field work took place once a week, during June to September 2019 for a total of 12 sampling campaigns in the selected river section. For collection of drifting insects, two traps with an area of 0,176 m² and 500 µm were used and placed against the current. Drifting traps remained submerged during the sampling period and were emptied every 12 hours from 06:00 to 18:00 h and 18:00 to 06:00 h, while D-Nets were used for benthic insect collection. A total of 3 984 aquatic insects were collected, where 1 387 belonged to the drifting and 2 597 to the benthic groups, respectively. The most abundant orders of the drifting group were Ephemeroptera, Trichopteran, Diptera and Coleoptera, whereas the benthic group most abundant orders were Trichopteran, Ephemeroptera, Odonata and Heteropteran. The highest aquatic insect abundance in the drifting group was recorded during nocturnal periods implying behavioral drifting, supporting the hypothesis that drifting as a predation escape mechanism. Jaccard similarity index between aquatic insect genera in the drifting group and benthic group was IJ = 52 %. This indicates that the largest part of taxa move through drifting and the fraction of drifting aquatic insects numeric structure is a reflex of the benthic numeric structure." (Authors)] Address: Rodríguez, Cristie, Universidad de Panamá, Centro Regional Universitario de Coclé, Panamá. Email: alisbeth26@hotmail.com

19744. Saha, I.; Dey, S.; Palit, S. (2022): Diversity study of Odonata in Chintamani Kar Bird Sanctuary, Kolkata, West Bengal, India. *International Journal of Animal Science and Technology Research and Development* 2(1): 1-12. (in English) ["Species records of protected areas by creating checklists and updating them is crucial to understand species distribution, dynamics and possible threats to them. Chintamani Kar Bird Sanctuary is a protected area famed for its wide variety of floral and faunal diversity, located in close proximity to the metropolis of Kolkata and Odonata is real flagship taxa of freshwater ecosystems, often used as indicator species to assess the quality of their close environment. [...] Species diversity indices like Simpson and Shannon are applied to analyze the odonatan population diversity in this protected area. Our study of Odonata populations has been made for the first time in this protected area. As far as species richness is concerned, the family Libellulidae is found to be dominant among Anisoptera whereas species of the family Coenagrionidae is dominant among Zygoptera. Our observations support the importance of this region in providing valuable habitats for Odonata." (Authors)] Address: Saha, I., Head, Assistant Professor, Stage-III (C.S.C.), Department of Zoology, Sarsuna College, West Bengal, India

19745. Sanmartín-Villar, I.; Lorenzo-Carballa, M.O.; Zhang, H.; Cordero-Rivera, A. (2022): *Ischnura praematura* sp. nov. (Odonata: Zygoptera: Coenagrionidae): a species from Yunnan (China) whose females mate in the teneral state. *Zootaxa* 5087(1): 59-74. (in English) ["*Ischnura praematura* sp. nov. (Holotype ♂, China, Yunnan, Lijiang, 26°31'03.54"N, 100°13'38.89"E, 2396 m, 04 xii 2015, I. Sanmartín-Villar & H. Zhang leg.) is morphologically described, illustrated and compared with close species of the genus. *Ischnura praematura* can be mainly distinguished from its congeners *I. aurora*, *I. rubilio* and *I. asiatica* by its abdominal and thoracic morphology and colouration. The posterior lobe of the prothorax is elevated in *I. praematura* and the mesostigmal plates possess dorsal triangular protuberances. *Ischnura praematura* shows pointed paraprocts, internalised wide cerci and lacks a dorsal tuberculum in the tenth abdominal segment. The blue abdominal colouration is present in the last three segments (incomplete for segment eight and ten in some individuals). No female polychromatism was detected and all females observed possessed different colouration than male (gynochrome). Morphological distinctiveness of the species is supported by genetic analyses, which show that *I. praematura* forms a well-supported, monophyletic clade, with *I. asiatica*, *I. ezoin* and *I. pumilio* as the most closely related species. In the field, mature females show strong reluctance to mate, and males were observed mating with newly emerged females." (Authors)] Address: Sanmartín-Villar, I., ECOEVO Lab, Univ. de Vigo, Escola de Enxeñaría Forestal, Campus A Xunqueira, Pontevedra, Spain. E-mail: sv.iago@gmail.com

19746. Santos, A.A.; Nel, A.; Rodríguez-Barreiro, I.; Sender, L.M.; Wappler, T.; Diez, J.B. (2022): Insect and plant diversity in hot-spring ecosystems during the Jurassic-Cretaceous boundary from Spain (Aguilar Fm., Palencia). *Biology* 2022, 11, 273. 19 pp. (in English) ["Simple Summary: In this study, we show and identify new plant and insect remains found in travertine deposits from the Jurassic-Cretaceous boundary of the Aguilar Formation (Palencia, North Spain). From this hot-spring palaeoenvironment, we have identified the presence of dragonflies of the families Cymatophlebiidae and Aktassiidae, representing the first report of these families for the Iberian Peninsula. In addition, we find

a flora dominated by Bennettitales and the presence of ferns that differ from other floras of the same age and geographical area. The unusual environmental and palaeoecological conditions of this hot-spring environment are also discussed, suggesting that this niche was an "ecological oasis" for some plants and insects. Abstract: Hydrothermal palaeoenvironments are very uncommon in Upper Jurassic and Lower Cretaceous deposits worldwide. We present new plant and insect remains from travertines formed during the Jurassic-Cretaceous boundary in northern Spain (Aguilar Fm., Palencia province). A total of 136 plant specimens and three insect wings were collected and studied. This entomofauna consists of dragonfly (Odonata) wings including Cymatophlebiidae and an undetermined new genus and species of Aktassiidae, representing the first report of these families for the Iberian Peninsula. The fossil flora shows different morphotypes of plants, which have been tentatively assigned to three different genera. The taphocoenosis of the flora was dominated by Bennettitales (98.5%) including cf. *Pterophyllum* sp., *Ptilophyllum* cf. *acutifolium*, *Ptilophyllum* cf. *pecten*, *Ptilophyllum* cf. *pectiniformis* and cf. *Ptilophyllum* sp., and the occasional presence of ferns (1.5%) represented by the taxon *Cladophlebis* cf. *denticulata*. The presence of the Anisoptera *Cymatophlebia* cf. *longialata* suggests a higher affinity for a Tithonian age of the studied site, and the anatomy and palaeogeographical distribution of this species suggest capacity to migrate for rather long distances. The floristic composition of the site differs remarkably from other Tithonian-Berriasian floras of the Iberian Peninsula. The presence of Odonata and the distinctive flora in (semi)arid conditions could be due to the hot-spring providing an environmental niche with constant conditions of warmth and humidity forming an "ecological oasis". (Authors)] Address: Diez, J.B., Depto de Xeociencias Mariñas e Ordenación do Territorio, Facultade de Ciencias do Mar, Universidade de Vigo, 36310 Vigo, Spain. Email: jbdiez@uvigo.es

19747. Schorr, M.; Snegovaya, N.Yu. (2022): On the occurrence of *Gomphus vulgatissimus* (Linnaeus, 1758) and *G. schneiderii* Selys, 1850 in Azerbaijan – a brief discussion of the known status quo. *International Dragonfly Fund - Report* 168: 25-32. (in English) [Boudot et al. (2021) removed "*G. vulgatissimus* from the list of Azerbaijan Odonata, subsuming all records of this taxon under *G. schneiderii*. This is contradictory to the fact that *G. vulgatissimus* was documented for Azerbaijan by Bartenef (1912). We discuss the current knowledge of the two taxa *G. vulgatissimus* and *G. schneiderii*, document a new record of *G. vulgatissimus* for Azerbaijan, and map all known findings of the two taxa that have been reported to date as well as the potential distribution (search area) of *G. vulgatissimus* in northern Azerbaijan." (Authors)] Address: Schorr, M., ÖSTLAP, Schulstr. 7B, 54314 Zerf, Germany. Email: bierschorr1@online.de

19748. Sherlock, C.; Femie, K.J.; Munno, K.; Provencher, J.; Rochman, C. (2022): The potential of aerial insectivores for monitoring microplastics in terrestrial environments. *Science of the Total Environment* 807 (2022) 150453: 10 pp. (in English) ["Highlight: . Microparticles (MP) found in tree swallows (.83%) at WWTP & reference sites. . At both sites, fecal sacs of chicks (90%) contained MPs and all were fibers. . Reference chicks had more MPs (feces) that were larger, more diverse in GI tracts. . Reference birds had more aquatic diet versus WWTP chicks had more terrestrial diet. MP numbers were not correlated between sample types or with chick condition and size. Abstract: Limited research has been conducted on microplastics in terrestrial ecosystems

and biota, despite being some of the most ubiquitous environmental pollutants. We investigated the presence of microplastics (over 125 μm) in tree swallow (*Tachycineta bicolor*) chicks (10 d. o.), an aerial insectivore whose diet involves terrestrial and/or freshwater sources. Swallows nested immediately downstream (300 m) of the discharge pipe of a large, urban wastewater treatment plant (WWTP) or at a rural conservation area (40 km apart). Anthropogenic microparticles (including microplastics) were identified in nearly all WWTP chicks (90%; N = 20) and reference chicks (83%; N = 20). All microparticles were fibers (100%) in the gastro-intestinal (GI) tracts of WWTP nestlings, whereas unexpectedly, they were more diverse in the GI tracts of reference chicks, with ~15% characterized as pre-production plastic pellets. The fecal sacs of most nestlings (90%) contained microparticles, and all were characterized as fibers suggesting their excretion by tree swallows. Compared to WWTP chicks, the reference chicks had more microparticles in their fecal sacs and larger particles (length, width) in their GI tracts, likely reflecting the more aquatic-based diet of the reference chicks fed insects caught adjacent to the nearby dam, compared to the more terrestrial-based diet of the WWTP chicks. The numbers of microparticles were not correlated between GI tracts and fecal sacs, nor with the chicks' condition or size (weight, organs, feathers). We commend sampling macroinvertebrate prey to permit stronger conclusions regarding WWTPs as possible sources of microplastics for swallows, and to determine if such macroinvertebrates may be a non-lethal method to characterize microparticle diversity ingested by birds as presently identified in chicks' GI tracts. We conclude that sampling fecal sacs only, while not indicative of the diversity of microplastics ingested by terrestrial passerines (e.g., tree swallows), is useful for determining their exposure to microparticles." (Authors)] Address: Sherlock, Cassandra, Dept of Ecology and Evolutionary Biology, Univ. of Toronto, 25 Willcocks St, Toronto, ON M5S 3B2, Canada

19749. Simonsen, T.J.; Glahder, M.; Pape, T.; Olsen, K.; Djernæs, M. (2022): Rhapsody in emerald: phylogenetic framework for Lestidae with reference to the systematic position of Chalcolestes Kennedy. *International Journal of Odonatology* 25: 16-21. (in English) ["We reconstruct a phylogenetic framework for the zygopteran family Lestidae based on a molecular dataset comprised of sequence data from the genes COI, 16S, 18S, 28S, and ITS1+2 from 41 ingroup taxa and 8 outgroup taxa with emphasis on the systematic position of the genus Chalcolestes Kennedy. We recover Lestidae as monophyletic with good statistical support. The family falls into two subequal clades. One, comprising the genus *Sympecma* Burmeister and *Lestes* Leach sensu lato (including the genus *Archilestes* Selys) is poorly to moderately supported. While the other, comprising the genera *Austrolestes* Tillyard, *Indolestes* Fraser, *Orolestes* McLachlan, and *Chalcolestes* is strongly supported. *Chalcolestes* is recovered as sister to the Oriental genus *Orolestes* with strong support. Our results thus support that *Chalcolestes* is a valid genus not closely related to *Lestes*. Monophyly of *Lestes* requires inclusion of the New World genus *Archilestes*, and our results support the need for a thorough revision of *Lestes*. ... Three main conclusions can be drawn from our results despite the somewhat limited taxon sampling. First, there is no phylogenetic support for dividing Lestidae into the subfamilies Lestinae and Sympecmatinae. Second, *Lestes* as currently defined is almost certainly not a monophyletic group, and we agree with Dijkstra and Kalkman (2012) that a phylogenetic revision of the genus is much needed. Third, *Chalcolestes* is a valid

genus that is not closely related to other European genera of Lestidae—neither *Lestes* nor *Sympecma*. Instead, the genus is most likely the sister group to *Orolestes* and placed in a clade with otherwise Oriental-Australian genera. Other than the much-needed revision of *Lestes* sensu lato, several high profile aspects of Lestidae phylogeny and systematics remain to be solved. The relationship and delimitation of *Austrolestes* and *Indolestes* remain unclear, and the two genera in combination should be the subject of a phylogenetic taxonomic revision. The higher-level phylogeny of Lestidae should be the subject of phylogenomic analyses in the mould of Bybee et al. (2021) and include also *Platylestes* and *Sinhalestes*. Such a study should address the phylogenetic position of *Sympecma*, identify natural divisions that can be used for a subfamily and tribal classification, and resolve the biogeography of the family including the geographical origin of *Chalcolestes*." (Authors)] Address: Simonsen, T.J., Natural History Museum Aarhus, 8000 Aarhus C, Denmark. Email: t.simonsen@nathist.dk

19750. Snegovaya, N.Yu. (2022): Odonata collected in 2021 in Azerbaijan, including new data on *Gomphus schneiderii* Selys, 1850 and *Libellula pontica* Selys, 1887. *International Dragonfly Fund - Report 168*: 1-23. (in English) ["This paper presents the results of a study on the odonate fauna in Azerbaijan. The survey was conducted in the summer of 2021 and covered 24 localities in twelve districts. A total of 34 species from 9 families was recorded. New localities for *Gomphus schneiderii* Selys, 1850 and *Libellula pontica* Selys, 1887 are reported. A formerly published record of *Gomphus vulgatissimus* from Khachmaz, Nabran village, has to be corrected into *G. schneiderii*." (Author)] Address: Snegovaya, Nataly Yu., Zoological Institute NAS of Azerbaijan, proezd 1128, kvartal 504, Baku, AZ 1073, Azerbaijan. Email: snegovaya@yahoo.com

19751. Späth, J.; Brodin, T.; McCallum, E.; Cervený, D.; Fick, J.; Nording, M.L. (2022): Metabolomics reveals changes in metabolite profiles due to growth and metamorphosis during the ontogeny of the northern damselfly. *Journal of Insect Physiology* Volume 136, January 2022, 104341: 8 pp. (in English) ["Highlights: • Baseline metabolism of damselflies at different ontogenetic stages. • 212 compounds annotated in three larval stages and adult damselflies. • Shift from protein catabolism to lipid catabolism across metamorphosis. • Metabolites affected by effluent exposure depend on ontogenetic stage. Abstract: Many insects have complex life cycles where a drastic ontogenetic change happens between the larval stages and the adult stage, i.e. metamorphosis. Damselflies are widely distributed and ecologically important semi-aquatic insects with a complex life cycle. Phenotypic changes over damselfly ontogeny have been documented, however, if and how metabolite profiles are also changing is currently unknown. Here we used a metabolomics methodology to gain insights into the metabolic changes during the life cycle of the *Coenagrion hastulatum*. Hatchlings of wild-caught damselflies were reared in the laboratory and metabolomics analyses using liquid chromatography and gas chromatography coupled to mass spectrometry were carried out at three larval stages and on adult damselflies. Additionally, a subset of larvae was exposed to wastewater effluent to assess how metabolite profiles responded to an environmental stressor. A total of 212 compounds belonging to several classes (e.g. amino acids, fatty acids, sugars) were annotated. Across metamorphosis, we found that damselflies shifted from protein catabolism to lipid catabolism. Wastewater effluent exposure resulted in ontogenetic stage-dependent changes of individual

metabolites, but not to a marked extent. Overall, our study is one of the first to describe changes of metabolite profiles during ontogeny of an insect, and it provides a first step towards a greater understanding of the physiological changes occurring during general insect—but especially damselfly—ontogeny." (Authors)] Address: Späth, Jana, Department of Chemistry, Umeå University, SE 90187 Umea, Sweden. E-mail address: jana.spath@umu.se

19752. Streib, L.; Juvigny-Khenafou, N.; Heer, H.; Kattwinkel, M.; Schäfer, R.B. (2022): Spatiotemporal dynamics drive synergism of land use and climatic extreme events in insect meta-populations. *Science of The Total Environment* 814, 25 March 2022, 152602: (in English) [nv; "Highlights: • Ecosystem risks often emerge from interactions of co-occurring stressors. • At higher spatiotemporal scales, research on stressor interactions is not very developed. • Scenarios of two global change stressors were simulated for insect meta-populations. • Interactions were driven by the continuous stressor, and changed over time. Abstract: Ecosystems are increasingly threatened by co-occurring stressors associated with anthropogenic global change. Spatial stressor patterns range from local to regional to global, and temporal stressor patterns from discrete to continuous. To date, most multiple stressor studies covered short periods and focused on local effects and interactions. However, it remains largely unknown how stressors with different spatiotemporal patterns interact in their effects over longer periods. In particular, at higher spatial scales, biotic dynamics in ecological networks complicate the understanding of stressor interactions. We used a spatially explicit meta-population model for a generic freshwater insect, parameterized based on traits of the European damselfly *Coenagrion mercuriale*, to simulate scenarios of discrete climatic extreme events and continuous land use-related stress. Climatic extreme events were modeled as recurring mortality in all patches, whereas land use permanently influenced meta-populations via patch qualities and network connectivity. We found that the risk of discrete climatic extreme events to meta-populations depended strongly on the proportion of land use types, with effects ranging from negligible to extinction. Land use-related stress limited recovery in meta-populations from effects of climatic extreme events, resulting in synergistic stressor interactions. Moreover, the spatial configuration of land use type influenced the combined stressor effects with clustered configurations resulting in lower effects compared to a random configuration. Finally, we found that combined stressor effects can vary with the time point at which they were determined, indicating that inconclusive results in multiple stressor research can partly be due to differences in the time of determination. We conclude that conservation should focus on regional landscape management to mitigate risks on meta-populations from future, intensified extreme climate events. Reducing land use effects, thus improving patch quality and network connectivity, can compensate for effects of additional discrete stressors and, in turn, synergistic interactions." (Authors)] Address: Streib, L., University of Koblenz-Landau, iES - Institute for Environmental Sciences, Quantitative Landscape Ecology, Herrenbergstr. 13, 76829 Landau / Pfalz, Germany. Email: streib@uni-landau.de

19753. Susanto, M.A.D. (2021): Inventory and identification dragonfly Family Libellulidae at Slamet Reservoir, Surabaya, East Java. *Journal on Biology and Instruction* 1(2): 40-50. (English, with Indonesian summary) ["Slamet Reservoir is an artificial reservoir located in the lowlands of urban areas. The existence of this reservoir with a stagnant

water habitat type has great potential to become a natural habitat for various types of dragonflies, especially the Libellulidae family. This study aims to inventory and identify the types of dragonflies in the family Libellulidae in the Slamet Reservoir. In this study, the Visual Encounter Survey (VES) method was modified by using the Belt Transect method. This method is an observation by following a predetermined circular line. Sampling was carried out by catching adult dragonflies using insect nets and then preserving them using 50% acetone. After preservation, the body part of the dragonfly was measured using a caliper. The results showed that in the Slamet Reservoir there were 12 species of dragonflies from the Libellulidae family with a total of 131 individuals. The species with the highest relative abundance value in the Slamet reservoir is *Brachythemis contaminata* with a value of 51.15%. While the species with the lowest relative abundance values were *Acisoma panorpoides*, *Dip-lacodes trivialis* and *Pantala flavescens* with a value of 0.76%." (Author)] Address: Susanto, M.A.D., Dept of Biol., Faculty of Science and Technology, Universitas Islam Negeri Sunan Ampel, Surabaya, Indonesia. Email: muhammadazmidwi@gmail.com

19754. Susanto, M.A.D.; Zulaikha, S.; Bahri, S.; Firdhausi, N.F.; Tyastirin, E. (2022): Community structure of dragonfly (insecta: Odonata) in pond habitat at Sumur Panguripan Cultural Reserve, Surabaya, Indonesia. *IOP Conference Series: Earth and Environmental Science*, Volume 976, 2nd International Conference on Tropical Wetland Biodiversity and Conservation 23-24th October 2021, Banjarbaru City, Indonesia Citation M A D Susanto et al 2022 IOP Conf. Ser.: Earth Environ. Sci. 976 012005. 11 pp. (in English) ["The Sumur Panguripan Cultural Reserve is an area of clean water wells in which there are two types of ponds, namely Canopied and Non-Canopied, with unspoiled environmental conditions. So, this area has potential as a natural habitat for the dragonfly community. The community of dragonflies at a location can be an environmental indicator, especially in waters, and also be used as a biological control for the terrestrial environment. This study aimed to report differences in the dragonfly's structure community from the two types of canopy in the pond area of the Sumur Panguripan Cultural Reserve. This study uses the Visual Encounter Survey (VES) method was modified using the Belt Transect method. The results of a study conducted in this location found that there were 20 species from 4 families, with 294 individuals. The value of species diversity of dragonflies at non-canopied locations is $H' = 2.26$, highest than the value of species diversity of dragonflies at locations with canopied that is $H' = 1.87$. At the canopied pond location, there were eight species with 48 individuals from 3 families. Meanwhile, at the Non-canopied pond location, there were 18 species with 246 individuals from 3 families." (Authors)] Address: Susanto, M.A.D., Dept of Biology, Fac. of Science & Technology, Universitas Islam Negeri Sunan Ampel, Surabaya, Indonesia. Email: nirmala_firdhausi@yahoo.com

19755. Szabo, B.; Mangione, R.; Rath, M.; Pašukonis, A.; Reber, .A.; Oh, J.; Ringler, M.; Ringler, E. (2022): Naive Poison Frog tadpoles use bi-modal cues to avoid insect predators but not heterospecific predatory tadpoles. *Journal of Experimental Biology* (2021) 224, jeb243647: 9 pp. (in English) ["For animals to survive until reproduction, it is crucial that juveniles successfully detect potential predators and respond with appropriate behavior. The recognition of cues originating from predators can be innate or learned. Cues of various modalities might be used alone or in multi-modal

combinations to detect and distinguish predators but studies investigating multi-modal integration in predator avoidance are scarce. Here, we used wild, naive tadpoles of the Neotropical Poison Frog *Allobates femoralis* (Boulenger, 1884) to test their reaction to cues with two modalities from two different sympatrically occurring potential predators: heterospecific predatory *Dendrobates tinctorius* tadpoles and dragonfly larvae. We presented *A. femoralis* tadpoles with olfactory or visual cues, or a combination of both and compared their reaction to a water-control in a between-individual design. In our trials, *A. femoralis* tadpoles reacted to multimodal stimuli (a combination of visual and chemical information) originating from dragonfly larvae with avoidance but showed no reaction to uni-modal cues or cues from heterospecific tadpoles. In addition, visual cues from conspecifics increased swimming activity while cues from predators had no effect on tadpole activity. Our results show that *A. femoralis* tadpoles can innately recognize some predators and likely need both visual and chemical information to effectively avoid them. This is the first study looking at anti-predator behavior in Poison Frog tadpoles. We discuss how parental care might influence the expression of predator avoidance responses in tadpoles." (Authors)] Address: Ringler, Eva, Division of Behavioural Ecology, Institute of Ecology and Evolution, University of Bern, Bern, Switzerland; email: eva.ringler@iee.unibe.ch

19756. Tanczuk, A., Bojar, P. (2022): Confirmation of breeding of *Cordulegaster boltonii* (DONOVAN, 1807) in the River Czarna Hańcza (the Suwalki Landscape Park). *Wiadomości entomologiczne* 41(1): 1-3. (in Polish) [20 VI 2021, 54°14'06"N, 22°47'30"E, UTM: FF11.] Address: Tanczuk, Agnieszka, Katedra Zoologii i Ochrony Przyrody, Instytut Nauk Biologicznych, Uniwersytet Marii Curie-Skłodowskiej, ul. Akademicka 19; atanczuk@gmail.com

19757. Tazunoki, Y.; Tokuda, M.; Sakuma, A.; Nishimuta, K.; Oba, Y.; Kadokami, K.; Miyawaki, T.; Ikegami, M.; Ueno, D. (2022): Comprehensive analyses of agrochemicals affecting aquatic ecosystems: A case study of Odonata communities and macrophytes in Saga Plain, northern Kyushu, Japan? *Environmental Pollution* 292, Part A, 1 January 2022, 118334: 9 pp. (in English) ["Highlights: • Negative effect of pesticides to odonata populations was investigated. • Comprehensive analysis with AIQS was used to quantify pesticides in water samples. • Insecticides, fungicides, and herbicides were detected in water environment. • Negative relationships were found between insecticides and abundance of odonates. • Fungicides and herbicides were not related to abundance of odonates and macrophytes. Abstract: The negative influence of agrochemicals (pesticides: insecticide, fungicide, and herbicide) on biodiversity is a major ecological concern. In recent decades, many insect species are reported to have rapidly declined worldwide, and pesticides, including neonicotinoids and fipronil, are suspected to be partially responsible. In Japan, application of systemic insecticides to nursery boxes in rice paddies is considered to have caused rapid declines in *Sympetrum* (Odonata: Libellulidae) and other dragonfly and damselfly populations since the 1990s. In addition to the direct lethal effects of pesticides, agrochemicals indirectly affect Odonata populations through reductions in macrophytes, which provide a habitat, and prey organisms. Due to technical restrictions, most previous studies first selected target chemicals and then analyzed their influence on focal organisms at various levels, from the laboratory to the field. However, in natural and agricultural environments, various chemicals co-occur

and can act synergistically. Under such circumstances, targeted analyses might lead to spurious correlations between a target chemical and the abundance of organisms. To address such problems, in this study we adopted a novel technique, "Comprehensive Target Analysis with an Automated Identification and Quantification System (CTA-AIQS)" to detect wide range of agrochemicals in water environment. The relationships between a wide range of pesticides and lentic Odonata communities were surveyed in agricultural and non-agricultural areas in Saga Plain, Kyushu, Japan. We detected significant negative relationships between several insecticides, i.e., acephate, clothianidin, dinotefuran, flubendiamide, pymetrozine, and thiametoxam (marginal for benthic odonates) and the abundance of lentic Eiprocta and benthic Odonates. In contrast, the herbicides we detected were not significantly related to the abundance of aquatic macrophytes, suggesting a lower impact of herbicides on aquatic vegetation at the field level. These results highlight the need for further assessments of the influence of non-neonicotinoid insecticides on aquatic organisms." (Authors)] Address: Ueno, D., Faculty of Agriculture, Saga University, Honjo 1, Saga, 840-0027, Japan. E-mail: uenod@cc.saga-u.ac.jp

19758. Valente-Neto, F.; Piovezan-Borges, A.C.; Urbieta, G.L.; Samways, M.J.; Roque, F. (2022): Research networks should improve connectivity for halting freshwater insect extinctions. *Ecological Entomology* 47(1): 63-75. (in English) [1. Avoiding freshwater insect extinctions requires studies assessing causal links between a human pressure and biodiversity measures (threats), the state of biodiversity through time (status), and solutions to manage species loss. However, an imbalance between these different approaches on declines of freshwater insects and the distribution of the studies between countries may have implications for implementing conservation knowledge into practical conservation actions. 2. Here, we evaluate country co-authorship relationships through quantitative bibliometric analysis to identify networks of research collaboration on freshwater insects extinction, and how this overall network is modified by the type of studies (status, threats, and solutions). 3. We detected that authors from developed countries dominated the networks, and most studies assessed threats to freshwater insects, knowledge which is part of a research network involving multiple countries. The status network of research collaboration was clearly more disconnected in comparison with the network of all studies, whereas the solution network showed the greatest connectivity. 4. These results reveal that an increase in research collaboration is required for all approaches assessed here, because many megadiverse countries are not present in the networks. This is especially required for status and solution studies. Expansion of research collaboration should decrease inequalities between developed and developing countries, achieved by funding conservation studies in developing countries. Studies should also decrease classical inequalities, including those related to sexual orientation, gender identity, and ethnic minorities. These recommendations would benefit freshwater insect conservation science and practice." (Authors)] Address: Valente-Neto, F., Laboratório de Ecologia, Instituto de Biociências, Universidade Federal de Mato Grosso do Sul – UFMS, Cidade Universitária, Bairro Universitário, Campo Grande, MS CEP: 79070-900, Brazil. E-mail: fvalenteneto@gmail.com

19759. Vilenica, M.; Rebrina, F.; Matonickin Kepcija, R.; Šegota, V.; Rumišek, M.; Ružanovic, L.; Brigic, A. (2022): Aquatic macrophyte vegetation promotes taxonomic and

functional diversity of Odonata assemblages in intermittent Karst Rivers in the Mediterranean. *Diversity* 2022, 14(1), 31; <https://doi.org/10.3390/d14010031>: 21 pp. (in English) ["Assemblages of adult Odonata were studied in four intermittent karst rivers encompassing macrophyte-rich (MRH) and macrophyte-poor habitats (MPH) in southern Europe, where temporary lotic habitats are the predominant freshwater type but are still understudied. With a total of 25 recorded species, the studied habitats support species-rich Odonata assemblages, as already shown for intermittent rivers in the Mediterranean. Aquatic macrophyte abundance, conductivity, and water velocity are the most significant determinants of Odonata assemblages in the studied IRES. MRH promote higher Odonata abundance and the taxonomic and functional diversity of their assemblages compared to the MPH. Odonata assemblages in MRH are characterized by higher values of body size and a higher share of species preferring lentic and temporary hydrological conditions. Moreover, their assemblages are characterized by various patterns of nymphal development and drought resilience strategies. In contrast, MPH are preferred by lotic species, with nymphal development all year round and with no specific drought-resisting strategies. Our results contribute to the knowledge of diversity and ecological requirements of dragonflies and damselflies in IRES habitats, which could provide scientific background for future conservation activities and bioassessment protocols of such habitats and their biota. ... In total, 25 Odonata species were recorded (Table 3). Overall, the most numerous species was *Platynemis pennipes* (Pallas, 1771), which was also most frequently recorded at MRH. *Calopteryx virgo* was the most numerous species at MPH (Table 3). Species recorded in low numbers (less than 20 individuals) were *Sympetrum fonscolombii*, *S. sanguineum*, *S. meridionale*, *Cordulegaster heros*, *Aeshna affinis*, *Crocothemis erythraea*, *Orthetrum cancellatum*, and *Somatochlora meridionalis* (Table 3)." (Authors)] Address: Vilenica, Marina, Department in Petrinja, Faculty of Teacher Education, University of Zagreb, 44250 Petrinja, Croatia. Email: marina.vilenica@ufzg.hr

19760. Xu, M.; Fincke, O.M. (2022): To harass or to respect: the economy of male persistence despite female refusal in a damselfly with scramble mate competition. *International Journal of Odonatology* 25: 7-15. (in English) ["In sexual conflict, males are often thought to gain fitness benefits from harassing females over mating. Yet when harassment itself incurs costs to males and if alternative, receptive females are available in a local population, theory predicts that when confronted with a female refusal, a male's choice of persisting or retreating is determined in part by the likelihood of achieving a mating. We tested that prediction in the damselfly *Enallagma hageni*, whose males compete by intense scramble competition, resulting in widespread mating harassment toward females, which have a high level of control over mating. Using captive individuals of *E. hageni* in outdoor insectaries, we quantified male persistence in mating after refusals by pre- and post-oviposition focal females whose egg content we quantified after observations. We documented a novel, context-dependent head-turning refusal signal of sexual non-receptivity, most often displayed in tandem pairs by post-oviposition females that typically carried few mature eggs for males to fertilize. Male persistence was less likely to result in mating with post-oviposition females compared with pre-oviposition females carrying a clutch of mature eggs. Accordingly, males were less likely to persist following refusal signals given by post-oviposition females, supporting the theoretical prediction. Compared with a re-

fusal signal known as wing spread, head-turning was significantly more effective in deterring harassing males. Our results suggest that despite on-going sexual conflict over mating, cooperation benefits both sexes when females use the honest signal of non-receptivity because they carry few mature eggs that males could fertilize." (Authors)] Address: Fincke, Ola, Dept of Biology, The University of Oklahoma, Norman OK, USA. Email: fincke@ou.edu

19761. Zouaimia, A. Adjami, Y.; Zebba, R.; Youcefi, A.; Bensakhri, Z.; Bensouilah, S.; Amari, H.; Ouakid, M.-L.; Houhamdi, M.; Mahdjoub, H.; Khelifa, R. (2022): Phenology of the regionally Critically Endangered dragonfly *Urothemis edwardsii* in the National Park of El Kala, Northeast of Algeria. *Nature Conservation Research* 7(1): 9 pp. (in English, with Russian summary) ["In the Mediterranean, *Urothemis edwardsii* is one of the most threatened dragonfly species with a relict population restricted to the northeast of Algeria. Despite the recent subtle local expansion in the geographic distribution of the species during the past decade, studies on the life history of the species are still lacking. We carried out a study on the phenology of emergence and flight season on Lake Bleu, Northeast-Algeria. Using repeated sampling of exuviae and marking of adults during two seasons (2018 and 2019), we estimated the population size, sex ratio, and the temporal pattern of emergence and flight season. The first year (2018) was considerably drier than the second year (2019). We collected a total of 576 and 887 exuviae and 711 and 655 adults in 2018 and 2019, respectively. The sex ratio at emergence was slightly female-biased with 57.1% in the first year and equal to unity (50.5%) in the second year, respectively. The species started its emergence earlier in the dry year (2018). The emergence of the species was quite asynchronous where 50% of the population emerged after 11 days and 16 days in 2018 and 2019, respectively. The difference in population size (based on exuviae) and the temporal pattern of emergence and flight season were likely due to differences in weather between the two years. The current study provides useful information on the life history and plasticity of *U. edwardsii*, which could be used for the management of this locally Critically Endangered dragonfly." (Authors)] Address: Khelifa, R., Biodiversity Research Center, University of British Columbia, 2212 Main Mall, Vancouver. B.C. V6T1Z4, Canada. Email: rassimkhelifa@gmail.com