Odonatological Abstract Service

published by the INTERNATIONAL DRAGONFLY FUND (IDF)

Editor:

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

Published in Zerf, Germany

ISSN 1438-0269

2016

19284. Casanueva, P.; Campos, F.; Santamaría, T.; Sánchez, L.F. (2016): Deformidad abdominal en una exuvia de Cordulegaster boltonii (Odonata, Cordulegastridae). Boletín de la Sociedad Entomológica Aragonesa 58: 244. (in Spanish) ["Description of a body anomaly, in the ventral area of abdominal segments 6 and 7 in a female exuvia of Cordulegaster boltonii, showing a low frequency of 0.08% in the sampling performed." (Authors/DeepL)] Address: Casanueva, Patricia, Depto de Ciencias Experimentales, Universidad Europea Miguel de Cervantes, Calle Padre Julio Chevalier 2, E-47012 Valladolid, Spain

19285. Fischer, I. (2016): Neuer Nachweis der Zierlichen Moosjungfer, Leucorrhinia caudalis (Charpentier, 1840) (Odonata: Libellulidae), in Wien. New record of the lilypad whiteface, Leucorrhinia caudalis (Charpentier, 1840) (Odonata: Libellulidae), in Vienna. Beiträge zur Entomofaunistik 17: 127-129. (in German) [18-v-2015, Vienna, Austra (48°13' 35,5" N, 16°24' 41,1" E)] Address: Fischer, Iris, Vogtgasse 5/2/18, 1140 Wien, Austria. Email: Fischer.Iris89@gmx.at

19286. Karube, H.; Phan, Q.T. (2016): Discovery of Chlorogomphus papilio Ris, 1927 from northern Vietnam. Tombo 58: 49-51. (in English, with Japanese summary) ["C. papilio is newly recorded from Vietnam, with a brief description of wing maculation, compared with that of Chinese population. They inhabit rather broad river in lowland area." (Authors)] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp

19287. Karube, H. (2016): First larval record of Indolestes boninensis (Asahina, 1952) from Anmma-isiana, Ogasawara. Tombo 58: 73-74. (in Japanese, with English summary) ["I. boninensis is an endemic damselfly of Ogasawara Island. Distributional records of this species were limited to the Chichi-jima group. Karube & Kosaka (2009) confirmed the presence of this species from NE Anijima island from photographs, as the previous records were doubtful. I discovered for the first time the larvae from the SW Amjima, which is the first reproductive evidence for this island." (Author)] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp

19288. Karube, H. (2016): Additional records of Vietnamese Odonata II - Rediscovery of Sieboldius gigas (Martin, 1904) (Anisoptera: Gomphidae). Tombo 58: 46-48. (in English, with Japanese summary) ["S. gigas was rediscovered from N. Vietnam. In this paper, it is re-described with a brief discussion on relationship. The species is considered to be related to S. maai Chao, 1990." (Author)] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp

19289. Kiauta, B.; Inoue, K. (2016): Obituary Professor N. W. Moore, the pioneer of Odonata Conservation. Tombo 58: 74-78. (in English or Japanese) [Obituary. Kiauta: "In memory of Professor Dr Norman Winfrid Moore, 3rd Baronet Hancox (1923 - 2015)"; Inoue: "Professor Moore's visits to Japan."] Address: Inoue, K., 5-9 Fuminosato 4-chome, Abeno-ku, Osaka 545, Japan. E-mail: ks-inoue@mx2.nisiq.net

19290. Kolozsvari, I. (2016): Characterization of the dragonfly fauna of the Tisza in the section between Tiszaujlak and Huszt. PhD thesis, Debrecen: 169 pp. (in Hungarian) ["During my research, first of all I tried to collect and systematize the odonatologic, faunistic literatures referring to Transcarpathia, as well as I tried to get an overall picture of the dragonfly fauna's species composition, their occurrence and quantitative proportions in the Tisza section between Tiszaújlak and Huszt in main, side and dead channels based on the data of my larvae and exuviae collections. Besides I tried to compile a natural habitat survey field method in a form of a data sheet that can be helpful in the objective and targeted surveying of dragonfly habitat background variables.

My dragonfly larvae and exuviae field samplings were carried out at Tiszaújlak, Tiszaújhely, Tiszabökény, Nagyszolos and Huszt, altogether on 13 main, 2 side and 3 dead channel sampling sites, on 30 m long channel and riverside stretches between 2010 and 2012. According to my research results the specimen of G. vulgatissimus species are connected with the plant coverage of the river bank, the rate of foliage closure and the characteristics of the river bank; the specimen of O. forcipatus species are associated with water depth, channel deepening tendency, type of plant coverage on the river bank and water temperature; the exuviae data of G. flavipes and O. cecilia are related to the mosaic-like bottom of the channel, the intensity of water flow near the river banks, the rate of foliage closure, and the rate of plant coverage of the river bank. In the Tisza sections at Tiszaújlak, Tiszaújhely, Tiszabökény, Nagyszolos and Huszt 8 dragonfly species were identified (G. vulgatissimus, G. flavipes, O. forcipatus, O. cecilia, S. metallica, C. splendens, P. pennipes, S. fusca). In the sections of the main, side and dead channels of the Tisza at Tiszaújlak, Tiszaújhely, Tiszabökény, Nagyszolos and Huszt I found significant differences between the quantity and composition of the dragonfly fauna. The results of the statistical data processing based on the dragonfly assemblages showed clear characteristic signs between the main, side and dead channel habitat types. The dragonfly species composition data from the dead channels at Tiszaújlak and Nagyszolos are different from the similar data of the main and side channels. In case of the dead channels, contrary to the main and side channels' Anisoptera dominance, the larval data marked the presence of particular Zygoptera. In the main and side channel sections mostly the typical flowing water species appeared while in the dead channels the proportion of those species were prominent too, which are typical in slow-flowing water and in standing water." (Author)] Address: Kolozsvári, I., Ferenc Rákóczi II. Transcarpathian Hungarian Institute, István Fodor Research Institute Kossuth square 6, Beregove 90202, Ukraine. E-mail: kolozsvaros@gmail.com

19291. Martina, S.; Höttinger, H. (2016): Die Libellen (Insecta: Odonata) eines Serpentinit- Steinbruches im Südburgenland, Österreich, unter besonderer Berücksichtigung ökologischer und naturschutzfachlicher Aspekte. Beiträge zur Entomofaunistik 17: 109-125. (in German, with English summary) ["Odonata of a serpentinite-quarry in southern Burgenland, Austria, with special focus on ecology and conservation. – Today secondary habitats like quarries, gravel-, sand-, and clay-pits are important refuges for many species of plants and animals. The abandoned serpentinite-quarry Bienenhütte, near Bernstein in southern Burgenland is inhabited by a species-rich flora and fauna and therefore has a very high value for nature conservation. 27 species of Odonata (45 % of all species listed for Burgenland) have been recorded there so far. Particularly notable among these are the first records of Leucorrhinia dubia from Burgenland and of L. pectoralis from southern Burgenland, some individuals of Sympetrum danae, which is very scarce in Burgenland, and a population of Coenagrion scitulum at an unusually high altitude. Serpentinite contains high concentrations of specific heavy-metals, especially nickel, chromium, iron and cobalt. The potential influence on the development of Odonata larvae is discussed. The importance of this quarry from a nature conservational view is presented, and suggestions for further conservation and management options are given." (Authors)] Address: Staufer, Martina, Lindenbauergasse 13, 1110 Wien, Austria. Email: m_staufer@web.de

19292. Matsuo, Y.; Naraoka, H. (2016): Discovery of Paracercion melanotum (Selys, 1876) (Coenagrionidae) in Aomori Prefecture. Tombo 58: 67-68. (in Japanese, with English summary) ["P. melanotum was recorded in Hachinohecity, Aomori Prefecture, on August 6, 2015. This is the first record of this species from Aomori Prefecture. We observed reproductive behavior of this species at the same site on August 6, 9 and 17, 2015." (Authors)] Address: Naraoka, H., 36-71, Aza-Motoizumi, Fukunoda, Itayanagi-cho, Kita-gun, Aomori Prefecture, 038-3661, Japan

19293. Naraoka, H. (2016): Effects of weather conditions on the diurnal variation of perch height of adult Ischnura elegans (Vander Linden,1820). Tombo 58: 61-66. (in Japanese, with English summary) ["The selection of perching site is important for reproduction, physiology and survival of Odonata. The author researched the diurnal change of perching height of I. elegans, in relation to weather conditions, which inhabits reed and sedge communities, at Obuchi-pond, in Aomori prefecture, Japan. Results showed that species perched lower in daytime, but sit higher from evening to next morning. On windy days, they generally perched lower, while on non windy days, they sit lower in the following order, rainy, cloudy to clear weather, and tend to perch lower according to higher temperature, lower humidity, and stronger sunshine. In addition, the height of perching was different between reed and sedge communities. Therefore, this species, which inhabits relatively uniform environment such as grassland, delicately changes the perching height according to time and weather condition, so that they may regulate their body temperature, prevent drying, escape from enemies and increase reproductive success." (Author)] Address: Naraoka, H., 36-71, Aza-Motoizumi, Fukunoda, Itayanagi-cho, Kita-gun, Aomori Pref., 038-3661, Japan

19294. Palatova, D.M.; Chertoprud, M.V.; Frolov, A.A. (2016): Fauna and types of soft-bottom macrozoobenthic assemblages in watercourses of mountainous regions on the eastern Black Sea coast. Inland Water Biology 9(2): 150-159. (in English) ["The species composition and communities of soft-bottom macrozoobenthos of the eastern Black Sea coast have been described based on an original collection of 132 quantitative and over 700 qualitative samples. More than 150 species and supraspecific taxa have been registered; 10 types of communities, each having a specific complex of dominants, have been singled out. Regional features of the pelophilic communities in mountainous regions on the eastern Black Sea coast and their altitude and temperature-dependent variability, as well as analogy with other Palaearctic regions, have been discussed.... The material of study involves 132 quantitative and >700

qualitative samples of pelophilic macrobenthos collected in watercourses of the eastern Black Sea region (Fig. 1) in 2003–2014. 86 quantitative samples were additionally collected in the watercourses of western Transcaucasia (including Abkhazia and West Georgia), 22 samples on the Armenian Highlands, 27 on the Anatolian Highlands, and 10 in the Talysh Mountains; single samples were collected from Crimea, as well as from republics of North Caucasus and Lowland Azerbaijan. ... 1. Odonata. Larvae of two dragonfly families on the eastern Black Sea coast are in some way connected with the soft grounds of watercourses. Gomphidae have burrowing and mainly rheophilic larvae-inhabiting pebbles, sand, and silt accumulations. We registered Ophiogomphus cecilia in the peidmont watercourses of the Black Sea coast of Asia Minor, Gomphus schneiderii in the lowland river of Adjara [Georgia] and North Turkey, G. vulgatissimus in piedmont rivers of Crimea, and Onychogomphus forcipatus in large rivers at the territory of the entire region (including highlands). Cordulegastridae are represented with five species indistinguishable based on larvae...; they inhabit the soft bottom of small brooks and forest springs. They were found throughout the region, except for Crimea." (Authors)] Address: Palatova, D.M., Moscow State Univ., Moscow, 119992 Russia. Email: ametropus@gmail.com

19295. Raab, B. (2016): Kieseintrag verbessert Paarungs- und Larvalhabitate der Grünen Keiljungfer. ANLiegen Natur 38(1): 49-58. (in German, with English summary) ["Gravel Improves Mating and Larval Habitats of the Green Club-tailed Dragonfly: The LIFE+-Project “Optimization of flowing waters in Middle Franconia for the Green Gomphid (Ophiogomphus cecilia)” was conducted by the Bavarian Society for the Protection of Birds (LBV) from 2010 to 2014. The project area is located in Bavaria, in the Central Franconian Basin. By dumping gravel into river beds hydromorphological processes should be initiated in order to increase the diversity of flow rates and bed structures, both important habitat prerequisites for O. cecilia. For this purpose an average of 70 tons of fine gravel were introduced at 14 river sections. More than 500 tons of gravel were introduced at a site at the river Rednitz. The gravel originated from nearby quarries and sand pits, to ensure geological autochthony. The introduction of gravel had varying effects: gradual drifting of gravel structures down the river, increased formation of rills and ridges and a high diversity of flow rates. At smaller rivers like the Aurach and Zenn, the gravel covered the whole cross section on a long stretch. At bigger rivers, for example at the Rednitz, this is only possible with enormous amounts of gravel. At sections with low flow rates (up to 0,75 m/s) the gravel remains in the river bed and reduces the flow rates even more. The gap system in the gravel body is cloged quickly by fine sediments. Therefore, gravel dumpings are recommended only for narrow river sections with high flow rates. The water depth should range between 20 and 50 cm. A success monitoring of the treatments could not be conducted so far. The monitoring results will be published in ANLiegen Natur as soon as they are available." (Author)] Address: Raab, B., Landesbund für Vogelschutz, Eisvogelweg 1, 91161 Hilpoltstein, Germany. Email: b-raab@lbv.de

19296. Rabitsch, W.; Genovesi, P.; Scalera, R.; Biala, K.; Josefsson. M.; Essl, F. (2016): Developing and testing alien species indicators for Europe. Journal for Nature Conservation 29: 89-96. (in English) ["Alien species indicators provide vital information to the biodiversity policy sector on the status-quo andtrends of biological invasions and on the efficacy of response measures. Applicable at different geographical scales and organizational levels, alien species indicators struggle with data availability and quality.Based on policy needs and previous work on the global scale, we here present a set of six alien species indicators for Europe, which capture complementary facets of biological invasions in Europe: (a) an combined index of invasion trends, (b) an indicator on pathways of invasions, (c) the Red List Index of Invasive Alien Species (IAS), (d) an indicator of IAS impacts on ecosystem services, (e) trends in incidence of livestock diseases and (f) an indicator on costs for alien species management and research. Each of these indicators has its particular strengths and shortcomings, but combined they allow for a nuanced understanding of the status and trends of biological invasions in Europe. We found that the scale and impact of biological invasions are steadily increasing across all impact indicators, although societal response in recent years has increased. The Red List Index is fit-for-purpose and demonstrates that overall extinction risks (here shown for amphibians in Europe) are increasing. Introduction pathway dynamics have changed,with some pathways decreasing in relevance (e.g., biological control agents) and others increasing (e.g., horticultural trade) providing a leverage for targeted policy and stakeholder response. The IAS indicators presented here for the first time on a continental basis serve as a starting point for future improvements,and as a basis for monitoring the efficacy of the recent EU legislation of IAS. This will need a better work-flow for data collection and management. To achieve this, all main actors must work toward improving the interoperability among existing databases and between data holders." (Authors) Two out of 137 European odonate species are classified as threatened by Invasive alien species, but no details are given.] Address: Rabitsch, W., Environment Agency Austria, Spittelauer Lande 5, 1090 Vienna, Austria. E-mail: wolfgang.rabitsch@umweltbundesamt.at(

19297. Sakai, S.; Eda, S. (2016): Two new records of sitting ovipositions into the mud by females of Aeshna crenata and A. juncea. Tombo 58: 69-70. (in Japanese, with English summary) ["Unusual oviposition behaviors were observed in A. crenata Hagen, 1856 and A. juncea (Linnaeus, 1758) in Nyukasa Plateau, Ina city, Nagano Prefecture, on August 12 and 23, 2015, respectively. Both species usually oviposit into plant tissues, however these females sat on the mud surface and laid eggs into it. It is not clear yet if such oviposition into the mud has any survival value or not." (Authors)] Address: Eda, S., 3-4-25 Sawamura, Matsumoto, Nagano 390-0877, Japan. E-mail: SND 02767@nifty.com

19298. Sano, S. (2016): New record of Sympetrum eroticum Selys, 1883) and Crocothemis servilia (Drury, 1770) in Hegura Island, off Ishikawa Prefecture. Tombo 58: 71-72.

(in Japanese, with English summary) ["Dragonflies were collected on September 20 to 21, 2015, in Hegura Island, located about 50 km north of Wajima, Ishikawa Prefecture. Both S. eroticum and C. servilia are recorded for the first time from the same Island." (Author)] Address: Sano, S., 236-0015 Room 1 Ishii Terrace, 112 Kanazawa-cho, Kanazawa-ku, Yokohama, Japan

19299. Takeuchi, T.; Yabuta, S.; Tsubaki, Y. (2016): The erroneous courtship hypothesis: do insects really engage in aerial wars of attrition? Biological Journal of the Linnean Society 118(4): 970-981. (in English) ["Males of various flying insects perform conspicuous aerial interactions around their mating stations. The broadly accepted interpretation of their aerial interaction is a war of attrition, where two contestants perform costly displays, and the one that reaches its cost threshold earlier gives up. The implicit but important requirement in this model is that some forces that match the intensity of display of the two contestants are necessary, and failure to enforce matching allows foul contestants that delay or stop their display to avoid paying contest costs. In addition, wars of attrition require flying insects to distinguish the sex of flying conspecifics because their aerial interactions begin when intruders fly into the territory. We investigated past research on the behaviour of odonates and butterflies aiming to clarify whether the two prerequisites of wars of attrition are fulfilled: (1) contestants can inflict substantial costs on nondisplaying opponents and (2) contestants can discriminate the sex of flying conspecifics. In odonates, we found an abundance of evidence suggesting that contests involve physical attack and that the ability of sexual discrimination is sufficient. Therefore, wars of attrition may occur in territorial odonates. In butterflies, however, we could not find any evidence that the two prerequisites are filled. The aerial interactions of butterflies are better interpreted as courtship between sexually active males (the erroneous courtship hypothesis). Based on these results, we discuss future directions of research on the aerial contests of flying insects." (Authors)] Address: Takeuchi, T., Center for Ecological Research, Kyoto University, Hirano 2-509-3, Otsu 5202113, Japan

19300. Vannier, J.; Schoenemann, B.; Gillot, T.; Charbonnier, S.; Clarkson, E. (2016): Exceptional preservation of eye structure in arthropod visual predators from the Middle Jurassic. Nature Communications 7, Article number: 10320 9 pp. (in English) ["Vision has revolutionized the way animals explore their environment and interact with each other and rapidly became a major driving force in animal evolution. However, direct evidence of how ancient animals could perceive their environment is extremely difficult to obtain because internal eye structures are almost never fossilized. Here, we reconstruct with unprecedented resolution the three-dimensional structure of the huge compound eye of a 160-million-year-old thylacocephalan arthropod from the La Voulte exceptional fossil biota in SE France. This arthropod had about 18,000 lenses on each eye, which is a record among extinct and extant arthropods and is surpassed only by modern dragonflies. Combined information about its eyes, internal organs and gut contents obtained by X-ray microtomography lead to the conclusion that this thylacocephalan arthropod was a visual hunter probably adapted to illuminated environments, thus contradicting the hypothesis that La Voulte was a deep-water environment." (Authors)] Address: Schoenemann, Brigitte, Dept of Neurobiology/Animal Physiology, Biocenter Cologne, Institute of Zoology, University of Cologne, Zülpicherstr. 47b, 50674 Köln, Germany. Email: B.Schoenemann@uni-koeln.de

19301. Vlasanek, P.; Kolár, V.; Tájková, P. (2016): New records of Gomphus pulchellus on the eastern edge of its range in the Czech Republic (Odonata: Gomphidae). Libellula 35 (1/2): 93-98. (in English, with German summary) ["New records of G. pulchellus are reported. It was observed in four new localities in the Czech Republic during July 2015. Individuals were probably migrants from Germany. It seems that the species is spreading eastward due to climate change." (Authors)] Address: Vlašánek, P.,Biology Centre CAS, v.v.i., Institute of Entomology, Branišovská 31, 370 05 Èeské Budìjovice, Czech Republic. Email: petisko@centrum.cz

19302. Yoshino, Y. (2016): Notes on measurement of flight speed or large size dragonfly (Aeshnidae etc.). Tombo 58: 53-60. (in Japanese, with English summary) ["In 2014 and 2015, concerning to 16 species of Aeshnidae, Gomphidae, Cordulegastridae, Corduliidae & Macromiidae, the flight speeds were measured by continuous shooting (1/7 second interval) using digital camera. The highest of flight speeds measured was 7.6 m/s (27 km/h) for Anaciaeschna martini S in crepuscular flight. On the other hand, from the calculated top speed 7.2 m/s already reported for Anax parthenope julius male, the same for Anaciaeschna martini male was estimated as 7.5 ~ 8.2 m/s, by using equations derived from the definition of the drag coefficient in aeronautical engineering. And under windless, uniform motion and horizontal flight condition, it seems that the top flight speed of Anaciaeschna martini male, based on the available power to flight muscles, may be less than 10 m/s, although the top flight speed will be achieved for only the very limited and very short opportunity and it will be extremely difficult to be measured. This reported measurement method of the flight speed, using commercial digital cameras, is comparatively easy for the amateurs, because of the low cost of the measurement equipment." (Author)] Address: Yoshino, Y.: Email: chlorogomphus@gmail.com

2017

19303. Bagheri, Z.M.; Wiederman, S.D.; Cazzolato, B.S.; Grainger, S.; O'Carroll, D.C. (2017): Performance of an insect-inspired target tracker in natural conditions. Bioinspiration & Biomimetics 12(2):025006. (in English) ["Robust and efficient target-tracking algorithms embedded on moving platforms, are a requirement for many computer vision and robotic applications. However, deployment of a real-time system is challenging, even with the computational power of modern hardware. As inspiration, we look to biological lightweight solutions-lightweight and low-powered flying insects.

For example, dragonflies pursue prey and mates within cluttered, natural environments, deftly selecting their target amidst swarms. In our laboratory, we study the physiology and morphology of dragonfly 'small target motion detector' neurons likely to underlie this pursuit behaviour. Here we describe our insect-inspired tracking model derived from these data and compare its efficacy and efficiency with state-of-the-art engineering models. For model inputs, we use both publicly available video sequences, as well as our own task-specific dataset (small targets embedded within natural scenes). In the context of the tracking problem, we describe differences in object statistics within the video sequences. For the general dataset, our model often locks on to small components of larger objects, tracking these moving features. When input imagery includes small moving targets, for which our highly nonlinear filtering is matched, the robustness outperforms state-of-the-art trackers. In all scenarios, our insect-inspired tracker runs at least twice the speed of the comparison algorithms." (Authors)] Address: Bagheri, Zahra, Adelaide Medical School, The University of Adelaide, Adelaide, SA, 5005, Australia. Email: zahra.bagheri@adelaide.edu.au

19304. Buczynski, P.; Buczynska, E.; Kowalak, E.; Matuszak-Krupa, J.; Plaska, W.; Stryjecki, R. (2017): Dragonflies (Odonata) of the Poleski National Park and its buffer zone: data from the years 2004 – 2016. Parki nar. Rez. Przyr. 36(1): 59-86. (in Polish, with English summary) ["The paper sums up the data collected in Poleski National Park during different study projects in the years 2004 . 2016. Forty five sites were examined: 34 in the park and 11 in its buffer zone. Fifty five dragonfly species were recorded: 53 in the park and 39 in its buffer zone. There are 15 special care species. High or extremely high densities of territorial males of Leucorrhinia pectoralis were recorded in some sites (38, 50, 61, and 105 ♂♂ 100 m^{-1}). The occurrence of particular species, habitat spectrum of ecological elements and valuable odonate assemblages, which are especially formed in lakes, fish ponds and fens and Sphagnum bogs, have been discussed. Considering earlier studies, 59 species of dragonflies have been recorded so far in the study area, which is 80% of the national fauna. This confirms the role of the Poleski National Park and its buffer zone in the protection of species richness of dragonflies and maintaining populations of many stenotopic species. In this area, a very large role is played by the traditional methods of land use and secondary, i.e. anthropogenic habitats. The most significant are fish ponds and fen/peat bog excavations. However, according to the authors, the approach of the park services to these water bodies is too passive. Especially peat excavations on Sphagnum bogs require active conseration, i.e. interference in the succession and deforestation of their marginal zones. Digging new excavations should also be considered, especially on peatlands free of natural water bodies. In comparison to earlier data the following species have not been found: Ischnura pumilio, Coenagrion armatum, Gomphus vulgatissimus and Ophiogomphus cecilia. Most of them occur ephemerally in the study area due to lack of suitable habitats, but C. armatum had been known from the five sites and at least at two of them the populations were large and stable. Both sites were investigated after 2004 but the species was absent. This may result in the first case from the changes in vegetation, and, in the second case from the drying out of the habitats. However, it is quite difficult to detect the species and hence it is very likely still occurs in the study area. We need a special research focused on the problem of its occurrence. The species new for the study area are as follows: Crocothemis erythraea, Sympetrum meridionale and S. pedemontanum. This shows that the Poleski National Park is being covered by the ranges of growing number of thermophilous species recently. In the following years, we can expect the increase in the number of such species. However, S. pedemontanum can create small, probably ephemeral populations in some regulated rivers and canals in the study area." (Authors)] Address: Buczynski, P., Dept of Zool., Maria Curie-Sklodowska University, Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

19305. Dawn, P. (2017): DragonflyIndia Meet 2016. International Dragonfly Fund Report 102: 1-21. (in English) ["The third meeting of DragonflyIndia social group was organized this time in Tiyabon Ecoresort, Gorumara National Park, Jalpaiguri district of West Bengal, India. Activities in the framework of the meeting are briefly outlined. A list of 66 Odonata taxa recorded during the field work is added." (Authors)] Address: Dawn, P., Dept. of Zoology, Shyampur Siddheswari Mahavidyalaya, Howrah, India. Email: prosenjit.dawn@gmail.com

19306. Fletcher, D.E.; Lindell, A.H.; Stillings, G.K.; Blas, S.A.; McArthur, J.V. (2017): Trace element accumulation in lotic dragonfly nymphs: Genus matters. PLoS ONE 12(2): e0172016: 27 pp. (in English) ["Constituents of coal combustion waste (CCW) expose aquatic organisms to complex mixtures of potentially toxic metals and metalloids. Multi-element trace element analyses were used to distinguish patterns of accumulation among 8 genera of dragonfly nymphs collected from two sites on a CCW contaminated coastal plain stream. Dragonfly nymphs are exceptional for comparing trace element accumulation in syntopic macroinvertebrates that are all predators within the same order (Odonata) and suborder (Anisoptera), but differ vastly in habitat use and body form. Sixteen trace element (Be, V, Cr, Ni, Cu, Zn, As, Se, Sr, Cd, Sb, Cs, Ba, Hg, Tl, and Pb) were analyzed and trophic position and basal carbon sources assessed with stable isotope analyses (C and N). Trophic positions varied within relatively narrow ranges. Size did not appear to influence trophic position. Trophic position rarely influenced trace element accumulation within genera and did not consistently correlate with accumulation among genera. Patterns between d13C and trace element accumulation were generally driven by differences between sites. An increase in trace element accumulation was associated with a divergence of carbon sources between sites in two genera. Higher trace element concentrations tended to accumulate in nymphs from the upstream site, closer to contaminant sources. Influences of factors such as body form

and habitat use appeared more influential on trace element accumulation than phylogeny for several elements (Ni, Ba, Sr, V, Be, Cd, and Cr) as higher concentrations accumulated in sprawler and the climber-sprawler genera, irrespective of family. In contrast, As and Se accumulated variably higher in burrowers, but accumulation in sprawlers differed between sites. Greater variation between genera than within genera suggests genus as an acceptable unit of comparison in dragonfly nymphs. Overall, taxonomic differences in trace element accumulation can be substantial, often exceeding variation between sites. Our results underscore the element and taxa specific nature of trace element accumulation, but we provide evidence of accumulation of some trace elements differing among dragonflies that differ in body form and utilize different sub-habitats within a stream reach." (Authors) Dromogomphus, Stylurus, Gomphus, Progomphus, Hagenius, Macromia, Epitheca, Boyeria] Address: Fletcher, D.E., Savannah River Ecology Lab., Univ. of Georgia, Aiken, South Carolina, USA. Email: fletcher@srel.uga.edu

19307. Fukasawa, K.; Mishima, Y.; Sasaki, K.; Kadoya, T. (2017): Ecological dissimilarity among land-use/land-cover types improves a heterogeneity index for predicting biodiversity in agricultural landscapes. Ambio 46(8): 894-906. (in English) ["Land-use/land-cover heterogeneity is among the most important factors influencing biodiversity in agricultural landscapes and is the key to the conservation of multihabitat dwellers that use both terrestrial and aquatic habitats. Heterogeneity indices based on land-use/land-cover maps typically do not integrate ecological dissimilarity between land-use/land-cover types. Here, we applied the concept of functional diversity to an existing land-use/land-cover diversity index (Satoyama index) to incorporate ecological dissimilarity and proposed a new index called the dissimilarity-based Satoyama index (DSI). Using Japan as a case study, we calculated the DSI for three land-use/land-cover maps with different spatial resolutions and derived similarity information from normalized difference vegetation index values. The DSI showed better performance in the prediction of Japanese damselfly species richness than that of the existing index, and a higher correlation between the index and species richness was obtained for higher resolution maps. Thus, our approach to improve the land-use/land-cover diversity index holds promise for future development and can be effective for conservation and monitoring efforts." (Authors)] Address: Fukasawa, K., Fukushima Branch, National Institute for Environmental Studies, Miharu, Japan

19308. Hacet, N. (2017): Updated checklist of Odonata fauna in the Turkish Thrace Region, with additional records of new, rare, and threatened taxa. Turkish Journal of Zoology 41: 33-42. ["A new record for the Odonata from Turkish Thrace, Lindenia tetraphylla, and its heterofamilial heterosexual tandem with a female of Orthetrum albistylum are reported. This finding increases the species number in the region to 56. The current species list of the region based on unpublished records and available literature is presented. Five species are listed at subspecies levels in the region and the controversial subspecies status of some species is summarized. Additional records of rare species based on specimens collected in the region between 2001 and 2015 are provided and their distributions and threat statuses in the European regional assessment are considered. Somatochlora flavomaculata is considered as a species whose presence in the region needs to be confirmed. The presence of Gomphus schneiderii is unclear in the region." (Author)] Address: Hacet, Nurten, Dept Biol., Fac. Science, Trakya Univ., Edirne, Turkey. E-mail: nhacet@hotmail.com

19309. Klaiber, J.; Altermatt, F.; Birrer, S.; Chittaro, Y.; Dziock, F.; Gonseth, Y.; Hoess, R.; Keller, D.; Küchler, H.; Luka, H.; Manzke, U.; Müller, A.; Pfeifer, M.A.; Roesti, C.; Schlegel, J.; Schneider, K.; Sonderegger, P.; Walter, T.; Holderegger, R.; Bergamini, A. (2017): Fauna Indicativa. WSL Berichte 54: 198 pp. (in German, with French and English summaries) ["The Fauna Indicativa characterizes ecological preferences and biological traits of all species of dragonflies, grasshoppers, ground beetles and butterflies of Switzerland in tables. In most cases, entries for preferences and traits are given as numbers and either specified as scaled values or Yes-No decisions. Other characteristics are specified as letters. The entries are specific to populations in Switzerland and are based mostly upon literature data and the assessment by experts. The Fauna Indicativa is a tool for the ecological evaluation of faunistic data and may form the base for developing indicators for monitoring. With the help of this tool, arthropod communities can be used in an easy way for the description of state and change of habitats in Switzerland. Examples for the applications of the Fauna Indicativa are given." (Authors)] Address: Gonseth, Y., info fauna - CSCF, Passage Maximilien-de-Meuron 6, 2000 Neuchatel, Switzerland. Email: yves.gonseth@unine.ch

19310. Sivasankaran, P.N.; Ward, T.A.; Salami, E.; Viyapuri, R.; Fearday, C.F.; Johan, M.R. (2017): An experimental study of the elastic properties of dragonfly-like flapping wings for use in Biomimetic Micro Air Vehicles (BMAV). Chinese Journal of Aeronautics 30(2): 726-737. (in English) ["This article studies the elastic properties of several Biomimetic Micro Air Vehicle (BMAV) wing structural designs that are based on a dragonfly wing. BMAVs are a new class of unmanned micro-sized air vehicles that mimic the flapping wing motion of flying biological organisms (e.g. insects, birds, or bats). Three structurally identical wings were fabricated using different materials: acrylonitrile butadiene styrene (ABS), polylactic acid (PLA) and acrylic. Simplified wing frame structures were fabricated from these materials and then a nanocomposite film was adhered to them which mimics the membrane of an actual dragonfly. These wings were then attached to an electromagnetic actuator and passively flapped at frequencies of 10–250 Hz. A three dimensional high frame rate imaging system was used to capture the flapping motion of these wings at a resolution of 320 × 240 pixels and 35,000 frames per second. The maximum bending angle, maximum wing tip deflection, maximum wing tip twist angle and wing tip twist speed of each wing were measured and compared to each other and an actual

dragonfly wing. The results show that the ABS wing has considerable flexibility in the chordwise direction, whereas the PLA and acrylic wings show better conformity to an actual dragonfly wing in the spanwise direction. Past studies have shown that the aerodynamic performance of a BMAV flapping wing is enhanced if its chordwise flexibility is increased and its spanwise flexibility is reduced. Therefore, the ABS wing (fabricated using a 3D printer) showed the most promising results for future applications." (Authors)] Address: Sivasankaran, P.N., Dept of Mechanical Engineering, University of Malaya, Kuala Lumpur 50603, Malaysia

19311. Zhang, H. (2017): Odonata fauna of Dai-Jingpo Autonomous Prefecture of Dehong in the western part of the Yunnan Province, China - a brief personal balance from seven years of surveys and workshop report on current studies. IDF-Report 103: 1-49. (in English) ["Between 2009 and 2016, a total of 174 Odonata species have been recorded in the Dehong Dai and Jingpo Autonomous Prefecture, China. 21 of these species are new records for China, and additional 26 taxa have to be described as new to science. Brief comments on selected species refer to morphological characters, distribution and seasonality." (Author)] Address: Zhang, H., Kunming Natural History Meseum of Zoology, Kunming Institute of Zoology, Chinese Academy of Sciences, China. E-mail: zhanghaomiao@mail.kiz.ac.cn

2018

19312. Dolný, A.; Šigutová, H.; Ožana, S.; Choleva, L. (2018): How difficult is it to reintroduce a dragonfly? Fifteen years monitoring Leucorrhinia dubia at the receiving site. Biological Conservation 218: 110-117. (in English) ["Highlights: •Population reintroductions are potential effective tools for wildlife conservation. •L. dubia larvae were translocated to artificially created bog pools. •The population was monitored for 15 years after larvae release. •Population size increased over the monitoring period with high genetic variability. •Reintroductions are effective measures for dragonfly conservation. Abstract: Conservation translocations (including reintroductions) are potentially powerful tools for wildlife conservation, and their use has increased worldwide. However, most studies have focused on vertebrates, with the long-term impact and ecological progress of translocations being neglected. Moreover, such projects rarely target insects. The present study reports the long-term persistence of a population of L. dubia reintroduced to artificially created bog pools in the Czech Republic. Eighty (pen)ultimate instar L. dubia larvae were translocated in 2001, and the dragonfly assemblage at the reintroduction site was monitored for 15 years following larvae release. In 2015–2017, the capture-mark-recapture method, the Jolly-Seber model, and exuviae collection were used to evaluate the demography of the translocated population. Microsatellite analysis was performed to assess the genetic variability of source and reintroduced populations. Over the monitored period, population size increased (80 larvae released vs. 108–115 exuviae and 75 adults at the end of the study) and L. dubia became a dominant species, whereas the composition and abundance of the local dragonfly assemblage were not substantially changed. These results indicate that reintroductions are effective measures for dragonfly conservation, as translocating a relatively small number of individuals led to the establishment of a self-sustaining population. Using (pen)ultimate instar larvae was optimal for dragonfly translocation, but the availability of a high-quality habitat and the active collaboration with nature conservation authorities were vital for the successful outcome. Genetic analysis suggested that the translocated population might serve as a source of genetic variation for the original population, if depleted." (Authors)] Address: Dolný, A., Dept of Biology and Ecology, Faculty of Science, University of Ostrava, Chittussiho 10, CZ-710 00 Slezská Ostrava, Czech Republic. E-mail: ales.dolny@osu.cz

19313. Gauci, C. (2018): Dragonflies and Damselflies of the Maltese Islands. Birdlife Malta: 150 pp. (in English) ["This book describes each of the 19 species recorded in the Maltese Islands and each species is amply illustrated by photographs which, for the commoner species, illustrate most or all the stages in their life cycle. It is hoped that besides being of help and interest to nature lovers, it will also raise a much needed awareness among the general public about biodiversity and nature conservation." (Author)] Address: Gauci, C., 28, Triq il-Kissier, Mosta, Malta MST1822

19314. Hintner, R. (2018): Untersuchungen zur Libellenfauna des Naturschutzgebietes Egelsee, Bezirk Spittal an der Drau, Kärnten. Carinthia II 208./128: 437-444. (in German, with English summary) ["Between July 2016 and July 2017, the dragon- and damselfly fauna of the nature protection area Egelsee was investigated for possible changes and a total of 24 permanently occurring species were confirmed. Six of these species are endangered in Carinthia. The endangered species Coenagrion hastulatum and Leucorrhinia dubia and the critically endangered Nehalennia speciosa have a high number of individuals. Erythromma viridulum and Libellula depressa have been discovered for the first time in this investigation area." (Author)] Address: Hintner, R., Radlach 54, 9754 Steinfeld, Austria. Email: robinhintner@gmail.com

19315. Ren, H.; Cui, N.; Tang, Q.; Tong, Y.; Zhao, X.; Liu, Y. (2018): High-performance, ultrathin, ultraflexible organic thin-film transistor array via solution process. Small 14(33), August 16, 2018, 1801020: (in English) ["Ultrathin organic thin-film transistors (OTFTs) have received extensive attention due to their outstanding advantages, such as extreme flexibility, good conformability, ultralight weight, and compatibility with low-cost and large-area solution-processed techniques. However, compared with the rigid substrates, it still remains a challenge to fabricate high-performance ultrathin OTFTs. In this study, a high-performance ultrathin 2,7-dioctyl[1]benzothieno[3,2-b][1]benzothiophene (C8-BTBT) OTFT array is demonstrated via a simple spin-coating method, with mobility as high as 11 $cm^2\ V^{-1}\ s^{-1}$ (average mobility: 7.22 $cm^2\ V^{-1}\ s^{-1}$), on/off current ratio of over 10^6 , switching current of >1 mA, and

a good yield ratio as high as 100%. The ultrathin thickness at ≈380 nm and the ultralight weight at ≈0.89 g m^{-2} enable the free-standing OTFTs to imperceptibly adhere onto human skin, and even a damselfly wing without affecting its flying. More importantly, the OTFTs show good electrical characteristics and mechanical stability when conformed onto the curved surfaces and even folded in a book after 100 folding cycles. These results illustrate the broad application potential of this simply fabricated ultrathin OTFT in next-generation electronics such as foldable displays and wearable devices.." (Authors)] Address: Tang, Q., Centre for Advanced Optoelectronic Functional Materials Research & Key Lab. of UV-Emitting Materials & Tech., Ministry of Education, Northeast Normal Univ., Changchun, 130024 P. R. China. E-mail: tangqx@nenu.edu.cn

2019

19316. Aziz, M.A.A.A.; Mohamed, M. (2019): Annotated checklist of odonates (Insecta: Odonata) in Sungai Bantang Recreational Forest, Bekok, Johor, Malaysia. IOP Conf. Series: Earth and Environmental Science 269 (2019) 012002: 15 pp.["A total of 34 species of odonates, including 17 species of dragonflies (Anisoptera) belonging to 2 families, and 15 species of damselflies (Zygoptera) belonging to 8 families were collected and recorded from Hutan Lipur Sungai Bantang in January, May and July 2017. From Anisoptera, Libellulidae is the most dominant family with 15 species and from Zygoptera, the richest family were Chlorocyphidae, Euphaeidae and Platycnemididae, each with three species respectively. A detailed list of odonates recorded from Hutan Lipur Sungai Bantang is presented. The result forms a baseline data of odonate fauna in this forest reserve useful in the monitoring of water quality of rivers found in the forest reserves in the future." (Authors)] Address: Abdul Aziz, M., Centre of Research Sustainable Uses of Natural Resources, Fac. Applied Sciences & Technology, Univ. Tun Hussein Onn Malaysia, Kampus Pagoh, Jalan Panchor, 84000, Muar, Johor, Malaysia. E-mail: maryati@uthm.edu.my

19317. Bakker, W.; Ruiter, E.J.; Bunskoek, M.; Bakker, W.; Milder-Mulderij, G.; Achterkamp, B. (2019): Dark Whiteface (Leucorrhinia albifrons) discovered in 2016 at Delden. Brachytron 20(2): 63-70. (in Dutch, with English summary) ["In 2016 Leucorrhinia albifrons was discovered at the Twickel estate near Delden, Overijssel, the Netherlands. During the year 2017, a systematic search in a wider area resulted In observations of at least six males and one female. In 2018 a single male was found. Because the species has been seen at this location during three consecutive years, it is very likely that a population has been present for a longer period of time. Indications of reproduction of L. albifrons were however not observed. In the summer of 2018 L. albifrons was also observed at other locations in the Netherlands, at several sites multiple individuals were seen." (Authors)] Address: Bakker, W.: spitskip@gmail.com

19318. Bora, A. (2019): Odonate (Dragonflies and damselflies) diversity as a marker of water quality in Sivasagar, Assam, India. International Journal on Emerging Technologies 10(3): 51-54. (in English) ["The present study was conducted in four different wetlands of Sivasagar district, Assam to determine whether diversity and abundance of odonates have any relationship with water quality. The Water Quality Index, Shannon-Weiner diversity index, Simpson's diversity index and species abundance values were calculated. Highest species richness and abundance were recorded in the site with highest water quality index and status good. The area with lowest water quality index showed lowest species richness and abundance. Brachydiplax chalybea, Camacinia gigantean, Diplacodes nebulosa, Agriocnemis kalinga and Ceriagrion olivaceum prefer habitat with slightly acidic water, moderate conductivity and higher concentration of DO. While species like Neurobasis chinensis, Orthetrum glaucum, Lathrecista asiatica and Palpopleura sexmaculata prefer habitas with neutral water, higher conductivity and higher concentration of DO. Odonata surveys can be used widely to assess site quality, monitor restoration, and as incremental benchmarks of ecological quality." (Author)] Address: Bora, A., Dept of Life Science & Bioinformatics, Assam University, 788011 Silchar, (Assam), India

19319. Buczynski, P.; Bielak-Bielec, P. (2019): Materials to the knowledge of dragonflies (Odonata) of rivers and lakes in Central Eastern Poland. Notatki Entomologiczne 4(2): 1-10. (in Polish, with English summary) ["The authors present and discuss a collection of dragonfly larvae from the years 2015–2018, obtained in central-eastern Poland (21°47'–24°08'E, 50°38'–51°43'N) in the rivers (28 sites) and lakes (three sites). Data from rivers, except for one site in the stagnant river's mouth section, is typical of species-poor assemblages characteristic for middle and lower reaches of rivers. Noteworthy are the occurrence sites of two species protected by law: Gomphus flavipes and Ophiogomphus cecilia. At the same time, a small number of records of O. cecilia may show a still insufficient water quality in a large part of the studied rivers. In the material from lakes, the most interesting is the presence of thermophilous Orthetrum albistylum and Crocothemis erythraea, which indicates the increasing water temperature in the lake littoral in the area of research and the associated change in the composition of the fauna of this habitat. The collection of the exuvia of Erythromma viridulum in the aquarium at the pet shop in Lublin is separately discussed: in most cases the material obtained in this way represents introduced exotic species. This is a valuable tip that native species can colonize aquariums in shops and that the identification of such individuals in aquariums should begin by checking whether it is not such a case." (Authors)] Address: Buczynski, P., Dept of Zool., Maria Curie-Sklodowska University, Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

19320. Cao, L.; Hou, W.; Hu, C. (2019): The complete mitochondrial genome sequence of Acisoma panorpoides Rambur, 1842 (Odonate: Libellulidae). Mitochondrial DNA Part B 4(2): 3644-3645. (in English) ["The phylogenetic relationships of dragonflies have received great attention all the time. For a better understanding the phylogenies among

odonate insects, the paper presented the complete mitochondrial genome of Acisoma panorpoides based on next generation sequencing data of total genomic DNA. The total length comprised 15,249 bp and the 37 genes (2 rRNA genes, 13 protein coding genes and 22 tRNA genes). Gene content and gene arrangement were identical to other odonate mitogenomes. Phylogenetic analyses using the whole sequences of the mitochondrial genome placed A. panorpoides as a sister species to Hydrobasileus croceus in Libellulidae." (Authors)] Address: Cao, L., College of Life Science, Jiangxi Normal University, Nanchang 330022, China. E-mail: clzclz1011@163.com

19321. Celinski, D.; Wolcezka, M.; Kadej, M.; Smolis, A.; Tarnawski, D. (2019): The first record of Leucorrhinia pectoralis (Charpentier, 1825) (Odonata: Libellulidae) in the “Stawy Milickie” Nature Reserve. Przyroda Sudetów 22: 73-78. (in Polish, with English summary) ["We describe observations (2.06.2018) of males of Leucorrhinia pectoralis in the nature reserve “Stawy Milickie”. The observed individuals stayed close to the margins of reed beds and small fragments of open water table surrounded by reeds (the dominant hydrophyte in the site of observation was Myriophyllum spicatum L.). The locality found by us in the nature reserve ”Stawy Milickie” (Stawno ponds) is among about a dozen records of L. pectoralis from Lower Silesia. The great majority of the known localities of the species is located in the south-western part of Lower Silesian province, while the above locality is situated in its north-eastern part, near the boundary of Lower Silesia and Wielkopolska." (Authors)] Address: Celinski, D., Pracownia Biologii Konserwatorskiej i Ochrony Bezkręgowców, Zakład Biologii, Ewolucji i Ochrony Bezkręgowców, Instytut Biologii Środowiskowej, Wydział Nauk Biologicznych, Uniwersytet Wrocławski, ul. Przybyszewskiego 65, 51-148 Wrocław, Poland. E-mail: damian.celinski@onet.pl

19322. Chelli, A.; Moulaï, R. (2019): Ecological characterization of the odonatofauna in lotic and lentic waters of northeast Algeria. Annales de la Société entomologique de France (N.S.) 55(5): 430-445. (in English, with French summary) ["The purpose of this paper is to determine the Odonata fauna structure and composition in Bejaia’s wetlands, which have been poorly sampled until now. This paper is a report of a pioneer study of dragonflies in the Bejaia area in northeastern Algeria, with the aim to improve the knowledge of the Odonata taxa present in this vast territory, which covers 3268 km². This region is of major importance, and contains Wadi Soummam which is classified by the Ramsar Convention as of international importance. In addition, Lake Mezaia is included in the Gouraya National Park, and the area also contains high mountain forest ponds, which are unknown to both the general public and the scientific community due to their remote location and poor accessibility. Despite the anthropogenic pressures on these wetlands, this study recorded 33 Odonata species, which represented 52% of the species known in Algeria. None were new to the country. The recorded species included two Maghrebian endemic taxa, namely Platycnemis subdilatata and Enallagma deserti." (Authors)] Address: Chelli, A., Laboratoire de Zoologie Appliquée et d’Écophysiologie Animale, Faculté des Sciences de la Nature et de la Vie, Université de Bejaia, Bejaia, Algeria

19323. Chovanec, A. (2019): Libellenkundliche Bewertung des restrukturierten Mündungsabschnitts der Mattig (Oberösterreich). im Auftrag des Amtes der Oberösterreichischen Landesregierung, Abt. Wasserwirtschaft: 37 pp. (in German) ["The lowest river kilometre of the Mattig in Braunau (Upper Austria) was the subject of a dragonfly study in 2019. Its aim was to evaluate the measures carried out in 2005-2007 for the ecological upgrading of this hyporhithral stretch of water. The restructuring measures favoured the colonisation of the river by dragonfly species specific to the water body type (especially Calopteryx virgo, Gomphus vulgatissimus, Onychogomphus forcipatus), which is expressed in the assessment "very good dragonfly ecological status". However, the low numbers of individuals, especially of sediment-bound species from the family Gomphidae, show that the supply of corresponding larval habitats in the studied section is rather low. Widening and the creation of flow-calming and flow-free zones promoted the abundance of individuals of Calopteryx splendens, a species with its longitudinal zonal focus in the Potamal, and of limnophilic species. This indicates potamalisation effects. The different characteristics of the five mapped study stretches in terms of water morphology, flow and bedload conditions as well as vegetation are reflected in differences in the dragonfly fauna." (Author/DeepL)] Address: Chovanec, A., Krotenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-mail: andreas.chovanec@bmnt.gv.at

19324. Chovanec, A. (2019): Restrukturierungsmaßnahmen an der Krems im Bereich Ansfelden / Oberaudorf (Oberösterreich): Bewertung aus libellenkundlicher Sicht im Jahr 2019. Im Auftrag des Amtes der Oberösterreichischen Landesregierung, Abt. Wasserwirtschaft: 59 pp. (in German) ["In the years 2006 - 2008, hydraulic engineering interventions were carried out on the approximately 1.5 km long section of the Krems in Ansfelden / Oberaudorf in order to increase flood safety and ecologically enhance the watercourse. Corrections were carried out in 2018. The aim of the present study, which was carried out in 2019, was to examine the ecological effectiveness of the measures in terms of dragonflies. At each of the six study stretches mapped six times, 28 dragonfly species were detected, of which 22 were classified as certain, probable or possibly native (reproducing). 21 species - 18 of them certainly, probably or possibly native - belong to the reference species spectrum specific to the water body type (indicator and accompanying species). In this area, the Krems is assigned to the transitional region Hyporhithral / Epipotamal of the bioregion Bavarian-Austrian Alpine Foothills. Four leading species (Calopteryx splendens, Calopteryx virgo, Gomphus vulgatissimus and Onychogomphus forcipatus) were certainly ground-dwelling, which could be confirmed by the finding of exuviae and newly hatched individuals. The high individual densities should be emphasised: 17 of the 22 ground-

dwelling species occurred frequently, very frequently or en masse in at least one study section. Based on the findings, the dragonfly ecological status of the entire watercourse section can be classified as "very good". The different water typological characteristics of sections in the study area are reflected in the dragonfly fauna: The free-flowing section of the Krems (study sections A and B) had a high structural diversity (gravel banks, helophytes, flow-calm zones with submerged macrophytes in the flow shadow of groynes) and was colonised in particular by the rheophilic and rheobiont (flow-loving) reference species. The dragonfly ecological condition of this section was assessed as "very good". As a result of the hydraulic engineering corrections carried out in 2018, the left-bank side channel connected on both sides (sections D and E) was doped and flowed through from the main channel of the Krems throughout 2019, which had a positive effect on the dragonfly fauna specific to the water body type. This section was also the habitat of rheophilic and rheobiont reference species in particular. The dragonfly ecological status of this section was classified as "good". (Author/DeepL)] Address: Chovanec, A., Krotenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-mail: andreas.chovanec@bmnt.gv.at

19325. Guilfoyle, M.P.; Philley, K.D.; Britzke, E.R.; Harrison, A.B.; Slack, W.T.; Schoppmann, N. (2019): Shale Barren mapping and threatened and endangered species surveys for Raystown Lake, PA: U.S. Army Corps of Engineers, Baltimore District. Technical Report. Project 122148: 192 pp. (in English) ["This study mapped and surveyed shale barren plant communities at Raystown Lake, Huntingdon County, Pennsylvania. The location and extent of the shale barren communities were assessed, and various botanical species, including state and federal listed species were identified. An acoustic bat survey was done to revise and update a prior bat survey completed in 2014. In addition, invertebrate surveys of aquatic insects and fresh water mussels were also performed. Finally, numerous nocturnal, xeric-habitat specialist moths were collected to assess the presence or absence of state listed, or other rare and sensitive species, on the shale barrens. A total of 73 potential shale barren areas were identified and mapped. All shale barren endemic species previously known from Huntingdon County were confirmed at Raystown Lake, with the exception of shale barren goldenrod (Solidago arguta). ... Aquatic invertebrate sampling yielded specimens of Calopteryx dimidiata, which was thought to be extirpated from Pennsylvania and represents a new county record. Some other additional rare, sensitive aquatic insects collected during this study include Boyeria grafiana, Cordulegaster erronea, ... Results of all these surveys are expected to update the knowledge and understanding of rare, sensitive, state or federal listed species on Raystown Lake. These results are discussed in relation to potential management actions that may assist with the conservation and protection of these species and their habitats. Further, these data can now be used to update the Raystown Lake Master Plan." (Authors)] Address: U.S. Army Engineer Research and Development Center (ERDC) Environmental Laboratory (EL) Waterways Experiment Station, 3909 Halls Ferry Road Vicksburg, MS 39180-6199, USA

19326. Huang, D.; Fu, Y.; Nel, A. (2019): The first Chinese representative of the Jurassic damseldragonfly genus Hypsothemis (Odonata: Isophlebioidea: Campterophlebiidae). Alcheringa 44(1): 99-103. (in English) ["A new campterophlebiid damsel-dragonfly, Hypsothemis sinensis sp. nov., is described from the lowermost Upper Jurassic Haifanggou Formation at the Daohugou locality in the Ningcheng Basin, China. This is the first Chinese representative of this genus, previously known only from the coeval upper Karabastau Formation in Kazakhstan, reflecting strong palaeobiogeographic links between these two entomofaunas." (Authors)] Address: Nel, A., Institut de Systématique, Evolution, Biodiversité, ISYEB, UMR 7205, CNRS, MNHN, UPMC, EPHE, Muséum national d'Histoire naturelle, Sorbonne Universités, Université des Antilles, 57, rue Cuvier, CP 50, Entomologie 75005 Paris, France. Email: anel@mnhn.fr

19327. Ilahi, I.; Yousafzai, A.M.; Attaullah, M.; Haq, T.U.; Ali, H.; Rahim, A.; Sajad, M.A.; Najeeb, S.; Zaman, S.; Ullah, S.; Ahmad, A.; Begum, R.; Waqas; Bibi, H.; Hussain, S.; Ahmad, B. (2019): The role of odonate nymphs in ecofriendly control of mosquitoes and sensitivity of odonate nymphs to inorganic nutrient pollutants. Applied Ecology and Environmental Research 17(3): 6171-6188. (in English) ["During the present research, the predatory efficiency of nymphs of six coexisting odonate species i.e., I. elegans, T. aurora, P. flavescens, L. fulva, S. decoloratum and C. servilia was studied by using the 3rd instar larvae of Cx. quinquefasciatus as prey. Among the odonate species, there was observed variation in the daily feeding rate. The highest number of mosquito larvae was ingested by the P. flavescens nymph (47.0 ± 5.1 mosquito larvae/day). The predation performance of the odonate nymph was also compared between the day and night times. The feeding rate of nymphs of most odonate species was significantly higher during the daytime as compared to night-time (P ≥. 0.05). During the present research, feeing rates of odonate nymphs on Cx. quinquefasciatus 3rd instar larvae were also studied under varied condition of prey and predator density and water volume. Feeding rate of nymphs of each odonate species was positively correlated with increase in predator and prey density but was negatively correlated with increase in water volume. During the present research, odonate nymphs i.e., I. elegans, T. aurora and P. flavescens were exposed to various concentration of NH_{4+} and NO_{3-} in the laboratory for seven days. Nymph of P. flavescens species was found least sensitive to both, NH_{4+} and NO_{3-}. From the findings of the present research it was concluded that P. flavescens species is more efficient predator of Cx. quinquefasciatus 3rd instar larvae and is highly resistant to increasing water level of NH_{4+} and NO_{3-}." (Authors)] Address: Ilahi, I., Dept of Zoology, University of Malakand, Chakdara, Dir Lower, Khyber Pakhtunkhwa, Pakistan. Email: ikramilahi@uom.edu.pk

19328. Johansson, F.; Bini, L.M.; Coiffard, P.; Svanbäck, R.; Wester, J.; Heino, J. (2019): Environmental differences

drive differences in the beta diversity of dragonfly assemblages among urban stormwater ponds. Ecological indicators 106(12): 9 pp. (in English) ["Subject: Anisoptera (Odonata), adults, algae, environmental factors, environmental indicators, land use, landscapes, macrophytes, models, oviposition sites, pollutants, ponds, predators, species diversity, stormwater, urban areas, vegetation cover, vegetation types, Sweden Abstract:Stormwater ponds are beneficial to urban landscapes because these man-made systems can reduce the negative effects of flooding in urban areas and restrain the distribution of pollutants. In addition, these systems are especially important to maintain the biodiversity of urban landscapes. Here, we sampled a set of 18 stormwater ponds in the city of Uppsala in Sweden to test the relationship between beta diversity of adult dragonflies and environmental factors (local and land use variables). We analysed the total beta diversity and its two components: replacement and richness difference. We recorded 31 species of Odonata, comprising 61% of the Odonata species in the province of Uppland in Sweden. By itself, this result indicates the importance of stormwater ponds in contributing to biodiversity in urban areas. The richness difference component of beta diversity was higher than the replacement component. Results from generalized dissimilarity models indicated that the richness difference component was mainly related with pond area and total vegetation cover (aquatic vegetation plus vegetation surrounding ponds). Focusing on different vegetation variables separately, models indicated that the beta diversity components were significantly correlated with percentage cover of floating algae scums, emergent aquatic macrophytes and tall shore vegetation. These results are consistent with what is known about the ecology of dragonflies, including the importance of aerial plant structures for perching, shelter from terrestrial and aquatic predators, and for providing oviposition sites. We also found that the stormwater ponds harboured a large part of the regional species pool. These systems are therefore important havens of biodiversity in urban landscapes. Our results also indicate that the management of different types of vegetation is key to maximize the potential of these systems in maintaining regional biodiversity." (Authors)] Address: Johansson, F., Dept of Ecology & Environmental Science, Animal Ecology Group, Umea University, 90187 Umea, Sweden. E-mail: frank.johansson@eg.umu.se

19329. Juracka, P.J.; Dobiáš, J.; Boukal, D.S.; Šorf, M.; Beran, L.; Cerný, M.; Petrusek, A. (2019): Spatial context strongly affects community composition of both passively and actively dispersing pool invertebrates in a highly heterogeneous landscape. Freshwater Biology 64(12): 2093-2106. (in English) ["1. The spatial distribution of suitable habitats and dispersal abilities of the constituent taxa jointly affect the structure of metacommunities in standing freshwaters. Most studies exploring spatial effects on aquatic metacommunities, however, focus on at most a few taxonomic groups. 2. Within two consecutive seasons, we studied spatial patterns in the species richness and composition of three passively dispersing and three actively flying freshwater invertebrate groups (rotifers, microcrustaceans and molluscs vs. hemipterans, aquatic beetles and odonates) in a metacommunity system consisting of 42 newly or recently created fishless pools in a highly heterogeneous Central European sandstone landscape consisting of deep valleys and steep ridges. We hypothesized that the extent to which these dispersal barriers affect invertebrate groups depends on their dispersal mode, and that the ability of each group to colonize new habitats is affected by the landscape morphology. Moreover, we predicted that the history and age of the pools would play a major role in structuring of invertebrate communities. 3. Following the classical island biogeography pattern, habitat size (measured as pool surface area or depth) was the key characteristic influencing species richness for each of the six studied groups (range of explained variation: 10%–58.7%). The number of nearby aquatic habitats (i.e., potential colonization sources) was also an important determinant of species richness for molluscs (18.8%), crustaceans (36.4%) and aquatic beetles (27.2%). After pool size, the most important factor influencing species richness was the presence and functional composition of aquatic macrophytes in the pools, which affected the species richness of odonates (25.2%), aquatic beetles (12.2%), rotifers (11.1%), and crustaceans (8.3%). 4. Valley distances between localities, defined as the shortest distance that avoids crossing steep ridges, explained consistently slightly more variation in species composition (2.6%–12.6%) than did Euclidean distances (1.0%–10.1%) for all six groups. Spatial variables (the valley distance matrix, position of pools within clusters in the landscape, and the number of nearby aquatic habitats) explained more variation in species composition (3.4%–25.4%) than local pool characteristics (2.8%–9.4%) or temporal variation (0%–7.6%) in all taxa except hemipterans, whose species composition was almost equally affected by local (3.3%) and spatial factors (3.4%). 5. We conclude that landscape-level spatial structure in our study area affects the dispersal and metacommunity assembly of both actively and passively dispersing invertebrates more than studied pool characteristics or temporal variation. The observed congruence between groups with different dispersal modes is likely because flying insects follow similar dispersal routes as the key animal vectors of passive dispersers. Our study highlights the importance of including relevant topography features in studies of aquatic metacommunities in complex and heterogeneous landscapes, even for taxa considered to be efficient dispersers." (Authors) The study includes 24 odonate taxa.] Address: Juracka, P.J., Dept Ecol., Fac. Science, Charles Univ., Vinicná 7, Prague 2, 12844, Czech Republic. Email: juracka@natur.cuni.cz

19330. Khan, M.K.; Herberstein, M.E. (2019): Sexually dimorphic blue bands are intrasexual aposematic signals in nonterritorial damselflies. Animal Behaviour 156: 21-29. (in English) ["Highlights: • Dimorphic male colour evolves by female choice or by male-male interactions. • In damselflies, females did not prefer males with abdominal blue bands. • However, conspicuous blue bands reduced male mating attempts. • Conspicuous male colour here functions as an antiharassment aposematic signal. Abstract: Sexually dimor-

phic traits in males are thought to evolve via female preference or male–male competition. Alternatively, in species without overt male displays or female mate choice, dimorphic coloration may function as a warning signal to conspecific males thereby avoiding costly harassment. We aimed to determine the function of sexual dimorphic coloration in the damselfly Xanthagrion erythroneurum in which males, but not females, have conspicuous blue bands on the tip of the abdomen. We show that the male blue bands and female black abdomen are chromatically and achromatically discriminable against their natural background. Moreover, the male blue bands and their adjacent abdominal segments generate higher internal contrast than female abdominal segments. We conducted two sets of experiments to test alternative hypotheses that the male blue bands are (1) the target of female mate choice, or (2) an intrasexual aposematic signal to avoid male mating harassment. We hid male blue bands by painting them black and measured female preference between the manipulated and the nonmanipulated (control) males. We found no difference in mating success between the control and manipulated males, thereby rejecting the female preference hypothesis. To test whether the blue bands function as a warning signal, we manipulated the females by painting male-like blue bands on their abdomen and measured the male response to those females relative to control females. Females with artificial blue bands on the terminal abdomen were mated less frequently than control females. However, when we painted blue bands on the anterior abdominal segments, the males did not discriminate between control and painted females. Our study demonstrates that dimorphic coloration advertises the males' unprofitability as mates to conspecifics thereby reducing intrasexual harassment." (Authors)] Address: Khan, M.K., Dept Biol. Sciences, Macquarie Univ., Sydney, NSW-2109, Australia. E-mail: bmbkawsar@gmail.com

19331. Luhring, T.M.; Vavra, J.M.; Cressler, C.E.; DeLong, J.P. (2019): Phenotypically plastic responses to predation risk are temperature dependent. Oecologia 191(3): 709-719. (in English) ["Predicting how organisms respond to climate change requires that we understand the temperature dependence of fitness in relevant ecological contexts (e.g., with or without predation risk). Predation risk often induces changes to life history traits that are themselves temperature dependent. We explore how perceived predation risk and temperature interact to determine fitness (indicated by the intrinsic rate of increase, r) through changes to its underlying components (net reproductive rate, generation time, and survival) in Daphnia magna. We exposed Daphnia to predation cues from dragonfly naiads early, late, or throughout their ontogeny. Predation risk increased r differentially across temperatures and depending on the timing of exposure to predation cues. The timing of predation risk likewise altered the temperature-dependent response of T and R0. Daphnia at hotter temperatures responded to predation risk by increasing r through a combination of increased R0 and decreased T that together countered an increase in mortality rate. However, only D. magna that experienced predation cues early in ontogeny showed elevated r at colder temperatures. These results highlight the fact that phenotypically plastic responses of life history traits to predation risk can be strongly temperature dependent." (Authors)] Address: Luhring, T.M., School Biological Sciences, University of Nebraska-Lincoln, 410 Manter Hall, Lincoln, NE, 68588, USA. Email: tomluhring@gmail.com.

19332. Martínez-Lendech, N.; Osorio-Beristain, M.; Franco, B.; Pedraza-Reyes, M.; Obregón, A.; Contreras-Garduño, J. (2019): Does juvenile hormone prompt males to oxidative stress? Journal of Experimental Biology 222 (5): jeb194530: 4pp. (in English) ["In invertebrates, it has been recently reported that secondary sexual characteristics (SSC) reflect the antioxidant defense of their bearers, but it is not known what physiological link maintains the honesty of those signals. Here, we use the damselfly Hetaerina americana to test whether Juvenile Hormone plays such a role. First, we analyzed whether oxidative damage is a real threat in natural damselfly populations by examining the accumulation of oxidized guanines as a function of age in males. Then, we injected paraquat (a pro-oxidant agent) and added the Juvenile Hormone analog Methoprene (JHa) to the experimental group and the JHa vehicle (acetone) to the control group, to determine whether JHa increases the levels of pro-oxidants and antioxidants. We found that DNA oxidation increased with age, and levels of hydrogen peroxide and superoxide dismutase, but not catalase or glutathione, were elevated in the JHa group compared to the control group. We propose that Juvenile Hormone is a mediator of the relationship between SSC and antioxidant capacity and based on the literature, we know that JHa suppresses immune response. We therefore suggest that Juvenile Hormone is a molecular mediator of the general health of males, which is reflected in their SSC." A(uthors)] Address: Contreras-Garduño,J. Escuela Nacional de Estudios Superiores, Unidad Morelia, UNAM , Antigua Carretera a Pátzcuaro 8701 , Ex-Hacienda de San José de La Huerta, 58190 Morelia, Michoacán, Mexico. Email: jcg@enesmorelia.unam.mx

19333. Morghad, F.; Samraoui, F.; Touati, L.; Samraoui, B. (2019): The times they are a changin': impact of landuse shift and climate on the comm unity of a Mediterranean stream over a 25-year period. Vie et milieu - Life and environment 69(1): 25-33. ["We assessed the observed effects of land-use alterations and global warming by analyzing changes in the Odonata community of a Mediterranean stream in northeastern Algeria, sampled at a 25-year interval. Results indicate that species richness has increased from 13 to 21 species. However, the apparent increase in species richness seemed to mirror recent physical and chemical changes brought upon the stream. In particular, these anthropogenic environmental changes seemed to have been driving a large-scale shift in the composition of the Odonata community of Wadi Bouaroug with an influx of widespread, thermophilic species (Paragomphus genei, Crocothemis erythraea, Sympetrum fonscolombii, Trithemis spp.) at the expense of rare, stenotypic species (Coenagrion puella, Gomphus lucasii). In the light of impending and

challenging climatic scenarios, we urge that steps should be taken to set up more long-term monitoring schemes and research of North African streams that may provide insights into causal mechanisms of global changes." (Authors)] Address: Samraoui, B., Dept of Biology, University of Annaba, Annaba, Algeria. E-mail: bsamraoui@gmail.com

19334. Ning, X. ; Cheng, C.; Yu, X.; Bu, W. (2019): A research of color pattern variation on thorax of Coeliccia cyanomelas (Odonata: Coenagrionoidea: Platycnemididae). Journal of Environmental Entomology 41(3): 566-573. (in Chinese, with English summary) ["The color pattern on thorax of male Coeliccia cyanomelas varied obviously between populations. This was mainly reflected in whether a pair of spots on the pronotum or not, as well as the size, shape and quantity of the marks on dorsal and lateral surface of synthorax. The geometric morphometrics, and observation of spots on the pronotum, were conducted based on 319 individuals of male C. cyanomelas from 34 populations. Almost all individuals from northwest region had a pair of spots on the pronotum, while those in the southeast were missing. The analyses of geometric morphometrics reflected that all samples can be divided into northwest and southeast types based on the shape of marks on lateral synthorax. Individuals of both types occurred in the overlapping area. Results from two methods in this study were coincident, which indicated a significant variation on color pattern of male C. cyanomelas. Geometric morphometric is very useful in analysis of the variation tendency of color pattern of Odonata, and can provide evidences for the evolutionary history and the formation of geographical pattern of species." (Authors)] Address: Yu, X., Coll. Life Sciences, Chongqing Normal Univ., Chongqing, PR China. E-mail: lannysummer@163.com

19335. Oliveira-Junior, J.M.B.; Juen , L. (2019): Structuring of dragonfly communities (Insecta: Odonata) in Eastern Amazon: Effects of environmental and spatial factors in preserved and altered streams. Insects 2019, 10, 322: 18 pp. (in English) ["The evaluation of the effects of environmental factors on natural communities has been one of the principal approaches in ecology; although, over the past decade, increasing importance has been given to spatial factors. In this context, we evaluated the relative importance of environmental and spatial factors for the structuring of the local odonate communities in preserved and altered streams. Adult Odonata were sampled in 98 streams in eastern Amazonia, Brazil. The physical features of each stream were evaluated and spatial variables were generated. Only environmental factors accounted for the variation in the Odonata community. The same pattern was observed in Zygoptera. For Anisoptera, environmental factors alone affect the variation in the community, considering all the environments together, and the altered areas on their own. As the two Odonata suborders presented distinct responses to environmental factors, this partitioning may contribute to an improvement in the precision of studies in biomonitoring. We thus suggest that studies would have a greater explanatory potential if additional variables are included, related to biotic interactions (e.g., competition). This will require further investigation on a finer scale of environmental variation to determine how the Odonata fauna of Amazonian streams behaves under this analytical perspective." (Authors)] Address: Oliveira-Junior, J.M.B., Programa de Pós-Graduação em Zoologia, Programa de Pós-Graduação em Ecologia, Laboratório de Ecologia e Conservação, Universidade Federal do Pará, Rua Augusto Correia, Nº 1, Bairro Guamá, CEP: 66075-110, Belém, Pará, Brazil

19336. Pavel, A.B.; Selma Menabit, S. Skolka, M.; Lupascu, N.; Pop, I.-C.; Opreanu. G. Stanescu, I. Scrieciu, A. (2019): New data regarding the presence of two insect larvae species – Gomphus (Stylurus) flavipes (Odonata) and Palingenia longicauda (Ephemeroptera) – in the lower sector of the Danube River. Geo-Eco-Marina 25/2019: 2019-140. (in English) ["The paper presents data regarding two larvae insect populations – Stylurus flavipes and Palingenia longicauda (Olivier, 1791), inhabiting in the communities existing at the water/sediment interface along the Danube River. S. flavipes is one of the most important indicator species, listed in Annex IV of the EU Habitats Directive (EU Directive 92/43/EEC) and included in the IUCN Red List of Threatened Species, 2014. This species of dragonfly has become an endangered species in most Western European countries due to water pollution and river regulation. The other important larvae species, mayfly P. longicauda, listed in Annex II of the Bern Convention, is considered critically endangered in Europe. Both require a specific habitat conditions in order to complete their life cycle. During the spring campaigns conducted during 2012-2015, the presence of the two species was reported in 26 profiles from the Lower Danube Sector, S. flavipes in 18 profiles, and P. longicauda in 10 profiles. The most abundant occurrences were recorded in 2015, at Km 4 – Măcin Arm (59.2 ind/m^2 for S. flavipes, respectively, in 2012, at Km 8 – Sf. Gheorghe) (125.8 ind/m^2) for P. longicauda. The presence or absence of larvae in samples, as well as their abundance, are strictly dependent on ecological conditions, the type of substrate representing the decisive factor in the microdistribution of the two larvae." (Authors)] Address: Pavel, Ana Bianca, National Institute of Marine Geology and Geo-Ecology (GeoEcoMar), 23-25 Dimitrie Onciul St., 024053 Bucharest, Romania. Email: ariadnas30@yahoo.com

19337. Pires, M.M.; Bender Kotzian, C.; Sganzerla, C.; Prass, G.; Schmidt Dalzochio, M.; Périco, E. (2019): Diversity of Odonata (Insecta) in Seasonal Deciduous Forest fragments in southern Brazil (state of Rio Grande do Sul), with a new record for the state and comments on the seasonal distribution of the species. Biota Neotrop. 19(4) e20190769: 12 pp. (in English, with Portuguese summary) ["We present an Odonata (Insecta) check list of species occurring in a fragment of the Seasonal Deciduous Forest (Atlantic Forest biome) from the central region of the state of Rio Grande do Sul (RS), southern Brazil, along with a list of the odonate species recorded in this phytoecological region for the state. In addition, we provide comments on the seasonal distribution of the species occurring in the study area. Two streams

and seven farm ponds located in the middle course of the Jacuí River basin were surveyed between December 2007 and February 2009. Overall, we recorded 49 species from 21 genera and six families. Argia serva had its first occurrence record mentioned for the state, elevating to 183 the total number of Odonata species occurring in Rio Grande do Sul. The number of species recorded in the study area corresponds to ~26% of the known Odonata diversity in RS. Libellulidae was the most species-rich family (22 species, ~45% of the total), followed by Coenagrionidae (18 species, 37% of the total). The checklist for the Seasonal Deciduous Forest in RS indicated the occurrence of 83 species of Odonata in this phytoecological region (~45% of the known odonate species in the state). This elevated diversity could be related to the density of the vegetation structure. In the study area, 20 species were found in streams, and 45 in farm ponds. Species occurrence showed marked seasonal patterns in the study area, with 88% of the species recorded from summer to autumn, and no species detected in streams in the winter. Moreover, 70% of the species were recorded in either one or two seasons in farm ponds, while 65% occurred solely in one season in streams. This result indicates that the life cycle of Odonata in southern Brazil is strongly influenced by seasonal patterns in temperature." (Author) A. serva is recorded for the first time in RS.] Address: Pires, M.M., Univde do Vale do Rio dos Sinos, Lab. de Ecologia e Conservacao de Ecossistemas Aquaticos, Av. Unisinos, 950, 93022-750, Sao Leopoldo, RS, Brasil. E-mail: marquespiresm@gmail.com

19338. Prokop, J.; Krzeminska, E.; Krzeminski, W.; Rosova, K.; Pecharova, M.; Nel, A. (2019): Ecomorphological diversification of the Late Palaeozoic Palaeodictyopterida reveals different larval strategies and amphibious lifestyle in adults. Soc. open sci. 6: 190460: 10 pp. (in English) ["The Late Palaeozoic insect superorder Palaeodictyopterida exhibits a remarkable disparity of larval ecomorphotypes, enabling these animals to occupy diverse ecological niches. The widely accepted hypothesis presumed that their immature stages only occupied terrestrial habitats, although authors more than a century ago hypothesized they had specializations for amphibious or even aquatic life histories. Here, we show that different species had a disparity of semiaquatic or aquatic specializations in larvae and even the supposed retention of abdominal tracheal gills by some adults. While a majority of mature larvae in Palaeodictyoptera lack unambiguous lateral tracheal gills, some recently discovered early instars had terminal appendages with prominent lateral lamellae like in living damselflies, allowing support in locomotion along with respiratory function. These results demonstrate that some species of Palaeodictyopterida had aquatic or semiaquatic larvae during at least a brief period of their post-embryonic development. The retention of functional gills or gill sockets by adults indicates their amphibious lifestyle and habitats tightly connected with a water environment as is analogously known for some modern Ephemeroptera or Plecoptera. Our study refutes an entirely terrestrial lifestyle for all representatives of the early diverging pterygote group of Palaeodictyopterida, a greatly varied and diverse lineage which probably encompassed many different biologies and life histories." (Authors) The paper includes references to Odonata.] Address: Prokop, J., Dept of Zoology, Faculty of Science, Charles University, Viniènà 7, CZ-128 00, Praha 2, Czech Republic

19339. Sansault, E.; Baeta, R.; Rivière, T. (2019): Suivi odonatologique des mardelles du Petit Eplin, saison 2018. Association Naturaliste d'Étude et de Protection des Écosystèmes CAUDALIS: 60 pp. (in French) [Indre-et-Loire, France; "Although the species range is significant, with 37 species observed in 2018 for 45 known historically, only three species are present on more than half of the mardelles (Sympetrum sanguineum, Lestes dryas and Libellula quadrimaculata). However, in terms of numbers and number of breeding sites, only S. sanguineum and L. dryas dominate the procession and together account for almost half of the Odonata numbers reported in 2018 (nearly 2,300 individuals observed). ... Conclusion: The Ruchard mardelles are a natural formation that appeared between 15,000 and 30,000 years ago through a phenomenon that is still poorly understood but which is known to be rare in our country. Their extensive use by pastoralists for thousands of years has, over the last forty years, given way to coniferous monocultures. This transformation of use has led to profound changes in the habitats present: the moors have been replaced by maritime pines and the mardelles have mostly been drained or filled in and are still under significant pressure. As far as Odonata are concerned, the sector remains one of the richest in the department, with 45 known species (of which 37 were observed during the 2018 season). The composition of the assemblage is quite unique, as it is dominated by a very common species, Sympetrum sanguineum, and by a fairly rare species, Lestes dryas. However, we note the absence of several very demanding heritage species such as Leucorrhinia pectoralis or Sympetrum danae. The latter, last observed on the site in 2013, is critically endangered in the Centre-Val de Loire region and could disappear rapidly if no measures are taken to conserve its breeding sites. A large-scale study on ways of conserving certain mardella habitats and restoring others could be carried out rapidly in conjunction with the State services (DDT, DREAL) and the owner (Groupement forestier de Cravant-Saint-Benoît). The conservation actions to be implemented could include the signing of a management agreement and the drafting of management plans, the carrying out of a hydrological study that could lead to work to modify the network of drains so that the area once again plays its role as a climatic and hydric buffer. All these measures could allow the mobilisation of European credits on the local territory via a large-scale LIFE-type project supported politically by the local authorities and technically by the associations. Such a project would be effective in restoring habitats considered to be priorities because of their poor state of conservation, while at the same time giving the local area an economic boost in the short term (involvement of local companies in the restoration work, setting up a sheep or cattle rearing project to supply local communities and schools with local meat, etc.) and in the long term (significant tourist value,

educational projects, return of ecosystem services provided free of charge by these natural habitats, fight against global warming, etc.)." (Authors/ DeepL)] Address: Sansault, E., Association Naturaliste d'Étude et de Protection des Écosystèmes CAUDALIS, 1, rue de la Mairie, 37520 La Riche, France. Email: eric.sansault@anepe-caudalis.fr

19340. Schilder, R.J.; Stewart, H. (2019): Parasitic gut infection in Libellula pulchella causes functional and molecular resemblance of dragonfly flight muscle to skeletal muscle of obese vertebrates. Journal of Experimental Biology 222: 10 pp. (in English) ["We previously demonstrated the existence of a naturally occurring metabolic disease phenotype in Libellula pulchella dragonflies that shows high similarity to vertebrate obesity and type II diabetes, and is caused by a protozoan gut parasite. To further mechanistic understanding of how this metabolic disease phenotype affects fitness of male L. pulchella in vivo, we examined infection effects on in situ muscle performance and molecular traits relevant to dragonfly flight performance in nature. Importantly, these traits were previously shown to be affected in obese vertebrates. Similarly to obesity effects in rat skeletal muscle, dragonfly gut infection caused a disruption of relationships between body mass, flight muscle power output and alternative pre-mRNA splicing of troponin T, which affects muscle calcium sensitivity and performance in insects and vertebrates. In addition, when simulated in situ to contract at cycle frequencies ranging from 20 to 45 Hz, flight muscles of infected individuals displayed a left shift in power–cycle frequency curves, indicating a significant reduction in their optimal cycle frequency. Interestingly, these power–cycle curves were similar to those produced by flight muscles of non-infected teneral (i.e. physiologically immature) adult L. pulchella males. Overall, our results indicate that the effects of metabolic disease on skeletal muscle physiology in natural insect systems are similar to those observed in vertebrates maintained in laboratory settings. More generally, they indicate that study of natural, host–parasite interactions can contribute important insight into how environmental factors other than diet and exercise may contribute to the development of metabolic disease phenotypes." (Authors)] Address: Schilder, R.J., Pennsylvania State University, Department of Entomology, 501 Ag Sciences & Industries Building, State College, PA 16802, USA. Email: rjs360@psu.edu

19341. Vršanský, P.; Sendi, H.; Aristov, D.; Bechly, G.; Müller, P.; Ellenberger, S.; Azar, D.; Ueda, K.; Barna, P.; Garcia, T. (2019): Ancient roaches further exemplify 'no land return' in aquatic insects. Gondwana Research 68: 22-33. (in English) ["Highlights: •No insects returned to land after adapting to aquatic habits. •Aquatic insect family/terrestrial insect family ratio stabilizes from Triassic. •Semiaquatic cockroaches were widespread since Jurassic to present. •Semiaquatic eoblattid roaches were present since Carboniferous. Abstract: Among insects, 236 families in 18 of 44 orders independently invaded water. We report living amphibiotic cockroaches from tropical streams of UNESCO BR Sumaco, Ecuador. We also describe the first fossil aquatic roach larvae (6 spp.; n = 44, 1, 1, 1, 1, 1) from the most diverse tropical Mesozoic sediments (Middle Jurassic Bakhar Fm in Mongolia, Kimmeridgian Karabastau Fm in Kazakhstan; Aptian Crato Fm in Brazil), and the Barremian Lebanese and Cenomanian Myanmar ambers. Tropic-limited occurrences are trophic- (biomass/litter-fall), structural- (diversity) and also abiotic-factor-dependent (high temperatures). Diverse Paleozoic aquatic eoblattids are here (re)described from the lower Permian sediments of Elmo, U.S.A. and Chekarda, Russia. They competed with true cockroaches to reach water prior to the Mesozoic. Due to different evolutionary rates or periodical changes in water characteristics, non-adapted terrestrial insects repeatedly invaded the aquatic realm with well adapted hydrobionts. Obscurely, most aquatic lineages still survive. In contrast with Crustacea, aquatic-terrestrial reversal is absent. A single principal lineage, namely of moths, ancestral to butterflies (origination of modern insects from ephemerans and dragonflies is questioned), evolved from insects with aquatic immature stages, and none from aquatic adults. The rest of the orders are terrestrial-derived. The proposed reason for the lack of land return is the character of numerous aquatic adaptations related to reductions, which are unlikely to be resuppressed. The aquatic insect family/terrestrial insect family ratio over time reveals a sharp rise from the Late Carboniferous to Late Triassic followed by lasting stability. Diversification of aquatic insects seems consistent with a 62.05 ± 0.02 Ma periodicity." (Authors)] Address: Bechly, G., Biologic Institute, 16310 NE 80th Street, Redmond, WA 98052, USA. E-mail: gbechly@biologicinstitute.org

2020

19342. BDS (2020): Notes & Observations. Dragonfly news 77: 28-29. (in English) [UK; Scorpionfly feeding on Aeshna grandis; deformed ey of A. mixta; mixted pairing between Sympetrum danae and S. striolatum] Address: not stated

19343. Bruus, M.; Rasmussen, J.J.; Strandberg, M.; Strandberg, B.; Sørensen, P.B.; Larsen, S.E.; Kjær, C.; Lorenz, S.; Wiberg-Larsen, P. (2020): Terrestrial adult stages of freshwater insects are sensitive to insecticides. Chemosphere 239, January 2020, 124799: 9 pp. (in English) ["Highlights: • Five of the six tested species were more sensitive to imidacloprid than the honeybee, when considering LD50 per individual. • Three of the six species tested were more sensitive to imidacloprid than the honeybee, when LD50 per g dw was considered. • All test species were more sensitive to lambda-cyhalothrin than the honey bee, irrespective of how LD50 was calculated. • The ranking of juveniles and adults according to sensitivity to lambda-cyhalothrin was not identical. Abstract: Terrestrial adult stages of freshwater insects may be exposed to pesticides by wind drift, over-spray, contact or feeding. However, studies addressing insecticide effects on freshwater invertebrates focus primarily on the impact of pesticides reaching the streams and potentially harming the aquatic juvenile stages. This is also reflected in the current risk assessment procedures, which do not include testing of adult freshwater insects. In order to assess the potential impact of insecticides

on adult stages of freshwater insects, we exposed six common species to the insecticides Karate (lambda-cyhalothrin) and Confidor (imidacloprid). Dose-response relations were established, and LD50 estimates were compared to those of the honey bee, Apis mellifera L. (Hymenoptera: Apidae), which is the standard terrestrial test insect when pesticides are evaluated prior to commercial release. Generally, the tested species were more sensitive to the studied insecticides than the honey bee. In order to examine whether the sensitivity of adult stages of freshwater insects corresponds with the sensitivity of the juvenile stages of the same species, the ranking of the two life stages with respect to the toxicity of Karate was compared, revealing some correspondence, but also some dissimilarities. Our results strongly indicate that terrestrial adult stages of aquatic insects are not adequately protected by current risk assessment procedures." (Authors) The paper includes references to Odonata.] Address: Bruus, Marianne, Aarhus Univ., Dept of Bioscience, Vejlsøvej 25, DK-8600, Silkeborg, Denmark

19344. Buczynski, P.; Buczyñska, E.; Jirak-Leszczyñska, A. (2020): Dragonflies (Odonata) of the Ojców National Park. Parki nar. Rez. Przyr. 39(1): 43-71. (in Polish, with English summary) ["In 2017-2019, the dragonfly fauna was studied in the Ojców National Park (southern Poland). This small park (2145.62 ha) protects the nature of the Polish Uplands. Its main axes are the valleys of two streams (Prądnik and Sąspówka) with little standing water, which is almost exclusively artificial. One of the streams (Prądnik) is heavily loaded with inflows from three wastewater treatment plants. The field work covered 52 sites, of which 43 were studied systematically and 40 dragonfly species were found. The most prevalent were Aeshna cyanea and Libellula depressa, Red-listed and protected species were only Ophiogomphus cecilia, Orthetrum coerulescens and Sympetrum depressiusculum. The authors analysed the occurrence of these species and the fauna of individual aquatic habitats (springs, streams, fish ponds, small water bodies) and discussed them against the background of fragmentary historical data. The odonatofauna of the park was not very rich compared to other national parks of Poland, it was also characterized by low numbers of individuals and very small numbers of species recorded in most sites (average 3.3) – with 28.8% of the sites without any dragonflies and up to 48.1% of the sites had neither autochthonous nor probably autochthonous species. Dragonflies in the springs were extremely rare and not numerous, the stream fauna was also poor, and in Prądnik it was clearly degraded by sewage inflows. The few centres of dragonfly diversity were found at two fish ponds, two artificial small water bodies located in the open area and one beaver pond. Without artificial waters, the park's fauna would probably be at least half the species poorer. Based on the collected data, the Ojców National Park was assessed as an area of minor and local significance for the protection of dragonflies, with not very rich and surprisingly strongly transformed fauna. (Authors)] Address: Buczynski, P., Dept of Zool., Maria Curie-Skłodowska University, Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

19345. Casanueva, P; Santamaría, T.; Hernández, M.A. Sánchez-Sastre, L.F.; Teixeira, A.; D Bennas, D.; El Haissoufi, M.; Ferreras-Romero, M.; Campos, F (2020): Biometric differences between several populations of Cordulegaster boltonii (Odonata: Cordulegastridae) in Ibero-Maghrebian area. Eur. J. Entomol. 117: 260-264. (in English) ["Biometric data of the exuviae of female larvae of the dragonfl y Cordulegaster boltonii collected in Portugal, Spain and Morocco were analysed to determine whether the size of three exuvial structures measured differed depending on the geographic localities of the populations. Based on the results recorded for the 16 populations studied, head width was negatively correlated with latitude and the greatest length of the gonapophysis was recorded for the Iberian populations at the centre of this peninsula. Multivariate cluster analysis revealed a clear separation of the Moroccan population. A second cluster separated the southernmost population (Sierra Nevada) from the remaining Iberian populations. Four population groups were distinguished: those located in watercourses in the north and central area of the Iberian Peninsula, those in Iberian watercourses in the East and Middle South, the Sierra Nevada and North Morocco. Some of these results coincide with the results of genetic studies of other authors." (Authors)] Address: Casanueva, Patricia, Department of Experimental Sciences, European University Miguel de Cervantes, Cl Padre Julio Chevalier 2, 47012 Valladolid, Spain. E-mail: pcasanueva@uemc.es

19346. Cham, S. (2020): On the discovery of a 'new' population of Orthetrum coerulescens (Fabricius) (Keeled Skimmer) in a chalk quarry and factors affecting its continued survival. Journal of the British Dragonfly Society 36(1): 11-21. (in English) ["O. coerulescens was first discovered at Sundon Quarry, Bedfordshire in 2017. This is a chalk quarry and hence is atypical of other sites where 0. coerulescens is found. In 2018 and 2019, higher numbers of adults were recorded, along with larvae and exuviae, confirming the presence of a breeding population. The Sundon population is one of the more inland populations in Britain and is some distance from the next known breeding site. It is considered to be vulnerable due to the small-scale nature of the habitat. Shallow seepages and runnels in base-rich sites are a scarce type of habitat and may explain the under reporting of any association of O. coerulecens with such sites. The continued survival of this colony of O. coerulecens will depend on a number of factors including whether the site can be managed to maintain the open seepage habitat and water supply that the species requires." (Author)] Address: Cham, S., 2 Hillside Road, Lower Stondon, Henlow, Bedfordshire, SG16 6LQ, UK. Email: stevecham1@aol.com

19347. Chelmick, D. (2020): Some observations on the life history and behaviour of Aeshna affinis Vander Linden (Southern Migrant Hawker). Journal of the British Dragonfly Society 36(1): 22-36. (in English) ["Aeshna affinis (Southern Migrant Hawker) has become a regular breeding species in the UK in recent years. Much of its life cycle is little known. This paper details the author's field observations, in both Spain and the UK, of some aspects of its habitat, life cycle

and adult behaviour. It is hoped that this will encourage more field observations so that a full understanding of its life cycle can be used to help conserve this apparently expanding species." (Author)] Address: Chelmick, D., 31 High Beech Lane, Haywards Heath, West Sussex RH16 1SQ, UK. Email: David.chelmick@gmail.com

19348. Choong, C.Y.; Dg Fazrinah, A.D.; Muhamad Amirul Ashraf, A.A.; Chung, A.Y.C.; Maryati, M. (2020): Diversity of Odonata species at Kangkawat, Imbak Canyon, Sabah. Journal of Tropical Biology and Conservation 17: 1-10. (in English) ["The Odonata fauna of Kangkawat Research Station in Imbak Canyon was surveyed during the Borneo Biogeographic Expedition from 28 September to 9 October 2018. A total of 56 species in 12 families were recorded – 18 species in Libellulidae, eight species in Platycnemididae, six species in Coenagrionidae, five species in Calopterygidae, four species each in Chlorocyphidae and Platystictidae, three species each in Euphaeidae and Gomphidae, two species in Synthemistidae and one species each in Devadattidae, Philosinidae and Aeshnidae. Of these, 10 species are new records for Imbak Canyon. The total number of species known from Imbak Canyon is now 83. Generally, Imbak Canyon is rich in Odonata, and it is a refuge for many uncommon species. Nevertheless, many more parts of the area still need to be explored for a more comprehensive picture of the Odonata of Imbak Canyon." (Authors)] Address: Choong C.Y., Centre for Insect Systematics, Fac. Science & Tech., Univ. Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia. Email: cychoong@ukm.edu.my

19349. Denis, A.; Azemar, F.; Compin, A.; Danflous, S.; Pelozuelo, L. (2020): Digital records of Macromia splendens larvae in notura and notes on their micro-habitat (Odonata: Macromiidae). Odonatologica 49(3/4): 313-321. (in English) ["M. splendens is a rare species, endemic to southern France and the Iberian Peninsula. Information about its larval ecology is still scarce. For the first time, we have obtained 30 photographic and video records of M. splendens larvae in natura from three small rivers in southern France and we comment on these observations. Our observations confirm that M. splendens larvae live in shady places and hide in a covering of brown detritus, consisting of leaves and sticks, as indicated by previous studies. However, our observations show that larvae are also present in open micro-habitats, exposing them to trampling by bathers or horses." (Authors)] Address: Pelozuelo, L., Laboratoire Ecologie Fonctionnelle et Environnement, CNRS, INPT, UPS, 118 route de Narbonne, Bâtiment 4R1, 31062 Toulouse Cedex 9, France. Email: laurent.pelozuelo@univ-tlse3.fr

19350. Dukic, A.; Bolesnikov, I. (2020): Caliaeschna microstigma (Schneider 1845) (Re)discovered in Serbia (Odonata: Aeshnidae). Acta Entomologica Slovenica 28: 21-28. (in English, with Slovene summary) ["The distribution of C. microstigma in Europe is restricted mostly to the Balkans. As its populations have been declining over the past years, the species is classified as near Threatened (nT) in the european and Mediterranean Red lists. In Serbia, this species was reported earlier, but the data is incomplete. Precise location and the description of the record is missing. During the field trip in July 2018 in Pèinja River valley (southern Serbia) two individuals of C. microstigma were recorded. Based on this study, further faunistic research should be carried out in southern parts of the country to map the present distribution of this rheophile species and to take the most effective management measures for its conservation." (Authors)] Address: Dukic, A., HabiProt, Janka Èmelika 28a 3/25, 21000 novi sad, Serbia. Email: aleksandar.djukic042-@gmail.com

19351. Gauci, C. (2020): First exuviae of Anax ephippiger (Burmeister) (Vagrant Emperor) found in the Maltese Islands. Journal of the British Dragonfly Society 36(1): 37-43. (in English) ["Despite several tandems of A. ephippiger having been regularly observed ovipositing in the autumn in the Maltese Islands in recent years, no evidence of a resulting generation had come to light. In November 2019, two exuviae belonging to this species were found, confirming the successful breeding of this species." (Author)] Address: Gauci, C., 28, Triq il-Kissier, Mosta, Malta, MST1822

19352. Hazra, M.; Hazra, T.; Sarkar, S.K.; Bera, S.; Khan, M.A. (2020): First fossil dragonfly from India. Current Science 119(7): 1204-1207. (in English) ["In the Indian wetland palaeoecosystem, no dragonfly has been reported from the Cenozoic sediments until now. Here, we report a well-preserved fossil dragonfly (Odonata: Anisoptera) recovered from the late Neogene sediments of the Chotanagpur plateau, Jharkhand, eastern India. It is characterized by well-preserved head, thorax and a long cylindrical abdomen with terminalia and four wings with longitudinal veins, cross-veins and characteristic small pterostigma at the apex. These significant morphological attributes reveal a close resemblance of the fossil specimen with modern dragonflies of the family Libellulidae (order: Odonata, sub-order: Anisoptera). To the best of our knowledge, there is no reliable occurrence of dragonfly in the Indian fossil record. The core distribution of the dragonfly, suggests that it thrived under a tropical, warm, humid climate during the depositional period. The fossil specimen was found associated with prolific and diversified tropical angiospermic plant remains, vertebrates and invertebrates that provided a suitable palaeoniche for the dragonfly to survive. In addition, the fossil material and associated angiospermic flora indicate the terrestrial as well as freshwater lacustrine environment in Chotanagpur plateau during the depositional period." (Authors) Günter Bechly wrote at 24-11-2021: "The fossil from India is certainly not a dragonfly and the reconstructed morphology is already downright ridiculously impossible. I am not even sure if it is a fossil insect at all and not rather a plant remnant."] Address: Khan M.A., Centre of Advanced Study, Dept of Botany, University of Calcutta, 35, B.C. Road, Kolkata 700 019, India. Email: khan.mahasinali@gmail.com

19353. Holzenthal, R.; Bueno-Soria, J. (2020): Oliver S. Flint, Jr. 1931-2019. Braueria 47: 5-26. (in English) [Obituary] Address: not stated

19354. Kiauta, B. (2020): Some personal recollections of the late Angelo Barbosa Monteiro Machado (1934-2020). Odonatologica 49(3/4): 191-198. (in English) ["Some personal recollections from 1963 to present are provided, with emphasis on ABMM's manifold work for Odonatologica and the SIO and on his research on human attitude towards jungle/forest in Brazil and in Europe." (Author)] Address: Kiauta, B., Callunastraat 6, 5853 GA Siebengewald, The Netherlands. Email: mbkiauta@gmail.com

19355. Liu, Y.; Luo, X.; Zeng, Y.; Deng, M.; Tu, W.; Wu, Y.; Mai, B. (2020): Bioaccumulation and biomagnigication of hexabromocyclododecane (HBCDD) in insect-dominated food webs from a former e-waste recycling site in South China. Chemosphere 240, February 2020, 124813: (in English) ["Highlights: • Occurrence of HBCDD were investigated in insects and their predators. • BMF of α-HBCDD >1 in poikilotherms while <1 in homeotherms. • Trophic magnification of α-HBCDD was found in aquatic but not in terrestrial food web. Abstract: Hexabromocyclododecane (HBCDD) has frequently been detected in wildlife. However, there is limited research on its bioaccumulation and biomagnification in insect-dominated aquatic and terrestrial food webs. This study investigated the occurrence of HBCDD in insects and their predators collected from a former e-waste contaminated pond and its surrounding region. The concentrations of ΣHBCDD (sum concentrations of α-, β-, and γ-HBCDDs) ranged from nd to 179 ng g^{-1} lipid weight. a-HBCDD was the predominant diastereoisomer in all biotic samples, and the contribution of α-HBCDD was higher in predators than in prey insects. A significantly positive linear relationship was found between ΣHBCDD concentrations (lipid weight) and trophic levels based on $\delta^{15}N$ in aquatic organisms ($p < 0.05$), while trophic dilution was observed in the terrestrial food web. This result indicates an opposite trophic transfer tendency of HBCDD in terrestrial and aquatic ecosystems. The biomagnification factor (BMF) for a-HBCDD was higher in terrestrial birds (2.03) than in frogs (0.29), toads (0.85), and lizards (0.63). This may be due to differences between poikilotherms and homeotherms in terrestrial ecosystems." (Authors) The authors included into their analysis odonate larvae (aquatic food web) and "Aeshnidae" and "Libellulidae" (terrestrial food web)] Address: Wu, Y., Research Institute of Poyang Lake, Jiangxi Acad. of Sciences, Nanchang, 330012, PR China. Email: wuyongming@jxas.ac.cn

19356. Meszaros, A. (2020): Black Pennant has reached the Carpathian Basin! The first occurrence of Selysiothemis nigra in Hungary (Odonata: Libellulidae). Folia ent. hung. 81, 2020: 11-16. (in English) ["A fresh, female specimen of S. nigra was found on a meadow at Káptalantóti, on the Balaton Uplands, Hungary. The species is a well-known migrant from Africa and Asia. In Europe, it is known from coastal areas of the Mediterranean and the Black Seas. The first record from Hungary as well as from the Carpathian Basin is presented." (Author)] Address: Mészáros, A., Eötvös Loránd University, Faculty of Science, Center of Environmental Sciences, H-1117 Budapest, Pázmány Péter sétány 1/A, Hungary. E-mail: meszaros.adam@ecolres.hu

19357. Michaelides, M. (2020): [The dragonflies of Cyprus]. Ithaki: 106 pp. (in Greek) [There is an introduction to the life cycle, tips on identification and how to use the guide. The guide covers the 32 species that may be seen in Cyprus. Each species has a page devoted to information on distribution, behaviour, phenology and preferred locations, as well as illustrations by Richard Lewington. For all but 4 species there is also at least one full-page colour photograph. Each species page shows the name of the species in Greek as well as the scientific name. In addition, the English common name is shown in the appendices along with the scientific and Greek names. (Dieter Prestel)] Address: to be ordered at: https://nibuk.de/

19358. Perron, M.A. (2020): The value of urban ponds for Odonata and plant biodiversity. Dissertation, Dept of Biology, University of Ottawa, Ottawa, Ontario, Canada. 242 pp. (in English) ["Urbanization involves the conversion of natural areas to impervious surfaces, which can lead to an increase in the frequency and severity of flood events in cities. To mitigate flood risk, stormwater ponds are constructed to manage urban runoff. Stormwater ponds can also be colonized by wildlife, but their suitability as habitat is disputed due to potential toxicological risks. This study assessed the suitability of stormwater ponds as habitat for the bioindicators Odonata (dragonflies and damselflies) and determined environmental factors that impact their community structure. Odonata (adults, nymphs and exuviae) were sampled at 41 stormwater ponds and 10 natural reference ponds across the National Capital Region of Canada, with a subset of ponds sampled over four years (2015-2018). Plant communities, water quality and surrounding land cover were analyzed at each pond to determine their impacts on Odonata community structure. Overall, stormwater ponds had lower Odonata abundance and a greater variation in species richness and community structure compared to natural ponds but had comparable dragonfly reproduction rates. Plants were the most significant driver of Odonata communities, as stormwater ponds with a high richness of native wetland plants had higher Odonata abundance and community structures similar to natural ponds. Water quality was the second most important driver of Odonata communities with dragonflies showing greater sensitivity to urban contaminants than damselflies. While stormwater ponds had higher concentrations of trace elements than natural ponds (e.g. Ni, V, As), concentrations were generally below toxic levels for all elements except copper and chloride, the latter likely an input from winter road salting. Surrounding land cover was the least important factor affecting Odonata communities. In conclusion, this research demonstrated the importance of local-scale factors related to plants and water quality in sustaining Odonata communities and specifies recommendations for stormwater pond design and maintenance that enhance urban biodiversity." (Author)] Address: Perron, Mary A., Dept Biol., Univ. of Ottawa, 20 Marie Curie Private, Ottawa, ON K1N 6N5, Canada. E-mail: mperr058@uottawa.ca

19359. Pinto, A.P.; Vaz-de-Mello, F.Z.; Grossi, P.C.; Drummond, G.M. (2020): A Zoologia brasileira se despede do

Professor Angelo Barbosa Monteiro Machado (1934–2020). Informativo Sociedade Brasileira de Zoologia XLII (132): 7-20. (in Portuguese) [obituary] Address: Pinto, A.P., Universidade Federal do Paraná, Departamento de Zoologia, Curitiba, PR, Brasil

19360. Redaktion (2020): Dr. Ollie Flint 1931 – 2019. Perla 38: 20-21. (in English) [Obituary] Address: not stated

19361. Rüppell, G.; Hilfert-Rüppell, D.; Schneider, B.; Dedenbach, H. (2020): On the firing line – interactions between hunting frogs and Odonata. International Journal of Odonatology 23(3): 199-217. (in English) ["Frogs are important predators of Odonata. We investigated frogs catching Odonata prey by means of slow-motion filming in the field in order to understand the prey–predator interactions. In particular, we aimed to analyse kinematics of captures, and of Odonata fleeing, through evaluation of frame-by-frame filming; 122 (20%) of 613 events were analysed. While dragonflies were ovipositing, frogs were sitting and waiting motionless, or they sneaked slowly towards the intended prey. The speed of the lashing tongue was much higher than the start and flight velocities of Odonata during escape attempts. The reaction time of Odonata was around 45×10–3 s, and it was not correlated to capture rate. The fleeing behaviour of Odonata cannot be considered to be stereotypical. The usual fleeing measure was to evade sideways to the jump direction of the frog, with the individual turning their body to one side and flying away from the frog. Perched odonates escaped by overturning to one side, sometimes falling into the water, or by flying in a loop. To escape, individuals were observed flying backward with the head down, in two cases. From the video clips, capture rates were counted. Large Anisoptera escaped more often than small Zygoptera. Anax imperator females mostly escaped after capture by fighting with strong wing beats, even when pulled under water by the frog." (Authors) Calopteryx splendens, Enallagma cyathigerum, Coenagrion puella, Aeshna cyanea, Anax imperator, Libellula quadrimaculata, Sympetrum striolatum] Address: Rüppell, G., An der Wasserfurche 32, Cremlingen, Germany. Email: g.rueppell@freenet.de

19362. Schepker, T.J.; Webb, E.B.; Tillitt, D.; LaGrange, T. (2020): Neonicotinoid insecticide concentrations in agricultural wetlands and associations with aquatic invertebrate communities. Agriculture, Ecosystems and Environment 287 (2020) 106678: 11 pp. (in English) ["Neonicotinoids are considered a superior insecticide for agricultural pest management, although their impacts on non-target insects is a rising concern. Aside from laboratory and mesocosm studies, limited research has been directed towards the role neonicotinoids may have in structuring aquatic invertebrate communities in field settings. Therefore, we simultaneously collected aquatic invertebrate and surface water samples from 26 wetlands within a highly modified agricultural landscape of Nebraska's Rainwater Basin during spring 2015. Water samples were tested for six different neonicotinoids, nutrients, and physical properties. Trace levels of clothianidin and imidacloprid were the only neonicotinoids detected, occurring in 85% and 15%, respectively, of wetlands sampled. All measurements for clothianidin and imidacloprid were below chronic toxicity benchmarks set by the United States Environmental Protection Agency. Neonicotinoid concentrations were significantly lower (W26, 0.05 = 42.5) at wetlands with vegetative buffer strips >50m wide compared to wetlands with vegetative buffers strips<50 m. Although neonicotinoids were below benchmark concentrations proposed by government regulations, a significant negative association between neonicotinoid concentrations and aquatic invertebrate biomass was observed across all wetlands studied (Parameter Estimate = -0.031; SE = 0.014)." (Authors) Taxa are not specified.] Address: Schepker, T., United States Army Corps of Engineers, 100 Arsenal Street, Saint Louis, MO 63118, USA. Email: Travis.J.Schepker@usace.army.mil

19363. Schreiner, G.D.; Duffy, L.A.; Brown, J.M. (2020): Thermal response of two sexually dimorphic Calopteryx (Odonata) over an ambient temperature range. Ecology and Evolution. 2020; 10: 12341-12347. (in English) ["1. Organisms may internally or behaviorally regulate their body temperatures or conform to the ambient air temperatures. Previous evidence is mixed on whether wing pigmentation influences thermoregulation in various odonates. 2. We investigated the thermal response of sympatric North American Calopteryx aequabilis and Calopteryx maculata with a thermal imaging study across a 25°C ambient temperature range. 3. We found that regressions of thorax temperature on ambient temperature standardized by species had similar slopes for male and female C. maculata, but females were consistently 1.5°C warmer than males. In contrast, the sexes of C. aequabilis differed in slope, with C. aequabilis females having a slope less than 1.0 and males having a slope greater than 1.0. 4. We found that regressions of thorax temperature on ambient temperature standardized by sex had similar slopes for males and females of both species, but C. maculata females were consistently 2.1°C warmer than C. aequabilis females. 5. Given that C. aequabilis is strongly sexually dimorphic in pigment, but C. maculata is not, our findings suggest that wing pigmentation may influence thermal response rate in sympatric populations of both species." (Authors)] Address: Schreiner, Gretchen, 3103 Chestnut Street, Grand Forks, ND 58201-7531, USA. Email: schreine@grinnell.edu

19364. Scribano, G.; Balestrieri, A.; Gazzola, A.; Pellitteri-Rosa, D. (2020): Strong behavioural defensive responses of endemic Rana latastei tadpoles induced by a native predator's odour. Ethology 126(9): 922-930. (in English) ["Prey species must constantly acquire information on predator identity, abundance and dangerousness from the environment. In aquatic habitats, this information is mainly propagated by water-borne chemical signals, either predator-specific odours or prey alarm cues. Anuran larvae innately respond to conspecific alarm cues and are able to associate them to predator cues during their lifetime. In this study, we investigated the anti-predatory responses of R. latastei tadpoles exposed to either conspecific or heterospecific alarm

cues and a native predator's (Anax imperator larvae) odour. Pre-and post-stimulus behaviours of each tadpole were recorded by a digital camera and analysed by a source executable software for image-based tracking. We found that Italian agile frog tadpoles responded to fasted dragonfly odour by strongly reducing their activity, both in terms of the amount of time they spent active and path length covered in comparison to control groups. Contrary to previous studies, predators' diet had a negligible effect on tadpole response and our experiment did not bring any evidence of the phylogenetic-relatedness hypothesis. The innate or early-in-development recognition of dragonfly larvae is clearly adaptive and may increase tadpole survival with relatively low costs, but, at the same time, may increase the risk of ignoring novel potential threats." (Authors)] Address: Scribano, G., Dept of Earth & Environmental Sciences, University of Pavia, 27100 Pavia, Italy. Email: giovanni.scribano01@universitadipavia.it

19365. Seehausen, M. (2020): Agriocnemis lepida sp. nov. from the Annamite Range in Lao PDR (Odonata: Coenagrionidae). Odonatologica 49(1/2): 177-190. (in English) ["Agriocnemis lepida sp. nov. is described and figured (holotype ♂: 20-ii-2003, Lao PDR, Khammouan Province, 2.5 km WNW Ban Tathot, Tham Kamouk, 17.6316 N 105.1250E, 200 m a.s.l., P. Jager leg.; deposited at the Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany). Additionally, illustrations of the male appendages and the posterior lobe of the prothorax of A. clauseni, A. minima, and A. nana as well as photographs and a Selys watercolour of the female holotype of A. carmelita are provided. Agriocnemis carmelita is shortly discussed with references to the genus Mortonagrion." (Author)] Address: Seehausen, M., Museum Wiesbaden, Naturhistorische Sammlungen, Friedrich-Ebert-Allee 2, 65185 Wiesbaden, Germany. E-mail: malte.seehausen@museum-wiesbaden.de

19366. Selvamurugan, S. (2020): A rare observations and description of damselflies (Zygoptera; Coenagrionidae) in Coimbatore District, Tamilnadu State, India. Roots International Journal of Multidisciplinary Researches 7(2): 72-80. (in English) [Records of Ceriagrion coromandelianum, Pseudagrion decorum and Ischnura rubilio from Coimbatore district, Tamilnadu, India are presented.] Address: Selvamurugan, S.. Junior Research Fellow Division of Chemistry and Bioprospecting Institute of forest genetics and tree breeding Coimbatore, Tamil Nadu, India

19367. Späth, J.; Nording, M.; Lindberg, R.; Brodin, T.; Jansson, S.; Yang, J.; Wan, D.; Hammock, B.; Fick, J. (2020): Novel metabolomic method to assess the effect-based removal efficiency of advanced wastewater treatment techniques. Environmental Chemistry 17(1): 1-5. (in English) ["Unprecedented levels of chemicals of anthropogenic origin are currently released into surface waters globally. Wastewater treatment plant effluent has been identified as a major source, containing a broad mixture of pharmaceuticals and consumer chemicals. Therefore, there is a need for implementation of advanced wastewater treatment techniques, such as ozonation and adsorption methods, to reduce the contamination. However, there are conflicting findings on the toxicity of treated effluent and only limited possibilities for assessing the effect-based removal efficiency (EBRE) of different treatment techniques. Here, we describe a metabolomics approach to detect perturbations in fatty acid catabolic pathways as a proxy for biological effects. Metabolites in three fatty acid pathways were analyzed in Coenagrion hastulatum larva by liquid chromatography coupled to mass spectrometry. The larvae were exposed for one week to either conventionally treated effluent (activated sludge treatment), effluent additionally treated with ozone or effluent additionally treated with biochar filtration and results were compared with those from tap water control exposure. Five lipoxygenase-derived oxylipins (9,10,13-TriHOME, 9,12,13-TriHOME, 9-HODE, 9-HOTrE, and 13-HOTrE) decreased in response to conventionally treated effluent exposure. By using an additional treatment step, oxylipin levels were restored with exception of 9,10,13-TriHOME (ozonated effluent), and 9-HOTrE and 13-HOTrE (effluent filtered with biochar). In conclusion, exposure to wastewater effluent affected fatty acid metabolite levels in damselfly larvae, and a subset of the analyzed metabolites may serve as indicators for biological effects in biota in response to effluent exposure. To that effect, our findings suggest a new metabolomics protocol for assessing EBRE." (Authors)] Address: Späht, Jana, Dept of Chemistry, Umeå University, 90187 Umeå, Sweden. Email: jana.spath@umu.se

19368. Start, D. (2020): Abundance and traits link predator ontogeny to prey communities. Ecology 101(6) e03044. 7 pp. (in English) ["Function and abundances shape species interactions and thus ecological communities. While communities are often summarized as the mean function of each species, intraspecific variation in traits and thus function is an important driver of community composition. Ontogeny is a common source of intraspecific variation, but while age-related functional changes can alter species interactions, so too can the effects of those functions on the density of the focal organism. For instance, ontogenetic variation can trigger higher levels of cannibalism, reducing abundances and altering interspecific interactions. I manipulate ontogenetic variation in damselfly larvae [Lestes congener)] to show that intraspecific variation can impact communities through two distinct mechanisms. First, within-species differences affect population sizes, and thus indirectly shape communities (indirect effect). In particular, ontogenetic variation resulted in smaller damselfly populations, likely because of increased cannibalism rates, and thus ontogenetically diverse populations had a smaller total effect on their prey. Second, trait variation can affect communities by creating differences in the strength of per capita species interactions (direct effect). In this case, damselfly populations with greater age variation had smaller per capita effects on prey communities. I conclude that ontogeny of a single species can directly and indirectly shape community composition." (Authors)] Address: Start, D., Center for Population Biology, University of California at Davis, Davis, California 95616 USA. E-mail: dstart@ucdavis.edu

19369. Stolbov, V.A.; Semerikov, F.I.; Tupitsyn, S.S. (2020): Parasitism of Odonata by Arrenurus water mites (Acariformes, Hydrachnidia, Arrenuridae) in Western Siberia. Odonatologica 49(3/4): 323-332. (in English) ["The infestation of odonate imagines by water mite larvae was studied in the south of Western Siberia. Data on the rate of infestation, parasite load and the distribution of larvae on the body of dragonflies is presented. Of 24 odonate species studied, parasites were found in 12 species, with Zygoptera and Sympetrum species being most affected. Very high parasite loads were observed on Coenagrion pulchellum and Sympetrum flaveolum, in which the infestation rates of mite larvae exceeded 75 %. Erythromma najas recorded the highest parasite loads (up to 299 larvae per host). In total, six species of parasitic mites were identified; their occurrence on different species of Odonata varied. Arrenurus papillator attacked only Sympetrum and Lestes, while five other species, among which A. tricuspidator and A. maculator predominated, were found on species of Coenagrionidae." (Authors)] Address: Stolbov, V.A., Tyumen State Univ., Institute of Biology, Volodarskogo str. 6, Tyumen, 625003, Russia. Email: vitusstgu@mail.ru

19370. Streib, L.; Kattwinkel, M.; Heer, H.; Ruzik, S.; Schäfer, R.B. (2020): How does habitat connectivity influence the colonization success of a hemimetabolous aquatic insect? - A modeling approach. Ecological Modelling 416, 15 January 2020, 108909: 12 pp. (in English) [Highlights: • Process-based meta-population model for hemimetabolous freshwater insects. • Analysis of how habitat connectivity affects patch colonization. • ANOVA of key habitat parameters. • Patch colonization success strongly influenced by habitat connectivity. • Habitat patch number most important, followed by landscape permeability. Abstract: Climate and land-use change constitute major threats to biodiversity. Beside pure habitat loss, changing environmental conditions are likely to result in decreasing landscape permeability and increasing landscape fragmentation. This compromises habitat connectivity and, thereby increases threats to meta-population persistence. Comprehensive theoretical knowledge and general understanding of key parameters affecting habitat connectivity are therefore mandatory to assess risks of environmental change. However, related studies are scarce for hemimetabolous freshwater insects, which depend on both aquatic and terrestrial sites to complete their life cycle. We developed a process-based, spatially explicit meta-population model for a hemimetabolous freshwater insect, parameterized based on the traits of a damselfly [Coenagrion mercuriale], and analyzed the influence of varying landscape permeability on patch colonization for differently structured coextensive habitat networks. The in total 675,000 networks were set up by varying (1) landscape scenarios, representing different levels of permeability, (2) stream networks and (3) derived habitat patch assemblages, using least-cost path analysis. We found that habitat connectivity in general strongly determined the proportion of colonized habitat patches (Spearman's $\rho = 0.64$). Moreover, a multifactorial ANOVA of the parameters used for habitat network set up showed that the number of habitat patches had the largest effects on the colonization success (18.6 % explained variance) followed by varying proportions of three landscape types incurring increasing dispersal costs (13.1 %) and the spatial arrangement of habitat patches (7.1 %). The introduced model generated theoretical knowledge how changing environmental conditions (e.g. landscape permeability) can influence the habitat connectivity of hemimetabolous freshwater species and, thus, has the potential to support conservation through habitat management within changing landscapes. Its design facilitates future adaptation to real hemimetabolous species and real-world habitats." (Authors)] Address: Streib, L., Institute for Environmental Sciences, University of Koblenz-Landau, 76829, Landau i. d. Pfalz, Germany. streib@uni-landau.de

19371. Su, G.; Dudley, R.; Pan, T.; Zheng, M.; Peng, L.; Li, Q. (2020): Maximum aerodynamic force production by the wandering glider dragonfly (Pantala flavescens, Libellulidae). Journal of Experimental Biology 223, jeb218552. 19 pp. (in English) ["Maximum whole-body force production can influence behavioral outcomes for volant taxa, and may also be relevant to aerodynamic optimization in microair vehicles. Here, we describe a new method for measuring maximum force production in free-flying animals, and present associated data for the wandering glider dragonfly. Flight trajectories were repeatedly acquired from pull-up responses by insects dropped in mid-air with submaximal loads attached beneath the center of body mass. Forces were estimated from calculations of the maximum time-averaged acceleration through time, and multiple estimates were obtained per individual so as to statistically facilitate approximation of maximum capacity through use of the Weibull distribution. On a group level, wandering glider dragonflies are here estimated to be capable of producing total aerodynamic force equal to ~4.3 times their own body weight, a value which significantly exceeds earlier estimates made for load-lifting dragonflies, and also for other volant taxa in sustained vertical load-lifting experiments. Maximum force production varied isometrically with body mass. Falling and recovery flight with submaximal load represents a new context for evaluating limits to force production by flying animals." (Authors)] Address: Pan, T., Nat. Key Lab. of Science & Tech. on Aero-Engine Aero-Thermodynamics, School of Energy & Power Engineering, Beihang University, Beijing 100191, China. Email: pantianyu@buaa.edu.cn

19372. Sugiman, U.; Atmowidi, T.; Priawandiputra, W. (2020): Community structure and habitat characteristics of dragonflies (Odonata) in tropical lowland forest of Ujung Kulon national park. Journal of Entomology and Zoology Studies 8(5): 251-258. (in English) ["Information about dragonflies and its habitat in Ujung Kulon National Park is poorly studied. The objective of this study was to inventory the dragonflies community structure in various habitats in the Ujung Kulon National Park and describe the contribution of habitat characteristics on the dragonfly communities structure. In this study, we surveyed the dragonfly communities in five locations, includes natural ponds, a shady small stream in the forest, and river habitat. We measured several

habitat characteristics and analyzed its contribution to the variation of the dragonfly communities structure using canonical correspondence analysis. 25 of dragonflies species (classified into 2 families of Anisoptera and 6 families of Zygopetra) were recorded in this study. Structure of the dragonfly community in among habitat type showed dissimilarity. Aquatic habitat type, conductivity, total dissolved solids, complexity of water substrate, the width of aquatic habitat, and canopy covering contributed to the variation of dragonfly communities structure. This study provided the new information about variation of the structure of dragonfly communities in various habitat types in this conservation area." (Authors)] Address: Sugiman, U., Dept of Biology, Faculty of Mathematics and Natural Sciences, IPB University, Bogor 16680, West Java, Indonesia

19373. Theischinger, G.; Richards, S.J. (2020): A new species of Teinobasis from Bougainville Island, Papua New Guinea, with a key to males of the genus from the Solomon Islands Archipelago (Odonata: Coenagrionidae). Odonatologica 49(3/4): 371-383. (in English) ["A new species of damselfly, Teinobasis taripu sp. nov., is described from Bougainville Island in the Solomon Islands Archipelago. The ♂ most closely resembles T. bradleyi Kimmins, 1957, which is known from several islands in the archipelago and occurs in sympatry with the new species on Bougainville. However, the new species can be distinguished from T. bradleyi by having a largely metallic black thorax speckled with yellowish brown (vs a more discrete pattern of metallic black and light blue), and by having a trilobed (vs unilobed) mid-dorsal appendix of abdominal segment 10. The new species is described, illustrated and diagnosed, and a key to the males of all Teinobasis species known from the Solomon Islands Archipelago is presented." (Authors)] Address: Theischinger G., 2A Hammerley Road, Grays Point, NSW 2232, Australia. E-mail: Gunther.Theischinger@environment.nsw.gov.au

19374. Tyrrell, M. (2020): Thoracic spur variations in Chalcolestes viridis (Vander Linden) (Willow Emerald Damselfly) and their use in identifying territorial males. Journal of the British Dragonfly Society 36(1): 1-10. (in English) ["C. viridis is still a new and uncommon species in Northamptonshire, with low populations densities at all sites where it is found. Territorial males are very mobile, flying between several perching sites, which makes assessing colony size difficult. The maximum number of adults recorded at any one site in Northamptonshire is 25, but the real number is unclear due to the mobility of this species. In order to better measure colony size, variations in the thoracic spur markings were analysed to find a method of separating individuals as they move around territories. Measurements were taken of the light yellow/green area on the thorax and its associated spur. Calculations of the Root Mean Square variance of its shape and size were found to provide the best methodology for identifying individuals." (Author)] Address: Tyrrell, M., 8 Warwick Close, Raunds, Northants, NN9 6JH, UK

19375. Theischinger, G.; Marinov, M.; Bybee, S.; Jensen, C.; Theuerkauf, J.; Rashni, B. (2020): The genus Gynacantha Rambur, 1842 in the South Pacific (Odonata: Anisoptera: Aeshnidae). Zootaxa 4778(1): 171-195. (in English). ["Available information on Gynacantha Rambur, 1842 species from the South Pacific is reviewed. Specimens were found to be sufficiently similar to G. rosenbergi Kaup in Brauer, 1867 to be placed in the same species group (G. rosenbergi group — established here) but also distinct enough to form a subgroup of its own (G. rosenbergi Pacific group). All species of the G. rosenbergi group are diagnosed, with three species, Gynacantha vitiana sp. n. (male and female) from Viti Levu, Fiji, G. koroana sp. n. (male) from Koro, Fiji and G. vanuatua sp. n. (male) from Malekula, Vanuatu being described as new to science. A key is presented for identification of the males." (Authors)] Address: Theischinger, G., Australian Museum, Entomology, 6 College Street, Sydney, NSW 2010, Australia. E-mail: theischingergunther@gmail.com

19376. Vilenica, M.; Pozojevic, I.; Vuckovic, N.; Mihaljevic, Z. (2020): How suitable are man-made water bodies as habitats for Odonata? Knowl. Manag. Aquat. Ecosyst. 2020, 421, 13. 10 pp. (in English, with French summary) ["Many studies have reported a negative impact of freshwater habitat modification on biota. Nevertheless, some man-made water bodies have proven to be valuable for biodiversity conservation as they can harbour many species. We investigated 36 man-made water bodies to determine their suitability as habitats for Odonata. Larvae were sampled in littoral, during the summer months of 2016 and 2017. At each sampling site, ten samples were collected using a benthos hand net. A total of 21 Odonata species was recorded. Odonata assemblages mainly consisted of common widespread species. Yet, at Vlaèine Reservoir, located in the Dinaric Western Balkan ecoregion, we also recorded a rare and endangered Mediterranean species, Lindenia tetraphylla. Aquatic and riparian vegetation, water level fluctuations and dissolved oxygen concentration had the highest influence on Odonata, showing that manmade water bodies with a well-developed riparian zone and aquatic vegetation, and with low daily and seasonal water level fluctuations, can provide suitable habitats for diverse Odonata species. Odonata are among the sensitive freshwater insects widely used as ecological indicators and umbrella species, therefore these results about their assemblages in heavily modified and man-made habitats could contribute to future conservation activities of freshwater biota and habitats." (Authors)] Address: Vilenica, Marina, Univ. of Zagreb, Fac.Teacher Education, Trg Matice hrvatske 12, Petrinja, Croatia

19377. von Ellenrieder, N.; Garrison, R.W.; Ramón C., G.M. (2020): Odonata collected in Napo province, Ecuador, in January of 2020. International Dragonfly Fund Report 150: 3-20. (in English) ["A ten day collecting trip to Napo province was conducted between January 13 and 23, 2020, visiting localities where W. C. Macintyre originally collected Argia schneideri Garrison & von Ellenrieder, 2017 between 1935 and 1942, with the intention of documenting its life habits and obtaining photographs in life. A total of 65 odonate species in 36 genera were collected, including four new records for Napo province, but the target species was not

found. A list of species recorded and color scans of species that have so far not been photographed are included. Color photographs and notes on the habitat of A. schneideri are made available through the courtesy of colleagues who found it elsewhere, and its current known distribution is discussed." (Authors)] Address: von Ellenrieder, Natalia , Plant Pest Diagnostic Center, California Dept of Food & Agriculture 3294 Meadowview Rd, Sacramento, CA 958321488, U.S.A. Email: natalia.ellenrieder@gmail.com

19378. Walia, G.K.; Chahal, S.S. (2020): Linear differentiation of chromosomes of Anisogomphus bivittatus selys, 1854 from India (Odonata: Anisoptera: Gomphidae). International Journal of Entomology Research 5(2): 120-122. (in English) [Live adult male specimens of Anisogomphus bivittatus of family Gomphidae have been collected from Andretta, Himachal Pradesh (India). Male germ cell chromosomes of the species have been described on the basis of conventional staining, Cbanding, silver nitrate staining and sequence specific staining. The species possesses 2n (♂) =23m, as the chromosome number and X0 (♂)/XX (♀) type sex determination. Dark terminal C-bands are present on all the autosomal bivalents, while m bivalent is C-negative and X chromosome is C-positive throughout the length. Terminal light/dark NOR's are present on all autosomal bivalents including m bivalent, while X chromosome possesses terminal dark NOR on one side and light NOR on other side. During sequence specific staining, all the autosomal bivalents except m bivalent show more CMA3 bright signals than DAPI signals at chiasmatic ends and X chromosome is also more CMA3 bright than DAPI.] Address: Walia, G.K., Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India

19379. Zheng, D. (2020): Odonatans in lowermost Cenomanian Kachin amber: updated review and a new hemiphlebiid damselfly. Cretaceous Research 118, 104640. (in English) ["Odonatans are rare in amber deposits, and only four fragmentary specimens were recorded in Lebanese, Jordanian, Charentes and South Dakota ambers except for Kachin amber. This study reviewed the odonatans in lowermost Cenomanian Kachin amber and commented 11 odonatans, which were previously placed in the family level. Until now, over 350 odonatans have been found in Kachin amber, including 38 species of three extant suborders, and representing the most diverse and abundant dragonfly assemblage in amber inclusions. The dominated odonatans include the damselflies Burmahemiphlebia zhangi and Mesomegaloprepus magnificus, and the damsel-dragonfly Burmaphlebia reifi, accounting for ca. 79 % of all odonatans. The Kachin odonatans include the earliest records of the damselfly Perilestidae, Platycnemididae and Platystictidae, and the youngest records of the true dragonfly Araripegomphidae and Stenophlebiidae, contributing to exploring the origination and evolution of these families. Hemiphlebiidae is the dominant family in Kachin amber, represented by the species Burmahemiphlebia zhangi with ca. 160 species been recorded. It is surprising that the hemiphlebiid damselfly is abundant, but the diversity is very low with only two species been previously reported. Herein, a new hemiphlebiid damselfly, Kachinhemiphlebia lini gen. et sp. nov., is described by the unique characters: Arc slightly distal of Ax2 in both fore- and hindwings; and a well-defined AA ending on posterior wing margin below Ax2. This is the second genus of the Hemiphlebiidae in Kachin amber." (Author)] Address: Zheng, D., State Key Laboratory of Palaeobiology & Stratigraphy, Nanjing Institute of Geology and Palaeontology and Center for Excellence in Life and Paleoenvironment, Chinese Academy of Sciences, 39 East Beijing Road, Nanjing, 210008, China. E-mail: dranzheng@gmail.com

2021

19380. Aliyev, S.; Mammadova, V.F.; Abdullayeva, L.R. (2021): Macrozoobenthos of Alijanchay river - the primary indicator of biodiversity within the Greater Caucasus in the territory of Azerbaijan. Ukrainian Journal of Ecology 11(6): 54-62. (in English) ["The article provides information on the biodiversity of the Alijanchay, one of the left tributaries of the Kura River, which originates in the highlands and is formed by inland waters and its main component macrozoobenthos, its species composition, biocenosis distribution, and ecological features. It is known that macrobenthic organisms are actively involved in forming the biological productivity of water bodies, the natural biofiltration of water. At the same time, biological indicators are organisms and form a link in the food chain in the ecosystem. Certain species are the first or second interim owners of parasites. It is worth mentioning some species, which prevent the regular operation of hydro-technical facilities. The river is mainly polluted by household waste. Recently, the development of agriculture and the increase in the number of fertilizers and various drugs applied to the soil have impacted the ecological stability of the river. Thus, the decrease in the species and number composition of fish formed in the river proves it again. The main task of the study is to assess the current state of biodiversity in the river, the general ecological status of the river, and determine the level of impact of natural and anthropogenic impacts on macrozoobenthos. The main focus here is done on macrobenthos, however, the forest and vegetation of riparian zones. During the study period, 154 species of organisms have been found, where 80 species of found organisms (52%) belong to river macrozoobenthos, 42 species (27%) to plants, and 32 species (21%) to vertebrates." (Authors) Epallage fatime, Calopteryx virgo, C. splendens, Lestes virens, L. sponsa, L. dryas, Sympecma fusca, Platycnemis pennipes, Ischnura elegans] Address: Mammadova, V.F., Ganja State Univ., Azerbaijan, Ganja Heydar Aliyev avenue 429 AZ 2001, Azerbaijan. E-mail: vefa.mamedova74@mail.ru

19381. Alvarez-Alvarez, K.L.; Bota-Sierra, C.A.; Vasquez-Ramos, J.M. (2021): New records of genera Aphylla and Micrathyria for Colombia (Odonata: Gomphidae, Libellulidae). Notulae odonatologicae 9(8): 358-366. (in English) ["We record Aphylla theodorina (Navas, 1933), Micrathyria artemis (Ris, 1911), and Micrathyria dido (Ris, 1911) for the first time for Colombia based on males taken on the

Barcelona Campus at the Universidad de Los Llanos, located in the foothills of the Colombian Eastern Andes in the Orinoco river basin. These collections extend the species' distribution hundreds of kilometres to the north-west." (Authors)] Address: Alvarez-Alvarez, Karen Lineke, Semillero de Investigation JIACACU, Grupo de Investigation Evaluation, Manejo y Conservation de Recursos Hidrobiologicos y Pesqueros (GIREHPES), Universidad de los Llanos, Meta, Colombia. Email: Karen.alvarez@unillanos.edu.co

19382. Antol, A.; Sniegula, S. (2021): Damselfly eggs alter their development rate in the presence of an invasive alien cue but not a native predator cue. Ecology and Evolution 11(14: 9361-9369. (in English) ["Biological invasions are a serious problem in natural ecosystems. Local species that are potential prey of invasive alien predators can be threatened by their inability to recognize invasive predator cues. Such an inability of prey to recognize the presence of the predator supports the naïve prey hypothesis. We exposed eggs of Ischnura elegans, to four treatments: water with no predator cue (control), water with a native predator cue (perch), water with an invasive alien predator cue (spinycheek crayfish) that is present in the damselfly sampling site, and water with an invasive alien predator cue (signal crayfish) that is absent in the damselfly sampling site but is expected to invade it. We measured egg development time, mortality between ovipositing and hatching, and hatching synchrony. Eggs took longer to develop in the signal crayfish group (however, in this group, we also observed high green algae growth), and there was a trend of shorter egg development time in the spinycheek crayfish group than in the control group. There was no difference in egg development time between the perch and the control group. Neither egg mortality nor hatching synchrony differed between groups. We suggest that egg response to signal crayfish could be a general stress reaction to an unfamiliar cue or an artifact due to algae development in this group. The egg response to the spinycheek crayfish cue could be caused by the predation of crayfish on damselfly eggs in nature. The lack of egg response to the perch cue could be caused by perch predation on damselfly larvae rather than on eggs. Such differences in egg responses to alternative predator cues can have important implications for understanding how this group of insects responds to biological invasions, starting from the egg stage." (Authors)] Address: Antol, A., Inst. of Nature Conserv., Polish Acad. Sciences, al. Adama Mickiewicza 33, 31-120 Kraków, Poland. E-mail: andrzejantol@gmail.com

19383. Antón-Tello, M.; Britto, V.O.; Gil-Delgado, J.A.; Rico, E.; Dies, J.I.; Monrós, J.S.; Vera, P. (2021): Unraveling diet composition and niche segregation of colonial waterbirds in a Mediterranean wetland using stable isotopes. Ibis 163(3): 913-927. (in English) ["Rice fields and waterbirds are an example of a synergy that can occur between agriculture and conservation. This connection is especially relevant during the farming period, when nesting waterbirds need to obtain resources to cover their energy requirements and that of their chicks in rice fields. However, new farming techniques may potentially put at risk the fulfilment of this role. Studies on how species use rice fields to feed during this critical period, are essential to understand waterbird population dynamics and to optimize conservation measures. At present, several species of colonial birds in l'Albufera de València (Spain) that depend on trophic resources available in rice fields have decling populations and decreases in productivity. We therefore assessed trophic niche segregation in the diet of chicks, of a waterbird community composed of seven species through stable isotope analyses of carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) obtained from chick blood and tissue samples of potential prey. According to trophic niche widths, chicks of Black-headed Gull Chroicocephalus ridibundus and Gull-billed Tern Gelochelidon nilotica showed a similar diet, although Gull-billed Tern had a major trophic specialization. The Western Cattle Egret Bubulcus ibis fed its chicks in a wider range of different habitats, with organisms located at the base of the food chain and with a greater importance of terrestrial prey than other species. Conversely, the Glossy Ibis Plegadis falcinellus had a more differentiated diet, mostly in freshwater habitats and mainly consuming odonates. Grey Heron Ardea cinerea, Little Egret Egretta garzetta and Squacco Heron Ardeola ralloides showed overlap between their niches, largely explained by the presence and abundance of cyprinid fish and odonates in their diets. Our results suggest a less important role than expected of Redswamp Crayfish Procambarus clarkii , and a more important role of odonates despite being a less energy-rich prey. In conclusion, the diet of generalistic species of waterbirds in this study suggests that their trophic niches can overlap when relative prey abundance is high." (Authors)] Address: Antón-Tello, M., Sociedad Española de Ornitología, Delegación de la Comunitat Valenciana, Alboraia, Valencia, 46120 Spain. E-mail: manton@seo.org

19384. Aristizábal, H.; Garzón Salamanca, L.L.; Lasso Alcala, C.A. (2021): Aquatic macroinvertebrates in endo- and exocarstic ecosystems of the department of Santander, Colombia. Memorias II Congreso colombiano de espeleología 2021: 146-156. (in Spanish, with English summary) ["Aquatic macroinvertebrates associated to endokarst and exokarst ecosystems have been little studied in Colombia. From 2016 to 2019, explorations have been carried out in Santander caves to recognize the fauna that live in these ecosystems. In other departments such as Cesar and Antioquia, studies are scarce, especially those that consider aquatic macroinvertebrates. In this study, 13 sampling points of endo and exokarst ecosystems of Santander. The samplings were carried out using hand nets, a Surber sampler and D-net, as a result, specimens of 50 species of aquatic macroinvertebrates were collected. The orders with the highest number of taxa were Diptera, Coleoptera, Hemiptera and Odonata. It is important to highlight the discovery of a new species of the genus Telmatotrephes (Hemiptera: Nepidae). 11 species with no bibliographic antecedents in caves were found. Therefore, the number of records of aquatic macroinvertebrates in endokarst and exokarst ecosystems of Santander has increased significantly." (Authors) Taxa are treated at genus level.] Address: Aristizábal, H.: E-mail: hernaris@equalambiental.com

19385. Arreaga Figueroa, L.L. (2021): Inventario de la entomofauna benéfica asociada al cultivo cacao (Theobroma cacao L.) en la estación experimental Litoral Sur del INIAP. B.Sc. thesis, Facultad de Ciencias Agrarias, Universidad de Guayaquil: xx + 65pp. (in Spanish, with English summary) [Ecuador "The following research seeks to observe the effect of the traps in two batches under study in Cacao (Theobroma cacao L), which was carried out at the south coast Experimental Station of INIAP, to develop the following objectives 1) Carry out assemblies of the entomofauna present in two agricultural production systems in cocoa cultivation, 2) Identify the main beneficial insects associated with cocoa cultivation, 3) Determine the population levels of insects found in two different crop production systems of cocoa. Two types of traps were used: a) Traps: yellow b) Trap with 3-liter plastic bottles. In the present test: it was possible to collect insects belonging to the following orders: Hymenoptera, Hemiptera, Diptera, Coleoptera, Lepidoptera, Blattodea, Odonata [= Erythemis vesiculosa (Fabricius, 1775)]. In the agroforestry lot, 296 individuals of the beneficial entomofauna and in the monoculture study lot, 832 individuals associated with the crop were captured" (Author).] Address: not stated

19386. Attaullah, M.; Ullah, I.; Ali, M.; Maula, F.; Ilahi, I.; Ahmad, B.; Khwaja, S (2021): Diversity of the Anisoptera & Zygoptera (Odonata: Insecta) of Swat, Pakistan. Brazilian Journal of Biology 83 • 2023: 8 pp. (in English, with Portuguese summary) ["Odonates are important biological control agents for the control of insect pests and insect disease vectors of medical and veterinary importance. The present study was conducted to evaluate the odonate fauna of Swat, Pakistan from March to October 2019. A total of 200 specimens of odonates were collected from diverse habitats. The collected specimens of the order Odonata belonged to 5 families, three families of Anisoptera namely Libellulidae, Gomphidae and Aeshnidae while two families of Zygoptera (Chlorocyphidae and Coenagrionidae). The specimens were categorized into 12 genera and 22 species. Libellulidae was the dominant family (n = 138) accounting for 69% of the odonate fauna. Orthetrum was the dominant genus (n = 73) of Anisoptera accounting for 36.5% of the odonate fauna. The least dominant genera were Anax, Paragomphus and Rhyothemis (n = 5 each) accounting each for 2.5% of the odonate fauna. In Zygoptera, the dominant genus was Ceriagrion (12.5%) and the least dominant genus was Ischnura (6%). Pantala flavescens was the most abundant odonate species in the study area recorded from all surveyed habitats. Shannon Diversity Index (H) was 2.988 and Simpson Diversity Index (D) was 0.95 for the collected odonate fauna. The highest abundance of Odonata was recorded in August, September and May while no odonate species were recorded in January, February, November and December. Lotic water bodies were the most suitable habitats with abundant odonate fauna. Anax immaculifrons was the largest sized odonate species having a wingspan of 53.2±1.63 mm and body length of 56.3 ± 0.4 mm. The present study shows the status of odonate fauna of Swat, Pakistan in diverse habitats and seasonsonal variation throughout the year. Further work is recommended to bridge the gaps in the existing literature." (Authors)] Address: Ilahi, I., Dept Zoology, University of Malakand, Chakdara, Dir Lower, Khyber Pakhtunkhwa, Pakistan. E-mail: ikramilahi@uom.edu.pk

19387. Barmentlo, S.H.; Schrama, M.; de Snoo, G.R.; van Bodegom, P.M.; van Nieuwenhuijzen, A.; Vijver, M.G. (2021): Experimental evidence for neonicotinoid driven decline in aquatic emerging insects. PNAS November 2, 2021 118 (44) e2105692118; 8 pp. (in English) ["Significance: Survey data show a large-scale decline in insects. This global decline is often linked to human actions in intensive agricultural areas. To investigate whether this decline has a causal relationship with neonicotinoid insecticides, we performed an outdoor experiment with representative surface water concentrations of the neonicotinoid thiacloprid. We exposed naturally formed aquatic communities to increasing neonicotinoid concentrations and monitored insect emergence during a 3-mo period. We show that increasing neonicotinoid concentrations strongly decreased the abundance and biomass of five major insect orders that together comprised >99% of the 55,574 collected insects as well as the diversity of the most species-rich freshwater family, thus showing a causal relation between insect decline and neonicotinoids. Abstract: There is an ongoing unprecedented loss in insects, both in terms of richness and biomass. The usage of pesticides, especially neonicotinoid insecticides, has been widely suggested to be a contributor to this decline. However, the risks of neonicotinoids to natural insect populations have remained largely unknown due to a lack of field-realistic experiments. Here, we used an outdoor experiment to determine effects of field-realistic concentrations of the commonly applied neonicotinoid thiacloprid on the emergence of naturally assembled aquatic insect populations. Following application, all major orders of emerging aquatic insects (Coleoptera, Diptera, Ephemeroptera, Odonata, and Trichoptera) declined strongly in both abundance and biomass. At the highest concentration (10 µg/L), emergence of most orders was nearly absent. Diversity of the most species-rich family, Chironomidae, decreased by 50% at more commonly observed concentrations (1 µg/L) and was generally reduced to a single species at the highest concentration. Our experimental findings thereby showcase a causal link of neonicotinoids and the ongoing insect decline. Given the urgency of the insect decline, our results highlight the need to reconsider the mass usage of neonicotinoids to preserve freshwater insects as well as the life and services depending on them." (Authors)] Address: Barmentlo, S.H., Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, Science Park 904, 1090 GE Amsterdam, The Netherlands. Email: S.H.Barmentlo@uva.nl.

19388. Bastos, R.C.; Brito, J.; Cunha, E.; Cruz, G.M.; Pereira, J.L.S.; Vieira, J.; Juen, L. (2021): Environmental impacts from human activities affect the diversity of the Odonata (Insecta) in the Eastern Amazon. International Journal of Odonatology 24: 300-315. (in English) ["Land use influences the biodiversity of stream systems by changing the chemical composition of the water and the physical structure of

the habitat. The present study evaluated the influence of these processes on the diversity metrics of Odonata at regional and local scales, testing the hypothesis that the two odonate suborders Anisoptera and Zygoptera will respond differently to habitat and landscape variables. The study focused on 13 sites in the municipality of Barcarena, Pará, Brazil. We found no significant impact from regional factors, although anisopterans were more affected by water temperature and Habitat Integrity Index (HII). The HII indicated that the local forest was stable, but anisopteran richness was negatively correlated with HII. It was indicating that these species favoured open areas with less riparian cover. Even though zygopterans did not exhibit a similar systematic pattern, the reduced abundance of Chalcopteryx rutilans, a species associated with better-preserved habitats, may indicate that some sites lack the habitat integrity necessary to establish populations of this species. These findings highlight the importance of preserving the riparian forest to maintain the health of the stream systems. We recommend more studies that focus on the broader geographic and temporal scales to account for factors such as the anthropogenic gradient and historical land use patterns." (Authors)] Address: Bastos, R.C., Graduate Program in Ecology, Federal Univ. Federal do Pará, Rua Augusto Correia, Nº 1, Bairro Guamá, CEP: 66.075-110, Belém, Pará, Brazil. Email: bastosrc.bio@gmail.com

19389. Belenguier, L. (2021): Suivi de Leucorrhinia dubia et Somatochlora arctica par relevé des exuvies: résultats sur trois tourbières Auvergnates en 2015 (Odonata: Libellulidae, Corduliidae). Martinia 35(4): 13-22. (in French, with English summary) ["A monitoring of the emergence of L. dubia and S. arctica over the 2015 season was carried out on three peat bogs in Auvergne: The results contribute to the knowledge of these two species by quantifying the populations, specify the phenology on the studied area and calculating the sex-ratio at emergence. The results confirm the presence of an important population of L. dubia on the peat bog of the Plaine Jacquot, even if the productivity (number of exuviae reported on the surface of the peat pits) is lower than that reported in the bibliography, which leads to propose hypotheses to explain this finding. For S. arctica, the population in the Vallat peat bog is large. The data collected confirm that the period of emergence of L. dubia in this zone is on average from May to July, with a peak generally between early and mid-June, and that the period of emergence of S. arctica is on average from May to July, with a peak generally between mid-May and mid-June. The sex ratio at emergence for both species is in favor of females. Additional perspective of study are proposed to improve our knowledge of these two heritage species." (Authors)] Address: Belenguier, L., 123 avenue Joseph Claussat 63400 Chamalières, France. E-mail: l.belenguier@gmail.com

19390. Bodas, A. (2021): Investigating the influence of educational media on children's views on conservation. MSc. thesis, Faculty of the Department of Psychological & Brain Sciences, Villanova University: 57 pp. (in English) ["Encouraging individuals, especially children, to decrease their use of natural resources is critical to creating sustainable communities. I investigated whether children's environmental views can be positively influenced by watching educational media about conservation. I measured 4-and-5-year-olds' (N = 56) knowledge, self-efficacy and environmental worry before and after showing them an episode of the PBS show Nature Cat. Children who watched an episode about conservation did not learn significantly more about conservation strategies as compared to a Comparison condition, who watched an episode about dragonflies. There was also no difference between conditions in selfefficacy ratings. Notably, however, children in the Experimental condition were significantly more concerned for the environment at posttest. These findings suggest that exposure to nature-related educational media may increase children's awareness of environmental problems and concern for the environment." (Author)] Address: not stated

19391. Borsos, S. (2021): Exuvium adatok Somogy megye szitakötõ faunájához (Insecta: Odonata). Natura Somogyiensis 36: 25-34. [Data for the dragonfly fauna of Somogy county (Insecta: Odonata) based on samples of exuviae: "The 2168 exuviae found during the collections can be classified into 31 species, 56% of the 55 dragonfly species known so far from Somogy County. Among them, 8 are protected (Aeshna isoceles, Gomphus flavipes, G. vulgatissimus, Onychogomphus forcipatus, Ophiogomphus cecilia, Epitheca bimaculata, Somatochlora flavomaculata, Libellula fulva) and 1 is highly protected (Cordulegaster heros) according to the currently in force FM Decree 66/2015 (26.X.). In the Hungarian Red List (2017) 4 species are listed, Endangered (EN): E. bimaculata, Vulnerable (VU): O. cecilia, C. heros, S. flavomaculata. C. heros is a species classified as threatened (NT) in the European Red List (2010). Based on the exuviae found, the most species-rich habitats were found in Lake 9 (Barcs), the Red Bank (Barcs) and the Gyótapusztai fishpond (Marcali). It is noteworthy that at Barcs, all four river dragonfly exuviae were found in the Dráva, demonstrating that this stretch of the Dráva is also an ecologically valuable and diverse habitat." (DeepL)] Address: Borsos, S., 7570 Barcs, Dohány utca 9., Hungary. E-mail: sborsos@index.hu

19392. Brasil, L.S.; Alves de Andrade, A.F.; Ribeiro, B.R.; Spigoloni, Z.A.; Juen, L.; De Marco Jr, P. (2021): A niche-based gap analysis for the conservation of odonate species in the Brazilian Amazon. Aquatic Conservation 31(5): 1150-1157. (in English) ["1. Despite the current rates of deforestation and the expected climatic changes, protecting species in their natural habitats is still the simplest, cheapest, and most effective way of safeguarding biodiversity. Here, the network of protected areas in the Brazilian Amazon was evaluated to assess its effectiveness in safeguarding species of Odonata. 2. Ecological niche models were built to assess the suitability of the habitat for 503 Amazonian odonate species. Then, the effectiveness for the protection of odonate species of three classes of protected areas (strictly protected area, sustainable use area, and indigenous territory) was evaluated. 3. Approximately 30% of the species

are protected within the network of protected areas. These findings highlight the importance of protected areas for safeguarding most odonate species in the Amazon. For under-represented or gap species, additional resources are still needed for effective management and protection on some private properties, which need to set aside land for conservation. In this way, it is possible to preserve habitats for odonate species and guarantee their conservation in the Amazon." (Authors)] Address: Brasil, L.S., Lab. de Ecologia e Conservação (LABECO), Universidade Federal do Pará, Belém, Pará, Brazil. Email: brasil_biologia@hotmail.com

19393. Braumiller, C. (2021): Libellenfauna der südlichen Niederen Tauern. Diplomarbeit, Karl-Franzens-Universität Graz: 84 pp. (in German, with English summary) ["The dragonfly fauna of the southern Lower Tauern was investigated. The habitats and the occurrence of the species were surveyed. For this purpose, ten study sites were selected in the municipalities of Krakau, Schöder, St. Peter am Kammersberg and Oberwölz, each of which was visited on four dates between June and September 2020. The habitats were determined according to the guidelines for "biotope type mapping". Dragonflies could be detected at each water body. The numbers of individuals and species were discussed in relation to the ground level, lake level, seasonal occurrence, habitats and degree of endangerment. A total of 18 species were detected of which 14 were classified as native. The lowest area is located at 1059 m and the number of species and individuals decreases with increasing altitude" (Author) https://unipub.uni-graz.at/obvugrhs/download/pdf/6434339?originalFilename=true; Calopteryx virgo; Coenagrion hastulatum; C. puella; Enallagma cyathigerum; Erythromma najas; Ischnura elegans; Lestes sponsa; Platycnemis pennipes; Pyrrhosoma nymphula; Aeshna cyanea; A. grandis; A. juncea; Cordulia aenea; Libellula depressa; L. quadrimaculata; Somatochlora metallica; Sympetrum danae; S. vulgatum] Address: not stated

19394. Bried, J.T. (2021): Odonata species diversity, distributions, and status in a rare sand prairie-savanna wetscape. International Journal of Odonatology 24: 197-214. (in English) ["Inland sand areas scattered across the North American eastern deciduous forest and western tallgrass prairie ecotone are known for supporting pyrogenic early-successional vegetation and specially adapted terrestrial faunas. Many of these globally and regionally rare systems contain functionally connected wetland networks (“wetscapes”) potentially important for aquatic insects. Sampling adults, nymphs, and exuviae in a remnant sand prairie-savanna wetscape in Illinois, USA, I assessed odonate species diversity (alpha, gamma, beta), distributions (spatial, temporal, abundance), and rarity status. In one field season (12 sites, 12 visits) I found more than a third of Illinois odonate species and close to half of the state’s lentic breeding odonates, including a new state record (Erythemis vesiculosa). Richness averaged 25.8 species per site, reducing to 12.4 species with removal of nonbreeding occurrences. Three sites including a shrub swamp, beaver pond, and forested vernal depressions complex made significant contributions to beta diversity, dependent on general versus breeding occurrences. Majorities of Anisoptera species (70%) and Zygoptera species (53%) bred at three or fewer sites. Eight species flew during all or most of the study period (late May to early October) whereas 14 species were detected on a single survey. Status classification derived from the observed spatial, temporal, and abundance distributions resulted in 24 common or very common species, 20 uncommon or rare species, and 10 vagrants across the wetscape. These context-specific classifications may be combined with diversity and breeding patterns and other information in wetscape prioritization schemes." (Author)] Address: Bried, J.T., Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign, Champaign, Illinois, USA. Email: bried@illinois.edu

19395. Carbonell, J.A.; Wang, Y.J.; Stoks, R. (2021): Evolution of cold tolerance and thermal plasticity in life history, behaviour and physiology during a poleward range expansion. Journal of Animal Ecology 90(7): 1666-1677. (in English) ["Many species that are moving polewards encounter novel thermal regimes to which they have to adapt. Therefore, rapid evolution of thermal tolerance and of thermal plasticity in fitness-related traits in edge populations can be crucial for the success and speed of range expansions. We tested for adaptation in cold tolerance and in life history, behavioural and physiological traits and their thermal plasticity during a poleward range expansion. We reconstructed the thermal performance curves of life history (survival, growth and development rates), behaviour (food intake) and cold tolerance (chill coma recovery time) in the aquatic larval stage of the damselfly Ischnura elegans that is currently showing a poleward range expansion in northern Europe. We studied larvae from three edge and three core populations using a common-garden experiment. Consistent with the colder annual temperatures, larvae at the expansion front evolved an improve cold tolerance. The edge populations showed no overall (across temperatures) evolution of a faster life history that would improve their range-shifting ability. Moreover, consistent with damselfly edge populations from colder latitudes, edge populations evolved at the highest rearing temperature (28 °C) a faster development rate, likely to better exploit the rare periods with higher temperatures. This was associated with a higher food intake and a lower metabolic rate. In conclusion, our results suggest that the edge populations rapidly evolved adaptive changes in trait means and thermal plasticity to the novel thermal conditions at the edge front. Our results highlight the importance of considering besides trait plasticity and the evolution of trait means, also the evolution of trait plasticity to improve forecasts of responses to climate change." (Authors)] Address: Stoks, R., Laboratorium voor Aquatische Ecologie, K.U.Leuven, De Beriotstraat 32, 3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

19396. Carrillo-Lara, D.E.; Novelo-Gutiérrez, R. (2021): The life cycle of Orthemis ferruginea (Fabricius, 1775) (Odonata: Libellulidae). International Journal of Odonatology 24: 275-299. (in English) ["The complete life cycle of O. ferruginea

is described for the first time, represent the first complete life cycle described for an odonate in Mexico. The 17 larval instars obtained are described and illustrated in detail, from prolarva through F-0. Two egg batches of different females were obtained in the field and were subsequently reared in the laboratory. Eggs and larvae of the batches were raised under 26°C controlled temperature conditions until they reached instars F-6 and F-5. An extra collection of wild organisms was made in order to complete the life cycle from F-5. Only four of the wild larvae managed to complete the last five missing larval instars at 30°C. Larvae of the youngest instars (F-15 to F-8) were fed nauplii of Artemia franciscana, while F-7 to F-0 were fed larvae of Culicidae and Chironomidae. Larval life cycle from F-0 to F-16 lasted average of 186 days." (Authors)] Address: Carrillo-Lara, Diana, Inst. de Ecología A.C. Red de Biodiversidad y Sistemática. Carretera Antigua a Coatepec 351, El Haya, 91073 Xalapa, Veracruz, Mexico. Email: dpepper.1120@gmail.com

19397. Cezário, R.R.; Lopez, V.M.; Gorb, S.; Guillermo-Ferreira, R. (2021): Dynamic iridescent signals of male copperwing damselflies coupled with wing-clapping displays: the perspective of different receivers. Biological Journal of the Linnean Society 134(1): 229-239. (in English) ["Dynamic signals are a widespread phenomenon in several taxa, usually associated with intraspecific communication. In contrast, dynamic iridescent signals are detectable only at specific angles of illumination; hence, the animal can hide the signal to avoid detection when necessary. This structural coloration is mostly dependent on the illumination, the contrast against the background and the vision of the receiver. Complex behavioural displays can be coupled with structural coloration to create dynamic visual signals that enhance these functions. Here, we address whether iridescence of the males of a damselfly that inhabits dark rainforests, Chalcopteryx scintillans, can be considered a dynamic visual signal. We analyse whether coloration is perceived by conspecifics, while reducing detectability to eavesdroppers against three types of backgrounds. Our results suggest that the visual background affects the detectability of male hindwings by different receivers, mostly predators and prey. We discuss whether these results and the angle dependence of colour could indicate a mechanism to avoid unwanted intraspecific interactions or even to lure both predators and prey. We conclude that the main functions of the dynamic iridescent signal are to communicate with conspecifics while hindering the signal for prey, adding evidence of the multifunctionality of structural coloration coupled with behavioural displays in animals." (Authors)] Address: Guillermo-Ferreira, R., Lab. of Ecological Studies on Ethology & Evolution (LESTES Lab), Federal Univ. of São Carlos, São Carlos, SP, Brazil. Email: rhainerguillermo@gmail.com

19398. Chitsaz, N.; Siddiqui, K.; Mariana, R.; Chahlac, J. (2021): An experimental study of the aerodynamics of micro corrugated wings at low Reynolds number. Experimental Thermal and Fluid Science 121, 1 February 2021, 110286. (in English) ["Highlights: • PIV was used to study the flow over reconstructed micro-corrugated Odonata wings. • We employed a non-destructive photogrammetry method to fabricate the wing. • The accuracy of corrugation patterns with fabricated wing was evaluated by Micro-CT. • Photogrammetry is advantageous to reconstruct the corrugated wing of MAVs. • The obtained aerodynamic results of corrugated wing benefit next generation of MAVs. Abstract: In this paper, an experimental study was performed to examine the flow characteristics of fabricated micro corrugated wings by fully mimicking the real 3D Odonata wing. For this purpose, a true scale hind wing from the Orthetrum caledonicum species with a semi span length of 60 mm was reconstructed by non-destructive close-range photogrammetry and fabricated with an advanced 3D printer. The accuracy of the proposed reconstruction technique was evaluated and compared with a 3D model of the same wing created using a Micro-Computed Tomography (CT) scanning technique to show that the close-range photogrammetry method was able to predict the pattern of micro corrugation of the wings with satisfactory fidelity. To do that, the corrugation patterns of both reconstructed wings were compared at different sections of the wings. Then, high-resolution Particle Image Velocimetry was used to investigate the flow field of the wing during gliding flight at three low Reynolds numbers Re=5×103, Re=8×103 and Re=12×103, and angle of attack 10°. The results include free stream velocity, vorticity distribution, boundary layer, and flow visualization. The velocity contour and vorticity boundary layer of both wings were compared experimentally. The flow behavior around the corrugated patterns reconstructed from both methods were compared with satisfactory agreement. The support the theory that the corrugations of the wing act as turbulators to generate unsteady vorticity to transition the boundary layer from laminar to turbulent quickly, leading to delayed stall and improved aerodynamic performance. Moreover, this study shows the application of the presented photogrammetry method for corrugated wing reconstruction, which is fast, low-cost, non-destructive, with high replication accuracy for the next generation of micro air vehicles." (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

19399. Choo, M.Z.J.; Low, B.W.; Ngiam, R.W.J.; Yeo, D.C.J. (2021): Predation of mosquitos by odonates in a tropical urban environment: insights from functional response and field mesocosm experiments. Biological Control 161, October 2021, 104702. (in English) ["Highlights: • Predation by urban odonates on Aedes albopictus larvae was evaluated. • Laboratory experiments showed high feeding response (Type II) at low prey density. • Field mesocosm experiments showed little predation impact on community composition. • Predation on naturally-colonizing mosquito larvae in mesocosms was size-selective. • Odonates can potentially be used as predators of mosquitoes in urban environments. Abstract: Mosquito borne diseases (e.g., dengue fever, Zika fever, chikungunya fever) are a recurring problem worldwide. Using the natural predators of mosquitoes, such as

odonates, provides an alternative, more sustainable approach towards vector control. We assessed the biological control potential of the larvae of three common urban odonates (Crocothemis servilia, Ischnura senegalensis, Orthetrum sabina) using laboratory-based functional response and field-based mesocosm experiments. Functional response experiments using fourth instar Aedes albopictus mosquito larvae as prey revealed Type II functional responses in all three odonate species, highlighting their predatory efficiencies at low prey densities and demonstrating that urban odonates can consume substantial numbers of mosquito larvae (up to 44 per day) under experimental conditions. Complementary field-based experiments, however, showed little impact of odonate larvae predation on the overall composition of naturally colonizing aquatic macroinvertebrate communities, but revealed substantial size-selective predation by odonate larvae on mosquito larvae. Our results provide the first assessment of the predation efficiencies of urban odonate larvae, and highlight their potential as biological control agents of mosquitoes and other aquatic insect pests in highly modified urban landscapes." (Authors)] Address: Yeo, D.C.J., Dept of Biological Sciences, National Univ. of Singapore, 16 Science Drive 4, 117558, Singapore. E-mail: dbsyeod@nus.edu.sg

19400. Córdoba-Aguilar, A.; San Miguel-Rodríguez, M.; Rocha-Ortega, M.; Lanz-Mendoza, H.; Cime-Castillo, J.; Benelli, G. (2021): Adult damselflies as possible regulators of mosquito populations in urban areas. Pest Management Science 77(10): 4274-4287. (in English) ["Background: Dragonfly and damselfly larvae have been considered as possible biocontrol agents against young instars of mosquito vectors in urban environments. Yet, our knowledge about adult odonate predation against mosquito adults is scarce. We quantified daily and annual predation rates, consumption rates and prey preferences of adult Hetaerina vulnerata male damselflies in an urban park. A focus on predation of mosquito species was provided, quantified their arbovirus (dengue, chikungunya and Zika) infection rates and biting activity. Results: Foraging times of H. vulnerata overlapped with those of maximum activity of hematophagous mosquitoes. The most consumed preys were Diptera and Hymenoptera and, in lower quantities, Hemiptera, Coleoptera, Trichoptera, Psocoptera, and Neuroptera. Of note, 7% of the diet was represented by hematophagous dipterans, with 2.4% being Aedes aegypti and A. albopictus. Prey abundance in the diet coincided with that of the same species in the environment. The arboviral infection rate (dengue, chikungunya and Zika) was 1.6% for Ae. aegypti and Ae. albopictus. The total biting rate of these mosquito vectors was 16 bites per person per day, while the annual rate of infectious bites was 93.4. Conclusion: Although 2.4% for both Aedes species seems a low consumption, considering the presence of 12 odonate species at the park, it can be argued that adult odonates may play a relevant role as mosquito vector regulators, therefore impacting the spread of mosquito-borne diseases. Our study outlines the need of further research on the topic on the possible role of adult odonates for mosquito biocontrol." (Authors)] Address: Córdoba-Aguilar, A., Depto de Ecología Evolutiva, Instituto de Ecología, Universidad Nacional Autónoma de México, Apdo. Postal 70-275, Ciudad Universitaria, 04510, México, D. F., México. E-mail: acordoba@ecologia.unam.mx

19401. Chuirazzi, C.; Ocampo, M.; Takahashi, M.K. (2021): Influence of prey diet quality on predator-induced traits in wood frog tadpoles (Lithobates sylvaticus). Amphibia-Reptilia 42(3): 331-341. (in English) ["Diet quality and predation are two critical factors in determining the growth and development of organisms. Various anurans are susceptible to phenotypic changes influenced by these factors. Yet, few studies examined prey diet quality as potential influence over predator-induced traits. Using wood frog tadpoles (Lithobates sylvaticus) as a model species, we investigated the effects of three diet compositions (plant-based, animal-based, omnivorous) crossed with presence or absence of chemical cues from predatory dragonfly larvae (Aeshnidae). After 35 days, we recorded 11 morphological measurements, Gosner stage, and intestinal length of tadpoles to assess phenotypic changes under the six different experimental conditions. Our results showed the additive effects of both diet quality and predator chemical cue without detection of interactions between the two. Tadpoles receiving the omnivorous diet grew and developed faster with wider denticle rows than those receiving the plant or animal diets. The growth and development of tadpoles receiving only the animal diet were significantly hindered. These results emphasize the importance of diet quality in the growth and development of larval wood frogs. Chemical cues from predators significantly reduced tadpole body size but, in contrast to previous findings, did not affect tail size. Our experimental procedure of providing water containing predator and injured conspecific chemical cues on a weekly basis likely provided relatively weak predation risk perceived by tadpoles compared to previous studies using caged predators. The predator environment in our experiment, however, represents one ecologically relevant scenario in which predation risk is not urgent." (Authors)] Address: Chuirazzi, Catherine, Dept Biol., Bucknell Univ., Lewisburg, PA 17837-2005, USA

19402. Clarke, D. (2021): Aeshna caerulea (Strom) (Azure Hawker) in Galloway: a history. J. Br. Dragonfly Society 37(2): 87-103. (in English) ["The only breeding population of Aeshna caerulea in the UK south of the Scottish Highlands was discovered in 1949 at the Silver Flowe, Galloway but has declined since then and may now be lost. Studies at that site, especially in the 1980s and 1990s, revealed much about the species' natural history and enabled the hitherto little-known larval stages to be characterised and published. Its apparent extinction at this location during the present century is discussed and linked to the direct and indirect effects of changes in climate and weather patterns on the species and its habitat." (Author)] Address: Clarke, D., Bumfoot, Cumwhitton, Brampton CA8 9EX, UK

19403. Clement, R.A.; Saxton, N.A.; Standring, S.; Arnold, P.R.; Johnson, K.K.; Bybee, D.R.; Bybee, S.M. (2021): Phylogeny, migration and geographic range size evolution of

Anax dragonflies (Anisoptera: Aeshnidae). Zoological Journal of the Linnean Society, zlab046, https://doi.org/10.1093/-zoolinnean/zlab046: (in English) ["The genus Anax is a group of cosmopolitan dragonflies noted for its conspicuous migratory behaviours and large size. Here we present the first dated, species-level, multigene, molecular phylogeny for the group to test generic and species-limits, as well as the evolution of migration and range size. Using five mitochondrial and nuclear gene regions (COI, COI/COII, CYTB/ND1, ITS1 and PRMT) from 20 species, we reconstructed a phylogeny of Anax using both a Bayesian and maximum likelihood approach. We found that Anax (including its hypothesized sister group Hemianax) forms a monophyletic group, and that 12 out of 20 species tested positive for monophyly were also monophyletic. The monophyly of several species of Anax is less clear. Migratory behaviour, which is known to occur in at least nine species, is recovered as the ancestral behaviour, which was lost and subsequently gained at least three times. Geographic range size seems to be tightly associated with migratory behaviour." (Authors)] Address: Clement, Rebecca, Computational Biol. Inst., The Milken Institute School of Public Health, The George Washington Univ., Washington, D.C., USA. E-mail: rebeclem@gmail.com

19404. Deacon, C.; Samways, M.J. (2021): Urban threats and conservation measures relating to aquatic arthropods on the iconic Table Mountain, South Africa: a review. Basic and Applied Ecology 56: 192- 212. (in English) ["Highlights: • Mountainous areas are attractive for human colonization. • In South Africa, mountains host high levels of aquatic arthropod endemism. • There are often trade-offs between urbanization and biodiversity conservation. • Urbanization presents several novel threats to freshwater conservation. • Threats can and have been mitigated to encourage arthropods in urban spaces. Abstract: Mountains supply essential resources, making them attractive areas for human settlement. Variation in elevation in mountainous areas determines local and regional climates, leading to complex biodiversity patterns. Mountains in the Cape Floristic Region have high species richness and beta diversity, and very high levels of local endemism. Table Mountain is an iconic mountain in the region, and unusual, as it is in the centre of the city of Cape Town. It is exceedingly rich in biodiversity, including many localized endemic species. However, increasing urbanization in the area is adversely affecting the local biodiversity, especially in the lowlands. Climate change effects to date are minimal, but projected to interact with the impacts of urbanization. Here we review the biodiversity patterns of green and blue spaces in and around Cape Town, including Table Mountain, focusing on aquatic arthropods. We also review the major threats that lead to biotic impoverishment, and provide information on current conservation efforts aimed at protecting the rich biodiversity of Table Mountain and its surrounds. Finally, we focus on the shortcomings of existing conservation actions, and then provide conservation strategies to limit aquatic arthropod biodiversity losses, based on actions that have already worked well. To ensure protection of all arthropods, freshwater habitats across all elevations require further conservation action. Education and creating awareness must continue to close the gaps between scientists, conservation practitioners and civil society as a crucial part of the conservation plan." (Authors)] Address: Samways, M.J., Dept Entomol. & Nematol., Univ. Stellenbosch, Private Bag X1, ZA-7602, Matieland, South Africa. E-mail: samways@sun.ac.za

19405. Deacon, C.; Samways, M.J.; Pryke, J.S. (2021): Relative importance of ecological versus biological traits in driving range sizes of African dragonflies. Journal of Biogeography 48(6): 1309-1321. (in English) ["Aim: Ecological traits (e.g. biotope specialisation and habitat preference) and biological traits (e.g. mobility and life history) are highly variable among species. In insect conservation, considerable focus has been on ecological generalisation, with species occupying many biotope types (generalists) often assumed to be widely distributed, whereas species occupying few biotope types (specialists) are assumed as rare and localised. Although this may be valid in most cases, there is an increasing recognition that functional traits, such as insect mobility and life history, have similar importance as drivers of range size among species. Here, we investigate ecological and biological traits simultaneously to determine their relative importance as drivers of range size variation. We hypothesise that ecological traits are primary drivers, whereas biological traits related to mobility and life history are less important drivers of range size. Location: Sub-Saharan Africa. Taxon: 115 sub-Saharan dragonfly species. Methods: Five measures of species range size were obtained from the Odonata Database of Africa. Number of biotope types occupied by adults and larvae, larval habitat preference and adult biological trait information were collated from published sources. We explore the relationships between ecological and biological traits. Using linear mixed models and model averaging, we determine the relative importance of number of biotope types occupied, overall habitat preference and traits related to mobility and life history that drive dragonfly range size while accounting for phylogenetic relationships among focal species. Results: Dragonflies occupying more biotope types had wider ranges, although these relationships were overall weak. Dragonflies with longer and later breeding seasons had wider ranges. Overall habitat preference and mobility traits had low importance in our models. Main conclusions: Ecological versus biological traits are interactive in shaping the geographical ranges of dragonfly species across Africa. Single traits are weak predictors of species range sizes and we recommend investigating multiple traits simultaneously to improve the accuracy of predictions. In doing so, more informed decisions can be made to ensure effective large-scale conservation of dragonflies." (Authors)] Address: Deacon, C., Dept of Conservation Ecology and Entomology, Stellenbosch University, South Africa. E-mail: charldeacon@sun.ac.za

19406. Dinesh, V.; Leenamma, J.; Josekumar, V.S. (2021): Spatial variation of benthic Odonate (Odonata: Insecta) community structure in the urban River Killiyar in southern Kerala, India. Journal of Aquatic Biology & Fisheries 9: 99-108. (in English) ["The spatial variation of benthic odonate

community assemblage in various zones (upper, middle, and lower zones) of the urban river Killiyar was assessed using the tools of geographic information system (GIS) and investigated their interaction with select water quality parameters. Benthic odonate larvae collected during this study belong to predators–engulfers of the functional feeding groups. A total of 147 individuals of 12 genera across nine families of benthic odonate taxa were recorded in this study. Out of the total taxa observed, Gomphidae comprised 34% individuals, followed by Libellulidae (33%). The former taxa were the dominant family in all the zones except the lower zone. The spatial analysis demonstrated high diversity and richness in the stations of the middle zone while moderate diversity in the rest of the stations. The population density observed was high at station Idappazhanjhi (K10). The distribution of taxa was relatively higher in the middle zone than that of other zones. The taxa Libellulidae was observed in most stations and directly associated with water temperature, pH, and dissolved oxygen. The major drivers that govern benthic odonate community assemblages in Killiyar were pH and dissolved oxygen. Investigating the community assemblage using GIS tools is novel and provides a better understanding of the ecology of odonate larval communities and their association with water quality. The outcome of this study supports the formulation of management strategies to protect the odonate diversity and conservation of their habitats, the riverine ecosystems in the urban landscapes in particular." (Authors)] Address: Dinesh, V., Dept Zool., Mar Ivanios College, Res. Centre, Univ. Kerala, Thiruvananthapuram, Kerala, India, 615 015. E-mail: dinupipit@gmail.com

19407. Doniol-Valcroze, P.; De Ferrière, P.; Jourdain, B.; Cugno, A. (2021): Première preuve de reproduction de Trithemis kirbyi (Odonata: Libellulidae) en France. Martinia 35 (2): 5-9. (French, with English summary) ["First evidence of the breeding of T. kirbyi in France: The recent incursions of T. kirbyi reported on the French territory since 2017, in a context of northwards and westwards range expansion, suggested a future settlement of the species in France. Following the recent establishment of the species in northern Spain, the discovery of many imagos and exuviae of T. kirbyi on the domain of the Villa Arnaga (Edmond Rostand's home and Museum) in Cambo-les-Bains, in the Pyrénées-Atlantiques department, thus constitutes the first evidence of breeding of the species on the French territory. The date of settlement on the site and the sustainability of the site remain, however, uncertain. Future surveys on this site and in the surrounding areas will make it possible to confirm whether or not the short and long run establishment of the species at this locality." (Authors)] Address: Doniol-Valcrozea, P., 567, route de Lesbouyries, 40390 Saint Martin-de-Seignanx, France. E-mail: pauldoniol-valcroze@orange.fr

19408. Dow, R.A.; Ahmad, R.; Butler, S.G.; Choong, C.Y.; Grinang, J.; Ng, Y.F.; Ngiam, R.W.J.; Reels, G.T.; Steinhoff, P.O.M.; Unggang, J. (2021): Previously unpublished Odonata records from Sarawak, Borneo, part VI: Miri Division including checklists for Niah, Lambir Hills, Loagan Bunut and Pulong Tau National Parks. Faunistic Studies in Southeast Asian and Pacific Island Odonata 36: 1-94. (in English) ["Records of Odonata made from 2005 to 2020 in Miri Division in Sarawak are presented, including records from Lambir Hills, Loagan Bunut, Niah and Pulong Tau National Parks. Primary types of Odonata originating from Miri Division are listed. Surveys of more than one day duration in Miri Division and covered here are tabulated with the funding source where appropriate; four of the surveys covered here were funded by the International Dragonfly Fund. One hundred and eighty-eight species are listed based on surveys made by the authors, of which Macromia jucunda Lieftinck, 1955, had not been recorded from Borneo before, Burmagomphus arthuri Lieftinck, 1953 is a new record for Miri Division and Camacinia gigantea (Brauer, 1867) has only been recorded from the Division recently with the only published record in a difficult to access publication (Choong (2020)). At least 48 more of the species listed were recorded from Miri Division for the first time in surveys covered in this report, although the records have been published (in most cases with no details beyond division and district in Dow (2021)) before. Two forms of Xiphiagrion cyanomelas Selys, 1876 are recorded and the likelihood that they represent different species is discussed. A possibly new, large sized, species of Macromia allied to M. westwoodii Selys, 1874 is recorded and discussed. Other notable records not published with details before include Rhinocypha stygia Förster, 1897, Rhinoneura caerulea Kimmins, 1936, Dysphaea lugens (Selys, 1873), Euphaea ameeka van Tol & Norma-Rashid, 1995, Euphaea basalis (Laidlaw, 1915), Amphicnemis new sp. cf mariae Lieftinck, 1940 (previously recorded from Usun Apau National Park), Anaciaeschna jaspidea (Burmeister, 1839), Heliaeschna uninervulata Martin, 1909, Borneogomphus sp., Heliogomphus borneensis Lieftinck, 1964, Ictinogomphus acutus (Laidlaw, 1914), Chlorogomphus sp., Macromia corycia Laidlaw, 1922, Idionyx montana Karsch, 1891, Hylaeothemis clementia Ris, 1909, Orchithemis xanthosoma Laidlaw, 1911, Rhyothemis fulgens Kirby, 1889, Rhyothemis regia (Brauer, 1867), Tetrathemis sp. cf platyptera Selys, 1878, Tramea phaeoneura Lieftinck, 1953 and Tramea sp. cf virginia (Rambur, 1842). The habitat preferences of Dysphaea lugens are discussed. A male-male tandem of Coeliccia nigrohamata Laidlaw, 1918 is reported. The somewhat peculiar distribution of Argiocnemis rubescens rubeola Selys, 1877 and Pseudothemis jorina Förster, 1904 in Sarawak is discussed. Activity of the apparently normally crepuscular Heliaeschna uninervulata in the middle of the day is reported. An interesting morphological detail of some female Chlorogomphus from Sarawak is discussed. The likelihood that Macromia corycia is a junior synonym of M. gerstaeckeri Krüger, 1899 is discussed. The possibility that the range of Rhyothemis regia is expanding in Sarawak is remarked upon. The identity of Tramea sp. cf virginia is discussed. With the records presented here at least 222 species of Odonata are known from Miri Division and with the addition of Macromia jucunda to the known fauna, 309 species have now been recorded from Sarawak. More detailed specimen records are given in Appendix 1 and a revised checklist of Odonata from Lambir Hills National Park and the first checklists from Loagan Bunut, Niah and Pulong Tau

National Parks are given in Appendix 2." (Authors)] Address: Dow, R.A., Inst. Biodiversity & Environmental Conservation, Univ. Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia. E-mail: rory.dow230@yahoo.co.uk

19409. Dow, R.A.; Orr, A.G. (2021): On the identity of two species of Tyriobapta (Odonata: Libellulidae) from Sundaland. Notulae odonatologicae 9(7): 296-305. (in English) ["The genus Tyriobapta Kirby, 1889, includes three species, all originally described from Borneo. The genotype, T. torrida is common in much of Sundaland where it inhabits a variety of standing and slowly flowing freshwater habitats in forest. The two other species, T. kuekenthali (Karsch, 1900) and T. laidlawi Ris, 1919, are much less often encountered. Recent literature has confused these two species, with their identities being reversed, as is clearly evinced by the original descriptions. This note remedies this misconception." (Author)] Address: Dow, R.A., Naturalis Biodiversity Centre, P.O. Box 9517, 2300 RA Leiden, The Netherlands. E-mail: rory.dow@virgin.net

19410. Du, R.; Lu, S.; Gong, S. (2021): Research status of dragonfly flapping-wing Micro Air Vehicle. Infrared, 2021, 42(8):38, online publication: 2021-09-08: 38-46. (in Chinese, with English summary) ["Dragonflies are considered to be one of the insects with simple flying behavior and efficient mobility, so they have become the bionic design prototypes of many micro air vehicles (MAV). The excellent flight characteristics of dragonflies are inseparable from their wing characteristics. It can not only withstand a variety of loads during flight, but also maintain high-efficiency flight characteristics. The research status and latest research progress of dragonfly wing structure characteristics, flight characteristics and dragonfly flapping-wing MAV are summarized. The wing vein, wing membrane, wing knot, pterostigma, fold structure, body fluid flow, material characteristics, flight mechanism and infrared detection application of dragonfly wings are summarized. In addition, according to the miniaturization requirements of the bionic flapping-wing MAV, the future research directions are analyzed." (Authors)] Address: Du, R., The 11th Res. Inst. China Electronics Tech. Group Corporation, Beijing 100015, China

19411. Dumont, H.J.; Schneider, T.; Vierstraete, A.; Borisov, S.N. (2021): Biogeography and relationship of the Gomphidae of Europe, North Africa, and the Middle East (Odonata). Odonatologica 50(1/2): 17-42. (in English) ["Around 27 species of predominantly riverine Gomphidae occur in the vast region encompassing Europe as far as the Urals, the Maghreb, the Mediterranean Basin, and the Middle East up to the west side of the Indus valley, including Arabia, Iran, and Baluchistan. They are the remains of a pre-Pleistocene fauna that we estimate at twice the current number. We analyse the relationships, losses, and their causes at the molecular level and, not surprisingly, confirm the widely held opinion that the ice age is overwhelmingly responsi-ble. Much extinction of European-West Asian and North American species took place in Beringia, presumably in an early phase of the glaciation. Recolonization between glacial stages can be evaluated for the final stage, the Würm-Wisconsin glaciation. Differences in the orientation of mountain chains allowed more species to survive in North America than in Eurasia. They recolonized Canada, Europe, the Russian Far East, and Japan. From China, 16 additional gomphids are moving west through Siberia. Some reach the Ob valley but in others disjunctions persist. There are, for example, no Stylurus species in Pakistan, India, Bangladesh, and Thailand. Numerous preglacial survivors currently occur in Mediterranean and Middle Eastern refuges. Beside ice, aridity played a role in limiting the fauna. Oriental species advanced into the Middle East and Anatolia, but there was apparently never enough running water in Baluchistan to allow a large-scale movement of gomphids towards Europe. Rather to the contrary, the southeastern-most gomphid is Gomphus amseli, with type locality at the Heri Rud in Afghanistan, which forms a cline towards the west. Pakistan is even more impoverished in gomphids than Europe but is home to one small genus, Anormogomphus, that extends from northern India to eastern Anatolia. Africa also contributed little to the Palaearctic fauna. No Gomphus extends further south than the Maghreb, where several endemic species occur. Paragomphus sinaiticus is a desert species that does not occur south of the Sahara. The richest populations are situated in Oman. Two colonies coincide with the position of the shores of Lake Megachad, in the foothills of the Sahara-Sahel mountains of Aïr, Tibesti and Ennedi. Perhaps biotic factors like interspecies competition explain its range better than environmental factors. Around 8500 BP, the most recent riverine contact with the Nile via the Wadi Howar facilitated contact and crossing of the Red Sea, but Saharan populations could be older. Arabia was presumably invaded via the Sinai Peninsula, terra typica of the species." (Authors) Gomphus maroccanus Lieftinck, 1966] Address: Dumont, H.J., Univ. Gent, Inst. Animal Ecology, K.L. Ledeganckstraat 35, B-9000 Gent, Belgium. E-mail: Henri.Dumont@ugent.be

19412. Elsowayeb, A.A.; Aboshaala, F.; Ghaliow, M.; Samraoui, B. (2021): Lindenia tetraphylla new to Libya (Odonata: Gomphidae). Notulae odonatologicae 9(8): 372-377. (in English) ["We report on the first record of L. tetraphylla in Libya. A total of 21 individuals of this species are the first documented records for this species in this country. All individuals were mature, observed in June in two non-consecutive years (2019 and 2021), suggesting local reproduction at two sites south of Misurata city. Habitats were man-made wetlands surrounded by lush vegetation. These observations and recent others from North Africa suggest that this species is progressively recovering parts of its western range lost during the 20th century, establishing itself now within a wide coastal and sub-coastal region in the countries bordering the southern Mediterranean. Further investigations are warranted to confirm the status, and to assess the life cycle and dispersal of L. tetraphylla in Libya." (Authors)] Address: Samraoui, B., Dept of Biology, University Badji Mokhtar Annaba, Algeria. Email: bsamraoui@gmail.com

19413. Escoto-Moreno, J.A.; Villalobos-Juárez, I.;

Hernández-Langford, D.G. (2021): New records of Odonata from central and Pacific Mexico. The Pan-Pacific Entomologist 97(1): 33-38. (in English) [Records of the following speices are documented: Lestes alacer, Argia lacrimans, Enallagma civile, Ischnura hastata, Ischnura ramburii, Anax junius, Triacantagyna septima, Rhionaeschna multicolor, Erythemis vesiculosa, Erythrodiplax basifusca, E. umbrata, Libellula croceipennis, Miathyria marcella, M. hagenii, Orthemis discolor, Pantala hymenaea, Perithemis intensa, Sympetrum corruptum, Tramea insularis, T. lacerata, T. onusta.] Address: Hernandez-Langford, D.G., Coleccion Zoologica, Departamento de Biolog..a, Centro de Ciencias Basicas, Universidad Autonoma de Aguascalientes, Avenida Universidad # 940 Ciudad Universitaria, 20131 Aguascalientes, Aguascalientes, Mexico. E-mail: digahela.87@gmail.com

19414. Faillace, C.A.; Sentis, A.; Montoya, J.M. (2021): Eco-evolutionary consequences of habitat warming and fragmentation in communities. Biological Reviews 96(5): 1933-1950 (in English) ["Eco-evolutionary dynamics can mediate species and community responses to habitat warming and fragmentation, two of the largest threats to biodiversity and ecosystems. The eco-evolutionary consequences of warming and fragmentation are typically studied independently, hindering our understanding of their simultaneous impacts. Here, we provide a new perspective rooted in trade-offs among traits for understanding their eco-evolutionary consequences. On the one hand, temperature influences traits related to metabolism, such as resource acquisition and activity levels. Such traits are also likely to have trade-offs with other energetically costly traits, like antipredator defences or dispersal. On the other hand, fragmentation can influence a variety of traits (e.g. dispersal) through its effects on the spatial environment experienced by individuals, as well as properties of populations, such as genetic structure. The combined effects of warming and fragmentation on communities should thus reflect their collective impact on traits of individuals and populations, as well as trade-offs at multiple trophic levels, leading to unexpected dynamics when effects are not additive and when evolutionary responses modulate them. Here, we provide a road map to navigate this complexity. First, we review single-species responses to warming and fragmentation. Second, we focus on consumer–resource interactions, considering how eco-evolutionary dynamics can arise in response to warming, fragmentation, and their interaction. Third, we illustrate our perspective with several example scenarios in which trait trade-offs could result in significant eco-evolutionary dynamics. Specifically, we consider the possible eco-evolutionary consequences of (i) evolution in thermal performance of a species involved in a consumer–resource interaction, (ii) ecological or evolutionary changes to encounter and attack rates of consumers, and (iii) changes to top consumer body size in tri-trophic food chains. In these scenarios, we present a number of novel, sometimes counter-intuitive, potential outcomes. Some of these expectations contrast with those solely based on ecological dynamics, for example, evolutionary responses in unexpected directions for resource species or unanticipated population declines in top consumers. Finally, we identify several unanswered questions about the conditions most likely to yield strong eco-evolutionary dynamics, how better to incorporate the role of trade-offs among traits, and the role of eco-evolutionary dynamics in governing responses to warming in fragmented communities." (Authors) The publication includes many references to Odonata.] Address: Faillace, Clara, Theoretical and Experimental Ecology Station, French National Centre of Scientific Research (CNRS), 2 Route du CNRS, Moulis, 09200, France

19415. Faria, A.P.J.; Paiva, C.K.S.; Calvão, L.B.; Martins Cruz, G.; Juen, L. (2021): Response of aquatic insects to an environmental gradient in Amazonian streams. Environmental Monitoring and Assessment volume 193, Article number: 763 (2021): 12 pp. (in English) ["The increasing land use in the Amazon region has resulted in the widespread substitution of forest areas with pasture and bauxite mining. These land uses reduce the forest cover of streams and modify their characteristics, reducing the diversity of aquatic insect assemblages. In the present study, we aimed to identify the threshold of the assemblages of the larvae of insects of the orders Ephemeroptera, Plecoptera, and Trichoptera (collectively known as EPT), and adults of the order Odonata, along an environmental gradient of land use and land cover (LULC). We sampled 30 streams along an environmental gradient determined by the proportion of forest, pasture, and bauxite mining observed within the catchment of each stream. We identified 12 taxa associated with forest (nine positively and three negatively) and four negatively associated with pasture. However, no taxa were associated explicitly with the bauxite mining gradient. As forest is converted to pasture, the abundance and frequency of occurrence of the taxa sensitive to pasture are reduced, reflecting their environmental sensitivity and their potential as sentinels of preserved streams. The identification of the thresholds of the EPT and odonates taxa allowed us to determine which of these organisms are positively or negatively associated with the environmental gradient of LULC in Amazonian streams. We hope that the results of the present study can be applied in future biomonitoring programs, particularly for monitoring the response of aquatic insects to the degradation of streams." (Authors)] Address: Faria, Ana Paula Justino, Laboratório de Ecologia e Conservação, Instituto de Ciências Biológicas, Universidade Federal Do Pará, Rua Augusto Corrêa, Rua Augusto Corrêa, nº.1, Bairro Guamá, Belém, Pará, CEP 66.075-110, Brazil

19416. Fraleigh, D.C.; Heitmann, J.B.; Robertson, B.A. (2021): Ultraviolet polarized light pollution and evolutionary traps for aquatic insects. Animal Behaviour 180: 239-247. (in English) ["Highlights: • We document a new type of pollution, ultraviolet polarized light pollution (UVPLP). • UVPLP is created by artificial objects and occurs nocturnally and diurnally. • Of six families of aquatic insect field-tested, only one used UVPLP to locate water. • UVPLP can attract animals to artificial surfaces, creating evolutionary traps. Abstract: When animals are misguided by evolved behavioural cues to preferentially make mistakes, they are caught in an

evolutionary trap. Aquatic insects rely heavily on polarized light cues to locate bodies of water necessary for oviposition and mating. However, where artificial objects (e.g. asphalt, buildings) are at least as effective at polarizing light as natural water bodies, aquatic insects may instead prefer to oviposit on those surfaces where there eggs fail to hatch. These objects are known to create evolutionary traps by polarizing light in the visible range (390–700 nm), yet their potential for creating evolutionary traps via the reflection of ultraviolet (UV) wavelengths (<380 nm) remains largely unknown. We surveyed the natural and artificial environment to understand the properties of objects that can polarize natural and artificial sources of UV light and conducted a multiple-choice field experiment to test the importance of UV polarized light in guiding habitat selection behaviour in six families of aquatic insects. We found that UV polarized light was associated with natural water bodies, was a common component of the man-made environment created by sunlight reflecting off vehicles, buildings and solar panels during the day, and originating from lamplight with a UV component at night. One of the six families of aquatic insects we examined was preferentially attracted only to UV polarized light sources, indicating that UV polarized light is a cue used in habitat selection. These results highlight a quantitatively new type of ecological light pollution capable of creating evolutionary traps for polarotactic insects at night, or even during the day." (Authors) The study includes references to Odonata.] Address: Robertson, B.A., Division of Science, Mathematics and Computing, Bard College, Annandale-on-Hudson, NY, U.S.A. E-mail: broberts@bard.edu

19417. Galicia-Mendoza, D.I.; Sanmartín-Villar, I.; García-Miranda, O.; Cordero-Rivera, A. (2021): Territorial damselflies are larger and show negative allometry in their genitalia. Biological Journal of the Linnean Society 134(3): 697-706. (in English) ["The 'functional allometry' hypothesis proposes that the variation in allometric patterns of sexually selected traits is related to their function. We hypothesize that the allometric patterns for genitalia of aggressively territorial organisms are different from those in non-territorial organisms and predict that in aggressively territorial species, where body size is related directly to reproductive success, males must allocate more resources to body size than to genitalia. We studied 59 species of damselflies in 51 genera. Species were divided into three categories: highly territorial and aggressive; low aggressive; and not aggressive. We measured the length of the genital ligula, the width at the basis and its maximum width, and we used body length and wing length as descriptors of body size. The slope of allometric relationships was estimated using ordinary least squares and reduced major axis regressions. Our results indicated first, that territorial damselflies are larger and that body length and wing length are not equivalent as estimators of body size in odonates. Second, ordinary least squares and reduced major axis regressions provided different results in some of the analyses. Third, we found that aggressive species have less steep allometric slopes than non-aggressive species, both for the length of the ligula and for the width at its basis." (Authors)] Address: Cordero-Rivera, A., Laboratory of Evolutionary & Conservation Ecology, Universidade de Vigo, E.E. Forestal, Campus A Xunqueira, 36005 Pontevedra, Spain. E-mail: adolfo.cordero@uvigo.gal

19418. García-Monsalve, M.V.; Altamiranda-Saavedra, M.; Palacino Rodríguez, F.; Cordero-Rivera, A. (2021): Demographic traits and behavior of Hetaerina cruentata (Odonata: Calopterygidae) in ecosystems of the Andean region of Colombia. International Journal of Odonatology 24: 261-273. (in English) ["Demography and territorial behavior of Hetaerina cruentata was studied along three lowland streams located at Norte de Santander department in the Colombian Andean region. Adult damselflies (N: 278) were individually marked, and using their recapture histories we estimated survival, longevity, sex ratio, age groups and population size at each location. We found no evidence for survival differences between ages and sexes. However, the proportion of resighted individuals was lower for females, and the sex ratio was male-biased in all populations. Although we recorded few reproductive events, a high number of male-male agonistic interactions were registered around midday. During reproductive behavior, we observed brief wing displays as signals between males and females, and the formation of the tandem position, followed by the intramale sperm translocation and copulation (mean duration 11.3 min). After copulation, the pair in tandem looked for suitable sites to oviposit, and then the male broke tandem and perched on the vegetation while the female laid eggs partially or completely underwater. The recapture probability was time-dependent, which suggests that the alternation of rainy and sunny days during the study may be generating differences in the demography of the three H. cruentata populations." (Authors)] Address: Palacino Rodríguez, F., Research Group on Odonates and other arthropods of Colombia (GINOCO), Acarology Research Center, Bogotá, Colombia. Email: odonata107@gmail.com

19419. Garda-Miranda, O.; Carrillo-Munoz, A.I. (2021): New records for Puebla and Morelos, Mexico (Odonata: Aeshnidae, Coenagrionidae, Libellulidae). Notulae odonatologicae 9(8): 331-334. (in English) ["Seven species of odonates new to Puebla and one to Morelos urban areas were identified from the entomological collection of the Universidad de las Americas Puebla (UDLAP), Mexico. Rarely observed species such as Argia extranea and A. westfalli were recorded in Puebla and Veracruz, respectively. Argia fumipennis, Ischnura demorsa, I. ramburii, Anax junius, and Triacanthagyna septima are discussed in detail. The ecological importance of the UDLAP campus, 'Flor del Bosque' State Park and Atlixco, is also noted. These records add to the knowledge of odonate distribution from Puebla, Morelos, and Veracruz." (Authors)] Address: Garda-Miranda, O., Departamento de Ciencias Qulmico-Biologicas, Universidad de las Americas Puebla, Ex-Hacienda Santa Catarina Martir, C. P. 72810 Puebla, Mexico. Email: oscar.garcia.miranda@outlook.com

19420. Gauci, C. (2021): First records of Trithemis kirbyi Selys, 1891 in the Maltese Islands (Odonata: Libellulidae).

Fragmenta entomologica 53(2): 423-425. (in English) ["In this contribution the author reports the first sightings of T. kirbyi in the Maltese Islands. Two single males were found at Imselliet Valley and Chadwick Lakes on 17 May 2020 and 13 Aug 2020 respectively." (Author)] Address: Gauci, C., 28 Triq il-Kissier, Mosta, Malta. Email: cjgauci48@yahoo.com

19421. Gauci, C. (2021): Anax ephippiger (Burmeister) (Vagrant Emperor) larvae surviving the winter and emerging in spring in the Maltese Islands. J. Br. Dragonfly Society 37(2): 82-86. (in English) ["Following the discovery of successful breeding of A. ephippiger in the Maltese Islands in late autumn 2019, three larvae of this species were confirmed to have emerged in spring 2020 clearly indicating that the larvae had managed to survive the winter. Another fresh exuvia was found at Imselliet Valley in May 2020. Four sightings of mature males in April were deemed to have been locally emerged individuals since there was no evidence of migration." (Author)] Address: Gauci, C., 28 Triq il-Kissier, Mosta, Malta MST1822

19422. Geraldo de Carvalho, F.; Duarte, L.; Nakamura, G.; Dubal dos Santos Seger, G.; Juen, L. (2021): Changes of phylogenetic and taxonomic diversity of Odonata (Insecta) in response to land use in Amazonia. Forests 2021, 12, 1061. https://doi. org/10.3390/f12081061: 15 pp. (in English) ["Changes in natural habitats for human use can alter the distribution of biodiversity, favoring species that are more tolerant to environmental disturbance. Usually, these species comprise clades of habitat generalists, which have biological mechanisms to colonize environments with different environmental conditions. However, such effects are still poorly understood for most biological groups, such as the Amazon odonates. Therefore, this study aims to evaluate the effects of land use along an environmental gradient on the phylogenetic and taxonomic diversity of Odonata in the Amazon. We tested the following hypotheses: In deforested areas (e.g., pasture for cattle, palm plantation, and logging), the Odonata community will be more taxonomically and phylogenetically impoverished than in forested areas. We assume that the modification of the natural habitat causes loss of specialist forest species and favors specialist species of open areas and/or habitat generalists. Data sampling was performed in 195 streams under different land-use types: livestock areas, palm monoculture, timber exploitation, and forest areas taken as reference sites. Our results showed that anthropogenic impacts affected the phylogenetic diversity of odonates and the increase in shrub vegetation was related to the increase in the phylogenetic diversity of communities. On the other hand, shrub vegetation is indicative of disturbed areas, where secondary vegetation predominates, with less canopy cover due to the absence or discontinuity of the native tree cover in these habitats. Nonetheless, species richness and abundance were not related to the effects of anthropogenic land use. Finally, our results suggest that the phylogenetic diversity of Amazonian odonates is related to riparian vegetation structure." (Authors)] Address: Juen, L., Programa de Pós-graduação em Ecologia, Universidade Federal do Pará-UFPA, Rua Augusto Correia, No Bairro Guamá, Belém 66075-110, Brazil. E-mail: leandrojuen@ufpa.br

19423. Guadin, B.; Gazzola, A.; Balestrieri, A.; Scribano, G.; Martín, J.; Pellitteri-Rosa, D. (2021): Effects of a group-living experience on the antipredator responses of individual tadpoles. Animal Behaviour 180: 90-99. (in English) ["Highlights: • Tadpoles reared alone were not very active even in predator-free tubs. • Predator-exposed tadpoles were bolder in the presence of conspecifics' cues. • However, this was observed only in tadpoles from the highest density treatment. Abstract: The tendency to aggregate during the larval stage is widespread and highly variable among anuran species. Several studies have highlighted the link between tadpole group density and their activity level, confirming that, usually, living in groups brings several antipredator benefits. However, nearly all studies have focused on the average behavioural responses of tadpoles tested in groups. In this study, we explored the effects of living in groups of three different sizes (1, 5 and 25 individuals per group) on the antipredator behaviour of individual green toad, Bufotes balearicus, tadpoles. We first assessed their basal activity and then examined changes in mobility rate and total distance after exposure to the chemical cues of predatory dragonfly, Aeshna cyanea, larvae. For both the pre- and poststimulus activity levels, we also tested the effects of the presence of conspecifics' chemical cues in the experimental tub. Our results showed that (1) a previous brief (8 days) experience of group living is sufficient to affect the basal level of activity of individual tadpoles, which increased with group size; (2) tadpoles that were reared alone did not lower their activity further when exposed to predators' odour; (3) the antipredator response of high-density-reared tadpoles decreased in the presence of conspecifics' cues, supporting the so-called dilution effect, which, anyway, may need a minimum group size to be apparent. We conclude that both previous group-rearing experience and current perception of the surrounding environment may affect antipredator behaviour in individual tadpoles." (Authors)] Address: Guadin, Bianca, Dipto di Scienze Della Terra e Dell'Ambiente, Univ. di Pavia, Pavia, Italy. E-mail: bianca.guadin01@universitadipavia.it

19424. Guillermo, R.; Juen, L. (2021): Odonate ethodiversity as a bioindicator of anthropogenic impact. International Journal of Odonatology 24: 149-157. (in English) [Mnesarete pudica, harassment, courtship, contest, chase, patrol "The increasing use of dragonflies and damselflies as models in studies on biodiversity in the last decades has unraveled several features of natural processes and mechanisms for species conservation. Nevertheless, biodiversity is a polysemic concept that resolves multiple dimensions that, together, enroll what we observe as species and lineages diversity. One of these dimensions is Ethodiversity, which may represent the individual diversity of behavioral traits and higher organization levels. Hence, measures of Ethodiversity may be used as indicator tools to measure such dimensions of biodiversity. However, we still lack methods and protocols to measure this diversity. Therefore, here we addressed whether damselfly behaviors may act

as indicators of environmental impacts. We collected behavioral data of 120 males in two sites, one in an ecological reserve and another in an impacted habitat. Our results show differences in behavioral syndromes and behavioral integrity when comparing populations in impacted and conserved environments. In conclusion, we hope that these results stimulate future endeavors to create a methodological framework to assess behavioral diversity." (Authors)] Address: Guillermo, R., Lestes Lab, Univ. Federal do Triângulo Mineiro, Uberaba, MG, Brazil. rhainerguillermo@gmail.com

19425. Guillermo-Ferreira, R. (2021): Wing-clapping in the damselfly Mnesarete pudica - a mating call? (Odonata: Calopterygidae). Odonatologica 50(1/2): 43-54. (in English) [" Wing-clapping is a conspicuous and poorly understood behavioural trait in damselflies. Its function has long been debated and several hypotheses have been proposed to explain why damselflies clap their wings, even when there is no other damselfly nearby. Here, I outline the existing hypotheses: (i) the territorial declaration hypothesis, which suggests that wing-clapping is used by males to proclaim territorial ownership to rivals; (ii) the thermoregulation hypothesis, which suggests that wing-clapping cools the body; and (iii) the courtship hypothesis, which suggests that wing-clapping is integral to the courtship behaviour of males. To these I add a fourth hypothesis, the mating call effect, which States that males use wing-clapping as a conspicuous Signal to attract mates, prior to courtship. I tested these hypotheses in the neotropical calopterygid Mnesarete pudica. The investigation was conducted in the field in Minas Gerais and São Paulo, Brazil, with frequencies of different behaviours being recorded by direct observation of marked individuals. The results show no Support for the territorial, thermoregulation, or the courtship hypotheses. A strong association between wing-clapping and other potential Signals such as brief flights and perch shifts is evident. I conclude that wing-clapping behaviour in Mnesarete pudica, and perhaps in other damselflies, may increase male conspicuousness to females and attract them to territories." (Author)] Address: Guillermo-Ferreira, R., Lestes Lab, Dept Hydrobiol., Fed. Univ. São Carlos - UFSCar, São Carlos, São Paulo, Brazil. Email: rhainerguillermo@gmail.com

19426. Gurung, M.M.; Kalkman, V.; Bhandari, G.S.; Dhimal, A. (2021): Nine new species of dragonfly and damselfly for Bhutan (Insect: Odonata) with a note on Calicnemia mortoni. Agrion 25(1): 22-28. (in English) ["Nine species mainly from three southern districts of the country (Samtse, Sarpang, and Samdrupjongkhar) are recorded as new to Bhutan. These records were largely collected during opportunistic sampling conducted between 20-vii-2018 and 10-vii-2020. In addition, records are also included based on photographs submitted to the Facebook page “Dragonflies and Damselflies of Bhutan-Eastern Himalayas”. The species recorded as new to Bhutan are: Anax ephippiger Burmeister, 1839, Agriocnemis pygmaea Rambur, 1842, Neurothemis intermedia Rambur, 1842, Bradinopyga geminata Rambur, 1842, Indothemis limbata Selys, 1891, Brachydiplax sobrina Rambur, 1842, Rhyothemis variegata Linnaeus, 1763, Orthetrum chrysis Selys, 1891 and Tramea basilaris Palisot de Beauvois, 1817. These records bring the number of species known from Bhutan to 128. The first field pictures of Calicnemia mortoni (Laidlaw, 1917) are also presented and the characters of this poorly known species are discussed." (Authors)] Address: Gurung, M.M., College of Natural Resources, Royal University of Bhutan, Lobesa-Punakha, Bhutan. E-mail: merman.gurung93@gmail.com

19427. Hämäläinen, M. (2021): Platycnemis sasakii Asahina, 1949 - a distinct species, endemic to Japan (Odonata: Platycnemididae). Odonatologica 50(3/4): 251-260. (in English) [" The taxonomic status of the endemic Japanese damselfly taxon, Platycnemis foliacea sasakii Asahina, 1949 (type locality: Tokyo), is upgraded from subspecies to species, P. sasakii. Several clear structural differences (including the shape of wings, density of wing venation, ratio of wing and abdomen lengths, shape of middle and hind tibiae) between males of P. sasakii and the continental Chinese P. foliacea Selys, 1886 (type locality: Beijing) are presented to support this action." (Author)] Address: Hämäläinen, M., Naturalis Biodiversity Center, Leiden, The Netherlands. Email: matti.hamalainen@helsinki.fi

19428. Haug, J.T.; Müller, P.; Haug, C. (2021): Fossil dragonfly-type larva with lateral abdominal protrusions and implications on the early evolution of Pterygota. iScience 24, 103162, October 22, 2021: 10 pp. (in English) ["Highlights: - A new dragonfly-type larva was found in Kachin amber (Myanmar, 99 million years old). - The larva possesses a terminal filum, which is not known in modern dragonfly larvae. - It also exhibits lateral abdominal protrusions where in other lineages gills occur. - This find makes an aquatic larva in the ground pattern of Pterygota more likely. Summary: Aquatic larvae are known in three early branches of Pterygota: Ephemeroptera, Plecoptera and Odonata. A common origin of these larvae has been suggested, yet also counterarguments have been put forward, for example, the different position of larval gills: laterally on the abdomen in Ephemeroptera, terminally in Odonata, variably in Plecoptera. We discuss recent fossil findings and report a new dragonfly-type larva from Kachin amber (Myanmar), which possesses ancestral characters such as a terminal filum, maintained in ephemeropterans, but lost in modern odonatan larvae. The new larva possesses lateral protrusions on the abdominal segments where in other lineages gills occur. Together with other fossils, such as a plecopteran retaining lateral gills on the abdomen, this indicates that lateral protrusions on the abdomen might have well been an ancestral feature, removing one important argument against the idea of an aquatic larva in the ground pattern of Pterygota." (Authors)] Address: Haug, Caroline, Ludwig-Maximilians-Univ. München (LMU Munich), Biocenter, Großhaderner Str. 2, 82152 Planegg-Martinsried, Germany. Email: carolin.haug@palaeo-evo-devo.info

19429. Hayles, A.; Hasan, J.; Bright, R.; Palms, D.; Brown, T.; Barker, D.; Vasilev, K. (2021): Hydrothermally etched titanium: a review on a promising mechano-bactericidal

surface for implant applications. Materials Today Chemistry 22, December 2021, 100622: (in English) ["Highlights: • Mechano-bactericidal titanium can be easily and cheaply fabricated by hydrothermal etching. • Surface topographical features can be tuned based on defined fabrication parameters. • The bactericidal mechanism is due to mechanical interaction and downstream metabolic effects. • Efficacy is determined by surface morphology and biological characteristics of bacteria. • Hydrothermally etched titanium is permissive to host tissue and suitable for implantation. Abstract: The growing demand for titanium-based implants and the subsequent rise in implant-associated infections necessitate novel developments in anti-infective technologies. Recent research has drawn inspiration from nature to solve this problem. The nanoscale topography observed on cicada and dragonfly wings serves as a blueprint for synthetic analogs which seek to kill bacteria on contact through mechanical forces. This type of interaction has been dubbed the mechano-bactericidal effect. Various techniques have been utilized to mimic and improve upon these natural bactericidal surfaces. Alkaline hydrothermal etching is a simple and cost-effective technique to fabricate nanoscale protrusions on titanium and its alloys. This review aims to consolidate the current knowledge surrounding how fabrication parameters lead to varying surface topographies on titanium substrates, and subsequently, how surface topography and bacterial characteristics affect bactericidal activity. The bactericidal mechanism of hydrothermally etched titanium is inferred from comparisons with similar mechano-bactericidal biomaterials. The hostility of hydrothermally etched titanium toward bacteria is discussed in contrast to the observed host cell compatibility. Last, suggestions are made for the standardization of terminology in this emerging field.] Address: Vasilev, K., Academic Unit of STEM, Univ. of South Australia, Mawson Lakes, Adelaide, 5095, South Australia, Australia. Email: krasimir.vasilev@unisa.edu.au

19430. Hering, J.; Fischer, S.; Geiter, O.; Wobker, J.; Siegel, S.; Späth, L.; Grimm, H.; Habib, M. (2021): Breeding colonies of Gull-billed Tern Gelochelidon nilotica and Little Tern Sternula albifrons on Lake Nasser, Egypt. Sandgrouse 43: 194-215. (in English) ["Knowledge of the breeding of Gull-billed Tern Gelochelidon nilotica and Little Tern Sternula albifrons on Lake Nasser in southern Egypt is scarce. ... Diet analyses of 46 Gull-billed Tern pellets showed that dragonflies were the main food source for the species (83.7% of all animal food items)..." (Authors)] Address: Hering, J., Wolkenburger Str. 11, 09212 Limbach-Oberfrohna, Germany. Email: jenshering.vso-bibliothek@t-online.de

19431. Hill, M.J.; Wood, P.J.; Fairchild, W.; Williams, P.; Nicolet, P.; Biggs, J. (2021): Garden pond diversity: opportunities for urban freshwater conservation. Basic and Applied Ecology 57: 28-40. (in English) ["Urbanisation is increasing globally, degrading terrestrial and freshwater habitats and reducing faunal and floral richness. Whilst the potential for garden ponds to serve as important biodiversity resources in urban areas has been documented in a limited number of studies, quantifying the contribution of garden ponds to urban freshwater diversity has been largely neglected. This study aims to quantify the taxonomic richness, community composition and conservation value of aquatic macroinvertebrates in domestic garden and non-urban ponds. Taxonomic richness was significantly lower in garden ponds than non-urban ponds at an alpha and gamma scale. A greater richness of Odonata, Coleoptera, Gastropoda and Hemiptera were recorded in non-urban ponds. Garden ponds were found to support compositionally different macroinvertebrate communities compared to non-urban ponds, influenced by variation in water depth and conductivity. A total of 23 taxa were recorded from garden ponds only. Non-urban ponds had a significantly higher conservation value compared to garden ponds (87% of garden ponds were of low or moderate conservation value, while only 35% of non-urban ponds were in these categories). Although urban garden ponds currently support limited macroinvertebrate diversity and have lower conservation value, they contribute to the regional species pool and their potential to limit future urban biodiversity loss is significant. Given their high abundance and popularity within the urban landscape, clear guidance is required for pond-owners on how to best manage garden ponds to support and sustain biodiversity. For this to be achieved, research is required to increase fundamental understanding of urban pond ecology, and the development of evidence led garden pond management practices." (Authors)] Address: Hill, M.J., School of Applied Sciences University of Huddersfield, Queensgate, Huddersfield, HD1 3DH, UK. Email: m.hill@hud.ac.uk

19432. Ivanova, E.P.; Linklater, D.P.; Medina, A.A.; Le, P.; Baulin, V.A.; Nguyen, H.K.D.; Curtain, R.; Hanssen, E.; Gervinskas, G.; Ng, H.S.; Truong, V.K; Luque, P.; Ramm, G.; Wösten, H.A.B.; Crawford, R.J.; Juodkazis, S.; Maclaughlin, S.bj (2021): Antifungal versus antibacterial defence of insect wings. Journal of Colloid and Interface Science 603: 886-897. (in English) ["Highlights: • We present a novel concept of dual defence against surface colonisation of insect wings by bacteria and fungi. • The antifouling and antibacterial properties of insect wings can be attributed to the unique combination of nanoscale structures on the wing surface. • The robust fungal-repelling properties of damselfly wing surfaces were demonstrated to arise from the presence of entrapped air, facilitated by the surface nano-topography. Abstract: Hypothesis: The ability exhibited by insect wings to resist microbial infestation is a unique feature developed over 400 million years of evolution in response to lifestyle and environmental pressures. The self-cleaning and antimicrobial properties of insect wings may be attributed to the unique combination of nanoscale structures found on the wing surface. Experiments: In this study, we characterised the wetting characteristics of superhydrophobic damselfly Calopteryx haemorrhoidalis wings. We revealed the details of air entrapment at the micro- and nano scales on damselfly wing surfaces using a combination of spectroscopic and electron microscopic techniques. Cryo-focused-ion-beam scanning electron microscopy was used to directly observe fungal spores and conidia that were unable to cross the air-liquid interface. By contrast, bacterial cells were able to

cross the air-water interface to be ruptured upon attachment to the nanopillar surface. The robustness of the air entrapment, and thus the wing antifungal behaviour, was demonstrated after 1-week of water immersion. A newly developed wetting model confirmed the strict Cassie-Baxter wetting regime when damselfly wings are immersed in water. Findings: We provide evidence that the surface nanopillar topography serves to resist both fungal and bacterial attachment via a dual action: repulsion of fungal conidia while simultaneously killing bacterial cells upon direct contact. These findings will play an important role in guiding the fabrication of biomimetic, anti-fouling surfaces that exhibit both bactericidal and anti-fungal properties." (Authors)] Address: Ivanova, Elena P., School of Science, College of Science, Engineering & Health, RMIT Univ., Melbourne, Victoria 3001, Australia. E-mail: elena.ivanova@rmit.edu.au

19433. Jocque, M.; Slootmakers, D.; Wellens, S.; De Roland, L.-A.R.; Mittermeier, J.C.; Wright, D. (2021): Notes on some collections of dragonflies from northern Madagascar. Notulae odonatologicae 9(7): 306-313. (in English) ["The Madagascar dragonfly fauna remains poorly documented. We list dragonfly observations from two Rapid Biodiversity Surveys in Mahajanga Province, northern Madagascar. Surveyed sites include a coastal area with several lakes close to Mariarano sampled in 2016 and a montane forested area with isolated forest patches in the Mahimoborondro and Bemanevika protected areas in north-central Madagascar close to Bealalana sampled in 2019. A total of 40 species were collected with observations made on three species IUCN listed as data deficient: Tatocnemis sinuatipennis, Neodythemis cf. trinervulata, and Pseudagrion simile." (Authors)] Address: Jocque, M., Biodiversity Inventory for Conservation NPO (BINCO), Walmersumstraat 44, 3380 Glabbeek, Belgium. Email: merlijn.jocque@binco.eu

19434. Kaiser, A.; Parkinson, D. (2021): Projet LIFE Ardenne liégeoise: réponse des libellules et papillons de jour aux travaux de restauration. Naturalistes Belges 2021, Les Naturalistes belges 102(1): 1-29. (in French, with English summary) ["During the 20th century, human activities and the abandonment of traditional agricultural practices led to the degradation of natural habitats on the Belgian high plateaux of the Liège Ardennes. The goal of the Ardenne liégeoise LIFE project (2012-2020) was to restore these habitats and to improve ecological connectivity between the Plateau des Tailles and the Hautes Fagnes. The aim of this paper is to provide an overview of the responses of dragonflies and butterflies to restoration actions undertaken within the framework of the project. On the basis of standardised transects and data obtained from regional naturalist databases, we show a generally positive and rapid response of dragonflies. In particular, many peat bog specialists expanded their range within the perimeter of the project by its completion. Butterflies show a more contrasted response and species associated with wet grasslands show negative trends in the study region despite restoration actions. Dragonfly and butterfly monitoring should continue to confirm these trends and refine their evaluation....Increase in peatland specialist species: All 8 typical bog species (Aeshna juncea, A. subarctica, Coenagrion hastulatum, Leucorrhinia dubia, L. rubicunda, Orthetrum coerulescens, Somatochlora arctica and Sympetrum danae) were recorded in the project area, both during the period 2006-2014 and 2015-2019. Fig. 7 shows the number of bog species observed per site for the periods 2006-2014 and 2015-2019, for the selection of 20 sites where water works were undertaken. In the period 2006-2014, seven of these sites had no peatland species and three had only one peatland species, showing that the majority of sites where waterworks were undertaken were initially (very) poor in peatland species. After the restoration work was completed, all sites had at least one peatland species, with the number varying between 1 and 8 (dominant value: 3). It was possible to observe all typical bog species on one site (Fagne de Malchamps) during the period 2015-2019. This increase in the number of sites in this selection of 20 sites is also visible on a more global scale: Table 5 shows the number of sites occupied by each peatland species at the scale of the project area (49 sites in total), for the two periods considered. Six species (Aeshna juncea, Coenagrion hastulatum, Leucorrhinia dubia, L. rubicunda, Orthetrum coerulescens and Sympetrum danae) were detected in a greater number of sites than in the reference period, while the number of sites occupied by the other two species (Somatochlora arctica and Aeshna subarctica) remained stable. For the majority of species, apparent local extinctions are nevertheless noted. Progression of pioneer species and the case of Leucorrhinia pectoralis: Pioneer species have also benefited greatly from the creation of new water bodies (on 24 of the 49 sites concerned by the project), as shown by the progress of Libellula depressa and Ischnura pumilio. The case of Leucorrhinia pectoralis is more complex. This species was first observed in 2010 at a site on the Plateau des Tailles (Grande Fange de Bihain), then again at the same location in 2012. In the following years, the number of sightings and the sites where the species is observed increases. Numbers vary greatly from one year to the next (maximum of seven individuals observed simultaneously at the same site) and observations are mainly concentrated in even-numbered years, especially in 2012 and 2018, years of leucorrhines influx. Of the 25 observations reported since 2010, 15 concerned single individuals and only one observation explicitly mentioned the presence of females. It should be noted that only two sites are frequented several years, which leads to a constant increase in the number of cumulative sites where the species is contacted. Thus, between 2010 and 2019, 14 sites had at least one record of L. pectoralis." (Authors) http://naturalistesbelges.be/wp-content/uploads/2021/10/Natbelg102_2021_1.-pdf] Address: Kaiser, Aurélien, Behavioural Ecology & Conservation Group, UC Louvain, Louvain-la-Neuve, Belgium. Email: kaiser.aurelien@gmail.com

19435. Kalkman, V.J. (2021): Ophiogomphus caudoforcipus Yousuf & Yunus, 1977, is a synonym of Ophiogomphus reductus Calvert, 1898. Notulae odonatologicae 9(7): 277-280. (in English) ["O. caudoforcipus, is only known from a single male collected on 04-viii-1966 at Mingora (Pakistan).

Based on a comparison between the description and material of O. reductus at the RMNH it is concluded that O. caudoforcipus is a junior synonym of O. reductus." (Authors)] Address: Kalkman, V.J., Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands. Email: vincent.kalkman@naturalis.nl

19436. Kalkman, V.J.; Blagoderov, V. (2021): On the synonymy of Pseudagrion bidentatum Morton, 1907, with P. hypermelas Selys, 1876. Notulae odonatologicae 9(7): 281-284. (in English) ["No new information on P. bidentatum has been published since its original description by Morton in 1907 based on a single male from western India. Although this species was already regarded as a synonym of either P. hypermelas Selys, 1876, or P. spencei Fraser, 1922, by Fraser in 1933 it was still treated as a valid species on later checklists. Based on a study of the original description and the holotype held at the National Scottish Museum, Edinburgh, we conclude that P. bidentatum is a junior synonym of P. hypermelas." (Authors)] Address: Kalkman, V.J., Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands. Email: vincent.kalkman@naturalis.nl

19437. Kalkman, V.J. (2021): On the synonymy of Agriocnemis corbeti Kumar & Prasad, 1978, with Agriocnemis pygmaea Rambur, 1842 (Odonata: Coenagrionidae). Notulae odonatologicae 9(8): 353-357. (in English) ["No new information on Agriocnemis corbeti has been published since its original description from 1978 based on a teneral male and five teneral females from Dehra Dun Valley, Uttarakhand, India. Based on a study of the original description it is concluded that the characters mentioned in the diagnosis are of little use as they can be found in the immature stages of several species of Agriocnemis. The characters mentioned in the description are difficult to interpret but the drawing of the appendages suggest that A. corbeti is conspecific with A. pygmaea. Agriocnemis corbeti is therefore considered a synonym of A. pygmaea. Records of A. pieris from Bangladesh are discussed and are all judged to belong to A. lacteola, with the former considered not to occur in Bangladesh." (Author)] Address: Kalkman, V.J., Naturalis Biodiversity Center, Leiden, The Netherlands. Email: vincent.kalkman@naturalis.nl

19438. Karube, H.; Kameda, H.; Kaga, R.: & Fujita, E. (2021): Contamination status on the neonicotinoid insecticide for the habitats of endangered dragonfly Libellula angelina Selys, 1883 in Japan). Tombo 63: 1-7. (in Japanese, with English summary) ["Libellula angelina Selys, 1883 has been designated as a critically endangered species on the Red List of the Japanese Ministry of the Environment. Amongst Japanese dragonfly species its decline is particularly strong. The authors publish the results of the analysis of the occurence of neonicotinoid-type agricultural chemicals performed in April 2019 of almost all breeding locations of this species. The analysis of 14 samples of 6 locations found low concentrations of clothianidin in three samples from two locations. On the other hand it detected the presence of Fipronil, which is known to affect the larvae of dragonflies strongly, in all samples. Moreover, in eight of the fourteen samples the pollution concentrations exceeded the environmental standard. It is possible that the recent decline of this species is caused by tins chemical substance." (Authors)] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp

19439. Kawata, N., Yoshida, M., Udono, K. & Sugimura, M. (2021): Behaviour and morphological characteristics of a gynandromorph individual of Nannophya pygmaea Rambur, 1842 (Libellulidae: Odonata). Tombo 63: 8-15. (Japanese, with English summary) ["A gynandromoroh of N. pygmaea was observed in Toyota City, Aichi Prefecture. There is no detailed report on the behavior of gynandromorph individual of Odonata in Japan. Although no reproductive behavior was observed, the gynandromorph had mud on its distal abdomen, which implies ovipositional or oviposition-like behavior. In addition, no territorial behavior like males was performed. These observations suggest that the behavior of this specimen may be closer to that of females, rather than of males. In its morphology, female characteristics appear strongly, except for the left side of the head and thorax, suggesting its behavior may related." (Authors)] Address: Kawata, N.: Email: leo.gacchan@gmail.com

19440. Khan, M.K. (2021): Gynacantha chaplini sp. nov., a new dragonfly from Bangladesh (Odonata: Aeshnidae). Odonatologica 50(1/2): 95-105. (in English) ["Gynacantha chaplini sp. nov. is described based on a male collected from the north-eastern region of Bangladesh. Distinguishing features of the adult male are illustrated and discussed. Gynacantha chaplini sp. nov. is distinguished from its congeners by a dark brown trapezium-shaped mark on the postfrons. An updated key is provided to identify the males of the Gynacantha species known from South Asia (Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka)." (Author)] Address: Khan, M.K., Dept of Biochemistry & Molecular Biology, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh. Email: bmbkawsar@gmail.com

19441. Khan, M.K.; Hämäläinen, M. (2021): The rare and beautiful damselfly Rhinocypha trimaculata rediscovered in Bangladesh: With notes on earlier records, redescription of male and distinguishing characters from R. ignipennis (Odonata: Chlorocyphidae). Notulae odonatologicae 9(8): 315-330. (in English) ["Rhinocypha trimaculata Selys, 1853, is a very rare species, for which only four records have been previously published (twice in the 19th century and twice in the 20th century; most recently recorded in Assam in 1973). The species was rediscovered and photographically documented in Sylhet Division of Bangladesh in 2014. Later, in 2018, two male specimens were collected at the same site. All known earlier records of this species are documented and discussed. The male of R. trimaculata is redescribed and illustrated, including SEM photos of the penis. Diagnostic features, differentiating R. trimaculata and the related R. ignipennis Selys, 1879, a montane species from north-eastern India and western Burma, are provided together with

photographs of type specimens of both species. Habitats and behaviour of R. trimaculata are discussed. We note that this vulnerable or endangered species appears to be confined to small forest streams in lowland areas within a small range in northeastern India and Bangladesh and requires immediate conservation action to protect it." (Authors)] Address: Khan, M.K., Dept of Biochemistry & Molecular Biology, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh. Email: bmbkawsar@gmail.com

19442. Kietzka, G.J.; Pryke, J.S.; Gaigher, R.; Samways, M.J. (2021): 32 years of essential management to retain value of an urban dragonfly awareness pond. Urban Ecosystems 24: 1295-1304. (in English) ["Pond construction in urban areas can mitigate loss of aquatic insects by providing refuges. Urban ponds are also an interface between civil society and aquatic insects, especially via charismatic dragonflies. Ponds have therefore been constructed specifically for dragonfly conservation awareness in many countries. Yet they require regular management, especially when an inflow to a shallow pond supplies inorganic and organic material, leading to vegetation overgrowth and natural infilling, rendering a pond back into a stream, unsuitable for many lentic species. Here, we assess changes in dragonfly diversity over a 32-year period at a pond constructed for dragonfly conservation awareness, and which underwent system changes: stream->pond vegetation overgrowth and infilling and then following restoration from stream->pond. Adult male dragonflies and 13 environmental variables were recorded along 31 transects, and compared with previous data collected at the same sites before pond construction and then in the short- and medium-term after. Years when the system comprised a pond had higher dragonfly abundance and species richness than when a stream, and both increased after the pond was restored. Shortly after restoration, the dragonfly assemblage closely resembled that of the earlier pond. Vegetation cover and alien vegetation presence were significant drivers of dragonfly assemblage change and decreased dragonfly abundance and species richness. Lessons learned here for maintaining a dragonfly awareness pond include periodical dredging to remove excessive vegetation overgrowth and infilling from organic and inorganic matter, and aim for high microhabitat heterogeneity using selective management of marginal vegetation, alongside a range of flow regimes." (Authors)] Address: Kietzka, Gabriella, Dept of Conservation Ecology & Entomology, Stellenbosch Univ., Private Bag X1, Matieland 7602, South Africa. E-mail: gabikietzka@gmail.com

19443. Kobylecki, P. (2021): New records of dragonflies (Odonata) of Podlasie. Odonatrix 178 (2021): 4pp. (in Polish, with English summary) [ponds and rivers near Wyliny-Ruœ village in 2021. In total, 30 dragonfly species were recorded, including Leucorrhinia albifrons.] Address: Kobylecki, P., ul. Liryczna 8, 04-410 Warszawa, Poland. Email: fario@poczta.fm

19444. Kolar, V.; Vlašánek, P.; Boukal, D.S. (2021): The influence of successional stage on local odonate communities in man-made standing waters. Ecological Engineering 173, December 2021, 106440: 10 pp. (in English) ["Highlights: • We compared odonate communities in sandpit ponds and fishponds. • Community composition differed between habitat types despite similar diversity. • Aquatic vegetation, water depth and bottom substrate shaped local communities. • Diverse habitats beget diverse odonate communities in man-made standing waters. Abstract: Man-made freshwater habitats are an important part of the European landscape, especially in areas with mostly absent or degraded natural habitats. To assess the role of different man-made standing waters in anthropogenic landscapes, we surveyed adult odonate communities in a cluster of 20 water bodies including fishponds and sandpit ponds in early and ongoing successional stages. We found 35 odonate species (i.e., 47% of the fauna of the Czech Republic), but their presence differed significantly among the three habitat types. The highest species diversity, driven mainly by the presence of generalists, was found in fishponds. Sandpit ponds in an early successional stage hosted the least diverse communities dominated by pioneer and vagrant species. Specialist species occurred in both types of sandpit ponds, especially those in an ongoing successional stage, more than in fishponds. Although the dragonfly biotic index did not differ among the three types of localities, all four species from the national Red list recorded during the study occurred only in sandpit ponds. The main environmental drivers of local odonate communities included the coverage of shoreline by emergent vegetation, water depth and bottom substrate; the latter two characteristics largely corresponded to the distinction between sandpit ponds and fishponds. We conclude that both sandpit ponds and fishponds play an important role in maintaining freshwater biodiversity that requires a mosaic of habitats in different successional stages." (Authors)] Address: Kolar, V., University of South Bohemia, Faculty of Science, Department of Ecosystem Biology, Branišovská 1760, CZ-37005 Ceské Budejovice, Czech Republic. E-mail: kolarvojta@seznam.cz

19445. Koperski, P. (2021): Linear and nonlinear effects of nutrient enrichments on the diversity of macrobenthos in lowland watercourses. Aquatic Ecology 55: 1011-1031. (in English) ["The study concerns the relationships between taxonomic, functional and phylogenetic diversity of benthic invertebrates inhabiting watercourses and abiotic parameters associated with excessive nutrients load (concentration of Kjejdahl nitrogen, nitrates, phosphorus, organic carbon and dissolved oxygen, values of BOD5 and electrolytic conductivity). The research used data on the species composition of leeches, molluscs and larval forms of odonates and chironomid dipterans. Their description using mathematical functions allowed to determine whether the diversity reaches maximal values at extreme or moderate values of nutrients enrichment. In most cases, statistically significant relationships were unimodal—the highest diversity was observed at intermediate values of nutrients content and associated parameters, however the different patterns of relationships, monotonic and inverse quadratic, were also observed. Indirect impacts of nutrients enrichment on diversity

were found as the most significant relationships. Significant responses of functional diversity were clearer and stronger than responses of taxonomic and phylogenetic diversity. The identification of fauna to the species level allowed for obtaining precise results that could enable selection of appropriate parameters for effective assessment of environmental degradation." (Author) "The most common and the most numerous species were: Calopteryx splendens, C. virgo, Platycnemis pennipes and Gomphus vulgatissimus] Address: Koperski, P., Institute of Functional Biology & Ecology, Faculty of Biology, Univ. of Warsaw, Biological & Chemical Research Center, Zwirki i Wigury 101, 02-089 Warsaw, Poland. Email: p.t.koperski@uw.edu.pl

19446. Krieg-Jacquier, R. (2021): Capacités de dispersion chez Leucorrhinia pectoralis (Charpentier, 1825) erratum (Odonata: Libellulidae). Martinia 35(6): 27-30. (in French and English) [A literature reference (Ott (1989)) to a dispersal of beyond 100 km for a male L. pectoralis in Germany is quoted repeatedly in literature as proving the long-range movement of the species. As Ott never has written this but mentioned the nearest known to him locality with a record of L. pectoralis he never has claimed such an (active) dispersal of the species. In this note, the author points to the risk of quoting successively a reference being either erroneous or out of context and its aftermath on the way it is read, especially by non-specialists. Beyond this risk, authors must be urged to exercise caution and to adopt accurate writing in order to avoid any misinterpretation.] Address: Krieg-Jacquier, R., Opie-odonates, 628 route de Marboz 01440 Viriat, France. Email: regis.krieg.jacquier@gmail.com

19447. Laakso, L.K.; Ilvonen, J.J.; Suhonen, J. (2021): Phenotypic variation in male Calopteryx splendens damselflies: the role of wing pigmentation and body size in thermoregulation. Biological Journal of the Linnean Society 134(3): 685 - 696. (in English) ["For ectothermic insects, their colour and size are important determinants of body temperature: larger bodies require more heat to reach a certain temperature, and dark colours absorb heat more efficiently. These dark colours are expressed using melanin, which has been intimately linked with the thermoregulatory capabilities of insects. Melanin is also linked with immune defence and is often used as a secondary sexual character in insects. There is a potential trade-off situation between thermoregulatory capabilities, immune defence and secondary sexual characters, all of which use melanin. Some Calopteryx damselflies, such as Calopteryx splendens, have melanin-based wing pigmentation that is sexually selected and drives intra- and interspecific territorial aggression. Our goal was to study experimentally how the wing pigmentation and body size of C. splendens males affect their thermoregulation and, especially, their ability to become active (hereafter, 'activate') after being cooled down. Our results were in line with our hypotheses, showing that individuals with larger wing spots had significantly faster activation times than those with smaller wing spots, and that individuals with larger body size had significantly slower activation times than those with smaller body size. Both variables showed an interaction and are therefore important in damselfly warm-up and activation. We discuss the role of wing pigmentation and thermoregulation in the behavioural patterns observed in Calopteryx species." (Authors)] Address: Laakso, Linda, Dept Biol., Univ. of Turku, FI-20014 Turku, Finland. E-mail: lklaak@utu.fi

19448. Landmann, M.; Schlick-Steiner, B.; Steiner, F.M.; Landmann, A. (2021): Connectivity within isolation: dispersal, population genetics, and conservation of the rarest European damselfly. Insect Conservation and Diversity 14(6): 800- 813. (in English) ["1. Coenagrion hylas (Trybom, 1899) has a very limited distribution in Europe, lives in very small, isolated populations, has rather specialised habitat demands, and is regarded as the rarest damselfly of Europe. 2. Using a combination of capture-mark-recapture and population genetics, we aimed to evaluate the state of the populations in the Tyrolean Lech valley and to test whether exuviae from this species are usable as a DNA source. DNA was extracted from midleg tibiae and exuviae and genotyped with species-specific microsatellite markers. The results from the capture–recapture and the genetic methods were congruent. 3. C. hylas has an unexpectedly high tendency to disperse within the valley, covering distances of up to 30 km, and lives longer than other damselflies, with an average longevity of 12 days and a maximum lifespan of at least 40 days. Low inbreeding coefficients and low ranges of genetic differentiation across sites provide evidence of panmixia, with no clear signs of inbreeding. The current population size is estimated at 1150 males based on the recapture data. 4. We further demonstrated that exuviae deliver a sufficient amount of DNA, which will be important for future monitoring. Although C. hylas currently shows appropriate viability at most Lech valley sites, our study indicates that management measurements, such as creating stepping stone habitats, are crucial to maintain the current population status. Given the high dispersal capability of the species, such management measurements seem promising." (Authors)] Address: Landmann, A., Institut für Naturkunde & Ökologie, Karl-Kapfererstr. 3, 6020 Innsbruck, Austria. Email: office@arminlandmann.at

19449. Lencioni, F.A.A.; Neiss, U.G.; Dutra, S.L.; Furieri, K.S.; Juen, L.; Batista, J.D.; Vilelam D.S. (2021): Synopsis of Lestes from Brazil with description of Lestes demarcoi sp. nov. (Zygoptera: Lestidae). Zootaxa 4990(3): 511-541. (in English) ["The Brazilian fauna of Lestidae contains two genera (Archilestes Selys, 1862 and Lestes Leach in Brewster, 1815) with 14 species, many of which are poorly defined and/or known only by primary literature. To improve the knowledge of the Brazilian species of the genus Lestes we examined 97 specimens pertaining to 11 of the 13 described species. Additionally, a new species is described here in honor to Prof. Dr. Paulo De Marco Júnior: Lestes demarcoi (Holotype and Allotype: Brazil: Amazonas, Manaus, Reserva Adolpho Ducke, Acará trail, 02º55'46" S & 59º58'22" W, 62 m, 13.iv.2009, collected in tandem, U.G. Neiss leg. and deposited in FAAL). Diagnostic illustrations of all species are provided. Color photographs of live individuals of Lestes dichrostigma Calvert, 1909, Lestes forficula Rambur,

1842 and Lestes paulistus Calvert, 1909 are also presented." (Authors)] Address: Lencioni, F.A.A., Rua Anibal, 216, d. Coleginho, Vila Zezé, Jacareí, CEP (ZIP) 12310-780, São Paulo, Brazil. E-mail: lencioni.odonata@gmail.com

19450. Liberto, B.; Studinski, J. (2021): Abundance and habitat associations of disjunct and regionally rare populations of Leucorrhinia glacialis and L. hudsonica in the Appalachian Mountains (Odonata: Libellulidae). Odonatologica 50(3/4): 187-202 -202. (in English) ["Leucorrhinia glacialis and L. hudsonica are boreal anisopterans common in Canada and the north-eastern USA but are rare in central Appalachia, where they are isolated at the extreme southern edge of their range. Adult and larval anisopteran surveys were conducted at 24 wetlands in central Appalachia to determine the number of populations and habitat associations of L. glacialis and I. hudsonica. A mark-recapture study at wetlands containing either of the two target species was conducted to estimate the population size and daily survival. Cormack-Jolly-Seber (CJS) and Jolly-Seber analyses were conducted for the populations of L. glacialis and L. hudsonica, and multivariate techniques explored habitat and community associations. L. hudsonica were found in three wetlands, with the largest population estimated at 34 individuals. Leucorrhinia glacialis were found in two wetlands, with one population estimated at 351 and the other being too large (i.e., not enough recaptures) to apply CJS methods. All wetlands containing populations of I. glacialis and L. hudsonica were permanent, acidic, and fishless, and dispersal from their natal ponds was rarely observed. Most of the wetlands containing these species were created by beaver, with some ponds rapidly shrinking due to a lack of dam maintenance. The isolation and rarity of habitats supporting L. glacialis and L. hudsonica in this region, coupled with the species' poor dispersal abilities and apparent reliance on beaver, suggests an uncertain future for these locally rare anisopterans. The protection of these rare habitats and populations, along with possible translocation efforts and beaver management, may increase these species' chances of persistence." (Authors)] Address: Liberto, Bethany, Frostburg State Univ., Frostburg, MD, USA. Email: bpliberto@gmail.com

19451. Lima, J.C.; Moreira, R.A.; Neto, A.J.G.; Andrade, D.; Freitas, E.C.; Daam, M.A.; Rocha, O. (2021): Metal toxicity can affect dragonfly nymphs and ostracods predation rates and food selectivity: Ecological implications on food webs. Water, Air, & Soil Pollution 232, issue 7, id. 288. (in English) ["Predation is known to play a prominent role in maintaining ecosystem structure and functioning. Despite metals being known to potentially affect predation in aquatic ecosystems, few studies have been conducted, so far, with the aim of evaluating this interplay. In the present study, the effects of four metal salts (copper, cadmium, mercury, and manganese) on the feeding rates and food preference of Tramea cophisa and of the ostracod Chlamydotheca sp. were studied by performing laboratory ecotoxicity tests. Food preference was evaluated by offering four prey species to dragonfly nymphs and three to adult large ostracods. In general, the food preference of both predator species after being exposed to metal salts was not altered, compared with controls, but the feeding rate of T. cophisa decreased in comparison with controls, after exposure to each metal salt, except manganese. Contrastingly, predation rates of Chlamydotheca sp. increased after metal salt exposure. This difference in response can be explained by differences in life-history traits of these two organisms. Both species individuals preferred soft-bodied prey (Oligochaeta, Chironomidae) over water-dwelling crustaceans that are likely to be more difficult to prey upon. Tests evaluating the effects of metals and other chemicals on predation behavior may lead to a better understanding of biotic interactions that can be restricted by chemical stress, improving our understanding of possible food web disruptions underlying chemical stress." (Authors)] Address: Lima, J.C., Post Graduate Program of Sciences of Environ. Engineering, São Carlos Engineering School, University of São Paulo, Avenida Do Trabalhador São-Carlense, 400, São Carlos, SP, 13560-970, Brazil

19452. Matthews, P.G.D. (2021): How insects transition from water to air: Respiratory insights from dragonflies. Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology 253, March 2021, 110859. (in English) ["Highlights: • Dragonfly nymphs reinvaded aquatic environment using tidally-ventilated rectal gill. • Nymphs hyperventilate in hypoxia but show no response to hypercapnia. • Nymphs maintain high hemolymph pCO_2 compared with other water-breathing animals. • Approaching metamorphosis nymphs breathe bimodally, increase pCO_2 and HCO_{3-}.• Dragonflies experience small rise in pCO_2 and HCO_{3-} as they move to breathing air. Abstract: 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 pCO_2 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 air-breathing 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." (Author)] Address: Lee, D.J., Dept of Zoology, University of British Columbia, Vancouver, BC, V6T 1Z4, Canada. E-mail: danlee@zoology.ubc.ca

19453. Martin, R.; Maynou, X. (2021): Paratanytarsus sp. (Diptera: Chironomidae) as commensal on larval Calopteryx

(Odonata: Calopterygidae). Notulae odonatologicae 9(8): 367-371. (in English) ["We describe larval Paratanytarsus sp. as epibionts on larvae of C. xanthostoma and C. haemorrhoidalis in the Tordera River, NE Iberian Peninsula. Tubular cases were fixed to different body parts such as thorax, abdomen, legs, and wing sheaths." (Authors)] Address: Martin, R., Inst. Catalana d'Historia Natural, c/del Carme 47, 08001 Barcelona, Spain. Email: ricardo.martin@cllicenciats.cat

19454. Martin, R.L.; McCauley, S.J. (2021): Risks for overwintering eggs of the dragonfly Sympetrum vicinum in aquatic and terrestrial environments. Hydrobiologia 848: 4933-4944. (in English) ["Risk-spreading behaviour is often exhibited by animals as a response to unpredictably variable environments. Using field and laboratory studies, we tested the hypothesis that Sympetrum vicinum dragonflies spread the risks of winter environments by laying eggs across a terrestrial–aquatic gradient. Sympetrum vicinum eggs that overwintered in terrestrial and benthic-limnetic habitats had significantly higher hatching success compared with eggs that overwintered in littoral sites. Low success may have been caused by hypoxia due to excess sediment in the littoral samples in the lab. While hypoxia experienced under winter conditions (4°C) had no negative effect on hatching success, hatching in hypoxic and anoxic water significantly decreased hatching success. Opportunistic egg predation by a winter-active caddisfly significantly decreased egg hatching success. Because S. vicinum eggs have a relatively low supercooling point (-26.25°C), freezing may not be a significant source of mortality in terrestrial or aquatic sites. By ovipositing in both terrestrial and aquatic environments, female dragonflies may be balancing the unpredictable risks of both the failure to inundate the eggs and egg predation. Our research highlights the potential for biotic interactions during winter to shape the behaviour and life-history of aquatic invertebrates." (Authors)] Address: Martin, Rosemary, Univ. of Toronto Mississauga, Mississauga, ON, Canada

19455. Mategaonkar, M.S.; Sharma, P.; Inamdar, S.A. (2021): Diversity of odonates at Lohegaon, Pune, (MS). Bioinfolet 18(3): 329-333. (in English) ["During present study 16 species of odonates were recorded from Air Force Station, Lohegaon, Pune. Among them 10 species were from family Libellulidae, 3 from Coenagrionidae and one each from families Gomphidae, Aeshnidae and Euphaeidae." (Authors)] Address: Mategaonkar, M.S., Postgraduate Dept of Zoology, Modern College of Arts, Science & Commerce, Ganeshkhind, Pune411016 (M.S.), India

19456. Maynou, X.; Martin, R. (2021): Hydra sp. (Anthomedusae: Hydridae) as epibiont of larval Calopteryx virgo (Odonata: Calopterygidae). Notulae odonatologicae 9(8): 341-343. (in English) ["In a mountain river in the Montseny massif, Catalan Pre-Coastal Range, northeastern Iberian Peninsula, we found a Hydra sp. (Anthomedusae: Hydridae) attached to the abdomen of a larva of Calopteryx virgo meridionalis." (Authors)] Address: Maynou, X., Institucio Catalana d'Historia Natural, c/del Carme 47, 08001 Barcelona, Spain. Email: xavier.maynou@gmail.com

19457. McDevitt-Galles, T.; Carpenter, S.A.; Koprivnikar, J.; Johnson, P.T.J. (2021): How predator and parasite size interact to determine consumption of infectious stages. Oecologia 197(3): 551-564. (in English) ["Parasites are important players in ecological communities that can shape community structure and influence ecosystem energy flow. Yet beyond their effects on hosts, parasites can also function as an important prey resource for predators. Predators that consume infectious stages in the environment can benefit from a nutrient-rich prey item while concurrently reducing transmission to downstream hosts, highlighting the broad importance of this interaction. Less clear, however, are the specific characteristics of parasites and predators that increase the likelihood of consumption. Here, we determine what combination(s) of predator and parasite morphological traits lead to high parasite consumption. We exposed the infectious stages (cercariae) of five trematode (fluke) taxa to aquatic insect predators with varying foraging strategies and morphologies. Across the 19 predator—parasite combinations tested, damselfly predators in the family Coenagrionidae were, on average, the most effective predators of cercariae, consuming between 13 and 55% of administered cercariae. Large-bodied cercariae of Ribeiroia ondatrae had the highest average vulnerability to predation, with 37–48% of cercariae consumed. The interaction between predator head width and cercariae tail size strongly influenced the probability of consumption: small-bodied predators were the most effective consumers, particularly for larger tailed parasites. Thus, the likelihood of parasite consumption depended strongly on the relative size between predator and parasite. Our study helps establish that predation on free-living parasites largely follows a broader predator–prey framework. This will help to identify which predator and parasite combinations will likely have high consumptive interactions, potentially reducing parasite transmission in natural populations." (Authors) Aeshnidae, Libellulidae, Coenagrionidae and Lestidae.] Address: McDevitt-Galles, T., Ecology and Evolutionary Biology, University of Colorado, Boulder, CO, USA. Email: travis.mcdevittgalles@colorado.edu

19458. Mendoza-Penagos, C.C.; Batista Calvão, L.; Juen, L. (2021): A new biomonitoring method using taxonomic families as substitutes for the suborders of the Odonata (Insecta) in Amazonian streams. Ecological Indicators Volume 124, May 2021, 107388: 12 pp. (in English) ["Highlights: • The family-level provides an effective tool for the biomonitoring of streams using odonates. • The use of family-level keeps essential ecological information of the species-level community. • Aggregate measures such as abundance can be very useful when higher taxonomic levels are used in biomonitoring. • The use of family-level could be advantageous in terms of time and financial resources. Abstract: Odonata have been widely used as bioindicators of environmental quality in different types of ecological research. In general, the taxonomic level used is the species, but higher taxa, such as the family, have received less attention. Assuming that higher taxa can reproduce the impacts that occur at the species level, we use facets of diversity at the community to assess if Odonata families could be an efficient tool for the

assessment of environmental impact in Amazon streams. We first assessed to what extent each family retains ecological information from the ecological diversity of the species of the suborder (Anisoptera or Zygoptera). We then quantified the degree of congruence between different taxonomic levels in the Odonata. Next, we evaluated the effects of environmental integrity on the facets of diversity of the families. Finally, we evaluated whether ecological thresholds can be detected using a family-level approach. We sampled adult odonates in 98 streams in the eastern Amazon, in the municipalities of Paragominas, Santarém, and Belterra, in the Brazilian state of Pará. The habitat integrity index (HII) was used to assess the environmental integrity of each stream. The congruence between the different taxonomic levels was evaluated using a Procrustes analysis. The degree of correlation of diversity facets was evaluated between families and each suborder. Linear mixed models and matrix regressions were used to measure the influence of environmental integrity on the diversity facets of the families. Higher-level ecological thresholds were detected using the TITAN analysis. The results of the analyses indicated a high degree of congruence between species-level and higher levels (family and suborder). The ability of the families to represent the diversity facets of the suborder is influenced by the abundance of individuals and the number of species in the family. The environmental integrity of the streams affects the facets of diversity of the families systematically, although cumulative measurements, such as abundance, appeared to be more advantageous as biomonitoring tools. The similarity of the responses observed at species and family levels supports the use of odonate families for the detection of ecological thresholds in stream environments. The sum of the evidence indicates that a family-level approach is effective for the identification of alterations in the environmental integrity of streams, providing valuable insights into the facets of diversity of the odonate community. The adoption of a family-level approach in environmental monitoring programs could optimize the investment of resources, in particular through the identification of specimens by non-specialists, permitting a significant increase in sampling effort and replication." (Authors)] Address: Mendoza-Penagos, C.C., Lab. Ecol. & Conservation, Univ.Federal do Pará, Inst. Biol. Sciences, Rua Augusto Correia, No. 1 Bairro Guamá, CEP 66.075-110 Belém, Paré, Brazil. E-mail: cristian.penagos@icb.ufpa.br

19459. Mujumdar, N.; Deshpande, A.; Dawn, P.; Koparde, P. (2021): Notes on the oviposition behaviour of three Elattoneura damselflies from India (Odonata: Platycnemididae). Notulae odonatologicae 9(8): 344-352. (in English) ["Oviposition behaviour of three Indian Elattoneura spp. is described and discussed. Endophytic oviposition in dry rigid substrates away from water by the endemic E. nigerrima and E. tetrica is recorded; this differs from the typical recorded use of submerged vegetation substrates in the genus. Contrasting behavioural observation of oviposition in E. campioni is also discussed." (Authors)] Address: Mujumdar, N., Bombay Natural History Society, Hornbill House, Shaheed Bhagat Singh Road, Colaba, Mumbai, Maharashtra 400001, India. Email: n.mujumdar@bnhs.org

19460. Nafisah, N.A.; Soesilohadi, R.C.H. (2021): Community structure of dragonfly (Ordo: Odonata) in natural forest and tourist sites Petungkriyono Forest, Central Java, Indonesia. Journal of Tropical Biodiversity and Biotechnology 6(3): 9 pp. (in English) ["Petungkriyono forest is a tropical rainforest with high biodiversity. The increasing tourism activities in Petungkriyono lead to land conversion. Dragonfly (order Odonata) is a good bioindicator for aquatic and terrestrial. This study aimed to compare the community structure of Odonata in natural forests and tourist sites. The method of collecting imago Odonata was done by direct searching, samples were captured using sweep netting. The results showed that the dragonflies found in all locations consisted of the same family, 2 families (Gomphidae and Libellulidae) from the suborder Anisoptera and 6 families (Calopterygidae, Chlorocyphidae, Coenagrionidae, Euphaidae Platycnemididae, and Platystictidae) from Zygoptera. The total species of dragonflies found in Sokokembang were 15 species with a total of 293 individuals, Tirta Muncar 13 species of 287 individuals, Karanggondang 17 species of 276 individuals, and Curug Lawe 14 species of 242 individuals. The highest relative abundance of individuals was in the natural forest of Sokokembang is Drepanosticta spatulifera (26.28%) and in Karanggondang Vestalis luctuosa (24.64%), while in the tourist forests of Tirta Muncar and Curug Lawe were Euphaea variegata (34.84% and 28.51 %). The structure of the Odonata community is based on the Shannon-Wiener diversity index in the natural forests of Sokokembang (2.18) and Karanggondang (2.21) at the tourist sites of Tirta Muncar (1.84) and Curug Lawe (2.11). The results showed that the structure of the Odonata community based on the level of the diversity index value, evenness index, and dominance index in natural forests and tourist sites in Petungkriyono forest was not significantly different." (Authors)] Address: Nafisah, N.A., Faculty of Biology, Universitas Gadjah Mada, Jl. Teknika Selatan, Sekip Utara Bulaksumur, Yogyakarta, Indonesia, 55281. Email: hidayat@ugm.ac.id

19461. Nilsson-Örtman, V.; Rowe, L. (2021): The evolution of developmental thresholds and reaction norms for age and size at maturity. PNAS 118(7) e2017185118 (in English) ["Significance: Why most—but not all—organisms mature earlier in better growth conditions remains a mystery. Theory suggest that a solution may lie in the existence and evolution of critical size thresholds during development. The threshold model makes two unique predictions on the evolution of reaction norms between species and the effect of food reductions within species. We test this model experimentally using five damselfly species aligned along an ephemeral–permanent gradient, finding strong support for each prediction. Permanent habitats favor large thresholds and early maturation in better conditions, whereas ephemeral habitats favor small thresholds producing the rarer pattern with delayed maturation. The evolution of developmental thresholds is critical for understanding natural and human-induced variation in age and size at maturity. Developing organisms typically mature earlier and at larger sizes in favorable growth conditions, while in rarer cases, maturity is delayed. The rarer reaction norm is easily accommodated

by general life history models, whereas the common pattern is not. Theory suggests that a solution to this paradox lies in the existence of critical size thresholds at which maturation or metamorphosis can commence, and in the evolution of these threshold sizes in response to environmental variation. For example, ephemeral environments might favor the evolution of smaller thresholds, enabling earlier maturation. The threshold model makes two unique and untested predictions. First, reaction norms for age and size should steepen, and even change sign, with decreases in threshold size; second, food reductions at sizes below the threshold should delay maturation, while those occurring after the threshold should accelerate maturation. We test these predictions through food manipulations in five damselfly species that theory suggests should differ in threshold size. The results provide strong support for the threshold model's predictions. In all species, early food reductions delayed maturation, while late reductions accelerated maturation. Reaction norms were steeper, and the effect of food reductions changed from decelerating to accelerating at a much smaller size in species from ephemeral habitats. These results support the view that developmental thresholds can account for the widespread observation of negative correlations between age and size at maturity. Moreover, evolution of the threshold appears to be both predictable and central to the observed diversity of reaction norms for age and size at maturity." (Authors) Ischnura ramburii, Enallagma doubledayi, Enallagma pollutum, Ischnura posita, I. hastata] Address: Nilsson-Örtman, V., Dept of Ecology & Evolutionary Biology, Univ. of Toronto, Toronto, ON M5S 3B2, Canada

19462. Noor-Ul-Islam, H.; Khan, K.; Zia, S.A.; Naeem, M.; Shams, W.A. (2021): Heavy metals accumulation in dragonflies (Odonata) and their habitats in district Swabi, Khyber Pakhtunkhwa, Pakistan: Assessing dragonfly bionomics in the region. Bulletin of Environmental Contamination and Toxicology 107(5): 838-847. (in English) ["The current study aimed to examine the bionomics of dragonflies and heavy metal accumulation in their bodies and environment (sediments and water) from district Swabi, Khyber Pakhtunkhwa, Pakistan. A total of 1683 dragonflies were collected from May to September, 2018 in 4 tehsils (administrative subdivisions) of district. Orthetrum pruinosum neglectum was the most abundant species followed by O. anceps and O. chrysostigma luzonicum. Highest abundance was observed in July and August corresponding to maximum temperature and rainfall. Dragonflies displayed preferable abundance within agricultural lands and on elevation ranging from 206 to 506 m. Heavy metal analysis of sediments and water samples from 4 tehsils showed significant differences in mean concentrations of Pb, Zn, Cu, and Fe. Abundance among districts was negatively associated with Fe levels in water while the species diversity had a significant positive relationship with Fe in sediments. Accumulation of metals in each body part significantly varied among species. N. tullia tullia and O. anceps specifically demonstrated their tolerance to high concentrations of heavy metals." (Authors)] Address: Noor-Ul-Islam, H., Dept of Zoology, Abdul Wali Khan Univ. Mardan, Mardan, Khyber Pakhtunkhwa, Pakistan

19463. Novelo-Gutiérrez, R.; Gomez-Anaya, J.A. (2021): Description of the larva of Argia cuprea (Hagen, 1861) with notes on its phylogenetic affinities (Odonata: Coenagrionidae). Zootaxa 5057(3): 437-445. (in English, with Spanish summary) ["The larva of A. cuprea is described and figured. It falls into the group of Argia larvae with prominent ligula and one palpal seta, but it differs from its closest relatives by a combination of features such as male gonapophyses reaching posterior ventral margin of S10; dorsal and ventral margin of paraproct with long, abundant, white, delicate setae on distal 0.40; tip of paraproct 20% its total length; lateral surface of paraproct with abundant spiniform setae restricted to the triangular, yellowish-brown, slightly sclerotized area along the inflated area. It appears closely related to A. oenea Hagen in Selys, 1865 and A. orichalcea Hagen in Selys, 1865 larvae." (Authors)] Address: Novelo-Gutiérrez, R., Instituto de Ecología, A.C. Red de Biodiversidad y Sistemática. Carretera antigua a Coatepec 351, El Haya 91073 Xalapa, Veracruz, Mexico. E-mail: rodolfo.novelo@inecol.edu.mx

19464. Nunes, L.; Casanueva, P.; Hernandez, M.A.; Sanchez-Sastre, L.F.; Santamaria, T.; Campos, F. (2021): Refining the identification criteria for forma typica and brachycerca in exuviae of Boyeria irene (Odonata: Aeshnidae). Odonatologica 50(3/4): 227-238. (in English) ["In female imagines of Boyeria irene, two forms are known according to the length of the cerci: forma brachycerca (short appendages) and f. typica (long appendages). Both forms are also recognisable in exuviae. Hitherto, no accurate measurements have been performed to distinguish between the two forms. Hence, we measured and analysed the absolute and relative length of the cerci in both sexes of exuviae from 11 populations originating from the centre and north of the Iberian Peninsula. We show that there are specimens intermediate between the two forms and that dimorphism is also present in males. The brachycerca form is more frequent in the north than in the centre of the Iberian Peninsula. Correct identification of both forms should always be based on accurate measurements of the length of the cerci." (Authors)] Address: Nunes, Luisa, Instituto Politecnico de Castelo Branco - Escola Superior Agraria, Qta Sra Mercules, 6000-900 Castelo Branco, Portugal. Email: lfnunes@ipcb.pt

19465. Oldak, K.A. (2021): Proposal of the monitoring methodology of the Green Hawker Aeshna viridis Eversmann, 1836 (Odonata: Aeshnidae). Folia Pomer. Univ. Technol. Stetin., Agric., Aliment., Pisc., Zootech. 358(57): 15-28. (in English) ["A. viridis, …is listed in Appendix II of the Bern Convention as well as Annex IV of the Habitats Directive. The decline in the range and abundance of A. viridis is associated with a strong dependence of this species on the presence of Stratiotes aloides in the water body and results from a decrease in the number of suitable habitats. So far, attempts to develop a monitoring methodology for this species have been made in several European countries, including Sweden, Denmark and the Netherlands. This article presents a proposal for a monitoring methodology based on the evaluation of indicators of population condition in the

form of exuviae density and number of adults, and indicators of habitat condition: the area of the water body covered by S. aloides, the presence of dense and undivided patches of S. aloides, succession in the water body and anthropopressure. The concept of population condition assessment methodology is based on observation of adult specimens and collecting exuviae, avoiding larvae sampling, which is invasive and associated with technical difficulties. The concept of the habitat condition assessment methodology, in turn, is based on strong association between A. viridis and S. aloides. It is proposed to monitoring A. viridis population on a minimum of several research areas within the country, on a two-year cycle. The presented proposal of the monitoring methodology requires pilot studies to be carried out within the A. viridis localities in order to determine the validity of assumptions made in the monitoring methodology." (Author)] Address: Oldak, K.A., Fac. of Animal Breeding, Bioengineering and Conservation, Warsaw University of Life Sciences – SGGW, Jana Ciszewskiego 8, 02-786 Warszawa, Poland. Email: odakkrystian@gmail.com

19466. Oliveira de Resende, B.; Santos Ferreira, V.R.; Juen, L.; Silvério, D.; Ramos Cabette, H.S. (2021): Seasonal fluctuations in the structure of the larval odonate community of a stream in the Cerrado–Amazon forest transition zone. Aquatic Ecology 55: 861-873. (in English) ["Climatic seasonality provokes considerable variability in the physical conditions of streams. Although few studies have assessed systematically the temporal effects of climate on aquatic communities, the diversity and structure of odonate larval assemblages (suborders Anisoptera and Zygoptera) are predicted to be influenced by seasonality. To evaluate this hypothesis, we tested the predictions that (1) the genera and abundance richness of zygopteran and anisopteran larvae will decrease during periods of high precipitation, (2) the genera richness and abundance of the two suborders will be associated inversely with temperature, and (3) the composition of the zygopteran assemblage will be more affected by seasonality, in particular precipitation, than that of the Anisoptera, whose composition will be influenced primarily by temperature. We collected odonate larvae every three months over a 6-year period at a stream located in the Cerrado–Amazon forest transition zone and compared these data with data on the local climate from the same period. Our results indicate that the seasonal variation in precipitation had a significant effect on the abundance of both odonate suborders, but that, while the anisopteran genera richness was affected by precipitation, the zygopteran richness was not. We showed that temperature affected the abundance of both suborders, but had no effect on genera richness. As we predicted, the composition of the zygopteran larval assemblage was affected more by the climatic variables than the Anisoptera. In addition, while the Zygoptera were affected primarily by precipitation, the Anisoptera were influenced most by temperature. The results indicate that the timing of the emergence of odonate larvae is synchronized with the months preceding the rainy season, when a high density of larvae are recorded, which may reflect a strategy for both the avoidance of the effects of fluctuations in water levels and the exploitation of the relatively abundant food sources found in the terrestrial environment. Temperature also appears to contribute to this synchrony, by either accelerating or delaying the process of larval emergence." (Authors)] Address: Oliveira de Resende, Bethânia, Programa de Pós-Graduação em Ecologia e Conservação, Lab. de Entom. de Nova Xavantina, Univ. do Estado de Mato Grosso, Mato Grosso, Brazil, Programa de Pós-Graduação em Ecologia, Laboratório de Ecologia e Conservação, Universidade Federal Do Pará, Belém, Pará, Brazil

19467. Ott, J. (2021): Kalikokrebs (Faxonius immunis) (Hagen, 1870) erobert den Bienwald – erste negative Auswirkungen auf gefährdete Libellenarten bereits erkennbar (Decapoda: Cambaridae). Fauna Flora Rheinland-Pfalz 14(3): 1103-1110. (in German, with English summary) ["Calico crayfish conquers the Bienwald – the first negative effects on endangered dragonfly species can already be seen. New records of the calico crayfish are reported, which is spreading further and further west in the Bienwald (southern Rhineland-Palatinate) via the local stream systems (Otterbach, Bruchbach, etc.). The species, which is very problematic for nature conservation, is already showing noticeable negative effects on nationally and internationally protected and endangered dragonfly species." (Author)] Address: Ott, J., Friedhofstr. 28, 67705 Trippstadt, Germany. E-mail: ott@lupogmbh.de

19468. Oliveira-Junior, J.N.B.; Teodósio, M.A.; Juen, L. (2021): Patterns of co-occurrence and body size in dragonflies and damselflies (Insecta: Odonata) in preserved and altered Amazonian streams. Austral Entomology 60(2): 436-450. (in English) ["Interspecific interactions, such as competition, are among the key factors that determine the distribution, abundance and diversity of organisms in natural communities of aquatic ecosystems. However, a marked reduction in the environmental integrity of streams may lead to modifications of the natural dynamics of these communities, including co-occurrence patterns and body size. In the Amazon, the replacement of forests by production systems is one of the leading causes of alterations to riverine ecosystem. The insects of the order Odonata (dragonflies and damselflies) are predators known to compete for environmental resources but are also sensitive to environmental changes such as those caused by shifts in land use. In this scenario, the present study evaluated species co-occurrence and body size patterns in adult odonates found at preserved and altered Amazonian streams, to determine whether there are morphological differences among the species that enable their coexistence. During the study, 98 streams in the eastern Amazon region were sampled, and a habitat integrity index (HII) was used to evaluate the integrity of each stream (based on variables such as the condition of the riparian vegetation and channel, and land use). Ten male individuals were selected from each species, and nine morphometric measurements were taken from each individual. A total of 3588 specimens were collected and distributed in nine families, 49 genera and 134 species. We found a non-random pattern of co-occurrence in the species of the

odonate suborder Zygoptera and a random pattern in the Anisoptera, in both preserved and altered streams. We found morphological divergence between pairs of zygopteran species, in the whole sample and both categories of stream integrity separately. No such morphological divergence was found in the pairs of anisopteran species. The distribution patterns of odonate species are limited by specific environmental processes, especially in preserved environments and in specialists, such as most zygopterans. Zygopteran species have more specific microhabitat requirements, which could explain this pattern, whereas anisopterans prefer open environments, which usually have a greater supply of resources, although there tends to be less microhabitat heterogeneity, which leads to reduced competition. Given this, future studies should use limiting similarity (e.g. morphological attributes) in addition to environmental and spatial factors to better understand the factors structuring these communities. Among these mechanisms, the effects of common ancestry (phylogenetic inertia) and biogeography are important factors that should also be considered in future studies." (Authors)] Address: Oliveira-Junior, J.N.B., Inst. Water Sciences & Technology, Postgraduate Programs in: Society, Environment & Quality of Life; Biodiversity; Society, Nature & Development, Federal Univ. of Western Pará, Unidade Tapajós, Santarém, Pará, 68040-255 Brazil. E-mail: jose.mbo@ufopa.edu.br

19469. Papazian, M.; Rainon, B.; Coache, A. (2021): Présence d'Orthetrum sabina (Drury, 1773) dans le domaine Afrotropical occidental (Odonata, Libellulidae). Bulletin de la Société entomologique de France 126(3): 337-344. (in French, with English summary) ["Presence of O. sabina in the western Afrotropical realm: Surveys carried out over the past fifteen years on the entire Beninese territory, in order to update the local Odonata fauna, enabled the collection in 2013 of a female specimen of O. sabina. This capture is, to our knowledge, the first established in the Afrotropical realm of West Africa." (Authors)] Address: Papazian, M., Le Constellation bât. A, 72 avenue des Caillols, F – 13012 Marseille, France. Email: papazianmcm@wanadoo.fr

19470. Parr, A.J. (2021): Migrant and dispersive dragonflies in Britain during 2020. J. Br. Dragonfly Society 37(2): 69-81. (in English) ["Following a dramatic season in 2019, the year 2020 turned out to be a quieter one for migrant dragonflies in Britain, though there were still several highlights. A number of these probably relate to the legacy of past influxes, but significant fresh immigration also clearly took place. The migrant season started with a few mature Sympetrum fonscolombii arriving during mid-late May, but by early June several instances of local emergence by this species had also been reported. Successful overwintering of larvae resulting from breeding attempts made during the species' near record breaking year in 2019 had presumably been aided by the mild winter of 2019/20. Anax parthenope also started to appear in early June. In many ways, the highlight of spring was, however, the discovery of significant numbers of Aeshna isoceles in the Weymouth area of Dorset, almost 250 km from the nearest known UK breeding population. Although the evidence is only circumstantial, it could well be that these sightings reflect a recently-established breeding population, perhaps initiated by migrants arriving during 2018 when A. isoceles was noted in the adjacent county of Devon. Late spring and summer saw further appearances of S. fonscolombii and A. parthenope, with the latter species going on to have an excellent year, with reports from some 75 sites. Although many individuals must have been immigrants, A. parthenope does now also seem to be becoming increasingly established as a resident in Britain. Another highlight of summer was the good showing by Aeshna affinis, which was reported not just from its Essex and Kent strongholds, but also from many other areas of southern Britain. This is the third year in a row that records have been quite widespread, and both the establishment of new breeding populations and an increase in immigration and/or internal dispersal seem to be involved. Finally, also of note during mid 2020 were several records of Ischnura pumilio well away from the species' core range. The later part of the season saw some large gatherings of Aeshna mixta, plus an unexpected series of records of this species caught overnight in moth traps, the exact significance of which currently remains uncertain though it may well reflect night-time migration. Also of interest were a scattering of records of locally-bred second-generation S. fonscolombii, though in unexceptional numbers. Mid September saw the start of a substantial influx of Anax ephippiger which went on until November. Once a great rarity in Britain, arrivals of A. ephippiger are now very much 'expected', particularly in autumn. It will be informative to see whether this trend is sustained." (Author)] Address: Parr, A.J., 10 Orchard Way, Barrow, Bury St. Edmunds, Suffolk IP29 5BX, UK. E-mail: Adrian.parr@bbsrc.ac.uk

19471. Paulson, D.R. (2021): Nocturnal roosting of neotropical libellulid dragonflies: perhaps only Orthemis roosts in groups. Notulae odonatologicae 9(7): 285-290. (in English) ["Four species of Orthemis are now known to form nocturnal roosting aggregations in Costa Rica, Panama, and Ecuador. A survey of 2 764 observational records from Costa Rica and Panama in iNaturalist revealed 9 communal roosts among 388 records of Orthemis but no such roosts in 2 376 records of 26 other libellulid genera. Additional unpublished photos add three more communal roosts in Orthemis." (Author)] Address: Paulson, D.R., Slater Museum of Natural History, University of Puget Sound, Tacoma WA 98416, USA. Email: dennispaulson@comcast.net

19472. Pereira Mendes, T.; Montag, L.F.; Alvarado, S.T.; Juen, L. (2021): Assessing habitat quality on alpha and beta diversity of Odonata larvae (Insect) in logging areas in Amazon forest. Hydrobiologia 848: 1147-1161. (in English) ["The present study evaluated the effects of habitat quality on the alpha and beta diversity of odonate larvae under conditions of reduced impact and conventional logging. We hypothesized that the variation in the abiotic conditions found in areas of conventional logging would result in a greater loss of alpha and beta diversity in these areas in comparison with areas of reduced-impact logging and native forest. The

study area was located in northeastern Pará state, in northern Brazil. We analyzed data from 10 control streams, located in areas of preserved native forest, 11 streams in forest harvested by reduced-impact logging, and nine streams in areas that had been logged conventionally. Environmental factors such as dissolved oxygen, woody debris, water temperature, sediments, and canopy cover were the principal predictors of the diversity of the Odonata. Our results showed that turnover was the principal component structuring beta diversity in the three areas (native forest, reduced impact and conventional logging). The results of the present study indicate that management initiatives based on reduced-impact logging techniques could be adopted to guarantee socio-economic benefits while minimizing the impacts of logging on local biodiversity." (Authors)] Address: Mendes, T.P., Progr. Pós-Graduação em Agricultura e Ambiente, Univ. Estadual do Maranhão, Balsas, Maranhão, Brazil

19473. Phan, Q.T.; Yokoi, N.; Makbun, N.; Joshi, S.; Subramanian, K.A.; Ngo, Q.P.; Dow, R.A. (2021): Drepanosticta hansruedii Phan, 2021, a new replacement name for Drepanosticta wildermuthi Phan, 2021 (Odonata: Zygoptera: Platystictidae). Zootaxa 5072(2): 200- (in English) ["Phan et al. (2021) provided a review of the damselfly Drepanosticta carmichaeli-group with description of the species D. wildermuthi Phan, 2021 from the Central Highlands of Vietnam. However this name is already established by Villanueva & Schorr (2011) based on specimens from the Philippines. Therefore, a new replacement name for the junior homonym is proposed: Drepanosticta hansruedii nom. nov.; Replacement name for Drepanosticta wildermuthi Phan, 2021." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Research, Institute of Research &Training of Medicine, Biology & Pharmacy, Duy Tan University, Da Nang, 550000, Vietnam. E-mail: pqtoan84@gmail.com

19474. Phan, Q.T.; Yokoi, N.; Makbun, N., Joshi, S.; Subramanian, K.A.; Ngo, Q.P.; Dow, R.A. (2021): A review of the Drepanosticta carmichaeli-group, with the description of D. wildermuthi sp. nov. from the Central Highlands of Vietnam (Odonata: Zygoptera: Platystictidae). Zootaxa 5067(2): 187--210. (in English) ["A modified and expanded definition of the Drepanosticta carmichaeli-group is given. This includes the species: D. annandalei Fraser, 1924, D. brownelli Tinkham, 1938, D. carmichaeli (Laidlaw, 1915), D. emtrai Dow, Kompier & Phan, 2018, D. hongkongensis Wilson, 1997, D. jurzitzai Hämäläinen, 1999, D. sumatrana Sasamoto & Karube, 2007, D. tenella Lieftinck, 1935, D. vietnamica Asahina, 1997 and D. wildermuthi sp. nov. [For the replacement name D. hansruedii, see OAS No. 19473]. The species of the group are reviewed and in most cases illustrated, diagnostic notes are given wherever possible. Drepanosticta polychromatica Fraser, 1931 is considered to be a junior synonym of D. carmichaeli and variation in D. carmichaeli is discussed. Drepanosticta wildermuthi sp. nov. from the Central Highlands of Vietnam (holotype male from Bao Loc district, Lam Dong Province) is described. The female of D. jurzitzai Hämäläinen, 1999 is described for the first time. A key to the males of the D. carmichaeli-group is provided." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Research, Institute of Research &Training of Medicine, Biology & Pharmacy, Duy Tan University, Da Nang, 550000, Vietnam. E-mail: pqtoan84@gmail.com

19475. Pintanel, P.; Tejedo, M.; Salinas-Ivanenko, S.; Jervis, P.; Merino-Viteri, A. (2021): Predators like it hot: Thermal mismatch in a predator-prey system across an elevational tropical gradient. Journal of Animal ecology 90(8): 1985-1995. (in English) [Ecuador "Climate change may have dramatic consequences for communities through both direct effects of peak temperatures upon individual species and through interspecific mismatches in thermal sensitivities of interacting organisms which mediate changes in interspecific interactions (i.e. predation). Despite this, there is a paucity of information on the patterns of spatial physiological sensitivity of interacting species (at both landscape and local scales) which could ultimately influence geographical variation in the effects of climate change on community processes. In order to assess where these impacts may occur, we first need to evaluate the spatial heterogeneity in the degree of mismatch in thermal tolerances between interacting organisms. We quantify the magnitude of interspecific mismatch in maximum (CT_{max}) and minimum (CT_{min}) thermal tolerances among a predator-prey system of dragonfly and anuran larvae in tropical montane (242-3631 m) and habitat (ponds and streams) gradients. To compare thermal mismatches between predator and prey, we coined the parameters maximum and minimum predatory tolerance margins (PTM_{max} and PTM_{min}), or difference in CT_{max} and CT_{min} of interacting organisms sampled across elevational and habitat gradients. Our analyses revealed that: (1) predators exhibit higher heat tolerances than prey (~ 4 ºC), a trend which remained stable across habitats and elevations. In contrast, we found no differences in minimum thermal tolerances between these groups. (2) Maximum and minimum thermal tolerances of both predators and prey decreased with elevation, but only maximum thermal tolerance varied across habitats, with pond species exhibiting higher heat tolerance than stream species. (3) Pond-dwelling organisms from low elevations (0-1500 m a.s.l.) may be more susceptible to direct effects of warming than their highland counterparts because their maximum thermal tolerances are only slightly higher than their exposed maximum environmental temperatures. The greater relative thermal tolerance of dragonfly naiad predators may further increase the vulnerability of lowland tadpoles to warming due to potentially enhanced indirect effects of higher predation rates by more heat-tolerant dragonfly predators. However, further experimental work is required to establish the individual and population-level consequences of this thermal tolerance mismatch upon biotic interactions such as predator-prey." (Authors)] Address: Merino-Viteri, A., Laboratorio de Ecofisiología & Museo de Zoología (QCAZ), Escuela de Ciencias Biológicas, Pontificia Universidad Católica del Ecuador, Quito, Ecuador. Email: armerino@puce.edu.ec

19476. Pires, M.M.; Ely-Junior, G.L.; Schmidt Dalzochio, M.; Sahlén, G.; Périco, E. (2021): Intraspecific morphological

variation in the dragonfly Erythrodiplax media (Odonata: Libellulidae) among South American grassland physiognomies. Neotropical Entomology 50: 736-747 . (in English) ["We assessed the intraspecific morphological variation in E. media Borror 1942 among grassland physiognomies ("Coastal," "Highland," and "Steppic") in the South Brazilian Campos. We measured six morphological traits (total body length, thorax height, length, and width of the fore- and hindwings) from 90 specimens (60 males and 45 females). We tested the effect of the grassland type on the set of traits using one-way MANOVA and principal component analysis (PCA) (separately for each sex). Grassland physiognomy affected the morphology of males and females. In both sexes, the PCA mostly opposed the specimens of the Coastal from the Highland and Steppic grasslands. The first PCA axis separated specimens according to body lengths, thorax heights, and wing width, while the second PCA axis opposed specimens according to wing length and thorax height from specimens with broader wings and longer body lengths. Males from the Coastal had longer body lengths and shorter thorax heights than Highland and Steppic grasslands, while males from the Steppic had longer fore- and hindwings than specimens from the Coastal and Highland grasslands. Females from the Coastal had significantly shorter forewings than specimens from the Steppic grasslands and shorter hindwings than Highland grasslands. Our results are likely explained by the differences in climate and habitat complexity among grassland types and indicate that the processes driving odonate performance vary among grassland biotopes. This study potentially indicates that dragonflies are sensitive to changes in the vegetation structure in South American subtropical grasslands." (Authors)] Address: Pires, M.M., Lab de Evolução e Ecologia, Univ do Vale do Taquari (UNIVATES), Lajeado, (RS), Brazil

19477. Pluot-Sigwalt, D.; Perrin, H. (2021): In memoriam Jean Legrand (1944-2020). Odonatologica 50(1/2): 1-16. (in English) ["Personal recollections and memories of a lifelong professional friendship with Jean Legrand are given. His odonatological bibliography and lists of species connected with his name are appended." (Authors)] Address: Pluot--Sigwalt, Dominique, Museum national d'Histoire naturelle, Entomologie, CP 50, 57, rue Cuvier, F-75231 Paris Cedex 05, France. Email: <dps@mnhn.fr

19478. Previsic, A.; Vilenica, M.; Vuckovic, N.; Petrovic, M.; Rozman, M. (2021): Aquatic insects transfer pharmaceuticals and endocrine disruptors from aquatic to terrestrial ecosystems. Environmental Science & Technology 55: 3736-3746. (in English) ["A wide range of pharmaceuticals and endocrine disrupting compounds enter freshwaters globally. As these contaminants are transported through aquatic food webs, understanding their impacts on both aquatic and terrestrial ecosystems remains a major challenge. Here, we provide the first direct evidence of the transfer of pharmaceuticals and endocrine disruptors through the aquatic–terrestrial habitat linkage by emerging aquatic insects. We also show that the type of insect metamorphosis and feeding behavior determine the bioaccumulation patterns of these contaminants. Adult Trichoptera, an important food source for riparian predators, showed an increased body burden of pharmaceuticals and endocrine disruptors. This implies that terrestrial predators, such as spiders, birds, and bats, are exposed to mixtures of pharmaceuticals and endocrine disruptors of aquatic origin, which may impact their physiology and population dynamics. Overall, our study provides valuable insights into the bioaccumulation patterns and trophic cross-ecosystem transfer of these contaminants, from aquatic primary producers to terrestrial predators." (Authors)] Address: Rozman, M., Ruder Boskovic Institute, Bijenicka cesta 54, 10000, Zagreb, Croatia. E-mail address: marko.rozman@irb.hr

19479. Raczynski, M.; Stoks, R.; Johansson, F.; Sniegula, S. (2021): Size-mediated priority effects are trait-dependent and consistent across latitudes in a damselfly. Oikos 130(9): 1535-1547. (in English) ["Variation in hatching time (phenology) might cause size differences within populations resulting in size-mediated priority effects (SMPEs) shaping intraspecific interactions. These phenology-driven effects potentially can be strengthened by seasonal time constraints caused by a short growth season, and depend on latitude. Here the single and combined effects of phenology and latitude-associated time constraints on SMPEs in larvae of an aquatic insect, the damselfly Lestes sponsa, are studied. We did so by rearing larvae in groups of 16 individuals with different phenology (hatching date) thereby imposing strong intraspecific competition, resulting in cannibalism. We thereby manipulated in a fully crossed way time constraints (combination of temperature and photoperiod: thermo-photoperiod) in larvae from low-latitude and more time constrained high-latitude populations, and examined effects on life history (survival, development, growth) and physiology (fat and protein contents, and phenoloxidase activity as a measure of immune function). Phenology, time constraints and latitude of origin had strong effects on life history, but only the time constraint affected the physiology. We detected a SMPE for survival that, however, was not stronger under time constraints and was consistent in strength between latitudes. Phenology and time constraints interacted for development and growth in a direction suggesting adaptive responses to time constraints but these life history traits did not show SMPEs. We provided important insights in the study of SMPEs thereby showing these to be trait-dependent and not more pronounced under experimentally manipulated or latitude-associated time constraints. Our study thereby makes an important addition to geographic variation in SMPEs, a largely neglected topic." (Authors)] Address: Sniegula, S., Dept of Ecosystem Conservation, Inst. of Nature Conservation, Polish Academy of Sciences, Krakow, Poland. E-mail: szymon.sniegula@gmail.com

19480. Ramil, N.H.; Abdul Manaf, N.F. (2021): Species diversity of dragonfly (Arthropoda: Odonata) and its relationship with air parameters at SG. Muar, Kuala Pilah. Journal of Academia 9(2): 30-39. (in English) ["The study of diversity and distribution of dragonfly, and their relationship with air parameters including temperature (°C) and humidity

(%) at Sungai Muar, Kuala Pilah, Negeri Sembilan was carried out on 14 and 15 March 2020. The sampling of dragonfly was done in two parts of Sungai Muar, Kuala Pilah. For each site, the sampling was conducted in the morning and evening with the air temperature and humidity were recorded at the same time using hygrometer and digital thermometer clock humidity temperature HTC-1. Method that has been used for this study are net sweeping. The samples were collected, preserved and identified until species level. A total of 231 individuals were recorded with Ischnura elegans from Coenagrionidae family as a dominant species with 145 individuals, while the lowest abundance is Pseudagrionidae sp. of Coenagrionidae family with one individual only. For the relationship, there is no significant linear correlation between air parameters with individual number of dragonflies. As a recommendation, the other parameters including air and water parameters should be measured to increase our understanding on the abiotic parameters effects towards the survivability of dragonfly. This research give benefit to society and ecology where it provides knowledge and understanding about dragonfly species and the function of dragonfly as indication of environmental quality. Besides, this research can be used as guidelines for future research and update the checklist of dragonfly in Sungai Muar, Kuala Pilah." (Authors) As some European taxa are listed, species identification is not reliable.] Address: Ramil, N.H., School of Biology, Faculty of Applied Sciences, Universiti Teknologi MARA (UiTM), Cawangan Negeri Sembilan, Kampus Kuala Pilah, 72000 Kuala Pilah, Negeri Sembilan, Malaysia. Email: nurhasyimah@uitm.edu.my

19481. Ribeiro, C.; Firme, B.; Araujo, S.A.; de Sa, A.; Zander, F.; Teixeira, K.; Santos, L.R.; Rodrigues, M.E. (2021): Check-list of Odonata from the state of Bahia, Brazil: ecological information, distribution, and new state records. Odonatologica 50(3/4): 161-186. (in English) ["A check-list of the Odonata species of the state of Bahia, Brazil, including information on their ecology and distribution in this state, was compiled. The data was collected by consulting databases and from specimens deposited in the collection of the Laboratory of Aquatic Organisms (LOA) of the State University of Santa Cruz. Altogether, 174 species from 12 families and 63 genera were recorded. Of these, two families, 15 genera, and 69 species are new records for the state. Additional information on habitats, vegetation types, and the types of land uses where the species were found is also presented. This information is considered a milestone for the state of Bahia and emphasizes the great diversity of Odonata species in poorly sampled regions in Brazil." (Authors)] Address: Ribeiro, Cintia, Laboratorio de Organismos Aquaticos, Depto de Ciencias Biol., Univ. Estadual de Santa Cruz (UESC), Ilheus, BA, Brazil. Email: cintiaribeirods@hotmail.com

19482. Sánchez-Sastre, L.F.; Ramírez del Palacio, O.; Casanueva, P.; Campos, F. (2021): Ampliación de la distribución conocida de Aeshna juncea, Sympetrum flaveolum y Coenagrion mercuriale (Odonata: Aeshnidae, Libellulidae, Coenagrionidae) para la provincia de Palencia, norte de España. Boletín de la Sociedad Entomológica Aragonesa 68: 383-384. (in Spanish, with English summary) ["Extending the known distribution of A. juncea, S. flaveolum and C. mercuriale in Palencia province, northern Spain: New 10x10 km UTM grid cells are added to the known geographical distribution of these threatened species of dragonflies in the Montaña Palentina Natural Park (Palencia province).] Address: Casanueva, Patricia, Dept Experim. Sciences, European Univ. Miguel de Cervantes, Cl Padre Julio Chevalier 2, 47012 Valladolid, Spain. E-mail: pcasanueva@uemc.es

19483. Santos, F.; Nicasio, K.; Silva, K.; Martins, J.; Périco, E.; Dalzochio, M.; Veras, D.; Cajaiba, R.L. (2021): Can artificial ponds retain dragonfly (Insecta: Odonata) biodiversity? A preliminary study in the Brazilian Amazon. Austral Entomology 60(4): 698-706. (in English) ["Although ponds are rich ecosystems for the maintenance of aquatic biodiversity, in many regions of the world, they have been adversely affected by anthropogenic changes in surrounding landscapes. Dragonflies (Insecta: Odonata) are characterized by larval phases that are closely associated with aquatic ecosystems and can accordingly serve as useful indicators of the quality of these environments. In this study, we evaluated the patterns of abundance, richness, and taxonomic composition of adult Odonata in artificial and natural ponds located in the Legal Amazon of Maranhão, which have been exposed to different levels of disturbance. We analysed how the composition of the Odonata assemblages varies between natural and artificial ponds and also assessed to what extent artificial ponds and degraded natural ponds are able to maintain Odonata biodiversity. Our results indicate that the abundance, richness, and composition of Odonata among the monitored ponds were adversely impacted by more disturbed landscapes, with greater abundance and richness being recorded in preserved natural ponds. Although the degraded artificial and natural ponds have Odonata diversities comparable to those of the preserved natural ponds, the latter tend to be characterized by unique and exclusive species, thereby indicating the urgent need for measures designed to protect these natural ecosystems." (Authors)] Address: Cajaiba, R.L., Laboratory of Ecology & Conservation, Federal Institute of Education, Science & Technology of Maranhão, Buriticupu, MA, Brazil. E-mail: reinaldocajaiba@hotmail.com

19484. Senouci, H.; Bounaceur, F. (2021): Contribution à la connaissance de l'odonatofaune du sous-bassin de la Haute Mina (Nord-Ouest algérien). Bulletin de la Société Zoologique de France 146(3): 103-110. (in French, with English summary) ["The present study was conducted to explore the Odonata of the upper Mina, located in the semi-arid bioclimatic zone. The investigations focused on the prospecting of 15 stations located in Tiaret region. The sampling produced 23 species divided into 7 families. The suborder Zygoptera is represented by 4 Families: Calopterygidae (1 species), Coenagrionidae (7 species), Platycnemididae (1 species) and Lestidae (1 species). The suborder Anisoptera is represented by 3 families: Libellulidae (9 species), Aeshnidae (2 species) and Gomphidae (2 species). Five species with limited geographical distributions

appear in the final inventory, including two Saharan species Enallagma deserti and Ischnura saharensis present at the northern limit of their distribution area. In terms of conservation biology, two species occupy the status (VU) on the global red list of IUCN: Gomphus lucasii and Sympetrum sanguineum." (Authors)] Address: Senouci, H., Lab. d'Agro-biotechnologie et de Nutrition en Zone Semi-aride. Faculté des sciences de la nature et de la vie. Université Ibn Khaldoun, Tiaret, Algeria. Email: ha-senouci@outlook.fr

19485. Siblova, Z.; David, S.; Moyzeova, M. (2021): Ecological and distribution traits of the large white-faced darter Leucorrhinia pectoralis (Charpentier, 1825) in Slovakia. Ekológia (Bratislava) 40(3): 248-257. (in English) ["L. pectoralis was recorded in Slovakia at 38 sites in 112 findings and there were 707 imagoes. Reproduction was confirmed in seven sites by finding of 35 larvae and exuviae. The highest number of sites with the occurrence of L. pectoralis is located in the Záhorská nížina lowland; most sites in Slovakia are located at an altitude of 213–351 m. L. pectoralis was recorded together with 49 species of dragonflies, and the average number of L. pectoralis was 9.56 individuals per site. It occurs in the communities as a dominant species (9.5%) together with eudominants Coenagrion puella, C. hastulatum and Libellula quadrimaculata. By non-metric multidimensional scaling (NMDS), we found a coenotic correlation to peat species L. quadrimaculata, Leucorrhinia rubicunda, L. dubia and Sympetrum danae. By redundancy linear analysis (RDA), we found a Monte Carlo permutation test to make a non-random contribution to the explained variability of seven factors (p = 0.012–0.034). L. pectoralis statistically significantly prefers habitats in the forest landscape (r = 0.62, p = 0.0063), the presence of vegetation (r = 0.94, p = 0.0003) and peatbogs (r = 0.61, p = 0.0058). We did not confirm a significant correlation to altitude. Based on easy determination, territoriality (especially males) and bioindicative sensitivity of larvae, L. pectoralis is accepted as an umbrella species. L. pectoralis has a high dispersion potential and is suitable for creating the metapopulation character of local populations, which is important for the conservation management of the species." (Authors)] Address: Šíblová, Zuzana, Katedra ekológie a environmentalistiky, Fakulta prírodných vied, Univ. Konštantína Filozofa v Nitre, Trieda A. Hlinku 1, 949 74 Nitra, Slovakia. E-mail: zuzana.siblova@savba.sk

19486. Silva, L.F.R.; Castro, D.M.P.; Juen, L.; Callisto, M.; Hughes, R.M.; Hermes, M.G. (2021): Functional responses of Odonata larvae to human disturbances in neotropical savanna headwater streams. Ecological Indicators 133, December 2021, 108367: (in English) ["Highlights: • Trait-based approach for assessing Odonata larvae responses to anthropogenic impact. • Odonata larvae have different traits comparing least and highly disturbed streams. • Odonata larvae traits can be a useful tool for assessing anthropogenic impacts. Abstract: Headwater streams are facing increasing disturbances from human pressures worldwide, thus better knowledge about bioindicators, particularly aquatic insect responses to various pressures and stressors, are urgently needed. Multiple trait-based approaches consider species attributes filtered by the environment, allowing them to persist in ecosystems under environmental pressures. Because this approach has been minimally explored in Odonata larvae, we aimed to understand how anthropogenic stressors structure Odonata larval assemblages in neotropical savanna streams by using multiple trait-based approaches. We hypothesized that a set of stressors--such as reduced substrate heterogeneity, poor water quality, natural land cover converted to pasture and agriculture, and reduced local riparian canopy cover--select Odonata functional traits. We collected 3209 Odonata larvae from 186 neotropical savanna headwater stream sites and used 39 environmental variables and seven traits in 23 categories related to their functional roles in Odonata genera. To assess associations between trait categories and environmental variables, we applied RLQ and fourth-corner statistical analyses. We found strong relationships between environmental variables and sets of Odonata biological traits that were separated into two main groups. Zygoptera genera (Perilestes, Allopodagrion, Heliocharis, Argia, Epipleoneura, Mnesarete/Hetaerina, Psaironeura) have elongated body shapes, caudal lamellae respiration, conforming thermoregulation, and endophytic oviposition. Such traits favor assemblages in conditions similar to reference streams, including denser riparian vegetation, good water quality, and diverse flows and substrate. Therefore, they are more sensitive to changes in those conditions. On the other hand, Anisoptera genera (Gomphoides, Archaeogomphus, Macrothemis, Brechmorhoga, Gynothemis, Phyllocycla) have cylindrical body shapes, internal gill respiration, endothermic thermoregulation, and burrowing behavior. Those traits facilitate their survival in intermediate or disturbed stream sites, characterized by riparian deforestation, increased erosion and siltation, and higher levels of total dissolved solids and conductivity. Therefore, using Odonata larval traits can be a valuable tool for assessing and monitoring anthropogenic impacts on neotropical savanna streams." (Authors)] Address: Silva, Larissa, Univ. Federal de Lavras, Setor de Zoologia Comparada, Depto de Biologia, Laboratório de Sistemática e Biologia de Insetos, CEP 37200-900 Lavras, Minas Gerais, Brazil. Email: larissa.silva9@estudante.ufla.brS

19487. Silva, L.F.R.; Castro, D.M.P.; Juen, L.; Callisto, M.; Hughes, R.M.; Hermes, M.G. (2021): A matter of suborder: are Zygoptera and Anisoptera larvae influenced by riparian vegetation in Neotropical Savanna streams? Hydrobiologia 848: 4433-4443. (in English) ["Initial Odonata larval distributions are primarily influenced by adult females at the moment of oviposition. However, after oviposition, the larvae are strongly associated with environmental conditions. In the case of both adults and larvae, anthropogenic disturbances that change these conditions may alter the composition and structure of Odonata assemblages. Therefore, based on the differing environmental requirements of Zygoptera and Anisoptera adults and larvae, together with their morphological and physiological differences, we suspected differing riparian preferences of larvae and adults for each suborder. We evaluated the richness and abundance of Odonata larvae. We hypothesized that Zygoptera larvae

would have greater richness and abundance in streams with canopy shading, lower temperature ranges, and high physical habitat heterogeneity. On the other hand, Anisoptera larvae would be more abundant in streams without canopy cover. We sampled 186 headwater stream sites in the Neotropical Savanna along an anthropogenic disturbance gradient and used a model selection approach to test our hypotheses, correlating environmental metrics with Odonata larval richness and abundance. We found higher richness of Zygoptera larvae in shaded sites with canopy cover >5 m high, whereas bare ground without riparian vegetation was important for Anisoptera richness and abundance. Our results indicated that Odonata larvae follow the same distribution, richness and abundance patterns as adults. Anthropogenic disturbances related to the removal or reduction of riparian vegetation can favor Anisoptera over Zygoptera larval assemblages in streams. Preserving riparian canopy cover is needed to maintain the richness of Zygoptera larvae in Neotropical Savanna streams." (Authors)] Address: Silva, Larissa, Laboratório de Sistemática e Biologia de Insetos, Setor de Zoologia Comparada, Departamento de Biologia, Universidade Federal de Lavras, CEP 37200-900, Lavras, Minas Gerais, Brazil

19488. Silva Vilela, D.; Stefani-Santos, G.; Avila Junior, W.F.; Magalhaes de Souza, M. (2021): Brechmorhoga goncalvensis sp. nov. from south-eastern Brazil (Odonata: Libellulidae). Odonatologica 50(1/2): 81-94. (in English) ["B. goncalvensis sp. nov. (♂ holotype: Brazil, Minas Gerais, Gonçalves, APA Fernão Dias, 22.7363 S, 45.8191 N, 1670 m a.s.L, 14-X-2019, deposited in coll. UFMG) is described and diagnosed based on specimens collected in Minas Gerais and Rio de Janeiro States, south-eastern Brazil. The new species can easily be separated from other congeners by the posterior hamule with a truncated base bearing two basal projections, cercus with a carina of 4-5 small denticles on the apical ventral margin, and its unique body coloration of double stripes on each side of the abdominal segments." (Authors)] Address: Silva Vilela, D., Rua Jaime Bilharinho, 575, Uberaba, Minas Gerais, Brazil. Email: deeogoo@gmail.com

19489. Simonsen, T.J.; Djernæs, M.; Fogh Nielsen, O.; Olsen, K. (2021): A tale of two Skimmers: complex relationships between DNA barcodes, distributions and taxonomy in European Orthetrum cancellatum and O. coerulescens. International Journal of Odonatology 24: 316-331. (in English) ["We explore the genetic diversity and phylogeography of the dragonflies Orthetrum cancellatum and O. coerulescens in Europe based on mitochondrial and nuclear DNA. Orthetrum cancellatum has a clear division between a group comprising Maltese, Italian, and central and northern European populations, and a group comprising mainly populations from southwestern and southeastern Europe, as well as some northern European specimens. We propose that the two groups represent two different Glacial refugia, one in the Italian Peninsula and one in the Balkans where the species survived during the Weichsel Glaciation. Orthetrum coerulescens shows a more complex pattern, although it too can be divided into two groups. One group comprise all the specimens we have identified as O. coerulescens anceps from their phenotype as well as specimens from Spain, Montenegro, and Pakistan, and some specimens from Italiy, Poland and Bulgaria. The other group comprise all other specimens from central and northern Europe, almost all specimens from Italy and Bulgaria, and all specimens from Malta. We propose that the latter group represents an Italian Glacial refugium from which the species spread to both central Europe, Malta and southern Balkan (Bulgaria) after the end of the Weichsel Glaciation. As specimens from Spain and Bulgaria, which were identified as O. coerulescens coerulescens group with specimens identified as O. coerulescens anceps we conclude that the two subspecies mix more or less freely across the Mediterranean and question the validity of two subspecies." (Authors)] Address: Simonsen, T.J., Natural History Museum Aarhus, Wilhelm Meyers Allé 10, DK-8000 Aarhus C, Denmark. Email: t.simonsen@nathist.dk

19490. Sparrow, D.J.; De Knijf, G.; Sparrow, R.L. (2021): Diversity, status and phenology of the dragonflies and damselflies of Cyprus (Insecta: Odonata). Diversity 2021, 13, 532: 13pp. (in English) ["Based on literature data, unpublished material and the results of the year-round monitoring at selected sites island-wide by the Cyprus Dragonfly Study Group since 2013, we acquired an excellent knowledge of the diversity and status of the Odonata of Cyprus. Altogether, 37 species are on the island's checklist. Ischnura pumilio, Aeshna affinis and Brachythemis impartita were only very rarely recorded in the past but are considered to be no longer present. The single record of Calopteryx virgo from 1930 is in our opinion a misidentification and has been removed from the checklist. The island has a rather impoverished odonate fauna compared to neighbouring countries. There are no endemic species, but the island is home to some range of restricted species of which Ischnura intermedia is the most important. Flight seasons determined for the 31 species with sufficient data were generally found to be longer than reported for other countries in the Eastern Mediterranean. This may be due to intensive year-round monitoring but could also result from Cyprus' warmer climate. Very wide annual variations were found in the abundance of all species over the seven years and show an almost immediate response to the wide fluctuations in Cyprus' annual rainfall levels." (Authors)] Address: Sparrow, D.J., Cyprus Dragonfly Study Group, PO Box 62624, 8047 Paphos, Cyprus. E-mail: davidrospfo@hotmail.com

19491. Stand-Perez, M.A.; Montes-Fontalvo, J.; Perez-Gutierrez, L.A. (2021): Sixteen new records of Odonata for Colombia from the Araracuara Region (Perilestidae, Calopterygidae, Heteragrionidae, Megapodagrionidae, Polythoridae, Coenagrionidae, Aeshnidae, Gomphidae, Libellulidae). Notulae odonatologicae 9(8): 378-388. (in English) ["A field trip to collect Odonata was carried out in Southern Serrania de Chiribiquete National Natural Park, Araracuara Region, Colombia. A total of 40 species were collected, of which 17 are new records for the country: Hetaerina charca,

Epipleoneura spatulata, Metaleptobasis gibbosa, Neoneura desana, N. luzmarina, N. fulvicollis, N. joana, Phoenicagrion paulsoni, Protoneura tenuis, Oxystigma petiolatum, Perissolestes romulus, Epigomphus paludosus, Zonophora regalis, Micrathyria hippolyte, Uracis ovipositrix, and Ypirangathemis calverti. The genera Schistolobos, and Ypirangathemis are reported for the first time for Colombia. A map of localities, photographs of the species, and notes on dragonfly and damselfly conservation are provided." (Authors)] Address: Stand-Perez, M.A., Red de Biol. Evol., Instit. de Ecologia A.C., Xalapa, Mexico. Email: mstand20@gmail.com

19492. Starnes, T.; Clausnitzer, V. (2021): Chapter 5: The status and distribution of freshwater odonates. In: Starnes, T. and Darwall, W.R.T. (eds.) (2021). Identification and validation of Western African freshwater Key Biodiversity Areas. Gland, Switzerland: IUCN: 53-61. (in English) ["At the time of publishing this report, the western Africa region included 307 species of freshwater odonates belonging to 13 families according to the Red List. Of these 307 species, 50 species are endemic to the region. These endemic species are largely forest dependent, either along streams or in swamp forests and are concentrated in the lower areas. Of the 307 species of odonate addressed in this work, five are Critically Endangered, seven are Endangered and two are Vulnerable, amounting to 14 globally threatened species (Table 5.1). Since the previous report on the western African Odonata in Dijkstra et al. (2009), 19 species have changed Red List category due to new information (nongenuine changes). There have been no genuine status changes during this time. Eight species have been moved from DD to LC, due to new information concerning their status and distributions, and one from DD to NT; Phyllomacromia lamottei is thought to be endemic to the Nimba Mts region. One species – Trithemis dubia – was moved from LC to DD due to unresolved taxonomy. Azuragrion buchholzi has moved from NT to LC due to a number of additional localities extending its known range in Cameroon and Gabon. Three species have been downlisted from VU to LC due to new records improving the prospects of these species; they are Agriocnemis angustirami, Nubiolestes diotima and Paragomphus sinaiticus. Conversely, three species have been uplisted from VU to EN, citing new information on threats to these species; they are Africocypha centripunctata, Ceriagrion citrinum and Umma purpurea. One species, Neodythemis takamandensis, has been downlisted from CR to LC due to several new records in Gabon significantly extending its range. The numbers in parentheses in Table 5.1 are taken from the previous regional report on western African freshwater biodiversity (Dijkstra et al., in Smith et al., 2009), and were based partly on regional assessments. Besides a number of new species being assessed since that time, the difference between the numbers reported is partly due to the use here of Global rather than Regional assessments e.g. Afroaeschna scotias is globally LC although it was assessed in 2006 as regionally VU, and partly due to status changes e.g. Agriocnemis angustirami has undergone a nongenuine status change from VU to LC. One CR species Pseudagrion mascagnii was not included in this analysis because its entire range is marked as 'Presence uncertain' in the Red List. However, the Red List assessment (Dijkstra, 2010c) states that the species is known from type pair collected at Regent in Sierra Leone, described in 2004 (Terzani & Marconi, 2004). A study on biodiversity hotspots and threatened dragonfly species in Africa did show that only 58% critically endangered and 60% endangered dragonfly species are found in formally protected areas, whereas 80% of species listed as vulnerable occur in protected areas (Simaika et al., 2013). Especially in western Africa there is a lack of protected areas in the biodiversity hotspots, especially of rare species (Pinkert et al., 2020)." (Authors)] Address: Clausnitzer, Viola, Heinzelstr. 3, 02826 Görlitz, Germany. Viola.Clausnitzer@senckenberg.de

19493. Stefani-Santos, G.; Avila, W.F.; Clemente, M.A.; Henriques, N.R.; Souza, A.S.B.; Vilela, D.S.; Souza, M.M. (2021): Odonata (Insecta) communities along an elevational gradient in the Atlantic forest of southeastern Brazil, with the description of the female of Heteragrion mantiqueirae Machado, 2006. International Journal of Odonatology 24: 178-196. (in English) ["Despite the important role of the order Odonata in ecosystems, there is a lack of information about dragonfly communities in several regions, high elevation sites, and environmentally protected areas in Minas Gerais State, Brazil. Our objective was to assess the abundance and richness of dragonfly and damselfly communities along an elevational gradient in the Atlantic Forest, southeastern Brazil. This study was conducted in the Fernão Dias Environmental Protection Area, Mantiqueira Mountain region, Gonçalves, Minas Gerais State, in sites covered by Seasonal Semideciduous and mixed forests. This is the first study of Odonata communities in the region. Samplings were carried out on 17 days from October 2019 to March 2020 at three elevation ranges (low, mid, and high). A total of 293 specimens, distributed in 39 species and 9 families, were sampled. Elevation did not influence the richness or abundance of dragonflies but altered community composition. Some species were found to be exclusive to high-elevation sites, such as Heteragrion mantiqueirae Machado, 2006, which was recorded for the first time in Minas Gerais and we provide a description and diagnosis of the single female collected in tandem. A novel species of the genus Brechmorhoga was found to occur at mid and high elevations. The composition of dragonfly communities depends on the degree of preservation and extension of forest areas. Therefore, conservation of forests in Gonçalves is crucial for preserving Odonata diversity in Minas Gerais State." (Authors)] Address: Ávila Jr, W.F., Depto de Biodiversidade, Evolução e Meio Ambiente, Programa de Pós-Graduação em Ecologia de Biomas Tropicais. Univ. Federal de Ouro Preto, Ouro Preto, Brazil. Email: walterfaj88@gmail.com

19494. Steffani, G.S.; Vieira, L.R.; de Souza, M.M. (2021): Influência do grau de conservaçao florestal sobre as comunidades de borboletas (Lepidoptera) e libélulas (Odonata) na Área de Proteção Ambiental Fernão Dias. Anais do Seminário Restaura Mantiqueira 1(1): 4 pp. (in Portuguese) ["The Atlantic Forest is home to great biodiversity of insects,

such as dragonflies and butterflies, which perform several environmental services in terrestrial and aquatic ecosystems, however the increasing deforestation puts this richness at risk. Therefore, the aim of this study was to evaluate how the degree of forest conservation affects these insects. The study was conducted in the period from October 2019 to March 2020, in areas of mixed forest in the Fernão Dias Environmental Protection Area, municipality of Gonçalves, using traps and active search to sample the species. The vegetation cover associated with the conservation of the areas, when comparing degraded areas with conserved areas, positively influenced the composition of the dragonfly and butterfly communities in the Fernão Dias APA. ... For Odonata, 293 individuals of 39 species distributed in nine families were collected. In the area of greater forest cover the richness was greater than in areas of greater anthropic action, however there was no statistical difference between richness by the Kruskal-Wallis test, but there was a change in the communities. There are three odonata species restricted to areas of less anthropic pressure and greater forest cover, which also occurred in other studies in high elevations associated to conserved forests, Bryoplathanon globifer, which has a record in mixed forest 1600 m in Serra do Papagaio State Park, Oxyagrion mirnae and Heteragrion mantiqueirae above 1500 m in Zona da Mata, the latter being an unprecedented record for Minas Gerais, until then described only for the state of São …." (Authors/DeepL)] Address: Santos, Stefani, Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas-Inconfidentes MG. Email: glaucia.stefani@alunos.ifsuldeminas.edu.br

19495. Stryjecki, R.; Zawal, A.; Krepski, T.; Stêpien, E.; Buczynska, E.; Buczynski, P.; Czachorowski, S.; Jankowiak, L.; Pakulnicka, J.; Sulikowska-Drozd, A.; Pešiæ, V.; Michonski, G.; Grabowski, M.; Jabło nska, A.;, Achrem, M.; Olechwir, T.; Pietrzak, L.; Szlauer-Lukaszewska, A. (2021): Anthropogenic transformations of river ecosystems are not always bad for the environment: Multi-taxa analyses of changes in aquatic and terrestrial environments after dredging of a small lowland river. PeerJ 9:e12224: 21 pp. (in English) ["Rivers are one of the most commonly transformed aquatic ecosystems. Most papers present significantly negative effects of activities such as dredging or channel regulation on the ecological status of rivers. The purpose of this work was to compare the response of various groups of invertebrates (Mollusca, Hydrachnidia, Odonata, Heteroptera, Coleoptera and Trichoptera) to an intervention involving dredging in conjunction with the removal of riparian vegetation. Habitat diversity increased after the dredging, and more individuals and species were caught than before the dredging. The increase in habitat diversity after the dredging translated into an increase in the species diversity of most investigated groups. Individual groups of invertebrates showed varied responses to the dredging, depending on the role of the terrestrial phase in their life cycle: the greater the role of the terrestrial phase in the life cycle, the more the group was affected by changes in the terrestrial environment following the intervention. In consequence, the intervention had the greatest negative impact on insects, and among these, on adult Odonata. The following conclusions can be drawn: (1) Dredging can benefit a previously anthropogenically transformed river ecosystem by increasing habitat diversity; (2) Odonata are particularly useful for assessing the impact of this type of intervention on invertebrate communities. They can be considered good indicators of habitat disturbances in both aquatic and terrestrial ecosystems." (Authors)] Address: Stryjecki, R., Dept of Zoology and Animal Ecology, University of Life Sciences in Lublin, Lublin, Poland. E-mail: robert.stryjecki@up.lublin.pl

19496. Subrero, E.; Pellegrino, I.; Cucco, M. (2021): Different stress from parasites and mate choice in two female morphs of the blue-tailed damselfly. Evolutionary Ecology 35: 687-704. (in English) ["In Odonates, female colour polymorphism is common and implies the presence of two or more female types with different colours and behaviours. To explain this phenomenon, several hypotheses have been proposed that consider morph frequency, population density, the presence of parasites, and mating behaviour. We studied the blue-tailed damselfly Ischnura elegans, a species with a blue androchrome morph and two gynochrome morphs (the common green infuscans, and the rare orange rufescens-obsoleta). The size of adult males and females, the presence of parasites, and pairing behaviour between males and the three female morphs was assessed in field conditions throughout the reproductive season in NW Italy. Moreover, growth and emergence success of larvae produced by the different morphs was analyzed in standardized conditions. In the field, males showed a preference for the gynochrome infuscans females, despite a similar frequency of androchrome females. In test conditions, male preference for the infuscans females was also observed. Paired males and paired androchrome females were larger than unpaired individuals, while there were no differences in size between paired and unpaired infuscans females. Males and androchrome females were more parasitized than infuscans females. The survival and emergence success of larvae produced by androchrome females was higher than those of offspring produced by the infuscans females. Our results suggest that a higher survival of progeny at the larval stage could counterbalance the higher parasitism and the lower pairing success of andromorph adult females and highlight the importance of considering the whole life-cycle in polymorphism studies." (Authros)] Address: Cucco, M., Univ. Piemonte Orientale, Alessandria, Italy. E-mail: marco.cucco@uniupo.it

19497. Susanto, M.A.; Bahri, S. (2021): Diversity and abundance dragonflies (Odonata) at Mount Sigogor Nature Reserve area, Ponorogo Regency, East Java, Indonesia. Jurnal Biota 7(2): 101-108. (in English) ["Mount Sigogor Nature Reserve area is a mountainous tropical rain forest, administratively located in Pupus Village, Ngebel District, Ponorogo Regency, East Java, Indonesia. One of the main functions of this nature reserve is as a water catchment area for the villages around the nature reserve area. Water sources and flows within the Mount Sigogor Nature Reserve area have the potential as natural habitat for dragonflies. This

study aims to determine the diversity and abundance of dragonflies in the Mount Sigogor Nature Reserve Area. The method of collecting dragonflies data used the Visual Day Flying method by recording the diversity of dragonflies species and counting the number of individuals from each observed dragonflies species. The data obtained were analyzed using the Relative abundance, Shannon-Wiener Heterogeneity Index and the frequency of Presence. The results of the research conducted showed that there were 14 species from 7 families with a total of 464 individuals. The Shannor-Wiener diversity index shows that the diversity value is H'= 1.81. Meanwhile, the presence frequency analysis showed that there were four species with a value of 100% which were classified as abundant Frequency of Presence, namely Euphaea variegata, Vestalis luctuosa, Rhinocypha anisoptera and Coeliccia membranipes." (Authors)] Address: Bahri, S., Biology Departement, Faculty of Science and Technology, UIN Sunan Ampel Surabaya

19498. Tandon, V.; Srivastava, A. (2021): Natural enemies of Rice White Stem Borer Scirpophaga fusciflua (Hampson) in Himachal Pradesh. Indian Journal of Entomology Online published Ref. No. e20421 DoI.: 10.5958/IJE.2021.27: 3 pp. (in English) ["Fortnightly surveys were made to study natural enemies of white stem borer (WSB) Scirpophaga fusciflua (Hampson) in rice. The surveys revealed that the predators of S. fusciflua first appeared in the second fortnight of July, with the peak during second fortnight of September during 2016 and 2017; and their relative proportion was- spiders (49.4% and 51.2%), dragonflies (22.2% and 22.6%) and damselflies (28.4% and 26.2%). Four species of parasitoids viz., egg- Telenomus sp. and Tetrastichus sp., larval- Stenobracon sp. and pupal parasitoids- Xanthopimpla punctata were observed from egg mass, larvae and pupae collected from Kangra valley of Himachal Pradesh. During 2016 and 2017, the % parasitization was observed to be maximum in the first fortnight of October (53.5 and 62.0%) followed by second fortnight of September (36.4 and 49.1%), respectively." (Authors)] Address: Tandon, V., Dept of Entomology, Rice and Wheat Research Centre, Malan 176047, Himachal Pradesh, India. Email: tandonvikas8763@gmail.com

19499. Teder, T.; Kaasik, A.; Taits, K.; Tammaru, T. (2021): Why do males emerge before females? Sexual size dimorphism drives sexual bimaturism in insects. Biol. Rev. 96(6): 2461-2475. (in English) ["Conspecific females and males often follow different development trajectories which leads to sex differences in age at maturity (sexual bimaturism, SBM). Whether SBM is typically selected for per se (direct selection hypothesis) or merely represents a side-effect of other sex-related adaptations (indirect selection hypothesis) is, however, still an open question. Substantial interspecific variation in the direction and degree of SBM, both in invertebrates and vertebrates, calls for multi-species studies to understand the relative importance of its evolutionary drivers. Here we use two complementary approaches to evaluate the evolutionary basis of SBM in insects. For this purpose, we assembled an extensive literaturederived data set of sex-specific development times and body sizes for a taxonomically and ecologically wide range of species. We use these data in a meta-analytic framework to evaluate support for the direct and indirect selection hypotheses. Our results confirm that protandry – males emerging as adults before females – is the prevailing form of SBMin insects. Nevertheless, protandry is not as ubiquitous as often presumed: females emerged before males (= protogyny) in about 36% of the 192 species for which we had data. Moreover, in a considerable proportion of species, the sex difference in the timing of adult emergence was negligible. In search for the evolutionary basis of SBM, we found stronger support for the hypothesis that explains SBM by indirect selection. First, across species, the direction and degree of SBM appeared to be positively associated with the direction and degree of sexual size dimorphism (SSD). This is consistent with the view that SBM is a correlative by-product of evolution towards sexually dimorphic body sizes. Second, within protandrous species, the degree of protandry typically increased with plastic increase in development time, with females prolonging their development more than males in unfavourable conditions. This pattern is in conflict with the direct selection hypothesis, which predicts the degree of protandry to be insensitive to the quality of the juvenile environment. These converging lines of evidence support the idea that, in insects, SBM is generally a by-product of SSD rather than a result of selection on the two sexes to mature at different times. It appears plausible that selective pressures on maturation time per se generally cannot compete with viability- and fecundity-mediated selection on insect body sizes. Nevertheless, exceptions certainly exist: there are undeniable cases of SBM where this trait has evolved in response to direct selection. In such cases, either the advantage of sex difference in maturation time must have been particularly large, or fitness effects of body size have been unusually weak." (Authors) This meta study includes data of Odonata.] Address: Teder, T., Dept of Zoology, Institute of Ecology and Earth Sciences, University of Tartu, Vanemuise 46, Tartu, EE-51003, Estonia

19500. Theischinger, G.; Toko, P.S.; Richards, S.J. (2021): A remarkable new species of Papuagrion Ris, 1913 from New Guinea (Odonata: Coenagrionidae). Odonatologica 50(1/2): 131-141. (in English) ["A new species of the coenagrionid damselfly genus Papuagrion is described from the lowlands of the Purari River basin in Gulf Province, Papua New Guinea. Papuagrion forceps sp. nov. is a large (abdomen + appendages 46.5-47.2 mm) slender species with a pre-dominantly black and brown abdomen. The male is unique in the genus in having superior appendages that are minute in comparison to the inferior appendages, with lower branches that are not visible in profile. The new species is currently known only from the type locality, where a male and a female were perched among low foliage in a remnant patch of lowland rainforest." (Authors)] Address: Toko, P.S., New Guinea Binatang Research Centre, Madang, Papua New Guinea, and Faculty of Science, University of South Bohemia, Ceske Budejovice, Czech Republic. Email: pagi.sione@gmail.com

19501. Theodoropoulos, C.; Karaouzas, I. (2021): Climate change and the future of Mediterranean freshwater macroinvertebrates: a model-based assessment. Hydrobiologia 848: 5033-5050. (in English) ["Mediterranean-climate rivers are projected to warm by 0.5–4°C and river flows to decline by 34% by 2071–2100. Using data from 191 Greek streams / rivers, we projected macroinvertebrate responses to 12 climate change scenarios for 2071–2100 to identify critical hydro-thermal limits beyond which irreversible responses are triggered and to assess the potential of environmental flows to mitigate the ecological impacts of climate change. Overall, macroinvertebrate assemblages will be less diverse, represented mostly by limnophilic, warm-dwelling taxa. Ephemeroptera, Plecoptera, Trichoptera and some Diptera will be replaced by Odonata, Amphipoda, Gastropoda and Heteroptera. Moderate average warming (1–1.8 °C) will not significantly affect assemblage abundance and richness but extreme warming (= 5 °C) will shift to limnophilic-type assemblages even in non-lentic hydrological conditions. Our models predict irreversible macroinvertebrate responses at = 3°C average warming combined with = 50% average flow decrease, or = 5°C warming regardless of flow decrease, or = 90% flow decrease regardless of warming. Beyond these limits, cold-dwelling taxa such as Limnephillidae and Potamanthidae will almost disappear (abundance: –87%), replaced by warm-dwelling Physidae (+100%) and Coenagrionidae (+97%). Environmental flows could mitigate the impacts of warming, compensating macroinvertebrates for up to 3°C when 50% decreased flows are provided, and for up to 5°C when flows within the 0–25% range are provided." (Authors)] Address: Theodoropoulos, C., Institute of Marine Biological Resources and Inland Waters, Hellenic Centre for Marine Research, 46.7 km Athens-Sounio Ave., 19013, Anavyssos, Greece

19502. Uboni, C.; Borsato, V., Bacaro, G. (2021): Odonate fauna assemblages in the “Cansiglio Forest” (Insecta: Odonata). Rendiconti Lincei. Science Fisiche e Natrali 32: 899-910. (in English) ["Odonata is considered a "flagship" group of insects and its investigation is of primary importance especially for protected areas where freshwater ecosystems occur. In this study, we focused on Odonate fauna in the "Cansiglio Forest" (Veneto, Italy), a karst area where the only checklist available dates back more than 40 years ago. In order to update the Odonate adult distribution in the area, we selected 21 ponds that were sampled monthly, from May to August, during a 2-years survey. In total, 21 species (belonging to 14 genera and 5 families) have been recorded: we confirmed 15 species from the previous species list and we added to the whole species list 6 new species. Dominant families were represented by Libellulidae (33%) and Aeshnidae (23%), the most common genus was Sympetrum (19%), and the most frequent species was Coenagrion puella (63%). In term of patterns of species richness, highly grazed and pastured ponds exhibited the lower number of species and individuals, as a probable response to the high level of animal disturbance on the vegetation and due to the eutrophication processes. Our results are important also in terms of conservation and management of freshwater sites belonging to Natura 2000 site. ... In detail, we confirmed the following species: Lestes barbarus, Sympecma fusca, Enallagma cyathigerum, Coenagrion scitulum, C. puella, Aeshna cyanea, A. affinis, Anax imperator, Libellula depressa, L. quadrimaculata, Crocothemis erythraea, Sympetrum striolatum, S. meridionale, S. fonscolombii, S. sanguineum. On the contrary, we did not confirm the following species: Ischnura elegans, Aeshna mixta, Orthetrum cancellatum, O. brunneum, Sympetrum vulgatum, S. flaveolum, Leucorrhinia pectoralis. Considering the last two species, their present lack in the study can be justified with the major threats connected with their ecology. It is known that S. flaveolum populations are in decline due to intensive grazing activity that damage pond banks especially during the reproductive period, and for grazing animal dejections that contribute to the phenomena of water eutrophication." (Authors)] Address: Uboni, Costanza, Dept Life Sciences, Univ. of Trieste, Via L. Giorgeri 10, Trieste, Italy. Email: costanza.uboni@gmail.com

19503. Utseth, H. (2021): Insect community response to recent rewetting of drained bogs in Southeastern Norway. MSc thesis, Faculty of Environmental Sciences and Natural Resource Management: IV + 34 pp. (in English, with Norwegian summary) ["During the last five years, Norway has rewetted almost 80 drained mires to reduce climate emissions, limit the risk of natural disasters, and to prevent further loss of biodiversity. Even more mires are planned to be rewetted over the next five years despite limited knowledge on how mire fauna responds to the measures. Therefore, this study used insects to discover possible community alterations resulting from drainage and rewetting of ombrogenous mires, more commonly known as bogs, in the southeastern part of Norway. Changes in densities of insect orders and four target butterfly species were assessed through a transect study comparing seven newly rewetted bogs to adjacent and otherwise comparative drained and pristine areas. The findings revealed a general similarity in the overall composition of insect orders, butterflies, and water insects, despite some alterations within specific orders among the three treatments. Drained bogs generally had higher abundances of dipterans and hymenopterans compared to pristine areas, and lower abundances of orthopterans. These responses might derive from drainage favoring species preferring temporal water sources and forest development, rather than bog specialists. Insect communities in rewetted bogs were more similar to drained bogs than to pristine, with the exception of a reversing response in the order of hymenopterans. Additionally, rewetted bogs stood out in their high abundance of odonates, likely due to the increased access to artificial pools from dammed ditches. As the observations of target butterflies were few and the samplings were conducted shortly after rewetting, further assessments of lower taxa and long-term studies of responses are necessary to better understand the potential of bog rewetting for insect communities....In this study, the odonate abundance in pristine bogs resembled that of drained ones, while they were the most abundant in rewetted bogs. One explanation behind higher abundances in rewetted sites might be the increased access to open water and ponds

due to dammed ditches (Eian, 2021). Since odonates have a larval stage generally dependent upon water, these dams might increase the availability of suitable larval habitats for some species (Beadle et al., 2015; Strobl et al., 2020). Even though drained bogs also can contain some ditches filled with water, these shallow and narrow pools might not be suitable habitats for all species (Elo et al., 2015). Another explanation can be that the study design itself has affected the number of odonates recorded for the different treatments. Transects in rewetted bogs always crossed a minimum of one ditch perpendicularly. In pristine bogs with open waters, the transect were usually located next to the ponds due to unsafe ground surrounding the water. This have impacted how close and frequently transect counts were to open water and may also have influenced the results if some species of odonates prefer to stay closer to water. However, an American study of adult dragonflies' land use around open water found unaffected abundances of dragonflies up to 160 meters from the closest pond (Bried & Ervin, 2006), suggesting that at least several dragonflies should not be notably affected by transects crossing by or directly over open waters." (Author)] Address: not stated

19504. Valeriano, W.W.; Andrade, R.R.; Vasco, J.P.; Malachias, A.; Almeida Neves, B.R.; Soares Guimarães, P.S.; Rodrigues, W.N. (2021): Mapping the local dielectric constant of a biological nanostructured system. Beilstein J. Nanotechnol. 12: 139-150. (in English) ["The aim of this work is to determine the varying dielectric constant of a biological nanostructured system via electrostatic force microscopy (EFM) and to show how this method is useful to study natural photonic crystals. We mapped the dielectric constant of the cross section of the posterior wing of the damselfly Chalcopteryx rutilans with nanometric resolution. We obtained structural information on its constitutive nanolayers and the absolute values of their dielectric constant. By relating the measured profile of the static dielectric constant to the profile of the refractive index in the visible range, combined with optical reflectance measurements and simulation, we were able to describe the origin of the strongly iridescent wing colors of this Amazonian rainforest damselfly. The method we demonstrate here should be useful for the study of other biological nanostructured systems." (Authors)] Address: Valeriano, W.W., Depto Física, ICEx, Univ. Federal de Minas Gerais, Av. Antônio Carlos 6627, 31270-901 Belo Horizonte, Minas Gerais, Brazil. Email: wescleyvaleriano@gmail.com

19505. Valeriano, W.W. (2021): Mapeamento da constante dielétrica local de um sistema biológico nanoestruturado: estudo da asa da libélula Chalcopterix rutilans. PhD thesis, Instituto de Ciências Exatas da Universidade Federal de Minas Gerais: 117 pp. (in Portuguese, with English summary) ["The aim of this work is to determine the dielectric constant value of a bio-nanostructured system via Electrostatic Force Microscopy (EFM) and to show how this method is useful to study natural photonic crystals. We mapped the dielectric constant of the cross-section of the posterior hind wing of C. rutilans with nanometric resolution and obtained not only structural information on its constitutive nanolayers but also on the absolute values of the dielectric constant variation in a nanometric scale. By relating the measured profile of the static dielectric constant to the profile of the refractive index in the visible range, combined with optical reflectance measurements and simulation, we were able to describe the origin of the strongly iridescent wing colors of this Amazonian rainforest damselfly. The method we demonstrated here may be useful for the study of other nanostructured biological systems." (Author)] Address: Valeriano, W.W., Depto de Física, ICEx, Universidade Federal de Minas Gerais, Av. Antônio Carlos 6627, 31270-901 Belo Horizonte, Minas Gerais, Brazil. Email: wescleyvaleriano@gmail.com

19506. van der Schans, J. (2021): Waargenomen libellen 2020. Nieuwetbrief Het Merkske 8: 30-32. (in Dutch) [Verbatim: "Last year's mild winter and a wet March made it look promising for the dragonflies in 2020. Ponds and pools filled with water and warm weather forecasts. But this will be a different story, because suddenly we have to deal with a large observer effect on our monitoring. As described in other articles of this newsletter, we suddenly had to deal with another exotic 'critter' which closed borders that did not normally exist and forced us to stay at home on the Belgian side of the border. As fellow observers talk about 'our front or backyard', there was no way to get there during the Lockdown. These areas are so close and yet suddenly so far away. The occasional sneak across the border via forest tracks and shortcuts in the hope of not being stopped. The observer effect, in this case not being able to go to the beautiful fens and pools, is therefore the reason that few species and low numbers were counted. Due to the lock-down and closing of the borders, some species have certainly been missed. Fortunately, in April and May it was fine (warm) dragonfly weather and Pyrrhosoma nymphula was observed first, followed by Libellula depressa and L. quadrimaculata. Remarkable was the frequently observed Cordulia aenea, which clearly enjoys life in the Merkske. Due to the great heat in the summer, there was, in contrast to last year, only a small influx of southern species. Anax parthenope knows to return to some popular pools every year and may reproduce in the area. Sympetrum meridionale was seen at three sites in Belgium and one site in the Netherlands where uncoloured dragonflies were observed, indicating local hatching and thus confirming a small population. Leucorrhinia pectoralis and L. rubicunda are still observed in small numbers. L. dubia was seen in 2020 at three locations in the Belgian part, two of which are new locations and one new location on the Dutch side. That is very promising. In contrast to last year, few Sympetrum fonscolombii and Orthetrum coerulescens was seen, but there were higher numbers of S. sanguineum. Of course, the observer effect mentioned above could be the cause. The large numbers of damselflies seen throughout the year were striking. Species like Ischnura pumilio and Lestes virens were common, together with Lestes sponsa and to a lesser extent Coenagrion scitulum. The populations of Calopteryx virgo and C. splendens seem stable but the low water level of the Merkske during the drought of last summer(s) is worrying. The life of the dragonfly larvae takes place under water. In the Dutch and Belgian part together

43 different species have been observed this year, 3 less than last year. Sympetrum danae and Ceriagrion tenellum are species that have almost disappeared. Even the heat-loving Crocothemis erythraea has only been observed in a few places. The national trend of declining dragonfly populations will certainly also apply to 't Merkske. The drought at the end of August and September also dried up deeper pools and fens, so 2021 will be an exciting year again. I would like to end with a quote that I ended with last year, "It even gives opportunities for new species". (Author/DeepL)] Address: not stated

19507. Van Eupen, C.; Maes, D.; Herremans, M.; Swinnen, K.R.R.; Somers, B.; Luca, S. (2021): The impact of data quality filtering of opportunistic citizen science data on species distribution model performance. Ecological Modelling 444: 11pp, Suppl. (in English) ["Highlights: • Stringent filtering of unstructured data should not be performed blindly. • Data quality is higher in verified or more detailed species records. • Both absolute and relative sample size are important in stringent filtering. • Decreasing sample size by filtering does not always decrease model performance. • Impact of stringent filtering on model performance differs among taxonomic groups. Abstract: Opportunistically collected species occurrence data are often used for species distribution models (SDMs) when high-quality data collected through standardized recording protocols are unavailable. While opportunistic data are abundant, uncertainty is usually high, e.g. due to observer effects or a lack of metadata. To increase data quality and improve model performance, we filtered species records based on record attributes that provide information on the observation process or post-entry data validation. Data filtering does not only increase the quality of species records, it simultaneously reduces sample size, a trade-off that remains relatively unexplored. By controlling for sample size in a dataset of 255 species, we were able to explore the combined impact of data quality and sample size on model performance. We applied three data quality filters based on observers' activity, the validation status of a record in the database and the detail of a submitted record, and analyzed changes in AUC, Sensitivity and Specificity using Maxent with and without filtering. The impact of stringent filtering on model performance depended on (1) the quality of the filtered data: records validated as correct and more detailed records lead to higher model performance, (2) the proportional reduction in sample size caused by filtering and the remaining absolute sample size: filters causing small reductions that lead to sample sizes of more than 100 presences generally benefitted model performance and (3) the taxonomic group: plant and dragonfly models benefitted more from data quality filtering compared to bird and butterfly models. Our results also indicate that recommendations for quality filtering depend on the goal of the study, e.g. increasing Sensitivity and/or Specificity. Further research must identify what drives species' sensitivity to data quality. Nonetheless, our study confirms that large quantities of volunteer generated and opportunistically collected data can make a valuable contribution to ecological research and species conservation." (Authors)] Address: Van Eupen, C., Ghent Univ., Dept Data Analysis & Mathematical Modelling, Coupure Links 653, B-9000 Ghent, Belgium

19508. Viela, D.S.; Garcia Junior, M.D.N.; Furieri, K.S.; Lencioni, F.A.A. (2021): Leptagrion jeromei (Odonata: Coenagrionidae) spec. nov. from Brazil, with notes on L. andromache Hagen in Selys, 1876. Zootaxa 5068(2): 240-246. (in English, with Portuguese summary) ["A new species of Leptagrion Selys, 1876 is described and named in honor to Dr. Jerome Constant: Leptagrion jeromei (Holotype: Brazil: Bahia, Jussari, RPPN Serra do Teimoso, Jequitiba tree (Cariniana legalis (Mart.) Kuntze, 1898) at 32 m, 10.v.2005, K.S. Furieri leg and deposited in FAAL). This species was confused for a long time with L. andromache Hagen in Selys, 1876 its closest congener. Diagnostic illustrations of L. andromache (lectotype and specimens collected at Amapá—Brazil) and L. jeromei spec. nov. are presented. We also present the northernmost record for L. andromache in Amapá state, Northern Brazil." (Authors)] Address: Viela, D.S., Lab. Biol. Aquática, Depto de Ciências Biológicas, Fac. de Ciências e Letras de Assis, Universidade Estadual Paulista, Assis, São Paulo, Brazil. Email: deeogoo@gmail.com

19509. Vilela, D.S.; Venâncio, H.; Santos, J.C. (2021): Morphological description of the final instar larvae of Argia reclusa Selys, 1865 and Tigriagrion aurantinigrum Calvert, 1909 from Southeastern Brazil (Odonata: Coenagrionidae). Zootaxa 5060(3): 392-400. (in English, with Portuguese summary) ["The final instar larvae of Argia reclusa Selys, 1865 and Tigriagrion aurantinigrum Calvert, 1909 are described, diagnosed and illustrated. The larvae of A. reclusa has a very prominent premental ligula, shared with a single species in Brazil, from which it can be separated by a combination of characters. The larvae of T. aurantinigrum is similar to most Oxyagrion in regard to prementum and lamellae shape, and differs from those taxa in palpal and premental setation and number of teeth on the labial palp. Both larvae were collected in a small stream of the Cerrado biome, where both species are common." (Authors)] Address: Vilela, D.S., Rua Jaime Bilharinho, 575, CEP 38065-280, Uberaba, Minas Gerais, Brazil.Vilela, D.S., Rua Jaime Bilharinho, 575, CEP 38065-280, Uberaba, Minas Gerais, Brazil. Email: deeogoo@gmail.com

19510. Vilenica, M.; Kulijer, D.; Gligorovic, B.; Gligorovic, A.; De Knijf, G. (2021): Distribution, habitat requirements, and vulnerability of Caliaeschna microstigma at the north-western edge of its range (Odonata: Aeshnidae). Odonatologica 50(3/4): 203-225. (in English) ["More than a decade of field surveys of Caliaeschna microstigma (Schneider, 1845), at the north-western edge of species' distribution in Bosnia & Herzegovina, Croatia, and Montenegro recorded its presence at 135 localities, of which 107 were previously unknown. Our sampling located populations north-west of the species' previously known range limit. Literature and new data showed that the species was most frequently observed in karst springs (42 % of all known localities) and streams (34 %) and, to a lesser extent, also in rivers (24%). Although it was observed over a wide range of altitudes,

from sea level to mountainous regions (865 m a.s.l.), 72 % of the localities were below 200 m a.s.l., and 43 % below 50 m a.s.l. Reproduction attempts and/or successful reproduction was recorded at approximately half the localities (53%, n = 71), mostly in the Mediterranean but also in the Alpine bio-geographical region. Most of the localities with C. microstigma present are suffering from various anthropogenic threats, such as domestic and constructional waste disposal, capture of spring water, and urban and agricultural impacts. This study contributes to a better understanding of the species' distribution and provides new insight into its habitat and microhabitat preferences." (Authors)] Address: Vilenica, Marina, University of Zagreb, Faculty of Teacher Education, Trg Matice Hrvatske 12, 44250 Petrinja, Croatia. Email: marina.vilenica@ufzg.hr

19511. Walia, G.K.; Katnoria, N. (2021): Chromosome characterization of four calopterygid damselflies with cytogenetic review of family Calopterygidae (Odonata: Zygoptera). J. Adv. Zool. 42(1): 107-117. (in English) ["Taxonomically, in family Calopterygidae, 183 species under 21 genera have been reported worldwide. Out of these, cytogenetic data pertains to only 22 species which is only 12% of the known species. In India, 9 species under 6 genera are present, while only 2 species has been studied cytogenetically. The present study has been conducted to linearly characterize the chromosomes of 4 species (Matrona nigripectus, Neurobasis chinensis, Vestalis apicalis and Vestalis gracilis) of family Calopterygidae by conventional staining, C-banding, silver nitrate staining and sequence-specific staining and also compiled the cytogenetic data of the family. The species were collected from Meghalaya, Goa, Kerala, Himachal Pradesh states of India. All the species possesses 2n=25m as the diploid chromosome number with XO-XX sex determination except Neurobasis chinensis with 2n=23, characterized by the presence of two equal sized large autosomal bivalents originated by the autosome fusion. C-banding and silver nitrate staining results depict the presence of C-bands and NOR's on the terminal positions of autosomal bivalents, while X chromosome and m bivalent show variation in distribution of C-heterochromatin and NOR's. Sequence-specific staining represents the complement of all the species as AT-rich due to more DAPI bright signals. All the cytogenetically studied species have been catalogued including the presently studied species and the list has been updated to 23 species." (Authors)] Address: Katnoria, Neha, Dept of Zoology and Environmental Sciences, Punjabi University, Patiala, India. E-mail : neha29katnoria@gmail.com

19512. Worthen, W.B.; Fravel, R.K.; Horne, C.P. (2021): Downstream changes in odonate (Insecta: Odonata) communities along a suburban to urban gradient: Untangling natural and anthropogenic effects. Insects 2021, 12(3), 201: 19 pp. (in English) ["Simple Summary: Dragonflies are sensitive to natural and human-caused variation in the aquatic and terrestrial habitats where their larvae and adults live. For example, a reduction in shady vegetation, as a consequence of increasing stream size or streamside deforestation, often causes a reduction in specialized forest species and an increase in generalist species. We surveyed larvae and adults at 15 sites along the Reedy River in Greenville Co, SC, USA, from headwater sites in forested suburban landscapes through the urban core of the city of Greenville. We described the sediment characteristics and shoreline vegetation in two 4 m × 20 m plots at each site, and measured the percentage of developed land, forested land, grasslands, and wetlands within 500 m of each plot center. At a small scale, within plots, larval abundance and diversity increased with increasing amounts of dead debris that may provide a refuge from predators. Adult abundance and diversity correlated with the amount of aquatic and shoreline vegetation used as perches. At a large scale, diversity responded more to natural changes in habitat than urbanization: damselfly diversity increased downstream and dragonfly diversity was greatest in sunny, open habitats with fields, wetlands, and open water. Abstract: The community structure of lotic odonates changes downstream, but it is difficult to untangle natural and anthropogenic causes. We surveyed larvae and adults at 15 sites along the Reedy River in Greenville Co., SC, USA, from sites in forested suburban landscapes through the urban core of the city of Greenville. We used principal component analyses and Akaike information criteria models to describe the relationships between larval and adult community descriptors (abundance, richness, and diversity) and habitat characteristics at several spatial scales, including water chemistry, sediment and detritus, aquatic and streamside vegetation, and the percent cover of landforms in the surrounding landscape. At all scales, larval abundance, richness, and diversity correlated with the amount of detritus. At a small scale, adult indices correlated with the amount of sunlight and streamside vegetation. Zygopteran community composition was nested at a large scale; richness and diversity did not correlate with changes in the landscape but increased downstream. Anisopteran composition was also nested, but richness correlated with the percent cover of field, wetland, and open water in the habitat and was unrelated to downstream site position. Landscape transformation affected anisopterans more than zygopterans by opening habitats that facilitate these generalist heliotherms." (Authors)] Address: Worthen, W.B., Biology Dept, Furman Univ., Greenville, SC 29613, USA

19513. Xu, J.H.; Liu, T.; Zhang, Y.; Zhang, Y.-N.; Wu, K.; Lei, C.; Fu, Q.; Fu, J.-J. (2021): Dragonfly wing-inspired architecture makes a stiff yet tough healable material. Matter 4(7): 2474-2489,. (in English) ["Highlights: •A universal fabrication methodology for the stiff yet tough healable material. •The fabricated nanocomposite shows exceptionally enhanced strength and toughness. •3D-interconnected MXene framework enables fast NIR laser responsive healing property. •The nanocomposite demonstrates great potential for high-temperature EMI shielding. Abstract: Progress and potential: Mechanical robust yet healable materials have many promising engineering applications from intelligent architecture to the auto industry. However, most of them possess ultralow fracture toughness that significantly limits their application because of the possible catastrophic fracture mode caused by small defects or cracks. In this work, we

propose a previously unreported strategy that imitates the microstructure of dragonfly wings to make stiff, brittle, and healable materials become a defect-tolerant nanocomposite with stable crack propagation behavior. Except for unprecedentedly mechanical enhancement, the dragonfly wing-inspired continuous MXene framework confers a nanocomposite with exceptional thermal stability, fast NIR-responsive healing performance, and excellent electromagnetic interference shielding capability. This unique and scale-up produced nanocomposite may find applications in harsh environments with superior mechanical, healable, and functional properties. Summary: Mechanically robust and healable polymers are in high demand for the intelligent architecture, aerospace engineering, and auto industry; however, most of them suffer from brittle fracture owing to the inherent conflict between stiffness and toughness within polymer systems. Inspired by the microstructure of dragonfly wings, we show how brittle, stiff, and healable materials can become defect tolerant by strategies ranging from molecular design to structural processing. Transition metal carbides/carbonitrides form an interconnected mechanical framework, similar to the rigid nervure in dragonfly wings, to stabilize the growth and slow down the extension of crack, while the initially glassy healing polymer closely bonds to rigid framework through powerful interfacial supramolecular interactions, playing a key role in the soft membrane dissipating stress energy. Compared with initial polymers, the obtained SP/MXene (SPM) nanocomposite exhibits an increase in fracture toughness and flexural strength (54.3- and 25.0-fold, respectively), exceptional thermal stability, mechanical and functional repairability, and good electromagnetic interference shielding." (Authors)] Address: Wu, K., College of Polymer Science & Engineering, State Key Lab. Polymer Materials Engineering, Sichuan Univ., Chengdu 610065, P. R. China. E-mail: kaiwu@scu.edu.cn

19514. Yamada, S.; Urabe, J. (2021): Death-feigning behaviours increase survival rate of littoral cladocerans under predation by odonate larvae. Freshwater Biology 66(11): 2030-2037. (in English) ["1. Because littoral cladocerans are common prey for odonate larvae, they are ideal organisms to examine prey and predator interactions in aquatic habitats. Although death-feigning behaviour observed in littoral cladocerans is viewed as a trait to reduce predation risk, no study has examined the effectiveness of death-feigning at reducing mortality. We studied the effectiveness of death-feigning behaviour by two littoral cladocerans, Chydorus sphaericus and Oxyurella tenuicaudis, against the odonate larvae of Sympetrum frequens. 2. We first examined how the odonate larvae detected the prey and found that the larvae consumed active cladocerans, even under dark conditions, but they did not consume anaesthetised cladocerans, indicating that the larvae detect the prey using mechanical cues such as vibrational currents created by the prey individuals. 3. We then observed behavioural events of odonate larvae and prey cladocerans using a video-recording system to count the number of cladocerans that showed death-feigning behaviours when odonate larvae attacked and those that were not consumed when they showed death-feigning behaviours. 4. We observed a total of 1,099 behavioural events in prey–predator interactions. On average, the odonate larvae pursued 63% of the cladocerans encountered, attacked 89% of the cladocerans pursued, and successfully captured only 29% of the cladocerans with the first attack. Among the cladocerans that were not captured, 38% of the individuals continually swam, but 62% ceased to move and exhibited death-feigning behaviours. The odonate larvae's capture rate for cladocerans exhibiting the death-feigning behaviours fell significantly short of that for cladocerans that were continually swimming. 5. The experiments clearly showed that the littoral cladocerans' death-feigning behaviour effectively decreased predation rate by odonate larvae. The results suggest that the death feigning serves as an adaptive behaviour to reduce mortality risk in littoral cladocerans under predation by such predators that can detect prey using mechanical cues such as those of vibrational currents." (Authors)] Address: Yamada, S., Aquatic Ecology Lab, Graduate School of Life Sciences, Tohoku University, Aoba 6-3, Aramaki Aoba-ku, Sendai 980-8578 Japan. Email: sayumi.yamada127@gmail.com

19515. Zhou, X.; Tan, Y.; Yi, X.; Wu, S.; Zhang, L.; Guo, A. (2021): Communities of adults dragonflies in rice fields in tropic and subtropic region in Hainan, China. Chinese Journal of Tropical Crops 42(9): 2711-2716. (in Chinese, with English summary) ["Dragonflies are increasingly used as the biological indicators to evaluate environmental quality. There are also many species of dragonflies in rice fields in Hainan Province. In order to make clear the community composition of dragonflies in rice fields in Hainan Province, the adult dragonflies were sampled in first and second rice seasons in 2017 in Sanya and Wenchang. The dragonfly community (n = 18 species, Tab. 1) was stable in different growth stages of two rice seasons in Hainan, with 5-15 species and (3.7±0.67) - (14.0±0.57) dragonflies per hundred clusters. The diversity index of dragonfly community was 2.007-2.193, the evenness index was 0.786-0.808, and the dominant concentration index was 0.148-0.190. 15 species from 3 families of adult dragonflies were collected in rice ecosystem in tropic region and 17 species from 2 families in subtropic region respectively and 11 species were both in Sanya and Wenchang. The similarity of community species was 0.701, and the similarity of dominant species was 0.857. In the first and second seasons there were significant differences in the number of individuals at tillering, flowering and fruiting stages in Sanya, while there were no significant differences in Wenchang. Agriocnemis femina, Ceriagorion auranticum and Neurothemis tullia may be sensitive to the change of environmental pollution in rice fields." (Authors)] Address: Guo, A.: Email:guoanping@itbb.org.cn