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2000

22344. Eder, H. (2000): Zerfurchte Flügel und zähe Luft. *Biologie in unserer Zeit* 50(1): 36-43. (in German, with English summary) ["Corrugated wings and viscous air Airborne microorganisms were bound to evolve morphologic characteristics that are optimized with respect to their scale regime. Vortices – stationary or dynamically generated – herein are playing a dominant role. The generation of vortices in microorganisms is assisted by micro-morphologic structures as veins, grooves and pores." (Author) The paper includes references to Odonata.] Address: Eder, H., Am Stadtpark 43, 81243 München, Germany. Email: ede-h@arcor.de

2003

22345. Klym, M.; Quinn, M. (2003): Introduction to dragonfly and damselfly watching. *Texas Parks 6 Wildlife*. 4200 Smith School Road, Austin, Texas 78744: 27 pp. (in English) [https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_w7-000_0892.pdf] Address: Texas Parks 6 Wildlife. 4200 Smith School Road, Austin, Texas 78744, USA

2006

22346. Jensen, E.V. (2006): Cumulative effects monitoring of Okanagan streams using benthic invertebrates, 1999 to 2004. Environmental Protection Division, Ministry of Environment, Penticton, B.C.: 60 pp. (in English) ["Biological monitoring is essential to describing and protecting biological resources. Chemical measurements, or habitat assessments are useful to aquatic resource management, but the primary sentinels and objects requiring protection are organisms living in the stream. The merits of using benthic invertebrate measures as cumulative effects indicators are many. Foremost is that biological condition of the streams is being directly assessed. Benthic invertebrates are useful integrators of various stressors and are acknowledged as useful cumulative effects indicators. Secondly, the ranking of stream condition using a benthic invertebrate index or metric, is a defensible objective statement describing stream health, which may be more readily understood by resource managers and the public, than chemical concentrations or habitat statements. Lastly, this process of regional correlation or calibration of benthic health to watershed condition factors can provide opportunities to collaborate across disciplines and integrate and strengthen cumulative effects assessments

of aquatic ecosystem condition in the Okanagan. In this study, benthic invertebrates were collected from 23 low elevation Okanagan stream sites between 1999 and 2004. Replicate sampling used a Surber net and data analysis followed the Benthic Index of Biological Integrity concept developed by Karr (Karr and Chu, 1999). Streams representing a gradient of conditions from low stress to high stress due to human alteration or use of the watershed were examined. Potential stress levels were established through GIS analysis at the watershed level and at the sampling reach for in-stream and near stream habitat condition. Low stress or reference sites and watersheds had low urban, agriculture, timber harvest factors, as well as low instream and near stream habitat alteration. High stress or high impact sites were chosen in watersheds and locations with high urban and agriculture landuse, and demonstrated degraded near and instream habitat. Categorical ranking by upper and lower relative stressor levels allowed calibration of a benthic index of biological integrity (B-IBI) for Okanagan streams. Five benthic invertebrate measures responded predictably over space and time to cumulative stress in valley bottom stream locations. These metric included total taxa, number of plecoptera taxa, number of ephemeroptera taxa, number of intolerant taxa, and number of clinger taxa. These metrics were found to respond predictably to cumulative watershed disturbance and clearly distinguished urban and highly altered sites from low impact sites. Secondary metrics, which responded predictably but did not clearly distinguish high and low stress categories were: number of trichoptera, Hilsenhoff biotic index, percent tolerant, percent predators and percent dominance. Primary metrics were summed into a multimetric index (B-IBI) and partitioned into excellent, good, fair, poor and very poor stream condition categories. The primary and secondary metrics correspond well to metrics used in B-IBI systems employed elsewhere in the Pacific Northwest. B-IBI scores were highest for stream sites on Equisis, Peachland, Shorts, Whiteman, Ellis upstream of Penticton, Chute, McDougall ups of Hwy 97, Coldstream and Lambly Creek (see Table 6 for site details). These sites were considered good to excellent, having a full range of biological diversity and presence of species sensitive to variety of stressors such as thermal, flow, sediment and toxic contaminants. B-IBI scores were lowest for Kelowna, Ellis near Okanagan River, Vernon at 25th Avenue in Vernon, Trout Creek near Hwy 97, Shuttleworth in Ok Falls, Eneas and Prairie Creeks in Summerland and BX Creek at 30th Avenue in Vernon. These sites were judged to be in poor or very poor condition, having almost half the species diversity as the reference group and very few intolerant taxa. A large number of

stream sites were ranked as fair (see Table 6) and have some loss of biodiversity. Water and sediment chemistry samples were collected during the study to complement the biological sampling. Water quality data indicated that in urban and agriculture settings, bacteriological measures frequently exceeded drinking and recreational water quality guidelines. Aquatic life protection guidelines were rarely challenged. Nitrate nitrogen was often orders of magnitude higher in streams flowing through urban and agriculture settings. Reduced sediment quality was more common in urban streams. Polycyclic aromatic hydrocarbons (PAHs) were often elevated in urban stream sediments of BX, Kelowna, Ellis and Eneas creeks. PAHs in BX Creek at 30th Avenue were consistently above Canadian Council of Ministers of the Environment aquatic life interim sediment guidelines but below probable effects levels. Lead and zinc were higher in BX and Kelowna creek sediments than other streams, and average values were between the CCME interim and probable effect levels. Pesticide analysis of stream sediments in 2003 found DDE (a breakdown product of DDT) above CCME aquatic life probable effects levels in Kelowna and Eneas creeks. Endosulphan was also detected in Eneas Creek. PCBs were not detected in urban sediments above detection limits. Further sampling and analysis would be required to describe variation in water and sediment quality for these study sites. Re-evaluation of the same habitat, water and sediment chemistry, and benthic invertebrate data set was carried out by Perrin (2006) using the Environment Canada's Benthic Assessment of Sediment (BEAST) software in CABIN (Canadian Aquatic Biomonitoring Network). Okanagan streams were classified by BEAST using the Fraser Basin reference groups as either unstressed, potentially stressed, stressed or severely stressed relative to Fraser Basin reference conditions, and then compared to B-IBI scores. BEAST was conservative in showing a better condition for 13% of the sites but a worse condition for 55% of the sites than was determined using the B-IBI process. Complete agreement of BEAST and B-IBI scores occurred for 29% of the sites, and 81% of the sites were within one stress category. No sites were more than 2 stress categories apart. The Okanagan CABIN data set and sediment quality data was further evaluated by Perrin (2006) using cluster analysis and multidimensional scaling. These analyses confirmed the BIBI classification of sites into the upper and lower stressor groups which were used in calibrating the Okanagan benthic index of biological integrity. Discriminant function analysis identified sediment PAH, nickel, manganese and water alkalinity as best discriminants of the reference group and two high stress groups. Polycyclic aromatic hydrocarbons (PAHs) in sediments were identified as the strongest discriminator of benthic community in high impact stations. Cause and effect can not be presumed as other stressors such as impervious surface area or measures of stream flow variation are often associated with deteriorating biological condition. Given the specificity of the CABIN model to the Fraser basin and traveling kick net collection method, the overall agreement between the two methods of analysis is encouraging. The comparability of the B-IBI and CABIN outputs suggests that either the B-IBI or BEAST can be used with confidence on Okanagan low elevation streams. Both methods will detect impairment when applied in riffle habitats. Perrin suggests Surber collected data can be used for BEAST assessment but notes assessment error potentially increases. Data compiled for a BIBI analysis may also be used for more in-depth analysis, including multivariate analysis of habitat variables and anthropogenic stressors. Methods of benthic invertebrate collection and data analysis will continue to evolve. Although metric scoring criteria and metric selection varies somewhat

between areas in the Pacific Northwest (Skeena, Fraser Valley, Puget Sound and Washington Cascade areas) the overall commonality in chosen metrics, enables comparable statements of aquatic ecosystem health among these study areas and could enable broad environmental reporting. Comparability of different methods applied in overlapping or adjacent areas through examination of performance characteristics (e.g., precision, sensitivity) known as a performance-based method system. The demonstrated common response of the Okanagan B-IBI with the Fraser Basin models and CABIN protocols may further allow harmonized reporting of environmental conditions across geographic and methodological boundaries. To this end, focused comparison of kick and surber net collections, and increased sampling of reference sites to develop an Okanagan model within CABIN is recommended. Defining benthic community response to stressors is potentially more powerful when spatial scales are reduced, and linking this work to probabilistic surveys would enable broader estimation of regional stream conditions. While harmonization of collection methods and analysis tools between jurisdictions and across borders is a worthy goal it is equally important to apply available information in a timely manner. Given that the B-IBI method has been calibrated for the Okanagan, it can be used to communicate aquatic ecological health and cumulative effects. Further effort must be made on a provincial scale to translate these and other indicator measurements into socially valued descriptors of the environment. Urban streams in the Okanagan are clearly degraded relative to Okanagan B-IBI reference sites, as well as Fraser Basin reference conditions. Reference condition assessments whether based on B-IBI or RCA may not necessarily require high specificity to be used to differentiate highly stressed sites from reference conditions, and provide better aquatic ecosystem condition definition than chemical measures. This information can be particularly useful to watershed and stormwater management efforts in the Okanagan Basin. As resource, site specificity or consequences of decisions increase, the burden of proof will necessarily rise and more stressor based assessments will be required." (Author)] Address: <https://www.ford.gov.bc.ca/hfd/library/documents/bib97302.pdf>

2007

22347. Ahrenhövel, C. (2007): Die Schutzgebiete der Stadt Weimar: Teil I: Die geschützten Landschaftsbestandteile „Tobritzteich bei Possendorf“, „Seeteich bei Legefild“ und „Erlenwiese“. Thüringer Faunistische Abhandlungen 12: 5-27. (in German, with English summary) [The natural reserves of the town of Weimar (Thuringia) Part I: The protected landscape components "Tobritzteich bei Possendorf", "Seeteich bei Legefild" and "Erlenwiese": The present paper is the start of a series about natural reserves in the urban area of Weimar. This first contribution introduces the protected landscape components "Tobritzteich bei Possendorf", "Seeteich bei Legefild" and "Erlenwiese", their significance as geotopes and the results of the survey of floristic and faunistic species. A total of 158 species of higher plants were proven to exist in the three reserves, among them the existence of the rare and endangered species *Trollius europaeus* and *Carex pseudocyperus*. The fauna of these reserves was investigated especially of the classes Mammalia, Aves and Amphibia among vertebrates; and mollusca, Odonata and Orthoptera among invertebrates. A total of 9 species of mammals, 85 of birds, 5 (+ 2 missing) of amphibians, 29 of molluscs, 20 of dragonflies and 7 of grasshoppers were recorded. The surveyed area is mainly significant as a breeding ground, feeding habitat and resting place for birds, among them 28 in

Thuringia endangered species. It is part of the registered special protected area no. 32 "Ilmtal zwischen Bad Berka und Weimar mit Buchfarter Wald". The small bodies of water have a particular importance for amphibians and dragonflies. In the 1970s and 1980s the tree frog (*Hyla arborea*) and natterjack toad (*Bufo calamita*) still occurred but have become extinct in the present. Of the occurring species of dragonflies, four have to be highlighted since they are considered endangered according to the Red List of Thuringia: *Lestes barbarus*, *L. dryas*, *Sympecma fused* and *Sympetrum flaveolum*. The contribution is supplemented by recommendations for the care and development of the three reserves." (Author)] Address: Arenhövel, C., Stadtverwaltung Weimar: Abt. Umwelt - Untere Naturschutzbehörde, Schwanseestr 17, 99423 Weimar, Germany

22348. Dethlefs, A. (2007): Untersuchungen zur Räuber-Beute-Interaktion zwischen Libellenlarven (Odonata: Anisoptera) und jungen Edelkrebse (Astacus astacus). Diplomarbeit. Christian-Albrechts Universität Kiel: 123 pp. + Anhang. (in German) ["In summary, it can be stated that the predation of dragonfly larvae on young crabs is limited to the Aeshnidae. In the case of *Anax imperator*, it was shown that they can eat almost all crabs on offer in a short time, but that they do not specialize in them and therefore also accept alternative food. This, as well as hiding places for the crabs, significantly reduces the mortality of the crabs. Once they reach a certain body length, the crabs are predators of the dragonfly larvae. There are a lot of dragonfly larvae in the crayfish breeding ponds. However, it must be noted that some of these larvae (Libellulidae) are not harmful. To show how relevant this is, the data from Figure 36 (p. 68) on the relative occurrence of anisopteran species was repeated differently colored in Figure 40: All species whose larvae have a Libellula-type capture mask are colored blue. These species, which are harmless for crayfish breeding, clearly dominate the dragonfly fauna. The few individuals of the red species are those with the Aeshna-type capture mask. They occur in small numbers. It is important to note that around 250 *Anax imperator* larvae were removed from the ponds in crayfish breeding before the first line taxation. These 250 larvae could not hatch there and therefore cannot be seen in Figure 40. Normally, about 90% of *Anax imperator* larvae survive hatching (Corbet, 1957). This means that approximately 225 adults of this species would dominate the ponds if the larvae had not been removed. The larvae of the species *A. imperator* occur in exceptionally (personal communication from Dr. Dreyer) large numbers. Based on the feeding tests carried out, this species is potentially dangerous to the young crabs. However, it has also been shown that if the larvae are offered alternative food, they will also eat it. So there is no specialization in crayfish. It is difficult to say whether *A. imperator* actually has a major influence on the crayfish population, as only counts before the onset of crayfish and those from the fall are available. According to these counts, the loss is around 50% (personal communication from the breeder). How great the natural loss of crabs is in this breeding is not known." (Author/Google translate)] Address: https://docplayer.org/72707332-Untersuchungen-zur-raeuber-beute-interaktion-zwischen-libellenlarven-odonata-anisoptera-und-jungen-edelkrebse-astacus-astacus-diplomarbeit.html#download_tab_content

22349. Ferreira, S.; Grosso-Silva, J.M.; Alves, P.C. (2007): Avaliação do Estado Actual do Conhecimento sobre a Entomofauna do Parque Natural do Douro Internacional. Relatório final. Outubro 2007. ICETA – Universidade do Porto: 91 pp. (in Spanish) [Records of 25 odonate species are

documented in an annex.] Address: <https://www.icnf.pt/api/file/doc/b84cfe7d557a36cc>

22350. Schrack, M.; Stolzenburg, U. (2007): Die Libellenfauna im Töpfergrund Radeburg in der Radeburger Heide. Veröffentlichungen des Museums der Westlausitz Kamenz, Sonderheft: 167-180. (in German) ["The focus of this work is the Töpfergrund near Radeburg (Sachsen, Germany) on the SW edge of the "Königsbrück-Ruhlander Heiden" natural area. Together with the neighboring NSG "Moorwald am Pechfluss near Medingen" and "Waldmoore bei Großdittmannsdorf" in the FFH area "Moorwaldgebiet Großdittmannsdorf", it has valuable habitats for numerous species of dragonflies in the moorland and rivers. With 41 species of dragonflies identified, 37 of them in Töpfergrund Radeburg, this forest area rich in water and moorland is of supra-regional importance in dragonfly science." (Author/Google translate)] Address: Schrack, M., Hauptstr. 48a, 01471 Radeburg OT Großdittmannsdorf, Germany

2009

22351. Ansori, I. (2009): Kelimpahan dan dinamika populasi Odonata berdasarkan hubungannya dengan fenologi padi. Di beberapa Persawahan sekitar Bandung Jawa Barat [Abundance and dynamics of Odonata populations based on their relationship with rice phenology in several rice fields around Bandung, West Java]. Jurnal Exacta VII(2): 69-75. (in Indonesian) ["Odonata diversity study was performed at 4 locations in the rice fields Bandung, Antapani, Cigadung, and Dago Dago Experts Corner. ... Sampling was conducted in line with the development of rice. Odonata adults were identified consisting of 2 families (Libellulidae & Aeshnidae) and 4 species, namely *Orthetrum sabina*, *Crocothemis servilia*, *Neurothemis terminata* and *Anaciaeschna jaspidea*. The results showed that *C. servilia* and *O. sabina* are the dominant species in the four study sites. In the early rice growth (vegetative phase up phase bunting ~ 22-27 days), showed the greatest number of individuals compared to another phase, and Odonata population decline with age older rice. result Odonata diversity index analysis for adults at four sites showed that rice Dago Corner has the highest diversity index. evenness Index highest adult Odonata obtained in rice fields and Dago Antapani expert." (Author/Google translator)] Address: Ansori, I., Program Studi Pendidikan Biologi, Jurusan PMIPA FKIP UNIB

22352. Bönsel, A. (2009): Koordination, Datenaufbereitung und Auswertung von Kartierungen im Rahmen des landesweiten Monitoringprogrammes MV: Artengruppe Libellen im Jahr 2009: Verbreitungskartierung: *Leucorrhinia pectoralis* (Große Moosjungfer), *L. albifrons* (Östliche Moosjungfer), *L. caudalis* (Zierliche Moosjungfer), *Aeshna viridis* (Grüne Moosjungfer), *Sympecma paedisca* (Sibirische Winterlibelle), *Gomphus flavipes* (Asiatische Keiljungfer); Monitoring: *Leucorrhinia pectoralis* (Große Moosjungfer) für das Jahr 2009. Im Auftrag Landesamt für Umwelt, Naturschutz & Geologie, Postfach 1338, 18263 Güstrow: II + 36 pp. (in German) ["Summary 1. 25 new cases of *L. pectoralis* were detected in 2009. With this mapping from 2009 and the recordings within the management plans, 246 occurrences of *L. pectoralis* are now known in Mecklenburg-Western Pomerania. 2. Only very isolated exuvia were found in both the state mapping and the mapping for management planning. 3. No new outstanding occurrences with over 50 individuals or more than 50 exuvia per 100 m search distance were found this year. 4. As in previous years, it was found that mesotrophic waters - such as bog waters or waters with marshy subsoil

- appear to be the most favorable locations for *L. pectoralis*. 5. This year 33 measuring table sheets were examined. The number of measuring table sheets examined was higher than in previous years because in some MTBs there are no optimal waters with the habitat requirements of *L. pectoralis* or other FFH dragonfly species and the general examination time per MTB was therefore shortened. 6. In 2009, new occurrences of *L. caudalis* and *A. viridis* were recorded alongside *L. pectoralis*. Despite intensive searches for water bodies, new occurrences of *L. albifrons* and *S. paedisca* could not be discovered based on autecological findings about the species. There was no search for *G. flavipes*, which only occurs on the Elbe in this federal state, in 2009. 7. In total there are 2 occurrences of *G. flavipes*, 9 occurrences of *L. albifrons*, 27 occurrences (with 13 new discoveries in 2009) of *L. caudalis*, 16 occurrences (2 new discoveries in 2009) of *A. viridis* and two old, currently uncontrolled occurrences of *S. paedisca*. 8. For the monitoring of *L. pectoralis*, 11 occurrences were recorded according to the BfN specifications and evaluated according to the BfN parameters. 9. Three of these monitoring sites still had exuvia in 2009. At all other locations either only adults were observed during the state mapping and monitoring of *L. pectoralis* in 2009 or the location was completely abandoned by the species. The reasons for the extinction of the occurrences are discussed in detail for all locations. 10. A site with 12 exuvia per m at the Schwarzer See near Bützow is the largest occurrence to date in the entire distribution area of the species. 11. Recommendations for improvement measures are made for all loss-making locations within the monitoring program. 12. It is recommended to abandon the Mummelsee and Stiegsee monitoring sites in southern MV and instead include occurrences with proof of soil stability as monitoring sites. The replacement sites should be located in the metropolitan area of microhollow forms, as these sites represent the most frequently populated habitats of the species in MV. 13. If it becomes apparent in 2010 that the site near Kamin is no longer inhabited by the species, a replacement will also be recommended. 14. The MTBs, which have not yet been examined, are among the regions in MV that have many potential bodies of water for at least one of the six occurring FFH dragonfly species and are therefore research-intensive. The originally targeted 32 MTBs to be examined per year cannot be assumed. To this end, the number of bodies of water to be examined per MTB increases in order to discover potential occurrences of *L. pectoralis* and/or other FFH dragonfly species. 15. In 2010, 19 MTBs are to be examined for the presence of FFH dragonfly species. Since the monitoring of *L. pectoralis* is to be continued and the monitoring of Appendix IV dragonfly species is to be started, the capacities have been exhausted. 16. There are still 46 MTBs to be examined for the years after 2010, but without additional monitoring. The desired goal of completing the national mapping of *L. pectoralis* on all MTBs in 2013 will remain achievable." (Author/Google translate)] Address: Vorhabensträger: Landesamt für Umwelt, Naturschutz & Geologie, Postfach 1338, 18263 Güstrow; Gutachterbüro: Planung für alternative Umwelt GbR, Bearbeiter: Dr. André Bönsel, An der Schule 2, 18337 Marlow, OT Gresenhorst, Germany

22353. Galan, C.; Herrera, F.; Rincon, A.; Leis, M. (2009): Diversidad de la fauna cavernícola de los karsts en caliza del norte de Venezuela. Bol. SVE 43: 31 pp. (in Spanish, with English summary) ["We present a comparative study about cave-dwelling fauna diversity in the most significative karstic regions of Northern Venezuela. The study is based in data obtained by mean of detailed surveys, with similar methodology, in three caves representatives of their respective regions: Los Laureles Cave (in Perijá Mountains, Zulia state),

Cueva Grande de Anton Göering (in Mata de Mango karst, Monagas state) and Coy-coy de Uria Cave (in the Sierra of San Louis, Falcon state). We study the ecology, taxonomic diversity, biomass and numeric abundance of the cave populations, which comprises a total number of 288 invertebrates and vertebrates cave-dwelling species. 31 of them are troglobites. More than 20 species are new species in Science. Some troglaphiles and troglobites organisms belong to zoological groups reported for first time for the fauna in the caves of Venezuela or even the Neotropical region. These data are the highest biomass values reported for cave-dwelling fauna around the world, with a biomass weight maximum in Cueva Grande de 3.824 kg (153 kg by 100 m of galleries). The principal factors, abiotic and biotic, which condition the high biodiversity and biomass found in these ecosystems, are discussed." (Authors) The table of results includes one Odonata without further details.] Address: Galán, C., Sociedad Venezolana de Espeleología. Apartado 47.334, Caracas 1041-A, Venezuela. E-mail: cegalham@yahoo.es

22354. Müller, J.; Steglich, R.; Wallaschek, M. (2009): Zur Libellenfauna im Ohre-Aller-Hügelland (Odonata). Entomologische Mitteilungen Sachsen-Anhalt 17(1): 10-17. (in German) ["So far, 28 dragonfly species have been identified in the Ohre-Aller hill country, most of which (75%) can be classified as ecologically undemanding and heat-loving species. According to the Saxony-Anhalt Red List, four species are currently considered to be threatened with extinction (1), critically endangered (1) and endangered (2), five other species belong to the pre-war stage and the assessment data for two species are still insufficient across the country. For the state of Saxony-Anhalt, the occurrence of *C. mercuriale* as an FFH species according to Appendix II with a special protection area of Europe-wide (community) importance in the Ohre-Aller hill country and the syntopically occurring *O. coerulescens* have a special, responsible significance. Gaps in the processing of the landscape unit are pointed out." (Authors/Google translate)] Address: Steglich, Rosmarie, Zollstr. 1/128, 39104 Magdeburg, Germany. Email: roeseli@mdcc-fun.de

22355. Rulik, B., Warthemann, G., Krüger, D., Quast, T., Osterloh, S., Osterloh, K. & Freitag, H. (2009): Kommentierte Artenlisten der Farn- und Blütenpflanzen und Insekten (Insecta; Diptera, Odonata, Coleoptera; Buprestidae) des GEO-Arteentages in Dessau-Roßlau 2009 und vorangegangener Jahre mit Erstrnachweisen von *Brachypeza radiata* Jenkinson, 1908 und *Trichonta paraterminalis* Zaitzev, 1999 (Insecta: Diptera: Mycetophilidae) in der BRD. Naturwissenschaftliche Beiträge des Museums Dessau 21: 87-106. (in German, with English summary) ["Selected results of entomological and botanical excursions in five study areas in the wider area of Lake Kühnauer in the city of Dessau-Roßlau are presented. The study sites are briefly characterized. Records of 55 insect species, including 27 Diptera, 18 Odonata, 10 Buprestidae (Coleoptera) and 198 ferns and flowering plants are listed in tabular form. Particularly rare and endangered species, as well as species documented for the first time locally or nationally, are discussed. The taxa *B. radiata*, *T. paraterminalis*, *Aeshna isocles* (O.F. Müller, 1767), *Trichys scrobiculatus* Kiesenwetter, 1857 (Coleoptera: Buprestidae), among others, receive detailed discussion. The botanical excursion to the Lobenbreite provides the first floristic survey of the area known to the authors since 1978 and is part of the revision of the flora of Dessau-Roßlau. *Silene otites* (L.) were found on regionally rare, partly endangered plant species. (earspoon catchfly), *Geranium sanguineum* L., *Vincetoxicum hirundinaria* Medik (swallowwort), *Ornithopus*

perpusillus L. (bird's foot) and *Colchicum autumnale* L. (autumn crocus) detected." (Authors/Google translate)] Address: Osterloh, Susanne, Krumbholzstr. 12, 06406 Bernburg/Saale, Germany.

2010

22356. Agaki, T.N. (2010): The diversity of dragonflies and damselflies (Odonata) at the inlet and outlet of the Sentani Lake (in Bahasa Indonesia). SUGAPA (Suara Serangga Papua) 5(1): 22-25. (in Indonesian, with English summary) ["The aim of this study was to know the diversity of Odonata at the inlet and outlet area of the Sentani Lake. Data were recorded during 32 days (from 19 September till 20 October 2009) in the environment of the Sentani Lake, Jayapura. The analysis of data was done from the end of October till December 2009. The used methods were observation, Count Transect method at Transect Line and documentation. The result of the survey -at all localities both at inlet as at outlet- consists of 449 specimens, representing 44 species in ten families. At the two inlet areas 298 specimens were recorded representing 35 species in 10 families: 16 species of the Family Libellulidae, 11 species of the Coenagrionidae, and 1 species each of the Gomphidae, Aeshnidae, Corduliidae, Calopterygidae, Chlorocyphidae, Protoneuridae, Platycnemididae and Platystictidae. At the single outlet area of the Sentani Lake 151 specimens were recorded representing 30 species in seven families: 13 species of the Family Libellulidae, 9 species of the Coenagrionidae, 3 species of the Protoneuridae, and 1 species each of the Gomphidae, Aeshnidae, Chlorocyphidae, and Platystictidae. The result shows that the diversity of Odonata at the inlet area is higher in comparison with the diversity at the outlet area; the equity of species in inlet and outlet areas is about the same (ISs = 64.61 %). Anisoptera species were more common at open and sunny river sites; Zygoptera were more often found close to bushes and trees at the river banks." (Author)] Address: <https://www.sugapa.org/wp-content/uploads/2018/05/Students-comer-Tirza-Natalia-Agaki-SUGAPA-51-2010.pdf>

22357. Lehoux, H. (2010): Limnologie et entomologie tropicales. Pré-projets pour le monitoring des rivières de la région d'Esquinas Costa Rica. Entreprise Centre de recherche Biologique Tropicale, La Gamba, Parque nacional de las Piedras Blancas, Costa-Rica: 41 pp, Annexe (in French, with English summary) ["In today's world, questions about water quality are a constant issue. Agriculture, industry and urban pollution are majorly responsible for the disturbance of lakes and rivers, our freshwater basins. This model study in La Gamba, Costa Rica, shall show the impact of human activities on the biological integrity in the Esquinas' drainage basin. While the first part of the study talks about the geographical structure of the river network as well as the general chemical and physical features of its water, the second, main part of the study assesses the different population structures of dragonflies and damselflies (odonata) in different habitats within the drainage basin. The study took place between April and June 2010, therefore in the beginning of the rainy season. In order to examine the physical structure of the river network, I measured current velocity, depth and width at different spots of nine rivers within the drainage basin. Of the same nine rivers, I took samples to learn about the water features, checking temperature, DO, suspended solids, pH, conductivity, NO₃ and PO₄. In addition to these measurements, I conducted a more detailed study of the morphology of one of the nine rivers, the Quebrada Negra, analyzing the daily change of water levels as well as level changes caused by rainfall, the sediment structure and the current

velocity throughout a transect of 100 meters. The study of the dragonflies and damselflies' distribution took place in the primary forest (4 sites), at forest margin (2 sites) and in cultivated areas (4 sites). 427 individuals of 26 species were identified during the twenty sampling periods. The species' assemblages were compared, and different sampled parameters were tested, in order to explain the differences in the distribution. In the end, the study leads to a discussion about the suitability of various protocols for the monitoring." (Author)] Address: Lehoux, H., 9, rue Duboys des Sauzais, 35150 Corps-Nuds, France

2011

22358. Kronshage, A.; Koch, L. (2011): Natur, Landschaft, Erdgeschichte [Schwelm]. In: Arbeitsgemeinschaft Umweltschutz Schwelm (Hrsg.): Über Berg und Tal. Wanderungen durch die Schwelmer Natur: 86-119. (in German) [On page 114, a passing note on Odonata is given, and a male *Calopteryx virgo* is figured.] Address: Koch, L., Heinrich-Heine-Str. 5, 58256 Ennepetal, Germany. E-mail: l-koch@t-online.de

22359. Lingenfelder, U. (2011): Bestandsüberprüfung der Helm-Azurjungfer (*Coenagrion mercuriale*) im Saarland 2011. Gutachten im Auftrag des Landesamtes für Umwelt- und Arbeitsschutz Saarland, Zentrum für Biodokumentation: 38 pp. (in German) [http://www.naturschutzdaten.saarland.de/natura2000/Natura2000/Allgemeine%20Daten%20und%20gebietsuebe%20Informationen/Daten%20zu%20Arten%20der%20FFH-Anhaenge/Coenagrion%20mercuriale%20-%20Helm-Azurjungfer/Daten_2011/Untersuchungsbericht_2011.pdf] Address: Lingenfelder, U., Seebergstr. 1, 67716 Heltersberg, Germany. E-mail: u.lingenfelder@vr-web.de

22360. Paternoster, D. (2011): Vegetation und Landschaftswandel der Pöggstaller Senke (südliches Waldviertel, NÖ) als Grundlagen für naturschutzfachliches Management. M.Sc. thesis, Fakultät für Lebenswissenschaften, Ökologie, Universität Wien: 155 pp, Anlagen (in German, with English summary) ["This work deals with vegetation and landscape changes of the Weitenbach-lowland between Pöggstall and Würmsdorf in the southern Waldviertel (Lower Austria). Results provide a basis for conservational issues. During the growing seasons in the years 2006 and 2007, both the vegetation and land use were mapped. 169 relevés were collected using the methodology of Braun-Blanquet (1964). For the survey of actual land use I used the mapping guide of Peterseil & Wrška (2001). The broad valley floor of the investigation area remains the last expanded and connected grassland area in the whole Weitenbach-Valley. For this reason, the phytosociological investigation focuses on characterisation of wet meadows and fen-meadows. Moreover the collected data are also compared with relevant regional literature. Altogether 26 different plant communities and 48 regionally or nationally endangered plant species were detected. Most of these species show preferences for wet meadows and fen-meadows. The chronological change of the landscape is characterized by means of a GIS-based analysis of historical cadastral land registers within an area of five square kilometers. The historical land use situation in 1823 is compared with the recent situation. Results are discussed in context of common signs of landscape change and historical evolution of vegetation in the Waldviertel-biom. The regional landscape change in and around the investigation area is characterized by an increase of forests and settlement areas, on the contrary the area of arable by a decrease. Using vegetation and landscape changes as

fundamentals, a management concept is formulated, which refers to the 44 ha large, broad valley floor between Pöggstall and Würnsdorf. Faunistic findings of former investigations done by the research community LANIUS are incorporated. The definition of management strategies and implementation of precise arrangements require appraisal of basically value-free natural resources, ecosystems, habitats or species. In this case the appraisal refers to plant communities and follows the reproducible and more or less standardized methodology of Plachter (1994). Fen-meadows and sedge reeds demonstrate the premium sites as far as nature conservation is concerned. Based on the appraisal results and in consideration of the historical landscape situation, a conservational overall concept is generated, which represents the target state in the face of nature conservation. According to the composition of vegetation, the management area is divided into three different zones (nature-zone, management-zone and development-zone). On the one hand the apportionment may support design of potential, prospective protected areas, on the other hand it helps to clarify the management requests of particular subjects of protection. Furthermore, a catalogue of measures is defined, that refers to plant communities and habitat types, respectively. In case of need the catalogue could be adapted for the level of parcels by intersection of the regional database with official land registers. In the printable version the phytosociological tables are added as attachments." (Author) Chapter 4.3.4 deals with Odonata. Tab. 16 checklists 29 odonate species including *Coenagrion scitulum*, *C. hastulatum* and *Sympetrum pedemontanum*] Address: <https://theses.univie.ac.at/detail/15015>

22361. Willis, C.K.; Samways, M.J. (2011): Water Dancers of South Africa's National Botanical Gardens. An illustrated dragonfly and damselfly checklist. SANBI Biodiversity Series 21: IV + 113 pp. (in English) [<https://www.sanbi.org/wp-content/uploads/2018/04/sanbibiodiversityseries21.pdf>] Address: Samways, M.J., Dept Entomol. & Nematol., Univ. Stellenbosch, Private Bag X1, ZA-7602, Matieland, South Africa. E-mail: samways@sun.ac.za

2012

22362. Bedjanic, M. (2012): O zeleni devi in vodni škarjici, rumenem porecniku in še cem z daljnega vzhoda Slovenije [About *Aeshna viridis* and *Stratiotes aloides*, *Stylurus flavipes* and something else from the far east of Slovenia]. Trdozy. Bilten slovenskih terenskih biologov in ljubiteljev narave 1(1): 18-19. (in Slovenian) [Verbatim/Google translate: Among Slovenian nature lovers, Mura has a very special, mystical or somewhat romantic place. Of course, because it is the first river in our country that is illuminated by the sun's rays in the morning, but even more so because of the extraordinary diversity of the living world with many habitats and plant and animal species that cannot be found anywhere else in Slovenia. Also from the point of view of the dragonfly fauna, the river landscape along the Mura is one of the most interesting areas in our country, as over 50 species of dragonflies have been recorded here in the last two decades, which is more than 2/3 of the Slovenian odonate fauna. One of the greatest odontological peculiarities of the world along the lower reaches of the Mura in Slovenia is undoubtedly *A. viridis*. In our country, it lives in only a few localities in the vicinity of Petišovci, and in addition, its biology in the company of European species of dragonflies is unprecedented. Its life and development are closely linked to the water shearwater plant (*S. aloides*). Females of *A. viridis* lay their eggs only in the succulent leaves of this plant, and the larvae then live in

its partially submerged leaf rosettes. State of residence or the state of water sedge habitats is thus the best, although of course not the only indirect indicator of the state and prospects for the survival of green camel populations in a certain area. Or to put it another way – if the water sedge disappears in an area, *A. viridis* will certainly disappear as well, but on the other hand, the presence of this very rare and endangered plant in our country is not a direct guarantee of the presence of the equally endangered dragonfly. We first found *S. aloides* in Slovenia only 15 years ago, and to date we have confirmed its development only on the Kapitany Lap, Nagy Parlag and Csiko Legelo wetlands in the vicinity of Petišovci, which are also the most beautiful still-preserved habitats of water sedge in our country. As part of the LIFE+ Nature project entitled Protection and management of freshwater wetlands in Slovenia - WETMAN 2011-2015, in 2011 we carefully investigated the mentioned three localities and, using the method of collecting lions, estimated that almost 600 adults metamorphosed from larvae in the vicinity of Petišovci that year specimens of green trees. Together with the currently still fairly good condition of water sedge habitats, the research gives us hope that the short-term survival of the two highly endangered species in our country is not in question. Unfortunately, due to the natural succession and landfall of dead fish, which no longer occur naturally, and the ever-present threat of inadequate fishing and other human interventions, the story of *A. viridis* and *S. aloides* is unfortunately less optimistic in the long run. In order to ensure a favorable conservation status of the two specialties of the Prekmurian marshes, active conservation measures will undoubtedly be necessary in the coming decades. However, the year 2011 served up another pleasant surprise from the landscape along the Mura. After half a century, we have again found *G. flavipes*, a species of dragonfly that was considered extinct in Slovenia. Luck smiled on us in mid-July at the side of the Mura river in the Murska šuma, southeast of Petišovci. But it wasn't easy - for this venture we had to gather odontologists from Slovenia, Serbia, Croatia, Bosnia and Herzegovina, Italy and Slovakia, who took part in the 1st International Meeting of odontologists of the Balkans BOOM 2011. Right on the team field of this meeting, the Slovakian colleague Dušan Šácha caught a solitary male of this rare and endangered species right next to the Croatian border. The Yellow River is included in the appendices of the Berne Convention and Annex IV of the Habitats Directive and is considered a typical type of larger lowland rivers with at least partially preserved natural river dynamics and diverse structures of the river ecosystem. All of this is undoubtedly fulfilled by Mura in the lower part of its Slovenian route, between Verže and the estuary of the Ledava, or the Hungarian border. If we add to all of the above the findings of many other endangered species of dragonflies, such as *Coenagrion pulchellum*, *Brachytron pratense*, *Epithea bimaculata*, *Aeshna grandis*, *Ophiogomphus cecilia* and *Leucorrhinia pectoralis*, which we observed in the landscape along the Mura in the past season, we can conclude that the diversity of the world of dragonflies here is really extraordinary. At least on paper, the wider area along the Mura River has a formally defined nature conservation status on the basis of the Birds Directive and the Habitats Directive and is included in the European network of Natura 2000 areas of nature conservation importance. the country's inexplicably delayed efforts to declare the Mura Regional Park unfortunately still remain.] Address: Bedjanic, M., M., National Institute of Biology, Vecna pot 111, 1000 Ljubljana, Slovenia. Email: matjaz.bedjanic@nib.si

22363. Donnelly, N. (2012): Ken Soltesz — An appreciation. *Argia* 24(4): 8-9. (in English) [Verbatim: The recent death of

Ken Soltesz has left a huge hole in the lives of the New York Ode Community. His energy, capacity for really hard work, enthusiasm, and generosity will not be seen around here again for a very long time. Ken contributed heavily to downstate New York records for my first paper on the Odonata of New York (BAO, 1992), and also for the second paper (WDA meeting 1999). His large body of records has been crucial for our knowledge of the odonate fauna of New York (summarized in the New York Dragonfly and Damselfly Survey (2005-2009) report). In fact, Ken's work was the "anchor" for this very important part of the state. Most of us became acquainted with Ken for the first time in 1990, when he organized a DSA Northeastern meeting at the Ward Pound Ridge Reserve in Westchester Co., New York, where Ken was the park naturalist. This was (for me) one of the most enjoyable DSA regional meetings that I have ever experienced, partly because of the marvelous venue and interesting odes, but mainly because of the hospitality of Ken and his wife Joyce. Most of my interaction with Ken in subsequent years involved the Delaware River, where Ken was doing extensive dragonfly surveying. In 1994, he had found exuviae of a strange Gomphus. In 1995, he was paddling down the Delaware River with Joyce and their daughters when their raft sped past a boulder in a rapids. With a "WHAT'S THAT?" shout he actually stopped the raft, hopped out (if that is the word), struggled upstream through the raging current and netted the first adult specimen of *Gomphus septima delawarensis* (Septima's Clubtail Northern form)! A later exercise was an Odonata inventory for West Point Military Reservation. Most people are familiar with the monumental architecture and Hudson River setting of the Military Academy; few are acquainted with a large "wild" area on the Reservation used for artillery (and other military) training of cadets. Ken picked his way warily through this tangle of splintered vegetation and documented an impressive odonate fauna, including an additional (and furthest north) record of *Gomphus rogersi* (Sable Clubtail). My last field trip with Ken and Joyce was in 1999 on the Wallkill River, where he had found a new locality for *Gomphus fraternus* (Midland Clubtail), an uncommon species in New York. By this time, as a result of diabetes, his health had deteriorated seriously. Not long thereafter his vision became very poor and he and Joyce retired to eastern Tennessee, where Ailsa and I had an enjoyable visit with them in 2009. We will all miss Ken a lot. Not only was he a thoroughly self-taught odonatist, but he was also perhaps the most generous person I have ever met. He did not hesitate to give you his time, his knowledge, and his superbly prepared specimens. Ken was a "keeper". We all extend our deepest regrets to Joyce and his daughters Tammy, Cathy, and Susie.] Address: Donnelly, T., 2091 Partridge Lane, Binghamton, NY 13903, USA. E-mail: tdonnel@binghamton.edu

22364. Hippke, M. (2012): Libellenmonitoring an neu angelegten Kleingewässern im Biosphärenreservat Schaalsee (2008 - 2011). *Virgo*, Mitteilungsblatt des Entomologischen Vereins Mecklenburg 15(1): 47-62. (in German) ["Between 2008 and 2011, dragonfly colonization was examined in 27 newly created small bodies of water. A total of 36 species were identified, including 19 Red List species. The species composition is primarily dominated by eurytopic, widespread and common species, but Mediterranean faunal elements have been identified with *Lestes barbarus*, *Sympetrum fonscolombii*, *Aeshna affinis* and *Crocothemis erythraea*, which are currently expanding their range to the north and are obviously influenced by small bodies of water that are rapidly warming. The number of species and the number of individuals increased significantly in most small bodies of water during the observation period. The results show great agreement

with a comparable study from Schleswig-Holstein." (Author/Google translate)] Address: Hippke, M., Wiesening 29, 19370 Parchim, Germany. E-mail: mathias-hippke@web.de

22365. Mancu, C.-O. (2012): Dragonfly Fauna (Insecta: Odonata) from Romania. PhD Thesis Abstract. "BABES-BOLYAI" University, CLUJ-NAPOCA, Faculty of Biology & Geology, Dept of Taxonomy & Ecology: 64 pp. (in English) [https://doctorat.ubbcluj.ro/sustinerea_publica/rezumate/2012/biologie/-Mancu_Cosmin_En.pdf] Address: Mancu, C.O., Acad. Remus Raduleț 13, bl. 119, ap. 7, Timisoara 300281, Timis County, Romania. E-mail: cosminovidiu@yahoo.com

22366. Martin, K. (2012): A brief field report on emergence of Riverine Clubtail (*Stylurus amnicola*) and Arrow Clubtail (*Stylurus spiniceps*) along a sandy bank in northern Connecticut. *Argia* 24(3): 17. (in English) ["In the summer of 2007, a sandy bank on the Connecticut River in East Windsor, Connecticut was visited a total of eight times between 27 June and 4 August. The location is immediately adjacent to the Interstate 91 overpass and is heavily visited by fishermen. The riverbanks in this area consist mainly of fine sand. During my visits to the area I observed many active emergences and eclosures, and countless cases of dragonfly mortality due to bird predation. The steep sandy banks and lack of extensive vegetation made the area ideal for recording emergence distance. Nymphal tracks were evident throughout the area, despite the heavy pedestrian use. A total of 209 *S. amnicola* emergence distances were recorded. Nymphs travelled an average of 10.99 feet from the edge of the river (s.d. 3.73). Fewer *S. spiniceps* (n=29) were observed, but emergence distance was similar (11.03 ft, s.d. = 3.64)." (Author)] Address: Martin, Kirsten, Univ. Saint Joseph, 1678 Asylum Ave., West Hartford, Connecticut, 06117, USA. Email: kirstenmartin@usj.edu

22367. O'Brien, M.F. (2012): Collecting Gray Petaltails (Odonata) with Mr. Williamson. *Newsletter of the Michigan Entomological Society* 57(1&2): 6-7. (in English) [The paper informs on paper triangles stored in the museum collection containing specimens of *Tanypteryx pryeri* and addition written information about the situation when catching the specimens. for example the following: "A second specimen collected by Deam in Perry Co., Indiana on 4 June 1918, has a most interesting comment: "It alighted in front of me and I killed it with the machete I was carrying." Those botanists did not mess around back then!" https://www.researchgate.net/publication/315081558_Collecting_Gray_Petaltails_Odonata_with_Mr_Williamson] Address: O'Brien, M.F., Museum of Zoology, University of Michigan, Ann Arbor, MI 48109-1079, USA

22368. O'Brien, M.F.; Craves, J. (2012): The Michigan Odonata Atlas. *Newsletter of the Michigan Entomological Society* 57(1&2): 7. (in English) [Announcement of producing the Michigan Odonata Atlas.] Address: Craves, Julie, Rouge River Bird Observatory, Environmental Interpretive Center, University of Michigan-Dearborn, Dearborn, MI 48128, USA. Email: nannothemis@gmail.com

22369. Vinko, D.; Bedjanic, M. (2012): Slovensko odonatološko društvo (SOD). *Trdozy. Bilten slovenskih terenskih biologov in ljubiteljev narave* 1(1): 16. (in Slovenian) [Brief presentation of the Slovene Odonatological Society.] Address: Vinko, D., Slovensko odonatološko društvo, Verovškova 56, Si-1000 Ljubljana, Slovenia. E-mail: damjan.vinko@gmail.com

22370. Conze, K.-J.; Joest, R. (2013): Die Grüne Flussjungfer etabliert sich wieder in NRW. *Natur in NRW* 1/13: 28-31. (in German) *Ophiogomphus cecilia*; ["In the summer of 2012, as part of a voluntary dragonfly mapping effort, a targeted search was made for the species that was particularly protected under Annex IV of the Habitats Directive and relevant to NRW planning. The high number of detections on the Lippe in the Soest district suggests that finds can also be expected on other bodies of water with targeted searches." (Authors/Google translate)] Address: Joest, R., Biologische Station Soest, Bad Sassendorf-Lohne. E-mail: r.joest@abu-naturschutz.de

22371. Dullinger, S.; Essl, F.; Rabitsch, W.; Erb, K.-H.; Gingrich, S.; Haberl, H.; Hülber, K.; Jarošík, V.; Krausmann, F.; Kühn, I.; Pergl, J.; Pyšek, P.; Hulme, P.E. (2013): Europe's other debt crisis caused by the long legacy of future extinctions. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, April 15, 2013: 6 pp. (in English) ["Rapid economic development in the past century has translated into severe pressures on species survival as a result of increasing land-use change, environmental pollution, and the spread of invasive alien species. However, though the impact of these pressures on biodiversity is substantial, it could be seriously underestimated if population declines of plants and animals lag behind contemporary environmental degradation. Here, we test for such a delay in impact by relating numbers of threatened species appearing on national red lists to historical and contemporary levels of socioeconomic pressures. Across 22 European countries, the proportions of vascular plants, bryophytes, mammals, reptiles, dragonflies, and grasshoppers facing medium-to-high extinction risks are more closely matched to indicators of socioeconomic pressures (i.e., human population density, per capita gross domestic product, and a measure of land use intensity) from the early or mid-, rather than the late, 20th century. We conclude that, irrespective of recent conservation actions, large-scale risks to biodiversity lag considerably behind contemporary levels of socioeconomic pressures. The negative impact of human activities on current biodiversity will not become fully realized until several decades into the future. Mitigating extinction risks might be an even greater challenge if temporal delays mean many threatened species might already be destined toward extinction." (Authors) Red List publications including Odonata were used as data base.] Address: Dullinger, S., Dept für Naturschutzbiologie, Vegetations- & Landschaftsökologie, Univ.Wien, 1030 Wien, Rennweg 14, Austria. E-mail: stefan.dullinger@univie.ac.at

22372. Erbida, N.; Vinko, D. (2013): Fotografski natečaj Pisani akrobati [Photography competition: Painted acrobats]. *Trdozy. Bilten slovenskih terenskih biologov in ljubiteljev narave* 2(2): 35-36. (in Slovenian) [Verbatim/Google translate: In 2013, within the framework of the Slovenian Odonatological Society, young odonatologists announced a photography competition for all lovers of natural history photography. The purpose of the competition was to show people of all ages the beauty and skill of dragonflies, to stimulate their interest and attract them to participate in our society. The competition, which we named Pisani acrobats, was divided into three age groups: youth, students and adults. During the summer and until the end of September, when the deadline for applications to the competition closed, we received 134 photos from 52 authors. The best photos, some of which are also published in *Trdoživ*, were chosen by a committee composed of: dr. Davorin Tome, Ph.D. Rudi Verovnik, Ph.D. Tomi Trilar, Ph.D.

Alja Pirnat and Ali Šalamun. After the publication of the bulletin, all that remains is the opening of the photography exhibition with the awarding of plaques and prizes, which will take place in early January 2014 at the Biology Department of the Faculty of Biotechnology in Ljubljana. At that time, we will also prepare a short lecture on dragonflies and invite those present to odontology fields intended for the general public, which we will organize in the spring and summer. We will also present a poster about dragonflies that we made as part of the project.] Address: Vinko, D., Slovensko odonološko društvo, Verovškova 56, SI-1000 Ljubljana, Slovenia. E-mail: damjan.vinko@gmail.com

22373. Gregoire, S.; Gregoire, J. (2013): Monitoring *Celithemis elisa* (Calico Pennant) emergence: Year 8 and counting. *Argia* 25(1): 16- (in English) [Verbatim: For odonates in central New York, the 2012 season was dismal. During the winter, temperatures were way above normal, resulting in no ice cover on lakes, ponds and streams. Lack of snowmelt and rainfall left all water levels frighteningly low, then a very warm (hot) March and April wreaked havoc on normal phenology. As the season progressed, high temperatures and continuing drought dried up many wetlands by late May. All this culminated just as our study of the emergence season for *C. elisa* was beginning. We have monitored their activity here for seven years and we were eager to see how these adverse conditions affected the population here. As we suspected, emergence began a little earlier than in previous years, but not by much. The trend has been for earlier emergence almost every year, so this was not unexpected. Each year, a peak period of emergence commences immediately, lasts a few days, and then reduces to a slower pace. After the initial burst, emergence continues in lower but steady numbers punctuated with occasional small surges lasting a few days. The pattern continued in 2012, although in low numbers overall. This too, was not unusual. As indicated in the accompanying table, their numbers have fluctuated greatly over the seven-year study period. Normally, emergence extends into late July, sometimes into August. In 2012, only a few emerged in late June and the population produced its last teneral in early July. It seemed very early to us but, accounting for the early beginning, was not beyond the range of total emergence periods we had previously witnessed. In summary, by their Standards, the emergence season for *C. elisa* was successful and normal. Their pond is deep and withstood the heat and drought, although it lost almost four feet in depth overall. Numbers were low, but not the lowest we've seen. With continuing study, we hope to set parameters around what *C. elisa* considers "normal". Each year presents a different set of Standards for us to ponder. As a result of the bad weather in 2012, we do not expect an abundant 2013, but it will no doubt give us something more to think about.] Address: Gregoire, Sue and John, Kestrel Haven Avian Migration Observatory, Burdett, New York 14818, USA. Email: khmo@empacc.net

22374. Meurgey, F. (2013): Vagrant Emperor, *Hemianax ephippiger* (Burmeister, 1839), in the New World: Synthesis and comments on recent discoveries. *Argia* 25(1): 5- (in English) [Verbatim: *H. ephippiger* is a well-known Palearctic migrant species originating from Africa that can reach the northernmost island of Iceland in summer. There is no consensus among odonatologists concerning the correct assignment of *ephippiger* to the genus *Anax* or *Hemianax*. Recent studies both on adults and larval characters between the two genera have reinstated the discussion. Rowe (1991) showed that larval characters of *Hemianax ephippiger* are not shared with any other *Anax* species to date. Gentilini et al. (1993), attempting to

map a small number of fossil wings onto extant taxa, place ephippiger and papuensis in the genus *Anax*. But the suppression of *Hemianax* is asserted as fact in the abstract, without any discussion in the text. In her phylogenetic study of the extant Aeshnidae, von Ellenrieder (2002) maintains the genus *Hemianax*. This long debate seems to continue and we choose to keep a conservative point of view in using *Hemianax ephippiger*. *Hemianax ephippiger* in the New World: The first known and documented observation of this Afrotropical aeshnid in the New World dates back to 2002 in French Guiana and constitutes the first record for the New World (Machet & Duquef, 2004). Later in 2006, a single female caught in Guadeloupe in the Lesser Antilles constituted the first record for the West Indies (Meurgey 2006). The following year, additional specimens were seen in the Virgin Islands in the Greater Antilles (Sibley, 2007) and two others (male and female) in Dominica (Meurgey and Weber, 2007) just south of Guadeloupe in the Lesser Antilles. As far as we know, no other record from the West Indies or the New World has been recorded since then (Meurgey & Picard, 2011). Recently, Lionel Dubief and Vincent Lemoine kindly informed us that they found two specimens in Guadeloupe at the same locality as in 2006 and 2007 (northwest of Grande-Terre). The first specimen was caught on 15 October and a second was only observed on 23 October 2012. A few months later, Maurice Duquef (2012) reported the capture of a general female in French Guiana on 21 March 2012, at almost the same locality as in 2002, indicating that the species probably breeds near Sinnamary. Following this, Dennis Paulson (pers. comm.) informed us that the species now breeds with certainty on Curaçao where exuviae were found, and is reported from Aruba where 3 individuals were found on 1-I-2013 by Gert Veurink. The arrival of several individuals in the West Indies in 2012 followed the tropical storm Rafael that originated on the west coast of Africa on 5 October and reached the Caribbean on 13 October. De Marmels (2007) stated that the arrival of African species such as *H. ephippiger* to the West Indies was correlated with the occurrence of tropical storms originating from the coasts of West Africa and was generally associated with large flows of Desert Locusts (*Schistocerca gregaria*). Given that the species has been recorded as breeding in the Caribbean region, we believe the species will extend its distribution in ensuing years throughout the West Indies and establish populations. Future tropical storms originating in Africa subsequently reaching the West Indies may augment populations of this species in the West Indies. The arrival of Afrotropical species to the West Indies (*H. ephippiger* and *Tramea basilaris*) and documented observations provides a unique opportunity to study the colonization of the Caribbean islands by species and to measure their negative or positive impact on native species. We urge visiting and resident odonatists to send us their observations, which will allow us to study and monitor the evolution of the colonization by *H. ephippiger* throughout the West Indies.] Address: Meurgey, F., Muséum d'Histoire naturelle de Nantes, 12, rue Voltaire, 44000 Nantes, France. E-mail: Francois.Meurgey@mairie-nantes.fr

22375. Satori, L. (2013): Effects of habitat management and restoration on freshwater ecosystem population dynamics. Tesi di dottorato, Università degli Studi di Milano-Bicocca: 149 pp. (in English) ["Although water quality improvement is generally the primary objective of treatment wetlands, the creation of habitats is an inevitable outcome of these projects. Macroinvertebrate are often early colonists of new created wetlands, with abundance and diversity approaching high levels within a few years from wetland construction. A deeper knowledge of the biodiversity hosted in these environments

is needed to evaluate if newly created ponds are appropriate management tools for biological conservation. The effectiveness of the interventions provided by Parco Pineta di Appiano Gentile e Tradate (a regional park in Lombardy, Italy) in freshwater ecosystem management and restoration has been evaluated, considering a set of natural, artificial and constructed wetlands spread within the park territory. Considering the macroinvertebrate community and analyzing the biodiversity hosted in all the considered wetlands, no significant differences were found between artificial and natural ecosystems. Even the constructed wetlands, which were characterized by low water quality and higher pollutants concentrations, presented a biodiversity level which in some cases exceeded that one present in natural ecosystems. Even though biodiversity was similar between wetland typologies, differences in community compositions have been enlightened. The macroinvertebrate community assemblages seemed to be influenced more by the geographical and hydromorphological variables of the ecosystem rather than the physicochemical water characteristics. In particular, water body area and habitat heterogeneity resulted to be the most important variables that influenced the community composition. Seasonal variations in hydrological conditions and resource availability were the main factors that influenced the macroinvertebrate dispersal, evaluated considering life-strategy groups. Although the considered ponds and wetlands presented different features, they all contributed to the local ecological network even if they were not all equally interconnected together. All the collected information could be useful to design further possible interventions for conservation aims." (Author) *Anaciaeschna isosceles*, *Aeshna cyanea*, *A. mixta*, *Anax parthenope*, *A. imperator*, *Coenagrion puella*/ *pulchellum*, *Ischnura elegans*, *Pyrhosoma nymphula*, *Cordulegaster boltonii*, *Chalcolestes viridis*, *Orthetrum coerulescens*, *Libellula depressa*] Address: https://boa.unimib.it/bitstream/10281/42353/1/phd_unimib_049340.pdf;%2012042013

22376. Stalter, D.; Magdeburg, A.; Quednow, K.; Botzat, A.; Oehlmann, J. (2013): Do contaminants originating from state-of-the-art treated wastewater impact the ecological quality of surface waters? PLoS ONE 8(4): e60616. doi: 10.1371/journal.pone.0060616: 10 pp. (in English) ["Since the 1980s, advances in wastewater treatment technology have led to considerably improved surface water quality in the urban areas of many high income countries. However, trace concentrations of organic wastewater-associated contaminants may still pose a key environmental hazard impairing the ecological quality of surface waters. To identify key impact factors, we analyzed the effects of a wide range of anthropogenic and environmental variables on the aquatic macroinvertebrate community. We assessed ecological water quality at 26 sampling sites in four urban German lowland river systems with a 0–100% load of state-of-the-art biological activated sludge treated wastewater. The chemical analysis suite comprised 12 organic contaminants (five phosphor organic flame retardants, two musk fragrances, bisphenol A, nonylphenol, octylphenol, diethyltoluamide, terbutryn), 16 polycyclic aromatic hydrocarbons, and 12 heavy metals. Non-metric multidimensional scaling identified organic contaminants that are mainly wastewater-associated (i.e., phosphor organic flame retardants, musk fragrances, and diethyltoluamide) as a major impact variable on macroinvertebrate species composition. The structural degradation of streams was also identified as a significant factor. Multiple linear regression models revealed a significant impact of organic contaminants on invertebrate populations, in particular on Ephemeroptera, Plecoptera, and Trichoptera species. Spearman rank correlation analyses confirmed wastewater-

associated organic contaminants as the most significant variable negatively impacting the biodiversity of sensitive macro-invertebrate species. In addition to increased aquatic pollution with organic contaminants, a greater wastewater fraction was accompanied by a slight decrease in oxygen concentration and an increase in salinity. This study highlights the importance of reducing the wastewater-associated impact on surface waters. For aquatic ecosystems in urban areas this would lead to: (i) improvement of the ecological integrity, (ii) reduction of biodiversity loss, and (iii) faster achievement of objectives of legislative requirements, e.g., the European Water Framework Directive." (Authors) The list of taxa (in supplementary file) includes *Coenagrion hylas* [sic]. Address: Stalter, D., Dept Aquatic Ecotoxicology, Biological Sciences Division, Goethe University Frankfurt am Main, Frankfurt am Main, Germany. Email: d.stalter@uq.edu.au

2014

22377. Galatowitsch, M.L. (2014): Invertebrate life-history trade-offs and dispersal across a pond-permanence gradient. Doctor of Philosophy (PhD) in Ecology, University of Canterbury. Biological Sciences: 175 pp. (in English) ["Flexible life-history traits and dispersal may allow generalist populations to persist across a range of habitats despite experiencing contrasting selection pressures. Invertebrates exploiting temporary ponds must develop quickly and disperse as adults, or have wide environmental tolerances. Conversely, permanent-pond invertebrates must avoid a suite of predators (e.g., fish and dragonflies). This gradient of pond permanence can result in life-history trade-offs that influence fitness, population dynamics, and genetic structure. In addition, recruitment between habitats may balance juvenile life-history trade-offs and be crucial to sustain generalist invertebrate populations in ponds with unpredictable hydrology. Through a multi-year survey of three pond complexes in the Canterbury high-country and a series of mesocosm experiments using two generalist pond invertebrates, *Xanthocnemis zealandica* damselflies and *Sigara arguta* waterboatmen, I found these two species had alternative life-history strategies that influenced their distributions across the pond-permanence gradient. With longer juvenile development, *X. zealandica* benefited from flexible life-history traits: temporary-pond *X. zealandica* had accelerated development and short-term desiccation tolerance, but were excluded from ponds with long dry periods, whereas, permanent-pond *X. zealandica* had extended development and predator avoidance behaviours (e.g., reduced movement and refuge-use). In contrast, *S. arguta* had an opportunistic life-history strategy with a fixed, rapid development response that allowed them to inhabit more temporary ponds, but they were intolerant of drying and limited to permanent ponds that contained shallow refuges from fish. These results illustrate how alternative life-history strategies enabled two generalist species to achieve broad realised niches. Recruitment between habitats also appeared to be important for balancing trade-offs and maintaining meta-populations across the pond-permanence gradient. To evaluate the importance of *X. zealandica* dispersal among and within pond complexes I used microsatellite analyses. While there was unique genetic population structure between the North and South Islands, at lower spatial scales there was little variability in genetic diversity and limited genetic structure in populations, likely due to gene flow among different habitat types. Overall, this work shows how an interaction of juvenile strategies and adult dispersal could reduce life-history trade-offs, resulting in weak selection pressures across an unpredictable disturbance gradient. Whether increasingly unpredictable hydrological patterns under climate-warming favour generalist species will

likely depend on how well generalist life-history traits and dispersal allow exploitation of a range of habitat types and resilience to variable selection pressures. Higher mean summer rainfall in New Zealand may allow both species to exploit more temporary ponds, whereas longer dry periods between extreme precipitation events could limit *X. zealandica* distributions. Thus, species with generalist strategies are likely to be favoured under warming, but their specific life-history strategies will likely promote or limit their ability to exploit more unpredictable habitats." (Author)] Address: <https://ir.canterbury.ac.nz/server/api/core/bitstreams/aaddda8e-9344-4465-936e-3fd9eae632bc/content>

22378. Grutters, M. (2014): Libellen als keurmeesters van de waterkwaliteit. Straatgras 26 [1] 2014 [Zuiderpark Special]: 3. (in Dutch) [Verbatim/Google translate: Dragonflies as inspectors of water quality: The redesign of the Zuiderpark does not seem to have harmed the dragonflies. In the period from 2007 onwards, 23 species were observed, with a maximum of eighteen species annually, compared to a maximum of fifteen species in the period 2000-2003. With the redesign, the water quality improved in a number of places, although this appears to be slowly deteriorating again (Andeweg 2014). It is important for dragonflies that in many places bank revetments have been replaced by natural banks with bank plants. Many species depend at some point in their life cycle on the presence of riparian, floating or submerged aquatic plants. The construction of „wadis“ and a helophyte filter played an important role. Blue damselflies: The monitoring consists of counting all species of Odonata three times a year on 18 counting routes along the banks of various waterways. By far the most common dragonfly species here are small, blue damselflies such as *Ischnura elegans* and *Erythromma viridulum*. These two species alone together account for three quarters of the total number of dragonflies counted. The lantern is seen along almost all waters. This species makes few demands on its habitat. *E. viridulum* is slightly less widespread and is limited to waterways where coarse hornwort (*Ceratophyllum demersum*) is abundant. As with the equally common *Erythromma najas*, eggs are often deposited on yellow wattle (*Nuphar lutea*), a common aquatic plant in the Zuiderpark. „Wadis“ [pools, water bodies]: We saw interesting developments at the wadis. Shortly after its construction, several species characteristic of such barren pioneer environments immediately appeared. These included the beautiful *Libellula depressa* and a number of darter species. For example, *Sympetrum striolatum* likes to reproduce in shallow pools with little vegetation. This dragonfly was often seen near the wadis. Over the years, numbers steadily decreased as the water and soil continued to condense. This allowed *Sympetrum vulgatum*, which is not a pioneer, to conquer territory. In recent years this was the most common darter species in the Zuiderpark. Critical species Among the species that increased is *Aeshna isocetes*. This was not on the species list before the redevelopment, but is now a common sight in the Zuiderpark. It can be seen as an indicator of clean water with richly vegetated banks. It is therefore no coincidence that it is mainly found around the helophyte filter in the western part of the park - the place with the best water quality. *Brachytron pratense* is also such a critical species, but it is rarely seen in the Zuiderpark. In the Kralingse Bos it does show an increase. Although the first pioneers are already a thing of the past, the current dragonfly diversity of the Zuiderpark can be said to be quite good. However, with a slow decline in numbers and distribution, the best times seem to be behind us. Possible future changes in water quality, as can be expected due to the construction of the Blue Connection, could lead to the further expansion

of the various species. Monitoring has shown that dragonflies quickly find the Zuiderpark if there are new suitable waters and that they can expand rapidly through quality improvement. Who knows what the future will bring.] Address: Mark Grutters, ecologist, Bureau Stadsnatuur, The Netherlands. Email: grutters@bureaustadsnatuur.nl]

22379. Huber, K. (2014): Libellen im Machland. ÖKO-L 36/2: 13-16. (in German) [The Machland is the Danube lowlands between Mauthausen and the entrance to the Strudengau shortly before Grein. The Machland stretches to the left and right of the Danube. It is therefore divided between Upper and Lower Austria. The spatial unit of the Upper Austrian Machland is given as 114 km². In 2012 and 2013, 43 odonate species were recorded.] Address: Huber, K., Naturschutzbund Oberösterreich, Regionalgruppe Machland, Parksiedlung 22, 3300 Amstetten, Austria

22380. Mota, E.C.M.; Marques, J.A.A.; Dias, N.; Santos, C.R.A. (2014): Environmental diagnoses of two urban streams with bioindicators Goiânia (Go). *Revista Mirante, Anápolis (GO)* 7(2): 109-144. (in Portuguese, with English summary) [Brazil "The present diagnosis was carried out in the municipality of Goiânia on September 16, 2006 (dry period), where 8 sampling stations were demarcated, collecting 4 points from Córrego Botafogo and 4 from Córrego Samambaia, throughout these eight stations, measuring some physicochemical variables. The structure of the aquatic insect community of the aforementioned watercourses was represented by 14 families distributed in the following orders: ... Odonata [Gomphidae], The physicochemical variables demonstrated greater impairment of quality in Córrego Botafogo, with Córrego Samambaia presenting better conditions for these parameters." (Authors)] Address: Mota, Eltania, Graduada em Química / UFG - Universidade Federal de Goiás, Goiânia – GO e Especialista em Perícia Ambiental / PUCGO – Pontifícia Univ. Católica de Goiás, Goiânia – GO. taniammota@yahoo.com.br

22381. Vidal-Cordero, J.M.; Hemando-Soriguer, A.; Cortés-Merino, S. (2014): Proyecto Técnico: Odonatofauna del Humedal de Padul (Granada, España). *Boletín de la Sociedad Odonatológica de Andalucía* 2: 37-40. (in Spanish) [Verbatim: The Padul wetland, located at the western end of the Sierra Nevada massif, south of Granada and the urban center of Padul, on the very border of two well-differentiated historical regions, the Lecrín Valley and the Temple, is the largest wetland in the province and one of the most important wetlands in the Spanish southeast, mainly due to the faunal diversity it has. This lagoon system forms a unique biotope within the complex ecosystem that makes up the entire Sierra Nevada Protected Space. Currently, it is the remnant of a much larger wetland, which occupied around 500 hectares, and which was drained in the 18th and 19th centuries in order to cultivate the drained land. It has numerous protection figures such as Natural Park, RAMSAR Convention, SPA Zone, etc. This protected area covers about 300 hectares, of which 90 hectares. It covers the swamp area that is divided into two parts, the Aguadero area (to the East), with a total area of about 80 hectares, highlighting the Aguadero lagoon with 25 hectares. and the waterlogged reedbed with about 40 hectares. of approximate surface area, and the Agia area (to the West), formed by a set of three lagoons and flooding areas with a total area of 11 hectares, of which the lagoons occupy 9 hectares. The Padul wetland presents the main elements of large wet complexes, such as areas of free water, flooded areas, flooded and dry reed beds, wet meadows, canals and ditches, springs, etc., giving it enormous ecological value. As a result of this well-conserved water system, a great

wealth of animal species can be found in the wetland that thrive there, not all of which benefit from an exhaustive study of their populations, such as the fortunate case of birds. Most of the monitoring of animal species falls on the ornithofauna and in fact, previous studies carried out by the Padul Ornithological Station Association (E.O.P.) have shown that the Padul wetland constitutes a place of settlement and passage of numerous species of birds. As a non-profit entity, the E.O.P. It is made up of a group of people with a common concern: the study, conservation and dissemination of the natural values of the Padul Wetland. This is why, in addition to working with the ornithofauna of this area, we aim to open the spotlight in relation to other animal groups whose presence and population dynamics in the wetland are less studied. Within the group of insects, odonates, along with butterflies, are those that enjoy a greater degree of admiration and have numerous people interested in observing, studying and photographing them (Herrera et al., 2009). Taking advantage of the intrinsic charisma that this order of insects provides, its ecological importance within the habitats in which it lives and the lack of knowledge of the species and their populations in the Padul wetlands, despite this first approach by Conesa, M. A., 2013, The Technical Project: Odonatofauna of the Padul Wetland was born in the winter of 2012, which aims to characterize the odonotofauna of the Padul Wetland, carrying out an inventory of the dragonflies and damselflies that are distributed in said wetland, as well as obtaining data related to its biology and conservation, involving E.O.P. volunteers. for the realization of said project and offering resulting information available for adequate environmental awareness. The project is being carried out by technicians and volunteers from the E.O.P. together with the technical support of a photographer and the supervision of the station director, for a period of seven months (April-October) and with a view to having continuity for a longer period of time and for a more exhaustive study of its composition, phenology and population dynamics.] Address: Vidal-Cordero, J. M. 1, porphirio_5@hotmail.com

2015

22382. Bedjanic, M. (2015): Slovensko odonatološko društvo izdalo jubilejno 30. številko biltena Erjavecia [The Slovenian Odonatological Society published the 30th anniversary issue of the Erjavecia newsletter]. *Trdoziv* 4(2): 10. (in Slovenian) [Verbatim: Erjavecia, named after Fran Erjavec, who was one of the first in our country to use the term "dragonfly" in the first Slovenian natural history textbook, is a newsletter of the Slovenian Odonatological Society. It has been published regularly since 1995. In its twenty years of publication, 30 volumes have already been published, since until 2005 they were published two per year, and since then a single issue for the current year has been published at the end of October. It is our intention and desire to publish as much interesting and valuable odontological information from our area as possible. There are a lot of various odontological tidbits, crackers and quite often quite substantial stories and reports from faunistic, ecological, nature conservation, historical, literary and other fields, which we have touched on so far in a total of more than 1,100 pages of Erjavecia. Even the jubilee issue of the newsletter touches on many interesting topics on 144 pages; among other things, it also brings a substantial odontological bibliography of Slovenia for the period from 1685 to 2015. This includes all known written sources about Slovenian dragonflies. The number of titles cited so far in the collection, which has been continuously updated for two decades, has also risen to almost 1,100. In the Slovenian Odonatological Society, we will continue to strive to ensure that Erjavecia remains

the central place for collecting a wide variety of information about dragonflies in Slovenia and beyond. All members of the Slovenian Odonatological Society and contributors receive the Erjavcica newsletter in printed form. You are welcome to send your field observations, experiences or any odontological notes to matjaz_bedjanic@yahoo.com.] Address: Bedjanic, M., M., National Institute of Biology, Vecna pot 111, 1000 Ljubljana, Slovenia. Email: matjaz.bedjanic@nib.si

22383. Bedjanic, M. (2015): Intervju: Bostjan Kiauta. Trdoziv 4(2): 23-28. (in Slovenian) [Matjaz Bedjanic, inspiring odonatologist from Slovenia, interviewed Bastiaan Kiauta, founder of journal *Odonatologica* and most influencing person of *Societas Internationalis Odonatologica*. Here we document in English language the questions asked. For the complete interview in Slovenian language see: https://botanico-drustvo.splet.arnes.si/files/2019/03/Trdoziv08_web.pdf. I used 'Google translate' to translate the questions into English language. The following questions were asked: "Prof. Kiauta, let's start with a question you've probably answered a thousand times: Why did you choose dragonflies as the central group of your admiration and research? How did you get into research in the first place? It must have been a special challenge in those days. At the beginning of your entomological journey, your uncle, Prof. Ciril Ažman, one of the last Slovenian polyhistorians. You were also in contact a lot with Alfonzo Gspan. I assume that these two men were your main source of information for such a broad knowledge of the development and history of Slovenian entomology. Can you tell us something else about your science activities during your high school years? What was fieldwork actually like in those days? Probably quite unimaginable from today's perspective... For this reason, the weight of your comprehensive faunistic contributions about the dragonflies of the Loka territory, the Triglav National Park, the Kamniška Bistrica basin, etc. so much bigger. In your work *Odonata fauna of Slovenia*, in the sixties of the last century, you recorded species of dragonflies for the territory of Yugoslavia at the time, for the first time, such as *Somatochlora alpestris* etc. ... Did this surprise you or were you specifically looking for them? In 1962 you moved to the Netherlands. Were you forced into this due to the political situation and pressures, or was Slovenia simply "too small" for you? The year 1971 is important in the Netherlands, when the international odontological association *Societas Internationalis Odonatologica* - S.I.O. was founded. You played the main role in this from the very beginning, you were the driving force of the project, and you were surrounded by the majority of active odontologists in the world. It probably opened your odontological horizons even further. If we are talking about journals and their editing, and in this respect we can draw a parallel with the field work that you talked about earlier... Today, the edition of the publication is a "small snack", but in the 70s and 80s of the last century there were no computers, no e-mail, technically it was the "Stone Age" of newspaper publishing back then compared to what is available today. The publication of a new volume every three months, always on time, 1,400 edited articles that had to be partly written, rewritten, edited, communicated with the authors through letters; How have you managed it in 42 years of publishing *Odonatologica*? Such extensive correspondence with many authors requires a lot of time, accuracy, discipline... I read somewhere that your correspondence with many odontologists around the world runs into hundreds of thousands of letters. Just the two of us exchanged several hundred letters in all these years from 1993 onwards. In your archive there is only ten and more meters of correspondence... Let's briefly review other matters that interest you. You have dealt with caves, bats, bears are also your favorite subject... In 2002, the Queen

of the Netherlands named you a Knight of the Order of Orange-Nassau. Can you tell us a bit more about how that came about? They say that behind every successful man is an equally successful woman. For you, this is your wife Marianne, who has been doing extremely important work "behind the scenes" for many years. As I know, you have a new very important occupation at home in the Netherlands, where you have been living on a farm for several years... One last question... Last year and again this year, you published some very interesting odontological contributions for the territory of Slovenia, for example the one about the dragonflies of Ljubljana in the journal *Natura Sloveniae*. In short, can you release us any other project that you plan to work on in the future? Dear Prof. Kiauta, thank you very much for this conversation. We want and hope that we can count on your cooperation and support for many years to come. We are proud that, as an honorary member of the Slovenian Odonatological Society, you are still an active odontologist, and we are glad that you are always ready to help younger colleagues with your knowledge and advice. We wish you and dear Marianne many more healthy, creative and happy years!" (Author/Google translate)] Address: Bedjanic, M., M., National Institute of Biology, Vecna pot 111, 1000 Ljubljana, Slovenia. Email: matjaz.bedjanic@nib.si

22384. Bernal, A.; Frutos, I.M.; Olivera, M. (2015): Confirmación de la presencia y reproducción de *Onychogomphus costae* (Selys 1885), (Odonata, Gomphidae) en la provincia de Cádiz. *Boletín de la Asociación Odonatológica de Andalucía* 3: 39-46. (in Spanish, with English summary) [There was just one former record of *O. costae* in the province of Cádiz (Jödicke, 1996). 18 potentially habitats of *O. costae* were studied, and at 12 of them the species was recorded. These records in the province of Cadiz are mapped. In a table the co-occurring species are listed.] Address: Bernal, A., C/ Juan Ramón Jiménez 28, 11160 Barbate, Cádiz, Spain. Email: arturo.libelula@gmail.com

22385. Bernal, A.; Olivera, M.; Frutos, I.M. (2015): Primera cita para la especie *Selysiotermis nigra* Van der Linden, 1825 (Odonata: Libellulidae) en la provincia de Cádiz. *Boletín de la Asociación Odonatológica de Andalucía* 3: 7-10. (in Spanish, with English title) [*S. nigra*, male 28-VIII-2014, La Molina, Spain.] Address: Bernal, A., C/ Juan Ramón Jiménez 28, 11160 Barbate, Cádiz, Spain. Email: arturo.libelula@gmail.com

22386. Conesa, M. (2015): Fauna odonológica en la Laguna Amarga (Córdoba, España). *Boletín de la Asociación Odonatológica de Andalucía* 3: 11-17. (in Spanish, with English summary) [The existence of 21 species of odonates was confirmed, among which *Trithemis kirbyi*, *Orthetrum trinacria*, *Brachythemis impartita* and *Diplacodes lefebvrei*.] Address: Conesa Garcia, M.A., Asociación Odonatológica de Andalucía, Spain. Email: mconesa@libelulas.es

22387. Gaona, M.J.; Navarrete, F.E. (2015): Nueva cita en la provincia de Cádiz (España) de *Orthetrum nitidinerve* (Selys, 1941), (Odonata: Libellulidae). *Boletín de la Sociedad Andaluza de Entomología* 25: 13-15. (in Spanish) [Verbatim: *O. nitidinerve* is a medium-sized anisopteran; males with the body covered with a grayish-blue pruinosity and orange pterostigma. Its main difference with the rest of the species of the genus lies in the yellow color of the radial and costal veins (Askew, 2004; Dijkstra & Lewington, 2006) (FIG. 1). The species object of this note is an Ibero-Maghrebi element (Torralba Burrial & Ocharan, 2007), distributed mainly throughout the Maghreb (Morocco, Algeria, Tunisia and Libya), reaching the Iberian Peninsula, Sardinia, Sicily and some localities in the Italian Peninsula (Conci & Nielsen, 1956). Most of

the citations are before 1980 (Boudot et al., 2009) In Andalusia it is cited for the first time by McLachlan (1889) in Algeciras (Cádiz) (UTM: 30STF70). Subsequently, it is cited on two more occasions in the province of Cádiz, specifically in Algeciras (30STE79), (Ocharan, 1992) and in the Barbate river basin (30STF31), (Hampe, 2004). Previously in the province of Málaga it is cited in the Arroyo Toquero (30SUF76), (Conesa, M. & García, E. 1983), and in the Arroyo de la Calera. Los Alcornocales, in the province of Cádiz (30STF64), (Cano-Villagas, F. et al. 2012). Recently, in September 2014, a female specimen was also located in Malaga in the Guadaiza river basin (30SUF15), (Conesa-García M. & Rodríguez-Martínez, D. 2015). The first observation of the species in grid 30-STF69 was on 9-IX-2014. Three adult males were observed. On 11-IX-2014, five adult males were counted again. In a new observation on September 15, 2014, 4 males and one female were recorded (FIG.2), all adults. On 30-IV- 2015, continuing sampling in the study area, a male teneral of *O. nitidinerve* was located (FIG. 3). Ten days later, new specimens were still observed, in this case a female (FIG. 4). The habitat where this population was found is a natural watercourse on sandstone soils, in a pasture replacing cork oak with *Teucrium scorodonia* (FIG. 5). Other species of odonates are observed in the sampled area: *Ischnura graellsii*; *Calopteryx haemorrhoidalis*; *Anax imperator*; *Orthetrum chrysostigma* and *O. coerulescens*.] Address: Gaona, J.M., C/Alhóndiga 5-1ºB 11370, Los Barrios, Cádiz, Spain. Email: ergaona1@hotmail.com

22388. Hernando Soriquer, A.; Vidal Cordero, J.M.; Cortés Merino, S.; Urbano Tenorio, F.; Hita Ordóñez, D.; Caballero Cid, M. (2015): Primera cita de *Trithemys kirbyi* (Sélys, 1891) (Odonata: Libellulidae) en la Reserva Natural del Humedal de Padul (Granada, Sureste de la Península Ibérica). Boletín de la Asociación Odonatológica de Andalucía 3: 3-6. (in Spanish, with English summary) [*T. kirbyi*: 22-06-13: 2 males; 06-07-13: 1 male; 31-08-13: 1 male] Address: Hernando Soriquer. Email: androcito90@gmail.com;

22389. Rache Rodríguez, L. (2015): Caracterización de hábitat y morfología de algunas especies del género *Perithemis* (Odonata: Anisoptera) presentes en la Cordillera Oriental. MSc thesis, Universidad Nacional de Colombia, Facultad de Ciencias, Departamento de Biología, Bogotá, Colombia: 140 pp. (in Spanish) ["Of the genus *Perithemis*, 14 species have been described so far and it is composed of small individuals with amber wings in males that sometimes have dark spots, while in females the wings are completely hyaline or with amber spots. In the present research, 30 bodies of water located on the two slopes of the Colombian eastern mountain range are studied in order to identify the general characteristics of the habitat of *Perithemis lais* and *P. mooma*, as well as establish the relationship between these and the morphology of the at. Because the two species show very different distributions (wide in *P. mooma* and restricted in *P. lais*) it is interesting to determine what factors may condition their presence in a specific region or body of water. Therefore, it was evaluated whether there were quantitative differences between the water bodies inhabited by *P. lais* and *P. mooma* and those in which they do not. As well as, determine if the morphology of the wings is related to the environmental variables of aquatic systems. Four samplings were carried out over a year in each of the selected sites, in which chemical, physical and biological variables of the water bodies were measured, as well as land use in the surroundings. In addition, adult individuals and larvae that were raised in the laboratory were collected in order to examine the morphology of the wings. The cluster and principal component analyzes showed that the water bodies in which the species were collected have

little internal variation and differ from the others. Through logistic regressions it was possible to establish the most important environmental variables for each of the species. In the case of *P. lais* they were temperature, shadow on the water mirror, continuity of the macrophyte belt and conductivity, while for *P. mooma* pH, conductivity, water temperature, free water mirror, oxygen, shadow on the water mirror, width and continuity of the macrophyte belt were selected. For its part, the analysis of the morphology of the wings was done through geometric morphometry, a method in which the shape of a group of organisms can be quantified, separating the effect of size, in order to compare it with others. For *P. mooma* and *P. lais*, the left forewing and hindwing of males collected in the selected water bodies were used. After observing the patterns shown in the principal components and cluster analysis, Manova and Monte Carlo tests were performed to test significant differences between the populations. In addition, multiple regressions were used to establish whether the environmental variables of the water bodies had any relationship with the shape and size of the wings. Very low interpopulation variation was found in the two species and little correlation between the shape of fore and hind wings with environmental variables, while size did show a strong correlation with altitude and temperature. It is proposed that the absence of interpopulation variability in the two species is due to the fact that the shape of the wings is a conservative trait in them and that there is genetic flow between the populations mediated by females that present some traits found in migratory species, which which enables them to travel great distances and allow genetic exchange." (Author/Google translate)] Address: <https://repositorio.unal.edu.co/bitstream/handle/unal/56544/leonardoracherodriguez.2015.pdf?sequence=1&isAllOwed=y>

22390. Rodríguez Martínez, D.; Conesa Garcia, M.A. (2015): Odonatos en los cursos fluviales de la fachada sur-oeste de Sierra Bermeja (Málaga, España): Resultados preliminares. Boletín de la Asociación Odonatológica de Andalucía 3: 28-38. (in Spanish, with English summary) ["Odonata in Rivers of the South-West Facade of Sierra Bermeja (Malaga, Spain): Preliminary Results: This document discloses the results until November 2014 of the sampling campaign that Asociación Odonatológica de Andalucía (AOA) has been developing in river basins of Sierra Bermeja, mainly in rivers Padrón, Castor, Guadalmanza, Guadalmina, Guadaiza and Verde. Among others, three new locations are disclosed for *Macromia splendens*, two for *Oxygastra curtisii*, two for *Gomphus graslinii* and one for *Orthetrum nitidinerve*. Significant progress has also been achieved in the general catalog of Odonata species present in the rivers of Sierra Bermeja, several of which had been poorly prospected to date. The results indicate that Sierra Bermeja is a wilderness area of the first order for the conservation of dragonflies in Andalusia: it has a very significant number of taxa - 42 species recorded so far- and several populations of dragonflies with a high degree of global threat or a very restricted distribution in the Iberian Peninsula and the European Union. Current distribution of some of these protected species, as *Macromia splendens* and *Gomphus graslinii*, could be significantly reduced short-term because the urban projects that develop and will be developed in Sierra Bermeja, incompatible with the conservation of the rivers and the surrounding forest habitats." (Authors)] Address: Conesa Garcia, M.A., AOA, Spain. Email: mconesa@libelulas.es

22391. Rodríguez Martínez, D.; Conesa Garcia, M.A. (2015): *Coenagrion lunulatum* (Charpentier, 1840) & *Sympetrum flavolum* (L., 1758) in Lake Tabatskuri, Georgia (Caucasus). Boletín de la Asociación Odonatológica de Andalucía 3: 18-24. (in Spanish, with English summary) [*C. lunulatum* and *S.*

flaveolum were recorded on July 6, 2014, along the northeastern shore of the lake. "In this area the lake overflows creating a marshy area of flooded grasslands and various arms of shallow water where reed beds thrive. The day started sunny and windless, with air temperature around 14°C at midday, and changed to very windy and finally stormy and rainy as the hours passed." (Authors)] Address: Conesa Garcia, M.A., AOA, Spain. Email: mconesa@libelulas.es

22392. Rodríguez Martínez, D.; Conesa Garcia, M.A. (2015): *Orthetrum nitidinerve* (Sélys, 1841) (Odonata: Libellulidae) en Sierra Bermeja (Málaga, España). *Boletín de la Asociación Odonatológica de Andalucía* 3: 25-27. (in Spanish, with English summary) ["In the course of a series of sampling carried out in Sierra Bermeja (Málaga), in the UTM UF15 grid we found an area of flooding, belonging to the sub-basin of the Daidín stream, a tributary course of the Guadaiza river, which originates in the ravine of the Cuerna and that leaves materials dragged as it passes through a system of terraces, formerly used for agriculture. Thanks to this contribution, several of these terraces are permanently flooded, forming large mudflats. This environment can be associated with index 3270: "River courses with contributions of muddy sediments on the banks, generally during floods, which are colonized by pioneer and nitrophilous species", in the catalog of Habitats of Community Interest, (Manuel, Robles & Tejero, 2009). In this area we found a female *Orthetrum nitidinerve*, on 13-IX-2014; Although the flight period recognized for the species ranges from April to October (Dijkstra & Lewington, 2006), we think that it was at the limit of its flight period, since its left hind wing was very deteriorated. In sampling after September no more individuals were observed. It is possible that the successive findings that have been found of this species in recent years are related to the impulse given by different naturalist associations (A.O.A. and the R.O.L.A.) in the study of dragonflies in Andalusia, considerably increasing the number of observers and the number of grids sampled." (Authors/Google translate)] Address: Conesa Garcia, M.A., AOA, Spain. Email: mconesa@libelulas.es

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22393. Bhati, D.; Srivastava, M. (2016): Entomo-fauna as documented employing cage net and light trap in some sewage irrigated agro-ecosystems in and around Bikaner, Rajasthan, India. *International Journal of Basic and Applied Sciences* 5(2): 23-36. (in English) ["During this century, the practice of irrigating agricultural crops with sewage waters in rural and peri-urban areas of our country is becoming a common practice as the soil is very good for cropping. Concern for human health and environment are the most important constraints in the use and before one can endorse this means, a thorough analysis seems to be a pre-requisite from social, economical and ecological standpoint. Looking into this, it was proposed to document information relating to insect status in such sewage irrigated farms and thus the present work was undertaken to study the insect scenario (diversity and density) in some sewage irrigated agro-ecosystems in and around Bikaner, Rajasthan. Indigenously designed cage and light trap were employed for insect collection. The cage net trap collection comprised of ... five odonates [*Lestes* sp., *Agriocnemis femina*, *Rhodischnura nursei*, *Bradinopyga geminata*, *Pantala flavescens*], ... while, in light trap collection order Lepidoptera was represented by thirteen species, order Coleoptera was represented by seventeen species, order Hemiptera was represented by seven species, order Hymenoptera, Orthoptera and Diptera by one species each respectively. Based on density (number), the cage net collection comprised of 6 dominant, 63 frequent and 28 rare species, while, in

light trap collection, based on density (number), 14 were dominant, 17 were frequent and 9 were rare." (Authors)] Address: Srivastava, Meera, Laboratory of Entomology, Post Graduate, Department of Zoology, Government Dungan College, Bikaner 334001, Rajasthan, India

22394. Calvao, L.B. (2016): Padrão de distribuição de Odonata (Insecta) em sistemas aquáticos com exploração de madeira na Amazônia Oriental: seleção de microhabitat e características morfológicas das libélulas. Tese (Doutorado) - Universidade Federal do Pará, Museu Paraense Emílio Goeldi, Belém, 2017. Programa de Pós-Graduação em Zoologia: 118 pp. (in Portuguese or English) ["Biological communities are distributed in a spatially structured way in aquatic systems, so that the loss of habitat integrity by anthropic actions and the restrictions imposed by the morphological characteristics of the species contribute to the existing pattern of the meta-community in the environment. The hydric systems constitute good models for identifying the processes that participate in the local distribution of organisms. The tributaries of these systems are arranged in a dendritic network under the restriction of multiple environmental conditions and are very sensitive to the modifications that occur in the drainage basin. These modifications are mainly those resulting from human activities, which generally culminate in the loss of resident biodiversity. In the Amazon region, wood exploitation has been considered one of the main activities that cause high rates of deforestation. To reduce the drastic effects on the environment, some forest management techniques, such as Reduced Impact Management (RIM), have been implemented in order to extract the raw material from the natural environment and promote the conservation of species and processes necessary for the functioning of the ecosystem. On the other hand, uncontrolled exploitation, known as conventional exploitation, alters the channel morphology of aquatic ecosystems, reduces vegetation cover and increases the input of fine sediment, generally altering acceptable physical-chemical-microbiological water parameters. Seeking to evaluate the effects of logging on aquatic biodiversity, we will use the order Odonata as a model organism, due to its sensitivity to modifications in the aquatic environment, high species diversity and being associated with diverse types of aquatic environments, as well as living at the interface with the terrestrial environment. The aim of the thesis is to evaluate the distribution pattern of Odonata species in water systems that are distributed in areas subjected to conventional or reduced impact logging in the Eastern Amazon region. To answer this objective the thesis was divided into three chapters, whose objectives are: (i) To evaluate if Odonata diversity decreases in areas with conventional logging, and, to identify which are the abiotic variables that structure Odonata composition. (ii) To evaluate the intensity of environmental and spatial factors on the distribution of Odonata species in the sampled streams and to verify if a taxonomic turnover of species occurs in natural areas (intact). (iii) To evaluate which are the morphological structures of the Odonata order associated with the environmental gradient in the three treatments (reference (REF), reduced impact management (MIR) and conventional logging (CC))." (Author) Translated with www.-DeepL.com/Translator (free version)] Address: <https://repositorio.ufpa.br/jspui/handle/2011/8748>

22395. Cho, R. (2016): Odonata in cranberry bogs successions in Manomet, Massachusetts. Senior Thesis, Boston College, Department of Earth and Environmental Sciences: 50 pp. (in English) ["Odonata are robust but due to their aquatic larval life cycle they are sensitive ecological markers. There is much literature on the organisms themselves, but no prior

documentation that they are found in the watery ditches of cranberry bogs. Cranberry bogs are an important part of Massachusetts' agricultural identity and some like Tidmarsh Farms, under conservation efforts, are being put into natural restoration. This study sets to explore Odonata specifically in cranberry systems by examining odonate adult and larval populations in and around the ditches of cranberry bogs followed for different lengths of time. Methods included taking pseudoreplicates of the three bog successions- 0, 5, and 15-year - by dipping for larvae and measuring ditch characteristics of width, depth, and vegetation cover, along with pollard walks to observe adults. I found that the dynamic nature of the bog by ditch characteristics and seasonal variation have an effect on odonate populations and may not adhere specifically to ecological succession theory. This data would hope to contribute to a more expansive longitudinal study of management practices and restoration on cranberry bogs and Odonata ecology as a whole." (Author)] Address: https://static1.squarespace.com/static/56abe18e859fd0cac926d37a7/573efe12555986cb895bb0a8/1463746076070/Cho_Rachel+Thesis.pdf

22396. Cifci, M.C. (2016): Odonata fauna of Ilısu dam water basin. The Abstract Book of Ecology 2016 Adnan Alde-mir Symposium, 16th -19th May 2016 The Kars Park Hotel Kars: 13-14. (in Bilingual in English and Turkish) [https://www.researchgate.net/publication/305209850_Odonata_-_Fauna_of_Ilisu_Dam_Water_Basin. Calopteryx splendens, Erythromma lindenii, Ischnura elegans, Epallage fatime, Platycnemis dealbata, P. kervillei, Gomphus schneiderii, Onychogomphus macrodon, Crocothemis erythraea, C. servilia, Orthetrum albistylum, O. brunneum, Sympetrum fonscolombii, Trithemis annulata] Address: Çiftçi, M.C., Siirt University, Agriculture Faculty, Department of Plant Protection, Siirt, Turkey. E-mail: empidae@gmail.com

22397. Dhandu, S.R. (2016): Lift & drag analysis of a 3D synthetic dragonfly wing. Master of Engineering thesis, The University of Canterbury: 119 pp. (in English) ["A 3D dragonfly wing is developed by using the Autodesk point cloud methodology, which takes several high definition (HD) pictures of the wing and uploads them into the software which computes all the spatial points and to give a rough matrix of the external structure. The structure is further modified by using Mesh mixer and printed in 3D of Acrylonitrile butadiene styrene (ABS) material. Initially a bending and torsion stiffness test is carried out by cantilevering the wing onto a U shaped frame, where the increasing weights are suspended on the wing tip end to calculate the deflection upon loading at different room temperatures. Keeping the Reynolds and Strouhal numbers constant, a flapping mechanism is de-signed consisting of two smart servo motors connected to the wing root with a fixtures designed to give the wing four axis degrees of freedom (DOF) maintaining the centre line axis. The servos are programmed by using Arduino Nano board and the whole mechanism is fixed onto two load cells on an apparatus which is connected to a LabView® programme for collecting the data. The data from the load cells is taken and investigated in MatLab® by using Fourier analysis. The maximum deflection of the wing tip as per the literature review is in the range of 3-12 mm depending on the loads acting on the wing during flight. For this thesis the average deflection of the wing tip during the experiment upon applied loading is to be about 3-10 mm. It varies with the forces acting on it and also expected to change for another sample of the model wing which can be produced using flexible PVC which has different properties. These deflection values are used to determine the amount of force acting on the wing tip during

the bottom end of the flap cycle. The torsional deflection of the wing during flight was assumed to be 20 degrees. Where as in the torsional stiffness experiment it is more than 10 degrees for the ABS structure. The values obtained during the experiment is lower compared to the value from the previous literature due to the rigidity of the material. It varies with the forces acting on it and also expected to change for another sample of the model wing which can be produced using flexible PVC which has different properties. The flapping experiment is carried out for various flapping and torsional angles using a flapping test rig. The data is studied for the extraction of the forces acting on the wing and it is assumed to give more information on the stable and unstable aerodynamics of the dragonfly wing. It is observed that when the phase difference is changed from 0° to 270° the lift generated value is raised from 0.4N to 0.6N. CL-max is determined as 0.55 and is maximum when the phase difference between the flapping angle, torsion angle is maintained as 270°. It is reducing for lower phase differences of 90° and 0°. For two consecutive experiments with a 180° phase difference CL-max is remaining constant at flapping angle of 60°, 90° while frequency and torsion angle are maintained constant. The CD is observed to be consistently low and reaching maximum of 0.125 within the experiments. This research values can be used as a source for developing a flapping unmanned aerial vehicle (UAV)." (Author)] Address: <https://ir.canterbury.ac.nz/server/api/core/bitstreams/b2377737-fd23-44-11-a820-714ec0c66f66/content>

22398. Dolný, A.; Harabis, F.; Bárta, D. (2016): Vážky (Insecta: Odonata) České Republiky. Academia, Praha: 342 pp. ["Dragonflies, which appeared on Earth almost 300 million years ago, stand out with a number of unique features. Due to the relatively low number of species, they belong to the best-studied groups of insects, with regard to their taxonomy, ecology and distribution. In addition, they are enjoying increasing popularity, so besides butterflies and beetles, there are probably not many other groups of insects that have the same positive reception from both the professional and the lay public. Also for these reasons, a new practical picture publication was created, which differs from previous works in many respects. Above all, this atlas can be used very well as a field guide, and at the same time, it also contains general information about the life of dragonflies, their biology and ecology." (Publisher/Google translate)] Address: Dolný, A., Dept of Biology and Ecology, Faculty of Science, University of Ostrava, Chittussiho 10, CZ-710 00 Slezská Ostrava, Czech Republic. Email: ales.dolny@osu.cz

22399. Ellis, L.E.; Jones, N.E. (2016): A test of the serial discontinuity concept: longitudinal trends of benthic invertebrates in regulated and natural rivers of northern Canada. River Research and Applications 32(3): 462-472. (in English) ["Abiotic and biotic impacts below impoundments within the context of the River Continuum (RCC) and the Serial Discontinuity Concepts (SDC) have been the focus of many lotic studies. Recovery gradients, however, are rarely examined in sufficient detail below dams. Further refinement and understanding are needed to inform science and river managers about regulated river ecology. In this study, we examine longitudinal patterns in abiotic and biotic characteristics in two regulated rivers in Northern Canada. We also examine spatial patterns on two natural rivers: a lake outlet river and a river with no lakes. Direct gradient analysis revealed that increases in periphyton, planktonic drift, primary production, substrate size, and changes in thermal regime at sites closest to the dam drive benthic invertebrate community characteristics. We test the Serial Discontinuity Concept by

comparing predicted functional forms of each environmental variable with the empirically derived forms. Substrate size, periphyton biomass, and drift density increased below dams and recovered quickly within 5 km downstream, following closely with SDC predictions. The response of organic matter and water quality was variable, and benthic invertebrate richness recovered relatively quickly, contrary to SDC predictions. Thermal regime and flow took much longer to recover than most variables and represent a second longer gradient type below dams. Plecoptera, Gomphidae, and Simuliidae were strongly influenced by altered resource and habitat and may be good candidates for indicators and predictive modelling. Our results generally support predictions from the Serial Discontinuity Concept and highlight the need for the further testing and refinement of this concept. ... The recovery of these variables and specific taxa (e.g. Plecoptera and Odonata) can provide river managers a focussed target on assessing the impacts of hydroelectric impoundments on rivers. Future studies could focus on specific environmental requirements of Plecoptera and Odonata to determine indicator capability. In particular, further study on Gomphidae would be especially useful as their presence is linked to riparian vegetation, incorporating lateral floodplain connectivity into river management." (Authors)] Address: Ellis, Lucie, Environmental and Life Sciences Graduate Program, Trent University, 2140 East Bank Drive, Peterborough, ON, Canada, K9J 7B8. E-mail: lucylee2@trentu.ca

22400. Erbida, N. (2016): Pisani akrobati. Zelene prestolnice 2016 [Colourful acrobats. Green Capitals 2016]. Trdoiv: Bilten slovenskih terenskih biologov in ljubiteljev narave 5(2): 49-50. (in Slovenian) [Verbatim/DeepL: Adult dragonflies are agile insects in a rainbow of colours that can be admired especially in the warmer part of the year. When we watch their antics by a marsh, lake or river, we are tempted to take a photo to capture the beautiful colours and their gracefulness. In order to draw the attention of the general public to the photogenic but unfortunately endangered dragonflies, the Slovenian Odonatological Society has launched its second photography competition. The first one was successfully held in 2013 under the name of the Photo Contest "Colourful Acrobats". Between May and September 2016, we collected 136 photographs from 55 authors in three sections, namely A (primary and secondary), B (students) and C (adults). In October, the jury consisted of: Dr Tomi Trilar, an employee of the Natural History Museum of Slovenia, where he works mainly on insects, but also on bioacoustics and photography; Dr Ali Šalamun, an employee of the Centre for Cartography of Fauna and Flora, where he works mainly on dragonflies and on Geographic Information Systems; and Mr Janez Tarman, a professional natural history photographer. The jury selected three winning photographs in each category, which are published in this issue, and the official announcement of the winners took place on 24 November 2016 at the Dept of Biology, Faculty of Biotechnology, University of Ljubljana. Here, the participants were introduced to dragonflies and the reasons why they are endangered, and were presented with symbolic prizes and awards. After the announcement, we opened an exhibition of the selected photographs, followed by a feast of local delicacies. During the project, we also organised photography field workshops in the Ljubljana area, where we showed the participants some techniques for photographing dragonflies. Creative workshops were held at the Ljubljana Zoo, where we worked with visitors to make dragonfly-shaped products, and two workshops were also held at the City Square, where the Green Capital of Europe 2016 Point For You was operating. The Green Capital's Colourful Acrobats photo competition was made possible by the Ljubljana

Municipality's Department of Environmental Protection, the STIKS Association, the Ljubljana School of Art, the Student Organisation of the Faculty of Biotechnology, the Department of Biology at the Faculty of Biology of the University of Ljubljana and the Ljubljana Zoo. The winning photographs are published, with one exception, as part of the article on the next page. The photo by Roko Štirn is featured in this month's Photo Life.] Address: <https://www.dlib.si/details/URN:NBN:SI:DOC4HUNW72O/?=&query=%27rele%253dTrdo%25c5%25beiv%27&pageSize=25>

22401. Erbida, N. (2016): Košèieni škratec na Ljubljanskem barju [Coenagrion ornatum on the Ljubljana Marshes]. Trdoiv: Bilten slovenskih terenskih biologov in ljubiteljev narave 5(2): 9. (in Slovenian) [Verbatim/DeepL: C. ornatum... is a habitat specialist, occupying only slow-moving, sunny waters with abundant riparian and aquatic vegetation. In Europe, it occurs in the east and south of the continent. The species is relatively poorly known, while its closest relative, C. mercuriale, is one of the best-studied European dragonfly species. This is mainly due to its distribution in western and central Europe, where dragonfly research is much more active than in the rest of the continent. Although the two species occupy similar habitats, both are threatened and protected in Europe and Slovenia. C. mercuriale does not occur in Slovenia. C. ornatum is found in a good part of Slovenia, but is rare wherever it occurs. Today, the species' habitats are mostly anthropogenic, such as drainage canals. Therefore, based on some previous surveys, we conclude that the largest populations in Slovenia are found in the Ljubljana Marshes and the Vipava Valley, where the canal networks are most extensive. However, we do not know how numerous these populations are, nor is it known how large populations occur elsewhere in Europe. Only a few waters in Slovenia have so far recorded a few tens of individuals, and most have only found a few individuals. Only a few waters in Slovenia have so far recorded a few dozen specimens, but mostly only a few specimens have been found. My Master's thesis Population dynamics of the C. ornatum at a selected location in the Ljubljana Marshes was aimed at determining the population size C. ornatum in the Ljubljana Marshes using the mark-release-recapture (MRR) method. Initially, we wanted to carry out the study over the whole of the Ljubljana Marshes, but it became apparent in the first fieldwork that a single individual could not capture and mark specimens over such a large area. The Ljubljana Marshes is a culturally and nature conservation important area and as such is protected as a landscape park and Natura 2000 site, for which C. ornatum is a qualifying species. We chose a 470 m long canal south-west of Kozlarjeva gošta and north of Matena. In the selected area, all specimens of the Box Turtle Dace were caught on each field day from the beginning of May until mid-July 2013. They were marked on the skirt with an alcohol marker with a permanent and unique mark. Despite the fact that the canal population is not isolated, we expected a higher recapture rate in this study, as the Bone Grebes are relatively poor fliers. The low recapture rate results in a rather imprecise estimate of the population size, but we still obtained a more accurate estimate than has been given in previous field surveys. The estimated population size of the Bactrian Lark for Slovenia as a whole has so far ranged from a few tens to a few hundreds of thousands of individuals. A total of 2,168 individuals were caught in the survey, of which 1,690 were males and 478 were females, with an overall recapture rate of 14%. As expected, more males were caught than females, and the recapture rate of males was also higher. This is because females spend most of their time away from the water, where they feed and produce eggs, and they are more cryptic in colour, making them

harder to spot. Therefore, fewer females than males were captured in the study, which was conducted only near the water. Males, on the other hand, spend most of their time by the water, waiting for females to mate with them just before they lay their eggs in the water. The total estimated population size in the selected canal is 12,617 or between 5,326 and 19,906 individuals. We also found that 79% of the specimens moved less than 100 m from their original capture site. No population study has been carried out in Slovenia on the Bone Bream, so a comparison of population abundance is not possible. However, based on the results and reports of other records of the species in Slovenia, the population in the Ljubljana Marshes is one of the largest in Slovenia. We believe that the planned maintenance of the canals is very important for the conservation of the Bone-nosed Damselfly, as well as for the conservation of other endangered dragonfly species present in this habitat. Further research is needed in the whole area, but we recommend that a larger number of people be mobilised to survey a larger area.] Address: <https://www.dlib.si/details/URN:NBN:SI:DOC-4HUNW72O/?=&query=%27rele%253dTrdo%25c5%25beiv%27&p ageSize=25>

22402. Frank, M. (2016): Eiablage von *Anax imperator* auf einer nassen Holzterrasse (Odonata: Aeshnidae). *Libellen in Hessen* 9: 45-50. (in German) ["A female *A. imperator* was observed laying her eggs on a wet wooden terrace in the middle of a residential area and at least two kilometers from the nearest reproductive water. The terrace had previously been cleaned with water and therefore had a surface that was still wet and reflected light. The most likely cause of this egg laying in unsuitable artificial substrate is thought to be a polarotactic response - a known, general ability of dragonflies to detect water surfaces based on reflected horizontally polarized light." (Author/Google translate)] Address: Frank, M., 55268 Nieder-Olm, Germany. E-mail: mikel.frank@gmx.de

22403. Joest, R.; Beckers, B. (2016): Libellenfauna des Feuchtwiesenschutzgebietes Ahsewiesen. *Natur in NRW* 1/16: 43-47. (in German) [Nordrhein-Westfalen, Germany "In the Ahsewiesen nature reserve, small bodies of water and lakes were created from 1988 onwards, ditches were dammed and waterlogging measures were carried out in order to improve living conditions, especially for meadow bird species. As part of the success monitoring, the dragonfly fauna was mapped from 1988 to 2003, which was repeated in 2015. The species identified in 2015 were predominantly widespread habitat generalists in still waters. What is remarkable is the relatively high number of individuals in the endangered pioneer species *Ischnura pumilio*. The total number of species has increased from four in 1988 to 27 in 2015. This is due to the creation of numerous small bodies of water and lakes as part of renaturation measures. In addition, supra-regional climatic changes have also enabled the establishment of heat-loving species. The development in the Ahsewiesen shows that the measures implemented to improve the habitat for meadow birds were also beneficial for other groups of species such as the dragonflies examined here. The living conditions for these species can be permanently improved through further measures aimed at increasing and maintaining the water level in the area. In order to maintain the quality of the habitat for specialized species, targeted optimization and maintenance to control the succession of water bodies is also necessary." (Authors/Google translate)] Address: Joest, R., Biologische Station Soest, Teichstr. 19, 59505 Bad Sassendorf-Lohne, Germany. E-mail: rjoest@abu-naturschutz.de

22404. Mancu, C.-O. (2016): Dragonflies (Insecta, Odonata)

in Timis county (Banat, Romania), a general view of distribution. *Acta Oecologica Carpatica* 9: 85-120. (in English, with French and Romanian summaries) ["This paper is a synthesis of more than 10 years of research in Timis County. Research started in 1999 and continued with some periods of interruption until 2015. The research was comprised of more than 1000 entries in a database of more than 100 toponyms and resulted in the knowledge that the area hosted 45 species of dragonflies. From these 45 species, nine are of more interest, being species of conservation interest (Natura 2000 species) (*Coenagrion ornatum*, *Gomphus flavipes* and *Ophiogomphus cecilia*) or rarer species in Romanian fauna (*Lestes parvidens*, *Coenagrion scitulum*, *Anax parthenope*, *Somatochlora meridionalis*, *Sympetrum depressiusculum* and *S. pedemontanum*)." (Author)] Address: Mancu, C.O., Acad. Remus Radulet 13, bl. 119, ap. 7, Timisoara 300281, Timis County, Romania. E-mail: cosminovidiu@yahoo.com

22405. Nair, A.; Agashe, D. (2016): Host-specific spatial and temporal variation in culturable gut bacterial communities of dragonflies. *Current Science* 110(8): 1513-1523. (in English) ["Many microbial communities are associated with specific animal hosts, with major impacts on the ecological and evolutionary dynamics of both partners. We analysed gut microbial communities of eight dragonfly species in southern India. Adult dragonflies are generalist opportunistic predators; thus, we expected to find relatively high individual variation but low host-specific variation in their gut community composition. However, we find that each host species has a distinct gut bacterial community, with sampling location and month playing a small but significant role in shaping community structure. These patterns suggest that dragonflies either specialize on subsets of available prey, or their guts impose differential selective pressures resulting in distinct communities." (Authors) *Pantala flavescens*, *Orthetrum sabina*, *O. pruinatum*, *Potamarcha congener*, *Rhodothemis rufa*, *Trithemis pallidinervis*, *Urothemis signata*] Address: Agashe, Deepa, National Centre for Biological Sciences, Tata Institute of Fundamental Research, GKVK, Bellary Road, Bengaluru 560 065, India. E-mail: dagashe@ncbs.res.in

22406. Opaev, A.S.; Panov, E.N. (2016): Space use in territorial and non-territorial male *Calopteryx splendens* (Odonata: Calopterygidae). *Odonatologica* 45(1/2): 57-76. (in English) ["In *Calopteryx damselflies* male territorial and non-territorial alternative mating tactics are identified. Territorial males are believed to secure more copulation. With increasing age, males starve and become non-territorial that only occasionally manage to copulate. However, space use of territorial and non-territorial males is not known in detail. We present the data on space use of individually marked male *C. splendens* ... obtained during two field seasons in Vladimir Oblast, Russia. Each damselfly was captured, marked and the wing length was measured. During observation sessions of 2-4 hours per day, each male was characterised as either territorial or non-territorial and encounter locations were mapped. The probability of being territorial declines with the male's age. Territorial vs non-territorial tactic in a given day strongly influences tactic retention on the next day. We identified the territorial and non-territorial phases in the life of a male, which occur consequently and have roughly similar duration. We define the territorial phase as all days until the last record of a male as a territorial individual. The subsequent days were defined as the non-territorial phase. During the territorial stage, males may (1) occupy a single territory; (2) be non-territorial in some of the days and then return to his previous territory or (3) after staying within a certain territory for several days change it and occupy another territory

on the next day or several days later. The transition from the territorial to the nonterritorial phase is gradual. It may suggest this transition caused by exhaustion. Thus, space use changes predictably during the life of a male. Characteristics of individual lifetime trajectory - number of days when the male was recorded as territorial, - number of territories occupied, etc. - did not depend on wing length." (Authors)] Address: Opaev, A.S., A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences, Moscow 119071, Russia. E-mail: aleksei.opaev@gmail.com

22407. Outomuro, D.; Angel-Giraldo, P.; Corral-Lopez, A.; Realpe, E. (2016): Multitrait aposematic signal in Batesian mimicry. *Evolution* 70(7): 1596-1608. ["Batesian mimics can parasitize Müllerian mimicry rings mimicking the warning color signal. The evolutionary success of Batesian mimics can increase adding complexity to the signal by behavioral and locomotor mimicry. We investigated three fundamental morphological and locomotor traits in a Neotropical mimicry ring based on Ithomiini butterflies and parasitized by Polythoridae damselflies: wing color, wing shape, and flight style. The study species have wings with a subapical white patch, considered the aposematic signal, and a more apical black patch. The main predators are VS-birds, visually more sensitive to violet than to ultraviolet wavelengths (UVS-birds). The white patches, compared to the black patches, were closer in the bird color space, with higher overlap for VS-birds than for UVS-birds. Using a discriminability index for bird vision, the white patches were more similar between the mimics and the model than the black patches. The wing shape of the mimics was closer to the model in the morphospace, compared to other outgroup damselflies. The wing-beat frequency was similar among mimics and the model, and different from another outgroup damselfly. Multitrait aposematic signals involving morphology and locomotion may favor the evolution of mimicry rings and the success of Batesian mimics by improving signal effectiveness toward predators." (Authors) Polythore procera, Euthore fasciata] Address: Outomuro, D., Section for Animal Ecology, Dept of Ecology & Genetics, Evolutionary Biology Centre, Uppsala University, Norbyvägen 18D 75236, Uppsala, Sweden. Email: outomuro.david@gmail.com

22408. Pitts, M. (2016): Damsels in distress: A study of the effect of temperature on damselfly competitive interactions. *Biological Sciences Undergraduate Honors Theses*. Paper 21: 16 pp. (in English) ["Temperature has a fundamental role in shaping numerous physiological aspects of organisms, such as growth rate, that determine an organism's performance. Due to global climate change, temperature is projected to keep increasing. As temperature increases, so does an organism's growth rate. Also, as competition increases organisms' growth rate decreases. While studies have examined these factors individually, no experiments have assessed the combined impact of temperature and competition on organism's growth rates. The experiment we conducted manipulated temperature and density in order to project what will happen as a result of rising temperatures." (Author) *Enallagma divagans*] Address: <https://scholarworks.uark.edu/cgi/viewcontent.cgi?article=1010&context=biscuit>

22409. Serrano Leon, J.P.; Gomez Blazquez, A.I. (2016): Notas sobre la presencia de *Paragomphus genei* (Sélys, 1841) (Odonata: Gomphidae), en la cabecera del río Guadamar, (Sevilla, España). *Boletín Asociación Odonatológica de Andalucía* 4: 15-19. (in Spanish) [Verbatim: *P. genei* is a small gomphid with a yellowish-olive color. It has light blue-gray eyes with greenish upper facets. Its thorax is yellowish-green with thick blurred stripes of brown tones on the sutures;

some specimens have a very greenish hue. On the abdomen you can see brown-mahogany and black spots. Males have lateral leaf expansions in the S8 and S9 segments and very characteristic long, yellowish hook-shaped cercoids (Fig. 1, A). The pterostigmata are yellowish in the center, surrounded by very thickened black veins (Dijkstra & Lewington, 2014). The species, the subject of the note, has been cited in all Andalusian provinces with the exception of Almería and Granada. Specifically in Seville there is a single record of a *P. genei* larva at the head of the Guadamar River near the Castillo de las Guardas (29SQB37), (Ferrerás & Gallardo, 1985). After a chance encounter of a female *Paragomphus genei* on a wild olive tree and an exuvia in the vicinity of the Guadamar River, near Gerena, a selection of different potential points was made (FIG.3) where more specimens could be located, to confirm the current status of the species. Much of the route at the head of the river is located within cattle farms that make sampling difficult. This prevented finding any point that confirms the presence on the UTM 10x10 km 29SQB46 grid. This circumstance is repeated when passing through Las Cortecillas (29SQB38). Sampling at each of the points was carried out between 12 and 5 p.m., since these are the main hours of activity for adults, between 30 or 60 minutes depending on the location. Transects were carried out on both banks, in search of the presence of both adults in flight and exuviae (Table 1) that ensured the presence and/or reproduction of the species at said points. These transects were extended to at least 50 meters from the water points so as not to underestimate the population. The adult specimens were photographed and all the exuviae found during sampling were cataloged and preserved for later confirmation. The species associated with each of the observation points were also noted. Point 1: 29SQB3777, Río Guadamar – Hacienda El Castillo. Sandy bed with a maximum channel width of 4 or 5 meters. Temporary course that is dry most of the year. On the second visit there was no longer any water flowing, leaving only isolated shallow pools. Abundant shrub and tree plant presence on the banks Point 2: 29SQB3775, Río Guadamar – El Castillo de las Guardas. (Fig. 4) Bed made up of a mixture of coarse sand, gravel and large rocks. Temporary course with bed width between 5 and 8 meters. Pools that are maintained throughout the year. Very abundant riparian vegetation on the banks with a large presence of *Nerium oleander*, *Typha* sp. and trees with roots submerged in water. Point 3: 29SQB4471, Guadamar River – El Alisar. Bed composed of gravel, rocks and coarse sand banks. Temporary course with an approximate width of 8 meters with a nearby irrigation dam. Shrub river-side vegetation composed mainly of *Typha* sp. and *Nerium oleander*. Point 4: 29SQB4857, Río Guadamar- Gerena. Bed 10 to 15 meters wide composed of coarse and fine sand. Water all year round with large water ponds. Shrub vegetation dominated by *Nerium oleander* with the presence of *Arundo donax* and *Typha* sp. Point 5: 29SQB4540, Río Guadamar-Sanlúcar la Mayor. Bed composed of silt, clay and sand. It has water and current throughout the year, although during the summer it is usually minimal. Tree and shrub vegetation in sections dominated by *Phragmites* sp., *Arundo donax*, *Scirpus* sp. and *Juncus* sp. Exuviae of *Paragomphus genei* were found in three of the five points sampled and adult specimens in two of them. *Paragomphus genei* was cited for the first time by Ferreras & Gallardo (1985), for the province of Seville, and was not cited again in subsequent sampling after the Aznalcóllar mine spill (Ferrerás, Cano & Salamanca, 2004). With the specimens and exuviae found in this work, the presence and reproduction of *Paragomphus genei* is reaffirmed in the headwaters of the Guadamar River in the province of Seville. Other species of odonates present in the studied area were the following: *Chalcolestes viridis*, *Ischnura*

graellsii, Platycnemis latipes, Anax imperator, A. parthenope, Onychogomphus forcipatus, Crocothemis erythraea, Orthetrum chrysostigma, O. cancellatum, O. trinacria, Symptetrum fonscolombii, Brachythemis impartita, T. annulata, T. kirbyi] Address: Email: yompisl@hotmail.com

22410. Siepielski, A.M.; Nemirov, A.; Cattivera, M.; Nickerson, A. (2016): Experimental evidence for an eco-evolutionary coupling between local adaptation and intraspecific competition. *The American Naturalist* 187(4): 447-456. (in English) ["Determining how adaptive evolution can be coupled to ecological processes is key for developing a more integrative understanding of the demographic factors that regulate populations. Intraspecific competition is an especially important ecological process because it generates negative density dependence in demographic rates. Although ecological factors are most often investigated to determine the strength of density dependence, evolutionary processes such as local adaptation could also feed back to shape variation in the strength of density dependence among populations. Using an experimental approach with damselflies, a predaceous aquatic insect, we find evidence that both density-dependent intraspecific competition and local adaptation can reduce per capita growth rates. In some cases, the effects of local adaptation on reducing per capita growth rates exceeded the ecological competitive effects of a doubling of density. However, we also found that these ecological and evolutionary properties of populations are coupled, and we offer two interpretations of the causes underlying this pattern: (1) the strength of density-dependent competition depends on the extent of local adaptation, or (2) the extent of local adaptation is shaped by the strength of density-dependent competition. Regardless of the underlying causal pathway, these results show how eco-evolutionary dynamics can affect a key demographic process regulating populations." (Authors)] Address: Siepielski, A.M., Program in Ecology & Evolutionary Biology, Dept of Biological Sciences, Univ. of Arkansas, Fayetteville, Arkansas 72701; e-mail: amsiepie@uark.edu

22411. Slugaski, C. (2016): Structure and function of dragonfly looming-sensitive neurons. *The FASEB Journal* 30(1, Supplement) [Federation of American Societies for Experimental Biology]. *Experimental Biology 2016 Meeting Abstracts*, April 2016: 760.3 - (in English) [Verbatim: "In this project, I aim to identify specific neurons in the dragonfly brain that respond selectively to looming stimuli. In the dragonfly nerve cord, there are large visual neurons, called Target Selective Descending Neurons (TSDNs). These neurons respond selectively to small moving stimuli, which mimic the movements of dragonfly prey. The response of these neurons is the steering movement of the dragonfly's wings, allowing them to predict the location of their prey for accurate interception. A subset of the TSDNs show large and precisely timed responses to the expanding image of an approaching object. I will be studying these "looming-sensitive" neurons, researching what visual information they are sending to the flight system. This material will allow for the analysis of the anatomical structure in the dragonfly brain. The visual responses of these dragonflies suggests that the looming-sensitive neurons are the specific TSDNs called MDT3 and DIT3, but in order to confirm this prediction, we must visualize the anatomy of the brain. With the use of a dye called Lucifer yellow, we can trace the response of the looming stimuli to a specific area of the brain. By injecting the dye with a recording microelectrode, we can positively identify these specific neurons." (Author)] Address: Slugaski, Clara, Biology, Union College, Schenectady, NY, USA

22412. Johnson, J. (2017): The spread of *Libellula saturata* (Flame Skimmer) through Oregon and its appearance in Washington. *Argia* 29(2): 6-7. (in English) ["In 2015, *L. saturata* was observed at wetlands in the middle of Portland such as Tanner Springs Park (OC 434573) and Westmoreland Park (OC 435648). By 2016, the species was conspicuous at Salish Ponds (report by Bonnie Comegys on the Western Odonata Facebook group) — within a dragonfly's easy flight of the Columbia River. On 10 September 2016, I observed a male and photographed an ovipositing female at Soapstone Lake, Clatsop Co. (OC 455310). This became the northernmost record in Oregon, and, because of the meandering route of the lower Columbia River, this was further north than most of Clark County, Washington. This really seemed like the year to finally find the species at my local ponds in the Vancouver area. I've been checking Kline Pond just north of Vancouver, Clark Co., Washington, on a somewhat regular basis throughout the odonate season — always thinking about the probability of eventually finding *L. saturata*. That finally happened on 14-IX- 2016. I found a lone male alternately flying back and forth as it chased other odonates and perching in the sun along the pond's northern shore. I obtained several photos during a few brief moments that it perched (OC 455577). I returned on 16 and 21 September, and on each of those days I found a lone male *L. saturata* appearing intermittently along the same stretch of shoreline on the north side of the pond. More photos were obtained both days (OC 455705, 456155, 456159)." (Author)] Address: Johnson, J.T., 3003 Unander Avenue, Vancouver, WA 98660, USA. E-mail: gomphusjim@gmail.com

22413. Kolar, V.; Hadacova, V (2017): Dragonflies and water beetles of selected peat bogs in the Bohemian Forest. *Silva Gabreta* 23: 19-32. (in Czech, with English summary) ["This paper presents the results of an inventarisation survey of dragonflies and water beetles in 14 selected peat bogs in the Bohemian Forest (Šumava in Czech, south-west Bohemia) in spring and summer in 2015. We found altogether 31 species from 9 families of dragonflies and 54 species from 8 families of diving beetles. During the survey, we found 11 dragonflies (e.g., *Aeshna subarctica*, *A. juncea*) species and 5 water beetles (e.g., *Laccobius gracilis*, *Ilybius crassus*) from the red list." (Authors) *Aeshna* cf. *caerulea* (CR), *A. cyanea*, *A. grandis*, *A. juncea* (VU), *A. mixta*, *A. subarctica* (CR), *Anax imperator*, *Calopteryx splendens*, *C. virgo*, *Coenagrion hastulatum* (NT), *C. puella*, *Enallagma cyathigerum*, *Erythromma najas*, *Pyrrosoma nymphula*, *Cordulegaster boltonii* (VU), *Cordulia aenea*, *Somatochlora alpestris* (EN), *S. arctica* (EN), *S. metallica*, *Ophiogomphus cecilia*, *Leucorrhinia rubicunda*, *L. dubia*] Address: Kolar, V., Entomologický ústav, Biologické centrum AV ČR, Branišovská 31, 37005 České Budějovice, Czech Republic. Email: kolarvojta@seznam.cz

22414. Tamm, J. (2017): Beobachtungen an der Sibirischen Mosaikjungfer (*Aeshna crenata*) in Südfinnland (Odonata: Aeshnidae). *Libellen in Hessen* 10: 87-95. (in German) ["*A. crenata* was observed at four forest ponds in southern Finland in August 2016. Some aspects of their biology and behavior are shared. G1: forest lake Pikku Sorlampi; 60°15'37,32" N, 24°36'48,59" E, G2: forest lake Vähä Haukkalampi, Nationalpark Nuuksio; 60°18'51,66" N, 24°30'01,58" E, G3: forest lake Ahvenisto, Nationalpark Nuuksio; 60°18'36,74" N, 24°29'43,48" E, G4: forest lake Niemelänlampi, Nationalpark Nuuksio; 60°18'29,06" N, 24°29'22,17" E.] Address: Email: jochen.tamm@t-online.de

22415. Tamm, J. (2017): Zum Vorkommen der Gestreiften Quelljungfer (*Cordulegaster bidentata*) im östlichen Taunus (Odonata: Cordulegasteridae). *Libellen in Hessen* 10: 57-67. (in German) ["*C. bidentata* was found in nine locations in the eastern Taunus, Gessen, Germany. Eight of these locations were identified as part of a species-focused imaginal mapping exercise in this region in 2016, which covered 109 head-water streams. The populated streams were mainly in the Hochtaunus and Vordertaunus, while only two occurrences were found in the Hintertaunus. These were also in the Pferdeskopf area, which is immediately north of the Hochtaunus and, as a high mountain range, is more similar to it than the rest of the Hintertaunus. *C. bidentata* was not found in the hilly region of the Hintertaunus proper. In the Hochtaunus and Vordertaunus, the colonization frequency of *C. bidentata* was 20% and reached a maximum of 36% in the deciduous forests of the Vordertaunus south of Eppstein. This is comparable to the peak values for the species in other parts of Hesse and Germany. The very different settlement densities seem to be based primarily on structural differences in the streams in the sub-regions. The populated streams were characterized by a clear gradient and a diggable loose sediment, at least in places. These circumstances are rare in the Hintertaunus. In the study area, *C. bidentata* is primarily affected by the large-scale cultivation of spruce in the Hochtaunus, especially where the most favorable stream structures for the species are otherwise present. The conservation of the dragonfly in the eastern Taunus is likely to depend above all on solving this problem." (Author/Google translate)] Address: Email: jochen.tamm@t-online.de

22416. Verhaagh, M. (2017): Dr. Ulrich Franke. *12. Januar 1943 – † 23. März 2017. *Carolinea* 75: 185-189. (in German) [Obituary. We owe one of the first identification keys for dragonfly larvae to Ulrich Franke, a dragonfly scientist active regionally in Baden-Württemberg (Germany). In contrast to Ris (1909), this one was readily available as it was printed in large quantities and was distributed free of charge to (young) aspiring dragonfly scientists. Ris, F. (1909): Odonata. In: Brauer, A. (Hrsg.): *Die Süßwasserfauna Deutschlands* Heft 9. Fischer, Jena. IV + 67 pp] Address: Verhaagh, M., Leiter Entomologie und Bibliothek, Staatliches Museum für Naturkunde Karlsruhe, Erbprinzenstraße 13, D-76133 Karlsruhe, Germany. Email: manfred.verhaagh@smnk.de

2018

22417. Bedjanic, M. (2018): Določevalni ključ: Spreletavci Slovenije [Determining key: Leucorrhinia Slovenian species]. *Trdoziv* 7(1): 32-40. (in Slovenian) [*Leucorrhinia caudalis*, *L. dubia* and *L. pectoralis* are represented in Slovenia. The paper deals with the five *Leucorrhinias* (in addition: *L. albifrons* and *L. rubicunda*) occurring in Western and Central Europe, and provides detailed keys, illustrations, distribution maps and information on habitats of them.] Address: Bedjanic, M., M., National Institute of Biology, Vecna pot 111, 1000 Ljubljana, Slovenia. Email: matjaz.bedjanic@nib.si

22418. Eda, S. (2018): An unusual oviposition site for *Epiophlebia superstes*. *Tombo* 60: 108-109. (in Japanese, with English summary) ["Oviposition scars of *Epiophlebia superstes* were found at a high position (about 10 cm) above the water in Ina city, Nagano prefecture on May 27, 2014. There is a small cliff between the site of the scars and the water. Normally this insect lays its eggs into plants some 10 ~ 40 cm above the water." (Author)] Address: Eda, S., 3-4-25 Sawamura, Matsumoto, Nagano 390-0877, Japan. E-mail: SND 02767@nifty.com

22419. Ehira, K. (2018): Interspecific copulation between male *Calopteryx japonica* and female *Mnais pruinosa*. *Tombo* 60: 104-105. (in Japanese, with English summary) ["A case of interspecific copulation between male *Calopteryx japonica* and a female *Mnais pruinosa* was observed at Kurino, Yusui town, Aira district, Kagoshima prefecture. Following action by the connected male just like intramale sperm translocation, the copula position was smoothly attained. During copulation, however, no rhythmical movement of the few basal segments of the male abdomen was observed. Subsequently, the male ceased copulation and tandem position and flew away. It took about three minutes from detection of the couple to the end of copulation." (Author)] Address: Email: menpo@hotmail.com

22420. French, S.K.; McCauley, S.J. (2018): Canopy cover affects habitat selection by adult dragonflies. *Hydrobiologia* 818(1): 129-143. (in English) ["The mechanisms structuring aquatic communities across environmental gradients are often difficult to distinguish from one another and can produce similar patterns of species distributions. In freshwater systems, the amount of canopy cover from surrounding trees is often associated with transitions in local community structure. These community changes could be driven by habitat selection prior to colonization of the aquatic habitat and/or species-sorting post-colonization. To assess the contributions of pre- versus post-colonization processes in structuring larval dragonfly assemblages, we tested the impact of artificial and natural canopy cover on the selection of experimental aquatic mesocosms by adult dragonflies, and monitored the performance (i.e. growth and survival) of larval dragonflies that were placed in mesocosms under a gradient of natural canopy cover. We found that greater levels of canopy cover resulted in fewer adult visits to mesocosms, and more natural canopy cover decreased the species richness of visitors. There were no effects of canopy cover on the growth and survival of larvae added to the mesocosms. Our results suggest that adult habitat selection plays a dominant role in structuring larval dragonfly assemblages across a canopy cover gradient, and that canopy cover can be an important environmental filter on species distributions." (Authors)] Address: French, Sarah, Dept Biol., Univ. Toronto Mississauga, Mississauga, Canada

22421. Futahashi, R.; Miyahata, T.; Yokoi, N. (2018): Distribution of species of the genus *Mnais* (Zygoptera: Calopterygidae) in northern Kanto district, C. Honshu, Japan. *Tombo* 60: 116-120. (in Japanese, with English summary) ["We surveyed the distribution of the genus *Mnais* in northern Kanto district, C. Honshu, based on nuclear ITS sequences. The distribution of the genus was found to be complex in Gunma Prefecture, whereas only *M. costalis* was recorded from Fukushima and Ibaraki Prefectures. Two larvae of interspecific hybrid were also recorded from Gunma Prefecture." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22422. Futahashi, R.; Okude, G.; Sugimura, M.; Ugai, S. (2018): Interspecific hybrids in Japanese Odonata. *Tombo* 60: 1-49. (in Japanese, with English summary) ["After Asanina's 1974 paper, more than 150 papers have reported on interspecific hybrid of Japanese Odonata. Combination of interspecific hybrids can be directly confirmed by analyzing biparentally inherited nuclear DNA and maternally inherited mitochondrial DNA. Based on nuclear and mitochondrial DNA analyses, we identified the following 21 combinations of interspecific hybrids in Japanese Odonata: (1) *Mnais costalis*

x *Mnais pruinosa*, (2) *Paracercion sieboldii* x *Paracercion melanotum*, (3) *Ischnura senegalensis* x *Ischnura elegans*, (4) *Anax parthenope* x *Anax nigrofasciatus*, (5) *Anax parthenope* x *Anax guttatus*, (6) *Anax parthenope* x *Anax panbeus*, (7) *Somatochlora uchidai* x *Somatochlora graeseri*, (8) *Sympetrum darwinianum* x *Sympetrum maculatum*, (9) *Sympetrum frequens* x *Sympetrum depressiusculum*, (10) *Sympetrum eroticum* x *Sympetrum baccha*, (11) *Sympetrum eroticum* x *Sympetrum parvulum*, (12) *Sympetrum eroticum* x *Sympetrum kunckeli*, (13) *Sympetrum eroticum* x *Sympetrum pedemontanum*, (14) *Sympetrum croceolum* x *Sympetrum speciosum*, (15) *Sympetrum croceolum* x *Sympetrum uniforme*, (16) *Tramea virginia* x *Tramea basilaris*, (17) *Tramea virginia* x *Tramea transmarina*, (18) *Zygomma obtusum* x *Zygomma petiolatum*, (19) *Orthetrum albistylum* x *Orthetrum japonicum*, (20) *Orthetrum melania* x *Orthetrum pruinatum*, (21) *Libellula quadrimaculata* x *Libellula angelina*. Among them, more than 50 individuals have been recorded in the following 3 combinations: *Anax parthenope* x *Anax nigrofasciatus*, *Sympetrum frequens* x *Sympetrum depressiusculum*, and *Sympetrum eroticum* x *Sympetrum baccha*, and among the former two combinations, F2 hybrids have been also obtained by breeding eggs derived from hybrid females. *Sympetrum eroticum* was involved in the 4 different hybrid combinations as paternal species in all examined individuals. Among 203 Japanese Odonata species, the following 2 combinations cannot be distinguished by nuclear ribosomal DNA including internal transcribed spacer (ITS) region: *Pseudocoptera annulata* vs *Pseudocoptera tokyoensis* and *Rhyothemis variegata* vs *Rhyothemis phyllis*. Additionally, the following 7 combinations cannot be distinguished by mitochondrial DNA probably due to mitochondrial introgression through hybridization: (1) *Mnais costalis* vs *Mnais pruinosa*, (2) *Paracercion hieroglyphicum* vs *Paracercion melanotum*, (3) *Anax parthenope* vs *Anax nigrofasciatus*, (4) *Trigomphus melampus* vs *Trigomphus ogumai* vs *Trigomphus interruptus*, (5) *Sympetrum frequens* vs *Sympetrum depressiusculum*, (6) *Sympetrum croceolum* vs *Sympetrum uniforme*, and (7) *Tramea virginia* vs *Tramea transmarina* vs *Tramea loewii*. In this review paper, we describe the morphological characteristics of above 21 combinations or interspecific hybrids in Japanese Odonata and list the records comprehensively." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science and Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22423. Itoh, S. (2018): New record of *Sympetrum speciosum* Oguma from Iwate Prefecture, North eastern Honshu, Japan. Tombo 60: 113-114. (in Japanese, with English summary) ["Two males of *S. speciosum speciosum* Oguma, 1915 were captured and another 11 males were observed in the south coastal area of Iwate Prefecture. It is a new record for Iwate and is the northern limit of the range of this species. This species could possibly expand its range northward rapidly." (Author)] Address: Itoh, S., Kinoshita 4-9-7-102, Wakabayashi-ku, Sendai-shi, Miyagi, 984-0047 Japan

22424. Itsuro, K.; Sasamoto, A.; Kagimoto, B. (2018): The supposed homeosis of the structure like secondary male genitalia appearing from anterior part of the 4th abdominal sternite in *Melligomphus viridicostus* (Oguma, 1926). Tombo 60: 96-97. (in Japanese, with English summary) ["An abnormal male *M. viridicostus* is reported. This specimen has a malformation resembling deformed secondary genitalia, visible from anterior part of the 4th sternite, in spite of it having the normal secondary genitalia from the 3rd segment. This malformation structure is presumed homeosis of normal secondary

genitalia on former segment is that the stem is short, the median segment is rudimentary or absent, and the distal segment is atrophic and asymmetrical, partly membranous, with much rudimental cornua." (Authors)] Address: Sasamoto, A., 190-4 Yakuoji Tawaramoto, Shiki-gun, Nara Prefecture, 636-0341, Japan. E-mail: akssmt@sea.plala.or.jp

22425. Karube, H.; Muramatsu, M. (2018): First record of *Orthetrum pruinatum neglectum* (Rambur, 1842) from Yonaguni-jima, Okinawa Pref. Tombo 60: 127-128. (in Japanese, with English summary) ["*O. pruinatum neglectum* is widely distributed in SE Asia but in Japan it is only known from the Yaeyama group of Ryukyu Islands. In 2017, we found this species on Yonaguni-jima island for the first time." (Authors)] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp

22426. Kawase, N.; Habano, Y. (2018): A first record of *Ceragrion auranticum* Fraser, 1922 from Shiga Prefecture, central Honshu. Tombo 60: 122-123. (in Japanese, with English summary) ["A male of *C. auranticum* was newly collected in Shiga Prefecture, central Honshu, Japan. This is the first record of this invasive species from the Kinki district, central Honshu. The natural distribution of this species is Kyushu, Ryukyu Islands, Korea, Taiwan, China and South East Asia. Recently, the invasion of this species to Kanto and Shikoku district was reported (Karube, 2007; Nakanishi, 2011; Kosuge, 2012; Sugimura, 2013). Those records were regarded as artificial by bringing tropical water plants with this damselfly's eggs to gardens or parks from where adults dispersed to surrounding areas (Karube et al., 2014)." (Authors)] Address: Email: kawasen@nifty.ne.jp

22427. Kobayashi, J. (2018): An *Orthetrum melania* (Selys, 1883) (Anisoptera, Libellulidae) with a deformed left hindwing. Tombo 60: 102-103. (in Japanese, with English summary) ["An *O. melania* with a deformed left hindwing was captured in Akita Prefecture. The left hindwing is clearly shorter and a little wider than the normal right hindwing. Part of wing veins (ex. A, and Cu) are absent or fused with other veins in the left hindwing." (Author)] Address: Email: Calopteryx73@hotmail.com

22428. Kobayashi, J. (2018): Records of five species of Odonata (Zygoptera and Anisoptera) from Akita Prefecture, northern Honshu. Tombo 60: 110-112. (in Japanese, with English summary) ["*Sympecma paedisca*, *Lestes japonicus*, *Polycanthagnyna melanictera*, *Asiagomphus melaenops* and *Nannophya pygmaea*, were collected from Akita Prefecture, northern Honshu, Japan. These species are rare, or declining in this area." (Authors)] Address: Kobayashi, J., Dept of Entomology, Faculty of Agriculture, Tokyo Univ. of Agriculture, 1737 Funako, Atsugi City, Kanagawa Prefecture 243-0034, Japan

22429. Kozen, M. (2018): The first record of *Brachythemis contaminata* (Fabricius, 1793) from Okinawa Island, Okinawa, Japan. Tombo 60: 129- (in Japanese, with English summary) ["Four males and four females of *B. contaminata* were collected on Okinawa island for the first time. The author visited Ihara, Itoman city, Okinawa Island in the late afternoon of October 14th, 2017 and found them. Territorial patrol flight of several males and oviposition behavior of several females were also observed at the water reservoir pond." (Author)] Address: Email: stigmd@gmail.com

22430. Kuroda, T.; Futahashi, R. (2018): A record of a unique wing marking pattern for *Tramea transmarina* Brauer,

1867 in Japan. Tombo 60: 99-101. (in Japanese, with English summary) ["A female of *T. transmarina* with a unique wing marking pattern was collected at Fukaji island, Kerama isls., Okinawa, Japan. The wing pattern of this specimen is similar to that of the subspecies *intersecta* known from Vanuatu and New Caledonia. Both nuclear and mitochondrial DNA analyses indicated that this specimen is *T. transmarina*, although we could not distinguish between subspecies by genetic analyses." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22431. Liu, Y.; Luo, X.-J.; Huang, L.-Q.; Yu, L.-H.; Mai, B.-X. (2018): Bioaccumulation of persistent halogenated organic pollutants in Insects: Common alterations to the pollutant pattern for different insects during metamorphosis. *Environ. Sci. Technol.* 52(9): 5145-5153. (in English) ["Few studies have examined the accumulation and fate of persistent halogenated organic pollutants (HOPs) in insects. We measured HOPs, including dichlorodiphenyltrichloroethanes (DDTs), polychlorinated biphenyls, and halogenated flame retardants, in insects from four taxonomic groups collected from an e-waste site. Dragonfly larvae collected from a pond contained the highest concentrations of all chemicals except DDTs, while the litchi stinkbugs contained the lowest. Different insect taxa exhibited different contaminant patterns which could be attributed to their habitats and feeding strategies. Bioaccumulation factors for dragonfly larvae and biomagnification factors for moth and grasshopper larvae were significantly positively correlated with the octanol-water partition coefficient of the chemicals ($\log KOW < 8$). Common nonlinear correlations between the ratio of larval to adult concentrations and $\log KOW$ were observed for all taxa studied. The ratio of concentrations decreased with increasing values of $\log KOW$ ($\log KOW < 6-6.5$), then increased ($6 < \log KOW < 8$) and decreased again ($\log KOW > 8$). This result implies that the mechanism that regulates organic pollutants in insects during metamorphosis is common to all the taxa studied." (Authors)] Address: Luo, X.-J., State Key Lab. Organic Geochemistry & Guangdong Key Lab. of Environmental Resources Utilization & Protection, Guangzhou Inst. of Geochemistry, Chinese Acad. Sciences, Guangzhou 510640, PR China. E-mail: luoxiaoj@gig.ac.cn

22432. Miyashita, T.; Futahashi, R. (2018): A record of *Neurothemis ramburii* (Anisoptera: Libellulidae) from Fuchu-shi, Tokyo. Tombo 60: 114-115. (in Japanese, with English summary) ["*N. ramburii* was photographed at Sengencho, Fuchu, Tokyo, Honshu, Japan. Due to the great distance from its known distribution, it is plausible that eggs or larvae of this species were introduced to Tokyo with aquatic plants." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science and Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22433. Ogino, S.; Ozono, A.; Futahashi, R. (2018): A record of *Sympetrum flaveolum* from Ishikawa Prefecture. Tombo 60: 121. (in Japanese, with English summary) ["A male of *S. flaveolum* was photographed at Fukami, Monzenmachi, Wajima city, Ishikawa Prefecture, central Honshu, Japan. This male was thought to have migrated from the continent. This is the first record of this species from central Honshu." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22434. Okude, G.; Futahashi, R.; Udono, K. (2018): DNA analysis of a hybrid between *Sympetrum eroticum* and

Sympetrum pedemontanum collected in 1962. Tombo 60: 50-52. (in Japanese, with English summary) ["We report the results of DNA analyses of a female interspecific hybrid between *S. eroticum* and *S. pedemontanum* collected in 1962. We succeeded in DNA amplification for relatively small regions (60-105 bp without primer regions) using specific primers. The results of nuclear and mitochondrial DNA analyses suggest that this individual was derived from interspecific mating between a male *S. eroticum* and a female *S. pedemontanum*." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science and Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22435. Okuyama, H., M. Kawanaka, A. Hara, A. Takeuchi, R. Suzuki, S. Sasaki, K. Watanabe, K. Osaki, K. Hirano, T. Kiyoshi, J. Takahashi (2018): The genetic diversity of a threatened skimmer species, *Nannophya pygmaea* (Odonata: Libellulidae): a report on the population in Kanagicho, Hamada City, Shimane Prefecture, Japan). Tombo 60: 90-95. (in Japanese, with English summary) ["A decline in the genetic diversity of *N. pygmaea* is likely to occur as a result of habitat destruction. *N. pygmaea* is considered vulnerable (VU) in Shimane Prefecture, Japan. In this study, we analyzed the genetic diversity of a *N. pygmaea* population in Kanagicho, a town in Hamada City located in Shimane Prefecture, was found in 2010, using the mitochondrial DNA 16S rDNA (503 bp) and nuclear DNA ITS 1(234 ~ 248 bp) and ITS2 (307 bp) partial regions. For 16S rDNA, ITS1 and ITS2 regions, two, ten and two haplotypes were identified, respectively. The nucleotide diversities were 0.00103, 0.00550 and 0.00013 and the haplotype diversities were 0.517, 0.676 and 0.038, respectively. As a result of phylogenetic analysis, this population belonged to the same clade as other Japanese, Chinese, Taiwanese and Malaysian populations. In this population, 90 % haplotypes for ITS1 region and 50% haplotypes for 16S rDNA and ITS2 regions were endemic. Thus, the present study suggests that *N. pygmaea* Shimane Prefecture population is important as a conservation population because this population maintains the genetic diversity and characteristic.] Address: Okuyama, H., Faculty of Life Sciences, Kyoto Sangyo University, Kamigamo, Motoyama, Kita-ku, Kyoto, Japan. E-mail: k5533@cc.kyoto-su.ac.jp

22436. Prescott, V.A.; Eason, P.K. (2018): Lentic and lotic odonate communities and the factors that influence them in urban versus rural landscapes. *Urban Ecosystems* 21(4): 737-750. (in English) ["Habitat alteration via urbanization has very different effects on even closely related taxa. Most research investigating the ecological effects of urbanization has focused on birds or mammals, resulting in a relatively poor understanding of how the species richness and community composition of invertebrates may change. We quantified differences in species richness of adult odonates at lentic and lotic sites in urban and rural landscapes, and we examined environmental factors that might drive the differences in community composition that we observed. For lotic sites, species richness did not differ between urban versus rural sites for either dragonflies or damselflies. For lentic sites, urban and rural sites contained similar dragonfly species richness, but damselfly species richness was significantly lower at urban sites than at rural sites. Differences in lentic odonate community composition were associated with the amount of urban development within 150 m of each site, mean algal coverage, and distance to the urban center. At lotic sites, water temperature and distance to the urban center were correlated with differences in odonate community composition. The differing responses to urbanization observed in this study were probably

a consequence of differences between lentic versus lotic ecosystems and between dragonflies versus damselflies in dispersal capability and habitat specificity. Given that different environmental factors affected these taxa differently in lentic and lotic sites, maintaining the highest level of odonate diversity possible across a landscape will require the use of different management practices for each ecosystem type." (Authors)] Address: Eason, Perri, University of Louisville, 2301 S 3rd St, Louisville, KY, 40292, USA

22437. Sakai, S.; Eda, S. (2018): Observation of an awkward behaviour-like oviposition by an interspecific tandem between a male *Sympetrum frequens* and a female *Pantala flavescens*. Tombo 60: 107-108. (in Japanese, with English summary) ["An interspecific tandem between a male *S. frequens* and a female *P. flavescens* flying awkwardly and trying to lay eggs was observed and successfully taken at Nyukasa in Ina city, Nagano prefecture, on 14-IX-2017." (Authors)] Address: Eda, S., 3-4-25 Sawamura, Matsumoto, Nagano 390-0877, Japan. E-mail: SND 02767@nifty.com

22438. Shimizu, N.; Futahashi, R. (2018): A record of a supposed hybrid between *Sympetrum darwinianum* and *Sympetrum maculatum* from Aichi Prefecture. Tombo 60: 52- (in Japanese, with English summary) ["A male of a supposed hybrid between *S. darwinianum* and *S. maculatum* was photographed at Tamano-cho, Kasugai city, Aichi Prefecture, central Honshu, Japan." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science and Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22439. Suda, S.; Futahashi, R. (2018): A record of the homeosis in *Anax parthenope*. Tombo 60: 98-99. (in Japanese, with English summary) ["We report an example of homeosis in a male of *A. parthenope*. Ectopic light blue markings are found in the left side of abdominal segments 3 and 4 and the ventral part of the corresponding region are slightly expanded like abdominal segments 2 and 3, suggesting that a part of abdominal segments 3 and 4 are transformed into abdominal segments 2 and 3 in this individual." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science and Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22440. Sugimura, M.; Okude, G.; Futahashi, R. (2018): DNA analyses of three dragonfly hybrids previously suspected by external morphology. Tombo 60: 53-56. (in Japanese, with English summary) ["We report the results of DNA analyses of three dragonfly hybrids belonging to the genera *Anax*, *Sympetrum*, and *Orthetrum*. The results of nuclear and mitochondrial DNA analyses suggest that these individuals were derived from interspecific mating between a male *Anax guttatus* and a female *A. parthenope*, a male *Sympetrum eroticum* and a female *S. parvulum*, and a male *Orthetrum japonicum* and a female *O. albistylum*, respectively. These hybrids have been recorded previously only once in Japan." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22441. Takechi, L.; Hisamatsu, S. (2018): Records of *Sympetrum fonscolombii* (Selys, 1840) from Ehime Prefecture, Japan. Tombo 60: 126-127. (in Japanese, with English summary) ["We summarize records of *S. fonscolombii* from Ehime Prefecture. In 2017, a large number of this species were observed in Ehime Prefecture and other regions in Japan." (Authors)] Address: Email: 1982takechi@gmail.com

22442. Takeda, H.; Sasamoto, A. (2018): The first record of *Sympetrum fonscolombii* from Nara prefecture, together with records of *S. uniforme* and *S. striolatum imitoides*. Tombo 60: 124-125. (in Japanese, with English summary) ["For the first time we record *S. fonscolombii* from Nara prefecture (1-X-2017, Mitsuyoshi, Koryo-cho, Kitakatsuragi-gun). In addition, *S. uniforme* and *S. striolatum imitoides* were observed at the same time, both of which were recently rare in Nara prefecture." (Authors)] Address: Sasamoto, A., 190-4 Yakuoji Tawaramoto, Shiki-gun, Nara prefecture, 636-0341, Japan. E-mail: akssmt@sea.plala.or.jp

22443. Tsuji, I.; Kawashima, I. (2018): Additional information on the intergeneric tandem formation observed between a male of *Orthetrum albistylum speciosum* (Uhler) and a female *Sympetrum frequens* (Selys). Tombo 60: 105-106. (in Japanese, with English summary) ["Abnormal intergeneric connection between a male of *O. albistylum speciosum* and a female *S. frequens* was observed in Yokosuka-shi, Kanagawa Prefecture (Miura Peninsula), C. honshu, Japan. The female denied copulation by the male, and behaved as if she were ovipositing. We briefly consider such behaviour, comparing with the previous records of the same combination.] Address: Email: itsurok29@jcom.home.ne.jp

22444. Ugai, S.; Futahashi, R. (2018): DNA analysis of the two hybrid specimens belonging to the genera *Anax* and *Tramea*. Tombo 60: 57-60. (in Japanese, with English summary) ["We report the results of DNA analyses of two cases of interspecific hybrids; a female between *A. panybeus* and *A. parthenope julius*, and a male between *T. virginia* and *T. basilaris burmeisteri*. These two individuals show intermediate external characteristics between the parent species. The results of nuclear and mitochondrial DNA analyses suggest that these individuals were derived from interspecific mating between a male *A. panybeus* and a female *A. parthenope julius*, and a male *T. virginia* and a female *T. basilaris burmeisteri*, respectively." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science and Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

2019

22445. Alemneh, T.; Ambelu, A.; Zaitchik, B.F.; Bahrdorff, S.; Mereta, S.T.; Pertoldi, C. (2019): A macroinvertebrate multimetric index for Ethiopian highland streams. *Hydrobiologia* 843: 125-141. (in English) ["Headwater streams in the highland regions of Ethiopia are exposed to severe human disturbances because of rapid population growth. Protection and management of headwater streams require the development of informative indices that can capture disturbance and assess streams water quality in highland regions. Therefore, we developed a multimetric index based on macroinvertebrate communities, to assess the ecological condition of the headwater streams in the Ethiopian highlands. We reviewed 38 potential metrics, representing various aspects of the macroinvertebrate assemblages, and selected four of them [total family richness, Simpson index, percentage of shredder, and family richness of EOT (Ephemeroptera, Odonata, and Trichoptera)] as final core metrics. A trisection inter-quartile range system was applied to derive scores for each core metric at impaired and reference sites. The macroinvertebrate multi-metric index (MMI) distinguished well between impaired and reference stream sites and was negatively correlated with the degree of disturbance. The results suggest that the MMI is robust measure of disturbance and can be used as a sensitive tool for evaluating the ecological condition of headwater streams in Ethiopian

highlands." (Authors)] Address: Alemneh, Temesgen, Dept of Earth & Planetary Sciences, Johns Hopkins Univ., Baltimore, MD 21210, USA. Email: tyimani1@jhu.edu

22446. Arbeitskreis Libellen in Hessen (2019): Libellenkartierung in Hessen. Libellen in Hessen Suppl. 2: 28 pp. (in German) [https://cloud.multibasecs.de/images/cloud/126/documents/LiH%20Supplement2_final.pdf] Address: AK Libellen in Hessen - HGON e. V., Lindenstraße 5, 61209 Echzell, Germany

22447. Guillermo-Ferreira, R.; Bispo, P.C.; Appel, E.; Kovalev, A.; Gorb, S.N. (2019): Structural coloration predicts the outcome of male contests in the Amazonian damselfly *Chalcopteryx scintillans* (Odonata: Polythoridae). *Arthropod Structure & Development* 53, November 2019, 100884: 10 pp. (in English) ["Highlights: • Structural coloration in an Amazonian damselfly is a result of a multilayered structure. • Male damselflies use the dorsal wing coloration during territorial contests. • Color hue seems to be the wing trait that predicts contest outcome. • Angle dependent structural coloration may be an adaptation to Rainforest light environment. Abstract: Iridescence is an optical effect that produces angle dependent coloration in animals. Recently, studies have attempted to unveil structures behind such elaborated visual signals and associated behaviors in Odonata. Here, we studied males of *C. scintillans*, which have hindwings that exhibit pronounced iridescence. This optical feature is used by the damselflies for intra-specific communication during territorial fights and courtship. The main question we addressed was whether male wing structural coloration may predict the outcome of male-male contests. We also studied the wing ultrastructure, in order to reveal the mechanisms that are responsible for wing coloration. Using various microscopical and spectroscopical techniques, we demonstrate that hindwing coloration is derived from two main effects: (1) light interference in the cuticle multilayer and (2) a specific angle dependent light scattering and antireflective properties of the epicuticular wax coverage. The results of our field experiment show that wing pigmentation and the hue of the dorsal surface of the hindwings is correlated with the outcome of territorial contests. This is one of the first studies showing that structural coloration derived from multilayer interference may influence the outcome of intrasexual agonistic interactions. This indicates that multicomponent structural coloration in visually guided insects may be under selective forces of male-male competition for resources and females." (Authors)] Address: Guillermo-Ferreira, R., Dept of Hydrobiology, Federal University of São Carlos – UFSCar, São Carlos, São Paulo, Brazil. Email: rhainerguilermo@gmail.com

22448. Karube, H.; Hayashi, M.; Kitano, T. (2019): The first record of *Zyxomma obtusum* Albarda, 1881 from Yonagum-jima Isiana, Okinawa Prefecture. *Tombo* 61: 55-56. (in Japanese, with English summary) ["*Z. obtusum* is widely distributed in SE Asia. It is recorded from the Daito islands and Yaeyama Islands of the Ryukyu Islands in Japan. In 2018, we newly found this species on Yonagum-jima Island": 25~26-V-2018, 23-VII-2018, 24-XI-2018] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp

22449. Kemabonta, K.A.; Essien, R.; Adu, B.W.; Ogbogu, S.U.; Iyasa, A.; Uche-Dike, R. (2019): Abundance and distribution of odonates (dragonflies and damselflies) in Akwa Ibom State, Nigeria. *Pan African Journal of Life Sciences* 1: 33-38. (in English) ["Introduction: Odonates are used as bio-

indicators for monitoring habitat degradation both on terrestrial and aquatic ecosystem because of their sensitivity to anthropogenic activities. They serve an important role in the ecological food chain by consuming aquatic larvae and being in turn consumed by birds and various amphibians. This study is part of the ongoing research on the diversity of Odonate species of Nigeria. The objective is to determine the abundance and distribution of odonates in Akwa Ibom State and to compare the species diversity across the various sites in Akwa Ibom State. Methodology: Akwa Ibom state was divided into six areas namely Ikot Akpaden, Obio Akpa, Ikot Okoro, Ikot Udofia, Urua Udofia and Obio Ndot using biotypes and a study site was randomly selected in each area. Adult members were captured using a sweep net and were preserved for identification using morphological features. Results: A total of 767 odonates were collected at the six study sites representing 24 species, 16 genera and four families namely Libellulidae (77%), Coenagrionidae (21%), Calopterygidae (>1%) and Chlorocyphidae (>1%). Most of the species collected were members of family Libellulidae (77%) with *Palpopleura lucia* having the highest occurrence (41%) and found in all the sites. Family Calopterygidae and Chlorocyphidae had less than 1% population of the total individuals collected. Ikot Okoro had the highest number of individuals (238) and the least evenness ($e^H/S=0.3292$) while Ikot Akpaden, which had the least effect of anthropogenic intrusion had the largest diversity of Odonata species ($H'=2.387$). Obio Ndot had the most evenly distributed Odonata species ($e^H/S=0.8028$). There was no statistical difference in the occurrence of dragonflies across all study sites ($p=0.238$). Conclusion: The high occurrence of family Libellulidae which are anthropogenic tolerant, and the absence of more highly localized species indicate that most of the study sites have been degraded and may not be fit for species with narrow niches. It is therefore vital to conserve the Odonata community by implementing proper forest management techniques." (Authors)] Address: Kehinde A., Dept of Zoology, Univ. of Lagos, Akoka Lagos State, Nigeria. E-mail: kkemabonta@unilag.edu.ng

22450. Ousterhout, B.H.; Serrano, M.; Bried, J.T.; Siepielski, A.M. (2019): A framework for linking competitor ecological differences to coexistence. *Journal of Animal Ecology* 88(10): 1534-1548. (in English) ["1. Not all ecological differences among competing species affect their ability to locally coexist. Rather, the differences that promote stable coexistence can be those which cause each species to experience stronger intraspecific than interspecific competition. Recent approaches have established how to detect the demographic signature of these competitive effects, but alone they cannot elucidate the ecological differences among species that yield these patterns. 2. Here, we present a unifying experimental and observational framework that identifies potential ecological differences among species shaping their responses to intra- and interspecific competition. We first describe a conceptual model establishing why the strength of intra- and interspecific competitive interactions should vary along environmental gradients related to species ecological differences. We then show how to apply the framework using *Enallagma* damselflies [*E. exsulans*, *E. traviatum*, *E. vesperum*], a diverse group of predatory aquatic insects. 3. To determine how species responded to intra- and interspecific competition along environmental gradients, we experimentally manipulated the relative abundances of three species and replicated this across five lakes which varied in environmental conditions affecting larval damselfly per capita growth and mortality rates – key vital rates regulating their populations. 4. Results suggest *Enallagma* are ecologically differentiated in ways that in some communities can result in intraspecific

competition exceeding interspecific competition. However, in many cases the opposite was true, or the effects of intra- and interspecific competition were equivalent via growth and mortality responses. Moreover, these effects tended to be weak and asymmetrical among competitors, which suggests that differential responses of larval growth and mortality to intra- and interspecific competition may not contribute strongly to the maintenance of *Enallagma* diversity. Different environmental factors appear to shape these demographic responses to competition, providing insight into the ecological mechanisms regulating damselfly assemblages. 5. This framework can be broadly applied to identify the ecological differences among species that may promote coexistence, advancing knowledge of the mechanisms underlying coexistence, and overcoming some limitations of purely phenomenological approaches." (Authors)] Address: Siepielski, A.M., Dept of Biological Sciences, Univ. of Arkansas, Fayetteville, Arkansas, USA. Email: amsiepie@uark.edu

22451. Rivas-Torres, A.; Lorenzo-Caballa, M.O.; Sánchez-Guillén, R.A.; Cordero-Rivera, A. (2019): Variation in intraspecific sperm translocation behaviour in a damselfly and its consequences for sperm viability. *Animal Behaviour* 156: 51-55. (in English) ["Highlights: • Males reused vesicle sperm when copulating 15 min after sperm translocation (ST). • The proportion of males that repeated ST increased over time. • Female fertility decreased with increasing time between ST and copulation. • Males seem to be able to detect whether their sperm vesicle is full or not. Sperm quality and viability affect both male and female fitness. Most dragonfly and damselfly males translocate sperm from the testis to the seminal vesicle before each copulation, a behaviour known as intramale sperm translocation (ST). However, some published observations indicate that odonate males can occasionally skip ST prior to copulation. Our aim was to determine the circumstances under which males skip ST and how this might affect sperm viability. We allowed males of *Ischnura graellsii* to perform ST (interrupting the copulation at this stage) and we studied ST behaviour during subsequent copulation. Males were randomly assigned to four treatments, which consisted of allowing the experimental male to copulate again 15 min or 1–3 days after his last ST. Fertility of females mated with the experimental males was analysed as a proxy for sperm viability. All males used the sperm that they translocated previously when the second mating took place 15 min after the manipulation, while the proportion of males that repeated ST increased steadily over time. Both treatment (time elapsed since last ST) and the interaction between treatment and ST (yes/no) had a significant effect on fertility, which decreased only in males that did not perform ST immediately before copulation. Additional experiments with damselflies of the genus *Calopteryx* showed also that males did not repeat ST when the time to the next copulation was less than a day. Our results suggest that sperm quality decays over time in odonates, and that males can choose whether to keep and reuse the sperm in the seminal vesicle or to discard it. We conclude that the special anatomical disposition of odonate males might increase selective pressures to maximize sperm viability and/or repeated intramale ST behaviour." (Authors)] Address: Rivas-Torres, A., ECOEVO Lab Universidade de Vigo, Escola de Enxeñaría Forestal Pontevedra Spain

22452. Vinko, D. (2019): Identity card: Temni slanišear (Selysiothemis nigra). *Trdozy. Bilten slovenskih terenskih biologov in ljubiteljev narave* 8(2): 41, 52- (in Slovenian) ["*S. nigra* is a dragonfly from the family Libellulidae. It is easily distinguished from the rest of the species; the base of the wings is without a spot, the pterostigma and the thinner veins of the

wings are pale gray. The posterior and anterior veins of the pterostigma are thicker and black, reminiscent of the "=" equation. His wings resemble the fluttering of a flag even in a slight flutter. Males (fig. 1) are dark, almost black (fig. 2), often with a slightly bluish tinge. Females (Fig. 3) and young males (Fig. 4) are mostly sandy-colored, with dark brown programs on the breast and a dark pattern on the back. Most of the time, it rests on solitary twigs or plants near the water habitat, often with its rear slightly raised (Fig. 5). Larvae (Fig. 6), which grow up relatively quickly, live on aquatic vegetation and can tolerate high salt concentrations. It is a migratory and nomadic species. It is found near shallow ponds and lakes and reservoirs, also near brackish waters and in karst fields. *S. nigra* can be recognized by their characteristic well-developed dorsal and lateral spines (Fig. 7). We have recorded this small winged dragonfly, measuring only about 3 cm, only three times. It was observed twice in 2012 in the Škocjan Bay, and in 2019 adults and egg-laying were observed near Sermin (Fig. 8). It has recently been "naturalized" in the Gulf of Trieste and is apparently expanding its range, which is linked to climate change. It is scattered throughout the Mediterranean, in North Africa and in the east as far as the Arabian Peninsula and South-West Asia." (Verbatim-/Google translate)] Address: Vinko, D., Slovensko odonološko društvo, Verovškova 56, Si-1000 Ljubljana, Slovenia. E-mail: damjan.vinko@gmail.com

22453. Voronin, M. Yu. (2019): Long-term monitoring of macrozoobenthos in the reservoir-cooler of Balakovo NPP. *Izv. Saratov Univ. (N. S.), Ser. Chemistry. Biology. Ecology* 19(4): 461-472. (in Russian, with English summary) ["For 8 years (2011–2018) macrozoobenthos samples were taken at the permanent stations in the reservoir-cooler of Balakovo NPP. Sampling stations were located in a highly heated part of the reservoir-cooler of the Balakovo NPP, and poorly heated part, in the adjacent water area of the Saratov reservoir. Differences were revealed: species richness and diversity; numbers and biomass; saprobity indices of the areas of these reservoirs; a positive or negative trend of long-term dynamics of the studied indicators macrozoobenthos. Over the study period the composition of benthic invertebrates of the reservoir-cooler of Balakovo NPP showed 42 species of aquatic organisms: ... Odonata [*Ischnura elegans*, *Orthetrum cancellatum*, *Platycnemis pennipes*] ... The species richness, abundance and biomass of macrozoobenthos of the highly heated thermal water part of the cooling reservoir of the Balakovo NPP is significantly lower compared to the cold-water one. The water reservoir-cooler of Balakovo NPP can be described as α -mesosaprobic (moderately polluted, the 3rd quality class). Adjacent to the reservoir-cooler an area of the Saratov reservoir can be described as α -mesosaprobic (contaminated, 4th class of quality). There was no statistically significant increase or decrease (from 2011 to 2018) in the number, or biomass of macrozoobenthos and saprobity of the studied reservoirs. A statistically significant increase in the number of macrozoobenthic species in the cooling reservoir of the Balakovo NPP was found. Due to the fact that by 2018, some restoration of submerged vegetation (previously depleted *Ctenopharyngodon idella*) and, accordingly, the phytophilic group of benthos began to be observed." (AuthorAddress: Voronin, M.Yu., Saratov State Univ., 83 Astrakhanskaya St., Saratov 410012, Russia. E-mail: voroninmj@yandex.ru

22454. Waller, J.T.; Willink, B.; Tschol, M.; Svensson, E.I. (2019): The odonate phenotypic database, a new open data resource for comparative studies of an old insect order. *Scientific Data* | (2019) 6:316 | <https://doi.org/10.1038/s41597-019-0318-9>: 6 pp. (in English) ["We present The Odonate

Phenotypic Database (OPD): an online data resource of dragonfly and damselfly phenotypes (Insecta: Odonata). Odonata is a relatively small insect order that currently consists of about 6400 species belonging to 32 families. The database consists of multiple morphological, life-history and behavioural traits, and biogeographical information collected from literature sources. We see taxon-specific phenotypic databases from Odonata and other organismal groups as becoming an increasing valuable resource in comparative studies. Our database has phenotypic records for 1011 of all 6400 known odonate species. The database is accessible at <http://www.odonatephenotypicdatabase.org/>, and a static version with an information file about the variables in the database is archived at Dryad." (Authors)] Address: Willink, Beatriz, Dept of Biology, Evolutionary Ecology Unit, Ecology Building, Lund University, Lund 223-62, Sweden. E-mail: beatriz.willink@ucr.ac.cr

22455. Zurek, R.; Bas, G.; Dumnicka, E.; Gloab, M.; Profus, P.; Szarek-Gwiazda, E.; Walusiak, E.; Cieczac, K. (2019): Plaszów pond in Kraków - biocenoses. *Chronmy Przyr. Ojcz.* 75(5): 345-362. (in Polish, with English summary) ["In 2017, a wildlife inventory was carried out for selected elements of the Plaszow Pond (Staw Plaszowski) biocoenosis and its surroundings. The species richness is relatively high, despite the fact that the fauna and flora of this water body are strongly affected by human activity in the highly urbanised environment, while the land development and busy streets significantly reduce the possibility of migration for many animal species. Aquatic and wetland plants were represented by 17 species, mainly common ones; the great horsetail *Equisetum telmateia* and common bladderwort *Utricularia vulgaris* were moderately abundant. In addition to bladderwort, the underwater meadows were composed of stoneworts from the genera *Chara* and *Nitellopsis* as well as filamentous yellow-green algae *Vaucheria* sp. A total of 21 zooplankton species, numerous zoobenthos taxa and seven fish species were found in the pond. Of the 24 identified dragonfly species, at least half are breeding in the pond. Only two amphibian taxa and three reptile species were recorded, including an alien (non-indigenous) species in our fauna, i.e. Cumberland slider *Trachemys scripta troostii* - a turtle coming from the USA. ... Nonetheless, the biological richness of the pond is endangered and certain measures should be taken to preserve it. ... Dragonflies: The tank is characterized by a typical, average odonata-fauna in terms of both the number and species composition. 24 species of vases were found, including one protected species - *Sympecma paedisca*. In addition, two southern species were observed: *Sympetrum fonscolombii* and *Crocothemis erithrea*. No representatives of the Lestidae family were found. In the case of the presence of two river species, *Calopteryx splendens* and *C. virgo* were probably individuals that flew from nearby watercourses. Probably, most of the species found were growing in the Plaszowski pond, but based on the presence of adolescent and observed reproductive behavior, they were able to confirm the reproduction only for half of them." (Authors)] Address: Dumnicka, Elzbieta, Instytut Ochrony Przyrody PAN 31.120 Krakow, al. Adama Mickiewicza 33, Poland. E-mail: dumnicka@iop.krakow.pl

2020

22456. Carbonell, J.A.; Stoks, R. (2020): Thermal evolution of life history and heat tolerance during range expansions toward warmer and cooler regions. *Ecology* 101(10). e03134: 11 pp. (in English) ["Species' range edges are expanding to both warmer and cooler regions. Yet, no studies directly compared the changes in range-limiting traits within the same

species during both types of range expansions. To increase our mechanistic understanding of range expansions it is crucial to disentangle the contributions of plastic and genetic changes in these traits. The aim of this study was to test for plastic and evolutionary changes in heat tolerance, life history and behaviour, and compare these during range expansions toward warmer and cooler regions. Using laboratory experiments we reconstructed the thermal performance curves (TPCurves) of larval life history (survival, growth and development rates) and larval heat tolerance (CTmax) across two recent range expansions from the core populations in southern France toward a warmer (southeastern Spain) and a cooler (northwestern Spain) region in Europe by *Ischnura elegans*. First-generation larvae from field-collected mothers were reared across a range of temperatures (16 - 28 °C) in incubators. The range expansion to the warmer region was associated with the evolution of a greater ability to cope with high temperatures (increased mean and thermal plasticity of CTmax), faster development and partly a faster growth indicating a higher time constraints caused by a shorter time frame available for larval development associated with a transition to a greater voltinism. Our results thereby support the emerging pattern that plasticity in heat tolerance alone is inadequate to adapt to new thermal regimes. The range expansion to the cooler region was associated with faster growth indicating countergradient variation without a change in CTmax. The evolution of a faster growth rate during both range expansions could be explained by a greater digestive efficiency rather than an increased food intake. Our results highlight that range expansions to warmer and cooler regions can result in similar evolutionary changes in the TPCurves for life history, and no opposite changes in heat tolerance." (Authors)] Address: Stoks, R., Lab. Aquat. Ecologie, K.U.Leuven, De Beriotstraat 32, 3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

22457. Dalal, J.; Sharma, S.; Bhardwaj, T.; Dhattarwal, S.K.; Verma, K. (2020): Seasonal study of the decomposition pattern and insects on a submerged pig cadaver. *Journal of Forensic and Legal Medicine* Volume 74, August 2020, 102023: 9 pp. (in English) ["Research on studying the decomposition pattern in aquatic habitat is very sparse worldwide. Due to this void, assessment of the postmortem submersion interval (PMSI) of drowned and submerged cadavers is still inaccurate and imprecise. The current work focused on studying the decomposition pattern and insects associated with submerged pig (*Sus scrofa*) carcasses during various seasons (winter, spring, summer, and rainy) for two years. The total postmortem submersion interval (PMSI) from the fresh stage till the sunken remains stage varied from 25 days for rainy season (624.5 ADD) to 78 days (1890.5 ADD) for winter season. The spring season at 44 days (1067.5 ADD) and summer season at 31 days (763.5 ADD) had moderate PMSI. During this time interval, five stages of decomposition were studied: submerged fresh, early floating, floating decay, advanced floating decay, and sunken remains. A total of 2385 insect specimens were found to be associated with different decomposition stages. The terrestrial activity during the first stage (submerged fresh) was almost nil as the carcasses were submerged. During the early floating stage (2nd stage), various terrestrial insect species visited the carcass and laid their eggs along with the presence of Chironomidae, Coenagrionidae, Lestidae, Aeshnidae families were also found associated with this stage. In the floating decay (3rd stage), the insects visiting and colonizing the carcass were from Coenagrionidae, Gomphidae, Aeshnidae, Gomphidae, Libellulidae, Chironomidae families along with Calliphoridae (Diptera). Species from the group of scavenging aquatic beetles (Hydrophilidae), *Enochrus esuriens*, *Regimbartia attenuata* (Fab),

Helochaeres sp. and burrowing water beetles, *Canthydrus laetabilis* (Family: Noteridae) and some terrestrial species of beetles, i.e. *Saprinus* sp., *Saprinus pensylvanicus* and *Necrobia rufipus* (Family: Histeridae) were also present during the 3rd, 4th and 5th stages. During advanced floating decay (4th stage) and sunken remains (5th stage), many hemipteran species such as *Ranatra digitata* and *Ranatra filiformis* (Fab) along with many coleopterans were found visiting the corpse." (Authors)] Address: Sharma, Sapna, Department of Genetics, Maharshi Dayanand University, Rohtak, Haryana, India. Email: sapforsci@gmail.com

22458. Desjonquères, C.; Gifford, T.; Linke, S. (2020): Passive acoustic monitoring as a potential tool to survey animal and ecosystem processes in freshwater environments. *Freshwater Biology* 65(1): 7-19. (in English) ["* Biodiversity in freshwater habitats is decreasing faster than in any other type of environment, mostly as a result of human activities. Monitoring these losses can help guide mitigation efforts. In most studies, sampling strategies predominantly rely on collecting animal and vegetal specimens. Although these techniques produce valuable data, they are invasive, time-consuming and typically permit only limited spatial and temporal replication. There is need for the development of complementary methods. * As observed in other ecosystems, freshwater environments host animals that emit sounds, either to communicate or as a by-product of their activity. The main freshwater soniferous groups are amphibians, fish, and macroinvertebrates (mainly Coleoptera and Hemiptera, but also some Decapoda, Odonata, and Trichoptera). Biophysical processes such as flow or sediment transport also produce sounds, as well as human activities within aquatic ecosystems. * Such animals and processes can be recorded, remotely and autonomously, and provide information on local diversity and ecosystem health. Passive acoustic monitoring (PAM) is an emerging method already deployed in terrestrial environments that uses sounds to survey environments. Key advantages of PAM are its non-invasive nature, as well as its ability to record autonomously and over long timescales. All these research topics are the main aims of ecoacoustics, a new scientific discipline investigating the ecological role of sounds. * In this paper, we review the sources of sounds present in freshwater environments. We then underline areas of research in which PAM may be helpful emphasising the role of PAM for the development of ecoacoustics. Finally, we present methods used to record and analyse sounds in those environments. * Passive acoustics represents a potentially revolutionary development in freshwater ecology, enabling continuous monitoring of dynamic bio-physical processes to inform conservation practitioners and managers." (Authors)] Address: Desjonqueres, Camille., Dept Biol. Sci., Univ. of Wisconsin, Milwaukee, 3209 N Maryland Ave, Milwaukee, WI, USA. Email: cdesjonqu@gmail.com

22459. DuBois, R.B. (2020): Odonata drift: a reassessment. *International Journal of Odonatology* 23(4): 381-396. (in English) ["More than 400 scientific journal articles and gray literature reports that addressed macroinvertebrate drift were reviewed and 63 articles were found that reported on the natural drift of Odonata at some taxonomic level. Forty-three species and 44 genera within 15 families (nine Zygoptera; six Anisoptera) were documented in the drift. Drift of another 13 species and eight genera was inferred from indirect evidence. The mean drift density reported was 0.03 m^{-3} (range $<0.001\text{--}0.153 \text{ m}^{-3}$), which is relatively low, but not unexpected because benthic densities of Odonata are often lower than those of the macroinvertebrate taxa that occur more frequently in the drift. Percent composition of odonates in the

total drift was invariably $<10\%$ and usually $<1\%$, but the percent was slightly higher if expressed as biomass or volume because odonate larvae are relatively large. Most odonates that drifted were not full grown. High flows were often associated with drift of Odonata, but not exclusively so; drift was highest at night and during summer months. Accidental (catastrophic) drift and active, behavioral drift to colonize new habitats and reduce crowding are thought to be the primary causes of Odonata drift, but its ecological significance would benefit from more research. The presumption that Odonata have a low predisposition to drift is probably not uniformly accurate. Use of drift nets specifically to collect odonates is unlikely to be as efficient as other collection methods in most circumstances, but it should not be entirely dismissed because drift nets are easy to set, relatively clean to operate, do not destroy habitats, and provide integrated samples of various habitats where it might be difficult or unsafe to use other methods." (Authors)] Address: DuBois, R., Dept of Natural Resources, Bureau of Natural Heritage Conservation, Superior, Wisconsin, USA. Email: rdbuobis@gmail.com

22460. Francisco de Avila Junior, W.; Vieira Machado, V.L.; Lencioni, F.A.; Carneiro, M.A.A. (2020): Distribution and composition of dragonfly and damselfly species (Odonata) of the upper Rio das Velhas, Ouro Preto, Minas Gerais State, Brazil. *Pap. Avulsos Zool.*, 2020; v.60: e20206065: 8 pp. (in English) ["This paper describes the composition and distribution of Anisoptera and Zygoptera species of the upper Rio das Velhas in the municipality of Ouro Preto, Minas Gerais State, Brazil. A total of 727 specimens of 40 species were collected near water bodies over a period of 23 months between 2015 and 2017. The families with greatest species richness were Libellulidae (13 species), Coenagrionidae (12 species) and Heteragrionidae and Aeshnidae (4 species each). Notable among the species collected were *Perilestes fragilis*, inhabiting well-preserved forests, *Minagrion waltheri*, pertaining a endemic genus of Brazil and the recently described *Heteragrion cauei* Ávila-Júnior et al., 2017, and three species recorded for the first time for the state: *Elasmothemis alcebiadesi*, *Erythrodiplax melanica* and *E. acantha*, the latter is considered Critically Endangered (CR) by the International Union for Conservation of Nature's (IUCN) Red List." (Authors)] Address: Francisco de Ávila Júnior, W., Univ. Federal de Ouro Preto (UFOP), Instituto de Ciências Exatas e Biológicas, Depto de Biodiversidade, Evolução e Meio Ambiente (DEBIO), Laboratório de Entomologia Ecológica. Ouro Preto, MG, Brasil. E-mail: walterfaj88@gmail.com

22461. Franke, S.; Brandl, R.; Heibl, C.; Mattivi, A.; Müller, J.; Pinkert, S.; Thorn, S. (2020): Predicting regional hotspots of phylogenetic diversity across multiple species groups. *Diversity and Distributions* 26(10): 1305-1314. (in English) ["Aim: The protection of phylogenetic diversity has become a priority in conservation biology, but its achievement requires a detailed understanding of (a) hotspots of phylogenetic diversity on a management-relevant scale and (b) the land use and climate factors determining local phylogenetic diversity. In this study, we identified spatial patterns of taxonomic and phylogenetic diversity and their environmental drivers. Location: Bavaria, Germany. Methods: To map the cross-taxon phylogenetic diversity, we combined species distribution data obtained from country-wide monitoring programmes and phylogenetic trees of birds, bats, dragonflies, grasshoppers and butterflies and calculated the phylogenetic diversity standardized by species richness. Generalized additive models were used to test the effects of land use and climate on phylogenetic diversity. We identified hotspots of phylogenetic diversity and assessed the extent to

which established protected areas in Bavaria cover these hotspots. Results: High coverage by urban areas, arable land and water bodies negatively affected the phylogenetic diversity of most species groups. The phylogenetic diversity of birds increased with increasing meadow cover. Climate did not influence the phylogenetic diversity of the studied groups. We identified 10 regional hotspots that contained the highest standardized phylogenetic diversity across the examined species groups. There was a strong mismatch between hotspots of phylogenetic diversity among the species groups. Protected areas (national parks, natural reserves and areas of the Flora-Fauna-Habitat Directive) overlapped only to ~9.6% with these hotspots of standardized phylogenetic diversity. Main conclusions: Cross-taxon approaches are required to identify hotspots of phylogenetic diversity at a management-relevant scale. At regional scales, land use was more important than climate in determining phylogenetic diversity. Our study highlights the importance of involving land users into strategies for protecting phylogenetic diversity." (Authors)] Address: Franke, Sophia, Dept of Animal Ecology, Faculty of Biology, Philipps-Universität Marburg, Karl-von-Frisch-Str. 8, 35032 Marburg, Germany. E-mail: sophia.franke@posteo.de

22462. Futahashi, R.; Kita, H. (2020): Rapid decline of the white-winged morph (forma edai) of *Mnais pruinosa* Selys, 1853. Tombo 62: 13-15. (in Japanese, with English summary) ["White-winged form (forma edai) of *M. pruinosa* was not uncommon in the Boso Peninsula, Chiba Prefecture, in the past. However, the individuals of this endemic form continuously decreased and have not been observed since 2004. The major cause of such rapid decline is considered as selective overcollection." (Authors)] Address: Futahashi, R., National Inst. of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

22463. Gultom, S.; Manalu, K.; Tambunan, E.P.S. (2020): Keanekaragaman Capung di Taman Wisata alam Danau Sicikeh – Cikeh desa lae Hole Kecamatan Parbuluan Kabupaten Dairi Sumatera Utara. [The diversity of Odonata in Sicikeh-cikeh Lake Cikeh village, Lae Hole Village, Kecamatan Parbuluan, Dairi District, North Sumatra]. Klorofil 4(2): 1-7. (in Indonesian, with English summary) ["This study aims to determine the type, abundance, and frequency of Odonata in the Lake Sicikeh-cikeh Nature Tourism Park, Lae Hole Village, Parbuluan District, North Sumatra Province. This research was conducted in November 2019. This research used the Exploration method. Observations were made at three stations. Data obtained from the field are processed manually, after the data is collected, processed, then presented in the form of a table and described descriptively. The results showed an abundance of dragonflies in Lake Sicikeh-Cikeh Nature Tourism Park categorized as moderate diversity. The highest abundance of dragonflies is found in the species of *Neurothemis fluctuans* with a relative abundance of 37.17%. The highest relative frequency is found in species of *Pseudagrion microcephalum* Rambur, *Neurothemis fluctuans* Fabricius, and *Rhodothemis rufa* Rambur with a relative abundance value of 15%." (Authors)] Address: Gultom, Sofiana, Program Studi Biologi, Fakultas Sains dan Teknologi, Universitas Islam Negeri Sumatera Utara, Indonesia. E-mail: sofanagultom7@gmail.com

22464. Kagimoto, B. (2020): A report on the Conservation of *Orthetrum poecilops* Ris, 1919. Tombo 62: 20-22. (in Japanese, with English summary) ["*O. poecilops* is a very rare species of dragonfly which is found only in Miyajima, Japan and in Fujian and Guangdong in China, including Hong Kong. At Miyajima the habitat is curiously a marsh near the

sea shore, where sea water flows in on a spring tide. Such a habitat is very vulnerable to any pressure of development. However Miyajima has been a forbidden island to develop as "God's island" because the God of Shinto is believed to reside there. In 2005 the Conservation committee started. This committee comprised staff from the Ministry of Environment, Hiroshima Prefectural Government, Hatsukaicm City and consisted mainly of specialists in insects. The project was to build fences to exclude invading wild bore around habitats in all 4 areas in Miyajima, so that the number of specimens of *O. poecilops* could be assessed, and to breed larvae from eggs artificially and so on. Thanks to these activities, the number of *poecilops* is increasing. From 2018 a new project has begun. The Conservation committee attempted to create a 5th habitat on the island. There are two big problems for Conservation. One is a lack of funds for everything. Another is pollution from scrap plastic. Fortunately the latter has little influence on the habitat at present. Thanks to such activities by the Conservation committee, *O. poecilops* has been able to survive on Miyajima Island." (Author)] Address: Email: miyajimatono@yahoo.co.jp

22465. Kita, H.; Suda, S. (2020): Habitat and Conservation Status of *Paracercion plagiosum* (Needham, 1930). Tombo 62: 9-12. (in Japanese, with English summary) ["*P. plagiosum* is designated as Endangered Class B (EN) in the Ministry of the Environment Red List category. Recently, many of the existing production areas have been lost and many of them are in crisis. The authors looked at the current status of habitats and conservation. To date, *P. plagiosum* has been found in ten prefectures in Tohoku and Kanto regions, of which Kanagawa Prefecture has become extinct and many habitats in other areas are at risk. It is important that this species inhabits abundant aquatic plants that serve as spawning substrates, but *P. plagiosum* tends to decline when aquatic plants decrease due to deteriorating water quality. Although many efforts have been made for *P. plagiosum*, such as habitat conservation and selection of important wetlands, the degradation of its habitat and the decline of this species are progressing at a faster speed. It shows how difficult it is to conserve this species, which is locally distributed only on human-sensitive plains and has high environmental preference." (Authors)] Address: Kita, H., Takiyama 6-2-15-308, Higashikunime City, Tokyo, 203-0033, Japan

22466. Koch, L. (2020): Libellen als Indikatoren für den ökologischen Zustand einer Region. *Natur und Umwelt im Pannonschen Raum* 30(2): 7. (in German) [Verbatim/Google translate: Dragonflies as indicators of the ecological condition of a region The Seewinkel region is one of Austria's "dragonfly hotspots": Of the 78 dragonfly species currently in Austria, around 50 are found here. Despite the extinction of insects, dragonflies are important indicators of the ecological condition of a region. The time of the impressive giant dragonflies with a wingspan of up to 70 cm in the Carboniferous period is over, but dragonflies still fascinate many people to this day. Due to the high diversity of different habitats, the Seewinkel region in Burgenland is home to around 50 species of dragonflies. The region offers, among other things, one of the rare Central European inland occurrences of the dark rush damselfly (*Lestes macrostigma*), which in the Seewinkel occurs primarily on salt lakes with brackish reed beds. Studies from 2008 showed that species that prefer to spend time on salt lakes appear to be experiencing a decline in their populations. This is due, among other things, to large-scale lowering of groundwater, which results in a change in the water regime and thus promotes the plants to dry out earlier in the season. The good news: Through renaturation measures in

bodies of water, former habitat losses can usually be quickly compensated for, as many dragonflies are known to quickly return to their former habitats. *Libellula depressa* and *Orthetrum coerulescens* are positive examples of this. Although these species were considered endangered in Burgenland until the 1980s, they are now benefiting from the improvement in water quality in gravel pits and rivers, so that their populations are now considered stable and, in the case of the *C. coerulescens*, are even increasing. Two thirds of the dragonfly species found in Austria are now endangered. Many of them are on the red list. Preserving as large a variety of dragonflies as possible is particularly important from a nature conservation perspective, as the presence or absence of a particular dragonfly species in a body of water can provide essential information about the ecological quality of their environment: dragonflies act as so-called bioindicators; i.e. indicator organisms that are used in conservation biology to obtain information about the ecological status of a habitat. It remains questionable whether an improvement in general water quality will be sufficient in the long term to protect dragonfly species that have become rare. Due to the current climate crisis, there are winners among dragonflies, who are expanding their range due to climate change, and losers, whose populations are expected to decline over the next few years. Nevertheless, habitat renaturation measures are extremely important, as they ultimately benefit the preservation and improvement of our fantastic nature and environment, of which these fascinating little animals are certainly the best proof.] Address: Koch, Laura, Naturschutz und Biodiversitätsmanagement sowie Zoologie an der Universität Wien

22467. Li, L.; Park, Y.-S. (2020): Habitat availability and environmental preference drive species range shifts in concordance with climate change. *Diversity and Distributions* 26(9): 1343-1356. (in English) ["Aim: A progressive increase in air temperature is recognized as the most important mechanistic driver of species range shifts. However, only a few studies have simultaneously considered the influence of both extrinsic and intrinsic mechanistic drivers; there are still no studies on the roles of extrinsic and intrinsic drivers that regulate such species changes. We investigated how species will shift their geographical ranges to cope with future climate change and analysed the relative importance of the mechanistic drivers in governing species range shifts. Location: 16 countries in South, West and North Europe. Methods: We used ensemble species distribution models on the European continental scale to predict 105 odonate species in response to climate change in the future decades until 2080s under three emission scenarios. We evaluated the projected changes in four community metrics (distribution area, optimum position, leading edge and trailing edge) and investigated how these changes are driven by extrinsic and intrinsic factors. Results: The odonate species were predicted to shift their range margins poleward, with a higher migration rate towards the trailing edge (2.38-10.34 km/year) than the leading edge (1.13-2.00 km/year). Contrary to the assumption that the response of the odonate species to climate change will linearly accelerate over time, the distribution areas of odonate species were predicted to increase until 2050s and then decline until 2080s under RCP 2.6 (representative concentration pathway). However, their distributions under RCP 4.5 and RCP 8.5 were predicted to decrease over time, with a higher rate under RCP 8.5. Overall, environmental preference and habitat override dispersal ability govern the range shift of odonate species. Main conclusions: Quantifying the relative importance of extrinsic and intrinsic factors across a large spatial scale under different emission scenarios can help understand the mechanistic processes to facilitate species range shifts."]

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22468. Lubelczyk, C.B.; Elias, S.P.; de Maynadier, P.G.; Brunelle, P.M.; Smith, L.B.; Smith Jr, R.P. (2020): Importation of dragonfly nymphs (Odonata: Anisoptera) to control mosquito larvae (Diptera: Culicidae) in southern Maine. *Northeastern Naturalist* 27(2): 330-343. (in English) ["A long-standing program in Maine promotes stocking of dragonfly (Odonata) nymphs for biological control of nuisance and vector mosquitoes. Currently the only sources of dragonflies for stocking are out-of-state biological supply companies. In 2 dragonfly shipments from suppliers in Massachusetts and North Carolina, we determined that 6.8% and 38.5% of species, respectively, were not native to Maine. In an experiment of stocking efficacy, we introduced 4, 2, or 0 dragonfly nymphs into artificial pools in a forest habitat and found no differences in mosquito larvae counts among treatments. While the motivation for using dragonflies as biological control agents is commendable, the practice may be ineffective, and risks accidental introductions of non-native aquatic plants and animals in water used for shipping." (Authors)] Address: Lubelczyk, C.B., Maine Medical Center Research Institute, 81 Research Drive Scarborough, ME 04074, USA. Email: lubelc@mmc.org

22469. Milkowski, M. (2020): Dragonflies (Odonata) of Radom - observations within the period of 2013-2018. *Odonatix* 1622: 9 pp. (in Polish, with English summary) ["Observations on dragonflies were carried out at the rivers and ponds within the boundaries of Radom 2013-2018. 43 dragonfly species recorded on 20 localities are presented, from which 4 species are protected by in Poland. *Sympecma paedisca*, *Ophiogomphus cecilia*, *Leucorrhinia pectoralis*, *L. albifrons*. 5 species of „southern“ dragonflies were observed. *Orthetrum albistylum*, *O. brunneum*, *Sympetrum fonscolombii*, *S. meridionale* and *Crocothemis erythraea*." (Author)] Address: Milkowski, M., ul. Krolowej Jadwigi 19 m. 21, 26-600 Radom, Poland. E-mail: milkowski63@wp.pl

22470. Ministry of the Environment (2020): The list of Odonata species in Red Data Book of Japan published by Ministry of the Environment. Tombo 62: 1-2. (in Japanese) [This note documents the odonate taxa listed in the Red Data Book of Japan (<https://www.env.go.jp/press/files/jp/11-0615.pdf>): Extinct: 0 species; Extinct in the Wild: 0 species; Critically Endangered: 5 species; Endangered: 10 species; Vulnerable: 13 species; Near Threatened: 27 species, Endangered regional populations: 1 species (*Mnais pruinosa*)]

22471. Satoh, R. (2020): The cause of a drastic decrease in number and Conservation measures for *Sympetrum maculatum* Oguma, 1922 in Niigata Prefecture. Tombo 62: 16-19. (in Japanese, with English summary) ["*S. maculatum* is a rare and endangered species, endemic in Honshu, Japan. In Niigata Prefecture, this species was not so rare in the past, but has drastically decreased in numbers recently. At O-ike pond, Murakami City, it was found a lot in the past, but became extinct due to eutrophication from feeding waterfowl, exuberant growth of tall plants, and artificial institution. In addition, destruction of satellite habitats may have contributed to the extinction of the population. On the other hand, more controlled activity in Takane district, Murakami City has achieved good results. In particular, reducing the number of tall plants contributes to expansion of oviposition sites and, as a result, the population has increased." (Author)] Address: Email: ryojis@cocoa.ocn.ne.jp

- 22472.** Smallshire, D.; Swash, A. (2020): Europe's Dragonflies. A field guide to the damselflies and dragonflies. Published by Princeton University Press: 360 pp. (in English) ["Europe's Dragonflies is a comprehensive, lavishly illustrated and beautifully designed photographic field guide to the damselflies and dragonflies of Europe. Written by two well-travelled experts, the book covers all 140 resident and vagrant species recorded, focussing on the field identification of adult insects. Concise species profiles highlight key identification features and provide information on behaviour, habitat preferences, distribution, flight periods, status and conservation. Other sections cover identification tips, conservation status and legislation. Presenting an unsurpassed selection of images of the highest quality, this is the go-to guide for anyone wishing to know more about these amazing and fascinating insects. Comprehensive coverage of every species of Odonata recorded in Europe; Stunning colour plates showing males, females, immatures, colour forms, subspecies and typical habitat for every species; Over 1,200 superb photographs, supplemented with illustrations of fine details; Detailed profiles for the 140 resident and vagrant species; Unique comparison plates for difficult groups; Easy to use by beginners and experts alike, avoiding technical terms" (Publisher)] Address: <https://oceanofpdf.com/authors/dave-smallshire/pdf-europes-dragonflies-a-field-guide-to-the-damselflies-and-dragonflies-download/?id=001811501763>
- 22473.** Vilela, D.; Venâncio, H.; Santos, J.C. (2020): *Forcepsioneura machadorum* (Coenagrionidae: Protoneurinae) sp. nov. from the Cerrado Biome of Minas Gerais, southeastern Brazil. *International Journal of Odonatology* 23(4): 397-404. (in English) ["The Neotropical genus *Forcepsioneura* is composed of 11 species that inhabit almost exclusively the Brazilian Atlantic Forest domain, with *F. sancta* (Hagen in Selys, 1860) being the only species of this genus known to occur in the Cerrado biome. Here we describe a new species of *Forcepsioneura* from the Cerrado of Minas Gerais State, Brazil. This new species is morphologically closer to *F. sancta* and can be separated from this and other species of *Forcepsioneura* mainly by the rectangular shape of male prothoracic hind lobe and cerci morphology." (Authors)] Address: Vilela, D.S., Rua Jaime Bilharinho, 575, CEP 38065-280, Uberaba, Minas Gerais, Brazil. Email: deegoo@gmail.com
- 22474.** Watanabe, K. (2020): Protectional activity of the last clear stream in Ishigaki Island. *Tombo* 62: 23-25. (in Japanese, with English summary) ["After return to Japan, in the year of 1972 there were many dam constructions in Okinawa Prefecture. As a result, many habitats of dragonflies disappeared. On Ishigaki Island, Shiramizu River is now only one river with no dams, and is known by prolific habitats of *Macromia urania* and *Macromidia ishidae*. In 1992, boring survey of Shiramizu Dam started, at the same time we established the Conservation group, Smramizu Nature Observation Party. We had regularly nature observation, negotiation with administration and issue of newsletter. These are successful ways to stop the Smramizu Dam construction." (Author)] Address: Email: odonet99@akubinet.com
- 22475.** Zessin, W. (2020): Kurzer Bericht von der 39. Tagung der „Gesellschaft deutschsprachiger Odonatologen e. V.“ in Höxter, Niedersachsen (12.-16.3.2020). *Virgo* 23: 86-90. (in German) [https://www.entomologie-mv.de/download/virgo_23/Virgo_2020-12_Zessin.pdf] Address: Zessin, W., Lange Str. 9, 19230 Jasnitz, Germany. Email: wolfgangzessin@aol.com
- 22476.** Akbar, L.A.; Basukriadi, A. (2021): Diversity of dragonflies and damselflies in lakes of Universitas Indonesia, Depok, West Java. *Journal of Physics Conference Series* 1725(1): 012035. Follow journal DOI: 10.1088/1742-6596/1725/1/01-2035: 6 pp. (in English) ["We investigated the diversity and distribution of Odonata inhabiting lakes at Universitas Indonesia, Depok, West Java in November 2017. The Study aimed to characterize the lakes based on the occurrence of some Odonata species. There were six study sites: Lake Agathis, Lake Kenanga, Lake Mahoni, Lake Puspa, Lake Salam, and Lake Ulin. Species of Odonata encountered within the study sites were caught using sweep nets, photographed and then released. A total of 16 species of Odonata were found including 12 dragonflies and 4 damselflies. The dragonflies were represented by two families. Of the 12 species of dragonflies recorded, 11 were from the family Libellulidae and 1 was from the family Gomphidae. *Brachydiplax chalybea* and *Orthetrum testaceum* were the most widely distributed species. However, the abundant species were *O. testaceum* and *Zygomma obtusum*. Damselflies were poorly represented, with only four species from two families, Coenagrionidae and Platycnemididae. Based on the species composition of Odonata from six lakes at Universitas Indonesia we conclude that most species are eurytopic or generalist that are widespread and tolerant to a wide range of environmental variables. In the current study, we consider that all lakes at Universitas Indonesia are disturbed habitats which are generally unsuitable for specialist or stenotopic species." (Authors)] Address: Basukriadi, A., Dept of Biology, Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Indonesia, Depok 16424, Indonesia. Email: basukriadi@sci.ui.ac.id
- 22477.** Barrows, E.M. (2021): Prey-handling flexibility in *Vespa crabro* Linnaeus, the European Hornet, (Hymenoptera: Vespidae). *Proceedings of the Entomological Society of Washington* 123(2): 424-428. (in English) ["Only Dijkstra et al. (2001) and Wiklund (2005), who observed *Vespa crabro* in Europe, have published detailed information about *V. crabro*'s prey-handling behavior. This study builds on their work and describes *V. crabro*'s prey handling of two very different kinds of prey in the field in the United States: a *Bombus impatiens* worker, a prey much smaller than her predator, and a female *Speyeria cybele* (great spangled fritillary), a prey much larger, but possibly not much different in weight compared to her predator. This paper also describes *V. crabro*'s reactions toward and interactions with cicadas which are its possible prey, and reviews current knowledge about this wasp's prey handling based on the scientific literature and appropriate online photographs and videos of this wasp and its prey." (Authors)] Address: Barrows, E.M., Dept of Biology, Georgetown Univ., Reiss Building Suite 406, Box 571229, Washington, D.C. 20057-1229
- 22478.** BCP Council (2021): 2021. Odonata Survey. Stour Valley · Millhams Mead · Throop Nature Park. Report Reference: BCP-OS-01, 18/10/2021: 35 pp. (in English) [The report can be downloaded at <https://bcpprojects.net/wp-content/uploads/2023/04/Odonata-Survey-Report-2021-compressed.pdf>] Address: <https://bcpprojects.net/wp-content/uploads/2023/04/Odonata-Survey-Report-2021-compressed.pdf>
- 22479.** Dada, O.C. (2021): Ecological studies on the diversity of Odonata (Insecta) in Ipogun, Ifedore local government area, Ondo state, Nigeria. M.Tech. thesis, Environmental Biology & Public Health, Federal University of technology,

Akure, Ondo State, Niveria: (in English) ["Odonata are particularly good indicators of freshwater ecosystem health. The constant disturbance of freshwater habitats can result in reduction of Odonata species diversity. Changes in Odonata diversity are influenced by human activities such as urbanization, agriculture and input of pollutants in water. This study assessed the abundance and diversity of Odonata along River Aponmu in Ipogun. A total of 906 individuals representing 64 species and 16 genera in seven families (Coenagrionidae, Lestidae, Platycnemididae, Chlorocyphidae, Calopterygidae, Libellulidae and Gomphidae) were collected and identified. Of the 906 individuals, Libellulidae had the highest percentage composition (44%) with 395 individuals out of which *Trithemis arteriosa* (a pollution tolerant species) had the highest number of individuals (225) and Gomphidae had the lowest percentage composition (0.03%) with 1 individual. Most of the species collected had tolerance for disturbed environment including *Pseudagrion melanicterum*, *Paragomphus genoi* and *Orthetrum julia*. Aponmu area had the highest species diversity ($H' = 2.312$) while Idi area had the least species diversity ($H' = 2.021$). Alaasin area had the highest Simpson_d value (0.8557) and the best taxa distribution (Evenness=0.524; Equitability_J= 0.7764) which made the area a more pristine site than the other sites while Aponmu area had the least distribution (Evenness=0.3365; Equitability_J= 0.6798). Cluster analysis revealed a close similarity between the Odonata assemblages at Alaasin and Aponmu areas while that of Idi area was quite different. Analysis of variance (ANOVA) of physico-chemical parameters revealed that temperature ($^{\circ}\text{C}$), pH, Dissolved Oxygen (DO), turbidity (NTU), Biochemical oxygen demand (BOD), Nitrate (NO_3) and Phosphate (PO_4) did not show significant difference at the three sites while Electrical Conductivity ($\mu\text{S}/\text{cm}$) and Total dissolved solids (mg/L) which had moderately high mean values indicated significant difference at Aponmu area ($p < 0.05$). *Trithemis arteriosa* exhibited a weak negative correlation to both temperature and Dissolved Oxygen (DO). This study has provided information on Odonata assemblage and physico-chemical parameters at River Aponmu and therefore infers that some parameters influence the abundance of some Odonata species and River Aponmu is somewhat polluted as it receives more pollutants resulting from human activities around it and could be unsafe for drinking." (Author) For a published version of the thesis see: Adu, B.; Dada, O.; Tunwase, V. (2022): An ecological study of freshwater ecosystem and its colligation to Odonates assemblages in Ipogun, Southwest Nigeria. *Bulletin of the National Research Centre* 46 (Art. No. 86), 12 pp. (<https://bnrc.springeropen.com/articles/10.1186/s42269-022-007-74-4>) Address: Dada, Omolola, Department of Biology, The Federal University of Technology Akure, Akure, Ondo State, Nigeria. Email: omololacomfy@gmail.com

22480. Dalal, J.; Sharma, S.; Bhardwaj, T.; Dhatarwal, S.K.; Verma, K. (2021): A seasonal study of the decomposition pattern and insects on submerged rabbit carcasses. *Oriental Insects* 55(2): 280-292. (in English) ["There is a long history of using insects on a decomposing corpse as an invaluable tool to estimate the minimum post-mortem interval (PMI) during death investigations. The present study was carried out to study the decomposition pattern and insects associated with a submerged rabbit (*Oryctolagus cuniculus* Linnaeus, 1758) carcass. A total of 1795 insect specimens were found to be associated with different decomposition stages. During the submerged fresh stage three species from the genus *Chironomus* visited the carcass. During the early floating and floating decay stages, insects belonging to Coenagrionidae, Chironomidae, Lestidae, Aeshnidae families along with the

aquatic beetles i.e. *Enochrus esuriens* (Walker, 1858), *Regimbartia attenuata* (Fabricius, 1801), genus *Helochares* and *Canthydrus laetabilis* (Walker, 1858) visited and colonised the carcass. The advanced floating decay and sunken remains stage saw a prominence of *Ranatra digitata* (Hafiz & Pradhan, 1949), *Ranatra filiformis* (Fabricius, 1790) and genera *Hydroglyphus*, *Hypoporus*, *Laccophilus*, *Berosus* and *Helochares*. The Post-Mortem Submersion Interval (PMSI) was found to be longest in the winters (44 days, ADD = 1066.5) and shortest in the rainy season (16 days, ADD = 405.5) while the spring and the summer season showed a moderate PMSI of 26 days (ADD = 632.5) and 19 days (ADD = 472.5) respectively. ... The pungent putrefaction odour attracted the adult aquatic Odonate species of the Coenagrionidae, Lestidae, Gomphidae and Aeshnidae families." (Authors) With 532 specimens, Odonata were the second common group of insects found at the carcass.] Address: Sapna Sharma Dept of Genetics, Maharshi Dayanand University, Rohtak, India. Email: sapforsci@gmail.com

22481. Doer, D.; Seif, J.; Ueber, T. (2021): Jahresbericht 2020. Landschaftserhaltungsverband Bodenseekreis e.V., 88045 Friedrichshafen: 64 pp. (in German) [Coenagrion mercuriale; https://www.bodenseekreis.de/fileadmin/03_umwelt_landnutzung/landschaftserhaltungsverband/downloads/lev_bsk_jahresbericht_2020.pdf] Address: Landschaftserhaltungsverband Bodenseekreis e.V., c/o Landratsamt Bodenseekreis, Albrechtstr. 67, 88045 Friedrichshafen, Germany. E-Mail: lev@bodenseekreis.de; Internet: <http://www.bodenseekreis.de/lev>

22482. Dolný, A.; Pyszko, P.; Šigitová, H. (2021): Community changes in odonate monitoring: why are long-term studies so relevant? *Insect Conservation and Diversity* 14(5): 597-608. (in English) ["1. Most ecological studies involving insects are based on medium- and short-term observations; however, the extent to which such data captures reality remains unclear. 2. We investigated the long-term dynamics of two Odonata communities (disturbed and undisturbed sites) over 18 years and analysed the differences in the short- and long-term results. We also focused on the sampling methodology to enhance the efficacy and objectivity of long-term monitoring involving Odonata. 3. During one year, we captured only 53% of the overall species richness; during three consecutive sampling years, it was 65%. To capture 95%, we needed 16 years. Changes in quantitative similarity (Renkonen index, P) were more pronounced within sites over time than between sites. Species constancy significantly increased with the maximum abundance class but decreased with increasing fluctuation ratio and specialisation (Dragonfly Biotic Index). Based on exuviae, we detected half of the species compared to adults, but the species accumulation curves peaked after a few sampling years. 4. Long- and short-term monitoring yield different results, both qualitatively (species richness, specialisation) and quantitatively (abundance, dominance). Ideal sampling should be sequential, lasting at least 10 years (capturing >80% of species). Intermittent sampling (one-year interspersed with pauses), allowing the inclusion of multiple sites in monitoring programme, may also provide satisfactory results when performed over a longer period. 5. Over the long term, sampling adults semi-quantitatively and exuviae qualitatively provided sufficient information, while being feasible in terms of both personnel and costs, thereby overcoming the main pitfalls of long-term monitoring programmes." (Authors)] Address: Šigitová, Hana, Dept of Biology and Ecology, University of Ostrava, Chittussiho 10, 710 00 Ostrava, Czech Republic. E-mail: hana.sigutova@osu.cz

22483. Dunn, K.L. (2021): Book Review: The Complete Field Guide to Dragonflies of Australia, Second Edition, by Günther Theischinger and John Hawking, with colour illustrations by Albert Orr. Calodema 949: 1-7. (in English) [Extensive book review. https://www.researchgate.net/publication/354-627637_Book_Review_The_Complete_Field_Guide_to_Dragonflies_of_Australia_Second_Edition_by_Gunther_Theischinger_and_John_Hawking_with_colour_illustrations_by_Albert_Orr_CSIRO_Publishing_March_2021] Address: Dunn, K.L., Centre for Integrative Ecology, School of Life and Environmental Sciences, Deakin University, Victoria, Australia. Email: k.dunn@deakin.edu.au

22484. Erasmus, J.H.; Lorenz, A.W.; Zimmermann, S.; Weperner, V.; Sures, B.; Smit, N.J.; Malherbe, W. (2021): A diversity and functional approach to evaluate the macroinvertebrate responses to multiple stressors in a small subtropical austral river. *Ecological Indicators* 131, November 2021, 108206: 11 pp. (in English) ["Highlights: • Hex River is subjected to multiple stressors i.e. mining, industrial and urban effluents. • Water chemistry variables were main drivers of macroinvertebrate community changes. • Mining impacted community features differently than urban impacts. • Combined macroinvertebrate approaches were able to differentiate stressor groups. Abstract: Aquatic macroinvertebrates are considered effective bioindicators of ecosystem health due to their different sensitivities to habitat alteration and pollution. Macroinvertebrate community structures can be assessed using commonly used diversity-based approaches, however, functional trait-based approaches are increasingly introduced into bioassessments. The Hex River is subjected to intensive mining activities, while urban and industrial effluents, as well as treated and untreated sewage also contributes to pollution in the river. The present study aimed to assess macroinvertebrate responses to different stressors (nutrient and chemical, especially metal pollutants), determine whether diversity-based or trait-based approaches provide a better indication of responses and, to evaluate the relationship between metal bioaccumulation and macroinvertebrate responses to this multi-stressor environment. The mining impacts, in combination with urban, industrial and sewage effluent, altered the macroinvertebrate community structure of the Hex River. The species richness significantly decreased from reference conditions (39 species) to impacted conditions (24 species), while the total number of individuals in tolerant species gradually increased. The diversity-based approach indicated a clear difference between reference and impacted conditions but did not clearly differentiate between different stressors, while the trait-based approach distinguished the urban, industrial and sewage effluent sites from mining impacted sites. The use of both approaches is, therefore, recommended as both complement each other. From the present study, it is evident that macroinvertebrates can be considered as both reliable accumulation-, and response bioindicators to pollution from mining, as well as urban and industrial activities. ... The species response curves revealed that metals from mining activities (Cr, Ni, Pt) had a significant negative effect on ... Odonata species (Nothiothemis sp., Trithemis sp.). In contrast, ... Odonata species (Pseudagrion sp.) increased in response to higher metal concentrations (Supplementary data, Fig. S2 and S3). ... Nothiothemis sp. had a significant negative response to Cl⁻. Chemical oxygen demand (mg/L), Electrical conductivity (µS/cm), Ni in the water and sediment, SO₄²⁻, as well as Total hardness (mg/L)." (Authors) In the supplemental material, the following taxa are listed: *Lesites* sp., *Ellatoneura glauca*, *Platycypha caligata*, *Pseudagrion* sp., *Enallagma glaucum*, *Agriocnemis pinheyi*, *Notogomphus* sp., *Ceratogomphus* sp., *Paragomphus* sp., *Onychogomphus* sp.,

Aeshna sp., *Anax* sp., *Tetrathemis* sp., *Acisoma* sp., *Nothiothemis* sp., *Orthetrum* sp., *Bradinopyga* sp., *Pantala* sp., *Trithemis* sp., and *Sympetrum fonscolombii*.] Address: Erasmus, J.H., Water Research Group, Unit for Environmental Sciences and Management, North-West University, 11 Hoffman St, Potchefstroom 2520, South Africa. Email: hannes.erasmus@nwu.ac.za

22485. Eslami Barzoko, Z.; Ebrahimi, M.; Kiany, M.; Sadeghi, S. (2021): Ecological drivers of Odonata beta diversity in arid and semi-arid regions of the Central Plateau of Iran. *Insect Conservation and Diversity* 14(1): 40-51. (in English) ["1. Freshwater habitats are among the most threatened and least studied habitats in arid regions of Iran. Discovering factors responsible for the spatial variation of biodiversity are one of the main considerations in conservation biology. As a first step towards developing conservation strategies, we aimed to investigate the beta diversity and response of Odonata assemblages to climate and landscape variables in arid and semi-arid regions of Iran. 2. A total of 120 water bodies were surveyed. The beta diversity distance matrices were calculated for Odonata, Anisoptera, and Zygoptera, using the Jaccard dissimilarity coefficient. Also, the replacement and richness difference components of Odonata beta diversity were computed. Each of the five dissimilarity matrices was modelled by generalised dissimilarity modelling (GDM). 3. We recorded 58 species of Odonata that represent 58% of the Odonata species in Iran. The average total beta diversity was high (0.873). GDMs results showed that the most influential variables varied between the replacement and richness difference components of Odonata beta diversity as well as between the two Odonata suborders. Anisoptera were most strongly affected by the temperature annual range, while the most important variable for Zygoptera was the average wind speed in April. 4. Our results suggest that the studies of the drivers of biodiversity patterns benefit from beta diversity partitioning also from comparing species groups with different ecological preferences. The high biodiversity of the studied water bodies as well as the anthropogenic and climate threats that they are faced with, make these ecosystems a conservation priority." (Authors)] Address: Sadeghi, S., Dept of Biology, Faculty of Sciences, Shiraz University, Shiraz, Iran. E-mail: ssadeghi@shirazu.ac.ir

22486. Fujita, Y.; Lima, M. (2021): Unsteady lift generation of corrugated wing by lambda vortex collapse. *Bulletin of the American Physical Society, 74th Annual Meeting of the APS Division of Fluid Dynamics, Sunday–Tuesday, November 21–23, 2021; Phoenix Convention Center, Phoenix, Arizona, Session P13: Biological Fluid Dynamics: Flying Insects. 4:05 PM–6:41 PM, Monday, November 22, 2021, Room: North 127 ABC:* (in English) [Verbatim: "Dragonfly wing is not smooth but corrugated; its vertical cross-section consists of connected series of line segments. Some previous studies suggest that the aerodynamic performance of the corrugated wing is higher than that of the flat wing at the low Reynolds numbers ($Re \sim O(10^3)$). However, the details are not fully investigated. In particular, the aerodynamic characteristics and flow property during unsteady wing motion has not been studied in detail because of the complicated flow characteristics. In this study, we analyzed flow around two-dimensional corrugated wing model that started impulsively by direct numerical simulations. We focused on a period between the generation of the leading-edge vortices (LEVs) and subsequent interactions, and its detachment. For the flat wing, so-called lambda vortex with the sign opposite to LEV. On the other hand, for the corrugated wing, the lambda vortex collapsed and stuck in the valleys of the corrugated

structure in a parameter range. The lambda vortex collapse changes the LEV dynamics to encourage the instantaneous lift enhancement of the corrugated wing. In the presentation, we will discuss the details." (Authors)] Address: Fujita, Yusuke, Program of Mathematical & Life Sciences, Graduate School of Integrated Sciences for Life, Hiroshima University

22487. Goldner, J. (2021): Investigating metapopulation responses to landscape-level habitat changes. PhD thesis, Faculty of Purdue University, Department of Entomology, West Lafayette, Indiana: 122 pp. (in English) ["The study of landscape structure and configuration is firmly established as integral to the continued advancement of ecology. The configuration of resource patches can have far-reaching implications for biodiversity, metapopulation dynamics, community structure, and habitat quality. Human activities, such as forestry, agriculture, and residential construction alter patch configuration by breaking larger patches into smaller fragments. This frequently results in pronounced, unforeseen consequences for species. The fragmentation and shrinking of habitat patches can lead to changes in the environmental conditions within the remaining patches (e.g., degradation), prompting responses from local populations. These responses can, in turn, cause changes to the metapopulation structure on large spatial scale. I examined the relationship between the degree of habitat fragmentation (edge density), and foraging lengths of *Calopteryx maculata*. I used correlated random walks to determine the biologically relevant landscape area over which forest fragmentation was calculated. Then, I used Moran's I to determine the spatial scale of wing length response to fragmentation. I found that wing lengths increased with edge density. I also found that wing lengths were spatially autocorrelated at distances below 5 Km. These findings suggest that damselflies adapt to changes in forest fragmentation at a relatively small spatial scale. Next, I assessed the slime mold *Physarum polycephalum*'s usefulness as a microcosm of dispersal in fragmented landscapes. Slime mold plasmodia were placed in dishes with oat patches of varying sizes and distances. The probability of each patch type being colonized first was compared to predictions of patch occupancy based on *C. maculata*. Patches that were nearer or larger were likely to be colonized before patches that were more distant, or smaller. Observed patch occupancy matched model predictions when only patch distance was varied, but not when patch size was varied. These results suggest that *P. polycephalum* has the potential to serve as a useful microcosm of dispersal in patchy landscapes. However, more testing is needed to develop the microcosm system. Finally, a lesson plan was developed to teach high school students about the concepts of landscape ecology and connectivity. An emphasis was placed on using active learning techniques, which have been demonstrated to result in greater understanding than traditional lecture formats. The lesson plan incorporates an education boardgame, *Humans & Habitats*, that I developed to illustrate how the conflicting goals of resource managers impact habitat connectivity. It also incorporates a scientific inquiry activity that uses *P. polycephalum* to test predictions about the effect of altered connectivity. The lesson plan and materials will be available to members of the public, free of charge." (Author)] Address: https://hammer.purdue.edu/articles/thesis/Investigating_Metapopulation_Responses_to_Landscape-Level_Habitat_Changes/17159243

22488. Hasik, A.Z. (2021): Host-parasite interactions within food webs. PhD thesis, University of Arkansas, Fayetteville: 141 pp. (in English) ["Parasitism is one of the most common life history strategies employed in nature, yet the effects of

parasites are often thought to be minimal, and the vast majority of studies fail to consider parasites and their effects on host organisms. This is likely a problem, as the magnitude of parasite-mediated effects on their hosts can be quite large. Additionally, the effects of parasites are known to extend beyond the host to affect other species interactions. I used a series of approaches to gain a more integral understanding of host-parasite interactions by studying (1) the effects of parasites on biotic interactions that hosts engage in, (2) how biotic interactions such as predation and competition can affect host immune defense, and (3) how abiotic and biotic factors within the local environment affecting the host can further mediate parasitism dynamics. Specifically, in Chapter 1 I conducted a phylogenetically informed meta-analysis of the effects of parasites on species interactions (i.e., predation, competition, mutualism, and reproduction). I found that despite a strong overall negative effect on species interactions, the effects of parasites surprisingly ranged from being strongly beneficial to strongly deleterious on host species interactions. In Chapter 2 I used larval damselflies and their dominant fish predator to test how cascading effects of predators on host competitive interactions and resource acquisition affected a critical component of damselfly immune function, the phenoloxidase (PO) cascade. I found that neither direct density-mediated effects, indirect, trait-mediated effects, nor combined effects of predators via natural selection affected total PO activity. Instead, PO levels increased with resource availability, implying resource limitation. Finally, in Chapter 3 I used two field experiments and a detailed observational study to investigate how host, abiotic, and biotic factors within the local environment affected the relationships between *Enallagma* spp. hosts and their water mite (*Arrenururs* spp.) ectoparasites. I found that parasitism was species-specific and did not vary with host density or host condition (i.e., immune function). Instead, parasitism was largely predicted by abiotic factors (i.e., pH). Collectively, my results indicate that parasites are key players in the complex web of species interactions that compose food webs. Furthermore, host-parasite interactions are mediated by many of the same ecological factors as other species interactions, which has implications for parasitism dynamics within ecological communities. Future studies of food webs must incorporate parasites into their experimental and theoretical designs, and future studies of host-parasite interactions must expand beyond the focal relationship and consider the ecology of both the host and parasite." (Author)] Address: <https://scholarworks.uark.edu/cgi/viewcontent.cgi?article=5706&context=etd>

22489. Hojaji, M.; Soufivand, M.R.; Lavimi, R. (2021): An experimental comparison between wing root and wing tip corrugation patterns of dragonfly wing at ultra-low Reynolds Number and high angles of attack. *Journal of Applied and Computational Mechanics* 8(4): 1176-1185. (in English) ["This study presents the empirical comparison between the wing root and wingtip corrugation patterns of dragonfly wing in the newly-built wind-tunnel at the IAUN. The main objective of the research is to investigate the effect of wingtip and wing root corrugations on aerodynamic forces and the flow physics around the cross-sections at $Re=10000$ and the angle of attack of 0° to 30° . For this aim, two cross-sections are extracted from wing root (first cross-section) and wingtip (second cross-section). The first cross-section has corrugations with higher density than the second cross-section. The comparison of lift coefficients obtained from pressure distribution and force measurement indicates an acceptable agreement between the results. Also, Particle Image Velocity (PIV) technique is used to measure the velocity field. The

results show that all corrugation patterns do not have positive effects on the aerodynamic forces. The second cross-section can generate considerable aerodynamic forces compared to the first cross-section. At $\alpha=25^\circ$, the lift coefficient generated by the second cross-section is 90% and 25% higher than that of the first cross-section and the flat plate, respectively. Based on results, corrugations in the wing root's vicinity have a crucial role in the solidity of insect wings; however, corrugations in the wing tip's vicinity play a vital role in generating adequate aerodynamic forces. The comparison conducted in the current research reveals the second cross-section is an appropriate replacement for the flat plate in MAVs due to generating more essential forces for flight." (Authors)] Address: Hojaji, M., Dept of Engineering, Najafabad Branch, Islamic Azad Univ., Najafabad, Iran

22490. Komaki, S. (2021): Widespread misperception about a major East Asian biogeographic boundary exposed through bibliographic survey and biogeographic meta-analysis. *Journal of Biogeography* 48(9): 2375-2386. (in English) ["Aim: The Watase line, a major biogeographic boundary between Palearctic and Oriental realms in East Asia, is generally drawn between Akuseki and Kodakara Islands of the Northern Ryukyu archipelago, Japan. However, no evidence can be found to support the positioning of the boundary between these two tiny volcanic islands. This study aimed to confirm whether and where the biogeographical boundary should be drawn. Location: East Asia. Taxon: Land snail, ant, dragonfly, butterfly, amphibian, reptile, bird and plant. Methods: A bibliographic survey was carried out to revisit an original definition of the Watase line and its usage. Biogeographic and meta-analyses were also performed using a Simpson dissimilarity index calculated from published distribution data to test whether and where any biogeographic boundary exists. To ensure the validity of the study design, similar surveys and analyses were conducted in another region of Southern Ryukyu, where a reliable biogeographic boundary has been proposed as a positive control. Results: The bibliographic survey showed that the Watase line had been described without specifying the precise position. No revised definition has been proposed for the boundary to date. Biogeographic analyses do not support the existence of a boundary between Akuseki and Kodakara Islands. Meanwhile, the presence of a boundary in Southern Ryukyu was endorsed by both the bibliographic survey and biogeographic analyses, supporting the validity of this study's design. Main conclusions: This study revealed that the major biogeographic boundary is widely used with deviations from the original definition. Presumably, ideas based on inappropriate evidence, such as the distribution of a symbolic species and unpublished data, have been referred to without being questioned and led to the current widespread misunderstanding. Misunderstandings like these could occur at any biogeographic boundaries around the world, and thus, systematic reviews of all boundaries are needed for an appropriate understanding of biodiversity." (Author)] Address: Komaki, S., Division of Biomedical Information Analysis, Iwate Tohoku Medical Megabank Organization, Iwate Medical University, Yahaba, Japan. E-mail: komaki@iwate-med.ac.jp

22491. Liu, C.; Du, R.; Li, F.; Sun, J. (2021): Bioinspiration of the vein structure of dragonfly wings on its flight characteristics. *Microscopy Research and Technique* 85(3): 829-839. (in English) ["Dragonflies have excellent flight characteristics, which are inextricably related to the characteristics of their wings. Their wings not only support a variety of loads during flight but also maintain high-efficiency flight characteristics. In this study, the forewing of *Pantala flavescens* was

used as a research object to explore the microstructure of the surface, cross section, and the vein distribution. Three-dimensional models of three different structures of the forewing vein, including an oval-shaped hollow tube, a circular hollow tube, and a circular solid tube, were established. Fluid dynamics analysis of these three forewing models under different angles of attack during gliding was carried out by FLUENT software, and subsequently, the influence of the dragonfly forewing vein structure on its flight characteristics was analyzed. The numerical simulation results indicated that the vein structure has a considerable influence on the lift, drag, and lift-drag ratio of the *P. flavescens* forewing. It was indicated that among the tested models, the forewing model with oval-shaped hollow tubular veins has better flight efficiency and aerodynamic characteristics. The results of this study may provide the basis for a novel bionic concept of flapping wing microaircraft design." (Authors)] Address: Sun, Jiyu, Key Lab. of Bionic Engineering (Ministry of Education), Jilin University, Changchun 130022, China. Email: sjy@jlu.edu.cn

22492. Mahfouf, N.; Khettabi, Z. (2021): Révision sur les sous ordres des odonate (Anizoptère; Zygoptère) dans sept régions de l'Algérie (Bejaia, Seybous, Zéralda, Biskra, Touggourt, Chott malghir et Oum-el Bouaghi). MSc. thesis, *Ecologie & Environnement, Université Oum El Bouaghi*: 62 pp. (in French, with English summary) ["Studies conducted in seven different regions (Alger, Béjaia, Annaba, Oum El Bouaghi, Biskra, Touggourt and Melghir) of Algeria have identified a very rich and diverse fauna of Odonata. The total fauna is distributed in much specimens divided into 7 families and 13 species in Zéralda, 18 in Béjaia and the highest in Sybousse with 34 species. The same fauna is made up of specimens divided over 4 families and 9 species in Oum El Bouaghi, while the Biskra region shows the weakness and diversity with specimens distributed in 3 families and 6 species. Touggourt watch too a specimens splitted into 3 families and 12 species but Chott Melghir contains a number of specimens distributed in 3 families and 14 species." (Authors)] Address: <http://bib.univ-oeb.dz:8080/jspui/bitstream/12345-6789/11430/1/memoire-master-pdf-2021.pdf>

22493. Ryu, S.; Zhang, H.; Salcedo, M.; Socha, J.J.; Pass, G. (2021): Circulatory flow patterns in a dragonfly wing elucidated from a microfluidic model. *Bulletin of the American Physical Society. 74th Annual Meeting of the APS Division of Fluid Dynamics. Sunday–Tuesday, November 21–23, 2021; Phoenix Convention Center, Phoenix, Arizona. Session P13: Biological Fluid Dynamics: Flying Insects. 4:05 PM–6:41 PM, Monday, November 22, 2021, Room: North 127 ABC*: (in English) [Verbatim: "Insect wings consist of a network of tubular veins and thin inter-connected membrane. Within these veins are hemolymph (blood), tracheal branches (oxygen delivery), and nerves connected to vital sensory organs on the wing. Since blood flow supplies water and nutrients to the sensory organs and other tissues and removes waste products, veins and hemolymph flow are crucial for stability, flexibility, and functionality of the delicate wing blade. However, the relationship of wing venation on hemolymph circulation remains poorly studied. Previous experiments tracking hemocytes (blood cells) in transparent veins of living specimen gave some insight into some flow patterns. To investigate detailed hemodynamics in complex wing venation, we used photo/soft-lithography to create a microfluidic wing vein model of *Anax junius*. Blood flow was simulated by injecting dyed water into the veins using a range of flow velocities and input locations. Microbeads were used to characterize local flow patterns within the veins. Visualized flow patterns suggested that advection dominates near the wing

base, whereas diffusion dominates toward the wing tip. Biomimetic wing vein devices allow for further investigation into the insect wing's unique circulatory system and transport phenomena." (Authors)] Address: not stated

22494. Simonova, M.A. (2021): Ecological and faunal overview of dragonflies (Insecta: Odonata) of Krasnodar. Ecology and Nature Conservation Ecosystems of southern regions of Russia and adjoining areas. Materials of the XXXIV Interregional scientific-practical conference. Krasnodar, 20 May 2021: 57-59. (in Russian) ["The species composition of dragonflies in Krasnodar has been studied. A total of 14 species ..., have been identified. The aerial analysis of the odonto-fauna of Krasnodar. Krasnodar identified 6 different habitat groups." (Author/DeePL) *Crocothemis erythraea*, *Orthetrum cancellatum*, *O. coerulescens*, *Sympetrum flaveolum*, *S. pedemontanum*, *Libellula depressa*, *Anaciaeschna isosceles*, *Aeshna crenata*, *Anax parthenope*, *Lestes virens*, *L. dryas*, *Calopteryx splendens*, *C. virgo*, *Ischnura elegans*. https://www.kubsu.ru/sites/default/files/faculty/sbornik_21_0.pdf] Address: Simonova, M.A., Kuban State University, 350040, Krasnodar, Stavropolskaja Str., 149, Russia

22495. Stevens, S.; Reading, R.P. (2021): Breeding Hudsonian Emerald (*Somatochlora hudsonica*, Hagen) under human care. Final Report, 2021, Butterfly Pavilion, 6252 East 104th Avenue, Westminster, CO 80020: 10 pp. (in English) [<https://assets.bouldercounty.gov/wp-content/uploads/2022/01/2021/breeding-dragonflies.pdf>] Address: Butterfly Pavilion, 6252 East 104th Avenue, Westminster, CO 80020, USA

22496. Strausfeld, N.J. (2021): The lobula plate is exclusive to insects. *Arthropod Structure & Development* Volume 61, March 2021, 101031: (in English) ["Highlights: • Six specific neuroanatomical traits define the holometabolan lobula plate. • Neuropils claimed as lobula plates in malacostracans do not share any of those traits. • Traits identified in Odonata correspond to three traits defining holometabolan lobula plates, suggesting possible homology. Abstract: Just one superorder of insects is known to possess a neuronal network that mediates extremely rapid reactions in flight in response to changes in optic flow. Research on the identity and functional organization of this network has over the course of almost half a century focused exclusively on the order Diptera, a member of the approximately 300-million-year-old clade Holometabola defined by its mode of development. However, it has been broadly claimed that the pivotal neuropil containing the network, the lobula plate, originated in the Cambrian before the divergence of Hexapoda and Crustacea from a mandibulate ancestor. This essay defines the traits that designate the lobula plate and argues against a homologue in Crustacea. It proposes that the origin of the lobula plate is relatively recent and may relate to the origin of flight." (Author)] Address: Strausfeld, N.J., Dept of Neuroscience, University of Arizona, Tucson, AZ, USA. Email: fly-brain@neurobio.arizona.edu

22497. Amrulloh, M.F.F.; Kamaludin, K.; Atini, B.; Priyam-bodo, H.Y.; Moi, M.Y. (2022): Diversity, evenness, and species richness of aerial insects in dry land of Kefamenanu, North Central Timor, East Nusa Tenggara. *Advances in Tropical Biodiversity and Environmental Sciences* 6(3): 98-106. (in English) ["This research was conducted to determine the diversity, richness, and evenness of aerial insects based on habitat characteristics in the dry land of Kefamenanu city, North Central Timor, East Nusa Tenggara. The research was conducted on three types of habitats, namely dry land, rivers, and lakes by purposive sampling method.

Sampling was done by documenting specimens in each habitat, identifying, inventorying, and analyzing quantitatively to obtain data on species diversity, species richness, and species evenness. Results revealed that aerial insects in Kefamenanu City were found in 9 orders, 25 families, 44 genera, 54 species, and 1998 individuals in three habitat types with diversity index ($H'=3.068$), evenness index ($E=0.774$), richness index ($R=6.974$), and dominance index (0.074). Aerial insects in dryland habitats are found in 8 orders, 18 families, 32 genera, 32 species, 514 individuals with diversity index ($H'=2.735$), evenness index ($E=0.789$), richness index ($R=4.966$), and dominance index (0.092). Aerial insects in river habitat found 7 orders, 20 families, 40 genera, 47 species, and 792 individuals with diversity index ($H'=3.205$), evenness index ($E=0.833$), richness index ($R=6.892$), and dominance index (0.075). Aerial insects in the lake habitat found 8 orders, 18 families, 35 genera, 39 species, 692 individuals with diversity index ($H'=2.906$), evenness index ($E=0.793$), richness index ($R=5.811$), and dominance index (0.083)." (Authors) 19 odonate species are listed.] Address: Amrulloh, M.F.F., Biology Education, Faculty of Education, Timor University, Jl Kefamenanu KM.09, Sasi, Kefamenanu, Timor Tengah Utara, Nusa Tenggara Timur, Indonesia - 85614. Email: mohamadfajar@unimor.ac.id

22498. Doer, D.; Seif, J.; Ueber, T. (2022): Jahresbericht 2021. Landschaftserhaltungsverband Bodenseekreis e.V., 88045 Friedrichshafen: 58pp (in German) [*Coenagrion mercuriale*; https://www.bodenseekreis.de/fileadmin/03_umwelt_landnutzung/landschaftserhaltungsverband/downloads/LEV_BSK_Jahresbericht_2021_druckversion.pdf] Address: Landschaftserhaltungsverband Bodenseekreis e.V., 88045 Friedrichshafen, Germany

22499. Hafeez, F.; Naeem-Ullah, U.; Akram, W.; Arshad, M.; Iftikhar, A.; Naeem, A.; Saleem, M.J. (2022): Habitat characterization of *Aedes albopictus*. *International Journal of Tropical Insect Science* 42: 1555-1560. (in English) ["*Aedes albopictus*, ever since, its distribution from country to country, has been known to transmit many viruses (like dengue) to human. The vector possesses enormous plasticity in habitat adoptability. The distribution pattern revealed that maximum population was collected from rural areas during rainy season, at temperature 31-40 °C and RH 41-50 %. The population was collected from clear water having plastic bottom. The small quiet places are more productive breeding places having EC (= 1000 µS/m), TDS (= 500 ppm) and DO (2-5 mg/l). The larval population was mostly established in the areas having exposed shady conditions and have less distance from human habitation. Flora such as *spirogyra*, grasses and algae, and predators such as damselfly, water bugs and beetles showed affinity with *Ae. albopictus* population. Stagnant clear water bodies are considered as potential breeding sites for dengue vector." (Authors) References to Odonata are made.] Address: Hafeez, F., Entomological Research Institute, Ayub Agricultural Research Institute, Faisalabad, Pakistan

22500. Mahmoud, M.M.; Younes, A.A.; El-Sherif, H.A.; Gawish, F.A.; Habib, M.R.; Kamel, M. (2022): Predicting the habitat suitability of *Schistosoma* intermediate host *Bulinus truncatus*, its predatory aquatic insect Odonata nymph, and the associated aquatic plant *Ceratophyllum demersum* using MaxEnt. *Parasitology Research* 121: 205-216. (in English) ["Schistosomiasis is one of the most important parasitic diseases in tropical and subtropical areas. Its prevalence is associated with the distribution of freshwater snails, which are their intermediate hosts. Thus, control of freshwater snails

is the solution to reduce the transmission of this disease. This will be achieved by understanding the relationship between the snails and their habitats including natural enemies and associated aquatic plants as well as the factors affecting their distribution. In this study, Maximum Entropy model (MaxEnt) was used for mapping and predicting the possible geographic distribution of *Bulinus truncatus* snail (the intermediate host of *Schistosoma haematobium*), Odonata nymph (predatory aquatic insect), and *Ceratophyllum demersum* (the associated aquatic plant) in Egypt based on topographic and climatic factors. The models of the investigated species were evaluated using the area under receiver operating characteristic curve. The results showed that the potential risk areas were along the banks of the Nile River and its irrigation canals. In addition, the MaxEnt models revealed some similarities in the distribution pattern of the vector, the predator, and the aquatic plant. It is obvious that the predictive distribution range of *B. truncatus* was affected by altitude, precipitation seasonality, isothermality, and mean temperature of warmest quarter. The presence of *B. truncatus* decreases with the increase of altitude and precipitation seasonality values. It could be concluded that the MaxEnt model could help introducing a predictive risk map for *Schistosoma haematobium* prevalence and performing better management strategies for schistosomiasis." (Authors)] Address: Mahmoud, Marwa, Dept of Medical Malacology, Theodor Bilharz Research Institute, Giza, Egypt

22501. Paz, L.E.; Rodriguez, M.; Gulloc, B.; Rodrigues Capitulo, A. (2022): Impacts of urban and industrial pollution on functional traits of benthic macroinvertebrates: Are some traits advantageous for survival? *Science of The Total Environment* Volume 807, Part 2, 10 February 2022, 150650: (in English) ["Highlights: • Urbanization and industrialization decrease functional richness and Rao diversity. • Gills, grazers, and crawlers are sensitive traits to these disturbances. • Spiracles, resistance forms and cylindrical body are related to these disturbances. Abstract: Urbanization and industrialization produce substantial changes in biodiversity and in the functionality of ecosystems. However, little is known about how anthropic pressures might drive these changes and about their functional consequences. We aimed to determine the responses of macroinvertebrate biological traits to urban and industrial pollution and assess the impacts of these disturbances on the functional diversity of these assemblages. We sampled benthic macroinvertebrates in 27 sites of four basins with different urban disturbance gradients (rural, peri-urban, and urban-industrial), among them the Matanza-Riachuelo River, one of the most polluted basins in the world. We classified macroinvertebrates into 11 traits and 56 categories. Then, we performed an RLQ analysis and computed functional richness, evenness, divergence and Rao diversity indexes for each site and community weighted means for each trait category. The urban and industrial sites (mainly low and middle Matanza-Riachuelo River Basin) showed high concentrations of ammonium, SRP, conductivity, COD, BOD, and organic matter, as well as the lowest values of DO. The functional richness and Rao index of these sites were significantly lower than that of the other sites. Macroinvertebrate traits associated with urban and industrial sites were aerial respiration (spiracles), forms of resistance (eggs or statoblast), cylindrical body shape, oviparity, feeding on macroinvertebrates, and full water swimmers. These traits potentially enabled tolerant species persistence at polluted sites while gills, grazers, and crawlers were sensitive to these disturbances. Urban and industrial activities influence biological traits, producing the disappearance or dominance of certain traits in macroinvertebrate assemblages. As a consequence,

extreme pollution caused predictable trait-based community changes resulting in reduced functional diversity, and potentially altered the ecosystem function." (Authors)] Address: Paz, L.E., Instituto Multidisciplinario sobre Ecosistemas y Desarrollo Sustentable, Universidad Nacional del Centro de la Provincia de Buenos Aires, CONICET, Campus Universitario, Paraje Arroyo Seco s/n, Tandil 7000, Buenos Aires, Argentina. Email: estefypaz15@gmail.com

22502. Sial, M.U.; Majeed, M.Z.; Atiq, A.; Farooq, T.; Aatif, H.M.; Jaleel, W.; Khan, S.; Akbar, R.; Zaman, M.; Saeed, R.; Ali, Y.; Saleh, M.; Ullah, F.; Khan, K.A.; Ghmrah, H.A. (2022): Differential efficacy of edaphic traps for monitoring arthropods diversity in subtropical regions. *Journal of King Saud University – Science* 34 (2022) 101686: 7 pp. (in English) [Installation of traps in the agricultural field is an economically important and cheaper technique to observe arthropods diversity. Cost-effective ecological monitoring of arthropods by traps has been gaining interest in the field of environmental entomology since last few decades. This study explains the effectiveness of four different types of traps (pitfall, yellow-sticky, pan and barrier traps) to monitor the arthropod diversity in summer and winter seasons. These traps were installed in different mango orchards located in Punjab, Pakistan. diversity of captured arthropods was 1.5 times higher in summer than in winter season. However, among the traps, pitfall traps were most effective than others for trapping edaphic arthropods in both seasons. The pan traps were found most effective in the summer season, while sticky traps in the winter season. The pitfall traps exhibited highest taxa richness index values (8.00 for summer and 5.00 for winter season), while the lowest values were recorded for barrier traps (5.00 for summer and 3.00 for winter season). Moreover, the pitfall were the most effective traps for the capture or collection of Arachnida, Coleoptera, Hymenoptera, Lepidoptera, Orthoptera and other arthropods. The PVC barrier and sticky traps were found most effective for Dipteran and Hemipteran's insects, respectively, and hence, are recommended for the ecological monitoring of these arthropod groups in future studies. ... Pan trap type was most effective for the capture of Odonata order ($F = 1.89$; $P = 0.085$)."] (Authors)] Address: Sial, M.U., Institute of Plant Protection, Muhammad Nawaz Shareef University of Agricultural, Multan, Pakistan

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22503. Apriani, N.; Maritsa, H.U.; Riany, H. (2023): Identifikasi Tingkat Serangan Serangga Penggerek (*Hypothenemus hampei*) Taman Kopi dan musuh Alaminya Nur Apriani, Hasna UI Maritsa, Hesti Riany [Identification of the attack level of borer insects (*Hypothenemus hampei*) in coffee gardens and their natural enemies]. *Organisms* 3(2): 8 pp. (in Indonesian, with English summary) ["*H. hampei* is the main pest of coffee plants. *H. hampei* uses coffee fruit and beans as a shelter, lay eggs, eats, reproduces and metamorphoses. This causes damage to coffee plants thereby reducing the quality of the coffee. The aim of this research was to determine the level of attack by the *Hypothenemus hampei* insect on coffee plants and identify its natural enemies. The method for measuring the level of attack was done by counting the coffee cherries that are attacked by the *Hypothenemus hampei* pest on 3 branches of the coffee tree and the enemy and calculating it using the pest attack intensity formula. Natural enemies were collected by direct observation and identified by matching their morphological characteristics with reference books. The percentage of *H. hampei* pest attacks on Liberica Coffee reached 12.35-61.97%, while the percentage of *H. hampei* pest attacks on Robusta Coffee reached

5.83-35.48%. The natural enemies found were weaver ants (*Oecophylla smaragdina*), wolf spiders (*Pardosa pseudoannulata*), and dragonflies (*Neurothemis fluctuans*)." (Authors)] Address: Apriani, N., Biologi, Fakultas Sains dan Teknologi, Universitas Jambi, Indonesia. Email: hestiriany@uinjambi.ac.id

22504. Babik, W.; Dudek, K.; Marszalek, M.; Palomar, G.; Antunes, B.; Sniegula, S. (2023): The genomic response to urbanization in the damselfly *Ischnura elegans*. *Evolutionary Applications* 16: 1805-1818. (in English) ["The complex and rapid environmental changes brought about by urbanization pose significant challenges to organisms. The multifaceted effects of urbanization often make it difficult to define and pinpoint the very nature of adaptive urban phenotypes. In such situations, scanning genomes for regions differentiated between urban and non-urban populations may be an attractive approach. Here, we investigated the genomic signatures of adaptation to urbanization in *Ischnura elegans* sampled from 31 rural and urban localities in three geographic regions: southern and northern Poland, and southern Sweden. Genome-wide variation was assessed using more than 370,000 single nucleotide polymorphisms (SNPs) genotyped by ddRADseq. Associations between SNPs and the level of urbanization were tested using two genetic environment association methods: Latent Factors Mixed Models and BayPass. While we found numerous candidate SNPs and a highly significant overlap between candidates identified by the two methods within the geographic regions, there was a distinctive lack of repeatability between the geographic regions both at the level of individual SNPs and of genomic regions. However, we found "synapse organization" at the top of the functional categories enriched among the genes located in the proximity of the candidate urbanization SNPs. Interestingly, the overall significance of "synapse organization" was built up by the accretion of different genes associated with candidate SNPs in different geographic regions. This finding is consistent with the highly polygenic nature of adaptation, where the response may be achieved through a subtle adjustment of allele frequencies in different genes that contribute to adaptive phenotypes. Taken together, our results point to a polygenic adaptive response in the nervous system, specifically implicating genes involved in synapse organization, which mirrors the findings from several genomic and behavioral studies of adaptation to urbanization in other taxa." (Authors)] Address: Babik, W., Fac. of Biology, Institute of Environmental Sciences, Jagiellonian University, Gronostajowa 7, Kraków 30-387, Poland. Email: wieslaw.babik@uj.edu.pl

22505. Beatty, C.D.; Rashni, B.; Cordero-Rivera, A.; Marinov, M. (2023): *Nikoulabasis roseosticta*, sp. nov. from Fiji (Odonata: Coenagrionidae). *Zootaxa* 5383(2): 135-152. (in English) ["*Nikoulabasis roseosticta* sp. nov. (holotype male, Fiji, Vanua Levu Island, Navuturerega creek, 6-VIII-2009, Christopher Beatty leg.) is erected as a new taxon. Illustrations of key characters and a distribution map are provided." (Authors)] Address: Beatty, C.D., Program for Conservation Genomics, Dept of Biology, Stanford University, Stanford, California 94305, USA. Email: cdbeatty@stanford.edu

22506. Bedjanič, M., 2023. Observation of heterospecific mating attempt by blue chaser *Libellula fulva* Müller, 1764 and broad-bodied chaser *L. depressa* Linnaeus, 1758 (Odonata: Libellulidae). *Natura sloveniae* 25(2): 53-60. (in English, with Slovene summary) [A successful copula formation between a *L. fulva* male and a *L. depressa* female was documented photographically on 23. 6. 2022 along a small stream at the Natura 2000 site Licenca pri Polčanah in NE Slovenia.

This represents the first record of an anomalous mating attempt with copula formation between the species involved. Their distribution in Slovenia as well as syntopic and syntemporal observations in the country are presented and briefly discussed, as are the site-specific factors and aged female colouration that may have contributed to the described rare attempt of heterospecific mating." (Author)] Address: Bedjanic, M., National Institute of Biology, Vecna pot 121, SI-1000 Ljubljana, Slovenia; E-mail: matjaz.bedjanic@nib.si

22507. Belahcen, K.; Chergui, B.; El Haissoufi, M.; L'Mohdi, Q.; El Alami, M.; Bennis, N. (2023): New data on biodiversity and chorology of aquatic insects of Tazekka National Park (Middle Atlas, Morocco) I: Odonata, Coleoptera, and Hemiptera. *Transactions of the American Entomological Society* 149(3): 261-297. (in English) ["Aquatic insects play a crucial role in freshwater ecosystems, and their diversity and distribution are important indicators of ecosystem health. In this study, we present old and new faunistic and distributional data on three orders of aquatic insects (Odonata, Hemiptera, and Coleoptera) in the Tazekka National Park, located in the Eastern Middle Atlas. An annotated list of 85 species is provided, of which 53 were identified from 1023 specimens collected seasonally between summer 2018 and summer 2019 at a total of 19 sampling sites. The remaining 32 species were identified from the literature but were not captured in this study. The 85 species are classified into 47 genera and 24 families, which are divided into 8 species of Odonata, 14 species of aquatic Hemiptera, and 63 species of aquatic Coleoptera. 18 of the captured species are new to the Tazekka National Park. A chorological analysis shows that most species are essentially Mediterranean (63%), whilst those whose distribution is wider in Palearctic (25%) or extends into Nearctic, Australian, or Afrotropical regions (12%) are clearly less represented. This chorotype pattern is similar to that observed for OCH in other national parks in northern Morocco." (Authors) *Calopteryx haemorrhoidalis*, *Pyrrhosoma nymphula*, *Platycnemis subdilatata*, *Boyeria irene*, *Cordulegaster algerica*, *Onychogomphus forcipatus unguiculatus*, *O. uncutus*, *Orthetrum coerulescens*] Address: Belahcen, K., LESCIB URL-CNRST N° 18, FS, Abdelmalek Essaadi University, Tetouan, Morocco

22508. Cano-Cobos, Y.; Mendoza-Penagos, C.; Aristizábal-Botero, A.; Realpe, E. (2023): Check-list of the Odonata from the Guainía Department in Colombia, including fourteen new national records. *Odonatologica* 52(3-4): 193-217. (in English) ["The Department of Guainía, in the Colombian Amazon, has a privileged situation in terms of biodiversity, but it remained for many years as one of the least explored territories of the country. Our contribution represents the result of several years of field collecting and taxonomic work in Guainía to increase the knowledge of the odonates there. We present here the first comprehensive checklist for Guainía with 104 species reported, of which 42 are new records for the department and 14 are new records for Colombia, including the rediscovery of the genus *Hylaeonympha* Rácenis, 1968. The updated number of Odonata reported for Colombia is now 513 species." (Authors)] Address: Cano-Cobos, Yiselle, Laboratorio de Biodiversidad y Genética Ambiental, Universidad Nacional de Avellaneda, Piñeyro 1870, Avellaneda, Buenos Aires, Argentina. Email: yisellecanoc@gmail.com

22509. Cazalis, V.; Santini, L.; Lucas, P.M.; González-Suárez, M.; Hoffmann, M.; Benítez-López, A.; Pacifici, M.; Schipper, A.M.; Böhm, M.; Zizka, A.; Clausnitzer, V.; Meyer, C.; Jung, M.; Butchart, S.H.M.; Cardoso, P.; Mancini, G.; Akçakaya, H.R.; Young, B.E.; Patoine, G.; Di Marco, M. (2023): Prioritizing

the reassessment of data deficient species on the IUCN Red List. *Conservation Biology* e14139: 16 pp. (in English, with Spanish summary) ["Despite being central to the implementation of conservation policies, the IUCN Red List of Threatened Species is hampered by the 14% of species classified as Data Deficient (DD), either because information to evaluate these species' extinction risk was lacking when they were last assessed or because assessors did not appropriately account for uncertainty. With limited funds and time for reassessment, robust methods are needed to identify which DD species are more likely to be reclassified in one of the data sufficient Red List categories. Here we present a reproducible workflow to help Red List assessors prioritise reassessment of DD species, and tested it with 6,887 DD species of mammals, reptiles, amphibians, fishes, and Odonata. Our workflow provides for each DD species: (i) the probability of being classified in a data sufficient category if reassessed today, (ii) the change in such probability since last assessment, and (iii) whether the species might qualify as threatened based on the recent rate of habitat loss. Combining these three elements, our workflow provides a priority list for reassessment of species more likely to be data sufficient, thus ultimately improving knowledge of poorly known species and the comprehensiveness and representativeness of the IUCN Red List." (Authors)] Address: Clausnitzer, Viola, Heinzlstr. 3, 02826 Görlitz, Germany. E-mail: violacl@t-online.de

22510. Cerini, F.; Vignoli, L.; Blust, M.; Strona, G. (2023): Functional traits predict species co-occurrence patterns in a North American Odonata metacommunity. *Ecosphere* 14(12), e4732: 11 pp. (in English) ["The probability of occurrence of a given species in a target locality and assemblage is conditioned not only by environmental/climatic variables but also by the presence of other species (i.e., species co-occurrence). This framework, already complex in nature, becomes even more complicated if one considers the functional traits of species that, in turn, might influence the structure of metacommunities in various ways. Depending on the ecological and environmental setting, functional similarity (i.e., convergence in morphological and ecological traits) between species might either reduce their co-occurrence due to high niche overlap driving negative interactions or promote it if the similar traits are associated with local habitat suitability. Similarly, functional divergence might either promote species co-occurrence by limiting negative interactions through niche separation or reduce it through trait mediated environmental filtering. Therefore, discriminating between these alternative scenarios—predicting whether two species will tend to co-occur or not based on their traits—is extremely challenging. Here, we develop a novel protocol to tackle the challenge, and we demonstrate its effectiveness by showing that ecological species traits can predict species co-occurrence in a large dataset of North American Odonata. To this end, we first used the Hierarchical Modeling of Species Communities framework to quantify the pairwise species co-occurrence after controlling for environmental and climatic factors. [Body length, Body coloration type, Flight mode, Body color, Presence of wing pigment, Habitat openness, Aquatic habitat type, Body color pattern, Hindwing length] Then, we used machine learning to generate models which proved capable of predict accurately the observed co-occurrence patterns from species functional traits. Our approach offers a generalizable analytical framework with the potential to clarify long-standing ecological questions." (Authors)] Address: Strona, G., European Commission, Joint Research Centre, Ispra, Italy. Email: giovanni.strona@ec.europa.eu

22511. Chandran, A.V.; Rison, K.J.; Haneef, M.; Crasta,

B.R.S.; Kalathumthodi, M.R. (2023): "On the distribution of *Hemicordulia asiatica* with breeding records from the plains of Kerala, southern India. *Notulae odonatologicae* 10(2): 38-44. (in English) ["*H. asiatica* Selys, 1878, is one of only two species of Corduliidae occurring in India and is very rarely encountered. Here, we compile the records of the species from India. Previous breeding records have been restricted to montane lakes and pools of mountain streams. We report its breeding from the plains for the first time. Teneral individuals were photographed and collected from domestic wells in Kerala, southern India. Our observations show that some adults of *H. asiatica* probably descend to the plains for breeding." (Authors)] Address: Chandran, A.V., Society for Odonate Studies, Velloppampil, Kuzhimattom P.O., Kottayam, Kerala, India 686533

22512. Chandran, A.V.; Raju, D.V.; Jose, S.K.; Mirza, Z.A. (2023): A new species of *Epithemis* Laidlaw, 1955 (Odonata: Libellulidae) from the Western Ghats, India. *Journal of Asia-Pacific Biodiversity* 16: 597-604. (in English) ["The monotypic genus *Epithemis* Laidlaw, 1955, is endemic to the Western Ghats and is represented by the nominate species *Epithemis mariae* (Laidlaw, 1915). *Epithemis mariae* is distributed across the Western Ghats and as part of an ongoing study, we identified a distinct population from Wayanad. Morphological and molecular data for *E. mariae* and the population from the Wayanad plateau affirm that the two are distinct taxa and allow us to describe a new species. *Epithemis wayanadensis* sp. nov. is described based on male specimens collected from Wayanad, a part of the Western Ghats in Kerala state, southern India." (Authors)] Address: Chandran, A.V., Aqua Research Lab, Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda, Thrissur, Kerala 680125, India. Email: avivekchandran2@gmail.com

22513. Craves, J.; O'Brien, D.S.; Hernandez, J. (2023): Plains Emerald (*Somatochlora ensigera*): New for Michigan. *Argia* 35(3): 34-36. (in English) ["*S. ensigera* is added to the Michigan list of Odonata based on nymphs collected in 2022 in the western Upper Peninsula." (Authors) (1): Little River southeast of the town of Wallace, ~8 km east of the Wisconsin border. (2): Kelley Creek, northwest of the town of Birch Creek and ~5.5 km east of the Wisconsin border.] Address: Craves, Julie, Rouge River Bird Observatory, Environmental Interpretive Center, University of Michigan-Dearborn, Dearborn, MI 48128, USA. Email: nannothemis@gmail.com

22514. De, K.; Dey, D.; Shruti, M.; Uniyal, V.P.; Adhikari, B.S.; Johnson, J.A.; Hussain, S.A. (2023): β -diversity of odonate community of the Ganga River: partitioning and insights from local and species contribution. *Wetlands Ecology and Management* 31: 899-912. (in English) ["The β -diversity studies reveal diversity patterns at a spatial scale and strengthen the process of regional diversity conservation. The aim of the current study was to understand the pattern of local contribution to β -diversity (LCBD) and species contribution to β -diversity (SCBD) of odonates in the Ganga River. We selected 27 sites along the banks of the Ganga River for the study, with an average distance between sites of 75 km, and recorded 30 species of odonate (species richness between 5 and 24) at these sites. Using β -regression analysis, we examined the impact of species richness and habitat variables on the LCBD. The LCBD was found to be negatively correlated with species richness and influenced by creeping macrophytes, water temperature, dissolved oxygen and salinity. We found that species with high SCBD scores (above 0.05) had intermediate occupancy (between 10 and 16 sites), including 5

species of dragonfly and 5 species of damselfly, and that the second-degree term the relationship between SCBD and the number of declared locations better stocked with species than in the first degree. Since the SCBD is responsible for identifying species that make the greatest contribution to β -diversity and the LCBD is responsible for identifying sites with particular combinations of species, the combined approach using both should be included for ecological assessments, river biodiversity restoration and maintenance plans." (Authors) *Ischnura rubilio*, *I. nursei*, *Brachydiplax sobrina*, *Pseudagrion rubriceps*, *P. decorum*, *Agriocnemis lacteola*, *A. pygmaea*, *A. femina*, *Brachydiplax farinosa*, *Acisoma panorpoides*, *Pantala flavescens*, *Diplacodes trivialis*, *Indothemis carnatica*, *Crocothemis servilia*, *Orthetrum pruinosum*, *O. sabina*, *O. luzonicum*, *Amphiallagma parvum*, *Ceriagrion coromandelianum*, *Rhyothemis variegata*, *Trithemis aurora*, *Brachythemis contaminata*, *Ictinogomphus rapax*, *Tramea basilaris*, *Tholymis tillarga*, *Platygomphus dolabratus*, *Anax guttatus*, *Urothemis signata*, *Neurothemis tullia*, *Rhodothemis rufa*] Address: De, K., Wildlife Institute of India, Chandrabani, Dehradun, 248001, India. Email: kritish.de@gmail.com

22515. Denck, E.; Ehlert, J.; Pinto, A.P. (2023): 150th anniversary of Alberto Santos-Dumont's birth, the father of aviation: the damselfly *Cyanallagma demoiselle* sp. nov. from the Brazilian Atlantic Forest (Odonata: Coenagrionidae). *International Journal of Odonatology* 26: 212-223. (in English) ["*Cyanallagma demoiselle* sp. nov. (holotype male deposited in DZUP: Brazil, São Paulo State, Cananéia, Ilha do Cardoso State Park), a new small greenish blue and black damselfly, is described, illustrated, and diagnosed based on males and females from the southeastern Atlantic Forest. This new coenagrionid is named after one of the most celebrated projects, the Demoiselle 20 or libellule aircraft, designed by the Brazilian inventor and aviation pioneer Alberto Santos-Dumont (1873–1932). This is the third new odonate species discovered in the same restinga-like formation at São Paulo, and like many other odonates from this assemblage, *C. demoiselle* sp. nov., appears to be a typical inhabitant of this type of environment. Due to its sharing many characteristics with other *Cyanallagma*, the new species can be considered a chimera. Its body coloration and genital ligula are similar to those of *C. trimaculatum*, whereas its caudal appendages closely resemble those of *C. nigrinuchale*. Despite of recent advances in taxonomic knowledge about *Cyanallagma*, this study highlights the need for better understanding the morphological correspondences or homologies among the structures of caudal appendages." (Authors)] Address: Denck, Emanuella, Laboratory of Systematics on Aquatic Insects, Departamento de Zoologia, Universidade Federal do Paraná, P. O. Box 19020, 81531-980, Curitiba, PR, Brazil

22516. Dewangan, N.K.; Pang, J.; Zhao, C.; Cao, C.; Yin, B.; Weng, S.; He, J. (2023): Host and transmission route of *Enterocytozoon hepatopenaei* (EHP) between dragonfly and shrimp. *Aquaculture* 574, 739642: (in English) ["*Enterocytozoon hepatopenaei* (EHP) is a shrimp pathogen that causes huge economic losses. In the present study, the hosts of EHP were investigated using polymerase chain reaction (PCR) in an aquaculture farm located in Maoming, China. EHP was detected in *Litopenaeus vannamei*, *Penaeus monodon*, *Varuna litterata*, *Mytilopsis leucophaeata*, and three dragonfly species (*Anax parthenope*, *Pantala flavescens*, and *Ischnura senegalensis*). In the histopathological examination using hematoxylin–eosin (HE) staining, EHP spores were found in nymphs and adult dragonflies naturally infected with EHP that were collected from the shrimp farm. Fluorescence in situ hybridization (FISH) results showed a positive signal for

EHP infection in the fat body of dragonfly nymphs. Immature and mature microsporidian spores and late sporogonial plasmodium were observed in the cytoplasm of dragonfly nymphs using transmission electron microscopy (TEM). The transmission of EHP from shrimp to dragonfly nymphs was confirmed via cohabitation challenge experiments in which EHP-free dragonfly nymphs were cohabited with EHP-infected shrimp, and the transmission of EHP from dragonfly nymphs to shrimp was demonstrated via the cohabitation of EHP-infected dragonfly nymphs with EHP-free shrimp and oral administration challenge experiments. This study confirms that dragonflies can act as natural EHP hosts, and a novel EHP horizontal transmission route exists between dragonflies and shrimp." (Authors)] Address: He, J., State Key Lab. for Biocontrol, School of Life Scien., Sun Yat-sen Univ. Guangzhou 510275, PR China. Email: lsshjg@mail.sysu.edu.cn

22517. Dou, X.; Jurenka, R. (2023): Pheromone biosynthesis activating neuropeptide family in insects: a review. *Front. Endocrinol.* 14:1274750. 10 pp. (in English) ["Neuropeptides are involved in almost all physiological activities of insects. Their classification is based on physiological function and the primary amino acid sequence. The pyrokinin (PK)/pheromone biosynthesis activating neuropeptides (PBAN) are one of the largest neuropeptide families in insects, with a conserved C-terminal domain of FXPRLamide. The peptide family is divided into two groups, PK1/diapause hormone (DH) with a WFGPRLa C-terminal ending and PK2/PBAN with FXPRLamide C-terminal ending. Since the development of cutting-edge technology, an increasing number of peptides have been sequenced primarily through genomic, transcriptomics, and proteomics, and their functions discovered using gene editing tools. In this review, we discussed newly discovered functions, and analyzed the distribution of genes encoding these peptides throughout different insect orders. In addition, the location of the peptides that were confirmed by PCR or immunocytochemistry is also described. A phylogenetic tree was constructed according to the sequences of the receptors of most insect orders. This review offers an understanding of the significance of this conserved peptide family in insects." (Authors)] The study includes references to Odonata.] Address: Jurenka, R., Dept of Plant Pathology, Entomology, Microbiology Iowa State University, Ames, IA, USA. Email: rjurenka@iastate.edu

22518. Duanmu, D.; Li, X.; Huang, W.; Hu, Y. (2023): Soft finger rehabilitation exoskeleton of biomimetic dragonfly abdominal ventral muscles: Center tendon pneumatic bellows actuator. *Biomimetics* 2023, 8, 614. 16 pp. (in English) ["The development of soft robotics owes much to the field of biomimetics, where soft actuators predominantly mimic the movement found in nature. In contrast to their rigid counterparts, soft robots offer superior safety and human-machine interaction comfort, particularly in medical applications. However, when it comes to the hand rehabilitation exoskeletons, the soft devices have been limited by size and material constraints, unable to provide sufficient tensile strength for patients with high muscle tension. In this paper, we drew inspiration from the muscle structure found in the tail of dragonflies and designed a novel central tendon-based bellows actuator. The experimental results demonstrated that the central tendon-based bellows actuator significantly outperforms conventional pneumatic bellows actuators in terms of mechanical output. The tensile strength of the central tendon-based bellows actuator exceeded that of pneumatic actuators more than tenfold, while adding only 2 g to the wearable weight. This finding suggests that the central tendon-based bellows actuator is exceptionally well-suited for applications

demanding substantial pulling force, such as in the field of exoskeleton robotics. With tensile strength exceeding that of pneumatic bellows actuators, this biomimetic design opens new avenues for safer and more effective human-machine interaction, revolutionizing various sectors from healthcare to industrial automation." (Authors)] Address: Hu, Y., Dept of Orthopaedics & Traumatology, The University of Hong Kong, Hong Kong, Email: yhud@hku.hk

22519. Eckberg, J.R. (2023): Odonata associated with the Las Vegas Wash and Clark County Wetlands Park, Clark County, Nevada. *Argia* 35(3): 23-25. (in English) ["Conclusion: In total, there have been 34 species of Odonata confirmed along the Wash over the past 23 years with 19 species of dragonflies and 15 damselflies. Table 1 shows the source of where the observation came from and if observations have been made by multiple people. The diversity is similar to other natural oases in southern Nevada, such as the Ash Meadows National Wildlife Refuge (Stevens & Ballowitz 2008) which had 32 species and the Upper Muddy River (Lund & Myrup 2011) which had 39." (Author)] Address: Email: jason.eckberg@snwa.com

22520. Gamage, C.P.P.H.M.; Rathnayake, W.A.S.P.P.; Gunawardana, O.G.Y.D.; Janith, H.C. (2023): Feeding behaviour of *Orthetrum sabina sabina* from Sri Lanka. *Scientific Reports in Life Sciences* 4(3): 33-37. (in English) ["Odonata species like *Orthetrum sabina* are common species of dragonfly that are widespread in Sri Lanka from degraded open wastelands to marshes, ponds, and streams. *O. sabina* is a very fierce predator and often preys on butterflies and other odonates, and feeding on a male *Neurothemis tullia* was recorded during a field visit to Kirala Kele Sanctuary in Sri Lanka where harbors diverse numbers of odonatan species in its habitats." (Authors)] Address: Gamage, C.P.P.H.M., Dept of Forestry & Environmental Science, University of Sri Jayewardenepura, Colombo, Sri Lanka

22521. Gayathri, M.; Anand, P.P.; Vardhanan, Y.S. (2023): Visualisation of early embryos of the wandering glider, *Pantala flavescens* (Fabricius, 1798) (Odonata: Libellulidae). *Aquatic Insects* 44(4): 297-309. (in English) ["The embryonic development of *P. flavescens* is documented for the first time. In contrast to previously reported insect embryonic development, we describe the embryological development of *P. flavescens* in living conditions by focusing on its externally recognisable features, i.e., we conducted the study in a purely non-destructive manner. The entire embryonic development was completed within six to seven days. We pictured the eggs at successive embryonic developmental stages: embryogenesis starts, germband formation, segmentation, blastokinesis, appendage formation, and dorsal closure. These findings can be helpful in future studies regarding the impacts of pollutants and climate change on the early embryonic development of dragonflies." (Author)] Address: Anand, P.P., Biochemistry & Toxicology Division, Dept of Zoology, Univ. of Calicut, Thengipalam, Kerala, India. Email: anandpp633@gmail.com

22522. Gomez-Llano, M.; Boys, W.A.; Ping, T.; Tye, S.P.; Siepielski, A.M. (2023): Interactions between fitness components across the life cycle constrain competitor coexistence. *Journal of Animal Ecology* 92(12): 2297-2308. (in English) ["Numerous mechanisms can promote competitor coexistence. Yet, these mechanisms are often considered in isolation from one another. Consequently, whether multiple mechanisms shaping coexistence combine to promote or constrain species coexistence remains an open question. Here, we aim to understand how multiple mechanisms interact within and

between life stages to determine frequency-dependent population growth, which has a key role stabilizing local competitor coexistence. We conducted field experiments in three lakes manipulating relative frequencies of two *Enallagma* species to evaluate demographic contributions of three mechanisms affecting different fitness components across the life cycle: the effect of resource competition on individual growth rate, predation shaping mortality rates, and mating harassment determining fecundity. We then used a demographic model that incorporates carry-over effects between life stages to decompose the relative effect of each fitness component generating frequency-dependent population growth. This decomposition showed that fitness components combined to increase population growth rates for one species when rare, but they combined to decrease population growth rates for the other species when rare, leading to predicted exclusion in most lakes. Because interactions between fitness components within and between life stages vary among populations, these results show that local coexistence is population specific. Moreover, we show that multiple mechanisms do not necessarily increase competitor coexistence, as they can also combine to yield exclusion. Identifying coexistence mechanisms in other systems will require greater focus on determining contributions of different fitness components across the life cycle shaping competitor coexistence in a way that captures the potential for population-level variation." (Authors)] Address: Gómez-Llano, M., Dept of Environmental & Life Sciences, Karlstad Univ., Karlstad, 65188 Sweden. Email: miguel.gomez@kau.se

22523. Gorman, F. (2023): Testing for relationships between animal personality traits, activity level and voracity, and the underlying influence of body size in the dragonfly predator, *Epiplatys canis*. Senior Theses, Trinity College, Hartford, CT 2023. Trinity College Digital Repository. 40 pp. (in English) ["Animal personality, defined as among-individual variation in behavior, is taxonomically widespread, but its ecological implications remain unclear. While associations between animal personality and ecological traits have been examined, methodological shortcomings, such as lack of repeated measurements, limit the insights these studies provide. Here, I measured the repeatability of activity level and feeding rate behaviors in the nymph stage of the dragonfly predator, *Epiplatys canis*, taking 10 repeated measurements of each trait over a 10-week period. Moreover, I tested for a relationship between among-individual variation in activity level and feeding rate while accounting for the underlying influence of nymph body size. While nymph feeding rate was highly repeatable across short and long timescales (i.e., individuals exhibited differences in voracity), activity level was not correlated with voracity. This lack of relationship between activity level and voracity was likely due to the low repeatability of activity level. However, dragonfly nymph body size influenced voracity, with larger nymphs consuming more *Daphnia magna* prey. Even after accounting for the positive relationship between body size and voracity, voracity was still shown to be highly repeatable. Overall, my findings suggest the personality of dragonfly activity level may only occur over short timescales, which limits its ecological effects on predator-prey interactions. Yet, individual differences in voracity can influence predator-prey interaction strength, and thus improving our understanding of voracity drivers as an important topic for future studies." (Author)] Address: <https://digitalrepository.trincoll.edu/theses/1021>

22524. Guerzon, V.M.; Burias, N.A.R.; de la Cruz, I.N.B. (2023): Records of Odonata in the riparian system of Andanan Watershed Forest Reserve, Philippines. *Journal of*

Ecosystem Science and Eco-Governance 5(1): 15-23. (in English) ["The Odonata fauna is a good biological indicator of freshwater ecosystems. This research aims to provide a record inventory of both dragonflies and damselflies occurring in the riparian ecosystem of Andanan Watershed Forest Reserve. Field collection using sweep nets was done in three locations along the riparian area. Odonatans (n=79) were recorded belonging to 19 species, comprising 58% dragonflies and 42% damselflies. Out of 19 species recorded in the area, one species of dragonfly and six species of damselfly are endemic to the Philippines, with 36.84% endemism in the area. All dragonflies documented are ground skimmers with a high tolerance for anthropogenic disturbances in freshwater systems. The genus *Orthetrum* is relatively abundant and obtained the highest number of species. On the other hand, the genus *Euphaea* in damselflies, was recorded to have the highest abundance. The genus *Risicnemis* has the highest species richness. All species of *Risicnemis* were also reported endemic. Despite the high diversity ($H'=2.77$; $H'/H_{max}=0.94$) of the Odonata fauna in Andanan Watershed Forest Reserve, human activities and intervention were still observed around the riparian ecosystem. The results shown in the current study may be utilized as primary information to allow local conservation efforts for odonatans found in the watershed and its tributaries." (Authors) *Diplacina bolivarii*, *Orthetrum pruinosum*, *O. sabina*, *O. testaceum*, *Potamarcha congener*, *Neurothemis ramburii*, *N. terminata*, *Pantala flavescens*, *Trithemis aurora*, *T. festiva*, *Vestalis melania*, *Rhinocypha turconii*, *Euphaea amphicyana*, *E. cora*, *Pseudagrion pilidorsum*, *Coeliccia dinocerus*, *Risicnemis appendiculata*, *R. erythraea*, *R. flammea*] Address: de la Cruz. I.N.B., Dept of Biology, College of Mathematics & Natural Sciences, Caraga State Univ., Butuan City, Agusan del Norte, Philippines. Email: ibdelacruz@carsu.edu.ph

22525. Gurung, M.M.; Wangmo, T.; Phan, Q.T.; Conniff, K. (2023): First record of androchrome females of *Anax nigrofasciatus* (Odonata: Aeshnidae) from Bhutan and notes on its occurrence in Asia. *Notulae odonatologicae* 10(2): 49-55. (in English) ["Androchrome females of *A. nigrofasciatus* were recorded for the first time in Tashigang district of Bhutan. Following the observation, photographs of female androchromes were obtained from online sources including biodiversity portal websites and Google blogs from India, Nepal, and Japan for comparison." (Authors)] Address: Gurung, M.M., College of Natural Resources, Dept of Forest Science, Royal University of Bhutan, Lobesa, Punakha Bhutan, PO 13001, Bhutan. Email: wangmotashi88@gmail.com

22526. Jiang, B.; Zhang, J.; Bai, X.; Zhang, Y.; Yao, Y.; Li, J.; Yu, G.; He, S.; Sun, Y.; Mikolajewski, D.J. (2023): Genetic variation and population structure of a widely distributed damselfly (*Ischnura senegalensis*). *Archives of Insect Biochemistry and Physiology* 114(2): 14 pp. (in English) ["*I. senegalensis* is among the most widespread damselfly species in the world. Unlike dragonflies with strong migration abilities, *I. senegalensis* have limited dispersing abilities. Gene flow among *I. senegalensis* populations may be greatly influenced by anthropogenic disturbance, fragmented suitable habitats, sea straits, or even global warming. In this study, to investigate the genetic diversity of *I. senegalensis* populations, we sequenced and collected 498 cytochrome oxidase I sequences across the Old World. Haplotype network analysis showed 51 haplotypes and *I. senegalensis* could be grouped into four regions (Afrotropical region, Oriental region, main Islands of Japan, and the Ryukyu Islands), each of which contains different dominant haplotypes. Based on molecular variance analysis, we found that populations from

the Afrotropical region have quite a low gene flow with the Asian populations (except Yemen). Furthermore, rice cultivation may aid the dispersion of *I. senegalensis* in the oriental region. Populations from the Ryukyu Islands show the highest genetic diversity, which may be due to the geological separation among islands. Our results prove that *I. senegalensis* has great genetic diversity among different populations across the world." (Authors)] Address: Jiang, B., Anhui Provincial Key Laboratory of the Conservation & Exploitation of Biological Resources, College of Life Sciences, Anhui Normal University, Wuhu, China

22527. Kalkman, V.J. (2023): On the synonymy of *Agrionoptera bartola* Needham & Gyger, 1937, with *Agrionoptera sexlineata* Selys, 1879. *Notulae odonatologicae* 10(2): 56-59. (in English) ["*A. bartola* was described by Needham & Gyger 1937 based on a female from an unknown locality without a holotype being designated. Since its description no further information has become available. A comparison of the original description with specimens of *A. sexlineata* failed to produce meaningful characters, apart from a size difference, separating the two. *A. bartola* is therefore considered a junior synonym of *A. sexlineata*." (Author)] Address: Kalkman, V.J., Natural Biodiversity Center, Postbus 9517, 2300 RA Leiden, The Netherlands. E-mail: kalkman@naturalis.nl

22528. Kapadi, P.; Ram, M.; Sahu, A.; Koparde, P.; Jhala, L.S. (2023): Odonata assemblage of the Gir National Park with three additional records for Gujarat state, India. *Notulae odonatologicae* 10(2): 31-37. (in English) ["The Gir National Park, which is home to the world's Asiatic lions (*Panthera leo persica*), comprises dry deciduous forests that are intersected by rivers and reservoirs. From June to October 2021, we conducted a study documenting the odonates in the Park. In total, we recorded 48 species from the study area. We provide an annotated list of odonates found in the Gir National Park and compare our findings with other lists. *Gomphidia t-nigrum*, *Macromia cingulata*, and *Libellago indica* were observed for the first time in Gujarat state, India." (Authors)] Address: Ram, M., Deputy Conservator of Forests, Wildlife Division, Sasan-Gir, Junagadh – 362 135, Gujarat, India. Email: mrlegha@gmail.com

22529. Kashyap, O.N.; Madhu, P. (2023): Study of flow around bio-inspired corrugated aerofoil at different angle of attacks in low Reynolds number regime. *AIP Conf. Proc.* 2399, 030031: 9 pp. (in English) ["MAVs operate in the region of low Reynolds-Number i.e 8000-10000. The use of scaled down models of traditional NACA aerofoil for the same have proven to be ineffective. This can be resolved by bio-mimicking the corrugated aerofoil structure found in the wings of the insects like Locusts and Odonata. The corrugated aerofoils can delay the flow separation and give higher lift to drag ratio than the traditional symmetric aerofoils at higher angle of attacks in region of low Reynolds Number, thus facilitating complex maneuverability. Keeping this as the objective of study, simulation analysis of flow over three different models of bio-inspired corrugated aerofoil at low Reynolds Number of 8000 has been carried out by varying the height and position of the corrugations. From this study it is evident that, by changing the height and position of the corrugations, the flow remains attached to the surface of the aerofoil at higher angles of attacks and delaying stall by limiting flow recirculation to only 0.3%C from the trailing edge, indicating stable flight during complex maneuvers and MAVs when implemented." (Authors)] Address: Kashyap, O.N., Mechanical Dept, BNM Institute of Technology, Karnataka, India. Email: omkarnkashyap@gmail.com

22530. Kathan, B. (2023): Larvalhabitate der Gestreiften Quelljungfer *Cordulegaster bidentata* im Raum Tübingen: Bestandsveränderungen, Umweltassoziationen und ein Methodentest. MSc thesis, Mathematisch-Naturwissenschaftlichen Fakultät der Eberhard Karls Universität Tübingen: 110 pp. (in German) ["Due to the very large populations, especially in the south of the country, Germany bears a special responsibility for the protection of *C. bidentata*, which is listed in the Habitats Directive as a character species for tufa springs. However, the lack of standardization of the larval recording method and the underrepresentation in routine dragonfly mapping results in incomplete knowledge about their current distribution and thus the degree of threat. Above all, anthropogenic changes to the source ecosystems and longer periods of drying as a result of climate change are considered to be the main causes of danger. Suitable habitats may already be rare regionally, which means that the distribution is viewed as heterogeneous, especially depending on the geology. The aim of the work was to contribute to a better understanding of the local distribution and threat using a universally applicable standard method and the assessment of the status of the target species in the Tübingen area. In 2022, more than 100 spring rivulets were examined for larvae between May and December and around 30 environmental parameters were recorded. In addition, a comparison of the presence/absence of the larvae from the years 2001 and 2022 was carried out, in which exactly the same spring rivulets (comparison bodies of water) were examined in order to be able to determine and interpret changes in distribution. In addition, additional habitats were sampled in order to be able to generate a more comprehensive picture (additional water bodies) and a principal component analysis was used to determine whether relevant environmental parameters correlated with both the presence of the larvae and the mean number of larvae per spring stream as response variables. In 2022, a total of 806 larvae of *C. bidentata* and 38 larvae of *C. boltonii* were detected in 65 of 78 water-bearing spring rivulets, of which 760 and 33 were in the comparison waters and 40 and 5 in the additional waters. Positive evidence was found in 28 habitats in which no larvae were found by H. Henheik in 2001. In 2001, Henheik recorded a number of 248 larvae that was 3.3 times smaller, with a time expenditure of around 2.5 times less. In 2022, only the suitability of isolated habitats was medium or high, as was the abundance of larvae. More than 50% of the rivulets exhibited anthropogenic disturbances. The probability of colonization or presence of the larvae correlated significantly with the first principal component associated with the habitat suitability and size (proportion of suitable flow stretches, proportion of fine debris, absolute length of the flow stretch), while the mean number of larvae across all sample locations of a spring stream correlated significantly with the first main component also with Rot.PC2, which was associated with the specific flow parameters "flow speed, number of impairments, stone content and continuity of the water flow". The method tested in this work was successfully established as a potential, universally applicable, future standard method because, depending on the length of the habitat, it proved to be very effective with up to 10 sampling sites with a sampling duration of 7 minutes each. A maximum of 10 larvae per sampling site and 39 larvae per spring stream were recorded. To save time and money, the number of sample sites for qualitative verification using identical methodology could also be reduced to 5. As measures to protect species, the dismantling of the pipework and stone frames is recommended and the use of optimal flow obstacles or the creation of new, flooded habitats using solar-powered deep water pumps are discussed. Future mapping of *C. bidentata* larvae, both in the study area and in principle, should include population genetic analyzes in order to be able to examine the genetic

diversity and the range of action of the species. In the appendix, the work contains detailed raw data tables with information on all relevant recorded variables per spring stream, including data on the parallel recorded occurrences of the fire salamander (*Salamandra salamandra*) as well as sketches of potentially ideal flow obstacles for testing and further development." (Author/Google translate)] Address: https://www.researchgate.net/publication/373101625_Larvalhabitate_der_Gestreiften_Quelljungfer_Cordulegaster_bidentata_im_Raum_Tubingen_Bestandsveränderungen_Umweltassoziationen_und_ein_Methodentest

22531. Kipping, J.; Clausnitzer, V.; Dijkstra, K.-D.B. (2023): The highlands and escarpment of Angola as an endemism hotspot for African dragonflies and damselflies (Insecta: Odonata). *Namibian Journal of Environment* 8: 173-186. (in English) ["The plateaus and escarpments of Angola are a major centre of Odonata endemism in Africa, rivalling and possibly surpassing the highlands of Ethiopia and South Africa. We discuss 34 likely endemic species and 8 near-endemics found in Angola's highland area. Remarkably, 20 of these endemics and near-endemics do not occur either along the western escarpment or on the high central plateau, but on the lower sandy plateaus farther east. Despite the western scarp having traditionally received much scientific attention, the first odonatological discoveries were made there only recently. Of the 42 species of interest discussed here, the taxonomy of 21 of them has yet to be fully resolved. Furthermore, many regions, particularly in northeastern Angola, are still to be explored." (Authors)] Address: Kipping, J., BioCart Ökologische Gutachten, Leipzig, Germany. Email: biocart-kipping@web.de

22532. Knowles, S.; Dennis, M.; McElwain, A.; Leis, E.; Richard, J. (2023): Pathology and infectious agents of unionid mussels: A primer for pathologists in disease surveillance and investigation of mortality events. *Veterinary Pathology* 60(5): 510-528. (in English) ["Freshwater mussels are one of the most imperiled groups of organisms in the world, and more than 30 species have gone extinct in the last century. While habitat alteration and destruction have contributed to the declines, the role of disease in mortality events is unclear. In an effort to involve veterinary pathologists in disease surveillance and the investigation of freshwater mussel mortality events, we provide information on the conservation status of unionids, sample collection and processing techniques, and unique and confounding anatomical and physiological differences. We review the published accounts of pathology and infectious agents described in freshwater mussels including neoplasms, viruses, bacteria, fungi, fungal-like agents, ciliated protists, Aspidogastrea, Digenea, Nematoda, Acari, Diptera, and Odonata. Of the identified infectious agents, a single viral disease, *Hyriopsis cumingii* plague disease, that occurs only in cultured mussels is known to cause high mortality. Parasites including ciliates, trematodes, nematodes, mites, and insects may decrease host fitness, but are not known to cause mortality. Many of the published reports identify infectious agents at the light or ultrastructural microscopy level with no lesion or molecular characterization. Although metagenomic analyses provide sequence information for infectious agents, studies often fail to link the agents to tissue changes at the light or ultrastructural level or confirm their role in disease. Pathologists can bridge this gap between identification of infectious agents and confirmation of disease, participate in disease surveillance to ensure successful propagation programs necessary to restore decimated populations, and investigate mussel mortality events to document pathology and identify causality." (Authors)] Address: Knowles,

Susan, U.S. Geological Survey, Madison, WI, USA. Email: sknowles@usgs.gov

22533. Koehnsen, A.; Gorb, S.N.; Büsse, S. (2023): A switchable joint in the head of dragonfly larvae (Insecta: Odonata) as key to the multifunctionality of the prehensile labial mask. *Journal of Experimental Zoology Part A: Ecological and Integrative Physiology* 339(7): 644-654. (in English) ["Odonata larvae capture prey by rapid protraction of a raptorial mouthpart, based on a modified labium. Yet, in insects with biting-chewing mouthparts, the labium has an essential role in food handling. These two distinct functions -prey capturing and handling—lead to a mechanical problem in Odonata larvae: while the labium is always protracted in a straight line during prey capture, food handling requires more dexterity. In this study, we investigate the role of the labium in the feeding process and analyse the mechanics of the labial joints in the larva *Anax imperator*. Our results show that the labium features a multiaxial joint connecting the basal segment (postmentum) and the head. During feeding, a combination of rotations around different axes is used to handle and orient prey, which is unique among biting-chewing mouthparts. Furthermore, we identified structures at the joint which likely restrict lateral motion during the predatory strike. Our results provide a further understanding of the unique prey-capturing apparatus of odonate larvae capable of controlling a 'switchable' multiaxial to a restricted monoaxial joint. This concept highlights the evolution of a highly modified raptorial mouthpart appendage where the degrees of freedom can be actively restricted to allow for the respectively needed functionality. Research Highlights: * Kinematics and functionality of the raptorial appendage in odonate larvae at joint level. * First assess to the multifunctionality of the prehensile labial mask. * Presenting a 'switchable' multiaxial to restricted monoaxial joint." (Authors)] Address: Büsse, S., Dept of Functional Morphology & Biomechanics, Institute of Zoology, Kiel University, Am Botanischen Garten 9, 24118 Kiel, Germany. Email: sbuesse@zoologie.uni-kiel.de

22534. Kosterin, O.E. (2023): Reconsideration of three Odonata taxa described by A.N. Bartenev from the same place in West Caucasus. *Odonatologica* 52(1/2): 89-126. (in English) ["*Enallagma cyathigerum* var. *rotundatum* Bartenef, 1929, *Leucorrhinia circassica* Bartenef, 1929, and *Aeschna juncea* var. *atshischgho* Bartenef, 1929, were described by A.N. Bartenev (= Bartenef) in three papers published in 1929 and 1930. Their type locality was the same highland lake group near Krasnaya Polyana Town in West Caucasus, Russia, presently known as the Khmelevskie Lakes. Their type series most probably no longer exist. Topotypes of the two former taxa obtained in 2008 and 2013, respectively, were examined as well as a specimen supposedly of the third taxon, collected 36 km from the type locality. Based on these specimens, *E. cyathigerum rotundatum* is concluded to be a valid subspecies and the senior subjective synonym of *Enallagma risi* Schmidt, 1961, and *L. circassica* to be a junior subjective synonym of *Leucorrhinia dubia* (Vander Linden, 1825). The Status of *A. juncea atshischgho* remains unresolved. Re-evaluation of available knowledge of the Palaearctic *Enallagma* spp. suggested downgrading *Enallagma deserti* (Selys, 1879) to the subspecies, *E. cyathigerum deserti*." (Author)] Address: Kosterin, O.E., Institute of Cytology & Genetics SB RAS, Academician Lavrentyev ave. 10, Novosibirsk, 630090, Russia. Email: kosterin@bionet.nsc.ru

22535. Kovács, T.; Murányi, D. (2023): Data to the distribution of *Helenoperla malickyi* Sivec, 1997 (Plecoptera: Perlidae). *Folia historico-naturalia Musei Matraensis* 47: 45-53.

(in English) [The paper includes records of *Cordulegaster bidentata*, *Caliaeschna microstigma*, *Calopteryx virgo*, and *Orychogomphus forcipatus* from Albania and Greece.] Address: Kovács, T., Mátra Museum of the Hungarian Natural History Museum, Kossuth Lajos u. 40, H-3200 Gyöngyös, Hungary. Email: koati1965@gmail.com

22536. Krishnanunniand, T.S.; Sarath, S. (2023): Odonate diversity in paddy fields and environs of Madakkathara Grama Panchayath, Thrissur, Kerala, India. *Indian Journal of Ecology* 50(5): 1493-1498. (in English) ["The diversity of odonates was documented from Madakkathara Grama Panchayath in the Thrissur District of Kerala state in southern India. Field surveys which were conducted from December 2018 to November 2019 recorded 47 odonates, including 32 species of Anisoptera and 15 species of Zygoptera. Among dragonflies, Libellulidae dominated with 30 species, while Coenagrionidae with 9 species were dominant among damselflies. 25.68% of the odonates in Kerala and 22.49% of the odonates in the Western Ghats were represented in the odonate diversity of the Madakkathara Grama Panchayath. *Pantala flavescens* dominated the count, especially around the monsoons." (Authors)] Address: Krishnanunniand, T.S., College of Forestry, Kerala Agricultural University KAU P.O, Vellanikkara, Thrissur- 680 656, India. Email: tskrishnanunni@gmail.com

22537. Li, B.; Lan, Z.; Guo, X.-R.; Zhang, A.-H.; Wei, W.; Li, Y.; Jin, Z.-H.; Gao, Z.-Y.; Zhang, X.-G.; Li, B.; Gao, J.-F.; Wang, C.-R. (2023): Survey of the *Prosthogonimus* spp. Metacercariae infection in the second intermediate host dragonfly in Heilongjiang Province, China. *Parasitology Research* 122: 2859-2870. (in English) ["*Prosthogonimiasis* poses a threat to the reproductive system of poultry and wild birds, which are the definitive hosts of the parasite causing this disease. However, the parasite infection of the second intermediate host (dragonfly), the primary vector of this pathogen, is rarely reported. In this study, the prevalence of *Prosthogonimus* infection in dragonflies was investigated from June 2019 to October 2022 in Heilongjiang Province, northeast China. The species of metacercariae isolated from dragonfly were identified by morphological characteristics, molecular biology techniques, and animal infection experiments. The results showed that 11 species of dragonflies and one damselfly were identified and among six of the dragonflies infected by *Prosthogonimus* metacercariae, *Sympetrum depressiusculum* (28.53%) had the highest infection rate among all positive dragonflies, followed by *Sympetrum vulgatum* (27.86%) and *S. frequens* (20.99%), which are preferred hosts, and the total prevalence was 20.39% (2061/10,110) in Heilongjiang Province. Three species of *Prosthogonimus* metacercariae were isolated, including *Prosthogonimus cuneatus*, *P. pullucidus*, and *Prosthogonimus* sp., among which *P. cuneatus* was the dominant species in dragonflies in Heilongjiang Province. This is the first report on the prevalence of *Prosthogonimus* in dragonflies in China, which provides baseline data for the control of *prosthogonimiasis* in Heilongjiang Province and a reference for the prevention of *prosthogonimiasis* in other areas of China." (Authors)] Address: Wang, C.-R., Heilongjiang Provincial Key Laboratory of Prevention and Control of Bovine Diseases, College of Animal Science & Veterinary Medicine, Heilongjiang Bayi Agricultural Univ., Heilongjiang Province, Daqing, 163316, China

22538. Lovish, B.A.N.; Kudesia, N. (2023): Prospects of entomophagy as a nutrition rich reservoir. *Journal of Entomological Research* 47(4): 835-838. (in English) ["Edible insects come in a wide variety of species, including Coleoptera, Hymenoptera, Orthoptera, Lepidoptera, Hemiptera, Isoptera,

Diptera, and Odonata. In addition, being higher in protein, lipids, vitamins, minerals, and fiber than other animal and plant-based food sources, they are consumed for their numerous nutraceutical benefits. Also, essential amino acids are abundant in edible insects. They are also the part of diet in north-east India with 255 different species. Some consumers find it difficult to accept insects as a whole, hence the market offers a variety of insect-based products like insect cookies, insect flour, insect protein bars, etc. for those consumers. Different categories of edible insects have been described in detail along with various techniques for extraction of nutrients from edible insects. Additionally, different varieties of edible insect-based products and their current market status has also been highlighted." (Authors)] Address: Lovish, B.A.N., Dept of Zoology, School of Bioengineering & Biosciences, Lovely Professional University, Phagwara - 144 411, Punjab, India. Email: najirila2010@gmail.com

22539. Luiza da Silva, N.; Pagliarini, C.D.; Kotz Kliemann, B.C.; Ramos, J.K.; Cesar do Bonfim, V.; Brandão, H.; Ramos, I.P. (2023): Diet composition of a native fish species in a neotropical lentic environment. *Acta Scientiarum. Biological Sciences*, v. 45, e67806: 9 pp. (in English) ["We characterized the diet, feeding habits, and trophic niche breadth of the native species *Hoplosternum littorale* (Hancock, 1828) in neotropical lentic environments. Collections were carried out in July 2018 at two sampling points (lagoons) located in the São Francisco Falso River and the Corvo River using gill nets. Stomach content was analyzed, and food items were separated, identified, and quantified using the volumetric method. PERMANOVA analysis was performed to evaluate possible differences in diet between the lagoons. Furthermore, PERMDISP was used to test the trophic niche breadth. 15 food items were recorded in the São Francisco lagoon, with the most consumed items being detritus, Diptera (larvae and pupa), and Odonata (nymph). Seven food items were recorded in the Corvo lagoon, with detritus being the most consumed. There was no difference in diet composition and trophic niche breadth between the evaluated lagoons. For both lagoons studied, the species was determined to be a detritivore feeding habit, given its diet's predominant consumption of detritus. The detritivore classification may be related to environmental conditions, food availability, and functional morphology. We also observed the presence of microplastics in the stomachs of some specimens, demonstrating anthropic influence on aquatic environments. ..."] (Authors) 8.84% of food items of *Hoplosternum littorale* are odonate larvae.] Address: Luiza da Silva, Natália, Faculdade de Engenharia, Univ. Estadual Paulista, Rua Monção, 226, 15385-000, Ilha Solteira, São Paulo, Brazil. Email: nattyluiza23@gmail.com

22540. Mahdjoub, H.; Zebba, R.; Kahalerras, A.; Amari, H.; Bensouilah, S.; Samways, M.J.; Khelifa, R. (2023): Condition-dependent survival and movement behavior in an endangered endemic damselfly. *Scientific Reports* 13, 21819: 10 pp. (in English) ["Movement is essential for the maintenance of populations in their natural habitats, particularly for threatened species living in fluctuating environments. Empirical evidence suggests that the probability and distance of movement in territorial species are context-dependent, often depending on population density and sex. Here, we investigate the movement behavior of the spring cohort of an endangered endemic damselfly *Calopteryx exul* in a lotic habitat of Northeast Algeria using capture-mark-recapture of adults. By sampling 10 gridded river stretches across a 2 km section of the watercourse, we were able to estimate the distance of movement throughout individual lifespans and estimate movement probability for both males and females.

We used multistate models to examine whether individual density and sex ratio influence survival and movement probability. We found that males and females had similar movement kernels with most individuals moving short distances (83% performing movements of < 100 m and only 1% > 1000 m). Of the 547 marked individuals, 63% were residents, and 37% were movers (moved at least 50 m from one sampling occasion to another). Survival probability showed higher estimates for females and was slightly density-dependent (i.e., lower survival probabilities were associated with high male densities). Survival probability did not show a marked difference between residents and movers. Movement probability and distances were positively correlated with individual density, but were not or slightly correlated with sex ratio, respectively. These results are not in line with the hypotheses of sex-biased movement and survival costs of movement. Our results suggest that the species performs mostly short-distance movements that are dependent on intraspecific interactions." (Authors)] Address: Khelifa, R., Institute for Resources, Environment, and Sustainability, University of British Columbia, 2202 Main Mall, Vancouver, BCV6T 1Z4, Canada. Email: rassim.khelifa@concordia.ca

22541. Maneechan, W.; Prommi, T.O. (2023): Proximate composition, fatty acid profile, and microplastic contamination of edible odonate larvae (Aeshnidae: *Anax* sp.) in rice fields. *Jordan Journal of Biological Sciences* 16(4): 649-654. (in English) ["Although the human consumption of edible insects is a culturally well documented practice, the nutritional literature of aquatic insects has not been completely covered. The present study was conducted with the aim of evaluating the proximate composition, fatty acid profiles, and microplastic contamination of edible odonate larvae (*Anax* sp.). Nutrient analysis showed that the proximate composition was a good source of protein (65.70 g/100g dry weight). The major fatty acids were oleic (1.08 g/100g DW) and palmitic acid (1.01 g/100g DW). The long-chain polyunsaturated fatty acid profile showed an abundance of linoleic, alpha-linolenic, and eicosapentaenoic acids. Total microplastics content found 694 items in the gastrointestinal tract, with a mean abundance of 11.57 items/individual. Five distinct polymers, including polyethylene, polyamide, polypropylene, polyethylene terephthalate, and cellulose, were identified through chemical analysis of FTIR spectra. Future research should be conducted regarding a comprehensive nutritional study to as method for a nutritional reference on food safety and security." (Authors)] Address: Prommi, T.O., Dept of Science & Bioinnovation, Faculty of Liberal Arts and Science, Kasetsart Univ., Kamphaeng Saen Campus, Nakhon Pathom Province, 73140, Thailand. Email: faastop@ku.ac.th

22542. Manu, M.K.; Ashiagbor, G.; Issah Seidu, I.; Groen, T.; Gyimah, T.; Toxopeus, B. (2023): Odonata as bioindicator for monitoring anthropogenic disturbance of Owabi wetland sanctuary, Ghana. *Aquatic Insects* 44(2): 151-169. (in English) ["This study proposes a method for assessing anthropogenic disturbance in the Owabi wetland sanctuary in Ghana using Odonata. Uniqueness of a species to specific land use (LU) class and its tolerance to environmental conditions served as the criteria for the monitoring. 29 species were identified from the families Aeshnidae, Libellulidae, Chlorocyphidae, Calopterygidae and Coenagrionidae. A Kruskal-Wallis's test suggest significant difference in species richness across the anthropogenic disturbance regimes. *Pantala flavescens* was identified as an indicator of high anthropogenic disturbance; *Orthetrum abbotti* and *Africallagma vaginale* were indicators of moderate anthropogenic disturbance; and *Tramea limbata*, *Olpogastra lugubris*, *Neodythemis klingi*, *Brachythemis*

leucosticta, Chlorocypha curta, C. luminosa, C. radix, Gynacantha bullata and Agriocnemis sp. were identified as indicators of low anthropogenic disturbance." (Authors)] Address: Manu, M.K., Dept of Wildlife & Range Management, Faculty of Renewable Natural Resources, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. Email: kusimanumartin@gmail.com

22543. Mavromati, E.; Kemitzoglou, D.; Tsiaoussi, V. (2023): Does littoral substrate affect macroinvertebrate assemblages in Mediterranean lakes? *Aquatic Ecology* 57: 667-679. (in English) ["The objective of this study was to investigate the effects of substrate type in macroinvertebrate assemblages in Mediterranean lakes. Samplings have taken place in the littoral zone of 21 lakes in Greece, between 2015 and 2018. We compared benthic macroinvertebrate assemblages among three substrate types of their littoral zones; sandy, covered with macrophytes and stony substrate. Benthic macroinvertebrate assemblages at sites with extended macrophyte cover differed only slightly in composition and abundance from the ones found in stony and sandy substrates. Coenagrionidae were indicative of sites covered with macrophytes and Oligochaeta and Erpobdellidae were representative of stony substrates. The type of substrate proved to be a statistically significant factor influencing the number of benthic macroinvertebrate taxa, the relative abundance of Oligochaeta and the relative abundance of Odonata. In the context of designing site-adapted management measures, priority could be given to the conservation and restoration of aquatic vegetation in lake littoral zones, which host rich macroinvertebrate assemblages with abundant taxa of Odonata." (Authors)] Address: Mavromati, Efpraxia, The Goulandris Natural History Museum, Greek Biotope/Wetland Centre, 14th km Thessaloniki – Mihionia, 57001 Thermi, Greece. Email: emavromati@ekby.gr

22544. Mendoza-Penagos, C.C.; Juen, L.; Neiss, U.G.; Hamada, N.; Muzón, J. (2023): Description of the final-instar larva of *Psaironeura tenuissima* (Odonata: Zygoptera: Coenagrionidae) from Amazonia. *International Journal of Odonatology* 26: 197-204. (in English, with Portuguese summary) ["The final-instar larva of *P. tenuissima* is described based on reared specimens from Amazonas and Pará states in the Brazilian Amazon. *Psaironeura* larvae are grouped with *Neoneura* and *Protoneura* larvae by having nodated caudal lamellae, however, they can be differentiated by the number of labial palp setae. *P. tenuissima* are morphologically compared with *P. angeloi* larvae as well as those of *Neoneura kiautai* and *Protoneura aurantiaca*. The *P. tenuissima* larva can be distinguished from that of *P. angeloi* by the shape of the superior margin of prementum, projections on the prothorax, caudal lamellae apex shape, and the number of setae in the paraproct ventral margin setae." (Authors)] Address: Mendoza-Penagos, C., Programa de Pós-graduação em Zoologia – PPGZOO, Universidade Federal do Pará, Belém, Brazil. Email: cristian.penagos@icb.ufpa.br

22545. Mohammed, H.; Adamu, K.M.; Adamu, A.K.; Mohammed, Y.M.; Usman, B. (2023): Anthropogenic impact on macroinvertebrates distribution and physicochemical characteristics of a tropical stream in north-central Nigeria. *Tropical Freshwater Biology* 32(1): 1-17. (in English) ["Emu is a tropical stream in Northcentral Nigeria that serves as the water source for drinking and other domestic activities for Kusotachin communities, Niger State, Nigeria. This study evaluates the impact of anthropogenic activities on the ecological health of the stream using physicochemical parameters and macroinvertebrate assemblages. Macroinvertebrates were collected for a period of 8 months (July 2021 to February 2022)

using modified kick sampling techniques, and the physicochemical parameters were determined using standard sampling and analytical procedures. Samples were collected from four different stations which are characterized by various anthropogenic activities across the stream bed. With the exception of depth, the measured physicochemical parameters showed no significant ($P > 0.05$) difference between the sampling stations. However, there were significant ($P < 0.05$) differences in air temperature, pH, electrical conductivity, total alkalinity, total hardness, dissolved oxygen, chemical oxygen demand, phosphate, and nitrate between the sampling months. A total of 506 individuals, from 30 species in eight groups of macroinvertebrates were identified. Hemiptera were the most represented group with 57.07% abundance, followed by Odonata with 27.44%, Arachnida (4.14%), Coleoptera (3.93%), Ephemeroptera (2.55%), Diptera (2.17%), Mollusca (1.38) % and the least abundance was 0.19% observed in Decapoda and Oligochaeta. The Canonical correspondence analysis (CCA) showed little or no correlations between the determined macroinvertebrates and physicochemical parameters. CCA axis 1 accounted for 44.94% of the variation of the macroinvertebrates data set with an Eigenvalue of 0.30. CCA axis 2 accounts for 30.5% of data set of macroinvertebrates and an Eigenvalue of 0.20 while CCA axis 3 accounts for 24.55% variation in data set with an Eigenvalue of 0.16. Overall, the low abundance of Ephemeroptera and the absence of other pollution-sensitive macroinvertebrate groups such as Plecoptera and Trichoptera, combined with deteriorating surface water quality, is an indication of pollution stress caused by various anthropogenic activities as the vegetative nature of the stream was the primary factor responsible for the macroinvertebrate assemblage structure." (Authors)] Address: unknown

22546. Moore, M.P.; Khan, F. (2023): Relatively large wings facilitate life at higher elevations among Nearctic dragonflies. *Journal of Animal Ecology* 92(8): 1613-1621. (in English) ["Determining which traits allow species to live at higher elevations is essential to understanding the forces that shape montane biodiversity. For the many animals that rely on flight for locomotion, a long-standing hypothesis is that species with relatively large wings should better persist in high-elevation environments because wings that are large relative to the body generate more lift and decrease the aerobic costs of remaining aloft. Although these biomechanical and physiological predictions have received some support in birds, other flying taxa often possess smaller wings at high elevations or no wings at all. To test if predictions about the requirements for relative wing size at high elevations are generalizable beyond birds, we conducted macroecological analyses on the altitudinal characteristics of 302 Nearctic dragonfly species. Consistent with the biomechanical and aerobic hypotheses, species with relatively larger wings live at higher elevations and have wider elevation breadths—even after controlling for a species' body size, mean thermal conditions, and range size. Moreover, a species' relative wing size had nearly as large of an impact on its maximum elevation as being adapted to the cold. Relatively large wings may be essential to high-elevation life in species that completely depend on flight for locomotion, like dragonflies or birds. With climate change forcing taxa to disperse upslope, our findings further suggest that relatively large wings could be a requirement for completely volant taxa to persist in montane habitats." (Authors)] Address: Moore, M.P., Dept of Integrative Biology, Univ. of Colorado Denver, Denver, Colorado, USA. Email: michael.p.moore@ucdenver.edu

22547. Natsume, H.; Sasamoto, A.; Futahashi, R. (2023):

In memoriam Kiyoshi Inoue (29th March 1932 – 21st May 2023). *Odonatologica* 52(3-4): 143-171. (in English) ["We provide a brief biography, recollections and memories of Kiyoshi Inoue, the long-time President of the International Odonatological Foundation, Societas Internationalis Odonatologica, with his complete odonatalogical bibliography, including editorials, for the first time." (Authors)] Address: Natsume, H., Shimo-meguro, Meguro-ku, Tokyo 153-0064, Japan

22548. Novelo-Gutiérrez, R.; Arce-Pérez, R. (2023): Predation of larvae of *Orthemis discolor* by "fire ants" *Solenopsis geminata* (Odonata: Libellulidae; Hymenoptera: Myrmicinae). *Notulae odonatologicae* 10(2): 45-48. (in English) ["During a collection trip in a location known as El Arenal, central Veracruz, Mexico, in August 2014, we observed an attack on larvae of *O. discolor* by fire ants, *S. geminata* in a desiccating pond. This appears to be the first record of an attack by ants on larvae of odonates that were neither moving toward the emergence support nor undergoing the last ecdysis." (Authors)] Address: Novelo-Gutiérrez, R., Red de Biodiversidad y Sistemática, Instituto de Ecología, A.C. Carretera antigua a Coatepec 351, El Haya, 91073 Xalapa, Veracruz, México. Email: rodolfo.novelo@inecol.mx

22549. Palomar, G.; Wos, G.; Stoks, R.; Sniegula, S. (2023): Latitude-specific urbanization effects on life history traits in the damselfly *Ischnura elegans*. *Evolutionary Applications* 16: 1503-1515. (in English) ["Many species are currently adapting to cities at different latitudes. Adaptation to urbanization may require eco-evolutionary changes in response to temperature and invasive species that may differ between latitudes. Here, we studied single and combined effects of increased temperatures and an invasive alien predator on the phenotypic response of replicated urban and rural populations of *I. elegans* and contrasted these between central and high latitudes. Adult females were collected in rural and urban ponds at central and high latitudes. Their larvae were exposed to temperature treatments (current [20°C], mild warming [24°C], and heat wave [28°C; for high latitude only]) crossed with the presence or absence of chemical cues released by the spiny-cheek crayfish (*Faxonius limosus*), only present at the central latitude. We measured treatment effects on larval development time, mass, and growth rate. Urbanization type affected all life history traits, yet these responses were often dependent on latitude, temperature, and sex. Mild warming decreased mass in rural and increased growth rate in urban populations. The effects of urbanization type on mass were latitude-dependent, with central-latitude populations having a greater phenotypic difference. Urbanization type effects were sex-specific with urban males being lighter and having a lower growth rate than rural males. At the current temperature and mild warming, the predator cue reduced the growth rate, and this independently of urbanization type and latitude of origin. This pattern was reversed during a heat wave in high-latitude damselflies. Our results highlight the context-dependence of evolutionary and plastic responses to urbanization, and caution for generalizing how populations respond to cities based on populations at a single latitude." (Authors)] Address: Sniegula, S., Inst. Nature Conservation, Polish Acad. of Sciences, al. Adama Mickiewicza 33, 31-120 Krakow, Poland. Email: szymon.sniegula@gmail.com

22550. Pereira de Gouvêa, T.; Vilela, D.S.; Dias de Oliveira, T.M.; Ferreira, E.D.F.; Mota de Almeida, J.A.; Barros de Souza, A.S.; Shimamoto, C.Y.; Barbado, N.; Magalhães de Souza, M. (2023): Survey of Odonata from two Conservation Units in western Paraná, southern Brazil. *Odonatologica* 52(3-4): 219-232. (in English) ["There are many under-

sampled sites, even Conservation Units (CUs), in the Brazilian Atlantic Forest, an important area of concern for conservation owing to its history of degradation and unique and rich biota. This study aimed to survey the fauna of Odonata in the Iguaçu National Park and the Bela Vista de Itaipu Biological Refuge, western state of Paraná, southern Brazil. The study was conducted from September 2021 to May 2022, comprising a total of 318 sampling hours. A total of 851 adult individuals of 97 species were collected in the two CUs, with 45 new records for the state of Paraná." (Authors)] Address: Pereira de Gouvêa, T., Instituto Federal de Educação Ciência e Tecnologia do Sul de Minas Gerais, Campus Inconfidentes. Praça Tiradentes, Inconfidentes, Minas Gerais MG, Brazil. Zip code: 37576 000. Email: taiguaragouvea.bio@gmail.com

22551. Pineda-Alarcón, L.Y.; Cañón Barriga, J.E. (2023): Modelación de la relación predador-presa para la comunidad de macroinvertebrados en el litoral del Lago de Tota - Modeling the predator-prey relationship for the macroinvertebrate community on the shore of Lake Tota. *Acta Biológica Colombiana* 28(2): 189-203. (in Spanish, with English summary) ["High Andean lakes are ecosystems affected by multiple anthropogenic pressures that alter water quality and biotic communities, and aquatic macroinvertebrates are excellent bioindicators for these ecosystems. The present work analyzes the dynamics of the macroinvertebrate community associated with *Egeria densa*, the relationship with physicochemical variables, biotic indices, and predator-prey interaction in the littoral of Lake Tota. This work was developed in three campaigns on nine sampling stations on the perimeter of the lake. Among the findings, *Hyallela* sp. (30 %) and *Dicrotendipes* sp. (27 %) are the most abundant and dominant taxa of the study, being bioindicators of the presence of decomposing organic matter and decrease in water quality. ANOVA analysis of the physicochemical variables of water and nutrients of *Egeria densa* showed significant differences at the temporal level. The biotic indices showed differences in water quality, determining a possible zoning of this parameter along the coast. Finally, to identify community relationships, a predator-prey model is presented, with *Hyallela* sp. as prey and *Ischnurasp.* as predator through the Lotka-Volterra equations, finding that there is agreement between the behavior of measured and simulated abundances. In this way, the trophic dynamics contribute to understand the communities and their projection in time in relation to the environmental conditions of the littoral zone." (Authors)] The study includes *Coryphaeschna* sp. and *Ischnura* sp.] Address: Pineda-Alarcón, Ludy, Grupo GAIA, Facultad de Ingeniería, Universidad de Antioquia, Calle 67 No. 53 - 108, Medellín, Colombia. Email: ludy.pineda@udea.edu.co

22552. Priyadarshana, T.S.; Slade, E.M. (2023): A meta-analysis reveals that dragonflies and damselflies can provide effective biological control of mosquitoes. *Journal of Animal Ecology* 92(8): 1589-1600. (in English) ["Odonata naiads have the potential to control mosquitoes, and indirectly the diseases they carry, due to their extensive predation on mosquito larvae. Experimental studies have measured the effectiveness of individual dragonfly/damselfly naiads in controlling mosquitoes by introducing them to mosquito larvae and counting the number of larvae eaten in a given time period (i.e. predation success). Without a quantitative synthesis, however, such individual measures are unable to provide a generalized estimation about the effectiveness of Odonata as biological mosquito control agents. To achieve this, we assembled a database containing 485 effect sizes across 31 studies on predation successes of 47 species of

commonly found Odonata naiads on nine species of mosquito larvae belonging to *Aedes*, *Anopheles* and *Culex*. These studies covered 14 countries across Asia, Africa and South and North America, where mosquitoes are the vectors of Chikungunya, Dengue, Japanese encephalitis, Lymphatic filariasis, Malaria, Rift Valley fever, West Nile fever, Yellow fever and Zika. Using this database, we conducted a meta-analysis to estimate the average predation success per day by a single individual dragonfly/damselfly naiad on these mosquito larvae as a generalized measure of the effectiveness of Odonata for mosquito control. We also built an interaction network for predator-Odonata and prey-mosquitoes and the diseases they vector to understand the functioning of this important predator-prey network. Our results showed that mosquito larvae were significantly reduced through predation by Odonata naiads. Within experimental containers, a single individual Odonata naiad can eat on average 40 (95% confidence intervals [CIs] = 20, 60) mosquito larvae per day, equivalent to a reduction of the mosquito larval population by 45% (95% CIs = 30%, 59%) per day. The average predation success did not significantly vary among *Aedes*, *Anopheles* and *Culex* mosquitoes or among the four (I–IV) mosquito larval stages. These results provide strong evidence that Odonata can be effective biological control agents of mosquitoes, and environmental planning to promote them could lower the risk of spreading mosquito-borne diseases in an environmentally friendly and cost-effective manner." (Authors)] Address: Priyadarshana, T., Asian School of the Environment, Nanyang Technological University, Singapore City, Singapore. Email: tharakas001@ntu.edu.sg

22553. Prunier, F.; De Knijf, G. (2023): Discovery of a population of *Onychogomphus cazuma* in Andalusia, Spain. *Notulae odonatologicae* 10(2): 60-66. (in English) ["*O. cazuma* is an endemic gomphid of eastern Spain and one of the rarest dragonflies in Europe. We report the discovery of a population of this species at Surgencia del Tajo del Buitre, Ardales, in Málaga province, Spain. Numerous exuviae and three emerging individuals were found in early June 2023. The site consists of a seepage with permanent slow-flowing water a few centimetres deep located below a cliff. We provide a detailed description of this Andalusian habitat and update the species' distribution map. We believe that *O. cazuma* might be more widespread in the Baetic Mountain range." (Authors)] Address: Prunier, F., Red de Observadores de Libélulas en Andalucía, C/ Toledillo, 14, 29490 Benarrabá, Spain

22554. Rosenfeld, S.; Maturana, C.S.; Gañan, M.; Rendoll Cárcamo, J.; Díaz, A.; Contador, T.; Aldea, C.; Gonzalez-Wevar, C.; Orlando, J.; Poulin, E. (2023): Revealing the hidden biodiversity of Antarctic and the Magellanic Sub-Antarctic Ecoregion: A comprehensive study of aquatic invertebrates from the BASE Project. *Biodiversity Data Journal* 11(2): 108566; <https://doi.org/10.3897/BDJ.11.e108566>: 25 pp. (in English) ["Antarctica, its outlying archipelagoes and the Magellanic Subantarctic (MSA) ecoregion are amongst the last true wilderness areas remaining on the planet. Therefore, the publication, citation and peer review of their biodiversity data are essential. The new Millennium Institute Biodiversity of Antarctic and Subantarctic Ecosystems (BASE), a Chilean scientific initiative funded by the National Agency of Research and Innovation, contributes 770 new records of aquatic invertebrates as a point of reference for present-day biodiversity research at these latitudes. The occurrence dataset presented here has never been released before and is the result of the systematic recording of occurrences of several taxa across the Antarctic, Subantarctic and Magellanic Subantarctic ecoregions. We collected data from marine

and freshwater invertebrates across numerous samplings from 2008 to 2023. From the 770 occurrences, we identified 160 taxa, 125 at species level and 35 at the genus level. The database has been registered in the Global Biodiversity Information Facility (GBIF)." (Authors) Rhionaeschna variegata (Fabricius, 1775)] Address: Rosenfeld, S., Millennium Institute Biodiversity of Antarctic and Subantarctic Ecosystems (BASE), Santiago, Chile

22555. Sahayaraj, K.; Hassan, E. (2023): *Worldwide Predatory Insects in Agroecosystems*. Publisher: Springer Singapore. Hardcover ISBN 978-981-99-0999-5 (Due: 31 December 2024). eBook ISBN: 978-981-99-1000-7 (Published: 29 November 2023): XXII, 858- (in English) [The book contains many references to Odonata.] Address: DOI: <https://doi.org/10.1007/978-981-99-1000-7>

22556. Samraoui, B.; Touati, L.; Samraoui, F. (2023): Life cycle and seasonal regulation of the Ibero-Maghrebian endemic *Onychogomphus costae* across an altitudinal gradient (Insecta, Odonata). *Hydrobiologia* 850: 4891-4905 (in English) ["The emergence and life cycle of the Ibero-Maghrebian endemic *O. costae*, was studied over an altitudinal gradient of the Seybouse River in northeastern Algeria. The asynchronous and protracted emergence period showed a "summer" pattern, extending from late April to mid-August and lasting about three and a half months. The proportion of the total emergence period, EM50, at sea level was unusually long, varying annually between 44 and 66 days. No differences in emergence sex ratios were observed in 2015, but in 2016 there was a statistically significant deviation from a 1:1 ratio in favour of females. In both years, the body size of female exuviae at emergence was consistently larger than that of males. The long flight and oviposition period of *O. costae* extends throughout spring and summer and is responsible for the phenotypic plasticity of the larvae and the asynchrony of their development. Larval growth and development of *O. costae* are consistent with regulated development and a semivoltine life cycle across the entire altitudinal gradient of the Seybouse River. Nevertheless, some voltinistic flexibility is evident at low elevations, with some individuals exhibiting a univoltine life cycle." (Authors)] Address: Samraoui, B., Lab. de Conservation des Zones Humides, Univ. 8 mai 1945, Guelma, 24000, Algeria. Email: bsamraoui@gmail.com

22557. Saxton, N.A.; Powell, G.S.; Bybee, S.M. (2023): A story of vicariance? How the geology of oceanic archipelagos influenced the evolutionary history of endemic damselflies. *Molecular Phylogenetics and Evolution* 186, 107831: 10 pp. (in English) ["South Pacific islands provide an ideal study system to explore patterns of speciation, specifically examining the role of dispersal versus vicariance. Dispersal is often the suggested mechanism of diversification in the South Pacific, specifically among remote island chains. Here, we provide a phylogeny of several related genera of Coenagrionidae from the South Pacific, based on five molecular loci, in order to examine patterns of speciation in the region. We used the endemic damselfly genera *Nesobasis*, *Nikulabasis*, and *Vanuatubasis* found across both Fiji and Vanuatu. Knowledge of the geologic history of the region was used to inform our understanding of the evolution of these genera. Both archipelagos used to be part of the Vitiac arc which spanned from the Solomon Islands to Tonga and began to break apart 10-12 Ma. Results of our divergence-time estimations and biogeographic reconstructions support that the breakup of this arc acted as a significant vicariance event in the evolution of these taxa. Specifically, it led to the extant generic diversity seen in these damselflies. We find that

within the archipelago of Vanuatu, that Espiritu Santo served as an important source for dispersal to other islands with Malekula acting as a stepping stone to Efate." (Authors)] Address: Saxton, Natalie, Department of Biology and Monte L. Bean Museum, Brigham Young University, Provo, UT 84602, USA. Email: natalie.saxton@case.edu

22558. Seehausen, M. (2023): Name-bearing types of Aeshnidae, Gomphidae, Chlorogomphidae, Macromiidae, Synthemistidae, and Corduliidae preserved in the Senckenberg Naturmuseum Frankfurt/Main (Odonata). *Odonatologica* 52 (3-4): 305-334. (in English) ["The name-bearing types of Anisoptera except Libellulidae preserved at the Senckenberg-Museum Frankfurt/Main (SMF), Germany are catalogued. There are 112 name-bearing types of 53 taxa within the families Aeshnidae, Gomphidae, Chlorogomphidae, Macromiidae, Synthemistidae, and Corduliidae. Of these taxa there are 47 additional paratypes and paralectotypes. The holotype female of *Aeschna rufipes*' is missing. The holotypes of *Progomphus aberrans*, *Progomphus virginiae*, and *Phyllocycla pallida* as well as some paratypes of *Phyllogomphoides lieftincki* were stated to be deposited at the Zoological Research Museum Alexander Koenig in Bonn, Germany, but were found at the SMF. The type status of *Aeschna umbrosa occidentalis*, *Progomphus auropictus*, *P. longistigma*, and *Macromia alleganiensis* is investigated. In addition, 67 secondary types of 28 other taxa are listed. A supplementary list of name-bearing types of Anisoptera except Libellulidae of 18 taxa described by Friedrich Ris and deposited in collections other than the SMF is provided." (Author)] Address: Seehausen, M., Zoologisches Museum der CAU zu Kiel, Hegewischstr. 3, 24105 Kiel, Germany;

22559. Silina, A.E.; Sushchik, N.N.; Gladyshev, M.I.; Kurina, E.M.; Kolmakova, A.A.; Seleznev, D.G. (2023): Emergence of amphibious insects from an old beaver pond in the Upper Kholer Valley under conditions of the forest steppe. *Contemporary Problems of Ecology* 16: 790-806. (in English) ["This work presents the results of studies of the emergence of amphibiotic insects from the old beaver pond on the Yuzhnaya River of the Privolzhskaya Lesostep Nature Reserve in the Upper Kholer basin. The parameters of abundance, biomass, and frequency of occurrence are given for insects from 34 families and 8 orders; the timing of their emergence in different parts of the pond is indicated. The dominant and common species are identified: chironomids *Paramerina cingulata* (Walk.) and *Cricotopus silvestris* (F.), biting midges (*Bezzia bicolor* (Mg.)), chaoborids *Chaoborus flavicans* (Mg.), and mayflies *Cloeon inscriptum* (Bgts.). The intensity of the emergence of insects is 12.10 individuals/m² per day; the average daily transfer of biomass is 49.23 mg/m² per day. The analysis of the fatty acid composition and content of the main biogenic elements in adults of amphibiotic insects is carried out. The results of calculations of the energy and matter transfer, including biogenic elements (carbon, phosphorus, and nitrogen) and polyunsaturated fatty acids (PUFAs) during the emergence of insects from various orders (Ephemeroptera, Odonata [*Gomphus vulgatissimus*, *Coenagrion puella*], Trichoptera, and Diptera) into adjacent terrestrial ecosystems, are presented. The transfer of wet biomass from water to land is 7.385 g/m² per year and, in dry weight, 2.216 g/m² per year; transfer of the main nutrients is carbon, 1.21 g/m² per year; nitrogen, 0.25 g/m² per year; and phosphorus, 0.03 g/m² per year. PUFA transfer is 24.16 kg/km² per year. ... Odonata were represented exclusively by Anisoptera [?] (genera *Sympetrum* and *Aeschna*) emerging in the second half of summer (from July 28 to August 25). Due to their large forms, they played a major role in the transfer of

biomass during this period, despite their low occurrence (FO = 1.9%). The proportion of dragonflies in the total transfer of bio mass by insects from the pond was 14.8%." (Authors)] Address: Silina, A.E., Belogorye Nature Reserve, 309342, Borisovka, Belgorod oblast, Russia

22560. So, J.; Choe, D.-H.; Rust, M.K.; Trumble, J.T.; Lee, C.-Y. (2023): The impact of selenium on insects. *Journal of Economic Entomology* 116(4): 1041-1062. (in English) ["Selenium, a naturally occurring metalloid, is an essential trace element for many higher organisms, including humans. Humans primarily become exposed to selenium by ingesting food products containing trace amounts of selenium compounds. Although essential in these small amounts, selenium exhibits toxic effects at higher doses. Previous studies investigating the effects on insects of order Blattodea, Coleoptera, Diptera, Ephemeroptera, Hemiptera, Hymenoptera, Lepidoptera, Odonata, and Orthoptera revealed impacts on mortality, growth, development, and behavior. Nearly every study examining selenium toxicity has shown that insects are negatively affected by exposure to selenium in their food. However, there were no clear patterns of toxicity between insect orders or similarities between insect species within families. At this time, the potential for control will need to be determined on a species-by-species basis. We suspect that the multiple modes of action, including mutation-inducing modification of important amino acids as well as impacts on microbiome composition, influence this variability. There are relatively few studies that have examined the potential effects of selenium on beneficial insects, and the results have ranged from increased predation (a strong positive effect) to toxicity resulting in reduced population growth or even the effective elimination of the natural enemies (more common negative effects). As a result, in those pest systems where selenium use is contemplated, additional research may be necessary to ascertain if selenium use is compatible with key biological control agents. This review explores selenium as a potential insecticide and possible future directions for research. ... The orders Odonata, Orthoptera, Coleoptera, and Blattodea have comparatively limited literature available regarding sublethal effects on behavior. Most of the available studies measure feeding behavior. For example, a common dragonfly, *Sympetrum corruptum* increased feeding on *C. quinquefasciatus* when grown in a selenate solution compared to nymphs maintained in an untreated solution (Jensen 2006)." (Authors)] Address: Lee, C.-Y., Dept Entomol., Univ. of California, Riverside, CA 92521, USA. Email: chowyang.lee@ucr.edu

22561. Société Limousine d'Odonatologie (2023): Suivi des Odonates dans le cadre de la renaturation de la Corrèze dans Tulle (19) Bilan des inventaires menés entre 2017 et 2023. Rapport d'étude pour Tulle Agglo – Communauté d'agglomération: 15 pp. (in French) [<https://www.researchgate.net/profile/Julien-Barataud>] Address: Barataud, J., le bourg, 19330 Chanteix, France. Email: julien.barataud@gmail.com

22562. Spyra, A.; Cieplak, A.; Kaszyca-Taszakowska, N. (2023): From extremely acidic to alkaline - aquatic invertebrates in forest mining lakes under the pressure of acidification. *Hydrobiology* 108(1-3): 5-16. (in English) ["Human activities, including the mining industry, have considerably degraded water habitats worldwide. Acidification has severely affected aquatic environments and biodiversity by altering food webs and reducing species richness. The study area in southern Poland is unique in addressing the effects of mining-related acidification on biodiversity in freshwater ecosystems along a broad pH gradient (2.4-9.6) in mining lakes. Study was design to test for effect of human induced

acidification. Using multivariate ordination techniques, we analyzed how variations in invertebrate composition are related to environmental factors. The results indicated that pH, hardness, total dissolved solids, and the content of ammonia and calcium were significantly associated with the distribution of invertebrates in the studied mining lakes. The highest iron content, relatively high values of conductivity and chlorides were found in the extremely acidic mining lakes. A clear trend in decreasing density with decreasing pH was observed for taxa such as Oligochaeta, Chironomidae, Glossiphoniidae and certain taxa of snails. However the density of other taxa such as Lestidae, Libellulidae, Caenidae, Sialidae, Helodidae, Hydrophilidae and Polycentropodidae increased with decreasing pH. Specific communities were found with increasing acidity. Therefore, a further increase in acidity will probably cause a stronger decline in most of taxa and their density, and on water chemistry (e.g., calcium concentration, nitrites, hardness). The data yielded offer an opportunity to fill knowledge gaps on acidic stress concerning less-studied environments like mining lakes and link environmental pollution with communities, which is especially important because aquatic forest habitats are especially exposed to different climatic factors and threats." (Authors)] Address: Spyra, Aneta, Fac. of Natural Sciences, Inst. Biol., Biotechnology & Environmental Protection, Univ. Silesia, Bankowa 9, 40-007 Katowice, Poland. Email: aneta.spyra@us.edu.pl

22563. Suárez-Tovar, C.M.; Rocha-Ortega, M.; Córdoba-Aguilar, A. (2023): Is body condition of Mexican rubyspot (*Odonata*: Zygoptera) associated with urbanization? *Journal of Insect Conservation* 27: 961-969. (in English) ["Urbanized areas can impose selective pressures on insects which can be identified at the individual level based on animal physiological condition. Physiological condition can be measured from variables such as body size, body mass or energetic budget of individuals. We examined whether body mass, wing spot size and energy reserves (proteins, lipids and carbohydrates) were reduced as urbanization increases, using adults of two damselflies, *Hetaerina americana* and *H. vulnerata*, in Central Mexico. We used a Habitat Integrity Index to assess the degree of urbanization in our sampled sites, considering biophysical attributes and the impact of anthropogenic activities. We did not find relation of above individual variables with urbanization degree. These results support possible resilience of rubyspot damselflies in the face of radical changes such as urbanization. Our finding echoes other results in damselflies research. Implications for insect conservation: Our results highlight the resilience of these damselflies species in the face of urban disturbances. Thus design cities considering not only requirements of humans is essential to promote the presence and conservation of these and other species of insects in cities." (Authors)] Address: Córdoba-Aguilar, A., Instituto de Ecología, Universidad Nacional Autónoma de México, Apdo. Postal 70-275, Circuito Exterior, Ciudad Universitaria, Coyoacán, 04510 México City, México. Email: acordoba@iecologia.unam.mx

22564. Sysiak, M.; Pietrzak, B.; Kubiak, M.; Bednarska, A.; Mikulski, A. (2023): Chemical cannibalistic cues make damselfly larvae hide rather than hunt. *Scientific Reports* 13, Article number: 13556: 13 pp. (in English) ["Adopting cannibalism substantially affects individual fitness, and recognizing the presence of other cannibals provides additional benefits such as the opportunity to prepare for hunting or defense. This recognition can be facilitated by perceiving conspecific chemical cues. Their role in cannibalistic interactions is less studied than in interspecific predation and it is unclear whether these cues inform individuals of danger or of food

availability. Interpretation of these cues is crucial to balance the costs and benefits of anti-predator and feeding strategies, which can directly influence individual fitness. In this study we aimed to test whether damselfly larvae shift towards bolder and more exploratory (cannibalistic) behavior, or become more careful to avoid potential cannibals (as prey) in response to such cues. We conducted behavioral and respiratory experiments with *Ischnura elegans* larvae to investigate their response to chemical cues from older and larger conspecific larvae. We found that *I. elegans* larvae decrease their activity and shift their respiratory-related behavior, indicating activation of anti-predator defense mechanisms in response to conspecific chemical cues. Our findings indicate that individuals exposed to conspecific chemical cues balance catching prey with staying safe." (Authors)] Address: Sysiak, Monika, Dept of Hydrobiology, Inst. Functional Biol. & Ecol., Fac. of Biology, University of Warsaw, Zwirki i Wigury 101, 02-089 Warsaw, Poland. Email: ma.sysiak@student.uw.edu.pl

22565. Szanyi, K.; Grigorszky, I.; Szabó, L.J.; Dévai, G. (2023): Past and present: changes in the Odonata fauna of small lowland watercourses. *Biodiversity Data Journal* 11(6): 24 pp. (in English) ["Small lowland watercourses, strongly exposed to anthropogenic activities and climate change, have received negligible odonatological attention. This study provides a revised checklist of three typical lowland small watercourses (Kállai-folyás, Konyári-Kálló and Ölyvös) within the Pannonian Lowland and presents the changes in their diversity over the past decades. Results revealed a significant biodiversity loss, with a 31.6% decline in Odonata fauna over the last 53 years. The upper and middle sections degraded the most, where the habitats have dried out or become intermittent. However, a diverse Odonata assemblage (1,277 individuals of 27 species) was observed at the 14 sampling sites of the three watercourses, containing protected and sensitive species (*Somatochlora flavomaculata*, *Orthetrum brunneum*, *Aeshna isoceles*, *Libellula fulva*). However, the low abundance of larval and exuvial forms (59 individuals of 13 species) suggests that the majority of the observed adults were developed in other watercourses. While recolonisation from nearby habitats is still possible, a parallel degradation of adjacent waterbodies could lead to an irreversible biodiversity loss." (Authors)] Address: Szanyi, K., Dept of Hydrobiol., Fac. of Science & Technology, Univ. of Debrecen, Debrecen, Hungary. Email: szanyi.kalman@science.unideb.hu

22566. Tachamo-Shah, R.D.; Devi, R.; Shah, D.N.; Sharma, S.; Sharma, L.; Adhikari, J.N.; Rijal, D. (2023): Wetland biodiversity of Ramaroshan Lake complex: a need for conservation. *Journal of Threatened Taxa* 15(12): 24299-24320. (in English) ["The Ramaroshan Lake Complex, situated in the mid-hills of Sudurpaschim Province, is renowned for its scenic beauty, yet there is a notable dearth of information regarding its biodiversity and ecological status. This study represents the first systematic examination of seasonal variations in water quality parameters and biodiversity encompassing aquatic macroinvertebrates, fishes, birds, herpetofauna, mammals, and macrophytes, as well as the surrounding vegetation within the complex, spanning the winters and summers of 2018 and 2019. Among the twenty water quality parameters investigated, thirteen displayed significant seasonal differences across the lakes ($p < 0.05$), with Batula and Ramaroshan lakes exhibiting elevated nutrient levels. Lamadaya Lake stood out with a highly diverse macroinvertebrate community compared to other lakes, while overall, the study recorded 45 aquatic macroinvertebrate families, three fish species, 79 bird species, 12 herpetofauna species, 12 mammal species, and 26 macrophyte species within the

complex. Additionally, the surrounding vegetation comprised 193 distinct plant species. Notably, the complex currently hosts 14 IUCN Red List species, including Near Threatened (5), Vulnerable (5), Critically Endangered (1), and Endangered (3) species, as well as five migratory wetland bird species, underscoring its significance for wildlife conservation. Given the diverse and cross-cutting nature of wetlands, the development of science-based policies and coordinated efforts among central, provincial, and local governments are essential for the preservation and sustainable management of these vital ecosystems." (Authors) Odonate taxa are treated at family level.] Address: Tachamo-Shah, R.D., Dept of Life Sciences, School of Science, Kathmandu Univ., Dhulikhel 45200, Nepal; Aquatic Ecology Centre, School of Science, Kathmandu University, Dhulikhel 45200, Nepal.

22567. Talley, J.; Pusdekar, S.; Feltenberger, A.; Ketner, N.; Evers, J.; Liu, M.; Gosh, A.; Palmer, S.E.; Wardill, T.J.; Gonzalez-Bellido, P.T. (2023): Predictive saccades and decision making in the beetle-predating saffron robber fly. *Current Biology* 33: 13 pp. (in English) ["Internal predictions about the sensory consequences of self-motion, encoded by corollary discharge, are ubiquitous in the animal kingdom, including for fruit flies, dragonflies, and humans. In contrast, predicting the future location of an independently moving external target requires an internal model. With the use of internal models for predictive gaze control, vertebrate predatory species compensate for their sluggish visual systems and long sensorimotor latencies. This ability is crucial for the timely and accurate decisions that underpin a successful attack. Here, we directly demonstrate that the robber fly *Laphria saffrana*, a specialized beetle predator, also uses predictive gaze control when head tracking potential prey. *Laphria* uses this predictive ability to perform the difficult categorization and perceptual decision task of differentiating a beetle from other flying insects with a low spatial resolution retina. Specifically, we show that (1) this predictive behavior is part of a saccade-and-fixate strategy, (2) the relative target angular position and velocity, acquired during fixation, inform the subsequent predictive saccade, and (3) the predictive saccade provides *Laphria* with additional fixation time to sample the frequency of the prey's specular wing reflections. We also demonstrate that *Laphria* uses such wing reflections as a proxy for the wingbeat frequency of the potential prey and that consecutively flashing LEDs to produce apparent motion elicits attacks when the LED flicker frequency matches that of the beetle's wingbeat cycle." (Authors) The paper includes many references to Odonata.] Address: Talley, Jennifer, Air Force Research Laboratory, Munitions Directorate, Eglin AFB, FL 32542, USA. Email: jennifer.talley.1@us.af.mil

22568. Tennesen, K.J.; Garrison, R.W. (2023): *Epipleoneura parmula* sp. nov. (Odonata: Coenagrionidae: Protoneurinae) from Amazonian Ecuador. *Zootaxa* 5343(4): 395-400. (in English, with Spanish summary) ["*Epipleoneura parmula* sp. nov. is described and illustrated based on males from eastern Ecuador (holotype: male, ECUADOR, Orellana Province, Primavera, Laguna Taracoa (0.4652°S, 76.7638°W), 247 m, 27 July 1977, Dennis R. Paulson & Susan Hills leg., in FSCA). Using the most recent synopsis of the genus (Pessacq 2014), the new species keys to the couplet separating *E. pallida* Rácenis and *E. ocuene* De Marmels, but unlike in those species, the epiproct branches are longer, fused nearly their entire length and their tips are accentuated. Adults were collected at a lake and several ponds, indicating that the habitat is lentic, although the nymph is unknown." (Authors)] Address: Garrison, R.W., Plant Pest Diagnostic Center, California Department of Food and Agriculture 3294

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22569. Termaat, T. (2023): Trending Dragonflies assessing and explaining trends and threats on different scales. PhD thesis, Wageningen University, Wageningen, NL: 206 pp. (in English, with Dutch summary) ["Monitoring biodiversity is necessary to keep track of the progress towards conservation targets and to measure the success of conservation strategies. However, adequate biodiversity monitoring programmes are not easy to achieve. They require enough data on species occurrence over a longer period of time, and a scientifically sound method for data analysis to derive robust, unbiased trend information. Monitoring programmes that meet these requirements are scarce and often cover only a small geographic area. In Europe, only two species groups currently are covered by monitoring programmes that have resulted in pan-European biodiversity indicators: birds and butterflies. Evidently, these two species groups do not sufficiently represent total biodiversity. Dragonflies (Odonata, including damselflies) may be a suitable additional indicator group. They are likely sensitive to other aspects of ecosystem quality than birds and butterflies and due to their strong dispersal capacities they may quickly respond to environmental change. The number of amateur naturalists watching dragonflies has greatly increased in recent decades, leading to a sharp rise in available distribution records throughout Europe. The majority of these records, however, are opportunistic', that is, collected without a standardised field protocol and without a design ensuring the geographical representativeness of sampled sites. Using these records requires a new method for data analysis that successfully corrects for unequal observation efforts. The aim of the research covered in this thesis is to find and test such a method, and use it to derive trends in the distribution of dragonflies at different spatial scales in Europe. Subsequently, it examines how the obtained trends can be explained and which consequences this has for dragonfly conservation. Chapter 2 of this thesis explores if occupancy models (also known as site-occupancy models) may be helpful to reduce biases in estimating trends based on opportunistic data, caused by temporal variation of observation effort and by incomplete reporting of sightings. Occupancy models estimate the probability of sites to be occupied while taking into account imperfect detection of a species, via the deduction of 'detection histories' from replicated visits. Such models were applied to three opportunistic datasets of dragonfly species (1999–2007) in the Netherlands: (1) one-species records, (2) short species day-lists and (3) comprehensive species day-lists. The resulting trend estimates were compared to trend estimates based on presence-absence records collected at fixed monitoring transects, via the standardised field protocol of the Dutch Dragonfly Monitoring Scheme (the 'golden standard'). In addition, conventional logistic regression analyses were applied to test if occupancy models performed better. Occupancy trends based on comprehensive species day-lists in combination with occupancy models were similar to those based on standardly collected data, while trends based on single-species records and short day-lists were too imprecise. Application of logistic regression models led to less realistic trend estimates than application of occupancy models. Thus, analysing comprehensive day-lists of opportunistic records with occupancy models can be a suitable and feasible alternative for dragonfly monitoring based on standardised observations. The monitoring method described in Chapter 2 can of course be used in other countries than the Netherlands as well, provided that these countries have sufficiently large datasets of opportunistic dragonfly records. However, to infer dragonfly

trends on a supranational scale, a method is needed to combine trends from different countries while taking into account the unequal geographical occupation of surveyed sites. Chapter 3 describes a pilot study for *Calopteryx splendens*. Opportunistic distribution records were collected from five countries (Ireland, Great Britain, the Netherlands, Belgium and France), covering the period 1990–2008. Occupancy trends were first estimated for each country separately. Then the countries were weighted according to the number of sites surveyed and the range of the species per country. These weights were then applied during the aggregation of the national trends into a supranational trend. This showed that the distribution of *C. splendens* increased significantly in the five countries combined. The pilot demonstrated that supranational occupancy trends can be successfully calculated, which opens new perspectives for international monitoring of biodiversity. Chapter 4 investigates how the dragonfly fauna of the Netherlands has developed in the period 1991–2013, using both standardised monitoring data on abundance and opportunistic data on distribution. Trends of dragonfly species from different habitat types are compared, as are trends of species with southern vs. northern distributions in Europe. Many species had declined prior to 1990, due to environmental pollution and habitat loss. Since the 1980s, stricter environmental regulations and habitat restoration projects led to improvements in freshwater habitats and many dragonfly species were able to quickly recover, leading to more positive conservation statuses. Species of running waters benefitted more than species of standing waters, and southern species had more positive trends than northern species, suggesting that climate change has contributed to the recovery. These outcomes support the suitability of dragonflies as indicators of freshwater habitat condition. However, dragonflies recovered more strongly in the Netherlands than many other aquatic or terrestrial insects (e.g. stoneflies, caddisflies, mayflies, butterflies, moths), likely because of their higher dispersal abilities or different habitat requirements. Following the method for supranational trend assessment in Chapter 3 and the explanations for the Dutch dragonfly trends found in Chapter 4. Chapter 5 explores how the occurrence of dragonflies has changed at a European level, in the period 1990–2015. Based on distribution data from 10 European geographic regions, occupancy indices were calculated for 99 (69%) of the European species. 55 of them increased in distribution at European level, 32 species remained stable, and none declined. Trends for 12 species were uncertain. To determine whether the changes found in dragonfly communities are driven by climate warming, Species Temperature Indices (STI) were calculated. STI is a simple measure of a species' preferred temperature regime, expressed as the mean annual temperature in the species' European range. Based on these STI, all species were categorised as either being cold-dwelling or warm-dwelling and Multi-species Indicators (MSI) were compiled. MSI of cold-dwelling and warm-dwelling species differed in some of the regions, but increased at a similar rate at European level. Furthermore, Community Temperature Indices (CTI) were calculated, as the average STI of all species in a region, weighted by species occupancies. CTI increased in all regions, except Cyprus. The European CTI increased slightly, but lagged behind the increase in temperature itself. This implies that dragonflies have accumulated a 'climate debt', meaning that problems for cold-dwelling species can still be expected after 2015. Dragonflies proved to be a suitable species group for monitoring changes in communities, both at regional and continental level. For effective species conservation it is not only important to notice early that a species is declining, but also to properly understand the causes of its decline. Furthermore, as insects may respond rapidly to environmental changes, it is necessary to

discriminate between former and current threats and to focus conservation efforts on the latter. Chapter 6 describes a study on the habitat requirements of *Coenagrion hastulatum*, an endangered species in the Netherlands, and investigates what has caused the progressive loss of its populations during the 20th and beginning of 21st century. Historically, habitat loss and changes in anthropogenic use of moorland pools and bogs were the most prominent causes. In the second half of the 20th century, strongly elevated atmospheric deposition of sulphur and nitrogen compounds, leading to acidification and eutrophication, was the main culprit. Sites where *C. hastulatum* disappeared between 2001 and 2015 had lower cover of essential vegetation structures. This suggests that they never fully recovered, despite the strong reduction in sulphur and moderate reduction in nitrogen deposition since the 1980s. Most recently, more populations have been lost as a direct result of prolonged droughts, a consequence of climate change. Thus, the most relevant pressures have indeed changed over time. Restoration of groundwater systems and rewetting measures are now first priorities for the conservation of *C. hastulatum* and other cold-adapted species of moorland pools and bogs. Chapter 7 contains an overall synthesis. It draws general conclusions, addresses implications for dragonfly conservation and discusses future prospects. At national level in the Netherlands, dragonflies reacted negatively to environmental problems in the 20th century, but most species quickly recovered as these problems were overcome or mitigated. However, climate change now has a dominant effect, both positive on warm-adapted species and negative on cold-adapted species. This is also true at a European level: the 'climatic debt' that dragonfly communities accumulated is now being paid, as many cold-adapted species have started to decline and will be listed as threatened on the updated IUCN Red List of European Odonata. Conservation efforts should prioritise the protection of oligo-mesotrophic freshwater habitats in northern Europe as areas of refuge for cold-adapted species. Halting human exploitation of these ecosystems and consolidating surface and groundwater levels are the most important measures. Protection of watersheds in southern and southeastern Europe is also pressing, as multiple dragonfly species in those regions are at risk due to desiccation of streams and rivers, including some range-restricted European endemics. This thesis supports the suitability of dragonflies as biodiversity indicators. Since dragonflies react to environmental change almost instantly, both positively and negatively, they inform us on the current condition of freshwater ecosystems. Due to their strong dispersal ability, habitat fragmentation plays a limited role. Dragonfly trends therefore have an 'early signalling' function and may be used as predictors of the future trends of other freshwater organisms that respond less rapidly. Furthermore, this thesis proves that it is feasible to start a European dragonfly monitoring programme right away, by compiling distribution data that are already available in many countries, and analysing those data with occupancy models. The resulting species indices and trends could form the basis of a freshwater biodiversity indicator, narrowing the gap in the availability of indicators currently employed by the European Environmental Agency." (Author)] Address: Termaat, T., De Vlinderstichting/Dutch Butterfly Conservation, Wageningen, The Netherlands. E-mail: timtermaat@gmail.com

22570. Tolman, E.R.; Beatty, C.D.; Bush, J.; Kohli, M.K.; Frandsen, P.B.; Gosnell, J.S.; Ware, J.L. (2023): Exploring chromosome evolution in 250 million year old groups of dragonflies and damselflies (Insecta: Odonata). *Molecular Ecology* 32: 5785–5797. (in English) ["Using recently published chromosome-length genome assemblies of *Ischnura elegans*,

Platynemis pennipes, *Pantala flavescens* and *Tanypteryx hageni*, we demonstrate that the autosomes of Odonata have undergone few fission, fusion, or inversion events, despite 250 million years of separation. In the four genomes discussed here, our results show that all autosomes have a clear ortholog in the ancestral karyotype. Despite this clear chromosomal orthology, we demonstrate that different factors, including concentration of repeat dynamics, GC content, relative position on the chromosome, and the relative proportion of coding sequence all influence the density of syntenic blocks across chromosomes. However, these factors do not interact to influence synteny the same way in any two pairs of species, nor is any one factor retained in all four species. Furthermore, it was previously unknown whether the microchromosomes in Odonata are descended from one ancestral chromosome. Despite structural rearrangements, our evidence suggests that the micro-chromosomes in the sampled Odonata do indeed descend from an ancestral chromosome, and that the micro-chromosome in *P. flavescens* was lost through fusion with autosomes." (Authors) T. hageni, P. flavescens, I. elegans, P. pennipes, Hetaerina americana, Rhinocypha anisoptera, Calopteryx splendens, Ladona fulva.] Address: Tolman, E.R., Division of Invertebrate Zoology, American Museum of Natural History, New York City, NY 10024, USA. Email: etolman@amnh.org

22571. Tsavdaridou, A.I.; Doxa, A.; Mazaris, A.D. (2023): Towards achieving a twenty-fold increase in the coverage of freshwater species distributions within protected areas in Europe. *Biological Conservation* 285, 110233: 9 pp. (in English) ["Freshwater ecosystems are threatened worldwide, with 1/3 of freshwater species being under extinction risk. Yet, systematic conservation planning has received little attention as a means to prioritize freshwater conservation areas. Here, we develop a comprehensive approach to spatially delineate key areas for freshwater conservation across Europe, considering directed-connectivity, climate change and human-related disturbances. We assess the adequacy of the current reserve network in protecting European freshwater ecosystems and provide guidelines for expansion. We conducted 13 prioritization scenarios for 18,300 sub-basins across Europe, accounting for the distribution of 1,668 freshwater species [including 131 odonate species]. Connectivity properties, metrics of climatic stability and human induced pressures were incorporated into the spatial prioritization framework. We highlight the critical importance of specific regions in Central and Southern Europe, the Mediterranean Basin, and parts of the Balkan Peninsula for future freshwater conservation efforts. However, our analysis also reveals the complete inadequacy of the current reserve network, as protected sub-basins only cover 4 % of the study area and encompass on average only 3 % of freshwater species distributions. In contrast, expanding current reserves to cover the top 17 % of high priority areas across Europe could substantially improve the overall coverage of species distributions, reaching an average of 61.5 % for all freshwater species and even exceeding 93.1 % for species of conservation interest (critically endangered, endangered and vulnerable species). The priority freshwater conservation network derived from the analysis provides specific spatial recommendations to help achieve conservation goals if the current reserve network is appropriately expanded." (Authors)] Address: Tsavdaridou, A.I., Dept of Ecology, School of Biology, Aristotle University of Thessaloniki, 54636 Thessaloniki, Greece. Email: atsavda@bio.auth.gr

22572. Vale, A.L.; Francisco de Ávila Jr., W.; Jacques, G.; Magalhães de Souza, M.; Pinto, A.P. (2023): Check-list of

the Odonata from the Sempre-Vivas National Park in the Cerrado region, Minas Gerais, south-eastern Brazil. *Odonatologica* 52(3-4): 233-246. (in English) ["This study is the first check-list of Odonata from the Sempre-Vivas National Park, a rocky field formation in the Cerrado domain in the north-eastern region of Minas Gerais, south-eastern Brazil. The sampling was carried out from 2018 to 2019, totalling 20 days of sampling effort and yielding almost 700 specimens collected. A rich community of 79 species from 10 families was recorded. Three sampled species are red-listed by IUCN and one at national level. These are most likely accorded threatened status due to lack of knowledge on their populations, insufficient collecting efforts, and the failure of published data from existing natural history collections." (Authors)] Address: Vale, Ana Luiza, Universidade do Extremo Sul Catarinense, Criciúma, SC, Brazil. Email: ana-luiza.ribeirovale@gmail.com

22573. van Hoof, B.A.; Cabana, M. (2023): Expansion of the known distribution of *Brachytron pratense* (Müller, 1764) (Odonata: Aeshnidae) in Cantabria (northern Spain). *Boletín de la Sociedad Entomológica Aragonesa* 72: 185-187. (in Spanish, with English summary) ["New records of *B. pratense* in the province of Cantabria, northern Spain, are provided. These observations contribute to expanding the known distribution within the autonomous community, with the addition two UTM 10x10 km grid squares." (Authors) 03/05/2021, a male, Mirador de las Dunas of the Parque Natural de las Dunas de Liencres (Piélagos – 30TVP2211). 06/05/2022, 30/03/2023 and 09/04/2023, La Cantera de Solvay in Cuchía (Miengo – 30TVP1709).] Address: van Hoof, B.A., Bo. Casar 253, Bloq. 2, 2A, Casar de Periedo (Cantabria), Spain. Email: bartavanhooft@gmail.com

22574. van Oppen, Y.B.; Milder-Mulderij, G.; Brochard, C.; Wiggers, R.; de Vries, S.; Krijnen, W.P. (2023): Modeling dragonfly population data with a Bayesian bivariate geometric mixed-effects model. *Journal of Applied Statistics* 50(10): 2171-2193. (in English) ["We develop a generalized linear mixed model (GLMM) for bivariate count responses for statistically analyzing dragonfly population [*Aeshna viridis*] data from the Northern Netherlands. The populations of the threatened dragonfly species *A. viridis* were counted in the years 2015–2018 at 17 different locations (ponds and ditches). Two different widely applied population size measures were used to quantify the population sizes, namely the number of found exoskeletons ('exuviae') and the number of spotted egg-laying females were counted. Since both measures (responses) led to many zero counts but also feature very large counts, our GLMM model builds on a zero-inflated bivariate geometric (ZIBGe) distribution, for which we show that it can be easily parameterized in terms of a correlation parameter and its two marginal medians. We model the medians with linear combinations of fixed (environmental covariates) and random (location-specific intercepts) effects. Modeling the medians yields a decreased sensitivity to overly large counts; in particular, in light of growing marginal zero inflation rates. Because of the relatively small sample size ($n = 114$) we follow a Bayesian modeling approach and use Metropolis-Hastings Markov Chain Monte Carlo (MCMC) simulations for generating posterior samples." (Authors)] Address: van Oppen, Y.B., Groningen Biomolecular Sciences and Biotechnology Institute, Groningen University, Groningen Netherlands. Email: y.b.van.oppen@rug.nl

22575. van Schalkwyk, J.; Kietzka, G.J.; Pryke, J.S.; Gaigher, R.; Samways, M.J. (2023): Enhancing semi-aquatic species representativeness beyond protected areas: dragonflies

in networks of conservation corridors. Biodiversity and Conservation 32: 3991-4005. (in English) ["Complementarity is crucial when prioritizing sites for biodiversity conservation. Networks of conservation corridors (CCs) can contribute to regional representativeness by complementing biodiversity features included in existing protected areas (PAs). We ask whether criteria important for CC management and design are effective at prioritizing complementary sites, and how the consideration of species represented in PAs influence criteria performance. We focused on species turnover of generalist and specialist dragonflies across 88 riverine sites. Criteria assessed included site-level estimates of dragonfly species richness, estimates of local habitat quality and corridor width. Measures of local habitat quality were based on either dragonfly indicator species or proportion of alien vegetation. Results showed that CCs complement dragonfly diversity in PAs by contributing unrepresented generalist species. Of the criteria, corridor width was the most efficient at prioritizing complementary sites, while prioritization based on dragonfly indicator species or species richness underperformed. When aiming to prioritize CC sites that also complement sites situated in established PAs, wide corridors with low levels of alien vegetation should be favoured.] Address: van Schalkwyk, Julia, Dept of Conservation Ecology & Entomology, Stellenbosch University, Private Bag X1, Matieland 7602, South Africa. Email: juliavanschalkwyk.3.14@gmail.com

22576. van Staveren, D.; Vergeer, P.; Meertens, H.; Huperichs, L.; van den Berg, L. (2023): Habitat restoration at the Kasteelhoeve Cartils Estate. *Natuurhistorisch Maandblad* 112(7): 181-187. (in Dutch, with English summary) ["The 'Kasteelhoeve Cartils' estate is located in the Eyserbeek valley, near the mouth of the Eyserbeek brook, between Eys and Gulpen in the south of the Dutch province of Limburg. The estate extends from a higher slope of the Ubachsberg Plateau (i.e. the Biesberg hill) to the low-lying village of Cartils. In 2010, the landowner of 'Kasteelhoeve Cartils' decided to transform large parts of the land into nature areas or manage them by means of an agri-environmental management approach. Since then, habitats have been restored on a large scale. The restoration efforts were explicitly aimed at restoring various types of habitat and the natural and unique gradients from dry to wet and from calcareous to acidic. By now, 14 of the 33 hectares have been transformed into a nature reserve because of their high potential for the development of calcareous grassland, mesotrophic flower-rich grasslands and calcareous marsh. The coming years will be marked by further development through appropriate management of the restored landscape. Eventually, the ecosystem approach to restoration that is being used will, in combination with effective management, create another jewel in the landscape of southern Limburg, in which the entire abiotic gradient from the edge of the plateau to the valley of the river Geul will be reflected in a unique, characteristic semi-natural vegetation." (Authors) The paper includes a reference to *Orthetrum brunneum* colonising newly developed habitats.] Address: van Staveren, D., Bosgroep Zuid Nederland, Huisvenseweg 14, 5591 VD Heeze, The Netherlands. Email: d.vanstaveren@bosgroepzuid.nl

22577. van't Hof, A.E.; Fincke, O.M. (2023): Novel hatching cue in the neotropical damselfly *Megaloprepus caerulatus*: larval adaptation and maternal constraint. *International Journal of Odonatology* 26: 153-163. (in English) ["The evolution of sibling cannibalism as a maternal strategy is particularly challenging to explain when nurseries are shared among multiple females. Such is the case for *Megaloprepus caerulatus*,

whose females lay eggs in bark above the water line in large, water-filled tree holes. Asynchronous egg hatching appears to be a maternal bet-hedging strategy to increase the chances that cannibalistic offspring hatch during windows of opportunity, which occur after the remaining large larvae emerge, having eaten all others. We investigated the proximate causes of asynchronous hatching. By monitoring the pattern of egg hatching under ambient temperature in an insectary, we found that egg hatching co-occurred with lower ambient temperatures, which decreased with increasing rainfall. Treating fully developed eggs to a lower temperature for two hours triggered increased hatching relative to controls at ambient temperature. Dissection of control clutches indicated that embryonic development of siblings was asynchronous. Results suggested that the hatching trigger is adaptive. Rainfall assures a recharge of the larval habitat with water and provides wet conditions essential for neonate mobility on bark. Only 40% of neonates in a 4-day drying treatment survived; none survived the 8- and 14-day treatments. This novel hatching trigger should increase the number of neonates entering the nursery after rains, constraining a mother's control over the timing of egg hatch, while increasing the competition among related and unrelated offspring for limited windows of opportunity in the shared nursery." (Authors)] Address: Fincke, O., Dept of Biology, University of Oklahoma, Norman OK, USA. Email: fincke@ou.edu

22578. Vejříková, I.; Vejřík, L.; Cech, M.; Blabolil, P.; Peterka, J. (2023): Variable diet plasticity in Eurasian perch (*Perca fluviatilis*): Current versus seasonal food uptake. *Ecology of Freshwater Fish* 32: 795-803. (in English) ["Diet plasticity is often studied in Eurasian perch (*Perca fluviatilis*), a species commonly described as having generalist populations composed of specialised individuals. Perch diet was examined using gut content analysis (GCA) and stable isotope analysis (SIA), and individual specialisation was calculated in two study lakes within 2 years. Mostly only one diet category was present in the perch stomach, with more variation in the diet in the Most lake compared to the Milada lake between 2013 and 2014. The calculated degree of individual specialisation indicated higher specialisation in the Most lake. Interestingly, despite the different or almost uniform diet composition between the years, the total niche width (based on SIA) of the population remained similar in both lakes. This suggests that the overall variation in the sources utilised by the entire population remained consistent between the years. GCA mostly indicated zooplankton as the prevailing food source, whereas SIA indicated significant utilisation of YOY fish earlier that year, an information that was completely missed by the GCA of fish caught in September. The differences between GCA and SIA results could be attributed to the different time intervals reflected by the methods, but possibly to the conversion of the diet into the body tissues that is reflected by SIA and may depend on the diet's nutritional values rather than the proportion of different prey consumed." (Authors) No details on Odonata are given.] Address: Vejříková, I., Biology Centre of the Czech Academy of Sciences, Institute of Hydrobiology, České Budejovice, Czech Republic

22579. Viella, D.S.; Lencioni, F.A.A.; Bota-Sierra, C.A.B.; Ware, J.A.; Bispo, P.C. (2023): Taxonomic revision of the Neotropical genus *Heteragrion* Selys, 1862 (Zygoptera: Heteragrionidae): male morphology, new species and illustrated key. *Zootaxa* 5356(1): 1-96. (in English, with Portuguese summary) ["In this study, we have comprehensively presented taxonomic information on all 62 known species of *Heteragrion* Selys, 1862, which includes illustrations, photographs, diagnostic characters, and a key to males. Our analysis is based

on the examination of over 900 specimens from 19 different collections worldwide, encompassing the type material for at least 42 species. Furthermore, we have described a new species, *Heteragrion corderoi* sp. nov. (male, Brazil, São Paulo state, Campos do Jordão, Condomínio Paradise, 24.i.1999, (Coordinates: -22.7072, -45.5894, 1796 m asl), F.A.A. Lencioni leg., LABECO), which we identified from a male that was previously considered to be a paratype of *H. mantiqueirae* Machado, 2006 and additional specimens collected in Campos do Jordão, São Paulo state." (Authors)] Address: Viella, D.S., Lab. de Biologia Aquática, Depto de Ciências Biológicas, Fac. de Ciências e Letras de Assis, Univ. Estadual Paulista, Assis, SP, Brazil. Email: deeogoo@gmail.com

22580. Vilela, D.S.; Jacques, G.; Magalhaes de Souza, M. (2023): A new species of *Minagrion* Santos, 1965 (Odonata: Coenagrionidae) from the Cerrado of Northern Minas Gerais state, Brazil. *Zootaxa* 5374(2): 255-262. (in English, with Portuguese summary) ["*Minagrion veredae* sp. nov. (Holotype male, Brazil (Z329), Minas Gerais state, Grande Sertão Veredas National Park, 15.iv.2023, (15°6' S, 45°48' W, 660 to 900m asl), P.S. Vital leg.) is described, illustrated and diagnosed based on specimens collected at the Grande Sertão Veredas National Park. The new species inhabits palm swamp environments, Cerrado domain phytophysognomy, as it is typical of other species of the genus. It can be diagnosed from its congeners mainly by the forcipate shape and large teeth of the cercus and the lanceolate shape of segment two of the genital ligula." (Authors)] Address: Vilela, D.S., Univ. Estadual Paulista, Depto de Ciências Biológicas, Faculdade de Ciências e Letras de Assis, Laboratório de Biologia Aquática, Assis, SP, Brazil. Email: diogo.vilela@ifsuldeminas.edu.br

22581. Vilela, D.S.; Reis dos Santos, M.; Heldt Junior, R.; Monteiro, R.T.; Pereira de Gouvêa, T.; de Souza, M.M. (2023): Odonata (Insecta) in high-altitude fields and associated ecosystems in the Poços de Caldas Plateau, Brazil. *Revista Chilena De Entomología* 49(4): 843- 860. (English, with Spanish summary) ["The High Altitude Fields (HAF) are unique phytosociological features that occur only in certain regions of the Atlantic Forest. It is composed of herbaceous and shrubby vegetation and shallow soils that promote local water infiltration and recharge. Occurring on top of hills, the HAF are isolated units in the landscape, connecting with the matrix through associated ecosystems (springs with riparian forests and "capões de mata", which are natural islands of arboreal vegetation, commonly associated with rural vegetation, such as high-altitude fields, located above 1,200 m in phytogeographic domains of the Atlantic Forest, Cerrado or Caatinga). These areas have great species endemism, and studies concerning the order Odonata are still scarce. Thus, we aimed to evaluate the ecological responses (richness, diversity, specificity) of adult odonates in these ecosystems. The study was conducted from November 2020 to March 2021 in three areas in the Poços de Caldas Plateau, Minas Gerais state, Brazil. A total of 45 species (247 specimens) were collected, with the highest total richness being recorded for Anisoptera. Among the sampled areas, there was no difference in Anisoptera communities, but there was a difference in Zygoptera species composition. In general, the most preserved remnant of HAF, the greater it presents greater richness of Odonata and harbors a regional pool of species." (Authors)] Address: Vilela, D.S., Laboratório de Zoologia, Instituto Federal de Educação Ciência e Tecnologia do Sul de Minas Gerais – IFSULDEMINAS – Inconfidentes, Brazil. Email: diogo.vilela@ifsuldeminas.edu.br

22582. Viza, A.; Garcia-Raventós, A.; Riera, J.L.; Maynou,

X.; Martín, R.; Prunier, F.; El Haissoufi, M.; Múrria, C. (2023): Species-specific functional traits rather than phylogenetic relatedness better predict future range-shift responses of odonates. *Insect Conservation and Diversity* 16(5): 574-587. (in English) ["Climate change has the potential to modify habitat characteristics and, consequently, induce species responses to ongoing environmental changes. Functional traits determine both if a species can persist and maintain stable population sizes in particular ecological conditions, and its capacity to disperse to more favourable habitats. Given that functional traits evolve over time, one could expect closely related species to show similar responses to climate change, which should identify vulnerable lineages. Alternatively, species-specific functional traits may anticipate species responses to climate change, and therefore, trait composition should be a strong predictor. We compiled a comprehensive dataset of functional traits of 84 Iberian and Moroccan odonates species and built a phylogenetic tree to determine if dissimilarity of traits and phylogenetic relatedness are relevant to better discriminate species range-shift responses to climate change. Modelling results for 66 species showed clear impacts of the increase in temperature and drought events on their potential distribution. The traits that best-discriminated species that expanded their ranges were multivoltinism, short-life cycles and preference for temporary habitats, whereas species with a reduced and displaced potential distribution were mostly semivoltine, with a short flying season, oviposition on gravel and restricted to permanent streams, small rivers or oligotrophic lakes. Trait conservatism was rejected and phylogenetic relatedness was a poor predictor of range shifts. Considering odonates as model organisms, traits such as voltinism, beginning and prolongation of flight period and preference of temporal habitats should be examined to anticipate range-shift responses of freshwater insects to climate change." (Authors)] Address: Viza, Aida, Dept de Biologia Evolutiva, Ecologia i Ciències Ambientals, Facultat de Biologia, Universitat de Barcelona, Avinguda Diagonal 643, 08028 Barcelona, Catalonia, Spain. Email: aida.viza@ub.edu

22583. Waldhauserová, I.; Waldhauser, M. (2023): Entomological research of damselflies and dragonflies (Odonata) and water beetles (Coleoptera) on selected localities in the CSA and Vršany surface mines (northwestern Bohemia). *Príroda, Praha* 45: 33-54. (in Czech Republic, faunistics, northwestern Bohemia, Odonata, Coleoptera, surface mine.) ["In 2021, a basic entomological survey of 26 selected sites in the area of the surface quarries of CSA and Vrsany in northwestern Bohemia was carried out. A total of 38 Odonata species and 65 aquatic beetle species were recorded, of which 8 Odonata species and 7 aquatic beetle species are included in the Red List of Threatened Species of the Czech Republic." (Authors)] Address: Waldhauser, M., Petrovice 136, 47125 Jablonné v Podještědí; waldhauser.martin@gmail.com

22584. Walia, G.K.; Dhillon, G.K. (2023): Phylogenetic analysis of *Aciagrion* Selys (Odonata: Coenagrionidae). *Journal of Natural History* 57(37-40): 1610-1628. (in English) ["Odonates are useful biological indicators of environmental health because of their pollution-free habitat requirements and amphibiotic life cycle. Due to habitat destruction by industrial development, there is a need to name these odonates and obtain their genetic data to be used in understanding their evolutionary history for biodiversity conservation. *Aciagrion* is a poorly known and taxonomically difficult genus of oriental damselflies. Species of this genus cannot be distinguished on the basis of morphological characters alone as they are morphologically similar to the damselflies of other genera (*Ischnura* and *Amphialagma*) and may also be referred to

as cryptic species. Here, therefore, molecular studies are carried out to distinguish the species of this genus. The phylogenetic relationships of five species of genus *Aciagrion* have been explored using molecular (based on concatenated sequences of mitochondrial genes- COI, ND1 and 16S rRNA genes) as well as external morphological characters. Single-linkage cluster analysis of morphological data sets did not explain the relationships appropriately among the species of this genus as outgroup species were also retrieved within in-group species. Interspecific genetic divergence, conserved, variable, parsimony-informative sites, nucleotide base composition and transition/transversion bias based on concatenated gene sequences have been calculated for these species. It is found that a multigene concatenation approach interprets phylogeny more appropriately than the morphological data alone. Presently, a COI gene fragment sequence for one species (the endemic *Aciagrion hisopa*), 16S rRNA gene fragments for four species and ND1 gene fragments for five species have been submitted for the first time to GenBank, and phylogenetic relationships based on three genes have also been determined for the first time. *Aciagrion migratum* is a new record from India." (Authors) *Aciagrion approximans*, *A. hisopa*, *A. migratum*, *A. occidentale*, *A. pallidum*, *Amphialagma parvum*, *Ischnura forcipata*] Address: Walia, Gurinder, Dept of Zoology & Environmental Sciences, Punjabi Univ., Patiala, India. Email: gurinderkaur_walia@yahoo.co.in

22585. Wang, H.; Wang, L.; Liao, J.; Han, B.-P. (2023): The complete mitochondrial genome of *Chlorogomphus shanicus* Wilson, 2002 (Anisoptera: Chlorogomphidae), an endemic species in South China. *Mitochondrial DNA Part B*, 8:11: 1192-1195. (in English) ["In this study, the complete mitochondrial genome of *C. shanicus* was reported, and the maximum-likelihood (ML) phylogenetic tree was constructed using 13 protein-coding genes (PCGs). The total length of the mitogenome of *C. shanicus* was 15,497 bp. Twelve PCGs started with ATN codons, except *cox1* began with TTG codon. Most transfer RNA genes (tRNAs) were predicted to fold in a typical cloverleaf structure, except the *trnS1* (*gct*), which lacked a dihydrouridine arm that had been simplified to a loop. The phylogenetic tree showed that Anisoptera was split into two clades, and revealed that *C. shanicus* was closely related to *Cordulegaster boltonii* (Donovan, 1807) which is endemic to Europe." (Authors)] Address: Han, B.-P., Dept of Ecology and Institute of Hydrobiology, Jinan University, Guangzhou, China. Email: tbphan@jnu.edu.cn

22586. Ware, J.L.; Abbott, J.C. (2023): In memoriam Michael Love May (1946 – 2023). *Odonatologica* 52(3/4): 173-180. (in English) ["Michael May was an odonatologist and entomologist with a long career working on thermoregulation, behaviour, and systematics. Here we share a brief outline of Mike's scientific career, a selected bibliography of his publications and warm reflections on his long, full life." (Authors)] Address: Ware, Jessica, Division of Invertebrate Zoology, American Museum of Natural History, 200 Central Park West, New York NY, 10024, USA. Email: jware@amnh.org

22587. Weihrauch, F. (2023): In memoriam Richard James Rowe (1948 – 2023). *Odonatologica* 52(3/4): 181-191. (in English) ["Personal recollections of Richard Rowe, a brief outline of his life and his scientific career, and his complete odonatalogical bibliography are presented." (Author)] Address: Weihrauch, F., Jägerstraße 21A, 85283 Wolnzach, Germany. Email: mail@osmylus.com

22588. Willacker, J.J.; Eagles-Smith, C.A.; Nelson, S.J.; Flanagan Pritz, C.A.; Krabbenhoft, D.P. (2023): The influence

of short-term temporal variability on the efficacy of dragonfly larvae as mercury biosentinels. *Science of The Total Environment* 867, 161469: 9pp. (in English) ["Highlights: • Spatial variation in Hg exceeded temporal variability. • Temporal patterns in Hg differed among sites in the same region. • %MeHg is consistent over time. • Relationship between abiotic and biotic Hg varies over time. Abstract: Mercury (Hg) exposure to fish, wildlife, and humans is widespread and of global concern, thus stimulating efforts to reduce emissions. Because the relationships between rates of inorganic Hg loading, methylmercury (MeHg) production, and bioaccumulation are extremely complex and challenging to predict, there is a need for reliable biosentinels to understand the distribution of Hg in the environment and monitor the effectiveness of reduction efforts. However, it is important to assess how temporal and spatial variation at multiple scales influences the efficacy of specific biosentinels. Seasonal and interannual variation in total Hg (THg) concentrations of dragonfly larvae were examined in relation to spatial variability among 21 sites in two U.S. national parks with contrasting ecologies Hg deposition patterns. Dragonfly THg differed among sampling events at 17 of the 21 sites, but by an average of only 20.4% across events, compared to an average difference of 52.7% among sites. Further, THg concentrations did not follow consistent seasonal patterns across sites or years, suggesting that the observed temporal variation was unlikely to bias monitoring efforts. Importantly, for a specific site, there was no difference in %MeHg in dragonflies among sampling events. Finally, there was significant temporal variability in the biogeochemical factors (aqueous inorganic Hg, aqueous MeHg, DOC, SO₄, and pH) influencing dragonfly THg, with the importance of individual factors varying by 2.4 to 4.3-fold across sampling events. Despite these results, it is noteworthy that the observed temporal variation in dragonfly THg concentrations was neither large nor consistent enough to bias spatial assessments. Thus, although this temporal variation may provide insights into the processes influencing biological Hg concentrations, it is unlikely to impair the use of dragonflies as biosentinels for monitoring spatial or temporal patterns at scales relevant to most mitigation efforts." (Authors)] Address: Willacker, J.J., U.S. Geological Survey, Forest & Rangeland Ecosystem Science Center, 3200 SW Jefferson Way, Corvallis, OR 97331, USA. Email: jwillacker@usgs.gov

22589. Willink, B.; Tunström, K.; Nilén, S.; Chikhi, R.; Lemane, T.; Takahashi, M.; Takahashi, Y.; Svensson, E.I.; West Wheat, C. (2023): The genomics and evolution of inter-sexual mimicry and female-limited polymorphisms in damselflies. *Nature Ecology & Evolution*: 15 pp, suppl. (in English) ["Sex-limited morphs can provide profound insights into the evolution and genomic architecture of complex phenotypes. Inter-sexual mimicry is one particular type of sex-limited polymorphism in which a novel morph resembles the opposite sex. While inter-sexual mimics are known in both sexes and a diverse range of animals, their evolutionary origin is poorly understood. Here, we investigated the genomic basis of female-limited morphs and male mimicry in *Ischnura elegans*. Differential gene expression between morphs has been documented in damselflies, but no causal locus has been previously identified. We found that male mimicry originated in an ancestrally sexually dimorphic lineage in association with multiple structural changes, probably driven by transposable element activity. These changes resulted in ~900 kb of novel genomic content that is partly shared by male mimics in a close relative, indicating that male mimicry is a trans-species polymorphism. More recently, a third morph originated following the translocation of part of the male-mimicry sequence into a genomic position ~3.5 mb apart. We provide

evidence of balancing selection maintaining male mimicry, in line with previous field population studies. Our results underscore how structural variants affecting a handful of potentially regulatory genes and morph-specific genes can give rise to novel and complex phenotypic polymorphisms." (Authors)] Address: Willink, Beatriz, Department of Zoology, Stockholm University, Stockholm, Sweden. Email: beatriz.willink@zoologi.su.se

22590. Worthen, W.B.; Harrell, M.D. (2023): Differences in perch height and response to intruders for territorial and non-territorial *Calopteryx maculata* (Odonata: Calopterygidae). *International Journal of Odonatology* 26: 145-152. (in English) ["In *C. maculata*, territorial males court potential mates and guard ovipositing females near the surface of the water. We conducted a survey and an experiment to determine whether there was a relationship between territoriality (site fidelity and agonistic behavior) and perch height. In the survey, males were captured, numbered, and released, and their perch height and location along a stream was noted for two weeks. Mean perch height was positively correlated with total distance travelled and negatively correlated with the number and percentage of times observed at the same site. Males that travelled less than 4 m had a significantly lower mean perch height than males that travelled more than 4 m. We conclude that males with greater site fidelity perch lower than males that travel widely. To test for a relationship between agonistic behavior and perch height, live male and female decoys, and a stick control, were run along a 20 m zip-line at two heights (25 cm and 75 cm), and the responses of resident males were recorded. Resident males that perched low (< 1 m high) approached decoys more often than resident males that perched high, and low-flying decoys were approached more than high-flying decoys. We conclude that territorial males—identified by greater site fidelity and agonistic behavior—perch lower than other males and are particularly responsive to low flying intruders. The benefits and costs of perching low and responding to low-flying intruders are discussed." (Authors)] Address: Worthen, W.B., Biology Dept, Furman University, Greenville, SC, 29613, USA

22591. Yalles Satha, A.; Aissaoui, N.; Kaour, D.; Benmars, B. (2023): Contribution à l'étude des odonates et macroinvertébrés des mares de la Moyenne et Haute Seybouse. publisher Université Frères Mentouri Constantine 1: 142 pp. (in French) ["We carried out an inventory of benthic macroinvertebrates and Odonata in six perennial ponds located in two sub-watersheds of the Middle and Upper Seybouse, located in the wilaya of Guelma. The climate of the region is Mediterranean type belonging to the semi-arid bioclimatic stage. The study period extended over four months from February until the end of May 2022. Field trips were carried out monthly making sure to respect the time allotted at each station. Using a landing net, all the microhabitats were carefully surveyed. The analysis of macroinvertebrate populations made it possible to identify 1010 individuals divided into eight classes: Insects with the main orders (Ephemeroptera, Diptera, Hemiptera, Coleoptera, Odonata, Crustaceans and Molluscs and Annelids). Furthermore, the Odonatological inventory of these ponds, allowed us to identify 187 individuals, including (6) Anisoptera and (10) Zygoptera," (Authors) *Anax imperator*, *Coenagrion scitulum*, *C. mercuriale*, *Ceragrion tenellum*, *Crocothemis erythraea*, *Erythromma lindenii*, *E. viridulum*, *Ischnura graellsii*, *I. pumilio*, *Lestes viridis*, *Orthetrum chrysostigma*, *O. nitidinerve*, *Platycnemis subdilatata*, *Sympetrum fonscolombii*, *Sympetrum fusca*, and *Trithemis kirbyi*] Address: Yalles Satha, Amina, Université 8 mai 1945 Guelma, Algeria. Email: sihem.yalles@yahoo.fr

22592. Yan, H.; Sun, F.; Zhang, Y. (2023): Scientific and technical analysis of lead-barium glaze dragonfly eye beads from the Late Warring States period in China. *Heritage Science* (2023) 11:186: 9 pp. (in English) ["This paper analyzed five dragonfly eye beads excavated from M176 of the Hejia Cemetery in the Late Warring States period (around 3rd c. BC) by using a super depth of field 3D microscope system (OM), scanning electron microscope-energy dispersive spectrum (SEM-EDS) and Raman spectroscopy. The analytical results confirmed that all the beads were glazed pottery and the glaze material belongs to the lead-barium-silicate (PbO-BaO-SiO₂) system. The color component of the glaze is Chinese Blue (BaCuSi₄O₁₀). Three beads, M176-2, M176-3, and M176-4, were formed with an inner core support and were made in the same batch. Additionally, two weathering products, CuPb₄(SO₄)₂(OH)₆ and PbCO₃, were detected on the glaze layer surface. The results of scientific and technological analysis show that these beads have differences in the composition of the body and glaze, and the color composition in the glaze layer is relatively rare in previous studies. The discovery of lead-barium glazed pottery beads from the Late Warring States period in northern China provides new evidence for further exploration into the origins and evolution of early glazed pottery. The identification of weathering products formed on the beads' surface within an alkaline burial environment holds valuable implications for the study of weathering and deterioration in silicate artifacts. Dragonfly eye beads are a type of bead imitating the structure of a dragonfly's compound eye by inlaying different colored-glass onto the base [1, 2]. It first appeared in ancient Egypt during the 18th dynasty (1550–1307 BC) [3], then became widely popular on the Mediterranean coast and the Iranian plateau [4, 5], and came into China through trade at a later time. However, the exact route of transmission has not been found clearly. Many different shapes of dragonfly eye beads have been excavated from various sites in China." (Authors)] Address: Sun, F., China-Central Asia "the Belt and Road" Joint Laboratory on Human & Environment Research, Key Laboratory of Cultural Heritage Research & Conservation, School of Cultural Heritage, Northwest University, Xi'an 710127, China. Email: sunfeng@nwu.edu.cn

22593. Yang, G.-H.; Zi, D.-D. (2023): Descriptions of the last instar larvae of *Anotogaster chaoi* Zhou, 1998 and *Neallogaster annandalei* (Fraser, 1923) from Erhai Lake Basin, Yunnan, China (Odonata: Cordulegastrids). *Zootaxa* 5357(3): 423-433. (in English) ["The exuviae of *A. chaoi* and *N. annandalei* are described and illustrated for the first time from Erhai Lake Basin, Yunnan Province, China, based on the final stage larvae reared in a laboratory. Diagnostic differences between the larvae of congeneric *A. chaoi*, *A. gregoryi* Fraser, 1923, as well as *N. annandalei* and *N. hermionae* (Fraser, 1927) are discussed, and notes on their habitats are provided." (Authors)] Address: Zi, D.-D., College of Agriculture and Life Sciences; Dali University; Yunnan 671003; China Cangshan Forest Ecosystem Observation & Research Station of Yunnan Province; Dali University Yunnan 671003; China

22594. Yang, N.; Ren, D.; Béthoux, O. (2023): Little bits of dragonfly history repeating exemplified by a new Pennsylvanian family. *Royal Society Open Science* 10: 230904. <https://doi.org/10.1098/rsos.230904>: 13 pp. (in English) ["During its 320 Myr evolution, Odonata wing morphology underwent intense modifications. The resulting diversity prompted comparative analyses focusing on phylogeny. However, homoplasy proved to plague wing-related characters. Concurrently, limited benefits were obtained from considering fossil taxa, similarly impacted. Herein, we investigate two aspects

particularly affected by convergence, namely the acquisition of vein-like structuring elements derived from regular cross-venation, termed conamina; and the evolution of butter knife wing shape. Conamen implementation is found to be consistently linked with vein curvature sharpening, itself generating potential breaking points. Conamina therefore likely evolved to address wing integrity issues during ever-more-demanding flight performance. Moreover, an existing conamen is likely to trigger the acquisition of further, associated conamina. As for butter knife shape, previously documented in the extinct Archizyoptera and among damselflies, we report a new, 315 Ma occurrence with the rare species *Haidilaozhen cuiiae* gen. et sp. nov. (family Haidilaozhenidae fam. nov.), from the Xiaheyan locality (China). The repeated acquisition of butter knife-shaped wing can be related to slow speed flight and, in turn, predator avoidance. In both cases of iterated regularities, the unique 'network-and-membrane' wing design proper to insects is found to compose a strong, constraining factor." (Authors)] Address: Ren, D., College of Life Sciences, Capital Normal University, 105 Xisanhuanbeilu, Haidian District, Beijing 100048, People's Republic of China. Email: rendong@mail.cnu.edu.cn

22595. Yang, Q.; Ren, D.; Shi, C. (2023): New petalurid dragonfly (Odonata: Aktassiidae) from the Lower Cretaceous of northern China. *Cretaceous Research* 151, 105609. (in English) ["A new species *Pseudocymatophlebia bisecta* sp. nov. (Odonata: Aktassiidae) is described from the Lower Cretaceous of China. It is assigned to this family by the typical very dense wing venation with a distinctly increased number of cells in the regions of R and M, the area between RP3/4 and MA widened near the posterior wing margin on forewing, with more than three rows of cells; RP3/4 undulate and distally diverging from MA. *Pseudocymatophlebia bisecta* sp. nov. differs from the other two species of this genus by discoidal triangle two-celled, elongate and wide in both fore- and hind wings. In addition, a revision of the genus *Pseudocymatophlebia* has been proposed." (Authors)] Address: Shi, C., School of Earth Sciences & Engineering, Guangdong Provincial Key Lab of Geological Processes & Mineral Resources, Sun Yat-sen University, Guangzhou 510275, PR China. Email: shichf5@mail.sysu.edu.cn

22596. Yeh, W.-C. (2023): An amendment on the record of *Rhyothemis fuliginosa* Selys, 1883 in Taiwan — a newly discovered gynomorphic wing pattern in female *R. regia* (Brauer, 1867). *Taiwanese Journal of Entomological Studies* 8(1): 21-28. (in English) ["The identity of Taiwanese *R. fuliginosa* is clarified to be the gynomorphic female of *R. regia* (Brauer, 1867). Female Taiwanese *R. r. regia* differ from female *R. fuliginosa* mainly in having paler face with weak metallic lustre, anteriorly more strongly incurved postclypeus and stouter cerci. The reported wing patterns of various subspecies of *R. regia* are compiled from the literature for comparison. A transitional variation of the female wing pattern of Taiwanese *R. r. regia* varying from andromorphic to gynomorphic is illustrated. The case of range expansion caused by climatic warming in *R. r. regia* and other libellulid dragonflies in Taiwan is elucidated." (Author)] Address: Yeh, W.-C., Division of Forest Protection, Taiwan Forestry Research Institute (TFRI), No. 53, Nanhai Rd., Zhongzheng Dist., Taipei, 100051, Taiwan. Email: wcyeh@tfri.gov.tw

22597. Zeng, Z.; Chen, X.-Y.; Yu, X. (2023): Stability of diagnostic morphological characters in *Ceriagrion* larvae (Odonata: Zygoptera). *Acta Hydrobiologica Sinica* 47(10): 1659-1668. (in Chinese, with English summary) ["Although dragonfly larvae can be good bioindicators in fresh water environment

assessments, their identification based on morphological characteristics is still a tough work, especially at species level. In the present study, 116 larvae of two Chinese widespread damselfly, *Ceriagrion fallax* Ris and *Ceriagrion auranticum* Fraser, were identified depending on sequence data of the mitochondrial genes Cytochrome Oxidase I (COI) and nuclear ribosomal genes ITS. The stability of two important morphological characters, caudal gills and mandibles, was discussed. For molecular analysis, LCO1490d (TTTCTAC-WAACCAYAAAGATATTGG) and HCO2198d (TAACTTC-WGGRTGTCC AAARAATCA) were used as COI primers, and Vrain2F (CTTTGTACACACCGCCCGTCGCT) and Vrain2R (TTTCACTCGCCGTTACTAAGGGAATC) as ITS primers. The reaction systems were 31.0 μ L: DNA template 3.0 μ L, upstream and downstream primers 2.0 μ L each, Mix 15.0 μ L (Jiangsu ComWin Biotech Co., Ltd's 2xEs Taq Master Mix), ddH₂O 9.0 μ L. Take 5.0 μ L PCR amplification products and detect them by electrophoresis using 1.5% agarose gel. The amplification products with detected by electrophoresis, and then sent to Chongqing Tsingke Xingye Biotechnology Co to sequence. Neighbor-Joining (NJ) trees and genetic distance method were using for the molecular identification of larvae, with the help of identified adults' sequences as conference. Relative large size of larval specimens, *C. fallax* (n=110) and *C. auranticum* (n=6), were dissected and photographed using LY-WN-OPLENC ultra-clear microphotographic system. Detailed comparative morphological examination was conducted focusing on two typical morphological features, caudal gill and mandibles. Our result showed that: (1) the presence or absence, numbers, and color of the black spots on the caudal gill were unstable, which have nothing to do with populations and sex; (2) characters of mandibles were also variable even within the same population. The discovery of the instability of the two typical diagnostic morphological characters indicates that characters of caudal gills and mandibles, at least, in these two species should be used with caution latterly in taxonomy. Our result also suggests that the similar instability may exist in other diagnostic morphological characteristics in other odonate species. The idea and methodology of this study can be instructive to future morphological studies on insect taxonomy." (Authors)] Address: Zeng, Z., College of Life Sciences, Chongqing Normal University, Chongqing 401331, China. BE-mail: zengzheng1027@126.com

22598. Zhang, H. (2023): Bio-inspired superhydrophobic surface based on hierarchical periodic surface structures of titanium by ultrafast laser. *Proceedings Volume 12793, International Conference on Mechatronics and Intelligent Control (ICMIC 2023); 127931P (2023)* <https://doi.org/10.1117/12.3006756>: 7 pp. (in English) ["Metallic materials are widely used in various industrial scenarios but they often suffer from different issues such as icing, corrosion, and damage, which negatively impact the safety and performance of equipment. Superhydrophobic materials, characterized by an apparent contact angle greater than 150° have been extensively studied as potential solutions to these problems. This paper introduces the basic theory of surface wettability, discusses applications of metallic surfaces and two main strategies for obtaining superhydrophobic surfaces. Inspired by the structure of dragonfly wings, we present an experimental method using a Ti:sapphire ultrafast laser system to fabricate superhydrophobic surfaces on TC4 titanium alloy samples. Scanning electron microscopy (SEM) and energy dispersive spectrometer (EDS) analysis reveal the ultrafast laser pulse can induce micro-scale groove structures and nano-scale laser induced periodic surface structures (LIPSS) on the morphology of titanium and will cause a significant change in the

surface chemistry. The resulting superhydrophobic behavior can be attributed to a combination of surface roughness and low surface energy, which has potential applications in fields such as self-cleaning surfaces, microfluidics, and anti-corrosion coatings." (Author)] Address: not stated

22599. Zhang, X.; Zheng, D.; Li, Y.; Song, S.; Zhang, H. (2023): Discovery of *Sinaeschnidia heishankowense* Hong, 1965 (Odonata: Aeschniidae) from the Lower Cretaceous of Baiwan Basin, southwestern Henan, China: biogeographic implications. *Cretaceous Research* 147, July 2023, 105513: (in English) ["The Jehol Biota is the best-preserved Cretaceous terrestrial biota and one of the most important treasures housing exceptionally-preserved fossils in the world. The Jehol Biota *sensus stricto* is found distributed in northern Hebei, western Liaoning and southeastern Inner Mongolia, northeast China, while the Jehol Biota *sensu lato* is distributed in most of East Asia. The three-stage evolution of the Jehol Biota suggests that the biota extended south to the Qinling-Dabie mountains at its second stage, including western and southern Henan. Here the adult dragonfly *Sinaeschnidia heishankowense* Hong, 1965 is reported for the first time from the Baiwan Formation of the Baiwan Basin, Zhenping County, southwestern Henan, China. *S. heishankowense* is one of the representatives of the second stage of the Jehol Biota, previously only recorded in the Lower Cretaceous Yixian Formation in western Liaoning and southeastern Inner Mongolia, and the equivalent strata in China. This finding confirms that the Jehol Biota reached southwestern Henan at its second stage, and that the Baiwan Formation in the Baiwan Basin could be generally correlated with the Yixian Formation in western Liaoning, assigned to a middle Barremian age (Lower Cretaceous) rather than to the Upper Jurassic as previously considered." (Authors)] Address: Zheng, D., State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology & Palaeontology & Center for Excellence in Life & Palaeoenvironment, Chinese Academy of Sciences, 39 East Beijing Road, Nanjing, 210008, China. Email: drzheng@nigpas.ac.cn

22600. Zheng, H.; Mofatteh, H.; Habcicsek, M.; Akbarzadeh, A.; Akbarzadeh, M. (2023): Dragonfly-inspired wing design enabled by machine learning and Maxwell's reciprocal diagrams. *Advanced Sciences* 2023, 2207635: 15 pp. (in English) ["This research is taking the first steps toward applying a 2D dragonfly wing skeleton in the design of an airplane wing using artificial intelligence. The work relates the 2D morphology of the structural network of dragonfly veins to a secondary graph that is topologically dual and geometrically perpendicular to the initial network. This secondary network is referred as the reciprocal diagram proposed by Maxwell that can represent the static equilibrium of forces in the initial graph. Surprisingly, the secondary graph shows a direct relationship between the thickness of the structural members of a dragonfly wing and their in-plane static equilibrium of forces that gives the location of the primary and secondary veins in the network. The initial and the reciprocal graph of the wing are used to train an integrated and comprehensive machine-learning model that can generate similar graphs with both primary and secondary veins for a given boundary geometry. The result shows that the proposed algorithm can generate similar vein networks for an arbitrary boundary geometry with no prior topological information or the primary veins' location. The structural performance of the dragonfly wing in nature also motivated the authors to test this research's real-world application for designing the cellular structures for the core of airplane wings as cantilever porous beams. The boundary geometry of various airplane wings

is used as an input for the design procedure. The internal structure is generated using the training model of the dragonfly veins and their reciprocal graphs. One application of this method is experimentally and numerically examined for designing the cellular core, 3D printed by fused deposition modeling, of the airfoil wing; the results suggest up to 25% improvements in the out-of-plane stiffness. The findings demonstrate that the proposed machine-learning-assisted approach can facilitate the generation of multiscale architectural patterns inspired by nature to form lightweight load-bearing elements with superior structural properties." (Authors)] Address: Akbarzadeh, M., Polyhedral Structures Laboratory, Dept of Architecture, Weitzman School of Design, University of Pennsylvania, Philadelphia, PA 19146, USA. E-mail: masouda@design.upenn.edu

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22601. Barrios, M.; Tesitore, G.; Burwood, M.; Suárez, B.; Meerhoff, M.; Alonso, J.; Ríos Touma, B.; Teixeira de Mello, F. (2024): Environmental and aquatic macroinvertebrates metrics respond to the Eucalyptus afforestation gradient in subtropical lowland streams. *Hydrobiologia* 851(2): 343-365. (in English) ["Eucalyptus afforestation may affect stream ecosystems, but the magnitude of these effects on water quality and biota in subtropical lowland streams is little understood. We evaluated the potential effects of Eucalyptus afforestation on water quality and macroinvertebrate assemblage. Water quality parameters and macroinvertebrate assemblages were sampled in summer and winter in 30 streams covering an afforestation gradient (from 0.05 to 96% of the catchment area) and tested their relationship. We analyzed the taxa density distribution in afforestation and water parameters using the Thresholds Indicator Taxa Analyses (TITAN). Nutrient concentrations, conductivity, and total dissolved solids showed positive responses to the increase of afforestation, but the responses varied among seasons. Macroinvertebrate metrics showed negative (Ephemeroptera-Trichoptera-Plecoptera (EPT), sensitive families, scrapers), and positive (Chironominae, Oligochaeta) responses to the afforestation. Densities of sensitive taxa (mostly EPT) decrease with an increase in Eucalyptus afforestation, which is also related to water quality and possibly to habitat changes attributed to afforestation management. The use of water quality parameters in combination with macroinvertebrates assemblage contributes to managing these streams under catchment afforestation." (Authors) Taxa include Odonata, and are treated at family or genus level.] Address: Barrios, M., Depto Ecología y Gestión Ambiental. Centro, Univ. Regional del Este (CURE), Univ. de la República, Entre Bv. Artigas y Aparicio Saravia, Av. Tacuarembó s/n, C.P. 20000, Maldonado, Uruguay

22602. Barta, B.; Szabó, A.; Szabó, B.; Ptacnik, R.; Vad, C.F.; Horváth, Z. (2024): How pondscapes function: connectivity matters for biodiversity even across small spatial scales in aquatic metacommunities. *Ecography* 2023: e0696. 12 pp. (in English) ["Habitat loss and fragmentation are growing global threats to natural habitats and their networks, posing significant challenges to biodiversity conservation. Globally, ponds are sharply declining in number because their small size makes them highly vulnerable to land use changes. While it is generally agreed that connectivity in habitat networks is crucial for sustaining biodiversity, the effect of connectivity on biodiversity patterns over small-scaled habitat networks has so far received less attention given the general assumption that metacommunities lack spatial structuring on small scales. In this study, we tested whether this holds for multiple passively and actively dispersing organism groups in a well-

delineated pond metacommunity of 54 bomb crater ponds situated within 1 km. We investigated the influence of space and environment on species richness and metacommunity structure in these ponds, which share similar age, size, and shape and are subject to strong environmental gradients, making it an ideal study system. We specifically examined the impact of network centrality on taxonomic richness and eigenvector-based spatial arrangement on metacommunity structure across different organism groups, including prokaryotes, microeukaryotes, zooplankton, macroinvertebrates, and amphibians. We found that while environmental filtering is the primary driver of community dynamics, there is also a significant spatial signal, particularly for passively dispersing groups, demonstrating the role of the central-peripheral connectivity gradient. These findings highlight the importance of studying and protecting ponds as parts of a network rather than focusing on individual ponds." (Authors) The paper includes references to "Odonata".] Address: Barta, Barbara, Institute of Aquatic Ecology, HUN-REN Centre for Ecological Research, Hungary. Email: barta.barbara@ecolres.hu

22603. Carchini, G.; Hardersen, S. (2024): Chapter 11 - Order Odonata. Identification and Ecology of Freshwater Arthropods in the Mediterranean Basin: 327-363. (in English) ["This chapter provides an identification key for the larval Odonata of the Mediterranean Basin, based on the most recent taxonomy. This key considers 14 genera with 48 species for the Zygoptera and 27 genera with 85 species for the Anisoptera. Because the larvae of several of these species have not yet been described and some species cannot reliably be distinguished, it only includes keys for families and genera." (Authors)] Address: Hardersen, S., Reparto Carabinieri Biodiversità di Verona, Centro Nazionale Carabinieri Biodiversità "Bosco Fontana", Marmirolo, Italy

22604. Malacarne, T.J.; Machado, N.R.; Moretto, Y. (2024): Influence of land use on the structure and functional diversity of aquatic insects in neotropical streams. *Hydrobiologia* 851: 265-280. (in English) ["Although many studies show the negative impacts of agricultural activities on aquatic ecosystems, few relate functional and structural characteristics of the biota. We evaluate the structure and functional dynamics of aquatic insects in headwater streams with different degrees of land cover and in different hydrological periods, in a hydrographic basin where agriculture and livestock predominate. Three diversity indices were measured: functional richness (FRic), functional equitability (FEve) and functional dispersal (FDis), with the highest values recorded for Trichoptera, Diptera, Coleoptera and Odonata. From the results, the abundance was higher in the dry season and some families were exclusive to this period. In the rainy season, there was a decline in total abundance and richness of families and an increase of Diptera in urban streams. In rural streams, we registered an occurrence of Odonata, Coleoptera and EPT and a reduction of Diptera. The recorded data confirm that urbanization has negative effects on ecosystem functioning, since urban streams showed lower richness, dispersion and functional evenness. Furthermore, the increase in taxonomic diversity was accompanied by an increase in functional diversity, which reinforces the importance of the combined approach of functional and structural traits to better understand the impacts of anthropic changes in neotropical streams." (Authors)] Address: Malacarne, Tássia, Biodiversity Department, Federal University of Paraná (UFPR), Palotina Sector, Palotina, Paraná, Brazil

22605. Munyai, L.F.; Liphadzi, T.; Mutshekwa, T.; Mutoti, M.I.; Mofu, L.; Murungweni, F.M. (2024): Water and sediment

chemistry as drivers of macroinvertebrates and fish assemblages in littoral zones of subtropical reservoirs. *Water* 2024, 16, 42. <https://doi.org/10.3390/w16010042>: 15 pp. (in English) ["Reservoirs are human-made ecosystems with diverse purposes that benefit humans both directly and indirectly. They however cause changes in geomorphological processes such as sediment cycling and influence the composition and structure of aquatic biota. This study aimed to identify water and sediment quality parameters as drivers of macroinvertebrates and fish communities during the cool-dry and hot-wet seasons in the littoral zones of three subtropical reservoirs (Albasini, Thathe and Nandoni). Macroinvertebrates and fish were collected from three sites (n = 3 from each site) in each reservoir. A total of 501 and 359 macroinvertebrates and fish individuals were collected throughout the sampling period, respectively. The present study employed a two-way ANOVA in conjunction with redundancy analysis (RDA) to assess the relationships that exist between water and sediment variables, macroinvertebrates diversity and species abundances across seasons. Based on the two-way ANOVA model, significant differences were observed across reservoirs for evenness, Simpson's diversity, and total abundance, while seasonal differences were observed for most metrics, with exception for evenness. The RDA results identified four water variables (i.e., water temperature, oxidation–reduction potential, pH and conductivity) and one sediment metal (Mg) as the most important parameters in driving the fish community structure. Field observations and metal results attest that the Nandoni reservoir shows high concentrations of metals in sediments as compared to other reservoirs, suggesting that anthropogenic activities such as car washing, brick making, recreation, fishing, wastewater treatment work and landfill site may be the major contributor of metals to the Nandoni reservoir, which accumulate in the littoral zones. Findings of this study highlight the need to analyze reservoir ecological conditions at several scales. The study of macroinvertebrates and fish, water, and sediment chemistry in the littoral zone laid the groundwork for proposing measures for conserving aquatic ecosystems. A total of 501 macroinvertebrate individuals belonging to 21 families and 7 orders were identified within three selected water bodies (Table 3). In terms of orders, Hemiptera (28.6%) was the dominating order followed by Odonata (23.8%) and Coleoptera (14.3%)." (Authors) Odonata taxa are treated at family level.] Address: Munyai, L.F., School of Biology and Environmental Sciences, University of Mpumalanga, Nelspruit 1200, South Africa. Email: munyailinton@gmail.com

22606. Musters, C.J.M.; Honkoop, H.P.; de Snoo, G.R. (2024): Well known indicator groups do not predict the decline of insects. *Ecological Indicators* 158, January 2024, 111458: 8 pp. (in English) ["Highlights: • Random Forests were trained with species samples to predict the decline of insect. • Training with random species samples resulted in prediction accuracy of 0 to 0.4. • Training with taxonomic samples resulted in low accuracy of prediction of decline. • Using taxonomic indicator groups is advised against in case of insects. Abstract: In decision making for insect conservation, one depends largely on knowledge of the relationship between changes in environmental factors and abundance of a very limited number of species. The species we have knowledge on cannot be regarded as a representative sample of all insects. How accurately do changes in the abundance of these species predict the changes in other species? To answer this question, we studied 373 insect species belonging to the Apidae (bees), Lepidoptera (butterflies), Orthoptera (grasshoppers), Ephemeroptera (mayflies), Trichoptera (caddisflies), Odonata (dragonflies), and Plecoptera (stoneflies),

with known population trends and attributes in the Netherlands. The 78 attributes included morphological and demographic trait values, as well as habitat requirements of species. We trained Random Forests (RFs) with random samples and with taxonomic groups to predict the decline of the species based on their attributes. Then we used the trained RFs to predict the decline of the species outside the training groups and checked the accuracy of the predictions. The results showed that accuracy of the predictions of the RFs trained by the random samples increased from 0 to 0.20 (maximum 0.40, on a scale of 0 to 1) with sample size increasing from 10 to 90% of the insects. Moreover, we found that the accuracy of the predictions by the RFs trained with the taxonomic groups were zero in case of butterflies and grasshoppers, and low in other groups (maximum 0.37, in case of bees predicting terrestrial insects). Accuracy depended significantly on the size of the taxonomic group. Large over- or underestimation of number of declining species occurred in all cases. Further, we found that the taxonomic groups had few attributes important for predicting in common. The attribute 'Active dispersion' had the highest importance when all insects were used for training the RF. Using 'indicator groups' for predicting the decline of insects has a high risk of over- or underestimating the actual number of declining species and should therefore be advised against unless the indicator group is sure to be representative." (Authors)] Address: Musters, C.J.M., Institute of Environmental Sciences, Leiden Univ., P.O. Box 9518, 2300 RA Leiden, the Netherlands. Email: Musters@cml.leidenuniv.nl

22607. Schuijt, L.M.; van Drimmelen, C.K.E.; Buijse, L.L.; van Smeden, J.; Wu, D.; Boerwinkel, M.-C.; Belgers, D.J.M.; Matser, A.M.; Roessink, I.; Beentjes, K.K.; Trimbos, K.B.; Smidt, H.; Van den Brink, P.J. (2024): Assessing ecological responses to exposure to the antibiotic sulfamethoxazole in freshwater mesocosms? *Environmental Pollution* 343, 123199: 12 pp. (in English) ["Highlights: • Environmentally relevant concentrations did not impair aquatic communities. • Combining DNA tools and morphological identification provided complementary information. • We observed inconsistent results between studies using comparable concentrations. Abstract: Antibiotics are a contaminant class of worldwide concern as they are frequently detected in aquatic ecosystems. To better understand the impacts of antibiotics on aquatic ecosystems, we conducted an outdoor mesocosm experiment in which aquatic communities were exposed to different concentrations of the antibiotic sulfamethoxazole (0, 0.15, 1.5, 15 and 150 µg/L). These concentrations include mean (0.15 µg/L) and maximum detected concentrations (15 and 150 µg/L) in aquatic ecosystems worldwide. Sulfamethoxazole was applied once a week for eight consecutive weeks to 1530 L outdoor mesocosms in the Netherlands, followed by an eight-week recovery period. We evaluated phytoplankton-, bacterial- and invertebrate responses during and after sulfamethoxazole exposure and assessed impacts on organic matter decomposition. Contrary to our expectations, consistent treatment-related effects on algal and bacterial communities could not be demonstrated. In addition, sulfamethoxazole did not significantly affect zooplankton and macroinvertebrate communities. However, some effects on specific taxa were observed, with an increase in *Mesostoma* flatworm abundance (NOEC of <0.15 µg/L). In addition, eDNA analyses indicated negative impacts on the insects Odonata [*Enallagma*] at a sulfamethoxazole concentration of 15 µg/L. Overall, environmentally relevant sulfamethoxazole concentration did not result in direct or indirect impairment of entire aquatic communities and ecological processes in our mesocosms. However, several specific macroinvertebrate

taxa demonstrated significant (in)direct effects from sulfamethoxazole. Comparison of the results with the literature showed inconsistent results between studies using comparable, environmentally relevant, concentrations. Therefore, our study highlights the importance of testing the ecological impacts of pharmaceuticals (such as sulfamethoxazole) across multiple trophic levels spanning multiple aquatic communities, to fully understand its potential ecological threats." (Authors)] Address: Van den Brink, P.J., Aquatic Ecology & Water Quality Management Group, Wageningen University & Research, Wageningen, the Netherlands. Email: paul.vandenbrink@wur.nl

22608. Silva, L.F.R.; Castro, D.M.P.; Juen, L.; Callisto, M.; Hughes, R.M.; Hermes, M.G. (2024): Ecological thresholds of Odonata larvae to anthropogenic disturbances in Neotropical savanna headwater streams. *Hydrobiologia* 851: 313-326. (in English) ["We evaluated whether ecological thresholds could be detected along gradients of disturbances by using larval Odonata genera. Morphological, physiological, and behavioral differences between Odonata suborders may be reflected in different thresholds to anthropogenic disturbance. Therefore, we hypothesized that larval Zygoptera genera would have narrower ecological thresholds in response to increased levels of stream disturbance and would be considered sensitive to anthropogenic disturbances, and the opposite for larval Anisoptera genera, which would have wider ecological thresholds and would be considered tolerant to anthropogenic disturbances. We assessed 30 larval Odonata genera collected from 186 headwater stream sites in the Neotropical Savanna. Threshold Indicator Taxa Analysis detected ecological thresholds in seven Odonata genera (*Argia*, *Brechmorhoga*, *Cacoides*, *Gomphoides*, *Phyllocyba*, *Progomphus* and *Hetaerina*) revealing them as robust bio-indicators (purity and reliability = 0.85). Most Zygoptera were associated with less-disturbed sites and most Anisoptera were associated with more-disturbed sites, but not all genera corresponded to this pattern. Therefore, we recommend using Odonata larvae at the genus-level, versus the suborder level, for constructing improved biomonitoring tools and obtaining more accurate impact assessments of Neotropical stream sites." (Authors)] Address: Castro, D.M.P., Depto de Ecologia e Conservação, Programa de Pós Graduação em Ecologia Aplicada, Universidade Federal de Lavras, Lavras, Minas Gerais, CEP 37200-900, Brazil

22609. Suárez-Tovar, C.M.; Pereira, J.L.; Rocha, T.; Rivera-Duarte, J.D.; Juen, L.; Córdoba-Aguilar, A. (2024): Fierce city hunters: more effective predation of dragonflies and damselflies in urbanized areas. *Animal Behaviour* 208: 51-58. (in English) ["One area of animal behaviour of growing interest is related to the behavioural traits that favour species' survival in rapidly changing environments (e.g. cities). In this regard, one animal group that is resilient to urbanization is that of odonate insects. These animals are formidable generalist predators that exhibit large behavioural flexibility. Here we tested whether adult odonate communities show differences in behavioural traits associated with reproduction, foraging and thermoregulation in relation to an urbanization gradient. Our results indicate that individuals were more efficient at capturing prey in more urbanized places. More effective predation in cities may occur because of changes in the environment, changes in odonate behaviour or modifications in prey communities whose characteristics influence the success rate of odonates during hunting." (Authors)] Address: Córdoba-Aguilar, A., Instituto de Ecología, Universidad Nacional Autónoma de México, Coyoacán, México City, Mexico. Email: acordoba@ieecologia.unam.mx