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1999

21557. Hutchinson, R. (1999): Rayon Entomologie: Corbet, P.S. 1999. Dragonflies: Behavior and ecology of Odonata. Comstock Publishing Associates, Ithaca NY. 829 pages, 248 figures, 96 photographies couleurs, 95 tableaux, 95 tableaux-annexes. Prix 95$ américains. Nouv'Ailes 9(3): 7. (in French) [Book review] Address: deceased

2000

21558. Vanderhaeghe, F. (2000): Wanneer zal de Gaffelwaterjuffer (Coenagrion scitulum) Nederland bereiken? NVL-Nieuwsbrief nummer 3 (Jrg 4), september 2000: 9-10. (in Dutch) ["With the increased inventory intensity of the last 10 to 20 years in Belgium, it has become clear that a number of dragonfly species are expanding their range to the north (see among others De Knijf & Anselin, 1996; De Knijf, 1999). A recent example is C. scitulum, which in 1998 was found back in Belgium for the first time since 1973 (Vanderhaeghe, 1998) ... At a camp of the Viezebeestjeswerkgroep (VBWG) of the Jeugdbond voor Natuurstudie en Milieubescherming (JNM) in the Boulonnais (north-west France) in 1996, to our amazement, there were a number of very northerly sightings of C. scitulum, up to 80 km from the Belgian border (West Flanders). This was much closer to Belgium than what could be expected from literature data (Vanderhaeghe, 1997). Two years later (1998), the first new Belgian sightings were a fact. He! involved 4 observations from Belgian Lorraine, always of wandering individuals, on 23/6, 26/6, 4/7 and 18/7. We then tried to get an overview of the state of the species in northern France. To this end, several people from the Societe Francaise d'Odonatologie (SFO) were written to, and with good results! Furthermore, documented information was obtained from the 4 Belgian sightings. A synthase of all this information can be found in Vanderhaeghe (1999). An important finding is that C. scitulum has been observed in several places in northern France up to near the Belgian border; here are oak some older sightings, of which it is not clear whether they are vagrants. A clear group of reports comes from the northern French coastal region, up to 30 km from Belgium; there are also records near the Belgian Fagne-Famenne region and near the Gaume. None of the Belgian sightings in 1998 were made in a suitable habitat (even: several specimens flew up from a flowery roadside along a busy road); this also applies to a sighting 4 km from Belgium in 1998 (chalk slope near Epiez-sur-Chiers). These data suggest that damselflies migrated during this period; however, it is difficult to estimate the distance travelled. The possibility of migration is oak cited by Jurzitza (1988). I have not actively collected data on the situation in 1999; in any case, ford damselflies have been observed again: military area near Arion (where 2 observations were made in 1998; there could therefore be a population here) (B. Janssens, T. Vanagt, oral med.), West Coast (= 1st recent observation for Flanders, if confirmed) (D. Bonte, oral med.), Roly (in the Fagne region; Anonymus, 1999). It is very plausible that this is a northward advance at several sites, independently of each other. The trend therefore appears to be continuing; it will be oak to look out for observations in the coming years. As pointed out by Dijkstra & Kalkman (1998), a first sighting for the Dutch territory, even in the near future, cannot be ruled out. An invasive movement along the coast is one of the most obvious possibilities in this respect (Zeeuws-Vlaanderen!). During migrations, the species can apparently be found in any habitat (oak dry). For population establishment, a diverse range of ponds and slow-flowing waters seem possible; these are often sites with lush aquatic and riparian vegetation (Vanderhaeghe, 1999). C. scitulum are not easily distinguished in flight from other blue-coloured damselflies, and it is therefore oak recommended that the species be caught and accurately identified with an loupe (neck shield, abdomen appendages); a photograph is desirable as evidence." (Author/DeepL)] Address: Vanderhaeghe, F., Lijsterstraat 20, 8800 Roeselare, Belgium. E-mail: Floris. Vanderhaeghe@rug.ac.be

2001

21559. Machado Caballero, J.E. (2001): Inventario y estudio comparativo de la fauna de Odonata en tres áreas de Honduras. Tesis presentada como requisito parcial para optar al titulo de Ingeniero Agronomo en el grado académico de Licenciatura. Zamorano Carrera de Ciencia y Produccion Agropecuaria. Zamorano: XI, 31pp. (in Spanish) [The odonate assemblages (84 species) of 3 areas in the departments of Atlantida and Francisco Morazan (Honduras) are described, and the odonate faunae of Honduras, Belize, Costa Rica and Nicaragua are briefly analysed and compared. "For the conservation of forests and the diversity they have, a better knowledge of the species that inhabit them, their distribution and classification is necessary. Most of this diversity is made up of insects. The group of odonata, by its nature, helps in the control of some pests and can be used as an ecological indicator of the quality of ecosystems. Currently there is little information on them in Honduras. The objectives were: to carry out an inventory of the species of the Odonata order, create a database and compare the fauna found with that of Belize, Nicaragua and Costa Rica. Captures were made from February to October in the Zamorano Valley (Yeguare) and in April and August in the Cuero y Salado Wildlife Refuge and the Pico Bonito National Park, complementing with specimens provided by parataxonomists and those existing in the ecological inventory of Zamorano. The trapped insects were laterally placed in paper envelopes and placed in acetone for 24 hours to prevent decomposition and color loss. Then they dried for one or two hours and were transferred to a transparent envelope with data on location, date and collector, as well as family, genus and species. A database was generated to compare the fauna of the three study areas with each other, and with the fauna of Belize, Nicaragua and Costa Rica. There are 84 species in the three study areas, belonging to 43 genera and 10 families. The families with the greatest richness of cspccics were Libellulidac, Cocnagrionidac and Aeshnidae,

which together account for more than 83% of the total fauna found. Mecistogaster linearis and Brechmorhoga nubecula, reported in the Pico Bonito National Park, are new records for Honduras. Contrasting the odonatofauna of Honduras with that of Belize, 114 species (65%) were found in common of 174 reported in that country. Costa Rica. There are 84 species in the three study areas, belonging to 43 genera and 10 families. Costa Rica shares with Honduras 132 (49%) of its 268 registered species, and Nicaragua coincides with 82 species (82%) of the 100 registered species. Despite having found a high diversity of Odonata species in Honduras, a good percentage is unknown. It is recommended to complete the information with collections in the departments of Ocotepeque, Lempira, Intibuca and La Paz that have not been studied."] Address: not stated

2004

21560. Hahn von Hessberg, C.M.; Grajales Quintero, A. (2004): Importancia del orden Odonata para la productión de peces en ambientes controlados. Revista Electrónica de Ingeniería en Producción Acuícola 1(1): 1-12. (in Spanish) ["It was determined that the immature forms of the Odonata inhabit mostly lentic waters with a lot of aquatic or emergent vegetation, with the exception of the species Pantala flavescens, which was also found in ponds without any type of vegetation, determining that this species is the one with the highest presentation in association with fish farming. The larvae that have a high predatory effect on fry of fish between 0.03 and 1.5 g of live weight are P. flavescens, fry larger than 1.5 grams (2.1 to 3 grams) are not preyed on due to their size. Other species of naiads that have a predatory effect on fish fry in their order are: Orthemis sp, Aeshna intrincata and Anax amazili due to their robust conformation, large size and preliminary observations. Physical factors such as temperature, water depth, presence or absence of vegetation, determine the consumption of the Pantala flavescens naiads, the ideal temperature that increased predatory activity was from 24º C average, limited by environmental factors and competition. existing by food. A single naiad can consume 5 fingerlings/day, the cost of a reversed fingerling is $3,015, therefore, in a 42-day cycle (age and most susceptible weight for the fish) there is a loss of $633.15; and per m² of pond there are losses worth $12,633.00. In a 150 m² pond (average of 20 naiads/m²), losses amount to $1,899,450 and annual losses of $16,507,125 (Hahn et.al 2001). Based on the high rate of predation observed on larvae and fingerlings of Oreochromis niloticus by Pantala flavescens, the need is felt to look for alternatives for selective biological or mechanical control without using chemical controls on this species of Odonata.] Address: Hahn von Hessberg, Christine, Profesore Depto Sistemas de Producción, Programa de Medicina Veterinaria y Zootecnia, Facultad de Ciencias Agropecuarias. Columbia. E-mail: agrajal@telesat.com.co

2005

21561. Craves, J. (2005): Canada darner with unusual thorax pattern. Williamsonia 9(1): 1. (in English) ["After attending an ornithological meeting in Grayling (Crawford Co.) on 28 Aug 2004,1 had a little bit of time to hunt for Odonata before heading back home. Consulting a map, I chose to explore Howe's Lake, a small sandy lake north of M-72 west of Grayling. There wasn't a lot actually plying the lake itself, but the wet, grassy depressions near the lake shore had several species of Lestes, Sympetrum costiferum (a county record), and quite a few Aeshna's patrolling lazily or ovipositing in the shallow water. I netted a few Aeshna canadensis, and some A. tuberculifera (a county record). It appeared that all the blue darners at the site were these two species, until I netted one with broken thoracic stripes, which I took to be A. interrupta. When I returned home to sort through the specimens, I turned this specimen over, I found that the other side of the thorax was the standard Canada Darner pattern. A closer examination revealed that this was indeed canadensis in all other characters, except that one side of the thorax. While I've found little on this phenomena in the literature, it is apparently not without precedent. For me it underscores the importance of actually collecting specimens - or in the least netting them and carefully examining them in the hand - in order to verify the identity. Even if I had seen this individual perched, I would have misidentified it had I only seen the one side (Variable Darner would have been a county record). This interesting specimen is in my personal reference collection." (Author)] Address: Craves, Julie, Univ. Michigan-Dearbom, USA. Email: jac@rrbo.org

21562. Hsu, C.-B.; Yang, P.-S. (2005): Examining the relationship between aquatic insect assemblages and water variables by ordination techniques. Formosan Entomol. 25: 67-85. (in English, with Chinese summary) ["Aquatic insects were sampled quarterly at five sites along the upper Keelung River, which runs through the Taipei metropolitan area and receives various forms of pollution and anthropogenic disturbances, between August 1996 and April 1997 to examine the distribution patterns of aquatic insects and their relationships with the water variables using univariate and multivariate analyses. Upstream sites 1 to 3 significantly differed from the downstream sites 4 and 5 in the number of taxa, density, Shannon diversity index, and the proportion of dominant taxon in the univariate analyses. Baetis spp. was the dominant taxon (14.22%) and Chironomidae was the dominant family (21.78%) in the entire study reach. The results of canonical correspondence analysis (CCA), a eigenanalysis-based ordination, were compared with the results of non-metric multidimensional scaling (MDS), a distance-based ordination. Differences in aquatic insect assemblages at the first three sites were only found by the multivariate approaches, not by the univariate approach. High number of taxa and abundances at the three upstream sites contributing to variances in the aquatic insect assemblages were perceived on the CCA ordination diagrams. However, the common taxa at the three sites also increased the community similarities and formed an upstream group of samples separate from the downstream group in the MDS plots. Differences in the results between the univariate and multivariate analyses at the three upstream sites were mainly caused by the limited distributions of some taxa, such as Epeorus erratus, Amphinemura sp., Protonemura sp., and Rhyacophila spp. at site 1. In the CCA, conductivity and biochemical oxygen demand (BOD) on axis 1 and water temperature and pH on axis 2 were the water variables that best explained about 42.9% of the variance in aquatic insect assemblages on the first two axes. In the MDS, chemical oxygen demand (COD) and BOD showed the highest correlation with aquatic insect assemblages in the upper Keelung River." (Authors) Euphaea formosa, Matrona basilaris subsp. maba, Heliogomphus retroflexus, Onychogomphus formosanus, Sieboldius deflexus, Stylogomphus shirozui, Zygonyx takasago.] Address: Yang, P.-S., Dept of Entomology, National Taiwan University, 1 Roosevelt Rd., Sec. 4, Taipei 106, Taiwan. Email: psyang@ntu.edu.tw

21563. Hutchinson, R. (2005): Des Epiophlebia superstes (Odonata: Anisozygoptera), dans la Collection nationale canadienne d'insectes, d'arachnides et de nématodes (CNC)

à Ottawa. Nouv'Ailes 15(2): 7. (in French) ["While working in the NCC's dragonfly collection, I discovered that there were specimens of a species of dragonfly [Epiophlebia superstes] considered a true living fossil. Indeed, there are eight males, eight females and three exuviae from a donation made by Dr. Hilton, professor at Bishop's University in Lennoxville in the Eastern Townships. These individuals were collected in Japan. In addition, I found two other females and a male, also collected in Japan by other entomologists." (Author/Google translate) Address: deceased

2007

21564. Truchon, G. (2007): Des demoiselles qui pratiquent la plongée. Nouv'Ailes 17(1): 13. (in French) [Verbatim/Google translate: Ladies who practice diving: The female of some Zygoptera (Calopteryx, Coenagrion, Enallagma and Hetaerina) lays her eggs by submerging herself completely under water. The number of eggs deposited is proportional to the immersion time and the females can dive several times a day in different places. Japanese researchers wanted to check whether these repeated dives were associated with a limited ability to breathe underwater. A series of experiments in the laboratory and in the field allowed them to demonstrate that these small dragonflies use a reserve of oxygen contained in the trachea which gives them an autonomy of about 30 minutes. To this reserve is added the air trapped on the surface of the wings and the body. Indeed, when the damselflies dive under water, a thin film of air covers the wings and the body. This reserve of air provides part of the oxygen required during immersion. Tsubaki et al. (2006) observed under the microscope the surface of the wings of different species of damselflies. They noted the presence of a structure facilitating the retention of air. This structure, which has the appearance of "spiky hairs", is denser in insects that dive regularly, compared to those that dive occasionally or rarely, and is absent in species that do not have the habit of laying their eggs. under water. Oxygen-rich water promotes the passage of this molecule to the air bubbles trapped under the wings and body of dragonflies. This allows the insect to replenish its oxygen reserves even while remaining underwater. Added together, these different mechanisms allow young ladies to dive for periods that can exceed 120 minutes. It therefore does not seem that the numerous dives observed are associated with a limited ability of these insects to remain underwater. Spawning underwater protects the eggs from desiccation and exploits additional substrate sites. But above all, it seems that it is to have peace that these little dragonflies immerse themselves. This habit allows them to avoid being harassed by males during spawning!] Address: not stated

2008

21565. Dumont, S.; Handfield, N. (2008): Émission de timbres sur les insectes utiles. Nouv'Ailes 18(1): 13. (in French) [Verbatim/Google translat: On October 11, I was about to mail the paper copies of the fall issue of Nouv'Ailes when I noticed that Canada Post was going to issue, the next day, a series of five stamps on the theme of beneficial insects. On these stamps, we find the convergent ladybug (1¢), the golden-eyed lacewing (3¢), the polar bumblebee (5¢), the Canadian aeschne (10¢) and finally the cecropia moth (25¢). As mentioned by one of our members on our discussion forum, the choice of the cecropia lead moth seems questionable as a beneficial insect, although if we go to the site http://www.postescanada.ca/personal/collecting/default-f .asp?stamp=stpartl&detail=2187 to read the presentation text of the series, we can see that they define beneficial insects as being those which contribute to pest control, provide pollination, eliminate animal waste and feed the wildlife. Cecropia moth, our largest moth, is there as food for wildlife; an important link in some food chains. It is of course an extended definition of beneficial insects, but it must be admitted, it is a very beautiful species. For collectors, these stamps are available in souvenir sheets of five stamps (we had some drawn at the meeting of the Montreal section on October 12!). This souvenir sheet also appears on the beautiful first day cover. Each stamp can also be purchased in sheets of 50 via http://www.canadapost.ca/personal/collecting/defaulte. asp?stamp=stpdtl&detail=2187 This is not the first time that Canada Post has issued stamps featuring insects. In 1988, we were treated to four stamps on the butterflies of Canada […] Address: not stated

21566. Hutchinson, R. (2008): Examen du tube digestif d'une libellule. Nouv'Ailes 18(1): 5. (in French) [Verbatim/Google translat: Recently, I found on my work table, near my binocular magnifying glass, an adult dragonfly, Tetragoneuria spinigera, in alcohol. The label indicates that the specimen, damaged (separate thorax and abdomen), comes from Baie-des-Rochers (Charlevoix-Est census division), July 2003. Examining the long stocky abdomen, I noticed that a small part of the digestive tract was visible and that I could extricate it by gently pulling it out of the abdominal cavity, which I did on the spot. I then spread it out on a piece of white cardboard. I was thus able to examine the contents of a good part of the digestive tract. I saw there shreds of wings, legs, thorax of more or less shredded insects. The experience allowed me to observe that there were many Diptera, in particular of the following families: Simulidae (black flies), Chironomidae, some mosquitoes (Culicidae) and representatives of the family Tipulidae. Determining the genus and species of all these prey is the responsibility of specialists in each group of Diptera. Nevertheless, this experiment confirms the assertions of several odonatologists to the effect that flies are the main constituents of the diet of dragonflies. For an exhaustive treatment of the subject, I invite readers to consult Corbet (1999).] Address: deceased

2010

21567. Englund, R.A. (2010): Odonata and selected aquatic insect taxa in the Austral Islands, French Polynesia. In: Meyer, J-Y. & Claridge, E. (2014): Terrestrial Biodiversity of the Austral Islands, French Polynesia. Muséum Nationale d'Histoire Naturelle, Paris. Patrimoines naturels 72: 102-113. (in English) [The Austral Islands is one of the most isolated archipelagos in French Polynesia (South Pacific). The small size of the islands and the occurrence of past and recent anthropogenic impacts have caused a rapid erosion of its unique biodiversity. A series of multidisciplinary field trips were conducted between 2002 and 2004 by a small but dedicated team of scientists from French Polynesia, France and other countries, with the aim of providing baseline knowledge of the terrestrial and freshwater biodiversity needed for the sustainable management of natural resources, the conservation of threatened endemic species and native habitats." (Publisher) The following Odonata taxa are listed and discussed: Anaciaeschna jaspidea, Anax prob. guttatus, Hemicordulia sp., Diplacodes bipunctata, Pantala flavescens, Tholymis tillarga, Ischnura aurora, I. jeanyvesmeyeri, I. rurutana, and I. thelmae.] Address: Englund, R.A., J. Linsley Gressit Center for Entomological Research, Bishop Museum, 1525 Bernice Street, Honolulu, Hawaii 96817, USA. E-mail: englund@bishopmuseum.org

21568. Hutchinson, R.; Ménard, B. (2010): Des araignées (Araneae) dans des exuvies de libellules (Odonata: Anisoptera). Nouv'Ailes 20(1): 3. (in French) [Verbatim (Google translate): On October 1, 2005, we were picking dragonfly exuviae from the inside walls of a small bridge that spans a body of water. It is, in fact, only an extension of the Ottawa River, in the heart of the city of Gatineau. In addition, an earthen embankment blocks this water to prevent it from reaching the Casino de Hull. The harvested exuviae were sheltered from the wind and the flow of rainwater. An exuviae is the remains or skin from which an adult dragonfly emerged, thus ending its larval existence. We noticed that some exuviae contained live spiders. We mention below the odonate species found with the spiders that had taken up residence in their exuviae. An exuviae of Epicordulia princeps contained the living spider, Steatoda bipunctata (L.) female (Theridiidae), with two Diptera (fly) remains, an indeterminate insect larva and a molting flap of a spider. Another Epicordulia princeps harbored a Tetragnatha sp. alone, who seemed immature to us. On the other hand, in an exuviae of Neurocordulia yamaskanensis, we discovered another female Steatoda bipunctata with remains of spider molts. Finally, we highlight the presence of a spider in the exuviae of two other dragonfly species, one in the remains of Libellula luctuosa and another in that of Tetragoneuria cynosura. Unfortunately for us or fortunately for the two coveted spiders, we dropped them on the grassy ground without being able to recover them. When handling these exuviae, it would be wise to place an insect net underneath to avoid losing the spiders hiding there. It is interesting to note that an American odonatologist (Manolis, 2008) reports that a male jumping spider, Sassacus vitis (Salticidae), absent from Quebec, was found in the large exuviae of Macromia magnifica, a species from western Canada and the United States. In Quebec we find the species Macromia illinoiensis Walsh (Macromiidae). We must remember that these exuviae were probably in these places since June or July, since they are odonates that emerge during the first half of the summer flight season of these splendid winged creatures, which are dragonflies. They are sheltered from the natural elements. It is possible that we can even redo this excursion in winter with the possibility of new discoveries. A question arises! Does the large size, in particular the enlargement and the rounded shape of the middle of the abdomen, of the exuviae of E. princeps and Macromia, and to a lesser extent, the size of Neurocordulia, favor their colonization by spiders? looking for shelter? Let us mention in passing that Steatoda bipunctata literally invade the exterior of human buildings almost everywhere in Quebec, thousands can be found under the shingles of a house, an experience that the first author once had when replacing old shingles. aluminum by new ones on a friend's house. In conclusion, we believe that a new avenue of research is opening up on the life of spiders and odonates. It is important to know if the size of the exuviae that clears space for a guest is a colonization factor for other organisms such as spiders. We urge naturalists to try such an experiment in order to advance our knowledge on a completely unusual subject.] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21569. Kazanci, N.; Ekingen, P.; Türkmen, G.; Ertungç, Ö.; Dügel, M.; Gültutan, Y. (2010): Assessment of ecological quality of Aksu Stream (Giresun, Turkey) in Eastern Black Sea Region by using Water Framework Directive (WFD) methods based on benthic macroinvertebrates. Review of Hydrobiology 3,2: 165-184. (in English, with Turkish summary) ["1. This research contains the irst assessment of water quality of Aksu Stream (Giresun, Turkey) by using benthic macroinvertebrates and physicochemical variables. 2. In July 2008 and June 2009, benthic macroinvertebrates were collected by standard D-frame net from each type of habitat of Aksu Stream's sites. Physicochemical variables were also measured for each sites. 3. Some metrics [Biological Monitoring Working Party Score (BMWP), Average Score per Taxon (ASPT), Simpson Diversity Index, Shannon-Wiener Diversity Index, Margalef Diversity Index, Ephemeroptera Plecoptera Trichoptera (EPT), Ephemeroptera Plecoptera (EP)] and functional feeding group ratio which are wanted to implement by European Union Water Framework Directive were applied to Aksu Stream with physicochemical variables for the first time. 4. These metrics were performed in order to evaluate the water quality of the stream by using ASTERICS software and to identify reference sites for Aksu Stream. The benthic macroinvertebrate communities of reference sites of Aksu Stream were also given. These reference sites and their benthic macroinvertebrate communities could be used to determine ecological quality of same types of streams in Eastern Black Sea Region. 5. Habitat quality of the Aksu Stream was high at the upstream region and was lower at the downstream region due to physical habitat degradation, urban waste waters, touristic, seasonal dwelling and agricultural activities." (Authors) The taxa list includes "Aeshnidae" and "Gomphidae".] Address: Kazanci, Nilgün, Hacettepe Üniversitesi, Fen Fakültesi, Biyoloji Bölümü, Hidrobiyoloji Anabilim Dalý, Beytepe, Ankara, Turkey. Email: nilgunkazanci@gmail.com

2012

21570. Hutchinson, R. (2012): Une nouvelle mention de l'araignée rarement récoltée au Québec, Clubiona maritima (Araneae: Clubionidae) dans une exuvie de Stylurus notatus (Odonata: Gomphidae). Nouv'Ailes 22(2): 16. (in French) [Verbatim/Google translate: On June 16, 2012, I collected a mature male of the spider Clubiona maritima from an exuviae of the dragonfly Stylurus notatus, which was in one of my vials containing only the remains of this species of gomphid. The exuviae was picked up in Luskville, on a stone wall that forms a rampart to prevent the water of the Ottawa River from flooding the raised grounds of riverside cottages. This is the second confirmed record of C. maritima for Quebec. Bélanger & Hutchinson (1992) report that the species was known only from Brown Lake in Gatineau Park. These mention many habitats. As far as I am concerned, I consider the carpets of dead and yellowed grasses and sedges that litter the damp ground near bodies of water as potential microhabitats leading to the capture of other C. maritima. By examining the specimens of the species deposited in the CNC (Canadian National Collection of Insects, Arachnids and Nematodes), I note that there are about ten vials from American states, and especially from Ontario, especially in the Niagara Peninsula. In the distribution map of the species by Dondale and Redner (1982), the reader finds about fifteen squares indicating capture sites, almost all located around the Great Lakes, with two exceptions. Our activity, which consists in collecting odonate exuviae as an integral part of our inventories of this marvelous group of insects, allows us to observe that the presence of spiders in exuviae does not seem to be a rare phenomenon, as evidenced by our mentions in a brief communication published in NOUV'AILES (Hutchinson and Ménard, 2010) and also a brief note by Manolis (2008), an American odonatologist. In this regard, I can also add recent data, namely the collection of the female Steatoda bipunctata spider from an exuviae of

Epitheca spinigera stuck to the inside wall of a bridge spanning a busy street in Gatineau, Boulevard Fournier, August 12, 2012. During this excursion, I also observed twice ants taking refuge in exuviae. Perspectives: Our odonatological activities, including exuviae, allow us to advance our knowledge in two important groups of invertebrates, namely dragonflies and spiders. Once again, we note that the collection of odonate remains is of great importance and we intend to pursue this type of initiative, which will bring great discoveries to come.] Address: deceased

2013

21571. Hutchinson, R. (2013): La recherche nocturne de libellules dans leur dortoir. Nouv'Ailes 23(1): 14-15. (in French) [Verbatim/Google translate: When the light of day disappears, the temperature drops, the coolness sets in, where to find the myriads of dragonflies that the odonatologist observed during the day? What are they doing? All must find a substrate to live there in a comatose state, in total immobility. Their customary activity can only resume with daylight, the return of the sun and a favorable temperature. Finding these sites, or roosts, where dragonflies take refuge to spend the night, is an arduous activity that I did many years ago. I searched enthusiastically in the field, flashlight in hand, in the late evening and at dusk, to discover adult dragonflies in their nocturnal lairs. I published my meager findings (Hutchinson, 1976c). In addition, I identified known cases from the odonatological literature (Corbet, 1999; Hutchinson 1976a, b). In this regard, it is fascinating to report five observations of dragonflies of the genus Boyeria (Aeshnidæ) found in a comatose state on buildings of three nature initiation camps that I attended. The first two were internships of the Cercles de Jeunes naturalistes and the last, the Ère de l'estuaire camp, located in Port-au-Saumon, in Charlevoix-Est, which was the "theatre" of three of these observations. On August 8, 2000, at the Marist camp, in Rawdon, young naturalists drew my attention to a female Boyeria vinosa suspended, motionless, from the ceiling inside a building, near the exit door, next to a a twinkling light. Two years later, the young naturalists were at another camp in Chertsey, located in the Laurentians. A similar case was reported to me at the end of July 2002. Another female Boyeria vinosa was observed with its front legs affixed to the ceiling of an outdoor toilet near a light left on for the convenience of campers. These observations have been the subject of a short note (Hutchinson, 2001). In Port-au-Saumon, we are able to add three other observations of Boyeria grafiana, a species of Aeshnidæ that frequents the Port-au-Saumon River, located near the Ère de l'estuaire camp. These adult Odonates have adopted parts of buildings to spend the night there. Thus, on July 31, 2009, the camp director, Denis Turcotte, spotted a male of this species hanging from the upright or the post of the Demeurance gallery, the activity leaders' building, just below a light that had remained on at the end of the evening. The next day, trainees showed me another Boyeria grafiana, a female, almost in the same place in the gallery, always with lights on to attract insects. Finally, a final noteworthy observation, a female Boyeria grafiana was clinging by the forelegs to the ceiling of a building housing showers, next to a flickering lamp, for the comfort and well-being of campers who would otherwise have had to wash in the dark. My experience in the field spanning many years, combined with bibliographic research, allow me to present three situations likely to promote the discovery of Odonata in their dormitories. I mention, in the first place, the search in the aquatic vegetation, emerged and semi-emerged from the edge of the water, to find Zygoptera and Sympetrum (Odonata: Libellulidæ), for example. The naturalist or odonatologist can then carefully examine the shrubs, either on the banks or even others a little further from the banks to discover another host of larger species. Finally, Odonata who adopt trees, including their crowns, most often remain inaccessible to the odonatologist, unless they can scrutinize the smallest recesses of the foliage of large trees.] Address: deceased

21572. Hutchinson, R.; Ménard, B. (2013): Nouvelles récoltes de naïades, d'exuvies et d'émergences de Williamsonia fletcheri Williamson (Odonata: Anisoptera: Corduliidae), près de Poltimore dans l'Outaouais québécois. Nouv'Ailes 23(2): 12. (in French) [Verbatim/Google translate: On May 18, 2009, we were revisiting a site very near Poltimore (45°47'N 75°42'W) in the census division of Papineau. It is a minerotrophic environment at one end of a lake (Ménard & Hutchinson, 1999), where the soggy ground is punctuated by small ponds containing very little water. Quite quickly, BM had the pleasure of discovering, observing and picking three emergences (two males, one female, with the exuviae) of this species of odonates rarely found in Quebec (Pilon & Lagacé, 1998) and a little throughout its range. For his part, RH was able to collect an adult male, an exuviae and three larvae. By examining all the material brought home, RH is able to add for both, an emergence, being a female (with the exuviae), another adult, an exuviae and seven larvae, for a grand total of 22 specimens. We returned on May 24, 2009 to the same site. BM brought back two exuviae and RH also two exuviae and three Williamsonia fletcheri larvae. Finally, another excursion, on May 21, 2011, allowed us to collect three other immature larvae, including one larva. The wing sheaths reached the end of the fourth abdominal segment in one case and the beginning of the third for the larva. Our harvests before 1999 We refer the reader to the articles by Ménard (1990, 1996) and Ménard & Hutchinson (1999), the last, quite exhaustive, detailing all our harvests before the year 2000. These harvests took place in three sites of Quebec's Outaouais, particularly in the fen, near Poltimore, in the Danford lake sector (45°57'N 76°08'W) and that of Jean-Venne lake (45°41'N 76°04'W), not to mention the great bog of Alfred, in Ontario. We mainly collected larvae, exuviae, and sometimes emergences. The aforementioned articles also mention the times when we observed adult individuals. Distribution and Abundance Pilon & Lagacé (1998) list only seven localities where this diminutive Cordulid has been found, and this only in the cold temperate zone of the province. Savard (2011) summarizes the state of the captures, these being in southwestern Quebec. On the other hand, he recently reported the capture or observations of the Black Emerald in Lac Saint-Jean and in the Quebec region. No doubt these finds will be the subject of mentions in later publications, since it is an extension of the interesting distribution area. The larva of W. fletcheri remained unknown until recently (Charlton & Cannings 1993). Moreover, we provided, at their request, specimens and information on our harvests from the Alfred peat bog and the environment located near Lake Jean-Venne, a fact cited in their description article. It bore the name of Lac Duncan at the time, although it was mentioned, without our knowledge, under the name of Lac Jean-Venne in the Répertoire toponymique du Québec (1987). The adult of the species was described by Williamson (1923) and the genus established by Davis (1913). No doubt the species will be found elsewhere in Quebec, further north and further east. It is a question of interested odonatologists and naturalists looking for W. fletcheri in environments conducive to its development. Happy hunting everyone!] Address: Menard, B.,

16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21573. Hutchinson, R.; Menard, B. (2013): Les larves d'Anax junius (Drury) (Odonata: Aeshnidæ) peuvent-elles vivre dans des eaux peuplées de poissons? Nouv'Ailes 23(1): 6-7. (in English) [Verbatim/Google translate: On August 16, 2012, during an excursion to Parc national de Plaisance, located about 40 km east of the city of Gatineau, we collected 15 exuviae of A. junius, at the edge of the Ottawa River. We were walking on a long wooden plank walkway, which the English call a "boardwalk", which spans the banks of the Ottawa River in the park. We carefully unhooked, on each side of the footbridge or the passage, the exuviae which were on the stems of aquatic plants at different heights from the surface of the water. On August 18, 2012, Benoît Ménard (BM) collected three mature Anax junius larvae on the shores of Lac Beauchamp, located in the municipal park with the same name. The lake, fed by underground springs, does not seem to have deteriorated despite the fact that the site was first a quartz mine, which was transported by train to Montreal, then a dump and finally, a park with trails for walking, cycling and nature observation. To his great surprise, BM was happy to find that the three larvae, brought alive to his home, turned into adult A. junius, two males and one female. The photos accompanying this article bear witness to this. The two environments mentioned above are populated by an ichthyofauna rich in species and individuals. At Lac Beauchamp, the fishing activity is clearly visible during our visits to study the dragonflies, as we can frequently see fishermen showing off their catches. In addition, the park authorities, whom we consulted, tell us that they recently stocked the lake with 4,000 brown trout. These collections contradict data from the odonatological literature, according to which the larvae of this species of Aeshnidae only thrive or even can live in waters devoid of fish (Corbet, 1999; Dunkle, 2000). Moreover, the first author cites other sources that support this thesis. Unusual fact, it is interesting to note that Paulson (2011) does not retain this particularity of the larvae of A. junius which would only live in waters devoid of fish. The reader can, moreover, consult the articles of Trottier (1966) and Young (1965 and 1967) to glean useful knowledge on the life of A. junius. As far as we are concerned, in the past we have collected many larvae and exuviae of A. junius in waters where the presence or proliferation of fish is rather unlikely, for example, in ponds and ponds of sand and gravel pits. These discoveries should encourage odonatologists and naturalists to increase research to confirm or invalidate the thesis that the larvae of A. junius live in waters devoid of fish. [...] As a corollary activity, the odonatologist can quite easily dissect fish from environments rich in Odonata larvae to examine the stomach contents and see if there are dragonfly larvae. It could thus determine which species have been victims of predation. The digestive tract of fish is a long tubular structure that runs through a good part of the body in its length. When preparing the fish, to cut out the edible muscle fillets, it is possible to isolate the digestive tract and place it on a white sheet, for example to examine its contents. I did these dissections on speckled trout, with trainees from the Ère de l'estuaire camp, in Port-au-Saumon (Charlevoix-Est) for several years. The odonatologist, who consults Corbet (1999), discovers that research on Odonata larvae in fish-rich environments or not, can be popular with certain odonatologists and aquatic biologists, few in number, it should be noted. However, this field of research requires knowledge of both the dragonfly larvae and the fish that inhabit the waters of our regions. We encourage Quebec naturalists to continue this research on the fauna of our vast territory.] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21574. Hutchinson, R.; Menard, B. (2013): Spiders collected in Odonata exuviae in the province of Quebec. Argia 25(1): 18. (in English) ["For over thirty years, both authors have been collecting a few odonate larvae and exuviae at each outing. About 6,000 larval and exuvial specimens have been donated to the Canadian National Collection (CNC) of insects, arachnids and nematodes of Agriculture Canada, in Ottawa. About 80 species or more are in the CNC. However, a few need to be identified to species, namely zygopterans, Aeshna specimens and some Somatochlora. Both authors have fairly large holdings of larvae and exuviae in their homes. The first author has furthermore learned to identify many common Quebec spiders to species with the help of Charles Dondale and Jim Redner, CNC arachnologists (now retired), who built the AgricultureCanada Spider Collection (about 500,000 specimens). Recendy, we discovered that live spiders could be found in dragonfly exuviae. Although this behavioral trait of spiders does not appear to be very frequent, we are able to report a few cases where we have found spiders in odonate exuviae. On 1 October 2005, under a bridge with much traffic in Gatineau, we discovered exuviae containing live spiders, including a female Steatoda bipunctata (Theridiidae; False Widow) spider residing in a larval skin of Epitheca princeps. The remains of two flies and some spider silk (probably part of a molt) were observed in the dragonfly exuvia. Another E. princeps exuvia contained a Tetragnatha sp. (Tetragnathidae; Orbweaver) spider, and an exuvia of Neurocordulia yamaskanensis was found to harbour a Steatoda bipunctata female and the remains of a spider molt. We also collected exuviae of Libellula luctuosa and Epitheca cynosura with spiders but lost the spiders because they feil from the exuviae on the grassy soil at our feet. We were unable to recoup the lost spiders (Hutchinson & Menard, 2010). When the presence of a spider is suspected in a skin, it is advisable to keep an insect net underneath so that the specimen will fall into the net, instead of on the ground. On 16 June 2012 at Luskville, on the shore of the wide Ottawa River, one of many larval skins collected of Stylurus notatus contained a rarely found spider for the province of Quebec, Clubiona maritima (Leafcurling Sac Spider), only the second record for the province (Beianger & Hutchinson, 1992). Details of this capture are given in Hutchinson (2012). Manolis (2008) has also reported a male Sassacus vitis (Jumping Spider) in a larval skin of Macromia pacifica. When searching for spiders in odonate exuviae, one must isolate each species in an individual vial while observing the possible presence of silk, remains of molt or prey, etc. It remains to be discovered how frequently spiders may adopt odonate larval skins as a refuge or residence to pursue their activities. In Gatineau, the underside of the bridge where our specimens were found is protected from wind and water and many spiders can be observed walking or hiding near the Odonata skins. The same cannot be said of the extensive stone walls on the shore of the Ottawa River in Luskville. Larval skins on the underside of the Gatineau Bridge can remain there for months protected from wind and water and snow, so that spiders can in all likelihood find long-term lodgings. The skins in Luskville are often blown away by wind or washed away by trickling water." (Authors)] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21575. Susanto, M.A.D.; Firdhausi, N.F.; Bahri, S. (2013): Diversity and community structure of dragonflies (Odonata) in various types of habitat at Lakarsantri District, Surabaya,

Indonesia. Journal of Tropical Biodiversity and Biotechnology 8(2): 17 pp. (in English) ["Dragonflies are insects that are very dependent on the existence of freshwater ecosystems, However, the population of dragonflies in urban freshwater ecosystems is at risk due to a number of issues. Consequently, it is essential to carry out research and efforts to preserve dragonflies in urban areas. This study aims to provide information about the diversity and structure of dragonfly communities in various habitat types in the Lakarsantri, Surabaya. Data collection in this study was carried out in the habitat types of ponds, reservoir, river, and rice field in July to September 2021. The study results show there are 22 species from 4 families with a total of 827 individuals. Analysis of the Shannon-Wiener diversity index showed that the highest value of dragonfly diversity was found in a pond, with a value of H' = 2.40, and the location with the lowest value was a river, with a value of H' = 1.77. At four research locations that have different aquatic ecosystems, the community structure of dragonfly is also different. The composition of the dragonfly community structure at the reservoir location has similarities to a pond, and at a river location, it has similarities to a paddy field. Differences in abiotic factors consisting of light intensity, humidity, and temperature at each study location have a correlation with differences in dragonfly community structure. In addition, the composition of the vegetation at each location is also one of the factors causing differences in the structure of the dragonfly community." (Authors)] Address: Susanto, M.A.D., Dept of Biology, Faculty of Mathematics & Natural Sciences, Univ. Brawijaya, Malang, Indonesia. Eemail: saifulsi@uinsby.ac.id

21576. Holusova, K.; Holusa, O. (2014): Finding of Leucorrhinia albifrons (Odonata: Libellulidae) in the Hustopecský biogeographical region in the southern Moravia (Czech Republic). Acta Mus. Beskid. 6: 125-127. (in Czech, with English summary) ["Two mature males of L. albifrons were found on 18.VI.2014 in the locality of Šardice village – Šardický potok stream – Písky place (48°56'50.67"N, 17°03'26.14"E, 176 m a.s.l.) in the Hustopecský bioregion (southern Moravia, Czech Republic). It is the first record from the northpannonian subprovince in the Czech Republic." (Authors)] Address: Holusova, Katerina, Ústav ochrany lesu a myslivosti, Lesnická a drevarská fakulta, Mendelova univerzita v Brne, Zemedelská 3, CZ-613 00 Brno. Czech Republic. Email: holusova.katerina@seznam.cz

2014

21577. Hutchinson, R.; Ménard, B.; Piché, C. (2014): Perithemis tenera (Say) (Odonata: Libellulidæ) Nouveau pour la vallée de l'outaouais québécois. Nouv'Ailes 24(1): 15-16. (in French) [Records of P. tenera between 2012 and 2013 in Quebec's Outaouais Valley are documented.] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

21578. Hutchinson, R.; Ménard, B.; Piché, C. (2014): Pachydiplax longipennis (Burmeister) (Odonata: Libellulidae) dans la région de l'Outaouais. Nouv'Ailes 24(1): 5-7. (in French) [Verbatim/Google translate: During our odonatological excursions in the Ottawa Valley, excursions that date back to the summer season of 1987 for RH and BM, we had never encountered this species of dragonfly (Ménard 1996) which nevertheless had a vast geographical distribution in North America. North (Needham et al. 2000). The literature on our odonates does not mention the presence of this dragonfly either for the Outaouais region of Quebec (see Pilon & Lagacé 1998, Walker & Corbet 1975, Robert, 1963). The first mention for Quebec is reported by Mochon (2012). During the summer of 2012, we observed and collected adult Pachydiplax at various sites in the city of Gatineau. It was in 2013, however, that we began to find larvae and exuviae of this monotypic dragonfly species. Thus, BM captured the first larva identified for Quebec on Monday, June 3, 2013, at the Touraine marsh. Touraine is a sector of the city of Gatineau (figure 1). First, we detail somewhat our harvests of the species during 2012-2013. We then present the general distribution for the North American continent. Finally, some data on the biology of this species of dragonfly will allow the reader to become aware of the interest and the importance of following the evolution of the presence, even the progressive invasion of this odonate, especially in the southwest. of the Quebec territory; more precisely in Gatineau, on the south bank of the Ottawa River facing Ottawa (Ontario). Summary of our observations: At all sites, males were present and showed a lot of aggression towards conspecifics. BM and RH saw few females. However, BM observed egg-laying and attempted egg-laying at the edge of Lac Beauchamp. The individuals observed were almost always at the edge of water bodies with abundant riparian vegetation, either floating or upright. At some sites in Gatineau Park, RH and BM were unable to collect specimens, as they did not hold a collection permit from Gatineau Park, which owns the site. Geographical distribution Literature data: According to Needham et al. (2000), the geographical distribution of Pachydiplax encompasses much of North America, as well as Mexico, Bermuda and the Bahamas. Walker & Corbet (1975) report the presence of the species in eastern parts of Ontario, Manitoba and British Columbia. Pilon & Lagacé (1998) and Savard (2011) do not mention the species as a component of the odonatofauna of Quebec. On the other hand, Mochon (2012) makes a first mention of Quebec in one of his articles; thus, the species is a new element that enriches our odonatological heritage. In addition (Mochon (2014) observes that at the sites he has visited since 2012, particularly in Estrie and Montérégie, these are populations and not isolated individuals. Our mentions for the Outaouais are firsts for our region. Biological elements: At sites where the species is well established, the frequency of sightings and the omnipresence of individuals make them the odonates of choice for ecological and behavioral studies, as evidenced by the many books and journal articles to their subject. The Quebec naturalist and odonatologist can glean many fascinating facts from general works, such as Dunkle, 1989, 2000 and Paulson, 2011, and also from Walker & Corbet (1975). Among a few traits mentioned by these three authors, it is important to note a certain resemblance between the males of Erythemis and Pachydiplax. However, the former often land on the ground, while the Pachydiplax often adopt perches on the vegetation, at different heights. We can also look for individuals of the latter species, either in wooded areas or often at the edge of the water where emergent vegetation is spreading. Observers have discovered feeding sites or territories far from the shores of bodies of water. Near the water, the males perch on riparian plants, such as shrubs, and claim a portion of the shore that they defend aggressively. Tandems (male-female) are rarely observed. Copulation lasts 10 to 40 seconds, according to Paulson (2011). Males provide hover surveillance around females, which lay 300 to 700 eggs in 35 seconds (Dunkle 1989, Paulson 2011). During our observations in 2012 and 2013, we observed many males who seemed to want to take over parts of the shore with aggressive flights, and whose movements seemed to us to be somewhat erratic. For more specific and detailed research, we refer the reader to the work of Fried & May (1982), feeding and territory of males, Johnson (1962), territorial behavior and reproduction, Robey (1975), reproduction, and

Sherman (1983), post-copulatory behavior. In addition, these articles provide information on other research on Pachydiplax, cited in the references. Outlook In Quebec, we are only at the beginning of our observations and our research on Pachydiplax. We still have to verify the behavioral traits mentioned above and first follow, if necessary, the invasion of the species to determine its geographical distribution, as it settles in Quebec territory. For the Outaouais, we need to assess the importance or the permanence of the establishment of Pachydiplax populations elsewhere than in the city of Gatineau, for example on a perimeter of 50 km around, say up to Kazabazua, for example. As to whether the arrival of the species here in Quebec would be linked to climate change, it would perhaps be wise to wait a few years before deciding.] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

21579. Jacq, F.A.; Butaud, F.-J.; Ramage, T. (2014): Mont Marau. Guide vert. Direction de L'Environnement, Papeete, Polynésie Française: 168 pp. (in French) [The book briefly introduces eight odonate taxa including an undescribed Hemicordulia.] Address: not stated

21580. Ceballos, C.P.; Zapata, D.; Alvarado, C.; Rincón, E. (2016): Morphology, diet, and population structure of the Southern White-lipped Mud Turtle Kinosternon leucostomum postinguinale (Testudines: Kinosternidae) in the Nus river drainage, Colombia. Journal of Herpetology 50(3): 374-380. (in English, with Spanish summary) ["Most existing studies on K. leucostomum, have been based on northern Central American populations, leaving a lack of information on populations from southern Central America and South America. Herein we studied morphology, diet, and population structure of a population of the southern Kinosternon leucostomum postinguinale inhabiting four creeks in Colombia. Observed habitats used were highly variable, ranging from relatively clean waters to streams used for sewage disposal of wastewater from a human settlement. Body size was smaller than that of other populations of southern K. l. postinguinale and also than that of the northern K. l. leucostomum. Sexual dimorphism was evident, with males heavier, longer, and wider than females. Body size was associated with the habitat of origin, with Barrio Nuevo individuals being the largest. The main components of the diet were plant material, insects [Odonata: n=1], snails, and algae. We did not find evidence of sexual differences in the diet, but we found geographic differences in the body size. The population with the largest individuals, from Barrio Nuevo Creek, consumed more snails while those from Totumo Creek, the population with the smallest individuals, consumed more ants and plant material as compared to the other creeks. Additionally, we found a highly male-biased sex ratio, with 2.5 adult males per female, very few juveniles, and no nests, which suggests a dangerous risk of population decline. We suggest continued monitoring of the demography of this population, emphasizing its reproductive biology." (Authors)] Address: Ceballos, Claudia, Grupo Centauro, Escuela de Medicina Veterinaria, Facultad de Ciencias Agrarias, Universidad de Antioquia, Medellín, Colombia. E-mail: claudiaceb@gmail.com

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21581. Chelmick, D.G.; Evangelio Pinach, J.M.; Diaz Martínez, C. (2016): Aportación al conocimiento de las libélulas (Insecta, Odonata) de la provincia de Guadalajara (Castilla-La Mancha, España). Contribution to the knowledge of the dragonflies (Insecta, Odonata) in the Guadalajara province (Castilla-La Mancha, Spain). Boln. Asoc. esp. Ent. 40(3-4): 539-547. (in Spanish) ["Conclusions: Lestes sponsa, Coenagrion scitulum, Aeshna juncea, Libellula quadrimaculata and Sympetrum sanguineum are cited for the first time from the province of Guadalajara. The provincial inventory of odonates is therefore made up of 46 species (22 Zygoptera and 24 Anisoptera). Finally, after the work of Prunier & Chelmick (2015) and the records compiled in this note, only the presence of Coenagrion caerulescens to be confirmed from the provincial catalogue, whose only citation is a specimen from the National Museum of Natural Sciences. collected in Azañón in 1956 (PARÍS et al., 2014)." (Authors)] Address: Chelmick, D.G., Macromia Scientific 31 High Beech Lane, Haywards Heath, West Sussex UK. Email: david.chelmick@gmail.com

21582. Entomofaune du Québec (2016): Publication d'un guide sur les naïades et exuvies des libellules du Québec. Nouv'Ailes 26(2): 4. (in French) ["A new guide, in French, has just been published: "Naiads and exuviae of dragonflies in Quebec: key to gender determination", published by Entomofaune du Québec. The two authors, Raymond Hutchinson and Benoît Ménard, well known to members of the AEAQ, offer naturalists the labor of thirty years devoted to the observation of the underwater world of dragonflies. This 73-page practical guide opens up a vast field of knowledge. It allows the identification and study of dragonfly naiads, either before they emerge from the water, or as exuviae left by new adults. The proposed identification key makes it possible to confidently separate the 52 genera of Zygoptera and Anisoptera listed in Quebec and near its borders. In addition, the key allows the identification of 32 species. From a scientific name, the naturalist will be able to consult reference works in the natural sciences and navigate effectively on the Internet to enrich himself with the knowledge accumulated before him. In this way, he will be able to communicate his observations and discoveries with passion and accuracy. No less than 116 anatomical drawings and 15 plates of illustrations, including 79 color photos, will help the naturalist finally give a name to his exuviae or dragonfly naiad specimens. The coiled book, in 7" X 9" (18 X 23 cm) format, printed on thick, semi-gloss paper, allows intensive use in the workshop or lab. You can order this magnificent guide, for $33 (taxes and postage included), by consulting the publisher's website: www.entomofaune.qc.ca" (Publisher)] Address: Entomofaune du Québec inc., 108-637 boulevard Talbot Saguenay (Chicoutimi), Québec G7H 6A4, (418) 545-5011, postes 6542 ou 5076

21583. Hutchinson, R.; Ménard, B.; McAllister, L.; Larochelle, M. (2016): Découverte de naïades d'Epiaeschna heros (Fabricius) (Odonata: Aeshnidae) à Gatineau en 2016 et émergence d'un individu dans un bac aménagé chez soi. Nouv'Ailes 26(2): 12-13. (in French) [Verbatim/Google translate: On August 27, 2016, the four naturalists went to the municipal park of Lac Beauchamp in order to visit a shrubby forest swamp and observe aquatic organisms, for example dragonfly naiads. Among the organisms encountered, they were surprised to catch three naiads or larvae of the largest dragonfly in Canada, Epiaeschna heros. Lyne, BM's spouse, caught one and BM, two. To our knowledge, this is only the second historical naiad fishery for this aeschnid in Quebec. Moreover, the species remains little captured at the adult stage in the province, of which the southwest constitutes the northern limit at present. According to Savard & Mochon (2014), the adult has been captured only once in the past 25 years, on June 24, 2013. The biotope of Parc du lac Beauchamp consists of a wooded shrubby swamp whose main plant components are red maple, winterberry, sphagnum

moss and sensitive fern. Although the free and open water column is very shallow, there seems to be enough space for the movements of such a large naiad. The bottom is usually lined with dead leaves with small trunks and branches lying here and there under the water or emerging on the surface. The middle consists of several connected ponds. These naiads play dead when fished or handled. One cannot help but observe the dark coloring of their bodies in harmony with the branches and the dead leaves in the middle. BM brought the three naiads home alive, installed them in breeding tanks to observe them, fed them and hoped to witness emergences, all for the taking of digital photos which will document this crucial aspect of their existence. In fact, on August 29, BM had the privilege of discovering the emergence of a male. Apparently, the emergence would have occurred on the ground in the entrance portico of the accommodation. BM observes that in a breeding tank (aquarium, artificial environment), these naiads of Epiæschna present some behavioral traits to remember. They are rather apathetic. They can also float like a twig in the water column or even land on different substrates. This is the second time in eleven years that RH and BM have discovered this species of æshnid in the wild, again at the municipal park of Lac Beauchamp, in Gatineau, but in another wooded swamp located about a kilometer from the first (Hutchinson & Ménard 2007). We had visited the first biotope nine times, from May 29 to November 5, 2005, allowing us to sample four larvae or naiads, two of which had subsequently emerged in the aquarium at BM. In addition, one molt and twenty exuviae were collected at the site. The vegetation composition of the 2005 treed swamp was somewhat different from our 2016 site where black ash dominated tree vegetation. Hydrocharis morsus-ranae covered much of the surface of the water. When the environment was completely dry in autumn, the water-hemlock, an umbellifer, almost dominated the swamp. Finally, let's mention Alisma plantago-aquatica and a few mosses that popped up here and there. Thus, some females of Epiæschna heros, entrusted their eggs to two different types of swamps according to their plant composition and probably their pH, the second being acidic. It is interesting to mention some habitats gleaned from the odonatological literature. Walker (1958) writes that E. heros haunts dark ponds and ditches as well as draining marshes. Dunkle (2000) also mentions ponds in wooded areas, but also slow-moving streams, including swamps and temporary ponds or ponds. Paulson (2011) specifies the following biotopes: swamps and slow-moving streams rather in wooded areas, where the water can be very shallow. It even evokes temporary environments where the presence of water remains seasonal. According to Savard and Mochon (2014), the odonatologist can select the following habitats: temporary ponds, shaded river marshes under a forest cover. To better understand the components of the habitat of E. heros at Beauchamp Park in Gatineau, we visit and sample the many pools of water to see which ones may prove favorable to the presence of this enormous Aeshnidæ. To date, we manage to distinguish at least two types of ponds or swamps to explore. First, water bodies with forest cover comprising a combination of the following elements: plants that grow in the water, trees, shrubs, herbaceous plants, mosses, with a bottom lined with dead leaves, twigs, logs, present in even a modest and shallow water column. Second, there are habitats made up mostly of dead leaves and decaying plant matter. These environments are often inhabited by recyclers of the Asellidæ and Ostracods type, crustaceans. These latter biotopes, so far, are the least likely to harbor E. hero. A final fascinating aspect to raise is the probability, or at least the possibility, that these larvae survive the drying up of these environments (see Arai 1984).] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

21584. Hutchinson, R.; Ménard, B. (2016): Émergences de Neurocordulia michaeli Brunelle (Odonata: Libellulidae: Corduliinae) dans un bac d'élevage, chez soi, l'hiver. Nouv'Ailes 26(1): 11. (in French) [Verbatim (Google translate): In Quebec, Neurocordulia yamaskanensis has been known for a long time (Provancher, 1875). This odonate is mentioned many times at different sites in the province (Pilon & Lagacé, 1998). It is one of the two species of dragonflies in the world's odonatofauna described by a Quebecer, Father Léon Provancher, the other being Somatochlora brevicincta, discovered and named by Brother Adrien Robert (1954). Neurocordulia michaeli was unknown to science until very recently (Brunelle, 2000). This species has recently become part of our entomological heritage (Charest & Savard, 2014). We have not yet found this Cordulid in the Outaouais. To familiarize ourselves with N. michaeli, we must therefore go to the edge of the Petawawa River, in Ontario. For example, on June 6, 2015, a trip to the Petawawa River caught a naiad (larva) of N. michaeli and two of N. yamaskanensis in torrential waters fed by the spring melt. RH and BM, the latter accompanied by his daughter Sophie and his nephew Daniel, waded into this rebellious water without the expected success. At the end of the season, on October 12, 2015, […] Indeed, they caught 34 naiads of Neurocordulia, almost all of them michaeli, about ten larvae or mature naiads as well as 24 of medium size and this, in about an hour and a half of intense fishing. The sampling method consisted of lifting the submerged stones to pick the Neurocordulia larvae attached to them. These submerged stones were mostly the size of a hand and were found under water with moderate current. At home, BM fed the naiads of Neurocordulia mosquito larvae and pupae, small amphipods and other small aquatic organisms. Naiads of Neurocordulia michaeli have obviously adapted to the new "artificial" micro-environment since in December 2015, BM had the chance to witness six emergences of N. michaeli, i.e. three males and three females, as evidenced by the photos accompanying this article. These attempts are part of a research spread over two or three seasons of research in the field, with partial breeding at home or in the laboratory, therefore outside the natural environment. We need to improve the diet of naiads in an artificial environment and do research on whether or not these larvae diapause are obligatory in the winter period to explain their emergence in the middle of winter. These data will therefore be integrated into one or two subsequent articles to be produced which will report on our next data collected during the 2016 and possibly 2017 seasons on our two species of Neurocordulia.] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21585. Hutchinson, R.; Menard, B. (2016): Premières mentions de naïades d'Hetaerina americana (Fabricius) (Odonata: Zygoptera: Calopterygidæ) au Québec. Nouv'Ailes 26(2): 10. (in French) [10 larvae of H. americana were caught at July 19, 2015, at the banks of the Châteauguay River, in Sainte-Martine, south of Montreal. Habitat: "running water flowing over many flat stones or rocks, often with only a few centimeters of water deep. The water flows into a widening of the river with more stagnant water. It was in this section of the river that the fished naiads were found. To our knowledge, these are the first captures of naiads of this species in Quebec, undoubtedly one of the most boreal sites for this species of Zygoptera." (Authors/Google translate)] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

21586. Hutchinson, R.; Ménard, B. (2016): Plusieurs émergences de l'espèce rarement trouvée au Québec Stylurus amnicola (Walsh) (Odonata: Gomphidae) dans des bacs d'élevage. Nouv'Ailes 26(2): 15. (in French) [Verbatim/Google translate: On June 19, 2016, BM, […] traveled to the Petite-Nation River, at a site located approximately 4 km north of the municipality of Plaisance in the province of Quebec. They explored a sandy, muddy and muddy section at the confluence of the Saint-Sixte and Petite-Nation rivers. They caught eight larvae of Stylurus amnicola, which they brought back alive to Gatineau. BM installed them in breeding containers. He did not have to feed them, since they emerged without additional feeding. In fact, they are burrowing larvae and we have yet to find out if these naiads will hunt prey by burrowing and moving in the sand, or by walking on the surface of the sand. It therefore remains to be observed. He obtained seven emergences, from June 21 (for the first), to June 29 (for the last). He also caught naiads of the following odonate species: Stylurus spiniceps (3), exuviae of Ophiogomphus anomalus two larvae of Neurocordulia yamaskanensis. It was very difficult to get to the collection site because of the steep banks and the inaccessibility of walking paths to get to the coveted biotopes. On August 12, 2016, a BM expedition to the river Désert, in the municipality of Maniwaki, in Quebec's Outaouais, again allowed him to meet this species of gomphid, very rarely found in Quebec until very recently. […] to catch a few additional naiads of Stylurus amnicola. These naiads are also being farmed in Gatineau, at BM, in the hope of obtaining emergences and use it to make other quality photographic shots, after having meticulously cleaned them with artists' brushes. S. amnicola has remained unknown in Quebec, except for the mention of Stöhr in 1918 in the Outaouais, on the banks of the Gatineau River. The mystery surrounding the existence of this species persisted until the early nineties. It began to dissipate thanks to the discoveries of Ménard (1996) who added the following sites: the Petite-Nation river, upstream from the falls, north of Plaisance, and the Désert river, in Maniwaki. Pilon & Lagacé (1998) add Moulin Banal Cove, near Quebec City, a site near the St. Lawrence River. Recently, an odonatologist from Lac Saint-Jean discovered a large number of exuviae on the banks of the Ashuapmushuan River, north of this immense lake (Michel Savard, personal communication). It is important to remember that even today, adult and mature individuals of this dragonfly remain almost impossible to spot in the airspace around bodies of water. The naturalist must, most of the time, rely on the collection of larvae and exuviae to document the existence of this species of odonate in nature. We must also draw attention to the fact that in 1996, larvae fishing in the Rivière Petite-Nation and the Rivière Désert was carried out approximately at the sites already listed. These are therefore not new references. Through these returns to sites already explored, BM hopes to gather additional data, particularly on the diet and behavior of naiads in captivity. He also intends to obtain many photos of living individuals taken at home, in an aquarium, after cleaning the naiads kept alive in the laboratory.] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

21587. Menard, B.; Hutchinson, R. (2016): Pêche de 2 larvules de Progomphus obscurus (Odonata: Gomphidae) près de Maniwaki: une première et une deuxième mentions de l'espèce pour la province de Québec. Nouv'Ailes 26(2): 6-7. (in French) [Verbatim/Google translate: On August 12, 2016, BM fished an immature dragonfly naiad, a larva, at the Désert River, in Maniwaki (Mont Cerf), [...] Vast sandy beaches stretched along the shores. At the first cast of the net, he caught a small gomphid larva with very fast movements, which was silting up at lightning speed. The unusual shape and morphological characteristics of this naiad allowed us to quickly come to the conclusion that it was a gomphid, in particular Progomphus obscurus. This is the first record for the province of Quebec for both this genus and species of odonate. Subsequently, about thirty additional hauls enabled BM to catch naiads of Ophiogomphus colubrinus, Gomphus adelphus and Macromia larvae. The people of the village define this sector of the shores as the 16th beach from the Maniwaki bridge. There would be up to 104 in the area. On August 20, 2016, BM resolved to return to the capture site of the first Progomphus caught on August 12. […] The naiad was dragged from the sand among heaps of dead wood lying in the water of the river. Lyne also caught several larvae of Stylurus amnicola (8). The expedition brought back specimens of the following species: Stylurus spiniceps and scudderi, as well as Stylogomphus albistylus. They also found Macromia larvae and Ophiogomphus naiads.] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

21588. Sheela, S.; Subramanian, K.A.; Das, D.; Venkataraman, K. (2016): The type specimens in the National Zoological Collection ODONATA. Type Catalogue Series, 3: 1-36. In English [Type specimens of 48 species or subspecies of Odonata and deposited in the Central Entomology Laboratory, ZSI, Kolkata are documented with images and associated meta data (labels) and their current taxonomic status. In the meantime, more taxa have been revised and had to be synonymized.] Address: Subramanian, K.A., Zool. Survey of India, Prani Vigyan Bhavan, M-Block, New Alipore, Kolkata-700 053, India. E-mail: subbuka.zsi@gmail.com

21589. Turgeon, R. (2016): Découverte du Gomphe ventru en Beauce une libellule menacée de disparition au Canada. Nouv'Ailes 26(1): 5. (in French) [Verbatim/Google translate): At the end of June 2015, on Saint John's Day, I walked through a forest clearing crossed by a small mountain stream in the hope of tracking down a Somatochlora tenebrosa. This dragonfly, rarely seen in Quebec, is familiar to me in this habitat. I am then about three kilometers from downtown Saint-Georges-de-Beauce, in the northern part going towards Notre-Dame-des-Pins. At a good distance, that is to say at least half a kilometer from the Chaudière River, in the low herbaceous vegetation of a maple stand dotted with softwoods, I capture in an entomological net a male clubtail exposing a large club. Without being able to put a name to it immediately, I take a series of point-blank photos of it. Hoping that it stays in place, I then place it on some foliage, but it's a waste of time for other photos because it immediately flies towards the canopy! It is only by examining my photos on the computer, and by consulting the guide to the odonates of Algonquin Park, that I realize that it could be Gomphus ventricosus. I send my photos to Michel Savard who confirms my identification. Back in the field, on June 30, at exactly the same place, I captured another male whose coloring turned out to be slightly different from the first due to the extent of the yellow in the eighth abdominal segment. According to the state of our knowledge, this would only be the third mention of this species in Quebec. We have to go back to June 18, 1940, in Farnham, for the discovery of the Skillet Clubtail in Quebec, by Brother Adrien Robert, author of the volume "Les libellules du Québec". Then, we refer to July 4, 2011 for the discovery of a male, on the bank of the Batiscan River in Mauricie, by Pierrette Charest (see the Entomofauna Bulletin of November 2011). At the suggestion of Michel Savard, the coordinator of the Initiative

pour un atlas des dragonflies du Québec (IALQ), I then explored the surroundings of the Chaudière hoping to find exuviae of the species there, but without success. I retain a constant between the observations of Adrien Robert and mine. the various males captured in the forest were far from a large watercourse. For the new season, in June 2016, I will try to document the abundance of the Skillet Clubtail at my observation site. This is quite a challenge for a species that the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2010) considers endangered.] Address: not stated

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21590. Hutchinson, R.; Ménard, B. (2017): Pêches de naïades de Somatochlora brevicincta (Odonata: Corduliidæ) à Senneterre en 2016. Nouv'Ailes 27(1): 4-5. (in French) ["On July 20, 2016, BM, accompanied by Majella Larochelle, allowed himself a two or three-day expedition to Lake Mistassini in the hope of collecting naiads of S. brevicincta and other species of odonates which mainly inhabit the subarctic regions. Due to the short time devoted to fieldwork and the great distance to travel from Gatineau to finally catch larvae in the field, the results were modest and mixed. No water nymphs were caught, unlike the 1996 expedition (Hutchinson & Ménard, 2000). However, on the way back, a brief stop in a reticulated bog in Senneterre allowed BM to catch two S. brevicincta larvae. These were brought back alive to Gatineau and placed in breeding tanks. In the subfamily Corduliinae, the genus Somatochlora has the largest number of species in North America (Needham et al., 2000). This statement also applies to the province of Quebec where 14 species are found (Savard, 2011). The description of S. brevicincta, as a new species, dates from a relatively recent period compared to all known taxa for Quebec (Robert, 1954). Moreover, the description of the larva or naiad is also recent (Hutchinson & Ménard 2000). […] S. brevicincta was little known at the time of Walker & Corbet (1975). It is currently listed in the following geographic entities: Quebec, Nova Scotia and British Columbia, for Canada and Maine and Minnesota, for the United States (Paulson, 2011). In Quebec, the distribution of S. brevicincta currently encompasses the regions of Abitibi, Lac Mistassini, Sept-Îles (Buidin & Rochepault, 2008), Lac-Saint-Jean (Michel Savard, pers. comm.) and Parc National Frontenac (Alain Mochon, pers. comm.). For naturalists and odonatologists wishing to fish for S. brevicincta naiads, BM offers the following technique. Once at the edge of the minerotrophic ponds of our peat bogs, the collector must recommend the following fishing procedures: with his net, he executes a circular movement from the bottom of the pond upwards in the direction of the opposite shore; in order to detach or extirpate the naiads clinging to the sphagnum moss or other plant material that lines or borders the pond, it agitates and grazes the bottom and the sphagnum, always directing the net towards the opposite bank. BM used this method at Lake Mistassini in 1996 and at Senneterre in 2016. It is worth remembering that adults of S. brevicincta are very discreet in nature and are often difficult to spot in flight or perched low in peat environments. Fishing for larvae therefore becomes an important activity to avoid returning empty-handed from one's odonatological expeditions. By the way, hello and good luck!" (Author/Google translate)] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21591. Johansson, F. (2017): Population structure of Leucorrhinia dubia (Vander Linden) the White-faced Darter in Europe with special reference to the population at Chartley Moss. J. Br. Dragonfly Society 33(2): 73-78. (in English) ["This article describes the population structure with regard to genetic variation and isolation of L. dubia in Western Europe, with a special focus on the British population at Chartley Moss. The British population is genetically closest to those in Switzerland and France but is genetically isolated from all populations in Europe. Information is also provided about Variation in the length of the spines in larvae raised in the absence of fish. This feature is of particular interest because these spines provide protection from fish predators as well as being used for keying out species at the larval stage." (Authors)] Address: Johansson, F., Animal Ecology, Dept of Ecology & Genetics, Uppsala University, Sweden

21592. Karle-Fendt, A.; Stadelmann, H. (2017): Die Fauna des Felmer Mooses – Die Libellen (1. Teil: Kleinlibellen). Naturkundl. Beiträge Allgäu 52: 33-43. (in German) [Records of 19 Zygoptera are documented.] Address: Alfred Karle-Fendt, A., Hofenerstr. 49, 87527 Sonthofen, Germany. Email: karlefendt@t-online.de

21593. Lozano, F.; Rodríguez, J.S.; Molineri, C. (2017): Acanthagrion peruvianum Leonard, 1977 (Odonata Coenagrionidae) a junior subjective synonym of A. floridense Fraser, 1946 and description of its final stadium larva. Zoologischer Anzeiger - A Journal of Comparative Zoology 270: 71-80. (in English) ["A. peruvianum is considered a junior subjective synonym of A. floridense Fraser, 1946 based on the analysis of type material. The species is diagnosed and SEM images are provided for male and female diagnostic characters. The larva of A. floridense is described based on specimens collected in Salta, Jujuy and Tucumán provinces (Argentina). A distribution map is given showing that this species is recorded for the first time for Misiones and San Luis provinces in Argentina, and for La Paz and Tarija departments in Bolivia." (Authors)] Address: Molineri, C., Instituto de Biodiversidad Neotropical, CONICET-UNT (Consejo Nacional de Investigaciones Científicas y Técnicas—Universidad Nacional de Tucumán), Facultad de Ciencias Naturales e Instituto M. Lillo, Tucumán, Argentina. Email: carlosmolineri@gmail.com

21594. Ménard, B.; Hutchinson, R. (2017): Première pêche au Québec de la naïade très rarement observée de Gomphaeschna furcillata (Odonata: Aeshnidae). Nouv'Ailes 27(2): 10-11. (in French) [A record of a larva of G. furcillata at 13-VIII-2017 near Mulgrave-et-Derry, Papineau, Québec, Canada is discussed in any details.] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1, Canada. Email: ménardben@vidéotron.ca

21595. Ménard, B.; Hutchinson, R. (2017): Nouvelles pêches de naïades de Progomphus obscurus (Rambur) (Odonata: Gomphidæ) au Québec. Nouv'Ailes 27(2): 5. (in French) ["On September 16, 2017, BM and his wife Line went again to the edge of the Désert River, near the town of Maniwaki, to the site where they had found two larvae of P. obscurus on August 12, 2016, a first and second mention of the species for Quebec (Hutchinson & Ménard, 2016). This time, they caught five naiads of P. obscurus, three almost mature specimens and two larvae (immature). These are five other mentions for the Quebec territory, at the same site however. These discoveries seem to confirm that a large population is spreading at least at this site and perhaps elsewhere in Quebec. BM therefore put them in breeding at his home in Gatineau. He feeds them with mosquito larvae (Culicidæ). However, these naiads seem reluctant to adopt the proposed diet. Research should be undertaken to better under-

stand the usual prey of organisms of the genus Progomphus, which burrow and live in the sand. We hope to have positive news to deliver on the evolution of the larvae kept in captivity at BM at later dates. We also intend to visit the site again in the hope of finding new confirmations of the importance of this population of P. obscurus on the banks of the Desert River. As additional information on the richness of the odonatofauna of the Desert River, BM reports that an impressive population of naiads of Stylurus amnicola of all sizes inhabit the site of this watercourse surveyed by BM and his wife, Line. This species was very rarely found for a very long time in Quebec." (Authors/Google translate)] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21596. Nagel, P.B. (2017): Diskussionsbeitrag: Populationserhaltende Maßnahmen im artenschutzrechtlichen Ausnahmeverfahren. ANLliegen Natur 39(1): 79-81. (in German) [If, for example, an infrastructure project fulfills the prohibition of species under species protection law, the project can only be approved by way of an exception under Section 45 (7) of the German Federal Nature Conservation Act. Among other things, it must be checked whether the conservation status of the populations of a species is not deteriorating. In practice, it is difficult to make a statement on this. The procedure discussed here offers approaches for a simplified examination of this question. As part of the exception, measures to ensure the conservation status of the affected populations of a species (including FCS measures, favorable conservation status) can be taken. However, these are not mandatory, such as measures to ensure coherence in European area protection. They are required when the conservation status would otherwise deteriorate or, in the case of Annex IV species of the Fauna-Flora-Habitat Directive with an unfavorable conservation status, it would be difficult to improve the status. A corresponding statement at the expense of the project is difficult to provide. In this article, a proposal for a simplified procedure is presented and discussed. The problems arosen, are discussed using the example of Ophiogomphus cecilia.] Address: Nagel, P.B., Bayerische Akademie für Naturschutz und Landschaftspflege (ANL), Seethalerstr. 6, 83410 Laufen, Germany. Email: paul-bastian.nagel@anl.bayern.de

21597. Baeta, R. (2018): Déclinaison régionale du Plan national d'actions en faveur des Odonates en région Centre Val de Loire. Mise à jour des connaissances sur la répartition des espèces – Bilan 2013-2017. Association Naturaliste d'Etude et de Protection des Ecosystèmes Caudalis – Direction Régionale de l'Environnement, de l'Aménagement et du Logement Centre, Janvier 2018: 33 pp. (in French) ["The development of the "Centre Val de Loire Regional Adaptation of the National Action Plan for Odonata 2013-2017" was jointly carried out by the CNRS-IRBI and the ANEPE Caudalis on behalf of the DREAL Centre. This document received the favorable opinion of the Regional Scientific Council for the Heritage of the Center during its meeting of 11-XII-2012. ANEPE Caudalis was then appointed by the DREAL Center as coordinator of this plan in the region. Many actions of this declension concern the acquisition of new knowledge, in particular in terms of the distribution of species. This synthesis draws up a cartographic assessment, species by species, of the regional knowledge acquired and centralized within the database developed within the framework of this PRA. This document was produced thanks to data collection work carried out each year with partners and regional naturalists, as well as bordering regions. We would therefore like to thank here all the contributors who have transmitted data and information, making it possible to produce the maps of the known distributions of the 31 species included in the PRA Odonates Center Val de Loire." (Google translate)] Address: Baeta, R., Animateur du Plan régional d'actions en faveur des Odonates en Centre-Val de Loire, association naturaliste d'étude et de protection des écosystèmes "Caudalis", 1 rue de la Mairie 37520 La Riche - Courriel, France. E-maiul: renaud.baeta@anepe-caudalis.fr

21598. Bartolucci, J.C. (2018): Amélioration des connaissances sur la répartition de l'Agrion de Mercure (Coenagrion mercuriale) en Lot-et-Garonne. Conservatoire d'espaces naturels d'Aquitaine: 53 pp. + annexes. (in French) ["Conclusion: In 2018, only eight locations of C. mercuriale were discovered. 58.1 kilometers were prospected via transects to which are added observations made outside transects. The distribution of the species on the territory is very heterogeneous with a good representation on the Landes plateau and the areas bordering the department. The meshes of the central part of Lot-et-Garonne remain unoccupied by C. mercuriale in view of the knowledge resulting from this work and previous work. Seven meshes are added to the atlas of the odonates of Aquitaine for this species which brings to 37 in total, or 47% of the department. Statistical analyzes of the variable analysis type were not possible due to the low number of stations discovered. However, for the sites where the species was observed, aquatic vegetation occupied 10 to 80% of the watercourse. The presence of typical watercress plants will reveal a significant potential for the site to host C. mercuriale. The surrounding environments were quite varied with crops, pastures, meadows, lawns in urban areas and roads. In addition to the presence of this vegetation, the management of the watercourse and its banks will strongly influence the potential of the environment for C. mercuriale. In general, it will prefer sites with a buffer zone (grass strip), strong sunlight and nearby shrubby areas allowing it to mature after emergence. All the data will be transmitted to the DDT47 in connection with the agreement set up specifically for this study. The elements collected in the field will be able to provide information on watercourses awaiting classification or highlight changes in already classified watercourses (flow that has become temporary, for example). CEN Aquitaine deemed it necessary to revisit certain favorable sites where the species could not be identified. In 2019, a special effort will be made to raise awareness among owners, users and managers of these small waterways. The main objective will be to introduce them to C. mercuriale and the importance at the departmental level of ensuring the conservation of the species and its habitat. It is planned to have a document signed in order to formalize, in a non-regulatory manner, the commitment to this cause of the various interlocutors. C. mercuriale presents a strong challenge at the level of the department. Despite the possibility of finding imagos in sites considered unfavorable to the species, the limiting factors for its establishment are induced by the larvae which have much stricter ecological requirements. Also, the intensification of anthropogenic pressures and alteration factors have led to its severe scarcity. If nothing is done quickly to protect this dragonfly, the remaining populations could still experience drastic drops with an increase in disappearances locally, or even eventually in most of the department." (Author/Google translate)] Address: Bartolucci, J.-C., chargé de missions, CEN Aquitaine - Antenne Lot-et-Garonne - Chemin du Rieulet - 47 160 Damazan, France. Email: jc.batolucci@cen-aquitaine.fr

21599. Chiricota, L. (2018): Première mention de la Libellula (Plathemis) lydia Drury (Odonata: Libellulidae) au Saguenay–

Lac-Saint-Jean, Québec. Fabreries 30: 18. (in French) [18-VI-2007, river Brassard, near Roberval (48°30'11"N, 72°14'56"E).] Address: Chiricota, Lise, 448, rue Léger, Roberval, (Québec) G8H 3G7, Canada.

21600. Evans, B.J.E. (2018): Neuronal encoding of natural imagery in dragonfly motion pathways. Dissertation Note: Thesis (Ph.D.) -- University of Adelaide, Adelaide Medical School, 2019: 243 pp. (in English) ["Vision is the primary sense of humans and most other animals. While the act of seeing seems easy, the neuronal architectures that underlie this ability are some of the most complex of the brain. Insects represent an excellent model for investigating how vision operates as they often lead rich visual lives while possessing relatively simple brains. Among insects, aerial predators such as the dragonfly face additional survival tasks. Not only must aerial predators successfully navigate three-dimensional visual environments, they must also be able to identify and track their prey. This task is made even more difficult due to the complexity of visual scenes that contain detail on all scales of magnification, making the job of the predator particularly challenging. Here I investigate the physiology of neurons accessible through tracts in the third neuropil of the optic lobe of the dragonfly. It is at this stage of processing that the first evidence of both wide-field motion and object detection emerges. My research extends the current understanding of two main pathways in the dragonfly visual system, the wide-field motion pathway and target-tracking pathway. While wide-field motion pathways have been studied in numerous insects, until now the dragonfly wide-field motion pathway remains unstudied. Investigation of this pathway has revealed properties, novel among insects, specifically the purely optical adaptation to motion at both high and low velocities through motion adaptation. Here I characterise these newly described neurons and investigate their adaptation properties. The dragonfly target-tracking pathway has been studied extensively, but most research has focussed on classical stimuli such as gratings and small black objects moving on white monitors. Here I extend previous research, which characterised the behaviour of target tracking neurons in cluttered environments, developing a paradigm to allow numerous properties of targets to be changed while still measuring tracking performance. I show that dragonfly neurons interact with clutter through the previously discovered selective attention system, treating cluttered scenes as collections of target-like features. I further show that this system uses the direction and speed of the target and background as one of the key parameters for tracking success. I also elucidate some additional properties of selective attention including the capacity to select for inhibitory targets or weakly salient features in preference to strongly excitatory ones. In collaboration with colleagues, I have also performed some limited modelling to demonstrate that a selective attention model, which includes switching best explains experimental data. Finally, I explore a mathematical model called divisive normalisation which may partially explain how neurons with large receptive fields can be used to re-establish target position information (lost in a position invariant system) through relatively simple integrations of multiple large receptive field neurons. In summary, my thesis provides a broad investigation into several questions about how dragonflies can function in natural environments. More broadly, my thesis addresses general questions about vision and how complicated visual tasks can be solved via clever strategies employed in neuronal systems and their modelled equivalents." (Author)] Address: Evans, B.J.E., Univ. of Adelaide, Adelaide, 5005 South Australia, Australia

21601. Felix, R.P.W.H.; van Hoof, PH.; Hoppenbrouwers, P.; de Jong, V.; Krekels, R.F.M. (2018): Insects in selected areas in the province of Limburg. Three years of research into dragonflies, butterflies, grasshoppers and crickets. Natuurhistorisch maandblad 107(7): 125-134. (in Dutch, with English summary) ["In the Netherlands, it is the provincial authorities which are responsible for nature conservation. They have set up a subsidy system, to which organisations and civilians managing nature areas can apply for financial support for their management activities. This subsidy system, called 'Subsidiestelsel Natuur en Landschap'(SNL), requires monitoring of the results of the management activities. Hence, a monitoring system has been developed, which is based on a defined set of management types. These management types are studied with regard to a variety of factors relating to the quality of nature areas. One of the factors assessed is the occurrence of selected flora and fauna species. In the 2014–2016 period, Bureau Natuurbalans – Limes Divergens carried out a survey of butterflies, dragonflies, grasshoppers and crickets in the province of Limburg according to the SNL assessment methodology. Roughly 6,100 ha of management types for which insects are used as quality indicators for SNL purposes were surveyed over this three-year period. The areas investigated include nearly 90% of all Natura 2000 areas in Limburg. The survey resulted in a dataset of 44,000 records collected in nearly 7,500 1-hectare grid squares, which comprise 45 butterfly, 55 dragonfly and 34 grasshopper and cricket species. Records mostly concern the more common species, which are often underrepresented in databases based on sightings by volunteers. One of the results of this study is a set of comprehensive distribution patterns of fairly common species like Meadow brown (Maniola jurtina) and Bog bush-cricket (Metrioptera brachyptera). This information is very difficult to gather using only the nonsystematic sightings collected by 'citizen science'. The article also describes aspects of the distribution of some less common or rare species. An example is given of the way the quality of the management types in one particular area, viz. the National Park Maasduinen, can be assessed using our data, following the guidelines described in the SNL methodology. The paper concludes with some notes on the method, based on our experiences in the field." (Authors)] Address: Krekels, R.F.M., Bureau Natuurbalans – Limes Divergens BV, Toernooiveld 1, 6525 ED Nijmegen, Netherlands: Email: krekels@natuurbalans.nl

21602. Hazarika, R.; Goswami, T. (2018): Dragonflies and damselflies of Hazara Pukhuri, Sonitpur, Assam, India. Northeast Journal of Contemporary' Research 5(1): 11-16. (in English) [Odonate from the 'Hazara Pukhuri', a large perennial pond in Tezpur, Sonitpur, Assam, India, are studied resulting in 12 taxa. " Most of the larvae are ... collected from the top soft layer of bottom soil near littoral zone of the ponds and also in association with aquatic macrophytes such as Eichhornia cressipes and Hydrilla verticillata." (Authors)] Address: Goswami, T., P.G. Dep Zool., Darrang Coll. Tezpur-784001, Assam, India. Email: tonmoyeegoswami@gnuiil.com

21603. Hutchinson, R.; Ménard, B. (2018): Gomphaeschna furcillata (Say) (Odonata: Aeshnidae) dans l'Outaouais québécois: premières mentions, aperçu de sa répartition et notes biologiques. Fabreries 30: 15-17. (in French, with English summary) ["The authors present their observations surrounding the capture of the small aeshnid, Gomphaeschna furcillata at a site situated a few kilometers west of Kazabazua (MRC de La Vallée-de-la-Gatineau). They also report the capture of two other specimens at Lake Beauchamp Municipal Park in the city of Gatineau, on June 9, 2007 and June

12, 2011, respectively. They also summarize the geographical distribution and some known biological data about the species." (Authors)] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21604. Karle-Fendt, A.; Stadelmann, H. (2018): Die Fauna des Felmer Mooses – Die Libellen (2. Teil: Großlibellen). Naturkundl. Beiträge Allgäu 53: 3-19. (in German) [Records of 30 anisopteran species are documented.] Address: Alfred Karle-Fendt, A., Hofenerstr. 49, 87527 Sonthofen, Germany. Email: karle-fendt@t-online.de

21605. Kobayashi, T.; Ralph, T.J.; Lobb, J.; Miller, J.; Theischinger, G.; Hunter, S.J.; Jacobs, S.J. (2018): Dunphy Lake in Warrumbungle National Park, NSW: aquatic animal community after the Wambelong fire in 2013. Australian Zoologist volume 39 (3): 469-479. (in English) ["Fires are a common occurrence in Australian terrestrial ecosystems. A large fire occurred in January 2013 within and adjacent to the Warrumbungle National Park, near Coonabarabran in NSW, burning over 560 km² of the park and surrounding region (the Wambelong fire). The Wambelong fire affected Dunphy Lake, the only lake in the park. In this study, we assessed the post-fire aquatic animal community of the lake in March and September 2014. At the times of sampling the lake was largely dry and had only small isolated pools. We found 53 invertebrate taxa including the larvae of the dragonfly Austrogynacantha heterogena and one vertebrate species (larvae of the frog Litoria rubella) in the pool-water samples. Artificial inundation of the lake sediment samples under laboratory conditions led to the emergence of 31 taxa, totalling 62 taxa in the lake overall. Most taxa found in the lake are opportunistic and characteristic of those in still-water bodies. Dunphy Lake seems to be highly resilient in sustaining diverse aquatic animals. We highlight the importance of complementary pre- and post-fire data for improved assessments and interpretations of fire impacts to guide monitoring of post-fire recovery." (Authors)] Address: Kobayashi, T., Science Division, Office of Environment & Heritage NSW, PO Box A290 Sydney South NSW 1232, AUstralia. Email: Yoshi.Kobayashi@environment.nsw.gov.au

21606. Kobayashi, T.; Ralph, T.J.; Berney, P. (2018): Aquatic animal community at Dunphy Lake after the Wambelong fire indicates the importance of ephemeral pools and lake sediment for recovery process. In: 2018 Linnean Society of New South Wales Natural History Field Symposium: volcanoes of northwest New South Wales: exploring relationships among geology, flora, fauna and fires: 16-["Fires are a natural phenomenon in many terrestrial ecosystems. The ecological effects of fires can be complex, depending on the attributes of fires, landscapes, as well as local climate and weather. A large fire occurred in January 2013 within and adjacent to the Warrumbungle National Park, affecting a large area of the park including Dunphy Lake (the Wambelong fire). We assessed the aquatic animal community of Dunphy Lake in March and September 2014. The lake was largely dry and covered with grasses, with only small isolated pools of water in the lake. We found 53 invertebrate taxa including the larvae of the dragonfly Austrogynacantha heterogena and one vertebrate species (larvae of the frog Litoria rubella) in the pool-water samples. Artificial inundation of the lake sediment samples under laboratory conditions led to the emergence of 31 taxa, totalling 62 taxa in the lake overall. Our results indicate the importance of ephemeral pools and lake sediment as refugia against drought and fires for aquatic organisms. The conservation of these seemingly marginal habitats across the park would help the recovery process of aquatic organisms and thus maintain the aquatic species diversity and function after major environmental disturbance." (Authors)] Address; Berney, P. National Parks and Wildlife Service NSW, Narrabri, NSW 2390

21607. Kulakov, O.I.; Tatarinov, A.G. (2018): Population of dragonfly larvae (Insecta, Odonata) in "floodless Lake Middle Week", Komi Republic. Biodiagnostics of the state of natural and natural-manmade systems. Materials of the 16th All-Russian Scientific and Practical Conference with international participation. 2018.Publisher: Vyatka State University (Kirov): 169-172. (in Russian) ["The first list of 35 species of dragonflies in the Komi Republic was published in the monograph by K. F. Sedykh [1]. The article by T. G. Stronk [2] provides information on 46 species of dragonflies. Currently, 53 species are included in the regional odontofauna [3, 4]. If the species composition of dragonflies has been revealed in sufficient detail, then there is practically no information on the structure of the population and the distribution of larvae in the water bodies of the republic. Studies of the population of dragonfly larvae were carried out in the Beloyarsky complex reserve, on the territory of which the biostation of the Syktyvkar State University is located (Kortkerossky district of the Komi Republic, 61°47'32" N, 51°48'23" E). The material was collected in the second ten days of June and the third ten days of July 2017 in the lakes Long, Priruslovoe and Krasivoye, which are floodplain closed water bodies formed as a result of separation from the oxbow lakes of the river. Vychegda. The collection of dragonfly larvae was carried out by “mowing” (wiring) with a water net over submerged vegetation in test plots 5 m long, up to 70 cm deep from the surface of the water surface and within 1.5 m from the shore to the center of the lake. In total, 12 plots were processed (four on each lake), on which 48 hydrobiological samples were taken for research, containing 634 specimens. larvae. The species diversity of dragonfly larvae in the surveyed lakes was assessed using the Margalef species richness (DMg), dominance D, Simpson evenness (DSm), and Berger-Parker (DB-P) indices widely used in ecological studies [5]. The abundance of larvae in water bodies was assessed using a five-point logarithmic scale [6]. Dragonfly larvae presented in hydrobiological samples belonged to 18 species from two suborders and five families (table). This is about 50% of the total identified composition of the odonatofauna of the reserve [3]. As expected, the samples did not contain rheophilic representatives of the families Calopterygidae and Gomphidae, as well as the species Platycnemis pennipes, Coenagrion lunulatum, Libellula depressa, whose larvae were found in other local water bodies. Oz. Prislovoe (I). In 2017, 209 specimens were found in hydrobiological samples. larvae of 12 species of dragonflies of different ages. In hydrobiological samples, representatives of the genera Coenagrion (C. johanssoni, C. hastulatum) and Sympetrum (S. flaveolum, S. vulgatum) dominated in terms of abundance; they accounted for more than half of the collected individuals. Three species can be attributed to the category of subdominants, the share of each of which in the samples was about 10%: the black pebble stone (Sympetrum danae), the metal headstock (Somatochlora metallica), and the rock rush (Aeschna juncea). The average density of larvae in the lake during the season was about 8 ind./m². Oz. Beautiful (II). Hydrobiological samples in 2017 contained 243 specimens. larvae of all 18 dragonfly species. The structure of the population turned out to be different than in the lake. Priruslov. Large representatives of the Anisoptera suborder dominated in terms of abundance: Aeshna juncea, the large k. The subdominants in terms of abundance were

Cordulia aenea, Sympetrum danae, and S. flaveolum. The average density of larvae in the lake during the season was about 13 ind./m². Oz. Long (III). In 2017, 182 larvae of 14 species of dragonflies were caught in this water body. The most abundant species were Aeshna grandis, Somatochlora metallica, Coenagrion johanssoni, C. hastulatum, and Sympetrum flaveolum. The composition of the background species included Cordulia aenea, Aeshna juncea, and S. vulgatum. The average density of larvae in the lake did not exceed 10 ind./m². In the odonatofauna of the studied water bodies, five morpho-ecological groups of dragonfly larvae are represented. The largest number of species was found in three groups: broad-gill larvae of stagnant and slow-flowing water bodies, short-bellied crawling larvae of stagnant water bodies, and long-bellied actively swimming larvae of stagnant and slow-flowing water bodies. For the larvae of dragonflies of the three indicated groups, the living conditions in the studied water bodies are the most favorable. The calculation of the indices of species richness and dominance also showed an approximately equal level of species diversity of dragonflies in the studied water bodies. This is explained by the close location of the lakes and the similarity of the structure of aquatic habitats (vegetation, depth, water surface area). How stable the structure of the population of dragonfly larvae in lakes, whether it is possible to speak about the existing structure of the population is a topic for further research." (Authors/ Google Translate)] Address: Kulakov, O.I., Institute of Biology, Komi Scientific Center, Ural Branch of RAS

21608. Lopez Colon, J.I.; Ceballos-Escalera, J.M.; Lopez Nieva, P.; Olivares Pantoja, A.; Espinosa Duran, J.S.; Espinosa Duran, M.L. (2018): Odonatos de la Zona Especial de Conservación (ZEC) Vegas, cuestas y páramos del sureste de Madrid. Boletín de la SAE Nº 28: 26-31. (in Spanish, with English summary) ["Odonata in the Special Conservation Zone (ZEC) Vegas, cuestas y páramos del sureste de Madrid Abstract: The preliminary list of 34 Odonata species occurring in the Special Conservation Zone (ZEC) Vegas, Cuestas y Páramos of southeast Madrid (Natura 2000 network; code: ES3110006), a protected area of the autonomous community of Madrid, is presented." (Authors)] Address: Lopez Colon, J.I., Centro de Educación Ambiental Caserío de Henares, Comunidad de Madrid, Camino de la Vega s/n, 28830 San Fernando de Henares (Madrid), Spain. E-mail: lopezicolon@gmail.com

21609. Pilon, J.G. (2018): Argia fumipennis (Burmeister) et Boyeria grafiana Williamson (Odonata), deux nouvelles mentions pour les îles de la Madeleine. Fabreries 30: 14. (in French) [Verbatim (Google translate): During an excursion to the Magdalen Islands from July 11 to 18, 2004, we explored the national wildlife reserve at the eastern tip of Grosse Île and the forest area of the southern dune of Île du Haven to Houses. We collected seven species of odonates there. At this point in the summer season, Libellula quadrimaculata quadrimaculata Linnaeus was found to be the dominant species in swampy areas, heathlands and shrubby areas. As secondary species, we found Cordulia shurtleffi and Sympetrum danae, mainly in shrubby areas. Lestes dryas and Enallagma hageni, mainly restricted to wetlands, were species of tertiary importance. These five species have already been identified for the fauna of the Magdalen Islands (Pilon & Lagacé 1998). During our investigations, we also found two other species of odonates. We first collected a female individual of Argia fumipennis at the eastern tip of Grosse Île (zone 11N12 of the National Topographic System of Canada) on July 12 in the marshy area. On July 14, we captured a female individual of Boyeria grafiana in a forest area of the southern dune of Havre aux Maisons Island (area 11N05). The present mentions of these two species constitute additions to the fauna of the Islands.] Address: Pilon, J.G., 576 Terrasse Magnan, Sainte-Thérèse (Québec) J7E 4Z4, Canada

2019

21610. Amila Faqhira, Z.; Suhaila, A.H. (2019): Drift pattern of tropical stream insect: Understanding the aquatic insects movement. Serangga 24(1): 1-10. (in English, with Malaysian summary) ["An investigation to determine the drift pattern of aquatic insects in an upstream river in Perak, Malaysia was carried out. Drift was sampled by collecting drifting insects using drift sampler at every six hourly intervals within 24-hours period. A total of 3147 individuals of drifting aquatic insects was collected represented by 9 orders, 49 families and 81 genera. There was a significant difference in the temporal drifting pattern in aquatic insects (Kruskal-Wallis test, P =0.00). Greatest drift abundance occurred at night time, which approximately 40 % higher than during the daytime samples, signifying diel periodicity of aquatic insect drift. In addition, nights without moonlight exhibited more drift rate as compared to bright, full-moonlit nights and differed significantly (P<0.05). Drifting aquatic insects displayed alternant pattern with the greatest abundance at 0200 to 0800 h interval, and the least was at 1400 to 2000 h interval." (Authors) Taxa include Odonata, and a treated at genus level.] Address: Suhaila, A.H., School of Biological Sciences, Universiti Sains Malaysia. 11800 Minden, Penang, Malaysia. E-mail: ahsuhaila@usm.my

21611. Bangser, K. (2019): Investigation of even-skipped, a developmentally-regulated gene controlling neural segmentation in dragonflies. Union College - Schenectady, NY. Honors Theses. 2267. https://digitalworks.union.edu/theses/-2267: II + 22 pp. (in English) ["A comprehensive understanding of the genetic mechanisms underlying pattern formation and neurogenesis is necessary in order to trace the evolutionary history of insect embryogenesis. One of the most important processes of embryogenesis is the organized pattern formation that allows for proper body segmentation and neural development. Proper segmentation, which relies on a series of specific gene expressions, is necessary for the development of an operational nervous system. Even-skipped (eve), one such regulatory gene, has been studied extensively in certain model organisms, and theories regarding the evolution of its functional role could be further elucidated by visualizing its expression in adult and larval dragonflies, which has yet to be accomplished. Through a protocol of immunofluorescence using antibodies raised against the even-skipped protein product (eve), this study aimed to visualize the localization of eve expression in both adult and larval dragonflies and thereby compare its expression throughout development. However, several methodological limitations were encountered, including a lack of published literature detailing a procedure for immunostaining in dragonflies and subsequent inability to properly permeate the target ganglia. Future research should attempt alternative methods of tissue permeation in order to successfully access the target neurons as well as explore alternative primary antibodies for use in targeting eve in tissue samples." (Author)] Address: Bangser, Kathryn, Dept Neuroscience, Union College - Schenectady, NY, USA

21612. Belkharchouche, H.; Larifi, Y. (2019): Contribution à l'étude Odonatologique du sous bassin versant d'El Malleh. Mémoire de Master, Faculté des Sciences de la Nature et

de la Vie, Sciences de la terre et de l'Univers, Université Guelma: 121 pp. (in French) ["Our Odonatological study was carried out in the sub-watershed of the El Malleh wadi located in the Seybouse basin (North-East Algeria). During nine consecutive months from October to June, we sampled Odonata at five stations. We have recorded twenty-five (25) Odonate species including fifteen (15) Anisoptera and ten (10) Zygoptera. The list includes twenty-one Least Concern species, one Vulnerable species (Gomphus lucasii), two Near Threatened (NT) species (Coenagrion scitulum, Onychogophus costae) and one Endangered (EN) species (Coenagrion mercuriale). Note also the presence of the pioneer species Platycnemis subdilatata and Enallagma deserti which are endemic to North Africa." (Authors/Google translate)] Address: https://dspace.univ-guelma.dz/jspui/handle/1234-56789/3744

21613. Briggs, A.J.; Pryke, J.S.; Samways, M.J.; Conlong, D.E. (2019): Complementarity among dragonflies across a pondscape in a rural landscape mosaic. Insect Conservation and Diversity 12(3): 241-250. (in English) ["1. Networks of ponds (pondscapes) are becoming increasingly significant for resilient landscape planning in rural areas. Farmland and forestry ponds are habitat islands that support heterogeneous communities of aquatic organisms. 2. Species richness, Dragonfly Biotic Index (DBI), Shannon's index, and species composition are used here to assess the complementary conservation value of adult dragonfly assemblages associated with forty ponds across a protected area-sugarcane-forestry mosaic. 3. Despite differences in environmental variables among the various ponds, dragonfly species richness, DBI, Shannon index scores, as well as responses to particular environmental variables, did not differ between ponds in sugarcane, plantation forestry, and protected areas. Dragonfly composition differed in response to vegetation cover. 4. Our results highlight the importance of catchment and regional management for all ponds within the pondscape, and show that ponds in the transformed areas (i.e. sugarcane and forestry areas) are important contributors to regional conservation. As the various ponds were complementary in their dragonfly assemblages, we recommend conservation focus at the level of the pondscape rather than on individual ponds." (Authors)] Address: Pryke, J.S., Department of Conservation Ecology and Entomology, Stellenbosch University, Private Bag X1, Matieland 7602, South Africa. Email: jpryke@sun.ac.za

21614. Cerini, F.; Bologna, M.A.; Vignoli, L. (2019): Dragonflies community assembly in artificial habitats: Glimpses from field and manipulative experiments. PLoS ONE 14(6): e0214127. https://doi.org/10.1371/journal.pone.0214127: 16pp. (in English) ["Several factors act on community structure, so determining species composition and abundance patterns. Core processes operating at local scales, such as species-environment matching and species interactions, shape observed assemblages. Artificial habitats (simplified structure) are useful systems for assessing the main factors affecting community composition and disentangling their assembly rules. Drinking troughs (brickwork tanks for free-ranging cattle watering) are widespread in Italy and represent a suitable aquatic habitat for colonization by various aquatic organisms. Dragonflies larvae are usually found in drinking troughs and often exhibit strong species interactions and striking community assembly patterns. Our primary aim was to search for Odonata communities exhibiting non-random co-occurrence/segregation patterns in drinking troughs. We performed null-model analyses by measuring a co-occurrence index (C-score) on larval Odonata assemblages (13 species from 28 distinct troughs). Overall, we found a non-random structure for the studied dragonfly assemblages, which, given their fast generation time, must have been generated by short-term ecological processes (i.e. interspecific interactions). We thus analyzed potential competition/predation among and within ecological guilds. From the field data, we speculated that interactions within the sprawlers' guild is likely among the main drivers structuring the studied assemblages, especially the effect of intraguild predation between C. erythraea and Sympetrum spp larval stages. We then experimentally tested these interactions in laboratory and demonstrated that intraguild predation among larvae at different development stages may result in an effective exclusion/negative impact on density pattern, representing one of the processes to take into consideration when studying dragonfly assemblages." (Authors)] Address: Cerini, F., Dipto di Scienze, Università Roma Tre, Viale G. Marconi, Roma, Italy. E-mail: leonardo.vignoli@uniroma3.it

21615. Cezário, R.R.; Vilela, D.S.; Guillermo-Ferreira, R. (2019): Final instar larva of Franciscagrion longispinum Machado & Bedê, 2015 (Odonata: Coenagrionidae), an endemic species from the springs of the São Francisco river. Zootaxa 4657(3): 581-586. (in English) ["Franciscagrion longispinum Machado & Bedê larvae were collected in the São Francisco river historical springs at the Serra da Canastra National Park, Brazil. Here, we describe and illustrate the final instar larvae of this rare and endemic species." (Authors)] Address: Guillermo-Ferreira, R., Lab. Ecological Studies on Ethology & Evolution (LESTES), Department of Hydrobiology, Federal University of São Carlos, São Carlos, SP, Brazil. E-mail: rhainer@ufscar.br

21616. Chang, G.-H.; Hsu, F.-H.; He, C.-S.; Hsiao, W.F. (2019): Survey of Lepidoptera and Odonata of Chiayi Shianghu Park. Jiada Agriculture and Forestry Journal 16(1): 101-115. (in Chinese, with English summary) [Taiwan "Survey of Rhopalocera and Odonata insect fauna of Chiayi Shianghu Park were conducted from January 2016 to December 2017. The purposes are providing the information of insect resources in this park for leisure activities of parent and children in the future. Six sampling sites were selected and each sampling site stayed for 30-40 minutes for counting. We used visual count method and sweeping to record the numbers of encounter lepidopterans and Odonata insects. Results have indicated that the peak period of insects of 2016 was from May to September. […] And there were Libellulidae (8 species), Platycnemididae (1 species), Coenagrionidae (1 species), and Gomphidae (1 species) in Odonata. The peak month of 2017 was August. […] And there were Libellulidae (6 species), and Gomphidae (1 species) in Odonata. […] Among Odonata species in 2016, Pantala flavescens (n=496) is dominate species and followed by Brachythemis contaminate (n=47) and Orthetrum glaucum (n=42); in 2017, P. flavescens (n=589) is dominate species and followed by Diplacodes trivialis (n=21) and Orthetrum glaucum (n=19). These results will provide basic information for ecotourism activity in the future in Chiayi." (Authors)] Address: Hsiao, W.F. Email: hsiaowf@gmail.com

21617. Chelmick, D.G.; Seidenbusch, R.; Vick, G.S. (2019): The final instar exuviae of the genus Urothemis in Africa (Odonata: Libellulidae). Odonatologica 48(1/2): 133-153. (in English) ["Four of the five species of the final instar exuviae of the genus Urothemis found in the Ethiopian Region are illustrated and described here, with U. venata being described for the first time. In addition, comparison is provided with the common Asian species U. signata. The feature which best

defines the species within the genus is the variation in eye shape. As to the African species, colour and patterning are variable but distinctive and can be used in identification. As to structural differences, U. assignata and U. edwardsii are similar in that they have strong lateral and dorsal abdominal spines. The remaining two species, U. thomasi and U. venata, have much smaller spines. The exuviae of the remaining species, U. luciana, is unknown. On the evidence of exuviae, U. thomasi is quite distinct from the Asian U. signata of which it is thought to be a subspecies." (Authors)] Address: Chelmick, D.G., Macromia Scientific, 31 High Beech Lane, Haywards Heath, RH16 1SQ, UK. E-mail: david.chelmick@gmail.com

21618. Choong, C.Y.; Chung, A.Y.C. (2019): Odonata fauna of Imbak Canyon Conservation Area, Sabah. Journal of Tropical Biology and Conservation 16: 1-8. (in English) ["The Odonata fauna of the Imbak Canyon Conservation Area (ICCA) was surveyed during the Batu Timbang Research Station Scientific Expedition on 16-26 August 2017. A total of 62 Odonata species from 13 families were recorded. The family Libellulidae had the highest number of species (27), and this was followed by Coenagrionidae (9 sp.), Calopterygidae (5 sp.), Platycnemididae (5 sp.) and Platystictidae (4 sp.). The other families (Devadattidae, Chlorocyphidae, Euphaeidae, Lestidae, Philosinidae, Aeshnidae, Corduliidae and Macromiidae) were only represented by 1-3 species. Of the species recorded, 30 are new records for ICCA. The number of species recorded was high, indicating the high diversity of Odonata fauna of ICCA. These records were combined with the existing records in literature to produce a checklist. At present, 68 species from 15 families are known from ICCA....Particularly interesting species recorded during the expedition were Lestes praevius, Vestalis beryllae, Telosticta janeus, Rhinagrion elopurae and Protosticta cf kinabaluensis." (Authors)] Address: Chung, A.Y.C., Forest Research Centre, Sabah Forestry Department, P.O. Box 1407, 90715 Sandakan, Sabah, Malaysia. E-mail: cychoong@ukm.edu.my

21619. Chung, A.Y.C. Binti, M.; Yukang, J.L. (2019): A preliminary assessment of insect diversity in Imbak Canyon – Batu Timbang. Journal of Tropical Biology and Conservation 16: 9-24. (in English) [Borneo, Sabah, Malaysia, survey by the Sabah Forestry Department team was carried out from 16th to 20th of August, 2017 in Imbak Canyon – Batu Timbang area. The list of 14 Odonata records includes Rhinocypha aurofulgens, Drepanosticta actaeon and Devadatta tanduk.] Address: Chung, A.Y.C., Forest Res. Centre, Sabah Forestry Dept, P.O. Box 1407, 90715 Sandakan, Sabah, Malaysia. E-mail: cychoong@ukm.edu.my

21620. Claisse, P.; Brisac, P.; Nel, A. (2019): The first fossil representative of the Nearctic genus Nasiaeschna in France (Odonata: Aeshnidae). Palaeoentomology 2(3): 219-222. (in English) ["The Miocene Odonata are rather well documented in France, thanks to many discoveries in the 'Massif Central' outcrops of Sainte Reine (latest Miocene, Cantal) and Montagne d'Andance (late Miocene, Ardèche) (Nel et al., 1994, 1996, 1997a,b; Riou & Nel, 1995). Among these, the family Aeshnidae is well-represented by the genera Aeshna, Boyeria, and Aeschnophlebia. Thus, it is with great surprise that one of us has found a new well-preserved specimen in the outcrop of Montagne d'Andance, representing a new species that we describe herein." (Authors)] Address: Claisse, Penelope, Institut Systématique Evolution Biodiversité (ISYEB), Muséum national d'Histoire naturelle, CNRS, Sorbonne Université, EPHE, 57 rue Cuvier, CP 50, 75005 Paris, France

21621. Dettner, K. (2019): Chapter 9. Defenses of water insects. K. Del-Claro, R. Guillermo (eds.), Aquatic Insects, Springer Nature Switzerland AG 2019. https://doi.org/-10.1007/978-3-030-16327-39: 191-262. (in English) ["This chapter compiles active and passive defensive mechanisms of aquatic and semiaquatic developmental stages of all insect orders against various predators. Mainly escape reactions, mechanical defense, defensive stridulation, and especially chemical defenses are described, illustrated, and tabulated. Apart from the large aquatic groups of ephemeropteran, Odonata or Trichoptera larvae especially aquatic bugs and water beetles are considered by even including small groups from Collembola up to Mecoptera. Differences between defensive mechanisms and strategies in aquatic and terrestrial insects are described. Aquatic insects especially rely on escape, mechanical defenses, defensive stridulation, and chemical defenses. Exocrine glands are mainly restricted to large taxa with both terrestrial and aquatic representatives (adephagan beetles, Heteroptera) and not invented in aquatic groups. Chemically aquatic insects especially evolved biosynthesis of aromatic and few aliphatic compounds against microorganisms. In contrast mainly steroids are targeted against cold-blooded vertebrates such as fishes and amphibians. As compared with terrestrial insects, aquatic representatives lack many mechanisms of defense such as reflex bleeding, incorporation of toxic compounds from plants, freshwater animals, or microorganisms. Exocrine secretions of water insects are usually externalized by secretion grooming in order to receive a clean body surface, to achieve an optimal breathing, and to modify the wettability of the body surface. Generally there exists a considerable lack of knowledge concerning bionomy and especially defenses of aquatic insects." (Author) Odonata are treated in Chapter 9.2.] Address: Dettner, K., Dept of Animal Ecology II, University of Bayreuth, Bayreuth, Germany. E-mail: k.dettner@uni-bayreuth.de

21622. D'Souza, A.R.M.; Pai, I.K. (2019): A comparative study on dragonfly diversity on a plateau and an agro-ecosystem in Goa, India. Journal of Threatened Taxa 11(8): 14010-14021. (in English) ["The present study was carried out to fill the lacuna in the understanding of the diversity of odonates of Goa in general and dragonflies in particular on plateau and paddy fields in coastal villages — agricultural area at Velsao and Taleigao Plateau. Diversity in plateau ecosystem was higher possibly due to a greater plant and insect diversity on the plateau, in comparison with the monoculture paddy agro-ecosystem. Highest number of species recorded belonged to the family Libellulidae. Monthly diversity showed correlation with monthly average rainfall and humidity." (Authors)] Address: D'Souza, A., Parvatibai Chowgule College of Arts and Science, Gogol-Margao, Goa 403602, India. E-mail: andrearmd@rediffmail.com,

21623. Evans, B.J.E.; O'Carroll, D.C.; Fabian, J.; Wiederman, S.D. (2019): Differential tuning to visual motion allows robust encoding of optic flow in the dragonfly. Journal of Neuroscience 39(41): 8051-8063. (in English) ["Visual cues provide an important means for aerial creatures to ascertain their self-motion through the environment. In many insects including flies, moths and bees, wide-field motion-sensitive neurons in the 3rd optic ganglion are thought to underlie such motion encoding, however these neurons can only respond robustly over limited speed ranges. The task is more complicated for some species of dragonflies that switch between extended periods of hovering flight and fast-moving pursuit of prey and conspecifics, requiring motion detection over a broad range of velocities. Since little is known

about motion processing in these insects, we performed intracellular recordings from hawking, emerald dragonflies (Hemicordulia spp.) and identified a diverse group of motion sensitive neurons that we named Lobula Tangential Cells (LTCs). Following prolonged visual stimulation with drifting gratings, we observed significant differences in both temporal and spatial tuning of LTCs. Cluster analysis of these changes confirmed several groups of LTCs with distinctive spatiotemporal tuning. These differences were associated with variation in velocity tuning in response to translated, natural scenes. LTCs with differences in velocity tuning ranges and optima may underlie how a broad range of motion velocities are encoded. In the hawking dragonfly, changes in LTCs tuning over time are therefore likely to support their extensive range of behaviours, from hovering to fast speed pursuits. Understanding how animals navigate the world is an inherently difficult and interesting problem. Insects are useful models for understanding neuronal mechanisms underlying these activities, with neurons that encode wide-field motion previously identified in insects such as flies, hawkmoths and butterflies. Like some Dipteran flies, dragonflies exhibit complex aerobatic behaviours such as hovering, patrolling and aerial combat. However, dragonflies lack halteres that support such diverse behaviour in flies. To understand how dragonflies might address this problem using only visual cues, we recorded from their wide-field motion sensitive neurons. We found these differ strongly in the ways they respond to sustained motion, allowing them collectively to encode the very broad range of velocities experienced during diverse behaviour." (Authors)] Address: Evans, B.J.E., University of Adelaide, Adelaide, 5005 South Australia, Australia

21624. García-Pozuelo-Ramos, C. (2019): Primera observación de Coenagrion scitulum (Rambur, (Odonata: Coenagrionidae), en la provincia de Toledo (España). Bol. Asoc. Odonatol. And. 29: 212-214. (in Spanish) [1-V-2019, La Canta quarry, on the banks of the La Canta road, between Illescas and Cedillo del Condado (location UTM 30 426162/4440975; datum WGS84)] Address: Ramos, P., SEACAM. Sociedad Entomológica y Ambiental de Castilla La Mancha, Spain. E-mail: pkymp @yahoo.es

21625. Hettyey, A.; Üveges, B.; Móricz, A.M.; Drahos, L.; Capon, R.J.; Van Buskirk, J.; Tóth, Z.; Bókony, V. (2019): Predator-induced changes in the chemical defence of a vertebrate. Journal of Animal Ecology 88(12): 1925-1935. (in English) ["1. Inducible defences are ubiquitous in the animal kingdom, but little is known about facultative changes in chemical defences in response to predators, especially so in vertebrates. 2. We tested for predator-induced changes in toxin production of larval common toads (Bufo bufo), which are known to synthesize bufadienolide compounds. 3. The experiment included larvae originating from three permanent and three temporary ponds reared in the presence or absence of chemical cues of three predators: dragonfly larvae, newts or fish. 4. Tadpoles raised with chemical cues of predation risk produced higher numbers of bufadienolide compounds and larger total bufadienolide quantities than predator-naive conspecifics. Further, the increase in intensity of chemical defence was greatest in response to fish, weakest to newts, and intermediate to dragonfly larvae. Tadpoles originating from temporary and permanent ponds did not differ in their baseline toxin content or in the magnitude of their induced chemical responses. 5. These results provide the first compelling evidence for predator-induced changes in chemical defence of a vertebrate that may have evolved to enhance survival under predation risk." (Authors)] Address: Hettyey, A., Lendület Evolutionary Ecology Research Group, Plant Protection Institute, Centre for Agricultural Research, Hungarian Academy of Sciences, Budapest, Hungary. Email: hettyey.attila@agrar.mta.hu

21626. Hutchinson, R.; Ménard, B. (2019): Émergence de Tramea lacerata Hagen, 1861 en milieu artificiel, une première pour le Québec. Répartition géographique et notes biologiques de l'espèce. Nouv'Ailes 29(1): 13-14. (in French) ["On September 8, 2018, in a large sandpit pond, located in the locality of Cantley (Gatineau census division, in the Quebec Outaouais), BM caught a dozen live naiads of Pantala flavescens. Back home, examining the fruits of his fishing, he discovered that there was among these naiads, which he put in breeding, a specimen of the odonate Tramea lacerata. The individual seemed about to emerge; which occurred on September 18, 2018. This is the first mention of a naiad of Tramea lacerata in Quebec for the Outaouais region and a fifth report of the species for the province." (Author/Google translate)] Address: Menard, B., 16, rue Smith, Gatineau (Québec) J8T 3A1. Email: ménardben@vidéotron.ca

21627. Lorenzo-Carballa, M.O.; Torres-Cambas, Y.; Heaton, K.; Hurst, G. D. D.; Charlat, S.; Sherratt, T.N.; Van Gossum, H.; Cordero-Rivera, A.; Beatty, C.D. (2019): Widespread Wolbachia infection in an insular radiation of damselflies (Odonata, Coenagrionidae). Scientific Reports 9, Article number: 11933: 13 pp. (in English) ["Wolbachia is one of the most common endosymbionts found infecting arthropods. Theory predicts symbionts like Wolbachia will be more common in species radiations, as host shift events occur with greatest frequency between closely related species. Further, the presence of Wolbachia itself may engender reproductive isolation, and promote speciation of their hosts. Here we screened 178 individuals belonging to 30 species of the damselfly genera Nesobasis and Melanesobasis — species radiations endemic to the Fiji archipelago in the South Pacific — for Wolbachia, using multilocus sequence typing to characterize bacterial strains. Incidence of Wolbachia was 71% in Nesobasis and 40% in Melanesobasis, and prevalence was also high, with an average of 88% in the Nesobasis species screened. We identified a total of 25 Wolbachia strains, belonging to supergroups A, B and F, with some epidemic strains present in multiple species. The occurrence of Wolbachia in both males and females, and the similar global prevalence found in both sexes rules out any strong effect of Wolbachia on the primary sex-ratio, but are compatible with the phenotype of cytoplasmic incompatibility. Nesobasis has higher species richness than most endemic island damselfly genera, and we discuss the potential for endosymbiont-mediated speciation within this group." (Authors)] Address: Lorenzo-Carballa, M.O., ECOEVO Lab, EE Forestal, Campus Universitario A Xunqueira s/n, 36005, Pontevedra, Spain. Email: m.o.lorenzo.carballa@gmail.com

21628. Maldonado, M.A.; Manara, E.; Martín, P.R. (2019): Antagonistic effects of a native apple snail on other snails and macroinvertebrates in Southern Pampas waterbodies: a mesocosm approach. Limnologica 78, September 2019, 125694: (in English) ["Macroinvertebrates represent an important component of communities and trophic webs of freshwater ecosystems. Pomacea canaliculata (family Ampullariidae), an invasive apple snail native to the Pampas ecoregion, acts as a voracious grazer and plays a structuring role on submerged macrophytes that serve as food, habitat or foraging ground for many macroinvertebrates. Laboratory studies show that P. canaliculata can also act as a competitor or predator of other macroinvertebrates. Using a

mesocosm approach, we sought to investigate if this species of apple snail affects other freshwater snails (Chilina parchappii, Heleobia parchappii, Biomphalaria peregrina and Melanoides tuberculata) as well as other macroinvertebrates and if consumption of submerged macrophytes and detritus mediates these effects. After twelve weeks we estimated in mesocosms with and without apple snails the abundance of snails and macroinvertebrates through samples taken separately from sediment and from macrophytes. We also estimated the coverage and biomass of macrophytes and the detritus biomass. Significantly lower abundance occurred in mesocosms with apple snails for all snail species and representative macroinvertebrates (i.e., Hirudinea, Ephemeroptera, Chironomidae and Odonata). Mesocosms with apple snails also resulted in lower total abundance of macroinvertebrates. We speculate that the negative effects of P. canaliculata on most other snails and macroinvertebrates living on macrophytes relates to their grazing on detritus and macrophytes. In contrast, the density of snails and macroinvertebrates in the samples from sediments were not affected by P. canaliculata. One snail species and Ephemeroptera were negatively affected by mechanisms not related to the reduction in macrophyte biomass and detritus. A decrease in the microhabitats provided by macrophytes probably mediated the negative effects on Odonata nymphs. The reduction in the abundances of snails and macroinvertebrates caused by P. canaliculata may have cascading effects on higher trophic levels in waterbodies from Southern Pampas but also in invaded regions." (Authors)] Address: Maldonado, Mara, INBIOSUR (Universidad Nacional del Sur – Consejo Nacional de Investigaciones Científicas y Técnicas), San Juan 671, 8000, Bahía Blanca, Argentina

21629. Mishra, A.; Rastogi, N. (2019): Unraveling the roles of solitary and social web-making spiders in perennial ecosystems: Influence on pests and beneficials. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences 90: 567-576. (in English) ["The results show that the orb-weaver spiders, Neoscona theisi and Cyrtophora citricola, occurred in both guava and citrus agroecosystems, and their prey primarily comprised a wide diversity of insect pests. In contrast, the sheet web-constructing social spider, Stegodyphus sarasinorum, occurred only in the citrus agroecosystem and preyed mainly on the beneficial insects, particularly the pollinators, including the Asian honeybee, Apis cerana, along with the predaceous ladybird beetle, Coccinella septempunctata, Agriocnemis femina, and the ant, Camponotus compressus. Field observations revealed that the beneficial insects caught and captured by the social spiders comprised mainly the flower-visiting insects of ornamental and weed plants growing in the vicinity of the fruit trees. N. theisi preyed predominantly on pests of paddy (Nephotettix nigropictus, Oxya nitidula), wheat (Rhopalosiphum padi), citrus (Papilio demoleus) and guava (Bactrocera dorsalis) and to a lesser extent on damselflies, houseflies, and ants. C. citricola with smaller orb webs preyed upon N. nigropictus, R. padi, M. domestica, C. septempunctata, and C. compressus. Except the guava pest, B. dorsalis, the pests of paddy and wheat from the infested crops cultivated in the nearby ~500-m distant located farm were attracted by the streetlights and were preyed upon by the arboreal spiders. The results highlight the significant role of orb web spiders in the suppression of insect pests of crops and also provide direct evidence of the negative role of social spiders as predators of the Asian honeybee, A. cerana, and other beneficial insects." (Authors)] Address: Rastogi, N., Dept of Zoology, Institute of Science, Banaras Hindu University Varanasi, India

21630. Monguí Torres, J.P. (2019): Patterns of genetic and morphological diversity in the highly polymorphic Neotropical banner damselflies, Polythore (Polythoridae: Odonata). Trabajo presentado como requisito para optar por el título de Biólogo. Facultad de Ciencias Naturales y Matemáticas Pregrado en Biología Universidad del Rosario, Bogotá: 31 pp. (in Spanish, with English summary) ["Genetic divergence across populations can be favored by geographical and/or phenotypic processes. However, phenotype polymorphisms caused by natural and/or sexual selection can obscure patterns of genetic divergence due to disparity across the morphological or behavioral traits with the genetic makeup in the populations. […] Polythore, exhibit a striking wing color polymorphism across all its geographical range, which includes the Andes Cordillera and Amazon Basin. The latter suggests that they are excellent model organisms to test the effects of high phenotypic polymorphisms and geographical processes on the patterns of genetic diversity. Our aim was to explore the genetic and morphological diversity across the phylogenetic tree of these colorful damselflies. Our mtDNA phylogenetic reconstruction shows a strong association with geographical location, resulting on the recovery of four well-supported geographical clades (i.e: Amazon clade; and the West, Southeast and Northeast Andean clades). Overall, the patterns of genetic and morphological diversity are high and concordant across all members tested in the Amazon clade; suggesting that these population may have been experiencing divergence due to vicariant events. While for the Andean clades, the morphospecies showed a pattern of recent diversification that might be promoted by dispersal events. Finally, the wing color pattern seems to be shaped by other selective pressures including, sexual and/or natural selection." (Author)] Address: https://repository.urosario.edu.co/items/-145a72c7-99e0-41a7-a124-527582724987

21631. Moroz, M.D.; Lipinskaya, T.P. (2019): Macrozoobenthos of the Shljamitsa and Chornaya Hancha rivers (reserve “Hrodno Forest”). Office of the president of the Republic of Belarus, State Nature Conservation Institution "Berezinsky Biosphere Reserve", Specially protected natural territories of Belarus. Research Collection of scientific articles Founded in 2006 ISSUE 14 Minsk Belarusian Printing House 2019: 155-167. (in Russian, with English summary) ["Studies of macrozoobenthos community were carried out on the model sites of the Shljamitsa and Chornaya Hancha rivers (reserve “Hrodno Forest”) in May 2019. Two protected species — Gomphus flavipes Charpentier, 1825 and Dolomedes plantarius (Clerck, 1757) (Pisauridae) were recorded." (Authors)] Address: Lipinskaya, Tatsiana, Scientific & Practical Center for Bioresources of the National Acad. Sci-enc. Belarus (27, Akademicheskaya Str., 220072, Minsk, Belarus. E-mail: tatsiana.lipinskaya@gmail.com

21632. Perich Prujà, A.; Leahy, K.; Piera, J. (2019): Reporting changes on species distributions using citizen science observations: The example of Trithemis kirbyi and Natusfera. 1st Meeting of the Iberian Ecological Society (SIBECOL) & XIV AEET Meeting: Abstract book: 134 (2019): 1 p. (in English) [Verbatim: A critic question in biogeography is how species will response in front of current rates of climate change: we may find many examples in the scientific literature reporting changes in species distributions worldwide that could be linked to climatic effects. A particular case is the dragonfly species Trithemis kirbyi Selys, 1891, originally distributed in Africa and southern Asia and associated to arid areas, that has been reported in the last years in the Iberian Peninsula. New observations in northern territories are among the most interesting to confirm the expansion rate of this species.

In this sense, the participation of non-academic experts that may contribute with new observations (what it is known as citizen science) could be very helpful, since this type of collaboration allows to cover a much wider monitoring area. The number of potential observations (and the covered area) may increase much more if volunteers do not require previous training nor expertise on identifying the reported observations. As an example, in this contribution we report provably the northernmost observation of Trithemis kirbyi in Catalonia (in the population of Albanyà, near the French borderline) using the citizen science platform Natusfera. This platform allows collaborative identification of the reported observations. We believe that this type of collaborative platforms could be used extensively to monitoring changes on species distributions, being a complementary tool for biogeographic studies] Address: https://digital.csic.es/handle/10261/192298

21633. Proess, R. (2019): Plan d'action espeèe Oxygastra curtisii (Dale, 1834). Gekielte Smaragdlibelle (Gekielter Flussfalke), Cordulie corps fin. https://environnement.public.lu-/dam-assets/documents/natur/planactionespeces/Oxygastra-curtisii.pdf: 15 pp. (in German) [Species conservation plan for O. curtisii in Luxembourg.] Address: Proess, R., Umweltplanungsbüro Ecotop, 45, Schlass Uecht, L-7435 Hollenfels, Luxembourg. Email: ecotop@pt.lu

21634. Rocha-Ortega, M.; Rodríguez, P.; Córdoba-Aguilar, A. (2019): Can dragonfly and damselfly communities be used as bioindicators of land use intensification? Ecological Indicators 107, December 2019, 105553: (in English) ["Highlights: • We assessed odonata richness, body size and species' response to land use intensification. • Dragonflies indicated current land use while damselflies indicated time-lagged land use. • Large species allowed evaluating recent reduction of original vegetation. • Small species provided information of historic habitat modification. • Individual species did not reflect ecological integrity. • Some species' combinations indicate environmental degradation. Abstract: There is a growing need to identify efficient biological indicators for assessing accelerated land use intensification, as well for understanding the effects of past environmental changes on species distributions. To address this, we used an extensive opportunistic survey dataset of 254 adult odonate […] species collected in nine Mexican hydrological regions during two time windows (1980–1993 and 1994–2010). We evaluated species richness, body size and individual species' response to land use intensification over time at a national scale using Phylogenetic Bayesian Regression Mixed Models. We found that dragonfly species serve as good indicators of current land use, whereas damselfly species show time-lagged effects of land use intensification. Large species could thus be used as a proxy of recent reduction of original vegetation, whereas small species provide information on historic habitat modification. Odonate body size seems to be a better variable for measuring the integrity of original vegetation than the more commonly used species richness. Finally, the use of individual species as bioindicators at broad spatial and temporal scales is not encouraged, as it does not reflect the degree of ecological integrity, and only the occurrence of some species combinations can indicate environmental degradation." (Authors)] Address: Rodríguez, Pilar, Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Liga Periférico – Insurgentes Sur 4903 Col. Parques del Pedregal, Tlalpan, CP 14010 Mexico, D.F., Mexico. Email: prodrig@conabio.gob.mx

21635. Ryndevich, S.K. (2019): Entomofauna (Insecta: Ephemeroptera, Odonata, Plecoptera, Hemiptera, Coleoptera, Megaloptera, Trichoptera) of intact water ecosystems of some specially protected natural areas of Belarus. Education institution "Baranovichi State University" - BarSU Herald 7: 98-107. (in Russian) ["The water and amphibiotic entomofauna (Ephemeroptera, Odonata, Plecoptera, Hemiptera, Coleoptera, Megaloptera, Trichoptera) of intact natural water ecosystems in the territory of the Berezinsky biosphere reserve, the National park "Pripyatsky" and the Republican landscape reserve "Stronga" is discussed in the article. In intact natural water bodies in the Berezinsky biosphere reserve 200 species of water and amphibiotic insects have been recorded, in the landscape reserve "Stronga" — 113 species, in the territory of the Pripyatsky national park — 71 species. In the study of specially protected natural areas 11 species — indicators of intact natural watercourses (Cordulegaster boltonii and Ophiogomphus cecilia, […]), the indicator of intact rivers, old river-beds, lakes and bogs Brachytron pratense, the intact dystrophic lakes indicator […] three indicators of intact upland and transitional bogs (beetle Ilybius wasastjernae (Sahlberg, 1824), dragonflies Aeshna subarctica Walker, 1908 and Somatochlora arctica (Zetterstedt, 1840)) have been recorded. The main directions of transformation of communities of model groups of water and amphibiotic insects in natural water ecosystems under anthropogenic impact are determined." (Author)] Address: E-mail: vestnik@barsu.by

21636. Schilling, E.G.; Lawrenz, R.; Kundel, H. (2019): A review of the reproductive habitat preferences and conservation challenges of a rare, transient, and ecologically restricted darner dragonfly: Rhionaeschna mutata. International Journal of Odonatology 22: 1-9. (in English) ["R. mutata is a rare North American dragonfly that is considered a species of concern or threatened throughout its range. It is most widely distributed in the eastern USA, but recent adult records indicate that its range extends further north and west than previously known. Effective conservation planning for rare species requires understanding their habitat requirements, and no comprehensive characterization of this species' reproductive habitat has previously been conducted. We conducted a review to synthesize information from records throughout this species' range and identified a narrow set of conditions that describe R. mutata reproductive habitat: small, heavily vegetated, fish-free ponds with a wooded riparian edge and with sphagnum present. While this habitat type may formerly have been widespread across this species' native range, anthropogenic activities have likely resulted in loss and increased fragmentation of R. mutata reproductive habitat. Our review also revealed that this species is transient or ephemeral, collected at a site one year and absent in subsequent years. Effective conservation planning for ecologically restricted odonates, such as R. mutata, requires consideration of multiple anthropogenic activities that threaten species' ability to persist." (Authors)] Address: Schilling, Emily, Biology Department, Augsburg University, Minneapolis, MN 55454, USA

21637. Schneider, M.F. (2019): Einfluss des Klimawandels auf Flora, Fauna und Lebensräume in den Landkreisen Ober-, Ost- und Unterallgäu (Bayern, Deutschland). Naturkundl. Beiträge Allgäu 54: 3-31. (in German) ["The aim of the present study was to investigate changes in air and water temperatures, the length of stay of migratory birds and the length of the growing season in the districts of Ober-, Ost- and Unterallgäu. The annual average temperatures have increased by 1.4 °C to 2.4 °C since 1850, the water temperatures in the bodies of water examined increased by 1.2 °C to 3.4 °C between 1981 and 2018. The length of the vegetation

period in the examined locations was between 238 and 271 days in 2016 and has increased by up to 35 days compared to 1952. Of 20 migratory bird species examined, 16 species returned from the wintering grounds an average of 13 days earlier in the 30-year period examined in 2017. Finally, biologists, lepidopterists, herpetologists and experts from forestry and water management were asked about their assessment of the impact of climate change on flora, fauna and habitats in the Allgäu (Bavaria), the results were presented and discussed. .... A "Mediterranization" of the Allgäu was caused by the following dragonfly species: Lestes barbarus with distribution area in the Mediterranean region, among others, in the Upper Allgäu Finds since 1963; Aeshna affinis, distribution area including southern Europe, found in Oberallgäu since 2002; Anax ephippiger, distribution area from Africa to India, unique find in Oberallgäu in 2000; Crocothemis erythraea, distribution area including the Mediterranean region, on the Upper Rhine since 2000, first found in Oberallgäu in 2002; Sympetrum fonscolombii, distribution area including Africa to India, found in Oberallgäu since 1990 (Karle-Fendt & Stadelmann, 2006). “The first record of Sympecma fusca was in Oberallgäu in 2008, and the species has since become established on the edge of the Alps. Another beneficiary of climate change, with many new discovery sites throughout Central Europe in recent years and a number of new populations in the Allgäu, is Leucorrhinia pectoralis” (pers. comm. Alfred Karle-Fendt)." (Author)] Address: Schneider, M.F., Pfeiffermühle 3, 87497 Wertach, Germany. Email: michaelfschneider@gmx.de

21638. Singh, D.; Hermans, J. (2019): Odonata observations in the Bandh Baretha region, Rajasthan, India. Brachytron 20(1): 38-48. (in English, with Dutch summary) ["Bandh Baretha dam is a water reservoir, part of Kakund river, situated in the Bharatpur District in the south eastern part of Rajasthan (India). The dragonfly fauna of the water reservoir and adjacent region was examined from 2010-2018. Field surveys were carried out between February and November across seven selected habitats. To date 50 dragonfly species have been recorded: 14 Zygoptera and 36 Anisoptera. Three species are reported for the first time for Rajasthan: Ictinogomphus angulosus, Gomphidia t-nigrum and Aethriamanta brevipennis. The present study describes the existence of characteristic dragonfly assemblages in the investigated habitats. It also emphasizes that long-term field studies are necessary to understand the status, distribution and stability of dragonfly populations in relation to changes in their environment due to increasing human influence" (Authors)] Address: Hermans, J.T., Hertestraat 21, 6067 ER Linne, The Netherlands. Email: jthermans21@gmail.com

21639. Slaats, J. (2019): Dragonflies of the Waterbloem area. Naturhist. maandbl. 108(6): 153-160. (in Dutch, with English summary) ["Extensive habitat management projects have been carried out in the Waterbloem nature reserve, situated near the village of Heibloem in the province of Limburg. Measures have included restoration of the Roggelse Beek brook and the transformation of coniferous woods into moist grassland and heather. Measures to retain precipitation have led to higher groundwater levels. Since these projects were expected to have favourable effects on the dragonfly fauna of the area, the dragonflies were investigated in 2005, 2012 and 2017. A total of 36 species were observed. Unfortunately, the expected positive effects on the dragonfly fauna were not observed. Common species have become even more common, and rare species became rarer or even disappeared from the area. It is not clear why the management measures had such a meagre impact on the dragonfly fauna. Perhaps a further raising of the groundwater level and/or deepening of stagnant water bodies could have a positive impact." (Author)] Address: Slaats, J., Astenseweg 6, 5768PD, Meijel, The Netherlands. Email: jan.slaats@hetnet.nl

21640. Souilmi, F.; Ghedda, K.; Fahde, A.; EL Fihri, F.Z.; Tahraoui, S.; Elasri, F.; Malki, M. (2019): Taxonomic diversity of benthic macroinvertebrates along the Oum Er Rbia River (Morocco): implications for water quality bio-monitoring using indicator species. West African Journal of Applied Ecology 27(1): 137-149. (in English) ["The macroinvertebrates of the Oum Er Rbia River were studied from samples collected seasonally from September 2015 to September 2016 at 10 sampling sites. The macroinvertebrates found during the sampling period were distributed into twelve orders. The most abundant order was Diptera, having 9618 individuals, followed by Ephemeroptera with 2985 individuals. Coleoptera, odonates and crustaceans represent only a small fraction of the total fauna. Hydropsyche, Chironomidae sp. and Simuliidae are numerically more inventoried. The composition and distribution of the species were directly or indirectly affected by the physicochemical variables and the quality of the habitat. Correspondence analysis results showed that habitat quality and quality of water represented species distribution patterns and species can be used as indicators to assess the quality of the Oum Er Rbia River system. Habitat management along the Oum Er Rbia river should be aimed at preserving native species, especially during the summer, when the biotope requirements are optimal. The results obtained in this study showed an alarming situation of the water quality of the Oum Er Rbia River and particularly in downstream segment. To solve this problem, we recommend the development of the wastewater discharge of Khenifra and Kasba Tadla and the purification of wastewater before it is discharged into the river." (Authors)] Address: Souilmi, Fatima, National Office for Electricity & drinking Water (ONEE), Rabat, Morocco. Email: fatimasouilmi@gmail.com

21641. Sukkaphat, P.; Saetang, W.; Poolprasert, P. (2019): Landmark-based geometric morphometric analysis of wing venation between two libellulid species, Brachythemis contaminata and Diplacodes trivialis. YRU Journal of Science and Technology 4(1): 8-13.["In this current research, a discrimination of two distinguished dragonfly species: Brachythemis contaminata and Diplacodes trivialis from Phichit-Phitsanulok areas was conducted using geometric morphometric analysis of wing venation. A total of 120 wings obtained from both males and females in each species (30 wings per sex in each species) were analyzed. Afterwards, a set of 15 landmarks in each digitized right forewing was chosen and all data were computed under the computer program. Our results revealed the patterns of forewing venation of dragonfly between sexes in the same species were more closely related to each other than the dragonfly of the same sex in another species. In this regards, it might be said that the landmark-based geometric morphometrics of the wing could be applied to identify libellulid group or species. Besides, the different sexes of dragonfly could be also classified. Thus, morphometric analysis of wing venation could be as a useful tool for systematic biology of dragonfly and other insects or fossil records which are merely known from a wing." (Authors)] Address: Sukkaphat, P., Program of Biology Faculty of Science and Technology, Pibulsongkram Rajabhat Univ., Mueang, Phitsanulok, 65000, Thailand

21642. Van Dievel, M.; Tüzün, N.; Stoks, R. (2019): Latitude-associated evolution and drivers of thermal response

curves in body stoichiometry. Journal of Animal Ecology 88(12): 1961-1972. (in English) ["1. Trait-based studies are needed to understand the plastic and genetic responses of organisms to warming. A neglected organismal trait is elemental composition, despite its potential to cascade into effects on the ecosystem level. 2. Warming is predicted to shape elemental composition through shifts in storage molecules associated with responses in growth, body size, and metabolic rate. Our goals were to quantify thermal response patterns in body composition, and to obtain insights in their underlying drivers and their evolution across latitudes. 3. We reconstructed the thermal response curves (TRCs) for body elemental composition [C(carbon), N(nitrogen), and the C:N ratio] of damselfly larvae from high- and low-latitude populations. Additionally, we quantified the TRCs for survival, growth and development rates and body size to assess local thermal adaptation, as well as the TRCs for metabolic rate and key macromolecules (proteins, fat, sugars, and cuticular melanin and chitin) as these may underlie the elemental TRCs. 4. All larvae died at 36°C. Up to 32°C, low-latitude larvae increased growth and development rates and did not suffer increased mortality. Instead, growth and development rates of high-latitude larvae were lower and levelled off at 24°C, and mortality increased at 32°C. This latitude-associated thermal adaptation pattern matched the 'hotter-is-better' hypothesis. With increasing temperatures, low-latitude larvae decreased C:N, while high-latitude larvae increased C:N. These patterns were driven by associated changes in N contents while C contents did not respond to temperature. Consistent with the temperature-size-rule and the thermal melanism hypothesis, body size and melanin levels decreased with warming. While all traits and associated macromolecules (except for metabolic rate that showed thermal compensation) assumed to underlie thermal responses in elemental composition showed thermal plasticity, these were largely independent and none could explain the stoichiometric TRCs. 5. Our results highlight that thermal responses in elemental composition cannot be explained by traditionally assumed drivers, asking for a broader perspective including the thermal dependence of elemental fluxes. Another key implication is that thermal evolution can reverse the plastic stoichiometric thermal responses, hence reverse how warming may shape food web dynamics through changes in body composition at different latitudes." (Authors)] Address: Stoks, R., Lab. voor Aquatische Ecologie, K.U.Leuven, De Beriotstraat 32, 3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

21643. Vega-Sánchez, Y.M.; Mendoza-Cuenca, L.F.; González-Rodríguez, A. (2019): Complex evolutionary history of the American Rubyspot damselfly, Hetaerina americana (Odonata): Evidence of cryptic speciation. Molecular Phylogenetics and Evolution 139, October 2019, 106536: 11pp. (in English) ["Highlights: • Genetic structure in Hetaerina americana was analyzed throughout its distribution. • High genetic differentiation was found for both nuclear and mitochondrial markers. • Mitonuclear discordance may be related to purifying selection on the mitogenome. • Morphological variation in caudal appendages is congruent with nuclear genetic structure. • We conclude that that Hetaerina americana represent a complex of cryptic species. Abstract: Analyzing the magnitude and distribution of genetic variation within and among populations allows for hypothesis testing about historical demographic size changes, secondary contacts, refugia, and speciation patterns. Species distribution and genetic structure are greatly influenced by the complex life cycle and behavior of odonates. H. americana has been widely used as a model system in behavioral studies, but its population genetic structure has not been analyzed, except for a single study that included only three populations but identified the presence of markedly differentiated genetic groups, suggesting the existence of cryptic species. Here, we tested this hypothesis by assessing throughout the distribution range of H. americana the patterns of genetic and morphological variation in the male caudal appendages, due to the great importance of these structures in mate recognition. As molecular markers we used sequences of the mitochondrial cytochrome oxidase I (COI) gene and the nuclear internal transcribed spacer (ITS) region, as well as six nuclear microsatellites. We found very high population genetic differentiation (FST > 0.51) in the three sets of markers but with strong mitonuclear discordance. A neutrality test suggested that the mitochondrial genome might be under purifying selection in association to climatic variables (temperature seasonality). The assignment of individuals to nuclear genetic groups showed little admixture and complete congruence with morphological differentiation in the male caudal appendages. Hence, the results suggest that H. americana represents at least two different cryptic species which are isolated reproductively." (Authors)] Address: Vega-Sánchez, Y.M., Instituto de Investigaciones en Ecosistemas y Sustentabilidad, Univd Nacional Autónoma de México, Antigua carretera a Pátzcuaro #8701, Morelia, Michoacán 58190, Mexico

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21644. Araújo, M.F.A.; De Marco, P.; Juen, L.; Tôrres, N.M. (2020): Vulnerability of Phyllocycla species (Odonata: Gomphidae) to current and planned anthropic activities by the Brazilian Government. Neotropical Entomology 49: 24-32. (in English) ["Although most species distribution modeling (SDMs) are constructed at the species level, an appreciation of evolutionary processes has led to modeling above this level. In view of the difficulty in estimating the impacts of human actions on rare or deficient data species, we proposed a new approach to vulnerability assessment based on concepts already well established in the literature (ecological niche, niche conservatism, and extinction thresholds). We used distribution modeling to predict where species of the genus Phyllocycla (Calvert 1948) are most vulnerable to local extinctions and how the implementation of planned anthropic activities by the Brazilian government may modify the potential distribution of the genus in Brazil. We chose that genus because its conservation status is little known, especially due to the data gap about its geographical distribution. We proposed modeling the whole genus and used the niche conservatism theory to justify our methods. The anthropic activities considered in our analysis were agriculture and livestock, rural settlements, energy production installations, transportation, oil extraction, mining, and urbanization. We found that only 55.3% of the original potential distribution of Phyllocycla in Brazil remains available. The area compromised by anthropic activities comprises mainly the Cerrado and Atlantic Forest biomes, with less impact on the Amazon. However, with the implementation of activities planned by the Brazilian government, it is possible that an additional 13.6% of this area will be unavailable to species of Phyllocycla, especially in the Amazon, where interest in mining and the implementation of new hydroelectric production have increased." (Authors)] Address: Araújo, Maysa Farias de Almeida, Faculdade de Medicina do Mucuri, Univ Federal dos Vales do Jequitinhonha e Mucuri, Teófilo Otoni, MG, Brasil. Email: maysa_fariasaa@yahoo.com.br

21645. Brockhaus, T.; Chovanec, A.; Böhme, F. (2020): Asymmetrische Positionierung der vier Flügel auf einer Abdomenseite bei Kleinlibellen (Odonata: Zygoptera). Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen 72: 1-11. (in German, with English summary) ["Asymmetric positioning of the four wings on the same side of the abdomen in damselflies (Odonata: Zygoptera). – Photos of damselflies presented in this paper show the positioning of all four wings on the same side of the abdomen for the purpose of ectothermic thermoregulation. This posture is well known in Sympecma spp. and, to a lesser extent, in other Lestidae as well as in Calopteryx spp.. In the present paper, this behaviour is documented for Sympecma fusca, Lestes sponsa, L. virens and for Pyrrhosoma nymphula. In most cases, the four wings are asymmetrically held behind the abdomen, away from the sun, to reflect radiation onto the abdomen. In this publication, the rare example of this posture during a copula of Calopteryx virgo is also presented. In contrast, a male of C. splendens is shown shading its abdomen with all wings." (Authors)] Address: Brockhaus, T., An der Morgensonne 5, 09387 Jahnsdorf, Germany. E-mail: T.Brockhaus@t-online.de

21646. Carr P. (2020): Odonata of the Chagos Archipelago, central Indian Ocean: an update. Notulae Odonatologicae 9(6): 229-235. (in English) [British Indian Ocean Territory (UK); "The Odonata of the Chagos Archipelago are poorly known. The fauna was last reviewed in 1997, with eight species being recorded. Between 1996 and 2020 the author visited all 55 islands of the archipelago. The same eight species were again recorded together with one new colonist and one new vagrant. Range extensions were recorded for six species, one being recorded from the archipelago for the first time since 1905. Immigration of Odonata was witnessed from October to November in 2009–2012. A flight season table is presented along with distribution data and habitat details where relevant." (Author)] Address: Carr, P., Inst. of Zoology, Zool. Soc. London, Regent's Park, London, UK, NW1 4RY

21647. Chance, F.S. (2020): Interception from a dragonfly neural network model. Proceedings of ACM International Conference on Neuromorphic Systems (ICONS'20). ACM, New York, NY, USA, https://doi.org/10.1145/nnnnnnn.nnnnnnn: 5 pp. (in English) ["While dragonflies are well-known for their high success rates when hunting prey, how the underlying neural circuitry generates the prey-interception trajectories used by dragonflies to hunt remains an open question. I present a model of dragonfly prey interception that uses a neural network to calculate motor commands for prey-interception. The model uses the motor outputs of the neural network to internally generate a forward model of prey-image translation resulting from the dragonfly's own turning that can then serve as a feedback guidance signal, resulting in trajectories with final approaches very similar to proportional navigation. The neural network is biologically-plausible and can therefore can be compared against in vivo neural responses in the biological dragonfly, yet parsimonious enough that the algorithm can be implemented without requiring specialized hardware." (Author)] Address: Chance, Frances, Sandia National Laboratories, Albuquerque, NM, USA. Email: fschanc@sandia.gov

21648. Chung, A.Y.C.; Japir, R.; Damit, D.F.A.; Binti, M.; Yukang, J.L. (2020): Insect diversity of Mount Silam and its surrounding forests in Lahad Datu, Sabah. In: Chung, A.Y.C., Nilus, R., Sugau, J.B., Suis, M.A.F. & Salleh, M. (2020). Compilation of papers – Mount Silam Scientific Expedition, Lahad Datu, Sabah. 13th-18th January, 2020. Sabah Forestry Department, Sandakan, Sabah. 149 pp. http://www.forest.sabah.gov.my/publications/: 110-124. (in English) ["This insect survey was conducted from 13th to 18th of January, 2020 in Mount Silam forest, Lahad Datu, Sabah. An average of 108 nocturnal insect species from 148 individuals was recorded from a one-metre-square area of the light-trapping cloth. The mean Shannon Index was 4.17 while Simpson Index was 129.84 and Fisher Alpha Index was 193.60. At least 15 Bornean endemic species were recorded during the brief survey. These pioneer data will serve as baseline information for other research work in future. The data will further strengthen the management of Mount Silam within Sapagaya Forest Reserve as a Class I Forest Reserve (Protection). The information on insect diversity and the aesthetic value of some of the flagship species can be used to promote sustainable nature tourism in Mount Silam since this area is a tourist attraction in Lahad Datu. ... At least 14 taxa of Odonates were recorded (Appendix 4), with two Bornean endemics. Both endemics are Libellago phaeton and Coeliccia nigrohamata. L. phaeton is known to be very common but localized on small clear streams and C. nigrohamata is also confined to small forest streams (Orr 2003)." (Authors)] Address: Forest Research Centre, Sabah Forestry Dept, P. O. Box 1407, 90715 Sandakan, Sabah, Malaysia. Email: Arthur.Chung@sabah.gov.my

21649. Dey R.; Pal A. (2020): Heterospecific pairing between male Agriocnemis kalinga Nair & Subramanian, 2014, and female A. pygmaea Rambur, 1842 (Odonata Coenagrionidae). Notulae Odonatologicae 9(6): 241-245. (in English) ["A heterospecific pair of A. kalinga and A. pygmaea was observed in Madhyamgram, West Bengal, India, for the first time. The species of Agriocnemis share several similarities and are often difficult to distinguish, especially in copula or in tandem. In this note identification of these two species is also discussed." (Authors)] Address: Pa, A., Taxonomy of Angiosperms & Biosystematics Laboratory, Dept of Botany, Univ. of North Bengal, Siliguri – 734013, Darjeeling, West Bengal, India

21650. Fortunato, M.H.T.; Lopes de Melo, C.; Fonseca Mendes, H. (2020): Piscicultura brasileira e a influência da ordem Odonata, uma revisao. Arquivos de Ciências Veterinárias e Zoologia da UNIPAR 23(1): 7 pp. (in Portuguese, with English and Spanish summary) ["Brazilian fish farming is expanding in Brazil, presenting exceptional annual growth. However, during the larviculture phase, where fish is inserted in excavated ponds, due to their vulnerability and size, they become susceptible to diseases and predators. Aquatic insects feature among the predators in fish farming, with the Odonata order being the most prominent. Despite their predatory action during the larvae phase of fish, the Odonata order plays an important role in the aquatic environment and is considered as bioindicators. Despite its importance, to solve these problems, fish farmers end up using agrochemicals or providing intense liming, which can have serious consequences for both fish and water quality. Therefore, in face of this scenario, further studies on fish farming sustainability with management or control of those predators would be important in order to mitigate the environmental impacts. Thus, the objective of this paper was to address the history of Brazilian fish farming, the problems faced in larviculture due to predation by Odonata and to offer sustainable control alternatives." (Authors)] Address: Fortunato, M.H.T., Biólogo pelo IFSULDEMINAS campus Muzambinho, mestre em Ciências Ambientais pela Univde Federal de Alfenas-UNIFAL. Doutorando em Agricultura Sustentável pela Univde José do Rosário Vellano-UNIFENAS. mtank@live.com

21651. Gillespie, C.M.; Mumme, R.L.; Wissinger, S.A. (2020): Pond drying cues promote cannibalism in larval Anax junius dragonflies. Freshwater Science 39(3): 576-583. (in English) ["Global climate change is expected to shorten hydroperiods and accelerate drying of ephemeral freshwater habitats, a shift that is likely to increase intraspecific competition and cannibalism in the aquatic animals that rely on those habitats. We experimentally examined the effects of simulated pond drying, tank size (initial larval density), and body size on survival and cannibalism in larvae of the dragonfly Anax junius, a species known to show frequent size-structured cannibalism. Thirty tanks of 3 different sizes were each stocked with 8 A. junius larvae (6 small, 1 medium, and 1 large) along with Enallagma damselfly larvae as prey. Anax junius survival and cannibalism were documented daily for 16 d. For tanks in the permanent hydroperiod treatment, we maintained water depth at a constant 14 cm for all 16 d, while we gradually reduced depth in the temporary hydroperiod tanks from 14 to 2 cm to simulate pond drying. We found that cannibalism was strongly size-dependent, as 31, 7, and 0% of small, medium, and large larvae, respectively, were cannibalized. Tank size (initial larval density) and hydroperiod treatment both affected larval survival and cannibalism. However, the effects of simulated pond drying were more pronounced than those of tank size. In addition, hydroperiod treatment was a predictor of daily risk of larval cannibalism, but daily volumetric larval density (number of A. junius alive divided by water volume present that day) was not. Our results, therefore, indicate that 1) pond drying can substantially increase cannibalism in larval odonates beyond its simple effect of producing high-density populations as water levels recede and 2) the effect of drying cues on the behavior and life-history characteristics of aquatic invertebrates merit increased attention from freshwater ecologists." (Authors)] Address: Mumme, R.L., Dept of Biology, Allegheny College, 520 North Main Street, Meadville, Pennsylvania 16335 USA. E-mail: rmumme@allegheny.edu

21652. Goldberg, W.; Martens, A. (2020): Zwei Jungtiere der Eiförmigen Schlammschnecke Radix balthica als Aufsitzer auf einem Weibchen von Ischnura elegans (Gastropoda; Odonata). Libellula 39(3/4): 173-177. (in German, with English summary) ["Radix balthica as a temporary epibiont of Ischnura elegans (Gastropoda; Odonata) – A female I. elegans was photographed in the evening of 24 June 2020 at a garden pond in Meißen, Germany, with two young snails of R. balthica attached, one on the thorax and one on the abdomen. In spite of the additional load the damselfly was able to fly a short distance. There is evidence that the snails moved to the female during its oviposition." (Authors)] Address: Goldberg, W., Meißner Berg 45, 01471 Radeburg, Germany. Email: w.goldberg@gmx.de

21653. Harabis, F.; Hronkova, J. (2020): European database of the life-history, morphological and habitat characteristics of dragonflies (Odonata). Eur. J. Entomol. 117: 302-308. (in English) ["Climate change and an ever-increasing effect of humans on the great majority of freshwater ecosystems have affected not only individual organisms but also the links between them. In order to effectively protect communities or entire freshwater ecosystems, we need to understand how individual organisms react to these changes and the functional interconnections between individual species. This can be achieved by evaluating the functioning of individual species, i.e. their traits. Odonata are increasingly used as indicators of changes in freshwater ecosystems. Although this taxonomic group is the subject of many ecological studies, there is no comprehensive database of the traits of European species. This is, why we decided to lay the foundations for an European database of dragonfly traits called dragonfly-database.eu, which is mainly based on Web of Science (WOS) publications and several monographs, and currently includes information on 79 European species. The main advantage of our database is that it is open to downloading, uploading, and storing of data. This is extremely important, because a database's applicability increases with the quality of the data it contains. Initially in compiling the database, we encountered several fundamental shortcomings in the knowledge of some often easily measurable traits in, some species. We believe that in combination with new statistical methods dragonfly-database.eu will become a very useful tool for many ecological studies and more effective conservation of threatened species." (Authors)] Address: Harabis, F., Dept of Ecology, Faculty of Environmental Sciences, Czech University of Life Sciences Prague, Kamýcká 129, Prague 6 – Suchdol, CZ-165 00, Czech Republic. E-mail: harabis@fzp.czu.cz

21654. Jödicke R.; von Ellenrieder N.; Garrison R.W. (2020): Reversal of precedence of the names Lestes dryas Kirby, 1890, and Agrion forcipula Charpentier, 1825 (Odonata: Lestidae), to preserve current usage. Notulae Odonatologicae 9(6): 246-255. (in English) ["The name Lestes dryas Kirby, 1890, is potentially threatened by its senior objective synonym, Agrion forcipula Charpentier, 1825. The purpose of this publication is to reverse their order of precedence preserving the current widespread usage of the junior name in accordance with Article 23.9.1 of the International Code of Zoological Nomenclature." (Authors)] Address: Garrison R.W., California Dept of Food & Agriculture, 3294 Meadowview Rd, Sacramento, California 95832, USA. Email: argiavivida@gmail.com

21655. Leppänen, M. (2020): Infection under the ion beam: focused ion beams and antibacterial properties of biomaterials. JYU dissertations 236, Faculty of Mathematics and Sciene, Univiersity of Jyväskylä: 167 pp. (in English) ["In this thesis, Helium Ion Microscopy (HIM) imaging and milling on organic and antibacterial materials will be discussed. In addition, I will discuss the antibacterial properties of surface-immobilized bacteriophages. HIM is a recently developed imaging method, which is especially suitable for biological samples because they can be imaged without a metal coating. Because of the state-of-the-art ion source, the microscope has also a higher imaging resolution compared to the scanning electron microscope (SEM). The suitability of HIM imaging for the bacteria-phage interactions is discussed in addition to the more delicate nanocellulose samples. High beam damage on the cellulose was found which has not been reported previously with HIM. Indeed an ion beam can have a milling property, which is demonstrated here with bacteria, bacteria-dragonfly interactions and encapsulated bacteriophages to obtain volumetric information. The antibacterial effectivity of immobilized bacteriophages was analyzed quantitatively with HIM-imaging and biological measures. It was found that detaching phages from the material are likely the major contributor to the infectivity of the phage-biomaterial." (Author)] Address: not stated

21656. Nelsen, J. (2020): Do mosquito pesticides harm their natural enemies? Ecological impacts and non-target effects of larvicides on mosquito predators. M.Sc. thesis, Biological, Environmental, and Earth Sciences: X + 102 pp. (in English) ["Larvicides are chemicals used to kill juvenile mosquitoes. When applied to an area, other aquatic organisms are exposed to these chemicals. The removal or impairment of top insect predators could be beneficial to mosquito populations

once harmful pesticide levels dissipate. Two common larvicides were examined: growth regulators (IGRs) and surface films (SFs). The goal of this project was to determine if larvicides harm mosquito predators common to southern Mississippi. I surveyed aquatic sites before and after IGR and SF treatments, and then compared changes in insect community structure. Community evenness was lower in SF treated habitats. When analyzing prey taxa only, evenness and diversity changed in control treatments, which suggests that differences measured were due to other environmental factors, not larvicide presence. I examined lethal and behavioral effects of IGRs and SFs on predatory insects. Surface films were lethal to Laccophilus adults (Coleoptera: Dytiscidae) at recommended and high concentrations. Dragonfly nymph location preference in aquariums varied between SFs and IGRs. Laccophilus larvae in IGRs spent more time moving and eating compared to SFs. Behavioral differences were among combined concentrations in both larvicide treatments, not within their respective concentrations and controls. Experiments were conducted to determine IGR and SF effects on the mosquito-regulating ability of predaceous insects. Treated predators were placed in mesocosms containing mosquito larvae. Mosquito survival was quantified by capturing emerging adults. There were no differences in emergence among all treatments. Implications of the findings from this thesis, similarities to past research, and suggestions for future work are discussed." (Author)] Address: not stated

21657. Nitzsche, K.N.; Shin, K.-C.; Kato, Y.; Kamauchi, H.; Takano, S.; Tayasu, I. (2020): Magnesium and zinc stable isotopes as a new tool to understand Mg and Zn sources in stream food webs. Ecosphere 11(8), August 2020, e03197: 20 pp. (in English) ["Non-traditional stable isotopes of metals were recently shown as new dietary tracers in terrestrial and marine mammals. Whether these metal stable isotopes can be used to understand feeding habits in stream food webs is not known yet. In this study, we explored the potential of stable isotopes of essential Mg (δ26Mg) and Zn (δ66Zn) as a new tool in stream ecology. For this purpose, we determined δ^{26}Mg and δ66Zn values of stream organisms and their potential metal sources in upper and lower reaches of two streams in the Lake Biwa catchment, Central Japan. Our goals were (1) to explore variations in δ^{26}Mg and δ^{66}Zn across organisms of different feeding habits and (2) to understand Mg and Zn sources to stream organisms. Overall, δ^{26}Mg and δ^{66}Zn values of organisms were neither related to each other, nor to δ^{13}C and δ^{15}N values, indicating different elemental sources and factors controlling isotopic fractionation depending on element and taxa. Low δ^{26}Mg values in filter-feeding caddisfly larvae and small gobies indicated aqueous Mg uptake. Higher δ^{26}Mg values in leaf-shredding crane fly and grazing mayfly larvae suggested Mg isotopic fractionation during Mg uptake from the diet. While the δ^{26}Mg values of stonefly nymphs reflected those of caddisfly larvae as a potential prey, the highest δ^{26}Mg values found in dobsonfly nymphs can be explained by ^{26}Mg enrichment during maturing. δ^{66}Zn values of caddisfly and mayfly larvae indicated Zn was a mixture of aqueous and dietary available Zn, while higher δ^{66}Zn values in crane fly larvae pointed to Zn isotopic fractionation during Zn uptake from plant litter. δ^{66}Zn values in stonefly and dobsonfly nymphs were often in the range of those of caddisfly larvae as their prey, while gomphid nymphs and small goby were depleted in ^{66}Zn relative to their dietary Zn sources. We conclude that δ^{26}Mg is a promising indicator to assess Mg sources in stream ecology depending on taxa, while the use of δ^{66}Zn is limited due to the complexity in Zn sources." (Authors)] Address: Tayasu, I., Res. Inst. Humanity & Nature (RIHN), 457-4 Motoyama, Kamigamo, Kita-ku, Kyoto 603-8047 Japan

21658. Rowe, R.; Player, W. (2020): Diet analysis of juvenile dragonflies using group-specific polymerase chain reaction. Poster Number 104, Biology and Biomedical Research, College of Arts and Sciences Department, Department of Biology, Winthrop University. (in English) ["Aquatic food webs are complex, and understanding interactions in these food webs can give an indication of ecosystem health and stability, as well as movement of energy and nutrients through ecosystems. Previous studies have utilized both microscopic gut content analysis and stable isotopes to aid in constructing food webs in these ecosystems. However, gut content analysis is time-consuming, stable isotope analysis can be cost prohibitive, and both methods only identify general categories of food items. The application of newer, molecular-based approaches has the potential to provide previously unavailable taxonomic resolution in aquatic food webs (i.e., who is eating whom?). DNA-based methods have been used in other disciplines for diet analyses, but have not been widely applied in freshwater ecology. We collected juvenile dragonflies (Odonata, Anisoptera) from Winthrop Lake in Rock Hill, South Carolina, dissected gut contents, and extracted DNA from individuals in three genera. We amplified DNA via PCR, using group-specific primers targeting mitochondrial CO1 gene regions for midges (Diptera, Chironomidae) and mosquitoes (Diptera, Culicidae) to identify these potential prey in gut contents; we used gel electrophoresis as a presence/absence test for DNA from these prey groups. Occurrence of prey groups in gut contents varied by individual and by genus of dragonfly examined. With further refinement, these methods have the potential to provide previously unavailable detail on predator—prey interactions in these ecosystems." (Authors)] Address: https://digitalcommons.winthrop.edu/-source/SOURCE_2020/allpresentationsandperformances-/114/

21659. Turcotte, D.; Arsenault, D. (2020): Hommage posthume à Raymond Hutchinson. Nouv'Ailes 30(1): 5-8. (in French) [Raymond P. Hutchinson (1937-2020) was a well known odonatologist from Quebec, Canada.] Address: http://www.aeaq.ca/s/NouvAiles_vol30_no111.pdf

21660. Vilela, D.S.; Anjos-Santos, D.; Koroiva, R.; Cordero-Rivera, A.; Guillermo-Ferreira, R. (2020): Revision of the genus Minagrion Santos, 1965 (Odonata: Coenagrionidae). Zootaxa 4786(2): 176-198.["Endemic to Brazil, the genus Minagrion Santos, 1965 is revised for the first time. The genus contains five species, and here we establish diagnostic characters, keys and drawings for both sexes. Furthermore, we propose the synonymy of M. franciscoi Machado & Bedê, 2015 new syn. with M. caldense Santos, 1965." (Authors)] Address: Silva Vilela, D., Graduate Program in Entomology, Dept Biol., Univ. of São Paulo (USP), Ribeirão Preto, Brazil. E-mail: deeogoo@gmail.com

21661. Wildermuth H. (2020): 'Drop and stop' - a case of interspecific anti-harassment behaviour in an aeshnid female (Odonata: Aeshnidae). Notulae Odonatologicae 9(6): 269-275. (in English) ["A female Aeshna cyanea, having been intercepted in mid-air by a male A. mixta attempting to mate, was observed to crash down together with the attacker to the ground where both remained motionless close to each other. After a short while the insects flew up simultaneously and the same behavioural sequence recurred. Following a short fight involving biting the female escaped and flew off. This is the first reported interspecific 'drop and stop' behaviour in anisopterans away from water." (Author)] Address: Wildermuth, H., Haltbergstr. 43, CH-8630 Rüti, Switzerland. E-mail: hansruedi@wildermuth.ch

21662. Štih, A.; T. Koren, T.; Frankovic, M. (2020): New data and checklist of dragonflies (Odonata) of Lastovo Island, Croatia. Libellula 39(3/4): 179-192. (in English, with German summary) ["In this paper we report the first overview of dragonfly fauna of Lastovo Island, southern Croatia, based on published literature data and recent surveys conducted in 2014 and 2018. So far 16 species have been recorded on the island. The following five species were detected for the first time for the island within this survey: Ischnura elegans, Aeshna isoceles, Anax parthenope, Sympetrum sanguineum, and Selysiothemis nigra. Of the recorded species the most important is the record of S. nigra, an endangered species according to the Red book of Odonata of Croatia, known only from a handful of localities across the coastal parts of the country. On the island, small ponds represent the only source of freshwater habitats suitable for dragonfly development. Most of the visited ponds are in favourable condition and some were also recently cleared of the surrounding vegetation and partially restored." (Authors)] Address: Štih, Ana, Association Hyla, Lipovac I no. 7, 10 000 Zagreb, Croatia. Email: ana.stih2@gmail.com,

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21663. Boys, W.A.; Siepielski, A.M.; Smith, B.D.; Patten, M.A.; Bried, J.T. (2021): Predicting the distributions of regional endemic dragonflies using a combined model approach. Insect Conservation and Diversity 14(1): 52-66. (in English) ["1. Climate warming is predicted to have large effects on insects, yet several data shortfalls, including distributional information, impede effective conservation strategies. 2. Knowledge of species distributions is a critical component for assessing conservation need but is often lacking for endemic or rare taxa, especially invertebrates. 3. One approach to better inform this gap is by using species distribution modelling (SDM) to predict suitable habitat and guide field surveys. 4. Here, we combine the predictions of two machine learning algorithms, maximum entropy and Random Forest, to estimate the current and future distributions of two endemic dragonflies of the Ozark-Ouachita Interior Highlands region in the southcentral United States. 5. Current suitable areas predicted by both algorithms largely overlapped for each species, but different environmental variables were most important for predicting their distributions. Field validation of these models resulted in new detections for both species showing their utility in guiding subsequent field surveys. 6. Future projections under two climate change scenarios support maintaining current suitable areas as these are predicted to be strongholds for these species. Our results suggest that combining outputs of multiple species distribution models is a useful tool for better informing the distributions of geographically limited or rare species." (Authors)] Address: Boys, W.A., Dept Biological Sciences, Univ. of Arkansas, Fayetteville, AR 72701, USA. E-mail: wadeboys@email.uark.edu

21664. Busmachiu, G.; Munjiu, O. (2021): Odonata (Insecta) of the scientific reserve "Lower Prut". Zonele umede - valori perene cu rol vital pentru omenire. Materialele Simpozionului stiinfific international dedicat aniversarii a 30 de ani de la fondarea Rezervatiei ,,PRUTUL DE JOS", 11-12 Noiembrie, 2021: 51-55. (in English) ["The paper includes the results of the study of Odonata species diversity carried out between 2002-2021 years in the Scientific Reserve "Lower Prut". During the investigation 18 species from 12 genera and 7 families were revealed. This result is a summary of existing data in the literature and our own research. The list of species is included also." (Authors)] Address: Busmachiu, Galina, Institutul de Zoologie, Academiei, 1 Chisinau, 2028, Republica Moldova. Email: bushmakiu@yahoo.com

21665. Clark, C.; Hossie, T.J.; Beresford, D.V. (2021): Density-dependent cannibalism in dragonfly nymphs (Odonata: Anisoptera) overwintering in temperate freshwater ponds. Environmental Entomology 50(6): 1483-1489. (in English) ["Density-dependent mortality by predation and cannibalism has been observed in aquatic insects such as dragonflies in response to shrinking habitat caused by summer drought. Winter conditions might also reduce the amount of livable habitat in temperate ponds and could augment rates of cannibalism. We hypothesized that cannibalism in dragonfly nymphs would increase in winter due to a seasonal decrease in available habitat caused by stratified lower oxygen levels leading to increased nymph density around pond edges. To determine whether cannibalism in nymphs is density-dependent and size-dependent (i.e., with smaller nymphs consumed) we experimentally manipulated nymph density in aquaria. To evaluate whether these patterns are observed in nature during the winter, we conducted field surveys for nymphs in two ponds across the fall and winter seasons. When nymphs were housed at different densities for 24 h, cannibalism was density-dependent, and only smaller nymphs were preyed upon. Our field surveys found that fewer nymphs were caught in the late winter sampling period (mixed-effects model, $P < 0.001$), and that these were larger than nymphs caught in the fall, although both patterns were restricted to the deeper pond ($P < 0.05$). Our results were consistent with the process we hypothesized, and the observed reduction in dissolved oxygen at the bottom of the deeper pond. The lack of significant changes to the relative abundance and size of nymphs in the shallower pond reveals that differences in pond characteristics can influence the degree to which winter conditions induce density-dependent cannibalism among dragonfly nymphs." (Authors)] Address: Beresford, D.V., Biology Department, Trent University, 600 West Bank Drive, Peterborough, Ontario, Canada. Email: davidberesford@trentu.ca

21666. Garcia Junior, M.D.N.; Damasceno, M.T.; Picanço Souto, R.N. (2021): Novos registros da família Aeshnidae (Odonata: Anisoptera) para o estado do Amapá, Brasil. Nature and Conservation 14(1): 181-184. (in Portuguese, with English summary) ["The order Odonata with approximately 7,000 species described worldwide comprises the second largest group of aquatic insects. In Brazil, the order is represented by about 860 species. Aeshnidae is a family of the suborder Anisoptera with wide worldwide distribution, for Brazil they are known around of 60 species, being that, in many states in the country little is known about the family. This work aims to present data collected during 2018 in four municipalities in the state of Amapá: Laranjal do Jari, Macapá, Porto Grande and Santana. Were sampled 58 specimens of seven species were included, included in five genera belonging to the family Aeshnidae.The species: Gynacantha nervosa Rambur, 1842, Neuraeschna costalis, Staurophlebia reticulata, Triacanthagyna ditzleri and T. septima count as new records for the state." (Authors)] Address: Garcia Junior, M.D.N., Univde Federal do Amapá, Brasil. Email: m.d.juniorbio@gmail.com

21667. García-Pozuelo-Ramos, C. (2021): Primera observación de Coenagrion mercuriale (Charpentier, 1840), (Odonata: Coenagrionidae), en la provincia de Toledo (España central). Boletín de la Sociedad Andaluza de Entomología 31: 143-147. (in Spanish) ["This note reports the first observation of C. mercuriale in the province of Toledo, contributing

to broaden the knowledge of the odonatofauna of this province. The population referred to in this note is located in Illescas, at the source of La Viñuela (UTM 30T 424621/-4441444, datum ETRS89, 607 masl). This spring flows into the La Viñuela stream, which is generally dry, except in the section flooded by the spring. This has a small and fluctuating flow, depending on the rainy season. Even so, in the last 45 years it has never dried up. It is located outside any urban area and is part of a cereal-growing steppe environment with olive groves. The episodes of fire in the surrounding vegetation and the removal of sediment from the small stream, formed by the drainage of the basin, are repeated in it. The channel cleared of vegetation does not usually exceed 15 meters in length, nor 10 centimeters in depth. This little anthropized stream, and the small pool it forms, are populated by the helophytes Typha sp. and Veronica sp. Riparian vegetation includes a small group of trees, including Alnus glutinosa (L.) Gaertn and Populus nigra (L.). In the immediate vicinity there is also the rush Scirpus holoschoenus (L.) Soják and the abundant blackberry (Rubus ulmifolius Schott). Overall, the habitat is typical of the species: a small stream, with sunny parts where the insect develops, with abundant riparian and semi-aquatic vegetation (Torralba-Burrial et al., 2011; Dijkstra et al., 2020). The observations of C. mercuriale in the Viñuela spring are the following: On May 14, 2021, at 2:00 p.m., with a light wind, 19ºC and an almost clear sky, 11 specimens were observed, 9 males and 2 females. Both were forming a tandem with their own males. The set was located in the sunny areas of the stream. On May 23, 2021, at 1:30 p.m., with a breeze, 25ºC and clear skies, 5 males and 3 females were found. Tandems and copulation attempts were produced. Copulation lasted approximately 25 minutes, after which the tandem entered the tangle of vegetation, being observed laying eggs on a submerged stem of Veronica sp." (Author)] Address: García-Pozuelo-Ramos, C., Soc. Entomol. y Ambiental de Castilla-La Mancha. Asociación Odonatológica de Andalucía (AOA), Spain. Email: pkymp@yahoo.es

21668. Glad, A.; Mallard, F.; Gourvil, P.-Y.; Goudiaby, A.; Bailleux, G. (2021): Chapitre 5. Évolution spatiale des leucorrhines et du cortège d'odonates associé des lagunes des Landes de Gascogne. In: Mallard F. (coord.), 2021. Programme les sentinelles du climat – Tome X: Réponses des espèces animales et végétales face au changement climatique et pistes d'actions de conservation de la biodiversité en région Nouvelle-Aquitaine, C. Nature: Le Haillan, Gironde, 724pp: 191-220. (in French) ["In order to help measure the impact of current climate change on biodiversity, odonates have been selected to serve as bio-indicators. Leucorrhines are particularly targeted by this study since these, with Boreo-montane affinities, are expected to be sensitive to climatic variations. In view of these elements, odonatologists agree that leucorrhine populations in the Landes de Gascogne are likely to become rare, or even disappear, if average temperatures increase. STELI transect type monitoring was set up for the imagoes (9 passages per site) as well as for the exuviae (three passages per site). Thus, 16 sites have been monitored since 2018 in the Landes and Gironde. The study of the microclimate shows that the sites are very similar climatically but that the annual variations are important. Variations in the abundance of species are observed on the sites, but the number of species counted each year is stable for each site. However, there are differences in terms of the composition of the processions between the sites studied. Taking into account new years of follow-up and new parameters could make it possible to better understand these differences. Leucorrhinia albifrons was observed in 6 lagoons in 2021 with 87 individuals (8 lagoons in 2020 with 180 individuals). L. pectoralis was not observed in 2020. The summers of 2018, 2019 and 2020 proved to be very hot, even scorching per period, while the year 2021 was characterized by high rainfall in spring and summer, therefore high water levels in the lagoons during the first passages with lower temperatures. The correlative distribution models created for 53 species of odonates present in the Nouvelle-Aquitaine region show varied responses to climate change. While some species are losing a large part of favorable habitats, others, on the contrary, are seeing their potential distribution extended to a large part of the region. The most important climatic variables for the species are degree-days above 30°C and rainfall, showing that the accumulation of high heat and drought can have a strong impact on these species." (Authors/Google translate)] Address: not stated

21669. Hämäläinen, M.; Sasamoto, A. (2021): On the incorrect authorship citations 'Matsumura in Oguma', 'Matsumura & Oguma in Oguma', 'Matsumura & Okumura in Okumura' and 'Kaup in Brauer' in various species of Odonata? Tombo 63: 28-37. (in English) ["This paper discusses citations crediting Matsumura as the author or co-author of a total of 11 new speciesgroup taxa in Odonata, published in papers by Oguma (in 1913 and 1926) and Okumura (in 1935), as well as citations crediting Kaup as author of 8 new species-group taxa in Odonata, published in papers authored by Brauer in 1866-1867. Interpreting the rules of the International Code of Zoological Nomenclature, neither Matsumura nor Kaup, respectively, qualify as authors of any of the new taxa." (Authors)] Address: Hämäläinen, M., Netherlands Centre for Biodiversity Naturalis, P.O. Box 9517, 2300 RA, Leiden, The Netherlands. E-mail: libellago@gmail.com

21670. Hermans, J.T. (2021): The Golden-ringed dragonfly (Cordulegaster boltonii) in the Dutch province of Limburg. A species severely endangered by worsening droughts Part 1: Distribution and habitat requirements. Naturhist. maandbl. 110(7): 151-164. (in Dutch, with English summary) ["C. boltonii is a distinctive and impressive dragonfly with black-and-yellow patterning. The female has a long, needle-like ovipositor. It is the only Cordulegaster species that occurs in a large part of western and northern Europe. It favours woodlands with small streams but also occurs along acidic running waters in open moorland and heath. The species is characteristic of swift clear running waters where sandy, silty or peaty debris on the bottom provides suitable hiding places for the larvae. The main flight period of the adults is from June to late July. C. boltonii is very rare in the Netherlands and has suffered a severe decline. One or two small, vulnerable populations remain in the province of Noord-Brabant, while the province of Limburg houses three important populations, at the Maalbeek, Meinweg and Haeselaarsbroek areas. These three populations are mainly situated in nature reserves, where groundwater feeds small streams and rivulets, mostly surrounded by woodland. The largest population of the C. boltonii in the Netherlands is found in the Meinweg National Park. This population is divided over four brooks: Bosbeek, Venbeek, Nartheciumbeek and Roode Beek. All habitats and populations of the Golden-ringed dragonfly in Limburg are briefly discussed." (Authors)] Address: Hermans, J.T., Hertestraat 21, 6067 ER Linne, The Netherlands. Email: jthermans21@gmail.com

21671. Hermans, J.T. (2021): The Golden-ringed dragonfly (Cordulegaster boltonii) in the Dutch province of Limburg. A species severely endangered by worsening droughts. Part 2: Ecology and threats. Naturhist. maandbl. 110(9): 207-

217. (in Dutch, with English summary) ["The ecology, biology and behaviour of larvae and adults of C. boltonii are discussed, based on the findings of recent research, which are compared with the available literature. The research particularly concerns the investigation of a population along the Roode Beek brook in the Meinweg National Park, which has been carried out since 2015. The main goal was to get more information about the oviposition sites and the presence of larvae. Oviposition was observed three times at small seepage streams where they flow into the Roode Beek. Most larvae were found in shallow places along the banks of the Roode Beek, where sand, fine mud and detritus had accumulated behind stones or wood, in meanders or where banks have collapsed. The article ends with an overview of threats, and presents advice about necessary measures to reduce habitat damage. One of the main threats to C. boltonii is the increasing drought due to climate change. Groundwater supplies to some seepage streams are diminishing, and hence a rivulet like the Bosbeek brook falls dry every year for several weeks to months, which may cause the local population to go extinct. Conversely, seepage streams along the Roode Beek may become inaccessible as ovipositing sites if the water level is raised as a consequence of dambuilding by Beavers (Castor fiber). Some populations of C. boltonii are very small and vulnerable, e.g. those at the Haeselaarsbroek site and along the Venbeek brook (Meinweg), where local threats can easily wipe out these populations. The province of Limburg harbours the largest and therefore most important populations of this species in the Netherlands. Improved protection of their breeding sites is necessary to give this beautiful dragonfly a brighter future." (Author)] Address: Hermans, J.T., Hertestraat 21, 6067 ER Linne, The Netherlands. Email: jthermans21@gmail.com

21672. Liu, Y.; Wang, Q.; Wu, Y.; Yang, C.; Luo, X.; Mai, B. (2021): Bioaccumulation of short- and medium-chain chlorinated paraffins in aquatic insects from an e-waste recycling site. Environmental Chemistry 40(10): 3037-3045. (in Chinese, with English summary) ["The concentrations of short-chain chlorinated paraffins (SCCPs) and medium-chain chlorinated paraffins (MCCPs) in aquatic insects and water from an electronic waste recycling site in Longtang Town, Qingyuan County of Guangdong Province were determined using gas chromatographic-mass spectrometric (GC/MS). The results showed that ∑SCCPs and ∑MCCPs concentrations in aquatic insects were range from 52 ng·g-1to 410 $ng \cdot g^{-1}$and 40 $ng \cdot g^{-1}$to 740 $ng \cdot g^{-1}$ wet weight (ww), respectively. Damselfly larvae have the highest level of ∑SCCPs and the highest level of ∑MCCPs was found in waterbeetles. Principal component analysis was conducted, and species-specific different composition patterns of SCCP and MCCP congeners were seen among aquatic insects. This may be due to differences in diet, feeding habits and bioaccumulation ability among different species. Bioaccumulation factor (BAF) values of ∑SCCPs and ∑MCCPs in aquatic insects were range from 3.27 to 3.79 and 2.62 to 3.34, respectively. BAFs of ∑SCCPs and ∑MCCPs in dragonfly larvae were lower than that of ∑PCBs (4.87) and ∑PBDEs (4.65), suggesting the bioaccumulation potential of SCCPs and MCCPs was below that of PCBs and PBDEs in aquatic insects. Significant negatively correlations ($P < 0.05$) were observed between BAF values and octanol-water partition coefficient (K_{OW}) and carbon-chain length ($C_{10\text{-}17}$) of SCCPs and MCCPs. Those results indicated that the physicochemical properties of compounds affected the bioaccumulation of SCCPs and MCCPs by aquatic insects, and homologues with low K_{OW} and low carbon chain length were preferred to bioaccumulation." (Authors)] Address: Liu, Y., Res. Institute of Poyang Lake, Jiangxi Acad. Sciences, Nanchang, 330096, China. E-mail: liuyu@jxas.ac.cn

21673. Mauersberger, R. (2021): Reproduktionsnachweise von Crocothemis erythraea, Ischnura pumilio und Orthetrum brunneum an einem kleinen Gartenteich im Norden Brandenburgs (Insecta: Odonata). Libellula 40 (3/4): 179-183. (in German, with English summary) [Germany " In a small lined garden pond with a maximum depth of 22 cm in Ahrensdorf near Templin the reproduction of C. erythraea, I. pumilio, and O. brunneum was successful. In the years at issue (2019 to 2021) there have been mild winters so that ice cover reached only a few centimeters thickness. I. pumilio and O. brunneum are rare species in the region in question." (Author)] Address: Mauersberger, R., Petersdorfer Str, 23, 17268 Templin, Germany. Email: rue.mau@web.de

21674. Moore, M.P.; Martin, R.A. (2021): Natural selection on adults has trait-dependent consequences for juvenile evolution in dragonflies. The American Naturalist 197(6): 677-689. (in English) ["Although natural selection often fluctuates across ontogeny, it remains unclear what conditions enable selection in one life-cycle stage to shape evolution in others. Organisms that undergo metamorphosis are useful for addressing this topic because their highly specialized life-cycle stages cannot always evolve independently despite their dramatic life-history transition. Using a comparative study of dragonflies, we examined three conditions that are hypothesized to allow selection in one stage to affect evolution in others. First, we tested whether lineages with less dramatic metamorphosis (e.g., hemimetabolous insects) lack the capacity for stage-specific evolution. Rejecting this hypothesis, we found that larval body shape evolves independently from selection on adult shape. Next, we evaluated whether stage-specific evolution is limited for homologous and/or coadapted structures. Indeed, we found that selection for larger wings is associated with the evolution of coadapted larval sheaths that store developing wing tissue. Finally, we assessed whether stage-specific evolution is restricted for traits linked to a single biochemical pathway. Supporting this hypothesis, we found that species with more wing melanization in the adult stage have evolved weaker melanin immune defenses in the larval stage. Thus, our results collectively show that natural selection in one stage imposes trait-dependent constraints on evolution in others." (Authors)] Address: Moore, M.P., Living Earth Collaborative, Washington University, Saint Louis, Missouri 63130; 2. Dept of Biology, Case Western Reserve University, Cleveland, Ohio 44106, USA.

21675. Sandu, C. (2021): The synthesis, characterization, and antimicrobial analysis of copper nanoparticle doped graphene-matrix material. MSc. thesis, Materials Science and Engineering, University of California, Riverside: IX + 44 pp. (in English) ["Pathogenic microbes pose a serious threat to public health. Specifically, antibiotic abuse is creating new strains of antibiotic resistant bacteria and creating a public health crisis. There are many health risks associated with the overuse of antibiotics. Their broad bactericidal effects can disrupt an individual's symbiotic relationship with beneficial bacteria [1]. Furthermore, antibiotics can be toxic to human and create serious side effects from skin sensitivity to organ failure [2]. In addition to some microbes' inherent antibiotic resistive genes, microbes evolve and mutate quickly thereby quickly producing antibiotic resistance. Antibiotic sensitive bacteria are able to acquire antibiotic resistance genes via horizontal gene transfer, causing the organism to then become resistant to specific classes of antibiotics, further

complicating treatment [3]. It is therefore of great interest in the scientific community to examine other methods of infectious disease prevention and treatment. Since the introduction of the GAIN Act in 2012, there has been new stimulated interest in the battle against bacteria, however no significant strides have been made yet [3]. Growing resistance to antibiotics continues to be a devastating public health problem. Attempts to tackle the problem involve research teams at the Massachusetts Institute of Technology (MIT) who utilize a type of phage therapy to target antibiotic resistance genes directly via the CRISPR (clustered, regularly interspaced short palindromic repeats) Cas9 gene editing technology [3]. The engineered phage (a phage is a virus which infects bacteria) delivers the CRISPR Cas9 RNA tool into resistant bacteria, resulting in genomic expression of the CRISPR Cas9 tool which then programs the bacteria to either become sensitive to drugs or to undergo lysis [4]. The CRISPR Cas9 tool encodes a DNA nuclease (DNA degrading enzyme) that recognizes and cleaves specific genes which code for antibiotic resistance [3]. The phage tool selectively kills bacteria with chromosomally integrated resistance genes, while bacteria with plasmid-integrated resistance genes become sensitive and continue to survive, adding a selective pressure which favors sensitive bacteria to resistant bacteria [4]. The surviving bacteria can then be effectively treated with antibiotics. Ironically, the CRISPR Cas9 system is a part of bacteria's natural immune defense against phage attacks [3]. While this tool seems very promising in research, gene therapy is very difficult to implement and apply. Furthermore, it does not prevent the development of antibiotic resistance; there will always be too great a pressure for bacteria to evolve further resistance and survive. The common solution to prevent pathogenic infections tends to rely on organic disinfectants or drugs, however this solution may lead to drug resistance and can harm the environment. Since about 80% of microbes are transmitted through surface contact, another approach to preventing the spread of harmful microbes is to develop surface technology which not only is bactericidal, but also overcomes the concern of drug resistance and is safe environment [5]. Naturally occurring structures can serve as templates for such bactericidal applications. It has been reported that the nanoscale structure of dragonfly wings may serve as a bactericidal surface [6]. Their natural structure can rupture adjacent microbial cells thereby killing and preventing bacterial growth. These organic templates can be reproduced synthetically and applied to the development of microbicide technologies. It has been observed that the interaction between synthetic nanoparticles and biological cells can be enough to cause cell lysis and death without any other external forces, chemical nor mechanical [7]. This idea is a promising opportunity for the development of novel bactericidal surface technologies which are effective and safe. Nanomaterials have the capacity to enhance the field of science that relies on public health and sterility, from water treatments, medical devices, and food processing [8]. Metal oxide nanoparticles such as zinc oxide and copper oxide exhibit antimicrobial behavior at different degrees in a variety of materials, forms, and morphologies [6]. The functional activity of nanoparticles is affected by material size, shape, and morphology. Analyzing and characterizing the effects of nanoparticles of varying properties is of current interest in research for biomedical and industrial applications. Medical devices may harbor harmful bacteria which can be deadly for an immune compromised or elderly patient [2]. Bacteria can produce highly resistant biofilms which allow them to survive on such surfaces for long lengths of time. Staphylococcus aureus and Escherichia coli are commonly acquired hospital infections that may cause deadly bloodstream, urinary tract, lung, heart, and skin infections [9]. These microbes can be very resistant to conventional antibiotics, requiring the need for novel methods of reducing microbial infections. Metallic nanoparticles have been reported to show antimicrobial activity especially towards pathogenic bacteria such as E. coli and S. aureus [7] [10]. Antimicrobial effects of the nanoparticle depend on the particle size, stability, and concentration; with the right preparation and application, these particles can hold a promising future in safely reducing infection. Furthermore, graphene based nanomaterials show promising development in the antimicrobial community [6]. Graphene materials have been shown to interact with biomolecules such as proteins, nucleic acids and membranes; these material-microbial interfaces are worthy of analysis in order to further understand the beneficial application of such materials [6]. Here, an economical, scalable and facile sol-gel method to synthesize a metallic copper nanoparticle embedded carbon matrix material (CMAT) is described. Furthermore, CMAT's antimicrobial potential is investigated. CMAT possesses hydrophobic properties as well as high flame resistivity and a high absorption ability of oils. These properties generate a spectrum of prospective CMAT applications ranging from environmental decontamination, biomedical antimicrobial coatings, storage solutions, and air filters." (Author) The paper includes references to Odonata.] Address: https://escholarship.org/-uc/item/28x228cz

21676. Savard, M. (2021): La fascinante communauté des libellules d'un étang de castor au parc de la Rivière-du-Moulin à Saguenay. Nouv'Ailes 31(1): 21-27. (in French) [Parc urbain de la Rivière-du-Moulin, Chicoutimi, town of Saguenay, Quebec, Canada. Phenology and abundance of the occurring 18 odonate species are outlined in details. Morphological characters of the five Lestes species L. congener, L. disjunctus, L. dryas, L. forcipatus, and L. unguiculatus are introduced. The French names of the species are documented.] Address: Email: michel.savard@ssss.gouv.qc.ca

21677. Savard, M. (2021): Raymond Hutchinson (1937-2020): un ténor des sciences naturelles. Le Naturaliste Canadien 145(1): 48-50. (in French) ["Raymond Hutchinson died at the age of 82 on March 13, 2020, in Gatineau. He was an inspiring naturalist and a great educator. Talkative, he knew how to surround himself and communicate his passion for nature, in particular the observation of dragonflies and spiders. His career as a high school teacher, his unwavering dedication to natural science initiation camps, his volunteer commitments with Les Cercles des Jeunes Naturalistes and the Association des entomologistes amateurs du Québec, his sustained relations with the taxonomists of the National Collection of insects, arachnids and nematodes, and, above all, his amateur passion, cultivated under the influence of Father Jean-Baptiste Genest, André Larochelle, Gilbert Bélanger and Benoît Ménard, traced the way to this great educator and prolific avant-garde author who, with rigor, pedagogy and perseverance, has considerably advanced odonatology and Araneology in Quebec." (Author/ Google translate)] Address: Email: michel.savard@ssss.gouv.qc.ca

21678. Tájek, P.; Waldhauser, M.; Štêrík, M.; Vlašánek, P.; Hesoun, P.; Rehounek, J.; Legát, J.; Cerný, L. (2021): First documented records of breeding of Gomphus pulchellus in the Czech Republic with notes on its habitat preferences (Odonata: Gomphidae). Libellula 40 (3/4): 185-196. (in English, with German and Czech summaries) ["In the Czech Republic, only single individuals of G. pulchellus with no reproductive behaviour were observed until 2017. Since 2018, reproduction has been recorded at six localities in the Czech

Republic. All known localities of G. pulchellus from the Czech Republic are reported. Additionally, habitat descriptions and the circumstances of unpublished records (after 2017) are presented and discussed. The discussed data proves the extension of the generative range of G. puchellus to the east." (Authors)] Address: Tájek, P., Nature Conservation Agency of the Czech Republic, Slavkovský les Mountains Regional Branch, Hlavní 504, 353 01 Mariánské Lázne, Czech Republic. Email: premysl.tajek@nature.cz

21679. Tájková, P.; Tájek, P.; Štêrík, M.; Váša, M.; Harabiš, F. (2021): Population size of the largest population of Leucorrhinia albifrons in the Czech Republic (Odonata: Libellulidae). Libellula 40 (3/4): 197-206. (in English, with German and Czech summaries) ["Distribution of threatened dragonfly Leucorrhinia albifrons is very scattered throughout Western and Central Europe. Most of them are small populations that are at high risk of extinction, therefore protecting large populations is key to maintaining the entire species in these regions. In this study we investigated population size and other population characteristics of Leucorrhinia albifrons at locality Komárí pond. We combined mark-releasere capture method (marking 726 adults) and exuvia sampling (1,564 specimen) to estimate precise population size. Very low recapture rate was recorded and life span was up to 41 days. According to our results the investigated population comprises 15,000–28,000 specimens, which is the largest detected population in the Czech Republic. Nevertheless, it is an isolated population that may be threatened by a change of land use management or accidental disturbances." (Authors)] Address: Tájková, Pavla, Czech Union for Nature Conservation, Local Chapter Kladská, Bezejmenná 480/8, 353 01, Mariánské Lázne, Czech Republic

21680. Wildermuth, H. (2021): Buchbesprechung. Libellula 40 (3/4): 207-208. (in German) [Baumann K., R. Jödicke, F. Kastner, A. Borkenstein, W. Burkart, U. Quante & T. Spengler (Ed.) (2021) Atlas der Libellen in Niedersachsen/Bremen. Mitteilungen der Arbeitsgemeinschaft Libellen in Niedersachsen und Bremen, Sonderband. NIBUK, Natur in Buch und Kunst, Ruppichteroth. Format A4, 383 Seiten, 300 Fotos; in Deutschland 30,- €, Versand frei.] Address: Wildermuth, H., Haltbergstr. 43, CH-8630 Rüti, Switzerland. E-mail: hansruedi@wildermuth.ch

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21681. Calvão, L.B.; Siqueira, T.; Faria, A.P.J.; Paiva, C.K.S.; Juen, L. (2022): Correlates of Odonata species composition in Amazonian streams depend on dissimilarity coefficient and oviposition strategy. Ecological Entomology 47(6): 998-1010. (in English) ["Environmental and spatial heterogeneity affects the distribution of aquatic insects, determining or influencing the variation in local species composition. Odonata have different strategies for oviposition site selection that depend on environmental conditions. However, Land Use and Land Cover (LULC) can reduce the availability of suitable sites for Odonata oviposition through environmental homogenization. We investigated the relationship between environmental and spatial heterogeneity and variation in species composition of Odonata with different oviposition strategies (endophytic, epiphytic and exophytic) in Amazonian streams in a gradient of LULC. We used the Jaccard and Bray-Curtis coefficients and the Manhattan distance to estimate a continuum of variation in species composition. Variation in the composition of endophytic and epiphytic species was explained by spatial heterogeneity. Using abundance data and the Manhattan distance, we found a relationship between variation in species composition and environmental heterogeneity. Endophytic species composition was related to perch heterogeneity, while exophytic species composition was related to perch and canopy cover heterogeneity. Exophytic and endophytic species could be used in biomonitoring as they respond to specific environmental predictors and because exophytic species do not have spatial patterns across the landscape. Different dissimilarity coefficients provide complementary information about the responses of multispecies communities to land use, as some will represent strong effects (presence-absence indexes) while others will represent more subtle effects (abundance-based indexes). Land use can increase the environmental heterogeneity of some predictors (perches and canopy cover). Physical changes in streams such as hydromorphological alterations can modify specific habitats, affecting oviposition strategies and supporting tolerant species." (Authors)] Address: Calvão, Lenize, Programa de Pós-Graduação em Ecologia, Inst. de Ciências Biol. (ICB), Lab. Ecol. e Conservação (LABECO), Univ.de Fed.do Pará (UFPA), Belém, Pará, Brazil. Email: lenizecalvao@gmail.com

21682. Dijkstra, K.-D. B. (2022): Odonata, Dragonflies, Damselflies, Angidina. In: Steven M. Goodman (ed.): The New Natural History of Madagascar. Princeton University Press. 2296 pp: 953-963. (in English) [As of April 2020, 173 described species of Odonata are recognized on Madagascar; these are checklisted, partly documented by photographs and commented family-wise.] Address: Dijkstra, K.D., Netherlands Centre for Biodiversity Naturalis, P.O. Box 9517, 2300 RA, Leiden, The Netherlands. E-mail: dijkstra@nnm.nl

21683. Hermans, J.T. (2022): The Banded darter (Sympetrum pedemontanum) in the Dutch province Limburg (Odonata: Libellulidae). Rise and demise of a pioneer species. natuurhistorisch maandblad 111(6): 145-155. (in Dutch, with English summary) ["This tiny, but eye-catching, dragonfly with characteristic brown bands near the tip of each wing in both sexes, has a wide distribution area that extends from western Europe to Japan. The Banded darter is rare over large areas. In Europe it is widely distributed, with a continuous range from northern Italy across central Europe to northern Germany and the Netherlands. Since the middle of the 20th century, it has expanded its range to the low-lying parts of Europe, colonising large parts of Germany and becoming regionally common in the Netherlands (provinces of Noord-Brabant and Overijssel). The first individuals in Limburg were seen in 1982. Since then, the numbers of observed Banded darters have increased in Limburg, though most records have concerned wanderers. It is only at two locations, near Weert and Montfort, that populations were established in recent decades. The Banded darter favours habitats with emergent vegetation which is neither too tall nor too dense, such as those present in flood plains of lakes and streams. Presently, many of these natural habitats have been altered by human activities, and their water regime changed. Today the Banded darter occurs mostly in man-made habitats like slow-flowing ditches, canals, quarries or fish pond complexes. In the Netherlands, it is mainly found along man-made ditches, usually surrounded by open agricultural land. Unfortunately, both populations of the Banded darter in Limburg have vanished. The main reason for the decline and local extinction in Weert and Montfort was the management of the water regime practiced by the regional water board. Activities like cleaning up ditches or changing the water level were often carried out during the main flight and reproduction period of the Banded darter. This caused a collapse of the populations from which they were not able to recover." (Author)] Address: Hermans, J.T., Hertestraat

21, 6067 ER Linne, The Netherlands. Email: jthermans21-@gmail.com

21684. Huang, D.; Fu, Y.; Lian, X.; Gao, J.; Nel, A. (2022): The oldest malachite damselfly (Odonata: Synlestidae) from the Lower Cretaceous of China. Cretaceous Research 129, January 2022, 105023: (in English) ["The synlestid damselfly, Cretaphylolestes cretacicus gen. et sp. nov., is described from the Lower Cretaceous Shouchang Formation (lower Aptian) of Zhejiang Province, Eastern China. It is the oldest Synlestidae, as we exclude the Late Jurassic–Early Cretaceous genus Gaurimacia from this family. The clade Lestiformia is currently represented in the Mesozoic by two Early Cretaceous genera of its stem group, a Perilestidae from the mid-Cretaceous Burmese amber and this newly described Synlestidae. This group remains under-represented in the Cretaceous, compared to the other zygopteran subclades. It probably diversified during the Late Cretaceous and the Paleocene, as the Lestidae are frequent and diverse in the Oligocene and more recent periods." (Authors)] Address: Huang, D., State Key Lab. of Palaeobiology & Stratigraphy, Nanjing. Institute of Geology & Palaeontology, Center for Excellence in Life & Paleoenvironment, Chinese Academy of Sciences, Nanjing, PR China. Email: dyhuang@nigpas.ac.cn

21685. Maurice, N. (2022): Les zones de rejet végétalisées de grande taille: observation et modélisation. Génie des procédés. PhD thesis, Sciences et Ingénierie des Molécules, des Produits, des Procédés et de l'Énergie Laboratoire Réactions et Génie des Procédés, Université de Lorraine: 288 pp. (in French, with English summary) ["Despite regulations, the anthropic pollution (nitrogen, phosphorus, trace elements (TE), pharmaceuticals, faecal coliforms, etc.) related to urban wastewater (wastewater treatment plant (WWTP) and urban stormwater runoff (USR)) is not negligible because it weakens aquatic ecosystems and it can be harmful for human health. In order to minimize its impact, the amount of pollutants must be reduced. Wetlands are wonders of nature and are often describe as Earth's kidney due to their capacity to filter pollutants, so they would be interesting candidates. Unfortunately, they have been in decline for several centuries (13 % of 17th century wetlands still remain at the beginning of the 21th century. This is why in 2011 the AZHUREV project (Aménagement d'une Zone Humide à Reims pour l'Épuration et le Vivant) was born. This project allowed the implementation of a large scale (6 ha) surface-flow constructed wetland (CW) (first water supply in 2017) at the outlet of the Grand Reims WWTP (capacity of 450,000 population equivalents). It is composed of three basins of 2 ha fed in parallel, by part of the effluents of the WWTP (10%), or by the USR (25 %) during rainy events, to improve the quality of these waters before their discharge into the environment. Initially these basins were different because of the quantity and type of emergent vegetation planted (Phragmites australis, Glyceria maxima, Scirpus lacustris). Today, there is no more difference because the proportion of planted plants has drastically decreased, P. australis being the only species still present, to the benefit of opportunistic species (submerged or floating). These basins were able to reduce the concentration of many compounds through various processes, oxidation/reduction (nitrogen, TE), precipitation /coprecipitation with carbonates and hydrogen sulphide (TE), biodegradation or photodegradation (pharmaceuticals, faecal coliforms), adsorption to sediments (TE and pharmaceuticals), or uptake by plants (nitrogen and phosphorus). Bacteria and aquatic plants are responsible for most of these mechanisms. Thus, the basins are better able to remove pollutants in summer due to the higher temperatures and longer days. Bacterial activity has a direct effect on pollutants and the bacterial genera found at the outlet of the CW take part in the nitrogen, sulphur and carbon cycles. Whereas the effect of plants is more indirect by promoting bacterial development (source of carbon and energy, support for the biofilm) and by bringing organic matter (adsorption site for pollutants) into the sediment during senescence. These plants are also a source of food (submerged or floating plants), a habitat and/or nesting area (emergent plants) for many wild animals, whether they are considered "harmful" (muskrat or coypu) or not (swan, coot, duck, grebe, frog, dragonfly, damselfly, gammarid, snail, etc.). Therefore, this CW offers two advantages: it improves the quality of urban water before it is discharged into the receiving environment and it provides food and shelter for many animal species that depend on this type of environment. The interconnection of the multiple variables measured has been transcribed into a conceptual model. These results are encouraging for a possible extension of the CW." (Author) Records of Coenagrion scitulum, Ischnura elegans, Crocothemis erythraea, Libellula quadrimaculata, and Aeshna mixta are documented.] Address: not stated

21686. Petermann, J.S.; Gossner, M.M. (2022): Aquatic islands in the sky: 100 years of research on water-filled tree holes. Ecology and Evolution 12(8).e9206: 17 pp. (in English) ["Water-filled tree holes are unique ecosystems that may occur high up in tree crowns and are essentially aquatic islands in the sky. Insect larvae, mesofauna, and other organisms colonize the waterbodies and feed on the accumulating detritus. Water-filled tree holes are not only important habitats for these species but have been used as model systems in ecology. Here, we review more than 100 years of research on treehole inhabiting organisms and show that most studies focus on selected or even single species (most of which are mosquitoes), whereas only few studies examine groups other than insects, especially in the tropics. Using a vote counting of results and a meta-analysis of community studies, we show that the effects of tree-hole size and resources on abundance and richness were investigated most frequently. Both were found to have a positive effect, but effect sizes were modulated by site-specific environmental variables such as temperature or precipitation. We also show that parameters such as the height of the tree holes above ground, tree-hole density, predation, and detritus type can be important drivers of organism abundance or richness but are less often tested. We identify several important research gaps and potential avenues for future research. Specifically, future studies should investigate the structure, functions, and temporal dynamics of tree-hole food webs and their cross-system interactions, for example, with terrestrial predators that act as a connection to their terrestrial surroundings in meta-ecosystems. Global observational or experimental tree-hole studies could contribute pivotal information on spatial variation of community structure and environmental drivers of community assembly. With a better understanding of these unique aquatic habitats in terrestrial ecosystems, natural and artificial tree holes can not only serve as model systems for addressing fundamental ecological questions but also serve as indicator systems of the impacts of environmental change on ecosystems." (Authors) Includes references to the study of Ola Fincke on Pseudostigmatidae.] Address: Petermann, Jana, Dept of Environment & Biodiversity, Univ. of Salzburg, Salzburg, Austria

21687. Petzold, F. (2022): 17 Jahre Libellenmonitoring an den Mooren im Thüringer Wald. Landschaftspflege und Naturschutz in Thüringen 58(3): 115-120. (in German, with

English summary) ["Since 2005, the dragonfly fauna in five raised bogs on the ridges of the Thuringian Forest has been studied using standardised methods as part of a monitoring project. The focus of the investigations is on the species typical for the moors. As the flagship species of the raised bogs of the Thuringian Forest, the Alpine Emerald Dragonfly Somatochlora alpestris is in special focus. A significant decline in the Population of this flagship species has been observed. The positive effects of extensive revitalisation measures are overshadowed by the negative effects of current climate changes (lackof precipitation, warming). However, the revitalisation measures have slowed down the population decline and the other moorland-typical species have also been preserved so far." (Author)] Address: Petzold, F., Lutherstr. 130, 07743 Jena, Germany. E-mail: falk_petzold@web.de

21688. Roy, S.; Singhamahapatra, A.; Nayak, A.K. (2022): Observations of Odonata (Insecta) from heterogeneous patches of Bankura district with first report of Microgomphus torquatus (Selys, 1854) from West Bengal state of India. Journal of Animal Diversity 4(2): 121-151. (in English) ["The diversity and heterogeneity of Odonata was studied at 10 sites located across almost all parts of the Bankura district (except northwestern and northeastern boundary regions), in the state of West Bengal, India from July 2015 to June 2022. Analysis of variance and rarefaction was performed to study the ß-diversity and compare the taxa abundance at the sites to understand the heterogeneity of Odonata observations. The seasonality of the species and their site-wise distribution were also studied. A total of 74 odonate species belonging to eight families, represented by 46 genera were recorded. The study adds 17 species to the known Odonata fauna of Bankura district, including the addition of M. torquatus to the fauna of West Bengal. It also confirms the addition of Ictinogomphus kishori to the known Odonata fauna of West Bengal, which has been confused with and misidentified as Ictinogomphus distinctus for long, the latter being described from the state of West Bengal and is also found in the region adjacent to the study area. Most recorded odonates belonged to the family Libellulidae (29 species), followed by Coenagrionidae (19 sp.), Gomphidae (9 sp.), Platycnenididae (6 sp.), Aeshnidae (5 sp.), Macromiidae (3 sp.), Lestidae (2 sp.), and Chlorocyphidae (1 sp.). Species diversity and abundance assessments are essential for conserving the habitats of the restricted and endemic (to peninsular India) species." (Authors)] Address: Nayak, A.K., Searsole Junior Basic School, Raniganj Circle, Searsole Rajbari, Paschim Bardhaman, West Bengal 713358, India. Email: amarnayak.stat@gmail.com

21689. Sadler, I.G. (2022): Functional feeding groups responses to fertilization and Largemouth Bass in southern Illinois experimental ponds. MSc. thesis, Southern Illinois University Carbondale: VIII + 98 pp. (in English) ["Eutrophication is a pervasive issue in freshwater systems. However, the effects of nutrient and piscivorous fish additions on freshwater invertebrate diversity, functional feeding groups (FFGs), and stoichiometric ratios are difficult to predict. These relationships are important to quantify in small lentic systems where nutrients like nitrogen (N) and phosphorus (P) and piscivorous fish are frequently added to enhance sport fishing. To study this, I administered 2 treatments, fertilization and Largemouth Bass (Micropterus salmoides, LMB) additions, to 28 experimental ponds in a fully crossed experimental design and estimated benthic invertebrate biomass and diversity before and after administering the treatments. I also sought to improve my understanding of the relationships between specific FFGs and nutrients by measuring the elemental composition of coarse (CPOM) and fine particulate organic matter (FPOM) and invertebrates before and after administering the treatments. Because consumer stoichiometric ratios are shaped by their environment and life histories, which can be governed by their functional role and/or evolutionary history, I was interested in determining whether my treatments and invertebrate FFG or taxonomic group better explained variation in invertebrate elemental nutrient content. I verified that fertilization altered nutrient availability in the ponds by measuring the nutrient content and biomass of FPOM and CPOM. FPOM P concentrations (µgP/L) were higher in ponds that received fertilizer (f= 4.84(1,22), P= 0.03) and LMB (f= 5.26(1,22), P= 0.04). Fertilization also increased CPOM biomass (f= 8.95(1,21), P=0.007). I found that Shannon diversity was increased or better maintained in ponds that received the fertilizer treatment (f= 6.54(1,20), P= 0.02). Predator (f= 4.47(1,21), P= 0.047) and GC (f= 5.05(1,21), P= 0.04) biomass increased after the addition of LMB to ponds. For scraper biomass, there was a significant interaction between fertilization and LMB additions such that LMB additions increased scraper biomass, but fertilization counteracted this effect (f= 4.93(1,17), P= 0.04). Fertilization increased the biomass of FCs (f= 6.64(1,9), P= 0.03) but decreased shredder biomass (f= 5.71(1,6), P= 0.004). In control ponds, SIMPER analysis revealed that a decrease in the predatory crayfish Cambaridae accounted for the greatest differences between pre and post sampling, followed by Odonates. Odonates and gastropods caused the greatest shifts in both fertilized and LMB ponds. The difference between fertilized and LMB ponds was that Coenagrionidae biomass did not increase and Dytiscidae did in fertilized ponds. Invertebrate elemental stoichiometric ratios were not affected by our treatments, which supports the assumption of homeostasis in ecological stoichiometry models. However, nutrient ratios varied across both FFG and taxonomic group, likely because of varying diets and life history strategies. Model comparison suggests that order best explained most of the variation in elemental ratios across invertebrates; however, FFG and order best explained invertebrate %P content and class and FFG best explained %C content. We found that predators, specifically Odonata and Hirudinea, have higher N content than other FFGs, and gathering-collectors (GCs), specifically Ephemeroptera, have a higher P content. Predators may have a higher N content because they feed on higher dietary N than herbivores. I determined that order was the best predictor of elemental nutrient content; however, FFG is also an acceptable predictor, which is important because identifying species to FFG is more rapid than taxonomic identification. In conclusion, humans are heavily altering the availabilities of N and P in freshwater ecosystems; thus, knowing the stoichiometric contents of individuals (at the order or FFG level) can facilitate predictions about how communities respond to nutrient additions. Furthermore, understanding how invertebrate communities respond in their functional makeup is of importance.] Address: not stated

21690. Samarasinghe, L.V. (2022): Observations on underwater oviposition of Pseudagrion microcephalum (Odonata: Coenagrionidae). Sri Lanka Naturalist 11: 18-20. (in English) ["The oviposition behavior of a pair of P. microcephalum was observed in the Bellanvila-Attidiya sanctuary during the months of June and July 2021. This species associated with a medium-size stream, and shrubs as well as grasses are found along its banks (Figure 1). The behaviors were observed for six days by naked eye and the photographs were taken using the Redmi 7 mobile phone camera (dual camera setup of 12MP + 2MP in the rear). A pair was observed flying near the canal and they were in tandem position and occasionally

landed on foliage of the bushes near the banks of the stream (Figure 2). Then they started mating and forming the heart wheel position for several minutes. After that the female laid down on a leaf on the surface of the water and prepared to lay eggs. Then slowly moved into the water, and few minutes later the male floated into the water (Figure 4). They remained in the water for about 15 minutes, during that time the female continued to lay eggs. This was observed for a few days but the heart wheel position was seen only two days. In this observation, the male separates in the tandem position in the water, but the female continues to lay eggs under the water (Figure 3), and when the female returns from the water, the male again caught in the tandem position. During the observed period, they showed an average submergence time of 8.33 minutes, with a minimum of three (3) minutes and a maximum of 27 minutes." (Author)] Address: Samarasinghe, L.V., Young Zoologists' Association of Sri Lanka, National Zoological Gardens, Dehiwala, Sri Lanka. Email: lasanvibudha@gmail.com

21691. Savard, M. (2022): Découverte d'une population de l'amphiagrion rougeâtre, Amphiagrion saucium (Odonata: Coenagrionidae), au Saguenay–Lac-Saint-Jean, une espèce vulnérable inféodée aux prés sourceux. Le Naturaliste canadien 146(1): 17-28. (in French) [" The discovery of a population of Amphiagrion saucium in the Parc de la Rivière-du-Moulin, an urban park in the city of Saguenay (Québec, Canada), represents a new addition to the known Odonata fauna of the lowland enclave of the Saguenay–Lac-Saint-Jean region. This population occupies a series of spring-fed marshes along the bed of an old meander exposed following a landslide during the Saguenay flood in 1996. Adults specifically use pools dominated by variegated scouring-rush (Equisetum variegatum). Their number declines rapidly from mid-July, which coincides with the start of the breeding season of Lestes disjunctus and Sympetrum obtrusum. At the northern limit of its range, the presence of beaver activity likely plays an important role in the population dynamics of A. saucium. In Québec and other inhabited regions of eastern North America, its specialized habitat, its low dispersal rate and its sensitivity to anthropogenic threats make this species vulnerable. In urban areas, it could benefit from improved stormwater management incorporating holding ponds. The abundance and phenology of all 15 species of Odonata found breeding in the study area in 2020 and 2021 are provided." (Author)] Address: Email: michel.savard@ssss.gouv.qc.ca

21692. Vilenica, M.; Katar, M.; Koren, T.; Štih Koren, A. (2022): Dragonfly fauna (Insecta: Odonata) of Papuk Nature Park, Croatia. Nat. Croat. 31(2): 351-364. (in English, with Croatian summary) ["Odonata is an amphibious insect order constituting an important link between aquatic and terrestrial habitats. Members of the group are widely used as bioindicators of freshwater habitat health. The Odonata fauna of a total of 44 freshwater habitats in the wider area of Papuk Nature Park was investigated in the spring and summer of 2017 and 2019. Twenty-three lotic and 21 lentic habitats were included in the study. We recorded 39 Odonata species, with a higher species richness (i.e. 35) documented at lentic than at lotic habitats (i.e. 16 species). Calopteryx virgo was the most widespread species in the area, while Aeshna affinis, Epitheca bimaculata, and Sympetrum meridionale were the rarest. The most frequently recorded species at lentic sites were Platycnemis pennipes, Coenagrion puella, and Ischnura elegans, while Calopteryx virgo, Onychogomphus forcipatus, and Cordulegaster bidentata were the most common species in lotic habitats. Although we recorded numerous anthropogenic pressures in freshwater habitats in the Park, 11 recorded species are of conservation concern, which highlights the conservation value of aquatic habitats in the study area. Our results represent the first Odonata checklist of Papuk Nature Park, and as such, they are an important contribution to our knowledge of the Odonata fauna and species distribution in Croatia." (Authors)] Address: Vilenica, Marina, Faculty of Teacher Education, University of Zagreb, Dept in Petrinja, Trg Matice hrvatske 12, 44250 Petrinja, Croatia

21693. Zheng, H.; Mofatteh, H.; Hablicsek, M.; Abdolhamid, A.; Akbarzadeh, M. (2022): Dragonfly-Inspired Wing Design Enabled by Machine Learning and Maxwell's Reciprocal Diagrams. Research Square 2207635: 15 pp. (in English) ["This research relates the morphology of the structural network of a dragonfly wing to the static equilibrium of forces using a geometry-based equilibrium method known as graphic statics. It then develops machine learning algorithms to generate similar structural networks for designing airplane wings using the in-plane equilibrium information of the dragonfly wing. This approach can generate a structural network in equilibrium with no prior information related to the topology or geometry of the network just by receiving the boundary geometry of the wing. This research shows that the internal network of the dragonfly wing can be assumed to be compression or tension-only system on a 2D plane. Consequently, another diagram is constructed to represent the geometric equilibrium of the forces in the initial network. This diagram is called the force diagram in the context of graphic statics. A new wing geometry is reconstructed from the force diagram, with its members sized according to the force magnitude. Both form of the network and its force diagram are used to train machine learning models for the generation of the structural network of the wing. The developed methodology is also capitalized to generate microstructural patterns inspired by other species with networks of convex polygons. We numerically and experimentally examine one application of this method in designing the cellular core, 3D printed by fused deposition modeling, of the airfoil wing, which suggests up to 25% improvement in the out-of-plane stiffness. Our findings suggest this ML-assisted approach enables leveraging million years of evolution in nature to develop the next generation of high-performance, lightweight structures." (Authors)] Address: Zheng, H., Polyhedral Structures Laboratory, Dept of Architecture, Weitzman School of Design, Univ. of Pennsylvania, Philadelphia, PA 19146, USA. Email: masouda@design.upenn.edu

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21694. Akamagwuna, F.C.; Odume, O.N.; Richoux, N.S. (2023): Agricultural disturbance affects taxonomic and functional diversity of Afrotropical macroinvertebrate composition in a South African river system. Environmental and Sustainability Indicators 18, 100251: 12 pp. (in English) ["Highlights: • We identified indicator taxa and indices of agricultural pollution. • Macroinvertebrate communities responded differentially to agricultural pollution. • Lymnaea spp., L. columella, Appasus spp. Biomphalaria spp., Trithemis spp. and Oligochaeta were tolerant to agriculture. • Afroptilum spp., P. piscis., B. harrisoni, Potamonautes spp. and Pseudocloeon spp. were sensitive to agriculture. Abstract: Developing species-level biomonitoring tools to monitor riverine systems threatened by anthropogenic pollution, including local agricultural activities in the Afrotropical region, remain a critical challenge. Here we explored the utility of taxonomic-based (diversity, richness, and composition) as well as functional-based (functional diversity) indices to examine the effects of

agricultural disturbance on macroinvertebrate communities in the Kat River, Eastern Cape Province of South Africa. We collected physicochemical parameters and macroinvertebrates from eight sites delineated into four land-use categories (highly impacted, HIC; impacted category, IC; moderately impacted, MIC and least impacted, LIC) using agricultural land cover. We recorded 70 macroinvertebrate taxa belonging to 49 families and 48 genera in the Kat River. Redundancy analysis (RDA) and Pearson correlation analysis revealed that species of Lymnaeidae, Belostomatidae, Planorbidae and Libellulidae families and class Oligochaeta were tolerant to agricultural disturbance, as they were dominant in the highly impacted sites and were significantly associated with high salinity, temperature, total dissolved solids (TDS), flow velocity and nutrients. Conversely, species of Baetidae, Caenidae and Potamonautidae were negatively associated with the highly impacted sites and high salinity, temperature, and nutrients. On the other hand, taxonomic indices showed more sensitivity to indicators of agricultural pollution than functional indices, with taxon richness, Shannon index, Simpson's index and Margalef's index declining significantly in the highly disturbed sites ($p<0.05$). They were negatively associated with high electrical conductivity, large river width, and high nitrite and nitrate concentrations; hence they were identified as indicator metrics sensitive to agricultural pollution. Overall, our study revealed that agricultural disturbance could differentially affect the structure and function of macroinvertebrates, and indicator taxonomic and functional indices were identified for long-term monitoring of rivers that drain agricultural landscapes." (Authors) Odonata are treated at family level.] Address: Akamagwuna, F.C., Dept Zoology & Entomology, Rhodes University, Makhanda, 6140, South Africa. Email addresses: f.akamagwuna@ru.ac.za

21695. Akindele, E.O.; Adedapo, A.M.; Fagbohun, I.R.; Akinpelu, O.T.; Aliu, O.O.; Kowobari, E.D. (2023): Macroinvertebrate metric indicators should be juxtaposed with the community conservation index as ecological tools for conservation evaluation of pristine freshwater ecosystems. Biologia 78: 1067-1078. (in English) ["The ecological significance of freshwater ecosystems for conservation in the temperate zone has been determined by aquatic biologists using a variety of ecological techniques. One such tool is the Community Conservation Index (CCI), which was primarily developed in Britain but is also recommended for international use. The current study intends to further test the CCI's applicability and its sensitivity in identifying freshwater systems of high conservation importance. The pristine condition of three natural monument (Arinta, Ekor, and Oowu waterfalls) streams was evaluated in this study using the macroinvertebrate metric indicators, and the results were compared with their CCIs. The relative compositions of stress-sensitive species, facultative species, functional feeding guilds (FFGs), and modes of locomotion or microhabitat preference (ML/MP) were selected as the macroinvertebrate metrics. The fauna was dominated by the taxonomic group EPT (Ephemeroptera, Plecoptera, Trichoptera), with the highest EPT-related metrics found at Oowu Waterfalls. Ironically, because a vulnerable species (i.e. Pentaphlebia stahli) is present there, the Ekor Waterfalls, which had the lowest values for the EPT-related metrics, had the highest CCI. Although both the CCI (>20) and macroinvertebrate metrics suggest that the three sites had high conservation value, the CCI proved to be more goal-oriented in determining the conservation value of pristine freshwater ecosystems. In light of the findings of this study, it is recommended that the CCI be utilized in conjunction with macroinvertebrate metric indicators for studies of a similar nature, particularly in Afrotropics' protected and pristine sites that are a potential refuge for rare and threatened species." (Authors)] Address: Akindele, E.O., Dept Zoology, Obafemi Awolowo Univ., Ile-Ife, Nigeria

21696. Alvarez-Alvarez, K.L.; Cortés-Hernández, M.Á.; Vásquez-Ramos, J.M.; Bota-Sierra, C.A. (2023): Libélulas del campus Barcelona de la Universidad de los Llanos, Villavicencio, Colombia. Ecosistemas 32(1): 2442. https://doi.org/10.7818/ECOS.2442: 6 pp. (in Spanish, with English summary) ["We present a checklist of the odonatofauna of the Barcelona campus of the Universidad de los Llanos, all the specimens are deposited in the entomological collection of the Museo de Historia Natural Unillanos– MHNU-E. In total, 424 specimens were recorded, grouped in 7 families, 31 genera and 61 species, of which 11 species are new records for the department of Meta. This study provides evidence of the high levels of diversity in the Barcelona campus, despite the different anthropic activities that are carried out, indicating the need to implement this information in the environmental conservation policies of the Universidad de los Llanos." (Authors) 10 species are reported as new records for the department of Meta: Argia insipida, Brechmorhoga praedatrix, Hetaerina westfalli, Idiataphe amazonica, Miathyria simplex, Micrathyria spuria, Oligoclada pachystigma, Orthemis schmidti, Planiplax sanguiniventris, Argia collata.] Address: Álvarez-Álvarez, Karen Lineke, Grupo de Invest. Eval., Manejo y Conserv. Recursos Hidrobiol. y Pesqueros, Univ. de los Llanos, km 12 vía Puerto López, vereda Barcelona, Meta, Colombia. Email: karen.alvarez@unillanos.edu.co

21697. Amrulloh, M.F.F.; Arifin, M.; Aini, N.; Shinta, A.; Nihayah J, A.Z. (2023): Keanekaragaman Capung (Odonata) di Kawasan Sungai Gendol, Jambon, Ngemplak, Sleman, Yogyakarta Pasca Banjir Lahar Dingin Gunung Merapi. Science and educational Journal 1(1): 37-45. (in Indonesian) ["The research aims to determine the diversity (Odonata) in the Kali Gendol area after the cold lava flood of Mount Merapi. The research was conducted in November 2015 for ±10 hours of total observation. The method used is the point count method, namely following the transect line accompanied by making 10 observation points with a distance between points of 50 m, at each point dragonflies are caught with insect nets at a radius of 10 m from the observation point for 15 minutes. Captured dragonflies are further identified using determination books or research journals. The calculation of the Dragonfly Diversity Index was carried out using the Shannon-Wiener (H') formula. The results showed that there were 13 species of dragonflies found, 6 species from 2 families of the order Anisoptera with 25 individuals and 8 species from 4 families of the Zygoptera order with 359 individuals. The highest relative abundance was Libellago lineata (32.81%), followed by Pseudagrion pruinosum (30.21%), Copera marginipes (20.31%). The diversity index of dragonflies obtained in the Kali Gendol area, Jambon, Ngemplak, Sleman, Yogyakarta after the cold lava flood of Mount Merapi was 0.71. This indicates that the diversity of dragonflies in the Kali Gendol area is relatively low due to several factors including biotic and abiotic factors." (Authors/Google Translate)] Address: Amrulloh, M.F.F., Biol. Education, Fac. of Education, Timor Univ., J1 Kefamenanu KM.09, Sasi, Kefamenanu, Timor Tengah Utara, Nusa Tenggara Timur, Indonesia - 85614. Email: mohamadfaiar@unimor.acid

21698. Assefa, W.W.; Eneyew, B.G.; Wondie, A. (2023): Macroinvertebrate assemblages along a gradient of physicochemical characteristics in four riverine wetlands, Upper Blue Nile basin, Northwestern Ethiopia. Environmental Monitoring and Assessment 195, Article number: 643: (in English)

["This study aims to examine the physicochemical variables that influence macroinvertebrate assemblages in wetlands of the Fetam River watershed. Macroinvertebrates and water quality samples were collected from 20 sampling stations across four wetlands between February and May 2022. Principal component analysis (PCA) was used to elucidate the physicochemical gradients among datasets and canonical correspondence analysis (CCA) was applied to explore the relationship between taxon assemblages and physicochemical variables. Aquatic insects such as Dytiscidae (Coleoptera), Chironomidae (Diptera), and Coenagrionidae were the most abundant families, and they comprised 20–80% of the macroinvertebrate communities. As demonstrated by cluster analysis, three site groups including slightly disturbed (SD), moderately disturbed (MD), and heavily disturbed (HD) sites were identified. PCA showed a clear separation of slightly disturbed sites from moderately and highly impacted sites. Differences in physicochemical variables, taxon richness and abundance, and Margalef diversity indices were observed along the SD to HD gradient. Phosphate concentration was an important predictor that influenced richness and diversity. The extracted two CCA axes of physicochemical variables accounted for 44% of the variability in macroinvertebrate assemblages. Nutrient concentration (nitrate, phosphate, and total phosphorus), conductivity, and turbidity were the main drivers of this variation. This suggested the need for sustainable wetland management intervention at the watershed level, ultimately benefiting invertebrate biodiversity." (Authors)] Address: Assefa, W.W., School of Fisheries & Wildlife, Dept of Biology & Blue Nile Water Institute, Bahir Dar University, Bahir Dar, Ethiopia

21699. Banda, K.; Ngwenya, V.; Mulema, M.; Chomba, I.; Chomba, M.; Nyambe, I. (2023): Influence of water quality on benthic macroinvertebrates in a groundwater-dependent wetland. Frontiers in Water 5: 1177724: 11 pp. (in English) [Zambia "Benthic invertebrates communities are frequently used as indicators of aquatic ecosystem health since many species are sensitive to pollution and abrupt changes in their environment. Limited knowledge exists on the interlinkages of hydrological dynamics, water quality and the ecological character of groundwater-dependant ecosystems especially in developing countries. In this study we assessed the sensitivity of benthic macroinvertebrates to water quality dynamics in the Barotse Floodplain, a groundwater-dependant wetland. Benthic invertebrates were sampled in the dry season using the kick-net method at selected points upstream, mid-stream and downstream. The selection of sampled points was based on an initially conducted water quality survey that characterized the wetland into mainly two water types, $NaHCO_3$ (upstream) and $CaMgHCO_3$ (downstream). Canonical Correspondence Analysis (CCA) was used to investigate the influence of water quality on macroinvertebrate subclass-taxa level. Furthermore, factor analysis was used to derive the processes propagating the observed water quality variability. It was established that the composition and diversity of macroinverbrate communities at subclass-taxa level was influenced by effects of the wetland flood pulse, salinity (mineralisation) from groundwater input and biogeochemical processes during the expansion and contraction of the floodplain-river exchange. This study has demonstrated that biomonitoring was effective in capturing the natural processes/regimes of the environmental (such as flooding) and thus has potential to be used for mointoring extreme effects of phenomenon such as climate change. It is recommended that, the families, genus and species taxonomic levels are needed to improve the understanding of responses of the subclass-taxa level and the detection of specific contamination signatures, to ensure wetland conservation and protection. Integrated water resources management for wetlands thus should incorporate biomonitoring conjuctively with traditional methods to ensure vital ecosystems are not compromised at the expense of maximizing the economic and social welfare of humanity." (Authors) Taxa - including "Odonata" - are treated at the order level.] Address: Kawawa Banda, Integrated Water Resource Management Centre, Dept of Geology, School of Mines, Univ. of Zambia, Lusaka, Zambia

21700. Bandara, Y.M.; Samarasinghe, L.V.; De Silva Ranasinghe, A.N.; Peiris, S. (2023): Diversity of dragonflies and damselflies (Order Odonata) in Bellanwila-Attidiya sanctuary at Ramsar City Colombo, Sri Lanka. Citizen Scientist Symposium on Conservation and Ecology: 19. (in English) ["Odonata are one of the most popular insect species in the world. About 132 species are recorded in Sri Lanka. They are widespread in ecosystems such as reservoirs, open fields, forests, and agricultural lands. Bellanwila Attidiya Sanctuary is an urban wetland in the lowland wet zone of Sri Lanka. Being located in a highly urbanized area, the level of contamination of the soil and water in this area and its impact on the biological balance is high. Odonata are considered as bioindicators, so the study was carried out to identify the diversity of Odonata in the area. Observations were carried out in three selected 100m long transects between 0600h to 0900h in the morning, monthly for a period of six months from November 2021 to March 2022. Data acquisition was carried out with the naked eye and binoculars, and photographed where necessary. The data were analysed using Microsoft Excel software and diversity indices. During the study, 13 species of Odonata belonging to three families, including nine species of Anisoptera and four species of Zygoptera were recorded from Bellanwila Attidiya Sanctuary. In Anisoptera, Family Libellulidae was well represented by eight species, followed by Family Gomphidae (1 species). Accordingly, the overall Shannon-Weiner index for all transects is 1.66, and Simpson's index is 0.75. Brachythemis contaminata, Ceriagrion coromandelianum, and Ischnura elegans were highest abundant, while Tholymis tillarga, Urothemis signata, and Pseudagrion microcephalum being the lowest. Compared with previous studies, the diversity of Odonata in the study area is low, while a few species dominate the area. The loss of diversity can be due to land and water pollution, the increase of invasive plant and animal species, and changes in natural conditions over time. The prevalence of Brachythemis contaminata, used as an environmental indicator, testifies to environmental pollution in the area." (Authors)] Address: Bandara, Y., Young Zoologists'Association of Sri Lanka, National Zool. Gardens, Anagarika Dharmapala Mawatha. Dchiwala, Sri Lanka. Email: bandarabachi@gmail.com

21701. Beresford, N.A.; Gashchak, S.; Wood, M.D.; Barnett, C.L. (2023): Mammals in the Chornobyl Exclusion Zone's Red Forest: a motion-activated camera trap study. Earth Syst. Sci. Data 15: 911-920. (in English) [Also a dragonfly was captured on the motion-activated digital trap cameras. "Since the accident at the Chornobyl Nuclear Power Plant in 1986, there have been few studies published on medium and large mammals inhabiting the area from which the human population was removed (now referred to as the Chornobyl Exclusion Zone, CEZ). The dataset presented in this paper describes a motionactivated camera trap study (n D 21 cameras) conducted from September 2016 to September 2017 in the Red Forest located within the Chornobyl Exclusion Zone. The Red Forest, which is likely the most anthropogenically contaminated radioactive terrestrial

ecosystem on earth, suffered a severe wildfire in July 2016. The motionactivated trap cameras were therefore in place as the Red Forest recovered from the wildfire. A total of 45 859 images were captured, and of these 19 391 contained identifiable species or organism types (e.g. insects). A total of 14 mammal species were positively identified together with 23 species of birds (though birds were not a focus of the study). Weighted absorbed radiation dose rates were estimated for mammals across the different camera trap locations; the number of species observed did not vary with estimated dose rate. We also observed no relationship between estimated weighted absorbed radiation dose rates and the number of triggering events for the four main species observed during the study (brown hare, Eurasian elk, red deer, roe deer). The data presented will be of value to those studying wildlife within the CEZ from the perspectives of the potential effects of radiation on wildlife and also rewilding in this large, abandoned area. They may also have value in any future studies investigating the impacts of the recent Russian military action in the CEZ. The data and supporting documentation are freely available from the Environmental Information Data Centre (EIDC) under the terms and conditions of a Creative Commons Attribution (CC BY) license: https://doi.org/10.5285/bf82cec2-5f8a-407c-bf74-f8689ca35e83 (Barnett et al., 2022a)." (Authors)] Address: Beresford, N.A., UK Centre Ecology & Hydrology, Lancaster Environment Centre, Bailrigg, Lancaster, LA11 4AP, UK. Email: nab@ceh.ac.uk

21702. Boieiro, M.; Antunes, S.; Figueiredo, H.; Soares, A.; Lopes, A.; Monteiro, E.; Garcia-Pereira, P.; Rego, C.; Conde, J.; Borges, P.A.V.; Serrano, A.R.M. (2023): Standardised inventories of lepidopterans and odonates from Serra da Estrela Natural Park (Portugal) - setting the scene for mountain biodiversity monitoring. Biodiversity Data Journal 11: e99558: 22 pp. (in English) ["Background: Mountain insect biodiversity is unique, but is menaced by different drivers, particularly climate and land-use changes. In mainland Portugal, the highest mountain - Serra da Estrela - is one of the most important biodiversity hotspots, being classified as Natural Park since 1976. Many lepidopteran and odonate species, including rare and protected species, are known to occur in Serra da Estrela, but basic knowledge on their abundance, distribution and ecology is still lacking. Standardised sampling of these communities is crucial to provide valuable biological information to support short-term decision-making for conservation management, setting simultaneously the standards for mountain biodiversity monitoring aiming to tackle the effects of environmental change in the long-term. New information: This study reports novel information on lepidopteran and odonate species diversity, distribution and abundance from Serra da Estrela Natural Park (Portugal). 72 lepidopteran and 26 odonate species were sampled in this protected area, including the first findings of Apatura ilia, Macromia splendens and Vanessa virginiensis. New populations of Euphydrias aurinia and Oxygastra curtisii, protected species under the Habitats Directive, were found in this Natural Park and novel distribution and ecological data were collected for most species, including several rare species and subspecies [e.g. Aeshna juncea, Coenonympha glycerion iphioides Staudinger, 1870, Cyaniris semiargus and Sympetrum flaveolum. All data were collected using standardised sampling allowing its use as a baseline for biodiversity monitoring in Serra da Estrela." (Authors)] Address: Boieiro, M., Centre for Ecology, Evolution and Environmental Changes (cE3c)/Azorean Biodiversity Group, CHANGE – Global Change & Sustainability Inst., Fac. of Agricultural Sciences & Environment, Univ. of the Azores, Angra do Heroísmo, Azores, Portugal. Email: mrboieiro@fc.ul.pt

21703. Cadena, J.T.; Boudot, J.-P.; Kalkman, V.J.; Marshal, L. (2023): Impacts of climate change on dragonflies and damselflies in West and Central Asia. Diversity and Distributions 29: 912-925. (in English) ["Aim: To project the impact of climate change on dragonfly and damselfly diversity in West and Central Asia. Location: West and Central Asia. Time period: 1900–2020 data used to predict distributions in 2070 and 2100. Methods: Based on 149,001 records, distribution models were created for 159 species using MaxEnt. Environmental variables consisted of climate variables taken from BIOCLIM, river data and soil data. The future climate data were obtained from CHELSA from CMIP6 climate models. The same variables were collected for three scenarios (SSP1-2.6, SSP3-7.0 and SSP5-8.5) of shared socioeconomic pathways for the years 2050–2070 and 2080–2100. For each scenario and period, diversity maps were prepared for six species groups: all species, Lentic, Lotic, Oriental, Afrotropical and Palaearctic species. Results: Strong declines in diversity are expected in western Turkey, the Levant and Azerbaijan, and to a lesser extent in parts of Iran and southern Central Asia. An in crease is expected in eastern Turkey and at higher elevations in Central Asia with a limited increase throughout the Arabian Peninsula. In contrast to expectations, a decrease in areas with <15 species was found. Faunal composition is predicted to show strong shifts, with Palaearctic species declining and Oriental and Afrotropical species increasing. No clear difference between the trend of lentic and lotic species is found, although there are clear spatial differences in trend between these groups. Main Conclusions: Climate change will result in strong changes in diversity and distribution of dragonflies and damselflies in West and Central Asia with regional declines and increases. None of the species are predicted to go extinct based on the impact of climate change only, however, the combined impact of climate change and anthropogenic forces is likely to push some of the species to near extinction by 2100." (Authors)] Address: Kalkman, V.J., Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands. Email: vincent.kalkman@naturalis.nl

21704. Cano-Cobos, Y.; Bota-Sierra, C. A.; Mendoza-Penagos, C. (2023): Ten new records of Odonata for Colombia (Coenagrionidae, Aeshnidae). Biota Colombiana 24(2), e1112: 7 pp. (in English, with Spanish ummary) ["We report ten new records of Odonata, including the true distribution of Acanthagrion yungarum Ris, 1918 in Colombia. The genus Dolonagrion Garrison & von Ellenrieder, 2008 is reported for the first time in the country with notes of its habitat. The other eight new records are A. amazonicum Sjöstedt, 1918, A. phallicorne Leonard, 1977, A. truncatum Selys, 1876, Mesoleptobasis cantralli Santos, 1961, Metaleptobasis lillianae Daigle, 2004, Neoneura denticulata Williamson, 1917, Neuraeschna maya Belle, 1989, and Protoneura klugi Cowley, 1941. A map of localities and photographs of the species are provided." (Authors)] Address: Cano-Cobos, Yiselle, Lab. Biodiversidad y Genética Ambiental (BioGeA), Univ. Nac. de Avellaneda, Argentina

21705. Cunha Ribeiro, G.; Nel, A. (2023): A new dragonfly genus and species from the Crato Formation, with a revised phylogenetic study of the Mesozoic family Liupanshaniidae (Odonata: Aeshnoptera). Cretaceous Research 148, 105545: (in English) ["The fourth genus and species of the Cretaceous aeshnopteran family Liupanshaniidae discovered in the Aptian Crato Formation, is described and illustrated as Brasiliupanshania cretacica gen. et sp. nov. Its phylogenetic position within the Liupanshaniidae is investigated using parsimony analyses, and it was found nested within the Liupanshaniidae. The Gondwanan species of the family do not

form a clade, but appears to be more closely related to various Laurasian clades, suggesting a very ancient Mesozoic diversification prior to Gondwana-Laurasia split." (Authors)] Address: Cunha Ribeiro, G., Univ. Federal Do ABC, Centro de Ciências Naturais e Humanas (CCNH), Santo André, São Paulo, Brazil. Email: guilherme.ribeiro@ufabc.edu.br

21706. Czechowski, P., Dubicka, A., Gajda, K., Mleczak, M., Orzechowski, R., Rychła, A. (2023): Wybrane grupy owadów (Insecta). – Selected groups of insects (Insecta). In: G. Gabrys, L. Jerzak, M. Maciantowicz (eds.). W krainie sosny. Lesny Kompleks: 296-324. (in Polish, with English summary) [Table 1. lists 56 of species of Odonata observed in the area of the Forest Park "Bory Lubuskie" together with the protection status] Address: Czechowski, P., Instytut Sportu, Turystyki i Zywienia, Uniwersytet Zielonogörski, ul. Profesora Zygmunta Szafrana 1,65-516 Zielona Göra, Poland. Email: p.czechowski@wnb.uz.zgora.pl

21707. Das, B.K.; Kunui, A.; Nandy, S.K.; Sahoo, A.K.; Meena, D.K.; Paul, S.K.; Sarkar, U.K.; Mondal, K. (2023): Altitudinal and seasonal distribution of benthic macroinvertebrates in River Tons — a tributary of Yamuna River, Uttarakhand, India. Environmental Monitoring and Assessment 195, Article number: 902: (in English) ["The main tributary of the Yamuna, the Tons River, exhibits altitudinal changes in its macroinvertebrate community's diversity, abundance, and composition. Between May 2019 and April 2021, the study was conducted in the upper section of the river. A total of 48 numbers of taxa from 34 families and ten orders were recorded during the investigation. At this elevation of 1150 to 1287 m, the two most predominant orders are Ephemeroptera (32.9%) and Trichoptera (29.5%). During the premonsoon season, they had the lowest macroinvertebrate density (250–290 individuals/m^2), and the post-monsoon season had the highest density (600–640 individuals/m^2). During the post-monsoon season, the maximum larval forms (60%) of various insect orders were predominant. The findings indicated that lower altitudes (1150–1232 m) have higher macroinvertebrate abundance than higher ones. The diversity of dominance is shallow at site-I (0.0738) and strong at the site-IV during the premonsoon season (0.03837). Taxa richness, as measured by the Margalef index (D), peaked in the spring season (January to March) at 6.9 and reached its lowest point (5.74) in the premonsoon season (April to May). Only 16 taxa were discovered in site-I and site-II, but 39 taxa were discovered at low altitudes (site-IV, 1100 m) (1277–1287 m). The Tons River contains a total of 12 and 13 genera, respectively, that belong to the orders Ephemeroptera and Trichoptera, according to qualitative study of the macroinvertebrates. The current study supports the use of macroinvertebrates as bioindicator species for monitoring biodiversity and assessing the health of ecosystems." (Authors) In site-IV Ophiogomphus sp. ... was the most prominent species during premonsoon.] Address: Das, B.K., ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal, 700120, India

21708. Datta, D.; Agarwala, B.K.; Majumder, J. (2023): Addition to the Odonata fauna of Tripura, India. Journal of Threatened Taxa 15(6): 23327-23337. (in English, with Bengali summary) ["The present study was conducted in nine different locations (forested areas and unclassified natural areas) of six administrative districts of Tripura State from March 2012 to May 2019 as part of the biodiversity exploration of the state for further addition of odonate fauna. ... Before this study, quality field data on distribution and habitat preference of odonates was scanty from most of the eastern Himalayan range, particularly from the southern and eastern parts including the state Tripura of India. Present study is a substantial advancement of the odonate diversity of Tripura over the earlier studies (Srivastava & Sinha 2000; Majumder et al. 2014). After this study with addition of 13 species, the updated odonate fauna of Tripura state is represented by 75 species under 49 genera (28 Anisoptera genera and 21 Zygoptera genera) and nine families (4 Anisoptera and 5 Zygoptera); ... M. montanus, D. walli and E. campioni showed Data Deficient as per IUCN Red List categories of threatened species. Among the 13 species reported here, 12 species are endemic to India except D. walli as per Subramanian & Babu (2017). P. magdalena, Macrogomphus montanus, Tetrathemis platyptera, Tramea limbata, Trithemis festiva, Z. petiolatum, Aciagrion occidentale, Argiocnemis rubescens, Mortonagrion aborense, Elattoneura campioni, Prodasineura verticalis, Pseudocopera ciliata are endemic to India recorded from this study. Members of T. festiva are found commonly near streams and those of Zyxomma petiolatum are common in shady areas surrounded by big trees and shrubs. Members of Aciagrion occidentale, Argiocnemis rubescens, Mortonagrion aborense, P. ciliata are very common in their respective study sites. However, P. magdalena, M. montanus, T. platyptera, T. limbata, Dysphaea walli, E. campioni, P. verticalis are found to be comparatively rare in their study sites. The documenting of the regional species pool from this part of India has benefited the inclusion of previously unrecorded odonate species, which will help future researchers in the understanding of species biology, distributional ranges, and prospective habitats." (Authors)] Address: Datta, D., Ecology and Biodiversity Laboratories, Dept of Zoology, Tripura University, Suryamaninagar, Tripura 799022, India. Email: dhimandata991@gmail.com

21709. Deacon, C.; Govender, S.; Samways, M.J. (2023): Overcoming biases and identifying opportunities for citizen science to contribute more to global macroinvertebrate conservation. Biodiversity and Conservation 32: 1789-1806. (in English) ["Citizen Science (CS) provides valuable data to assist professional scientists in making informed decisions on macroinvertebrate conservation. However, CS is not developed nor implemented uniformly across the globe, and there are biases and challenges in the extent that it can contribute to global macroinvertebrate conservation. Here, a meta-analysis was performed using 107 Citizen Science Projects (CSPs) to identify underlying biases related to taxon representativity, country wealth, and demographic participation. Macroinvertebrate orders with the highest representativity were Lepidoptera and Hymenoptera, accounting for 53% of represented macroinvertebrate groups. The orders Scorpiones, Parasitiformes, and Spirobolida had proportionately the highest IUCN threat statuses, but significantly lower CSP representation, indicating that these orders require more public attention. Hymenoptera, Odonata, Coleoptera, Hemiptera, Diptera and Clitellata had the highest levels of Data Deficient species, suggesting that the primary objective of CSPs targeted at these orders should be collecting distribution and abundance data to improve Red List assessments. Global distribution of CSPs was uneven and the number of CSPs per country was positively correlated with national Gross Domestic Product (GDP) and GDP per capita, suggesting that countries with relatively low GDP face challenges to successfully establish and maintain CSPs. Establishing new CSPs can assist macroinvertebrate conservation in these countries, where biodiversity levels are often high. To accommodate these biases, CSP development should adopt a bottom-up approach, in which CSPs are designed to address data gaps, and to address local

socio-economic limitations and cultural ideologies. Guidelines for such development are presented here, with emphasis on addressing societal variations and inter-disciplinary communication gaps to ensure equitable opportunities for CSP participation." (Authors)] Address: Deacon, C., Dept Conserv. Ecol. & Ento., Stellenbosch Univ., P/Bag X1, Matieland 7602, South Africa. Email: charldeacon@sun.ac.za

21710. El Yaagoubi, S.; El Alami, M.; Harrak, R.; Azmizem, A.; Ikssi, M.; Mansour, M.R.A. (2023): Assessment of functional feeding groups (FFG) structure of aquatic insects in North- western Rif - Morocco. Biodiversity Data Journal 11: e104218. doi: 10.3897/BDJ.11.e104218: 23 pp. ["The involvement of trait-based approaches is crucial for understanding spatial patterns, energy flow and matter transfer in running water systems, which requires consistent knowledge of the functional structures of aquatic communities, with the advantage of combining physical properties and behavioral mechanisms of food acquisition rather than the taxonomic group. The present study indicated how functional feeding groups may be used as a proxy for classical taxonomic evaluation, as well as the potential interest in incorporating them as indicators of anthropogenic stressors. The composition and abundance of the functional feeding groups of aquatic insects were examined from September 2021 to August 2022 along the Western Rif Region. Benthic samples were collected from nine sampling points in the studied area using a Surber sampler with a mesh size of 500 µm and a diameter of 20*20 cm. The stations included in this work were chosen for their accessibility as well as their position on the hydrographic systems. The abundance of sampled aquatic organisms in the whole study area revealed 5,342 individuals belonging to 60 families and seven orders of aquatic insects, classified into five feeding functional groups. In terms of abundance, Collectorgatherers (Ephemeroptera and Diptera) were the most abundant trophic group at most of the sites, with a proportion of 38.47%. Predators (Coleoptera, Hemiptera and Odonata) were the second group at all sites, followed by Collector-filters, accounting for 39.53%, 28.14% and 22.37% respectively, while Scarpers and Shredders had the lowest representation across all sites with 4.16%. The high number of registered Collectors could be related to their ability to feed on a diverse range of food items compared to the remaining trophic guilds. According to the Canonical Correspondence Analysis results, physicochemical (i.e. T, pH, BOD, Cl- and NO -) and hydromorphological (i.e. current velocity and depth) variables were amongst the key predictors of shaping the functional structure of aquatic biota during this investigation. It is highly recommended to carry out suitable measures to largely attenuate anthropogenic pressures in order to preserve the integrity of freshwater bodies and their biota." (Authors)] Address: El Yaagoubi, Sara, Laboratoire Ecologie, Systématique, Conservation de la Biodiversité, LESCB URL-CNRST N°18, FS, Abdelmalek Essaadi University, Tétouan 93000, Morocco. Email: Sara El Yaagoubi (sara.elyaagoubi@etu.uae.ac.ma)

21711. Elme-Tumpay, A.; Bustamante-Navarrete, A.; Zuñiga-Rivas, D.B.; Yabar-Landa, E. (2023): Catalogación de las libélulas (Insecta: Odonata) de un humedal andino en el departamento de Cusco, Perú. Revista Chilena de Entomología 49(2): 325-330. (in Spanish, with English summary) ["Three species of odonates represented in the Entomological Collection of the Universidad Nacional de San Antonio Abad del Cusco (ECUC) are cataloged for the Andean Wetland Lucre -Huacarpay, department of Cusco, Peru, and distribution data for these species are provided." (Authors) Rhionaeschna absoluta (Calvert, 1952); Sympetrum gilvum (Selys, 1884); Protallagma titicacae (Calvert, 1909)] Address: Elme-Tumpay, A., Lab. Biodivers. y Genética Ambiental (BioGeA), Univ. Nac. de Avellaneda, Mario Bravo 1460, CP1870 Piñeyro, Avellaneda, Buenos Aires, Argentina. Email: araselmt@gmail.com

21712. Endersby, I. (2023): Catalogue of Australian fossil dragonflies. Busybird Publishing. ISBN: 978-1-922954-22-0 (print). 123 pp. In English [Ian Endersby compiles the available information of known Australian fossil Odonata organizing it according Name of taxon, family, Repository (Museum), Registration Number(s), Original description, Etymology, Locality/Geocordinates, Palaeocoordinates, Stratigraphic Information, Geological Age, Other References, Collector and Date, Voucher Information from Description, Comments, Figure(s) of specimens. There are 27 counterparts so, if part and counterpart are counted separately, there are 89 specimens. [61 + 27 = 89 of which 8 (4 parts; 4 counterparts) are no longer recognised as dragonflies.] Prints or pdf are available from the author.] Address: Endersby, I., 56 Looker Rd, Montgomery, Victoria 3094, Australia. E-mail: endersby@pacific.net.au

21713. Engelhardt, E.K.; Bowler, D.E.; Hof, C. (2023): European Habitats Directive has fostered monitoring but not prevented species declines. Conservation Letters 16(3) e12948: 10 pp. (in English) ["Strong biodiversity declines have been reported across the European Union, especially in insects, despite conservation policy such as the Habitats Directive that aims to halt biodiversity loss. Using 50 years of observational data, we examined indicators for the goals of the Directive in terms of improving monitoring efforts and occupancy trends of butterfly and dragonfly annex species in a central European region. We quantified annual monitoring effort and used occupancy-detection models to compare species trends for 18 years before and after legal implementation of the Directive. Monitoring efforts increased after implementation, while occupancy trends both improved and deteriorated. Contrary to its main goal, the European Habitats Directive did not prevent a worsening of all annex species' occupancy trends in the studied region. While the increased monitoring efforts aid biodiversity assessments, more serious broad-scale conservation measures are needed to halt biodiversity loss across Europe." (Authors)] Address: Engelhardt, Eva Katharina, Technical University of Munich, Hans-Carl-von-Carlowitz-Platz 2, 85350 Freising-Weihenstephan, Germany. Email: e.k.engelhardt@tum.de

21714. Ewunkem, A.J.; Beard, A.F.; Brittany L. Justice, B.L.; Peoples, S.L.; Meixner, J.A.; Kemper, W.; Iloghalu, U.B. (2023): Honeybee wings hold antibiofouling and antimicrobial clues for improved applications in health care and industries. AIMS Microbiology 9(2): 332-345. (in English) ["Natural surfaces with remarkable properties and functionality have become the focus of intense research. Heretofore, the natural antimicrobial properties of insect wings have inspired research into their applications. The wings of cicadas, butterflies, dragonflies, and damselflies have evolved phenomenal anti-biofouling and antimicrobial properties. These wings are covered by periodic topography ranging from highly ordered hexagonal arrays of nanopillars to intricate "Christmas-tree" like structures with the ability to kill microbes by physically rupturing the cell membrane. In contrast, the topography of honeybee wings has received less attention. The role topography plays in antibiofouling, and antimicrobial activity of honeybee wings has never been investigated. Here, through antimicrobial and electron microscopy studies, we showed that pristine honeybee wings displayed no microbes on the wing surface. Also, the wings displayed antimicrobial properties that disrupt microbial cells and inhibit

their growth. The antimicrobial activities of the wings were extremely effective at inhibiting the growth of Gram-negative bacterial cells when compared to Grampositive bacterial cells. The fore wing was effective at inhibiting the growth of Gram-negative bacteria compared to Gram-positive samples. Electron microscopy revealed that the wings were studded with an array of rough, sharp, and pointed pillars that were distributed on both the dorsal and ventral sides, which enhanced anti-biofouling and antimicrobial effects. Our findings demonstrate the potential benefits of incorporating honeybee wings nanopatterns into the design of antibacterial nanomaterials which can be translated into countless applications in healthcare and industry.] Address: Ewunkem, A.J., Department of Biological Sciences, Winston Salem State University, Winston-Salem, North Carolina, USA

21715. Faasen, T. (2023): Tukanobasis huamantincoae, a new species of damselfly from Peru (Odonata: Coenagrionidae), with updated generic characterization. International Journal of Odonatology 26: 54-62. (in English) ["Tukanobasis huamantincoae sp. n. (holotype male: Peru, Loreto Región [MUSM]) is described and illustrated. Males of T. huamantincoae can be distinguished from T. corbeti by the presence of postocular spots and antehumeral stripes, the absence of apical brown wingspots, smaller number of postnodals, shorter CuA, vein descending from quadrangle not forming straight line to wing margin, pterostigma in HW distally distinctly yellow, S8–10 orange/red, cerci more strongly curved and with apical blunt appendix, genital ligula with triangular lateral lobes and overall smaller body dimensions. With the description of this second species of Tukanobasis it becomes clear that some characters previously attributed to the genus are species-specific, requiring an updated generic characterization." (Author)] Address: Faasen, T., Ecologica, Rondven 22, 6026PX, Maarheeze, The Netherlands. Email: tim.faasen@ecologica.eu

21716. Farfán-Beltrán, M.E.; Arellano-Aguilar, O.; Córdoba--Aguilar, A. (2023): Understanding the impact of physico-chemical parameters on aquatic invertebrates in Lake Chalco, Mexico City. Revista Mexicana de Biodiversidad 94, e944846: 14 pp. (in English, with Spanish summary) ["Many urban environments are places with strong stressors that substantially modify water quality. Although tests evaluating water quality are usually physico-chemical, including biological components can also provide relevant information. Lake Chalco, at the border between Mexico City and Estado de México, interacts with the surrounding human population. We investigated some water quality parameters and the community of macroinvertebrates living in Lake Chalco. From January to October 2017, we sampled water along the shoreline in 4 permanent areas of the lake. We recorded the NH_4+, NO_3-N, NO_2-N, total P, Zn, Cu^{2+}, ORP, DO, TDS, conductivity, and pH. In addition, we characterized the richness, composition, and abundance of the macroinvertebrate community. There was spatial and temporal variation in physico-chemical parameters, perhaps due to the agricultural activity around the lake. Nevertheless, water quality was unable to be placed in a category of the national law. Four out of 20 macroinvertebrate RTU's significantly correlated with environmental variables. Thus, no bioindicators could be proposed. In general, lake water quality is poor, so it is not recommended for anthropic activities. Yet, the lake may be important as a center of dispersion for aquatic invertebrates." (Authors) Only Anax junius is listed in an appendix of recorded taxa.] Address: Farfán-Beltrán, M.E., Univ. Nac. Autónoma de México, Inst. de Ecología, Depto de Ecol. Evol., AP 70-275, Ciudad Universitaria, 04510 Ciudad de México, Mexico

21717. Fekete, J.; De Knijf, G.; Dinis, M.; Padisák, J.; Boda, P.; Mizsei, E.; Várbíró, G. (2023): Winners and losers: Cordulegaster species under the pressure of climate change. Insects 14, 348. https://doi.org/ 10.3390/insects14040348: 15 pp. (in English) ["Simple Summary: Climate change is already affecting biodiversity and will do so even more in the future. As bioclimatic parameters, such as precipitation and temperature, directly or indirectly determine the occurrence of species, the accelerated changes in these variables could have a huge impact on species distributions. In this study, we aimed to use species distribution modeling to predict the potential distribution of the Balkan Goldenring (Cordulegaster heros) and the Two-Toothed Goldenring (C. bidentata) under recent and future climatic conditions to obtain a more accurate picture of the most suitable areas over time, thus facilitating the planning of conservation projects. According to our results, these montane species are strongly influenced by climatic variables. The models predict that the two species respond differently to changes in bioclimatic variables in the size of the potential range but similarly in range shift. Abstract: (1) Bioclimatic factors have a proven effect on species distributions in terrestrial, marine, or freshwater ecosystems. Because of anthropogenic effects, the changes in these variables are accelerated; thus, the knowledge of the impact has great importance from a conservation point of view. C. heros and C. bidentata, confined to the hilly and mountainous regions in Europe, are classified as "Near Threatened" according to the IUCN Red List. (2) Modeling the potential occurrence of both species under present and future climatic conditions provides a more accurate picture of the most suitable areas. The models were used to predict the responses of both species to 6 different climate scenarios for the year 2070. (3) We revealed which climatic and abiotic variables affect them the most and which areas are the most suitable for the species. We calculated how future climatic changes would affect the range of suitable areas for the two species. (4) According to our results, the suitable area for C. bidentata and C. heros are strongly influenced by bioclimatic variables and showed an upward shift toward high elevations. The models predict a loss of suitable area in the case of C. bidentata and a large gain in the case of C. heros." (Authors)] Address: Fekete, Judit, Research Group of Limnology, Centre of Natural Science, Univ. of Pannonia, Egyetem St. 10, 8200 Veszprém, Hungary. Email: fekete.judit@ecolres.hu

21718. Ferreira, V.R.S.; de Resende, B.O.; Bastos, R.C.; da Brito, J.S.; de Carvalho, F.G.; Calvão, L.B.; Oliveira-Junior, J.M.B.; Neiss, U.G.; Ferreira, R.; Juen, L. (2023): Amazonian Odonata Trait Bank. Ecology and Evolution. 2023; 13: e10149.: 21pp. (in English) ["Discussion regarding the gaps of knowledge on Odonata is common in the literature. Such gaps are even greater when dealing with basic biological data for biodiverse environments like the Amazon Rainforest. Therefore, studies that address, classify, and standardize functional traits allow the elaboration of a wide range of ecological and evolutionary hypotheses. Moreover, such endeavors aid conservation and management planning by providing a better understanding of which functional traits are filtered or favored under environmental changes. Here, our main goal was to produce a database with 68 functional traits of 218 Odonata species that occur in the Brazilian Amazon. We extracted data on behavior, habit/habitat (larvae and adults), thermoregulation, and geographic distribution from 419 literature sources classified into different research areas. Moreover, we measured 22 morphological traits of approximately 2500 adults and categorized species distributions based on approximately 40,000 geographic records for the Americas. As a result, we provided

a functional matrix and identified different functional patterns for the Odonata suborders, as well as a strong relationship between the different trait categories. For this reason, we recommend the selection of key traits that represent a set of functional variables, reducing the sampling effort. In conclusion, we detect and discuss gaps in the literature and suggest research to be developed with the present Amazonian Odonata Trait Bank (AMO-TB)." (Authors)] Address: Ferreira, V.R.S., Laboratório de Ecologia e Conservação (LABECO), Programa de Pós Graduação em Ecologia, Universidade Federal do Pará, Augusto Correa, Belém, Pará, 66075-110, Brazil. Email: victor_rennan890@hotmail.com

21719. Fischer, I.; Kargl, V. (2023): Endbericht libellenkundliche Erhebung Tiergarten Schönbrunn & Schwarze Lacke 2022. Im Auftrag der: Schönbrunner Tiergarten Ges.m.b.H. it Unterstützung der: Wiener Umweltschutzabteilung (MA22): 29 pp. (in German, with English summary) ["In 2022, the dragonfly fauna was surveyed at 44 water bodies in Schönbrunn Zoo and at the Black Lake in the "Higher Federal Teaching and Research Institute for Horticulture Schönbrunn". A total of 26 dragonfly species from 8 different families could be detected, 23 of them were indigenous to the study area. 9 of the identified species (35%) were endangered species according to the Red List of Austria. The evidence of the species Coenagrion scitulum, classified as “endangered” in Austria, should be emphasized." (Authors/Google translate)] Address: Fischer, Iris, Lenneisgasse 4-8/14/10, 1140 Wien, Austria. Emil: iris.fischer@nhm-wien.ac.at

21720. García-Giron, J.; Bini, L.M.; Heino, J. (2023): Shortfalls in our understanding of the causes and consequences of functional and phylogenetic variation of freshwater communities across continents. Biological Conservation 282 (2023) 110082: 8 pp. (in English) ["Freshwater ecosystems harbour a disproportionately high biodiversity relative to their area, being also one of the most threatened ecosystem types worldwide. However, our capacity to design evidence-based conservation plans for this realm is restricted by all biodiversity shortfalls that have been recognized so far. In this context, the paucity of comparable field data and information on traits and phylogenies of freshwater organisms should be emphasized. Here, we highlight how increased knowledge could be gained and where we should aim at in research on the functional and phylogenetic features of freshwater communities. First, attempts to combine datasets from different sources should pay careful attention to data harmonization. Second, more effort should be focused on natural history observations on species habitats and life histories, providing the backbone of information for multi-trait databases. Third, fully resolved phylogenies would be required for deciphering the evolutionary relationships of freshwater organisms. Provided that these three hurdles can be overcome, conducting studies of local freshwater communities across continental spatial extents would pave the way for mapping functionally important ecosystems and evolutionarily valuable areas for the conservation of freshwater organisms and their habitats." (Authors) The study includes a reference to Odonata.] Address: García-Girón, J., Dept of Biodiversity & Environmental Management, University of León, Campus de Vegazana, 24007 León, Spain

21721. Garrison, M.; Tennessen, K.J. (2023): Nymph Cove: Identification to genus: Aeshnidae (Part I). Argia 35(1): 35-37. (in English) [Information on identification of larvae the following taxa are given: Gomphaeschna, Coryphaeschna, Basiaeschna, Boyeria, Epiaeschna, and Nasiaeschna] Address: Garrison, Marla, Biology Faculty McHenry County College Crystal Lake, IL, USA. E-mail: mgarriso@mchenry.edu

21722. Gazanfar, T.; Khaleel, M. (2023): Occurence and distribution of two new libellulids (Odonata: Insecta) of the Kashmir Valley, India: Orthetrum sabina (Drury, 1770) and Palpopleura sexmaculata (Fabricius, 1787). Journal of Threatened Taxa 15(6): 23338-23343.["Odonates from the Kashmir Himalaya have been least studied with only 22 species reported from this region. After a long gap of 41 years, the present work forms the first observations on occurence and distribution of two new odonates from the Kashmir valley. O. sabina and P. sexmaculata are reported for the first time from this region. The findings open new insights about phenology, distribution patterns, behaviour, and the effects of climate change on Himalayan Odonata." (Authors)] Address: Gazanfar, T., Wildlife Research and Conservation Foundation, Rajbagh, Srinagar, Kashmir, Jammu & Kashmir 190008, India. Email: gazanfar.tahir@gmail.com

21723. Gazzola, A.; Guadin, B.; Balestrieri, A.; Pellitteri-Rosa, D. (2023): Effects of predation risk on the sensory asymmetries and defensive strategies of Bufotes balearicus tadpoles. Animal Cognition 26: 491-501. (in English) ["Lateralization consists of the differential use of bilateral organs or limbs and is well described in many taxa and in several contexts. Common ecological frameworks where it can be observed are foraging and predatory ones, with benefits related to both visual and auditory lateralization such as faster response or increasing neural processing ability. Anuran amphibians are considered relevant models for investigating lateralization, due to their great ecological variety and the possibility of easily being raised under laboratory conditions. By adopting the “rotational preference test”, we used Balearic green toad tadpoles to test the effects of behavioural defensive responses triggered by different predator types (native vs alien, i.e. dragonfly larvae Aeshna cyanea and adult red swamp crayfish Procambarus clarkii) and diets (fasted vs. tadpole-fed predators) on their lateralization. We recorded tadpoles’ responses to five different chemical cues: clean water (control treatment), fasted dragonfly larvae and crayfish, and tadpole-fed dragonfly larvae and crayfish. Green toad tadpoles did not show a bias in a predominant direction, although lateralization occurred at the individual level, as shown by the intensity index (LA). Perceived predation risk was the highest in tadpoles exposed to the combined chemical cues of conspecific prey and native predators, which elicited both changes in the intensity of lateralization and a marked reduction in tadpoles’ activity level. Our results suggest that contextual predation threat may induce very rapid changes in the expression of asymmetries at the individual level, and might play a role as part of the complex defensive strategies adopted by prey in the attempt to escape predators." (Authors)] Address: Pellitteri-Rosa, Daniele, Dept Earth & Environ. Scienc., Univ. Pavia, Pavia, Italy. Email: daniele.pellitterirosa@unipv.it

21724. Glad, A.; Mallard, F. (2023): Spatial distribution modeling of Odonata in the New Aquitaine Region (France): A tool to target refuge areas under climate change. In: Walter Leal Filho, Marina Kovaleva, Fátima Alves, Ismaila Rimi Abubakar (editors) (2023): Climate change strategies: Handling the challenges of adapting to a changing climate. https://-doi.org/10.1007/978-3-031-28728-2. Publisher: Springer Cham: 545-566. (in English) ["Odonata are good indicators of climate change effects due to their fast response to climatic variables such as temperature, humidity and amount of rainfall. This study aims to investigate the effect of three scenario of climate change at a regional scale (New Aquitaine region,

France) on 59 Odonata species distribution using species distribution modeling methods. Those results allow to identify species that will be the most impacted by climate change but also to evaluate changes in Odonata diversity across the study area, through the calculation of diversity indices for each climate scenario. 24–33% of the species are predicted loss between 75 and 100% of suitable habitat by 2100 under two scenarios. Predicted distribution map can be use by managers, and stakeholders to target areas to be protect in priority. Different approaches can be pursued: protections of areas that are suitable or will be suitable in the future for rare species and/or target areas that will be suitable for high number of species leading to a higher diversity. By protecting wetland suitable for diverse Odonata species, other wetland affiliated species such as amphibians, birds, and plants might benefits from those actions." (Authors)] Address: Glad, Anouk, Cistude Nature, Chemin du Moulinat, 33185 Le Haillan, France. Email: gladanouk@gmail.com

21725. Gong, L.; Gu, H.; Chang, Y.; Wang, Z.; Shi, B.; Lin, A.; Wu, H.; Feng, J.; Jiang, T. (2023): Seasonal variation of population and individual dietary niche in the avivorous bat, Ia io. Oecologia 201: 733-747. (in English) ["The variation in niche breadth can affect how species respond to environmental and resource changes. However, there is still no clear understanding of how seasonal variability in food resources impacts the variation of individual dietary diversity, thereby affecting the dynamics of a population's dietary niche breadth. Optimal foraging theory (OFT) and the niche variation hypothesis (NVH) predict that when food resources are limited, the population niche breadth will widen or narrow due to increased within-individual dietary diversity and individual specialization or reduced within-individual dietary diversity, respectively. Here, we used DNA metabarcoding to examine the composition and seasonality of diets of the avivorous bat Ia io. Furthermore, we investigated how the dietary niches changed among seasons and how the population niche breadth changed when the availability of insect resources was reduced in autumn. We found that there was differentiation in dietary niches among seasons and a low degree of overlap, and the decrease of insect resource availability and the emergence of ecological opportunities of nocturnal migratory birds might drive dietary niche shifts toward birds in I. io. However, the population's dietary niche breadth did not broaden by increasing the within-individual dietary diversity or individual specialization, but rather became narrower by reducing dietary diversity via predation on bird resources that served as an ecological opportunity when insect resources were scarce in autumn. Our findings were consistent with the predictions of OFT, because birds as prey for bats provided extremely different resources from those of insects in size and nutritional value. Our work highlights the importance of size and quality of prey resources along with other factors (i.e., physiological, behavioral, and life-history traits) in dietary niche variation." (Authors)] Address: Jiang, T., Jilin Prov. Key Lab. Animal Resource Conserv. & Utilization, Northeast Normal Univ., 2555 Jingyue Street, Changchun, 130117, China

21726. Goodman, A.; Tolman, E.; Uche-Dike, R.; Abbott, J.; Breinholt, J.W.; Bybee, S.; Frandsen, P.B.; Gosnell, J.S.; Guralnick, R.; Kalkman, V.J.; Kohli, M.; Lontchi, M.F.; Lupiyaningdyah, P.; Newton, L.; Ware, J.L. (2023): Assessment of targeted enrichment locus capture across time and museums using odonate specimens. Insect Systematics and Diversity 7(3): 1-9. (in English) ["The use of gDNAs isolated from museum specimens for high throughput sequencing, especially targeted sequencing in the context of phylogenetics, is a common practice. Yet, little understanding has been focused on comparing the quality of DNA and results of sequencing museum DNAs. Dragonflies and damselflies are ubiquitous in freshwater ecosystems and are commonly collected and preserved insects in museum collections hence their use in this study. However, the history of odonate preservation across time and museums has resulted in wide variability in the success of viable DNA extraction, necessitating an assessment of their usefulness in genetic studies. Using Anchored Hybrid Enrichment probes, we sequenced DNA from samples at 2 museums, 48 from the American Museum of Natural History (AMNH) in NYC, USA and 46 from the Naturalis Biodiversity Center (RMNH) in Leiden, Netherlands ranging from global collection localities and across a 120-year time span. We recovered at least 4 loci out of an >1,000 locus probe set for all samples, with the average capture being ~385 loci (539 loci on average when a clade of ambiguous taxa omitted). Neither specimen age nor size was a good predictor of locus capture, but recapture rates differed significantly between museums. Samples from the AMNH had lower overall locus capture than the RMNH, perhaps due to differences in specimen storage over time." (Authors)] Address: Goodman, A., Division of Invertebrate Zoology, American Museum of Natural History, New York City, NY 10024, USA. Email: agoodman@amnh.org

21727. Grether, G.F.; Beninde, J.; Beraut, E.; Chumchim, N.; Escalona, M.; MacDonald, Z.G.; Miller, C.; Sahasrabudhe, R.; Shedlock, A.M.; Toffelmier, E.; Shaffer, H.B. (2023): Reference genome for the American rubyspot damselfly, Hetaerina americana. Journal of Heredity Journal of Heredity 114(4): 385-394. (in English) ["Odonata play important roles in both aquatic and terrestrial food webs and can serve as sentinels of ecosystem health and predictors of population trends in other taxa. The habitat requirements and limited dispersal of lotic damselflies make them especially sensitive to habitat loss and fragmentation. As such, landscape genomic studies of these taxa can help focus conservation efforts on watersheds with high levels of genetic diversity, local adaptation, and even cryptic endemism. Here, as part of the California Conservation Genomics Project (CCGP), we report the first reference genome for H. americana, a species associated with springs, streams and rivers throughout California. Following the CCGP assembly pipeline, we produced two de novo genome assemblies. The primary assembly includes 1,630,044,487 base pairs, with a contig N50 of 5.4 Mb, a scaffold N50 of 86.2 Mb, and a BUSCO completeness score of 97.6%. This is the seventh Odonata genome to be made publicly available and the first for the subfamily Hetaerininae. This reference genome fills an important phylogenetic gap in our understanding of Odonata genome evolution, and provides a genomic resource for a host of interesting ecological, evolutionary, and conservation questions for which the rubyspot damselfly genus Hetaerina is an important model system." (Authors)] Address: Grether, G.F., Dept Ecol. & Evol. Biol., Univ. California Los Angeles, Los Angeles, CA 90095-1606 USA. E-mail: ggrether@g.ucla.edu

21728. Haglund, E.H. (2023): Rising temperatures and the damselfly shrinkage. BSc thesis, Faculty of Health, Science and Technology, Biology, Karlstads Universitet: 10 pp. (in English) ["Body size governs how temperature affects an organism. As temperature vary on different geographical scales, it mediates activity based on size. How does temperature distribute different sized individuals - and what reproductive fitness follow? This study involves the damselfly Enallagma exsulans and field studies at lake Fayetteville, USA. By measuring body length, temperature, copulatory status, and

egg counts, I perform regression analysis to determine the fitness implications of varying temperature. Smaller individuals manage to stay active at higher temperatures, they mate at a higher rate, and they generate more eggs. My study contrasts previous research and highlights both the relevance and complexity of specificity when connecting temperature to fitness." (Author) https://www.diva-portal.org/smash/get/diva2:1765197/FULLTEXT01.pdf] Address: not stated

21729. Hébert, C. (2023): Bilan des inventaires d'insectes réalisés sur l'île d'Anticosti depuis 150 ans: une biodiversité riche, mais en déclin. Le Naturaliste canadien 147(1): 59-75. (in French, with English summary) ["Despite its isolation, Anticosti Island has been the subject of several entomological inventories over the last 150 years. William Couper was the first to inventory Anticosti in 1872. In 1904, Joseph Schmitt reported 161 species in Monographie de l'île d'Anticosti (golfe Saint-Laurent). In the 1970s, the work of Luc Jobin on the hemlock looper outbreak facilitated access to the island and naturalists or students inventoried Coleoptera, Odonata and Orthoptera. After the Earth Summit in 1992, the entomofauna of Anticosti Island was inventoried by the Canadian Forest Service, using different types of traps. During the same time period, two other inventories of Odonata were carried out by naturalists. Finally, in a master's thesis, Pierre-Marc Brousseau reported several hundred species of insects of little studied orders. To date, 1541 species are listed. Trapping data provide standardized estimates and reliable time markers for measuring insect response to environmental changes. These data suggest that the decline of insects, reported elsewhere on the planet, is also observed on Anticosti. The island offers an ideal context to study the decline of insects and establish a biodiversity monitoring network." (Author)] Address: Christian Hébert: Email: christian.hebert@nrcan-rncan.gc.ca

21730. Hersch, K.; Moore, M.P. (2023): Ornamentation diversified faster than eco-morphology across Nearctic dragonflies. Biological Journal of the Linnean Society 139(1): 70-78. (in English) ["Eco-morphology and ornamentation are two phenotypic dimensions along which co-existing species often diverge, yet theory makes contrasting predictions about how these phenotypes diversify relative to each other. Some theory predicts that intense reproductive demands cause more pronounced divergence in ornamentation than in eco-morphology. Other theory predicts that preferences for condition-dependent ornamentation in species encountering divergent ecological conditions will facilitate rapid divergence in eco-morphology but not ornamentation. We evaluated these conflicting predictions in Nearctic Libelluloidea dragonflies by testing if the diversification of a condition-dependent ornament, male wing melanization, was slower and less pronounced between species than the diversification of two key eco-morphological traits, body size and relative wing size. We found that male wing melanization evolved much faster than either body size or relative wing size. Furthermore, in contrast to the patterns for either eco-morphological trait, the best-supported models of diversification in male wing melanization indicate that the majority of divergence arose between the most closely related species. These results reveal that the primary axis of divergence between closely related Libelluloidea dragonflies is ornamentation rather than eco-morphology. Our study therefore suggests that evolutionary responses to disparate reproductive demands may be fundamental to the persistence and co-existence of closely related species." (Authors)] Address: Moore, M.P., Dept Integr. Biol., Univ. Colorado

21731. Hu, F.-S.; Futahashi, R. (2023): Molecular phylogenetic analysis and its impact on the conservation of Ischnura rubilio Selys, 1876 (Odonata: Coenagrionidae) in Taiwan. International Journal of Odonatology 26(8): 63-73. (in English) ["Although Ischnura aurora (Brauer, 1865) was traditionally considered to be widely distributed in Asia, the populations west of continental China have recently been identified as equivalent to Ischnura rubilio Selys, 1876. While the Taiwanese population has long been regarded as I. aurora as well, Taiwan in fact represents the distribution boundary between I. aurora and I. rubilio. Based on molecular and morphological analyses, we confirm that the "I. aurora-like" damselfly in Taiwan corresponds to I. rubilio. It is noteworthy that the abdominal blue spots of males in the Taiwan population have a unique phenotype compared to those found in specimens from India and continental China. According to past references and current surveys, the I. rubilio population in Taiwan has critically declined, with only one confirmed locality currently remaining. To maintain the Taiwanese population of I. rubilio, we recommend that prompt conservation measures of the habitat be implemented, focusing on the concept of the Satoyama Initiative." (Authors)] Address: Hu, F.-S., Dept Biol. Scienc., National Sun Yat-sen Univ., 70 Lienhai Rd., Kaohsiung 80424, Taiwan. Email: fangshuo_hu@smail.nchu.edu.tw

21732. Jouault, J.; Nel, A. (2023): A new genus and species of the damsel-dragonfly family Burmaphlebiidae (Odonata: Epiproctophora). Annales de la Société entomologique de France (N.S.) 59(2): 101-106. (in English, with French summary) [Myanmar; "Bilebullephlebia legendrei n. gen., n. sp. is described, illustrated, and placed into the small epiproctophoran family Burmaphlebiidae. This family was previously known from the mid-Cretaceous Kachin amber by two monotypic genera, but the new fossil shows that its diversity is underestimated. At least one additional genus with an enigmatic wing venation remains to be described from the same deposit. Nothing is known about the genitalia configuration of the Burmaphlebiidae but new fossils are expected to clarify the position of the family which is currently only discussed in light of wing venation characters." (Authors)] Address: Jouaulta, C., Institut de Systématique, Évolution, Biodiversité (ISYEB) Muséum national d'Histoire naturelle, CNRS, Sorbonne Université, EPHE, Université des Antilles, 75005 Paris, France. Email: jouaultc0@gmail.com

21733. Jumaat, A.H.; Hamid, S.A.B. (2023): Monitoring heavy metal bioaccumulation in rivers using damselflies (Insecta: Odonata, Zygoptera) as biological indicator. Sains Malaysiana 52(2): 321-331. (in English, with Malaysian summary) ["Contamination by pollutants in freshwater ecosystem has been identified extensively in river, sediments, and freshwater biota. Pollutants may have incorporated into the sediments and accumulated in tissue of aquatic organisms which persist as difficult to degrade matter in upper trophic level. Therefore, few selected heavy metals were measured from the river sediment and tissue of Odonata larvae collected from the selected rivers using inductively coupled plasma optical emission spectrometry (ICP-OES). The results showed metals in Odonata tissue were higher than in the sediments. Mn and Zn were found in greatest concentrations both in sediment and Odonata's tissue. Biota-sediment accumulation factors (BSAF) were computed based on these data, and it was discovered that all values of BSAF for Cd, Cu, Mn, and Zn were typically high (BSAF >1). In conclusion, the rivers contamination induced accumulation of heavy metal in the river sediments and Odonata larvae (P. microcephalum, P. fraseri, and C. marginipes). The highest concentration value was calculated as 29.23 for Cd in the C. marginipes. The high concentrations of this element in the insect body tissue has shown a trace of bioaccumulation and may pose biomagnification

to organisms in the upper trophic level. The results of this study indicated that damselfly is reliable to become a bioindicator for heavy metals particularly pollution in the river." (Authors)] Address: Jumaat, A.H., School of Biol. Sciences, Univ. Sains Malaysia, 11800 Minden, Penang, Malaysia

21734. Keinath, S.; Onandia, G.; Griesbaum, F.; Rödel, M.O. (2023): Effects of urbanization, biotic and abiotic factors on aquatic insect diversity in urban ponds. Frontiers in Ecology and Evolution 11:414: 16 pp. (in English) ["Urbanization leads to drastic modifications of the terrestrial and aquatic environment. However, urban ponds may provide valuable habitats for different taxa, including aquatic insects and amphibians. We aim to understand how a set of biotic and abiotic factors influence aquatic insect diversity in 18 urban ponds in the German metropolis Berlin, one of the greenest whilst most densely populated European cities. Greenspace is important for the terrestrial stages of some aquatic insects and amphibians, providing crucial resources. Thus, greenspace was assumed to have positive effects on aquatic insect diversity, whereas built-up area was assumed to affect diversity negatively. Because some aquatic insects prey on tadpoles, their abundance and diversity were assumed to depend on tadpole abundance, which in turn, depends on other food (i.e., phytoplankton) availability in ponds. We visited the ponds twice a year, in spring and summer, and collected data on aquatic insects that are known to prey on tadpoles, tadpole abundance, phytoplankton biomass, the presence or absence of large insect predators, as well as physical-chemical parameters. We assumed higher total aquatic insect abundance, genera richness, alpha-diversity, and evenness, as well as abundance and genera richness of different aquatic insect taxonomic groups to be associated with high tadpole abundance in ponds surrounded by high amount of greenspace and low levels of built-up area. Accordingly, we expected aquatic insects to be modulated by phytoplankton biomass, the presence of newts and fish, and to be affected by ponds' abiotic conditions. Our results showed that biological interactions and abiotic water conditions override urban effects in ponds' terrestrial surroundings on aquatic insect diversity levels, whereas aquatic insects' taxonomic groups responded differently on different land-use types around ponds. We explain our findings due to different dependences and demands towards terrestrial and/or aquatic habitats by different taxonomic groups of aquatic insects, and differences in their colonization behavior." (Authors) Odonate taxa are treated at family level.] Address: Keinath, Silvia, Museum für Naturkunde, Berlin – Leibniz Institute for Evolution and Biodiversity Science, Berlin. Email: silvia.keinath@mfn.berlin

21735. Khoiriyah, K.; Rahmawati, S.; Adriani, N.K.W.M.; Gustiani, A.; Ramadhana, N.; Aryanti, N.A. (2023): Karakteristik Lingkungan Sebagai Habitat Odonata di Kota Malang. Jurnal Ilmu Lingkungan 21(3): 565-573. (in Indonesian, with English summary) ["The growth of Malang City is so fast that it causes some green areas to decrease so that human activities increase, which impacted on the aquatic environment as a habitat for Odonata. The purpose of the study was to identify the diversity of dragonflies and the characteristics of the aquatic environment on the existence of the dragonfly community in Malang City. The study was conducted in June-August 2022 on 3 water land covers in Malang City, namely rivers, rice fields and lakes. The data collection of dragonflies and their physical and chemical environment used the point count method by random sampling scattered in the city of Malang. The results showed that dragonflies in Malang City were found to consist of 2 sub-orders with 8 families and a total of 28 species with a dragonfly diversity index in Malang City of 2.18 which was classified as moderate. Physical and chemical environmental factors influence the diversity of dragonflies based on multiple linear regression tests." (Authors)] Address: Aryanti, N.A., Program Studi Kehutanan, Fakultas Pertanian-Peternakan, Universitas Muhammadiyah Malang Jalan Raya Tlogomas No. 246 Tlogomas, Babatan, Tegalgondo, Kec. Lowokwaru, Kota Malang, Jawa Timur 65144, Indonesia. Email: nirmalaaaryanti@gmail.com

21736. Kiew, R.; Nuratiqah. A.R.; Zubaid, A. (2023): Malaysian Cave and Karst Conservancy Batu Caves Scientific Expedition 2019. Malayan Nature Journal 75(1): 1-13. (in English) [Batu Caves, an isolated limestone karst hill covering 1.1 km² and 329 m tall, lies about 11 km from Malaysia's capital city, Kuala Lumpur. It is surrounded by urbanisation and encroachment presses ever-closer to its base. It is famous for the Sri Subrarmaniam Swamy Temple Cave that attracts thousands of devotees and tourists. The forested buffer zone has been eliminated making the hill vulnerable to accidental fires and invasion by alien species. Although the last quarry closed in 1982 due to public pressure, the hill has yet to be given secure legal protection. However, the Expedition demonstrated that it still harbours significant biodiversity: 366 species of vascular plants, of which one is a new species, five are endemic to Batu Caves, 22 are threatened and five are probably extinct; 56 bryophytes with two liverworts that are new records for Peninsular Malaysia; 15 species of bats roost in the caves and include 6 new records; a family of dusky leaf monkeys still survive; 51 bird species were recorded including three limestone specialists; 25 reptiles including the bent–toed gecko endemic to Batu Caves; seven species of amphibians; 38 native species of snail of which eight are endemic to Batu Caves; 52 butterflies; as well as five new caves that were discovered and mapped and fossil sites recorded. Batu Caves is important as the site where orang-utan fossil teeth were first discovered in Peninsular Malaysia." (Authors)] Address: Malaysian Cave and Karst Conservancy, c/o EcoKnights, 41, Lorong Burhanuddin Helmi 11, 60000 Kuala Lumpur, Malaysia. Email: ruth@frim.gov.my

21737. King, B.H.; Gunathunga, P.B. (2023): Gustation across the class insecta: Body locations. Annals of the Entomological Society of America 116(2): 76-82. (in English) ["This review summarizes which body parts have taste function in which insect taxa. Evidence of taste by mouthparts, antennae, and tarsi is widespread. Mouthparts that commonly have taste function are the labium, including the labella and labial palps, the maxillae, including the galeae and maxillary palps, the inner surface of the labrum or clypeolabrum of chewers, and inside the precibarium/cibarium of hemipterans, which have piercing-sucking mouthparts. Tasting with mandibles has not been found, and tasting with the hypopharynx is seldom reported. Use of the antennae appears uncommon among fly species, but common among species of lepidopterans, hymenopterans, beetles, and bugs. Although tasting with legs, especially tarsi, is reported mostly for fly and lepidopteran species, there is also evidence of it for multiple species of beetles, grasshoppers, and hemipterans, and one species of a roach, an ant, and a bee. Ovipositor taste function has been supported for some species of flies, lepidopterans, hymenopterans, orthopterans, and odonates. Taste by wings has been much less studied, but has been documented in a few fly species. Taste remains unstudied for any species or any body parts of Archaeognatha, Dermaptera, Mantodea, Mecoptera, Phasmatodea, Megaloptera, Neuroptera, Phthiraptera, Psocoptera, Siphonaptera, as well as Raphidioptera, Strepsiptera, Embioptera, Notoptera, and Zoraptera. Across holometabolous insects, larvae have not often

been examined, the exception being some species of lepidopterans, flies, and beetles. Taste studies of antenna and legs are uncommon for even lepidopteran and beetle larvae." (Authors) Examples of insects with evidence regarding taste function on the abdomen, e.g., the ovipositor: Aeshna cyanea and Ischnura elegans!] Address: King, Bethia, Department of Biological Sciences, Northern Illinois University, DeKalb, IL 60115, USA. Email: bking@niu.edu

21738. Kosterin, O.E. (2023): Odonata of Aldan Ulus of Yakutia (East Siberia, Russia): 20 years later. International Dragonfly Fund - Report 179: 1-34. (in English) ["Odonata of the Aldan Ulus (District) of Sakha Republic (Yakutia), East Siberia, Russia, were studied in late June – early July 2022 for the second time, 20 years after the analogous previous study (Kosterin 2004a), partly in the same localities. This time 20 species were found, that is 1.5 times more than 13 species on the previous study. This increase could be an effect of the current climate amelioration but no northward range extensions were registered, all species being known in Yakutia more northerly for quite a long time. Ten species were found in 2022 but not in 2002 (Coenagrion armatum, C. glaciale, C. hylas, C. lanceolatum, Erythromma najas, Aeshna crenata, A. juncea, Ophiogomphus obscurus, Leucorrhinia intermedia, Sympetrum flaveolum), while three species were found in 2002 but not this time (Aeshna caerulea, Nihonogomphus ruptus and Somatochlora sahlbergi). In total, 23 species have been registered in Aldan Ulus up to date. Variation in Enallagma cyathigerum, Erythromma najas, Somatochlora exuberata and Leucorrhinia orientalis is briefly discussed. Mass emergence of O. obscurus from the Aldan River on a rainy day (and even during showers) following a period of hot weather was observed and discussed." (Author)] Address: Kosterin, O.E., Institute of Cytology & Genetics SB RAS, Academician Lavrentyev ave. 10, Novosibirsk, 630090, Russia; Novosibirsk State University, Pirogova str. 2, Novosibirsk, 630090, Russia. Email: kosterin@bionet.nsc.ru

21739. Kusumorini, A.; Rahmah, N.A.; Kinasih, I. (2023): Identification of insects visitors to oil palm flowers in the community plantation of Kalicinta village, North Kotabumi district, North Lampung regency. Advances in Engineering Research. Proceedings of the 12th International Conference on Green Technology (ICGT 2022): 239-254. (in English) ["Palm oil is a plantation commodity with economic value in Indonesia. Insects are one of the crucial factors influencing oil palm fruit productivity. The study aimed to identify the insect visitors on male and female palm flowers based on border habitat types and visitation times. The research was conducted in Kalicinta Village, North Kotabumi District, from August 2020 to September 2020. The study was carried out at three observation stations: SS (palm plantations bordering palm plantations), SK (palm plantations bordering rubber plantations), and (palm plantations bordering cassava plantations). Insects were collected using the swap and yellow sticky trap methods. 25 morphospecies and eight insect orders visited oil palm flowers. The result showed that oil palm flowers were visited by 25 morphospecies and eight insect orders. These orders were Coleoptera, Dermaptera, Diptera, Hymenoptera, Hemiptera, Lepidoptera, Odonata [Neurothemis, Orthemis (sic!)], and Mantodea. Male palm flowers were visited by 25 morphospecies of insects, while female palm flowers were visited by only 5 morphospecies. Elaeidobius sp. (Coleoptera: Curculionidae) was the most common species to visit both male and female flowers, followed by Apis sp. (Hymenoptera: Apidae), and Camponotus sp. (Hymenoptera: Formicidae) respectively. Most insects visit in the morning and the habitat of palm bordering palm is the most visited." (Authors)] Address: Kusumorini, Astuti, Department of Biology, Faculty of Science and Technology, The State of Islamic University of Sunan Gunung Djati of Bandung, Bandung, West Java, Indonesia. Email: astuti@uinsgd.ac.id

21740. Kutasi, K.; Kolozsvári, I. (2023): Comparative study of the dragonfly habitats around Tisobikeny. 6th International conference of young scientists. Kharkiv Forum of Natural Sciences, May 18-19, 2023: 332-334. (in English) [19 odonate species including Coenagrion scitulum and Aeshna viridis are documented. "The results show that the Batar-Magosliget section is more species-rich than the Ukrainian part, according to the literature. The Batar is a small lowland river with a slow flow, so larvae of dragonfly species with a preference for a slight current and a higher tolerance for stagnant water are found. Stagnant water species are present in the fishpond in the Tisobikeny. In the Tisza, mainly reophilic species with a more specialised tolerance are found in smaller numbers of species and individuals. The dragonfly fauna of all three water types is very different." (Authors)] Address: Kutasi, K., Ferenc Rákóczi II Transcarpathian Hungarian College of Higher Education, Ukraine. Email: kutasi.kamilla.b18bi@kmf.org.ua

21741. Landmann, A. (2023): Die Libellenfauna (Odonata) eines Wildflusstales in den Alpen (Tiroler Lechtal) – mit Bemerkungen zum Erstnachweis von Gomphus pulchellus in Tirol. Entomologica Austriaca 30: 67-84. (in German, with English summary) ["The dragonfly fauna (Odonata) of a wild-river valley in the Alps (Tyrolean Lech) – with remarks on the 'first' record of G. pulchellus in Tyrol. The Tyrolean Lech-river valley is widely regarded one of the least impaired river ecosystems of the Alps. In the Lech region some river stretches indeed were preserved where semi-natural braided floodplains predominate and where a high diversity of spring waters, bogs, ponds and running as well as stagnant riverine water bodies can be found offering attractive habitats for Odonata. This paper illustrates the regional diversity and distribution patterns of Odonata in the river valley. So far, 38 species (14 Zygoptera, 24 Anisoptera) were recorded along a 60km long stretch of the Lech at 800–1,200m a.s.l. The species list not only includes Coenagrion hylas as a special odonatological gem, whose only larger self-sustaining European populations inhabit the valley, but also a high proportion of lotic or rheophilic species bound to landscapes with a network of undisturbed or near-natural running waters. This e.g. includes Ischnura pumilio, Cordulegaster bidentata and Orthetrum coerulescens which are listed in higher threat categories in several Red Lists of the Alpine countries. In addition, the data at hand indicate that Gomphus pulchellus – that recently was reported as new for the Tyrolean Odonata fauna based on a record from 2020 has already been observed 17 years earlier in the upper part of the Lech valley." (Author)] Address: Landmann, A., Institut für Naturkunde & Ökologie, Karl Kapfererstrasse 3, A-6020 Innsbruck, Austria. E-Mail: office@arminlandmann.at

21742. Landmann, T.; Schmitt, M.; Ekim, B.; Villinger, J.; Ashiono, F.; Habel, J.C.; Tonnang, H.E.Z. (2023): Insect diversity is a good indicator of biodiversity status in Africa. Communications Earth & Environment 4(234): 11 pp. (in English) ["Reliable metrics to monitor human impacts on biodiversity are essential for informing conservation policy. As insects are indicators of global change, whose declines profoundly affect ecosystems, insect diversity may predict biodiversity status. Here we present an unbiased and straightforward biodiversity status metric based on insect diversity (richness) and landscape naturalness. Insect diversity was estimated using spatially explicit earth observation data and insect species

assemblages across microhabitats in two agro-ecological zones in Africa. Landscape naturalness was estimated using various human impact factors. Biodiversity status values differed considerably ($p < 0.05$) between protected and non-protected areas, while protected areas, regardless of agro-ecology, shared similar biodiversity status values. The metric is consistent when using richness from different indicator taxa (i.e., stingless bees, butterflies, dragonflies) and independent data for landscape naturalness. Our biodiversity status metric is applicable to data-scarce environments and practical for conservation actions and reporting the status of biodiversity targets." (Authors)] Address: Landmann, T., International Centre of Insect Physiology and Ecology, Nairobi, Kenya. Email: tlandmann@icipe.org

21743. Lemmers, P.; Aukema, R.; Crombaghs, B.H.J.M.; Hermans, J.T. (2023): Impact of activities of the beaver (Castor fiber) on the sustainable conserv ation of Brook kamprey (Lampetra planeri) and Golden-ringed dragonfly (Cordulegaster boltonii) in the Roode Beek brook (Meinweg area). natuurhistorisch maandblad 112(3): 93-101. (in Dutch, with English summary) ["The Roode Beek brook in the province of Limburg is known as one of the most natural brooks in the Netherlands. In 2012, the first sightings of Beavers were recorded along this brook. There were concerns that the habitats of Brook lamprey and C. boltonii, which in the vulnerable developmental stage largely depend on sand and soil banks in fastflowing streams, would be affected or could even disappear. Between 2018 and 2021, using a specially designed rake, silt and sand accumulations and detritus in nine sections of the brook were surveyed for the presence of Brook lamprey larvae and C. boltonii larvae. Larvae of both species were found in similar habitats in shallow sections of the brook (depth < 50 cm). The established larval densities of Brook lamprey in the study area were low despite the presence of abundant habitat. Further analysis of previous observations and the literature revealed that the density in the study area has probably always been low and that the species mainly occurs in more downstream parts of the Roode Beek. In contrast, more larvae of C. boltonii were found when more upstream parts of the brook were sampled. The distribution pattern and age structure of these larvae were consistent with the outcomes of a similar survey conducted in 2007, before the arrival of the Beaver. The presence and influence of smaller dams does not seem to hinder C. boltonii, as larvae of all length classes were found upstream and downstream of small dams. However, impoundment by the large dam at St. Ludwig does seem to affect larval distribution locally, an effect seen in a stretch of about 50 m of the brook. The effect is caused by increasing water depth, lack of flow and associated increased silt sedimentation, which are direct results of the large dam. Larvae were found again where appreciable water flow returned and silt sedimentation was significantly decreased. Based on the present study, it is estimated that the sustainable conservation of both Brook lamprey and C. boltonii in the Roode Beek is not affected by Beaver activities." (Authors)] Address: Hermans, J.T., Hertestraat 21, 6067 ER Linne, The Netherlands

21744. Li, Z.; Cheng, Y.; Chen, J.; Xu, W.; Ma, W.; Li, S.; Du, E. (2023): Widely targeted HPLC-MS/MS metabolomics analysis reveals natural metabolic insights in insects. Metabolites 2023, 13(6), 735; https://doi.org/10.3390/metabo13060735: 17 pp. (in English) ["Insect metabolites play vital roles in regulating the physiology, behavior, and numerous adaptations of insects, which has contributed to them becoming the largest class of Animalia. However, systematic metabolomics within the insects is still unclear. The present study performed a widely targeted metabolomics analysis based on the HPLC-MS/MS technology to construct a novel integrated metabolic database presenting comprehensive multimetabolite profiles from nine insect species across three metamorphosis types. A total of 1442 metabolites were identified, including amino acids and their metabolites, organic acids and their derivatives, fatty acids (FAs), glycerophospholipids (GPs), nucleotides and their metabolites, and benzene and its substituted derivatives. Among them, 622 metabolites were used to generate a 0 and 1 matrix based on their presence or absence, and these metabolites were enriched in arachidonic acid metabolism, tyrosine metabolism, phenylalanine metabolism, and insect hormone biosynthesis pathways. Our study revealed that there is a high coincidence between the evolutionary relationships of the species and the hierarchical cluster based on the types of metabolites, while the quantities of the metabolites show a high diversity among species. The metabolome of the nine representative insects provides an important platform for implementing the analysis of insect systemic metabolites and biological events at the metabolic level. ... Nine species representing three metamorphosis types were used in this study, as shown in Figure 1, including one ametabolous species (Thermobia domestica), four hemimetabolous species (Pantala flavecens, Calopteryx splendens, Locusta migratoria, Periplaneta americana, Apolygus lucorum), and four holometabolous species (Apis mellifera, Tenebrio molitor, Bombyx mori, Drosophila melanogaster)." (Authors)] Address: Li, Z., Guangdong Provincial Key Lab. Insect Developmental Biol. & Applied Tech., Inst. Insect Science & Technology & School of Life Sciences, South China Normal Univ., Guangzhou 510631, China. Email: 2020010172@m.scnu.edu.cn

21745. Liao, J.; Lin, B.-Q.; Wang, H.-J.; Wu, Z.-Q. (2023): Genetic structural variation in mitochondrial genomes of four species of Gomphidae and their phylogenetic implications. Gene Reports 33, 101808: (in English) ["The Gomphids are the most diverse and important group in the (sub)tropics. Currently, research on Gomphids is mainly focused on fieldwork and morphological classification, however, the molecular-based study is still insufficient. Here, complete mitogenomes of Nihonogomphus semanticus (15,368bp), Nihonogomphus lieftincki (15,342bp), Asiagomphus septimus (15,334bp), and Davidius fruhstorferi (15,682bp) were obtained by high-throughput sequencing. Of the 37 genes conserved in order and orientation, 9 protein-coding genes (PCGs) and 14 tRNA genes were encoded by heavy strand, while the rest were encoded by light strand. The secondary structures of the protein encoded by 13 PCGs showed a general trend of proportion: a helix > random coil > extended strand > ß turn. The trnS1 gene lacked a dihydrouridine arm and was thus reduced to a loop. The 3D structures of the protein encoded by 13 PCGs showed moderate to high levels of consistency among species. Phylogenetic analysis showed that Gomphids were well–supported monophyletic group, both BI and ML tree showed clear phylogenetic relationships in known Gomphidae: ((((D. lunatus + D. fruhstorferi) + A. septimus) + ((N. semanticus + N. lieftincki) + Ophiogomphus cecilia)) + Ictinogomphus sp MT 2014). Our study provides insight into the gene or their protein structure features of the family Gomphidae mitogenomes and lays the foundation for further phylogenetic studies." (Authors)] Address: Liao, J., Fisheries College, Guangdong Ocean University, Zhanjiang 524025, China. Email: liaojian05@outlook.com

21746. Lichkovskaya, I.Yu.; Krapivnikova, O.V.; Merkulova, M.A.; Babkina, N.G. (2023): Macrozoobenthos of Otoka Lake in Dubki Lake Natural landmark surrounding (The Ryazan

Region). Problems of regional ecology, Biological Sciences 2/2023 (DOI: 10.24412/1728-323X-2023-2-22-25): 22-25. (in Russian, with English summary) ["For the first time, the results of an investigation of the macrozoobenthos of Otoka Lake, bordering the regional natural landmark of "Dubki" (the Ryazan Region), are presented. The species composition of the lake currently includes 67 species and supra-specific taxa, with a predominance of molluscs (38 %). Two larvae of Aeshna viridis, which are included in the Red Data Book of the Ryazan Region, were found in the clumps of Stratiotes aloides, on the bottom. Based on the analysis of a number of quantitative data, it was found that the best conditions for bottom organisms were on soils made of sand and plant residues. On average, communities of different soils on Otoka lake tend to have an equal abundance of all species (E = 0.79). The most balanced are the complexes of bottom organisms on the soils of sand and silt (E = 0.98) of sand and plant residues (E = 0.96). According to the results of the bio-indication study, in autumn for most of the biotopes of the lake, the water quality corresponds to the alpha-mesosaprobic zone." (Authors) 10 odonate species are listed, including Coenagrion mercuriale which is a misidentification.] Address: Lichkovskaya, I.Yu., FSBD "Oka State Nature Biosphere Reserve", Brykin Bor, Russia. Email: heteroptera@yandex.ru

21747. Lövei, G.L.; Ferrante, M.; Möller, D.; Möller, G.; Vincze, E. (2023): The need for a (non-destructive) method revolution in entomology. Biological Conservation 282, 110075: 5 pp. (in English) ["Highlights: • Arthropod decline triggered arthropod conservation efforts. • Traditional entomological methods often result in killing study subjects. • Currently, lethal methods dominate in tropical and multiple-species focus studies. • Dragonflies, grasshoppers and butterflies are often studied by non-lethal methods. • Entomologists should promote non-lethal methods, especially in conservation research. Abstract: There are worrying signs that arthropods are in decline both in density and diversity. This threatens global biodiversity as well as the ecosystem services provided by arthropods. Nonetheless, entomological research, even when studying arthropods with a conservation focus, frequently uses lethal methods. We analysed 1029 articles published in the major biological conservation journals between 2014 and 2020 and found that, while single-species-focused studies used more non-lethal than lethal methods (76.3 % vs. 23.7 %, respectively), the opposite was true for multiple-species ones (24.0 % vs. 76.0 %). In tropical regions, 74.6 % of studies used lethal methods vs. 18.5 % non-lethal ones. Of the major orders, Odonata, Lepidoptera and Orthoptera were generally studied using non-lethal methods (88.1 %, 80.7 %, and 70.8 %, respectively) in non-tropical regions, while in the tropics, only Lepidoptera were frequently (51.9 %) studied by such methods. We argue that even if the evidence for arthropod decline were uncertain, and even if research would not add much to the overall level of mortality, entomologists should be showing an example. If research on invertebrates continues to be ethically blind, entomologists risk losing public support for conserving arthropod diversity." (Authors)] Address: Lövei, G.L., Dept Agroecol., Aarhus Univ., Flakkebjerg Research Centre, 4200 Slagelse, Denmark. Email: gabor.lovei@agro.au.dk

21748. Lu, K.; Shen, S.; Miller, L.M.; Huang, X. (2023): Golden ratio in venation patterns of dragonfly wings. Scientific Reports 13(7820): 6 pp. (in English) ["The vein pattern in insect wings allows this lightweight structure to carry multiple biological functions. Here, an investigation of the angular distribution of the vein struts in dragonfly wings revealed that the golden angle or golden ratio dominates the venation patterns. We find that the golden angle dominates the intervein angles in regions where thin veins and membranes demand strength reinforcement. A golden ratio partition method has thus been developed that explains a set of preferred intervein angles in distorted polygon-shaped venation cells throughout the venation pattern in dragonfly wings. These observations provide new evidence that the wing structure is spatially optimized, by the golden rule in nature, for supporting biomechanical functions of dragonfly wings." (Authors)] Address: Huang, X., National Synchrotron Light Source II, Brookhaven Nat. Lab., Upton, NY, 11973, USA

21749. Marcellino, B.J.L. (2023): Behavioural responses as a function of temperature and interactions between behaviour and melanin ornaments in dragonflies. MSc. thesis, Ecology & Evolutionary Biology, University of Toronto, Canada: VII + 50 pp. (in English) ["Sexual selection creates and maintains elaborate phenotypes despite costs imposed by natural selection. This creates a trade-off between natural and sexual selection, whereby organisms can display traits that decrease survivorship if they sufficiently improve reproductive success. In many species of odonates males possess ornaments, formed by melanin, which increase their mating success, but also increase body temperature, potentially imposing novel trade-offs in a warming climate. Using a combination of comparative and experimental methods, I examined the effects of temperature on mating and thermoregulatory behaviour in Celithemis elisa and Leucorrhinia intacta. In C. elisa, I found evidence for this trade-off with positive associations between temperature and time spent thermoregulating and a negative association with time spent mating. In L. intacta, only thermoregulatory behaviour was positively associated with temperature. My results suggest that some dragonflies will have reduced time windows for mating as climate change continues." (Author) https://tspace.library.utoronto.ca/handle/-1807/128174] Address: Marcellino, Bianca, Graduate Dept Ecology & Evolutionary Biology Univ. Toronto, Canada

21750. Marshall, C. (2023): Damselflies, climate change, and microbiomes. MSc thesis, Biology Education Centre and Department of Animal Ecology, Uppsala University. 18 pp. In English ["Climate change is expected to increase temperatures across the world. These changes can have a profound negative impact on biodiversity, threatening endangered species under pressure from anthropogenic sources (e.g., burning fossil fuels, deforestation, etc.). Gut microbiomes have become a focus of research in wildlife due to the role they play in the health and fitness of an organism. Increased temperatures have been shown to disrupt microbial communities, limiting the adaptive potential of species confronted with these changes. In this study damselflies were used to experimentally study the effect different temperature regimes and detritus levels have on the abundance of different microbial communities. A metabarcoding technique using the 16S rRNA gene to extract, amplify, and identify bacterial communities within damselfly guts. Species of bacteria that were once difficult to identify via culturing are now easily classified with modern molecular and bioinformatic methods. The study found that temperature, and to a lesser extent grass, had a significant effect on damselfly larva microbiome. The overall composition of the damselfly microbiome shifted over time. The proportion of the microbiome represented by the taxa Proteobacteria increased due to temperature, aligning with previous research on invertebrates. These findings suggest that damselfly microbiomes have a resident microbiome which is sensitive to environmental conditions and should be considered when assessing threats to biodiversity." (Author)] Address: not stated

21751. Masina, F.M.; Wasserman, R.J.; Wu, N.; Mungenge, C.P.; Dondofema, F.; Keates, C.; Shikwambana, P.; Dalu, T. (2023): Macroinvertebrate diversity in relationship to limnochemistry in an Austral semi–arid transboundary aquafer region pan system. Science of The Total Environment 878, 163161: (in English) ["Highlights: • All metals and nutrients were significant seasonal with the exception for P and K concentrations. • Toxic risk index values indicated low toxic risk across all seasons. • 41 macroinvertebrates species belonging to 7 orders were identified. • First two CCA axes accounted for 76.1 % of the total explained fitted cumulative variance. • Understanding relationships between macroinvertebrates and their environment is crucial in understanding how ecosystem functions. Abstract: Pan–wetland systems are one of the world's essential and productive ecosystems and are considered important, unique and complex ecosystems. Anthropogenic activities around the temporary pans in the Khakhea Bray Transboundary Aquifer region [Botsuana/-South Africa] are increasingly becoming a big issue of concern as this may affect pan biodiversity. The study specifically aimed to investigate spatial and temporal distributions of metal and nutrient concentrations within the pans in relation to land use, identify potential pollution sources in this water–scarce region, and assess macroinvertebrate diversity and distribution in relation to pan limnochemistry using a combination of multivariate analyses from 10 pans across three seasons. Environmental and anthropogenic variables influence water quality and the distribution of metals concentration in Khakhea–Bray pan systems. Anthropogenic activities such as animal grazing, infrastructure degradation, water withdrawal and littering have resulted in poor water quality within temporary pans, which may strongly influence macroinvertebrate diversity and distribution. 41 macroinvertebrate species from 5 insect orders (i.e., Coleoptera, Hemiptera, Odonata, Ephemeroptera, Diptera), Crustacea and Mollusca were identified. Significant differences were observed across the seasons for macroinvertebrate taxa, with high and low species richness being observed in autumn and winter, respectively. Water (i.e., temperature, dissolved oxygen, pH, salinity, conductivity), physical (i.e., stone composition) and sediment (i.e., sulphur, sodium) parameters were found to have a significant impact on the macroinvertebrate communities. Therefore, understanding the relationships between macroinvertebrates and their environment is crucial in understanding how the ecosystem taxa are structured and is vital for informing conservation managers on how to properly manage and protect these systems from further degradation." (Authors)] Address: Aquatic Systems Research Group, School of Biology and Environmental Sciences, University of Mpumalanga, Nelspruit 1200, South Africa. Email: dalutatenda@yahoo.co.uk

21752. Mejillón Vargas, D.S.; Suárez Vera, K.P. (2023): Estado poblacional de Lepidópteros y Odonatos presentes en un fragmento del bosque húmedo tropical Olón, provincia de Santa Elena, Ecuador. La Libertad. UPSE, Matriz. Facultad de Ciencias del Mar: 94 pp. (in Spanish) ["Ecuador is a megadiverse country with characteristics of presenting ideal ecosystems for many species, including insects, this research work was developed during the dry season from August to December 2022, which aimed to determine the diversity of Odonata and Lepidoptera through the identification and population count of species present in three transects placed on the Las Cascades trail, providing information on two bioindicator groups of the tropical humid forest Olón, Santa Elena. Two capture methods were applied: entomological net and V.S.R traps and they were established with 5 traps per transect. With the implemented methodology, a total of 897 individuals of the Order Lepidoptera and 351 individuals of the Order Odonata were registered. The registered lepidopteran community is made up of 6 families consisting of Nymphalidae, Hesperiidae, Papilionidae, Lycaenidae, Pieridae and Riodinidae, the first being the most abundant. and diverse. The registered Odonata belong to five families made up of Aeshnidae, Libellulidae, Coenagrionidae, Calopterygidae and Heteragrionidae, the third being the most diverse group and showing the most abundant genus Argia (121 ind), however, the diversity obtained from the Shannon indices (3.28 bit) and Margalef (6.12 bit) was high in the case of Lepidoptera and for Odonata it was medium (2.00 bit) and low (1.75 bit) respectively. The presence and absence of organisms was taken into account to obtain the Jaccard similarity indices, which were relatively high (0.6), highlighting the similarity of transect 1 and 2 for both orders. This work aims to provide information on Lepidoptera and odonates present in Ecuador for future research." (Authors/Google Translate) the following taxa are listed: Rhionaeschna psilus, Erythrodiplax umbrata, E. fusca, Brechmorhoga praecox, Erythemis vesiculosa, Macrothemis sp., Orthemis sp., Argia inculta, A. acridens, Leptobasis linda, Ischnura sp., Acanthagrion sp., Telebasis brevis, Hetaerina occisa, H. cooki] Address: https://repositorio.upse.edu.ec/bitstream/46000/-9669/4/UPSE-TBI-2023-0035.pdf

21753. Mochon, A.; Savard, M. (2023): Premier inventaire de l'odonatofaune du parc national du Bic et liste annotée des espèces de la région administrative du Bas-Saint-Laurent, Québec (Insecta: Odonata). Le Naturaliste canadien 147(2): 3-56. (in French, with English summary) ["The first comprehensive inventory of dragonflies in the Parc national du Bic (Bic National Park, Québec, Canada) was conducted between 2021 and 2022. Fifty species were identified from 6 biotopes: a fast-flowing river, a recent pond in a restored exploited peatland, a shallow kettle lake, a salt marsh, a beaver pond, and a set of 4 small forest ponds. The discovery of an exuviae of Libellula pulchella in the park provided the first proof that this species can complete its development at this latitude. The update to the list of odonates occurring in the Bas-Saint-Laurent region added 38 species, bringing the total to 81. Global warming seems to have favoured the northward expansion of Aeshna constricta, Leucorrhinia intacta and of Plathemis lydia in the province of Québec." (Authors)] Address: Savard, M.; E-mail: michel.savard@ssss.gouv.qc.ca

21754. Mogali, S.; Saidapur, S.; Shanbhag, B. (2023): Behavioral responses of tadpoles of Clinotarsus curtipes (Anura: Ranidae) to odor cues of dragonfly larvae. Phyllomedusa: Journal of Herpetology 22(1): 11-20. (in English, with Portuguese summary) ["In aquatic environments, many prey animals, including anuran larvae, predominantly use chemical cues to assess predation risk. In such systems, a variety of chemical cues (e.g., kairomones, alarm, dietary) affect the behavioral responses of the prey tadpoles. Many anuran tadpoles are able to discriminate different chemical cues and exhibit differential antipredator behavioral responses according to the perceived risk. The behavioral responses of tadpoles of Clinotarsus curtipes to predatory larvae of the dragonfly Pantala flavescens were studied in the laboratory. The predator's kairomones (water conditioned by a starved predator) or its diet-derived metabolites released in excreta of a predator after consumption of conspecific (C. curtipes) or heterogeneric (Indosylvirana temporalis) prey tadpoles were used to simulate predation threat. The tadpoles of C. curtipes had no behavioral response to predator kairomones. However, the tadpoles showed antipredator behavioral responses i.e., reduced swimming movements and overall time

spent swimming, and had a higher burst speed in response to water-borne cues released from the excreta of predators fed both conspecific and heterogeneric prey. The antipredator behavioral responses of tadpoles were most intense in response to cues of predators fed on conspecific prey. The findings of the present study show that tadpoles of C. curtipes are capable of assessing levels of predation threat and modulating the intensity of their defense behavior in accordance with the perceived threat." (Authors)] Address: Shanbhag, B., Dept of Marine Biology, Karnatak University Post-Graduate Centre, Kodibag, Karwar-581 303, Karnataka, India. Email: bhagyashrishanbhag@gmail.com

21755. Moi, D.; Barrios, M.; Giancarlo, B.; Tesitore, G.; Burwood, M.; Romero, G.Q.; Mormul, R.P.; Kratina, P.; Juen, L.; Michelan, T.S.; Montag, L.F.A.; Cruz, G.M.; García-Girón, J.; Heino, J.; Hughes, R.M.; Figueiredo, B.R.S.; Teixeira de Mello, F. (2023): Human land-uses homogenize stream assemblages and reduce animal biomass production. Journal of Animal Ecology 92(6): 1176-1189. (in English) ["1. Human land-use change is a major threat to natural ecosystems worldwide. Nonetheless, the effects of human land-uses on the structure of plant and animal assemblages and their functional characteristics need to be better understood. Furthermore, the pathways by which human land uses affect ecosystem functions, such as biomass production, still need to be clarified. 2. We compiled a unique dataset of fish, arthropod and macrophyte assemblages from 61 stream ecosystems in two Neotropical biomes: Amazonian rainforest and Uruguayan grasslands. We then tested how the cover of agriculture, pasture, urbanization and afforestation affected the taxonomic richness and functional diversity of those three species assemblages, and the consequences of these effects for animal biomass production. Single trait categories and functional diversity were evaluated, combining recruitment and life-history, resource and habitat-use, and body size. 3.The effects of intensive human land-uses on taxonomic and functional diversities were as strong as other drivers known to affect biodiversity, such as local climate and environmental factors. In both biomes, the taxonomic richness and functional diversity of animal and macrophyte assemblages decreased with increasing cover of agriculture, pasture, and urbanization. Human land-uses were associated with functional homogenization of both animal and macrophyte assemblages. Human land-uses reduced animal biomass through direct and indirect pathways mediated by declines in taxonomic and functional diversities. 4. Our findings indicate that converting natural ecosystems to supply human demands results in species loss and trait homogenization across multiple biotic assemblages, ultimately reducing animal biomass production in streams." (Authors)] Address: Moi, D.A., Graduate Program in Ecology of Inland Water Ecosystems (PEA), Dept of Biology (DBI), Center of Biological Sciences (CCB), State University of Maringá (UEM), Brazil. Email: dieisonandrebv@outlook.com

21756. Molineri, C.; Rodréguez, J.S.; Leiva, M.; Márquez, A. (2023): Diagnoses and key for the larvae of Progomphus Selys, 1854 from Argentina (Anisoptera: Gomphidae), with first larval descriptions for P. aberrans Belle, 1973 and P. kimminsi Belle, 1973. Zootaxa 5297(2): 239-259. (in English) ["Ten species of Progomphus Selys, 1854 are known to occur in Argentina. The larval stages of only four of them are described. We here add the larval descriptions of two species: P. aberrans and P. kimminsi, and diagnose and illustrate important characters for the remaining species known at the larval stage in Argentina: P. complicatus, P. joergenseni, P. lepidus and P. phyllochromus. New geographical records for these species are presented, including new records for P. kimminsi in Bolivia, and new provincial records in Argentina: P. aberrans and P. joergenseni in San Luis, and P. kimminsi in Santiago del Estero. A key to distinguish the larval stage of Argentinean species is proposed." (Authors)] Address: Molineri, C., Instituto de Biodiversidad Neotropical, CONICET-UNT (Consejo Nacional de Investigaciones Científicas y Técnicas—Universidad Nacional de Tucumán), Facultad de Ciencias Naturales e Instituto M. Lillo, Tucumán, Argentina. Email: carlosmolineri@gmail.com

21757. Molineri, C.; Márquez, J.; Rodríguez, J.; Emmerich, D.; Lozano, F. (2023): Exploring the Odonata diversity in the Chaco ecoregion (Northern Argentina). International Dragonfly Fund - Report 178: 1-37. (in English) ["During 2021 and 2022, 33 localities mostly in the Dry Chaco ecoregion from Argentina were assessed for Odonata diversity. We registered 84 species, about 29% of the total richness known for Argentina. We reared 14 species from larva to adult, two of which are still unknown at the larval stage (Progomphus aberrans Belle and P. kimminsi Belle). We also report 13 new provincial records: Orthemis aequilibris Calvert, Brachymesia furcata (Hagen, 1861), and Neoneura confundens Wasscher & van't Bosch for Formosa province; Rhionaeschna planaltica (Calvert), Erythemis plebeja (Burmeister), Erythrodiplax nigricans (Rambur, 1842) and Progomphus aberrans Belle for San Luis province; Planiplax erythropyga (Karsch 1891), Homeoura chelifera (Selys, 1876) and Oxyagrion brevistigma Selys, 1876 for Córdoba province; Tigriagrion aurantinigrum Calvert for Corrientes province; and Acanthagrion minutum Leonard and Telebasis willinki Fraser for Misiones province." (Authors)] Address: Molineri, C., Instituto de Biodiversidad Neotropical. Tucumán, Argentina. Email: carlosmolineri@gmail.com

21758. Moore, M.P. (2023): Ornamented species incur higher male mortality in the larval stage. Biology Letters 19(5): 5 pp. (in English) ["Life-cycle stages are not always capable of evolving independently from each other, but it remains unclear if evolving to meet the demands of one stage actually imposes costs on other stages. Male ornamentation is a useful trait in which to test this potential evolutionary constraint because ornaments improve reproduction in the adult stage but can require the expression of risky traits in the juvenile stage. Here, I compared larval mortality between populations of ornamented and non-ornamented dragonfly species. Since males produce more exaggerated melanin wing ornaments than females, I tested if larval mortality of males is higher in populations of species that have evolved adult male wing ornamentation. My analyses uncover male-biased larval mortality in species that have evolved male ornamentation. These findings indicate that evolving to optimize mating for the adult stage imposes a cost to survival in the larval stage. Thus, this study reveals that evolution in one life--cycle stage can impose fitness costs on other stages that persist over macroevolutionary timescales." (Author)] Address: Moore, M.P., Dept of Integrative Biology, Univ. of Colorado Denver, Denver, CO 80204, USA. Email: michael.p.moore@ucdenver.edu

21759. Nakanishi, K.; Usio, N.; Yokomizo, H.; Takashima, T.; Hayashi, T.I. (2023): Chlorantraniliprole application differentially affects adult emergence of Sympetrum dragonflies in rice paddy fields. Paddy and Water Environment 20: 177-183. (in English) ["Rice paddy fields are important habitat for many dragonfly species. In Japan, populations of dragonflies inhabiting rice paddies, in particular Sympetrum (Odonata: Libellulidae), have decreased greatly in the last few

decades. A major cause of the decline has been suggested to be the use of systemic insecticides (e.g., phenylpyrazole and neonicotinoid) in nursery boxes of rice seedlings. In this study, we examined the effects of chlorantraniliprole (CAP), a novel anthranilic diamide insecticide, on adult emergence of Sympetrum dragonflies in ten rice paddy fields by counting their exuviae remaining on the rice plants as an abundance index. Our results suggest that CAP is a potential factor that reduced the emergence rate of S. infuscatum but not of S. frequens. This difference may be due to differential sensitivity to CAP, different lengths of the nymphal stage, or different effects of bottom-up controls via reduction of prey organisms that are highly sensitive to CAP." (Authors)] Address: Nakanishi, K., Health & Environmental Risk Division, National Institute for Environmental Studies, Onogawa 16-2, Tsukuba, Ibaraki 305-8506, Japan. Email: nakanishi.kosuke@nies.go.jp

21760. Newar, R.; Bora, A.; Puzari, M. (2023): Survey of odonate diversity in and around the Dibrugarh university campus. International Journal of Entomology Research 8(3): 20-22. (in English) ["In this study, we have prepared a baseline data of diversity of Odonates in the Dibrugarh University campus. We found Libelludidae and Coenagrionidae to be most dominant." (Authors)] Address: Newar, R., Dept of Life Sciences, Dibrugarh Univ., Dibrugarh, Assam, India

21761. Ngiam, R.W.J.; Bing, T.H.; Bun, T.H. (2023): Biodiversity Record: New Singapore record of the damselfly, Aciagrion borneense. Nature in Singapore 16: e2023024: 4 pp. (in English) [Singapore Island, marsh at Holland Plain, off Old Holland Road; 27 & 28-XII-2022 around 1000 hrs.] Address: Ngiam, R.W.J., National Biodiversity Centre, National Parks Board, 1 Cluny Road, Singapore 259569. Email: yanrobin@hotmail.com

21762. Nienhaus, H.; Fitzpatrick, S.W.; Bloom, D.D.; Schriever, T.A. (2023): Dispersal ability and biogeographic gradients influence gene flow of 3 aquatic insects in Laurentian Great Lakes interdunal wetlands. Freshwater Science 42(1): 88-103. (in English) ["Population genetic connectivity is influenced by multiple abiotic and biotic attributes, including geography, dispersal ability, and life history, which may lead to different patterns of population structure of organisms occupying similar habitats. We investigated how differences in dispersal ability and biogeographic gradients correspond with population structuring of 3 aquatic insect species found within naturally fragmented interdunal wetlands along the eastern shoreline of Lake Michigan in midwestern USA. Interdunal wetlands are small, highly fragmented, and patchily distributed along the eastern coast of Lake Michigan, USA. Our focal species, Anax junius, Notonecta undulata Say, 1832, and Caenis amica Hagen, 1861 were chosen as high, intermediate, and low dispersers, respectively. We hypothesized that all insect populations experience isolation by distance with relatively low gene flow among sites, but that the strength of isolation by distance varies with dispersal ability. We used cytochrome c oxidase subunit I sequence data to confirm species identification and restriction enzymeassociation DNA sequencing for population genomic analyses. Our cytochrome c oxidase subunit I data revealed that Caenis populations consisted of multiple species split along a latitudinal gradient. Restriction site-association DNA sequencing data showed that A. junius displayed strong isolation by distance, where N. undulata did not. Additionally, both A. junius and N. undulata populations displayed 2 genetic clusters along the coastline, and genetic diversity increased along with latitude. These results indicate that biogeographical variables, such as latitude and covarying abiotic factors, may be stronger predictors of population structure than dispersal ability and that inference of population structure within aquatic macroinvertebrates should be on a species-specific basis." (Authors)] Address: Nienhaus, Halle, Department of Biological Sciences, Western Michigan Univ., 1903 West Michigan Avenue, Kalamazoo, Michigan 49008 USA. Email. Halle.nienhaus@gmail.com

21763. Novelo Gutierrez, R.: Bota-Sierra, C.A. (2023): The larvae of Cora inca Selys, 1873 and Polythore gigantea (Selys, 1853) from Colombia (Odonata: Polythoridae), with a larval diagnoses of some genera in the family. Zootaxa 5254(4): 517-533. (in English, with Spanish summar) ["The larvae of C. inca and P. gigantea were found in first and second order forested streams at the Tatamá Natural National Park in the Colombian Western Andes. Their final larval stadia are here described and figured. C. inca differs from the larvae of C. cyane Selys, 1853 and C. marina Selys, 1868 by a combination of features including presence of an irregular patch of minute, gray scales to each side of the ventral midline on the ventral pad of hypopharynx, paraprocts with five projections, and the position of epiproct and paraproct projections. On the other hand, the larva of P. gigantea differs from the larva of P. spaeteri Burmeister & Börzsöny, 2003 by antennal scape slightly shorter than 3rd antennomere, prementum 0.10x longer than its widest part, and the position of epiproct and paraproct projections. Although most of the larvae in the family Polythoridae are still unknown, here we discuss the main morphological characteristics that help to diagnose some of the genera in this family, presenting a regional taxonomic key that includes the genera Cora Selys, 1853, Euthore Selys, 1859, Miocora Calvert, 1917, and Polythore Calvert, 1917." (Authors)] Address: Novelo Gutierrez, R., Instituto de Ecología, A.C. Red de Biodiversidad y Sistemática. Carretera antigua a Coatepec 351, El Haya 91073 Xalapa, Veracruz, Mexico. Email: rodolfo.novelo@inecol.mx

21764. Novelo-Gutierrez, R.; Gomez-Anaya, J.A. (2023): The rediscovery of Heteragrion azulum Dunkle, 1989 with additional notes on the female (Odonata: Heteragrionidae). Zootaxa 5256(2): 195-200.["Some details of the morphology of the female of Heteragrion azulum Dunkle, 1989 are described for the first time such as the intersternite, and illustrated with high quality photographs, based upon two specimens collected in the tropical rain forest at the region of Los Tuxtlas, in the state of Veracruz, Mexico. A comparison with females of the other three species of Heteragrion Selys, 1862 occurring in Mexico is also provided. Additional data of males of H. azulum collected together with the females are also given, including some illustrations.] Address: Novelo-Gutiérrez, R., Instituto de Ecología, A.C. Red de Biodiversidad y Sistemática. Carretera antigua a Coatepec 351, El Haya 91073 Xalapa, Veracruz, Mexico. E-mail: rodolfo.novelo@inecol.edu.mx

21765. Noviza, F.P.; Aziza, E.P.N.; Satria, R. (2023): Inventory of Dragonfly (Odonata) Suborder Anisoptera in the Maninjau Nature Reserve, West Sumatra. Serambi, Biologi 8(1): 104-108. (in Indonesian, with English summary) ["This study aims to inventory of Anisoptera in the Maninjau Nature Reserve Area. The research was conducted in July 2022, using the photographic method. A total of 56 individuals, four species, three genera, one dragonfly family were collected from the Maninjau Nature Reserve Area (Diplacodes trivialis, Neurothemis fluctuans, Orthetrum sabina, O. chrysis). The most commonly found species is the Orthetrum genus, which has the most distribution in the Maninjau Nature Reserve. This type of dragonfly has a wide selection of habitats, even in

polluted habitats." (Authors)] Address: Satria, R., Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, West Sumatera, Indonesia. Email: rijalsatria@yahoo.co.id

21766. Nunes Garcia Junior, M.D.; Damasceno, M.T. (2023): A ordem Odonata no estado do Amapá, Brasil. In: Joaquim de Freitas, D.R. (org.): Principais temas da pesquisa em Ciências Biológicas. DOI: 10.22533/at.ed.932232103. 130 pp. ISBN: 978-65-258-1193-2. https://www.atenaeditora.-com.br/catalogo/download-file/5964: 10-19. (in Portuguese, with English summary) ["Dragonflies comprise an important group of aquatic insects, with recorded occurrence in virtually the entire world. In Brazil, the group has a high diversity of species, but there is little information about the diversity of Odonata for the Amazon region, especially for the state of Amapá. Thus, the present work aims to present a list of species occurring in the state. So far, 121 species, 53 genera and 10 families of Odonata have been registered for Amapá. Despite the low number of studies about the group, a high diversity of species is observed in the state, which reinforces the need to carry out research in order to understand the distribution and the existing Odonata fauna in Amapá." (Authors)] Address: Damasceno, Monique, Univde Federal do Amapá (UNIFAP), Programa de Pós-Graduação em Biodiversidade Tropical (PPGBio), Macapá-Amapá, Brazil

21767. Nyambe Mbia, D.-I.; Foto Menbohan, H.-N.; Gwos Nhioock, S.R.; Nwaha, M.; Tchouapi, Y.L.; Betsi, W.C.N.; Mboye, B.R.; Biram Àa Ngon, E.B. (2023): Influence of granulometry on the distribution of benthic macro invertebrates in some streams of the Mvilla and Haut-Nyong watersheds in Cameroon. World Journal of Advanced Research and Reviews 17(2): 658-677. (in English) ["This study was conducted from November 2018 to October 2019 in 8 forested streams in the Haut-Nyong and Mvilla watersheds to determine the influence of substrates granulometry on benthic macroinvertebrates. The physicochemical analyses showed highly oxygenated, weakly mineralized and slightly acidic waters. The granulometric analyses reveal 9 categories of substrates depending on the scale of sand, sand+gravel or sand+mud. Sampling of benthic macroinvertebrates allowed the collection of 15058 organisms divided into 5 classes, 14 orders and 49 families [including Odonata]. The results showed a taxonomic richness strongly influenced by the nature of the substrate. The combination of coarse sand + silt + dead leaves was more favored the development of benthic macroinvertebrates with 48 families. The taxonomic richness associated to the different index revealed good ecological quality of Sounou, Bengo'o and Lo'o rivers." (Authors)] Address: Nyambe Mbia, D.-I., Lab. Hydrobiol. Environ. (LHE), Fac. Sci., Univ. of Yaounde I, P.O. Box: 812 Yaounde–Cameroon.

21768. Ołdak, K.A. (2023): Dragonflies (Odonata) of the "Bagno Pogorzel" Nature Reserve (east-central Poland). Parki nar. Rez. Przyr. 42(1): 23-39. (in Polish, with English summary) ["The aim of the study was to determine the species composition of Odonata of the "Bagno Pogorzel" Nature Reserve (east-central Poland), comprising, i.a., complex of Sphagnum bogs and dystrophic lakes. The study was conducted in 2021-2022 and consisted of the observation of imagines and the collection of exuviae. A total of 31 species of dragonflies were found (41.9% of the Polish odonate fauna), 23 of which were classified as autochthonous or probably autochthonous. The species found were mostly eurytopes, although there was also a significant proportion of tyrphobionts and tyrphophiles. The most abundant species were Libellula quadrimaculata, Coenagrion pulchellum and C. puella. Five species protected by law in Poland were recorded: Nehalennia speciosa, Sympecma paedisca, Aeshna subarctica, Leucorrhinia albifrons and L. pectoralis. The endangered N. speciosa is the most interesting of the recorded species due to its severely fragmented extent and relict and fairly rare occurrence in Poland. It was observed in the ecotone zone between a Pinus sylvestris forest and an open peatland or dystrophic lake. Six species classified as umbrella species for Sphagnum bogs were recorded: N. speciosa, A. subarctica, A. juncea, L. albifrons, L. dubia and L. pectoralis. Value of biocenosis naturalness qualitative index (Wns) for Sphagnum bogs was 3.65. In light of the literature data, this value is at most moderate, suggesting the disturbed naturalness of the boggy complex. The reserve is one of the Poland's important refuges of "special concern" dragonfly species. Threats to the local dragonfly populations have been identified in the reserve: some forms of human impact and drying out of the peatland. There is a need to prepare a conservation plan for the reserve, taking into account the conservation policy towards dragonflies." (Author)] Address: Ołdak, K.A., ul. Ziemowita 14, 05 – 300 Mińsk Mazowiecki, Poland. Email: krystian.adam.-oldak@gmail.com

21769. O'Neill, D.; Häkkinen, H.; Neumann, J.; Shaffrey, L.; Cheffings, C.; Norris, K.; Pettorelli, N. (2023): Investigating the potential of social media and citizen science data to track changes in species' distributions. Ecology and Evolution 13(5), e10063: 13 pp. (in English) ["How to best track species as they rapidly alter their distributions in response to climate change has become a key scientific priority. Information on species distributions is derived from biological records, which tend to be primarily sourced from traditional recording schemes, but increasingly also by citizen science initiatives and social media platforms, with biological recording having become more accessible to the general public. To date, however, our understanding of the respective potential of social media and citizen science to complement the information gathered by traditional recording schemes remains limited, particularly when it comes to tracking species on the move with climate change. To address this gap, we investigated how species occurrence observations vary between different sources and to what extent traditional, citizen science, and social media records are complementary, using Calopteryx splendens in Britain as a case study. C. splendens occurrences were extracted from citizen science initiatives (iRecord, iNaturalist) and social media platforms (Facebook, Flickr, Twitter), and compared with traditional records primarily sourced from the British Dragonfly Society. Our results showed that species presence maps differ between record types, with 61% of the citizen science, 58% of the traditional, and 49% of the social media observations being unique to that data type. C. splendens habitat suitability maps differed most according to traditional and social media projections, with traditional and citizen science being the most consistent. We conclude that (i) social media records provide insights into C. splendens distribution and habitat preference that are different from, and complementary to, the insights gathered from traditional recording schemes and citizen science initiatives; (ii) predicted habitat suitability maps that ignore information from social media records can substantially underestimate (by over 3500 km² in the case of C. splendens) potential suitable habitat availability." (Authors)] Address: O'Neill, Daisy, Inst. Zool., Zool. Soc. London, Regent's Park, London NW1 4RY, UK. Email: d.oneill@-pgr.reading.ac.uk

21770. Ott, J. (2023): Sensibilität von Libellen gegenüber invasiven Krebsen. Eine Risikoanalyse für den rheinland-pfälzischen Teil des nördlichen Oberrheintieflands. Naturschutz

und Landschaftsplanung 55(7): 30-36. (in German, with English summary) ["Sensitivity of dragonflies to invasive crustaceans – Risk analysis for the Rhineland-Palatinate part of the Northern Upper Rhine Plains. In Rhineland-Palatinate, six invasive crayfish species (Decapoda) with varying degrees of threat potential for dragonflies and other aquatic organisms and ecosystems have been identified in the Northern Upper Rhine Plain. The signal and calico crayfish in particular have a very negative effect; the no less invasive marbled crayfish and the red swamp crayfish have only spread locally so far. The negative effects on dragonflies have been documented several times; in this article, a risk analysis is carried out by overlapping the distribution data of crayfish and dragonflies in the Rhineland-Palatinate part of the Northern Upper Rhine Plain. It shows that more than 80 % of dragonfly species are affected, with many endangered and/or protected species being affected. In addition, many nature reserves and protected areas under the EU Habitats Directive are also affected in the alluvial zone of the river Rhine. Due to the steady spread of invasive crayfish, this will continue to increase. Finally, some management suggestions are made, although their impact will remain limited." (Author)] Address: Ott, J., Friedhofstr. 28, D-67705 Trippstadt, Germany. E-mail: ott@lupogmbh.de

21771. Pereira de Gouvea, T.; Stefani-Santos, G.; Vilela, D.S.; Francisco de Ávila Júnior, F.; Magalhães de Souza, M. (2023): Odonata community in transition areas between Cerrado and Atlantic Forest biomes in south-central Minas Gerais, Brazil. Acta Scientiarum Biological Sciences 45: e63434: 10 pp. (in English) ["Faunal inventories are essential for biota management and conservation, especially in areas with potential for the creation of conservation units. Inventories of insect taxa such as Odonata, which perform several environmental services in aquatic and terrestrial ecosystems, are of great importance. In view of the above, this study aimed to update and expand the list of Odonata species in the Barroso region, Minas Gerais State, Brazil. This study was carried out in three areas of forest fragments in Atlantic Forest and Cerrado biomes in October 2020, December 2020, January 2021, and March 2021. The sampling effort was 8 hours per day during 20 days, totaling 140 sampling hours. A total of 43 Odonata species were recorded, which increased the richness of the study area from 57 to 76 species. The studied areas harbor rare and endangered species. However, since the last sampling in 2009, there has been a significant reduction in diversity in the Atlantic Forest fragment. In view of the changes that forest fragments are undergoing, we underscore the need to create a conservation unit, especially in Baú Forest." (Authors)] Address: Pereira de Gouvêa, T., Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas, Praça Tiradentes, 416, 37576-000, Inconfidentes, Minas Gerais, Brazil. Email: taiguaragouvea.bio@gmail.com

21772. Pereira-Moura, L.; Veras, D.S.; de Carvalho, F.G.; Juen, L.; Marques Couceiro, S.R. (2023): Habitat specificity and morphology-main filters for the distribution of Odonata in the Cerrado Maranhense, Brazil. Aquatic Ecology 57: 443-458. (in English) ["Our study evaluates the relationship among habitat specificity, morphology and differences in spatial niche breadth of Odonata, in streams with different environmental conditions in the Cerrado Maranhense. We collected in 24 streams between May and November 2016 and March and April 2017. A total of 824 specimens were collected, distributed in 57 species, of which 12 were classified as generalists and five as specialists in integral habitat. Habitat generalists tend to be larger than species that specialize in intact environments; PERMANOVA showed a significant separation between the generalist and specialist groups in environments with less anthropic impact (Pseudo $F = 0.173$; $p = 0.001$). The length and width of the wings along with the length of the chest were the most important characteristics for this differentiation. Telebasis griffinii and Epipleoneura williamsoni (OMI – 0.0 and 5.0) presented the lowest spatial niche values. However, specialist species did not always show the lowest values. More than half of the species in our study (n = 35) were considered rare by the Multinomial species classification method (CLAM) for having an abundance of less than seven individuals. The number of rare species is a matter of concern given the fragmentation of the region's aquatic environments, which has been shaping Odonata assemblages, making room for generalist species and excluding species that need more complete conditions." (Authors)] Address: Pereira-Moura, L., Programa de Pós-Graduação em Biodiversidade e Biotecnologia - BioNorte, Lab. de Ecologia e Taxonomia de Invertebrados Aquáticos, Univde Federal do Oeste do Pará, Campus Tapajós, Vera Paz, sn, bloco 11, sala 03, Salé, Santarém, PA, Brazil

21773. Pinto, T.J.; Smith, W.S. (2023): Impacts of sedimentation and dam failure on the macroinvertebrate community in a tropical stream. Limnetica 42(1): 19-36. (in English, with Portuguese summary) ["Impacts of sedimentation and dam failure on the macroinvertebrate community in a tropical stream Changes in land use due to human activities lead to disturbances related to sedimentation in aquatic ecosystems. Furthermore, the construction of dams in streams raises concerns about their safety, and the rupture of these structures implies significant impacts. Thus, this article assessed the effects of sedimentation and dam failure on the aquatic macroinvertebrate community in a tropical stream and verified its influence on the structural and functional composition of this assemblage of organisms. Water physical-chemical parameters and macroinvertebrate fauna data were obtained from monitoring data for both the pre- and post-rupture period. Macroinvertebrates were identified at the family level and classified according to functional feeding groups. Structural and functional biological indexes were applied, and data were analyzed using comparison tests, correlation matrix, correspondence, and cluster analysis. The results showed that sedimentation resulted in the impoverishment of macroinvertebrate fauna, with the loss of important functional feeding groups, indicating a low environmental quality. Dam failure changed the composition of the fauna, leading to the disappearance of important orders, the appearance of organisms belonging to the order Coleoptera, and the loss of feeding groups with consequent loss of ecological functions. The dam failure was not the only stressor for the studied stream, because it already suffered from small and medium scale disturbances related to sedimentation. However, the rupture of the structure resulted in greater environmental losses, and is considered large scale, implying the need to implement recovery measures in the area." (Authors)] Address: Pinto, T.J., Post-Graduate Program in Environmental Engineering Sciences, Center of Water Resources and Environmental Studies, Nucleus of Ecotoxicology & Applied Ecology, University of São Paulo, Rodovia Domingos Innocentini, km 13, 13560-970, Itirapina (SP), Brazil. Email: thandyjuniosilva@gmail.com

21774. Plunkett, C.; Chance, F. (2023): Modeling coordinate transformations in the dragonfly nervous system. NICE-2023: Neuro-Inspired Computational Elements Conference April 2023. https://doi.org/10.1145/3584954.3584959: 6-10. (in English) ["Coordinate transformations are a fundamental

operation that must be performed by any animal relying upon sensory information to interact with the external world. We present a neural network model that performs a coordinate transformation from the dragonfly eye's frame of reference to the body's frame of reference while hunting. We demonstrate that the model successfully calculates turns required for interception, and discuss how future work will compare our model with biological dragonfly neural circuitry and guide neural-inspired neuromorphic implementations of coordinate transformations." (Authors)] Address: Chance, Frances, Sandia National Laboratories, Albuquerque, NM, USA. Email: fschanc@sandia.gov

21775. Powell, L.L.; Vaz Pinto, P.; Mills, M.S.; Baptista, N.L.; Costa, K.; Dijkstra, K.D.B.; Gomes, A.L.; Guedes, P.; Júlio, T.; Monadjem, A.; Palmeirim, A.F.; Russo, V.; Melo, M. (2023): The last Afromontane forests in Angola are threatened by fires. Nature Ecology & Evolution 7: 628-629. (in English) ["Afromontane forests — a unique ecosystem of cool, moist temperate forest that is now mostly restricted to high elevations — are a relic of glacial periods, when they were much more widespread in Africa. In southwestern Africa, only around 700 ha remains, all of which is located in Angola. The Namba mountain range in the highlands of western Angola contains the majority (about 85%) of the Afromontane forest patches of the region. Despite these mountains only recently being explored by scientists, they represent the best opportunity to conserve the most-threatened habitat in Angola — however, the situation there is alarming. ... only from Namba. ... A new species of Trithemis dragonfly, found only at streams and bogs in the Namba Mountains; these wetland habitats rely on precipitation from the Afromontane forest fragments and, lyinj in the valleys, are particularly vulnerable to impacts such as grassland fires and drainage for agriculture." (Authors)] Address: Melo, M., CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Lab. Associado, Campus de Vairão, Univ. Porto, Vairão, Portugal

21776. Prendi, M.; Paparisto, A.; Cuvelier, S. (2023): Proterebia phegea (Lepidoptera: Nymphalidae: Satyrinae): building bridges between the relic populations of Croatia, Bosnia-Herzegovina, Greece, and a new record from northern Albania. Phegea 51(2): 59-62, suppl. (in English, with Dutch, Albanian and French summaries) ["During the weekly field surveys (March 2021–September 2022) for the master thesis of the first author, 20 species of butterflies and 10 species of Odonata (S1) were recorded in the six selected sites (S1) of the Vau-Dejës region." (Authors) Recorded Odonata species are: Ischnura elegans, Enallagma cyathigerum, Anax imperator, Lindenia tetraphylla, Orthetrum brunneum, O. cancellatum, O. coerulescens, Sympetrum fonscolombii, Crocothemis erythraea, Trithemis annulata] Address: Prendi, M., Faculty of Natural Sciences, Dept Biology, Bulevardi Zogu i Parë, Tirana Univ., Al-1001 Tirana, Albania. Email: markoprendi16051999@gmail.com

21777. Putra, I.L.I.; Putri, W.A. (2023): Keanekaragaman Jenis Capung (Hexapoda: Odonata) Di Sekitar Kampus 4 Universitas Ahmad Dahlan, Yogyakarta. Diversity of dragonfly (Hexapoda: Odonata) around Universitas Ahmad Dahlan, Campus. Metamorfosa: Journal of Biological Sciences 10(1): 84-95. (in Indonesian, with English summary) ["This study aims to determine the diversity of species, characteristics of species, and species of dragonflies which were abundant around campus 4 Universitas Ahmad Dahlan (UAD). The sampling location was divided into four, namely rice fields, housing, vacant land and campus areas. Each area had 2 plots measuring 35 x 20 m². Each plot had 5 subplot measuring 150 m² dispersed in the plot. Sampling was conducted at 08.00 - 11.00 WIB and 15.00 - 17.00 WIB. Sampling was done using a net. The dragonfly that caught was inserted in the papillot paper and the thorax was pressed to death. Dragonflies were identified to the species level by comparing their morphology with an identification reference book. Abiotic factors that measured were air temperature and humidity, wind speed, CO, DO and water pH. The results of this study were there were 4 species of dragonflies that obtained, namely Pantala flavescens, Orthetrum sabina, Sympetrum fonscolombii and Diplacodes trivialis with a low diversity level of 0.36. The most abundant dragonfly species, S. fonscolombii, was 249 individuals with a dominance index value of 0.74 and the least abundant was Diplacodes trivialis with 10 individuals, with a dominance index value of 0.03. The conclusion of this research is that in the area around campus 4 UAD there is a disturbance in the form of land use change which causes a small index of dragonfly species diversity at that location." (Authors) The occurrence of S. fonscolombii in Indonesia (Sumatra) is more than questionable.] Address: Putri, W.A., Laboratorium Ekologi dan Sistematika, Program Studi Biologi, Fakultas Sains dan Teknologi Terapan, Universitas Ahmad Dahlan

21778. Rahim, A.M.; Hamid, S.A. (2023): A note on diversity of aquatic insects in rivers of Royal Belum State Park, Perak. J. Trop. Resour. Sustain. Sci. 10: 64-67. (in English) ["Royal Belum State Park is one of the oldest, protected and pristine land masses that joins hundreds of small tributaries that feed Lake Temenggor. A scientific expedition was conducted, and the diversity of aquatic insects was studied. Five rivers namely Sungai Ta Ng, Sungai Papan, Sungai Gen, Sungai Ruok and Sungai Rambutan were chosen. A kick-sampling technique was deployed to collect the aquatic insect larvae. The study recorded a total of 42 families and 61 genera of aquatic insects which Sungai Papan has the largest number of taxa recorded (18 families, 26 genera). The number of intolerant taxa (Ephemeroptera, Plecoptera, Trichoptera; EPT) in Sungai Papan was substantial (15 genera). Odonata was discovered to be the most diverse order (13 genera), followed by Ephemeroptera (10 genera) and Trichoptera (10 genera). The findings provided a concise richness of aquatic insects, which might serve as a good tool for evaluating the conservation needs of the area." (Authors) Taxa are treated at genus level.] Address: Hamid, S.A., School of Biological Sciences, Universiti Sains Malaysia. 11800 Minden, Penang, Malaysia. Email: ahsuhaila@usm.my

21779. Rashni, B.; Donnelly, T.; Sakiti-Waqa, H.; Osborne-Naikatini, T.; Raituva, J.; Maiwaqa, M.; Maiwaqa, P.V.: Marinov, M. (2023): On the Fijian endemic Nesobasis brachycerca Tillyard, 1924 (Odonata: Coenagrionidae) with first description of the female and updated description of the male. Zootaxa 5311(2): 251-266. (in English) ["N. brachycerca specimens have been sampled during the course of an ongoing PhD study investigating the utility of Odonata individuals for assessing the conservation importance of the Fijian freshwater resources. Material was analysed and compared to all published records on this taxon. We here provide the first morphological description (by supposition) of the female of N. brachycerca, update the morphological characteristics of the male and present some habitat specifications measured in the field.] Address: Rashni, Bindiya, University of the South Pacific; Discipline of Biological and Chemical Sciences; School of Agriculture; Geography; Environment; Ocean and Natural Sciences; Laucala Campus, Fiji

21780. Reis, K.S.S.; Braga, C.F.; Santos, T.M.T. (2023): Predatory activity of aquatic insects (Odonata: Libellulidae and Coleoptera: Hydrophilidae) on tadpoles of Rhinella sp. and Physalaemus sp. under laboratory conditions. Acta Brasiliensis 7(1): 22-26. (in English, with Portuguese summary) ["Predation regulates the functioning of communities and affects the population dynamics of organisms in the environment. The main aquatic predators are represented by invertebrates of the Insecta class, which feed on vertebrate and/or invertebrate organisms. Among vertebrates, tadpoles are the most consumed. This experiment studied the predatory activity of aquatic insects (Libellulidae and Coleoptera: Hydrophilidae) on Rhinella tadpoles sp. and Physalaemus sp. in the city of Capitão Poço, Pará, Brazil. The experiment had six treatments performed in two phases (day and night). Significant differences were observed only between treatments 1 (control) and 2 (Libellulidae) (F= 7.21; p= 0.00). Insect predatory activity was performed in both phases, with no significant differences (F= 1.33; p= 0.26). The success of the Libellulidae family is related to the strategies and morphological aspects that their larvae use in the act of predation. In contrast, the Hydrophilidae family, represented by adults in this experiment, has characteristics that may have contributed to the low predatory activity observed, such as: base diet consisting of algae and organic matter." (Authors)] Address: Santos, T.M.T., Museu Paraense Emílio Goeldi, Belém, 66040- 376, Pará, Brasil. Email: thuareag@gmail.com

21781. Rivas-Torres, A.; Di Pietro, V.; Cordero-Rivera, A. (2023): Sex wars: a female genital spine forces male damselflies to shorten copulation duration. Evolution, qpad073, https://doi.org/10.1093/evolut/qpad073: 8 pp. (in English) ["In some species males use weapons to harm females, increasing their short-term fitness. Here we show that females can use genital adaptations against males. Females of the damselfly Enallagma cyathigerum have a conspicuous vulvar spine on the 8 th abdominal segment, which contacts with the male during copulation. We tested three hypotheses for its function: it (i) inflicts damage to the male during copulation; (ii) facilitates endophytic oviposition; (iii) stimulates males during copulation to increase their investment. We found that males mated on average for 54 min with control females, but increased copulation to 99 min with females without spine. There was no evidence of physical harm of the spine on the male's seminal vesicle, which shows 8-18 folds, exactly where the spine contacts during copulation. Females with and without spine exhibited the same egg-laying rates and showed similar fecundity and fertility. Longevity was also similar in males mated to control and spineless females. In contrast to many species where females resist male harassment by behavioral responses, the morphological adaptation observed in E. cyathigerum appears to act as a sexual weapon, allowing females to control copulation duration. We suggest that the spine has evolved because of sexual conflict over mating duration." (Authors)] Address: Cordero Rivera, A., Departamento de Ecoloxia e Bioloxia Animal, Universidade de Vigo, E.U.E.T. Forestal, Campus Universitario, 36005 Pontevedra, Spain. E-mail: cordero@uvigo.gal

21782. Romero-Lebrón, E.; Fernández-Monescillo, M.; Matushkina, N.; Delclòs, X.; Gleiser, R. M. (2023): Damselflies (Coenagrionidae) have been avoiding leaf veins during oviposition for at least 52 million years. iScience 26(6) 106865: 14 pp. (in English) [Plant-insect interactions can provide extremely valuable information for reconstructing the oviposition behavior. We have studied about 1350 endophytic egg traces of coenagrionid damselflies from the Eocene, identifying triangular or drop-shaped scars associated with them. This study aims to determine the origin of these scars. Our behavioral study of about 1,800 endophytic eggs from recent coenagrionids indicates that these scars were caused by ovipositor incisions, but without egg insertion. The scar correlates (c2-test) with leaf veins in both fossil and extant species. We infer that a female would detect the proximity of a leaf vein and avoid egg-laying, generating a scar that also fossilizes. For the first time, a scar produced by the ovipositor has been identified, indicating the existence of undesirable areas for oviposition. Accordingly, we recognize that Coenagrionidae damselflies (narrow-winged damselflies or pond damselflies) have been avoiding leaf veins for at least 52 million years." (Authors)] Address: Romero-Lebrón, Eugenia, Universidad Nacional de Córdoba (UNC) – CONICET. IMBIV: Instituto Multidisciplinario de Biología, Vegetal. Centro de Relevamiento y Evaluación de Recursos Agrícolas y Naturales (CREAN). Av., Valparaíso s/n 5016, Córdoba, Argentina. Email: eugeniaromerolebron@gmail.com

21783. Sammoudi, R.; Chahlaoui, A.; Khaffou, M.; Elouahli, A.; Fekhaoui, M.; Arahou, M. (2023): Biodiversity assessment and ecotypology of the Taanzoult plain running water (Aguelmam Sidi Ali, Morocco). Scientific African 20, July 2023, e01631: 12 pp. (in English) ["Highlights: • Biological diversity is low in the dry season and increases along the flow gradient. • Low representation of bioindicators indicates the degradation of and aquatic biotope. • Imminent health risk due to the presence of anopheles and the abundance of Lymnaeidae. • Poor biological waters quality in dry seasons compared to the wet season. Abstract: The Taanzoult plain is an integral part of the Aguelmam Sidi Ali wetland in the central Moroccan Middle Atlas. Its composition, of several geomorphological facies and terrestrial and aquatic habitats, offers consequent ecosystemic and socioeconomic services. Nevertheless, it is subject to strong anthropic pressure. The objective of this study is to measure the biodiversity and to evaluate the anthropogenic interactions within the aquatic environment. Benthic population dynamics were analyzed at seven monthly stations along the 12-month hydrobiological cycle. The study allowed the inventory of 25432 individuals divided into nine taxonomic classes. The taxonomic wealth is 106 taxa belonging to 92 genera and 64 families of which 70 taxa were recorded at water sources and 77 taxa at the streams. This richness is composed mainly of 64% of insects, 10% of clitellates, 9% of gastropods and 9% of crustaceans. The quantitative and qualitative biological indicators have generally concluded to a poor water quality for both springs and streams. Moreover, the bioindicator species of the good quality of water resources and the surrounding terrestrial ecosystem (Odonata and Plecoptera) are less present despite the absence of their aquatic predators (fish). Thus, the presence of Lymnaeidae and Planorbidae hosts of several pathogens responsible for waterborne diseases and the presence of Anopheles (Culicidae) agent responsible for malaria. In this context, the aquatic biodiversity is significantly influenced by the anthropozoogenic impact according to a spatiotemporal typology. Indeed, these observations highlight aquatic life degradation and put in suspicion the quality of drinking water and hydropathy. So, it would be judicious to set up a rigorous surveillance system to prevent the imminent health risk and to regulate the pastoral activity in the wetland, in order to foresee adequate development of the water sources in order to perpetuate the offered ecosystem services. ... it was noticed that the Odonata (six taxa with 48 individuals) and the Plecoptera (one taxon with nine individuals) are less represented despite the absence of their aquatic predators (fish)." (Authors)] Address: Sammoudi, R., Mohammed V University,

Scientific Institute, Rabat, Morocco. Email: rachid.sammoudi@is.um5.ac.ma

21784. Sanap, N.P. (2023): Odonatan diversity in around the campus area of Pt. Ravishankar Shukla University Raipur (C.C.), India. Biodiversity Assessment: Tool for Conservation Volume II: 27-31. (in English) [15 Odonata species are listed.] Address: Sanap, N.P., Shardchandra Arts, Commerce and Science College, Naigaon, Dist. Nanded, India. E-mail: npsanap@gmail.com

21785. Santana Reisa, K.S.; Braga, C.F.; Trindade dos Santos, T.M. (2023): Predatory activity of aquatic insects (Odonata: Libellulidae and Coleoptera: Hydrophilidae) on tadpoles of Rhinellasp. and Physalaemussp. under laboratory conditions. Acta Brasiliensis7(1): 22-26. (in English, with Portuguese summary) ["Predation regulates the functioning of communities and affects the population dynamics of organisms in the environment. The main aquatic predators are represented by invertebrates of the Insecta class, which feed on vertebrate and/or invertebrate organisms. Among vertebrates, tadpoles are the most consumed. This experiment studied the predatory activity of aquatic insects (Libellulidae and Coleoptera: Hydrophilidae) on Rhinella tadpoles sp.and Physalaemus sp. in the city of Capitão Poço, Pará, Brazil. The experiment had six treatments performed in two phases (day and night). Significant differences were observed only between treatments 1 (control) and 2 (Libellulidae) (F= 7.21; p= 0.00). Insect predatory activity was performed in both phases, with no significant differences (F= 1.33; p= 0.26). The success of the Libellulidae is related to the strategies and morphological aspects that their larvae use in the act of predation. In contrast, the Hydrophilidae, represented by adults in this experiment, has characteristics that may have contributed to the low predatory activity observed, such as: base diet consisting of algae and organic matter." (Authors)] Address: Trindade dos Santos, T.M., Museu Paraense Emílio Goeldi, Belém, 66040-376, Pará, Brasil. Email: thuareag@gmail.com

21786. Sarsavan, A.; Wasnik, A.; Soman, S.C. (2023): Climate change effects on tropical odonate community. Holistic Approach Environ. 13(3): 92-105. (in English) ["Climate change, such as increased rainfall variability, has affected Yavatmal district in the last decade. Uncertainty of rainfall affects the inter-annual vegetation growth, and thus biodiversity. A baseline study was carried out in 4 habitats in Waghadi basin of Yavatmal district to analyse Odonates species abundance, richness, and diversity as a prerequisite for the protection and management of these habitats. A total of 1263 individuals of 30 species distributed in 6 families were collected. Libellulidae is most dominant family with 13 species. The influence of vegetation on species richness and diversity was analysed (using normalized difference vegetation index values at buffer zones of 1000 m, 500 m, 100 m and 50 m), with further research into the trends of species diversity for each habitat. There was an increase in species richness and diversity with an increase in the dense vegetation, especially around temporary water bodies. This study indicates the contribution of temporary water bodies to ecosystem function and suggests its conservation by monitoring the impacts of increased rainfall variability and anthropogenic influence using odonates." (Authors)] Address: Sarsavan, A., Foundation for Ecological Security (FES), Anand, Gujarat, India. Email: anilsarsavan@gmail.com

21787. Savard, M. (2023): Climate perturbation: dragonflies now in November in the plain of Lac Saint-Jean and Saguenay, province of Québec, Canada. Argia 35(1): 24-29. (in English) ["An exceptionally warm weather occurring in fall 2022 extended the flight period of dragonflies in the plain of Lac Saint-Jean and Saguenay, Québec. The date of 4-XI-2022 represents the first dragonfly observation recorded so late in this northern latitude. This exceptional fact pushes the date record for this ecological region back by three weeks. With a generally upward trend in autumn temperatures, it will perhaps be customary to see in late October, or even early November, Sympetrum vicinum and other late-season species, such as Lestes congener, Aeshna umbrosa, Sympetrum obtrusum, and S. danae." (Author)] Address: Savard, M.; E-mail: michel.savard@ssss.gouv.qc.ca

21788. Sawant, D.; Deulkar, R.M.; Ogale, S.; Ogale, H. (2023): Four new records of dragonflies (Insecta, Odonata) from Amboli region of Western Ghats, Maharashtra, India. Entomon 48(1): 99-106. (in English) ["Microgomphus souteri, M. flavocolorata, M. irata and Idionyx corona reported from Maharashtra State for the first time. The records are the northern most distribution range for the respective species. Brief description with identification characters of the species is provided." (Authors)] Address: Ogale, H., 1040, Whistling Woods, Amboli, Sindhudurg 416510, Maharashtra, India

21789. Schwyzer, P.W. (2023): Die Schabracken-Königslibelle Anax ephippiger im Irchelpark (Stadt Zürich) beobachtet. Ornithologischer Beobachter 120(2): 98. (in German) [Switzerland, 9-V-2023] Address: not stated

21790. Seehausen, M.; Turiault, M.; Fliedner, H.; Deliry, C. (2023): "A nice old greybeard" - Friedrich Ris' correspondence archived at the Senckenberg Museum Frankfurt/Main, Germany. International Dragonfly Fund Report 180: 1-84. (in English) ["The private papers of Friedrich Ris including letters he received were digitized and perused. Altogether 1635 letters written by 118 correspondents are considered, and their content is summarized. In addition 14 letters sent to Ris' relatives after his death are included. The correspondence covers the 53 years from 28-xii-1884 to 28-i-1931. Generally the correspondence involves an exchange of expertise, publications, illustrations, photographs, and to some extent private matters. Also the selling of specimens is mentioned in some letters. During the First World War Ris, a neutral Swiss citizen, corresponded with several entomologists from warring nations on both sides of the conflict. The lack of letters from Förster and Krüger is discussed. The correspondence resulted in the discovery of some Odonata specimens captured by Bartenev. Calopteryx splendens was a species of special interest to Ris, he requested specimens from several correspondents at least after 1912. There is evidence for the deposition of the holotype of Selysiothemis nigra in Selys' collection. Furthermore the correspondence provides information e.g. about the exchange of type material, the discovery of new species, the extensive collecting of [E.B.] Williamson, of different points of view regarding the correct spelling of Aeshna, and further odonatological topics. Apparently unpublished data found in the correspondence are the first records of Lestes macrostigma at the Lake Neusiedl, Austria in 1923 by Zerny, and the quantities of Somatochlora arctica captured by Morton during his 1904 trip to Switzerland. Probably the earliest photographs of water mites on the wings of Sympetrum meridionale were found in Ris mss responding to a letter of Viets." (Authors)] Address: Seehausen, M., Zool. Mus. der CAU zu Kiel, Hegewischstr. 3, 24105 Kiel, Germany. Email: mseehausen@zoolmuseum.uni-kiel.de

21791. Seehausen, M. (2023): Nachweise der an Libellen parasitierenden Gnitze Forcipomyia paludis in Vorpommern

und auf Rügen (Odonata; Diptera: Ceratopogonidae). Libellula 41(3/4): 107-114. (in German, with English summary) ["Records of the biting midge Forcipomyia paludis in Western Pomerania and Rügen Island – Three localities where Forcipomyia paludis and Cladium mariscus co-occur are presented. In 2021 and 2022, a total of 75 midges on 63 Odonata individuals were recorded. All records are listed in detail. At most five midges on a male Gomphus vulgatissimus were observed on 11 June 2022. Phenologically, the observations were made between 11 June (2022) and 2 August (2022), the latter currently being the latest record in Germany. A preference of the midges for the upper side of the wing (67%) and the hindwing (70%) in Anisoptera, and under side of the wing (63%) and the forewing (68%) in Zygoptera was detected." (Authors)] Address: Seehausen, M., Waldhöhe 9a, D-24306 Plön, Germany. Email: m.seehausen@gmx.de

21792. Sharma, A.K.; Kumar, N.; Naveen; Tare, S.; Nayak, S.; Seervi, S. (2023): Phototactic response and taxonomic distribution of predaceous species of paddy ecosystem. Biological Forum – An International Journal 15(3): 91-94. (in English) ["The present investigation was carried out at the Research Farm of the College of Agriculture, JNKVV, Jabalpur (M.P.) during Kharif 2020 with a view to collect valuable information on the distribution of predatory species of paddy ecosystem in the Jabalpur region. The majority of nocturnal insect pests with a positive phototropic response are being controlled with light traps. Therefore, gathering data and documentation on natural enemies found in the paddy ecosystem's light traps is equally crucial. During the investigation, light trap collection was represented by a total of 17 predatory species. These species belong to 5 orders and 13 families. Among these orders, Coleoptera was the highest order with 4 families and 6 species. The highest size of trap catch of 3,856 beetles was recorded in Coccinella sp. of the family Coccinellidae. Hemiptera was the next order, represented by 3 families and 5 species. Major hemipteroid predatory species were Canthecona furcellata (166), Antilochus sp. (122) Ectomocoris cordiger (145), Sirthenea sp. (98) and Erthesina fullo (52). Among the other predatory orders, Odonata was represented by Libellula sp. (224) and Coenagrion sp. (52). Similarly orders Hymenoptera was also represented by two species viz. Eumenes sp. (58) and Dorylus sp. (21) while order Dictioptera was represented by only one species each. Thus, these results concluded that the positive benefit far outweighs the negative effect, demonstrating the safety of using light traps in IPM programmes with regard to their influence on natural enemies." (Authors)] Address: Sharma, A.K., Department of Entomology, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh), India

21793. Sharma, P.; Kangale, M.; Agase, D.M. (2023): Study of odonates diversity near Koradi Lake, Koradi, Nagpur, Maharashtra. Journal of Entomology and Zoology Studies 11(1): 126-130. (in English) [Odonata are "prevalent near marshy areas, ponds, lakes, rivers, ditches, and other water bodies. They contribute significantly to the biological foundation of all terrestrial ecosystems as herbivores, pollinators, seed dispersers, predators, detritivores, and vectors. They also serve as effective environmental indicators and biocontrol agents. The objective of the present study was to determine the diversity of odonates in the area around Nagpur's Koradi Lake, which is home to a wide variety of birds and insects. Twenty species of Odonates from 15 genera and three families were discovered during the monitoring in the marked areas near the lake. In total, 1071 individual odonates have been observed in the Koradi region. Libellulidae had the most species (12), followed by Coenagrionidae (7 species), and Aeshnidae (1 species). It was noted that urbanisation and pollution could have a negative impact on the diversity of odonates in the Koradi region." (Authors)] Address: Agase. D.M., Govt. J.S.T.P.G. College, Balaghat, Madhya Pradesh, India

21794. Shavkatovna, A.M.; Japakovich, M.M.; Iskandarovich, I.A.; Babajanovna, D.M.; Saparboyevich, D.J. (2023): Update to the status of Lindenia tetraphylla (Vander Linden, 1825) (Odonata Gomphidae: Lindenia (De Haan, 1826)) in Uzbekistan, with special reference to the Khorezm region. International Journal of Environmental Engineering and Development 1: 11-17. (in English) ["Considering that odontological studies have not been adequately conducted in the Khorezm oasis located in the north-western part of Uzbekistan, we presented the obtained results about the state of Lindenia tetraphylla for the last three years. Species L. tetraphylla was included in the section “Endangered species” (LC-Least concern ver 3.1) of the International Red Book (IUCN). During our researches, this species was recorded in 3 regions of the oasis, as well as in one region of the Republic of Karakalpakstan. L. tetraphylla was found mainly in the protected tugai biotope areas of the oasis." (Authors)] Address: Shavkatovna, A.M., Khorezm Mamun Academy, PhD student, Khiva, Markaz Str.,1, Uzbekistan

21795. Sinambela, M.; Hutagaol, Y.; Sinaga, T.; Simorangkir, A. (2023): Population of macrozoobenthos in Mariah Bandar Springs, Pematang Bandar District, Simalungun Regency, North Sumatra. JBIO: jurnal biosains 9(1): 63-69. (in English) ["Research on macrozoobenthic populations in Mariah Bandar Springs, Pematang Bandar District, Simalungun Regency, North Sumatra Province was carried out from May 2022 to June 2022. The purpose of this study was to gather information about macrozoobenthos populations in Mariah Bandar Springs and to find out about the diversity of macrozoobenthos populations in Mariah Bandar Spring Waters. This research was conducted in three locations, namely upstream, middle and downstream of Mariah Bandar Springs. There are each sub-location from each of these locations, in one location consisting of the upper, middle and lower ends. Each of the locations uses three points in macrozoobenthos sampling. Macrozoobenthos sampling using surber net. The results showed that there were 9 species of macrozoobenthos including Lumbricus sp, Thiara winteri, Enallagma nymph, Thiara scraba, Corbicula fluminea, Chironomus sp, Orthetrum glaucum larvae, Hagenius brevistylus [sic] and Euplanaria sp. Based on the Shannon-Wienner diversity index, locations I, II, III have low diversity (H' = 0.147)." (Authors)] Address: Sinambela, Masdiana, Biologi, Fak. Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Medan, Indonesia. Email: masdianasinambela@gmail.com

21796. Sittenthaler, M.; Fischer, I.; Chovanec, A.; Koblmüller, S.; Macek, O.; Sattmann, H.; Szucsich, N.; Zangl, L.; Haring, E. (2023): DNA barcoding of exuviae for species identification of Central European damselflies and dragonflies (Insecta: Odonata). Journal of Insect Conservation 27: 435-450. (in English) ["Monitoring of odonates has become an important instrument for ecological status assessment of (semi-)aquatic habitats. Besides information on presence and abundance, knowledge about a species ´ autochthony at the surveyed waterbody is a significant information within the assessment process. Here, the finding of exuviae represents the ultimate proof of successful reproduction. Although feasible for most odonate species, morphological identification of exuviae is often time consuming, as it relies

on small, fragile structures. To facilitate species identification of exuviae, a DNA barcoding approach was developed, including (1) non-destructive extraction of DNA using whole exuviae or their tracheal tubes, and (2) primer systems for long (< 600 bp) and short (< 200 bp) CO1 fragments. A total of 85 exuviae from 33 species were analysed and compared to results of morphological identification. Additionally, factors potentially influencing DNA quality and quantity, as well as PCR and sequencing success were investigated. Eighty-two exuviae matched the morphologically identified genus, and 60 matched at species level. Of the 33 species present in the data set, 82% could be identified to species level via DNA barcoding. The results show how DNA-based approaches can support fast and accurate species identification and therefore enhance monitoring of an ecologically important taxonomic group, with high relevance for conservation and habitat restoration. Moreover, the use of exuviae as DNA resource once more shows that non-invasive sampling offers great potential for molecular species identification, which is essential when studying rare and endangered species. Implications for insect conservation Our results show how molecular tools, here DNA barcoding of odonate exuviae, can support species monitoring without the need of catching individuals, harming, or even killing them. Obtaining DNA from non-invasive sources can thus be a direct advantage to the conservation of insects, especially when dealing with rare and endangered species and/or populations. Using the example of odonates as bioindicator organisms for aquatic and semi-aquatic habitats, we highlight the importance of non-invasive genetic approaches for population studies and monitoring of insect species and/or species communities for ecosystem assessments and conservation management." (Authors)] Address: Fischer, Iris, Central Research Laboratories, Natural History Museum Vienna, Burgring 7, 1010 Vienna, Austria. Email: iris.fischer@nhm-wien.ac.at

21797. Spoelstra, J.; Post, R. (2023): Groundwater characterization of the eastern Minesing Wetlands in support of the endangered Hine's emerald dragonfly (Somatochlora hineana). Wetlands Ecology and Management 31: 309-327. (in English) ["The Minesing Wetlands contain Canada's only known population of Hine's emerald dragonfly (HED), a species listed as endangered since 2011. The HED relies on groundwater discharge areas to complete its life cycle and therefore the population is potentially sensitive to changes in groundwater. The goals of this study were to, (1) characterize groundwater discharge to the eastern portion of the Minesing Wetlands, which corresponds to the HED habitat, (2) document any significant changes in groundwater chemistry since a 1998 study, and (3) establish a comprehensive baseline water quality data set to facilitate future comparisons. Consistent with HED habitats in the USA, the chemistry of Minesing Wetlands groundwater was dominated by calcium and bicarbonate. Low groundwater chloride and nitrate concentrations indicated minimal impact from activities such as road salt application and fertilizer use. Nitrate was generally only found at the wetland margin where groundwater springs emerged from the base of the uplands. The dominant form of inorganic nitrogen in wetland groundwater was ammonium (max = 1.5 mg N/L), and soluble reactive phosphorus concentrations were also relatively high (8 to 122 µg/L). The most consistent change in wetland groundwater chemistry between the 1998 study and samples collected in 2015–2017 was that chloride concentrations in 10 of 23 wells increased over time, however the maximum mean well chloride (11.6 mg/L) remained well below the guideline for the protection of aquatic life (120 mg/L). To preserve HED habitat, potential impacts to groundwater need to be considered during land use planning for the recharge area." (Authors)] Address: Spoelstra, J., Environment & Climate Change Canada, Canada Centre for Inland Waters, 867 Lakeshore Road, P.O. Box 5050, Burlington, ON L7S 1A1, Canada. E-mail: John.Spoelstra@ec.gc.ca

21798. Tadhg, C.; Stafford, R.; Gillingham, P.K.; Bullock, J.M.; Brown, D.; Brown, M.; Walls, R.M.; Diaz, A. (2023): Correlated biodiversity change between plant and insect assemblages resurveyed after 80 years across a dynamic habitat mosaic. Ecology and Evolution 13:e10168: 13 pp. (in English) ["Historical data on co-occurring taxa are extremely rare. As such, the extent to which distinct co-occurring taxa experience similar long-term patterns in species richness and compositional change (e.g., when exposed to a changing environment) is not clear. Using data from a diverse ecological community surveyed in the 1930s and resurveyed in the 2010s, we investigated whether local plant and insect assemblages displayed cross-taxon congruence — that is, spatiotemporal correlation in species richness and compositional change — across six co-occurring taxa: vascular plants, non-vascular plants, Orthoptera, ants (Hymenoptera: Formicinae), hoverflies (Diptera: Syrphidae), and Odonata. All taxa exhibited high levels of turnover across the ca. 80-year time period. Despite minimal observed changes at the level of the whole study system, species richness displayed widespread cross-taxon congruence (i.e., correlated temporal change) across local assemblages within the study system. Hierarchical logistic regression models suggest a role for shared responses to environmental change underlying cross-taxon correlations and highlight stronger correlations between vascular plants and their direct consumers, suggesting a possible role for biotic interactions between these groups. These results provide an illustration of cross-taxon congruence in biodiversity change using data unique in its combination of temporal and taxonomic scope, and highlight the potential for cascading and comparable effects of environmental change (abiotic and biotic) on co-occurring plant and insect communities. However, analyses of historical resurveys based on currently available data come with inherent uncertainties. As such, this study highlights a need for well-designed experiments, and monitoring programs incorporating co-occurring taxa, to determine the underlying mechanisms and prevalence of congruent biodiversity change as anthropogenic environmental change accelerates apace." (Authors)] Address: Tadhg, Carroll, Leverhulme Centre for Anthropocene Biodiversity, Univ. of York, YO10 5DD, York, Wentworth Way, UK. Email: tadhg.carroll@york.ac.uk

21799. Tamm, J.; Opper, E. (2023): Ein Weibchen von Cordulegaster bidentata in der Rhein-Main-Ebene fernab der regulären Artlebensräume (Odonata: Cordulegastridae). Libellen in Hessen 16: 71-77. (in German) [Hessen, Germany "A female Cordulegaster bidentata was observed by the second author on June 12, 2022 in a wet old grass fallow on the edge of the Gundwiesen in the nature reserve "Mönchbruch near Mörfelden and Rüsselsheim" in the northern Upper Rhine plain next to Frankfurt Airport. This first record of an imago of this species in the lowlands is described and discussed in more detail." (Authors)] Address: Opper, E., 65812 Bad Soden, Germany. Email: nachtfalter1@gmx.de

21800. Tantipanatip, W. (2023): The relationship between diversity of aquatic insects with water quality in Rama Public Park, Phra Nakhon Si Ayutthaya province. Pathumwan Academic Journal 13(36): 67-77. (in Thai, with English summary) ["Diversity of aquatic insects along with the water

quality in Rama Public Park, Phra Nakhon Si Ayutthaya province were examined 10 sites from June 2017 to April 2018. A total of 1,041 individuals in 22 families and 4 orders of aquatic insects were found in this study. The order Hemiptera had the highest number of families (7 families), followed by order Odonata (6 families), Coleoptera (5 families), Diptera (4 families). Physico-chemical water quality parameter at each site, such as total dissolved solids, biochemical oxygen demand and conductivity were significantly different (P<0.05). Most of physico-chemical water quality parameters in Rama Public Park were in class 3 and 4 of the Classification and Standards of Water of Thailand for agriculture. The correlation between physicochemical water quality parameters and aquatic insects were analyzed. The physico-chemical parameters, such as, water and air temperature, turbidity, BOD, pH and conductivity were significantly correlated with Coenagrionidae, Notonectidae, Dytiscidae, Corduliidae, Protoneuridae and Naucoridae (P<0.05). Assessment of water quality could lead to an administrative planning and management of water resources in the Rama Public Park. Promoting conservation of water resources should be emphasized." (Author)] Address: Tantipanatip, W., Dept of Environmental Science, Faculty of Science and Technology, Phranakorn Si Ayutthaya Rajabhat Universit, Phranakhon Si Ayutthaya, Thailand, 13000. Email: watcharaporn@aru.ac.th

21801. Thio, H.B.; Ngiam, R.W.J. (2023): Biodiversity Record: Heterospecific pairing of scarlet skimmer and sultan dragonflies. Nature in Singapore, 16: e2023031. 2 pp. (in English) [heterospecific pair of a male Orthetrum testaceum and female Camacinia gigantea; Singapore Island, Upper Seletar Reservoir Park; 16-XII-2022; around 1136 hrs.] Address: Ngiam, R.W.J., National Biodiversity Centre, National Parks Board, 1 Cluny Road, Singapore 259569. Email: yanrobin@hotmail.com

21802. Toh, R. (2023): Biodiversity Record: The dragonfly, Brachygonia oculata, at Admiralty Park. Nature in Singapore, 16: e2023036. 1 pp. (in English) [Location, date and time: Singapore Island, Admiralty Park; 18-II-2023.] Address: Rachel Toh. Email: racheltzrq@gmail.com

21803. Trajanovski, S.; Zdraveski, K.; Trajanovska, S.; Budzakoska Gjoreska, B.; Zoroski, G.; Trichkova, T. (2023): Macroinvertebrate fauna of Belchishta Wetland, Republic of North Macedonia: Diversity and conservation status. Acta Zool. Bulg. 75(1): 133-144. (in English) ["This study depicts the results from the extensive monitoring of the invertebrate fauna of Belchishta Wetland, which is the largest preserved wetland in North Macedonia with an area of 137 hectares, including flooded forests and wet habitats. A total of thirty taxa belonging to eight systematic groups were registered, three of them being endemic species. Among the three endemic species, two are on the national list of endangered species. The thirty registered taxa of the invertebrate fauna of Belchishta Wetland point to a pronounced biodiversity, the framework of which includes endemic species with a narrow area of distribution and low abundance. These are justified arguments for the immediate adoption of conservation and protection measures through integral management of the whole Belchishta Wetland." (Authors) The list of taxa includes thre odonate species: Calopteryx virgo Linnaeus, 1758, Calopteryx splendens Harris, 1780, and "Calopteryx maculate Beauvois, 1805" [sic, a North American species]] Address: Trajanovski, S., Public Scientific Institution Hydrobiological Institute Ohrid, Naum Ohridski Blvd. 50, 6000 Ohrid, Republic of North Macedonia. E-mail: trajsa@hio.edu.mk

21804. Tshimwandi, F.S. (2023): Feeding ecology of the African tigerfish Hydrocynus vittatus castelnau, 1861 in the floodplains of the Kavango river, Namibia. M.Sc. thesis, Biodiversity Management, Faculty of Agriculture, Engineering and Natural Sciences, University of Namibia: IX + 41 pp. (in English) ["The feeding ecology of the African tigerfish Hydrocynus vittatus was investigated in the floodplains of the Kavango River, Namibia. A total of 275 samples of tigerfish were caught, using a seine and an experimental multifilament gillnet, during the annual flooding period between February and May 2020. The result of the study shows a significant ontogenetic dietary shift (P < 0.05) between size classes of tigerfish. The study also find a significant different (P < 0.05) in the diet composition of different size classes of tigerfish, where small size class tigerfish (20 mm -149 mm) fed predominately on aquatic macro invertebrates, which contributed by percentage number 94.5 % (N%), feeding mainly prey on the group of Corixidae 42.5%, Notonectidae 25.5% and Letophilebiidae 18.2%. Medium size class tigerfish (150 mm – 190 mm) fed on both portions of fish (Enteromius spp) and aquatic macro invertebrates (Trichoptera and Libellulidae) and the large size class tigerfish (200 mm - 585 mm) were predominately piscivorous (68.2 % N), feeding mainly on Cichlidae 34.9% and M. altisambesi 15.9 %. Overall, the results of the study show that tigerfish did not consume prey larger than 150 mm in total length (TL), and the predator - prey length ratio was approximately 23%. The study findings show that tigerfish on the Kamutjonga floodplains feed predominately on aquatic macro invertebrates when in the early stages of life and are piscivorous in the adult stage life. The study results provide important information in understanding the dietary requirement of tigerfish in the Kamutjonga floodplains. Such information is important in conservation measure of tigerfish. Henceforth, the study recommended multi-species modeling studies based on predator-prey interactions, in order to better understand, resource use and partitioning among species on the Kamutjonga floodplain." (Author)] Address: not stated

21805. Tuhin, M.I.A.; Nasiruddin, M.; Nayem, Z. (2023): Diversity and relative abundance of entomofauna of four ecologically different areas of Chittagong University Campus, Bangladesh. American Journal of Life Science and Innovation, 2(2), 1–11.: 1-11. (in English) ["The present study was conducted to find the relative abundance and diversity of insects in the four areas of the Chittagong University (CU) campus from January 2018 to December 2018. The entire study found six orders - Odonata, Orthoptera, Coleoptera, Lepidoptera, Diptera, and Hymenoptera. Three families under Odonata, two under Orthoptera, four under Coleoptera, five under Lepidoptera, five under Diptera, and three under Hymenoptera were collected from the four study spots. Among them, fifteen species of Odonata, seven species of Orthoptera, seven species of Coleoptera, thirty-five species of Lepidoptera, five species of Diptera, and four species of Hymenopteran were identified. The highest number of insects (478) were collected in January 2018, whereas the lowest number of insects (404) were collected in August 2018. The highest abundance (1598) of insects was found in spot 1 (ground area) and the lowest (990) in spot 2 (hilly area). Lepidoptera (2688) was the most dominant order in the four studied spots, followed by Odonata (1453), Orthoptera (505), Coleoptera (223), Diptera (202), and Hymenoptera (186). During the study period, the highest species richness was observed in Spot 3 (2.61 ± 0.01) and lowest in Spot 2 (2.03 ± 0.008); the highest species diversity was observed in Spot 1 (1.36 ± 0.02) and lowest in Spot 2 (1.09 ± 0.01); and the highest species evenness was observed in

Spot 1 (0.53 ± 0.006) and lowest in Spot 2 (0.47 ± 0.006). Compared with the previous study, it can be concluded that the species diversity and abundance of Odonata, Orthoptera, and Lepidoptera were increased, whereas the diversity and abundance of Coleoptera and Hymenoptera were decreased. The abundance and diversity of insects depended on seasonal fluctuation and ecological and environmental conditions." (Authors)] Address: Nayem, Zannatul, Department of Zoology, University of Chittagong, Bangladesh

21806. Udayanga, L.; Perera, S.J.; Ranathunge, T. (2023): Chapter 24: Natural enemies against dengue. In: Meththika Vithanage, Majeti Narasimha Vara Prasad (eds.): One health: Human, animal, and environment triad. https://doi.org/10.-1002/9781119867333.ch24: 351-362. (in English) ["Dengue is recognized as one of the most common and rapidly spreading mosquito-borne viral disease, causing approximately 100 million infections annually around the world, also making a major challenge to the health sectors of Sri Lanka, due to the absence of a specific treatment or a vaccine. Hence health entities around the world rely upon vector control as the primary management strategy for dengue prevention. Regardless of the availability of diverse vector control strategies, unintentional ill effects on the environment and the fast development of insecticide resistance have hindered their success. Biological control of larval and adult stages of Aedes vector mosquitoes using locally available natural predators provides a cost-effective, sustainable, and environmentally friendly strategy for dengue vector control. The remarkable ecosystem diversity in Sri Lanka harbors a wide range of natural predators of Aedes , which range from microscopic copepods (Mesocyclops leuckarti and Mesocyclops scrassus) to macroscopic dragonflies (Pantala flavescens and Anax indicus) and fish (Aplocheilus dayi, Aplocheilus parvus , and Puntius bimaculatus). Ongoing research recommends aforementioned native species as excellent biological control agents of Aedes over some exotic species introduced for the same purpose, as a major contributing aspect in integrated vector management for dengue." (Authors)] Address: Udayanga, L., Dept Bio-Systems Engineering, Fac. Agriculture & Plantation Management, Wayamba Univ. of Sri Lanka, Kuliyapitiya, Sri Lanka

21807. Verheyen, J.; Cuypers, K.; Stoks, R. (2023): Adverse effects of the pesticide chlorpyrifos on the physiology of a damselfly only occur at the cold and hot extremes of a temperature gradient? Environmental Pollution 326, 121438. (in English) ["Ecotoxicological studies considerably improved realism by assessing the toxicity of pollutants at different temperatures. Nevertheless, they may miss key interaction patterns between pollutants and temperature by typically considering only part of the natural thermal gradient experienced by species and ignoring daily temperature fluctuations (DTF). We therefore tested in a common garden laboratory experiment the effects of the pesticide chlorpyrifos across a range of mean temperatures and DTF on physiological traits (related to oxidative stress and bioenergetics) in low- and high-latitude populations of Ischnura elegans damselfly larvae. As expected, the impact of chlorpyrifos varied along the wide range of mean temperatures (12–34°C). None of the physiological traits (except the superoxide anion levels) were affected by chlorpyrifos at the intermediate mean temperatures (20–24°C). Instead, most of them were negatively affected by chlorpyrifos (reduced activity levels of the antioxidant defense enzymes superoxide dismutase [SOD], catalase [CAT] and peroxidase [PER], and a reduced energy budget) at the very high (=28°C) or extreme high temperatures (=32°C), and to lesser extent at the lower mean temperatures (=16°C). Notably, at the lower mean temperatures the negative impact of chlorpyrifos was often only present or stronger under DTF. Although the chlorpyrifos effects on the physiological traits greatly depended on the experimentally imposed thermal gradient, patterns were mainly consistent across the natural latitude-associated thermal gradient, indicating the generality of our results. The thermal patterns in chlorpyrifos-induced physiological responses contributed to the observed toxicity patterns in life history (reduced survival and growth at low and high mean temperatures). Taken together, our results underscore the importance of evaluating pesticide toxicity along a temperature gradient and of taking a mechanistic approach with a focus on physiology, to improve our understanding of the combined effects of pollutants and temperature in natural populations." (Authors)] Address: Verheyen, Julie, Evolutionary Stress Ecology and Ecotoxicology, University of Leuven, Charles Deberiotstraat 32, 3000, Leuven, Belgium. Email: julie.verheyen@kuleuven.be

21808. Walia, G.K.; Chahal, S.S.; Singh, N. (2023): Chromosomal characterisation of three dragonflies' species (Odonata: Anisoptera: Gomphidae). Proceedings of the Zoological Society 76: 55-58. (in English) ["Dragonflies of the family Gomphidae (order Odonata) possess characterstic club-like structure in the last segment of abdomen. Male germ cell chromosomes of Lamelligomphus biforceps, Nepogomphus walli and Onychogomphus grammicus of family Gomphidae were investigated, using carbolfuchsin staining, C-banding, silver nitrate staining and sequence specific staining. All the three possess chromosome complement 2n = 23, which is the type number of the family Gomphidae with XO/XX sex determining mechanism. Terminal C-bands are present on the autosomal bivalents, while bivalents show variation in distribution of NORs (Nuclear Organiser Regions). X chromosome is C- positive and NOR rich in all the species. All the autosomes show CMA3 (Chromomycin A3) bright signals in Lamelligomphus biforceps, whereas bright DAPI (4',6-diamidino-2-phenylindole) signals in Onychogomphus grammicus, and both DAPI and CMA3 bright signals in Nepogomphus walli. The X chromosome of L. biforceps possesses DAPI bright signals, while it reveals both DAPI and CMA3 bright signals in N. walli and O. grammicus. Cytogenetic analyses of all the species have been done for the first time." (Authors)] Address: Walia, Gurinder Kaur, Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India

21809. Wang, C.; Wang, X.; Yu, J.; Ding, B. (2023): Highly transparent carbon nanofibrous membranes inspired by dragonfly wings. ACS Nano 17(11): 10888-10897. (in English) ["Carbon nanofibrous membrane (CNFM) materials are commonly black and opaque, and their poor optical performance severely limits their application in emerging fields, such as electronic skin, wearable devices, and environmental technologies. However, it is extremely difficult for carbon nanofibrous membranes to achieve high light transmittance owing to their complex fibrous structures and high light absorption. Few researchers have studied transparent carbon nanofibrous membrane (TCNFM) materials. In the current study, a biomimetic TCNFM inspired by dragonfly wings is fabricated using electrospinning technologies and a self-designed patterned substrate, with the aim to construct a differential electric field. Compared with the disordered CNFM, the resultant TCNFM yields an approximately 18-fold higher light transmittance. The freestanding TCNFMs also exhibit high porosities (>90%), good flexibility, and good mechanical properties. The mechanism by which the TCNFMs achieve

high transparency and reduce light absorption is also elucidated. In addition, the TCNFMs display a high PM0.3 removal efficiency (>90%), low air resistance (<100 Pa), and good conductive properties, including a low resistivity (<0.37 O Ω cm)." (Authors)] Address: unknown

21810. Wasscher, M.; Hermans, J. (2023): Obituary: Bastiaan Kiauta (1937 – 2022). Brachytron 23: 3-6. (in Dutch, with English summary) ["On 26 March 2022, Bastiaan Kiauta (1937 – 2022) passed away at the age of 85. A short outline is given of his contribution to the study of dragonflies in the Netherlands. In the first place he contributed to the knowledge of dragonfly distribution, especially in the sixties. Secondly, he was the key initiator of the Dutch Dragonfly Researchers (the NLO), which was the predecessor of the NVL (Dutch Dragonfly Society) founded in 1997. In the third place, for more than 40 years he was editor-in-chief of the world dragonfly journal Odonatologica of the SIO. This journal is on the one hand a platform for publications, on the other hand Kiauta provided a summary of all publications which appeared in the period 1971-2013. His death marks the end of a special era in Dutch dragonfly study." (Authors)] Address: Wasscher, M., Minstraat 15bis, NL-3582 CA Utrecht, The Netherlands, E-mail: marcel.hilair@12move.nl

21811. Wildermuth, H. (2023): Libellen der Pfäffikersee-Gegend. Ornithologischer Beobachter 120(2): 131. (in German) [Verbatim (translation, Google translate): Lecture «Dragonflies of the Pfäffikersee area» Then Hansruedi Wildermuth, who knows dragonflies better than anyone else in Switzerland, presents the most important dragonfly species in Lake Pfäffikon and their habitats with magnificent pictures. Of the approximately 80 species occurring in Switzerland, almost 50 species have been identified in the Pfäffikersee area. Dragonflies spend most of their lives as larvae in water. They have very different ways of life and colonize different habitats such as the lake shore, ponds, fens, raised bogs, watercourses and ditches. A special feature of the Pfäffikersee is the dwarf dragonfly, which has its last location here in the canton of Zurich. In addition, it is only represented in Switzerland on Lake Neuchâtel. In order to promote the demanding species of large and small moss damsels, heavily forested raised bogs were cleared and peat cuts were renatured. Locations for observing dragonflies on the Pfäffikersee are the nature center in Pfäffikon, the Aa bridge and the boat harbor and the fishing piers at the southern end as well as the Messikommerweg through the Robenhuserried. At the end of his presentation, Hansruedi Wildermuth would like to thank everyone who works to preserve and enhance the landscape jewel of the Pfäffikersee. The audience thanked the speaker with long-lasting and hearty applause.] Address: Wildermuth, H., Haltbergstr. 43, CH-8630 Rüti, Switzerland. E-mail: hansruedi@wildermuth.ch

21812. Wondmagegn, T.; Mengistou, S. (2023): Development of macroinvertebrate based multimetric index for ecological health monitoring in Lake Hawassa, Ethiopia. Environmental and Sustainability Indicators 18, June 2023, 100242. in English ["Highlights: • A macroinvertebrate multimetric index (MMIH) was developed to assess the ecological condition of Lake Hawassa. • Habitat disturbance score against notable human activities was conducted to set reference conditions. • The newly developed MMIH index discriminates very well between the reference and non-reference sites of the lake. • It was validated and performed well in discriminating the reference and non-reference sites the independent data sets. Abstract: Little information is available on the use and applicability of biotic indices in aquatic resource conservation and management in Eastern Africa, especially in lentic ecosystems. The aim of this study was to develop a macroinvertebrate multimetric index (MMIH) to assess the ecological condition of Lake Hawassa. Sampling sites were clustered based on percentage disturbance score (PDS) and categorized into minimally (three sites), moderately (three sites) and highly disturbed (three sites). Physicochemical and invertebrate sampling was done at these clustered sites along the lakeshore area from February to November 2015 and 2016. Out of a total of 35 macroinvertebrate candidate metrics, ten core metrics were selected based on redundancy analysis, metrics response to environmental parameters, percent discriminatory efficiency (%DE) and box and whisker plots, and incorporated in the development of MMIH. The developed MMIH index performed well and showed a clear demarcation between the reference and non-reference sites and between the three-disturbance levels. The validation of the MMIH index performed well in discriminating the independent data sets taken from Lake Hawassa and L. Ziway. Besides, it also showed a strong but inverse relation with PDS (R2 = 0.91, P = 0.0003). Hence, in a lentic ecosystem, this index should be considered as a starting point in terms of lake bio-assessment in Ethiopia, but additional data in all ecoregions of the country are necessary to determine the long-term reliability and usefulness of the MMIH. In the short-term, this index will provide resource managers and aquatic environmentalists with a tool to assess the ecological condition of freshwater lakes." (Authors)] Address: Wondmagegn, T., Department of Animal Science, Debre Markos University, Debre Markos, Ethiopia. Email: wondmagegnet@gmail.com

21813. Woods, T.; McGarvey, D.J. (2023): Drivers of Odonata flight timing revealed by natural history collection data. Journal of Animal Ecology 92(1): 310-323. (in English) ["(1) Global change may cause widespread phenological shifts. But knowledge of the extent and generality of these shifts is limited by the availability of phenological records with sufficiently large spatiotemporal extents. Using North American odonates as a model system, we show how a combination of natural history museum and community science collections, beginning in 1901 and extending through 2020, can be leveraged to better understand phenology. (2) We begin with an analysis of odonate functional traits. Principal coordinate analysis is used to place odonate genera within a three-dimensional trait ordination. From this, we identify seven distinct functional groups and select a single odonate genus to represent each group. Next, we pair the odonate records with a list of environmental covariates, including air temperature and degree days, photoperiod, precipitation, latitude and elevation. An iterative subsampling process is then used to mitigate spatiotemporal sampling bias within the odonate dataset. Finally, we use path analysis to quantify the direct effects of degree days, photoperiod and precipitation on odonate emergence timing, while accounting for indirect effects of latitude, elevation and year. (3) Path models showed that degree days, photoperiod and precipitation each have a significant influence on odonate emergence timing, but degree days have the largest overall effect. Notably, the effect that each covariate has on emergence timing varied among functional groups, with positive relationships observed for some group representatives and negative relationships observed for others. For instance, Calopteryx sp. emerged earlier as degree days increased, while Sympetrum sp. emerged later. (4) Previous studies have linked odonate emergence timing to temperature, photoperiod or precipitation. By using natural history museum and community science data to simultaneously examine all three influences, we show that

systems-level understanding of odonate phenology may now be possible." (Authors)] Address: Woods, T., Department of Ecology and Evolutionary Biology, The University of Tennessee, Knoxville, Knoxville, Tennessee, USA. Email: woodstaylorelizabeth@gmail.com

21814. Wos, G.; Palomar, G.; Marszalek, M.; Babik, W.; Sniegula, S. (2023): The effect of temperature and invasive alien predator on genetic and phenotypic variation in the damselfly Ischnura elegans: cross-latitude comparison. Frontiers in Zoology, 10 Apr 2023, 20(1):13. DOI: 10.1186/s12983-023-00494-z PMID: 37032330 PMCID: PMC10084621: 14 pp. (in English) ["Background: Understanding and predicting how organisms respond to human-caused environmental changes has become a major concern in conservation biology. Here, we linked gene expression and phenotypic data to identify candidate genes underlying existing phenotypic trait differentiation under individual and combined environmental variables. For this purpose, we used Ischnura elegans. Egg clutches from replicated high- (southern Sweden) and central-latitude (southern Poland) populations facing different degrees of seasonal time constraints were collected. Damselfly larvae were exposed to experimental treatments: current and mild warming temperatures crossed with the presence or absence of an invasive alien predator cue released by the spiny-cheek crayfish, Faxonius limosus, which is only present in Poland to date. We measured the following traits: larval development time, body size, mass and growth rate, and used the larvae for gene expression analysis by RNA-seq. Data were analysed using a multivariate approach. Results: We showed latitudinal differences in coping with mild warming and predator cues. When exposed to an increased temperature and a predator cue, central-latitude individuals had the shortest development and the fastest growth compared to high-latitude individuals. There was a general effect of predator cues regarding mass and growth rate reduction independent of latitude. Transcriptome analysis revealed that metabolic pathways related to larval anatomy and development tended to be upregulated in response to mild warming but only in fast-growing central-latitude individuals. Metabolic pathways linked to oxidative stress tended to be downregulated in response to a predator cue, especially in central-latitude individuals. Conclusion: Different phenotypic and transcriptomic responses to environmental factors might be attributed to the variability in I. elegans life history strategies between the two latitudes caused by seasonal time constraints and to its coexistence with the invasive alien predator in nature. By providing insights into how organisms may respond to future anthropogenic changes, our results may be of particular interest in conservation biology." (Authors)] Address: Wos, G., Institute of Nature Conservation Polish Acad. of Sciences, al. Adama Mickiewicza 33, 31-120 Kraków, Poland. Email: wos@iop.krakow.pl

21815. Xu, J.; Liu, W.; Shang, W.; Chen, J.; Lian, J. (2023): Drop impact dynamic and directional transport on dragonfly wing surface. Friction 11(5): 737-747. (in English) ["The ability of dragonflies to fly in the rain without being wetted by raindrops has motivated researchers to investigate the impact behavior of a drop on the superhydrophobic wings of dragonflies. This superhydrophobic surface is used as a reference for the design of directional surfaces and has attracted extensive attention owing to its wide applicability in microfluidics, self-cleaning, and other fields. In this study, the static contact angle and rebound process of a drop impacting a dragonfly wing surface are investigated experimentally, whereas the wetting pressure, Gibbs free energy, and Stokes number vs. coefficient of restitution are theoretically calculated to examine the dynamic and unidirectional transport behaviors of the drop. Results show that the initial inclination angle of the dragonfly wing is similar to the sliding angles along with the drop sliding. The water drop bounces from the bottom of the dragonfly wing to the distal position, demonstrating directional migration. The drop impacts the dragonfly wing surface, and the drop exhibits compression, recovery, and separation phases; in these three phases, the drop morphology evolves. As the Gibbs free energy and cross-sectional area evolve, the coefficient of restitution decreases as the drop continues to bounce, and the Stokes number increases." (Authors)] Address: Chen, J., School of Mechanical Engineering, Purdue University, West Lafayette, Indiana 47907, USA. E-mail: junchen@purdue.edu

21816. Yoshioka, A.; Mitamura, T.; Matsuki, N.; Shimizu, A.; Ouchi, H.; Oguma, H.; Jo, J.; Fukasawa, K.; Kumada, N.; Jingu, S.; Tabuchi, K. (2023): Camera-trapping estimates of the relative population density of Sympetrum dragonflies: application to multihabitat users in agricultural landscapes. PeerJ 11:e14881: 22 pp. (in English) ["Although camera trapping has been effectively used for wildlife monitoring, its application to multihabitat insects (i.e., insects requiring terrestrial and aquatic ecosystems) is limited. Among such insects, perching Sympetrum are agroenvironmental indicators that substantially contribute to agricultural biodiversity. To examine whether custom-developed camera traps for perching dragonflies can be used to assess the relative population density of darter dragonflies, camera trapping, a line-transect survey of mature adult dragonflies, and a line-transect survey of exuviae were conducted for three years in rice paddy fields in Japan. The detection frequency of camera traps in autumn was significantly correlated with the density index of mature adults recorded during the transect surveys in the same season for both Sympetrum infuscatum and other darter species. In analyses of camera-detection frequency in autumn and exuviae in early summer, a significant correlation was observed between the camera-detection frequency of mature adults and the exuviae-density index in the following year for S. infuscatum; however, a similar correlation was not observed for other darter species. These results suggest that terrestrial camera trapping has the potential to be effective for monitoring the relative density of multihabitat users such as S. infuscatum, which shows frequent perching behavior and relatively short-distance dispersal." (Authors) https://peerj.com/articles/14881/#supplemental-information] Address: Yoshioka, A., Fukushima Regional Collaborative Research Center, National Institute for Environmental Studies, Miharu, Tamura-gun, Fukushima, Japan

21817. Zakqy, N.; Wiyatiningsih, S. (2023): Diversity of important pests and natural enemies in rice plants. Nusantara Science and Technology Proceedings, Seminar Nasional Agroteknologi 2022. doi: 10.11594/ nstp.2023.3117.: 82-86. In English [The purpose of the study was to obtain data on pests and natural enemies in lowland rice cultivation. Pests are leafhoppers (Nephotettix virescen, Nilaparvata lugens), rice ear bugs (Leptocorisa oratorius) or armyworms (Mythimna separate). Amomg the natural enemies Orthetrum sabina is listed.] Address: Wiyatiningsih, S., Department of Agrotechnology, Faculty of Agriculture, Univiersitas Pembangunan Nasional “Veteran” Jawa Timur, Surabaya 60294, Indonesia. Email: sri.wiyatiningsih@upnjatim.ac.id