

# Odonatological Abstract Service

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## 1998

**19762.** Arcas, J. (1998): Diet of Red-backed Shrikes (*Lanius collurio* L.) in Orense (Galicia, NW Spain). *Ardeola* 45(1): 69-71. (in Spanish, with English title) ["Intact specimens of dragonflies (Odonata) were also found, including the wings, contrary to what has been mentioned by other authors (Cramp & Perrins, 1993) that this species detaches these hard parts before ingesting them, although it is possible that these shrikes ingest whole dragonflies if they are small in size (Hernández, pers. comm.). One of the regurgitates contained two intact specimens of *Pyrrhosoma nymphula* (4.2 cm and 3.6 cm)." (Author/DeepL)] Address: Arcas, J., Laboratorio de Anatomía Animal. Depto de Ecología y Biología Animal. Facultad de Ciencias, Universidad de Vigo. Apdo. 874. E-36200 Vigo, Pontevedra, Spain.

**19763.** Leonard, N.J. (1998): Ectoparasitism of Odonata hosts: Host response to parasitism and host sex biases in parasitism. MSc thesis, Dept of Biology, Carleton Univ., Ottawa, Ontario: XIII + 91 pp. (in English) ["In the first chapter, I found that natural high levels of *Limnochares americana* (Lundblad) tend to negatively affect the survivorship and significantly reduce the time to female maturation of its damselfly host, *Enallagma ebrium* (Hagen). I observed that damselflies increase their grooming behaviours when they are being colonised by mite larvae. However, I did not observe any adaptive host response, i.e., an increase in reproductive effort, by adult males or females. In the second chapter, I investigated the causes of sex biases in parasitism by *L. americana* observed for field-caught *Nehalennia irene* (Hagen) and *Leucorrhinia frigida* (Selys). I also used *Enallagma ebrium* (Hagen), to test for the occurrence of a sex bias in engorgement size of *L. americana*. I found that *N. irene* showed no sex biases in parasitism in the laboratory whereas *L. frigida* females were more susceptible to mite colonisation than males. I also found that mites attained a larger size on *E. ebrium* females in the laboratory but not in the field." (Author)] Address: not stated

**19764.** Petitjeannin, M. (1998): Introduction aux élevages de larves aquatiques d'insectes Reunionais. Rapport de stage de fin de maîtrise. Observatoire Reunionais de l'eau, Parc de la Providence, 97489 Saint-Denis, France: 39 pp. (in French) ["Insects represent 80% of the world's fauna. Thanks to their tremendous adaptability, they have colonized all continental, equatorial and aquatic environments. In La Reunion, the ORE has identified 26 families of insects whose larvae are aquatic. In Europe in particular, the larvae of certain insects make it possible to assess the quality and

study running and lake water systems. These studies are based on the diversity and size of populations and therefore on a detailed knowledge of the insects and their development, i. e. larvae, nymphs and adults. They therefore require the master of systematics. The determination of larvae up to the species is often very difficult, even impossible. Indeed, the specific characteristics of the species are generally carried on the male genitalia of imago [imago = adult insect]. To overcome this difficulty, many authors recommend breeding larvae in order to obtain adults. Thus, in order to improve knowledge of Reunion Island insects, the ORE and Insectarium du Port have joined forces to carry out a breeding study of aquatic insect larvae. This project has started through an internship that took place during July and August 1998 to set up an eievage implementation method. For a first test, it is the order of Odonates which was retained, represented at the Reunion by 2 families of Dragonflies (Anisopteres) and 1 family of Demoiselles (Zygopteres). Indeed, it possessed three major assets: the larvae are sensitive to pollution, predators therefore easy to feed and rather easy to breed. Moreover, the adults are known by MM GUILLERMET C and COUTEYENS from the Insectarium. Larvae were collected from about ten sites and placed in aquanums at the Port Insectarium to allow them to continue their development. The difficulty consists in creating an artificial environment close to their natural environment. In parallel, in the ORE laboratory, the morphological characteristics of each individual were observed in order to try to identify and differentiate them. It was possible to establish the experimental conditions necessary for the development of larvae. Thanks to this work and the knowledge of the Insectarium staff, 8 different larvae were identified: 4 Coenagnonidae (Demoiselles) out of 6 described in Reunion Island, 1 Aeshnidae (Dragonflies) on 2, 3 Libellulidae (Libellules) out of 8. Of these eight, three are identified as *Anax imperator* (Aeshmidae), *Pantala flavescens* (Libellulidae) and *Ishnura senegalensis* (Coenagnonidae), following the success of the first stage of this project, it would be interesting to continue it in order to deepen the fine determination of Odonate larvae and to reschedule to other orders. The continuation of breeding is essential because it will make it possible to better understand the Reunionese insect fauna and therefore their ecology and their sensitivity to environmental degradation." (Author/DeepL)] Address: Petitjeannin, Mathilde, Observatoire Reunionais de l'eau, Parc de la Providence, 97489 Saint-Denis, France. E-mail: ore@runtel.fr

## 1999

**19765.** Abbott, J.C. (1999): Biodiversity of dragonflies and damselflies (Odonata) of the south-central nearctic and adjacent neotropical biotic provinces. Ph.D. Dissertation. Univ.

of North Texas, Denton, Texas: 911 pp. (in English) ["The south-central United States serves as an important biogeographical link and dispersal corridor between Nearctic and Neotropical elements of western hemisphere odonate faunas. Its species are reasonably well known because of substantial collections, but there has been no concerted effort to document the extent of biodiversity and possible geographic affinities of dragonflies and damselflies of this region. The recent discoveries of *Argia leonorae* Garrison, *Gomphus gonzalezi* Dunkle and *Erpetogomphus heterodon* Garrison from southern and western Texas and northern Mexico suggest that Odonata species remain to be discovered in this area, particularly from far south Texas and northern Mexico. I have documented a total of 12,515 records of Odonata found in 408 counties within the south-central U.S. A total of 73 species of damselflies and 160 species of dragonflies was revealed in the region. The 233 (197 in Texas) Odonata species are distributed among 10 families and 66 genera. Illustrated family, generic, and species-level keys are provided. Since the beginning of this work in the Fall of 1993, one species has been added each to the Louisiana and Oklahoma faunas, and 12 species have been added, previously unreported from Texas, including four new to the U.S. The area of highest Odonata biodiversity overall (161 spp.) is in the Austroriparian biotic province. The greatest degree of faunal similarity between the south-central U.S. and other intra-continental regions was observed for the eastern (64%) United States. Diversity is a function of area, and as expected, the numbers of breeding birds and Odonata, in each contiguous U.S. state are positively correlated ( $r=0.376$ ,  $n=33$ ,  $p=0.031$ ). There is, however, no strong correlation between land area and species diversity within the region, but those natural biotic provinces (Austroriparian, Texan, Balconian) where aquatic systems and topographic heterogeneity are the greatest provide a broader spectrum of potential Odonata habitats and thus support a greater number of Odonata species." (Author)] Address: Abbott, J.C., Alabama Mus. of Nat. History & UA Museums Dept of Res. & Collections, The Univ. of Alabama, Tuscaloosa, AL 35487, USA. Email: jabbott1@ua.edu

**19766.** Frey, J., (1999): Practical aspects of biotope mapping in cities: methods, problems and solutions. An example of Mainz, Germany. *Deinsea* 5: 41-56. (in English) ["Biotope mapping of Mainz' - this is the name of a research project commissioned by the City of Mainz and carried out by an interdisciplinary group of geographers, biologists and environmental planners at Mainz Univ. between 1993 and 1997. The project's goal was not only to gather, analyse and evaluate data relating to urban biotopes, but also to apply and - if necessary - modify the 'Basic program for biotope mapping in urban areas', which was set up by a working group at the German Federal Nature Conservancy in 1993. In conformity with the legal mandate, the work followed the strategy of integrated nature conservation, i.e. simultaneous protection of biotic, abiotic and aesthetic resources, which is considered as an inevitable component of sustainable development in urban areas. Some of the methodological aspects recommended in the 'Basic program' and completed in the 'Biotope mapping of Mainz' are: the application of a well-structured biotope type reference key, the elaboration of a microsite key with relevance to flora, fauna and aesthetics, very detailed mapping and description of biotope types, subtypes and variations, as well as mappings and descriptions of the phenomena of nature, recreational activities and environmental impacts related to biotope types. Further, the 'Biotope mapping of Mainz' supplemented some new spatial aspects and assessment procedures that

might eventually get planning authorities more adopted to the idea of sustainable land use in populated areas, such as the environmental zoning of the landscape within the city limits, the delimitation and description of 'urban landscape units' in detail (including climate, soil and water conditions, flora and fauna as well as historical and cultural features), the development of environmental quality targets and standards specified for each 'urban landscape unit', the assessment of the unit's biotope types with reference to the established environmental quality standards, and last, suggestions and recommendations for urban planning and environmental management. With the items mentioned, the research project 'Biotope mapping of Mainz' made its scientific outcome more accessible and understandable. As a consequence, it is reported that local planning authorities are applying the project's findings and giving a positive feedback of the results." (Author) In APPENDIX 1 the biotope subtype '5520 - Ponds with slightly disturbed embankments' and its fauna with bioindicative value is described. Odonata: *Aeshna cyanea*, *A. mixta*, *Calopteryx splendens*, *Coenagrion puella*, *Ischnura elegans*, *Lestes sponsa*, *Orthetrum cancellatum*, *Sympetrum sanguineum* / *S. vulgatum*.] Address: not stated

**19767.** Lahiri, A.R. (1999): New records of Odonata (Insecta) from Little Andaman Island. *Fraseria* (N. S.) 5(1/2): 57-59. (in English) ["Eleven odonate species viz., *Vestalis gracilis gracilis* (Rambur), (family Calopterygidae), *Prodasi-neura verticalis andamanensis* (Fraser) (family Protoneuridae), *Copera marginipes* (Rambur). (family Platycnemididae), *Ceragrion cerinorubellum* (Brauer) (family Coenagrionidae), *Crocothemis servilia servilia* (Drury), *Lathrecista asiatica asiatica* (Fabricius), *Neurothemis fluctuans* (Fabricius), *Pantala flavescens* (Fabricius), *Potamarcha congener* (Rambur), *Trithemis aurora* (Burmeister) and *T. festiva* (Rambur) (family Libellulidae) have been reported for the first time from Little Andaman Island." (Author)] Address: Lahiri, A.R., Zoological Survey of India, Calcutta, India

**19768.** Mitra, T.R. (1999): Biology and ecology of dragonflies (Insecta: Odonata) with notes on their adaptations in different ecosystems of India. *Rec. zool. Surv. India* 97(2): 173-188. (in English) ["The paper reviews biology of dragonflies in general on the basis of current information available on the subject. In addition to the above it contains summaries of ecological records of different ecological areas Viz. Gangetic Plain, Eastern and Western Himalaya, Chhota Nagpur Plateau, Arid zones, Eastern and Western Ghats including valleys of southern India." (Author)] Address: Mitra, T.R., Zoological Survey of India, M-Block, New Alipore-700053, India

2000

**19769.** Dawson, M.J.; Hemmings, J. (2000): Sardinia 1999. *Bulletin of the Amateur Entomologists' Society* 59: 15-17. (in English) [Other insects seen: *Calopteryx splendens*, *C. virgo*, *C. haemorrhoidalis*, *Libellula fulva*, *Crocothemis erythraea*, *Sympetrum striolatum*] Address: Dawson, M.J., 66 Tivoli Crescent, Brighton BN1 5ND, UK.

2001

**19770.** Schmidtke, S. (2001): *Schriftenverzeichnis Ferdinand Karsch(-Haack)s (1853-1936)*. *Capri: Zeitschrift für schwule Geschichte* 31: 13-32. (in German) [Bibliography.] Address: not stated

**19771.** Hunger, H.; Buchwald, R. (2003): Naturschutzorientierte Untersuchungen zur Bestandssituation dreier europaweit geschützter Libellenarten auf Metapopulationsniveau unter Einsatz eines Geographischen Informationssystems (GIS). Programm Lebensgrundlage Umwelt und ihre Sicherung. Abschlussbericht. Förderkennzeichen BWC 20001: 26 pp. (in German) ["All available data on the occurrence of the dragonfly species *Coenagrion mercuriale*, *Leucorrhinia pectoralis* and *Ophiogomphus cecilia* in Baden-Württemberg were compiled and entered into the GIS and database. For *Coenagrion mercuriale*, a habitat model was created that allows the selection of areas with particularly favourable conditions for the species in the Upper Rhine Plain. From digital data on land use (ATKIS) and a slope model (from the digital elevation model DHM 50), cost surfaces were generated and, taking into account the dispersal behaviour and the quality of the individual occurrences (patches), species-specific dispersal models were created, from which information on the degree of connectivity or isolation between the patches and thus on the structure of the metapopulations was obtained. The model also incorporated findings from marking experiments and other field trials conducted with *C. mercuriale*. By combining the dispersal model and the habitat model, areas were identified where planning and implementation of maintenance and development measures are both particularly urgent and have above-average prospects of sustainable success. For *Leucorrhinia pectoralis*, a cartographic documentation of the most important occurrence areas with a total area of a good 85 ha was carried out. This provides the basis for future detection and quantification of negative changes in the habitats of the species. An aerial photo analysis showed that serious negative habitat changes for the species can be detected within five years due to succession processes. Maintenance measures are therefore urgent and a permanent task. The project provided the impetus to design further research projects, for which funding has already been approved. Among other things, these serve to close the very clear knowledge gaps on the current distribution situation and habitat requirements of *Ophiogomphus cecilia* in southwest Germany. The methods developed in the project will thus find further use. At the same time, they represent a promising approach for similar questions in related fields. A synoptic evaluation of the results of the project will lead to concrete proposals for action for nature conservation administration, which are particularly needed for the fulfilment of the reporting obligation prescribed in the Habitats Directive (Article 17)."] (Authors/DeePL)] Address: Hunger, H., Institut für Naturschutz und Landschaftsanalyse (INULA), Wilhelmstraße 8, 79098 Freiburg, Germany. E-mail: holger.hunger@inula.de

**19772.** Russell, D.B. (2004): Numerical and experimental investigations into the aerodynamics of dragonfly flight. Ph.D. thesis, Cornell Univ.: XV + 137 pp. (in English) ["Dragonflies are one of the most maneuverable of the insect flyers. They are capable of sustained gliding flight as well as hovering, and are able to change direction very rapidly. Exactly how they use their wings to generate aerodynamic forces remains unknown. A new method was developed for solving 2D incompressible viscous flow problems [46] in order to numerically model the uid response and forces generated by multiple flapping wings. This nite difference scheme uses the streamfunctionvorticity formulation on a regular grid, and handles multiple moving irregular boundaries. To test the usefulness of this model, dragonflies were

tethered to a vertical force sensor and lmed using high-speed digital video. This allowed the correlation of specific wing kinematics to the vertical force generated, so that when these kinematics are modeled numerically the forces calculated can be compared with experiment. The results include detailed descriptions of two distinct wing kinematic patterns, out of four observed. These kinematics resemble motions described by previous researchers in free flight conditions except for the phase between the fore and hind wings. The forces calculated from applying the numeric method to a 2D approximation of these movements compare well to measured forces. The differences seen can be attributed to 3D effects and to the simplified wing cross-section used in the model. We show that wing inertia is a large component of the instantaneous forces experienced by a dragonfly, and that the dragon y generates productive force during both the downstroke and the upstroke. The counterstroking behavior seen in free flight is shown to require less power than the in-phase motion observed in the tethered dragonfly, while producing the same average vertical force. We also show evidence suggesting that during hovering flight wing rotation is passively driven by fluid forces, while during forward flight rotation at the end of the downstroke is actively driven by the dragonfly. Finally, the effectiveness of applying such a 2D model to the problem is examined, and suggestions are made for future research to improve modeling ability.] Address: Russell, D., Theoretical and Applied Mechanics, Cornell Univ., Ithaca, New York 14853, USA

## 2005

**19773.** Camier, T. (2005): Gemeine Winterlibelle *Sympetma fusca* und Gebänderte Heidelibelle *Sympetrum pedemontinum* im Kreis Wesermarsch. Beitr. Naturk. Niedersachsens 58: 41-42. (in German) [Niedersachsen, Germany, *S. fusca*: 15.9.1995; *S. pedemontanum*, female, 22.8.2002] Address: Camier, T., Haasenstr. 7, 26919 Brake, Germany

**19774.** Mitra, T.R. (2005): Evolutionary adaptations in morphology and ecology of *Tholymis tillarga* (Fabricius) and *Bradinopyga geminata* (Rambur) (Insecta: Odonata). Records of the Zoological Survey of India 104(1-2): 101-104. (in English) ["Experimental observations: Five examples of *Brachythemis contaminata* (Fabricius) were fixed on a white wall in a well illuminated room in the right. By the side of these specimens one example of *Tholymis tillarga* (Fabricius) was also fixed. The House gecko (*Hemidactylus brookii*) moving on the wall attacked the specimens of *Brachythemis contaminata* but not the *Tholymis tillarga*, since the opalescent white spot was glowing. Two examples of *Tholymis tillarga* were fixed on the black board and then the board was fixed on the wall. The room was illuminated. The opalescent white spot was distinct, and the gecko, moving about did not devour the dragonflies. But when the light was made dim, the spot was not very distinctly glowing and the gecko then attacked the dragonflies. One specimen of *Bradinopyga geminata* was fixed on the dirty portion of the wall and the light of the room was made dim, the gecko could not see the specimen. The last two specimens of *Bradinopyga geminata* were fixed on the black board and the board was fixed on the white wall in a well illuminated room. The gecko moving on the wall, walked over the board but did not attack the odonata specimen probably due to marginer of the body colour of the odonata specimen with the black background." (Author)] Address: Mitra, T.R., Zoological Survey of India, M-Block, New Alipore, Kolkata-700 053, India

**19775.** Palot, M.J.; Radhakrishnan, C.; Soniya, V.P. (2005): Odonata (Insecta) diversity of rice field habitat in Palakkad District, Kerala. Records of the Zoological Survey of India 104(31-2): 71-77. (in English) ["Altogether 21 species under 18 genera of 5 families were recorded during the study. Of these, 6 species are additions to the odonate fauna of the rice-field habitats of India. 5 species were seen throughout the study. Maximum species richness was seen during the harvesting stage. Diversity and richness of species observed in three different stages of the paddy-crop are summarized in Table 1." (Authors)] Address: Palot, M.J., Western Ghats Field Research Station, Zoological Survey of India, Calicut-673 002, India

**19776.** Yamauchi, T. (2005): The research of dragonfly in city park in the Tamagawa River region. Toyama Biological Society, Yoshihama: 17 pp. [ "This survey was conducted over a short period of two years, and with a limited number of people and limited time, so there is still a sense of a general lack of information. There is an undeniable feeling that there is still a general lack of information. There are many other urban parks in the Tama River basin, and many smaller water bodies suitable for dragonflies exist, such as ponds in private gardens. There are many other urban parks in the Tama River basin, as well as many smaller water bodies suitable for dragonflies, such as ponds in private gardens. It is difficult to cover all such water bodies in a survey, and the findings obtained in this study are therefore intended to be positioned as a sample only. The survey was conducted in the same way as the survey of the other water bodies. However, we were able to identify more species of dragonflies than expected during this survey. In particular, large, highly migratory species, such as the Maltese dragonfly, [...] These dragonflies are thought to be migrating from one generation to the next in a network of small riparian areas scattered in densely populated residential areas. The dragonflies are thought to be migrating from one place to another, repeating generations. The reason why there have been fewer records of the yellow damselfly and the red damselfly compared to the red damselfly is that these damselflies are not active during the daytime. The reason why there have been fewer records of the Japanese oak and the Japanese oak may be that these are dusk-flying species that are not active during the daytime, and that surveys in the morning and evening at dusk have not been sufficient. Further scrutiny reveals that these dragonflies are not active during the daytime. Further examination would have increased the number of sites where these dragonflies have been recorded. Thus, this survey revealed the existence of dragonflies that make good use of the environment created by humans. However, they are However, their populations are still small and they are surviving in small numbers, barely clinging to the few remaining water bodies. The park environment used by local residents tends to prioritise convenience, and even if a pond or other water feature is built, it may not be safe for children to enter, or it may be infested with bowflies. Even if a pond or other water feature is built, it is not always managed in a way that it is protected by a concrete revetment, the water depth is kept very shallow and the sediments in the pond are constantly cleaned out. Many parks have adopted a management approach whereby the ponds are concrete-walled, the depth of the water is very shallow and the sediments are constantly cleaned. In fact, some of the parks surveyed were such water bodies. However, such water bodies can be described as barren environments from a biological point of view, as there is no food chain in the water. Even if a highly fecund species were to fly in and spawn in these waters, they would

not be able to reproduce. Even if a highly fecund species flies in and lays eggs, the larvae and larvae are removed if they are unlucky when they hatch. Very fast-growing cormorant dragonflies (from hatching). It is difficult for any but the very fast-growing *C. ubiculatus* (hatching to fledging in about 40 days) to breed in these water bodies. However, even if these water bodies were to be covered with fallen leaves and soil on the bottom and planted with water-parasitic plants such as gingerbread along the shore, the number of dragonflies that fly in and breed in shallow water would increase dramatically. The number of dragonflies that fly and breed, even at shallow depths, is thought to increase dramatically. Although pseudo, this would bring the area closer to the aforementioned water bodies with a rich dragonfly fauna. Furthermore, a park with such a modified water body can be created. The more parks with such modified water areas are created, the more small and medium-sized dragonfly species, which previously had difficulty in migrating over long distances, will increase. If the local government develops the area with these points in mind, not only dragonflies but also a rich biota will be formed, and local children will be provided with a place where they can easily come into contact with nature close at hand. The local community will be nurtured and enriched." ] <http://www.tokyuenvironment.or.jp/wp/wp-content/uploads/2011/02/5804c671e3-23fac4a4df619507c19c691.pdf>.

## 2006

**19777.** Emiliyamma, K.G.; Radhakrishnan, C. (2006): 7. Odonata (insecta) of the union territory of Pondicherry, India. Records of the Zoological Survey of India, Volume 106 (Part I): 55-61. (in English) ["The present paper deals with 15 species and subspecies of Odonata recorded for the first time from the Union Territory of Pondicherry, India." (Authors)] Address: Emiliyamma, K.G., Western Ghats Field Research Station, Zoological Survey of India, Calicut-670 002, Kerala, India

**19778.** Marczak, Laurie B., John S. Richardson, and Marie-Claire Classen (2006): Life history phenology and sediment size association of the dragonfly *Cordulegaster dorsalis* (Odonata: Cordulegasteridae) in an ephemeral habitat in southwestern British Columbia. Canadian Field Naturalist 120(3): 347-350. (in English) ["The life cycle of *C. dorsalis* was studied over one year by systematic sampling of larvae in three intermittent headwater streams in southwestern British Columbia, Canada. We determined that larvae normally take three years to reach maturity, emerging throughout July and August. There is limited evidence suggesting a split cohort development, with early emergence after two years. Additionally, we tested whether larval instars were distributed randomly or if they occupied different sediment microhabitats. Smaller animals tend to be associated with smaller grained organic sediments, although there was high variation between the streams." (Authors)] Address: Marczak, Laurie, Dept of Forest Sciences, Univ. of British Columbia, 3041-2424 Main Mall, Vancouver, British Columbia V6T 1Z4, Canada. Email: [laurie@interchange.ubc.ca](mailto:laurie@interchange.ubc.ca)

## 2007

**19779.** Heitkamp, U. (2007): Zur Fauna und Flora und zum naturschutzfachlichen Wert des „Erdpfuhls“, einer Doline im Gipskarst des Ravensberges bei Lüthorst (Landkreis Nörtheim, Süd-Niedersachsen). Naturkundliche Berichte Fauna Flora Süd-Niedersachsen 12: 76-117. (in German) [21

odonate species recorded in the Erdpfluß correspond to approx. 31 % of the dragonfly species recorded so far in Lower Saxony. Of the species found, 14 (= 66.7 %) have been proven to reproduce in the habitat. The most frequent zygopteran species were *Coenagrion puella*, followed by *Ischnura elegans*, among the anisopteran *Orthetrum cancellatum* and *Sympetrum vulgatum*.] Address: Heitkamp, U. Bergstr. 17, 37130 Gleichen-Diemarden, Germany

**19780.** Mikát, M. (2007): [Contribution to the ecology and ethology of Lestidae (Odonata, Lestidae)]. Støedoškolská odborná èinnost 2006/2007 obor 04 – Biologie: 63 pp. (in Czech) ["Conclusion: This paper summarizes the results of the study of populations using the mark-recapture method from 2006. The thesis deals mainly with the species *L. sponsa*, *L. virens*, *L. barbarus* and *S. fusca*. 2269 darters were tagged and 1154 recaptures were made. Approximately half of the tagged and recaptured individuals belonged to *L. sponsa*. The current abundance of individuals at the wetland was calculated using the Lincoln-Petersen index. This abundance has evolved over the study period. It is significantly (si 3-6 times) lower than the total population size Population size was calculated using the Schnabel index and in the Mark Program. The presence of the majority of females outside the wetland is likely to have the greatest influence on the skewed sex ratio at the wetland The probability of capturing individuals of all species was strongly dependent on time and the sex of the individual The observed population size is 4000 individuals for *L. sponsa*, around 700 individuals for *L. virens*, 500 individuals for *L. barbarus* and 400 individuals for *S. fusca*. Species of *Lestes* hornwort prefer generally dry wetlands. This preference is least pronounced in *L. sponsa*. *S. fusca* has been observed more in flooded wetlands. In *L. barbarus*, a preference for less overgrown sites was observed. Most of the recaptured individuals were caught at the marking site Some individuals, on the other hand, covered distances longer than 400 m. The most frequently migrating species was *S. fusca*, while the lowest proportion of migrations was found for *L. barbarus*. In the species *L. virens* and *L. sponsa*, females migrated more than males." (Author/DeepL)] Address: Mikát, M., Biskupské gymnázium Bohuslava Balbína, Sexta A, Orlické náboží 356 / 1, 500 03 Hradec Králové 3, Czech Republic

**19781.** Ökologische Bildungsstätte Oberfranken (2007): Mögliche Auswirkungen des Klimawandels auf Moorbellen in Nordwestoberfranken (Wiederholungskartierung). Unveröffentlichtes Gutachten im Auftrag des Bundes Naturschutz, Nürnberg: 58 pp, maps. (in German) ["Extensive inventories of dragonfly species have been available from Northwest Upper Franconia since the end of the 1970s. In recent years, there have been increasing indications from various parts of the study area that the dragonfly species typical of north-western Upper Franconia in boggy waters and bogs (*Coenagrion hastulatum*, *Aeshna juncea*, *Somatochlora arctica*, *Leucorrhinia dubia*, *L. pectoralis*, *L. rubicunda*) have suffered severe population losses. The reasons for the population decline of the damselfly could also be climate change: Many studies already show that in recent years, due to the often unusually warm and dry weather, more Mediterranean dragonfly species have migrated to Germany and spread. Bog dragonflies, on the other hand, which have a boreal or Euro-Siberian distribution area, prefer a cooler climate and are therefore in principle threatened by climate change. The aim was to monitor the former and current occurrences of bog dragonfly species in northwest Upper Franconia, to check the condition of the habitats, to develop concrete protection measures for

the occurrences and to check whether a possible influence of climate change on bog dragonfly species is already detectable. The dragonfly population surveys of the Working Group Ecology Coburg of the German Nature Conservation Association, which started in the late 1970s, as well as numerous other dragonfly mappings in the Coburg, Kronach and Lichtenfels area, were evaluated in 2006 with regard to the occurrence of the bog dragonfly species *Aeshna juncea*, *Somatochlora arctica*, *Leucorrhinia dubia*, *L. pectoralis*, *L. rubicunda*. All current and former occurrences of these species as well as other peatland waters that appeared suitable (a total of 41 sample sites) were visited at least three times during the main flight period of the respective species in order to record imagines. The data from the new mapping of damselflies and their habitats were compared with the old data in order to identify population changes or range shifts. In 2006, 33 dragonfly species were recorded in the sample areas, including 13 Red List species. In total, at least one of the above-mentioned dragonfly species was found at 19 of the 41 sample sites investigated. The peat mosaic dragonfly was detected at 9 sites. Compared to the data from the period 1981 - 2003, the species has lost about 60 % of its sites. The sites where the species is found at altitudes up to 400 m above sea level are particularly affected by the decline. The Spear-throated damselfly was found in 16 sample plots in 2006. In comparison with the data from the period 1981 - 2003, a decline in the number of sites by approx. 50 % can be observed. The sites at altitudes of up to 350 m above sea level are particularly affected by the decline. There were 11 records of the damselfly. Half of the occurrences found since 1981 could no longer be confirmed. However, the loss of range was independent of altitude. The species could no longer be found at the 6 known sites of the Large Moss Damselfly, but one new record was found. The Northern damselfly was no longer found at the 5 known sites. The Arctic Emerald Damselfly was found away from one water body. *Crocothemis erythraea* was found for the first time at three ponds. At two typical peat ponds the damselfly was associated with the damselfly! At least for the Peat damselfly and Spear-spotted damselfly, there seems to be a connection with climate change, as the occurrences at climatically favoured altitudes below 400 m and 350 m a.s.l., respectively, were preferably no longer occupied. In the case of the other damselfly species, there is a strong suspicion that climate change plays a role in the sharp decline in occurrence. Concrete conservation measures were then proposed for the occurrences of the damselfly in order to stabilise the population and - if possible - also to enable dispersal or reintroduction." (Author/DeepL) [https://www.oekologische-bildungsstaette.de/medien/pdf/Moorlibellen\\_2007.pdf](https://www.oekologische-bildungsstaette.de/medien/pdf/Moorlibellen_2007.pdf)] Address: Ökologische Bildungsstätte Oberfranken, Beyer, S., Unteres Schloß, 96268 Mitwitz, Germany. Email: stefan.beyer@oekologische-bildungsstaette.de

**19782.** Sindaco, R. (2007): Le libellule del Piemonte occidentale tra i fiumi Po e Dora Riparia (Insecta: Odonata). In: Delmastro G.B., Gaggino A., Giachino P.M., Morisi A., Rastelli M. (eds). (2007): Ricerche sugli ambienti acquatici del Po Cuneese - Interreg IIIA "Aqua". Memorie dell'Associazione Naturalistica Piemontese 8: 65-74. (in Italian, with English summary) ["The dragonflies of the western Piedmont between the Po and the Dora Riparia rivers. The status of the knowledges on the Odonata of the northern Cottian Alps and the adjacent plain is presented. In the study area 52 species (36 species of dragonflies and 16 of damselflies) were found; this number represents more than the 80% of species known for the whole Piedmont administrative region. The past occurrence of 6 species (4 Zygoptera and

2Anisoptera) was not confirmed in recent years. The conservation of many localized species depends on the conservation of the main sites and the creation of new biotopes in highly anthropized areas." (Authors)] Address: Istituto per le Piante da Legno e l'Ambiente, corso Casale 476, I-10132 Torino. E-mail: sindaco@ipla.org

## 2008

**19783.** Blanckenhagen, B. von (2008): Nachuntersuchung 2008 zur Verbreitung der Großen Moosjungfer (*Leucorrhinia pectoralis*) in Hessen (Art der Anhänge II und IV der FFH-Richtlinie). Unveröffentlichtes Gutachten im Auftrag von Hessen-Forst FENA, AVENA: 31 pp. + Anhang- (in German) [As a species listed in Annexes II and IV of the Habitats Directive (92/43/EEC), *Leucorrhinia pectoralis* is of particular conservation and political interest. Thus, the state of Hessen (Germany) is also obliged to designate special protection areas for the dragonfly species and to monitor and document the status of the Hessian populations. The present species support concept provides an overview of the current population situation of *L. pectoralis* in Hessen as well as in the natural areas and districts of Hessen. The description of the ecology is followed by an explanation of general threats and the resulting general measures for the protection of the species. Within the framework of the report, surveys of the distribution of *L. pectoralis* were carried out in three regions in central and northern Hesse by means of field surveys. For the three occurrences - in the Burgwald, on the Lahnberge near Marburg and in the Reinhardswald - area-specific measures were finally proposed to improve the conservation status of the populations and to safeguard the population. Based on the studied water bodies and other suitable water bodies in the study areas, a regional network concept was developed to maintain as much habitat as possible for *L. pectoralis* and to enable the colonisation of new water bodies. In addition, the possibilities and limits of a supra-regional habitat network are presented and the importance of "stepping stone biotopes" is discussed. For the southern Hessian occurrences, some of which are located in FFH areas, the respective FFH baseline data collections were evaluated with regard to proposed measures for the conservation and development of *L. pectoralis*. Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: von Blanckenhagen, B., Kaffweg 8, 35039 Marburg, Germany. E-mail: benno.v.blanckenhagen@web.de

**19784.** Bui Huu Manh (2008): [Photographic checklist of damselflies and dragonflies of Phu Quoc] (Vietnamese). <http://wildlifeatrisk.org/upload/download/books.P10.%20PQ-Dragonfly-book.pdf>. (in Vietnamese) [<http://wildlifeatrisk.org/upload/download/books.P10.%20PQ-Dragonfly-book.pdf>]

**19785.** Franck, D. (2008): Eine Wissenschaft im Aufbruch. Chronik der Ethnologischen Gesellschaft 1949 - 2000. Verlag Niel & More: [Christiane Buchholtz (1926-), a leading researcher in the 1950-1970th of ethology of especially Caopterygidae, is introduced on pages 72-74. Buchholtz, C.; Sippel-Forck, M., Auf der Hofstatt 12, 35112 Fronhausen, Oberwalgern, Germany

**19786.** Schiel, F.-J. (2008): Die Libellenfauna der Kiesgrube Reiselfingen. Veränderungen zwischen 1993 und 2007. *Mercuriale* 8: 37-44. (in German) ["Species spectrum and population changes of the dragonfly fauna of the Reiselfingen gravel pit (MTB 8116) are presented for the period between 1993 and 2007. The Reiselfingen gravel pit, which

is operated on a large scale by dry mining, is located in the west of the Baar nature reserve at 730 m above sea level, on the northern edge of the Wutach gorge. Over a 15-year period of observation, the number of dragonfly species increased from 18 in 1993 to 30 in 2005-2007; the number of certain to probably native dragonfly species increased from 14 to 19 during this period. The increase in species numbers is attributed to a combination of three factors: (1) a very slow, successive saturation of the species range due to a low number of stillwaters in the surrounding area, (2) a spread of heat-loving species due to climate warming, and (3) the successive increase in the range of waters after 1993 due to the creation and maturation of conservation waters. The number of species records continued to rise between 2002 and 2007. At the same time, however, the continuities and population sizes of several marsh species in particular declined again significantly; this is attributed to the increasing shading of shallow riparian and alternating water zones as a result of woody growth." (Authors) Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: Schiel, F.-J., Inst. Naturschutz und Landschaftsanalyse, Turenweg 9, D-77880 Sasbach, Germany. E-mail: Franz-Josef.Schiel@INULA.de

## 2009

**19787.** Babu, R.; Sinha, C.; Prasad, M. (2009): New records of Odonata (Anisoptera) from Maharashtra. *Rec. zool. Surv. India* 108(4): 113-117. (in English) [Records of five odonate species are documented: *Anormogomphus heteropterus* Selys 1854, *Orthetrum testaceum* (Burmeister 1839), *Onychogomphus grammicus* (Rambur 1842), *Indothemis limbata* (Selys, 1891), and *Orthetrum japonicum internum* McLachlan, 1894.] Address: Prasad, M., Sajjan Apartments, 811A, Uma Kanta Sen Lane, Paikpara, Kolkata-700 030, India

**19788.** Behrens, M.; Fartmann, T.; Hölzel, N. (Red.) (2009): Auswirkungen von Klimaänderungen auf die Biologische Vielfalt: Pilotstudie zu den voraussichtlichen Auswirkungen des Klimawandels auf ausgewählte Tier- und Pflanzenarten in Nordrhein-Westfalen Teil 2: zweiter Schritt der Empfindlichkeitsanalyse – Wirkprognose. Auftragnehmer: Institut für Landschaftsökologie (ILÖK), Westfälische Wilhelms-Universität; Auftraggeber: Ministerium für Umwelt und Naturschutz, Landwirtschaft und Verbraucherschutz des Landes Nordrhein-Westfalen (MUNLV NRW). Münster und Düsseldorf: 364 pp. (in German) [In Chapter "2.2 Libellen" (pages: 49-71) Norbert Menke, Klaus-Jürgen Conze and Matthias Olthoff are treating the following odonate species which are considered sensitive to climate change: *Aeshna juncea*, *A. subarctica elisabethae*, *Coenagrion hastulatum*, *C. lunulatum*, *Cordulegaster bidentata*, *Lestes dryas*, *Leucorrhinia dubia*, *L. rubicunda*, *Nehalennia speciosa*, *Somatochlora arctica*, and *S. flavomaculata*.] Address: Conze, K.-J., Hamburger Straße 92, 45145 Essen, Germany. E-mail: [kjc@loekplan.de](mailto:kjc@loekplan.de)

**19789.** Bradley, T.J.; Briscoe, A.D.; Brady, S.G.; Contreras, H.L.; Danforth, B.N.; Dudley, R.; Grimaldi, D.; Harrison, J.F.; Kaiser, J.A.; Merlin, C.; Reppert, S.M.; VandenBrooksk, J.M.; Yanoviak, S.P. (2009): Episodes in insect evolution. *Integrative and Comparative Biology* 49(5): 590-606. (in English) ["Synopsis: This article derives from a society-wide symposium organized by Timothy Bradley and Adriana Briscoe and presented at the 2009 annual meeting of the Society for Integrative and Comparative Biology in Boston, Massachusetts. David Grimaldi provided the opening

presentation in which he outlined the major evolutionary events in the formation and subsequent diversification of the insect clade. This presentation was followed by speakers who detailed the evolutionary history of specific physiological and/or behavioral traits that have caused insects to be both ecologically successful and fascinating as subjects for biological study. These include a review of the evolutionary history of the insects, the origins of flight, osmoregulation, the evolution of tracheal systems, the evolution of color vision, circadian clocks, and the evolution of eusociality. These topics, as covered by the speakers, provide an overview of the pattern and timing of evolutionary diversification and specialization in the group of animals we know as insects." (Authors) The paper includes references to Odonata.] Address: Bradley, T.J., Dept of Ecology & Evolutionary Biology, Univ. of California Irvine, Irvine, CA 92697-2525, USA. E-mail: tbradley@uci.edu

**19790.** Cano-Villegas (2009): Expansión de *Trithemis kirbyi* Sélys, 1891 (Odonata: Libellulidae) en la provincia de Málaga (sur de la Península Ibérica). Boletín de la Sociedad Entomológica Aragonesa 44: 589-572. (in Spanish, with English summary) ["*T. kirbyi* is recorded, for the first time, from Ciudad Real (first record from Castilla La Mancha) and Huelva (Andalusia). The presence in the province of Badajoz (Extremadura) is also confirmed. The increment of its distribution range to inland and the Atlantic coast is shown with this new data." (Authors)] Address: Cano-Villegas, F.-J., C/ Montemayor, 4 1º-2; 14003 –Córdoba, Spain. Email: fjcanovi2@hotmail.com

**19791.** Koch, B.; Wildermuth, H.; Walter, T. (2009): Einfluss der Habitateigenschaften auf das Verbreitungsmuster von *Coenagrion mercuriale* an einem renaturierten Fließgewässer im Schweizer Mittelland (Odonata: Coenagrionidae). Libellula 28(3/4): 139-158. (in German, with English summary) ["Distribution pattern of *C. mercuriale* and habitat characteristics on a revitalized stream in the Swiss Midlands — Only few and isolated populations of the Southern Damselfly exist in Switzerland and the species is considered as critically endangered. The recent discovery of a hitherto unknown population of *C. mercuriale* on a revitalized stream in the Canton of Zurich caused a study to be made on the size and the distribution pattern of the population along a heterogeneously structured 2.15 km-stretch. In summer 2007, the abundance of *C. mercuriale* was recorded at 215 sections and data on physical parameters were collected. The results of statistical analyses showed that the distribution pattern of *C. mercuriale* was significantly affected by the width of the watercourse, depth of the water, cover of the water vegetation, cover and width of the riparian vegetation and cover by trees higher than three metres. The composition of the riparian vegetation that could be classified into six different groups using a cluster analysis also exhibited an effect on the distribution. *C. mercuriale* preferred sites with relatively wide and deep water, luxuriant aquatic vegetation, wide intermittent but jaggy riparian vegetation and little cover by trees shading the water surface. Riparian vegetation that was mainly composed of *Carex* spp., *Lythrum salicaria* or *Phalaris arundinacea* was most densely colonized by *C. mercuriale*. In contrast, sections overgrown predominantly by *Filipendula ulmaria* and *Epilobium hirsutum* were generally avoided. Additionally, data on the local dragonfly fauna were collected and 14 streams in the neighbourhood of the study site were examined for their suitability for colonization by *C. mercuriale*. In total 21 Odonata species were recorded. Maintenance of the habitat by patchy clearance of dense riparian vegetation, aiming at the promotion of the

local population, was conducted in the frame of a conservation programme in late 2007 and early 2008. Censuses carried out during the flying season 2008 showed that the measures adopted had a positive effect on *C. mercuriale*." (Authors)] Address: Koch, Bärbel, Via Grütli 21, 6855 Stabio, Switzerland. E-mail: baerbel.koch@hotmail.com

**19792.** Lockwood, M. (2009): Els odonats del PP.NN de l'Alt Pirineu 2009. Parc Natural de l'Alt Pirineu. Generalitat de Catalunya, Departament de Medi Ambient i Habitatge. Oxygastra, Grup d'estudi deis odonats de Catalunya: 40 pp. (in Catalan, with English summary) ["In 2009, the odontological surveys were repeated in the PP.NN of the Alt Pirineu, which had started in 2007 and continued in 2008. In 2008 it became clear that the set of ponds in the Baciver area Pudo-Garrabea has a high specific wealth of odonts; in 2009 it was possible to verify that this area really is exceptional within the framework of the central Pyrenees, since surveys in the central and eastern sectors of the PP.NN of the Alt Pyrenees at the headwaters of the rivers Noguera de Cardós and Noguera de Vallferrera have revealed that these last sectors harbor a very impoverished odontofauna. In the lakes of Guerosso and Flamicella no odonate was observed, while in Guiló, Romedo, Mariola and Montarenyó only detect *Aeshna juncea*, the only species that seems to be well distributed throughout the high area of the park. The explanation of this phenomenon is neither simple nor entirely clear. Obviously, the western sector of the natural park has a series of habitats very suitable for odonates – a profusion of small ponds with good growth of macrophytes and vertical vegetation (which the adults use as watchtowers and through which the larvae climb when metamorphosing). On the other hand, in the Aiguamoll de Guiló, as an example, there is only one pond/wetland, which is very enclosed between the mountains that surround it, while in the ponds of Romedo or Mariola there are few macrophytes and a general absence of the vertical vegetation. The grazing load seems to be greater outside the western sector: in Baciver there are flat meadows where cows and horses can freely roam, while in places like Guiló the cattle tend to congregate around the only pond there has And when the waters of the pond are not very deep, the animals can enter to graze the vegetation, muddying the water and trampling the vertical stems that many odonate species need. But we also think it is significant that the Baciver sector is very close to the Aran Valley, an excellent natural corridor through which Eurosiberian species such as *Leucorrhinia dubia* will have passed to colonize the nearest natural park areas ; the rest of the park, on the other hand, is much more isolated from this entrance route and on the south face of the great barrier of the axial Pyrenees. Possibly, however, *L. dubia* is on the way to expansion or regression, since there are no studies that confirm or deny if this taxon was present in the natural park previously or if in the past there were more diverse odonate communities in the central sectors and oriental However, during fieldwork in 2009, it was possible to establish what could be an oviposition site of *Cordulegaster bidentata* near Burg, and the presence of a total of 29 species in the natural park has been confirmed. However, it has not been possible to find *Leucorrhinia pectoralis*, cited once in 1992, and it is given as extinct in Catalonia. In addition, the counts of the Odonats Bioindicadors project were carried out in the Noguera de Cardós river, and it is expected to continue with these counts in the coming years." (Author/Google Translate)] Address: Lockwood, M., Grupo Oxygastra, Institució Catalana d'Història Natural, Carrer del Carme, 47; 08001 Barcelona, Spain. E-mail: mike@walkingcatalonia.net



**19793.** Maibach, A. (2009): Gestion intégrée des éléments naturels et de la biodiversité en forêt secondaire (forêts de la région de Suchy, canton de Vaud, Suisse). III. Suivi de la colonisation par les libellules (Insecta, Odonata) d'un bassin aménagé de crues aménagées de manière naturelle. Bulletin de la Société Vaudoise des Sciences Naturelle 91(3): 217-233. (in French, with English summary) ["This pond was dug at the beginning of 1992 near the village of Suchy, with the aim of buffering the flow of water coming from the surrounding forested area. The development of dragonfly populations was followed over 5 years (1993-1997) from the second season following the digging of the pond. Our study shows a very rapid development of populations with 27 species present at the end of the survey (the sixth season after digging). However, the proportion of the autochthonous species (those with complete development in the site) develops more slowly, from 43% during the second year post-creation until 81% during the sixth year. Colonisation follows in the classic manner with the quick appearance of pioneers (generalist species) and the progressive arrival of specialists, whose proportion reaches 45% at the end of the survey. Colonisation of the Suchy pond appears to be relatively quick in comparison to other ponds in the vicinity. Favourable factors for this colonisation and for the resulting biodiversity, particularly in terms their contribution to safeguarding rare or threatened species, are analysed and discussed." (Author)] Address: Maibach, A., Bureau d'études en environnement A. Maibach Sàrl, La Poya 10, CP 99, 1610 Oron-la-Ville, Switzerland. Email: alain.maibach@amai-bach.ch

**19794.** Nandy, S.; Babu, R. (2009): On a collection of dragonflies (Odonata: Anisoptera) from Andaman and Nicobar islands. Rec. zool. Surv. India 109(4): 35-51. (in English) ["The paper deals with some collection of 15 species of Anisoptera from Andaman and Nicobar Islands. In this present study, *Neurothemis intermedia atlanta* Ris and *Tamea basilaris burmeisteri* Kirby have been recorded for the first time from Andaman & Nicobar Islands (South Andaman), Also *Orthetrum pruinatum neglectum* (Rambur) is recorded newly from Andaman Islands (North and South Andaman) and *Trithemis aurora* (Burmeister) is recorded newly from Nicobar Islands. Distributions of *Potamarcha congener* (Rambur) from North Andaman, four species [*Crocothemis servilia servilia* (Drury), *Diplacodes trivialis* (Rambur), *Lathrecista asiatica asiatica* (Fabricius) and *Orthetrum sabina sabina* (Drury)] from Middle Andaman and four species [*Diplacodes trivialis* (Rambur), *Orthetrum sabina sabina* (Drury), *Neurothemis fulvia* (Drury) and *Tholymis tillarga* (Fabricius)] from Little Andaman are newly recorded. A consolidated list of 44 species of Anisoptera, so far recorded from these Islands is provided along with distribution within Andaman & Nicobar Islands." (Authors)

**19795.** "The history of odonatological exploration of the archipelago is reviewed and the 44 known Anisoptera species are listed with reference to the islands where they occur (North Andaman, Middle Andaman, South Andaman, Little Andaman, Nicobar). *Neurothemis intermedia atlanta* and *Tamea basilaris burmeisteri* are new for the archipelago. *Orthetrum pruinatum neglectum* was known from Nicobar but it is new for N & S Andaman, whereas *Trithemis aurora* was known from all Andaman isls and it is for the first time recorded from Nicobar." (OA)] Address: Nandy, S., Zool. Surv. India, M-Block, New Alipore, Kolkata-700053, India

**19796.** Padilla, D.P.; Gonzalez-Castro, A.; Nieves, C.; Nogales, M. (2009): Trophic ecology of the Southern Grey

Shrike (*Lanius meridionalis*) in insular environments: the influence of altitude and seasonality. Journal of Ornithology 150: 557-568. (in English) ["The seasonal diet and prey selection of the Southern Grey Shrike (*Lanius meridionalis*) was studied in two different insular habitats: shrub environments of the Canary Islands in coastal and high mountain zones. We measured, in each season, food availability and prey size in order to determine prey size selection of shrikes along an altitudinal gradient. Moreover, we compared the diet patterns observed with those documented on the continent, to determine if Southern Grey Shrikes in the islands' high mountain zone (which has a continental climate) showed seasonal diet variation similar to those in northern continental areas. We analysed a total of 1,139 shrike pellets collected in 1 year and identified 10,179 prey items. Numerically arthropods (91%), and in terms of biomass lizards (70%) were the main prey consumed by the shrikes. The proportions of the main prey items differed significantly between seasons and habitats. Diet in the coastal areas was less variable than in the high mountain zone. The greater seasonal climatic variation in the high mountain zone was associated with diet patterns similar to those found in some northern continental areas, such as the Iberian Peninsula and southern France. Finally, shrikes selected the largest prey in the high mountain habitat. This suggests that foraging behaviour in this species is related to climatic conditions, as the biggest and most profitable prey were consumed in the most harsh habitats." (Authors) The diet includes "Odonata".] Address: Padilla, D.P., Island Ecology and Evolution Research Group (IPNA-CSIC), Avda. Astrofísico Francisco Sañchez 3, 38206 La Laguna, Tenerife, Canary Islands, Spain. E-mail: dpadilla@ipna.csic.es

**19797.** Rytuba, J.J.; Hothem, R.L.; May, J.T.; Kim, C.S.; Lawler, D.; Goldstein, D. (2009): Environmental impact of the Contact and Sonoma mercury mines on water, sediment, and biota in Anna Belcher and Little Sulphur Creek watersheds, Sonoma County, California. U.S. Geological Survey Open-File Report 2008-1381 [http://pubs.usgs.gov/of/2008/1381/]: 76 pp. (in English) ["Conclusions: Calcines and waste rock eroded from the Contact and Sonoma mines have contributed Hg-enriched sediment to Anna Belcher and Little Sulphur Creeks. A significant amount of calcines still remains at the Contact Mine, and natural cementation of calcines by magnesite only partially mitigates erosion of the calcines. The calcines have very high Mg concentration, 14-15 % because of the magnesite cement, but relatively low Hg concentrations, 3.7 to 65 ppm, (one sample with 200 ppm Hg exceeded the range). Mercury concentration in the calcines increases with decreasing grain size, resulting in about 350% higher Hg concentration in the finest grain-size fraction (<20  $\mu$ m) as compared to the largest grain-size fraction (2,830 $\mu$ m). Unusually high concentrations of tellurium, up to 2.8 ppm, are present in the calcines. The Sonoma Mine calcines are not cemented, but are covered by vegetation that serves to limit erosion and the release of Hg-enriched sediment. The Hg concentrations in the Sonoma Mine calcines are relatively low (14.8-91.4 ppm). Mercury concentration increases with decreasing grain size, but the highest Hg concentration occurs in the coarsest grain-size fraction, indicating that HgS remains encapsulated in the larger fragments. Calcines from both mines have elevated concentrations of Co, Cr, and Ni that reflect the serpentinite host rock. Concentrations of Hg T and MMeHg in waters sampled at and downstream from the Contact and Sonoma mine areas are dependent on flow conditions. Highest concentrations occur under high-flow conditions (104-13,900 ng/L for Hg T, and 0.046-17 ng/L for



unfiltered MMeHg). The highest concentrations of Hg T and MMeHg occurred in waters in a side tributary to Anna Belcher Creek that receives runoff from the Sonoma mine area. Below the mine area, Hg T concentrations in water samples from Anna Belcher and Little Sulphur Creeks were relatively low, meet the 50 ng/L USEPA criterion (USEPA, 1999), and are near or below the water-quality objective of 12 ng/L. The highest concentration of MMeHg occurs in pond water samples from above the Sonoma Mine workings. MMeHg concentration in samples from Anna Belcher and Little Sulphur Creek is relatively low. Methylation of mercury is highest in the pond, as indicated by the MMeHg in sediment, and relatively low in the lower reach of Anna Belcher Creek. Anna Belcher Creek flows through the north side of the Contact Mine calcine pile and, during storm events, Hg-enriched sediment is released into the creek. This release of Hg-enriched sediment results in variable but always-elevated concentrations of Hg (4.7 to >100 ppm) in the bed-load sediment downstream from the mine area. Hg-enriched sediment from Anna Belcher Creek increases the Hg concentration of sediment in Little Sulphur Creek for at least 2 km downstream from the confluence. The highest concentration of MMeHg in the invertebrate samples was in water boatmen (Corixidae) samples from the Sonoma Mine pond. The MMeHg concentration was 16 times higher than mean values found in a comparable taxon, water striders (Gerridae), from a reference site. The data for biota from the Sonoma pond are consistent with the high percentage of MMeHg found in the pond sediment, which indicates a high level of MMeHg production in the pond environment. In Anna Belcher Creek downstream from the mine area, MMeHg concentrations in dragonfly larvae (Aeshnidae, Libellulidae, and Cordulegastridae) samples were much higher than those in Aeshnidae samples from the reference site. The highest value recorded for the Cordulegastridae samples from the creek at the Twin Falls site was 13 times higher than the reference value. No statistical difference was noted between rainbow trout samples from the two Anna Belcher sites, but the concentrations from both sites were statistically higher than those in brown trout from a reference site. The biota data indicate that the Hg-enriched sediment released from the Contact and Sonoma mines and then methylated in both pond and stream environments is bioaccumulated in both invertebrates and fish." Address: Rytuba, J.J., U.S. Geol. Survey, Menlo Park, California, USA

## 2010

**19798.** Herrera Grao, T.; Gavira Romero, O.; Blanco Garrido, F. (2010): *Habitantes del agua, Odonatos*. Ed.: Agencia Andaluza del Agua. Consejería de Medio Ambiente. Junta de Andalucía. 2009: 271 pp. (in Spanish) [Andalucía, Spain; Chapter 1. Introduction 13 Chapter 2. How to use this guide 17 Chapter 3. Aquatic habitat typologies of Andalusia 25 Chapter 4. Taxonomy and systematics of odonates 57 Chapter 5. Morphology 71 Chapter 6. Biology 79 Chapter 7. Dragonflies and humans: myths, legends and facts 97 Odonates as indicators in Andalusian aquatic environments 105 Chapter 9. Chapter 9. Odonates in figures 109 Chapter 10. Species descriptions 113 Appendices 245 Glossary of terms 247 Index of species 251 Bibliography and recommended websites 255 Image credits.] Address: not stated

## 2011

**19799.** Dévai, G. (2011): Data on the dragonfly (Odonata) fauna collected by the staff of the Hungarian Natural History Museum in course of the Hortobágy National Park research

programme. *Studia odonatol. hung.* 12: 47-54. (in Hungarian, with English summary) ["This is the 17th paper of a series directed at communicating faunistical data of Hungary which had been unpublished until December 31, 1987 (cf. DÉVAI et al. 1993). The author presents faunistical data from 16 localities in 12 10×10 km UTM grid map cells (DT 85, 95, 97, 98; ET 07, 08, 09, 16, 17, 18, 26, 27) in the Hortobágy National Park and adjoining nature conservation areas. The total investigated area belongs to three geographical microregions (Hortobágy, Borsodiártér, Tiszafüred–Kunhegyesi-sík) of the plain Tiszai-Alföld. Collections were made between 1974–1976, with the participation of 14 specialists and one unidentified person in 3 years and 27 days. In the report information on 129 adults (52 males and 77 females) is given in detail, representing 61 faunistical data. In this study 23 species (11 Zygoptera and 12 Anisoptera) were found to occur in the area, out of which 1 belongs to the very frequent, 16 to the frequent, 5 to the less frequent and 1 to the rare class of country-wide occurrence frequency." (Authors)] Address: Dévai, G.Y., Dept of Hydrobiology, Faculty of Science and Technology, Univ. of Debrecen, Egyetem tér 1, H-4032 Debrecen, Hungary

**19800.** Dijkstra, K.-D.B.; Boudot, J.-P.; Clausnitzer, V.; Kipping, J.; Kisakye, J.J.; Ogbogu, S.S.; Samraoui, B.; Samways, M.J.; Schütte, K.; Simaika, J.P.; Suhling, F.; Tchiboza, S.L. (2011): *Dragonflies and damselflies of Africa (Odonata): history, diversity, distribution, and conservation*. In: William Darwall, Kevin Smith, David Allen, Robert Holland, Ian Harrison and Emma Brooks (eds.): *The Diversity of life in African Freshwaters: Underwater, under threat. An analysis of the status and distribution of freshwater species throughout mainland Africa: 126-177,-325-330.* (in English) [[https://www.researchgate.net/publication/255969418\\_Dragonflies\\_and\\_damselflies\\_of\\_Africa\\_Odonata\\_history\\_diversity\\_distribution\\_and\\_conservation\\_Chap\\_5\\_pp\\_126-177\\_In\\_WRT\\_Darwall\\_KG\\_Smith\\_DJ\\_Allen\\_RA\\_Ho\\_lland\\_IJ\\_Harrison\\_EGE\\_Brooks\\_eds\\_The\\_Diversity\\_of\\_](https://www.researchgate.net/publication/255969418_Dragonflies_and_damselflies_of_Africa_Odonata_history_diversity_distribution_and_conservation_Chap_5_pp_126-177_In_WRT_Darwall_KG_Smith_DJ_Allen_RA_Ho_lland_IJ_Harrison_EGE_Brooks_eds_The_Diversity_of_)] Address: Dijkstra, K.D., Netherlands Centre for Biodiversity Naturalis, P.O. Box 9517, NL-2300 RA, Leiden, The Netherlands. E-mail: [dijkstra@nrm.nl](mailto:dijkstra@nrm.nl)

**19801.** Donath, H. (2011): *Zur Wiederbesiedelung der Schrake-Dobra nach der Renaturierung am Beispiel der Libellen*. *Biologische Studien, Luckau* 40: 43-52. (in German) ["During lignite mining, the lowland streams Schrake and Dobra had been converted into a channel discoloured rusty brown with iron hydroxide sludge. In addition to the aesthetic impairment, biodiversity was also considerably restricted as a result. Four-year studies of the dragonfly fauna after completion of the renaturation measures show that the species diversity has increased significantly. Even Red List species such as *Orthetrum coerulescens*, which is highly endangered in Brandenburg and in Germany as a whole, have successfully settled. If it is possible to maintain a differentiation of sections with riparian woods as well as open areas - although in need of maintenance - for the further development of the watercourse, a species-rich dragonfly fauna would also be secured in the long term." (Author/DeepL)] Address: Donath, H., Caule Nr. 1, D-15926 Zieckau, Germany

**19802.** Verdú, J.R.; Numa, C.; Galante, E. (Eds) (2011): *Atlas y Libro Rojo de los Invertebrados amenazados de España (Especies Vulnerables)*. Dirección General de Medio Natural y Política Forestal, Ministerio de Medio Ambiente, Medio rural y Marino, Madrid: 1318 pp. (in Spanish) [The following odonate species are treated in detail: *Aeshna*

juncea, Coenagrion caerulescens, C. mercurial, C. scitulum, Cordulegaster bidentate, Gomphus simillimus simillimus, Gomphus vulgatissimus, Onychogomphus costae, Lestes macrostigma, Orthetrum nitidinerve, Sympetrum flavolum, Zygonyx torridus. [https://www.miteco.gob.es/es/biodiversidad/temas/inventarios-nacionales/inventario-especies-terrestres/inventario-nacional-de-biodiversidad/ieet\\_invert\\_vulne\\_atlas.aspx](https://www.miteco.gob.es/es/biodiversidad/temas/inventarios-nacionales/inventario-especies-terrestres/inventario-nacional-de-biodiversidad/ieet_invert_vulne_atlas.aspx)] Address: not stated

## 2012

**19803.** Mezquita Aranburu, I. (2012): Libélulas de Bizkaia. Colección BIZKAIKO GAIK - TEMAS VIZCAINOS editado por. ISBN: 978-84-8056-317-8: 179 pp. (in Baskian) [Dragonflies of Bizkaia: [https://www.researchgate.net/publication/283710329\\_Libelulas\\_de\\_Bizkaia](https://www.researchgate.net/publication/283710329_Libelulas_de_Bizkaia)]

**19804.** Wildermuth, H. (2012): Insekten im Mittelpunkt einer Naturschutzausstellung. Entomo Helvetica 5: 54-57. (in German) [The author reports on a nature conservation exhibition in Rüti, Switzerland, which was open to the public between June 2011 and January 2012. The focus of the information was on the habitats dry meadow, wet meadow and forest stream. Many examples were used to show the interactions and interconnections between the habitats. In particular, butterflies and dragonflies are dealt with.] Address: Wildermuth, H., Haltbergstr. 43, 8630 Rüti, Switzerland. E-mail: [hansruedi@wildermuth.ch](mailto:hansruedi@wildermuth.ch)

**19805.** Wildermuth, H. (2012): SAGLS-Exkursionen zum Thema Neuschaffung und Regeneration von Libellengewässern. Entomo Helvetica 5: 175-177. (in German) [In 2010 and 2011, the Swiss Association for Dragonfly Conservation (SAGLS) organised two excursions on the promotion of dragonfly habitats. Both times, the excursion destinations were different biotopes in Suisse romande. On 26 June 2010, a group of interested experts led by Alain Maibach and Antoine Gander visited several water bodies in the Yverdon area that are particularly important for dragonflies. The excursion of 10 September 2011 led to the valley of La Brévine in the Neuchâtel Jura. Neuchâtel Jura, where remnants of the once extensive upland moors are being regenerated at altitudes of over 1000 m. The excursion of 10 September 2011 led to the valley of La Brévine in the Neuchâtel Jura.] Address: Wildermuth, H., Haltbergstr. 43, CH-8630 Rüti, Switzerland. E-mail: [hansruedi@wildermuth.ch](mailto:hansruedi@wildermuth.ch)

## 2013

**19806.** Andor, L.; Előd, K.; Balázs, C.; Ildikó, S. (2013): Adatok a Koppány-patak makroszkopikus vízi gerinctelen faunájához. Natura Somogyiensis 23: 153-158. (in Hungarian, with English summary) ["The Koppány stream is a lowland stream in Southwestern Hungary. The aquatic macroinvertebrate fauna of the Koppány stream is poorly known. During the collections 71 aquatic macroinvertebrate species were collected (5 Ephemeroptera, 6 Odonata [Platycnemis pennipes, Ischnura elegans pontica, Calopteryx splendens, Anax imperator, Sympetrum striolatum, S. vulgatum], 16 Heteroptera, 4 Coleoptera and 4 Trichoptera) in 2010." (Authors)] Address: Andor, L., Balaton-felvidéki Nemzeti Park Igazgatóság, H-8903 Zalaegerszeg, Pf. 37., Hungary, [a.lokkos@gmail.com](mailto:a.lokkos@gmail.com)

**19807.** Chovanec, A. (2013): Bewertung der Renaturierungsmaßnahmen an der Krems (OÖ) im Bereich Ansfelden / Oberaudorf aus libellenkundlicher Sicht. Im Auftrag

des Amtes der Oberösterreichischen Landesregierung, Abt. Oberflächengewässernwirtschaft: 52 pp. (in German) ["Conclusions The measures carried out on the lower Krems in the Ansfelden / Oberaudorf area resulted in an increase of the habitat availability relevant from a dragonfly point of view. The species spectrum detected includes rhithral and potanal species of the water type-specific dragonfly associations, but the occurrence of the most indicative species is limited to only a few sections within the study area. The section (D) with the highest number of individuals also fell dry from August 2013 onwards. The study area has a high potential for dragonflies, and the following measures are recommended to stabilise and strengthen the populations of the water-type-specific species: Increase the structural offer in the main channel of the Krems: Demand the development of gravel banks (cf. e.g. WILDERMUTH & KURY 2009), such as upstream of the inflow area into the left bank tributary (Fig. 23). Increased dotation of the left-bank tributary and transformation into a permanently flowing tributary through hydraulic engineering measures (instead of two "water bodies" - a perennial backwater area and a temporarily flowing section)." (Author/SeepL)] Address: Chovanec, A., Krottenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-mail: [andreas.chovanec@bmlfuw.gv.at](mailto:andreas.chovanec@bmlfuw.gv.at)

**19808.** Kang, S.R.; King, S.L. (2013): Effects of hydrologic connectivity on aquatic macroinvertebrate assemblages in different marsh types. Aquat. Biol. 18: 149-160. (in English) ["Hydrologic connectivity can be an important driver of aquatic macroinvertebrate assemblages. Its effects on aquatic macroinvertebrate assemblages in coastal marshes, however, are relatively poorly studied. We evaluated the effects of lateral hydrologic connectivity (permanently connected ponds: PCPs; temporary connected ponds: TCPs), and other environmental variables on aquatic macroinvertebrate assemblages and functional feeding groups (FFGs) in freshwater, brackish, and saline marshes in Louisiana, USA. We hypothesized that (1) aquatic macroinvertebrate assemblages in PCPs would have higher assemblage metric values (density, biomass, Shannon-Wiener diversity) than TCPs and (2) the density and proportional abundance of certain FFGs (i.e. scrapers, shredders, and collectors) would be greater in freshwater marsh than brackish and saline marshes. The data in our study only partially supported our first hypothesis: while freshwater marsh PCPs had higher density and biomass than TCPs, assemblage metric values in saline TCPs were greater than saline PCPs. In freshwater TCPs, long duration of isolation limited access of macroinvertebrates from adjacent water bodies, which may have reduced assemblage metric values. However, the relatively short duration of isolation in saline TCPs provided more stable or similar habitat conditions, facilitating higher assemblage metric values. As predicted by our second hypothesis, freshwater PCPs and TCPs supported a greater density of scrapers, shredders, and collectors than brackish and saline ponds. Aquatic macroinvertebrate assemblages seem to be structured by individual taxa responses to salinity as well as pond habitat attributes." (Authors) Odonate taxa are: Coryphaeschna, Enallagma, Ischnura, Erythemis, and Pachydiplax.] Address: Kang, S.R., School of Renewable Natural Resources, LSU AgCenter, Baton Rouge, Louisiana 70803-4301, USA. E-mail: [skang1@tigers.lsu.edu](mailto:skang1@tigers.lsu.edu)

## 2014

**19809.** Aland, S.R.; Mamlayya, A.B.; Bhawane, G.P. (2014): Economically important insect fauna of Amba Reserve Forest, Western Ghat, Kolhapur district, Maharashtra.

Avishkar – Solapur Univ. Research Journal 3: 102-119. (in English) ["The present study was carried out for three years (2007-2009). During the study period of three years, a total of 290 insect species were found economically important. 66 species belonging to orders Lepidoptera, Coleoptera, Orthoptera and Hymenoptera were leaf eaters. 2 species of the orders Lepidoptera and Coleoptera were leaf rollers. 13 species of the orders Lepidoptera, Coleoptera and Hemiptera were stem & root borers. 9 species of the orders Coleoptera, Isoptera and Lepidoptera were bark feeders. 28 species of the orders Heteroptera and Thysanoptera were sap suckers. The insects belonging to orders Coleoptera and Diptera were fruit destroyers. 105 species of the orders Diptera, Hymenoptera, Neuroptera, Coleoptera and Odonata [n = 64 taxa] were predators. 29 species of orders Hymenoptera and Diptera were parasites. 6 species of the orders Coleoptera and Hymenoptera were drug producers and 9 species belonging to the orders Orthoptera, Isoptera and Lepidoptera were nutritive insects. 11 species of insects of the orders Lepidoptera and Hymenoptera were pollinators and 9 species of the orders Homoptera, Lepidoptera and Hymenoptera were productive insects." (Authors)] Address: Aland, S.R., Dept of Zoology, Walchand College of Arts and Science, Solapur – 413 006, India

**19810.** Aprianti, R.; Jasmi, J.; Zeswita, A.L. (2014): Kepadatan populasi *Orthetrum sabina* (Odonata: Libellulidae) pada pertanaman padi sawah di Kanagarian air Bangis kecamatan Sungai Beremas kabupaten Pasaman Barat. *Beranda* 1(1): 5 pp. (in Indonesian, with English summary) [Population density of *Orthetrum sabina* (Odonata: Libellulidae) in rice paddy fields in Kanagarian air Bangis, Sungai Beremas sub-district, West Pasaman district. - In February 2014, the population of *O. sabina* in Kanagarian air Bangis, Sungai Beremas district, Pasaman Barat Regency was studied. "Sample of research done for 1 week with condition rice field that flooded and dry land are 3 days in the light months and 3 days in dark month. From the result of population *O. sabina* in Kanagarian Air Bangis found that characteristics of *O. sabina* average abdomen length 29-30 mm and body length 50-53 mm have compound eyes green colour with slender abdomen. Totally population of *O. sabina* in wet rice field (0,99 individuals/m<sup>2</sup>) higher than dry land rice (0,76 individuals/m<sup>2</sup>). Meanwhile, average population density in the light month (0,94 individuals/m<sup>2</sup>) higher than in the dark month (0,77 individuals/m<sup>2</sup>).] Address: Aprianti, R., Program Studi Pendidikan Biologi Sekolah Tinggi Keguruan Dan Ilmu Pendidikan (STKIP ) PGRI Sumatera Barat, Rizaaprianti22@gmail.com

**19811.** Cano-Villegas, F.J.; Carpintero, S. (2014): Libélulas Africanas en la Península Ibérica. *Quercus* 344: 34-44. (in Spanish) [Records and distribution of *Diplacodes lefebvrei*, *Brachythemis impartita*, *Paragomphus genei*, *Trithemis annulata*, *Trithemis kirbyi*, *Orthetrum trinacria*, and *Sympetrum sinaiticum* are discussed in detail.] Address: Cano-Villegas, F.J., Asociación Odonatológica de Andalucía. Isla de Mallorca, 2 P6 4ªA, 14011 Córdoba, Spain. E-mail: fjcanovi2@hotmail.com

**19812.** Conesa Garcia, M.A.; Bernal Sánchez, A.; Cano Villegas, F. (2014): New morphological data of the larvae F0 and exuviae of *Brachythemis impartita* (Karsch, 1890), (Odonata, Libellulidae). *Boletín de la Sociedad Odonatológica de Andalucía* 2: 2-11. (in Spanish) ["There is no original description of the larvae of *B. impartita*. The limited morphological data published in the literature about *Brachythemis leucosticta* (Burmeister, 1839) for the fauna in Europe

and North Africa must be ascribed to *B. impartita* (DIJKSTRA & MATUSKINA, 2009). Our study provides an analysis of 22 morphological parameters measured in F0 larvae and exuviae of samples which undoubtedly belong to *B. impartita*. Larval morphology is described in different stages and the results obtained are compared with those for known species of *Brachythemis lacustris* (Kirby, 1889) and *B. leucosticta*, both of African distribution." (Authors)] Address: Cano Villegas, F.J., Depto de Ciencias Ambientales, Área de Zoología, Universidad Pablo de Olavide, 41013 (Sevilla), Spain. E-mail: fjcanovi1@wanadoo.es

**19813.** Consatti, G.; Martins dos Santos, D.; Renner, S.; Périco, E. (2014): Presença de Odonata em áreas preservadas e não preservadas nas matas ciliares do Rio Taquari, RS. *Revista de Iniciação Científica da ULBRA* 12: 57-65. (in Portuguese, with English summary) ["In nature, the riparian forest acts as filters and protection against erosion, serving also as shelter for fauna. The Odonata order is composed by organisms which are sensitive to environment changes, its life cycle is aquatic and terrestrial, doing so, these insects can be potential bioindicators. The main goal of this project was to compare the odonate richness and abundance, in preserved and degraded riparian zones along the Taquari River margins. Were collected 81 specimens, belonging to 24 species. We found a significant difference in the abundance and richness, between the preserved and degraded areas. We suggest that such difference can be attributed to the better vegetation conditions found on the preserved areas, which consequently increases the biodiversity." (Authors)] Address: Périco, E., Coordenador do Setor de Ecologia e Sensoriamento Remoto/UNIVATES. E-mail: perico@univates.br

**19814.** Dalecky, V. (2014): The influence of forest management to forest populations of dragonflies *Cordulegaster* (Odonata: Cordulegastridae) in selected Moravia and Silesia region. *SilvaNet* 2014: 26-27. (in Czech) ["From the preliminary results [...] it can be concluded that, despite the often intensive management, the populations of forest rheophilic dragonflies are not extremely threatened. The most common risk arises from clear-cut mining or the processing of calamitous mining that directly connects to watercourses. If riparian vegetation with a minimum width of approx. 2 m is preserved, the biggest negative effect, the washing of the surface layer of soil into water courses, is prevented. The nature of the riparian vegetation is most suitable diverse with a mixture of trees, shrubs and herbaceous undergrowth of various ages, which prevents the aforementioned negative influence." (Author/Deepl)] Address: Dalecký, V., Mendelova univerzita v Brně / Lesnická a dřevářská fakulta, Czech Republic. E-mail: v.dalecky@gmail.com

**19815.** Ezquerro, C.Z.; Asso, T.L.; Rodríguez Saldaña, J.I.; Martínez, E.; López, R.Z.; Marín, A.C. (2014): Libélulas y Caballitos de Agua de La Rioja (Odonata). Colección: Ciencias de la Tierra, nº 33: 362 pp. (in Spanish) ["Odonata are a very ancient group, whose morphology has changed very little over time for more than 200 million years. Moreover, they form a worldwide assemblage of about 6,000 species. A tiny group compared to the specific richness of Lepidoptera (175,000) or Coleoptera (350,000). But curiously, odonates have become a group of animals of great interest due to their beauty, their harmlessness and for being one of the few orders of insects that does not include any pest species, and which, on the contrary, has very positive effects on humans, by ridding us of a large number of insects that come into conflict with us (mosquitoes, for example) or with our

agriculture and livestock. In La Rioja, 49 of the 77 species of odonates that inhabit the Iberian Peninsula have been found (23 damselflies and 26 dragonflies). The odonata-fauna of La Rioja is mainly Mediterranean, with a small component of Nordic species that live mainly in the Sierra, and another small number of elements of African origin that live in the Ebro Valley. With this monograph, magnificently illustrated with photographs of the species, our aim is to take a step forward in the knowledge of the biodiversity of La Rioja; to open a new door to more specific studies; and above all, to provide the first support to anyone interested in identifying, knowing where they live, when they fly and what problems the Odonata currently living in our region are experiencing." (Publisher/DeepL)] Address: <https://www.larioja.org/i-estudios-riojanos/es/publicaciones/novedades/monografias/libelulas-caballitos-agua-ri-oja-odonata>

**19816.** Fan, T.; Zhang, R.; Fan, F.; Liu, Z.; Xiong, J. (2014): A water surface small target detection approach inspired by dragonfly vision mechanism. *WIT Transactions on Engineering Sciences* 94: 151-157. (in English) ["Weak and small target detection technique is widely used in military and industry applications. The targets are weak and small in the image when targets are far from the imaging system. Under this complex condition, the image has very low SNR and it is difficult to detect the targets. On this situation, a weak and small target detection approach based on dragonfly compound eye is proposed in this paper. Dragonfly compound eye has obvious characteristics of polarized light, and it can detect the surface of water and the targets on water accurately. The new method uses the polarization characteristics of dragonfly compound eye to get the polarization image of targets, and then completes the weak small target detection. The experimental data shows that this new target detection method has advantages of high precision and small false alarm rate." (Authors)] Address: Fan, T., School of Information Engineering, Natnchang Institute of Technology, Natnchang, China

**19817.** Frutos Cuadrado, I.M.; Sanabria Hidalgo, A. (2014): *Trithemis kirbyi* (Sélys 1891) (Odonata: Libellulidae) en la comarca de La Serena, Extremadura (España). *Boletín de la Sociedad Odonatológica de Andalucía* 2: 41-43. (in Spanish) ["This note describes the observation of two (three) adult males of *Trithemis kirbyi* during the summer of 2012, in an abandoned granite quarry in the vicinity of the town of Quintana de la Serena, in the province of Badajoz, UTM coordinates (Huso 30, Datum WGS84): X 266,811.63 Y 4,292,667.32. The quarry is currently unexploited and was closed by the administration 10 years ago, as it is located practically inside the town centre, thus avoiding the danger to the nearby population that such exploitation entails. The quarry covers an area of approximately 2000 m<sup>2</sup> and has a maximum depth of 12 m. The predominant marsh vegetation is exclusively of bulrushes (*Typha latifolia*) and sedges (Fig. 1)." (Author/DeepL)] Address: Isidoro M. Frutos Cuadrado. I.M., Pza. de los Barcos, 3, 2º-A, 11100-San Fernando, Cádiz, Spain. Email: [muscaria17@hotmail.com](mailto:muscaria17@hotmail.com)

**19818.** Fulan, J.A.; Santos, L.R.; Ferreira, L. (2014): Observações sobre a criação de ninfas de *Brechmorhoga Kirby, 1894* (Insecta: Odonata) em condições artificiais. *Revista Brasileira de Biociências* 12(4): 206-209. ["Observations on rearing of *Brechmorhoga Kirby, 1894* (Insecta: Odonata) nymphs under artificial conditions). The goal of this work was to contribute to the improvement of a rearing method for *Brechmorhoga* that would allow a greater success in adult emergence. We sampled a total of 300

*Brechmorhoga* nymphs in association with a macrophyte in the Been stream, southern Amazonas state, Brazil. Out of the 300 sampled nymphs, only 60 were appropriate for rearing outside their natural habitat, as they were in the penultimate and last developmental stages. The tested methods for nymph rearing were: no substrate, artificial substrate (filter paper strips) and natural substrate (macrophyte). All methods were tested in laboratory and greenhouse. All adults obtained were recorded in the greenhouse vivaria with macrophyte. The results of the log-rank test showed a significant difference between treatment with natural substrate in laboratory and in greenhouse; and between treatments without substrate and with natural substrate in laboratory. We concluded that the rearing of *Brechmorhoga* under artificial conditions was more efficient in the presence of macrophytes in greenhouse vivaria." (Authors)] Address: Fulan, J.A., Instituto de Educação, Agricultura e Ambiente, Universidade Federal do Amazonas (UFAM). Rua 29 de Agosto 786, CEP 69800-000, Humaitá, AM, Brasil. Email: [joaofulan@ig.com.br](mailto:joaofulan@ig.com.br)

**19819.** Gustia, N.; Jasmi, J.; Pratiwi, P. (2014): Kepadatan populasi capung *Crocothemis servilia* (Odonata: Libellulidae) pada pertanaman padi sawah di kelurahan Anduring kecamatan Kuranji Padang Sumatera barat. *Beranda* 1(1): 5 pp. (in Indonesian, with English summary) [Population density of dragonflies *Crocothemis servilia* (Odonata: Libellulidae) in paddy rice fields in Anduring sub-district, Kuranji sub-district, Padang, West Sumatra - "Dragonflies can serve as an indicator to monitor the water quality of surrounding environment and predators on crop pests of rice, in addition to the dragonfly also play a role in health and agriculture. *C. servilia* is commonly found in rice crops. So far there are no data on the density of Odonata including dragonfly *C. servilia* in the District of Kuranji Anduring. The purpose of this study was to determine the population density of *C. servilia* on rice planting in Anduring Kuranji District of Padang in West Sumatra. This study was conducted in January-February 2014, with a descriptive survey method. It is by way of direct collection of the *C. servilia* existing research in the location. Field sampling done at night on dry rice and wet rice fields when the bright moon and new moon. Physical environmental factors measured are temperature and humidity. The area used as a place of research about + 1 Ha. The characteristics of *C. servilia* which are found are the average length of the male dragonfly *C. servilia* abdomen is 30 mm long and 27 mm in females. [...] The average of population density of *C. servilia* in the rice fields location of Anduring Kuranji District of Padang in West Sumatra on dry fields individuals/m<sup>2</sup> is 0.15, and the wet rice fields (aqueous) was 0.09 individuals/m<sup>2</sup>." (Authors)] Address: Gustia, N., Program Studi Pendidikan Biologi Sekolah Tinggi Keguruan Dan Ilmu Pendidikan (STKIP) PGRI Sumatera Barat. E-mail: [nuri.gustia@yahoo.com](mailto:nuri.gustia@yahoo.com)

**19820.** Itrac-Bruneau, R.; Louboutin, B.; Merlet, F. (2014): Première observation de *Coenagrion hastulatum* dans le département du Gard (Odonata: Coenagrionidae). *Martinia* 30(2): 64-65. (in French) [France; Lac des Pises et Montagne du Lingas, 14-VII-2013, 44,04467 N / 3,50798 E.] Address: Merlet, Florence, 78 rue de Cornouailles, F-78180 Montigny-le-Bretonneux, France. Email: [florence.merlet@gmail.com](mailto:florence.merlet@gmail.com)

**19821.** Kobayashi, J. (2014): Comparative morphology of the female internal reproductive organs in the Japanese Odonata (Preliminary report). *Jpn. J. Ent. (N.S.)* 17(1): 2-9. (in Japanese, with English summary) ["The ovaries of 15

species of adult Odonata are preliminarily described and illustrated anatomically. The ovaries extend from the anterior margin of the mesopostscutum under the apodeme to the 8th abdominal segment. Those occupy the greater part of the abdominal cavity, and unite at the gonopore in ventral side of the 8th segment. The ovarioles open dorsally and sequentially into each calyx, previously known as a part of the lateral oviduct. The calyces store many matured eggs, and the lateral oviducts open into the common oviduct at the posterior part of the 8th abdominal segment. Each entire ovary is covered with a thin membrane, which is probably presumed to be homologous with the peritoneal sheath as is known in adults of some dipteran species in structure. The ovarioles are counted one by one in 15 species based on fresh material. The numbers of ovarioles per individual is range from 166 to 256 in *Ischnura senegalensis* (Rambur, 1842) and 568 up to 1459 in *Orthetrum albistylum* (Brauer, 1848). The numbers also usually vary in each species, however, those are more stable in number in such groups as Zygoptera and Libellulidae than the others." (Author) *Mnais pruinosa*, *Calopteryx cornelia*, *Atrocalopteryx atrata*, *Ischnura senegalensis*, *Sinictinogomphus clavatus*, *Anax parthenope*, *Sympetrum darwinianum*, *S. frequens*, *S. eroticum*, *S. pedemontanum*, *S. speciosum*, *Crocothemis servilia*, *Pantala flavescens*, *Orthetrum albistylum*, *O. melania*] Address: Kobayashi, J., Lab. Entomology, Tokyo Univ. of Agriculture, 1737 Funako, Atsugi, Kanagawa, 243.0034 Japan

**19822.** Lorenzo-Carballa, M.O.; Cordero-Rivera, A. (2014): Odonates. Dragonflies and Damselflies. In: Pablo Vargas, Rafael Zardoya (Eds): The tree of life. Publisher: Sinauer Associates: 353-363. (in English) ["Odonates currently include about 30 families and almost 6000 species, found on all continents except Antarctica. The relationships between the families based on DNA sequences have in most cases proven to be inconsistent with previous classifications, such as the sister relationship between Zygoptera (damselflies) and Epirocta (primarily dragonflies). The results of the most recent phylogenetic analyses, based on both molecular and morphological characters, have helped to clarify some of these relationships, although debate continues over the position of certain groups, such as the Epiophlebitoptera. The fossil record indicates the appearance of the Odonata in the Late Carboniferous, with a wide diversification in the Permian and finally the evolution of the groups extant today in the Jurassic and Cretaceous. Their body structure, as well as certain lifestyles observed in extant species, appear to have changed little since then. They present some morphological characteristics that are unique among insects, of which the most notable is the presence of secondary male genitalia separate from the testes, a feature that determines a unique reproductive behavior involving two points of contact between male and female during copulation, and makes them an appropriate group to test new theories on sexual conflict. One question of debate is whether the polychromatism observed in many species is an ancestral character, a question that will be answered with the development of robust phylogenies. Among the most successful speciation mechanisms in this group are those related to the selective pressures exerted by predatory ray-finned fishes, with very remarkable examples in some genera." (Authors)] Address: Cordero Rivera, A., Depto de Ecología e Biología Animal, Universidade de Vigo, E.U.E.T. Forestal, Campus Universitario, 36005 Pontevedra, Spain. E-mail: [acordero@uvigo.es](mailto:acordero@uvigo.es)

**19823.** Matushkina N.O. (2014): Dragonflies (Odonata) of the Kaniv nature reserve. Short determination key to larvae

and exuviae. Kiv: 16 pp.- (in Ukrainian) ["Dragonflies are amphibiotic insects, the larvae of which develop in various types of water bodies, from streams, rivers and marshes to man-made ponds and pits. Using the proposed key, it is possible to identify mature larvae that have clearly visible wing rudiments and larval skins (exuvia) remaining after winging. The younger larva is determined only to the family level. To determine the species, as well as some genera from the families Coenagrionidae and Libellulidae, it is necessary to use special markers (see the list of recommended literature), and the determination should be carried out at a high magnification of binoculars, making temporary preparations of individual parts of the body. The following key for identification does not include species whose distribution is limited to certain regions of Ukraine (mainly the Carpathians and the South), or which are rare or few in the Middle Dnieper region." (Author)] Address: Matushkina, Natalia A., Dept of Zoology, Biological Faculty, National Taras Shevchenko Univ. of Kyiv, vul. Volodymyrs'ka, 64, Kyiv UA-01033, Ukraine. E-mail: [odonataty@gmail.com](mailto:odonataty@gmail.com)

**19824.** Monzó, J.C. (2014): Primas citas de *Trithemis kirbyi* en la provincia de Alicante. *Quercus* 344: 43. (in Spanish) ["9-VIII-2012, around 12:00 p.m., Jacobo Ramos detected a male specimen, which he brought to the attention of the Municipal Area of the Environment of the Pinoso City Council. A week later, on August 16 and also around 12 noon, Jacobo Ramos, Ricardo Menor and José Carlos Monzó detected a female in the same area. At the time of sending this note, at the end of August 2014, three more males have appeared." (Author/Google Translate)] Address: Monzó, J.C., Área de Medio Ambiente, Ayuntamiento de Pinoso, Paseo de la Constitución, 44, 03650 Pinoso, Alicante, Spain. Email: [jc.monzo@medioambientepinoso.org](mailto:jc.monzo@medioambientepinoso.org)

**19825.** Riservato, E.; Festi, A.; Fabbri, R.; Grieco, C.; Hardersen, S.; la Porta, G.; Landi, F.; Siesa, E.; Utzeri, C. (2014): Odonata - atlante delle libellule Italiane. Società per lo Studio e la Conservazione dell Libellule. Edizioni Belvedere, Latina, "le scienze" (17): 224 pp. (in Italian) ["This volume, edited by the Italian Society for the Study and Conservation of Dragonflies - ODONATA.IT (Onlus) and published by Belvedere Editions, represents the first mapping of dragonfly species in Italy and offers an up-to-date and real picture of the knowledge on the composition and distribution of odonates in our country. The atlas is based on more than 71,000 data (2/3 of which are unpublished) and covers 92 species, for each of which there is a card containing the distribution map, a brief description of the global and Italian range, the phenology and habitats frequented by larvae and adults, as well as a colour photograph to illustrate the habitus of the species. Some general aspects are also briefly illustrated (generalities, biodiversity and conservation, ecology, zoogeography and taxonomy) and the common names of Italian odonates are introduced for the first time." Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)]

**19826.** Sánchez, A.M.; Regil, O.R. (2014): Hábitos alimentarios de *Gambusia yucatanensis* en la división académica de ciencias biológicas (UJAT). *Kukulab* 17(32): 43-48. (in Spanish) [Mexico "The aim of this study is to know the feeding habits of *Gambusia yucatanensis*, as this species has little commercial demand, but it is very important to use it as a biological control of some pests (mosquito larvae). A comparison was made between two study areas, the Tintal and the Herbarium. In this study, the digestive tracts of 136 individuals of *G. yucatanensis* were analysed. They were collected in the months of October and November 2010. It was found

that the overall diet consists of 7 food components that are of animal origin, recording that most of the components were insects, such as: Diptera (54%) as primary food, Os-tracods (18%), Gastropods (17%), and Hymenoptera (13%) as secondary food. The incidental ones were Chelicerates (4%), Odonata (3%) and Plecoptera (1%)." (Authors) Translated with www.DeepL.com/Translator (free version)] Address: América Mondragón Sánchez, División Académica de Ciencias Biol., Univ. Juárez Autónoma de Tabasco, Km 0.5 carretera Villahermosa - Cárdenas, Villahermosa, Tabasco, Mexico. Email: a\_my\_galaxy@hotmail.com

## 2015

**19827.** Jisha Krishnan, E. K.; Sebastian, C. D. (2015): Species authentication and taxonomic relationship assessment of Coenagrionidae) using the molecular marker Cytochrome oxidase. International Journal of Current Research 7(12): 23997-23999. (in English) ["Ceriagrion coromandelianum [...] is a widely distributed damselfly species in South Asia. It acts as a natural 'biocontrol' agent against paddy pests like leaf hopper, planthopper, midges and flies. The partial sequence of cytochrome oxidase I gene of C. coromandelianum was analysed by PCR and the result yielded a gene product of 573 bp length. Phylogenetic tree constructed by Maximum likelihood and Neighbour joining method supported with the bootstrap value, taxonomically confirmed the relationship of this species with other damselflies and depicted that it is closely related to C. nipponicum than other Ceriagrion members. Evolutionary divergence and tree reveals that all the Ceriagrion members are having a monophyletic ancestry originating from a common clade with maximum divergence for C. whellani followed by C. nipponicum, C. coromandelianum and C. glabrum and it occurred mainly due to the transitional change of nucleotides." (Authors) Chromagrion conditum, C. coromandelianum, C. glabrum, C. nipponicum, C. whellani, Teinobasis cryptica, Ischnura senegalensis, I. senegalensis] Address: Sebastian, C. D., Molecular Biology Laboratory, Dept Zool., Univ. of Calicut, Kerala, India. E-mail: drcdsebastian@gmail.com

**19828.** Medona, M.R.; Nirmala, T.; Rose, M.R.D. (2015): Diversity and distribution of aquatic insects in Sothuparai Reservoir, at Periyakulam, Theni district, Tamilnadu, India. Int. J. Cur. Res. Rev. 7(9): 10-15. (in English) ["The present study deals with the diversity and distribution of aquatic insects from Sothuparai Reservoir. It is located at the foothills of the Western Ghats. The aquatic entomofauna were sampled systematically and randomly using standard protocols. The aquatic insects act as an indicator species to monitor the environmental pollution. Ephemeropteran were most diverse and its presence indicative of good water quality. The abundance of organic pollution tolerant Baetis were found in downstream, nearer to human settlements. The physico chemical variations of water taken into account for the study were found to be influencing the distribution of aquatic insects. It is suggested that routine bio monitoring of the reservoir using aquatic insect indicators will facilitate better conservation and management. ... Odonata contributes 19 % of the total fauna. Libellulidae, Gomphidae and Euphaeidae were the families belonging to Odonata. The nymphs of this family remain attached to macrophytes. Crocothemis was the species of the Libellulidae, the naid of which is mud dwelling. 16 genera in Western Ghats have been collected by Subramanian and Sivaramakrishnan, (2005)." (Authors)] Address: Medona, Mary, Dept of Zoology, Jayaraj Annapackiam College for Women, Periyakulam, TN, India. E-mail: medonawilson@gmail.com

**19829.** Abdul Hamid, M.F. (2016): Aerodynamic models for insect flight. Ph.D. thesis, Univ. of Manchester: 164 pp. (in English) ["Numerical models of insect flapping flight have previously been developed and used to simulate the performance of insect flight. These models were commonly developed via Blade Element Theory, offering efficient computation, thus allowing them to be coupled with optimisation procedures for predicting optimal flight. However, the models have only been used for simulating hover flight, and often neglect the presence of the induced flow effect. Although some models account for the induced flow effect, the rapid changes of this effect on each local wing element have not been modelled. Crucially, this effect appears in both axial and radial directions, which influences the direction and magnitude of the incoming air, and hence the resulting aerodynamic forces. This thesis describes the development of flapping wing models aimed at advancing theoretical tools for simulating the optimum performance of insect flight. Two models are presented: single and tandem wing configurations for hawk moth and dragonfly, respectively. These models are designed by integrating a numerical design procedure to account for the induced flow effects. This approach facilitates the determination of the instantaneous relative velocity at any given spanwise location on the wing, following the changes of the axial and radial induced flow effects on the wing. For the dragonfly, both wings are coupled to account for the interaction of the flow, particularly the fact that the hindwing operates in the slipstream of the forewing. A heuristic optimisation procedure (particle swarming) is used to optimise the stroke or the wing kinematics at all flight conditions (hover, level, and accelerating flight). The cost function is the propulsive efficiency coupled with constraints for flight stability. The vector of the kinematic variables consists of up to 28 independent parameters (14 per wing for a dragonfly), each with a constrained range derived from the maximum available power, the flight muscle ratio, and the kinematics of real insects; this will prevent physically-unrealistic solutions of the wing motion. The model developed in this thesis accounts for the induced flow, and eliminates the dependency on the empirical translation lift coefficient. Validations are shown with numerical simulations for the hover case, and with experimental results for the forward flight case. From the results obtained, the effect of the induced velocity is found to be greatest in the middle of the stroke. The use of an optimisation process is shown to greatly improve the flapping kinematics, resulting in low power consumption in all flight conditions. In addition, a study on dragonfly flight has shown that the maximum acceleration is dependent on the size of the flight muscle." (Author)] Address: Abdul Hamid, M.F., School of Mechanical, Aerospace and Civil Engineering, Univ. of Manchester, UK.

**19830.** Adu, B.W.; Kemabonta, K.A.; Ogbogu, S.S. (2016): Composition and abundance of odonates at Alatori stream, south-west Nigeria. UNILAG Journal of Medicine, Science and Technology 4(1): 96-110. (in English) ["Odonata are sensitive to human disturbance both as adults that are on wings and as larvae that are aquatic. This attribute suggests their usage as assessment tool for determination of human disturbance within the ecosystem. Alatori stream in Akure Forest Reserve was studied from May 2008 to April 2010 in order to determine the water quality and abundance of Odonata species of the stream. Adults and larvae specimens were sampled throughout the sampling period. A total of 767 adult specimens and 108 larvae were collected. Only

45.4% of the penultimate and ultimate larvae collected eclosed (emerged) to teneral adults. The composition of Odonata families occurring at the stream showed that Libellulidae was the highest (281) followed by Chlorocyphidae (158) while the lowest was Megapodagrionidae (5). The occurrence of members of the families Megapodagrionidae, Chlorocyphidae and Calopterygidae indicates that the stream ecosystem can sustain species with narrow niches. Seven physico-chemical variables: temperature (water and ambient), pH, turbidity, electrical conductivity, dissolved oxygen, water current velocity and depth of the stream were examined and analysed. Analysis of variance (ANOVA) result revealed that conductivity, temperature and water depth played a major role in determining the community structure of odonate assemblage in the stream. The mean ( $\pm$ ) standard deviation of electrical conductivity ( $184.25 \pm 6.37 \mu\text{S/cm}$ ) of the water was indicative of an unpolluted freshwater system with stable habitat structure. The study suggests that the water quality of Alatori stream is healthy and can sustain Odonata and other fauna within the ecosystem." (Authors)] Address: Adu, B., Dept of Biology, Federal Univ. of Technology, Akure, Ondo State, Nigeria

**19831.** Adu, B.W.; Kehinde, K.K.A.; Ogbogu, S.S. (2016): Monitoring of environmental disturbance using abundance and distribution of red-vein and dark-vein species of genus *Trithemis* (Odonata: Libellulidae). *Zoologist (The)* 14: 31-36. (in English) ["Environmental changes as a result of human disturbance in Akure Forest Reserve were investigated for a period of twelve months using abundance and diversity of Red-vein and Dark-vein *Trithemis* species as an assessment tool. Four study sites (AGO, ALA, APO, and ROD), based on type of water bodies and landscapes, were identified and selected for this study. Diversity indices and Dragonfly Biotic Index (DBI) were used to compare the assemblages of the odonate species in the study-sites. A total of 199 specimens were collected out of which 121 and 78 were Red-vein and Dark-vein species respectively. Members of this genus differ in their dispersal capacities and coloration. Based on Dragonfly Biotic Index (DBI) used and the pattern of distribution of *Trithemis* (Red-vein and Dark-vein species), in the forest ROD and APO were the least disturbed site with the highest DBI value of 9. AGO with DBI value of 2 was the most disturbed site. The pattern of distribution of this species revealed that Akure Forest Reserve is degenerating, a situation that could lead to loss of biodiversity if urgent conservative measures were not put in place." (Authors) The study includes the following species: *Trithemis aenea*, *T. annulata*, *T. arteriosa*, *T. hecate*, *T. kirby*, *T. grouti*, *T. furva*, *T. imitata*] Address: Adu, B.W., Dept of Biol., Federal Univ. Technology, Akure, Ondo State, Nigeria. Email: williamsadubabs@yahoo.com

**19832.** Allison, S.E. (2016): Variation in female mating behavior and success in the damselfly, *Calopteryx maculata*. M.Sc. thesis, Dept of Biology, James Madison Univ.: VI, 25 pp. (in English) ["Traditionally, the study of sexual selection has focused on the evolution of elaborate male traits and how they enhance the ability to out-compete other males directly (access to females) and indirectly (access to desirable territories or resources). Female trait studies have focused most on evolved preferences for male traits. While we know much about how sexual selection acts on males, there is a deficit of equivalent study on females. In insects, including damselflies, male size and pigmentation are positively correlated with fat reserves and immune abilities, and therefore with male competitive ability. Here, we show that phenotypic variation that has been well-documented in

males of the Ebony jewelwing damselfly, *Calopteryx maculata*, is also present in females of the species. We measured female mating success and behaviour of *C. maculata* at Smith Creek in Rockingham County, Virginia. Males were marked with multiple colours of fluorescent powder that was transferred to females when mating. Uniquely-numbered females were digitally scanned and repeatedly observed throughout the summer. We determined that there is significant variation in female mating frequency, wing pigmentation, size, and shape. The study of trait variation within females, and thus the opportunity for selection to act on those traits, is essential in understanding how evolution on females may have contributed to sex differences, and may change the way we think about the role of females in sexual selection." (Author)] Address: not stated

**19833.** Arimoto, S.; Sakiko Ando, S.; Kmeil, A.; Nomura, T.; Hara, Y.; Nakashima, A. (2016): Changes of the diversity of dragonfly in the 1998–2015 in Mohko–Fudodani, Kainan City, Wakayama Prefecture, central Japan. [Nankin creatures] 58(1): 56-62. (in Japanese, with English title) ["The changes in the dragonfly fauna observed between 1998 and 2015 in the Menzhi Fudo Valley, where a small dragonfly pond was created in 1998, were summarised as follows The following is a summary of the changes in the dragonfly fauna observed between 1998 and 2015 in the Menzhi Fudo Valley, where a small dragonfly pond was created in 1998. (1) In the Mengzifudo Valley, 65 species of dragonflies in 9 families were observed during the period. (1) 65 species of dragonflies in nine families were observed in the Menzhi Fudo Valley. The number of these species increased rapidly after the construction of the dragonfly ponds, but they remained established. The number of dragonfly species increased rapidly after the construction of the dragonfly ponds. The number of dragonfly species observed in the study area was 65 in 9 families during the study period. Among the dragonfly species identified, eight species are on the national Red List and 15 species are from the Japanese Red List. (2) Among the dragonfly species identified, eight species on the national Red List and 15 species on the Wakayama Prefecture Red List were included. The number of dragonfly species identified included eight national Red List species and 15 Wakayama Prefecture Red List species. Some of these species were identified after the construction of the dragonfly ponds and became established. The number of dragonfly species included in the list was 8 national species and 15 species from the Wakayama Prefecture Red List. The majority of species that were present before the construction of the dragonfly ponds continued to be established in the area. However, overall, the list of species was not very large. However, overall, the number of confirmed species peaked in 2002. However, the number of confirmed species gradually decreased after peaking in 2002. This is due to canopy development and This was thought to be due to the progression of vegetation succession, such as canopy development and an increase in dragonfly pond plants. However, the factors that determined this were not within the scope of this study. However, the factors that determined this could not be identified within the scope of this survey." (Authors/Deepl.)] Address: Arimoto, S., NPO Association for Trying to Restore Nature, Biotope Mengji, 1064-2 Mengji, Kainan, Wakayama 640-0452

**19834.** Babu, R.; Srinivasan, G. (2016): On the distribution of *Aeshna petalura* Martin, 1908 (Odonata: Anisoptera: Aeshnidae) in the Indian subcontinent. *Journal of Threatened Taxa* 8(7): 9034-9037. (in English) [Records of *A. petalura* in India, Nepal and China are compiled and plotted



in a distribution map. Emphasis is given to altitudinal distribution.] Address: Babu, R., Southern Regional Centre, 2 Marine Biology Regional Centre, Zoological Survey of India, 130, Santhome High Road, Chennai, Tamil Nadu 600028, India. Email: baburzsi@gmail.com

**19835.** Balazs, A.; David, S.; Holusa, O. (2016): Dragonflies (Insecta: Odonata) of the Cerová vrchovina Uplands in Slovakia. *Acta Mus. Beskid.* 8: 25-40. (in Slovakian, with English summary) ["This work provides data of the systematic research on the dragonflies in the Cerová vrchovina Uplands in the southern Slovakia, realized in 2012–2014 investigating a total of 30 sites (8 habitat types). During investigation, 39 dragonfly species belonging to 9 families were confirmed. For fifteen of these recorded species larval development has been proved: *Aeshna cyanea*, *A. mixta*, *Anax imperator*, *Calopteryx virgo*, *Chalcolestes viridis*, *Coenagrion ornatum*, *Cordulegaster bidentata*, *Enallagma cyathigerum*, *Erythromma viridulum*, *Ischnura elegans*, *Orthetrum albistylum*, *O. brunneum*, *Platycnemis pennipes*, *Sympetrum sanguineum* and *S. vulgatum*. In the area, all dragonfly species which are evaluated and listed in the Carpathian Red List of Dragonflies have been found (35 of them Least Concern, Near Threatened *Coenagrion ornatum* and *Sympetrum pedemontanum* and Data Deficient *C. scitulum* and *Somatochlora flavomaculata*). The following species significant from faunistic point of view were recorded for the first time in the Cerová vrchovina Uplands: *Aeshna mixta*, *Coenagrion ornatum*, *C. scitulum*, *Cordulegaster bidentata*, *Cordulia aenea*, *Crocothemis erythraea*, *Erythromma viridulum*, *Orthetrum albistylum*, *O. coerulescens*, *Somatochlora flavomaculata*, *S. metallica*, *Sympetma fusca*, *Sympetrum fonscolombii*, *S. pedemontanum* and *S. striolatum*. Next nine faunistically significant dragonfly species have national importance: *Anax imperator*, *Coenagrion scitulum*, *Cordulegaster bidentata*, *Onychogomphus forcipatus*, *Orthetrum coerulescens*, *Somatochlora flavomaculata*, *S. metallica*, *Sympetma fusca*, *Sympetrum pedemontanum*; the species of *Coenagrion ornatum* is listed in Annex II (EU Habitat Directive) as species of Community importance." (Authors)] Address: Balázs, A., Ústav ochrany lesů a myslivosti, Lesnická a dřevařská fakulta, Mendelova Univerzita v Brně, Zemědělská 3, CZ-613 00 Brno, Czech Republic. E-mail: balazsaeko@gmail.com

**19836.** Bar-Zakay, D.; Boudot, J.-P.; Simon, D. (2016): Note on a population of *Pseudagrion torridum* from the Yarkon River catchment, Tel-Aviv, Israel (Odonata: Coenagrionidae). *Notulae odonatologicae* 8(8): 290-296. (in English) ["A new Israeli population of *Pseudagrion torridum*, discovered in summer 2013 near Tel-Aviv, Israel, is described. This population is highly heterogeneous, with individuals resembling the nominotypical subspecies and others, particularly females, resembling the subspecies *P. t. hulae*. The infraspecific taxonomy of *P. torridum* is critically discussed." (Authors)] Address: Bar-Zakay, Dorit, Mismhar Hagvul 13, Tel-Aviv 6969783, Israel. E-mail: dorit@doritbarzakay.com

**19837.** Boruah, B.; Gogoi, M.J.; Payra, A.; Das, G.N.; Bortamuly, M.; Sharma, R. (2016): Diversity and habitat preference of Odonata fauna (Insecta) in Kaziranga-Karbi hills, Central Assam, Northeast India. *Ambient Science* 3(2): 64-68. (in English) ["Diversity of Odonata and their habitat preference was studied in a landscape between Kaziranga National Park and Karbi Hills of Assam. During study period we recorded total 82 species of odonates from 51 genera and 10 families out of which, Anisoptera represented by 43 species and Zygoptera represented by 39 species. Family

Libellulidae was the most dominant family with 36 species among the Anisoptera than after family Coenagrionidae with 20 species among Zygoptera. Among the six selected habitats, stream and river sites hold highest species (45) and lowest species found in human habitations (21). Among the recorded species *Orthetrum pruinosum*, *Orthetrum sabina* and *Pantala flavescens* were found to be occupied in all types of habitats. Sørensen's Similarity index of all the six habitats for odonates species composition during study periods had maximum values CLWP (0.77) and lowest value FA-GL (0.26). A checklist of odonates for central Assam has also been forwarded." (Authors)] Address: Boruah, B., Dept of Wildlife and Biodiversity Conservation, North Orissa Univ., Odisha, India

**19838.** Buczyński, P.; Zawal, A.; Buczyńska, E.; Stępień, E.; Dabkowski, P.; Michoński, G.; Szlauer-Lukaszewska, A.; Pakulnicka, J.; Stryjecki, R.; Czachorowski, S. (2016): Early recolonization of a dredged lowland river by dragonflies (Insecta: Odonata). *Knowl. Manag. Aquat. Ecosyst.*, 417, 43: 11 pp. (in English, with French summary) ["The influence of dredging on the dragonfly assemblages of the small regulated lowland River Kr'piel (north-western Poland) was analyzed a short time after the dredging. Dragonfly assemblages were destroyed, but they began to recover rapidly. Many biocoenotic indices reached high values at just six months after the dredging. The recolonization first occurred as a result of larval drift, and then, via dispersion of adult dragonflies. This process took place in conditions different from the prevailing conditions in the period before dredging, in terms of microhabitat availability and physico-chemical conditions. Compared to the previous assemblage, the emerging assemblage was more typical of assemblages found in small, natural running waters. Therefore, dredging (carried out for economic reasons) could be regarded as a process that unintentionally had a positive influence on odonate assemblages. Currently, when most small watercourses are regulated, dredging that is properly planned and controlled has proven to protect the natural fauna. It is worthwhile to apply lessons learned from examples of active fauna protection to what is currently known as "the rotational model" for dredging." (Authors)] *Calopteryx splendens*, *C. virgo*, *Platycnemis pennipes*, *Ischnura elegans*, *Erythromma najas*, *Aeshna cyanea*, *A. Aeshna mixta*, *Gomphus vulgatissimus*, *Somatochlora metallica*, *Sympetrum vulgatum*] Address: Buczyński, P., Dept of Zool., Maria Curie-Skłodowska Univ., Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

**19839.** Büsse, S. (2016): Morphological re-examination of *Epiophlebia laidlawi* (Insecta: Odonata) including remarks on taxonomy. *International Journal of Odonatology* 19(4): 221-238. (in English) ["*Epiophlebia* is the only known taxon of Odonata that is neither part of the Zygoptera nor Anisoptera. Previously, two species of *Epiophlebia* were recognized, restricted to areas in Japan (*E. superstes*) and the Himalayas (*E. laidlawi*). Recently, the group gained attention with the description of new species from China – *E. sinensis* and *E. diana* – while a subsequent genetic study suggested only one species of *Epiophlebia*. To clarify these conflicting hypotheses this study focused on the under-recorded *E. laidlawi*. This study elucidated the morphology of this species in comparison to *E. superstes*, representing the first comparative study of *Epiophlebia* species. Furthermore, it presents notes on the taxonomic conditions of this group. With this study, a first step is made to resolve the confusion regarding the taxonomic status of the described *Epiophlebia* species. A number of anatomical characters –

for example the different shape of the vertex of the head, the distinct colour patterns of the head, thorax and the abdomen or the differences in the shape of the hamulus anterior and posterior in the secondary male genitalia – confirmed the species status of *E. laidlawi* and underlined its distinctness from *E. superstes*. However, in the Chinese species *E. sinensis* and *E. diana* a re-examination is advised; especially in *E. diana* the species status is questionable." (Author)] Address: Büsse, S., Dept of Functional Morphology and Biomechanics, Institute of Zoology, Kiel Univ., Kiel, Germany. Email: sbuesse@zoologie.uni-kiel.de

**19840.** Bybee, S.; Córdoba-Aguilar, A.; Duryea, M.C.; Futahashi, R.; Hansson, B.; Lorenzo-Carballa, M.O.; Schilder, R.; Stoks, R.; Suvorov, A.; Svensson, E.I.; Swaegers, J.; Takahashi, Y.; Watts, P.C.; Wellenreuther, M. (2016): Odonata (dragonflies and damselflies) as a bridge between ecology and evolutionary genomics. *Frontiers in Zoology* 201613: 46: 20 pp. (in English) ["Odonata present an unparalleled insect model to integrate evolutionary genomics with ecology for the study of insect evolution. Key features of Odonata include their ancient phylogenetic position, extensive phenotypic and ecological diversity, several unique evolutionary innovations, ease of study in the wild and usefulness as bioindicators for freshwater ecosystems worldwide. In this review, we synthesize studies on the evolution, ecology and physiology of odonates, highlighting those areas where the integration of ecology with genomics would yield significant insights into the evolutionary processes that would not be gained easily by working on other animal groups. We argue that the unique features of this group combined with their complex life cycle, flight behaviour, diversity in ecological niches and their sensitivity to anthropogenic change make odonates a promising and fruitful taxon for genomics focused research. Future areas of research that deserve increased attention are also briefly outlined." (Authors) "Conclusions: Further development of genomic resources for Odonata could strongly improve research on microevolution driven by anthropogenic environmental changes. Integrating genomic data with the extensive field ecology knowledge of many species could be a major leap forward in the field of eco-evolutionary dynamics [207]. Phenotypic change can come about by adaptation, plasticity or an interaction of the two [207]. Disentangling contributions from these effects is important, as they are expected to be associated with different patterns, rates, limits and costs [207]. Moreover, population genomics could allow the prediction of hybridisation rates and improve the precision of demographic inferences by using dragonflies and damselflies as bioindicator species. This would allow us to plan conservation efforts best suited for Odonata itself, other co-occurring species and their environment. Transcriptomic analyses would allow the identification of genes and molecular processes likely to respond to selection due to climate change and habitat loss (which can be studied across a complex life cycle in Odonata), as recently done by Lancaster et al. [182]. Additionally, reduced representation sequencing approaches for genotyping (e.g. RAD, ddRAD, GBS) make it possible to develop and sequence many markers in nonmodel species [208], e.g. by sequencing large pools of individuals [209], and hence allow for the detection of outlier loci under selection. Such transcriptomic and genomic studies would benefit from the availability of reference transcriptomes and genomes so that annotation of differentially expressed genes and outlier loci is possible." ] Address: Bybee, S., Brigham Young Univ., Provo, UT 84606, USA. Email: seth.bybee@byu.edu

**19841.** Casallas-Mancipe, A.C. & Rache-Rodríguez, L. (2016): Migrating Odonata in the Colombian Andes. *Notulae odonatologicae* 8(8): 314-318. (in English) ["A migratory movement of Odonata at high elevations of the Colombian Andes, in the city of Bogotá at ca 2 600 m a.s.l., is reported for the first time. The species involved were *Anax amazili* and *Pantala hymenaea*." (Authors)] Address: Casallas-Mancipe, Adriana Carolina, Universidad Nacional de Colombia, Carrera 30 no. 45-03, A. A. 7495, Bogotá, D.C., Colombia. Email: accasallasm@unal.edu.co

**19842.** Chauhan, P.; Wellenreuther, M.; Hansson, B. (2016): Transcriptome profiling in the damselfly *Ischnura elegans* identifies genes with sex-biased expression. *BMC Genomics* 201617:985. DOI: 10.1186/s12864-016-3334-6: 12 pp. (in English) ["Background: Sexual dimorphism occurs widely across the animal kingdom and has profound effects on evolutionary trajectories. Here, we investigate sex-specific gene expression in *Ischnura elegans*, a species with pronounced sexual differences including a female-limited colour polymorphism with two female-like gynochrome morphs and one male-mimicking, androchrome morph. Whole-organism transcriptome profiling and sex-biased gene expression analysis was conducted on adults of both sexes (pooling all females as well as separating the three morphs) to gain insights into genes and pathways potentially associated with sexual development and sexual conflict. Results: The de novo transcriptome assembly was of high quality and completeness (54 k transcripts; 99.6% CEGMA score; 55% annotated). We identified transcripts of several relevant pathways, including transcripts involved in sex determination, hormone biosynthesis, pigmentation and innate immune signalling. A total of 1,683 genes were differentially expressed (DE) between males and all females (1,173 were female-biased; 510 male-biased). The DE genes were associated with sex-specific physiological and reproductive processes, olfaction, pigmentation (ommochrome and melanin), hormone (ecdysone) biosynthesis and innate immunity signalling pathways. Comparisons between males and each female morph category showed that the gynochromes differed more from males than the androchrome morph. Conclusions: This is the first study to characterize sex-biased gene expression in odonates, one of the most ancient extant insect orders. Comparison between *I. elegans* sexes revealed expression differences in several genes related to sexual differences in behaviour and development as well as morphology. The differential expression of several olfactory genes suggests interesting sexual components in the detection of odours, pheromones and environmental volatiles. Up-regulation of pigmentation pathways in females indicates a prominent role of ommochrome pigments in the formation of the genetically controlled female colour polymorphism. Finally, the female-biased expression of several immunity genes suggests a stronger immune response in females, possibly related to the high levels of male mating harassment and recurrent matings in this species, both of which have been shown to injure females and expose them to sexually transmitted diseases and toxins contained in seminal fluids." (Authors)] Address: Chauhan, P., Dept of Biology, Lund Univ., Lund, Sweden. Email: Pallavi.Chauhan@biol.lu.se

**19843.** Cheng, Y.-C.; Lin, C.-P. (2016): Dietary niche partitioning of *Euphaea formosa* and *Matrona cyanoptera* (Odonata: Zygoptera) on the basis of DNA barcoding of larval feces. *Journal of Insect Science* 16(1), 73: 1-5. (in English) ["Odonate larvae are commonly considered opportunistic general predators in freshwater ecosystems. However,

the dietary breadth of most odonate larvae in forest streams is still poorly documented. We characterized the prey species and estimated the level of dietary niche overlap of two damselflies, *Euphaea formosa* Hagen 1869 and *Matrona cyanoptera* Hämäläinen and Yeh, 2000 in a forest stream of central Taiwan on the basis of DNA barcoding of larval feces. A collection of 23 successfully identified cytochrome c oxidase 1 (CO1) barcoding sequences suggested that the mayflies (Ephemeroptera), caddisflies (Trichoptera), and midges (Diptera) comprise the majority (43%, 6/14) of prey species consumed by *E. formosa* larvae, whereas the identified prey for *M. cyanoptera* were mainly zooplankton (56%, 5/9). Statistical analysis of dietary overlap indicated that these two species occupy different dietary niches (Pianka's index = 0.219). DNA barcoding analysis of damselfly larval feces was effective in detecting less sclerotized prey such as vertebrates (fish and frog) and small zooplankton. However, a moderately successful rate (<70%) of PCR amplification by universal CO1 primers and a low percentage (<60%) of identifiable sequences in public databases indicate the limitations of naive DNA barcoding in fecal analysis." (Authors)] Address: Lin, C.-P., Dept of Life Science, National Taiwan Normal Univ., Taipei, 11610, Taiwan. Email: treehopper@ntnu.edu.tw

**19844.** Chovanec, A. (2016): Libellenkundliche Untersuchungen an der restrukturierten Pram (Riedau / Zell) und an der regulierten Trattnach (Schlößberg) in Oberösterreich im Jahr 2016. Im Auftrag des Amtes der Oberösterreichischen Landesregierung, Abt. Oberflächengewässermanagement. 67 pp. (in German) [Austria: "In the present study, the ecological status of the restructured section of the Pram River in the area from Riedau to Zell as well as of a regulated section of the Trattnach River in the area of Schlößberg were assessed from the dragonfly point of view, with special consideration of the morphological conditions. This was done on the basis of the Dragonfly Association Index (DAI) and was based - in accordance with the requirements of the Water Framework Directive and the Water Act - on a comparison between a water body type-specific reference condition and the status quo. The method is based on an approach published by the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) (CHOVANEC et al. 2014), which has also been used in Upper Austria in recent years on the Krems and Aschach rivers as well as on the Leitenbach and Sandbach rivers. Pram: A total of 27 species were detected at the three restructured stretches of the Pram and at two mapped small water bodies. This corresponds to 35% of the Austrian species spectrum (78 species). 25 of the 27 species were native. According to the Red List for Austria, three species (all from the river damselfly family / Gomphidae) are "endangered", four species "potentially endangered". With *Ophiogomphus cecilia*, a species was found that is listed in Annexes II and IV of the EU Habitats Directive. A total of 16 species were sighted on the Pram itself, 14 of which were native. The assessment was based exclusively on the ground-dwelling species sighted on the Pram. The application of the DAI results in a very good dragonfly ecological status for the entire section, whereby it must be emphasised that the numbers of individuals of individual species of the guideline-compliant associations were very low. Trattnach: Six dragonfly species were recorded at the study section on the regulated Trattnach, which corresponds to 8% of the species inventory recorded for Austria. Of the 6 species, four were native. Two species are "potentially endangered" according to the Red List, one is "endangered". None of the species is listed in the Annexes of the Habitats Directive. The DAI calculation

results in moderate dragonfly ecological status for the entire section. This relatively good assessment can be explained primarily by the punctual occurrence of *Onychogomphus forcipatus* on a small gravel bank. An assessment of the dominant condition of the Trattnach without the gravel bank results in the unsatisfactory dragonfly ecological condition." (Author/DeepL)] Address: Chovanec, A., Krotenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-mail: andreas.chovanec@bmlfuw.gv.at

**19845.** Chuang, C.-J.; Liu, C.-D.; Patil, R.A.; Wu, C.-C.; Chang, Y.-C.; Peng, C.-W.; Chao, T.-W.; Liou, J.-W.; Liou, Y.; Ma, Y.-R. (2016): Impact of cuticle photoluminescence on the color morphism of a male damselfly *Ischnura senegalensis* (Rambur, 1842). *Scientific Reports* | 6:38051 | DOI: 10.1038/srep38051: 8 pp. (in English) ["In this study *I. senegalensis* was first found to produce strong photoluminescence (PL) emissions from various coloured-body portions, such as the eighth abdominal segment of the tail. The colours of the coloured-body portions can be enhanced or modified by the PL emissions for assistance in reducing intrasexual and male harassment, and improving mature mating and conspecific identity. Therefore, the PL emissions that contribute to the colour modification and coloration are involved in the cuticle evolution of the damselflies. The micro-PL confocal images verify that the PL emissions can strongly influence the surface colours of the cuticle, and demonstrate why *I. senegalensis* is called a bluetail. ... The Damselfly *Ischnura senegalensis* (Rambur, 1842) was first found to emit strong PL emissions from the various coloured-body portions of the compound eyes, thorax front, wings, and eighth abdominal segment of the tail. There is an obvious difference in appearance of the colours of the coloured-body portions in the PL image and those in the optical image, indicating that the PL emissions act as biological pigments and multilayer structures and can modify the colours or coloration of the coloured-body portions. This PL phenomenon is strongly related to cuticle evolution in the damselflies. The ultrathin histological sections of the various specific body portions of the damselfly *Ischnura senegalensis* were examined by confocal fluorescence microscopy and TEM. Micro-PL confocal and TEM images of the ultrathin histological sections of the various specific body portions show that The cuticle PL does impact on the colour morphism of a male damselfly *Ischnura senegalensis*, and it helps to reduce intrasexual and male harassment and to signal mature mating and conspecific identity." (Authors)] Address: Chuang, C.-J., Dept of Opto-Electronic Engineering, National Dong Hwa Univ., Hualien, 97401, Taiwan.

**19846.** Cicort-Lucaciu, A.-S.; Sas-Kovács, I.; Covaciu-Marcov, S.-D. (2016): Non road human influence upon road mortality on three secondary roads from the Vâlsan river protected area, Romania. *Muzeul Olteniei Craiova. Oltenia. Studii și comunicări. Țiințele Naturii* 32(2): 99-106. (in English, with Romanian summary) ["Human activities, unrelated to road, but taking place in its proximity, can modify the amplitude of road mortality in some animal groups. This is the case of bees, wasps and Coleoptera Geotrupidae on three secondary roads from the Vâlsan river basin, Romania. Black locust plantations near a road attract bees in the blooming period, increasing their chance of falling victim on the road. Coleoptera Geotrupidae are frequently killed on roads used by the local people's cows, being attracted by manure. Wasps come on the roads for feeding on the corpses of other road killed animals, while they are sometimes killed. Only in two days on the three secondary roads there were killed 899 individuals, from 50 taxa, mostly invertebrates.

The differences of the road mortality by roads and periods were not significant." (Authors) "Odonata" are harmed, but quite moderately.] Address: Covaciu-Marcov, S.-D., Univ. of Oradea, Faculty of Sciences, Dept of Biology; 1, Universităţii, Oradea 410087, Romania. E-mail: severcovaciu1@gmail.com

**19847.** Conesa Garcia, M.A.; Serrano Leon, J.P. (2016): La larva F0 y exuvia de *Calopteryx xanthostoma* (Charpentier, 1825), (Odonata: Calopterygidae). Boletín Asociación Odonatológica de Andalucía 4: 31-40. (in Spanish, with English summary) ["The F0 larval morphology and exuviae of *Calopteryx xanthostoma* (Charpentier, 1825), (Odonata: Calopterygidae). As a result of the genetic study of the genus *Calopteryx* Leach, 1815, in the palearctic fauna, *Calopteryx xanthostoma* (Charpentier, 1825) and *Calopteryx splendens* (Harris, 1782), have been separated. Both species can be easily distinguished in their adult specimens; however, the same does not apply to their larvae. There are few bibliographic references to *C. xanthostoma* larvae and, at present, no morphological criteria has been proposed to allow a clear separation between these two species in their larval level. In this paper a morphological study of larvae F0 and exuviae *C. xanthostoma* seeks to alleviate this lack of information." (Authors)] Address: Conesa García, M.A., Universidad Animal. Centro María Zambrano. UNED-Málaga. mconesa@malaga.uned.es

**19848.** Cottin, C.; Kronshage, A.; Kriger, D. (2016): Schätzung eines Libellenbestands im Naturschutzgebiet Heiliges Meer mit der Rückfangmethode der Biostatistik. Fachhochschule Bielefeld, Forschungsreihe des Fachbereichs Ingenieurwissenschaften und Mathematik 4: 1-17. (in German) ["*Lestes virens* lives in the nature reserve "Heiliges Meer" [Nordrhein-Westfalen, Germany]. Ecologists are interested in determining the approximate population size of these animals. of these animals. The specimens cannot be easily counted; however, it is known, that they rarely leave their relatively limited habitat. It is therefore a good idea to estimate the population size using the so-called recapture method. In this method dragonflies are captured and marked. Subsequently (for example, on the next day), dragonflies are caught again and an estimate of the size of the total population is determined from the ratio of marked dragonflies caught again to the total number of dragonflies caught. However, this method, which may seem relatively simple mathematically, has many aspects that are far from trivial when it comes to formulating statements about the quality of the estimated value. In detail, depending on the exact model assumptions, there are also different variants for calculating such estimators, with specific advantages and disadvantages. Using the dragonfly example, such modelling tasks in statistical ecology will be examined in more detail in this article - following on from the bachelor's thesis of the third author." (Authors/DeepL) (Authors)] Address: Cottin, Claudia, Fachbereich Ingenieurwissenschaften und Mathematik, FH Bielefeld, Germany. E-mail: claudia.cottin@fh-bielefeld.de

**19849.** DuBois, R.; Van den Broek, F. (2016): What is the incomparable *Anax longipes* (Comet Darner) doing in Wisconsin?. *Argia* 28(3): 16-18. (in English) ["In 2014, *A. longipes* was reported at four new sites. Repeated observations and photographs of males were made by Edgar Spalding and Karl Legler at a pond in Middleton Hills west of Madison in Dane County on 31 May, 2 June, and 8 June. An ovipositing female was photographed by Margo Dolan at Mystery Pond at the Schlitiz Audubon Center near Lake Michigan in

northern Milwaukee County on 16 June. A male was reported by Paul Sparks near the Milwaukee River, also in northern Milwaukee County, on 20 June. At least one male was seen and Pond (Fig. 2) at the Forest Beach Migratory Preserve near Lake Michigan in Ozaukee County on 30 June, 1 July, and 4 July. In 2015 Freda again photographed two males at the Clubhouse Pond on 21 June and continued to observe them there for several days. Also in the summer of 2015 Matt Berg observed a male flying with several *Anax junius* (Common Green Darner) males at Paradise Lake in Douglas County. No adults of *A. longipes* were seen at the Forest Beach Clubhouse Pond in 2016, but on 28 June Freda found a single exuvia of *A. longipes* while searching the entire perimeter of the pond (Fig. 3). Additional complete searches of the shoreline around the Clubhouse Pond and two other wetlands on the property on 7 July, and just at the Clubhouse Pond on 5 August, did not turn up any other exuviae of *A. longipes*, although many exuviae of *A. junius* and a variety of species of skimmers were found on these dates." (Authors)] Address: Robert DuBois: Email: robert.dubois@wisconsin.gov

**19850.** Foglini, C.; Falco, R.; Bergero, V. (2016): Indagine sull'odonatofauna del SIC IT20A0003 Palata Menasciutto e obiettivi di conservazione. Technical Report • January 2016. DOI: 10.13140/RG.2.2.22262.70726: 14 pp. (in Italian) [https://www.researchgate.net/publication/319393174\_Indagine\_sull%27odonatofauna\_del\_SIC\_IT20A0003\_Palata\_Menasciutto\_e\_obiettivi\_di\_conservazione?channel=doi&linkId=59a7d03daca272895c18be17&showFulltext=true] Address: not stated

**19851.** Garlet, J.; Corrêa Costa, E.; Boscardin, J. (2016): Survey of insect in Eucalyptus spp. plantation by light trap in Sao Francisco de Assis, RS. *Ciência Florestal*, Santa Maria 26(2): 365-374. (in Portuguese, with English summary) ["The cultivation of eucalyptus has become an important economic activity in Brazil. However, with the increase of the plantation areas, some entomological problems tend to increase in the same proportion. The constant monitoring of the insects associated with homogeneous planting systems is very important in order to seek the development of programs for integrated pest management. Thus, the purpose of this study was to perform a survey on the insect populations associated with *Eucalyptus* spp., in São Francisco de Assis, RS. The collects were carried out by light traps from July 2008 to August 2009 in three-year-old stands with the species: *Eucalyptus dunni*, *Eucalyptus grandis* and *Eucalyptus grandis* x *Eucalyptus urophylla*. The insects collected were analyzed using the faunistic indices, frequency, abundance, diversity, and constancy. The correlation between the pest species identified and the meteorological variables for the period were also performed. We collected 3623 individuals belonging to eight orders (Blattodea, Coleoptera, Dermaptera, Hemiptera, Hymenoptera, Lepidoptera, Mantodea and Odonata [Libellulidae]). Three species and three genus of Lepidoptera defoliators considered of economic importance were identified: *Automeris illustris*, *Eupseudosoma* sp., *Sabulodes* sp., *Sarsina* sp., *Thyrinteina amobia* and *Agrotis ipsilon* as well as the borer *Phoracantha semipunctata*. Our results show that there are important pest species of *Eucalyptus* already established in the region therefore some constant monitoring is required so that these species do not cause damage to plantations." (Authors)] Address: Garlet, Juliana, Engenharia Florestal, Dr<sup>a</sup>, Professora Adjunta da Faculdade Ciências Biológicas e Agrárias, Universidade do Estado de Mato Grosso, Campus II, Av. Perimetral Rogério Silva, s/n, Jardim Flamboyant,

CEP 78580-000, Alta Floresta (MT), Brasil. E-mail: juliana-garlet@yahoo.com.br

**19852.** Gupta, S.; Veeneela, R. (2016): A preliminary study on Odonata diversity in three diverse landscapes of Cachar district, Assam, India. *Current World Environment* 11(2): 477-485. (in English) ["Odonates are valuable as indicators of aquatic and terrestrial ecosystem health and also play a vital role as prey and predator to maintain the balance of trophic levels of food chain. Diversity and distribution of different species of Odonata and physico-chemical properties of water of their habitat in the rural (RA), urban (UA) and tea garden (TG) area of Cachar district of Assam was investigated. A total of fourteen (14) species (larva and adult) were recorded from the three areas. Six species were recorded in RA, four species in TG and six species in UA. Two species *Ischnura aurora aurora* and *Agriocnemis pygmaea pygmaea* were recorded common in TG and UA. In TG presence of only two tolerant families indicated that the water quality of the area is polluted. In RA, presence of Aeshnidae indicated relatively better condition of water quality." (Authors)] Address: Gupta, Susmita, Dept of Ecology and Environmental Science, Assam Univ., Silchar-788011, India

**19853.** Hafiane, M.; Hamzaoui, D.; Attou, F.; Bouchelouche, D.; Arab, A.; Alfarhan, A.H.; Samraoui, B. (2016): Anthropogenic impacts and their influence on the spatial distribution of the Odonata of Wadi El Harrach (North-central Algeria). *Revue d'Écologie* 71(3): 239-249. (in English, with French summary) ["In spite of a relatively good knowledge of the odonatafauna of the Maghreb, some large areas like the centre of Algeria have remained little explored. These areas have witnessed a demographic explosion and an agro-industrial development over the last century which have adversely impacted most natural ecosystems. Wadi El Harrach, an intermittent river that cuts through the Mitidja plain, near Algiers, is notorious for its pollution and represents a good model to investigate anthropogenic impacts on freshwater communities. In line with the increasing use of assessment methods developed to monitor and evaluate the ecological integrity of running waters, we sampled Odonata of Wadi El Harrach and measured various abiotic parameters representative of the water quality of the habitat. Both data sets were jointly used to analyse the correspondence between the two assessments. Results indicated congruence between both approaches and highlighted the potential of Odonata as reliable bioindicators of ecological conditions of lotic ecosystems." (Authors)]

**19854.** *Calopteryx haemorrhoidalis*, *Platycnemis subdilatata*, *Erythromma lindenii*, *Ischnura graellsii*, *Onychogomphus costae*, *O. forcipatus unguiculatus*, *Anax imperator*, *Orthetrum coerulescens anceps*, *O. chrysostigma*, *Sympetrum fonscolombii*, *Crocothemis erythraea*, *Trithemis annulata*, *Trithemis kirbyi*] Address: Hafiane, Mouna, Univ. of Sciences and Technology Houari Boumediène. Faculty of Science. Biological, Dynamic & Biodiversity Lab., BP 32, El Alia, Algiers, Algeria. E-mails: mounahafiane@yahoo.fr

**19855.** Holzinger, W.; Komposch, B. (2016): Bestandssituation der Großen Quelljungfer (*Cordulegaster heros* Theischinger, 1979) im Bezirk Mattersburg Große Quelljungfer: Larve und Lebensraum (Blumaugraben). Auftraggeber: Amt der Burgenländischen Landesregierung, Abteilung 5 – Anlagenrecht, Umweltschutz & Verkehr, Europaplatz 1, 7000 Eisenstadt, Austria. GZ: 5/N.A-10044-5-2015. Auftragnehmer: ÖKOTEAM - Institut für Tierökologie und Naturraumplanung, Bergmannsgasse 22, 8010 Graz, Austria: 44 pp. (in

German) ["Ökoteam was commissioned by the Office of the Provincial Government of Burgenland in August 2015 to prepare this expert report. The commission relates to the Large Spring Damselfly (*Cordulegaster heros* Theischinger, 1979), a dragonfly species native to Austria and listed in Annex II of the Habitats Directive (code: 4046), and includes the following questions: \* Are there such important occurrences of the Large Spring Damselfly (*Cordulegaster heros* Theischinger, 1979) in the district of Mattersburg that a listing in the Natura 2000 network of protected areas is recommended? \* Can these occurrences be covered by the existing European nature reserve AT 1123323 Mattersburger Hügelland or should additional areas be designated as protected areas for the species? \* How are the populations of the species in any protected areas to be classified (presence, conservation status)? \* What threats could these populations face and what protective measures could be taken for the species? \* How should further monitoring be carried out? According to the commission, the focus of the study was on the existing Natura 2000 site "Mattersburger Hügelland" (AT1123323). A total of 42 stretches of water were investigated for the occurrence of the damselfly. The majority of the sections are located in the Natura 2000 site. The mapping was carried out by searching for larvae directly in the water body. The field work was carried out on four dates in May 2016. A section of at least 50 m in length was defined at each of the water bodies surveyed, which is homogeneous with regard to the habitat parameters and impairments relevant to the assessment. The number of animals was recorded, differentiated according to large and small larvae. In addition, eight essential habitat parameters were recorded. The assessment of the conservation status of a species is carried out in accordance with the requirements of the Habitats Directive according to the criteria \*status of the population, \*habitat quality and \*impairments. For this purpose, the assessment scheme developed by Ökoteam (2016) for Styria was adopted with slight modifications. *Cordulegaster heros* was detected at 18 of the 42 water body sections investigated. A total of 124 larvae of the species were found, as well as several records of the two-striped damselfly (*Cordulegaster bidentata*). Seven of the breeding waters are at least partially located in the existing Natura 2000 site. Four of them (Marzer Bach-Zubringer I, Auwiesenbach, Auwiesenbach-Zubringer and Romersee-Zubringer) show an excellent conservation status of *C. heros*. Currently, the conservation status in the area is assessed as 'good', the population's share of the national stock in the continental region is in the category 'C'. In order to improve this assessment, it is recommended to extend the area to include the Blumaugraben, the Hochbergbach 1, the Auwiesenbach and/or the Kaltwasserbach. Proposals for the protection of stocks include the establishment of buffer strips (10 m on both sides of the watercourse) and a more natural watercourse design in the future. In addition, it is proposed to conduct future monitoring surveys according to the method applied here." (Authors) Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: Holzinger, W.E., ÖKOTEAM – Institut für Tierökologie und Naturraumplanung, Bergmannsgasse 22, 8010 Graz, Austria. EMail: [holzinger@oekoteam.at](mailto:holzinger@oekoteam.at)

**19856.** Holzinger, W.; Zimmermann, P.; Payandeh, R.; Payandeh, S. (2016): Bestandssituation der Großen Quelljungfer *Cordulegaster heros* Theischinger, 1979 in der Steiermark und Vorschläge zur Ausweisung von Schutzgebieten. Auftraggeber: Amt der Steiermärkischen Landesregierung, Abteilung 13 - Umwelt und Raumordnung, Referat Naturschutz, 8010 Graz, Stempfergasse 7, Austria. GZ: ABT13-

56O-26/2013-2. Auftragnehmer: ÖKOTEAM - Institut für Tierökologie und Naturraumplanung, Bergmannsgasse 22, A-8010 Graz, Austria: 42 pp. (in German) ["Due to ongoing infringement proceedings, the Republic of Austria and possibly also the Province of Styria are required to designate new protected areas for (among others) the dragonfly species *C. heros*. In this context, Ökoteam was commissioned in summer 2013 to prepare this expert report. The assignment includes the following questions: What is the distribution of *C. heros* in Styria? Where are the main areas of occurrence? Are there well-suited (nationally important) populations of the damselfly within the existing Natura 2000 sites in Styria, so that the species should be re-nominated in these areas to ensure its protection? Is it necessary from a technical point of view to expand existing areas and/or designate new areas in Styria in order to ensure the protection of the species in the Natura 2000 network of protected areas? How are the populations of the species in possible protected areas to be classified (information according to the standard data sheet)? What threats could these populations be exposed to and what protective measures could be taken for the species? The dragonfly is widespread in south-eastern Europe and reaches the north-western limit of its range in eastern Austria. Here, the range boundary runs across Carinthia (Villach area) along the eastern edge of the Alps to Lower Austria. It inhabits smaller, mostly shaded watercourses (preferably river classification number 2) in the planar to colline altitudinal zone. The larvae develop in sandy substrate in water depths below 20 cm and current velocities mostly below 6 cm/s and need three to five years for their development. Hatching occurs on land a few metres from the shore; the adults are the largest dragonflies in Europe and fly from early June to late August. Throughout Europe, the species is considered "Near Threatened" and its populations are declining. Its conservation status is good in the alpine and continental region, "favourable" in Austria, but in the Red Lists of Austria and Carinthia it is classified as critically endangered ("EN"), and in Lower Austria "endangerment is likely". The main cause of threat to the species is the destruction of its habitats by backfilling, piping and shoring. Before the start of this study, only few current distribution data on this species were available from Styria. Therefore, 100 grid squares in the potential distribution area (south-eastern Alpine foothills and Styrian foothills) were randomly selected and potentially suitable watercourse sections were then examined for the presence of larvae. Eight further sites were added due to chance findings and were also included in the data evaluation. Detections were made at a total of 31 water bodies, three of which are located in a Natura 2000 site. These data were used to model the probability of occurrence of the species for the whole of Styria using MaxEnt. Mapping and modelling showed that a relatively widespread distribution can be expected across the entire Alpine foothills of Styria, with the exception of the wider valley flats in the Grazer and Leibnitzer Feld and the flat lowlands of eastern Styria. The most important occurrences are in the hill country between the Grazer Bucht and the Raabtal, in the north-western Grazer Berg- und Hügel-land and in the Windische Büheln. Translated with www.DeepL.com/Translator (free version)] Address: Holzinger, W.E., ÖKOTEAM – Institut für Tierökologie und Naturraumplanung, Bergmannsgasse 22, 8010 Graz, Austria. EMail: holzinger@oekoteam.at

**19857.** Hughes, M.I.; Kaunisto, K.; Suhonen, J. (2016): Large males have fewer water mites (*Arrenurus* sp.) on the Variable Damselfly (*Coenagrion pulchellum*). *Canadian Journal of Zoology* 94(5): 339-343. (in English) ["Ectoparasitic

water mites *Arrenurus* sp. (Dugés, 1834) may affect damselflies in different ways resulting in lower longevity and reproduction success. We studied the variation of water mite occurrence on *C. pulchellum* in relation to the host's sex, location and wing length, and the amount of black pigment on the abdomens of males. In our study we found that water mite prevalence and abundance were higher on females. Location of the populations did not affect the prevalence of water mites, nor did the colouring of males. The prevalence and abundance of water mites was lower on larger males than on smaller ones. Our results suggest that females are likely to have more water mites due to different behaviour and life history strategies. According to our results male body size is a sign of good condition and, thus, of sufficient resources available to be directed to strengthening their immune systems." (Authors)] Address: Hughes, Maria, Section of Ecology, Dept of Biology, Univ. of Turku FI-20014 Turku, Finland. E-mail: mainhu@utu.fi

**19858.** Ilmi, N.; Abdullah, T.; Agus, N. (2016): Tanggapan fungsional *Agriconemis* sp. (Odonata: Libellulidae [sic!]) terhadap *leptocorisa acuta* t. (Hemiptera: Alydidae). *Beranda* 4(2): 35-41. (in Indonesian) ["*Agriconemis* sp. is one of the potential predators to control several types of pests on rice plants because of its polyphagous nature. One of its prey, namely walang sangu (*Leptocorisa acuta*) is an important pest in rice cultivation that can cause 50% yield loss. 20 individuals). All prey exposed to an image of *Agriconemis* sp. For 2 hours. Each experimental unit was repeated three times. Data were analyzed using Holling equation analysis and logistic regression to determine the type of predatory functional response. The results showed that the lowest predation rate was 0.888 fish/minute, namely the number of *L. acuta* provided ( $N_i$ ) was only 5 with a total time ( $T_t$ ) of predation that was 43 minutes, while the eggplant; ie 1.85 tails/minute on the number of prey provided ( $N_t$ ) IS tails with  $m_l$  time ( $T_t$ ) of predation 120 minutes. The results of the logarithmic regression show that the value of  $r$  is close to 1 ie 0.974, it can be concluded that the type of functional response *Agriconemis* sp. to *Lacuza* is type III or ugmord functional response, at first the increase in predation is slow, followed by a faster increase, then relatively constant." (Author) (Google translate)] Address: not stated

**19859.** Ilvonen, J.J.; Suhonen, J. (2016): Phylogeny affects host's weight, immune response and parasitism in damselflies and dragonflies. *R. Soc. open sci.* 3: 160421. <http://dx.doi.org/10.1098/rsos.160421>: 9 pp. (in English) ["Host-parasite interactions are an intriguing part of ecology, and understanding how hosts are able to withstand parasitic attacks, e.g. by allocating resources to immune defence, is important. Damselflies and dragonflies show a variety of parasitism patterns, but large-scale comparative immune defence studies are rare, and it is difficult to say what the interplay is between their immune defence and parasitism. The aim of this study was to find whether there are differences in immune response between different damselfly and dragonfly species and whether these could explain their levels of gregarine and water mite parasitism. Using an artificial pathogen, a piece of nylon filament, we measured the encapsulation response of 22 different damselfly and dragonfly species and found that (i) there are significant encapsulation differences between species, (ii) body mass has a strong association with encapsulation and parasite prevalences, (iii) body mass shows a strong phylogenetic signal, whereas encapsulation response and gregarine and water mite prevalences show weak signals, and (iv) associations between the traits are affected by phylogeny. We do not

know what the relationship is between these four traits, but it seems clear that phylogeny plays a role in determining parasitism levels of damselflies and dragonflies." (Authors)

**19860.** *Sympetrum vulgatum*, *S. flaveolum*, *S. danae*, *Leucorrhinia dubia*, *Libellula quadrimaculata*, *Somatochlora metallica*, *Cordulia aenea*, *Aeshna grandis*, *A. juncaea*, *A. subarctica*, *Ischnura elegans*, *Enallagma cyathigerum*, *Erythromma najas*, *Coenagrion hastulatum*, *C. pulchellum*, *C. armatum*, *C. johannsoni*, *Calopteryx virgo*, *C. splendens*, *Platycnemis pennipes*, *Pyrrhosoma nymphula*, *Lestes sponsa*] Address: Ilvonen, J.J., Section of Ecology, Dept of Biology, Univ. of Turku, 20014 Turku, Finland

**19861.** Jafer Palot, M. (2016): On a collection of Odonata (Insecta) from Lonar (Crater) Lake and its environs, Buldhana district, Maharashtra, India. *Bugs R All* 22: 6-9. (in English) ["Odonata were recorded from the Lonar Crater Lake and its environs. The suborder Zygoptera (Damselflies) represented by 5 species and the suborder Anisoptera (Dragonflies) with 16 species. The extreme salinity and high alkalinity (the pH higher than 10.5) of the Lake does not influence the odonata diversity of the area. The lake is known to support blue-green algae and certain micro-organisms. There is no previous record of higher aqua]c organisms and fishes inhab]ng this saline lake. The present report provides breeding records of 3 species of dragonflies (*Diplacodes trivialis*, *Orthetrum sabina*, *Brachythemis contaminata*) and two species of damselflies (*Ischnura senegalensis* and *Agriocnemis pygmaea*) within the Lonar Lake. *Tramea basiliaris* and *Trithemis pallidinervis* were sighted near Kalapaani and never within Lonar lake. The perennial stream flowing through the rim and marshes a]racted many of the hill stream - loving species such as *Trithemis fes,va*, *T. aurora* and *Orthetrum pruinosum*. The detailed species account and ecological observa]ons are given below." (Author)] Address: Jafer Palot, M., Western Ghats Regional Centre, Zoological Survey of India, Calicut 673 006, India. Email: palot.zsi@gmail.com

**19862.** Joshi, S. (2016): Odonata of India: a web-based resource. *Parthenos* (a newsletter of DiversityIndia) April 2016: 25-30. (in English) [Records of *Lyriothemis mortoni* Ris, 1919, *Protosticta ponmudiensis* Kiran, Kalesh & Kunte 2015, *Calicnemia nipalica* Kimmins, 1958, *Calicnemia erythromelas* Selys, 1891, and *Amphithemis vacillans* Selys, 1891 are documented.]

**19863.** Kemabonta, K.A.; Adu, B.W.; Ohadiwe, A.C. (2016): Impact of human disturbance on the abundance, diversity and distribution of Odonata in the Univ. of Lagos, Akoka, Lagos, Nigeria. *Applied Tropical Agriculture* 21(3): 143-150. (in English) ["Odonata fauna inhabiting Univ. of Lagos (Unilag), Akoka, Southwestern Nigeria was investigated for a period of 7 months (March to September) 2015. At the time of this study a portion of the Univ. forest was cut down and burnt. The three study sites investigated were: Distance Learning Institute (DLI), High Rise Area and Lagoon Front Area. Data collected from the study sites were subjected to diversity indices, descriptive statistics and diversity t-Test. A total of 787 individuals of dragonflies and damselflies from 13 genera, 3 families and 21 species were sampled. The three families include *Coenagrionidae* (62%), *Libellulidae* (36%) and *Platycnemididae* (2%). The most dominant species was *Ceriagrion glabrum* (42%) followed by *Acisoma panoipoides* (10%). The DLI study site had the richest odonate fauna (Shannon Wiener index ( $H' = 1.94$ ), Simpson's Dominance index ( $C = 0.85$ ); while the least was

the High Rise study site (Shannon Wiener index ( $H' = 1.91$ ), Simpson's Dominance index ( $C = 0.85$ ). The distribution of the fauna was highest at DLI study site (Evenness = 0.99), followed by Lagoon front (0.98) and High rise (0.97). Degree of concentration at different study sites, was highest at DLI (0.85) and least at High rise (0.85). Most of the odonates sampled in this study are ubiquitous damselflies. When compared with the study on odonates at same study sites a year before, It is obvious that the human disturbance experienced at the study sites is detrimental to the assemblage of localized Odonata species of the forest. Hence, there is a strong need to preserve the Odonata community of the Univ. of Lagos." (Authors)] Address: Kemabonta, K.A., Dept of Zool., Fac. of Science, Univ. of Lagos, Akoka, Lagos State, Nigeria. E-mail: kennykemabonta@yahoo.com

**19864.** Ketenchiev, Kh.A.; Kharitonov A. Yu.; Kozminov, S.G. (2016): The Caucasus as one of Mediterranean centers of species diversity of dragonflies (Odonata). *Dagestan State Pedagogical Univ. Journal. Natural and Exact Sciences* 10(2): 46-51. (in Russian, with English summary) ["The paper considers the Caucasus as a province of Mediterranean region and dragonflies' biodiversity center, its limits and faunal composition, formed under the influence of the Holarctic and Paleosubtropic areas. In the fauna there are 86 species of dragonflies, which are distributed to 3 suborders, 11 families and 29 genera. The authors define a unique combination of regional climatic characteristics, landscapes, determined the faunal composition of dragonflies, its historical and original formation." (Authors)] Address: Ketenchiev, H.A., Institute of Chemistry and Biology (IChB), Kh. M. Berbekov KBSU, Nalchik, Russia. E-mail: h\_a\_k@mail.ru

**19865.** Khan, S.A. (2016): Odonata nymphs from Chakwal, Punjab, Pakistan. *International Journal of Zoology Studies* 182: 9-11. (in English) ["Odonata naiads were collected from different localities of the district Chakwal Punjab Pakistan. A series of collection was conducted during the year 2013 to explore the Odonata naiads. The specimens were collected from different aquatic habitats includes water filled holes, temporary ponds, and seasonal streams. As a whole 10 Zygoptera and 25 Anisoptera species were identified." (Authors) As the list of taxa includes North American species, some of the identifications can not be correct.] Address: Khan, S.A., Univ. College of Agriculture, Univ. of Sargodha, Pakistan

**19866.** Kittel, R.N.; Engels, W. (2016): Diversity of dragonflies (Odonata: Anisoptera) of Rio Grande do Sul, Brazil, with five new records for the state. *Notulae odonatologicae* 8(8): 284-289. (in English) ["During a survey of Odonata in the summer 2004/2005 at the Araucaria forest reserve Pró-Mata in the Serra Geral mountain range, Rio Grande do Sul, Brazil, five species of Anisoptera new to the state were recorded. These are *Erythrodiplax diversa* (Navás, 1916), *Erythrodiplax ochracea* (Burmeister, 1839), *Micrathyrina laevigata* Calvert, 1909, *Progomphus gracilis* Hagen in Selys, 1854 and *Rhionaeschna eduardoi* (Machado, 1984). These additions increase the number of dragonflies (Anisoptera) known from Rio Grande do Sul to 59 species." (Authors)] Address: Kittel, Rebecca, Lab. of Insect Biodiversity and Ecosystems Science, Graduate School of Agricultural Science, Kobe Univ., Rokkodai 1-1, Nada, Kobe, 657-8501 Japan. E-mail: rebecca.n.kittel@gmail.com

**19867.** Kozminov, S.G.; Ketenchiev, Kh.A. (2016): Preimaginal development dragonflies *Anax imperator* Leach,



1815 (Odonata). Proceedings of Gorsky State Agrarian Univ. 53(3): 164-170. (in Russian, with English summary) ["The preimaginal stage of dragonflies, entering into various biotic and abiotic relationships, being an integral component of aquatic biocenoses, makes the main or only contribution to the production processes of many water bodies. Studies of the preimaginal development of *Anax imperator* were carried out under the conditions of the Kabardino-Balkarian Republic. Preimaginal development is characterized by a change in morphology, a gradual linear increase in the size of the body and its individual parts. 14 age stages were determined, differing in a complex of morphometric, morphological parameters, distinctly combined into eight age groups. The definition of regional criteria for preimaginal development will allow studying the processes of dragonfly variability to changing environmental conditions, and can be used both in applied and theoretical fields of biology. Under experimental conditions, the preimaginal stages of development of dragonflies. *A. imperator* are described in detail, their morphological and morphometric parameters are revealed. In their preimaginal development, dragonflies of this species go through 14 age stages; after 28 days. With increasing age, the time between molts increases: stage 1 up to 4 molts after 3-4 days; 5-7 - 4-7; 9-10 - 8-10; 11-12 - 10-13; 12-13 - 15-16; 14 - final, hatched after 18-20 days. The complex of morphological and morphometric parameters makes it possible to accurately determine the preimaginal stage of development. All age stages are clearly grouped into eight age groups, which can be used in population monitoring, physiological, ethological and many other applied studies." (Authors)] Address: Khasan Alievich Ketenchiev, K.A., «Zoology & Botany» Dept, Kabardino-Balkarian State Univ. 360004, Republic of Kabardino-Balkaria, Nalchik, 173 Chernishevsky Str., Russia. E-mail: h\_a\_k@mail.ru

**19868.** Lagesson, A.; Fahlman, J.; Brodin, T.; Fick, J.; Jons-son, M.; Byström, P.; Klaminder, J. (2016): Bioaccumulation of five pharmaceuticals at multiple trophic levels in an aquatic food web - Insights from a field experiment. *Science of The Total Environment* 568: 208-215. (in English) ["Highlights: •A study of uptake of five pharmaceuticals by fish and four aquatic invertebrates. •There are inter-specific differences in uptake of pharmaceuticals. •Highest concentrations were found for the benthic species. •Important to not only consider waterborne exposure in risk assessments. •Important to include organisms from different trophic levels in risk assessments. Abstract: Pharmaceuticals derived from manufacturing and human consumption contaminate surface waters worldwide. To what extent such pharmaceutical contamination accumulates and disperses over time in different compartments of aquatic food webs is not well known. In this study we assess to what extent five pharmaceuticals (diphenhydramine, oxazepam, trimethoprim, diclofenac, and hydroxyzine) are taken up by fish (European perch) and four aquatic invertebrate taxa (damselfly larvae [*Coenagrion* sp.], mayfly larvae, waterlouse, and ramshorn snail), by tracing their bioconcentrations over several months in a semi-natural large-scale (pond) system. The results suggest both significant differences among drugs in their capacity to bioaccumulate and differences among species in uptake. While no support for in situ uptake of diclofenac and trimethoprim was found, oxazepam, diphenhydramine, and hydroxyzine were detected in all analyzed species. Here, the highest bioaccumulation factor (tissue:water ratio) was found for hydroxyzine. In the food web, the highest concentrations were found in the benthic species ramshorn snail and waterlouse, indicating that bottom-living organism at lower trophic posi-

tions are the prime receivers of the pharmaceuticals. In general, concentrations in the biota decreased over time in response to decreasing water concentrations. However, two interesting exceptions to this trend were noted. First, mayfly larvae (primarily grazers) showed peak concentrations (a fourfold increase) of oxazepam, diphenhydramine, and hydroxyzine about 30 days after initial addition of pharmaceuticals. Second, perch (top-predator) showed an increase in concentrations of oxazepam throughout the study period. Our results show that drugs can remain bioavailable for aquatic organism for long time periods (weeks to months) and even re-enter the food web at a later time. As such, for an understanding of accumulation and dispersion of pharmaceuticals in aquatic food webs, detailed ecological knowledge is required." (Authors)] Address: Lagesson, Annelie, Dept of Ecol. & Environmental Science, Umeå Univ., 90187 Umeå, Sweden. E-mail: annelie.lagesson@umu.se

**19869.** Lara-Contreras, J.-C. (2016): Ácaros ectoparásitos (Hydrachnidia) de las especies de libélulas (Odonata) presentes en diferentes humedales de la Sabana de Bogotá. MSc thesis, Universidad Nacional de Colombia, Facultad de Ciencias, Depto de Biología, Bogotá, Colombia: IX + 58 pp. (in Spanish, with English summary) ["This study was aimed to establish relationships between the disturbance associated to activities around the wetlands, physico-chemical variables of water, adult Odonata and larval water mites parasites on dragonflies and damselflies, in different wetlands from Bogotá Savanna located between 2.500 and 2.600 meters of altitude. Eight species of dragonflies and damselflies were found, two morfo-species of *Arrenurus* spp were affecting two species of Zygoptera. A relationship between the disturbance, pH, oxygen, conductivity, nitrites, nitrates, phosphates and water mites abundance was found." (Author)] Address: not stated

**19870.** Linnell, J. D. C., Kaltendorfer, B., Bredin, Y. & Gjershaug, J. O. (2016): Biodiversity assessment of the Fagaras Mountains, Romania. NINA Report 1236: 86 pp. (in English) ["This report aims to summarise the existing knowledge concerning the biodiversity of the Fagaras Mountains, in the southern Carpathians of Romania. It is intended to provide a basis for an assessment of the ecosystem services that are being provided, and that could be provided, by the area. The Fagaras Mountains consist of an uninterrupted 70-80 km long ridge that reaches to over 2500 m in altitude, with many side ridges branching off, creating a highly variable topography. As well as containing Romania's highest mountain, it also contains the largest area of continuous alpine zone habitat in Romania. The slopes are covered with spruce forests at higher altitudes and mixed deciduous forests at lower altitudes. At lower altitudes land-use gives way extensive low-intensity agriculture at the forest-farmland interface, and then more intensive agriculture where soils permit. Most of the mountain range is protected within two Natura 2000 sites that combine to an area of 2436 km<sup>2</sup>, and these adjoin several other Natura 2000 sites, and other Romanian protected areas. Our biodiversity assessment consisted of collecting existing data from published and unpublished sources. Over 72% of the area is forested, with the rest consisting of alpine grasslands (25%) and rock, scree and bogs. Some patches of virgin forest have been identified along the northern slopes of the mountain range, and many areas have not been surveyed. The biodiversity of the Fagaras Mountains has not been as well studied as in many of the neighbouring regions, however, it was still possible to build up a good preliminary species of species diversity for some species groups, including mammals (57

species), birds (130 species), amphibians (17 species), reptiles (13 species), fish (12 species), freshwater crayfish (2 species), butterflies and moths (563 species), beetles (125 species), dragonflies (15 species), spiders (40 species), water-bugs (22 species), water-mites (28 species), lichens (144 species) and plants (895 species). For other species groups such as fungi (19 species), snails (6 species) and crickets (2 species) there is clearly a lot more registration to do before these species lists will become complete. Of these species, a total of 107 are of EU community interest, being listed on either the Habitats Directive or the Birds Directive. Many of the species are also on the national Romanian red list. In terms of its size, species diversity, and ecological integrity the Fagaras Mountains are clearly an area with a very high biodiversity value. The majority of the records we found come from only two areas that have been comparatively well studied (Sinca Noua and the Upper Dambovită river basin). As a result, further studies of new areas and other species groups are clearly going to lead to an increase in the areas known diversity. Most of the area is subject to multiple human land uses, such as forestry, hunting, livestock grazing, the gathering of berries and mushrooms and low-intensity agriculture. These have formerly been conducted with low intensity and in ways that have been largely compatible with biodiversity conservation. However, recent trends have been towards an intensification of all human activities in recent years, most visibly shown by the introduction of poorly regulated clearcutting of forests. In addition, the area has been subject to a lot of poorly planned development, such as small scale hydro-electric plants, second homes and tourist infrastructure. There is therefore a desperate need to establish land-use zoning plans and guidelines for practices (forestry, hunting, livestock grazing, gathering of non-timber forest products, infrastructure development, agriculture) that are compatible with the conservation objectives of the Natura 2000 site. While the urgency of the situation requires that this work start at once to avoid irreversible changes, a great deal of further work to map habitats and species is needed in order to fine tune management guidelines for the specific human activities and land-uses." (Authors) *Aeshna mixta*, *Anax parthenope*, *Calopteryx splendens*, *C. virgo*, *Coenagrion ornatum*, *Ischnura pumilio*, *Somatochlora alpestris*, *Onychogomphus forcipatus*, *Ophiogomphus cecilia*, *Lestes barbarus*, *Libellula depressa*, *L. quadrimaculata*, *Orthetrum brunneum*, *O. coerulescens*, *Platycnemis pennipes*] Address: John D. C. Linnell, Email: john.linnell@nina.no

**19871.** Maity, P.; Roy, S.; Chakraborti, U.; Biswas, O.; Ghosh, J.; Gayen, A.K.; Mitra, B. (2016): Insect faunal diversity of Salt Lake City – an urbanized area adjacent to Kolkata, India. *Bioscience Discovery* 7(2): 101-112. (in English) ["Salt Lake City or Bidhannagar, a part of East Kolkata Wetland, is an advanced township adjacent to Kolkata. A total of 266 insect species of 206 genera under 74 families belonging to the eleven order are reported in this communication. Of them, Lepidoptera shared maximum species (73 species), followed by Odonata (46 species), Diptera (44 species), Coleoptera (42 species), Hemiptera (25 species), Hymenoptera (17 species), Orthoptera (10 species) and Blattaria (06 species). The orders Ephemeroptera, Dermaptera and Mantodea shared single species respectively. Present work is the baseline data of insect faunal diversity of Salt Lake City, an urbanized area in the vicinity of Kolkata, West Bengal." (Authors) The list of Odonata refers to 'Dawn, P. (2014): Taxonomic study of Odonata [Insecta] in Kolkata and surroundings, West Bengal, India. *J. Entomol. Zool. Studies* 2(3): 147-152' and includes only six own records of

common dragonflies.] Address: Roy, S., Zoological Survey of India, Prani Vigyan Bhawan, M- Block, New Alipore, Kolkata, India. Email: sroy.zoology@gmail.com

**19872.** Matushkina, N.A. (2016): First record of extra-abdominal processes in adult Odonata. *International Journal of Odonatology* 19(1-2): 53-61. (in English) ["Paired extra-abdominal processes (ap) were found in the pleural region of abdominal segments 6–9 in adult Odonata for the first time. They are unsegmented bulge-like or rod-like structures of different size, degree of sclerotization and mobility. A short search across odonatan families has shown that ap are inherent for all studied Aeshnidae and for some other Anisoptera. A comparative study of final stadium larvae has shown that ap appear as remnants of larval lateral spines originally situated on larval tergites. This fact provides evidence about the complex nature of the pleural region in the Aeshnidae imago which includes part of the area of the larval tergite." (Author) *Aeshna affinis*, *A. cyanea*, *Amphibaeschna ampla*, *Coryphaeschna adnexa*, *Rhionaeschna absoluta*, *Anax imperator*, *Austroaeschna unicornis*, *Brachytron pratense*, *Epiaeschna heros*, *Basiaeschna janata*, *Boyeria vinosa*, *Gomphaeschna antilope*, *Telephlebia tillyardi*, *Gynacantha adela*, *Triacanthogyna septima*, *Phenes raptor*, *Cordulegaster bidentata*, *Epithea bimaculata*, *Gomphus vulgatissimus*, *Orthetrum cancellatum*, *Epiophlebia superstes*, *Epallage fatime*, *Hetaerina americana*, *Coenagrion pulchellum*] Address: Matushkina, Natalia, Dept of Zoology, Institute of Biology, Taras Shevchenko National Univ. of Kyiv, Kyiv, Ukraine. Email: odonataly@gmail.com

**19873.** Matúšová, Z.; Stašiov, S.; Antalová, K. (2016): Príspevok k poznaniu vážok Ondavskej vrchoviny. „Zoológia 2016“ 24.–26. November 2016, Univerzita Konštantína Filozofa v Nitre: 152-154. (in Slovakian, with English summary) ["In this study we summarize the data on the occurrence of dragonflies (Odonata) in Ondavská vrchovina highlands collected during the past 16 years. The data come from 12 sites including running and stagnant waters. Overall, we recorded 15 dragonfly species while 2 of them are of some conservation concern. The presence of *Onychogomphus forcipatus* in each of the studied rivers may indicate relatively favourable conditions of running waters in Ondavská vrchovina highlands." (Authors) *Calopteryx splendens*, *C. virgo*, *Lestes sponsa*, *Platycnemis pennipes*, *Coenagrion puella*, *Enallagma cyathigerum*, *Erythromma najas*, *Ischnura elegans*, *Aeshna cyanea*, *Anax imperator*, *Gomphus vulgatissimus*, *Onychogomphus forcipatus*, *Libellula depressa*, *Orthetrum cancellatum*, *Sympetrum sanguineum*] Address: Matúšová, Zuzana, Katedra biológie a všeobecnej ekológie, Fakulta ekológie a environmentalistiky, Technická univerzita vo Zvolene, T. G. Masaryka 20, SK-960 53, Zvolen, Slovakia. E-mail: zuzana.matushova@gmail.com

**19874.** Merlet, F.; Itrac-Bruneau, R. (2016): Aborder la gestion conservatoire en faveur des Odonates. Guide technique. Office pour les insectes et leur environnement & Société française d'Odonatologie. Direction régionale de l'environnement, de l'aménagement et du logement Hauts de France: 96 pp. (in French) ["Conclusion: As Wildermuth & Küry said in their guide Protecting and promoting dragonflies, it is time to take action! This technical guide to conservation management in favour of Odonata is intended to unite the players around a single objective: to preserve dragonflies and their habitats. Prior to any intervention, a manager must ask himself the right questions: what species are present and what are their ecological requirements?

Given this diversity, what are the responsibilities of the site? What is the state of health of the habitats? How can the conservation management of the site be best understood by taking all these elements into account? In order to answer these questions, it is advisable to consult specialists in Odonata in order to better understand the problems of the site. This document should first help the manager to prioritise the steps to be taken. Once the conservation objectives have been defined, it is then necessary, in addition to internal technical skills and the local network, to use this guide to follow the steps listed and target the appropriate action(s). For their part, odonatologists can put their knowledge and naturalist skills to use in conservation. When they detect the presence of a species of heritage interest or a dysfunction of the environment (absence of species characteristic of the habitat, for example) on a site, they can approach the management bodies to alert them. If the site does not have any, the local structures in charge of nature conservation, the competent authorities or the owner can be contacted. They can then propose to become involved in the diagnosis prior to the action (inventory of Odonata, analysis of needs and degradation factors), orient the measures according to the ecological requirements of the species and continue this partnership to evaluate the effectiveness of the measures on Odonata. This guide also offers the odonatologist the possibility of being an actor in conservation by proposing the key elements of successful conservation management. These partnerships between managers and naturalists should enable operations to be implemented under the best possible conditions. More generally, conservation management must be the result of consultation between all the players in the area: cooperation, exchanges and sharing of experience are the guarantees of the success of the action undertaken." (Authors) Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: Merlet, Florence, 78 rue de Cornouailles, 78180 Montigny-le-Bretonneux, France. Email: [florence.merlet@gmail.com](mailto:florence.merlet@gmail.com)

**19875.** Michelson, C. (2016): Effects of agricultural land use on tree swallow (*Tachycineta bicolor*) reproduction, body condition and diet. MSc. thesis, Dept of Biology, Univ. of Saskatchewan: IX + 115 pp. (in English) ["Agricultural practices have intensified over the last 50 years, increasing crop production and altering the Canadian Prairie landscape by removing non-cropped habitats and wetlands. The productivity, trophic structure and diversity have changed through increased agrochemical inputs and reductions in yearly rotation and diversification of crop types. Most intensive agricultural practices have negative effects on invertebrate communities that can indirectly affect higher trophic organisms, such as birds. Many populations of aerial insectivorous bird species have been experiencing rapid declines in the last 30–40 years. Dependency on high abundances of aerial insects for reproduction and survival is a common link among all species of this guild. My thesis examined aerial insect abundance as a potential link between agricultural land use and the reproductive ecology, nestling body condition, and diet of an aerial insectivore species, the tree swallow (*Tachycineta bicolor*). My broad goal was to determine whether agriculture has deleterious effects on timing of breeding, reproductive investment and success, and nestling quality, as mediated by food supply and differences in diet. Aerial insect abundance and biomass estimates obtained from passive insect traps which capture primarily aquatic dipterans were similar between agricultural and reference sites during all stages of breeding. However, estimates derived from sweep-net sampling in terrestrial habitats in 2013 indicated higher abundances of aquatic

and terrestrial Diptera at a reference site relative to agricultural sites. Multiple measures of tree swallow productivity were not related to agriculture land use but nestling body condition was significantly lower on agricultural sites. Using stable isotope analysis ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ), I found site and age specific differences in swallow diets and isotopic niche widths but variation was not consistently related to agricultural land use. Aquatic insect prey (Diptera and Odonata) made up the majority of the diet of swallows but nestlings had a larger proportion of terrestrial Diptera which resulted in larger isotopic niche widths compared to adults. The assimilated isotopic diet of nestling and adult swallows were not strong predictors of body size, mass or condition, suggesting that site differences in the diet do not appreciably affect condition. Nestlings raised on agricultural sites had lower body condition that was not directly linked to their diet alone. This suggests other unmeasured factors related to agricultural land use may affect nestling tree swallows. This study tested responses in an aerial insectivore species to land use and potential shifts in the insect community, which may provide important information for conservation and management decisions for many species within the aerial insectivore guild." (Author)] Address: Michelson, Chantel Irene, Univ. of Saskatchewan, Saskatoon, Saskatchewan, S7N 5E2, Canada.

**19876.** Mikolajewski, D.J.; Conrad, A.; Leipelt, K.-G.; Mauersberger, R. (2016): Larvale Aktivität und Feindvermeidungsverhalten bei vier Leucorrhinia-Arten (Odonata: Libellulidae). *Libellula* 35(3/4): 195-206. (in German, with English summary) ["Larval activity and predator avoidance behaviour of four Leucorrhinia species (Odonata: Libellulidae) – An organisms' activity mediates food intake as well as the likelihood of being detected by predators. Larval odonates can plastically reduce their activity in response to predators as well as avoiding predators by increasing distance from them. Larvae of the European Leucorrhinia species express an overall low activity but comparative data are rare. Here we present data for larval activity as well as predator avoidance behaviour in *L. caudalis*, *L. dubia*, *L. pectoralis*, and *L. rubicunda* in the absence and presence of a predatory fish (perch *Perca fluviatilis*). All four species differ in their activity but only *L. dubia* plastically reduced its activity in response to predatory fish. However, larvae of all species tried to avoid predatory fish by increasing their distance from a compartment keeping predatory fish. We discuss our data with regards to developmental differences and predator related habitat preferences in Leucorrhinia-species." (Authors)] Address: Mikolajewski, D.J., Institut für Biologie, Freie Universität Berlin, Königin-Luise-Str. 1–3, 14195 Berlin, Germany. Email: [d.mikolajewski@gmx.de](mailto:d.mikolajewski@gmx.de)

**19877.** Miller, S. (2016): To investigate materials and the lifecycle of the dragonfly. Degree Programme in Fine Art, Calligraphy, Satakunnan ammattikorkeakoulu, Satakunta Univ. of Applied Sciences: 32 pp. (in English) ["The purpose of this thesis was to investigate materials and the lifecycle of the dragonfly. The idea was to demonstrate the three stages of the Dragonfly's life, the egg, the nymph and lastly the dragonfly. The script Cnut was analysed and studied, and a practice book produced. Versals were also analysed and studied, and a practice book produced. The colour systems were investigated in colour swatches, these were red, blue and yellow, cyan, yellow, magenta and black, and two red, two blues and two yellows. Different types of Vellum were also investigated and discussed. Different types of Gilding glues were also investigated on paper and vellum. These materials were investigated to be used in the pieces

of calligraphy. A Vellum piece was produced and three pieces illustrating the Lifecycle of the Dragonfly were produced. It was concluded that the two blues, two reds and two yellow colour system was the best one to use for calligraphy as it produced the widest range of colours, also in the use of painting other colours could be supplemented easily in the illustrate the Lifecycle of the Dragonfly. The result of the Gilding experiments was that Gesso and Gums were suited for Vellum and Paper use. Reindeer Vellum was found to be the most suitable for use with Calligraphy.] Address: not stated

**19878.** Mogali, S.; Saidapur, S.; Shanbhag, B. (2016): Influence of desiccation, predatory cues, and density on metamorphic traits of the bronze frog *Hylarana temporalis*. *Amphibia-Reptilia* 37(2): 199-205. (in English) ["We conducted an experiment to understand the influence of ecological factors (desiccation, predation threat and density) on two major metamorphic traits, larval period and size at metamorphosis, in the Indian bronze frog. Tadpoles were reared in groups of 15 (low), 30 (medium) and 60 (high) densities. We created the threat of desiccation by removing 0.5 l water at 10 days intervals until the water quantity reached 0.5 l. Caged dragonfly larvae (*Pantala flavescens*) provided the predation threat. Results show that each ecological factor independently influenced metamorphic traits but not in an interactive way. Under desiccation threat the tadpoles metamorphosed earlier and at smaller sizes compared to those reared in constant water (at corresponding densities) regardless of presence/absence of predator. In contrast, under predation threat, tadpoles metamorphosed early and at a bigger size than those reared without predator regardless of density of rearing, and desiccation threat. Alternatively, an increase in density of rearing delayed metamorphosis with smaller metamorphic size in constant water and also under threat of desiccation regardless of whether predation threat existed or not. Thus, our study revealed that *H. temporalis* tadpoles can modify their response to each ecological factor regardless of what other factors operate simultaneously; the threat of desiccation shortens larval period at the cost of growth. Whereas, predator pressure shortens larval period along with increased growth; while greater density increases larval period and slows down growth in *H. temporalis*."] (Authors)] Address: Shanbhag, B., Dept of Marine Biol., Karnatak Univ. Post-Graduate Centre, Kodibag, Karwar-581 303, Karnataka, India. Email: bhagyashrishanbhag@gmail.com

**19879.** Naka, H.; Ikari, K.; Narusawa, K.; Hashimoto, H. (2016): Experimental visualization of three-dimensional flow using flapping model mimicking free-flight of dragonfly by tomography. *Transactions of the Visualization Society of Japan* 36(12): 71-81. (in Japanese, with English summary) ["Dragonflies generate three-dimensional flow to gain aerodynamic forces. However, three-dimensional flow in free-flight of dragonfly is not clarified experimentally. In this study, experimental visualization and particle image velocimetry (PIV) analysis using tomography is carried out to clarify experimentally the three-dimensional flow. The flap simulator mimicking flapping motion of dragonfly is used for visualization because reproducible measurement is important for tomography. The flow is visualized with tomography from front and lateral side of the flap simulator. As a result, straight flight of dragonfly generates swift flow in a posterior direction in the center on the direction of wingspan. Moreover, it is confirmed that the flow is drawn to base-side of wings. It is suspected that the flow pulled by the flow in a posterior direction. Therefore, straight flight of dragonfly does not

generate the extra flow in the direction of wingspan and generates the swift flow in a posterior direction."] (Authors)] Address: Hashimoto, H., Dept of Mechanical Engineering, Faculty of Engineering, Tokai College of Human Sciences (?259-1292 Shimokane, Kanagawa) 4-1-1 Kitakanome, Tsuka City, Japan. Email: hiromu@keyaki.cc.u-tokai.ac.jp

**19880.** Naraoka, H. (2016): The factors influencing the length of the terrestrial period in the final instar larvae of *Epiophlebia superstes* (Selys, 1889) (Anisozygoptera: Epiophlebiidae). *International Journal of Odonatology* 19(3): 95-105. (in English) ["The terrestrial period before adult eclosion of the final instar larvae of *Epiophlebia superstes* was studied during spring 2008 to 2012, at a mountain stream in Nurukawa, Aomori prefecture, northern Japan. The average terrestrial period of larvae that left the water during early, middle and late April, estimated by mark-release-recapture and caging methods, was 45.3 days ( $\pm 1.3$  days,  $n = 8$ ), 35.8 days ( $\pm 1.8$  days,  $n = 9$ ) and 29.0 days ( $\pm 1.4$  days,  $n = 2$ ), respectively. The date on which a larva left the water was negatively correlated with the terrestrial period ( $r^2 = 0.80$ ,  $df = 17$ ,  $p < 0.01$ ). Also, indoors, the terrestrial period was negatively correlated to air temperature ( $r^2 = 0.76$ ,  $df = 7$ ,  $p < 0.01$ ."] (Author)] Address: Naraoka, H., 36-22, Motoizumi, Fukunoda, Itayanagi-cho, Kita-gun, Aomori Prefecture, 038-3661, Japan. E-mail: sbnkq127@ybb.ne.jp

**19881.** Ostrovsky, A. M. (2016): *Sympetrum meridionale* (Selys, 1841) (Odonata, Libellulidae) – a new kind of dragonfly for the fauna of Belarus. *Proceedings of the Francisk Scorina Gomel State Univ.* 6(99): 30-33. (in Russian, with English summary) ["*S. meridionale* was first discovered in the territory of Belarus, as an invasive element of the local fauna of dragonflies. The material was collected in 2016."] (Author) Gomel, floodplain meadow in the region of the railway bridge over the river. Sozh, net on dry stems, 31.VII. 2016 (1 male); Gomel, low wetland in the floodplain of the river. Sozh, densely overgrown with macrophytes, net on shore grass and shrub vegetation, 03.VIII.2016 (4 males, 2 females); Gomel, left bank of the river. Sozh in the section from the Novobelitsky automobile bridge to the rowing canal, with a net in the air and on coastal vegetation, 11.VIII. 2016 (1male, 3 females). A.M. Ostrovsky leg. et det. The material is stored in the collection of the author.] Address: not stated

**19882.** Palacio, A. del; Muzon, J. (2016): Redescription of *Erythrodiplax pallida* (Needham, 1904) (Odonata: Libellulidae). *International Journal of Odonatology* 19(1-2): 23-30. (in English) ["A redescription of both sexes of *E. pallida* is provided based on specimens collected in shallow wetlands associated with flood plains from small streams to large rivers in Corrientes and Buenos Aires provinces, Argentina. The vesica spermalis morphology resembles those of the *basalis* and *nigricans* groups due to the presence of median and posterior lobes and the lack of paired lobes. *E. pallida* is easily distinguished from the other congeners by the white frons."] (Authors)] Address: Palacio, A. del, Instituto de Limnología "DR RA Ringuélet" (CONICET – CCT La Plata), La Plata, Argentina. Email: adelpalacio87@gmail.com

**19883.** Patra, D.; Roy, S.; Chowdhury, S. (2016): Diversity and abundance of Odonata fauna in Midnapore and Surrounding areas, West Midnapore, West Bengal. *Journal of Entomology and Zoology Studies* 2016; 4(6): 553-558: 553-558. (in English) ["A study was conducted on the status and diversity of Odonata fauna in Midnapore, West Bengal and associated areas in various natural and anthropological

habitats from June 2013 to July 2015. Forty-one species of odonates belonging to the 29 Genera and 6 Families were recorded from the study area during study period. Suborder Zygoptera was represented by 2 families and Suborder Anisoptera represented 4 families. Among them 29 species were dragonflies under the families; Aeshnidae, Gomphidae, Libellulidae and Macromiidae whereas the other 12 species were damselflies under 2 families; Coenagrionidae, Platynemididae. Species composition was highest in the family Libellulidae (56%) followed by the family Coenagrionidae (22%). Their status has been assessed in that study area. Species have been classified based on their relative estimate of abundance. Such studies on monitoring the species diversity and abundance can give valuable information and insight on the population status of Odonates." (Authors)] Address: Patra, Debarun, Dept of Zool., Midnapore College, Midnapore, West Midnapore, West Bengal, India

**19884.** Phan, Q.T.; Kompier, T. (2016): A study of the genus *Protosticta* Selys, 1855, with descriptions of four new species from Vietnam (Odonata: Platystictidae). *Zootaxa* 4098(3): 529-544. (in English) ["The genus *Protosticta* Selys, 1855 from Vietnam is revised. Four new species, *P. ngoai* spec. nov., *P. socculus* spec. nov., *P. pseudocuriosa* spec. nov., and *P. spinosa* spec. nov. are described; detailed morphological structures of four species *P. beaumonti* Wilson, 1997 (dark form), *P. caroli* van Tol, 2008, *P. grandis* Asahina, 1995, and *P. satoi* Asahina, 1997, are provided. *P. beaumonti* is newly recorded for Vietnam. The female of *P. caroli* is described for the first time. *P. linnaei* van Tol, 2008, is also listed here, based on the original description and visual inspection of the type specimens. The occurrence of *P. khaosoidaoensis* Asahina, 1984, in Vietnam is reviewed and rejected. A total of nine *Protosticta* species have now been recorded for Vietnam." (Authors)] Address: Phan, Q.T., Dept of Biological Science, Tokyo Metropolitan Univ., Minami-Osawa 1-1, Hachioji, Tokyo 192-0397, Japan. E-mail: pqtoan84@gmail.com

**19885.** Polaskova, V.; Schenkova, J.; Bartosova, M.; Radkova, V. (2016): Aquatic invertebrates of calcareous wetlands in post - mining landscape: a comparison with natural calcareous fens. In 2nd Central European Symposium of Aquatic Macroinvertebrate Research. 2016: 39-[Verbatim: "Although many studies have dealt with vegetation and terrestrial fauna of post-industrial biotopes, comprehensive hydrobiological research on post-industrial wetlands is still rather rare. Due to specific bedrock chemistry of the Sokolov Coal Basin in the north-western Czech Republic, wetlands with calcium carbonate (tufa) precipitation, high conductivity and sulphate concentrations occur in this area. Within post-industrial wetlands, this combination of abiotic conditions is completely unique. Macroinvertebrate assemblages of nine wetlands in two spoil banks were studied in spring and autumn in 2014. In total, 159 taxa (mostly identified at the species level) of Mollusca, Clitellata, Ephemeroptera, Plecoptera, Odonata, Heteroptera, Trichoptera, Coleoptera and Diptera were found. Diptera with 85 taxa was the most diverse group comprising many rare and protected taxa closely associated with specific conditions of the post-industrial calcareous wetlands. Moreover, Diptera assemblages included a high number of spring fen specialists [...]. Despite extreme chemical conditions, calcareous wetlands in post-mining landscape provide important refuges for a high number of aquatic invertebrates, including rare and specialized taxa. Calcareous wetlands of the Sokolov spoil banks can be thus considered as unique biotopes with similar taxa richness as highly threatened and quickly disappearing

spring fens." (Authors)] Address: not stated

**19886.** Porter R.F. (2016): Odonata from Iraq, with three new records. *Notulae odonatologicae* 8(8): 254-260. (in English) ["Twenty-two taxa of Odonata were recorded between 2009 and 2013 in the Peramagroon Mountains (Zagros range) and the Central Marshes of Iraq. *Chalcolestes parvidens*, *Erythromma lindenii* and *Orthetrum chrysostigma* are new records for the country, bringing the national checklist to at least 44 species. The discovered population of *E. lindenii* showed characters transitory to ssp. *zernyi* Schmidt, 1939." (Author)] Address: Porter R.F., BirdLife International, The David Attenborough Building, Pembroke Street, Cambridge, CB2 3QZ, United Kingdom. Email: rforporter@talktalk.net

**19887.** Rajabi, H.; Ghoroubi, N.; Stamm, K.; Appel, E.; Gorb, S.N. (2016): Dragonfly wing nodus: a one-way hinge contributing to the asymmetric wing deformation. *Acta Biomaterialia* 60: 330-338. (in English) ["Dragonfly wings are highly specialized locomotor systems, which are formed by a combination of several structural components. The wing components, also known as structural elements, are responsible for the various aspects of the wing functionality. Considering the complex interactions between the wing components, modelling of the wings as a whole is only possible with inevitable huge oversimplifications. In order to overcome this difficulty, we have recently proposed a new approach to model individual components of complex wings comparatively. Here, we use this approach to study nodus, a structural element of dragonfly wings which has been less studied to date. Using a combination of several imaging techniques including scanning electron microscopy (SEM), wide-field fluorescence microscopy (WFM), confocal laser scanning microscopy (CLSM) and micro-computed tomography (micro-CT) scanning, we aim to characterize the spatial morphology and material composition of fore- and hindwing nodi of the dragonfly *Brachythemis contaminata*. The microscopy results show the presence of resilin in the nodi, which is expected to help the deformability of the wings. The computational results based on three-dimensional (3D) structural data suggest that the specific geometry of the nodus restrains its displacements when subjected to pressure on the ventral side. This effect, resulting from an interlocking mechanism, is expected to contribute to the dorso-ventral asymmetry of wing deformation and to provide a higher resistance to aerodynamic forces during the downstroke. Our results provide an important step towards better understanding of the structure-property-function relationship in dragonfly wings. Statement of significance: In this study, we investigate the wing nodus, a specialized wing component in dragonflies. Using a combination of modern imaging techniques, we demonstrate the presence of resilin in the nodus, which is expected to facilitate the wing deformability in flight. The specific geometry of the nodus, however, seems to restrain its displacements when subjected to pressure on the ventral side. This effect, resulting from an interlocking mechanism, is suggested to contribute to dorso-ventral asymmetry of wing deformations and to provide a higher resistance to aerodynamic forces during the downstroke. Our results provide an important step towards better understanding of the structure-property-function relationship in dragonfly wings and might help to design more efficient wings for biomimetic micro-air vehicles." (Authors)] Address: Rajabi, H., Institute of Zoology, Functional Morphology & Biomechanics, Kiel Univ., Kiel, Germany. Email: hrajabi@zoologie.uni-kiel.de

**19888.** Robinson, J. (2016): Mercury concentrations in invertebrates from a contaminated wetland, Montague Gold Mines, Dartmouth, Nova Scotia. B.Sc., Thesis, Saint Mary's Univ., Halifax, Nova Scotia: 44 pp. (in English) ["Mercury pollution has become a significant concern to environmentalists over the past several decades. With natural releases of mercury and increasing anthropogenic activities releasing larger quantities of mercury into the environment over the last several decades, harm to organisms and ecosystems is also on the rise. One anthropogenic activity that will be considered in this report is gold mining and its products' bioavailability, via mercury contaminated-tailing material, in aquatic invertebrates at a wetland located in the Montague Gold Mining District in Dartmouth, Nova Scotia. Sediment from the study wetland at Montague Mining District showed significantly elevated total mercury concentrations with all samples far above the Canadian Council of Ministers of the Environment freshwater sediment values. Focal invertebrates (Anisoptera, Zygoptera and Dolomedes) were collected from the study wetland as well and analyzed for total mercury content displaying significantly higher total mercury concentrations than invertebrates of the same sub-order and genus collected from a non-contaminated reference site. Additionally, Anisoptera total mercury levels far exceeded levels found at a similar study conducted at Kejimikujik National Park, indicating this site in particular is of high concern for mercury contamination, bioavailability and potential biomagnification through terrestrial and aquatic food chains. With respect to parental Hg transfer to young, our results suggest that Hg transfer from Dolomedes to their young within their egg sacs is likely. Due to the nature of the odonate and dolomedes lifecycles and their potential to spread contamination not only to terrestrial landscapes, but also to other aquatic habitats, it is clear that the impacts go beyond the boundaries of the Old Stamp Mill wetland." (Author)] Address: not stated

**19889.** Sanmartín-Villar, I.; Cordero-Rivera, A. (2016): Female colour polymorphism and unique reproductive behaviour in Polythore damselflies (Zygoptera: Polythoridae). *Neotropical Entomology* 45(6): 658-664. (in English) ["We studied Polythore damselflies by mark-recapture techniques in the Jatun Sacha Biological Reserve (Ecuador) for a period of 48 days in October–December 2014. Three species were found: Polythore mutata (MacLachlan) was the commonest species (111 individuals marked), Polythore derivata (MacLachlan) was rare (24 individuals) and Polythore concinna (MacLachlan) occasional (four individuals). In P. mutata, we found two phenotypes amongst females, one of them with a white band on the wings, very similar in colouration to the conspecific male (androchrome), and the other with an amber band (gynochrome). The recapture of marked females indicates that both phenotypes are maintained since emergence to maturation and are not age-related (i.e. polymorphism). Androchromes represent 40% of females observed. The colour of the wing band showed an age-dependent change in size with opposite trends between sexes, increasing in males and decreasing in females. Males and females were observed to return to the same forest locations in different days. Courtships and ovipositions involving androchrome females were not observed. No matings were observed in any morph. In contrast, we recorded two consecutive matings of one female P. derivata. We found that Polythore males grasp the mesothorax of females during mating instead of the prothorax as in other Zygoptera. We discuss the rarity of reproductive behaviour in this genus and how female morphs might be maintained." (Authors)] Address: Cordero Rivera, A., Depto

Ecología e Biología Animal, Universidade de Vigo, E.U.E.T. Forestal, Campus Universitario, 36005 Pontevedra, Spain. E-mail: acordero@uvigo.es

**19890.** Shahr, M.N.A.; Uddin, B.; Khan, M.K. (2016): OdoBD: An online database of ecological and genetic information of the Odonata of Bangladesh. FCRSD2016, Sylhet, Bangladesh: 48- (in English) [Verbatim: Odonata (dragonflies and damselflies) are carnivorous insects distributed in the diverse freshwater reservoirs throughout the world. Bangladesh situated in the South-east Asia, is gifted with the rich network of water resources like ponds, lakes, marshes, rivers, streams and mangrove swamps. This various range of water bodies along with many tropical forest patches has generated suitable habitat for many Odonata species. Till date, scanty of studies have been carried out to annotate the Odonata fauna of Bangladesh. Currently, nearly hundred species is known from Bangladesh, however there is no consolidated database of this taxa for this country, and information on these species remains elusive. The largely unconsolidated information makes large-scale analysis and researches involving Odonates particularly challenging. Thus, we have developed an online database of all the known Odonates from different locations of Bangladesh to generate an integrated and widely accessible source to facilitate studies of ecology, conservation, and genetic analysis. Currently, we have amassed information of 86 different species from all over the country. The database, -named Odonata of Bangladesh (www.Odobd.org), contains information on morphology, habitat, abundance, gene and protein sequences, worldwide distribution and conservation status of the Bangladeshi Odonates and is updated on a regular basis. We have included gender specified photographs with descriptions for better understanding for the novice researchers and naturalists. This database will spread the knowledge of the Bangladeshi Odonates as well as will enhance the opportunities for ecological and genetic research on those species. [http://www.rufford.org/projects/md\\_kawsar\\_khan](http://www.rufford.org/projects/md_kawsar_khan)] Address: Md Nur Ahad Shahr, Dept of Biochemistry & Molecular Biology, Shahjala! Univ. of Science & Technology, Sylhet, Bangladesh. E-mail: md.ahadshah@student.sust.edu

**19891.** Siregar, A.Z.; Bakti, D. (2016): Diversity and distribution of Odonata In Univ. Sumatera Utara, Medan, Indonesian. *International Journal of Scientific & Technology Research* 5(5): 229-234. (in English) ["A total of nine stations randomly selected study sites around the Univ. Sumatera Utara area conducted during a month (16 January 2016 until 16 February 2016) for identified of Odonata. Odonata are insect which function as bioindicator and conservation of an environment status in the area. The sampled were collected using a sweep net (400 pm mesh, 60 cm x 90 cm) with six times the swing starts at 0900 until 1200 noon hour and identified in the laboratory. Consist of two sub-orders, 4 families, 24 genera, 32 species and 156 individuals identified dragonfly, Orthetrum sabina, Pantala flavescens and Agrionemis femina are the kinds of dragonflies dominant, while two types of Vestalis/Arthystira amoena and Tholymis aurora is found only in the Station 3. As much as 54% relative abundance of family Coenagrionidae dominated, followed by Libellulidae (35%), Gomphidae (8%) and the smallest recorded from family Calopterygidae (35). The calculation of the value of the index is done, includes diversity Shannon, evenness and varied of Jaccard index (H=2.48-3.79, E=0.70-0.85, CJ=0.45 to 1.00). Based on the conservation status, calculated the percentage of attendance dragonfly, divided into four groups of species that are rare (6.28%),

there are species (54.24%), many species (24.78%) and very many species (14.70%). This study shows diversity and distribution of Odonata can be used as potential as predators and conservation status of ecosystem Univ. of Sumatera Utara areas." (Authors)] Address: Ameilia Zullyanti Siregar, Departement Agroecotechnology, Faculty of Agriculture. E-mail: comazsyanti@gmail.com

**19892.** Soendjoto, M.A.; Riefani, M.K.; Perdana, Y.P. (2016): Odonata (casar dan carum) di Hutan Kota Tanjung Persada, Tanjung, Provinsi Kalimantan Selatan. Prosiding Seminar Nasional Lahan Basah, 2016 (1). Lambung Mangkurat Univ. Press, Banjarmasin, Indonesia: 146-149. (in English) ["There was no data on Odonata in Hutan Kota Tanjung Persada (HKTP, Urban Forest of Tanjung Persada), Tanjung, Data is important to show the existence and the condition of waters in the HKTP area. In addition, it can be used as environmental education materials for students in Tanjung (the city of Tabalong Regency) and its surrounding areas. The objectives of the research were to list Odonata species and to link the (dominant color) species to the area where it was found. Data was collected through survey in 4 consecutive days of September 2016. The area consisted of the exposed area and the shaded one. The identified Odonatas were noted directly, but the unidentified ones were documented as photographs before they were identified. Fourteen species were found in HKTP. There were 8 dragonfly species (2 families) and 6 damselfly species (2 families). The number of species in the exposed area was higher than that in the shaded area." (Authors)] Address: Mochamad, A.S., Fakultas Kehutanan, Universitas Lambung Mangkurat, Jalan Ahmad Yani Km 36 Banjarbaru, Indonesia

**19893.** Sonnenburg, H.; Garczorz, T. (2016): Die Libellenfauna des NSG "Donoper Teich - Hiddeser Bent" (Detmold) unter besonderer Berücksichtigung des Hochmoorlebensraumes (Insecta: Odonata). Mitteilungen der Arbeitsgemeinschaft ostwestfälisch-lippischer Entomologen 30(1): 1-17. (in German) ["The results of the dragonfly fauna survey carried out in the Donoper Teich - Hiddeser Bent nature reserve from 2011 to 2014 are presented, supplemented by data from previous years. The main focus of the survey was Hiddeser Bent. The Hiddeser Bent (here especially the eastern area) is characterised by a particular richness of dragonfly species. With the exception of the ubiquitous *Libellula quadrimaculata*, *Sympetrum striolatum* and *Coenagrion puella*, the species recorded mostly occurred in very low densities. Species specific to the high moors of the Hiddeser Bent include *Aeshna subarctica*, *Somatochlora arctica* and *Leucorrhinia dubia*. *Aeshna juncea*, *Orthetrum coerulescens* and *Lestes virens* occurred in small numbers as further species typical of the bog, but not exclusively bound to bog habitats. Despite the immigration of new species, a loss of importance of the Hiddeser Bent for the dragonfly fauna can be assumed, which particularly affects the more demanding species of the raised bogs and acidic, nutrient-poor waters. This is due to the progressive shrinkage process and the drying out of the bog depressions in summer." (Authors/DeepL)] Address: Sonnenburg, H., Biologischen Station Lippe, Domäne 2, 32816 Schieder-Schwabenberg, Germany. E-Mail: h.sonnenburg@biologischestationlippede

**19894.** Soomets, E.; Rannap, R.; Lõhmus, A. (2016): Patterns of assemblage structure indicate a broader conservation potential of focal amphibians for pond management. PLoS ONE 11(7): e0160012. doi:10.1371/journal.pone.

0160012: 16 pp. (in English) ["Small freshwater ponds host diverse and vulnerable biotic assemblages but relatively few conspicuous, specially protected taxa. In Europe, the amphibians *Triturus cristatus* and *Pelobates fuscus* are among a few species whose populations have been successfully restored using pond restoration and management activities at the landscape scale. In this study, we explored whether the ponds constructed for those two target species have wider conservation significance, particularly for other species of conservation concern. We recorded the occurrence of amphibians and selected aquatic macro-invertebrates (dragonflies; damselflies; diving beetles; water scavenger beetles) in 66 ponds specially constructed for amphibians (up to 8 years post construction) and, for comparison, in 100 man-made ponds (created by local people for cattle or garden watering, peat excavation, etc.) and 65 natural ponds in Estonia. We analysed nestedness of the species assemblages and its dependence on the environment, and described the co-occurrence patterns between the target amphibians and other aquatic species. The assemblages in all ponds were significantly nested, but the environmental determinants of nestedness and co-occurrence of particular species differed among pond types. Constructed ponds were most species-rich irrespective of the presence of the target species; however, *T. cristatus* was frequent in those ponds and rare elsewhere, and it showed nested patterns in every type of pond. We thus conclude that pond construction for the protected amphibians can serve broader habitat conservation aims in the short term. However, the heterogeneity and inconsistent presence of species of conservation concern observed in other types of ponds implies that long-term perspectives on pond management require more explicit consideration of different habitat and biodiversity values. We also highlight nestedness analysis as a tool that can be used for the practical task of selecting focal species for habitat conservation." (Authors) *Coenagrion armatum*, *C. hastulatum*, *C. puella*, *C. pulchellum*, *Cordulia aenea*, *Enallagma cyathigerum*, *Epitheca bimaculata*, *Erythromma najas*, *Leucorrhinia albifrons*, *L. caudalis*, *L. dubia*, *L. pectoralis*, *L. rubicunda*, *Libellula depressa*, *L. quadrimaculata*, *Orthetrum cancellatum*.] Address: Soomets, E., Inst. Ecol. & Earth Sciences, Univ. of Tartu, Tartu, Estonia. Email: elin.soomets@ut.ee

**19895.** Suhaila, A.H.; Che Salmah, M.R.; Nurul Huda, A. (2016): Composition and distribution of Odonata larvae and its relationship with physiochemical water quality in northern peninsular Malaysia. Malaysian Journal of Science 35(2): 198-209. (in English, with Malaysian summary) ["A study on composition and distribution for Odonata larvae and their relationship with physicochemical parameters was carried out in selected rivers of Gunung Jerai Forest Reserve, Kedah. Different river physicochemical parameters might influence or affect different type of Odonata composition. Therefore, Odonata larvae were sampled monthly at three selected rivers in Gunung Jerai Forest Reserve which were Teroi, Tupah, Batu Hampar rivers from August 2007 until January 2008 by using a D-frame aquatic net. A total of 253 individuals of 12 genera belonging to nine families of Odonata have been identified. Greatest number of Odonata individuals was recorded in Teroi River (112 individuals) with mean density recorded highest in January 2008 (6.6 ind/m<sup>2</sup>). The major families were Libellulidae, Euphaeidae and Gomphidae. Aeshnidae, Macromiidae, Calopterygidae, Coenagrionidae, Amphipterygidae and Chlorocyphidae represented the minority groups. Libellulidae reported the greatest number of individuals in all study areas, followed by Euphaeidae. Ranking from the highest to the lowest



number of genus collected were *Zygonyx*, *Euphaea*, *Macromia*, *Anax*, *Ophiogomphus*, *Libellago*, *Vestalis* and *Devadatta*, *Neurobasis*, *Cercion*, *Pseudagrion*, *Gomphidictinus*, and *Paragomphus*. The distribution of these genera were significant in different months studied (Kruskal Wallis,  $p < 0.05$ ) in all three rivers. The abundance of individuals collected was strongly influenced by velocity of water. Libellulid *Zygonyx* was the most affected by velocity and biochemical oxygen demand in all studied river. A *Euphaea* larva was influenced by temperature, depth, pH and biochemical oxygen demand. The ecological index (Richness, diversity and evenness index) exhibited poor Odonata communities in all studied rivers. In conclusion, water velocity, biochemical oxygen demand do have influenced on Libellulidae family while temperature, depth, pH and biochemical oxygen demand have influenced on Euphaeidae family." (Authors)] Address: Suhaila, A.H., School of Biological Sciences, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia. Email: ahsuhaila@usm.my

**19896.** Svensson, E.; Nordén, A.; Waller, J.; Runemark, A. (2016): Linking intra- and interspecific assortative mating: consequences for asymmetric sexual isolation. *Evolution* 70(6): 1165-1179. (in English) ["Assortative mating is of interest because of its role in speciation and the maintenance of species boundaries. However, we know little about how within-species assortment is related to interspecific sexual isolation. Most previous studies of assortative mating have focused on a single trait in males and females, rather than utilizing multivariate trait information. Here we investigate how intraspecific assortative mating relates to sexual isolation in two sympatric and congeneric damselfly species (genus *Calopteryx*). We connect intraspecific assortment to interspecific sexual isolation by combining field observations, mate preference experiments and enforced copulation experiments. Using canonical correlation analysis, we demonstrate multivariate intraspecific assortment for body size and body shape. Males of the smaller species mate more frequently with heterospecific females than males of the larger species, which showed less attraction to small heterospecific females. Field experiments suggest that sexual isolation asymmetry is caused by male preferences for large heterospecific females, rather than by mechanical isolation due to interspecific size differences or female preferences for large males. Male preferences for large females and male-male competition for high quality females can therefore counteract sexual isolation. This sexual isolation asymmetry therefore indicates that sexual selection currently opposes a species boundary." (Authors)] Address: Svensson, E., Evolutionary Ecology Unit, Dept of Biology, Lund Univ., Lund, Sweden. E-mail: erik.svensson@biol.lu.se

**19897.** Takiya, D.; Santos, A.; Pinto, A.; Henriques-Oliveira, A.; Carvalho, A.; Sampaio, B.; Clarkson, B.; Moreira, F.; Avelino-Capistrano, F.; Gonçalves, I.; Cordeiro, I.; Câmara, J.; Barbosa, J.; de Souza, W.; Rafael, J. (2016): Aquatic insects from the Caatinga: checklists and diversity assessments of Ubajara (Ceará State) and Sete Cidades (Piauí State) National Parks, Northeastern Brazil. *Biodiversity Data Journal* 4: e8354. doi: 10.3897/BDJ.4.e8354: 195 pp. (in English) ["Background: Diversity and distribution of Neotropical aquatic insects is still poorly known, with many species to be recorded and many others to be described, due to the small number of taxonomists and sparse faunistic studies. This knowledge is especially poor in the Caatinga Domain in Northeastern Brazil, even though, this region may have played an important historical role in the spatial evolution of faunas of forested areas in northern South

America.

**19898.** New information: Aquatic insect checklists of 96 species from Parque Nacional de Ubajara (Ceará State, Brazil) and 112 species from Parque Nacional de Sete Cidades (Piauí State, Brazil) are presented, representing the following taxa: Elmidae, Epimetopidae, Hydrophilidae, and Torridincolidae (Coleoptera), Hemerodromiinae (Diptera: Empididae), Ephemeroptera, Gerromorpha and Nepomorpha (Hemiptera), Odonata, Plecoptera, and Trichoptera. Because of the scarce number of biological inventories in Northeastern Brazil, several new distributional records (of species, genera, and families) for Brazil, Northeastern Brazil, and Ceará and Piauí states are provided. In addition, several undescribed species were detected, being 26 from Ubajara and 20 from Sete Cidades. Results represent a significant increase to the known fauna of these states, ranging from 13%-70% increase for Ceará and 41% to 91% increase for Piauí. Although both parks are relatively close to each other and within the Caatinga domain, their aquatic fauna display a very high complementarity (89% species), possibly due to structural differences of water bodies sampled in each park. Rarefaction curves based on quantitative light trap samples suggest a much higher expected species richness of aquatic insects at Sete Cidades than at Ubajara National Park. Discussion on biogeographical affinities of this sample of the Caatinga fauna is provided." (Authors) Odonata on pages 144-156.] Address: Pinto, Â.P. Laboratory of Systematics on Aquatic Insects (LABSIA), Depto de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil

**19899.** Terek, J.; Brazda, J.; Obona, J.; Słmolak, R. (2016): Macrozoobenthos of two hydromelioration channels (Hran area, eastern Slovak lowland, Slovakia) in different time periods. *Folia Oecologica* 8(2): 52-59. (in English) ["In four profiles of two hydromelioration channels, relatively high diversity of macrozoobenthos species (100 taxa) was found. Samples taken from this channel consisted of the following higher taxonomical groups: Oligochaeta, Hirudinea (3 taxa), Amphipoda (2 taxa), Isopoda (1 taxa), Mollusca (13 taxa), Diptera (30 taxa), Odonata (17 taxa), Ephemeroptera (3 taxa), Trichoptera (8 taxa), Heteroptera (10), Megaloptera (1 taxa), Lepidoptera (2 taxa), and Coleoptera (9 taxa)." (Authors)

**19900.** *Platycnemis pennipes*, *Coenagrion puella*, *C. pulchellum*, *Coenagrion* / *Ischnura* indet, *Erythromma najas*, *E. viridulum*, *Pyrrhosoma nymphula*, *Ischnura elegans*, *Somatochlora* sp. cf., *Aeshna grandis*, *Anaciaeschna isosceles*, *Anax imperator*, *Brachytron pretense*, *Crocothemis erythraea*, *Libellula depressa*, *Orthetrum albistylum*, *Sympetrum vulgatum*] Address: Terek, J., Dept of Environmental Management, Faculty of Management, Univ. of Prešov, 17. novembra 1, 081 16 Prešov, Slovakia. Email: jozef.terek@unipo.sk

**19901.** Thein, P.P.; Choi, S.-W. (2016): Forest insect assemblages attracted to light trap on two high mountains (Mt. Jirisan and Mt. Hallasan) in South Korea. *Journal of Forestry Research* 27(5): 1203-1210. (in English) ["Assemblages of forest insects across two high mountains (Mt. Hallasan: JJ and Mt. Jirisan: JR) in South Korea were compared by collecting insects using an ultraviolet light trap at 20 sites (200–1700 m elevation ranges) from May to October 2013. A total of 2960 individuals, representing 481 species of 10 orders [including Odonata not further specified],

were collected on JJ, compared with 7080 individuals representing 769 species of 14 orders on JR. The estimated number of species on JJ was 667 compared with 952 on JR. The differentiation among habitats ( $\beta$ -diversity) was higher on JJ (4.95) than JR (4.33) because of the island characteristics of JJ. Six insect orders (Lepidoptera, Coleoptera, Diptera, Hymenoptera, Hemiptera and Trichoptera) were dominant on both mountains, suggesting that the light trap captures represented well the insect fauna and is an effective method for investigating forest insect diversity. We concluded that forest insect assemblages on mountains are mainly affected by the elevation and the dominant forest in each elevation. In addition, the insect fauna on each mountain was differentiated by the habitat, which could be correlated with geological history." (Authors) See Table 1 for site information. Col: Coleoptera, Dip: Diptera, Hem: Hemiptera, Hym: Hymenoptera, Lep: Lepidoptera and Others: Dermaptera, Ephemeroptera, Mecoptera, Neuroptera, Odonata, Orthoptera, Plecoptera and Psocoptera. Table 3...] Address: Choi, S.-W., Dept of Environ.I Education, Mokpo Nat.I Univ., Muan, Jeonnam, 58554, South Korea. E-mail: choisw@mokpo.ac.kr

**19902.** Therry, L.; Janne Swaegers, J.; Dinh, K.V.; Bonte, D.; Stoks, R. (2016): Low larval densities in northern populations reinforce range expansion by a Mediterranean damselfly. *Freshwater Biology* 61: 1430-1441. (in English) ["(1.) Contemporary climate change triggers a poleward range shift in many species. A growing number of studies document evolutionary changes in traits accelerating range expansion (such as growth rate and dispersal-related traits). In contrast, the direct impact of decreasing conspecific densities towards the very edge of the expansion front has been neglected. Density effects may, however, have a profound direct impact on traits involved in range expansion and influence range dynamics. (2.) In this study, we contrast the effects of high conspecific larval density typical for established populations and low larval density typical for newly founded populations at the edge of the expansion front on a set of larval traits that may affect the range dynamics in the poleward moving damselfly *Coenagrion scitulum*. We therefore ran an outdoor mesocosm experiment with a low- and high-density treatment close to the species' northern expansion front. Density effects on survival, growth rate and body size are scored both during the pre-winter growth period and during the subsequent winter period. Additionally, foraging activity was scored at the end of the pre-winter period and body condition [size-corrected body mass, fat content and activity of phenoloxidase (PO)] was scored at the end of the winter period. (3.) The low-density treatment had strong direct positive effects on survival, growth rate and body size of larvae before winter indicating relaxed competition. Lower foraging activity at the low-density treatment indicated higher food availability at low conspecific densities. Interestingly, the initial density treatment had stronger effect than densities experienced at the time of quantification on survival during the pre-freezing winter period and body condition estimates at the end of the experiment, indicating also delayed effects of the initial density treatment. Survival throughout a freezing period indicated extreme winter conditions are not likely a limiting factor in the range expansion of this Mediterranean species. (4.) The increased survival and individual growth rates (through causing shifts in voltinism) at low conspecific density will translate in increased population growth rates. Furthermore, nutritional advantages at low conspecific density may increase investment in dispersal ability. Together, these direct and delayed density-

dependent effects that gradually increase towards the expansion front are expected to accelerate range expansion." (Authors)] Address: Therry, L., Lab. of Aquatic Ecology, Evolution and Conservation, KU Leuven, Deberiotstraat 32, B-3000 Leuven, Belgium. Email: therry.lieven@gmail.com

**19903.** Tran, T.T.; Janssens, L.; Dinh, K.V.; Op de Beeck, L.; Stoks, R. (2016): Evolution determines how global warming and pesticide exposure will shape predator-prey interactions with vector mosquitoes. *Evolutionary Applications*: 13 pp. (in English) ["How evolution may mitigate the effects of global warming and pesticide exposure on predator-prey interactions is directly relevant for vector control. Using a space-for-time substitution approach, we addressed how 4°C warming and exposure to the pesticide endosulfan shape the predation on *Culex pipiens* mosquitoes by damselfly predators from replicated low- and high-latitude populations. Although warming was only lethal for the mosquitoes, it reduced predation rates on these prey. Possibly, under warming escape speeds of the mosquitoes increased more than the attack efficiency of the predators. Endosulfan imposed mortality and induced behavioral changes (including increased filtering and thrashing and a positional shift away from the bottom) in mosquito larvae. Although the pesticide was only lethal for the mosquitoes, it reduced predation rates by the low-latitude predators. This can be explained by the combination of the evolution of a faster life history and associated higher vulnerabilities to the pesticide (in terms of growth rate and lowered foraging activity) in the low-latitude predators and pesticide-induced survival selection in the mosquitoes. Our results suggest that predation rates on mosquitoes at the high latitude will be reduced under warming unless predators evolve toward the current low-latitude phenotype or low-latitude predators move poleward." (Authors)] Address: Tran, T.T., Inst. Aquaculture, Nha Trang Univ., No 2, Nguyen Dinh Chieu Street, Nha Trang, Vietnam. Email: thanhtam.ntu.edu@gmail.com

**19904.** Van Dievel, M.; Janssens, L.; Stoks, R. (2016): Short- and long-term behavioural, physiological and stoichiometric responses to predation risk indicate chronic stress and compensatory mechanisms. *Oecologia* 181(2): 347-357. (in English) ["Prey organisms are expected to use different short- and long-term responses to predation risk to avoid excessive costs. Contrasting both types of responses is important to identify chronic stress responses and possible compensatory mechanisms in order to better understand the full impact of predators on prey life history and population dynamics. Using larvae of the damselfly *Enallagma cyathigerum*, we contrasted the effects of short- and long-term predation risk, with special focus on consequences for body stoichiometry. Under short-term predation risk, larvae reduced growth rate, which was associated with a reduced food intake, increased metabolic rate and reduced glucose content. Under long-term predation risk, larvae showed chronic predator stress as indicated by persistent increases in metabolic rate and reduced food intake. Despite this, larvae were able to compensate for the short-term growth reduction under long-term predation risk by relying on physiological compensatory mechanisms, including reduced energy storage. Only under long-term predation risk did we observe an increase in body C:N ratio, as predicted under the general stress paradigm (GSP). Although this was caused by a predator-induced decrease in N content, there was no associated increase in C content. These stoichiometric changes could not be explained by GSP responses because, under chronic predation risk, there was no decrease in N-rich proteins or increase in C-

rich fat and sugars; instead glycogen decreased. Our results highlight the importance of compensatory mechanisms and the value of explicitly integrating physiological mechanisms to obtain insights into the temporal dynamics of non-consumptive effects, including effects on body stoichiometry." (Authors)] Address: Van Dievel, Marie, Lab. of Aquatic Ecology, Evolution & Conservation, Univ. Leuven, Belgium. E-mail: marie.vandieval@bio.kuleuven.be

**19905.** Van Dinh, K.; Janssens, L.; Therry, L.; Bervoets, L.; Bonte, D.; Stoks, R. (2016): Delayed effects of chlorpyrifos across metamorphosis on dispersal-related traits in a poleward moving damselfly?. *Environmental Pollution* 218: 634-643. (in English) ["Highlights: •We exposed edge & core larvae of a poleward moving damselfly to chlorpyrifos (CPF). •Chlorpyrifos had no direct effects in the larval exposure stage. •Delayed effects of CPF caused wing malformations and impaired adult immune response. •Delayed effects of CPF reduced flight muscles only in edge males. •CPF may slow down poleward range expansions under global warming. Abstract; How exposure to contaminants may interfere with the widespread poleward range expansions under global warming is largely unknown. Pesticide exposure may negatively affect traits shaping the speed of range expansion, including traits related to population growth rate and dispersal-related traits. Moreover, rapid evolution of growth rates during poleward range expansions may come at a cost of a reduced investment in detoxification and repair thereby increasing the vulnerability to contaminants at expanding range fronts. We tested effects of a sublethal concentration of the widespread pesticide chlorpyrifos on traits related to range expansion in replicated edge and core populations of the poleward moving damselfly *Coenagrion scitulum* reared at low and high food levels in a common garden experiment. Food limitation in the larval stage had strong negative effects both in the larval stage and across metamorphosis in the adult stage. Exposure to chlorpyrifos during the larval stage did not affect larval traits but caused delayed effects across metamorphosis by increasing the incidence of wing malformations during metamorphosis and by reducing a key component of the adult immune response. There was some support for an evolutionary trade-off scenario as the faster growing edge larvae suffered a higher mortality during metamorphosis. Instead, there was no clear support for the faster growing edge larvae being more vulnerable to chlorpyrifos. Our data indicate that sublethal delayed effects of pesticide exposure, partly in association with the rapid evolution of faster growth rates, may slow down range expansions." (Authors)] Address: Stoks, R., Lab. Aquatic Ecol., K.U.Leuven, De Beriotstraat 32, 3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

**19906.** van Grunsven, R.; De Knijf, G. (2016): Portret: Geelvlak heidelibel. *Brachytron* 18(1): 70-72. (in Dutch) ["The decline in Yellow-spotted Dragonflies (*Sympetrum flaveolum*) is obvious (Figure 2), but the absence of invasions does not necessarily mean that everything is fine. This could be pure coincidence, possibly 2016 is another invasion year and suddenly there are Yellow-spotted Dragonflies everywhere again. However, this does not seem likely to us. The invasions have to come from somewhere and for us that is mainly north-east Germany and northern Poland. However, the Yellow-spotted Dragonfly is listed as endangered on the German Red List (Ott et al. 2015) and in Poland the trend is less negative, but even there this species is declining significantly in large parts of the country (pers. med. R. Bernard). After invasions the animals can be found in all kinds of places, they seem to be little critical then. But for long-term

populations and large numbers, they depend on sedge and hollow-point vegetation, grassy marshes that flood in winter and run dry in summer, and on small, stagnant water bodies, such as cattle drinking pools, in agricultural areas. However, the hydrology and landscape in many areas of Central and Eastern Europe have changed significantly in recent decades. Drainage and groundwater extraction have caused many marshes and pools to disappear, and potential habitats to dry up too early in the year. In addition, intensification of agriculture leads to eutrophication, resulting in a compaction of the vegetation, which also makes it unsuitable for *S. flaveolum* (Bernard et al. 2002). Climate change may also cause pools and marshes to dry up too early in the year. Therefore, it is questionable whether the source populations are still large enough to ensure a large invasion and thus repopulate suitable areas in the Low Countries. Therefore, it seems unlikely that our Flemish and Dutch regions will be able to accommodate sustainable populations of *S. flaveolum* in the short term. In the meantime, *S. flaveolum* has become a real rarity here and is no longer a common part of the Dutch and Belgian dragonfly fauna. But you can still, with a lot of luck, come across them somewhere in late summer." (Author) Translated with www.DeepL.com/Translator (free version)] Address: Knijf, G. de, Research Institute for Nature and Forest (INBO), Havenlaan 88 bus 73, 1000 Brussels, Belgium. E-mail: geert.deknijf@inbo.be

**19907.** Venter, H.J.; Bezuidenhout, C.C. (2016): DNA-based identification of aquatic invertebrates – useful in the South African context? *South Afr. Jour. Sci.* 112(5/6) (Art. #2015-0444): 4 pp. (in English) ["The concept of using specific regions of DNA to identify organisms – processes such as DNA barcoding – is not new to South African biologists. The African Centre for DNA Barcoding reports that 12 548 plant species and 1493 animal species had been barcoded in South Africa by July 2013, while the Barcode of Life Database (BOLD) contains 62 926 records for South Africa, 11 392 of which had species names (representing 4541 species). In light of this, it is surprising that aquatic macroinvertebrates of South Africa have not received much attention as potential barcoding projects thus far – barcoding of aquatic species has tended to focus on invasive species and fishes. Perusal of the BOLD records for South Africa indicates a noticeable absence of aquatic macroinvertebrates, including families used for biomonitoring strategies such as the South African Scoring System. Meanwhile, the approach of collecting specimens and isolating their DNA individually in order to identify them (as in the case of DNA barcoding), has been shifting towards making use of the DNA which organisms naturally shed into their environments (eDNA). Coupling environmental and bulk sample DNA with high-throughput sequencing technology has given rise to metabarcoding, which has the potential to characterise the whole community of organisms present in an environment. Harnessing barcoding and metabarcoding approaches with environmental DNA (eDNA) potentially offers a non-invasive means of measuring the biodiversity in an environment and has great potential for biomonitoring. Aquatic ecosystems are well suited to these approaches – but could they be useful in a South African context?" (Authors) The study includes a passing reference to "Odonata".] Address: Venter, Hermoine, Unit for Environmental Sciences and Management, School of Biological Sciences, North-West Univ., Private Bag X6001, Potchefstroom 2520, South Africa. Email: hermoine.venter@outlook.com

**19908.** Verspui, K.; Wasscher, M.T. (2016): The damselfly and dragonfly watercolour collection of Edmond de Selys

Longchamps: I Agrionines. International Journal of Odonatology 19(3): 1-32. (in English) ["In the nineteenth century Edmond de Selys Longchamps assembled a collection consisting of watercolours, drawings and notes on Odonata. Most illustrations were based on specimens from his extensive odonate collection and were mainly executed by Selys himself and by Guillaume Severin. These illustrations and notes are presently housed in the Royal Belgian Institute of Natural Sciences in Brussels. To make this unpublished information accessible, we digitised this material and it will be presented on the website of this Institute. This first article presents the part of the collection concerning Agrionines (all Zygoptera except Calopterygoidea). The Agrionines are represented by 506 sheets with watercolours, 90 sheets with drawings in ink or pencil and 150 sheets with text. To provide an overview of the collection, subject matter and characteristics of the sheets with illustrations and the text sheets are analysed. The majority (85%) of all sheets with illustrations have been associated with current species names by using references and expert opinions. This information should facilitate searching for various species in the watercolour collection. The rediscovery and documentation of this collection of Selys, that remained largely unknown for almost a century, will hopefully prove useful to those conducting research on the taxonomy of Odonata." (Authors)] Address: Wasscher, M., Minstraat 15bis, NL-3582 CA Utrecht, The Netherlands, E-mail: marcel.hilair@12move.nl

**19909.** Wang, X.; Chu, Z.; Babacar D.; Huang, T.; Tang, Z.; He, Z.; Bao, H.; Zhao, B.; Gao, Y.; Hu, X.; Jia, X. (2016): Study on predatory effect of *Ischnura heterosticta* larvae on *Misgurnus anguillicaudatus* larvae. Journal of Fisheries of China 40(12): 1866-1873. (in Chinese, with English summary) ["To investigate the influence of the predator, *I. heterosticta* larvae on survival rate of *Misgurnus anguillicaudatus* larvae, we studied the predatory effect of *I. heterosticta* larvae on *M. anguillicaudatus* larva based on the predator-prey relationship theory. Results of experiments showed that: the predation functional response of *I. heterosticta* larvae to *M. anguillicaudatus* larvae belonged to type Holling-II. With the increase in daily age of *M. anguillicaudatus* larvae, the moment attack ( $a'$ ) and the largest preying amount per day ( $1/Th$ ) declined. The preying amount increased as prey density increased. The predatory function of different sizes of *I. heterosticta* larva to *M. anguillicaudatus* larva had significant differences. For *I. heterosticta* larvae with different body lengths ( $16.3\pm 0.2$ ), ( $13.1\pm 0.3$ ), ( $9.8\pm 0.2$ ) and ( $5.8\pm 0.3$ ) mm to 3-day-age larvae of *M. anguillicaudatus*, the moment attack and the largest preying amount per day were 0.8349, 0.5724, 0.2002, 0.0432, and 27.39, 18.99, 9.49, 3.14, respectively. With the density of *I. heterosticta* larvae increased, the mutual interference between the individuals led to reduction in the time of a single *I. heterosticta* larva looking for prey. Under intraspecific competition, predator effect rate (E) as a function of density (P) was  $E = 0.1403 \times P - 0.2361$ . With the increase of *M. anguillicaudatus* larvae and *I. heterosticta* larvae density, interference effect increases obviously, predatory efficiency rate (E) drops, but had little impact on preying amount, and the model of interspecific interference was  $N_a =$  (Equation presented) The results demonstrated that *I. heterosticta* larva is important predator, which can remarkably reduce the survival rate of *M. anguillicaudatus* larvae." (Authors)] Address: Chu, Z., School of Fishery, Zhejiang Ocean Univ., Zhoushan 316022, China. E-mail: czj0501@sina.com

**19910.** Wang, X. (2016): Effects of *Ischnura heterosticta* larvae on predation and control of *Misgurnus anguillicaudatus*

larvae. M.Sc. thesis, Zhejiang Ocean Univ.: 57 pp. (in Diptera larvae *Trichosanthes* Predator-prey effect High-performance cyhalothrin *Chlorella acute* toxicity trapping device) ["After a large number of studies, it was found that the larvae of *I. heterosticta* affected the survival of larvae of loach larvae. However, there is no report on predatory effects of predators on loach. In this paper, we studied the predator-prey effect of Diptera larvae on the larvae of the loach, and established the predator-prey effect model to provide the theoretical basis for the prevention and control of the larvae of the mussel larvae. On this basis, Chrysanthemum, trichlorfon and other insecticides and homemade trapping device on the killing of the damn larvae, for the effective prevention and control of soymilk larvae to provide technical basis. The results of this study are as follows: 1. Predator-prey effect of Duck Soybean larvae on the larvae of the real loach The predation effect of the stellate larvae on the larvae of the larvae was studied by predator-prey method. The results showed that: (1) The predator-prey function of *Drosophila* larvae to Loach was Holling-?. The maximum predation rate  $1/Th$  of the larvae of the mongolica larvae decreased with the increase of the larval age, and the predation increased with the increase of the prey density. (2) The size of the larvae was different The larvae of the three kinds of Diptera larvae were significantly different from the larvae of  $16.3 \pm 0.2$ mm,  $13.1 \pm 0.3$ mm,  $9.8 \pm 0.2$ mm and  $5.8 \pm 0.3$ mm, respectively. The larvae and the maximum predation (3) With the increase of the density of Soybean larvae, the mutual interference between individuals, resulting in a single maiden larvae to find prey time to reduce the species within the species, The relationship between predator-prey (E) and self-density (P) is  $0.2361E - 0.1403P - (28)'$ . (4) With the increase of larvae and larvae density, the interference effect is obvious. And the predation rate E decreased, but it had little effect on its predation, and the inter-species interference reaction model was  $N_a = (?)$ . 2, the effective effect of cyhalothrin and trichlorfon on the killing of Diptera larvae using hydrostatic biological test method to carry out the high efficacy of cyhalothrin and trichlorfon two commonly used fishery drugs on the acute toxicity of Diptera larvae Experiment and establish the logarithmic linear regression equation of corresponding mortality - drug mass concentration. The results showed that the sensitivity of the soymilk larvae to cyhalothrin was greater than that of trichlorfon. The half-lethal concentrations of the two drugs at 24h, 48h and 96h were  $6.44\mu\text{g} / \text{L}$ ,  $5.31\mu\text{g} / \text{L}$ ,  $4.57\mu\text{g} / \text{L}$  and  $0.81\text{mg} / \text{L}$ ,  $0.65\text{mg} / \text{L}$ ,  $0.56\text{mg} / \text{L}$ , the safety mass concentration was  $0.89\mu\text{g} / \text{L}$ ,  $0.11\text{mg} / \text{L}$ . The acute toxicity test of two commonly used fishery drugs on 5-day-old and 25-day-old loach larvae showed that the lethality of cyhalothrin was less than or equal to 5.8% As the soymilk larvae to kill the drug; and trichlorfon on the damn mother larvae have a significant killing effect, the mortality rate of up to 89.6% or more, can be used as a traditional medicine to kill the damn mothers to use. 3, self-made trapping device on the killing effect of *Dipterocarca* larvae found that Soybean larvae with phototaxis and the use of oil film can lead to suffocation death, in view of this, the use of oil film asphyxia design of the soymilk larvae trap device, and carried out The killing test of the larvae of. The results show that the trapping device has the advantages of simplicity, efficiency, economy, practicality and safety. The setting depth of the device and the setting of the water plants have the influence on the larvae of the suckling bean sores. The device is set at 30-40cm The larvae had significant killing effect on the larvae of *Soya japonica* larvae, and the lethality rate was about 20% -30% at 12h, while the larvae had no lethal effect on the larvae. Therefore, the trapping device can be used as the main technical means

to kill the soymilk larvae in the breeding base of loach.] Address: Wang, X., School of Fishery, Zhejiang Ocean Univ., Zhoushan 316022, China

**19911.** Wei, Y.; Zhu, Y.-y.; Wang, M.-I. (2016): A facile surface-enhanced Raman spectroscopy detection of pesticide residues with Au nanoparticles/dragonfly wing arrays. *Optik - International Journal for Light and Electron Optics* 127(22): 10735-10739. (in English) ["Recent studies have conclusively show that the surface-enhanced Raman spectroscopy (SERS) has been widely used for chemical and biomolecular sensing. In this work, a facile, low-cost, green and rapid method to detect the pesticide residues is presented by using Au nanoparticles/dragonfly wing (AuNPs/DW) arrays as SERS-active substrate. The AuNPs/DW substrate is prepared by decorating the AuNPs on the DW surface with a simple two-step method, meanwhile, the microstructure properties and SERS signal are characterized by the scanning electron microscopy (SEM) and confocal microprobe Raman system. The experimental results show that compared with the conventional Raman spectroscopy, the AuNPs/DW substrate can enhance the Raman signal dramatically due to the largescale nanosized protrusions on the DW surface. The detection limit for rhodamine 6G (R6G) could reach as low as 10<sup>-8</sup> M, which is important for the analysis of the most components and structures of samples. For the application of the three-dimensional AuNPs/DW, the micro-sample of thiram and carbaryl can also be detected quantitatively, and the detection limit both reach up to 10<sup>-7</sup> M. The above phenomenon indicate that three-dimensional nanostructure AuNPs/DW is a promising SERS substrate for the test of samples in low concentration. Hence, our study will provide an effective approach for the rapid, sensitive and stable trace detection of organic molecular species." (Authors)] Address: Zhu, Y.-y., College of Science, Yanshan Univ., Qinhuangdao 066004, China. Email: yyzhu@ysu.edu.cn

**19912.** Zebba, M.R. (2016): *Ecologie et statut des Gomphidae (Odonata) à Oued Seybouse. Doctorat 3ème cycle en Sciences Biologiques, Département d'écologie & génie de l'environnement, Faculté des Sciences de la nature et de la vie et des sciences de la terre et de l'univers: 139 pp.* (in French, with English summary) ["Our study on ecology of the two species of Gomphidae (*Gomphus lucasii*, *Onycomphus costae*) at the Seybouse River (Northeast Algeria), allowed us to follow: The emergence and habitat preference of (Larvae, Exuviae, Seasonal regulation, Site selection ...), Movement and dispersal of adults (Lifetime, Dispersal, Philopatry, Microhabitat). The emergence season of *G.lucasii* started (29 April to 30 May) with a peak on 8 May, however, for *O.costae* started in mid-May and lasted 68 and 58 days showing a peak in late May and early June in 2011 and 2012, respectively. The vertical stratification of exuviae of the two species on vegetation support during the emergence was influenced by support height, size (body, head) of exuviae, and daily population density. Mortality was caused mainly by ants and bird predation, and deformity of teneral 1,44% and 9,15% of the total emergent population of *G.lucasii* and *O. costae*, respectively. Movement and dispersal of adults, a total of 1316, 255 individuals were marked and the resighting rate along the watercourse were 8.13%, 2.66% and the females were significantly further from the water than males for *G.lucasii* and *O.costae*, respectively. Philopatry to reproductive sites had a mean of 1.11% while philopatry to emergence site was lower (0.4%) and noted only in males of *Gomphus lucasii*. The maximum observed lifespan of *G.lucasii* was 27 days for males and

21 days for females, and 31 days for males and 47 days for females for the *O.costae*." (Author)] Address: not stated

2017

**19913.** Acorn, J.H. (2017): Entomological citizen science in Canada. *Can. Entomol.* 149: 774-785. (in English) ["Citizen science involves voluntary participation in the scientific process, typically by gathering data in order to monitor some aspect of the natural world. Entomological citizen science, as an extension of traditional amateur entomology, is an active field in Canada, with online databases such as eButterfly and BugGuide attracting both contributors and database users. As well, traditional amateur entomology continues to be important in Canada, as do short-term insect-themed educational events, the involvement of amateurs in entomological societies, and online crowdsourcing initiatives. Success of citizen science projects can be measured in many ways. In terms of published papers that analyse trends in citizen science data, Canadian projects have only begun to deliver. More valuable are particular records that improve our knowledge of geographic ranges and phenology. In terms of the endurance of particular projects, and the willingness of volunteers to participate, citizen science entomology in Canada is clearly a success. However, quality control of citizen science data remains an issue for some projects. As well, challenges remain with respect to balancing the goals of researchers, participants, and supporting institutions." (Author) Citizen science projects also include Odonata.] Address: Acorn, J.H., Dept of Renewable Resources, Univ. of Alberta, Edmonton, Alberta, T6G 2H1, Canada. Email: jacorn@ualberta.ca

**19914.** Baleguel, N.P.; Che, J.N.; Baleguel, P.D. (2017): Efficacy of temephos and permethrin in black fly (*Simulium* spp) control and their effect on non-target entomofauna in a portion of Sanaga Valley in Cameroon. *Revue Scientifique et Technique Forêt et Environnement du Bassin du Congo* 8: 11-18. (in English, with French summary) ["The biodiversity in the Congo Basin can be at once a blessing and a curse. A good example of a curse is the abundance of insects that cause nuisance and morbidity in this area especially onchocerciasis transmitted by black fly (*Simulium* spp) which is a major problem in disturbed environments (climate change). Black fly bites reduce the duration a man can work and increase the likelihood of the transmission of onchocerciasis (river blindness) in the tropical rainforest area of Cameroon. In order to decrease nuisance and morbidity caused by black fly and improve farmers' productivity, a study was conducted between 2007 and 2009 in a portion of Sanaga Valley in Cameroon (Monatele (04° 09' N, 11° 01' E), Ossebe (04° 03' N, 10° 36' E), Songndong (03° 51' N, 10° 15' E), Batombe (03° 51' N, 10° 10' E) and Ka'a (04° 43' N, 12° 24' E)), one of the most infected zones of the country. Black fly and nontarget insects captured were identified using identification keys. Data recorded on sticky traps and artificial breeding sites were used to evaluate the efficacy of temephos and permethrin, and their impact on non-target associated entomofauna in the reproduction sites of *Simulium damnosum*. Both larvicides, temephos and permethrin, are effective in the control of black fly though permethrin caused limited undesirable effects on non-target species. Insects of the Order Odonata [*Brachythemis lacustris*] were more affected by permethrin than insects of the Orders Ephemeroptera, Plecoptera and Tricoptera (EPT), which are the most vulnerable orders. This means that it has limited environmental effects when sprayed as specified in this trial and can be used in the integrated vector management of black

fly." (Author)] Address: Baleguel, N.P., Yaounde Initiative Foundation-Cameroon; P.O. Box 3878 Messa-Yaounde, Cameroon. E-mail: baleguel2001@yahoo.fr

**19915.** Bandara, C.D.; Singh, S.; Afara, I.O.; Tesfamichael, T.; Wolff, A.; Ostrikov, K.; Oloyede, A. (2017): Bactericidal effects of natural nanotopography of dragonfly wing on *Escherichia coli*. *ACS Appl. Mater. Interfaces*, DOI: 10.1021/acscami.6b13666: 6746-6760. (in English) ["Nano-textured surfaces (NTS) are critical to organisms as self-adaptation and survival tools. These NTS have been actively mimicked in the process of developing bactericidal surfaces for diverse biomedical and hygiene applications. To design and fabricate bactericidal topographies effectively for various applications, understanding the bactericidal mechanism of NTS in nature is essential. The current mechanistic explanations on natural bactericidal activity of nanopillars have not utilized recent advances in microscopy to study the natural interaction. This research reveals the natural bactericidal interaction between *E.coli* and a dragonfly wing's NTS using advanced microscopy techniques and propose a model. Contrary to the existing mechanistic models, this experimental approach demonstrated that the NTS of dragonfly wings has two prominent nanopillar populations and the resolved interface shows membrane damage occurred without direct contact of the bacterial cell membrane with the nanopillars. We propose that the bacterial membrane damage is initiated by a combination of strong adhesion between nanopillars and bacterium EPS layer as well as shear force when immobilised bacterium attempt to move on the NTS. These findings could help guide the design of novel bio-mimetic nanomaterials by maximising the synergies between both biochemical and mechanical bactericidal effects." (Authors)] Address: Bandara, C.D., School of Chemistry, Physics and Mechanical Engineering, Science & Engineering Faculty, Queensland Univ. of Technology (QUT), Brisbane, Queensland 4001, Australia

**19916.** Berg, D. (2017): Untersuchungen zur Libellenfauna (Odonata) in der Haseaue bei Gehrde (Landkreis Osnabrück, Niedersachsen). Bc.S. thesis, Fakultät Agrarwissenschaften und Landschaftsarchitektur, Studiengang Landschaftsentwicklung (B.Eng.), Hochschule Osnabrück: V, 88 pp, Anhänge- (in German, with English summary) ["During the year 2016 the diversity of Odonata in the meadows of the river Hase near Gehrde in the district of Osnabrück (Lower Saxony) was analysed. Also the biotope types and the quality of the water body structure of the river Hase were mapped. The biotope mapping based on Drachenfels (2013), the mapping of the water body structure on Rasper (2001 a). 27 Odonata species were detected, of which 23 are indigenous, based on exuviae findings. Besides that, two species are probably indigenous because reproductive behaviour was observed. The two remaining species are possibly or possibly not indigenous. Most of the detected Odonata are considered as widespread. However, the species are differently distributed among the nine standing water bodies and the river Hase in the investigation area. In the case of two exuviae of the genus *Sympecma* the species could not be determined. No species of the family Gomphidae was found. A total of 114 biotope types were mapped in the 62,91 ha large investigation area. 69 biotope types are mapped as mixed biotope types. With a percentage of 17,32 % (10,89 ha) species-poor extensive grassland on dry mineral soil (GET - Artenarmes Extensivgrünland trockener Mineralböden) took the most of the area. The second largest biotope type was sandy farmland (AS - Sandacker), which took 14,52 % (9,13 ha) of the investigated area. 14,19 % (8,93

ha) are covered with grassland seedings (GA - Grünland-Einsaaten). Overall, the quality of the water body structure of the river Hase ranged from quality class 3 (moderately modified) to 7 (completely modified). All river sections featured a completely modified channel development and longitudinal profile, resulting in quality class 7. The quality classes of the cross profile ranged from 3 to 5 (strongly modified), the river bank structure from 5 to 7. With quality classes from 3 to 7, the water body environment showed the most structural differences. An assessing of the river bottom was not possible. Based on the results, notes on care and further development of the investigation area were given, which aim at the support of Odonata." (Author)] Address: Berg, D., Samlandstr. 17, 49545 Tecklenburg, Germany

**19917.** Boarman, M.J.S. (2017): Trade-offs and temporal variation in predator-mediated natural selection and sexual selection on the wings of the damselfly *Calopteryx splendens*. Master of Science (MS), Ohio Univ., Biological Sciences (Arts and Sciences): 63 pp. (in English) ["Evolutionary theory predicts a trade-off between sexual selection and natural selection on secondary sexual traits. Understanding the relationship between mating success and predation risk can give insight into the evolutionary dynamics that interact to promote or constrain phenotypic change, yet it has been little studied in the wild. I conducted a two-year cross-sectional field study on *C. splendens* to test for trade-offs between sexual selection and predation risk, and to assess variation in sexual and natural selection. At the study population, the White Wagtail (*Motacilla alba*) captures *C. splendens* in flight, then flies to feeding stations where it removes the wings and consumes the body. I used geometric morphometric techniques to quantify damselfly wing morphology, and compared wing shape and secondary sexual traits of wings from feeding stations to a random sample of wings from the population to quantify the strength, mode, and direction of natural selection on males. Simultaneously, I measured wing traits from individuals caught in the act of mating and compared them to a random sample of wings from the population to quantify the strength, mode, and direction of sexual selection on male wings. By comparing natural selection and sexual selection on wing traits simultaneously, I tested for trade-offs between types of selection. My results suggest that predator-mediated selection fluctuates through time, and is especially variable in how it operates on the size of secondary sexual traits displayed by males. Sexual selection operated almost exclusively on secondary sexual traits, and was consistent across years. Predator-mediated selection acted differently on fore- and hindwings, favoring males with long, narrow forewings and short, broad hindwings. A trade-off between natural and sexual selection was revealed on wing patch characteristics, with males possessing larger and darker wing patches experiencing higher predation rates, while achieving the highest mating success." (Author)] Address: not stated

**19918.** Braatz, E. (2017): Research proposal for odonate fitness in relation to Imidacloprid and varying pH . Retrieved from the Univ. of Minnesota Digital Conservancy, <http://hdl.handle.net/11299/189087>: 36 pp. (in English) ["Both neonicotinoids and varying pH levels affect odonate growth rates, which in turn can affect fitness. This proposal aims to assess how the combined stress of living in nonneutral water (pH = 5.0, 6.0, 8.0, and 9.0) and being exposed to a continuous, sublethal dose of 0.02 µg/L of the neonicotinoid imidacloprid will affect *Anax junius stadia* growth rates. Mortality rates will also be measured." (Author)] Address: not stated

**19919.** Casas, P.A.S.; Sing, K.-W.; Lee, P.-S.; Nuñez, O.M.; Villanueva, R.J.T.; Wilson, J.-J. (2017): DNA barcodes for dragonflies and damselflies (Odonata) of Mindanao, Philippines. Mitochondrial DNA Part A <http://dx.doi.org/10.1080/24701394.2016.1267157>: 9 pp. (in English) ["Reliable species identification provides a sounder basis for use of species in the order Odonata as biological indicators and for their conservation, an urgent concern as many species are threatened with imminent extinction. We generated 134 COI barcodes from 36 morphologically identified species of Odonata collected from Mindanao Island, representing 10 families and 19 genera. Intraspecific sequence divergences ranged from 0 to 6.7% with four species showing more than 2%, while interspecific sequence divergences ranged from 0.5 to 23.3% with seven species showing less than 2%. Consequently, no distinct gap was observed between intraspecific and interspecific DNA barcode divergences. The numerous islands of the Philippine archipelago may have facilitated rapid speciation in the Odonata and resulted in low interspecific sequence divergences among closely related groups of species. This study contributes DNA barcodes for 36 morphologically identified species of Odonata reported from Mindanao including 31 species with no previous DNA barcode records." (Authors) *Coelicia dinoceras*, *C. angustior*, *Devadatta podolestoides basilanensis*, *Diplacina bolivarii*, *D. centrosaurus*, *D. flavomaculata*, *D. krios*, *D. lymetta*, *Drepanosticta* sp.1, *Drepanosticta* sp.2, *Drepanosticta* sp.3, *Gynacantha* sp.1, *Gynacantha* sp.2, *Heteronaias heterodoxa*, *Orthetrum pruinosum*, *Pandanobasis cantuga*, *Pericnemis* sp. 1, *Pericnemis* sp. 2, *Prodasi-neura integra*, *Pseudagrion pilidorsum*, *Rhinagrion reinhardi*, *R. colorata*, *R. sanguinolenta*, *R. turconii*, *R. antoniae*, *R. appendiculata*, *R. atripes*, *R. erythrura*, *R. flammea*, *R. fulgiferons*, *R. tendipes*, *S. sp. cf. dentifer*, *S. dentifer*, *T. anamajiae*, *T. filiformis*, *T. samaritis*, *T. aurora*, *T. festiva*, *V. melania*] Address: Casas, Princess Angelie S., Dept of Biological Sciences, College of Science & Mathematics, Mindanao State Univ.-Iligan Institute of Technology, Iligan City, Philippines. E-mail: princessangeliecasas48@gmail.com

**19920.** Ceder, P.; Jönsson, C. (2017): Tillväxttakt hos sydvänska populationer av trollsländor (Odonata) i ett varmare klimat - en pilotstudie. Independent thesis Basic level (degree of Bachelor): 16 pp. (in Swedish, with English summary) ["In order to gain better understanding of climate change effects on ecosystems, it is necessary to study the response of different species to predicted climate change. Dragonflies are, due to their ecology, a suitable organism group for conducting such studies. In this pilot study we examined the response in growth- and mortality rate to increased ambient temperatures in an experimental set-up of three temperature levels (20°C, 22°C och 24°C) in larvae of three species from the Aeshnidae family (*Aeshna grandis*, *A. cyanea* and *Anax imperator*). *A. imperator* were, due to insufficient number of collected specimens, excluded in the 22°C temperature regime. The studied species are reproducing in Sweden, but *A. grandis* and *A. cyanea* are native, whereas *A. imperator* is considered newly established since it was first discovered in Sweden in the early 2000's. Our results show that *A. grandis* and *A. cyanea* reacted positively to an increased ambient temperature, in terms of growth rates. However, the response to increased temperatures differed between the two species as *A. grandis* showed both higher growth- and mortality rate, compared to *A. cyanea*. Thus, we assume that both species are likely to benefit from the ongoing climate change, but that interactions between them may change. Further studies are required to elucidate how the two species will be affected in

presence of newly established species, such as *A. imperator*. Although, based on our results, the competitiveness of both native species might increase with rising temperatures - which should be considered in future conservation planning." (Authors)] Address: not stated

**19921.** Chavez Landi, P.A. (2017): Fisiología térmica de un depredador *Dasythemis* sp. (Odonata: Libellulidae) y su presa *Hypsiboas pellucens* (Anura: Hylidae) y sus posibles implicaciones frente al cambio climático. Disertación previa a la obtención del título de Licenciada en Ciencias Biológicas: X, 55 pp. (in Spanish, with English summary) ["Temperature is considered one of the most important abiotic factors in the biology of the organisms. Constant temperature change as a consequence of climate change can influence the physiological responses of the communities' structure. The principal purpose of this study was to determine the variation of the physiological thermal parameters in are species (*Dasythemis* sp. and *Hypsiboas pellucens*), who coexist in the same pond near Mindo (Pichincha), and to evaluate their vulnerability to possible environmental temperature in the future. We used a temperature ramp protocol which increases or decreases the temperature at a gradual rate of 0.25°C min<sup>-1</sup>, the Maximum Critical Temperature (CT<sub>max</sub>) and the Minimal Critical Temperature (CT<sub>min</sub>) were determined, along with the thermal tolerance (CT<sub>max</sub> – CT<sub>min</sub>) for both species. To assess prey's performance, the maximum speed of scape was analyzed, at several temperatures and a temperature gradient was used to determine the preferred temperature of both species. To assess the vulnerability to potential temperature changes we compared micro environmental temperature of the collection ponds during the period March to December 2016 and was compared maximum value with the CT<sub>max</sub> for each specie. The maximum and minimum thermal tolerances were 45.5°C and 6.62°C for the predator 40.4°C and 8.1°C for the prey. The maximum temperature registered in the micro-environment was 38.6°C, and the minimum temperature was 15.9°C. The performance escape speed was 86.72 cm gr<sup>-1</sup> s<sup>-1</sup> at an optimal temperature of 28.1°C. The mean preferable temperature of the prey was 24.4°C and 23.4°C for the predator. In conclusion, there are significant differences in thermal tolerances between the predator and the prey and the prey's preferable temperatures is above the predator's temperature. The tadpoles had a WT (warming tolerance) lower (1.85°C) than dragonfly larvae (6.88°C) would be the most vulnerable to future environmental changes. However, the optimal temperature and temperature frequency in the microenvironment indicate that in the near future climate change could improve species performance." (Author)] Address: not stated

**19922.** Choong, C.Y.; Yasser, M.A.; Nurfarhana-Hizan, H. (2017): Ancient Creatures: Dragonflies and Damselflies of Malaysia. Ministry of Natural Resources and Environment, Putrajaya, Malaysia: 115 pp. (in Bilingual in Malay and English) [This book contains published data and information about the wealth of special dragonflies and dragonflies in Malaysia that are presented in a clear and interesting way. The featured images have been selected to enhance the pages of this book, complete with QR codes for additional information from the Malaysia Biodiversity Information System (MyBIS) website. The purpose of the ml website is to establish a repository center that summarizes information on biological diversity in Malaysia. Almost 400 species of Odonata contained in 17 families can be found in Malaysia. At least 180 species are dragonflies and 210 species are damselflies. The biological diversity book 'Ancient Creatures:



Dragonflies and Damselflies of Malaysia' displays a total of 69 species of dragonflies and 73 species of damselflies, most of which can be found throughout Malaysia." (Publisher) The following species are documented in brilliant photographs: *Adagrion hisopa*, *Amphicnemis bebar*, *A. gracilis*, *Archibasis rebecca*, *Argiocnemis rubescens*, *Aristocypha fenestrella*, *Calicnemia chaseni*, *C. redangulata*, *Cenagrion auranticum*, *C. bellano*, *C. comorbellum*, *C. chaoi*, *Coeliccia albicauda*, *C. campioni*, *C. didyma*, *C. octogesima*, *Copera marginipes*, *C. vittata*, *Devadatta argyroides*, *Drepanosticta fontinalis*, *D. rufostigma*, *D. sharpi*, *D. versicolor*, *Dysphaea dimidiata*, *Elatoneura analis*, *E. aurantiaca*, *Euphaea impar*, *E. masoni*, *E. subnodalis*, *E. tricolor*, *Helioocypha bifurcata*, *H. perforata*, *Indolestes dajakanus*, *Ischnura senegalensis*, *Lestes dorothea*, *L. praemorosus*, *Libellago aurantiaca*, *L. hyalina*, *L. lineata*, *L. semio-paca*, *L. stigmatizans*, *Mortonagrion arthuri*, *Neurobasis chinensis*, *Orolestes wallacei*, *Pseudocopteryx ciliata*, *Podotestes buwaldai*, *P. orientalis*, *Prodasineura dorsalis*, *P. humeralis*, *P. laidlawii*, *P. notostigma*, *Pseudagrion australasiae*, *P. microcephalum*, *P. pilidorsum*, *P. pruinatum*, *P. rubriceps*, *P. willamsoni*, *Rhinagrion elopurum*, *R. macrocephalum*, *R. viridatum*, *Rhinocypha aurofulgens*, *R. humeralis*, *R. spinifer*, *Stenagrion dubium*, *Sundacypha petiolata*, *Teinobasis laidlawii*, *T. ruficollis*, *Telosticta janeus*, *Vestalis amphystha*, *V. amoena*, *V. beryllae*, *V. gracilis*, *Adsoma panorpoides*, *Aethriamanta brevispennis*, *A. gracilis*, *Agrioptera insignis*, *A. sexlineata*, *Anax panybeus*, *Brachythemis contaminata*, *Brachydiplax chalybea*, *Burmagomphus insularis*, *Camacinia gigantea*, *Chalybeothemis chini*, *Cratilla lineata*, *C. metallica*, *Crocothemis servilia*, *Diplacodes nebulosa*, *D. trivialis*, *Epophthalmia vittigera*, *Gomphidictinus perakensis*, *Gynacantha basiguttata*, *G. limbalis*, *Heliaeschna idae*, *Ictinogomphus acutus*, *Ictinogomphus decoratus*, *Idionyx yolanda*, *Indaeschna grubaueri*, *Indothemis camatica*, *I. limbata*, *Lathrecista asiatica*, *Leptogomphus timan*, *Lyriothemis biappendiculata*, *Macrogomphus parallelogramma*, *Macromia cincta*, *M. moorei*, *Microgomphus chetifer*, *Nannophya pygmaea*, *Nesoxenia lineata*, *Neurothemis fluctuans*, *N. fulvia*, *N. ramburii*, *N. terminata*, *Onychogomphus thienemanni*, *Onychothemis coccinea*, *O. culminicola*, *O. testacea*, *Orchithemis pulcherrima*, *Orthetrum chrysis*, *O. glaucum*, *O. luzonicum*, *O. pruinatum*, *O. sabina*, *O. testaceum*, *O. triangulare*, *Pseudothemis jorina*, *Raphisoma bispina*, *Rhyothemis aterrima*, *R. obsolescens*, *R. phyllis*, *R. ptunia*, *R. triangularis*, *Tetrathemis irregularis*, *T. platyptera*, *Tholymis tillarga*, *Trithemis aurora*, *T. festiva*, *T. pallidinervis*, *Urothemis signata*, *Zygonyx ida*, *Z. iris*, *Zyxomma obtusum*.] Address: Choong, C.Y., Centre for Insect Systematics, Univ. Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia. Email: cychoong@ukm.edu.my

**19923.** Chovanec, A. (2017): Die Libellenfauna (Insecta: Odonata) der Klosterneuburger Donau-Au (Niederösterreich): Bewertung, Entwicklungstendenzen und Managementempfehlungen. Wiss. Mitt. Niederösterreich. Landesmuseum 27: 39-68. (in German, with English summary) ["The dragonfly fauna (Insecta: Odonata) of the Danube floodplains in Klosterneuburg (Lower Austria): assessment, development trends and management recommendations The dragonfly fauna of the Danube floodplains in Klosterneuburg (Lower Austria) was investigated in 2015. A total of 31 species (30 of them autochthonous) were recorded at eight water bodies, which corresponds to 40 % of the Austrian inventory of Odonate species and 22 % of the European inventory. Five spp. are threatened according to the Austrian Red List. Remarkable is the record of *Coenagrion scitulum*

("critically endangered"). The values of the Odonata Habitat Indices, the species-specific habitat values and the analyses concerning dragonfly associations indicate, that all habitat types characteristic for floodplain areas are present, but hydrologically dynamic sections and temporary waters only to a limited extend. The Odonate fauna recorded is dominated by limnophilic species typical of open waters, submerged macrophytes and reed as well as riparian trees. The ecological status is classified as "good", but it has to be pointed out, that only few sites are existent serving as suitable habitats for floodplain-specific dragonfly communities. Some of these sites are influenced and endangered by shadowing, terrestrialisation processes and desiccation. The results obtained in 2015 are compared with surveys carried out in 1999 and 2000 and represent the basis of management recommendations." (Author)] Address: Chovanec, A., c/o Umweltbundesamt, Spittelauer Lände 5, A-1090 Wien, Austria. E-mail: chovanec@ubavie.gv.at

**19924.** Chovanec, A.; Waringer, J.; Holzinger, W.E.; Moog, O.; Janecek, B. (2017): Odonata. In Moog, O. & A. Hartmann (Eds.): Fauna Aquatica Austriaca, 3. Edition 2017. BMLFUW, Wien: 1-18. (in English) ["The catalogue of Odonata with ecological notes of Janecek et al. (2002) represents a reissue of the first edition from 1995. The species inventory of this revised version has been harmonised with the current status of the species occurring in Austria listed by Holzinger et al. (2015). Ecological classifications were based on literature published since 1995 containing detailed information on distribution and ecological requirements of the relevant species (...) Furthermore, regional information from Austria as well as studies dealing with the colonisation of near-pristine river stretches by dragonflies were included (...). Species traits defined as methodological framework for the calculation of the Dragonfly Association Index (Chovanec et al. 2014b, 2015) were also taken into account. Data on typological features of Austrian surface waters were taken from Muhar et al. (2004), Wildermuth & Küry (2009), Wimmer et al. (2012) und Wiesbauer & Denner (2013). The assignment of valency points for species appearing in the hypopotamon was carried out on the basis of the literature published (...). "Littoral" within the zonal distribution was defined as an isolated standing water body. Slowflowing sections or standing patches, particularly in the littoral areas of lowland rivers, were assigned to the respective biocoenotic region. In the case of the distribution of saprobic valency points 44 of the 78 species were classified for the first time, the classification of nine species remained unchanged. The saprobic values of 15 species are now higher due to the changes made in this study, in the case of ten species they are lower now. The revision of the classification of the longitudinal distribution revealed the following changes: three species were classified for the first time, 12 species remained unchanged. Sixty-three species were newly classified: in the case of 53 species the valency points now reflect a stronger preference for running waters in line with a stronger expansion towards the upper rhithral sections. A large portion of those changes concerned species formerly classified as +/- limnobiocenic (expressed by 10 valency points for the littoral), which now show a more split distribution of the points. This fact reflects the increased knowledge of the ecological plasticity of odonate species. Due to this increased knowledge on the ecology of many dragonfly species, we refrained from the usage of a "+" sign indicating lacking or scarce information. The order in the Species inventory follows Wildermuth & Martens (2014)."] (Authors)] Address: Chovanec, A., Umweltbundesamt, Spit-

telauer Lände 5, 1090 Wien, Austria. Email: andreas.-chovanec@bmlfuw.gv.at

**19925.** Chovanec, A. (2017): Libellenkundliche Untersuchungen an Waldzeller / Mühlheimer Ache sowie am Gurtenbach (Oberösterreich) im Jahr 2017. Im Auftrag des Amtes der Oberösterreichischen Landesregierung, Abt. Oberflächengewässerswirtschaft: 63 pp. (in German) [Austria; "The aim of the present study, carried out in 2017, was to evaluate restructuring measures in the upper and lower reaches of the Ach (Waldzeller and Mühlheimer Ache) and the Gurtenbach by means of dragonfly surveys. This was the first time that sections of the metarhithral (Waldzeller Ache, Gurten) and the transitional meta-/hyporhithral were the subject of the determination of the dragonfly ecological status according to the Water Act and the Water Framework Directive (WRG, WFD) in Upper Austria. Similar to fish, the number of dragonfly species is increasing along the stream continuum. The association approach, which had been used in studies conducted mainly on waters in the hyporhithral/epipotamal transition zone, could not be applied due to the lower number of species in the rhithral. Therefore, an assessment approach based on the study of reference species was developed within the framework of this work. The newly developed assessment method is based on the numerical classification of dragonfly species within the Fauna Aquatica Austriaca with regard to their occurrence within biocenotic regions (CHOVANEC et al. 2017). A system of leading and accompanying species was developed for the waters of the metarhithral and the transitional meta-/hyporhithral area of the bioregion "Bayerisch-Österreichisches Alpenvorland". Four study stretches of the Waldzeller Ache, three of the Mühlheimer Ache and four of the Gurtenbach, each 100 m long, were mapped five times. A total of 28 species were detected; this corresponds to 43% of the species spectrum detected for Upper Austria (65 spp.) and 36% of the species spectrum detected for Austria (78 spp.). Twelve species are listed in one of the endangerment categories of the Red List for Austria, two of which are "critically endangered" (*Erythromma lindenii*, *Somatochlora flavomaculata*), five "endangered". No species listed in any of the Annexes of the Habitats Directive or in the European Red List was detected. *Calopteryx virgo* ("potentially endangered"), flagship species in all three sections, was found on the ground in all eleven stretches surveyed. *Onychogomphus forcipatus* ("endangered"), also the leading species, was found on the ground in seven of the eleven stretches. It was absent from the hard-built stretch of the Gurtenbach, from those stretches characterised by strong potamalisation effects and from one - from a morphological point of view monotonous - stretch of the Mühlheimer Ache. The ecological status of all stretches where this species was detected was assessed as "good". The accompanying species *Orthetrum brunneum* ("potentially endangered") was sighted at six of the seven stretches along the Ach, but not at the Gurtenbach. The flagship species *Cordulegaster boltonii* ("endangered") was only found on the uppermost stretch of the Waldzeller Ache in Kraxenberg. Waldzeller Ache (Metarhithral): Good ecological status - despite the residual water situation - was achieved at three of the four stretches investigated. A total of eleven species were sighted here, six of which were native. The fourth stretch showed reduced flow conditions and thus potamalisation effects due to backwater conditions: Although the species inventory increased to 14 species (ten native), the ecological status was "moderate". Mühlheimer Ache (transition area meta-/hyporhithral): A total of 13 species were found on the three stretches, nine of them native. The ecological status of two

stretches was "good", of one "unsatisfactory": The reason for this is the reduced heterogeneity of water morphology, flow and substrate conditions at this stretch. On the lowest stretch ("good"), slight potamalisation effects could be detected. The increase in the number of species in the longitudinal course of the river is well documented in the stretches along the Ach: The stretches of the metarhithral of the Waldzell Ache in "good ecological status" showed a species spectrum of eleven species with six native species, those of the transitional meta-/hyporhithral of the Mühlheimer Ache showed an inventory of 13 species with nine native species. At the metarhithral of the Gurtenbach estuary section, a comparison was made between regulated and restructured sections. The ecological status of the regulated section was rated "unsatisfactory". The mapping revealed the presence of five species, three of which were native. The extremely low numbers of individuals were striking. The two immediately adjacent restructured stretches achieved "good ecological status". A slight potamalisation effect due to the widening of the riverbed in one of the two stretches was reflected in a comparatively high number of species (14, nine native); due to the detection of water body type-specific relevant indicator species, the prerequisite for the classification of "good" was nevertheless met. The fourth stretch had the highest number of species (17, eight native), but there were no indicator and associated species. The ecological status of this stretch was rated "unsatisfactory". As this stretch is hydrologically strongly influenced by backwater from the Inn-Schärding reservoir, it should be classified as "heavily modified" - just like the corresponding water body of the Inn. A total of 23 species were sighted on the Gurtenbach, twelve of them native." (Author/DeepL)] Address: Chovanec, A., Krotenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-mail: andreas.chovanec@bmlfuw.gv.at

**19926.** Collins, S.D.; Abbott, J.C.; McIntyre, N.E. (2017): Quantifying the degree of bias from using county-scale data in species distribution modeling: Can increasing sample size or using county-averaged environmental data reduce distributional overprediction? *Ecology and Evolution* 7(15): 6012-6022. (in English) ["Citizen-science databases have been used to develop species distribution models (SDMs), although many taxa may be only georeferenced to county. It is tacitly assumed that SDMs built from county-scale data should be less precise than those built with more accurate localities, but the extent of the bias is currently unknown. Our aims in this study were to illustrate the effects of using county-scale data on the spatial extent and accuracy of SDMs relative to true locality data and to compare potential compensatory methods (including increased sample size and using overall county environmental averages rather than point locality environmental data). To do so, we developed SDMs in maxent with PRISM-derived BIOCLIM parameters for 283 and 230 species of odonates (dragonflies and damselflies) and butterflies, respectively, for five subsets from the OdonataCentral and Butterflies and Moths of North America citizen-science databases: (1) a true locality dataset, (2) a corresponding sister dataset of county-centroid coordinates, (3) a dataset where the average environmental conditions within each county were assigned to each record, (4) a 50/50% mix of true localities and county-centroid coordinates, and (5) a 50/50% mix of true localities and records assigned the average environmental conditions within each county. These mixtures allowed us to quantify the degree of bias from county-scale data. Models developed with county centroids overpredicted the extent of suitable habitat by 15% on average compared to true locality

models, although larger sample sizes (>100 locality records) reduced this disparity. Assigning county-averaged environmental conditions did not offer consistent improvement, however. Because county-level data are of limited value for developing SDMs except for species that are widespread and well collected or that inhabit regions where small, climatically uniform counties predominate, three means of encouraging more accurate georeferencing in citizen-science databases are provided." (Authors)] Address: McIntyre, Nancy, Dept of Biological Sciences, Texas Tech Univ., Lubbock, TX, USA. E-mail: nancy.mcintyre@ttu.edu

**19927.** Cruz da Silva, E.; Silva da Rocha, T.; Barbosa de Oliveira Junior, J.M. (2017): Efeito de variações temporais e microclimáticas diárias sobre a riqueza de eúécies de Zygoptera (INSECTA: Odonata) em igarapés no município de Santarém-Pa. VIII Congresso Brasileiro de Gestão Ambiental Campo Grande/MS – 27 a 30/11/2017: 5 pp. (in Portuguese) [The physical conditions of the aquatic environment, such as air temperature and humidity, physical parameters of the water, rainfall and environmental luminosity are essential aspects in the distribution pattern of Odonata communities. In this context, the present work aimed to evaluate the effect of daily temporal and microclimatic variations on the species richness of Zygoptera in streams in the municipality of Santarém, Pará, Brazil. Zygoptera adults were sampled in four igarapés during 12 consecutive days (three times in each igarapé), between 06:00 and 18:00 h. In each igarapé, a 100-m stretch was marked, subdivided into 20 segments of five meters each. A Hobo Data Logger was used to measure air temperature, relative humidity and luminosity during 12 hours at five-minute intervals. A total of 383 individuals of Zygoptera were collected. Air temperature and luminosity had a positive effect on Zygoptera species richness ( $r = 0.546$ ;  $p = 0.054$ ;  $r = 0.831$ ;  $p = 0.001$  respectively), there was no effect of relative humidity on species richness ( $r = -0.34$ ;  $p = 0.28$ ). There was higher richness of the individuals in the hours between 10:00 and 14:00 ( $F(11, 132) = 5.565$  and  $p < 0.001$ ). The suborder Zygoptera showed great relationship with the environmental variables temperature and luminosity, possibly because they are thermal conformers. Zygoptera usually occurs in preserved environments. Therefore, it is important to maintain the integrity of the hydric systems for the conservation of the species." (Authors/DeepL)] Address: Cruz da Silva, E., Graduando no Curso de Bacharelado em Ciências Biológicas na Universidade Federal do Oeste do Pará (UFOPA). Email: evertonsilva856@gmail.com

**19928.** De Knijf, G. (2017): Country-based odonatological journals in Europe. *Agrion* 21(1): 37-44. (in English) [Journals from Finland, Poland, France, Germany, Slovenia, Spain, UK and Netherlands/Belgium are introduced.] Address: Knijf, G. de, Research Institute for Nature and Forest (INBO), Havenlaan 88 bus 73, 1000 Brussels, Belgium. E-mail: geert.deknijf@inbo.be

**19929.** Denis, A.; Danflous, S.; Pélozuelo, L. (2017): État des lieux des connaissances sur trois odonates protégés de grands cours d'eau *Oxygastra curtisii* (Dale, 1834), la cordulie à corps fin, *Gomphus graslinii* Rambur, 1842, le gompe de Graslin et *Macromia splendens* (Pictet, 1843), la cordulie splendide. Conference: Les invertébrés dans la conservation et la gestion des espaces naturels At: Toulouse, January 2017: 127-131. (in French, with English summary) ["*Oxygastra curtisii*, *Gomphus graslinii* and *Macromia splendens* are three protected species of dragonflies inhabiting the large rivers of Southern Europe. They are targeted

by the national Biodiversity Action Plan in favour of Dragonflies. The review of the literature available highlights a great lack in the knowledge of the biology and the ecology of these species. This limits our ability to assess the main factors threatening them." (Authors)] Address: Denis, Alice, Conservatoire d'Espaces Naturels Midi-Pyrenees, 75, France. E-mail: alice.denis@espaces.naturels.fr

**19930.** Dijkstra, K. D-B. (2017): Taxonomy: use the Red List as a registry. *Nature* 546: 599-600. (in English) [Verbatim: Taxonomy and conservation might seem to operate as separate bodies (S. T. Garnett and L. Christidis *Nature* 546, 25–27; 2017). In fact, they are joined at the hip. Taxonomists provide the language to plead conservation's case. And conservationists could be taxonomy's greatest allies — the record of what lives and what might be lost is the field's strongest justification today. The authors call for coordination between taxonomy and conservation, which is already happening informally. The International Union for Conservation of Nature (IUCN) has a huge stake in understanding species, with millions of organisms at risk but only 80,000 assessed so far. Its Red List of Threatened Species provides consistency in species' status. The IUCN also sets guidelines for predicting species' responses to climate change and for classifying the impact of invasive alien organisms. This interpretation of complex data underpins both policy and practice. The Red List is maintained by the IUCN's specialist groups, which include taxonomists. Although a species' taxonomic status is crucial to its conservation status and the data on populations and threats are assessed by strict criteria, no guidelines for species circumscription exist. By formalizing the updating and consistency of its list, the IUCN could provide a certified registry of the life worth conserving. More species could be 'pre-listed' as extant, valid and potentially under threat using the Red List's Not Evaluated status. This would stimulate conservation thinking in taxonomy and promote formation of specialist groups. Because Red List maintenance relies on volunteer input, new funding mechanisms would be needed to expand its structure.] Address: Dijkstra, K. D-B., Naturalis Biodiversity Center, Leiden, the Netherlands. E-mail: kd.dijkstra@naturalis.nl

**19931.** Ehikhamele, I.E.; Ogbogu, S.S. (2017): Assessment of the concentrations of some heavy metals and their effects on the macroinvertebrate composition in Igun southwestern Nigeria, using reference site approach. *Journal of Entomology and Zoology Studies* 5(1): 452-458. (in English) ["A survey was conducted from September 2014 to February 2015 to determine the resident aquatic macroinvertebrates and selected heavy metals of Igun and Osu Reservoirs, in Atakumosa West Local Government Area of Osun State, southwestern Nigeria. This was with a view to detecting the effects of gold mining activities on Igun Reservoir using Osu Reservoir as a reference site. Sampling for heavy metals and macroinvertebrate fauna was carried out fortnightly for six months. The collected aquatic macroinvertebrates were preserved in 70% ethanol and identified using appropriate identification keys. Water sample were collected for the determination of heavy metals which include, Cadmium (Cd), Gold (Au), Lead (Pb), Zinc (Zn) and Manganese (Mn), using (Atomic Absorption Spectroscopy) A total of 136 macroinvertebrate specimens representing 17 species in 12 families were collected from Igun Reservoir. Class Gastropoda had the highest number of specimens 61(44.85%), representing five species in three families (Planorbidae, Thiaridae and Physidae). A total of 408 macroinvertebrate specimens representing 32 species in 16

families were collected from Osu Reservoir. Ephemeroptera, represented by six species from two families (Caenidae and Baetidae) had the highest number of specimens, 136 (33.33%). Simpson Diversity Index (1-D) for Igun and Osu Reservoirs were 0.84 and 0.89 respectively. Cd correlated with Mn ( $r = 0.82$ ) while Pb correlated with Mn ( $r = 0.62$ ). Pb also negatively correlated with the abundance of Odonata ( $r = -0.77$ ) in Igun Reservoir while Cd correlated negatively with the abundance of Coleoptera ( $r = -0.58$ ) in Osu Reservoir. The concentration of zinc was within the WHO permissible limits for freshwater while other heavy metals were above the limits in both reservoirs." (Authors) Chlorolestes conspicuus, C. elegans, C. apicans, Chlorolestes sp., Lestes plagus, L. ictericus, Ophiogomphus sp. [?], Actinogomphus ferox, Ceratogomphus triceratus, Actinogomphus, Trithemis dorsalis, Trithemis, Diplacodes sp., Pseudagrion inopinatum, Ceriagrion bakeri, Allocnemis leucostita, Metacnemis leucostita] Address: Ehikhamele, I.E., Dept of Zoology, Faculty, of Science, Obafemi Awolowo, Univ., Ile-Ife, Osun State, Nigeria

**19932.** Fadilah, U.; Atmowidi, T.; Priawandiputra, W. (2017): Comparison of aquatic insect assemblages between managed and unmanaged artificial lakes in Indonesia. *Journal of Entomology and Zoology Studies* 5(2): 496-506. (in English) ["Aquatic insects are an example of organisms vulnerable to habitat alteration. Several artificial lakes were constructed with different maintenance pattern (managed and unmanaged) in Bekasi, which could impact development of aquatic insect community differently. Therefore, the present study examined the aquatic insect assemblages between managed and unmanaged artificial lakes in Indonesia from January to June 2016. Additionally, the influences of physico-chemical factors to the aquatic insect communities were assessed. The results showed that the abundance of insects were higher in managed (1059 individuals) than unmanaged lakes (426 individuals) ( $p < 0.05$ , T-test). Significance of the difference of species composition between managed and unmanaged lakes was illustrated by the separated groups in nMDS graph ( $p < 0.001$ , One-way ANOSIM). However, the same dominant species (*Orthetrum testaceum*) was found in both lakes. *O. testaceum* and *Desmopachria latissima* have strong correlation with all physico-chemical parameters. Different management of artificial lakes significantly changed the aquatic insect assemblages and unmanaged artificial lake decreased the abundance of aquatic insect." (Authors)] Address: Priawandiputra, W., Animal Biosystematics and Ecology Division, Dept of Biology, Faculty of Mathematics and Natural Sciences, Bogor Agricultural Univ., Bogor, Indonesia

**19933.** Gazzola, A.; Balestrieri, A.; Ghitti, M.; Paganelli, D.; Galeotti, P. (2017): Behavioural and life history responses to predation risk by common frog tadpoles exposed to two predators during ontogeny. *acta ethologica* 20(5): 235-241. (in English) ["The presence of predators can induce changes in both the morphology and behaviour of Anuran larvae, affecting both their size and developmental stage at metamorphosis and, consequently, the fitness of adult individuals. Tadpoles have been shown to be capable of finely tuning their defensive responses according to the actual risk perceived, which is expected to vary according to the prey-to-predator size ratio. In this study, we exposed common frog (*Rana temporaria*) tadpoles (Gosner stages 28-30), for a period of 2 weeks, to the non-lethal presence of dragonfly larvae (*Anax imperator*) and backswimmers (*Notonecta glauca*). In such a narrow window of time, we expected be-

havioural responses to be similar for both predators and exposure to predation risk to have negligible effects on tadpole development and weight. Overall, tadpoles increased hiding behaviour and were less active when predators were present in the experimental mesocosms, but behavioural responses were constrained to the early phase of the ontogeny and were no longer used when tadpoles reached a threshold size. Developmental rate slightly slowed down for predator treatments in comparison to controls, possibly as a consequence of energetic investment in unrecorded morphological defences. Although variation in laboratory conditions and protocols makes it hard to compare the results of different experiments, our results contribute to verify the consistency of behavioural responses in Anuran larvae." (Authors)] Address: Gazzola, A., Eco-Ethology Laboratory, DSTA- Dept of Earth and Environmental Sciences, Univ. of Pavia, Pavia, Italy

**19934.** Georgieva, G.; Radeva, K.L.; Uzunov, Y.I. (2017): New Data on bottom invertebrates of the Negovan marshes and the adjacent Lesnovska River. *Acta zool. bulg.* 69(1): 89-94. (in English) ["The current study presents recent data of the benthic macroinvertebrate fauna of two pit lakes (the Big Lake and the Small Lake) and the adjacent sector of the Lesnovska River near Negovan Village, western suburb area of the capital city of Sofia, western Bulgaria. The two pit lakes are under different degree of degradation. The Big Lake is still used for excavation of inert materials, while the Small Lake has been abandoned years ago and has slowly restored its quality of a natural wetland. Both lakes have never been studied hydrobiologically apart from several faunistic contributions. In the present study, parameters, indices and metrics indicating the cenotic structure of the benthic community and ecological state of the water bodies were used following the national regulations. The macrozoobenthos density in the Big Lake was lower in comparison to the Small Lake and the Lesnovska River. The river and the Small Lake had high level of faunistic similarity. Some non-indigenous and invasive species were registered in both lakes." (Authors)] Address: Georgieva, Galia, Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 2 Gagarin Street, 1113 Sofia, Bulgaria. E-mail: tsambi@abv.bg,

**19935.** Geraeds, R. (2017): Observations of dragonflies outside the immediate vicinity of water. The value of an abandoned field for dragonflies. *Brachytron* 19(2): 77-89. (in Odonata, maturation period, habitat, abandoned arable fields) ["Research on dragonflies generally takes place at their reproduction sites. However, the maturation period, between the moment the dragonflies emerge and the time they return to the water, is often spent away from the immediate vicinity of water. Detailed information about the habitats that are used during the maturation period is scarce. For this reason, observations of dragonflies were collected during a research project on reptiles in an abandoned field in the Driestruik Nature Reserve. During 90 days in the period between September 2011 until October 2016, 978 observations of 1242 dragonflies were collected. In total 34 dragonfly species were found: 11 species of damselflies and 23 species of dragonflies. All species with populations in the Driestruik Nature Reserve were found in the abandoned field. In addition, 11 species were found of which no populations are present in the area. These are predominantly species with a preference for flowing water like brooks and rivers. When the observations of the most frequently observed damselflies were examined, it appeared that the majority of the animals use the abandoned field mainly during

the maturation period. From the observations of dragonflies it can be deduced that the former field is used during the maturation period, but that most dragonfly species also frequently use the area during the breeding period. It is striking that most observations (48%) were made in the eastern part of the research area, which with its 0,3 hectare represents approximately 25% of the total investigated area. In contrast to the rest of the area, this part also borders on forest on the north side, making it more sheltered. In addition, the largest variation in vegetation structure is present in this part of the former field. These conditions are likely to result in a warmer microclimate, which is attractive for dragonflies." (Author)] Address: Geraeds, R.P.G., Rijksweg Noord 280, 6136 AH Sittard, Netherlands. E-mail: rob.geraeds@kpnplanet.nl

**19936.** Guerrero, L.S.C. (2017): El trabajo de campo con *Mesamphiagrion laterale* (Odonata: Coenagrionidae) como estrategia educativa para la enseñanza de ecología de poblaciones en el Humedal la Conejera, Bogotá D.C.. Bio – grafía. Escritos sobre la Biología y su Enseñanza . ISSN 2027-1034 Edición Extraordinaria. Memorias del IX Encuentro Nacional de Experiencias en Enseñanza de la Biología y la Educación Ambiental. IV Congreso Nacional de Investigación en Enseñanza de la Biología: 720-727. (in Spanish, with English summary) [oas 63 "The Following article is frame into a developed research as grade work of Biology teacher of Pedagógica Nacional Univ., to show there the main results of project, has a purpose to design a educative strategy to teaching and learning of population ecology from the field research with *Mesamphiagrion laterale* in the Conejera Wetland in Bogota D.C. Therefore to realice a research of three population attributes: Population size, sexual distribution and spacial distribution of Odonato *M. laterale* found in the Conejera Wetland, in this article the first and second attribute are present; the metodological procediments are to establish 10 areas to sampling in a different location of Wetland, and visiting in a 4 moments, the capture-recapture method was used. Similary for the education part, has development 10 class sessions in the Tibabuyes Universal school with 4º students of 9º to design a educative strategy to learn population ecology from the work and biological experience of Wetland. The Project propose 5 educational estrategy result of students and teacher research: Previous ideas, conceptual approach of population ecology, establishment of methodologies for working with populations, practical experiences and process of organization and systematization of population data." (Authors)] Address: Guerrero, Lynda, Licenciada en Biología, Universidad Pedagógica Nacional, línea de investigación: Enseñanza de la ecología, Grupo de investigación: CAS-CADA, Columbia. E-mail: lindasa95@hotmail.com.

**19937.** Gyulavári, H.A.; Tüzün, N.; Arambourou, H.; Therry, L.; Dévai, G.; Stoks, R. (2017): Within-season variation in sexual selection on flight performance and flight-related traits in a damselfly. *Evolutionary Ecology* 31: 21-36. (in English) ["While selection is a key mechanism of evolution, our understanding of within-season variation in sexual selection remains limited. Here, we studied within-season sexual selection on two key performance traits, flight speed and flight endurance, and a set of morphological and physiological phenotypic traits in a natural population of the territorial damselfly *Chalcolestes viridis*. We applied a path analysis approach to address whether the flight-related traits affected mating success directly or indirectly through their effect on the flight performance traits, and whether these selection patterns differed between the first and second half of the reproductive season. While some trait means did not

differ between both parts of the season (flight speed, wing loading and non-allometric wing shape), most traits showed within-season differences (flight endurance, fat content, flight muscle ratio, wing centroid size, body mass and the allometric wing shape). Despite the within-season temporal differences in flight endurance, sexual selection consistently favoured males with a higher flight endurance. None of the detected patterns of sexual selection on the flight-related traits were consistently significant in both periods: while we detected selection on wing loading and wing centroid size in the first half of the season, we detected selection on body mass in the second half of the season. More studies focusing on understudied traits such as performance traits are needed to refine our knowledge of the temporal dynamics of selection patterns in nature. This is important to arrive at a better understanding of the adaptive evolutionary dynamics of traits in natural populations." (Authors)] translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (kostenlose Version)] Address: Stoks, R., Lab. Aquat. Ecol., K.U.Leuven, De Beriotstraat 32, B-3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

**19938.** Halimi, E., Papparisto, A. (2017): Data for Aquatic Insects (Odonata) with Environmental Impact on Aquatic Ecosystems in Albania. 1-st International Conference on Social and Natural Sciences Proceedings Vienna, 8-9 April: 80-86. (in English) ["Aquatic insects show a high interest due to their feature to serve like environmental bioindicators. In that study, by analyzing the biodiversity of dragonfly Odonata through the comparison of the data on quantity and quality related to these aquatic insects, we have evaluated the actual environmental situation of aquatic ecosystems for the Kavaja and Divjaka. The period of time when the biological material was collected was 2009-2011. By this study are defined for Odonata Order was 23 species, 17 genera and 8 families of. The most represented group was Anisoptera by 14 species and a frequency of 60.86%. The Libellulidae is the most represented family by 8 species and a frequency of 34.78%. The ecosystems around the Divjaka (Karavasta lagoon) are presented by a frequency slightly higher of species compared to these of Kavaja (Spille). The Odonata in the environment of Divjaka are more represented by 17 species and a frequency of 73.91% while the frequency were lower with 14 species and a frequency of 60.86% to Kavaja. It is an indicator of the quality considerably better of the Divjaka area. In both areas are encountered 8 common species and the "Jaccard index" of similarity coefficient" was 34.78%, which is an indication of small difference among the conditions of environmental quality for these bio-indicator species." (Authors)] Address: no details are given

**19939.** Harisha, M.N.; Hosetti, B.B. (2017): Conservation status, threats and diversity of Odonates in Kuvempu Univ. Campus, Mid-Western Ghats, Shivamogga district, Karnataka, India. *Journal of Entomology and Zoology Studies* 5(2): 389-393. (in English) ["Odonata sampling was carried out from October 2010 to September 2011.... A total of 32 species of Odonates in 24 genera belonging to 6 families have been reported. During the study, the Anisoptera were found to be more diverse and predominant with 23 species belonging to 3 families, contributed 72%, followed by the Zygoptera which were found to be less diverse with 9 species belonging to 3 families, contributed 28% composition of total odonates recorded from Kundavada Lake, Davanagere District, Karnataka." (Authors)] Address: MN Harisha, M.N., Dept of Post Graduate, Studies & Research in Wildlife and Management, Kuvempu Univ., Jnana Sahyadri, Shankaraghatta-577451, Shivamogga, Karnataka, India

**19940.** Haro, R.; Hess, M.; Rolffhus, K.; Sandheinrich, M.; Wiener, J. (2017): Why is mercury concentration in larval spiketail dragonflies (Family Cordulegastridae) consistently greater than in their burrowing relatives, the clubtail dragonflies (family Gomphidae)? 13th The International Conference on Mercury as a Global Pollutant: RP-075- (in English) [Verbatim: "In North America, larval dragonflies are increasingly used as biosentinels for monitoring mercury (Hg) contamination in freshwater food webs. For practical reasons, field studies and monitoring programs alike often do not identify larval dragonflies below the taxonomic level of family. Several studies, however, have recognized that differences in Hg concentration among coincidentally collected families do occur and may be associated with distinct family-level behavioral habits or guilds (e.g., burrowers vs. climbers). Understanding the consistency of these differences among guilds across habitats and water bodies will be important to the refinement of protocols using larval dragonflies as biosentinels. Apart from the implications for monitoring Hg, these guild differences generate basic questions about the intersection of environmental toxicology, behavioral ecology, and phylogeny. Two separate field studies conducted in the north-central states of Wisconsin and Michigan (USA) have shown consistent differences in total mercury (THg) concentration between two intraguild (burrower) families of late-instar larval dragonflies: the spiketails (Family Cordulegastridae) and the clubtails (Family Gomphidae). Across 5 of 6 water bodies, 3 streams and 3 lakes, THg concentration in spiketail larvae was significantly greater than in coincidentally collected clubtail larvae. Furthermore, spiketail THg concentration was often greater than all other co-occurring larvae belonging to non-burrowing guilds (i.e., sprawlers and climbers). Mean (SE) THg concentration across water bodies ranged from 170.9 10.0 497.8 136.2 ng/g dwt. and from 67.0 2.1 165.0 18.2 ng/g dwt. for spiketails and clubtails, respectively. In the 5 water bodies with significant differences, spiketail THg concentrations were between 189% and 558% greater than their clubtail counterparts. An explanation for these differences likely includes voltinism; in the north-central US, spiketails are merovoltine, spending 3 to 4 years as larvae, while clubtails are typically bivoltine, spending 2 years as larvae. However, other factors including the amount of body setae (surface area), differences in burrowing behavior, and the significance of their phylogenetic relationship are explored."] Address: Haro, R., River Studies Center, La Crosse, USA

**19941.** Hayat, M. (2017): Cycle de vie et écologie de Coenagrion mercuriale dans le bassin versant de la Seybouse (Nord-Est de l'Algérie). Doctorat du troisième cycle, Faculté des Sciences, Département de Biologie, Université Badji Mokhtar-Annaba: 75 pp. (in French, with English and Arabian summaries) ["C. mercuriale is a threatened damselfly in most parts of its geographic distribution. It is listed as endangered in North Africa, where no data on its biology or ecology are available. The purpose of this study was to determine the life history traits and demographic parameters of this species in the southern limit of its distribution, to compare of our results with those presented in the literature for the UK (the northern limit of the species distribution) and to determine the latitudinal adaptation of the species. The estimation of the population size showed a very high number with a total of 1765 individuals. The species did not show a winter diapause and produced two generations per year. The first generation was emerged mid spring and the second the late summer. After emergence, adults spent a period of maturation that lasted 3 to 4 days. Afterwards, they

returned to aquatic environments to breed. The reproduction period was positively correlated with male size. However, the rest period was positively correlated with the copulation period. Finally, a seasonal difference in the body size between generations was found with a decrease in the body size in the first generation and an increase the opposite was found in the second generation." (Author)] Address: not stated

**19942.** Herzog, R.; Hadrys, H. (2017): Long-term genetic monitoring of a riverine dragonfly, *Orthetrum coerulescens* (Odonata: Libellulidae): Direct anthropogenic impact versus climate change effects. PLoS ONE 12(5): e0178014. <https://doi.org/10.1371/journal.pone.0178014>: 13 pp. (in English) ["Modern conservationists call for long term genetic monitoring datasets to evaluate and understand the impact of human activities on natural ecosystems and species on a global but also local scale. However, long-term monitoring datasets are still rare but in high demand to correctly identify, evaluate and respond to environmental changes. In the presented study, a population of the riverine dragonfly, *Orthetrum coerulescens* (Odonata: Libellulidae), was monitored over a time period from 1989 to 2013. Study site was an artificial irrigation ditch in one of the last European stone steppes and "nature heritage", the Crau in Southern France. This artificial riverine habitat has an unusual high diversity of odonate species, prominent indicators for evaluating freshwater habitats. A clearing of the canal and destruction of the bank vegetation in 1996 was assumed to have great negative impact on the odonate larval and adult populations. Two mitochondrial markers (CO1 & ND1) and a panel of nuclear microsatellite loci were used to assess the genetic diversity. Over time they revealed a dramatic decline in diversity parameters between the years 2004 and 2007, however not between 1996 and 1997. From 2007 onwards the population shows a stabilizing trend but has not reached the amount of genetic variation found at the beginning of this survey. This decline cannot be referred to the clearing of the canal or any other direct anthropogenic impact. Instead, it is most likely that the populations' decay was due to by extreme weather conditions during the specific years. A severe drought was recorded for the summer months of these years, leading to reduced water levels in the canal causing also other water parameters to change, and therefore impacting temperature sensitive riverine habitat specialists like the *O. coerulescens* in a significant way. The data provide important insights into population genetic dynamics and metrics not always congruent with traditional monitoring data (e.g. abundance); a fact that should be regarded with caution when management plans for developed landscapes are designed." (Authors)] Address: Herzog, Rebecca, ITZ, Ecology & Evolution, Univ. of Veterinary Medicine Hannover, Hannover, Germany. E-mail: rebecca.herzog@ecolevol.de

**19943.** Hrdličková, E.; Bulánková, E. (2017): Ecological and hydromorphological evaluation of monitoring sites at the upper Myjava River. Folia faunistica Slovaca 22: 93-101. (in Slovak, with English summary) ["Since 2006 the upper part of the Myjava River has undergone strong changes. Above the monitoring site Myjava NAD (rkm 72.6) a water reservoir was rebuilt to a dry polder in 2006 and the stagnant water has changed into realined channel of the Myjava River. Because of benthic invertebrates has not been monitored at this locality since 2010 we would like to evaluate changes of macrozoobenthos communities at the sampling site Myjava NAD in present and compare them with the sampling site which is relatively undisturbed. This reference site

(hypocrenal) is situated in the beech forest at rkm 82. We assessed physico-chemical parameters, hydromorphology using River Habitat Survey at both localities in 2014 – 2015. Macrozoobenthos was sampled by kicking technique in spring and in autumn 2014 – 2015. The aim of our research was to: 1. Evaluate hydromorphology of selected stream sites; 2. Find out macrozoobenthos structure at these sampling sites 3. Compare changes in metrics found out during monitoring in 2003 – 2013 with our data from 2014. The PCA showed that the structure of macrozoobenthos is influenced first of all by the hydromorphological features of the Myjava River and the physico-chemicals parameters had less influence. Metrics calculated from macrozoobenthos abundance of the site Myjava NAD from the years 2003, 2014, 2015 showed that biological status is better but the site is hydromorphologically disturbed and therefore it belongs to the HMWB. According to the ecological evaluation we found out that the sampling site in the beech forest has a character of a reference site therefore it is unique in the Myjava River basin. Occurrence of the protected species *Cordulegaster heros*, sensitive species *Ibisia marginata* and *Ephemera danica* was threatened by the clearcutting in 2015. We suggest to minimize human impact in the vicinity of the stream at this valuable part of the Myjava River." (Authors)] Address: Bulánková, Eva., Dept of Ecology, Faculty of Natural Sciences, Comenius Univ., Ilkovičova 6, 842 15 Bratislava, Slovakia. Email: bulankova@fns.uniba.sk

**19944.** Irawan, F.; Hadi, M.; Tarwotjo, U. (2017): Struktur komunitas Odonata di Kawasan Wana Wisata Curug Semirang Kecamatan Ungaran Barat, Semarang. *Bioma : Berkala Ilmiah Biologi* 19(1): 69-75. (in Indonesian, with English summary) ["Dragonflies role as a predator in an ecosystem and become a healthy aquatic bio-indicators related to the life cycle. The diversity of habitat, food and predators affect community structure dragonfly. This study aims to determine the composition and community structure dragonfly morning and afternoon as well as the relationship with the physical environmental factors on four habitat in Semirang waterfall. Research using transect Point Count method. Statistically, the biodiversity of odonata in each habitat is significantly different. The results shows there are 15 species from 10 Family in morning observations and 12 species of 6 Family in afternoon observations, with a total of 17 species of 10 family of Odonata. Biodiversity in each station is low to moderately with high evenness. The highest abundance found in river habitat without the canopy during the afternoon that *Vestalis luctuosa* (61.29%), while the lowest abundance found in the the canopied river habitat when afternoon that is *Drepanosticta spatulifera* (1.33%). Common species at area of Semirang waterfall are *Euphaea variegata*, *Orthetrum sabina* and *Vestalis luctuosa*. Endemic species at area of Semirang waterfall are *Heliocypha fenestrata*, *Drepanosticta spatulifera* and *D. sundana*." (Authors)] Address: Irawan, F., Lab. Ekologi dan Biosistemik, Departemen Biol. Fak. Sains dan Matematika, Universitas Diponegoro, Semarang Jln. Prof. Soedarto, SH., Tembalang, Semarang, 50275, Indonesia. Email: frendi311@gmail.com

**19945.** Isaacson, J. (2017): Digest: Premating barriers drive reproductive isolation between two damselfly species. *Evolution* 71(10): 2541-2542. (in English) [This article corresponds to Barnard, A.A., O.M. Fincke, M.A. McPeck, & J.P. Masly. 2017. Mechanical and tactile incompatibilities cause reproductive isolation between two young damselfly species. *Evolution*. <https://doi.org/10.1111/evo.13315>. Abstract: "External reproductive structures play an important role in

reproductive isolation but are not thought to drive reproductive isolation between recently diverged species. Barnard et al. (2017) found that external reproductive structures cause strong premating isolation between two *Enallagma* species through mechanical and tactile isolation, and that premating barriers are stronger than postmating barriers for this species pair. Their results demonstrate that differences in external reproductive structures may contribute to speciation." (Author)] Address: Isaacson, J., Dept of Biology at Western Univ.. Email: jisaacso@uwo.ca

**19946.** Ito, K.; Sakuraba, N.; Yamaguchi, K. (2017): A control law for vehicle merging inspired by dragonfly behavior. *Artificial Life and Robotics* 22: 153-162. (in English) ["Autonomous control of vehicles has recently attracted considerable attention. In this sense, vehicle merging has become an important topic in this field of research. However, in conventional studies, the controlled vehicle must calculate the movement of other surrounding vehicles to complete the merge, requiring high computational costs. In this paper, we focus on dragonfly behaviour to solve this issue. Indeed, insects can behave adaptively in the complex real world in spite of the limited size of their brains. They reduce the computational requirements of their brain by relying on different properties of their surroundings, basing their intelligent behaviours on simple strategies. The behaviour of a dragonfly when chasing a prey is an example of these strategies. In this study, we address the vehicle merging maneuver by applying dragonfly's strategies to control the movement of the merging vehicle. We propose a simple control method inspired by the aforementioned strategies and, finally, we present simulation results that were conducted to demonstrate the effectiveness of this method." (Authors)] Address: Ito, K., Hosei Univ., Koganei, Japan

**19947.** Janssens, L.; Tüzün, N.; Stoks, R. (2017): Testing the time-scale dependence of delayed interactions: A heat wave during the egg stage shapes how a pesticide interacts with a successive heat wave in the larval stage?. *Environmental Pollution* 230: 351-359. (in English) ["Highlights: •An egg heat wave affected larval survival and oxidative damage in damselflies [*Chalcolestes viridis*]. •Also larval pesticide exposure had delayed effects on survival and oxidative damage. •An egg heat wave shaped the interaction between a pesticide and a heat wave in larvae. •Successive stressors have delayed effects and can thereby interact across life stages. Abstract: Under global change organisms are exposed to multiple, potentially interacting stressors. Especially interactions between successive stressors are poorly understood and recently suggested to depend on their timing of exposure. We particularly need studies assessing the impact of exposure to relevant stressors at various life stages and how these interact. We investigated the single and combined impacts of a heat wave (mild [25 °C] and extreme [30 °C]) during the egg stage, followed by successive exposure to esfenvalerate (ESF) and a heat wave during the larval stage in damselflies. Each stressor caused mortality. The egg heat wave and larval ESF exposure had delayed effects on survival, growth and lipid peroxidation (MDA). This resulted in deviations from the prediction that stressors separated by a long time interval would not interact: the egg heat wave modulated the interaction between the stressors in the larval stage. Firstly, ESF caused delayed mortality only in larvae that had been exposed to the extreme egg heat wave and this strongly depended upon the larval heat wave treatment. Secondly, ESF only increased MDA in larvae not exposed to the egg heat wave. We found little support for the prediction that when there is



limited time between stressors, synergistic interactions should occur. The intermediate ESF concentration only caused delayed mortality when combined with the larval heat wave, and the lowest ESF concentrations only increased oxidative damage when followed by the mild larval heat wave. Survival selection mitigated the interaction patterns between successive stressors that are individually lethal, and therefore should be included in a predictive framework for the time-scale dependence of the outcome of multistressor studies with pollutants. The egg heat wave shaping the interaction pattern between successive pesticide exposure and a larval heat wave highlights the connectivity between the concepts of 'heat-induced pesticide sensitivity' and 'pesticide-induced heat sensitivity'." (Authors)] Address: Janssens, Lizanne, Laboratory of Aquatic Ecology, Evolution and Conservation, Univ. of Leuven, Charles Deberiotstraat 32, B-3000 Leuven, Belgium. E-mail: Lizanne.janssens@kuleuven.be

**19948.** Janssens, L.; Op de Beeck, L.; Stoks, R. (2017): Stoichiometric responses to an agricultural pesticide are modified by predator cues. *Environ. Sci. Technol.* 51(1): 581-588. (in English) ["Current ecological risk assessment of pesticides fails to protect aquatic ecosystem health. To get better insight in how pesticides may affect aquatic ecosystems, we tested how sublethal pesticide concentrations modify body stoichiometry. Moreover, as interactions with natural stressors may cause underestimates of the impact of pesticides, we also tested whether this pathway depended on the presence of predator cues. Therefore, we exposed damselfly larvae to chlorpyrifos and cues from predatory dragonflies and focused on body stoichiometry and associated explanatory variables (growth rate, RNA : DNA and energy storage molecules). The way the predator cues modulated the pesticide effects strongly differed between endpoints. Exposure to chlorpyrifos affected the key body stoichiometric ratios: chlorpyrifos consistently increased N:P, while its effects on C:N (decrease with predator cues) and C:P (increase without predator cues) strongly depended upon the presence of the natural stressor. These stoichiometric responses could be explained by associated changes in growth, RNA:DNA and in C-rich fat and sugars and N-rich proteins. The observed changes in body stoichiometry may affect the damselflies' food quality, and have the potential to cascade through the food web and shape nutrient cycling." (Authors)] Address: Janssens, Lizanne, Lab. Aquat. Ecol., Evolution & Conservation, Univ. of Leuven, Charles Deberiotstraat 32, B-3000 Leuven, Belgium

**19949.** Janssens, L.; Stoks, R. (2017): Chlorpyrifos-induced oxidative damage is reduced under warming and predation risk: Explaining antagonistic interactions with a pesticide. *Environmental Pollution* 226: 79-88. (in English) ["Highlights: •Co-exposure to pesticides, warming and predators is common in nature. •Chlorpyrifos increased ROS and oxidative damage and decreased antioxidant defence. •Animals coped better with the pesticide when reared at higher temperatures. •The predator cues lowered the pesticide-induced increase in oxidative damage. •Cross-tolerance and maximum damage levels may explain antagonistic interactions. Interactions with pollutants and environmental factors are poorly studied for physiological traits. Yet physiological traits are important for explaining and predicting interactions at higher levels of organization. We investigated the single and combined impact of the pesticide chlorpyrifos, predation risk and warming on endpoints related to oxidative stress in *Enallagma cyathigerum*. We thereby integrated information on reactive oxygen species (ROS), antioxidant

enzymes and oxidative damage. All three treatments impacted the oxidative stress levels and for most traits the pesticide interacted antagonistically with warming or predation risk. Chlorpyrifos exposure resulted in increased ROS levels, decreased antioxidant defence and increased oxidative damage compared to the control situation. Under warming, the pesticide-induced increase in oxidative stress was less strong and the investment in antioxidant defence higher. Although both the pesticide and predation risk increased oxidative damage, the effects of the pesticide on oxidative damage were less strong in the presence of predator cues (at 20 °C). Despite the weaker pesticide-induced effects under predation risk, the combination of the pesticide and predator cues consistently caused the highest ROS levels, the lowest antioxidant defence and the highest oxidative damage, indicating the importance of cumulative stressor effects for impairing fitness. Our results provide the first evidence for antagonistic interactions of warming and predation risk with a pollutant for physiological traits. We identified two general mechanisms that may generate antagonistic interactions for oxidative stress: cross-tolerance and the maximum cumulative levels of damage." Address: Stoks, R., Lab. Aquatische Ecologie, K.U.Leuven, De Beriotstraat 32, B-3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

**19950.** Johansson, F.; Halvarsson, P.; Mikolajewski, D.J.; Höglund, J. (2017): Genetic differentiation in the boreal dragonfly *Leucorrhinia dubia* in the Palearctic region. *Biological Journal of the Linnean Society* 121: 294-304. (in English) ["The last glacial period had a strong influence on the population genetic structure of boreal species in southern and central Europe. In addition, recent and current human impact on the boreal environment has led to habitat loss, which also has a large influence on population genetic structure of species. Here we present the spatial genetic structure of the boreal dragonfly *Leucorrhinia dubia* using ddRAD sequencing. We sampled individuals from nine locations in Europe, three in Asia (Russia and Japan) and one location of *L. intermedia* in Japan. Results showed three distinct genetic clusters in Europe. One genetic cluster consisted of individuals sampled from the locations in the Swiss Alps, a second consisted of individuals sampled in the United Kingdom, and a third cluster consisted of individuals from the rest of the seven sampled locations in Europe covering a latitudinal gradient from the French Pyrenees to the north of Finland. There was also a weak support that the French Pyrenees and Austrian Alps samples differentiated from the cluster of the five samples from central and north Europe. We suggest that these clusters reflect historical recolonization patterns since the last glaciation. The *L. dubia* individuals sampled from locations in Asia formed one cluster referring to *L. dubia orientalis* separated from the individuals sampled in European and from the *L. intermedia* locality sampled. Our result suggests that aquatic insects in the fragmented boreal landscape in south central Europe and United Kingdom need conservation consideration." (Authors)] Address: Mikolajewski, D.J., Institut für Biologie, Freie Universität Berlin, Königin-Luise-Straße 1-3, 14195 Berlin, Germany. Email: d.mikolajewski@gmx.de

**19951.** Junior dos Santos, J.; Kroth, N.; Breaux, J.A.; Albeny-Simões, D. (2017): Do container size and predator presence affect *Culex* (Diptera: Culicidae) oviposition preferences? *Revista Brasileira de Entomologia* 62(1): 40-45. ["Organisms with complex life cycles typically do not exhibit parental care. Hence, the ability of adult females to choose quality oviposition sites is critical for offspring success.

Gravid females of many insect taxa have the capability to detect environmental conditions in water-holding containers (e.g., resource level, presence of competitors or predators) and to choose the sites that are most suitable for offspring growth and development. Mosquitoes may also detect physical container characteristics related to water permanence such as surface area, volume, or container size, and some species such as those in the genus *Culex* have been shown to prefer larger containers. However, predators may also preferentially colonize larger containers; thus, ovipositing females may face decisions based on cues of site quality that balance the costs and benefits for offspring. We used a field experiment to evaluate the oviposition preferences of two *Culex* species in response to experimental container size and predator abundances within the containers. We found that both species avoided ovipositing in the largest containers, which have high abundances of *Chaoborus* sp. and dragonfly larvae (predators). However, the container size most commonly chosen for oviposition (15-L buckets) also had high mean abundance per liter of dragonfly larvae. These results suggest either prey naiveté or reduced vulnerability of these species to dragonflies compared to *Chaoborus* sp. Other potential mechanisms for the observed patterns are discussed." (Authors)] Address: Junior dos Santos, J., Universidade Comunitária da Região de Chapecó, UNOCHAPECO, Curso de Graduação em Ciências Biológicas, Chapecó, SC, Brazil

**19952.** Kappes, E.; Kappes, W. (2017): *Ceriatrigon georgifreyi* auf Lesbos, Griechenland (Odonata: Coenagrionidae). *Libellula* 36(1/2): 45-50. (in German, with English summary) [*C. georgifreyi* in Lesbos, Greece – Since 1992, it is known that members of the genus *Ceriatrigon* are to be found in Lesbos, however the identification of the species has hitherto been unclear. On 27-iv-2016, *C. georgifreyi* was recorded for the first time in Lesbos, 1.5 km northeast of the Golf of Kalloni, where close to the Krioneri riverbed, a small pond was fed all year round by a strong artesian spring. A male specimen was caught, photographed and the tip of the abdomen studied with a hand lens. This is the first documented record of *C. georgifreyi* in Lesbos and the fourth recorded location in Greece." (Authors)] Address: Kappes, W., Eichenweg 27, D-22395 Hamburg, Germany. Email: eva.wulf.kappes@t-online.de

**19953.** Karlson, E. (2017): Temperature acclimation in dragonfly larvae: which species are more vulnerable to global warming? M.Sc. dissertation, Biology Education Centre & Dept of ecology and genetics/Animal ecology, Uppsala Univ.: 33pp. (in English) ["Climate change is affecting all known habitats on earth. Increased temperatures in aquatic habitats will not only heat the waters but will also cause larger variation in temperature fluctuation. Many animals in aquatic systems are adapted to specific habitats in these waters and may face disadvantages if temperatures changes too much. In my project. I have used larvae of dragonflies and damselflies to examine how they might be affected by changes in water temperature caused by climate change. I sampled damselfly and dragonfly Larvae in three lakes around Uppsala at two water depths, in order to examine whether these species differed in their depth distribution. Larvae exposed to thermal fluctuations should be better at adapting to the increase in temperature from global warming. In a laboratory experiment I tested the ability to acclimate to three temperatures (18, 21 and 24°C) in three species of damselfly larvae (*Ischnura elegans*, *Coenagrion pulchellum*, and *Erythromma najas*), over four different time intervals (1,2, 12 and 24 hours) for *E. najas* and two time intervals for *I. elegans* and *C. pulchellum*. To measure acclimation. I introduced prey items in a laboratory experiment, and counted how many strikes and captures the larvae managed to do during a 10 mm interval after being acclimated to the four different time intervals. The results of the field sampling in the lakes showed species specific depth distribution differences in dragonfly and damselfly larvae, with the majority of species preferring the surface over the bottom. The results from the temperature acclimation experiments showed that species changed their strikes and capture success on prey over the different time intervals, and especially *E. najas* showed a clear trend that suggest adaptation to temperate changes. Species differed in prey capture behaviour, with *E. najas* having the highest and *C. pulchellum* the lowest number of strikes and capture success. Results also suggested that *E. najas* is able to acclimate to the temperatures over the time period tested. This species also had a wide depth distribution in the lakes, which might explain its faster acclimation, even though a similar depth distribution was found in the non acclimating *C. pulchellum*. The other two species (besides *E. najas*) showed less clear patterns with regard to acclimation and it was difficult to tell if they were able to acclimate to the tested temperatures. My results suggest that damselfly larvae species are able to acclimate in prey capture behaviour over relatively short time periods in response to temperature fluctuations, and they might therefore be able to adapt to increasing temperature fluctuations in the future." (Authors)] Address: not stated

**19954.** Khelifa, M.R. (2017): Bioécologie de *Platycnemis subdilata* (Odonata: Platycnemididae) dans le bassin versant de la Seybouse. PhD thesis, Département de Biologie animale et végétale, Faculté des Sciences Biologiques et des Sciences Agronomiques, Université Mouloud Mammeri de Tizi-Ouzou: 101 pp. (in French, with English and Arabian summaries) ["*P. subdilata* is endemic to North Africa (Tunisia, Algeria and Morocco) but it has not been studied since its description in 1849. This study aims to document the distribution, abundance, taxonomy, life history, adult behavior, senescence and demographic parameters of the species in the Seybouse watershed, Northeast Algeria. The results show that *P. subdilata* is the most abundant lotic species in the watershed, estimating a minimum population size of 50,000 mature individuals. The exuvia is easily identifiable compared to other zygopterans of the region because it has a tail-like filament at the end of the caudal gills. In addition, the species presents morphological criteria that differentiate it from *P. pennipes* which is widespread in Europe. *P. subdilata* is univoltine with direct embryonic development and a fairly asynchronous larval development followed by a relatively long emergence season and flight period. Adult behavior is typically non-territorial in which the males use two different techniques to acquire females; one is to wait at reproductive sites and another is to seek within foraging sites. Senescence was recorded in clutch size and the rate of egg deposition. Adult survival depended on age and movement between foraging sites (dispersal), but reproductive success depended on age and sex. This study represents the raw material for future studies on *P. subdilata*." (Author)] Address: Khelifa, R., Biodiversity Research Center, Univ. of British Columbia, 2212 Main Mall, Vancouver. B.C. V6T1Z4, Canada. Email: rassimkhelifa@gmail.com

**19955.** Kulijer, D. (2017): First survey of the dragonfly fauna (Insecta, Odonata) of northwestern Bosnia. *Natura Croatica: Periodicum Musei Historiae Naturalis Croatici*

26(1): 65-80. (in English, with Bosnian summary) ["The results of the first study of the dragonfly fauna in northwest Bosnia are presented. Field surveys were conducted in summer 2012 and 2013, resulting in the identification of 36 species. Out of these, 34 are new for the region. The present paper gives a detailed overview of the results and a comparison of the dragonfly fauna composition of the region studied with the neighboring areas within Bosnia and Herzegovina and Croatia is made. The most abundant species were: *Calopteryx virgo*, *Sympetrum sanguineum*, *Onychogomphus forcipatus*, *Somatochlora meridionalis*, *Calopteryx splendens* and *Platycnemis pennipes*. Noteworthy are the records of *Chalcolestes viridis* and *Coenagrion scitulum*, two species that are rare in Bosnia and Herzegovina, and also *Coenagrion ornatum* and *Cordulegaster heros*, species of European conservation concern. Distribution and the status of these species and the conservation of dragonfly species in the country are briefly discussed. The data collected represent an important contribution to the knowledge of the dragonfly fauna of the Una River basin and Bosnia and Herzegovina." (Author)] Address: Kulijer, D., National Museum of Bosnia and Herzegovina, Zmaja od Bosne 3, 71000 Sarajevo, Bosnia and Herzegovina

**19956.** Kuncce, W.; Stoks, R.; Johansson, F. (2017): Single and mixture impacts of two pyrethroids on damselfly predatory behavior and physiological biomarkers. *Aquatic Toxicology* 190: 70-77. (in English) ["Highlights: •Damselfly larvae [*Coenagrion puella*] exposed to sub-lethal combination of pyrethroid insecticides. •Exposure to deltamethrin reduces predatory ability. •Combined exposure to deltamethrin and esfenvalerate inhibits the GST detoxification pathway. •Observed effects can eventually result in lower emergence of adults from contaminated ponds. Abstract: Direct mortality due to toxicity of single pesticide exposure along a concentration gradient, while the most common, is only one important parameter for assessing the effects of pesticide contamination on aquatic ecosystems. Sub-lethal toxicity can induce changes in an organism's behavior and physiology that may have population-level ramifications and consequences for ecosystem health. Additionally, the simultaneous detection of multiple contaminants in monitored watersheds stresses the importance of gaining a greater understanding of the toxicities of combined exposures, particularly at low, environmentally relevant concentrations. Using larvae of *Coenagrion puella*, we conducted a combined exposure investigation of two widely-used pyrethroid insecticides presumed to share the same neurotoxic mechanism of action, and estimated their effect on predatory ability, mobility and three physiological biomarkers (Glutathione S-transferase; GST, respiratory electron transport system; ETS, and malondialdehyde; MDA). Deltamethrin exposure (0.065 µg/L and 0.13 µg/L) was found to reduce the predatory ability, but it did not affect the larvae's mobility. Esfenvalerate exposure (0.069 µg/L and 0.13 µg/L), on the other hand, induced no significant changes in predatory ability or mobility. The decrease in predatory ability after the combination exposure (0.067 µg/L deltamethrin and 0.12 µg/L esfenvalerate) did not significantly differ from the impact of the single deltamethrin exposures. Glutathione-S-transferase was induced after single esfenvalerate exposure and the lower deltamethrin concentration exposure, but seemingly inhibited after exposure to the higher concentration of deltamethrin as well as the combination of both pyrethroids. Our data indicate that sub-lethal exposure to deltamethrin reduces predatory ability and suggest that sub-lethal combined exposure to deltamethrin and esfenvalerate inhibits

the GST detoxification pathway. These effects can eventually result in a lower emergence of adults from contaminated ponds." (Authors)] Address: Kuncce, W., Dept of Ecology and Genetics, Animal ecology, Norbyvägen 18 D, Uppsala Univ., SE-752 36 Uppsala, Sweden

**19957.** Laister, G. (2017): Öfter mal was Neues – Saphirauge (*Erythromma lindenii*) neu für das Linzer Stadtgebiet. *ÖKO·L* 39/2: 23-24. (in German) ["The first record from the Linz area dates from early August 1965 (Theischinger 1966). At that time Günther Theischinger was able to find a single, freshly hatched male at a pond in the Pleschinger Au. After that, there were no encounters with this species for a long time. It was not until 2013 - and in almost every year since then - that I was able to detect *E. lindenii* at the Großer Weikersee, but only in single specimens (12. 8. 2013, 6. 9. 2013, 7. 7. 2014, 8. 7. 2016). This makes it the 55th dragonfly species on Linz city territory. There is also another record from Upper Austria from the Machland region in 2013 (Huber 2014)." (Author(DeepL))] Address: Laister, G., Roseggerstr. 20, 4020 Linz, Austria. E-mail: gerold.laister@mag.linz.at

**19958.** Leiza, L.P.; Conesa García, M.A.; Torralba Burrial, A. (2017): Contribución de la red de seguimiento de la calidad de los ríos guipuzcoanos al conocimiento de la distribución de los Odonata de Gipuzkoa (España). *Boletín de la Sociedad Entomológica Aragonesa* 61: 278-280. (in Spanish, with English summary) ["Data on the distribution of rheophilic Odonata are presented, extracted from the analysis of the larvae included in the samples of benthic macroinvertebrates collected in a series of river quality monitoring campaigns conducted in Gipuzkoa (Spain). Records of special interest are those of *Coenagrion mercuriale* (Charpentier, 1840), *Onychogomphus forcipatus forcipatus* (Linnaeus, 1758), *Onychogomphus forcipatus unguiculatus* (Vander Linden, 1820) and *Oxygastra curtisii* (Dale, 1834)." (Authors)] Address: Leiza, L.P., EKOLUR Asesoría Ambiental SLL, Camino de Astigarraga 2, Pl. 4ª dcha.-Of. 8. 20180 Oiartzun, Spain. E-mail: leire@ekolur.com

**19959.** Lin, H.-T.; Leonardo, A. (2017): Heuristic rules underlying dragonfly prey selection and interception. *Current Biology* 27(8): 1124-1137. (in English) ["Highlights: •Dragonflies use heuristic selection rules to determine which prey to pursue. •Prey angular size and speed, foveation error, and zenith crossing are evaluated. •These rules initialize takeoff for optimal interception flight conditions. •Prey that do not satisfy the rules are usually ignored or pursued unsuccessfully. Summary: Animals use rules to initiate behaviors. Such rules are often described as triggers that determine when behavior begins. However, although less explored, these selection rules are also an opportunity to establish sensorimotor constraints that influence how the behavior ends. These constraints may be particularly significant in influencing success in prey capture. Here we explore this in dragonfly prey interception. We found that in the moments leading up to takeoff, perched dragonflies employ a series of sensorimotor rules that determine the time of takeoff and increase the probability of successful capture. First, the dragonfly makes a head saccade followed by smooth pursuit movements to orient its direction-of-gaze at potential prey. Second, the dragonfly assesses whether the prey's angular size and speed co-vary within a privileged range. Finally, the dragonfly times the moment of its takeoff to a prediction of when the prey will cross the zenith. Each of these processes serves a purpose. The angular size-speed criteria biases interception flights to catchable prey, while

the head movements and the predictive takeoff ensure flights begin with the prey visually fixated and directly overhead—the key parameters that underlie interception steering. Prey that do not elicit takeoff generally fail at least one of the criterion, and the loss of prey fixation or overhead positioning during flight is strongly correlated with terminated flights. Thus from an abundance of potential targets, the dragonfly selects a stereotyped set of takeoff conditions based on the prey and body states most likely to end in successful capture." (Authors)] Address: Leonardo, A., Janelia Research Campus, Howard Hughes Medical Institute, 19700 Helix Drive, Ashburn, VA 20147, USA. E-mail: leonardo@janelia.hhmi.org

**19960.** Mabidi, A.; Bird, M.S.; Perissinotto, R. (2017): Distribution and diversity of aquatic macroinvertebrate assemblages in a semi-arid region earmarked for shale gas exploration (Eastern Cape Karoo, South Africa). *PLoS ONE* 12(6): e0178559. <https://doi.org/10.1371/journal.pone.0178559>. 27 pp. (in English) ["This study aims to investigate macroinvertebrate assemblage structure and composition across the three major waterbody types (temporary rivers, depression wetlands and semipermanent dams) of the Eastern Cape Karoo, and to identify important environmental and spatial correlates of macroinvertebrate assemblage composition in the region. A total of 33 waterbodies (9 dams, 13 depression wetlands and 11 rivers) were sampled. Altogether, 91 taxa were recorded in November 2014 and 82 in April 2015. Twenty-seven taxa were common to all three waterbody types (across both sampling occasions), with 17 of these observed in November and 19 in April. The ANOSIM tests revealed significant differences in assemblage composition between the depression wetlands and rivers for both sampling occasions, but dams did not differ from the other waterbody types. SIMPER analyses indicated that the notonectid *Anisops varia* and the corixid *Micronecta scutellaris* were abundant across all three waterbody types during both sampling occasions. The mayfly *Cloeon africanum* and the damselfly *Pseudagrion* sp. were abundant in river habitats during both sampling occasions, while the gastropod mollusc *Bulinus tropicus* and the copepod *Lovenula falcifera* best characterised depression wetlands on both occasions. Non-metric multidimensional scaling ordination highlighted a clear separation of assemblages between November and April, while distance-based Redundancy Analysis revealed that conductivity, altitude, turbidity and pH were the most important variables explaining the variation in macroinvertebrate assemblage patterns. These results provide baseline information which is important for future biological monitoring of impacts associated with hydraulic fracturing activities and climatic changes in the region." (Authors)] Address: Mabidi, Annah, DST/NRF Research Chair in Shallow Water Ecosystems, Nelson Mandela Metropolitan Univ., Port Elizabeth, South Africa. E-mail: annahanusa@gmail.com

**19961.** Masius, P. (2017): *Coenagrion mercuriale* an der Weende bei Göttingen. *Mitteilungen Nr. 3 der AG Libellen in Niedersachsen und Bremen*: 22-25. (in German) [Weende between Bovenden and Nörten-Hardenberg (Landkreis Göttingen, Niedersachsen, Germany); 5-VII-2016] Address: Masius, P., Auf dem Hagen 18, 37079 Göttingen, Germany. E-mail: Patrick\_masius@gmx.de

**19962.** Miriglu, A.; Demirtas, A. (2017): Ecological niche modelling of *Calopteryx splendens* (Harris, 1782) (Insecta: Odonata) subspecies in Turkey. *Süleyman Demirel Univ. Journal of Natural and Applied Sciences* 21(3): 935-941. (in

Turkish, with English summary) ["Turkey is an important region in terms of biodiversity because of its geographical location, topographical structure and the presence of various climate types. The emergence of new species and subspecies can be seen. In this study, we evaluated subspecies of *C. splendens* distributed in Turkey. 19 ecological parameters of the current known localities of these subspecies were analyzed. The potential habitats and new locations for the subspecies populations were investigated. Current distribution maps of *C. splendens* subspecies have been made using MaxEnt ecological niche modelling methods. According to these results, it was found that the distribution areas of *C. splendens* subspecies, whose distributions according to faunistic data are known, almost overlapped with the distribution areas of ecological data." (Authors)] Address: Demirtas, A., Ondokuz Mayıs Üniversitesi, Fen-Edebiyat Fakültesi, Biyoloji Bölümü, 55105, Samsun, Turkey

**19963.** Mukherjee, P.; Khan, M.M.H. (2017): Abundance of arthropod insect pests and natural enemies in rice field as influenced by rice growth stages and neighboring crops. *Bangladesh J. Agril. Res.* 42(2): 309-319. (in English) ["Studies were conducted to record the abundance of arthropod insect pests and natural enemies in rice fields as influenced by rice growth stages and neighboring crops at the experimental farm of Patuakhali Science and Technology Univ. (PSTU), Dumki, Patuakhali during 2012 in Boro rice season following randomized complete block design. Results indicated that rice-tree habitat showed the highest abundance of leafhoppers (100.75) followed by cricket (16.50), grasshoppers (15.25) and stink bugs (15.25). The lowest abundance of all insect pests was in rice-sesame habitat. No significant differences were found on the abundance of rice bug, rice hispa and stem borer populations. At seedling stage, the highest abundance of leafhopper (94.25) was recorded followed by grasshopper (47.00) and stink bug (26.50) while the lowest was stem borer (0.57) and rice hispa (6.00). At early tillering stage, maximum number of grasshopper (17.25) was recorded followed by cricket (7.00). At maximum tillering stage, the highest abundance of leafhoppers (122.5) was obtained followed by rice bug (62.00) and the lowest was the stink bug (7.00). At panical initiation stage, the highest abundance of rice bug (334.00) was recorded which was followed by leafhoppers (65.25) and the lowest was the cricket (15.75). No population of rice hispa and stem borer was recorded at maximum tillering and panical initiation stages. In case of natural enemies, the highest abundance of lady bird beetle (45.27) and damselfly (16.73) was found in rice-rice habitat. The highest abundance of ichneumonid wasp (57.53) was in rice-tree habitat and ground beetle (28.80) was in rice-sesame habitat. No significant differences were observed on the abundance of dragonfly, spider and dipteran fly among different habitats. Among different growth stages of rice plant, significantly the highest abundance of lady bird beetle was recorded at maximum tillering stage. The highest abundance of ichneumonid wasp and ground beetle was recorded at seedling stage. The highest abundance of damselfly, spider and dipteran fly was at early tillering stage. No significant difference was observed on the abundance of dragonfly among different rice growth stages." "Dragonfly population did not differ significantly within rice habitats. The maximum number of dragonfly was observed in rice-maize habitat (1.50 dragonfly/40 sweeps) followed by rice-sesame and rice-maize habitats. The minimum number of dragonfly was observed in rice-tree habitat (0.42 dragonfly/40 sweeps) (Table 3). In case of different growth stages, dragonfly population also did not differ significantly (Table 4). The highest abundance

was at panicle initiation stage (2.25 dragonfly/40 sweeps) and the lowest was found at seedling stage. No dragonfly population was observed at early tillering stage." (Authors)] Address: Mukherjee, P., Dept Entomology, Patuakhali Science and Technology Univ., Dumki, Patuakhali, Bangladesh

**19964.** Mutlu, O.; Ulak, G.; Akar, F.; Erden, F.; Celikyurt, I.K.; Bektas, E.; Tanyeri, P.; Kaya, H. (2017): Effects of acute administration of adipokinetic hormone on depression, anxiety, pain, locomotion and memory in mice. *Chin J Physiol.* 60(2): 106-113. (in English) ["The neurosecretory cells in the corpus cardiacum of insects synthesize a set of hormones that are called adipokinetic, hypertrehalosemic or hyperprolinemic depending on the insect in question. They are the Adipokinetic Hormone/Red Pigment-Concentrating Hormone (AKH/RPCH) family of peptides. The present study investigated the effects of acute administration of *Locusta migratoria* (Locmi-AKHII) and *Anax imperator* (Anaim-AKH) on depression, anxiety, pain (analgesy), locomotion and memory in mice in forced swimming (FST), elevated plus maze (EPM), hot plate, locomotor activity and passive avoidance tests. Both Locmi-AKH-II (4 mg/kg) and Anaim-AKH (0.25 and 0.50 mg/kg) decreased immobility time (in sec, s) in the FST test. Anaim-AKH (0.5 and 1 mg/kg) increased the percentage of time spent in open arms/total time spent and the percentage of the number of open arm/total arm entries in the EPM test. Anaim-AKH (1 and 2 mg/kg) significantly increased latency (s) (initial time passed) for mice to lick their hind paws or jumping in the hot plate test. Anaim-AKH (4 mg/kg) significantly decreased the total distance (cm) moved, or the speed (cm/s) of movement of the animals in the locomotor activity test. Neither Locmi-AKH-II nor Anaim-AKH altered the retention latency (s) in the passive avoidance test. Both Locmi-AKH-II and Anaim-AKH exerted antidepressant effects, while only Anaim-AKH had anxiolytic and analgesic effects when administered acutely. Anaim-AKH diminished locomotion at higher doses while Locmi-AKH-II had no such effects. Neither Locmi-AKH-II nor Anaim-AKH disturbed learning and memory when acutely administered. Data of our studies suggest clinical potentials of AKH to be used in depression, anxiety and pain without disturbing memory." (Authors)] Address: Mutlu, O., Kocaeli Univ. Medical Faculty, Dept of Pharmacology, 41380, Kocaeli, Turkey

**19965.** Op de Beeck, L.; Verheyen, J.; Olsen, K.; Stoks, R. (2017): Negative effects of pesticides under global warming can be counteracted by a higher degradation rate and thermal adaptation. *Journal of Applied Ecology* 54(6): 1847-1855. (in English) ["1. An alarming finding for biodiversity is that global warming and pesticides often interact synergistically. Yet, this synergism may not capture the full picture because two counteracting processes may reduce the higher impact of pesticides under warming: higher pesticide degradation in the environment and thermal adaptation of populations. 2. We tested for the effects of warming and multiple pulses of the insecticide chlorpyrifos on life history and fitness-related physiological traits in the damselfly *Ischnura elegans*. To assess whether thermal adaptation is able to mitigate the impact of the pesticide under future warming, we exposed replicated populations from a colder, high latitude and from a warmer, low latitude in a common garden rearing experiment at 20 and 24°C (the respective mean summer water temperatures at both latitudes). 3. At the higher temperature pesticide degradation was higher, leading to less accumulation after multiple pulses compared to the lower temperature. Accordingly, the pesticide caused

less mortality and less oxidative damage at the higher temperature. This contradicts the general belief (based on studies that kept pesticide concentrations constant) of a higher impact of pesticides under warming. Furthermore, the reduction of the impact of the pesticide at the higher temperature was more pronounced in the warm-adapted low-latitude populations, indicating a counteracting role of thermal adaptation. 4. Policy implications. Our findings provide proof-of-principle for two key insights that will allow improving ecological risk assessment of pesticides under global warming: (i) higher pesticide degradation in the environment under warming may temper the impact of multiple pesticide pulses; (ii) gradual thermal evolution may further reduce the impact of pesticides at high latitudes under global warming. This knowledge can be very important for policy makers to arrive at a more realistic forecasting of the impacts of chemical pollution and climate change interactions on organisms." (Authors)] Address: Op de Beeck, Lin, Laboratory of Aquatic Ecology, Evolution and Conservation, Univ. of Leuven, Charles Deberiotstraat 32, B-3000 Leuven, Belgium. Email: lin.opdebeeck@kuleuven.be

**19966.** Ott, J. (2017): Libelle des Jahres 2017: Gemeine Keiljungfer. DATZ 1/2017: 11- (in German) [General introduction into the dragonfly of the year 2017 *Gomphus vulgaticissimus*.] Address: Ott, J., Friedhofstr. 28, D-67705 Trippstadt, Germany. E-mail: ott@lupogmbh.de

**19967.** Outomuro, D.; Söderquist, L.; Johansson, F.; Ödeen, A.; Nordström, K. (2017): The price of looking sexy: visual ecology of a three level predator-prey system. *Functional Ecology* 31(3): 707-718. (in English) ["(1.) Colour signals and colour vision play a pivotal role in intraspecific communication and predator-prey interactions. However, the costs of expressing conspicuous sexual signals at multiple trophic levels have been largely overlooked. Sexual signals can also experience character displacement in sympatric populations of closely-related species, leading to potential changes in conspicuousness. (2.) We here investigate a bird-damselfly-fruit fly predator-prey system, where two closely related damselfly species have conspicuous, sexually selected wing coloration. The damselflies can occur in sympatry and allopatry and reproductive character displacement in the coloration size has been previously reported. (3.) We quantify the damselfly wing reflectance from replicated sympatric and allopatric populations, and use receptor noise models to investigate the visual discriminability of the wing coloration for the bird, damselfly and fly vision systems, against natural backgrounds. We perform electroretinograms to study damselfly eye sensitivity. We also estimate damselfly predation risk in natural populations. (4.) We find that the chromatic component of wing coloration makes males highly discriminable to the predator, but not to the prey. However, female wing coloration is predominantly cryptic for the predator and prey, and interestingly, also for male damselflies. A female being cryptic to conspecifics likely reduces male harassment. The estimates of predation risk partially support the discriminability results. We also show that there is no difference in colour vision sensitivity between the two damselfly species and sexes, and no difference in wing coloration or its discriminability between sympatric and allopatric populations. (5.) Our results suggest that sexually selected traits can be antagonistically selected by predators and prey, and that this antagonistic selection can be sex-dependent: males are paying a large cost in terms of conspicuousness, while females remain mostly cryptic. Our study thus emphasizes the need for investigating visual communication at multi-trophic levels since the

degree of colour discriminability can differ between predators, prey and the focal species." (Authors)] Address: Outomuro, D., Section for Animal Ecology, Dept of Ecology and Genetics, Evolutionary Biology Centre, Uppsala Univ., Norbyvägen 18D, 75236 Uppsala, Sweden. E-mail: outomuro.-david@gmail.com

**19968.** Owens, G.L.; Rennison, D.J. (2017): Evolutionary ecology of opsin gene sequence, expression and repertoire. *Molecular Ecology* 26: 1207-1210. (in English) ["Linking molecular evolution to biological function is a long-standing challenge in evolutionary biology. Some of the best examples of this involve opsins, the genes that encode the molecular basis of light reception. In this issue of *Molecular Ecology*, three studies examine opsin gene sequence, expression and repertoire to determine how natural selection has shaped the visual system. First, Escobar-Camacho et al. (2017) use opsin repertoire and expression in three Amazonian cichlid species to show that a shift in sensitivity towards longer wavelengths is coincident with the long-wavelength-dominated Amazon basin. Second, Stieb et al. (2017) explore opsin sequence and expression in reef-dwelling damselfish and find that UV- and long-wavelength vision are both important, but likely for different ecological functions. Lastly, Suvorov et al. (2017) study an expansive opsin repertoire in the insect order Odonata and find evidence that copy number expansion is consistent with the permanent heterozygote model of gene duplication. Together these studies emphasize the utility of opsin genes for studying both the local adaptation of sensory systems and, more generally, gene family evolution." (Authors)] Address: Owens, G.L., Dept of Botany and Biodiversity Research Centre, Univ. of British Columbia, Vancouver, BC, Canada E-mail: gregory.owens@alumni.ubc.ca

**19969.** Pereira, D.F.G. (2017): Filtros ambientais determinando caracteres funcionais de assembleias de Odonata. *Dissertação (Mestrado) - Universidade Federal do Pará, Empresa Brasileira de Pesquisa Agropecuária, Instituto de Ciências Biológicas, Belém, 2017. Programa de Pós-Graduação em Ecologia: X + 28 pp.* (in Portuguese, with English summary) ["Species distribution is affected by availability of habitats that fit within the limits of variation of their niche and by interaction with other species. Environmental modifications, especially those of anthropic origin, are increasingly common, and are considered major causes of species extinction during the Anthropocene. Aquatic ecosystems are considered among the most vulnerable on the planet because of its dependence on the surroundings and the drainage system. However, species responses to these changes are not random, and can follow patterns that are caused by the specific functionality or morphology of each taxon. This work's goal was to evaluate if environmental factors work as ecological filters for the establishment of Odonata species through selection of their functional and morphological characters, testing the hypotheses that a) the environment works as a filter over species, by facilitating or hindering characters and b) that due to their thermoregulatory and reproductive requirements, indispensable for colonization and population maintenance, thorax width and oviposition type will be the most affected biological variables. Considering that, we sampled 97 streams in the oriental side of the Brazilian Amazon Forest, distributed over an environmental gradient which covers areas ranging from untouched primary forest to areas extremely modified by agriculture and livestock. We used six functional traits (total body length, fore wing length, fore wing width, thorax width, abdominal

length and oviposition type) and seven environmental variables (habitat integrity index, dissolved oxygen, water temperature, canopy cover, macrophytes cover, pH and conductivity). To evaluate if the environmental variables affected the odonate communities, we used the combination of the RLQ and Fourth Corner analysis, with which we assessed the relation between each of the selected traits with each of the habitat descriptors. Among the studied environmental variables, habitat integrity index presented the largest effect over the community of Odonata, having a negative relation with fore wing width, thorax width and exophytic oviposition, and a positive relation with endophytic oviposition. Macrophytes cover showed a negative relation with abdominal length and a positive relation with thorax width and exophytic oviposition. No other environmental descriptor presented significant relations. The results show that poorly preserved habitats facilitate the occurrence of organisms with larger thorax and the substitution of the endophytic by the exophytic type of oviposition. Since environmental impacts usually do not change Odonata species richness, only community composition, these results point that there is favouritism towards groups of species with those characters, like the Libellulidae family, with detriment to other families or groups (specially of the Zygoptera suborder), what might result in community homogeneity and loss of functional and phylogenetic diversity. Thus, the preservation of primary forest is indispensable for the maintenance of Odonata, being the best way to conserve the different ecophysiological and behavioural groups in the order. The dragonfly communities' responses, directed by morphological and behavioural traits, enlightens ecological response patterns, and the addition of oviposition categories to conservation policies for the Odonata is critical in making them more effective, as they are absolutely necessary for population stability and colonizing new sites." (Author) "Conclusion The results of this study allow us to identify a clear influence of environmental factors on the composition of Odonata assemblages, confirming the hypotheses that the environment works as an environmental filter for certain characters and that thorax width and oviposition would be the characters most influenced. The quality of the environment, measured by the environmental integrity index, in particular, has a marked effect on the composition of the assembly, affecting both morphological and behavioural characters. The morphophysiological/behavioural approach used in this study sheds new light on Odonata distribution patterns (and their determinants), in contrast to traditional approaches, commonly working with suborders independently or with thermoregulatory categories. Therefore, the integration of morphological and behavioral data in Odonata studies (especially on oviposition) is necessary for a better understanding of the processes that determine the occurrence of the species." Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (free version)] Address: Pereira, D., Laboratório de Sistemática e Ecologia de Insetos – Centro Universitário do Norte do Espírito Santo, Brasil. E-mail: pereira.dfg@gmail.com

**19970.** Pfeifer, E.; Markow, T.A. (2017): Population connectivity and genetic diversity in long-distance migrating insects: divergent patterns in representative butterflies and dragonflies. *Biological Journal of the Linnean Society* 122 (2): 479-486. (in English) ["A number of insect species undergo annual and strikingly long-distance migrations. While the census sizes appear to be very large in many of these species, our understanding of their population genetics and interpopulation connectivity remains elusive. Here, we summarize the utility and limitations of mitochondrial DNA barcodes to assess migratory patterns and genetic connectivity

among populations of four well-known species of long-distance, multigenerational insect migrants, *Danaus plexippus* and *Vanessa cardui*, and *Pantala flavescens* and *Anax junius*. We contrast the differences between the two butterfly species, which show low genetic diversity and little or no phylogeographic structuring, with the two dragonfly species which show an intriguing pattern of high genetic diversity and no apparent phylogeographic structure. Although a recent population genetic study of *P. flavescens* reported high gene flow and reduced (or diminished) COI genetic diversity across widely separated geographic regions, suggesting global panmixia, reanalysis of the data from that study revealed high genetic diversity in agreement with other studies on both *P. flavescens* and *A. junius*. The presence of isolated populations of *P. flavescens*, such as found on Easter Island that appear non-migratory, as well as evidence for significant structure among some migratory populations, suggest that concluding global panmixia in *P. flavescens* may be premature. We also suggest that cost-effective barcode analyses would be the method of choice for preliminary analyses of large data sets required to assess migratory routes and connectivity among populations on a global scale." (Authors)] Address: Pfeiler, E., Centro de Investigación & Alimentación y Desarrollo, A.C., Unidad Guaymas, Apartado Postal 284, Guaymas, Sonora C.P. 85480, México. Email: pfeiler@ciad.mx

**19971.** Phillips, I.D.; Prestie, K.S. (2017): Evidence for substrate influence on artificial substrate invertebrate communities. *Environmental Entomology* 46(4): 926-930. (in English) ["Cobble baskets are frequently used as a tool to measure differences in benthic macroinvertebrate communities between waterbodies; however, underlying differences in substrate type may influence the resultant colonization of baskets, misrepresenting communities. This study tests the hypothesis that cobble basket placement influences the resulting benthic macroinvertebrate community. Cobble basket arrays (n=74) were deployed in Dog Lake, Saskatchewan, in 2011 (97 d) and 2012 (95 d) on cobble habitats and soft or sandy substrates ~100 m apart. Baskets placed on cobble substrate had significantly higher Shannon-Weaver diversity relative to those placed on soft substrate in both years, and higher % EPT (Ephemeroptera Plecoptera Trichoptera) in 2011, but total density was not significantly different. Nonmetric multidimensional scaling revealed that the community was different between both treatments, characterized by higher densities of *Gammarus lacustris* Sars in baskets placed on soft sediment in both years, higher densities of *Aeshna* sp. and *Mystacides* sp. on cobble substrate in 2011, and higher densities of *Helobdella stagnalis* (L.) and *Glossophinia complanata* (L.) on cobble substrate in 2012. The results were consistent with the hypothesis that baskets placed on cobble substrate versus soft substrate will result in differing community colonization. The resulting recommendation for monitoring and assessment using cobble baskets in lakes is that baskets be placed on comparable substrate type when comparing between lakes, and that cobble beds be chosen as a more appropriate substrate for deployment, as the added habitat complexity of baskets on soft sediment may act as an attractant and not reflect the true community composition of that habitat." (Authors)] Address: Phillips, I.D., Water Quality and Habitat Assessment Services, Water Security Agency, 101-108 Research Dr., Saskatoon, Saskatchewan, S7N 3R3, Canada. Email: iain.phillips@wsask.ca

**19972.** Pinkert, S.; Brandl, R.; Zeuss, D. (2017): Colour lightness of dragonfly assemblages across North America and

Europe. *Ecography* 39: 1-8. (in English) ["Dark-coloured ectotherms absorb energy from the environment at higher rates than light-coloured ectotherms. The thermal melanism hypothesis (TMH) states that this physical mechanism links the colour lightness of the body surfaces of ectotherms to their thermal environment and hence to their geographical distribution. Studies on different insect taxa in Europe found support for this prediction of the TMH. However, whether these results hold also for other biogeographical regions remains unclear. Here, we quantify and map the colour lightness of dragonfly species in North America and directly compare our results to previously published findings for Europe. We estimated the colour lightness of 152 North American dragonfly species from published illustrations, compiled their distribution data from the literature and combined all these data with six biologically relevant environmental variables. We evaluated the importance of phylogenetic autocorrelation for the spatial variation of mean colour lightness of dragonfly assemblages (grid cells of approximately 50 km × 50 km size) by repeating all analyses also for the phylogenetically predicted component of the colour lightness of species and the species-specific deviation from this prediction. We also accounted for spatial autocorrelation with autoregressive error models. All statistical approaches showed that dragonfly assemblages from both continents consistently tended to be darker coloured in regions with cold climates and lighter coloured in regions with warm climates. Regression slopes, however, were significantly less steep, and the amount of variance explained by environmental variables was lower for North America than for Europe. Our results highlight the importance of colour lightness for the distribution of dragonfly species, but they also indicate that idiosyncrasies of the continents modify the general pattern." (Authors)] Address: Pinkert, S., Dept of Ecology – Animal Ecology, Philipps-Universität Marburg, Karl-von-Frisch-Strasse 8, 35043 Marburg, Germany. E-mail: stefanpinkert@posteo.de

**19973.** Pinkert, S.; Dijkstra, K.-D.B.; Zeuss, D.; Reudenbach, C.; Brandl, R.; Hof, C. (2017): Evolutionary processes, dispersal limitation and climatic history shape current diversity patterns of European dragonflies. *Ecography* 41(5): 795-804. (in English) ["We investigated the effects of contemporary and historical factors on the spatial variation of European dragonfly diversity. Specifically, we tested to what extent patterns of endemism and phylogenetic diversity of European dragonfly assemblages are structured by (i) phylogenetic conservatism of thermal adaptations and (ii) differences in the ability of post-glacial recolonization by species adapted to running waters (lotic) and still waters (lentic). We investigated patterns of dragonfly diversity using digital distribution maps and a phylogeny of 122 European dragonfly species, which we constructed by combining taxonomic and molecular data. We calculated total taxonomic distinctiveness and mean pairwise distances across 4,192 50 km × 50 km equal-area grid cells as measures of phylogenetic diversity. We compared species richness with corrected weighted endemism and standardized effect sizes of mean pairwise distances or residuals of total taxonomic distinctiveness to identify areas with higher or lower phylogenetic diversity than expected by chance. Broken-line regression was used to detect breakpoints in diversity-latitude relationships. Dragonfly species richness peaked in central Europe, whereas endemism and phylogenetic diversity decreased from warm areas in the south-west to cold areas in the north-east and with an increasing proportion of lentic species. Except for species richness, all measures of diversity were consistently higher in formerly unglaciated areas



south of the 0°C isotherm during the Last Glacial Maximum than in formerly glaciated areas. These results indicate that the distributions of dragonfly species in Europe were shaped by both phylogenetic conservatism of thermal adaptations and differences between lentic and lotic species in the ability of post-glacial recolonization/dispersal in concert with the climatic history of the continent. The complex diversity patterns of European dragonflies provide an example of how integrating climatic and evolutionary history with contemporary ecological data can improve our understanding of the processes driving the geographical variation of biological diversity." (Authors)] Address: Pinkert, S., Dept of Ecology – Animal Ecology, Philipps-Universität Marburg, Karl-Von-Frisch-Strasse 8, 35043 Marburg, Germany. E-mail: stefanpinkert@posteo.de

**19974.** Rach, J.; Bergmann, T.; Paknia, O.; DeSalle, R.; Schierwater, B.; Hadrys, H. (2017): The marker choice: Unexpected resolving power of an unexplored CO1 region for layered DNA barcoding approaches. *PLoS ONE* 12(4): e0174842. <https://doi.org/10.1371/journal.pone.0174842>: 14 pp. (in English) ["The potential of DNA barcoding approaches to identify single species and characterize species compositions strongly depends on the marker choice. The prominent "Folmer region", a 648 basepair fragment at the 5' end of the mitochondrial CO1 gene, has been traditionally applied as a universal DNA barcoding region for metazoans. In order to find a suitable marker for biomonitoring odonates (dragonflies and damselflies), we here explore a new region of the CO1 gene (CO1B) for DNA barcoding in 51 populations of 23 dragonfly and damselfly species. We compare the "Folmer region", the mitochondrial ND1 gene (NADH dehydrogenase 1) and the new CO1 region with regard to (i) speed and reproducibility of sequence generation, (ii) levels of homoplasy and (iii) numbers of diagnostic characters for discriminating closely related sister taxa and populations. The performances of the gene regions regarding these criteria were quite different. Both, the amplification of CO1B and ND1 was highly reproducible and CO1B showed the highest potential for discriminating sister taxa at different taxonomic levels. In contrast, the amplification of the "Folmer region" using the universal primers was difficult and the third codon positions of this fragment have experienced nucleotide substitution saturation. Most important, exploring this new barcode region of the CO1 gene identified a higher discriminating power between closely related sister taxa. Together with the design of layered barcode approaches adapted to the specific taxonomic "environment", this new marker will further enhance the discrimination power at the species level." (Authors)] *Aeshna cyanea*, *A. grandis*, *A. mixta*, *A. rileyi*, *Anaciaeschna triangulifera*, *Anax imperator*, *A. speratus*, *Brachytron pratense*, *Gynacantha villosa*, *Paragomphus genei*, *Crocothemis erythraea*, *C. sanguinolenta*, *Orthetrum julia falsum*, *O. trinacria*, *Trithemis morrisoni*, *T. s. palustris*, *Pseudagrion acaciae*, *P. bicoerulans*, *P. kersteni*, *P. massaicum*, *P. niloticum*, *Chlorocnemis abbotti*, *Coryphagrion grandis*] Address: Rach, Jessica, ITZ, Ecology & Evolution, TiHo Hannover, Hannover, D-30559, Germany

**19975.** Razeng, E.; Smith, A.E.; Harrison, K.A.; Pavlova, A.; Nguyen, T.; Pinder, A.; Suter, P.; Webb, J.; Gardner, M.G.; Box, J.B.; Thompson, R.; Davis, J.; Sunnucks, P. (2017): Evolutionary divergence in freshwater insects with contrasting dispersal capacity across a sea of desert. *Freshwater Biology* 62(8): 1443-1459. (in English) ["1. Arid landscapes pose arguably one of the greatest challenges to dispersal of aquatic insects, and may drive speciation in taxa

with low dispersal potential. We investigated genetic divergence in aquatic insects with high and low dispersal potential between two regions within the Australian arid zone. We used two dragonfly species [*Diplacodes haematodes*, *Orthetrum caledonicum*] to infer patterns for strong-dispersing species, and mayfly species from two genera to represent weak-dispersing species. Based on dispersal-related traits of the taxa, we predicted that dragonflies would show little divergence between and within the two geographical regions, while mayflies would show evidence of genetic isolation, with divergence timing associated with aridification in Australia. 2. Samples were collected from perennial pools in ephemeral stream networks in central and western Australia. The two study regions are separated by approximately 1,500 km of predominantly dune desert. Collected insects were sequenced for one mitochondrial and one nuclear marker. We investigated spatial distribution of haplotypes, estimated divergence dates for identified mayfly lineages, and performed phylogenetic reconstruction to investigate relationships with known congeners. 3. Both dragonfly species showed evidence of recent or ongoing gene flow between the central and western Australian study regions. In contrast, mayflies showed evidence of ancient, but not recent, gene flow between regions, with species-level CO1 divergence within regions. We found 11 previously unknown putative mayfly species, that if confirmed could double the known diversity within these genera in Australia. Timing of divergence events for mayflies coincided with the development of the Australian arid zone, and phylogenetic relationships are similar to divergence patterns found in other Australian arid taxa. 4. The findings of this study suggest that aridification is more likely to be a driver of diversification in taxa with low dispersal potential than in those with high dispersal potential. This is because effective aerial dispersal is integral for maintaining gene flow when aquatic connections are lost between distant populations, and reduced gene flow can promote genetic divergence." (Authors)] Address: Razeng, Emma, School of Biological Sciences, Monash Univ., Clayton, VIC 3800 Australia. Email: emma.razeng@monash.edu

**19976.** Rivas-Torres, A., Sanmartín-Villar, I.; Gabela-Flores, M.V.; Cordero-Rivera, A. (2017): Demographics and behaviour of *Heteragrion cooki*, a forest damselfly endemic to Ecuador (Odonata). *International Journal of Odonatology* 20(2): 123-135. (in English) ["Damselflies adapted to forest habitats are expected to be negatively affected by the disturbance of riparian forests, due to the change in insolation when trees are cleared. In this paper, we compare survivorship and behaviour of two populations of *Heteragrion cooki* by means of mark-recapture methods and focal observations of adults. We found similar densities of males (but not of females) in both streams, and similar recapture rates, higher for males (50%) than for females (20%). Body size was also significantly different between populations, with smaller individuals in the shadiest stream. The analysis of daily survival rates indicated that in the shaded stream, males survived better than females, whereas in the sunnier stream survival was similar between sexes, but varied over time. Furthermore, in the sunny stream, body size was negatively correlated with survival. Males arrived earlier than females to the stream, with a maximum activity between 13 and 16 hours. They defended small patches of the stream, exhibiting high site fidelity and aggressive behaviour against conspecific males. Copulation, which was very rarely seen in the stream, lasted about six minutes. Pairs in tandem remained for an average of 45 minutes laying eggs on roots

and lianas. We found that *H. cooki* was not drastically affected by the loss of riparian vegetation, maintaining similar densities of males in both streams, probably because small remnants of native forests were still found near to the stream." (Authors)] Address: Rivas-Torres, A., ECOEVO Lab, Unie de Vigo, EUE Forestal, Pontevedra, Spain. Email: arivasto@gmail.com

**19977.** Roh, C. (2017): Hydrodynamics of insects. Part 1. Jetting of the dragonfly larvae. Part 2. Honeybee at the air-water interface: Surfing with the capillary wave. Ph.D. thesis, California Institute of Technology. doi:10.7907/Z97P8-WFW. <http://resolver.caltech.edu/CaltechTHESIS:060820-17-183218154> : 103 pp. (in English) ["This thesis presents the study on the hydrodynamics of two insects commonly known for their aerial adaptation: the dragonfly and the honeybee. Part 1: Anisopteran dragonflies live underwater in their larval stages. The key factor for their aquatic adaptation is the modified hindgut chamber that is used as a pump. The two main functions of this biological pump are jet propulsion and respiration. Both functions involve jetting and refilling of the chamber through an orifice guard by a tri-leaflet anal valve. Despite it being a unique machinery among insects, associated hydrodynamic studies are limited thus far. In the first part of this thesis, various aspects of the hydrodynamics of the dragonfly larvae's ventilatory flow are studied. The flow visualization showed that the respiratory flow is laminar but the propulsion flow is turbulent. The hydrodynamic force analysis showed that jetting and refilling phase forces are dominated by quasi-steady momentum flux and unsteady acceleration, respectively. Finally, simultaneous measurement of the anal valve kinematics and jet flow showed that the larvae could influence the direction and magnitude of the jet by controlling the anal valve leaflets. Part 2: Water-collecting honeybees often fall onto water surfaces. However, bees trapped by the "stickiness" of the water can propel by vibrating their wings, often making it to shore. In the second part of this thesis, the honeybee's propulsion mechanisms at the air-water interface is studied. The result shows that the bees can achieve three body-lengths per second propulsion speed. High-speed video of their wing motion shows that honeybee's propulsion involves pulling blobs of water with the underside of the wing, while pushing on a surface wave with its trailing edge. This propulsion mechanism resembles surfing on a self-generated capillary wave. Moreover, their wing vibration generates complicated surface waves and flows, below which the deeper water flow shows a single jet stream. From the wave and flow field measurements, the average force imparted to the surrounding fluid is estimated and compared to the average force calculated from the bee's body motion. The resulting average forces are of the same order of magnitude, which means that generating wave and flow are both important for the bee's propulsion." (Author)] Address: not stated

**19978.** Rossi, C. (2017): *Selysiotemis nigra*, especie nueva en la provincia de Jaén. Boletín Rola nº 10, segundo semestre 2017: 7-12. (in Spanish, with English summary) [2017; records of *S. nigra* from four localities in Jaén province, Spain are documented.] Address: E-mail: scarmiglione@hotmail.com

**19979.** Sánchez-Guillén, R.A.; Wellenreuther, M.; Chávez-Ríos, J.R.; Beatty, C.D.; Rivas-Torres, A.; Velasquez-Velez, M.; Cordero-Rivera, A. (2017): Alternative reproductive strategies and the maintenance of female color polymorphism

in damselflies. *Ecol Evol.* 2017; 11pp. <https://doi.org/10.1002/ece3.3083>: 11 pp. (in English) ["Genetic polymorphisms are powerful model systems to study the maintenance of diversity in nature. In some systems, polymorphisms are limited to female coloration; these are thought to have arisen as a consequence of reducing male mating harassment, commonly resulting in negative frequency-dependent selection on female color morphs. One example is the damselfly *Ischnura elegans*, which shows three female color morphs and strong sexual conflict over mating rates. Here, we present research integrating male tactics, and female evolutionary strategies (female mating behavior and morph-specific female fecundity) in populations with different morph-specific mating frequencies, to obtain an understanding of mating rates in nature that goes beyond the mere measure of color frequencies. We found that female morph behavior differed significantly among but not within morphs (i.e., female morph behavior was fixed). In contrast, male tactics were strongly affected by the female morph frequency in the population. Laboratory work comparing morph-specific female fecundity revealed that androchrome females have lower fecundity than both of the gynochrome female morphs in the short term (3-days), but over a 10-day period one of the gynochrome female morphs became more fecund than either of the other morphs. In summary, our study found sex-specific dynamics in response to different morph frequencies and also highlights the importance of studying morph-specific fecundities across different time frames to gain a better understanding of the role of alternative reproductive strategies in the maintenance of female-limited color polymorphism" (Authors)] Address: Sánchez-Guillén, Rosa, Depto de Ecología e Biología Animal, E. U. E. T. Forestal, Universidade de Vigo, Pontevedra, Spain. E-mail: rguillen@uvigo.es

**19980.** Schneider, T.; Ikemeyer, D. (2017): Late summer observations on Odonata from the Armenian Highland to the Talysh Mountains in north-west Iran. *Entomologist's Monthly Magazine* 153: 1-10. (in English) ["In August 2016, 32 Odonata species were recorded from north-west Iran. A poorly-known central Asian species *Sympetrum haritonovi*, which has its western outposts in the Taurus Mountains, Turkey was found in a new location on the Armenian Highland in Iran further filling the geographical gap between its terra typica in Tadjikistan and its western outposts. The newly detected population with over 1000 individuals may be the largest so far known. *Lestes dryas* and *Coenagrion puella*, both Euro-Siberian faunal elements and new for Iran, were detected in the Armenian Highland; *L. dryas* also in the Talysh Mountains. *Platycnemis kervillei* is regarded as a Levantine endemic and an early summer species; however, we found large populations by some mountain brooks in Azarbāyejān-e-Sharqi Province and Ardabil Province, extending its range significantly to the north-east and its flight season significantly into late summer." (Authors)] Address: Schneider, T., Arnold-Knoblauchring 76, D-14109 Berlin, Germany. E-mail: thomas.rs@gmx.de

**19981.** Seidu, I.; Danquah, E.; Nsor, C.A.; Kwarteng, D.A.; Lancaster, L. (2017): Odonata community structure and patterns of land use in the Atewa Range Forest Reserve, Eastern Region (Ghana). *International Journal of Odonatology* 20(3/4): 173-189. (in English) ["Recent studies have indicated that frequent anthropogenic disturbances in tropical developing countries are primary drivers of reduction in community diversity and local extinction of many arthropods, including dragonflies. We assessed the impact of anthropogenic disturbances on odonate assemblages across

three different land use types, in a biodiverse nature reserve in Ghana. A total of 37 transects (100 x 10 m) were used to survey odonate species over two seasons and three rivers which pass through agricultural, matured forest and forest margin habitats. A total of 6940 individuals, belonging to 53 species (23 Zygoptera and 30 Anisoptera) in eight families, were recorded. *Sapho ciliata* (15% relative abundance) was the most abundant zygopteran, whereas *Orthetrum julia* (4.8% Relative abundance) was the dominant anisopteran. Rarer species like *Umma cincta*, *Chlorocnemis* sp. and *Elatoneura* sp. were represented by < 50 individuals. The effective number of species was affected by the surrounding terrestrial habitat type and this most strongly reflected the difference between agricultural habitats (8.09 ± s.e. 0.41) and matured forests (5.0 ± s.e. 0.24). A canonical correspondence analysis revealed that turbidity, surface water temperature, canopy cover and channel width were the key factors that influenced odonate assemblages. Degraded habitats were dominated by generalist and heliophilic dragonflies, while matured forest habitat included more stenotopic damselflies and dragonflies. These findings improve our understanding of the drivers of odonata distributions and diversity and will help river managers use odonates to monitor riverine health, as part of conservation activities." (Authors)] Address: Seidua, I., Dept of Wildlife and Range Management, Faculty of Renewable Natural Resources, Kwame Nkrumah Univ. of Science and Technology, Kumasi, Ghana. Email: antwiseidu88@gmail.com

**19982.** Setyawati, S.M.; Purwowidodo; Huda, M.M.; Dewi, B.A. (2017): The diversity of the dragonfly of *Orthetrum* genus in protected area of Mount Prau, Central Java Indonesia. *J. Nat. Scien. & Math. Res.* 3(1): 228-235. (in English) ["Dragonfly of the genus *Orthetrum* is a dragonfly of the Libellulidae family. This dragonfly has a variety of types of morphological structure, body color, distribution and habitat. Habitat dragonfly of the genus *Orthetrum* is quite extensive, especially around lowland to upland waters. Protected Forest Mount Prau Central Java, is a rainforest that has a water flow appropriate for life dragonflies. It allows the Dragonflies of all kinds to live and thrive in the environment, including *Orthetrum*. This research was conducted to find out the types of *Orthetrum* that can be found in Protected Forest Area of Mount Prau, Central Java. Determination of sampling is done along the river flow at 3 stations with total sub plot of sample as much as 12 point, starting from near settlement flow up to 2100 m toward waterfall source. The results of the sample analysis showed morphological variations in the structure of the thorax and abdomen as well as the color variations and patterns on the thorax, abdomen, and wings. Identification of the dragonfly obtained four types of dragonfly *Orthetrum* with variations on the sex, the male and female sabina *Orthetrum*, *Orthetrum cafferum* males. *Orthetrum testaceum* male, male and female *pruinatum* *Orthetrum*, and *Orthetrum* male and female *glaucum*. ©2017 JNSMR UIN Walisongo. All rights reserved." (Authors) ] Address: Setyawati, S.M., Biology Education Dept, Faculty of Sciences and Technology Universitas Islam Negeri Walisongo Semarang, Central Java Indonesia. E-mail: siti.mukhlisoh@walisongo.ac.id

**19983.** Shkëmbi, E.; Qirinxhi, X.; Misja, K.; Papparisto, A. (2017): Contribution to the knowledge of Odonata in Shkodra Lake, Albania. 1-st International Conference on Social and Natural Sciences Proceedings Vienna, 8-9 April: 231-236. ["Shkodra Lake is located in the northwest part of Albania. It lies on the border of Albania and Montenegro, approximately two-third (229 km<sup>2</sup>) of its surface belongs to

Montenegro and about one-third (142 km<sup>2</sup>) belongs to Albania. The aim of our research is to complete the list of Odonata for Albania. In term of its Odonata fauna, the Albanian part of Shkodra Lake, is insufficiently known, with some sporadic data. Expeditions were conducted along the coast of the Albanian part of the lake, during spring-summer 2015 and 2016. 94 specimens have been classified into 16 species, 6 of them are Zygoptera and 10 are Anisoptera. *Erythromma lindenii* is reported for the first time in this area while *Lindenia tetraphylla* is mentioned as Vulnerable on the European Red List (Kalkman et al., 2010). Discussions on the need for further research and possible future additions to the fauna of Shkodra lake are still in progress." (Authors)] Address: Shkëmbi, Enilda, Univ. of Tirana, Faculty of Natural Science, Dept of Biology, Albania

**19984.** Silva Filho, E. (2017): Efficiency of dragonfly nymphs (Odonata) as potential predators of *Aedes aegypti* larvae, under laboratory conditions in São Cristóvão, Sergipe. *Trabalho de Conclusão de Curso (Graduação de Tecnólogo em Agroecologia) - Instituto Federal de Sergipe, São Cristóvão: 24 pp.* (in Portuguese, with English summary) ["Studies to combat the *A. aegypti* vector are important to reduce the incidence of Dengue, Zika, Chikungunya and yellow fever, responsible for thousands of deaths worldwide. The objective of this work is to evaluate the efficiency of Odonatas nymphs as predators of *Aedes aegypti* larvae under laboratory conditions. 30 Odonata nymphs, from different families, were collected with D network, in the Poxim Agu river stretch (IFS), then transported to the laboratory in thermal boxes. In this, the nymphs were individualized in 20 cm diameter plastic pots containing river water and kept at room temperature, totaling 30 trials. To verify the potential predation of *A. aegypti* larvae by the Odonata nymphs, 30 mosquito larvae were added to each pot. Predation was evaluated daily by counting the number of predated larvae. The Odonata nymphs had an average predation efficiency of 6.08 mosquito larvae per day and could predate about 2189 larvae in a year. The families Aeshnidae (9.28), Libellulidae (8.37) obtained the highest averages of predation per day. All odonata families predated 25 to 30 larvae in one day, except Cordulidae, with a maximum of 8 prey larvae. The conditions of this experiment resemble the conditions domiciled found in water storage containers. Therefore, odonata nymphs (Aeshnidae and Libellulidae) are effective for the reduction or even extinction of the *Aedes aegypti* population and should be used in all municipalities in Brazil to reduce and / or eradicate Zika, Dengue, Chikungunya and yellow fever." (Author)] Address: not stated

**19985.** Subramanian, K.A.; Babu, R. (2017): Checklist of Odonata (Insecta) of India. Version 3.0. *www.zsi.gov.in. Zoological Survey of India: 54 pp.* (in English) ["Odonata of India is represented by 487 species and 27 subspecies in 152 genera and 18 families. Zygoptera comprise of 210 species under 57 genera and 9 families; Anisozygoptera one species under one genera and one family; Anisoptera 276 species under 94 genera and 8 families. One species in Zygoptera is considered as incenae sedis. High diversity and endemism is found in the hill streams and rivers of Western Ghats and eastern Himalaya. The taxonomy of adult is well worked out. however the descriptions of larva and their ecology remains as a major gap area, especially for several elusive hill stream breeding species. Geographically, the central India, eastern ghats, eastern Himalaya and Andaman Nicobar islands remains under explored where new species and records are still awaiting formal scientific description. In the current checklist, with reference to Version 2.0 (2014),

there are 58 nomenclatural changes, 29 new additions, 10 deletions and 7 species are kept under doubtful status." (Authors)] Address: Subramanian, K.A. and Babu, R., Zoological Survey of India, Southern Regional Centre, 130, Santhome High Road, Chennai-600 0028, India. E-mail: subbukilZsi@gmail.com, baburzsi@gmail.com

**19986.** Sumanapala, A.P. (2017): A Field Guide to the Dragonflies and Damselflies of Sri Lanka. Dilmah Conservation: 174 pp. (in English) ["A Field Guide to the Dragonflies and Damselflies of Sri Lanka covers 105 of the odonate species known from Sri Lanka with photographs and description on identification, habits, habitats and distribution. The introductory chapters cover morphology, biology, ecology, diversity and conservation of Odonata with special references to Sri Lankan species." (Publisher) [https://www.researchgate.net/publication/317238127\\_A\\_Field\\_Guide\\_to\\_the\\_Dragonflies\\_and\\_Damselflies\\_of\\_Sri\\_Lanka](https://www.researchgate.net/publication/317238127_A_Field_Guide_to_the_Dragonflies_and_Damselflies_of_Sri_Lanka)] Address: Ceylon Tea Services PLC, MJF Group, 111, Negombo Road, Peliyagoda, Sri Lanka. Email: info@dilmahconservation.org

**19987.** Tüzün, N.; Op de Beeck, L.; Brans, K.I.; Janssens, L.; Stoks R. (2017): Microgeographic differentiation in thermal performance curves between rural and urban populations of an aquatic insect. *Evolutionary Applications* 10(10): 1067-1075. (in English) ["The rapidly increasing rate of urbanization has a major impact on the ecology and evolution of species. While increased temperatures are a key aspect of urbanization ("urban heat islands"), we have very limited knowledge whether this generates differentiation in thermal responses between rural and urban populations. In a common garden experiment, we compared the thermal performance curves (TPCs) for growth rate and mortality in larvae of the damselfly *Coenagrion puella* from three urban and three rural populations. TPCs for growth rate shifted vertically, consistent with the faster-slower theoretical model whereby the cold-adapted rural larvae grew faster than the warm-adapted urban larvae across temperatures. In line with costs of rapid growth, rural larvae showed lower survival than urban larvae across temperatures. The relatively lower temperatures, hence expected shorter growing seasons in rural populations compared to the populations in the urban heat islands likely impose stronger time constraints to reach a certain developmental stage before winter, thereby selecting for faster growth rates. In addition, higher predation rates at higher temperature may have contributed to the growth rate differences between urban and rural ponds. A faster-slower differentiation in TPCs may be a widespread pattern along the urbanization gradient. The observed microgeographic differentiation in TPCs supports the view that urbanization may drive life history evolution. Moreover, because of the urban heat island effect, urban environments have the potential to aid in developing predictions on the impact of climate change on rural populations." (Authors)] Address: Tüzün, N., Evolutionary Stress Ecology & Ecotoxicology, Univ. of Leuven, Leuven, Belgium. Email: nedim.tuzun@kuleuven.be

**19988.** Wang, P.-L.; Ciou, J.-S.; Yang, L.-J.; Chung, Y.-C.; Kapri, N.; Esakki, B. (2017): A new vortex-based device using dragonfly wing to reduce the chip size. *Nano/Micro Engineered and Molecular Systems (NEMS)*, 2017 IEEE 12th International Conference, 9-12 April 2017. doi: 10.1109/NEMS.2017.8016979: 81-84. (in English) ["This work presents a new vortex-based flow device. A corrugated dragonfly wing blocks in a microchannel of 250 µm wide good to

capture particles and to reduce the chip size. Two conclusions have been found. The new flow chips made of PDMS and their microbes filling experiments firstly revealed that only one dragonfly wing in the channel works in particle capture but without choking. Secondly, COMSOL-Multiphysics simulation of the new design using dragonfly wing predicted that the reduced entrance channel length by 50% was achieved by adding a dragonfly wing to the previous design by Sollier. This new design of vortex-based devices is good for the integration and application for tumor cell collection, capture and sorting in the future." (Authors)] Address: Wang, P.-L., Tamkang Univ., Tamsui, Taiwan

**19989.** Wasscher, M. (2017): The surroundings of Zanderij, the best-studied area for the dragonflies of Suriname. *Agria* 29(1): 23-26. (in English) [A total of 188 odonate taxa is listed. The list includes 7 species with their type localities in Suriname. 75 species are rather rare. 21 rare and 7 very rare. The author concludes: "The Zanderij area has a very high number of Odonata species. On one hand, this is because the savannah creeks in the area seem to be different from many other creeks in the country, with a sandy bottom and sometimes rich water vegetation. On the other hand, the high number of species is to some extent due simply to the fact that the area has been visited very often over many years." ] Address: Wasscher, M., Minstraat 15bis, NL-3582 CA Utrecht, The Netherlands, E-mail: marcel.hilair@12move.nl

**19990.** Winfrey, C.; Fincke, O.M. (2017): Role of visual and non-visual cues in damselfly mate recognition. *International Journal of Odonatology* 20(1): 43-53. (in English) ["In many species of damselflies, sexual conflict in the form of male harassment is thought to explain the widespread existence of female-limited color polymorphisms. With a few exceptions, the majority of investigations into these mating systems have assumed that male damselflies primarily use visual cues to detect and recognize their mates. Recently, laboratory studies have demonstrated that damselflies orient to olfactory signals from prey and that males orient to chemical cues from conspecific females. However, to date there are no field experiments which explicitly test the role that chemical cues play in sex recognition. Here we used a field experiment on *Enallagma civile* damselflies to test if free flying males detect and recognize females in the absence of visual cues through the use of non-visual signals. In the absence of visual cues males did not exhibit positive responses toward female conspecifics, whereas when both visual and non-visual cues were present, males readily detected females and often tried to mate with them. Although it is possible that non-visual cues may be involved during close contact, our results emphasized that visual cues take center stage in damselfly mate recognition in the field environment. Because the field environment is the context in which selection acts on natural populations, results of this study have implications for our understanding of how selection on visual cues acts to maintain female-limited color polymorphism in damselflies whose males must search for potential mates." (Authors)] Address: Fincke, O.M., Dept Zool., Univ. Oklahoma, 730 Van Vleet Oval, Room 314, Norman, OK 73019, USA. E-mail: fincke@ou.edu

**19991.** Winterholler, M.; Burbach, K.; Krach, J.E.; Sachtelben, J.; Schlumprecht, H.; Suttner, G.; Voith, J.; Weihrauch, F. (2017): Rote Liste und Gesamtartenliste der Libellen (Odonata) Bayerns. Stand 2017. Herausgeber: Bayerisches Landesamt für Umwelt (LfU), Bürgermeister-Ulrich-Straße 160, 86179 Augsburg: 15 pp. (in German) [Red List

of threatened Odonata of the federal state Bayern, Germany, and checklist of Bavarian Odonata.

**19992.** Zimová, K. (2017): Dragonflies (Odonata) of selected ponds in the Zbiroh area. *Bakalářská Práce, Biologie se zaměřením na vzdělávání, Plzeň: IV + 56 pp.* (in Czech, with English summary) ["The inventory research was done from April to September 2016 in selected ponds near Kaøez village (four ponds) and near Jableèno village (two ponds) in the Zbiroh area. The main aim of the research was observation of species diversity. In total, 21 species of dragonflies was observed, of them 11 species of the suborder Anisoptera and 10 of the suborder Zygoptera. Thirteen genera was observed (number of species is in brackets): Calopteryx (2), Ischnura (1), Coenagrion (2), Pyrrhosoma (1), Enallagma (1), Platycnemis (1), Lestes (2), Cordulia (1), Aeshna (4), Anax (1), Libellula (2), Orthetrum (1), and Symptetrum (2). Detail illustration of observed species are presented. The result indicates that despite intensive economic exploitation of ponds, the dragonflies diversity is rather high. The presence of littoral vegetation is likely the important factor controlling diversity of dragonflies. This is a contribution to mapping of the dragonflies distribution in the territory of the Czech Republic." (Author)] Address: not stated

## 2020

**19993.** Palacino-Rodríguez, F.; Altamiranda-Saavedra, M.; Palacino, D.A.; Penagos, A.C. (2020): Effects of seasonality and environmental change on an Andean damselfly *Mesamphiagrion laterale* (Odonata: Coenagrionidae). *Journal of Insect Conservation* 24: 499-511. (in English) ["Land use change, notably the conversion of natural habitats into agriculture, has strong negative effects on wild animal populations. Effects of disturbance and seasonality on demographic parameters of the damselfly *Mesamphiagrion laterale* Selys, 1876 were assessed to investigate how individual survival probability and over population size changed according to season and anthropogenic disturbance (agricultural habitat vs. forested habitat). For each habitat type, forest cover, area covered by vegetation, percentage of macrophytes and water physicochemical attributes were measured. Likewise, population parameters such as sex ratio, population size, life expectancy, survival and recapture rates were estimated using Cormack-Jolly-Seber (CJ-S) models. Life expectancy of the total population was lower during the rainy season, while population size and survival in males were lower in agricultural habitats during this same season. Human activities related to agriculture and livestock production in the Colombian Andes threaten the long-term viability of odonate populations through degradation of aquatic habitats. Contrary to our initially proposed hypotheses, these effects were more intense for males due to their closer association with riparian vegetation and thus greater exposure to aquatic pollutants." (Authors)] Address: Palacino-Rodríguez, F., Grupo de Investigación en Biología (GRIB), Depto de Biología, Universidad El Bosque, Av. Cra. 9 No. 131A-02, Bogotá, Colombia

## 2021

**19994.** Hemnani, M.; Campos Guimarães, I.S.; Kaefer, I.L. (2021): First record of leucism in a tadpole of the cane toad *Rhinella marina* (Anura: Bufonidae). *Herpetology Notes* 14: 859-861. (in English) ["In May 2018, in the morning, we collected parts of several egg strings of *Rhinella* attached to emergent vegetation in a fish farming

pond of the Experimental Farm of the Universidade Federal do Amazonas, Manaus, Brazilian Amazon. ... One of the main predators of *R. marina* tadpoles are dragonfly larvae, also known as naiads (Magnusson et al., 1991). They are known as ambush predators, slowly approaching the prey through visual and mechanical perception (Touchon et al., 2014). Along with them, other predators such as snakes (Kaefer and Montanarin, 2011) are also visually oriented predators of *R. marina* tadpoles. Similar as suggested for albino *Rhinella ornata*, depigmented tadpoles may suffer higher predation pressure due to the absence of aposematism, which is typical of bufonid larvae (Brassaloti and Bertoluci, 2009)." (Author)] Address: Hemnani, Mahima, Universidade Federal do Amazonas, Instituto de Ciências Biológicas, Programa de Pós-graduação em Zoologia, Av. General Rodrigo Otávio Jordão Ramos, 6200, 69077-000 Manaus, Amazonas, Brazil. E-mail: hemnanimahi@gmail.com

**19995.** Holzinger, W.E.; Kerschbaumsteiner, H.; Komposch, B. (2021): Die Libellenfauna des Attemsmoores (Steiermark, Österreich). *Joannea Zoologie* 19: 229-240 (German, with English summary) ["The dragonfly fauna of the Attemsmoor (Styria, Austria). – The dragonfly fauna of the Attemsmoor, a nationally important bog in southeastern Austria, is described. It comprises 27 species. The most remarkable discovery is an isolated small population of *Leucorrhinia pectoralis*. Other Red List species are *Coenagrion ornatum*, *Libellula fulva* and *Aeshna isosceles*. Measures to preserve the last open bog pond are urgently needed as it is in danger of being overgrown with reed." (Authors)] Address: Holzinger, W.E., ÖKOTEAM – Institut für Tierökologie und Naturlandschaftsplanung, Bergmannsgasse 22, 8010 Graz, Austria. EMail: holzinger@oekoteam.at

**19996.** Hemnani, M.; Campos Guimarães, I.S.; Kaefer, I.L. (2021): First record of leucism in a tadpole of the cane toad *Rhinella marina* (Anura: Bufonidae). *Herpetology Notes* 14: 859-861. (in English) ["In May 2018, in the morning, we collected parts of several egg strings of *Rhinella* attached to emergent vegetation in a fish farming pond of the Experimental Farm of the Universidade Federal do Amazonas, Manaus, Brazilian Amazon. ... One of the main predators of *R. marina* tadpoles are dragonfly larvae, also known as naiads (Magnusson et al., 1991). They are known as ambush predators, slowly approaching the prey through visual and mechanical perception (Touchon et al., 2014). Along with them, other predators such as snakes (Kaefer and Montanarin, 2011) are also visually oriented predators of *R. marina* tadpoles. Similar as suggested for albino *Rhinella ornata*, depigmented tadpoles may suffer higher predation pressure due to the absence of aposematism, which is typical of bufonid larvae (Brassaloti and Bertoluci, 2009)." (Author)] Address: Hemnani, Mahima, Universidade Federal do Amazonas, Instituto de Ciências Biológicas, Programa de Pós-graduação em Zoologia, Av. General Rodrigo Otávio Jordão Ramos, 6200, 69077-000 Manaus, Amazonas, Brazil. E-mail: hemnanimahi@gmail.com

**19997.** Iregui, D.A.O. (2021): Fortalecimiento de la colección de referencia Odonata del Museo de Ciencias de la Universidad el Bosque. *Universidad El Bosque, Facultad de Ciencias, Programa de Biología, Bogotá D.C.:* 118 pp. (in Spanish) [Colombia; "Biological collections housed in museums have been essential for the conservation of biological heritage and knowledge of the biodiversity of a territory. The Museo de Ciencias de la Universidad El Bosque (MC-

UB) has reference collections in six areas, including the Arthropods and Invertebrates of the continent where the Odonata Reference Collection is located, in which this internship was developed, carrying out the process of diagnosis, curation and generation of dissemination elements. Initially the collection had 463 specimens, later 464 were entered for a total of 927 records distributed in 12 families, 32 genera and 48 species, which presented a Completeness Index in the data set (Cc) of 72.04% and a Collections Health Index (ISC) of 9.71%, indicating that the collection was about to be optimised. After the internship, the Cc improved to 96.33%, the CSI to 68.29%, demonstrating the strengthening of the physical and documentary aspects of the collection. Additionally, taxonomic identifications of the 927 specimens were corrected and taxonomic identifications were made, and the results obtained were used to generate material for dissemination to the scientific community." (Author(DeepL) Address: not stated

**19998.** IUCN (2021): The conservation status of species and habitat in freshwater Key Biodiversity Areas (KBAs) and key additional sites from the Sebou Basin. Project WAMAN (Water Management) Sebou Project, Málaga: 57 pages + annexes- (in English) ["This report presents the results of a broad assessment of the freshwater diversity in four Key Biodiversity Areas (KBAs) and some key additional sites in the Sebou river basin in Morocco. The Sebou river basin houses a large proportion of the Moroccan human population that depends on the river for their livelihood. The basin has important ecosystems for threatened species that are currently being recognized as Ramsar sites or national parks. Additionally, four sites have been identified as Key Biodiversity Areas (KBAs) for the persistence of freshwater biodiversity. Assessments were made on the effectiveness of the existing Key Biodiversity Areas (KBAs) in containing important populations of trigger species. During the summers of 2018 and 2019, biodiversity surveys of the taxa used to identify freshwater KBAs (fishes, molluscs, dragonflies and damselflies, crabs and aquatic plants) were undertaken by a team of experts in 39 sampling points, of which 29 were located in KBAs, and the remaining 10 were located in surrounding areas. A total of 192 species was recorded: 17 fish, 6 bivalve, 17 gastropod, 44 dragonfly and damselfly, 2 crayfish/crab species and 106 aquatic plant species. Twenty-one of these species are classified as threatened with extinction in the IUCN Red List of Threatened Species™ (7 aquatic plant species, 2 fish species, 1 damselfly species, 1 crayfish species, 4 bivalve species, and 6 gastropod species). The highest native freshwater biodiversity was recorded in the South and East of KBA Oued Imouzzar Kandar. Also, in the central-east of KBA Oued Tizguite & Oued Ouaslane a high number of native species were found, especially aquatic plants. On the other hand, the number of threatened species was especially high in the KBA Oued Bouhlou and the KBA Oued Tigrigra. KBA Oued Bouhlou and its surroundings hosted a high number of threatened fish and a total of 7 threatened molluscs, including the Critically Endangered *Pseudunio maroccanus* (assessed as *Margaritifera marocana* in the IUCN Red List) and *Unio foucauldianus*. Many threatened molluscs species were also found in the surroundings of the KBA Oued Tigrigra, as well as the Endangered damselfly species *Calopteryx exul* and several threatened aquatic plants. For the surrounding areas, high freshwater biodiversity was found in the main channel of Oued Sebou, especially a high number of fish and dragonfly species. A major threat to the survival of the freshwater biodiversity is the introduction of non-native species that might outcompete the native species. A

total of 11 non-native fish species were found in this study. High numbers of non-native fish were found in KBA Oued Tizguite & Oued Ouaslane and KBA Oued Tigrigra, as well as in the lakes' region (Dayat Iffer/ Dayat Yfrah/ Dayat Afourgah) and the sites in Aguelmam n'Tifounassine and Sidi Ali. Habitat Quality Assessments (HQA) produced high values for KBAs and surrounding areas, but the Habitat Modification scores (HMS) were neither clearly negative nor positive. The region around the KBA Oued Tizguite & Oued Ouaslane is especially affected by human activity, and management plans have to be implemented to properly protect the biodiversity in the area. Other important threats are the construction of dams that are hindering the environmental flow required by many threatened species, soil erosion and siltation of river substrate and wastewater/solid waste disposal in the rivers. The Sebou basin has a high socio-economic importance for the Moroccan population, and is extensively used both for agriculture and industry. The effluents from agricultural or industrial activities have caused high contamination levels, that are harmful to humans, their livestock and the biodiversity. Another issue is the water shortage due to the water extraction for agricultural and urban uses, causing extreme droughts in some sites, especially in KBA Imouzzar Kandar. This intensive water extraction causes soil saline extrusion and increased water conductivity, as has been witnessed in the sites Aguelmam n'Tifounassine & Sidi Ali. Lastly, many of the springs and lakes are becoming unsustainable tourism destinations and have been completely altered and polluted, with the risk of a complete destruction of the freshwater biodiversity in the near future. The inclusion of freshwater biodiversity into the management plan for the Sebou basin, with the involvement of local authorities and communities, is necessary in order to preserve these high valued freshwater ecosystems. In the river Bouhlou crossing the Tazekka natural park, one of the best recruiting populations of the freshwater mussel *Pseudunio maroccanus* (assessed as *Margaritifera marocana* in the IUCN Red List), one of the world's 100 most threatened species, was detected. In order to protect this precious freshwater biodiversity, several measures should be taken to adjust the agricultural and industrial sector: inclusion of freshwater biodiversity into the water management plans and the increase of riparian buffers, wastewater treatment plans, the prevention of cattle overgrazing and bank destruction by trampling near the river banks. Campaigns on the correct management of the channels and the control of recreational activities by local authorities, could aid to manage the environmental flow necessary for many native species. For the rivers/lakes suffering from droughts, it will be necessary to setup an aquifer management plan covering the catchment of the aquifer on which the rivers/lakes depend, and develop artificial reservoirs to enable the reduction of exploitation of ground water. Finally, measures should be taken to stop the active re-stocking of fish in order to avoid non-native species outcompeting the native species. Further studies should be conducted to have a better understanding on the freshwater biodiversity in the Sebou basin. It is necessary to re-evaluate some of the KBAs to assess the presence of their trigger species and other threatened species. Finally, many of the additional sites that were studied here could be included as extension of the KBA, or a new KBA should be created to help focusing conservation efforts and promoting management actions that allow the persistence of the biodiversity elements present in there." (Authors)] Address: <https://portals.iucn.org/library/sites/library/files/documents/2022-028-En.pdf>

**19999.** Janra, M.N.; Herwina, H. (2021): How to reclaim

your dragons? A retrospective review on odonatology in West Sumatra, Indonesia. IOP Conference Series: Earth and Environmental Science, Volume 757 012086: 9 pp. (in English) ["Dragonflies and damselflies (Odonata) were not really popular subjects for biological studies at least until a decade ago in West Sumatra. In many scientific publications published by Lieftinck, a colonial era odonatologist, not many localities in West Sumatra mentioned as the origin of his Odonata specimens. In this study, we intend to review the extent of current odonatological works in West Sumatra to gain perspective on the ongoing scientific aspects of this taxon. We used literature study method to compile data from historical and recent bibliographies, published works and other resources regarding dragonflies in West Sumatra. As result, from around 294 odonate species ever recorded in Sumatra Island, 98 species have been recognized from within the borders of West Sumatra Province with more than half recently reobserved. Albeit most publications are taxonomical and inventorial in their nature, further survey works are still needed to gain thorough insight on West Sumatran odonates. Meanwhile, the current studies and researches indicate the possibilities that dragonflies can also be integrated into the wider aspects, such as ecotourism, pest management, landscaping, environmental impact assessment, aesthetic and many others. Hence, introducing odonates as fascinating study object to the new generation of biologists can help furthering the advance and diversification of odonatological study in West Sumatra." (Authors)] Address: Janra, M.N., Biology Dept, Faculty of Mathematics and Natural Sciences, Universitas Andalas, Padang, Indonesia. Email: mnjanra@sci.unand.ac.id

**20000.** Karube, H. (2021): *Asahinagomphus* gen. nov., a new gomphid genus separated from *Burmagomphus* Williamson, 1907 (Odonata: Gomphidae). *Tombo* 63: 16-20. (in English) ["A new gomphid genus *Asahinagomphus* gen. nov. is described. The new genus is monotypic for *A. insolitus* first described and so far placed in *Burmagomphus* Selys, 1858. The genus is including *Gomphus* (s. lato), and characterized mainly by a peculiar male cerci and wing venation especially reduced anal triangle." (Author)] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp

**20001.** Kopetz, A.; Krebs, D.; Weigel, A. (2021): Bericht zur Gemeinschaftsexkursion des Thüringer Entomologenverbandes e.V. (TEV) im Sommer 2021 in den Landkris Sonneberg (Südthüringen). *Mitteilungen des Thüringer Entomologenverbandes* 28(2): 78-194. (in German) [Germany; On page 123, Dr. Jochen Müller lists records of *Coenagrion puella*, *Enallagma cyathigerum*, *Ischnura elegans*, and *Platycnemis pennipes*.] Address: not stated

**20002.** Lang, X.; Song, B.; Yang, W. (2021): Numerical simulation of pitching motion effects on the aerodynamic performance of a dragonfly-like flapping wing. 32nd Congress of the International Council of the Aeronautical Sciences, September 6-10, 2021, Pudong Shangri-La, Shanghai, China: 9 pp. (in English) ["Dragonflies have remarkable flight skills and their excellent flight performance has attracted persistent attention. The multi-degree-of-freedom flapping kinematics and interaction of the tandem wings might account for their extraordinary flight skills. In this paper, the effects of pitching motion on the aerodynamic performance of a dragonfly-like flapping wing have been numerically studied. A transient numerical method based on the overset mesh technique is used to simulate the flapping

and pitching movements. Different pitching amplitudes have been evaluated as the forewing and hindwing flap in counter-stroking during the hovering process. It is found that the pitching motion has an obvious influence on the tandem wings' aerodynamic performance, and there is a reasonable pitching amplitude to make the hovering vertical force optimal. Additionally, the interaction of the tandem configuration will lead to an obvious fluctuation in the aerodynamic force. The research in this paper is helpful to understand the flight mechanism of dragonflies flight." (Authors)] Address: Lang, X., School of Aeronautics, Northwestern Polytechnical University, Xi'an 710072, China

**20003.** Membere, O.; Bawo, D.D.S.; Onwuteaka, J.; Ugbohome, A.P.; Nwosu, O.R. (2021): Abundance and diversity of insects associated with *Rhizophora* mangle and *Avicennia germinans* in Bundu-Ama mangrove ecosystem of the Niger Delta, Nigeria. *Scientific African* 14(7):e01058: 11 pp. (in English) ["Mangrove species diversity is well known for larger animals and plant, but little is known about mangrove insects and their significance and yet they perform important roles in the ecology of the habitat. The present study was conducted to determine the diversity of insects associated with *Rhizophora* mangle and *Avicennia germinans* in Bundu-Ama mangrove habitats, a tributary of the Bonny River in the Niger Delta. Two stations were established based on the abundance of the mangroves. A total of 18 mangrove trees (nine each) for both species were randomly selected and insect samples collected bi-weekly between 7 am and 11 am between April and June 2017, making a total of 108 trees within the study period. Each tree was sampled for 10 minutes using sweep net, hand net and handpicking methods. A total of 8 insect orders (Diptera, Coleoptera, Hymenoptera, Homoptera, Rhopalocera, Odonata [one species, 15 specimens; not identified], Phasmida and Heterocera), 20 families and 35 species were identified. Hymenoptera (49.1%) was the highest insect order recorded, followed by Diptera and Homoptera. *Avicennia* had more insect orders, families and species. Coleoptera, diptera and Hymenoptera were found on both plants while others were on *Avicennia* only. Formicidae was the most abundant family (37.1%) while Lagiidae was the least (0.2%). The most abundant species was *Camponotus acvapimenis*. The highest species diversity was observed in the Diptera with Shannon H' of 2.00 for *Avicennia* and 2.13 for *Rhizophora*. The richness index was 2.43 for *Avicennia* and 2.62 for *Rhizophora*, and the highest species evenness ( $E' = 0.40$ ) was observed in the Diptera indicating that the insects were not evenly distributed. Two insect associations were identified: a specialist group of 23 species on *Avicennia*, and 6 species on *Rhizophora*, while the second group were the generalist made up of 3 species *Anopheles squamosus*, *Musca domestica* and *Fannia* sp. Insect families (Muscidae, Calliphoridae, Syrphidae, Ceratopogonidae, Culicidae, Tabanidae) are of medical, veterinary and ecological importance as pollinators, bioindicators, predators, parasitoid, agricultural pest and detritivores. Insect diversity was found to be higher in *Avicennia* than in *Rhizophora*. This study has shown that the mangroves of Bundu-Ama have a vast array of insects which will contribute to their biodiversity data and subsequent conservation and management of ecosystem in the Niger Delta." (Authors)] Address: Ugbohome, A.P., Dept of Animal and Environmental Biology, Faculty of Science, Rivers State University Nkpolu-Oroworukwo, Port Harcourt, Nigeria. Email: ugbohome.adaobi@ust.edu.ng

**20004.** Mezquita, I. (2021): Euskal Herriko Odonatuen identifikaziorako gakoa. Clave para la identificación de los



Odonatos del País Vasco. 2ª edición, corregida y aumentada. 2. ed. hand. eta zuz. Aranzadi Zientzia Elkartea: 42 pp. (in Basque and Spanish versions) [<https://www.researchgate.net/profile/Inaki-Mezquita>] Address: Mezquita, I., 1Sociedad de Ciencias Aranzadi, Zorroagagaina 11, 20014 Donostia, Spain

**20005.** Nhi, P.T.; Tru, H.V.; Phu, P.V. Quynh Nga, C.T.; Hiep, N.D.; Cuong, N.Q.; Dac, L.X.; Phuong, P.M.; Duy, V.D. (2021): First study of insects from the Truong Sa archipelago, Khanh Hoa province, Vietnam. *Journal of Forestry Science and Technology* 12: 98-105. (in English, with Vietnamese summary) ["On the basis of the recent field surveys conducted during 2020–2021 [...] a total of 54 species in 49 genera, 26 families of nine orders have been recorded from eight islands namely Nam Yet, Phan Vinh, Son Ca, Sinh Ton Dong, Sinh Ton, Song Tu Tay, Truong Sa Dong and Truong Sa Lon. Among nine insect orders, Lepidoptera is the most diverse from Truong Sa archipelago with 19 recorded species, followed by Coleoptera with 17 species, Hemiptera with five species, Orthoptera with four species, Blattodea with three species, Diptera and Odonata with two species [*Pantala flavescens*, *Tramea virginia*], each, Dermaptera and Hymenoptera with one species, each. [...]" (Authors)] Address: Nhi, P.T., Inst. of Ecology & Biological Resources, Vietnam Academy of Science & Technology, Vietnam

**20006.** Petrovicová, K.; Langraf, V.; David, S.; Krumpálová, Z.; Schlarmanová, J. (2021): Distinct Odonata assemblage variations in lentic reservoirs in Slovakia (Central Europe). *Biologia* 76: 3727-3741. (in English) ["The effects of various aquatic habitats on the abundance, species richness, diversity and taxonomic distinctness of Odonata were studied. The impact of environmental factors and living conditions in lentic habitats were expressed by the composition of coenoses, on the evaluation we used the Dragonfly Biotic Index. The positive effects of habitat heterogeneity on biodiversity are well known, but it is not clear how the diversity of studied and ecologically important taxa, such as odonates, may vary in different water reservoirs. We investigated how Odonata community metrics (composition, abundance, diversity and environmental compatibility) differ in lentic water: ponds, fishponds, excavation of mineral material and in marshlands, where biodiversity plays an important role. Using an entomological mesh, we took samples in the southwestern part of Slovakia in six geo-morphological units at 54 study sites during four years. This study detected distinct odonates assemblage variations among habitats and heterogeneity among gradients. Wide ranges of microhabitats with different environmental properties create appropriate conditions for living span of them. Surprisingly, the highest species richness was recorded in the excavation of mineral materials habitats. Stagnicolous Odonata species correlated (CCA) with the habitats of excavation of mineral material and marshlands; showed links to the littoral vegetation and dense vegetation cover. While the euryecious species have been linked to the ponds and fishponds; and correlated with the water body size. It seems to be degraded habitats are not so much suitable for rare and endangered species, but to preserve the biological value of the environment and for the existence of the high abundance and species richness of odonates." (Author)] Address: Petrovicová, Kornélia, Dept Environment & Biology, Fac. Agrobiolgy & Food Resources, Slovak University of Agriculture in Nitra, Nitra, Slovakia. Email: kornelia.petrovicova@gmail.com

**20007.** Petzold, F. (2021): Zum Vorkommen von *Coenagrion ornatum* in Brandenburg (Odonata: Coenagrionidae).

*Libellula* 40(1/2): 93-106. (in German, with English summary) ["The occurrence of *Coenagrion ornatum* in Brandenburg (Odonata: Coenagrionidae) – In 2016, *C. ornatum* was verified at a ditch in the Special Area of Conservation (SAC) "Löcknitz". In 2019 and 2020, the occurrence could be confirmed again and the successful reproduction and settlement of new sections in the ditch system could be proven. The species is thus considered to be established in Brandenburg. The occurrence is to be seen in the context of the individual-rich occurrences in the Landgrabenniederung in the border area between Saxony-Anhalt and Lower Saxony, only 30 to 40 km away. The results of the surveys conducted between 2016 and 2020 are briefly presented. The occurrence described is currently the only known of the species in Brandenburg." (Author)] Address: Petzold, F., Pappelallee 73, 10437 Berlin, Germany. Email: petzold.falk@googlemail.com

**20008.** Phan, Q.T.; Karube, H. (2021): Description of two new species of the genus *Chlorogomphus* Selys, 1854 (Odonata: Chlorogomphidae) and a new record of *Chlorogomphus gracilis* Wilson & Reels, 2001 from the Central Highlands of Vietnam. *European Journal of Taxonomy* 794: 91-110. (in English) ["Two new species of the genus *Chlorogomphus* are described based on both sexes collected from the Central Highlands of Vietnam. These species are *C. hoaian* sp. nov. (holotype male from Kon Ka Kinh National Park, 14.3672° N, 108.5368° E, alt. 1000 m) and *C. vani* sp. nov. (holotype male from Chu Yang Sin National Park, 12.4780° N, 108.4617° E, alt. 749 m). Furthermore, *C. gracilis* Wilson & Reels, 2001 is recorded from Vietnam for the first time, with notes on its morphology and detailed illustrations of male and female structures." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Res., Institute of Research & Training of Medicine, Biology & Pharmacy, Duy Tan University, Da Nang, 550000, Vietnam. E-mail: pqtoan84@gmail.com

**20009.** Priyadarshana, T.S. (2021): Do predatory adult odonates estimate their adult prey odonates' body size and dispersal ability to proceed with a successful attack? *J. of Threatened Taxa* 13(7): 18949-18952. (in English) ["The results of the analysis showed strong evidence that the predatory odonates performing the attack had larger body size and greater hind-wing length than their prey odonates across all three predation types. This indicates that predatory adult odonates may estimate the body size and dispersal ability of the adult prey odonates to execute a successful attack even when both groups belong to the same taxonomic group. *Orthetrum sabina* had the highest percentage with 70 % (n= 47) of attacks on both Anisoptera and Zygoptera species, including *O. sabina*-*O. sabina* attacks. It is also important to note that the attacks of the predatory odonates were mostly on the head or thorax of their prey odonates."] Address: Priyadarshana, T.S., Asian School of the Environment, Nanyang Tech.I Univ., 50 Nanyang Avenue, 639798, Singapore. Email: tharakas001@e.ntu.edu.sg

**20010.** Rychla, A. (2021): New data on the abundance and phenology of the Broad Scarlet *Crocothemis erythraea* (BRULLÉ, 1832) (Odonata: Libellulidae) on example of a site at lake Plaw (Lubuskie district). *Odonatrix* 174 (2021): 8 pp. (in Polish, with English summary) ["*C. erythraea* is a Mediterranean dragonfly species, constantly expanding its range northwards. Although it is already widespread in Poland, little is known about its ecology in the country. Therefore, the purpose of this study was to provide new infor-

mation on the abundance and phenology of an autochthonous population inhabiting shallow, eutrophic lake Plaw in western Poland. During 20 visits, which lasted from April 29th to August 16th, 2020, all Anisoptera exuviae were collected from a 20-meter-long transect along shoreline of the lake. In total, 436 exuviae representing 13 Anisoptera species were collected. Out of it, 244 exuviae belonged to *C. erythraea*, which made 56 % of the entire sample and was evidence for absolute dominance of this species in the investigated odonatological community. First exuviae of *C. erythraea* were found on May 19th, 2020 and the last ones on August 1th, 2020. Thereby, the entire emergence period lasted for 74 days. The highest exuviae abundances were recorded from Mid-June to the beginning of July, thus indicating asynchronous emergence of one generation. The results show that *C. erythraea* has been much more abundant in the dragonfly community as assumed by now. However, it is not clear whether this is a long-term trend or an effect of high air temperatures in recent years. As the species may interact with other native species, more attention should be paid for gathering data on the quantitative status of *C. erythraea* in the whole community of Odonata in Poland." (Author)] Address: Rychla, Anna, Sekcja Odonatologiczna Polskiego Towarzystwa Entomologicznego. E-mail: rychlan@op.pl

**20011.** Schiel, F.-J.; Martens, A. (2021): Dritter Aquariennachweis von *Orthetrum sabina* (Drury) in Deutschland. *Mercuriale* 21: 57-59. (in German, with English summary) ["Third record of *O. sabina* in Germany. – In August 2021 a male *O. sabina* emerged from an aquarium in Tomerdingen, Baden-Württemberg, Germany. The circumstances are described and shortly discussed." (Authors)] Address: Schiel, F.-J., INULA – Institut für Naturschutz und Landschaftsanalyse, Turenneweg 9, D-77880 Sasbach, Germany. Email: franz-josef.schiel@inula.de

**20012.** Schiel, F.-J. (2021): Wiederfund der Östlichen Moosjungfer (*Leucorrhinia albifrons*) in der baden-württembergischen Oberrheinebene (Odonata: Libellulidae). *Mercuriale* 21: 47-55. (in German, with English summary) ["Rediscovery of *Leucorrhinia albifrons* in the Upper Rhine Valley in the German federal state of Baden-Württemberg (Odonata: Libellulidae). - On June 26 and 28, 2021, I observed at least two males of *Leucorrhinia albifrons* in a gravel pit about 10 km south of Karlsruhe. This is the first record on the right bank of the Rhine within the Upper Rhine Valley since the records of Fischer (1850). The circumstances of the record as well as the habitat are described and status and possible migration routes are discussed." (Author)] Address: Schiel, F.-J., INULA – Institut für Naturschutz und Landschaftsanalyse, Turenneweg 9, D-77880 Sasbach, Germany. Email: franz-josef.schiel@inula.de

**20013.** Singh, A.P.; De, K.; Uniyal, V.P.; Sathyakumar, S. (2021): A preliminary assessment of odonate diversity along the river Tirthan, Great Himalayan National Park Conservation Area, India with reference to the impact of climate change. *Journal of Threatened Taxa* 13(11): 19611-19615. (in English) ["A total of 19 species of odonates, including eight species of Anisoptera (dragonflies) and 11 species of Zygoptera (damselflies), were recorded along the Tirthan River, Great Himalayan National Park Conservation Area (GHNPCA), Himachal Pradesh. Among these species, 17 were reported from the area for the first time. With the addition of these new records the number of odonates known from the GHNPCA is increased to 23 species representing

18 genera and eight families. *Indothemis carnatica*, *Agriocnemis femina*, and *Argiocnemis rubescens* are reported for the first time from the western Himalayan region. The study found a significant change in the species composition of odonates over a period of 18 years in the area, which may be due to changes in microhabitat conditions associated with climate change." (Authors)] Address: Amar Paul Singh, A.P., Wildlife Institute of India, Post Box #18, Chandrabani, Dehradun Uttarakhand 248001, India. E-mail: amarpaulsingh4@gmail.com

**20014.** Soder, E.A.; Wildermuth, H. (2021): Baumfalke (*Falco subbuteo*) erbeutet *Anax parthenope* "(Odonata: Aeshnidae). *Mercuriale* 21: 81-84. (in German) [Documentation of a hunting flight of the hobby in Rottenschwil, Aargau, Switzerland, 20-V-2021, preying on *A. parthenope*.] Address: Soder, E.A., Sulzbacherstr. 71, CH-8610 Uster, Switzerland. Email: eric.soder@topics.ch

**20015.** Susanto, M.A.D; Zulaikha, S. (2021): Diversity and community structure of dragonfly and damselfly (Odonata) at the Selorejo waterfall area, Ponorogo Regency, East Java Indonesia. *Jurnal Riset Biologi dan Aplikasinya* 3(1): 30-37. (in English) ["Selorejo Waterfall is a natural tourism area that is quite far from downtown Ponorogo and directly adjacent to the Gunung Sigogor Nature Reserve. Hence, this area has the potential as a natural habitat for dragonfly and damselfly. The presence of dragonfly and damselfly species is determined by the type of habitat, canopy conditions, vegetation diversity, and the microclimate that exists in a location. This study aimed to determine the diversity of dragonfly and damselfly and to determine the community structure of dragonflies in Selorejo Waterfall. The sampling method was Visual Day Flying. The results of research conducted in two streams showed that there were 12 species from 6 families with a total of 230 individuals. The value of species diversity at this location is  $H' = 2.05$ . In the community structure at the Selorejo Waterfall dragonfly, there are differences in the number of species and individuals in the two streams in Selorejo Waterfall Area. The large stream, eight species from four families, 151 individuals in total. Meanwhile, in small stream, there were nine species from six families, 79 individuals in total. The differences in the number of species and individual dragonflies in the two streams at Selorejo Waterfall can be used to describe the diversity and structure of the Odonata community in the area." (Authors)] Address: Susanto, M.A.D., Biology Department, Faculty of Science and Technology, UIN Sunan Ampel Surabaya Jln. Ahmad Yani No.117, Jemur Wonosari, Wonocolo District, Surabaya 60237, East Java, Indonesia. E-mail: Muhammadazmidwi@gmail.com

**20016.** Tamm, J.; Dressler, B. (2021): Nachweise des Bachwechselflers bei *Cordulegaster bidentata* und weitere Beobachtungen zu Raumnutzung und Verhalten bei einer Metapopulation im Taunus (Odonata: Cordulegasteridae). *Libellula* 40(1/2): 19-46. (in German, with English summary) ["Evidence of stream hopping and further observations on special performance and behaviour in a metapopulation of *C. bidentata* living at forest streams in Taunus mountains, Germany - At 8 small forest streams in the Taunus mountains, Hesse, Central Germany, the spatial performance of a metapopulation of *Cordulegaster bidentata* was studied by 7 observers using 16 colour marked adult males. After marking, 969 individuals passing above 7 streams were counted during 9 counting days, among them 47 marked ones (5 %). In spite of sparse appearance of marked males, 7 ones were observed again after marking. 4 of them did not appear

on the stream, where they had been marked, but on other streams in the surroundings. Maximum range between the places of marking and reobserving was 1,125 m. Most marked males only occurred sporadically at the streams. One can conclude that in general a remarkable part of male *C. bidentata* do not take part in patrolling flight activities along the streams regularly. Moreover, male *C. boltonii* were common along two streams together with *C. bidentata*. This uncommon phenomenon is described and discussed." (Authors)] Address: Tamm, J., 34131 Kassel, Germany. E-Mail: jochen.tamm@t-online.de

**20017.** Theischinger, G.; Hawking, J. (2021): The complete field guide to dragonflies of Australia. Second Edition. CSIRO Publishing: 406 pp. (in English) ["Dragonflies and damselflies are conspicuous insects: many are large and brightly coloured. They are also valuable indicators of environmental wellbeing. A detailed knowledge of the dragonfly fauna is therefore an important basis for decisions about environmental protection and management. This comprehensive guide to the Australian dragonfly fauna covers eight families of dragonflies and 10 families of damselflies, comprising the 113 genera and 333 species found in Australia. It has been updated with newly identified species and revised family names to reflect new world consensus systematics. Stunning full-colour images and distribution maps are accompanied by identification keys for adults as well as larvae, which are often used as bait for freshwater fish. This second edition of The Complete Field Guide to Dragonflies of Australia also includes illustrations by Albert Orr, one of the most renowned dragonfly illustrators. The extraordinary diversity of dragonflies will interest entomologists and amateur naturalists alike." (Publisher)] Address: Theischinger G., 2A Hammerley Road, Grays Point, NSW 2232, Australia. E-mail: Gunther.Theischinger@environment.nsw.gov.au

**20018.** Vdovina, O.N.; Bezmaternykh, O.M.; Krylova, E.N. (2021): Macrozoobenthos of Lake Pryatel'skoye (Altai Krai, Russia) after its watering. Bulletin of the Altai Branch of the Russian Geographical Society 4(63): 88-100. (in Russian, with English summary) ["Lake Pryatel'skoye is located in the south of West Siberia. The composition and structure of benthic invertebrates communities of the newly filled (after a long drying out) lake were studied in August 2019. The zoobenthos includes 23 species of benthic invertebrates from 5 classes [including *Coenagrion lunulatum*]). The lake is characterized by low numbers and small biomass of macrozoobenthos, the productivity class is "lowest", which corresponded to the ultraoligotrophic type of the lakes. The state of benthic invertebrates communities corresponds to the first stage of succession in artificially created lakes." (Authors)] Address: Vdovina, Olga, Laboratory of Hydrobiology of the Institute for Water & Environmental Problems SB RAS (IWEPSB RAS), 1, Molodezhnaya St., 656038 Barnaul, Russia. E-mail: olgazhukova1984@yandex.ru

**20019.** Villanueva, R.J.T.; van Beijnen, J. (2021): *Onychothemis yvonneae* spec. nov. (Odonata: Libellulidae), a new dragonfly from a lowland riverine forest in northern Palawan, Philippines. Philippine Journal of Systematic Biology 15(1): 1-4. (in English) ["The Cleopatra's Needle Mountain Range (CNMR) in northern Palawan includes one of the largest remaining patches of primary forest in the Philippines and has a high conservation value. To provide scientific baseline information to recognize the CNMR as a protected area, biologists mapped its biodiversity during fieldwork conducted from October to December 2014. The present study proposes a new species of Odonata discovered

during the survey. *Onychothemis yvonneae* spec. nov. is described, illustrated, and compared with its nearest allies. The new species is the second member of the genus *Onychothemis* in the Philippines and is the seventh known overall. *Onychothemis yvonneae* appears to be most closely related to *O. testacea* and *O. tonkinensis*." (Authors)] Address: Villanueva, R.J.T., College of Arts and Sciences Education, University of Mindanao, Matina, 8000 Davao City, Philippines. Email: rjtvillanueva@gmail.com

**20020.** Wildermuth, H. (2021): Sitzwarten als multifunktionale Habitat-Elemente für Großlibellen (Odonata: Libellulidae, Gomphidae). Mercuriale 21: 61-74. (in German, with English summary) ["Perches as multifunctional habitat elements for Odonata. - For dragonflies, perching stations serve as vantage points from which they can monitor their surroundings and take off without obstacles at lightning speed. As obligatory habitat elements they fulfill their function in the context of different behavioural ranges. With selected examples from the literature and on the basis of own photographically documented observations of some libellulids and gomphids, it is presented which substrates they use in terrestrial and aquatic habitats in connection with food acquisition, reproduction and thermoregulation." (Author)] Address: Wildermuth, H., Haltbergstr. 43, CH-8630 Rüti, Switzerland. E-mail: hansruedi@wildermuth.ch

**20021.** Yapó, M.L.; Gogbé, Z.M.; Kakpu, A.A.J.P.; Diomandé, D. (2021): Seasonal variations of Odonata diversity around Napié Dam Lake, northern Côte d'Ivoire, west Africa. Rev. Ivoir. Sci. Technol. 38: 1-9. (in English, with French summary) ["A seasonal diversity of Odonata species are studied in the north of Côte d'Ivoire. The study was carried out during two seasons (rainy and dry seasons). Odonata species were collected using Sweep-net technique between 9:00 am to 02:00 pm. Thirty three species belonging to 2 suborders (Anisoptera and Zygoptera) and 4 families were recorded. A total of 436 individuals and 365 individuals of Odonata encountered during rainy season and dry season respectively. Significant differences in Odonata specific richness and abundance occurred between rainy and dry seasons. *Brachythemis leucosticta*, *B. impartita*, *Crocothemis erythraea* and *Palpopleura lucia* recorded the highest abundance in rainy season however [sic] *B. leucosticta*, *B. impartita* and *C. erythraea* encountered the most abundance in dry season. Shannon diversity index indicated that rainy season is relatively diverse than dry season." (Author)] Address: Yapó, M.L., UFR Sciences Biologiques, Université Peleforo Gon Coulibaly, BP 1328 Korhogo, Côte d'Ivoire. Email: yapomilaur@gmail.com

**20022.** Zessin, W.; Brauckmann, C.; Gröning, E. (2021): A new insect (probably basal Odonatoptera) from the Pennsylvanian (Late Carboniferous) of the Piesberg Fossil-Lagerstätte, Osnabrück, Germany. Palaeoentomology 4(6): 532-536. (in English) ["The rich Pennsylvanian (Late Carboniferous; Moscovian, Westphalian D/Asturian) insect fauna of the large Piesberg quarry N Osnabrück, Lower Saxony, Germany with hitherto more than 1,300 registered specimens shows a great diversity. It includes palaeopterous (more than 20 specimens of Odonatoptera, and a number of Palaeodictyoptera) as well as neopterous insects (far more than 1,000 specimens). Only a smaller part has already been described, and the research is still continuing." (Authors)] Address: Zessin, W., Lange Str. 9, D-19230 Jasnitz, Germany. E-mail: zessin@zoo-schwerin.de