

**THE ACCESSORY GLANDS OF THE FEMALE GENITAL TRACT
IN *AESHNA JUNCEA* (L.) AND *A. GRANDIS* (L.)
(ANISOPTERA: AESHNIDAE)**

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The micro-anatomy of the ♀ accessory glands in adult *A. juncea* and *A. grandis* is similar but the size of the *A. grandis* glands is clearly larger than that of *A. juncea*. The secretory cells constitute a simple columnar epithelium surrounding a cuticle-lined lumen. The glandular epithelium is provided with a peculiar system of deep, narrow, intercellular crypts bordered with microvillar cell membranes. Lipids released to the crypt lumen are presumably forced into the central gland lumen by contractions of the muscular network attached to the outside of the gland. The efferent duct of each gland that opens to the distal part of the vagina has a complicated muscular apparatus, probably serving as a pump. The secreted substances accumulate in the central gland cavity mainly during the pre-reproductive phase, which the dragonflies spend away from water. The secretion contains substances with wax-like properties and becomes darkened by osmication. Secretory cells appear to possess a limited life span; scattered cells in process of dying occur already during the early reproductive phase. In the late reproductive phase most of the glandular epithelium presents a disintegrated appearance. There is no cell renewal in the gland in the course of adult life. The pattern of cell death indicates a decomposition by apoptosis. Besides contributing to investment of the eggs, the glands presumably intervene also in other aspects of the reproductive processes.

**LIVE MASS AND LENGTH-MASS ALLOMETRY
OF ADULT ODONATES COLLECTED IN EAST-CENTRAL
MISSISSIPPI, UNITED STATES**

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Live mass was recorded for over 290 adult Odon. during peak flight season in Mississippi. Total live mass is reported for 19 spp., along with a quantitative species subset analysis of inter- and intraspecific sex partitioned mass. Fresh mass was significantly correlated with species and sex in Anisoptera ($p = 0.021$) and Zygoptera ($p = 0.001$), based on separate species-level analyses of the Libellulidae ($n = 6$ spp.) and Coenagrionidae ($n = 4$ spp.), respectively. Total live mass also was correlated with total body length in the libellulid dragonflies ($r^2 = 0.59-0.94$, $p < 0.0001-0.03$) and length-mass slopes were not significantly different among species. Limitations and cautions of mass prediction via proportionate size dimension(s) are discussed, some advantages of working with adults as opposed to larvae and measuring fresh mass as opposed to dry mass are described, and further study of length-mass relationships in adult Odon. is encouraged.

**FITNESS-RELATED ATTRIBUTES AND
GREGARINE BURDEN IN A NON-TERRITORIAL
DAMSELFLY *ENALLAGMA PRAEVARUM* HAGEN
(ZYGOPTERA: COENAGRIONIDAE)**

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Odon. are usually infected with intestinal gregarines. Using *E. praevarum* adults, it was investigated whether: (a) both sexes differed in the degree of parasitism and immune ability (as shown by melanization of artificial, nylon-based implants in the thoracic region); and, (b) gamete production, survival and fat reserves correlated with gregarine burden. 2 sets of in-copula (to control for age) animals were used. One was used for estimation of egg and sperm, and the other for fat reserves. Survival was monitored as the time that field-captured insects survived under laboratory conditions in the absence of food. Gregarines were counted by dissection of the gut. Despite the case that ♀♀ had more parasites than ♂♂, both sexes did not differ in immune ability. Eggs, but neither sperm nor fat reserves in both sexes, correlated negatively with parasite number. Survival in both sexes also correlated inversely with gregarine burden. This, however, held only for ♂♂ when the analysis was performed by sex. These results are discussed in terms of the detrimental effects of gregarine on Zygoptera hosts.

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A REVIEW OF THE ODONATA OF KAMCHATKA PENINSULA, RUSSIA

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All knowledge of the odon. fauna of Kamchatka Peninsula (NE Asia) is reviewed, using literature data, miscellaneous collections and the results of an expedition by the authors in July 2003. In total, 27 spp. have become known, with *Lestes dryas*, *Coenagrion hastulatum*, *Aeshna serrata*, *Eitheca bimaculata*, *Somatochlora exuberata*, *S. alpestris*, and *Leucorrhinia intermedia* here reported for the first time. *Aeshna palmata* is dismissed; *Anax junius*, twice reported in the 19th century, is an American migrant that rarely reaches Kamchatka; the southern migrants, *Pantala flavescens* and *Sympetrum frequens*, are represented by one old record each, with specimens still preserved in Zool. Inst., St Petersburg. Very few more spp. may be expected in future, and it is concluded that the fauna is of an impoverished boreal extraction. This lack of endemism is understandable, since dragonflies could only begin reinvading the peninsula around 13,000 BP. 7 spp. are Holarctic, 1 is SE Palaearctic, 5 are NE Palaearctic, 1 is an American vagrant, 1 is a sub-cosmopolitan migrant, and the remainder are transpalaearctic.

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**FORAGING BEHAVIOUR OF THE DAMSELFLY LARVA
PYRRHOSOMA NYMPHULA (SULZER)
IN RESPONSE TO PREDATOR PRESENCE
(ZYGOPTERA: COENAGRIONIDAE)**

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The trade off between foraging and predator avoidance was studied. In the presence of a larva of the predatory *Aeshna juncea*, *P. nymphula* was found to reduce foraging activity significantly. *P. nymphula* reduced foraging activity in response to chemical stimuli from *A. juncea* but not in response to visual stimuli. Foraging activity was further reduced when the diet of *A. juncea* was changed from chironomid larvae to *P. nymphula*. This suggests that predators are detected chemically and are chemically labelled by their diet. Foraging activity was found to increase with starvation level after 48 h without access to food, with a further increase after 72 h of starvation. The presence of chemical stimuli from conspecific fed predators delayed the increase in foraging activity until 72 h of starvation. These results have implications for larval survival and adult reproductive fitness.

SHORT COMMUNICATIONS

***HETERAGRION BICKORUM* SPEC. NOV. FROM ECUADOR
(ZYGOPTERA: MEGAPODAGRIONIDAE)**

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The new sp. is described and illustrated (holotype ♂ and allotype ♀ [pair in tandem]: Ecuador, Napo province, Limoncocha, 28-VIII-1980). The holotype and allotype are deposited in the Florida State Collection of Arthropods, Gainesville, Florida, USA.

***FORCEPSIONEURA GROSSIORUM* SPEC. NOV. FROM BRAZIL
(ZYGOPTERA: PROTONEURIDAE)***

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The new sp. (holotype ♂: Nova Friburgo, Rio de Janeiro, Brasil, 25-VII-2002; deposited in the author's collection in Belo Horizonte) is described, illustrated and compared with its congeners. It differs from all congeners by the unique structure of the posterior prothoracic lobe.

* Studies on neotropical Protoneuridae, 17.

**THE MORPHOLOGICAL 'FORMS' OF
PALPOPLEURA LUCIA (DRURY) ARE SEPARATE SPECIES
AS EVIDENCED BY DNA SEQUENCING
(ANISOPTERA: LIBELLULIDAE)**

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P. lucia is a widespread African sp. with a checkered taxonomic history. Currently 2 'forms' or subspecies, *P. l. lucia* and *P. l. portia* are recognized, although debate over the taxonomic status of these taxa has hardly let up over the last 230 years. The 2 'forms' show distinctive wing pattern differences although other aspects of their morphology are very similar. They can occur highly sympatrically at some localities in southern Africa, as well as elsewhere, thus raising the question of whether they are two species or one perhaps with balanced polymorphism. DNA sequence data from the ITS2 and COI genes were collected from specimens of both these 'forms' to assess more rigorously the taxonomic status of these taxa. The closely related *P. deceptor* (Calv.) and *P. jucunda* (Ramb.) were included in the data set to provide a baseline for comparisons. Specimens from all 4 taxa were from pools of the flood plain of the Sabie R., Kruger National Park, South Africa, and were potentially able to interbreed. Both phylogenetic analyses and comparisons of sequence divergence levels strongly support the hypothesis that the 2 'forms' of *P. lucia* are reproductively isolated and should be accorded full species status as *P. lucia* (Drury, 1773) and *P. portia* (Drury, 1773).

***ACANTHAGRION HARTEI* SP. NOV. FROM ECUADOR
(ZYGOPTERA: COENAGRIONIDAE)**

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The new sp. is described and illustrated. Holotype ♂: Ecuador, Morona, Santiago prov., Bomboiza, 20-IX-1990, deposited in USNM, Washington. It is assigned to the *apicale*-group, and differs from the other spp. of that group by characters of the ♂ terminalia and genital ligula.

EXUVIAE AS A RELIABLE SOURCE OF DNA FOR POPULATION-GENETIC ANALYSIS OF ODONATES

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Genetic analyses are widely used for a variety of ecological research scenarios, especially to aid species' conservation programs. Where genetic material is required from rare or endangered spp. it is essential that the samples be collected non-destructively, the ultimate goal should be to develop reliable DNA extraction protocols that may be used with non-invasively collected samples. In this paper 3 methods of DNA extraction (DNeasy tissue kit, proteinase-K/TNES and Chelex-100) that use odonate (*Coenagrion mercuriale*) exuviae as a non-invasive source of genetic material are described and compared. DNA extracted from exuviae produced consistent genotypes at 5 polymorphic microsatellite loci for all of the samples processed using the DNeasy tissue kit and proteinase-K/TNES methods and 4 out of the 6 exuviae treated with Chelex-100. Exuviae offer an effective source of genetic material from endangered odonates and also highly mobile spp. that are too difficult to catch in significant numbers. As such, it is expected DNA extracted from exuviae to be widely applied to odonatological genetic research.

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