

**EFFECT OF PAPER MILL EFFLUENT  
ON THE CEPHALIC NEUROSECRETORY AND  
MIDGUT PROTEASE ACTIVITIES IN THE LAST INSTAR  
LARVA OF *BRADINOPYGA GEMINATA* (RAMBUR)  
(ANISOPTERA: LIBELLULIDAE)**

R.J. ANDREW<sup>1</sup>, E. BALMIK<sup>2</sup> and L. KODHE<sup>2</sup>

<sup>1</sup> Department of Zoology, Hislop College, Civil Lines, Nagpur-440 001 (MS), India

<sup>2</sup> Department of Zoology, SSES's Science College, Congress nagar,  
Nagpur-440 012 (MS), India

*Received August 21, 2004 / Revised and Accepted January 20, 2006*

The last instar larvae were treated with sub-lethal concentrations of paper mill effluent (PME) for 5 days. PME inhibits the synthesis of neurohormones in the A-type cells of the medial group of the brain and in the intrinsic neurosecretory cells of the corpora cardiaca. PME also causes histomorphological changes in the corpora allata and suppress protease activity of the midgut. These findings suggest that various metamorphic and intermediary metabolic alterations caused by the PME treatment is modulated by the changes in the synthesis and secretion of the neurohormones of the cephalic neurosecretory complex.

**DESCRIPTIONS OF THE LAST INSTAR LARVAE  
OF *NEODYTHEMIS HILDEBRANDTI* KARSCH  
AND *N. AFRA* (RIS) WITH COMMENTS ON THE STATUS  
OF THE GENUS AND SUBFAMILY  
(ANISOPTERA: LIBELLULIDAE, TETRATHEMISTINAE)**

S.G. BUTLER<sup>1</sup>, D.G. CHELMICK<sup>2</sup> and G.S. VICK<sup>3</sup>

<sup>1</sup> Red Willow, All Stretton, Shropshire SY6 6HN, United Kingdom  
sgbutler15@btopenworld.com

<sup>2</sup> 31 High Beech Lane, Haywards Heath, West Sussex, RH16 1SQ, United Kingdom  
dgc@davidchelmick.com

<sup>3</sup> Crossfields, Little London, Tadley, Hants, RG26 5ET, United Kingdom  
camdragonfly@aol.com

*Received February 16, 2006 / Reviewed and Accepted March 1, 2006*

The larvae of *N. hildebrandti* (from Nosy Be, Madagascar) and *N. afra* (from Mt Kupe, Cameroon) are described, illustrated from exuviae, and compared with the larva of *N. (Allorrhizucha) klingi* (Karsch) from W Africa. Differences between the larva of *Neodythemis* and that of other known African Tetrathemistinae genera (*Malgasophlebia*, *Notiothemis* and *Tetrathemis*) are highlighted, and it is suggested that this provides support for the view that *Neodythemis* (including *Allorrhizucha*) and *Micromacromia* form a natural group, the 'neodythemistines', and that they are only distantly related to other genera in the subfamily. This provides additional evidence for the view that Tetrathemistinae is not a phylogenetically homogenous grouping within the Libellulidae.

***ELASMOTHEMIS ALICIAE* SPEC. NOV.,  
A NEW DRAGONFLY FROM MEXICO, BELIZE AND  
COSTA RICA WITH A DESCRIPTION OF ITS LARVA  
AND A KEY TO THE KNOWN LARVAE OF THE GENUS  
(ANISOPTERA: LIBELLULIDAE)**

E. GONZÁLEZ-SORIANO <sup>1</sup> and R. NOVELO-GUTIÉRREZ <sup>2</sup>

<sup>1</sup>Instituto de Biología, UNAM, Departamento de Zoología, Apartado Postal 70-153,  
MX-04510, D. F., México  
esoriano@ibiologia.unam.mx

<sup>2</sup>Instituto de Ecología A. C., Departamento de Entomología, Apartado Postal 63,  
MX-91000 Xalapa, Veracruz, México  
novelor@ecologia.edu.mx

*Received March 9, 2005 / Revised and Accepted November 25, 2005*

The new sp. and its larva are described and illustrated from specimens collected in Mexico (states of San Luis Potosí and Veracruz), Belize (Toledo distr.) and Costa Rica (Heredia prov.). Holotype ♂ and allotype ♀ (in copula): Mexico, Veracruz state, Rio La Palma, 25 km N of Catemaco, 28-VIII-1988; deposited at UNAM, Mexico. The sp. is closely related to *E. cannaerioides* Calv. with which it was formerly confused. Adults of the former are larger than those of the latter. The larva is also easily distinguished from *E. cannaerioides* by its larger size and differences in the shape of the dorsal protuberances. Notes on biology and distribution are provided and the known larvae of the genus *Elasmothemis* Westfall are keyed.

**VIBRORECEPTORS AND PROPRIOCEPTORS ON THE  
LARVAL ANTENNAE OF *ERYTHROMMA LINDENII* (SÉLYS)  
(ZYGOPTERA: COENAGRIONIDAE)**

F. MEURGEY<sup>1</sup> and M.J. FAUCHEUX<sup>2</sup>

<sup>1</sup> Muséum d'Histoire Naturelle de Nantes, 12 rue Voltaire, F-44000 Nantes, France  
Francois.MEURGEY@mairie-nantes.fr

<sup>2</sup> Laboratoire d'Endocrinologie des Insectes Sociaux, Université de Nantes, 2 rue de la Houssière, B.P. 92208, F-44322 Nantes Cedex 03, France  
fauchoux.michel@free.fr

*Received February 8, 2006 / Revised and Accepted May 2, 2006*

The larval antennae of *E. lindenii* are short and made up of a scape, a pedicel and a fourth-segmented flagellum. They bear four types of aporous and exclusively mechanoreceptive sensilla: spatula-shaped sensilla chaetica, curved sensilla chaetica, sensilla filiformia and sensilla campaniformia. The curved sensilla chaetica are proprioceptors which monitor the relative position of the 3<sup>rd</sup> and 4<sup>th</sup> flagellomeres. Sensilla filiformia are vibration receptors which play the major role in prey detection. The unique sensillum campaniformium on the pedicel is a proprioceptor which informs the larva of the position of the flagellum relative to the pedicel. Spatula-shaped sensilla chaetica are tactile receptors distributed on the scape and the pedicel. No chemoreceptive sensilla has been observed on the antennae.

## REMARKABLE ELEVATIONAL TOLERANCE IN AN AFRICAN ODONATA LARVAL ASSEMBLAGE

A.S. NIBA<sup>1</sup> and M.J. SAMWAYS<sup>2</sup>

<sup>1</sup>School of Botany and Zoology, University of KwaZulu-Natal, P/Bag X01, Scottsville,  
Pietermaritzburg-3209, South Africa

<sup>2</sup>Department of Conservation Ecology and Entomology & Centre for Agricultural Biodiversity,  
University of Stellenbosch, P/Bag X1, Matieland-7602, South Africa

*Received 15 October, 2005 / Reviewed and Accepted 2 February, 2006*

The spatial patterns in species richness and abundance were investigated here at a series of reservoirs at different elevations, to establish which factors determine species distributions along this topographic gradient. Larvae of 18 spp. were sampled in small reservoirs across a 1250 m elevational gradient at one latitude. Most spp. occurred throughout all elevations indicating that this subtropical odon. assemblage as a whole is remarkably tolerant of elevational changes. Although Anisoptera larval species richness and abundance increased significantly with increasing elevation, there was no change in Zygoptera species richness, while Zygoptera abundance decreased significantly. Species-site-variable triplots for Anisoptera and Zygoptera larvae indicated that no measured site variable on an individual basis clearly accounted for larval species assemblage distribution patterns. Nevertheless, canonical axes and their respective intra-set correlation coefficients showed that some measured site variables e.g. floating/submerged vegetation, turbidity, pH, water temperature (resulting from sunny or shade habitat conditions), marginal grasses, water depth as well as elevation to some extent, explained the main variation in species assemblage composition/distribution in a broadly similar manner for both suborders. Generally, the reservoirs recruited spp. from the regional pool, irrespective of the elevation of the pool. These spp. were all geographically widespread spp. that took advantage of the presence of these man-made reservoirs, and included only one national endemic. Although these artificial water bodies are not increasing the 'extent of species occurrence', they play a major role in increasing 'area of occupancy'. Furthermore, these spp. are remarkably vagile, habitat-tolerant, as well as elevationally-widespread. A reasonable explanation is that this assemblage is the historical survivor over many millennia of oscillating wet/dry periods and natural selection. The present-day spp. are those that readily recolonise pools after drought has been broken, and are pioneering residents of new water bodies over a wide elevational range.

**THE LARVAE OF  
*TEINOPODAGRION DECIPIENS* DE MARMELS  
AND *T. MERIDIONALE* DE MARMELS  
(ZYGOPTERA: MEGAPODAGRIONIDAE)**

N. VON ELLENRIEDER

IBIGEO, Museo de Ciencias Naturales de Salta, Universidad Nacional de Salta,  
Mendoza 2, AR-4400 Salta, Argentina  
odo\_nata@hotmail.com

*Received January 11, 2006 / Reviewed and Accepted February 6, 2006*

The larvae of 2 spp. are described and illustrated: *T. decipiens*, based on specimens from the Bolivian Yungas, and *T. meridionale*, based on specimens from the Argentine Yungas. A key to all known larvae is provided.

SHORT COMMUNICATIONS

**REPRODUCTIVE BEHAVIOUR OF *DIASTATOPS OBSCURA*  
(FABRICIUS) IN A RIVERINE ENVIRONMENT  
(ANISOPTERA: LIBELLULIDAE)**

J.B. IRUSTA and A. ARAÚJO

Sector of Psychobiology, Department of Physiology,  
Universidade Federal do Rio Grande do Norte, Caixa Postal 1511,  
BR-59072-970 Campus Universitário, Natal-RN, Brazil  
banuelos@ufrnet.br & arrilton@cb.ufrn.br

*Received August 6, 2004 / Revised and Accepted December 2, 2005*

The reproductive behaviour of this neotropical dragonfly is described in a riverine environment in NE Brazil. In areas used for reproduction, the ♂♂ behave like territorial perchers in order to defend the territories that will be used by ♀♀ during their oviposition. The preferences of the ♂♂ in reproductive territorial selection and the variation of their reproductive strategies are analyzed from an adaptationist point of view.

## **REGIONAL RESPONSE OF ODONATA TO RIVER SYSTEMS IMPACTED BY AND CLEARED OF INVASIVE ALIEN TREES**

M.J. SAMWAYS and P.B.C. GRANT

Department of Conservation Ecology and Entomology & Centre for Agricultural Biodiversity,  
University of Stellenbosch, P/Bag X1, Matieland-7602, South Africa

*Received October 19, 2005 / Reviewed and Accepted January 16, 2006*

Invasive alien organisms are a major threat to indigenous biodiversity. Invasive alien trees (IATs) are a component of this threat to South African odonates. IATs shade out the habitat of the sun-loving odonate species. A national programme to remove IATs from river systems has been initiated in South Africa. Results from widely-separated sites show that the impacts of IATs are the same in different physiognomic areas. In turn, removal of the IATs is beneficial to a range of species from narrow endemics to widespread generalists. Indications are that this nation-wide IAT-removal programme is beneficial across a wide geographical area, leading to rapid and significant odonate assemblage recovery. The IAT-removal programme must also consider removal of alien seedlings so as not to reverse the recovery programme.