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Genera of aquatic insects from Costa Rica, deposited at the Museo de Zoología, Universidad de Costa Rica

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Abstract: A first checklist of the genera of aquatic insects from Costa Rica is presented. The material has been collected since 1990 throughout the entire country and is deposited at the Museo de Zoología, Universidad de Costa Rica. The collection includes only the aquatic stages from each order and contains a total of 278 genera from 92 families in 11 orders.

Key words: Aquatic insects, checklist, entomology, taxonomy, Costa Rica.

Although only three percent of insect species are aquatic or semiaquatic, representatives may be found in about half of all the insect orders (Merritt & Cummins 1996). These aquatic insects have one or more life stages living in or closely associated with aquatic, mainly freshwater habitats, and many groups are aquatic only during their immature stages, *e.g.* mayflies (Ephemeroptera), caddisflies (Trichoptera) and dragonflies (Odonata).

Besides the well known, major ecological role played by insects in aquatic habitats, more applied research has revealed the importance of aquatic insects as vectors of diseases, indicators in the assessment and monitoring of water quality, and as paleoecological tools in the interpretation of conditions in past environments (Williams & Feltmate 1992).

The use of aquatic insects as indicators of water quality has been intensively studied in the temperate zones (Hauer & Lamberti 1996). In the tropics, however, such studies are scarce, and knowledge of the taxonomy and ecology of aquatic insects is still very poor. The study of these organisms in the neotropics presents certain difficulties, due to the lack of specialists and local reference collections in Latin American countries, and the poor distribution of specialized literature. Furthermore, most of the keys published on aquatic insects are designed for the fauna in the temperate zones, and of limited use for the neotropics.

One result of all these difficulties is that the identification of aquatic organisms made during studies and monitoring of aquatic systems are often not very reliable (Rincón *et al.* 1997). Nonetheless, the correct identification of the specimens is indispensable for their use as indicators in the assessment of water quality.

A first step that helps avoid misidentification of aquatic insects lies in the establishment of a reference collection, and the publication of a list of the taxa encountered in the diffe-

rent aquatic systems of Costa Rica. This is the objective of the present study.

MATERIALS AND METHODS

The material (over 30 000 specimens) has been collected by several persons and the author during various field projects, ecological studies, courses and theses, since 1990. The collections were made in a variety of freshwater habitats (*e.g.* rivers, streams, springs, lakes, ponds, swamps and phytotelmata) throughout the entire country, using different methods, such as hand sampling, Surber sampler, and artifical substrate. All specimens are preserved in 70% alcohol and deposited at the Museo de Zoología, Escuela de Biologia, Universidad de Costa Rica.

The following keys were used for identification: Darsie (1993), Edmunds *et al.* (1976), Epler (1996), Flowers (1992), McCafferty (1981), Merritt & Cummins (1996), Rojas *et al.* (1993), Roldán (1988), Spangler & Santiago-Fragoso (1992), Vargas (1974), Wiggins (1977), and the drafts of the keys for the identification of several groups of aquatic insects from Costa Rica (Springer & Hanson in prep.). In doubtful cases the identification was corroborated with the respective specialists or remained at family level.

RESULTS

A total of 278 genera, belonging to 92 families and 11 orders, were identified and deposited at the reference collection of the Museo de Zoología, Universidad de Costa Rica. At the moment the collection contains only the aquatic stages of each order, which means that the following are represented only by their immature stages: Ephemeroptera, Odonata, Plecoptera, Megaloptera, Neuroptera, Blattodea, Trichoptera, Lepidoptera, and Diptera. In the case of Hemiptera it includes adults and nymphs, and in the Coleoptera, depending on the family, adults and larvae, or only larvae, which is indicated in the list after the family name.

DISCUSSION

Due to the difficulties in identification, in particular of the larval stages, it was not possible in some cases to go to the genus level, but to avoid the loss of information, these unidentified genera are also included in the list. This is especially true for the dipterans, but also for some families in other orders, *e.g.* Libellulidae and Coenagrionidae (both Odonata), or Baetidae (Ephemeroptera). The cause of the identification problems in these families lies in the fact that the diagnostic characters are still unknown for many genera, due to the extremely high percentage of undescribed larval stages.

The best represented group of the main orders in the collection are the caddisflies. This order has been intensively studied by Holzenthal during the past ten years, and his collection of Costa Rican species (adults) contains a total of 47 genera; nine of them with their immature stages unknown. From the remaining 38 genera with described larval stages (at genus level) 36 are represented in the collection.

Further taxonomic studies and an overall review of the literature will be required in the future in order to assess the total diversity of Costa Rican aquatic insects. A guidebook with identification keys to genus level to the freshwater arthropods of Costa Rica is in preparation (Springer & Hanson in prep.).

List of aquatic insect genera deposited at the Museo de Zoología, UCR

ORDER EPHEMEROPTERA (larv.)
BAETIDAE
Baetis
Baetodes
Callibaetis
Camelobaetidius (syn. *Dactylobaetis*)
Fallceon
Moribaetis
Gen. undet.
CAENIDAE
Caenis
EUTHYPLOCIIDAE
Euthyplocia
HEPTAGENIIDAE
Iron
Stenonema
ISONYCHIIDAE
Isonychia
LEPTOHYPHIDAE
(syn. TRICORYTHIDAE)
Haplohyphes
Leptohyphes
Tricorythodes
LEPTOPHLEBIIDAE
Farrodes
Hagenulopsis
Hydrosmilodon

Terpides
Thraulodes
Traverella
OLIGONEURIIDAE
Lachlania
POLYMITARCYIDAE
Tortopus
ORDER ODONATA (larv.)
SUBORDER ANISOPTERA
AESHNIDAE
Aeshna
Anax
Coryphaeshna
Gynacantha
Remartinea
Triacanthagyna
Gen. undet.
CORDULEGASTRIDAE
Cordulegaster
CORDULIIDAE
Neocordulia
LIBELLULIDAE
Brechmorhoga
Cannaphila
Dythemis
Elasmothemis
Erythrodiplax
Libellula
Macrothemis
Micrathyria
Orthemis
Paltothemis
Pantala
Perithemis
Pseudoleon
Sympetrum
Tramea
Gen undet.
GOMPHIDAE
Agriogomphus
Aphylla
Desmogomphus
Epigomphus
Erpetogomphus
Perigomphus
Phyllocycla
Phyllogomphoides
Progomphus
SUBORDER ZYGOPTERA
CALOPTERYGIDAE
Hetaerina
COENAGRIONIDAE
Acanthagrion
Argia
Enallagma
Leptobasis
Telebasis
Gen. undet.
LESTIDAE
Archilestes
Lestes
MEGAPODAGRIONIDAE
Heteragrion
Philogenia
Thaumatoneura
PERILESTIDAE
Perissolestes
PLATYSTICITIDAE
Palaemnema
POLYTHORIDAE
Cora
PROTONEURIDAE
Neoneura
Protoneura
Psaironeura
PSEUDOSTIGMATIDAE
Mecistogaster
Megaloprepus
ORDER PLECOPTERA
PERLIDAE (nymph)
Anacroneuria
ORDER BLATTODEA
BLABERIDAE (nymph)
cf. *Epilampra*
ORDER HEMIPTERA (nymph & ad.)
BELOSTOMATIDAE
Abedus
Belostoma
Lethocerus
CORIXIDAE
Graptocorixa
Tenagobia
Gen. undet.
GELASTOCORIDAE
Gelastocoris
Nerthra
GERRIDAE
Eurygerris
Metrobates
Potamobates
Rheumatobates
Telmatometra
Trepobates
Gen. undet.
HEBRIDAE
Hebrus
MESOVELIIDAE
Mesavelia
Mesoveloidea
NAUCORIDAE
Ambrysus
Cryphocricos
Heleocoris
Limnocaris
NEPIDAE
Curicta
Ranatra
NOTONECTIDAE
Buenoa
Martarega
Notonecta
OCHTERIDAE
Ochterus
PLEIDAE
cf. *Paraplea*
SALDIDAE
Gen. undet.
VELIIDAE
Microvelia
Rhagovelia
Stridulivelia
ORDER MEGALOPTERA
CORYDALIDAE (larv.)
Corydalus
Chloronia
Platyneuromus
SIALIDAE (larv.)
cf. *Sialis*
ORDER NEUROPTERA
SISYRIDAE (larv.)
Gen. undet.
ORDER COLEOPTERA
CHRYSOMELIDAE (larv.)
Gen. undet.
CURCULIONIDAE (larv. & ad.)
Lissorhoptrus
Gen. undet.
DYTISCIDAE (larv. & ad.)
Agametrus
Celina
Copelatus
Desmopachria
Hydraticus
Hydrovatus
Laccodytes
Laccophilus
Liodessus
Megadytes
Neobidessus
Neoclypeodytes
Pachydrus
Rhantus
Thermonectes
DRYOPIDAE (ad.)
Dryops
Helichus
Pelonomus
ELMIDAE (larv. & ad.)
Austrolimnius
Cylloepus
Disersus
Heterelmis
Hexacylloepus
Hexanchorus
Macrelmis
Microcylloepus
Neocylloepus
Neoelmis
Onychelmis
Phanocerus
Pseudodisersus
Stenhelmoides
Xenelmis
Gen. undet.
GYRINIDAE (larv. & ad.)
Dineutus
Enhydrus
Gyretes
Gyrinus
HALIPLIDAE (larv.)
Haliplus
HYDROPHILIDAE (larv. & ad.)
Anacaena
Derallus
Enochrus

Helochares
Hydraena
Hydrochus
Paracymus
Sphaeridiinae Gen. undet.
Tropisternus
Gen. undet.
HYDROSCAPHIDAE (larv. & ad.)
Hydroscapha
LAMPYRIDAE (larv.)
Gen. undet.
LIMNICHIDAE (ad.)
Limnochoderus
Gen. undet.
LUTROCHIDAE (larv.)
Lutrochus
NOTERIDAE (ad.)
Hydrocanthus
Suphisellus
Gen. undet.
PSEPHENIDAE (larv.),
Eubriinae Gen. undet.
cf. *Psephenops*
PTILODACTYLIDAE (larv.)
Anchytarsus
SCIRTIDAE (larv.)
(syn. HELODIDAE)
Scirtes
Gen. undet.
STAPHYLINIDAE (larv. & ad.)
Gen.undet.
ORDER TRICHOPTERA (larv.)
ANOMALOPSYCHIDAE
Contulma
CALAMOCERATIDAE
Phylloicus
GLOSSOSOMATIDAE
Culoptila
Mexitrichia
Mortionella
Protoptila
HELICOPSYCHIDAE
Cochliopsyche
Helicopsyche
HYDROBIOSIDAE
Atopsyche
HYDROPSYCHIDAE
Calosopsyche
Leptonema
Macronema
Macrostemum
Smicridea
Gen. undet.
HYDROPTILIDAE
Alisotrichia
Brysopteryx
Hydroptila
Leucotrichia
Mayatrichia
Neotrichia
Ochrotrichia
Oxyethira
Rhyacopsyche
Zumatrichia
Gen. undet.
LEPIDOSTOMATIDAE
Lepidostoma
LEPTOCERIDAE
Atanatolica
Nectopsyche
Oecetis
Triaenodes
Triplectides
LIMNEPHILIDAE
Limnephilus
ODONTOCERIDAE
Marilia
PHILOPOTAMIDAE
Chimarra
Wormaldia
POLYCENTROPODIDAE
Cyrnellus
Polycentropus
Polyplectropus
XIPHOCENTRONIDAE
Xiphocentron
ORDER LEPIDOPTERA (larv.)
PYRALIDAE
Petrophila
Gen. undet.
ORDER DIPTERA (larv.)
NEMATOCERA
BLEPHARICERIDAE
Paltostoma
Gen.undet.
CERATOPOGONIDAE
cf. *Alluaudomyia*
cf. *Atrichopogon*
cf. *Probezzia*
cf. *Stilobezzia*
Gen. undet.
CHAOBORIDAE
Chaoborus
CHIRONOMIDAE
Chiranimini Gen. undet.
Orthocladiinae Gen. undet.
Pentaneurini Gen. undet.
Tanytarsini Gen. undet.
Tanypodini Gen. undet.
CORETHRELLIDAE
Corethrella
CULICIDAE
Aedes
Anapheles
Culex
Haemagogus
Orthopodomyia
Psorophora
Toxorhynchites
Wyeomyia
DIXIDAE
Dixella
PSYCHODIDAE
Clogmia
Maruina
Pericoma
Gen. undet.
SIMULIDAE
Simulium
TIPULIDAE
Hexatoma
Molophilus
Tipula
Limonia
Limoniinae Gen. undet.
Tipulinae Gen. undet.
BRACHYCERA - ORTHORRHAPHA
ATHERICIDAE
Atherix
DOLICHOPODIDAE
Gen. undet.
EMPIDIDAE
Neoplosta
Hemerodromia
Gen. undet.
STRATIOMYIDAE
Caloporyphus
Euparyphus
Myxosorgus
Nemotelus
Odontomyia
Stratiomys
Gen. undet.
TABANIDAE
Gen. undet.
BRACHYCERA - CYCLORRHAPHA
EPHYDRIDAE
Gen. undet.
MUSCIDAE
cf. *Lispe*
cf. *Limnophora*
Gen. undet.
SCIOMYZIDAE
Gen. undet.
SYRPHIDAE
Gen. undet.

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This study is a contribution to the Museo de Zoología, Escuela de Biología, UCR, # 112.

RESUMEN

Se presenta una primera lista de los géneros de insectos acuáticos de Costa Rica. El material ha sido recolectado desde 1990 por todo el país y se encuentra depositado en la colección húmeda del Museo de Zoología, Universidad de Costa Rica. La colección incluye solamente los estadíos acuáticos de cada orden y contiene un total de 278 géneros de 92 familias, perteneciente a 11 órdenes.

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