

CHIRONOMIDS OF THE YUCATÁN PENINSULA

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Introduction

One of the many areas of the globe, where the chironomid fauna has practically not been studied yet, is the Yucatán peninsula. It is vast and mostly plain lowland marking the southern border of the Mexican Gulf. The geological history of Yucatán is linked in many ways with that of the Caribbean and Central America (Iturralde-Vinent and MacPhee 1999). In biogeographical terms, Yucatán belongs to the Neotropical region and the Caribbean subregion (Morrone 2006). Occurrence of endemisms seems to justify a subdivision in three more areas (Espadas et al. 2003). To date, studies of chironomid communities in Central America concentrated mainly on the mountainous reaches along the cordillera ridges and volcano foothills (e.g. Coffman et al. 1992; Watson and Heyn 1992; Sublette and Sasa 1994).

The study presented here is part of a major research project. Its purpose is to estimate the importance of climatic and geogene factors for the taxonomic composition of chironomid communities in lakes of the peninsula. A preliminary overview on the chironomid diversity of this region is given in this article.

Sampling sites and methods

18 lowland lakes, differing in basin morphometry, anthropogenous impact, and chemical properties, were studied in the lowland (up to 150 m a.s.l.) of Yucatán. The lake basins are embedded in limestone and gypsum karst and scattered across a NE-SW precipitation gradient from 600 to 1900 mm a⁻¹. Some of the lakes communicate hydrologically with the mangrove belt of the coastline through a diffuse net of canals. Immature chironomids were sampled from the sediment surface layer at maximum lake depth (SMD) and in the littoral from surface drift and various firm substrates. Adults were caught with an insect net from emerging plants and in a light trap after sunset. So far, larval head capsules, given in individuals per gram dry sediment (g⁻¹), and male adults were analyzed. Littoral samples await processing. Environmental predictors

include 31 parameters for lake morphometry, lithology, physico-chemical analyses, littoral morphology, hinterland use, and anthropogenic disturbance.

First results and considerations

To date, 84 taxa (mainly morpho-species) out of 48 chironomid genera have been identified on the basis of head capsules from SMD and adult males from all 18 lakes (Tab. 1). Eight genera belonged to the Tanypodinae, only two genera to the Orthocladiinae, and the majority, i.e. 38, to the Chironominae (29 Chironomini, 9 Tanytarsini). The dominant taxa that occurred in all lakes were *Cladopelma lateralis* and *Tanytarsus* species (this genus probably comprises a greater number of morpho-species than separated here). Further on, *Chironomus*, *Goeldichironomus*, *Polypedilum*, *Cladotanytarsus*, *Labrundinia*, *Natarsia*, *Procladius* were present in more than 70% of the lakes. The most abundant genera, reaching abundances of 4 to 10 g⁻¹, were *Labrundinia*, *Natarsia*, *Cladopelma*, *Microtendipes*, *Xenochironomus*, *Cladotanytarsus*, and *Tanytarsus*. Mean taxa number from SMD was 14.4, whereat greatest diversity was found in Lake Yaxha (20) and Gravel Pond (19), lowest in Honey Camp Lagoon (7) and Lake Chichancanab (9). Median total abundance of head capsules from SMD was 53.5 g⁻¹. Density was exceptionally high in Punta Laguna (1033 g⁻¹), moderate in Honey Camp Lagoon (174 g⁻¹), Cenote (172 g⁻¹) and extremely low, however, in Lake Izabal (0.81 g⁻¹).

The slope of the species-area relationship indicated that about 50 to 60 % of the estimated chironomid diversity of Yucatán lowland lakes was covered by the list above. For most of the taxa, marked out as morpho-species, no taxonomic descriptions exist. The number of taxa is expected to rise further when data from littoral immatures and all adults are included. However, a certain drawback is the fact that explicit combinations of the metamorphic stages can be attained only under reserve.

Relatively low SMD head capsule abundance in Yucatán lakes, in comparison to temperate lakes, may have several reasons: 1) The lakes studied, like most shallow lakes of the (Sub-)Tropics, are holomictic and thus sedimentation is disturbed by turbulence, which causes head capsules to disaggregate more likely. 2) Sedimentation rates are increased owing to both inflow of allochthonous inorganic suspended matter from affluents, mainly during the rain periods, and/or high autochthonous production conditioned by lake morphometry and/or anthropogenic alterations. 3) Durability of the sediment may be reduced due to precipitation and redilution processes of the geogene gypsum. Consequently, time-consuming analysis of low-density material did not help promoting the taxonomic gain.

A view on numerical attributes revealed that both, number of taxa and equitability (evenness) of the communities tended to decrease towards higher latitudes, at which SMD abundances, however, increased significantly with the probability of drought events occurring. Number of taxa was highest in eutrophic conditions. Correspondence analyses showed that the most important environmental predictors, besides trophic state of the lakes and mean annual precipitation, were concentration of gypsum (CaSO₄) and salinity (predominantly NaCl), the latter occurring in

lakes subject to aperiodical seawater infiltration. Surprisingly, morphometric properties, such as littoral formation, lake surface area, and average lake depth were of subordinate explanatory value for the community structure.

Expectations of finding a high ratio of species versus genera were supported by assumptions from biogeography and evolutionary history. Central America is a relatively young land bridge, which gave way to a radiation from both Americas (Bănărescu 1995). Colonization of aquatic habitats and ecological niching in process is assumed to be reflected in a relatively great taxonomic depth (Coffman et al. 1992).

The biogeographic position of chironomids of the Yucatán peninsula can be determined with some certainty. Studies of taxa assemblages, including descriptions of new species, exist for Costa Rica (Coffman et al. 1992; Watson and Heyn 1992; Andersen 1996; Epler 1996a, b), Nicaragua (Palomaki 1987; Ráudez Reyes 2004), Guatemala (Sublette and Sasa 1994), and Mexico (Epler 1987; Contreras-Ramos and Andersen 1999; Andersen et al. 2000, Andersen and Mendes 2002; Kyerematen and Andersen 2002). Other works (e.g. Borkent 1984; Spies and Reiss 1996; Mendes et al. 2004) refer to entire Central America and beyond.

Table 1. Chironomid taxa recorded from lakes of Yucatán peninsula (l: larva, a: adult)

Taxon	Stage	Taxon	Stage
<i>Ablabesmyia</i> sp.	l	<i>Nilothauma</i> sp.	l
<i>Ablabesmyia cinctipes</i>	a	<i>Oukuriella</i> c.f. <i>simulatrix</i>	a
<i>Coelotanypus</i> sp.1	l	<i>Paracladopelma</i> sp.	l
<i>Coelotanypus</i> sp.2	l	<i>Paralauterborniella</i> sp.	l
<i>Fittkauimyia</i> sp.	l	<i>Paratendipes</i> sp.1	l
<i>Labrundinia</i> sp.	l	<i>Paratendipes</i> c.f. <i>subaequalis</i>	l
<i>Labrundinia fosteri</i>	a	<i>Parachironomus</i> sp.	l
<i>Natarsia</i> sp.	l	<i>Parachironomus directus</i>	a
<i>Nilotanypus</i> sp.	l	<i>Pedionomus</i> sp.	l
<i>Procladius</i> sp.	l	<i>Pedionomus curticaudatus</i>	a
<i>Tanypus</i> c.f. <i>mopunctipens</i>	l	<i>Phaenopsectra</i> sp.	l
c.f. <i>Tanypus</i> sp.A	l	<i>Polypedilum</i> sp.	l
<i>Nanocladius</i> sp.	l	<i>Polypedilum purus</i>	a
<i>Cricotopus</i> sp.	a	<i>Polypedilum</i> sp.A	a
<i>Apedilum</i> sp.	l	<i>Polypedilum</i> sp.B	a
<i>Apedilum subcinctum</i>	a	<i>Polypedilum</i> sp.C	a
<i>Apedilum elachisto</i>	a	<i>Polypedilum</i> sp.D	a
<i>Asheum curticaudatus</i>	a	<i>Polypedilum</i> sp.E	a
<i>Axarus</i> sp.	l	<i>Polypedilum</i> sp.F	a
<i>Beardius</i> sp.	l	<i>Pseudochironomus</i> sp.	a
<i>Beardius aciculatus</i>	a	<i>Saetheria</i> sp.	l
<i>Fissimentum</i> sp.	l	<i>Xenochironomus</i> sp.	l
<i>Chironomus</i> sp.1	l	<i>Zavreliella</i> sp.	l
<i>Chironomus</i> sp.2	l	<i>Zavreliella longiseta</i>	a

Taxon	Stage	Taxon	Stage
<i>Cladopelma</i> sp.1	1	<i>Caladomyia pistra</i> sp.	a
<i>Cladopelma</i> sp.2	1	<i>Cladotanytarsus</i> sp.1	1
<i>Cladopelma forcipis</i>	a	<i>Cladotanytarsus</i> sp.A	a
<i>Cryptochironomus</i> sp.	1	<i>Micropsectra</i> sp.	1
<i>Cryptochironomus</i> sp.A	a	<i>Nimbocera</i> sp.	1
<i>Cryptochironomus</i> sp.B	a	<i>Paratanytarsus</i> sp.	1
<i>Dicrotendipes</i> sp.	1	<i>Stempellina</i> sp.	1
<i>Dicrotendipes</i> c.f. <i>sinoposus</i>	a	<i>Stempellinella</i> sp.1	1
<i>Einfeldia</i> sp.	1	<i>Stempellinella</i> sp.2	1
<i>Glyptotendipes</i> sp.	1	<i>Stempellinella</i> sp.3	1
<i>Goeldichironomus</i> sp.1	1	<i>Sublettea</i> sp.	1
<i>Goeldichironomus</i> sp.2	1	<i>Tanytarsus</i> sp.1	1
<i>Goeldichironomus amazonicus</i>	a	<i>Tanytarsus</i> sp.2	1
<i>Goeldichironomus carus</i>	a	<i>Tanytarsus</i> sp.3	1
<i>Goeldichironomus holoprasinus</i>	a	<i>Tanytarsus</i> sp.4	1
<i>Hyporhygma</i> sp.	1	<i>Tanytarsus hastatus</i>	a
c.f. <i>Lipinella</i> sp.	1	<i>Tanytarsus</i> sp.A	a
<i>Microchironomus</i> sp.	1	<i>Tanytarsus</i> sp.B	a
<i>Microtendipes</i> sp.	1	<i>Tanytarsus</i> sp.C	a

However, comparability of the aforementioned studies with ours suffered from certain limitations. On the one hand, those studies were carried out at different geographic altitudes, thus covering the range from tropical to temperate fauna. On the other, only rough descriptions of the habitat types, samples were taken from, were given, often mingling captures from running and still waters. The occurrence of Orthoclaadiinae, being well represented in those other studies, entailed low taxonomic overlap with our data, not exceeding 50 percent on the generic level. Consequently, the chironomid fauna from a nearby site in Guatemala (Sublette and Sasa 1994) most closely resembled that from the northern Andes of Colombia (Riss and Ospina 2000). And the so far only record from the central lowlands of Yucatán (Contreras-Ramos and Andersen 1999) displayed a generic correspondence with our data of 64 percent – not more than comparison with the chironomid list for northern Colombia (Nazarova et al. 2004). Latter findings indicate that the chironomids of the entire Yucatán lowland can be regarded as a circum-Caribbean element.

Comparative analyses of existing record lists were limited due to ambiguity or absence of pertinent complementary information about sample habitats in most of the chironomid field studies referred to here. Generally spoken, better comparability of study results would allow for means and goals to an advanced level, such as ecological meta-analyses or biogeographic diagnoses. This conclusion also may be understood as a plea for stronger consideration of simple but useful ecological specifications of

sample habitats to be given along with future chironomid field records.

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