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CHIRONOMIDAE IN FRESHWATER HABITATS IN TENERIFE, CANARY ISLANDS

P.D. Armitage[1], *J.H. Blackburn*, *Å.N. Nilsson* *and B. Malmqvist*

[1]Institute of Freshwater Ecology, River Laboratory East Stoke Wareham, Dorset BH20 6BB, England

[2]Department of Animal Ecology University of Umeå Sweden

INTRODUCTION

Some groups of the freshwater fauna of the Canary Islands have been well studied. These include beetles, blackflies, mosquitoes, odonates and water bugs (see Malmqvist *et al.*, 1993 for a review of studies). The Chironomidae of the Canary Islands in contrast have been the subject of only occasional investigations (Becker, 1908; Santos Abreu, 1918; Storå, 1936). Subsequent collections of adult material have been made (Armitage, 1987; Armitage and Tuiskunen, 1988) and Cranston and Armitage (1988) redescribed material from the earlier collections of Becker and Santos Abreu. More recently 7 permanent freshwater streams on the island of Tenerife have been examined by Malmqvist *et al.* (1993). Chironomid data are presented in that paper and this present study analyses those records together with new information from a number of additional sites, based largely on larval material.

Study Area and Methods

Tenerife is the largest (2057km^2) and highest (3718m) of the Canary Islands and is situated at latitude 28°15"N, 300km off the coast of Morocco in the trade wind belt. The island has a volcanic origin and has never been connecced to the African mainland (Schmincke, 1976). This isolation together with the arid nature of the southern part of the island which lies within a rain shadow result in a paucity of freshwater fauna and natural freshwater habicats. This situation is exacerbated by the continuing pressure on existing water sources.

The habitats sampled included stream riffles (7 localities on 'permanent' streams), stream pools (11 localities), streams general, that is not specifically pool or riffle samples (17 localities), residual pools in dried-up stream beds (12 localities), 4 ponds, 4 reservoirs, 14 artificial pipes, channels ('canals') and 15 seepages/trickles (wet walls). The location of the sites is indicated in Fig. 1 and the altitiidinal distribution is illustrated in Fig. 2. Some localities were sampled on more than one occasion in 'spring' and 'autumn/winter' in 1991 and 1993 and details are presented in the appendix. Details on sampling methodology and information on che physical and chemical features of the main stream sices are presented in Malmqvist ec al. (1993).

The majority of material was larval hence most records are at genus level but the inclusion of some pupae and adults facilitated identification to species in some cases. Light traps located by three streams also provided some adult material. Semi-quantitative data on spatial and temporal changes in the chironomid communities of the 7 'permanent' streams are presented in

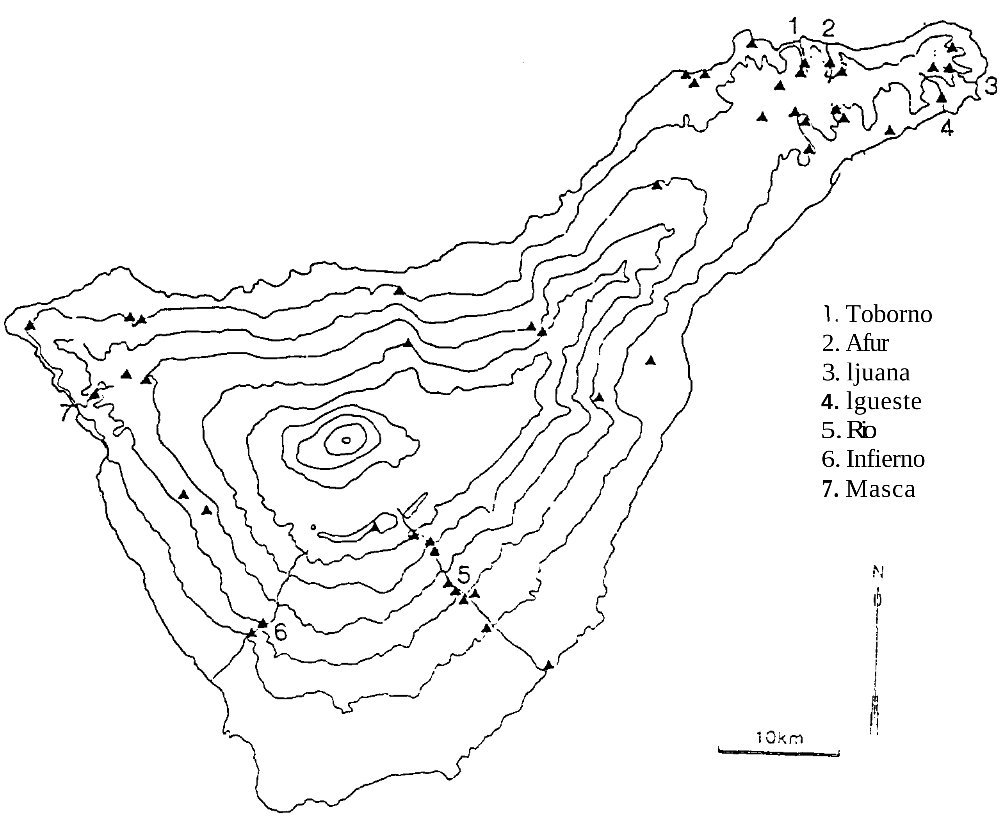

Figure 1. Tenerife; location of sampling locations in relation to the 7 main stream sites.

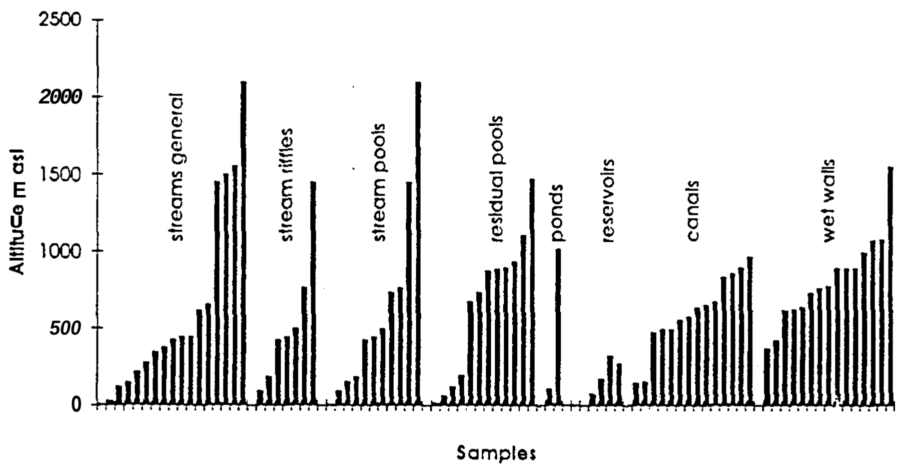

Figure 2. The altitudinal distribution of sample sites per habitat type.

Malmqvist *et* al. (1993) buc in this present work most samples were not quanticative and to ensure compatibility all are treated qualicacively.

The data from the collections were analysed to examine the relationship between the chironomid community as a whole to the particular habitat types using ordinacion cechniques. In addition the richness of habitat types in relation to sarnple effort is examined briefly.

RESULTS

The distribution of taxa in the habitat types is presented in Table 1. Forty-three separate tasa were recorded bcit the list includes some taxa groups and larvas unidentifiable to species. Of che species, most are cosmopolitan or European in distribution and the African element is weak.

The most commonly occurring taxa in stream pools were *Ablabesmyia longistyla* Fittkau, *Zavrelimyia ?nubila* (Meigen) and *Chironomus* spp.. In riffles *Rheotanytarsus* spp. and *Thienemaniella clavicornis* (Kieffer) were the common forms and in residual pools, ponds and reservoirs *Chironomus* spp. dominated the records. In 'canals' *Paratrichocladius* spp. (probably *rufiventris* (Meigen)) with *Rheotanytarsus* spp. were the most commonly occurring taxa. Chironomidae were seldom found in 'wet wall' sarnples and here the most common taxa were *Rheocricotopus* sp, Paratrichocludius sp. and *O. (Eudactylocladius)* sp.

The associacion of assemblages of chironomid taxa with habitat type was tested using Detrended Correspondence Analysis [DCA] (DECORANA; Hill, 1979) in the program CANOCO (ter Braak, 1988). The data matrix consisted of a reduced list of 41 taxa (see Fig. 3) at 118 sites. Ordination resulting from **DCA**, groups samples on the basis of their faunal composition and the relationship between asis scores and environmental variables allows che detection of general trends governing the distribution of samples. **A** preliminar); run showed that the taxon *Halocladius*, which occurred at only one site not associated with any other species, was exerting a distorting effect on the ordinarion and it was omitted from the list of tasa. Fig. 3a presents the results of the site ordination. Clearly there is rnuch variation and considerable overlap between habitat types. Nevertheless, lentic and lotic components are recognizable. The ordination of tasa is shown in Fig. 3b. and reflects the same lentic-lotic trend from right to left along axis 1, but no well-defined assemblages of tasa could be detected in response to underlying environmental gradients, a feature which may be linked to the opportunistic response of chironomid species to habitat availability (Rossaro, 1393). Even the very large altitudinal variation **in** sites was not evident in the ordination.

Table 1 List of tasa found in 6 habitat categories with number of records per habitat

Habitats	streams general	stream pools	screarn riffles	residual pools	'canals'	wet walls	ponds	reservoirs
Sampling occasions	25	23	14	21	20	15	7	6
Ablabesmyia longistyla Ficc.	4	12	7	1	2	-	-	
Ablabesmyia sp.		1		2	2	-	-	
Bryophaenocladius sp.					1	-	-	
Cardiocladius capucinus? (Zett.)					1			-
Cardiocladius sp.					1			-
Chaetocladius sp.				1				
Chironomus sp.	2	9	2	10	4		4	5
Cladotanytarsus sp.		2	1			1		
Corynoneura sp. **A.**	-		4			1		
Cricotopus (C.) vierriensis Goetgh.	2	-	-	-	6	1		
Cricotopus (I.) ornatus Mg.	-	-	-	-				1
Cricotopus (I.) sylvestris Fabr.	-	1					1	
Cricotopus sp.	1	7	5		3			
Dicrotendipes sp.	-	2		1			2	
Eukiefferiella ? ilkleyensis (Edw.)	1	1	4		1			
Eukiefferiella ? minor (Edw.)	5	2	3			1		-
Halocladius sp.	-	1	-	-				-
Limnophyes ? minimus (Mg.)	1	-	-	-	-			-
Limnophyes sp.	1	2	1			1		-
Macropelopia nebulosa (Mg.)	1	5	1		-	-	-	-
Macropelopia sp.	3					-	-	-
Metriocnemus ? fuscipes (Mg.)		1				-	-	
Metriocnemus obscuripes (Holmgr.)		1				-	-	-
Metriocnemus sp.	1				-	-	-	-
Micropsectra ? notescens (Walk.)	1	3	1					-
Micropsectra sp.	1	2	1		-	1		-
Orthocladius ? (Eudactylocladius) sp.	2				1	2		-
Orthocladius (Euorthocladius) rivicola Kieff	2	4	5		-	-	-	
Orthocladius (Orthocladius) sp.		4	5	1	1	-	-	
Orthocladius sp.	1				1	-	-	-
Orthocladius/Cricotopus sp.	5			2	2	-	-	
Parakiefferiella sp.	1					-	-	
Paramerina vaillanti (Fitt.)		1	1		-	-	-	
Paramerina mauritanica (Firt.)	1				-	-	-	
Paramerina sp. Pe1 (sensu Langton 1991)	-	5	3	-		-	-	-
Paramerina sp. 1	-	-	1	-		-	-	
Parametriocnemus stylatus (K.)	4	5	7	1	1	1	-	
Paratrichocladius rufiventris (Mg.)	3	4	7	1	6	2	-	
Paratrichocladius sp.	7	1	-	-	12			
Phaenopsectra sp.	3	6	1	3	2	-		
Polypedilum sp.	5	6	1	3	2	-	?	4
Procladius (Holotanypus) choreus (Mg.)	1	4	-	1	-	-	1	
Procladius (Psilotanypus) sp.	-	-	-	-	1	-		
Procladius sp.	-	-	-	1				1
Psectrocladius limbatellus Holmgr.	1	2	2	2	1		!	
Psectrocladius ? octomaculatus Wülk.	-	-	-	-				1
Psectrocladius sp.	-	-	-	-			2	2
Rheocricotopus atripes K	4	4	4	1			-	-
Rheocricotopus sp.	2	3	4	?	1	3		

Table 1. cont.

Habitats	streams general	stream pools	stream riffles	residual pools	'canals'	wet walls	ponds	reservoirs
Sampling occasions	25	23	14	21	20	15	7	8
Rheotanytarsus sp	3	4	11	1	10			
Stictochironomus sp.	1	1		3		-1		
Tanytarsus sp.		7	2	1				
Thienemanniella ? clavicornis K.		5	8					
Thienemanniella sp.	2			1	2	1		
Thienemannimyia gp.	1							
Trissopelopia ? flavida (K.)	1	1	1					
Virgatanytarsus albisutus (Santos Abreu)	1	4	6					
Zavrelimyia ? nubila (Mg.)	4	11	7	5	1			
Zavrelimyia sp.	4	1		5	1			

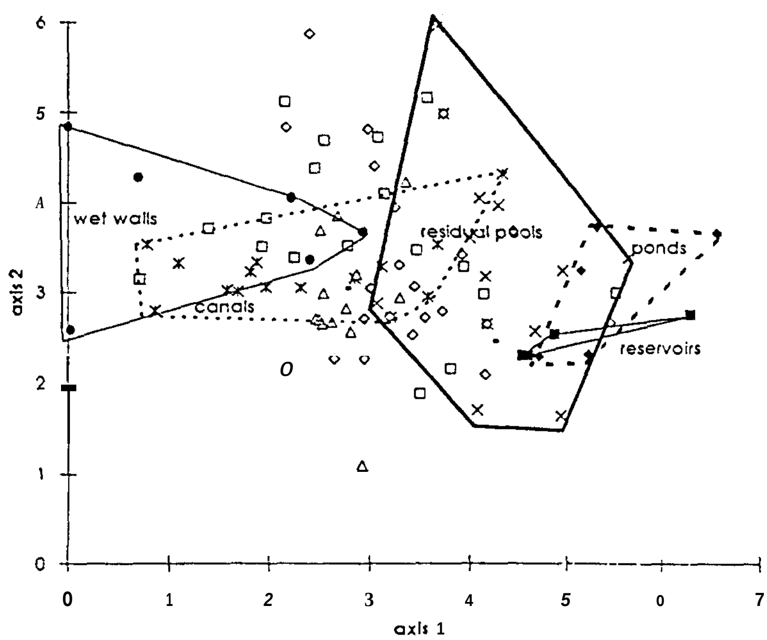

Figure 3n. Plots of ordination sample scores derived from DECORANA analysis of the entire sample site matrix. The polygons surround the data points in particular habitat types; (open square=streams general, open diamond=stream pools, open triangle=stream riffles, X=residual pools, closed circle=wet walls and seepages, closed square=reservoirs, closed diamond=ponds, ='canals' (artificial channels), =light trap)

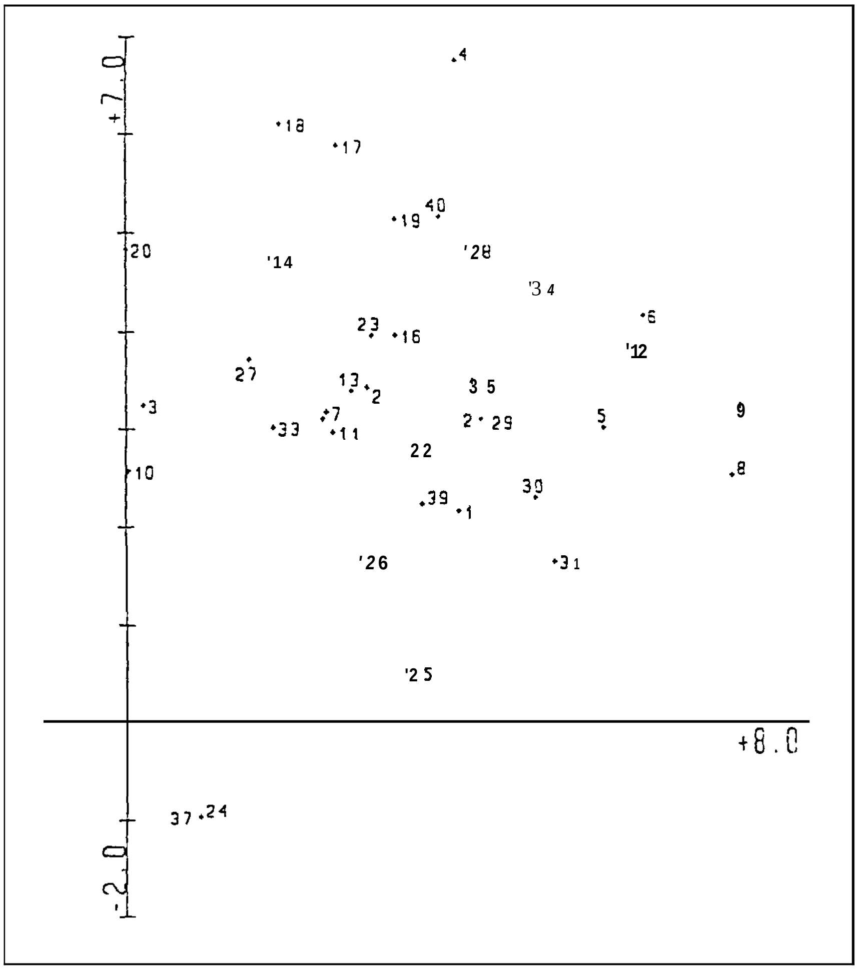

Figure 3b. Plocs of ordination species scores. (axis1=x axis, axis2=y axis). 1 *Ablabesmyia* sp., 2 *Bryophaenocladius* sp., 3 *Cardiocladius* **sp., 4** *Chaetocladius* sp., 5 Chironomiu spp., 6 *Cladotanytarsus* sp., 7 Corynonettra sp., 6 *Cricotopus ornatus*, 9 *C. sylvestris*, 10 *C. vierriensis*, 11 *Cricotopus* sp., 12 *Dicrotendipes* sp., 13 *Eukiefferiella ?ilkleyensis*, 14 E. *?minor*, 16 *Limnophyes* sp., 17 *Macropelopia* sp., 18 *Metriocnemus* spp., 19 *Micropsectra* sp., 20 *Orthocladius (Eudactylocladius)* sp., 21 O.*(Euorthocladius)* sp., 22 O.*(Orthocladius)* sp., 23 *Orthocladius/Cricotopus* spp , 24 *Parakiefferiello* sp., 2í *Paramerina* spp., 26 *Parametriocnemus stylatus*, 27 *Paratrichocladius rufiventris?*, 28 *Phaenopsectra* sp. 29 *Polypedilum* sp., 30 *Procladius* spp. 31 *Psectrocladius* spp., 32 *Rheocricotopus* sp., 33 *Rheotanytarsus* spp., 34 *Stictochironomus* sp., 35 *Tanytarsus* sp., 36 *Thienemanniella* sp., 37 *Thienemannimyia* group, 38 *Trissopelopia* sp. 39 *Virgatanytarsus* sp. 40 *Zavrelimyia* sp.

The relative richness of the habitat types is illustrated in Fig. 4. In the upper part of che figure it is clear that chere is a positive relationship between total nurnher of tasa and the number of sampling occasions, with the exception chat streani riffles have slightly higher number of tasa chan expected and wet walls a lower number than expected. This point is borne out when the rnean number of **caso** per sample is considered (lower

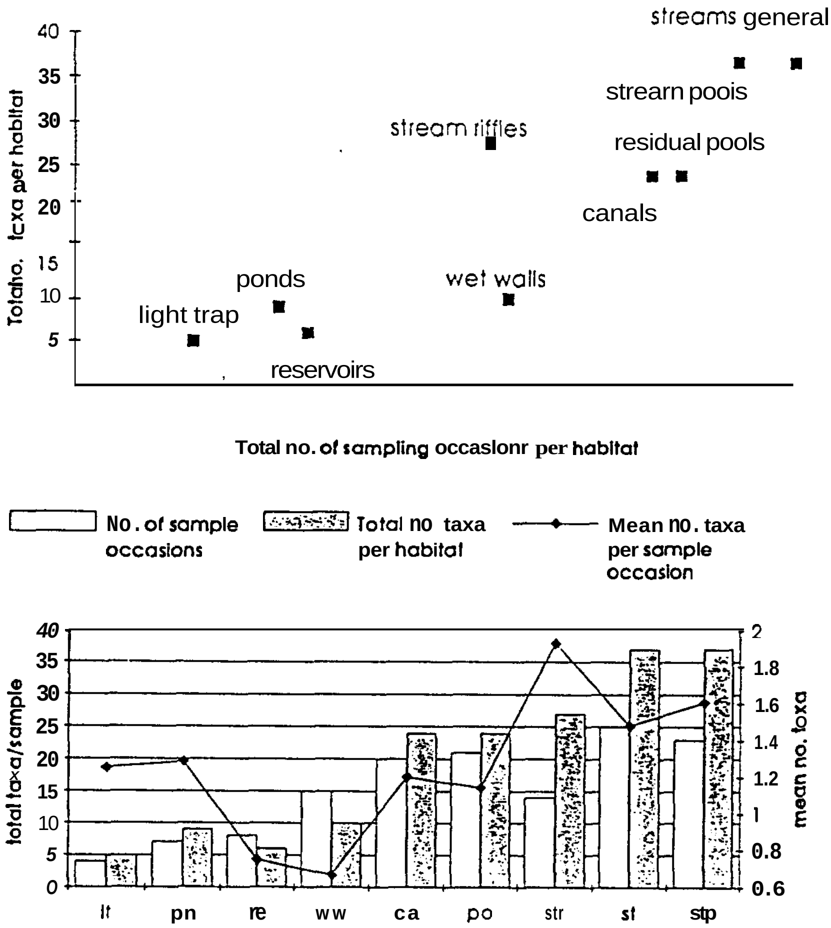

Figure 4. Taxon richness per sample effort (upper) and per habitat type (lower). (lt- light trap, pn - ponds, re - reservoirs, ww - wet walls, ca - canals, po - residual pools, and streams - general, st, riffles str and pools stp).

section of Fig. 4). The stream habitats contain more taxa than standing waters and within the latter ponds are richer than reservoirs.

Discussion

The study of Chironomidae of Tenerife is still at an early stage. Although the work of Malmqvist *et al.* (1993) was systematic and detailed, collections of larval material do not usually provide the information necessary for species identifications. Adult material in good condition is required.

Some taxa that were represented by adult, pupal and larval material were still difficult to identify to species. The genus *Paratrichocladius* definitely contained *P. rufiventris* but also included some forms which did not readily fit that species, with pupal exuviae near *rufiventris* but with a point patch on tergite VII and adult features (gonocoxite lobe) which did not fit *P. rufiventris*. Within the *Rheotanytarsus* complex there are probably three species.

One of these is new (*Rheotanytarsus* Pe 2, sensu Langton (1991) and is currently being described from all life-history stages (collected by PDA in 1983 and 1985). No pupal or adult material is available for the other *Rheotanytarsus* species. All queried species reqiiire more adult material to be certain of their idencity.

The paucity of taxa found in chis present survey may reflecc not only the isolated and arid nature of much of the island buc also the absence of suicable material which would have permitted furcher idencificacion of the genera recorded. In neighbouring Morocco, Azzouzi and Laville (1987) recorded 65 species based on data from the literature becween 1955 and 1986; with more colleccions this total rose to 134 species. Subsequent studies in lotic habitacs (Azzouzi *et* al., 1992) have now raised this number to 223 species. In Tenerife a large increase in che recorded species can also be especced with more systematic study, despite the limited availability of freshwater habitat. Standing water habitats in the form of small reservoirs are increasing and it is likely that tasa lists from these habitats will increase over che next few years. Omitted from chis study are terrestrial and marine habitats which can be expected to contribute a number of species (Arrnicape, 1987; Armitage and Tuiskunen, 1988).

It is too early for biogeographic speculation and this should await che availability of comprehensive species lists based largely on adult material.

Acknowledgements

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