Observations on Lotic Chironomid Life Cycles in Western Ireland

By Edward Fahy

An Foras Forbartha, St. Martin's House, Waterloo Road, Dublin 4.

Abstract

Observations on the life cycles of Chironomidae in Western Ireland are presented. Fifty four species were captured in a small stream system in the course of several sampling programmes which included an artifical rearing procedure for fourth instar larvae, the results of which are discussed in some detail. Trapping of adults provided further data on flight period and there are observations on the frequency of some of the more common larvae in the benthos. The data suggest that most species have a one-year life cycle which is the case for the majority of the other invertebrates in the stream system.

Introduction

Fahy and Murray (1972) gave an account of the species composition of the Chironomids in a small stream system in western Ireland. The species list was built up from several trapping and sampling programmes which also gave information on the larval life cycle in the benthos (as indicated by montly larval counts), and the seasonal occurrence of adults.

Methods

Artificial rearing programme

Three different sampling sites on the Altahoney system (see Fig. 1, Fahy & Murray 1972) were visited in rotation during a 12 month period. Standard handnet samples from approximately 1 m^2 area of the stream benthos were taken on each occasion. Under optimal conditions (bright light and sometimes magnification) the contents were hand sorted: all debris was removed along with the larger invertebrates, and fourth instar chironomid larvae, which were identified by their thoracic development, were picked out with a paintbrush and placed in wide dishes, one or at most two larvae to a dish. When two larvae were reared together they were of different sizes so that confusion could not occur after emergence. Each dish contained approximately 2 mm water, the wide surface area and the shallow depth permitting diffusion of oxygen. The dishes were examined daily and the date of pupation noted, later the date of emergence was also noted. After emergence of the adult it was left for 3 hours to allow the exoskeleton to set and the colours develop, then killed by immersion in alcohol (90 %) and identified. Successful emergence did not always occur however and the adult frequently died while struggling out of the pupal exuvium.

Chironomid larvae are delicate and fail to develop beyond the pupa if roughly handled. In preliminary trials collections taken during floods or from riffles had a lower success rate than similar samples from relatively still water. Another factor was the time of

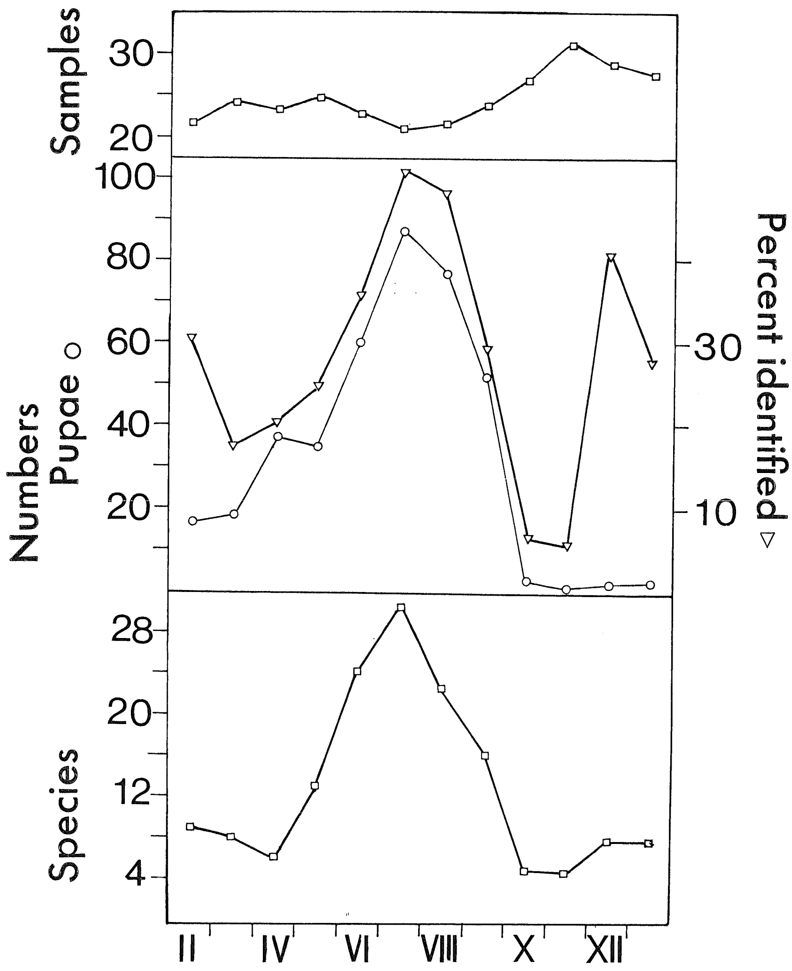

Fig. 1. Graphic summary of an artificial rearing programme for lotic chironomids from a small stream system in western Ireland (explanation in text).

year, successful development occurring most frequently during the warmer months. A possible explanation for this is that some species over-winter as the fourth instar and require food during this period. In less than optimal artificial conditions their chances of survival would be reduced.

Details of the rearing programme are summarised graphically in Fig. 1. At the beginning of the programme only successful emergences were considered. Later, pupae and larvae could be identified and were retained even when the adult was not obtained. This technique broke down where such groups as *Cricotopus* were concerned.

The Orthocladiinae, Diamesinae and Tanypodinae were the most successful animals to culture by the techniques described above. Chironomini and Tanytarsini emerged only occasionally possibly because they suffered damage during the removal of their hard cases from the benthos.

Natural Trappings

A Mundie trap was placed at one of the three sites (Site II) and emptied as near as possible to once a day during the rearing programme. The results of this work are summarised below together with the results of the artificial culturing programme (Nomenclature as in Fahy & Murray 1972).

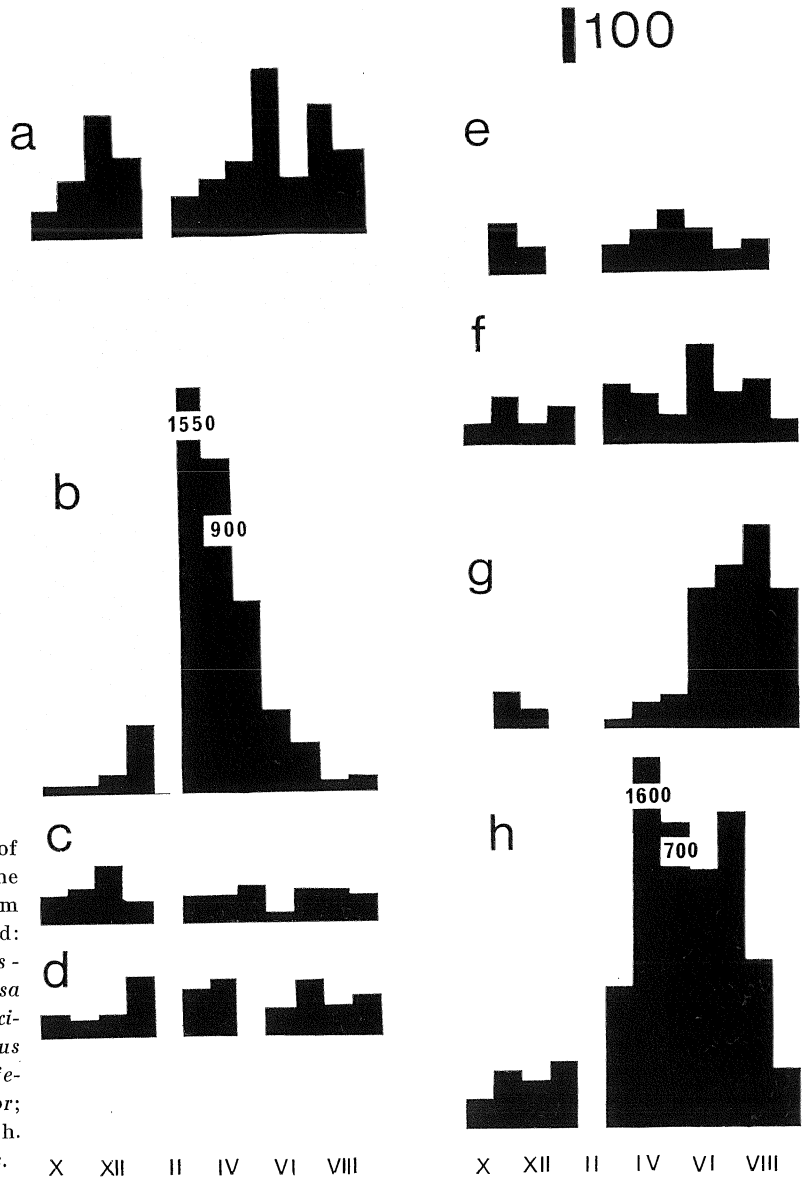

Fig. 2. The occurrence of some Chironomids in the benthos of a small stream system in western Ireland: a. *Cricotopus tremulus-bicinctus*; b. *Psilodiamesa gaedii*; c. *Rheopelopia eximia* group; d. *Cricotopus skirwithensis*; e. *Eukiefferiella hospita*; f. *E. minor*; g. *Tanytarsus* indet. 1; h. *Eukiefferiella calvescens*.

	Material artifically reared	Artificial emergence times	Natural trappings
Tanypodinae			
Nilotanypus dubius	14 males & 21 females	5 IV—10 IX	1 IV—12 IX
Telmatopelopia nemorum	3 females	25 VIII	nil
Krenopelopia nigropunctata ...	2 males and 1 female	21 VI—7 VII	nil
Paramerina cinqulata	2 males	24 VII—25 VIII	1 male 28 VIII
Rheopelopia eximia	3 males & 27 females	1 VI—29 VII	23 V—25 VIII
Macropelopia notata	2 males & 2 females	5 VII—29 VIII	1 VII—3 VIII

	Material artifically reared	Artificial emergence times	Natural trappings
Trissopelopia longimana	4 females & 1 male	19 VI—10 VIII	1 male, 20 VII
Thienemannimyia northumbrica	3 females	21 VI—10 VI	nil
T. lentiginosa	nil	—	1 male, 7 VII
Diamesinae			
Diamesa insignipes	4 males & 2 females	14 XII—3 II	30 XI—15 II
D. cinerella	3 males & 4 females	18 XII—4 II	10 XII—15 II
Potthastia montium	1 male & 2 females	5 VI—7 VII	4 V—10 VII
Psilodiamesa gaedii	42 males & 8 females	15 IV—7 VI (35 were recorded in May)	3 IV—5 VI
Orthocladiinae			
Cricotopus similis	10 males & 3 females	22 VII—4 IX	15 VII—10 IX
C. oscillator	nil	—	1 male, 27 VI
C. bicinctus	6 males & 2 females	31 V—27 VIII	25 V—20 VIII
C. tibialis	4 males & 2 females	24 V—26 VIII	18 V—20VIII
C. triannulatus	4 males and 3 females	31 VI—7 IX	20 VI—19 IX
C. laricomalis	1 male	17 IX	nil
C. skirwithensis	2 males & 3 females	6 VI—28 IX	1 VI—30 IX
C. pulchripes	nil	—	19 V—25 VIII
C. motitator	5 males & 2 females	19 VI—10 VII	nil
C. tremulus	3 males & 1 female	28 V—30 VII	20 V—30 VIII
C. inserpens	23 males & 20 females	25 VIII—5 X	20 VII—9 X
Rheocricotopus chalybeatus ...	16 males & 38 females	28 IV—12 IX	26 IV—25 IX
Eukiefferiella hospita	18 males and 15 females	23 VII—12 II	20 VII—20 I
E. minor	43 males & 31 females	21 XI—16 III	10 XI—10 III
E. bicolor	3 males & 2 females	15 II—1 V	15 III—5 V
E. calvescens & E. veralli	(see Fahy, 1972)		
Parametriocnemus stylatus	1 male and 2 females	10 X—5 XI	1 male, 28 X
Psectrocladius sordidellus	3 males and 2 females	20 VII—10 VIII	25 VII—15 VIII
Brillia modesta	8 males and 6 females	26 VI—15 XII	20 VI—12 XII
Orthocladius excerptus	23 males & 22 females	6 XII—2 III	10 XII—27 II
Chaetocladius femineus	1 male & 4 females	5 III—4 V	nil
Eurothocladius frigidus	20 males & 19 females	3 XII—27 IV	7 IV—30 IV
Eurothocladius rivicola	3 males	15—28 II	nil
Orthocladius rhyacobius	nil	—	1 male, 3 IV
O. saxicola	2 males	9 VI	nil
Synorthocladius semivirens	1 male & 4 females	19 VIII—10 IX	10 VIII—22 IX
Corynoneura carriana	2 females	1 IX	2 VIII—10 IX
C. flavescens	1 female	24 IX	nil
C. lobata	2 males & 3 females	2 XI—3 I	1 male, 16 XII
C. majuscula	2 males & 3 females	10 VIII—28 IX	20 VII—20 IX
Thienemanniella chavicornis ..	3 males & 1 female	4 VI—25 VII	30 V—1 IX
In addition the larva of *Thienemanniella* indet. 2 was brought to maturity but was in too poor condition to enable identification.			
Tanytarsini			
Microspectra groenlandica	1 male	27 VI	nil
M. monticola	1 male & 5 females	26 VI—5 VII	11 VI—15 VII
Paratanytarsus intricatus	2 males	14—16 VI	nil
Tanytarsus arduennensis	3 males & 3 females	29 VII—6 VIII	10 VIII—15 VIII
T. eminulus	1 male	20 VII	10 VII—8 VIII
Chironominae			
Pentapedilum tritum	nil	—	15 VII—28 VIII
Polypedilum acutum	1 male & 3 females	7 VI—8 IX	20 VI—10 LVIII
P. convictus	10 males and 3 females	10 VI—18 VIII	1 VI—10 VIII
Kribioxenus brayi	1 male	21 VIII	nil

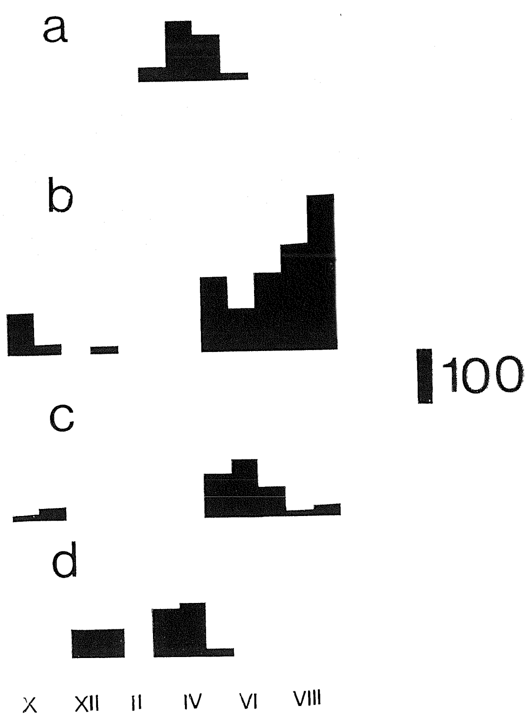

Fig. 3. The occurrence of some Chironomids in the benthos of a small stream in western Ireland: a. *Rheocricotopus chalybeatus* (similar cycles apply for *Nilotanypus dubius* and *Microspectra monticola*); b. *Potthastia montium* (similar cycles apply for *Microtendipes tarsalis* Walk., *Thienemanniella clavicornis, Corynoneura majuscula* and *Synorthocladius semivirens*); c. *Corynoneura carriana* and d. c.f. *Eukiefferiella longipes*.

Benthic samples

In 1968 and 1969 the benthos of sites 1—111 (Fig. 1 in Fahy & Murray, 1972) was sampled with a handnet and larval counts were carried out. The numbers/m^2 of the most common species are shown graphically in Figs. 2 & 3. To summarise these counts, there were 3 types of larval frequency:

1. Species which were present all the year round in the bethos and which had a time of maximum occurrence; the Orthocladiinae made up the bulk of these.
2. Species which occurred for a limited period only — or which were recognisable for a limited period only.
3. Species which were discontinuous; the majority of these were taken in numbers which did not exceed 100.

The number of samples per month on which the results are based varied between 20 and 36, 11 being taken in February 1969, a month which is not included in the histograms. The frequencies shown in Figs. 2 and 3 are of faunal numbers at site II.

Conclusion

In broad outline the life cycles of the Chironomidae appear to be in accordance with the results obtained by other workers, notably Miller (1941), Hynes (1966) and Morgan and Waddell (1961). The Diamesinae are a spring group, the Orthocladiinae occur in greatest number in the summer but have a second, smaller, burst of activity during the winter months and the Chironomini and Tanytarsini are summer groups.

A noteworthy point in the results presented above is the relatively short duration of the adult emergence and/or flight period and the occurrence of a single peaked frequency distribution for almost all larvae. These facts suggest a single generation per year, although this may not be the case for all species, for example *Nilotanyphs dubius*.

Were most Chironomids to have a univoltine life history this would be similar to the situation prevailing for the majority of benthic invertebrates occurring in the stream system.

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