

# Studies on the Biology of Oligochaetes from the Phreatic water of an exposed gravel bed.

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With plates 100 (1)–103 (4)

## Introduction

In the course of collecting specimens of the water mite *Neocarus hibernicus* and the amphipod *Niphargus aquilex*, monthly samples of aquatic oligochaetes were obtained from the phreatic water of an exposed gravel bed of the River Oberwater in Hampshire (Nat. Grid Ref. S. U. 247038). The habitat and sampling methods have already been described (Gledhill in press), and it is only necessary to mention that samples usually consisted of approximately 35 litres of water collected by the method of Karaman/Chappuis. Only material retained by a 250  $\mu$  sieve was examined and some of the smallest worms may have been lost.

## Results

A species list together with data on abundance and seasonal occurrence is given in Table 1.

Figure 1. shows the total number of oligochaetes per monthly sample of 35 litres of water during 1966. The January sample may be atypical because flood conditions prevented digging at the usual sampling position. The mean number of worms contained in the samples of March to June plus those of November and December was only about one fifth of the mean for July to October (41 per sample as opposed to 207 per sample.). The latter high values were at first largely the result of an increase in the number of Naididae but in September and October Tubificidae were predominant. It is possible to separate the components of the overall pattern and to suggest explanations for the fluctuations by considering the detailed changes of individual species populations.

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## Tubificidae

*PSAMMORYCTES BARBATUS* (Grube) Figure 2.

This species occurs in sand and gravel bed habitats as well as other situations (Berg, 1948). Mature specimens of *P. barbatus* were present from March to June and reached maximum proportions in April when they constituted 60% of the population of that species, fifteen out of twenty five specimens collected then were mature. Mature animals were not recorded after June but in the Susaa, Jonassen (in Berg 1948) found mature *P. barbatus* in June, July, and August. A large increase in numbers per sample occurred in July, this was due to the presence of small animals (Figure 3) having a mean width of 290  $\mu$  across the eighth anterior segment when mounted in Amman's lactophenol. The mean width increased to 380  $\mu$  by October but satisfactory samples were not obtained after this. Mature adult specimens of *Psammoryctes* from the same habitat varied in width from 620  $\mu$  to 750  $\mu$ .

*RHYACODRILUS COCCINEUS* (Vejdovsky) Figure 2.

This species is often found in rivers (Brinkhurst, 1964). As in the preceding species maturity was attained in the period March to July, the peak was in May when 63% of the population was mature (17 out of 27 animals). In July a decrease in the population of mature animals was accompanied by an increase in the numbers of small animals (mean width of the eighth segment 260  $\mu$ ), the succeeding samples gave little indication of any growth.

*AULODRILUS PLURISETA* (Piguet) Figure 2.

Reproduction in *A. pluriseta* is chiefly asexual by fragmentation (Brinkhurst 1964). This accounts for the almost total absence of sexually mature forms throughout the year. The increase in numbers between August and October may have been caused by reproduction or immigration, peak numbers were attained in October.

*LIMNODRILUS HOFFMEISTERI* Claparede Figure 2.

This extremely common worm is found in many types of sediment but most often in mud and sand (Berg, 1948, Wrobel, 1965, Wachs, 1967). It is often abundant in polluted situations where oxygen is low (Brinkhurst 1963). *L. hoffmeisteri* may not be a breeding species in the gravel bed under consideration. The large numbers present in October were probably the result of immigration from the rather sparse deposits of mud and sand on the river bed. *L. hoffmeisteri* is basically a winter and spring breeder but is extremely adaptable in this respect (Kennedy 1966, and personal observations).

### Lumbriculidae

#### *STYLODRILUS HERINGIANUS* Claparede. Figure 2.

Though common in both running and stillwaters this species is also to be found in large numbers in the phreatic habitat (Wrobel, 1965). In the present study the numbers of *S. heringianus* taken per sample were remarkably constant throughout the year, a tendency to decrease in November and December was common to most other species and may have resulted from washing out by floods which occurred in early November. Mature specimens of *Stylodrilus* (with penes everted) were present from March to June but there was no subsequent increase in population density. Width frequency data were inadequate to assist in the interpretation of results.

#### *LUMBRICULUS VARIEGATUS* (Müller) Figure 4.

In the Susaa *L. variegatus* was widespread but never abundant (Berg, 1948) Small numbers of this species were present in the phreatic water of the Oberwater throughout the year but mature specimens were not found, reproduction is presumably asexual.

### Naididae

#### *PRISTINA* spp. Ehrenberg. Figure 4.

Large numbers of worms of this genus were recorded in July, these were chiefly *P. idrensis* plus another species probably *P. amphibiotica*, and were largely responsible for the increase in total oligochaetes at that time.

#### *NAIS* spp. O. F. Müller. Figure 4.

Small numbers of *Nais* spp. were present from July to September.

#### *OPHIDONAIS SERPENTINA* (O. F. Müller). Figure 4d.

*O. serpentina* appeared in August and specimens were still present in December. The general pattern of numerical abundance was similar to that of *Nais* spp.

### Enchytraeidae

#### *PROPAPPUS* sp. Michaelsen. Figure 4.

Recorded by Wrobel (1965) from sandy and stony bottoms. A species of this genus together with other unidentified Enchytraeidae was present in large numbers in the January sample. At this time Enchytraeidae made up

78% of the total oligochaete population. The unusual constitution of this sample may be due to the use of a slightly different sampling site (see page 1 paragraph 3).

### Discussion

It is doubtful whether any of the oligochaetes recorded in the present work can be regarded as phreaticolous forms. Botea (1963) in his survey of some Rumanian phreatic habitats mentions the following species in common with the present study — 1. *Nais communis* in grits with "strong water jets") 2. *Nais elinguis* (very abundant in detritus) 3. *Pristina foreli* 4. *Stylodrilus heringianus* (large numbers in phreatic water) 5. *Propappus volki* (said to be littorheotactic, Botea, 1963) and 6. *Eiseniella tetraedra*. Botea comments that Tubificidae have rarely been found.

In contrast to the above, the Tubificidae form a very important component of the fauna in the gravel bed studied. Some species at least of this family mature and reproduce under these conditions (*P. barbatus*, *R. coccineus* and possibly also *E. moldaviensis*). Many other species occur in large numbers at certain times of the year, in specific cases this seasonal pattern may be related to voluntary or obligate emigration from more characteristic habitats. Botea (1963) states that the phreatic environment favours non-swimming and small species which settle and may reproduce there, clearly it will also be a source of shelter for the young stages of larger forms when conditions elsewhere are adverse.

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### SUMMARY

More than twenty species of oligochaeta belonging to the families Enchytraeidae, Naididae, Tubificidae and Lumbriculidae were found in the phreatic water of the river bank gravels.

*Psammoryctes barbatus*, *Rhyacodrilus coccineus* and *Stylodrilus heringianus* were found throughout the year, attaining maturity in the spring. These three species may be univoltine under these conditions.

The family Naididae and a few species of Tubificidae show well marked seasons of abundance, chiefly in the summer and autumn.

### RÉSUMÉ

Plus de vingt espèces d'Oligochètes appartenant aux familles des Enchytraeidae, Naididae, Tubificidae et Lumbriculidae ont été récoltées dans l'eau de la nappe phréatique baignant les graviers superficiels des berges de la rivière Oberwater.

*Psammoryctes barbatus*, *Rhyacodrilus coccineus* et *Stylodrilus heringianus* ont été rencontrés toute l'année, mais ils ne sont matures qu'au printemps. Ces trois espèces sont peut-être univoltines dans ce biotope.

La famille des Naididae et quelques espèces de Tubificidae se montrent plus abondantes à certaines époques de l'année, principalement en été et en automne.

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## EXPLANATIONS OF PLATES 100 (1)—103 (4)

Plate 100 (1): Total number of Oligochaeta per sample of 35 litres. — Plate 101 (2): Numbers of selected species per sample of 35 litres. Enclosed unshaded areas indicate mature worms. — Plate 102 (3): *Psammoryctes barbatus*, width frequencies of monthly samples. (Measured in prepared specimens across 8th anterior segment). Broken lines indicate samples from stations other than that normally sampled. — Plate 103 (4): Numbers of selected species per sample of 35 litres.









