Reaction of Glossoscolecidae (Annelida, Oligochaeta) to flooding in a Central Amazonian inundation forest

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Abstract

Horizontal migration in response to flooding is reported for Glossoscolecidae of a black-water inundation forest. During increasing water-level, Glossoscolecidae migrate towards the dry-land forest, 16-26m distance beyond the water margin. With decreasing water-level, they return to the inundation-forest, following the water margin at 5-10m distance. Distribution seems to be correlated with humidity and pH of the soil.

Introduction

In 1976/77, a 'minimal program for ecosystem analyses' was carried out in a black-water inundation forest (= Igapó) at Rio Tarumã Mirím near Manaus, Brazil (Adis, 1977, 1981). During the non-flooded period (September-March) Glossoscolecidae — mainly *Tairona tipema* (Righi *et al.*, 1976) — were sporadically caught in pitfall traps and ground photoeclectors. Some occured in arboreal photoeclectors throughout inundation. However, reaction of Glossoscolecidae to flooding remained unknown. Further investigations have now been carried out during rising and receding water-level in 1981/82.

Study area, methods

The study area is situated at the lower course of Rio Tarumã Mirím, an affluent of the Rio Negro, about 20 km upstream from Manaus. A detailed description of the area investigated is given in Adis (1981).

Soil samples were taken in the upper, central and lower part of the Igapó: — 1) During the receding flood stage at site L_b (Fig. 1) on July 10, 1981, at site L_a on August 18, 1982 and 100 m south of site L_a on August 27, 1981; — 2) During the increasing flood stage between sites L_a and L_b on April 06, 1982. Additional soil samples were taken near the forest edge (150 m west of site L_a) on October 19, 1981. At each site, five soil samples (Ø: 21 cm, depth 10 cm) were collected every 5 m along a transect towards the dry-land forest. Samples were either taken from the water margin up to 20 m distance (10.7.81, 18.8.81) or 1 m from the water margin up to 31 m distance (27.8.81, 19.10.81, 6.4.82). A split corer (= steel cylinder with lateral hinges) served as collecting device. It was driven into the soil by a mallet. To avoid material decomposition, Glossoscolecidae were hand sorted from the samples in the laboratory and preserved in alcohol on the day of collection.

Results

During high water-level, Glossoscolecidae were found concentrating between 5 m and 10 m distant from the water margin in the upper part of the forest (Fig. 2: L_b). Up to 45 specimens per sample (= about 1300/m²) were collected in July 1981, the majority from the 6 - 10 cm deep humus layer (= matting of roots with fine humus). With increasing distance from the water margin, soil humidity and pH decreased (Fig. 2: L_b) and the number of Glossoscolecidae sampled dropped significantly ($p < 0.05$). Only a few specimens were encountered when soil humidity was lower than 30% and soil pH below 3,6.

With receding flood, Glossoscolecidae immigrated into the Igapó, in accompanying the water margin (comp. Irmler, 1976). They mostly dispersed to humid places in the forest

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(e.g. logs, roots of buttressed trees, soil depressions), where they stayed until the end of the dry season in December (comp. Adis 1981, 1982). The maximum number of Glossoscolecidae collected in the lower part of the forest in August 1981 was 22 specimens per sample (= about 635/m²). Most of them were found between 1 m and 11 m distant from the water margin (Figs. 2, 3). Throughout the horizontal immigration into the Igapó, single cocoons were deposited in the humus layer. The receding high water-level- reached the forest edge in October 1981, where no Glossoscolecidae could be found in soil samples.

During the rainy season of the non-flooded period (December — March/April), Glossoscolecidae were colonizing the humus layer of the inundation forest. Gut contents, examined throughout the period investigated, mainly contained small roots (calyptras), small leaves (litter), tannins, few hyphae and spores of fungi and almost no soil particles (comp. Schaller 1973). In the anterior part of the digestive tract elongate-shaped bacteria ("bacilli") were found; in the posterior part round-shaped bacteria ("cocci") occured (Katz, pers comm.).

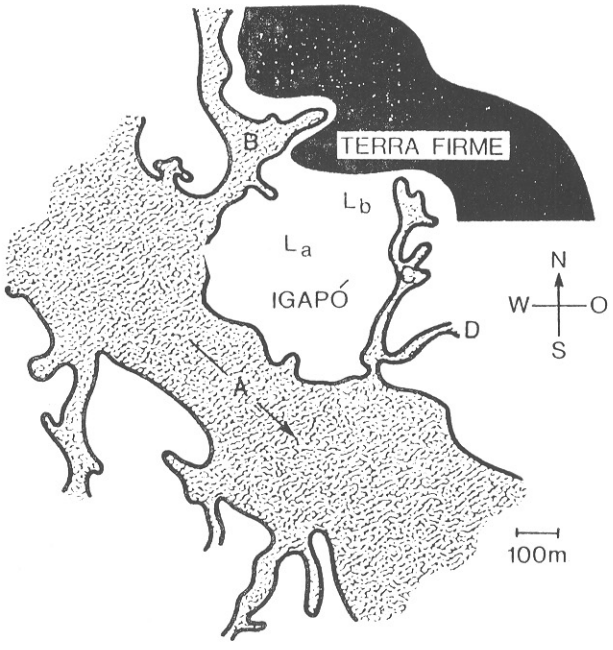

Fig. 1 — Location of the study area at Rio Tarumã-Mirim (to Adis 1981). A = Rio Tarumã-Mirim, B = Igarapé São João, C = Igarapé Nova Inveja, D = Igarapé Pupunha, La/Lb = sampling sites.

With increasing water-level and subsequent forest inundation, Glossoscolecidae (including the young progeny) apparently escaped flooding, in migrating beyond the water margin towards the dry-land forest. In April 1982, up to 26 specimens per sample (= about 750/m²)

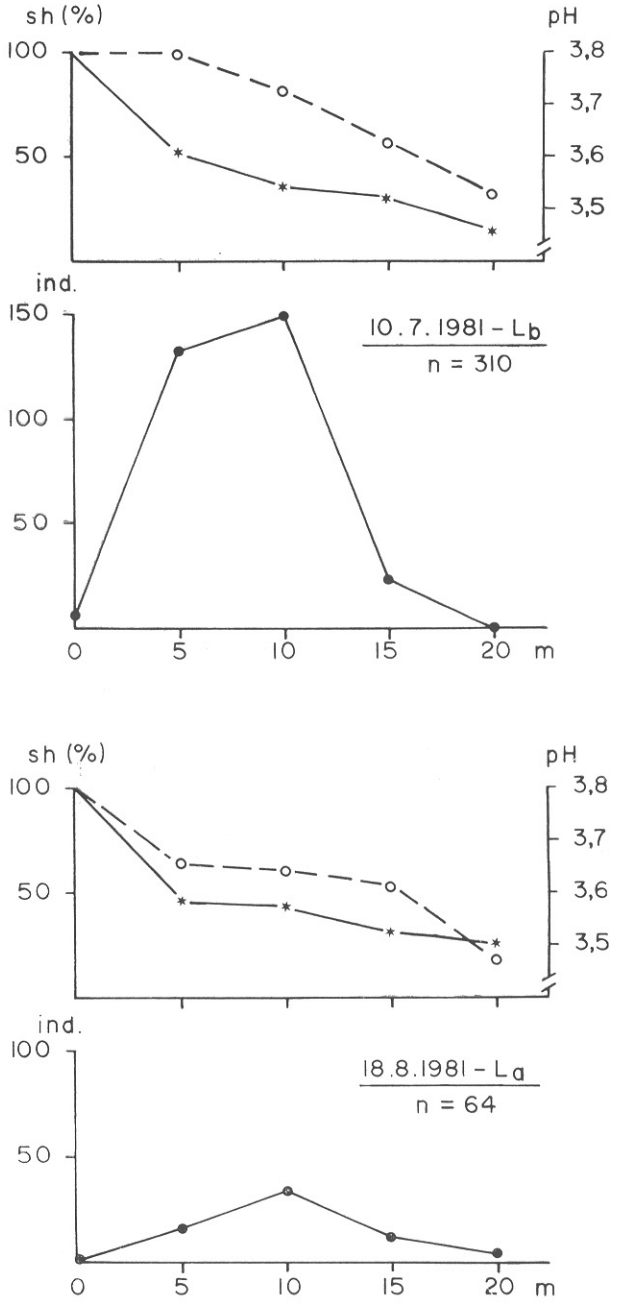

Fig. 2 — Total catch of Glossoscolecidae sampled up to 20m distance from the water margin during the receding flood stage in the upper and lower part of the forest (Lb and La respectively; 5 samples taken every 5m). * ——— * = soil humidity (sh), o — — o = pH of soil (pH).

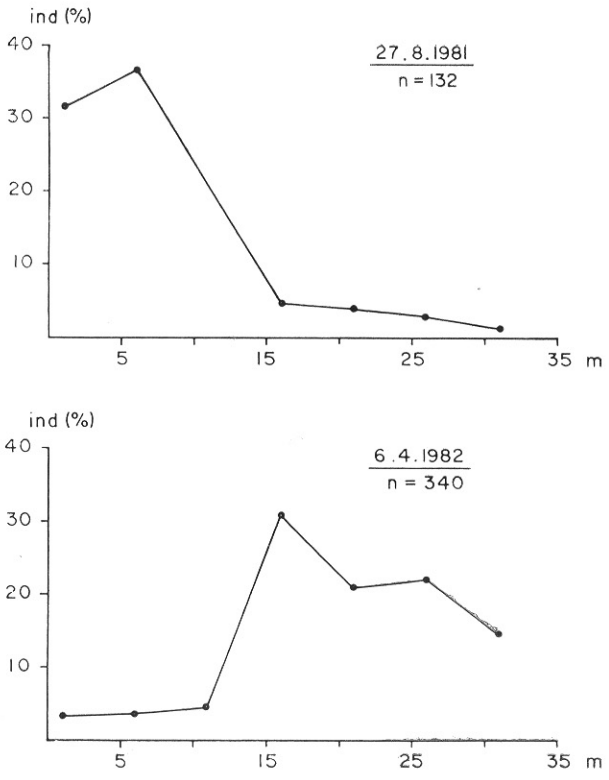

Fig. 3 — Total catch of Glossoscolecidae (in %) sampled up to 26m distance from the water margin during receding flood stage in the lower part of the forest (27.8.1981) and during increasing flood stage in the central part of the forest (6.4.82; 5 samples taken every 5m).

were collected in the central part of the forest, mostly 16-26 m distant from the water margin (Fig. 3). Some of them apparently mount tree trunks. They were caught in arboreal photo-eclectors (Adis 1981). Others were drowned and mostly eaten by fish when appearing in the water after having emerged from the humus layer.

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Resumo

Migrações horizontais devido as inundações são observadas para Glossoscolecidae de um igapó na região da água preta. Durante a subida do nível da água (enchente), os Glossoscolecidae estão migrando na direção da terra firme, acompanhando a margem da água numa distância de 16m até 26m. Durante a descida do nível da água (vazante), eles retornam para o igapó, seguindo a margem da água numa distância de 5m até 10m. A distribuição parece estar correlacionada com a umidade e o pH do solo.

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