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First records of freshwater Bryozoa (Phylactolaemata) from Kalimantan, island of Borneo, Indonesia

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Abstract. A collection of freshwater bryozoans from Danau Sentarum National Park (Kalimantan, Borneo, Indonesia) included statoblasts on a piece of styrofoam and a colony inside a plastic bottle. The colony was taxonomically undeterminable; the statoblasts were assigned to the following species: *Hyalinella lendenfeldi*, *Plumatella javanica*, *Plumatella vorstmani* and two unidentified plumatellid species. The present study provided first records of these species from Borneo.

Keywords. Indonesia, Kalimantan, Phylactolaemata, Plumatellidae.

INTRODUCTION

Although bryozoans constitute an important part of the fresh water benthic fauna they are very often overlooked. In many regions of the world they are among the least known animal taxa (Ricciardi & Reiswig 1993). Freshwater bryozoans are, however, among the most important suspension-feeding animals (Wood 2006), and can even dominate in epibenthic and littoral communities (Raddum & Johnson 1983).

Freshwater bryozoans were mostly studied in temperate zones of Europe, North America and Japan (Wood 2002), and in a few tropical regions (Wiebach 1964, 1970, 1974a, 1974b, Wood & Okamura 1999, Wood 2006, Wöss 2008). However, bryozoan faunas are still less known in Africa, South America, Central America, and in some parts of Asia (Massard & Geimer 2008). Indonesian waters have been largely unexplored. Only a single collection of freshwater bryozoans exists in the Academy of Sciences in Jakarta, containing species labeled as follows: *Plumatella javanica, Plumatella gelatinosa, Plumatella emarginata, Plumatella punctata, Plumatella agilis, Plumatella fruticosa, Plumatella casmiana, Plumatella polymorpha, Lophopodella stuhlmanni and Lophopodella carteri*. All specimens were collected by Vorstman in 1926 and 1927 (Vorstman 1928a,b, 1930). Unfortunately, the material is poorly preserved and we were not able to check the taxonomic identity of any of these taxa. Furthermore, the bryozoan

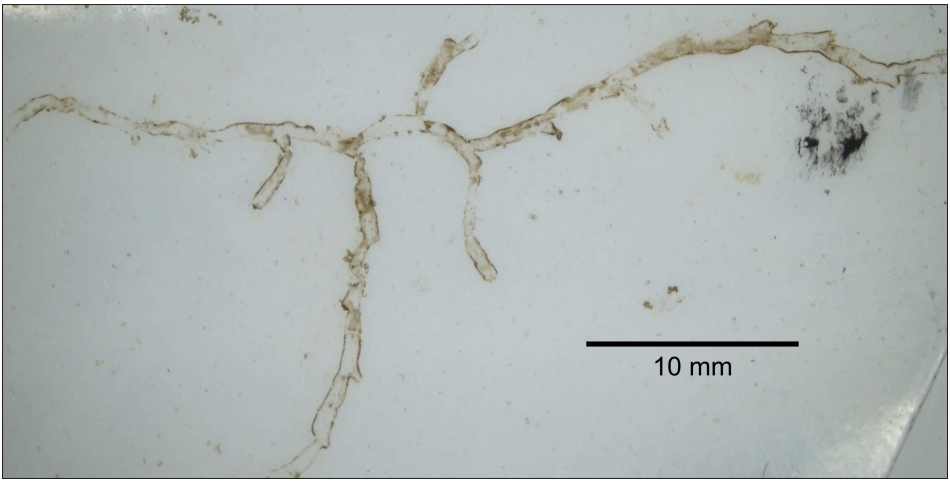

Fig.1: Undetermined, highly abraded plumatellid colony inside a plastic bottle, showing the characteristic development of a running uniserial colony.

taxa currently on the Indonesian list are in need of revision. No data are available on this animal group from Kalimantan, the Indonesian part of the Borneo island, which contains the largest area of fresh water lakes and rivers in Indonesia. In this paper we provide first records of freshwater bryozoans from Kalimantan.

MATERIALS AND METHODS

During an expedition to the Danau Sentarum National Park in Kalimantan, Borneo, Indonesia, one of us (KZ) collected freshwater bryozoans. The Danau Sentarum National Park is situated in the flood plain in West Kalimantan Province. It consists of many small and larger freshwater lakes, freshwater swamps and flooded forests about 700 km upstream from the mouth of the Kapuas River. The lakes are of the so-called black-water type: tannin rich, almost black with a low pH (Onrizal et al. 2005).

In October 2009, toward the end of the dry season, five days were spent systematically checking foam, bottles and other floating objects for the presence of statoblasts with a 10x magnifying hand-glass. Bryozoans were found only near the field station of the Indonesian Academy of Sciences in the Kapuas River (GPS location 00° 47.103‘ N, 112° 09.234‘E, 22 m above sea level). During the investigation, no living bryozoan colonies were found. However, on 15 October, only one trace of the colony inside a bottle (fig. 1) could be sampled as well as several statoblasts on rigid plastic polystyrene foam (figs. 2-10); both of these artificial substrates were used as floaters close to the shore by local Melayu fishermen.

Floating plastic foam, bottles and other objects were checked for the presence of buoyant statoblasts using a hand magnifying glass (10×). The material found was fixed in 90% ethanol and then studied under the binocular microscope. Selected statoblasts were

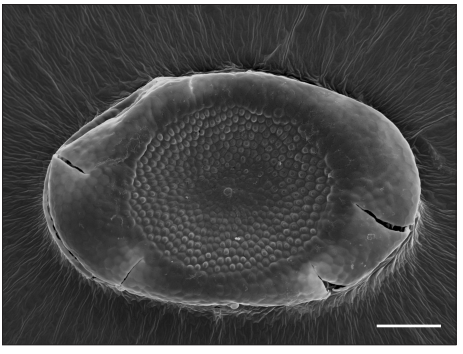

Fig. 2: *Plumatella vorstmani*: ventral valve of floatoblast, fenestra densely tuberculated with central protuberance. Scale bar = 50 µm.

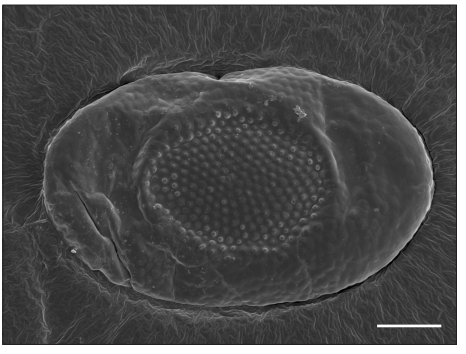

Fig. 3: *Plumatella vorstmani*: dorsal valve of floatoblast. Scale bar = 50 µm.

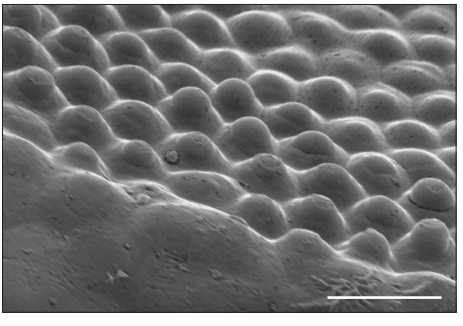

Fig. 4: *Plumatella vorstmani*: fenestra with tubercles, in many cases capped with hypertubercles. Scale bar = 10 µm.

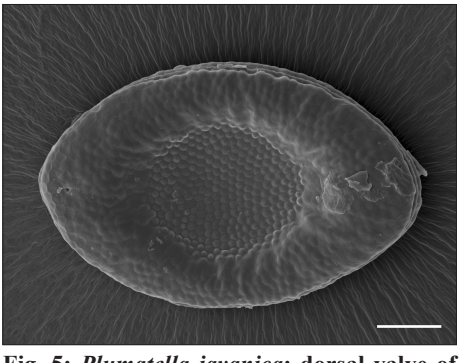

Fig. 5: *Plumatella javanica*: dorsal valve of floatoblast; floatoblasts elliptical and tapered, small fenestra with tubercles rounded-hexagonal in outline. Scale bar = 50 µm.

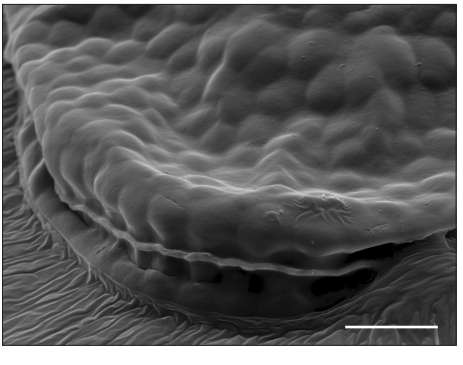

Fig. 6: *Plumatella javanica*: annulus cells convex, suture line as simple ridge. Scale bar = 20 µm.

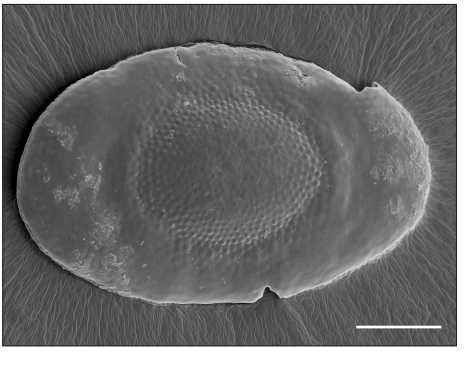

Fig. 7: *Hyalinella lendenfeldi:* ventral valve of floatoblast; floatoblasts broadly oval and large, tubercles of the fenestra most distinctly away from the central area. Scale bar = 100 µm.

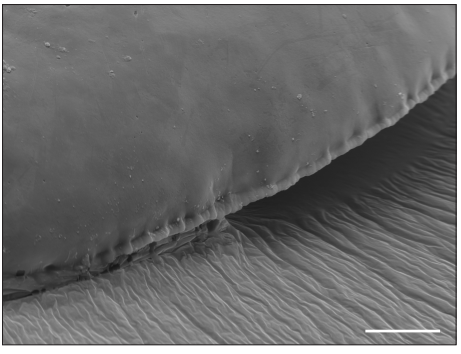

Fig. 8: ***Hyalinella lendenfeldi****:* **annulus smooth, suture line as ridge with small protuberances. Scale bar = 20 µm.**

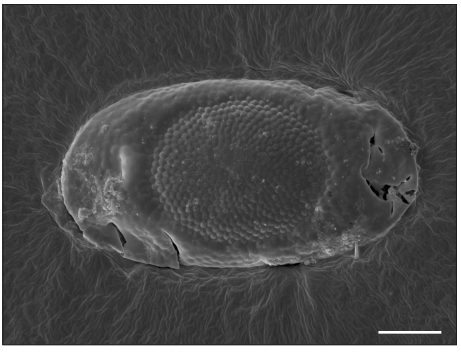

Fig. 9: ***Plumatella*** **sp. 1: small floatoblast of rectangular shape with tapered endings, presumably ventral valve. Scale bar = 50µm.**

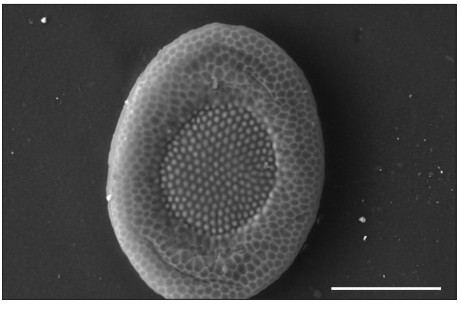

Fig. 10: ***Plumatella*** **sp. 2: small floatoblast of broadly-oval shape ("*Plumatella repens* – like"), dorsal valve. Scale bar = 100 µm.**

treated in bleach and cleaned in ultrasonic bath for a few minutes. Photo documentation was made with the VP SEM Hitachi S3700N at the National Museum, Prague and with the REM Philips KL 20 at the Department of Cell Imaging and Ultrastructure Research of the University of Vienna.

The statoblasts were compared with specimens from the Wiebach Collection (Wiebach 1964, 1970, 1974a,b) in the Zoological Museum of the University of Hamburg, Germany, by one of us (EW) in January 2010. The Wiebach Collection contains type specimens of *Plumatella javanica* and several other species from tropical countries.

RESULTS

The colony (fig. 1) presumably belongs to the family Plumatellidae, but the species was undeterminable.

The collected piece of foam contained more than 50 specimens of different statoblasts, all of which were floatoblasts. These resting stages could be assigned to the following species: *Plumatella vorstmani* Toriumi, 1952 (figs. 2-4)*, Plumatella javanica* Kraepelin, 1906 (figs. 5-6), and *Hyalinella lendenfeldi* (Ridley, 1886; figs. 7-8). Most abundant was *P. vorstmani*, followed by *P. javanica; H. lendenfeldi* was scarce. Exact identification of

some *Plumatella* specimens was impossible, in some cases, due to the fact that only one of the floatoblast valves was available for SEM examination (figs. 9-10).

DISCUSSION

Small number of collected bryozoans was probably due to the late sampling date (October), which represents the end of the dry season, when rivers and lakes showed lowest water levels combined with a low oxygen kontent.

It is interesting that no sessoblasts were found, although *Plumatella* – unlike *Hyalinella* – usually produces two kinds of statoblasts (floatoblasts and sessoblasts). The floatoblast facilitates dispersal and colonization of new substrates, in contrast to the sessoblast (cemented to the substrate), which promotes the local persistence of the bryozoan colonies (Wöss 2005). The absence of sessoblasts was also reported from other tropical regions (Wood 2002). It could be explained by small sample size. On the other hand, this observation could also raise the question whether freshwater bryozoans have different life cycle strategies in tropical environments relying less on the formation of colonies by sessoblasts.

All species we have found were reported from Thailand (Wood 2006). *Plumatella vorstmani* and *P. javanica* were also found in Japan (Hirose 2007), and *Hyalinella lendenfeldi* and *P. javanica* were also recorded from Cambodia (Hirose & Mawatari 2007). The records from Kalimantan extend known range of all three identified species.

CONCLUSIONS

In agreement with previous studies of tropical freshwater bryozoans, no sessoblasts were found, which contributes to the ongoing discussion on the significance of sessile resting stages in tropical regions (Wood 2000). Small number of bryozoan taxa recorded might be due to unfavorable environmental conditions during the end of the dry season, when rivers and lakes showed lowest water levels combined with low oxygen content.

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