

## PRELIMINARY STUDY ON FRESHWATER OLIGOCHAETA IN INDONESIA

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### Abstract

On the basis of new material, 18 species of freshwater oligochaetes are reported from West Sumatra and Central Kalimantan, Indonesia. Among them, 13 naidid species (*Chaetogaster diastrophus*, *C. diaphanus*, *Allonais pectinata*, *Dero (Dero) digitata*, *D. (D.) indica*, *D. (D.) dorsalis*, *D. (Aulophorus) flabelliger*, *D. (A.) indicus*, *Branchiodrilus hortensis*, *Pristina aequisetata*, *P. synclites*, *P. biserrata*, and *Stylaria lacustris*) are newly recorded from Indonesia. The Indonesian freshwater oligochaete fauna appears to be characterized by a high diversity in the family Naididae, whereas it is poor in the Tubificidae.

### Introduction

Indonesia comprises numerous islands ranging around the equator in southeast Asia and has various kinds of freshwater bodies. Thus it seems probable that this area harbors a rich fauna of aquatic oligochaetes. However, faunistic studies of this animal group in Indonesian freshwaters have been poorly done. So far only 15 naidid, 6 tubificid, and 2 enchytraeid species have been recorded from Sumatra, Java, and Bali (Michaelsen and Boldt, 1932; Ohtaka and Usman, 1997).

In this report we record and describe 18 species of freshwater oligochaetes from West Sumatra and Central Kalimantan, on the basis of material collected in our preliminary surveys.

### Materials and Methods

The material was collected from shallow lotic and lentic freshwaters in West Sumatra in 1988 and in a peat swamp area of Central Kalimantan in 1998. Specimens were collected by scooping with a hand net or using an Ekman-Birge bottom sampler and were immediately fixed in a 10% formalin solution. Later, they were observed and illustrated under a light microscope after having been mounted whole in either CMCP-10 (Polysciences Inc.) or Canada Balsam. The specimens are deposited in the Museum Zoologicum Bogoriense, Indonesia (MZB), and in the Department of Natural Science, Faculty of Education, Hirosaki University, Hirosaki, Japan (AO collection).

### Systematic Account

Family Naididae

Subfamily Naidinae

*Chaetogaster diastrophus* (Gruithuisen, 1828)

*Nais diastrophus* Gruithuisen, 1828, Nova Acta phys.- med. Acad. Leop. Carol. Nat.

Cur. Bonn, 14, p. 416, pl. XXV, figs 7-9; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* One immature specimen (MZB 115), L. Singkarak, West Sumatra, littoral with sandy bottom, 29 July 1988.

*Remarks.* This is the first record of this species from Indonesia.

***Chaetogaster diaphanus*** (Gruithuisen, 1828)

*Nais diaphana* Gruithuisen, 1828, Nova Acta phys.- med. Acad. Leop. Carol. Nat. Cur. Bonn, 14, p. 409, pl. XXV, figs 1-5; see Brinkhurst and Jamieson (1971) for synonymies and references.

*Material examined.* Two immature (MZB 116, 117) and three immature specimens (AO collection), L. Singkarak, West Sumatra, littoral with aquatic vegetation, 30 July 1988. Two immature specimens (AO collection), a ditch with submerged vegetation, Padang, West Sumatra, 3 Aug. 1988.

*Remarks.* This is the first record of this species from Indonesia.

***Nais pardalis*** Piguet, 1906

*Nais Bretscheri* Michalsen var. *pardalis* Piguet, 1906, Revue suisse Zool., 14, p. 270, pl. X, fig. 20, pl. XII, figs 4, 5, 17; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* Two immature (MZB 118, 119) and four immature specimens (AO collection), Lake Singkarak, West Sumatra, 30 July 1988, littoral with submerged vegetation. Six immature specimens (AO collection), a ditch with submerged vegetation, Padang, West Sumatra, 3 Aug. 1988.

*Remarks.* This species was once recorded from Sumatra and Java (Michaelsen and Boldt, 1932).

***Allonais pectinata*** (Stephenson, 1910)

*Nais pectinata* Stephenson, 1910, Rec. Ind. Mus., 5, p. 236, pl. XI, fig. 1; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* One immature specimen (AO collection), Lake Singkarak, West Sumatra, littoral with submerged vegetation, 29 July 1988.

*Description.* Body 2.5 mm long in fixed state. Dorsal chaetal bundles from VI, with 1 smooth hair and 1 needle. Needle teeth divergent with almost equal length, and with 2-5 long and fine intermediate teeth. Ventral chaetae in II-V 2-5 per bundle, with nodulus proximal, upper tooth a little longer and thinner than lower tooth; those in the following segments 3-6 per bundle, with nodulus median to distal, upper tooth as long as and thinner than lower tooth.

*Remarks.* This is the first record of this species from Indonesia.

***Dero (Dero) digitata*** (Müller, 1773)

*Nais digitata (coeca)* Müller, 1773, Vermium terrestrium et fluviatilium II, p. 22; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* One immature specimen (AO collection), paddy field at Aru Indah, Padang, West Sumatra, 4 Aug. 1988. One immature specimen (MZB 120), Pondok Ambung, Tanjung Puting National Park, Central Kalimantan, littoral, among aquatic vegetation and roots, 24 Feb. 1998. One immature (MZB 121) and one immature specimen (AO collection), Lake Sembuluh, Central Kalimantan, western

shore, sand with submerged vegetation, 25 Feb. 1998.

*Remarks.* This is the first record of this species from Indonesia.

***Dero (Dero) indica*** Naidu, 1962

*Dero indica* Naidu, 1962a, p. 533, figs. 14a-g; Brinkhurst and Jamieson, 1971, p. 367, fig. 7.13 i-m.

*Material examined.* One immature (MZB 122) and one immature specimen (AO collection), paddy field at Aru Indah, Padang, West Sumatra, 4 Aug. 1988.

*Remarks.* This is the first record of this species from Indonesia. The specimens were collected together with *Dero digitata*, and are distinguished by having paired hairs and needles in anterior dorsal bundles. However, the shapes of each sort of chaetae in *digitata* and *indica* closely resemble each other, and both are possibly synonyms.

***Dero (Dero) dorsalis*** Ferronnière, 1899

*Dero dorsale* Ferronnière, 1899, Bull. Soc. Sci. nat. Ouest Fr., 9, p. 255; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* One immature (MZB 123) and one immature specimen (AO collection), paddy fields in Tabin, Padang, West Sumatra, 3 Aug. 1988.

*Remarks.* This is the first record of this species from Indonesia.

***Dero (Aulophorus) flabelliger*** Stephenson, 1931

*Aulophorus flabelliger* Stephenson, 1931, p. 44, fig. 4; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* One immature (MZB 124) and nine immature specimens (AO collection), paddy fields in Tabin, Padang, West Sumatra, 3 Aug. 1988.

*Remarks.* This is the first record of this species from Indonesia.

***Dero (Aulophorus) furcatus*** (Müller, 1773)

*Nais furcata* Müller, 1773, Vermium terrestrium et fluviatilium II, p. 23; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* One immature specimen (AO collection), littoral L. Singkarak, West Sumatra, 30 July 1988. One immature specimen (MZB 125), Lake Sabuah, Palangkaraya, Central Kalimantan, littoral, mud with aquatic vegetation, 22 Feb. 1998.

*Description.* Body 4-6 mm long in fixed state. Branchial fossa with one pair of long palps and three pairs of digitate gills. Dorsal chaetal bundles from V, consisting of one hair and one needle in which upper tooth thinner and a little shorter than lower tooth. Ventral chaetae in anterior bundles 3-4 per bundle, with proximal to medial nodulus, upper tooth longer and thinner than lower tooth; those in the following segment 2-4 per bundle, with distal nodulus, upper tooth becoming shorter and much thinner than lower tooth in posterior bundles.

*Remarks.* This species was once recorded from Sumatra and Java (Michaelsen and Boldt, 1932).

***Dero (Aulophorus) indicus*** Naidu, 1962 (Fig. 1 A-E)

*Aulophorus indicus* Naidu, 1962b, p. 909, fig. 23 a-d; Brinkhurst and Jamieson, 1971, p. 378, fig. 7.18 a-c.

*Material examined.* One immature specimen (AO collection), Lake Sembuluh, Central Kalimantan, eastern shore with sandy bottom, 25 Feb. 1998.

*Description.* Body 4 mm long in fixed state. No eyes. Branchial fossa with one pair of lateral palps and three pairs of gills. Dorsal chaetal bundles from V, with 1 hair and 1 needle with distal nodulus (Fig. 1A). Distal end of needle shortly bifid, upper tooth as long as or a little longer than lower tooth, with some short intermediate teeth (Fig. 1B). Ventral chaetae in II-IV (Fig. 1C) longer and straighter than the following ones, 4 per bundle, with proximal nodulus, upper tooth more than two times longer and almost as thick as lower tooth; those in the following segments (Fig. 1D, E) 3-4 per bundle, with distal nodulus, upper tooth becoming shorter and much thinner than lower tooth in posterior bundles.

*Remarks.* This species is distinguished from congeners by having three pairs of gills, dorsal chaetae beginning in V, pectinate needles and anterior ventral chaeta with upper tooth more than twice as long as lower tooth. This is the first record of this species from Indonesia.

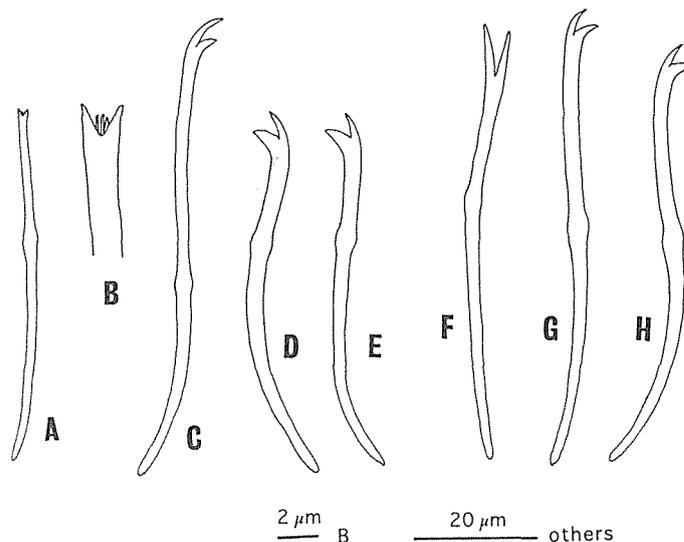


Fig. 1. A-E, *Aulophorus indicus* from Lake Sembuluh, Central Kalimantan: A, dorsal needle in VII; B, the same, distal end; C, ventral chaeta in II; D, the same in VII; E, the same in XV. F-H, *Pristina synclites* from Lake Sabuah, Central Kalimantan: F, dorsal needle in XII; G, ventral chaeta in III; H, the same in XV.

*Branchiodrilus hortensis* (Stephenson, 1910)

*Lahoria hortensis* Stephenson, 1910, p. 59, figs. 1-3, pl. VIII; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* One immature specimen (AO collection), Lake Sabuah, Palangkaraya, Central Kalimantan, littoral, mud with aquatic vegetation, 22 Feb. 1998.

*Remarks.* This is the first record of this species from Indonesia.

*Pristina longiseta* Ehrenberg, 1828

*Pristina longiseta* Ehrenberg, 1828, Animalia evertebrata Phytozoa, p. 112; see Brinkhurst and Jamieson (1971) and Rodriguez (1987) for synonymies and other

references.

*Material examined.* One immature specimen (AO collection), a small current in Padang, West Sumatra, with dense submerged vegetation, 3 Aug. 1988. One immature specimen (MZB 126), Lake Sabuah, Palangkaraya, Central Kalimantan, littoral, mud with vegetation, 22 Feb. 1998. One immature (MZB 127) and four immature specimens (AO collection), Pondok Ambung, Tanjung Puting National Park, Central Kalimantan, littoral with aquatic vegetation, 24 Feb. 1998. One immature specimen (AO collection), Lake Sembuluh, Central Kalimantan, littoral on submerged vegetation, 25 Feb. 1998.

*Remarks.* This species was once recorded from Sumatra (Michaelsen and Boldt, 1932).

***Pristina aequiseta* Bourne, 1891**

*Pristina aequiseta* Bourne, 1891, Q. Jl. microsc. Sci. (N. S.), 32, p. 352; Sperber, 1948, p. 230, fig. 24, pl. XXI, fig. 5. Brinkhurst and Jamieson, 1971, p. 401, fig. 7.24 d-g. Loden and Harman, 1980, p. 33, fig. 1.

*Pristina foreli* (Piguet). Sperber, 1948, p. 229, pl. XXI, fig. 4. Brinkhurst and Jamieson, 1971, p. 399, fig. 7.24 a-c.

*Pristina evelinae* Marcus. Sperber, 1948, p. 232, fig. 25. Naidu, 1963, p. 214, fig. 33 a-d. Brinkhurst and Jamieson, p. 401, fig. 7.24 h, 7.25 a-d.

*Material examined.* One immature specimen (AO collection), paddy field in Tabing, Padang, West Sumatra, 3 Aug. 1988. One immature specimen (MZB 128), Pondok Ambung, Tanjung Puting National Park, Central Kalimantan, littoral with submerged vegetation, 24 Feb. 1998. Two immature specimens (AO collection), Lake Sembuluh, Central Kalimantan, western shore, sand with submerged vegetation, 25 Feb. 1998.

*Remarks.* This is the first record of this species from Indonesia. The Lake Sembuluh specimens have single simple-pointed giant chaeta in the ventral bundle of V and are ascribable to *P. evelinae* Marcus, which was regarded as an ecomorph of *P. aequisteta* by Harman (1974).

***Pristina synclites* Stephenson, 1925 (Fig. 1F-H)**

*Pristina synclites* Stephenson, 1925, p. 45, pl. III, fig. 1; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* One immature (MZB 129) and one immature specimen (AO collection), Lake Sabuah, Palangkaraya, Central Kalimantan, littoral with aquatic vegetation, 22 Feb. 1998.

*Description.* Body 3-5 mm long in fixed state. Prostomium forming a short proboscis. Dorsal chaetal bundle beginning in II, consisting of one smooth hair and one needle. Needle with long and parallel distal teeth; upper tooth a little shorter and thinner than lower tooth (Fig. 1F). Ventral chaetae bifid, 4 per bundle in anterior segments and 2-4 per bundle in posterior ones. Upper tooth of all ventral chaetae almost as long as and thinner than lower (Fig. 1 G, H).

*Remarks.* This is the first record of this species from Indonesia.

***Pristina biserrata* Chen, 1940 (Fig.2)**

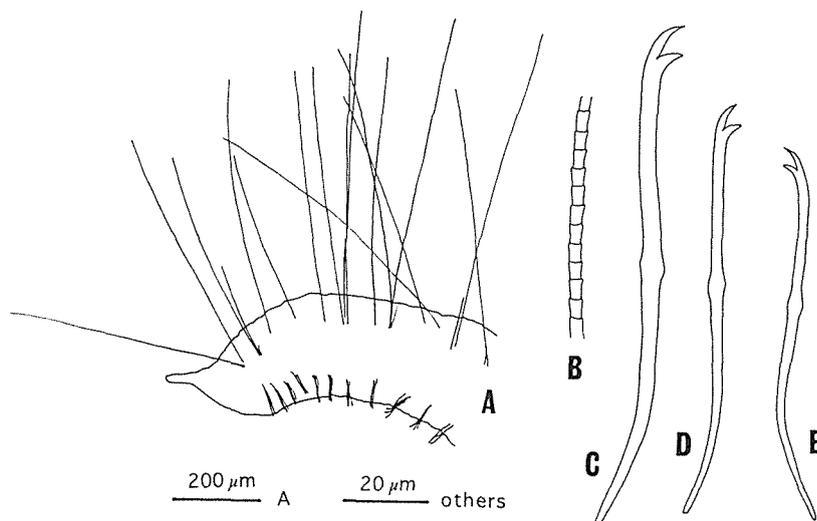
*Pristina biserrata* Chen, 1940, p. 49, figs. 13-14; see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Material examined.* Three immature specimens (AO collection), Lake Sabuah,

Palangkaraya, Central Kalimantan, littoral mud with vegetation, 22 Feb. 1998. Two immature (MZB 130, 131) and six immature specimens (AO collection), Pondok Ambung, Tanjung Puting National Park, Central Kalimantan, littoral with aquatic vegetation, 24 Feb. 1998. One immature specimen (AO collection), Lake Sembuluh, Central Kalimantan, eastern shore, sand, 25 Feb. 1998.

*Description.* Body 2-5 mm long in fixed state. Prostomium forming a proboscis (Fig. 2A). No eyes. Dorsal chaetal bundles beginning in II, with 1-3 hairs and 2-4 needles. Hair chaetae up to 900  $\mu\text{m}$  long, distinctly jointed with 4-6  $\mu\text{m}$  apart proximally (Fig. 2B). Needle chaetae 68-80  $\mu\text{m}$  long, with simple pointed end and without nodulus. Ventral chaetae in II (Fig. 2C) 3-4 per bundle, 100-110  $\mu\text{m}$  long, fewer, longer, and thicker than those in the following segments, nodulus almost medially; those in the following segments (Fig. 2D, E) 6-10 per bundle, 80-90  $\mu\text{m}$  long, with nodules distally. All ventral chaetae bifurcate, with upper tooth about twice longer and almost as thick as lower.

*Remarks.* As in the original description from China (Chen, 1940), this species is characterized by having very long and distinctly jointed hairs on the dorsal bundle. In the original account, the ventral chaetae in III-VII are described as thinner than in the following segments, while they hardly differ in the present material. Chen (1940) mistook the needle chaetae for very short hairs, which Brinkhurst and Jamieson (1971) later corrected. The present species is one of the most dominant naidids among aquatic vegetation in Central Kalimantan. This is the first record of this species from Indonesia.



**Fig. 2.** *Pristina biserrata* from Pondok Ambung, Tanjung Puting National Park, Central Kalimantan: A, anterior part of body showing chaetal arrangements; B, proximal part of hair chaeta; C, ventral chaeta in II; D, the same in III; E, the same in VIII.

#### Subfamily **Stylariinae**

##### *Stylaria lacustris* (Linnaeus, 1767)

*Nereis lacustris* Linnaeus, 1767, Systema Naturae, 1, II, ed. 12, p. 1089 (partim); see Brinkhurst and Jamieson (1971) for synonymies and other references.

*Stylaria fossularis* Leidy, 1852, Proc. Acad. nat. Sci. Philad. 5, 287; see Brinkhurst and

Jamieson (1971) for synonymies and other references.

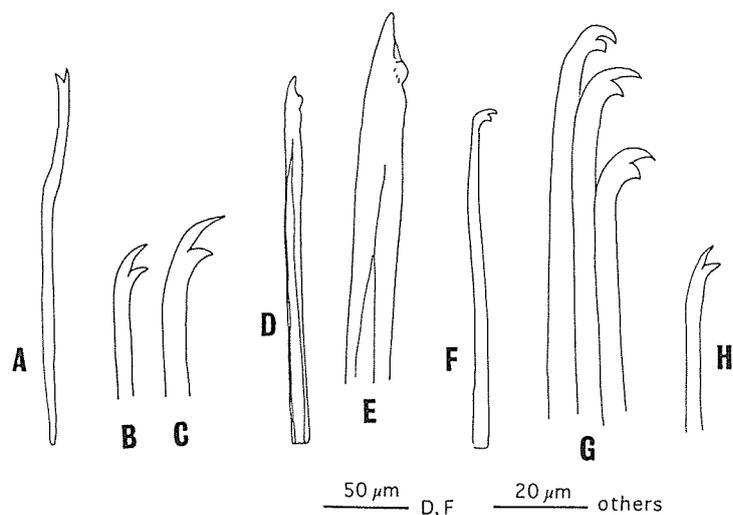
*Material examined.* One immature (MZB 132) and 15 immature specimens (AO collection), Lake Sembuluh, Central Kalimantan, littoral, sand with submerged vegetations, 25 Feb. 1998.

*Remarks.* Common and abundant at vegetated littorals in the lake surveyed. All the specimens examined lack an invaginated lobe on the prostomium, and are ascribable to *S. fossularis*, which has been synonymized into *S. lacustris* (Brinkhurst, 1986). This is the first record of this species from Indonesia.

**Naididae gen. sp. (Fig. 3)**

*Material examined.* Two mature specimens (AO collection), paddy fields, Tabing, Padang, West Sumatra, 3 Aug. 1988.

*Description.* Body 8 mm long in fixed state. Dorsal chaetal bundles beginning in IV, composed of 1 hair and 1 bayonet-shaped needle chaeta (Fig. 3A). Dorsal needle chaetae with distal nodulus and with shortly bifid teeth in which upper tooth a little longer and thinner than lower. Ventral chaetae from II to IV (Fig. 3B, C) 2-3 per bundle, variable in size within a bundle, distal end bifid with upper tooth longer and a little thinner than lower tooth. Ventral chaeta in V modified into a single large, thick and straight spermathecal chaeta (Fig. 3D); shaft hollow and without nodulus, lower tooth of distal end vestigial (Fig. 3E). Penial chaetae 3 per bundle in VI; the shaft straight and lacking nodulus (Fig. 3F), distal end curved and bifid (Fig. 3 G). Ventral chaetal bundles from VII on composed of 4-5 bifid chaetae with a distal nodulus, upper tooth a little longer and thinner than lower tooth (Fig. 3H). Internal characters could not be examined.



**Fig. 3.** Naididae gen. sp. from Padang, West Sumatra: A, dorsal needle in a middle segment; B and C, distal ends of ventral chaetae in IV; D, spermathecal chaeta in V; E, the same, distal end; F, penial chaeta in VI; G, distal ends of penial chaetae; H, distal end of ventral chaeta in a posterior segment.

*Remarks.* Since the present specimens were mounted with CMCP-10, the internal structures including genital organs could not be observed. Nevertheless, composition of the dorsal chaetal bundles (1 hair and 1 needle) and segmental position of the genital organs (spermatheca in V and male pore in VI) strongly suggest that this species is ascribable to the family Naididae. However, no naidid species have such a combination of genal chaetae as this species. It is highly probable that the present specimens represent an as yet undescribed species.

#### Family **Tubificidae**

##### Subfamily **Tubificinae**

*Aulodrilus acutus* Ohtaka and Usman, 1997

*Aulodrilus acutus* Ohtaka and Usman, 1997, p. 149, figs. 3-4.

*Material examined.* One immature specimen (MZB 133), northern tip of Lake Sabuah, Palangkaraya, Central Kalimantan, sandy mud, 22 Feb. 1998.

*Remarks.* This species, originally described from West Sumatra (Ohtaka and Usman, 1997), is characterized by having tapering distal ends to the dorsal oar-shaped chaetae.

#### **Discussion**

A total of 35 oligochaete species have so far been recorded from Sumatra, Kalimantan, Java, and Bali (Michaelsen and Boldt, 1932; Ohtaka and Usman, 1997, present study; Table 1), which belong to the Indo-Malayan subregion of the Sino-Indian zoogeographical region (Timm, 1980). According to Timm (1980), the aquatic oligochaete fauna in this subregion is characterized by numerous species of Naididae, especially *Dero*. Although taxonomic and faunistic investigations of aquatic oligochaetes in the Indo-Malayan subregion has been focused on India and neighboring areas, a similar tendency is also encountered in Indonesian freshwaters so far surveyed, where 77% (27 spp.) of the fauna is occupied by the family Naididae.

In contrast to the rich variety of naidids, only six tubificid species have hitherto been known from Indonesia. The family Tubificidae is thought to originate from the northern temperate zone, and most tubificids need hibernation in cold water for successful sexual reproduction (Timm, 1980). Thus, the paucity of tubificids in this area may be attributable to such evolutionary and physiological trends in the family.

We still have many unidentified specimens in our collection. In addition, there remain vast areas in Indonesia that are still unsurveyed. Thus much work remains to be done to reveal the complete diversity of freshwater oligochaetes in Indonesia.

#### **Acknowledgments**

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Table 1. A list of freshwater oligochaetes so far reported from Indonesia.

Only the taxa identified specifically are listed.

References: +, Michaelsen and Boldt (1932); ++, Ohtaka and Usman (1997);

+++ , present study

Taxon	Sumatra	Kalimantan	Java	Bali
Family Naididae				
<i>Chaetogaster diastrophus</i>	+++			
<i>C. diaphanus</i>	+++			
<i>Nais pardalis</i>	+, +++		+	
<i>N. bretscheri</i>	+			
<i>N. communis</i>			+	
<i>N. raviensis</i>	+			
<i>Allonais pectinata</i>	+++			
<i>A. gwaliorensis</i>	+ <sup>1)</sup>			+ <sup>1)</sup>
<i>A. paraguayensis</i>	+ <sup>2)</sup>		+ <sup>2)</sup>	
<i>A. inaequalis</i>	+ <sup>3)</sup>		+ <sup>3)</sup>	
<i>Dero (Dero) digitata</i>	+++	+++		
<i>D. (D.) indica</i>	+++			
<i>D. (D.) dorsalis</i>	+++			
<i>D. (Aulophorus) flabelliger</i>	+++			
<i>D. (A.) furcatus</i>	+, +++	+++	+	
<i>D. (A.) indicus</i>		+++		
<i>D. (A.) gravelyi</i>	+			+
<i>D. (A.) tonkinensis</i>	+		+	
<i>Branchiodrilus hortensis</i>		+++		
<i>Pristina breviseta</i>	+			
<i>P. longiseta</i>	+, +++	+++		
<i>P. aequiseta</i>	+++	+++		
<i>P. synclites</i>		+++		
<i>P. biserrata</i>		+++		
<i>P. proboscidea</i>	+		+	
<i>Pristinella rosea</i>	+ <sup>4)</sup>		+ <sup>4)</sup>	+ <sup>4)</sup>
<i>Stylaria lacustris</i>		+++		
Family Tubificidae				
<i>Limnodrilus hoffmeisteri</i>	++		+ <sup>5)</sup>	
<i>Aulodrilus pluriseta</i>	+ <sup>6)</sup>			
<i>A. pigueti</i>	++			
<i>A. acutus</i>	++	+++		
<i>Teneridrilus mastix</i> <sup>7)</sup>	++ <sup>8)</sup>			
<i>Branchiura sowerbyi</i>	++			
Family Enchytraeidae				
<i>Fridericia bulbosa</i>			+	
<i>Enchytraeus harurami</i>	+		+	

1), as *Nais gwaliorensis* ; 2), as *Nais paraguayensis* ; 3), as *Nais pectinata* var. *inaequalis* and var. *ranauana* ; 4), as *Pristina rosea* ; 5), as *Limnodrilus socialis* ; 6), as *Aulodrilus trivandranus* ; 7), after Ohtaka and Nishino (1999); 8), as *Teneridrilus* sp.

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