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Checklist of Polychaetous Annelids in Malaysia with Redescription of Two Commercially Exploited Species

^{1,2}I. Idris and ¹A. Arshad

¹Laboratory of Aquatic Biology and Ecology, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400, Serdang, Malaysia

²Department of Marine Science, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu, 21030, Kuala Terengganu, Malaysia

Corresponding Author: I. Idris, Laboratory of Aquatic Biology and Ecology, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400, Serdang, Malaysia

ABSTRACT

A checklist of polychaetous annelids identified within Malaysian territory is presented. The checklist is produced based on the collected specimens by the present authors and from published materials. Two species from the checklist that are currently commercially exploited were described in detail based on their original descriptions as well as current observation. In total, 64 polychaete species from 31 families have been identified in Malaysia from 1866 until present. The two described species, *Halla okudai* Imajima, 1967 and *Diopatra claperedii* Grube, 1878 are harvested as baitworms along the west coast of Peninsular Malaysia. The checklist has extended the distribution of these two species from their previous records. The number of polychaete species identified in Malaysia is lower than its neighbouring countries except the Philippines. The polychaete research in Malaysia is evaluated and research direction is commented.

Key words: Checklist, polychaete, commercial, *Halla okudai*, *Diopatra claperedii*

INTRODUCTION

Malaysia is situated in one of the biodiversity epicentre hotspots of the world (Myers *et al.*, 2000). The marine biodiversity in Malaysia is part of the imaginary area of Coral Triangle, which is considered the highest in the world (Veron *et al.*, 2009). Hence, Malaysia is rich in terms of its biodiversity treasure. However, diversity of many marine taxon groups remained unknown including polychaeta.

A lengthy checklist of polychaetes in the South China Sea was done by Paxton and Chou (2000) based on identified species published in numerous publications with only one species identified from Malaysia-*Sasekumaria selangora* (Rullier, 1976). They concluded that such a low number of identified species in Malaysia is probably due to lack of collecting efforts either by local taxonomists or scientific expeditions (Paxton and Chou, 2000). Other countries in South East Asia region such as Singapore (Chan, 2009), Indonesia (Al-Hakim and Glasby, 2004) and Thailand (Aungtonya *et al.*, 2002) have put up the catalogue of polychaete species found in their waters. This action was done basically for the perpetuation of polychaete

diversity to spur on further research on polychaete worms. A polychaete inventory would contribute significantly to the national marine database program.

Polychaete is relatively small in size among invertebrate marine organisms, although some species can attain length up to 6 meters (Rouse and Pleijel, 2001). Their intermediate positions in food web (primary or secondary users) (Fauchald and Jumars, 1979) make them less important by many researchers. However, their importance in natural ecosystems such as pollution determinant (Reish and Gerlinger, 1997) continues to receive further recognition. Moreover, some polychaete species can also be utilized economically either through direct usage (as baitworm) (Olive, 1994) or indirectly (as aquaculture feed for broodstock) (Olive, 1999). For example, *Diopatra neopolitana* fishery in estuary of Canal de Mira, Portugal is valued €325,000 per year (Cunha *et al.*, 2005), while in Maine, USA, bloodworm collecting (*Glycera dibranchiata*) generates 800 jobs annually since 1940 with average catch value of USD 6 million (Sypitkowski *et al.*, 2009).

At present, there is no polychaete taxonomist in Malaysia. Most of the previous documentations were conducted during pre-independence era (<1950s) by scientists from various nationalities. After independence, research was carried out through collaborative research with international researchers. Nevertheless, these sporadic researches created patches of information in various unquoted publications. Hence, the objective of this study was to generate a checklist of Malaysian polychaete species. Special mention is on marine baitworms with commercial importance and the subject of research by the present authors.

MATERIALS AND METHODS

Construction of checklist: Information on polychaete was gathered from local and international literature and on-going study by first author. In order to produce a reliable checklist, any polychaete specimens that were only identified to family or genus level without any additional data and/or depository information were omitted from the list. Identified species with uncertain taxonomic status (e.g., cosmopolitan species, junior synonym or given a different name by later taxonomist) will be mentioned. Species mentioned to distribute in this region (e.g., Malay Archipelago) without specifying the collection place in Malaysia or Malaya (Fauvel, 1953) are also excluded from the list. Literatures chosen are available as official publications that are accessible either from library or electronic databases. The authenticity of the species is confirmed with the World Polychaeta Database (www.marinespecies.org/polychaeta), which is a part of World Register of Marine Species, on its existence, spelling, records and authors.

Description of commercially exploited species: Specimens of *Diopatra claparedii* were collected from various locations on the west coast of Peninsular Malaysia while *Halla okudai* was collected at one location in Malacca (Fig. 1). Information on the sampling locations and the sale of the worms were gathered from local recreational anglers, and through visiting local fishing shops and bait stalls. Collected specimens were fixed and preserved in standard preparation of 10% buffered formalin, followed later by 70% ethanol for long term storage.

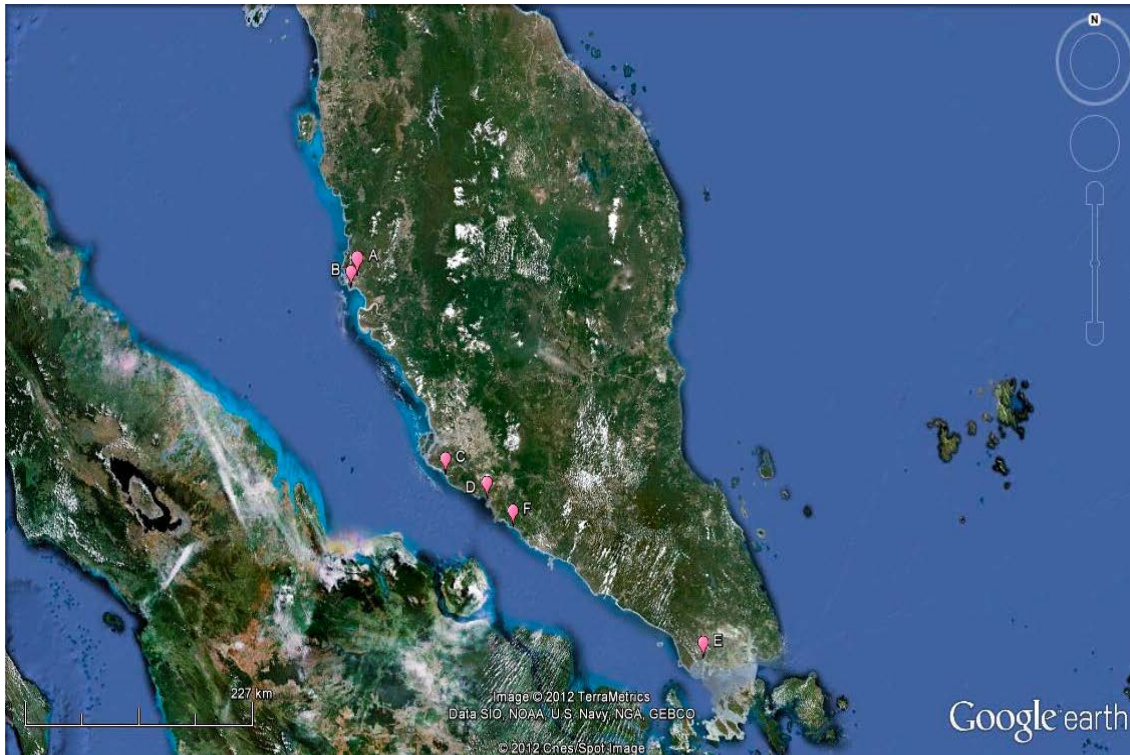


Fig. 1: Sampling location for *Diopatra claparedii* (a, b, c, d, e) and *Halla okudai* (f) in Peninsular Malaysia

Physical observations were done using a combination of stereo (Olympus SZ) and compound (Nikon Eclipse E400) microscopes. Detailed character information was observed and counted using scanning electron microscope (SEM) Zeiss EVO LS15 SEM with Robinson Backscatter Detector. Necessary biometric measurements (total length, width at chaetiger 10 without parapodium) were obtained using an ocular micrometre to the nearest 0.01 mm. Specimens of *H. okudai* and *D. claparedii* were deposited at the Australian Museum, Sydney (AM) and Museum and Art Gallery of the Northern Territory (NTM).

RESULTS

Results obtained from both literature reviews and laboratory works are divided into two sections, namely a) systematics of identified polychaete species in Malaysia and b) Systematics and discriptions of two commercially exploited species.

A total of 64 species from 31 families of polychaete have been identified throughout Malaysia (Table 1). The earliest record of Malaysian (previously Malaya) holotype polychaetes is *Gaudichaudius cimex*; a scaleworm species found in the Straits of Malaca (specific location is unknown) by Quatrefages in 1866 (Solis-Weiss *et al.*, 2004). The specimen is currently deposited at the Muséum national d'Histoire naturelle, Paris. In addition, holotypes of six species also were collected from Malaysia.

Table 1: Polychaetous annelids found in Malaysian waters

Family	Species
Alciopidae	<i>Rhynchonereella moebii</i> (Apstein, 1893)
	<i>Vanadis minuta</i> Treadwell, 1906
	<i>Plotohormis capitata</i> (Greeff, 1876)
Ampharetidae	<i>Ampharete</i> sp. Malmgren, 1866
Capitellidae	<i>Notomastus latericeus</i> Sars, 1851
	<i>Parheteromastus tenuis</i> Monro, 1937
	<i>Leiochrides australis</i> Augener, 1914
	<i>Euclymene annandalei</i> Southern, 1921
	<i>Euclymene</i> sp. Verrill, 1900
Chaetopteridae	<i>Sasekumaria selangora</i> Rullier, 1976*
Cirratulidae	<i>Cirriformia tentaculata</i> (Montagu, 1808)
	<i>Tharyx</i> sp. Webster and Benedict, 1885
Cossuridae	<i>Cossura</i> sp. Webster and Benedict, 1885
Dorvilleidae	<i>Protodorvillea egena</i> (Ehlers, 1913)
Eulepethidae	<i>Grubeuleps malayensis</i> Nishi, 2001*
Eunicidae	<i>Marphysa</i> cf. <i>sanguinea</i> Montagu, 1815
	<i>Marphysa</i> cf. <i>mossambica</i> (Peters, 1854)
	<i>Eunice</i> sp. Cuvier, 1817
Fabriciidae	<i>Caobangia abbotti</i> Jones, 1974*
Flabelligeridae	<i>Pherusa</i> sp. Oken, 1807
Glyceridae	<i>Glycera prashadi</i> Fauvel, 1923
	<i>Glycera tessellata</i> Grube, 1840
	<i>Glycera alba</i> (Muller, 1776)
Iospilidae	<i>Phalacrophorus uniformis</i> Reibisch, 1895
Lopadorrhynchidae	<i>Lopadorrhynchus brevis</i> Grube, 1855
	<i>Maupasia coeca</i> Viguiet, 1886
	<i>Pelagobia longicirrata</i> Greeff, 1879
	<i>Lumbrineris malaysiae</i> (Rullier, 1969)*
Lumbrineridae	<i>Lumbrinerides acuta</i> (Verrill, 1875)
	<i>Neanthes willeyi</i> (Day, 1934)
Nereididae	<i>Dendronereis</i> sp. Peters, 1854
	<i>Perinereis rhombodonta</i> Wu <i>et al.</i> , 1985
	<i>Perinereis</i> cf. <i>nuntia</i> (Saviguy in Lamarck, 1818)
	<i>Perenereis cultrifera</i> (Grube, 1840)
	<i>Pseudonereis variegata</i> (Grube, 1857)
	<i>Namalycastis</i> cf. <i>abiuma</i> (Grube, 1871)
	<i>Namalycastis rhodochorde</i> Glasby <i>et al.</i> , 2007
	<i>Platynereis bicanaliculata</i> (Baird, 1864)
Oeonidae	<i>Halla okudai</i> Imajima, 1967
Onuphidae	<i>Diopatra neapolitana</i> Delle Chiaje, 1841
	<i>Diopatra claparedii</i> Grube, 1878
Orbiniidae	<i>Naineris kalkudaensis</i> (Silva, 1965)
	<i>Scoloplos (Leodamas) chevalieri</i> (Fauvel, 1902)
Oweniidae	<i>Owenia</i> sp. Delle Chiaje, 1844
Poecilochaetidae	<i>Poecilochaetus serpens</i> Allen, 1904
Polynoidae	<i>Drieschia pelagica</i> Michaelsen, 1892
	<i>Olgalepidonotus kumari</i> (Rullier, 1970)*
	<i>Gaudichaudius cimex</i> (Quatrefages, 1866)*

Table 1: Continue

Family	Species
Sabellidae	<i>Branchiomma nigromaculatum</i> (Baird, 1864)
Scalibregmatidae	<i>Parasclerocheilus branchiatus</i> Fauvel, 1928
Sigalionidae	<i>Euthalenessa digitata</i> (McIntosh, 1885)
Spionidae	<i>Pisione oerstedii</i> Grube, 1857
	<i>Prionospio</i> sp. Malmgren, 1867
	<i>Paraprionospio pinnata</i> (Ehlers, 1901)
Steruaspidae	<i>Sternaspis scutata</i> Ranzani, 1817
Syllidae	<i>Syllis cornuta</i> Rathke, 1843
Terebellidae	<i>Lanice socialis</i> (Willey, 1905)
	<i>Lanice</i> sp. Malmgren, 1866
	<i>Lysilla</i> sp. Malmgren, 1866
Typhloscolecidae	<i>Typhloscolex muelleri</i> Busch, 1851
Tomopteridae	<i>Tomopteris nisseni</i> Rosa, 1908
	<i>Tomopteris (Johnstonella) aloysii (sabaudiae)</i> Rosa, 1908
	<i>Tomopteris (Johnstonella) dunckeri</i> Rosa, 1908
	<i>Tomopteris mariana</i> Greeff, 1885

*Indicates that the holotype specimen was collected from Malaysia

The highest number of species identified belong to family Nereididae (nine species), followed by family Capitellidae (five species) and Tomopteridae (four species). *Caobangia abbotti* Jones, 1974 is currently the only freshwater polychaete species found in Malaysia, and is endemic to Sabah and Sarawak (Jones, 1974).

SYSTEMATICS OF IDENTIFIED POLYCHAETE SPECIES IN MALAYSIA

FAMILY ALCIOPIDAE EHLERS, 1864

Rhynchonereella moebii (Apstein 1893):

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Cosmopolitan (?). Other records only showed Caribbean distribution

Vanadis minuta Treadwell, 1906:

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Cosmopolitan (?). Other records showed distribution in Indian Ocean and Southern Africa

Plotohelmis capitata (Greeff, 1876):

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Cosmopolitan (?). Other records showed European distribution

FAMILY AMPHARETIDAE MALMGREN, 1866

***Ampharete* sp. Malmgren, 1866:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (sedantria)
- **Remark:** Cosmopolitan species

FAMILY CAPITELLIDAE GRUBE, 1862

***Notomastus latericeus* Sars, 1851:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

***Parheteromastus tenuis* Monro, 1937:**

- **Distribution:** Kapar mangrove forest, Klang (Sasekumar, 1974)
- **Type:** Benthic (errantia). Live in various mangrove zonations
- **Remark:** Many publications used wrong spelling *Paraheteromastus tenuis*

***Leiochrides australis* Augener, 1914:**

- **Distribution:** Kapar mangrove forest, Klang (Sasekumar, 1974)
- **Type:** Benthic (errantia). Live in various mangrove zonations
- **Remark:** Holotype was collected from south-west of Australia

***Euclymene annandalei* Southern, 1921:**

- **Distribution:** Kapar mangrove forest, Klang (Sasekumar, 1974)
- **Type:** Benthic (sedantria-with tube). Found in the landward area of mangrove
- **Remark:** Holotype was collected from Indian Ocean (Chilka Lake). Sasekumar (1974) has spelled the species name wrongly as *Clymene annandali*

***Euclymene* sp. Verrill, 1900:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

FAMILY CHAETOPTERIDAE AUDOUIN AND EDWARDS, 1833

***Sasekumaria selangora* Rullier, 1976:**

- **Junior synonym:** *Mesochaetopterus selangolus* Nishi, 1999
- **Distribution:** Morib beach, Selangor (Rullier, 1976)
- **Type:** Benthic (sedantria)

- **Remark:** Only found at this location (endemic species). Nishi (1999) placed the species under genus *Mesochaetopterus*. However, the WORMS's database still recognizes *Sasekumaria* as accepted genus for this species

FAMILY CIRRATULIDAE CARUS, 1863

***Cirriformia tentaculata* (Montagu, 1808):**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (partially errantia)
- **Remark:** Cosmopolitan species

***Tharyx* sp. Webster and Benedict, 1885:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

FAMILY COSSURIDAE DAY, 1963

***Cossura* sp. Webster and Benedict, 1885:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

FAMILY DORVILLEIDAE CHAMBERLIN, 1919

***Protodorvillea egena* (Ehlers, 1913):**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found in mid-tide region
- **Remark:** Cosmopolitan but mostly found in the Mediterranean and Red Seas

FAMILY EULEPETHIDAE CHAMBERLIAN, 1919

***Grubeulepis malayensis* (Nishi, 2001):**

- **Distribution:** Morib, Selangor (Nishi, 2001)
- **Type:** Benthic (errantia). Live in Chaetopterid tubes
- **Remark:** Holotype was collected from Morib, Selangor

FAMILY EUNICIDAE LATREILLE AND BERTHOLD, 1827

***Marphysa* cf. *sanguinea* Montagu, 1815:**

- **Distribution:** Morib, Selangor and Pengkalan Balak, Malacca (Idris *et al.*, in prep)
- **Type:** Benthic (errantia). Found in mangrove and mud flats
- **Remark:** Most probably a new species. *M. sanguinea* is no longer considered as cosmopolitan species (Lewis and Karageorgopoulos, 2008)

***Marphysa cf. mossambica* (Peters, 1854):**

- **Distribution:** Along the west coast of Peninsular Malaysia (Idris *et al.*, in prep)
- **Type:** Benthic (errantia). Found in mangrove and mud flats
- **Remark:** Most probably a new species. Holotype was collected from Mozambique

***Eunice sp.* Cuvier, 1817:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** First record of *Eunice* in Malaysia

FAMILY FABRICIIDAE RIOJA, 1923

***Caobangia abbotti* Jones, 1974:**

- **Distribution:** Sabah and Sarawak (Jones, 1974)
- **Type:** Benthic (sedantria). Found as boring organism in fresh and brackish water gastropods and bivalves
- **Remark:** Holotype was collected from Sabah. The only freshwater polychaete found in Malaysia at the moment

FAMILY FLABELLIGERIDAE DE SAINT-JOSEPH, 1894

***Pherusa sp.* Oken, 1807:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

FAMILY GLYCERIDAE GRUBE, 1850

***Glycera prashadi* Fauvel, 1923:**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Not confined to any tidal level
- **Remark:** Holotype was collected from Mozambique

***Glycera tessellata* Grube, 1840:**

- **Distribution:** Kapar mangrove forest, Klang (Sasekumar, 1974)
- **Type:** Benthic (errantia). Found in various soil conditions in mangrove forest
- **Remark:** Cosmopolitan species

***Glycera alba* (Muller, 1776):**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

FAMILY IOSPILIDAE BERGSTROM, 1914

***Phalacrophorus uniformis* Reibisch, 1895:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Cosmopolitan. Other records only showed European distribution

FAMILY LOPADORRHYNCHIDAE CLAPAREDE, 1868

***Lopadorrhynchus brevis* Grube, 1855:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Cosmopolitan species

***Maupasia coeca* Viguier, 1886:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Cosmopolitan species

***Pelagobia longicirrata* Greeff, 1879:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Cosmopolitan species but first record in tropical sea

FAMILY LUMBRINERIDAE SCHMARDA, 1861

***Lumbrineris malaysiae* (Rullier, 1970):**

- **Distribution:** Kapar mangrove forest, Klang (Sasekumar, 1974)
- **Type:** Benthic (errantia). Found mostly in the mud bank and in seaward mangrove vegetation
- **Remark:** Holotype was collected from Malaysia. Previously identified as *Lubriconereis malaysiae* but later revision has changed the genus to current name

***Lumbrinerides acuta* (Verrill, 1875):**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species. Nakao *et al.* (1989) identified the species as *Lumbrineris acuta* but current name is accepted by taxonomist

FAMILY NEREIDIDAE BLAINVILLE, 1818

***Neanthes willeyi* (Day, 1934):**

- **Distribution:** Kapar mangrove forest, Klang (Sasekumar, 1974)
- **Type:** Benthic (errantia). Habitat ranges from seaward mud-bank to stream
- **Remark:** Cosmopolitan species. Previously identified as *Nereis (Neanthes) capensis*

***Dendronereis* sp. Peters, 1854:**

- **Distribution:** Kapar mangrove forest, Klang (Sasekumar, 1974)
- **Type:** Benthic (errantia). Found at the low-tide level of mud-bank
- **Remark:** Mostly found in the Indian Ocean near African continent

***Perinereis rhombodonta* Wu *et al.*, 1985:**

- **Distribution:** Blue Lagoon, Port Dickson, Negeri Sembilan (Glasby and Hsieh, 2006)
- **Type:** Benthic (errantia). Found on the sandy shore
- **Remark:** Cosmopolitan species, but current distribution only in Indo-West Pacific

***Perinereis* cf. *nuntia* (Savigny in Lamarck, 1818):**

- **Distribution:** Bt. 4, Port Dickson, Negeri Sembilan (Idris *et al.*, 2012)
- **Type:** Benthic (errantia). Found on the sandy shores in mid and upper tide level
- **Remark:** A complex species. Has similarity with similar specimen from Indonesia (Glasby and Hsieh, 2006). Probably a new species and used as baitworm

***Perenereis cultrifera* (Grube, 1840):**

- **Distribution:** Pulau Aur, Johore (Chuang, 1961)
- **Type:** Benthic (errantia). Found on the sandy shores
- **Remark:** Cosmopolitan species

***Pseudonereis variegata* (Grube, 1857):**

- **Distribution:** Pulau Aur, Johore (Chuang, 1961)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

***Namalycastis* cf. *abiuma* (Grube, 1871):**

- **Distribution:** Pekan, Pahang (Idris *et al.*, 2012)
- **Type:** Benthic (errantia). Found in peat swamp with seawater intrusion
- **Remark:** A complex species. Finite identification is still on going. Used as baitworm

***Namalycastis rhodochorde* Glasby *et al.*, 2007:**

- **Distribution:** West coast of Peninsular Malaysia and Sabah (Glasby *et al.*, 2007; Idris *et al.*, 2012)
- **Type:** Benthic (errantia). Found in mangrove and swamp with *Nypa fruticans* (Nypa tree)
- **Remark:** Used as baitworm. Have a wide distribution in South East Asia. Holotype was collected from West Kalimantan, Indonesia

***Platynereis bicanaliculata* (Baird, 1864):**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Cosmopolitan species
- **Remark:** Benthic (errantia)

FAMILY OENONIDAE KINBERG, 1865

***Halla okudai* Imajima, 1967:**

- **Distribution:** Malacca (present study)
- **Type:** Benthic (errantia). Found in sand bar in lowest tidal level
- **Remark:** The nearest location to Malacca where this species is found is Darwin, Australia

FAMILY ONUPHIDAE KINBERG, 1865

***Diopatra neapolitana* Delle Chiaje, 1841:**

- **Distribution:** Teluk Aling, Penang and Kapar mangrove forest, Klang. (Sasekumar, 1974; Ong, 1995)
- **Type:** Benthic (sedentary in tube). Found in medium tide level with medium fine sand as well as in the mangrove and mudflats
- **Remark:** Cosmopolitan species

***Diopatra clapedii* Grube, 1878:**

- **Distribution:** Along the mudflats in the west coast of Peninsular Malaysia (Paxton, 2002; present study)
- **Type:** Benthic (sedentary in tube). Found in medium tide level with medium fine sand in the mangrove and mudflats
- **Remark:** Commonly found in Singapore, Peninsular Malaysia and Thailand. Used as baitworm

FAMILY ORBINIIDAE HARTMAN, 1942

***Naineris kalkudaensis* (Silva, 1965):**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found among tubes of *D. neapolitana*
- **Remark:** Holotype was collected in Indian Ocean

***Scoloplos (Leodamas) chevalieri* (Fauvel, 1902):**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found in mid-tide region
- **Remark:** Cosmopolitan but mostly found in the Mediterranean and Red Seas

FAMILY OWENIIDAE RIOJA, 1917

***Owenia* sp. Delle Chiaje, 1844:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

FAMILY POECILOCHAETIDAE HANNERZ, 1956

***Poecilochaetus serpens* Allen 1904:**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found at low-tide region
- **Remark:** Cosmopolitan species

FAMILY POLYNOIDAE MALMGREN, 1867

***Drieschia pelagica* Michaelsen, 1892:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic

***Olgalepidonotus kumari* (Rullier, 1970):**

- **Distribution:** Kapar mangrove forest, Klang (Sasekumar, 1974)
- **Type:** Benthic (errantia). Mostly found in the sand/muddy area near stream
- **Remark:** Holotype was described from Port Swettenham Malaysia. However, it was identified as *Lepidonotus kumari* but is change to current name by Pettibone (1995)

***Gaudichaudius cimex* (Quatrefages, 1866):**

- **Distribution:** Straits of Malacca (Solis-Weiss *et al.*, 2004)
- **Type:** Benthic (errantia)
- **Remark:** Holotype was collected from the Straits of Malacca. Original name is *Iphione cimex* but a review by Pettibone (1986) has placed this species in its current classification

FAMILY SABELLIDAE LATREILLE, 1825

***Branchiomma nigromaculatum* (Baird, 1864):**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (sedantria-in tube). Found at low-tide level in fine sand
- **Remark:** Cosmopolitan species. Ong (1995) wrongly spelled the species as *Branchiomma nigromatulata*

FAMILY SCALIBREGMATIDAE MALMGREN, 1867

***Parasclerocheilus branchiatus* Fauvel, 1928:**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found at the mean tide level in the coarse sand
- **Remark:** Found in the Indian Ocean

FAMILY SIGALIONIDAE MALMGREN, 1867

***Euthalenessa digitata* (McIntosh, 1885):**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found in mean tide level
- **Remark:** Cosmopolitan (?). Holotype was described from the Red Sea

***Pisione oerstedii* Grube, 1857:**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found in low-tide region in fine sand
- **Remark:** Cosmopolitan. Holotype was described from New Zealand (Southern Ocean)

FAMILY SPIONIDAE GRUBE, 1850

***Prionospio* sp. Malmgren, 1867:**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found at the lowest tide level in very fine sand
- **Remark:** Cosmopolitan and complex species group

***Paraprionospio pinnata* (Ehlers, 1901):**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

FAMILY STERNASPIDAE CARUS, 1863

***Sternaspis scutata* Ranzani, 1817:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (errantia)
- **Remark:** Cosmopolitan species

FAMILY SYLLIDAE GRUBE, 1850

***Syllis cornuta* (Rathke, 1843):**

- **Distribution:** Teluk Aling, Penang (Ong, 1995)
- **Type:** Benthic (errantia). Found in low-tide region in fine sand
- **Remark:** Cosmopolitan species. Ong (1995) identified it as *Langerhansia cornuta* (Rathke, 1843). However, Fauchald and Musco (2012) have declassified genus *Langerhansia* and remove this species into genus *Syllis*

FAMILY TEREPELLIDAE MALMGREN, 1867

***Lanice socialis* (Willey, 1905):**

- **Distribution:** Teluk Aling, Penang (Ong, 1995).
- **Type:** Benthic (sedantria-in tube). Found at the mean tide level in coarse sand.
- **Remark:** Found in the Indian Ocean.

***Lanice* sp. Malmgren, 1866:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic (?). Current classification has put this species as benthic
- **Remark:** Rezai *et al.* (2002) included this species under family Typhloscolecidae

***Lysilla* sp. Malmgren, 1866:**

- **Distribution:** Kuala Terengganu river estuary (Nakao *et al.*, 1989)
- **Type:** Benthic (sedantria)
- **Remark:** Cosmopolitan species

FAMILY TYPHLOSCOLECIDAE ULJANIN, 1878

***Typhloscolex muelleri* Busch, 1851:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Cosmopolitan species. Wrongly spelled as *T. mulleri* in Rezai *et al.* (2002)

FAMILY TOMOPTERIDAE JOHNSTON, 1865:

***Tomopteris nisseni* Rosa, 1908:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic

***Tomopteris (Johnstonella) aloysii (sabaudiae)* Rosa, 1908:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic

***Tomopteris (Johnstonella) dunckeri* Rosa, 1908:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Other distribution including European waters and the Red Sea

***Tomopteris mariana* Greeff, 1885:**

- **Distribution:** Straits of Malacca (Dales, 1959 in Rezai *et al.*, 2002)
- **Type:** Pelagic
- **Remark:** Other distribution including Guinea Islands

Systematics and descriptions of two commercially exploited species:

Order Eunicida **Fauchald, 1977**

Family Oeonidae **Kinberg, 1865**

Genus *Halla* Costa, 1844

Species *okudai* Imajima, 1967

Halla okudai Imajima, 1967 p. 437

Halla parthenopeia Okuda, 1933, pp. 243-247, pl. 12, Fig. a-p.

Local name: Ruat beting (beting = sandbar)

Material examined: (AM W.38706, AM W38707, NTM W024773) Malaysia - Southwest coast of Peninsular Malaysia, Kg. Tengah, Pengkalan Balak, Malacca, 2°22'0.09"N, 102°0'24.83"E (range 1-2 km), coll. baitdiggers, 23rd Jan 2011, Det. Paxton and Idris 2011.

Comparison material examined: *H. okudai* (AM W.33881) Australia - Port River, Adelaide, South Australia, 34.770°S, 138.510°E, coll. Sam Davies 2007; Det. Paxton. H.; *Halla* sp. (AM W.24796) Australia-Off Balls Head, Port Jackson, NSW, 33°50.9'S, 151°11.5'E, coll. Anonymous 1st Jul 1892; *Halla* sp. (AM W.24795) Port Jackson, NSW, 33°51'S, 151°16'E; *Halla* sp. (AM W.5705), 80 m Off Cronulla, NSW, coll. CSIRO Fisheries, 3rd Feb 1965; *O. fulgida* (AM W.26060) Australia-South Ledge, Cook Island, NSW, depth. 14 m, coll. GDF Wilson 9th June 1993, Det. Anna Murray 1999; *O. fulgida* (previously identified as *O. haswelli*) (AM E.683), Bass Strait, east coast of Flinders Island, Tasmania, 39.85°S, 147.9°E, coll. FIS "Endeavour" 1909-1914; *Oenone* sp. (AM W.6280, 2 km, East of Long Bay, NSW (Stn 4), depth. 66 m, coll. Shelf Benthic Survey 29th Sept 1973, Det. Powers April 1974; *Oenone fulgida* (AW G.11368) Italy-Bay of Naples, 40.75°N, 14.25°W, Dec 1908.

Diagnosis: Conical shaped prostomium equipped with three antennae and two pairs of eyes on dorsal side. Peristomium consists of two rings and without appendages. Branchia is absent. Sub-biramous parapodium with slender dorsal cirri that grew gradually longer towards posterior. No clear differentiation within trunk/metastomium. Chaetigers' size gradually increases towards the antero-mid-section but tapering towards the posterior. Capillary chaetae present in all chaetigers. Two subacicula, unidentate hooded hooks located on the ventral and two pinnate capillary chaetae on the dorsal side of neuropodium starting from the median chaetigers towards the posterior can be observed. Jaws are prionognath type with identical formulae for both sides.

Morphology: Morphology of this species is based on description by Okuda (1933) and observation on the materials collected in this study. Adult specimen is medium to large size. Body vermiform with number of segment more than 900 and length approximately 70 cm for preserved specimen. Live specimens measured 1 to 2 m. Prostomium is conical with blunt tip (Fig. 2a, b), smooth surface and a bit flattened on ventral side with the ventral-posterior margin covered by peristomium which formed the mouth. Two pairs of eyes present and located at the antero-lateral side of each lateral antenna. The eyes are faint whitish in colour and have to be carefully examined on preserved specimen. The second pair of eyes, mentioned by Okuda (1933), as located between the lateral and the median antennae is difficult to observe due to its cryptic and posteriorly position. Nuchal organ is absent. No anterior appendages except three antennae located mid posterior-dorsally of prostomium. Peristomium consists of two distinct rings. In the mid dorsal section of anterior region, a distinct V-shaped notch on both peristomium rings and extended to the anterior section of first segment on which the antennae are positioned. Antennae have smooth surface, digitiform and relatively short (Fig. 2b). The median antenna is slightly longer than lateral antennae and reaches

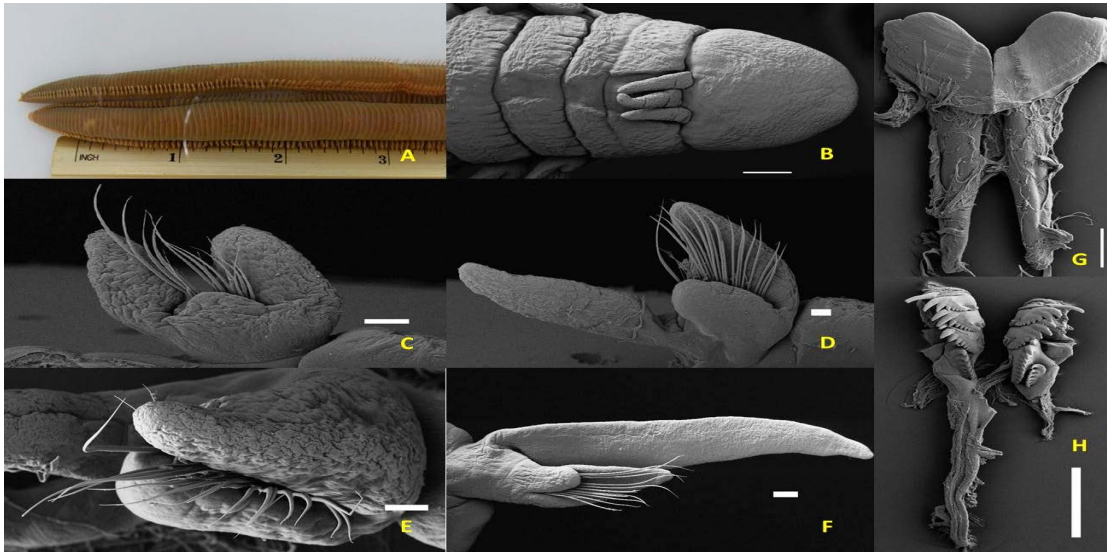


Fig. 2(a-h): *Halla okudai* Imajima 1967, (a) Anterior section of live specimens showing the body colouration, (b) SEM of dorsal view of anterior section. Note the digitiform (finger shaped) of nuchal antenna and the V shaped notch reached the first chaetiger, (c) Chaetiger 1, (d) Chaetiger 10, note the position of pre-setal lobe compared to chaetiger 1, (e) Chaetiger 10 (lateral view), (f) Chaetiger 600. Note the long and tapering notopodium, (g) Mandible and (h) Jaw; Scale: b = 500 μ m, c, d, e = 100 μ m; f, g = 200 μ m, h = 1 mm

the end of notch. Mouth is ventrally positioned and only occupies the first ring of peristomium, with the anterior most section of mouth covers the posterior section of prostomium. There are about seven foldings mid-circling the mouth for expansion of proboscis when everted. Proboscis is retracted on most preserved specimens, leaving the jaws and mandibles visible only by dissection. Live and preserved specimens are light brown. However, some specimens, probably due to stress after harvesting or as part of defence/feeding mechanisms, emitted dark purple/violet secretion which leave stained marks on skin upon contact that can last for a couple of days. This secretion turns the fixation and preservation solutions turned purplish.

The width of chaetigerous segment increasing until reaching the maximum width approximately 1/5 of body length, maintaining the width to another 1/5 of body length and gradually tapering towards the posterior. The anal opening is simple ring and though not present when observed by the present author, there are marks of pygidium appendages (cirri), which probably missing during sampling or fixation process. Okuda (1933) however, described clearly the pygidium as consisting of four digitiform (also known as finger shaped cirri). Branchia is absent throughout the metastomium. Parapodium is sub-biramous (Fig. 2c, d, f). Aciculae are projecting within noto and neuropodium when observed under light microscope. Notopodia are represented with gradually large, elongated and flattened oar shaped dorsal lobe towards the posterior region. Neuropodia are represented with parapodial lobes in horizontal arrangement (pre and post-setal

lobes). In the anterior most segments, the pre-setal lobe is located approximately between the notopodial lobe and post setal lobe. However, starting from chaetiger 3, the pre-setal lobe is moving to the similar position with post-setal lobe. Pre-setal lobe is relatively smaller than post-setal lobe and the tips of both lobes are dorsally pointed throughout the trunk. Capillary chaetae present from anterior to posterior chaetigers. Chaetae emerged from the body wall in between these lobes, in a relatively straight, vertical line. Two subaciculae unidentate hooded hooks projected from the ventral position of neuropodium from middle chaetigers approximately 70 to 110 segments towards the posterior.

Jaws prionognath (saw-jaw) type (Paxton, 2009) (Fig. 2g, h). Both mandibles and jaws complex are black (sclerotized). Mandibles consist of a pair of fused proximal shafts widening distally in anterior direction towards the cutting plate. The cutting plate has smooth edge. The fused section begins from the posterior of the cutting plate to the mid-section. The dorsal carriers of jaws are long, slender and have fine tips at the posterior end. Anterior section of dorsal carriers, just after the mid-section, are concavely shaped with the knife like curve at the posterior section and ended at small sharp edge which are connected to the first jaw by ligament. Maxillae consist of five pairs of jaws with equal numbers of teeth on both sides. However, the size of MIR (maxilla 1 right) is smaller than the left. Dental formula for *H. okudai* is as follows: MI = 6+6, MII = 7+7, MIII = 6 + 6, MIV = 3 + 3, MV = 1+1.

Remarks: First report and description of this species was done by Okuda in 1933 (Okuda, 1933) on specimens collected from Kajima Bay, Seto Inland Seas, Japan. However, he identified it as *H. parthenopeia* Delle Chiaje, 1828. When Imajima examined the type specimens in 1967 (Imajima, 1967), he found some differences on this species which are strong enough to erect new name. The differences are: 1) digitiform antennae, 2) subacicula, unidentate, hooded hooks emerged from chaetiger 70-110, 3). Subtriangular/conical prostomium and 4) large body size. Hence, he renamed the specimen as *H. okudai*. However, when comparing the drawing between Okuda (1933) and Fauvel (1923), the drawings of the antennae are similar (pointed) compared to observation (digitiform) by Imajima (1967). Observations (present study) on collected and comparison materials of *H. parthenopeia* from Italy are agreeing with Imajima's description on the antennae using both light and microscopy approach. The possible explanation for pointed antennae in earlier descriptions is that the preservation has shrunk the coloured muscle to pointed shape which clearly seen under microscope. However, the cuticle of the antennae, which is transparent, are still finger shaped, probably maintained by the osmotic pressure of ethanol. Hence, there is possibility that *H. okudai* is the junior synonym of *H. parthenopeia*.

Since the publication by Okuda (1933), there is no report of *H. okudai* outside of Japan emerged until Paxton in 2007 identified the species from south of Adelaide, Australia (specimen No. AM W.33881, deposited at the Australian Museum). In South East Asia region, checklists prepared by Paxton and Chou (2000) on South China Sea's polychaetes, Chan (2009) on Singaporean polychaetes and Aungtonya *et al.* (2002) on identified polychaetes in Thailand did not include *H. okudai*. As such, this is the first time *H. okudai* reported in the South East Asia, specifically Straits of Malacca. This finding has updated the geographical distribution of this species.

Economic exploitation: This species is collected from intertidal sandbars at Kampung (Village) Tengah, Pengkalan Balak, Malacca. Harvesting of this worm is made by digging using shovel and

fork during low-tide. A small plastic bag normally consisting of 1-2 worms is sold for RM10 (~USD3.00). This species is popular among recreational anglers for fishing. At present, this is the only place in Malaysia of which this species is collected and sold as baitworm.

Order Eunicida **Fauchald, 1977**

Family Onuphidae **Kinberg, 1865**

Subfamily Onuphinae **Kinberg, 1865**

Genus *Diopatra* **Audouin and Edwards, 1833**

Species *claparedii* **Grube 1878**

Diopatra claparedii **Grube 1878**, p140, pl. 9, Fig. 11a–b, 282.

Diopatra bulohensis **Tan and Chou, 1996**, p359, Fig. 2-3. Junior synonymy

Local name: Ruat/punpun sarung (sarung = tube)

Material examined: (AM W.38696, NTM W024765) Malaysia-Pantai Kelanang, Morib, Selangor, between mudflat and mangrove forest, N2°45.609, E 101°26.126, coll. Izwandy Idris, 16th June 2011, Det. Paxton and Idris, Oct 2011; (AM W.38698, NTM W024766) Kg. Sitiawan, Lumut, Perak, 4°14'59.25"N, 100°41'21.58"E, coll. Local baitdigger, 8th Feb 2011, Det. Paxton and Idris, Oct 2011; (AM W.38700, NTM W024769) Kuala Lukut, Negeri Sembilan, 2°34'43.74"N, 101°47'13.86"E, coll. 8th Feb 2011, Det. Paxton and Idris, Oct 2011; (AM W.38702, NTM W024764) Teluk Murok, Lumut, Perak, 4°9'50.21"N, 100°38'6.18"E (range 2km), coll. Local baitdigger, 8th Feb 2011, Det. Paxton and Idris, Oct 2011; (AM W.38704, NTM W024767) Tg. Kupang (2nd Link bridge to Singapore), Johore, N 01°21.575', E 103°37.323', coll. Izwandy Idris, 27th Feb 2011, Det. Paxton and Idris, Oct 2011.

Comparison material examined: *Diopatra claparedii* (AM W.27381) Singapore-Sg. Buloh estuary, 3°14'N, 101°19'E, coll. Reef Ecology Study Team, National University of Singapore, Det. Paxton, 2002; *D. maculata* (AM W.19746, paratype) Australia-Corneillee Island, Western Australia, 14°12'S, 124°44'E (Stn 65-Intertidal), coll. Hutchings P, 19th Jul 1988, Det. Paxton 1990; *D. sugokai* (AM W.23996) Taiwan-Hsiang-Shan, Hsin-Chu, northern Taiwan, 24°50'N, 120°54'E (intertidal sandflat), coll. Hsien, H. L. Mar 1990, Det. Paxton H, 1996; *D. amboinensis* (AM W.20560) Australia-Townsville, north Queensland, coll. Muftley, R., Det. Paxton, H. 1990; *D. albimandibulata* (AM W.20367) Abbot Point, Bowen, Queensland, 19°35'S, 148°4'E (Stn127, 5 m), coll. Oftaway J, 10th June 1983, Det. Paxton H, 1991; *D. liliputiana* (AM W.19691-holotype) Enderby Island, near station, Dampier Archipelago, Western Australia, mangroves, high spring tides, 20°36'S, 116°30'E, coll. Hutchings P, 31st Mar 1987, Det. Paxton H, 1991; *D. gigova* (AM W.19692-holotype) Enderby Island, Dampier Archipelago, below hut, 20°36'S, 116°30'E, intertidal, coll. Hutchings P, 27th Mar 1987, Det. Paxton H, 1990.

Diagnosis: Prostomium with shorter palps than antennae. Ceratophores with 7-11 rings. Peristomial cirri are about the same length with the peristomium. 3-4 modified chaetigers with three types of hooks (falcate, weakly pseudocompound bidantate and slender pseudocompound bidantate) and simple limbate chaetae. Funnel like pectinate chaetae begin from chaetiger 6. Subacicula hooks begins from chaetiger 20.

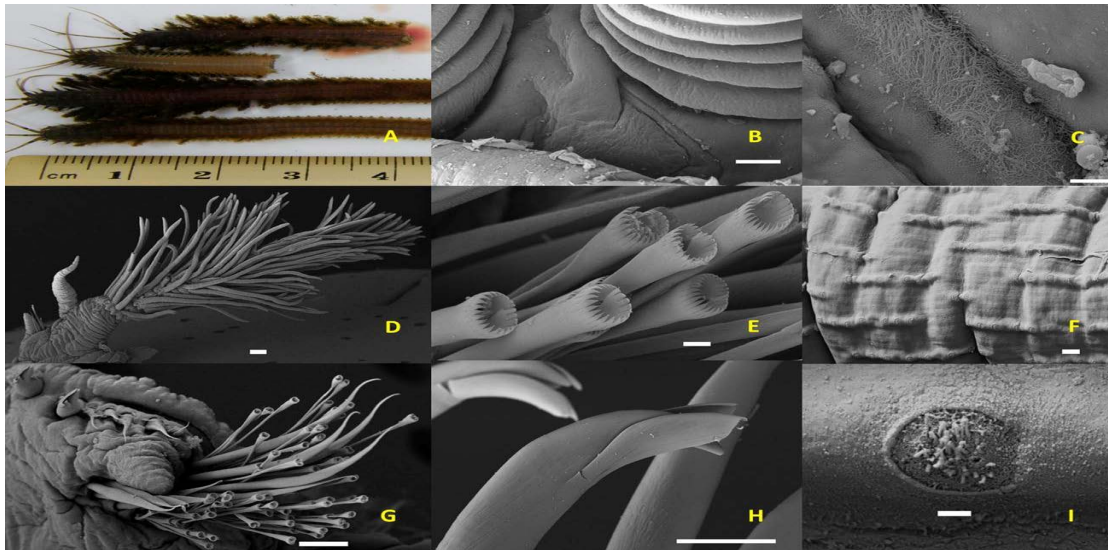


Fig. 3(a-i): *Diopatra claparedii* Grube. 1878, (a) Anterior section of live specimens, note the red blood at the end of segment due to the presence of haemoglobin, (b) Basal of antennae, showing the location of nuchal organ, (c) Nuchal organ, showing the hairy structures, (d) Chaetiger 8, showing the spiral branchiae, (e) Pectinate chaetae from chaetiger 40, (f) Detail of antenna, showing the rows of sensory buds, (g) Chaetiger 40, showing three types of chaetae, (h) Chaetiger 1, showing lateral view of bidantate hooded hooks and (i) Detail view of sensory bud. Scale: b, d, g = 100 μ m, c = 10 μ m, e = 10 μ m, f = 20 μ m, h = 50 μ m, i = 2 μ m

Morphology: Incomplete specimen, 119-141 segments with lengths varies from 9.5 cm (119 segments) to 11.4 cm (122 segments). Body colours changing gradually; dark brown from prostomium to modified chaetigers including their appendages, while light green greyish starting from branchiae chaetigers towards the posterior section. On the antennae and palps, brown and greenish bands can be observed after ceratophores. The width at the widest segment without parapodium ranges from 70 mm (119 chaetigers) to 75 mm (141 chaetigers). Three antennae i.e., median and lateral antennae and a pair of palps are located on the dorsal side of prostomium. Ceratophores range from 7-11 rings. All antennae and palps are relatively short in preserved specimen. Length of median antennae reached to the posterior region of chaetiger 4 while the tip of palps reached the posterior section of chaetiger 2. Styles gradually tapering and end with fine tip. Sensory buds circle (Fig. 3i), forming approximately 36 rows consisting between 3 to 7 buds in each row. Nuchal organs are clearly visible, forming $\frac{3}{4}$ circle of hairy structure (Fig. 3b, c) and located posteriorly between median and lateral antennae. Peristomial cirri are about the same length with peristomium, subdistally positioned on the peristomium and located almost a straight line with lateral antennae. Frontal lips located at the anterior region of prostomium-short and subulate. Upper lips which are located at the antero-ventral positioned are subrectangular and medially separated while V shaped lower lip originated from peristomium.

Jaws are labidognatha type (Paxton, 2009) with dental formula; MI = 1+1, MII = 7 + 7-8, MIII = 5-7 + 0, MIV = 4-5 + 4-5, MV = 1 + 1. Mandibles are dark shafts and high cutting plates with smooth edges. Both jaws and mandibles are mineralized with calcified area can be seen on the edge of each maxilla and mandible.

Modified parapodia (up to 3-4 chaetigers) have two slender upper simple chaetae. Parapodium is sub-biramous. Notopodium is represented with slender, tapering dorsal cirri. Neuropodium is consisting of liplike presetal, mid setal and subulate postsetal lobes. The anteriormost chaetae is a slender pseudocompound bidantate hooded hook located outside of the presetal lobe, pointed ventrally. The hood roof of this slender pseudocompound hook is higher than weakly pseudocompound hook (Fig. 3h). The falcate and weakly pseudocompound bidantate hooded hooks are located between the presetal and midsetal lobes, orientating laterally. Lastly, the simple limbate chaetae are located between the midsetal and postsetal and pointed dorsally.

Anterior parapodia and most chaetae positioned laterally until chaetiger 14 when they are gradually dorsally pointed. Ventral cirri, long and subulate from chaetiger 1-4, become reduced almost instantly starting from chaetiger 5 (where branchiae emerged abruptly), becoming ventral/glandular lobe on chaetiger 6 and gradually disappear. Spiral branchiae, a key morphological character in genus *Diopatra* emerged from chaetiger 4-5 (Fig. 3d). The most developed branchia is at chaetiger 7-9 with approximately 17 whorls and length $\frac{3}{4}$ related to the width of segment. The width of branchia is approximately $\frac{1}{8}$ of the filament's width while the filament's length is three times longer to the width of branchia's trunk. Branchiae gradually reduced their size, filaments and whorls until chaetiger 65-93 where only single filament remains. Limbate chaetae emerged in the same chaetiger with branchiae, replacing the hooks. Funnel like pectinate chaetae emerged on the second chaetiger with branchiae (chaetiger 5-6). Number of pectinate chaetae increasing towards median region; 1 chaeta on chaetiger 5-6 while approximately 60 chaetae at chaetiger 40 bearing 22 to 28 teeth per chaeta (Fig. 3e). The pectinate chaetae are located within the bundle of limbate chaetae on the upper side of notopodium. Two subacicula falcate hooded hooks emerged around chaetiger 20 towards the posterior region (Fig. 3g).

Tubes design and materials are typical of genus *Diopatra* and divided into two section. The first section, mostly exposed during low-tide is made from combination of plant debris, shell fragments, sand particles and anthropogenic waste (plastic pieces etc.) as the outer layer and glued to the inner-layer made from hardened jelly-like substance. The arrangement of the outer layer is done at different angles and in some tubes, a 'roof' like arrangement made from leaf on the opening of the tube in angle that prevents sunlight from entering the tube directly. The second section (completely submerged all the time) is only the continuation of the inner layer from the first section.

Remarks: Onuphids from genus *Diopatra* are well known to be notoriously difficult to identify as they are superficially very similar and lack clear diagnostic features (Paxton, 2002). Previous records of occurrence *Diopatra* sp. in Malaysia are identified as *D. neopolitana* (Sasekumar, 1974; Ong, 1995), a species that previously regarded as cosmopolitan. However, it is believed that Sasekumar's, 1974 specimen is actually *D. claparedii* based on the location it was found. Specimen identified by Ong (1995) is still warrant further investigation for confirmation since the habitat stated is different from *D. claparedii*.

Economic exploitation: This species is widely distributed along the west coast of Peninsular Malaysia and mostly collected at mudflat adjacent to mangrove or estuary. Detecting this species is relatively easier than other commercially exploited polychaetes due to the presence of tubes. Although, quite abundant, they are not very popular among anglers in comparison with *Marphysa* spp. (Idris *et al.*, in prep) and Nereididae species (Idris *et al.*, 2012) since some inexperienced baitdiggers were selling empty tubes. A plastic bag normally consists of 10 tubes is sold for RM5 (~USD1.50). This worm is used for catching similar fishes as *H. okudai*. After collected, *D. claparedii* can live up to four days provided being kept in moisten tubes, under shade with room temperature.

DISCUSSION

Most of the species identified were collected along the Straits of Malacca. This is because Straits of Malacca is the second busiest shipping lane in the world after the Dover Straits (Freeman, 2003). Hence, most of the scientific expeditions that en route to the far east and south from Europe will sail through the straits and made Singapore as one of the port of call (Freeman, 2003), allowing polychaete researcher such as Jean Louis Armand de Quatrefages de Bréau who was employed by Muséum national d'Histoire naturelle, Paris to collect polychaete specimens in Malay peninsula. In contrast, the east coast of Malay Peninsula and Borneo were receiving little attention until after the Second World War.

In south east Asia region, Indian islands (Andaman and Nicobar) have the highest number of identified polychaete species followed by Vietnam (previously known as South Vietnam), Thailand, Indonesia, Singapore, Malaysia, and Philippines (Table 2). In comparison, a total of 661 species has been identified in the South China Sea region. This clearly shows that a number of species in Malaysian waters is probably higher than what have been identified.

Interestingly, many species identified from the previous study are categorized as cosmopolitan species. Cosmopolitan species refers to species that can be found in more than two oceans including connecting seas (Sterrer, 1973). However, this concept has been challenged currently, since a number of studies using both morphology and molecular taxonomy showed that species used to be treated as cosmopolitan are actually different, for example Hutchings and Karageorgopoulos (2003) and Lewis and Karageorgopoulos (2008). Many species in the Malaysian checklist are categorized as cosmopolitan by previous taxonomist, they could be new species pending on the detail works on the morphology and molecular.

Table 2: Comparison on families and species identified between countries in south East Asia region

Country/Region	Family	Species	Reference
South China sea	54	661	Paxton and Chou (2000)
Vietnam	37	162	Paxton and Chou (2000)
Thailand	37	145 (30 holotypes, 28 paratypes)	Aungtonya <i>et al.</i> (2002)
Indonesia (Natuna Island)	38	129 (52 under Linnaean binomial names)	Al-Hakim and Glasby (2004)
Singapore	29	74	Tan and Chou (1993), Chan (2009)
Malaysia	31	64 (6 holotypes)	This study
Andaman Sea (Andaman and Nicobar Islands)	29	191	Rajasekaran and Fernando (2012)
Philippines	16	53	Paxton and Chou (2000)

Way forward in polychaete research in Malaysia: In comparison with data from neighbouring countries more research on polychaete should be done in Malaysian waters. However, with 72 families and more than 14000 species identified worldwide (Beesley *et al.*, 2000; Rouse and Pleijel, 2001), a systematic approach in defining the direction of polychaete research should be done to avoid patchiness in species identification. In the end, although it is impossible to have a complete inventory of polychaete in Malaysia, the intensive checklist will provide information that is useful for conservation management, policy decision and also wealth creation.

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