RAFFLES BULLETIN OF ZOOLOGY **65**: 545–558
Date of publication: 12 October 2017
http://zoobank.org/urn:lsid:zoobank.org:pub:C10419D5-20E3-4B86-92BA-0F0EA6FA4364

History of collection and discovery of polychaetes (Annelida), including a bibliography, from the Indo-Malay-Philippines Archipelago and surrounding seas

Christopher J. Glasby[1] & Inayat al Hakim[2]

Abstract. The polychaetes (Annelida) of Indo-Malay-Philippines Archipelago (IMPA) are poorly known taxonomically as a result of a lack of systematic collections, the dispersed nature of the collections throughout the world, and the lack of knowledge on the whereabouts of the type material. This has hindered both taxonomic studies on the group and, ultimately, biodiversity comparisons with other species-rich marine groups. In this study, we trace the history of scientific discovery of polychaetes and allied forms from IMPA. We find that the polychaetes and allies of the IMPA are described in a vast literature spanning almost 300 years, covering three main periods: shore collecting by the first European colonisers during the seventeenth to end of the nineteenth centuries, deep-sea collections from nineteenth and twentieth century European voyages of discovery, and post-1960s bilateral and multinational collaborative voyages and expeditions. A comprehensive bibliography of relevant literature is produced and the fate of the polychaete specimens collected discussed.

Key words. bioregional bibliography, Polychaeta, IMPA, Central Indo-Pacific realm

INTRODUCTION

The Indo-Malay-Philippines Archipelago (IMPA)—also referred to as the Central Indo-Pacific Realm (Spalding et al., 2007) and the Indo-Australian Archipelago (Bellwood & Meyer, 2009; Lohman et al., 2011)—is a marine biodiversity hotspot in the Indo-west Pacific Realm (Hoeksema, 2007). Extending from mainland Southeast Asia almost to Australia, it includes the nations of Indonesia, Brunei, Singapore, peninsular Thailand, Malaysia, Timor Leste, the Philippines and New Guinea. It is one of four major biogeographic regions in the tropics (Ekman, 1953), and its boundaries closely approximate Brigg's (1974) concept of the Indo-Malayan triangle. It was recognised as a distinct biogeographic region as early as the mid-nineteenth century by Alfred Russel Wallace who referred to it as the Malay Archipelago in the classic diary of his travels (Wallace, 1869). The IMPA is often further subdivided into three distinct geomorphic areas, demarked on the basis of the continental shelves and basins as follows: to the west the Malay peninsula and the large islands of Sumatra, Java and Borneo are perched atop the Sunda Shelf [=Sundaland] and to the east New Guinea, Aru Islands are part of the Sahul shelf extending north from Australia [=Sahulland]; a central region approximating the biogeographic entity known as Wallacea comprising Sulawesi, Timor and the island groups of Moluccas, Halmahera and the Lesser Sunda Islands (Tomascik et al., 1997; Carpenter & Springer, 2005; Bellwood, 2007). The Philippines (excluding Palawan) has faunal connections with both Sundaland and Wallacea depending on the group; Palawan has clear affinities with Sundaland. This equivocal position of the greater Philippines is reflected in the positions of Wallace's Line, which is either to east of the Philippines corresponding to Wallace's (1860) original line, or to the west of it, reflecting Wallace's later ideas, as published by Huxley (1868) (Fig. 1). While these geomorphic areas have broad applicability to terrestrial areas of endemism, their validity as applied to marine areas of endemism has yet to be tested rigorously.

The polychaete diversity in the IMPA is poorly known, and this reflects a general neglect of polychaete taxonomy in tropical waters (Fauchald, 1976). The only previous inventory is that of Knox (1957) who reported 372 species in the more important families in the Malay Archipelago and South China Sea combined, more than any other region in the Indo-Pacific. By contrast, adjacent areas are better known; for example, the Indian Ocean polychaete fauna has been documented by Fauvel (1953), Hartman (1974), and Soota et al. (1980); the East Asian polychaete fauna has been check-listed by Paxton & Chou (2000), Salazar-Vallejo et al. (2014), and Glasby et al. (2016); and the Australian fauna including the Arafura and Timor Seas immediately to the north of Australia by Paxton & Chou (2000) and Hutchings & Yerman (2010). This lack of polychaete knowledge has hindered analytical studies examining the benthic biodiversity and biogeography of the IMPA, especially in respect to

[1]Museum & Art Gallery of the Northern Territory, GPO Box 4646, Darwin NT 0801, Australia; Email: chris.glasby@nt.gov.au

[2]Pusat Penelitian Oseanografi, Lembaga llmu Pengetahuan Indonesia (LIPI), Jl. Pasir Putih, Ancol Timur, PO Box 4801/JKTF, Jakarta 11048, Indonesia

ISSN 2345-7600 (electronic) | ISSN 0217-2445 (print)

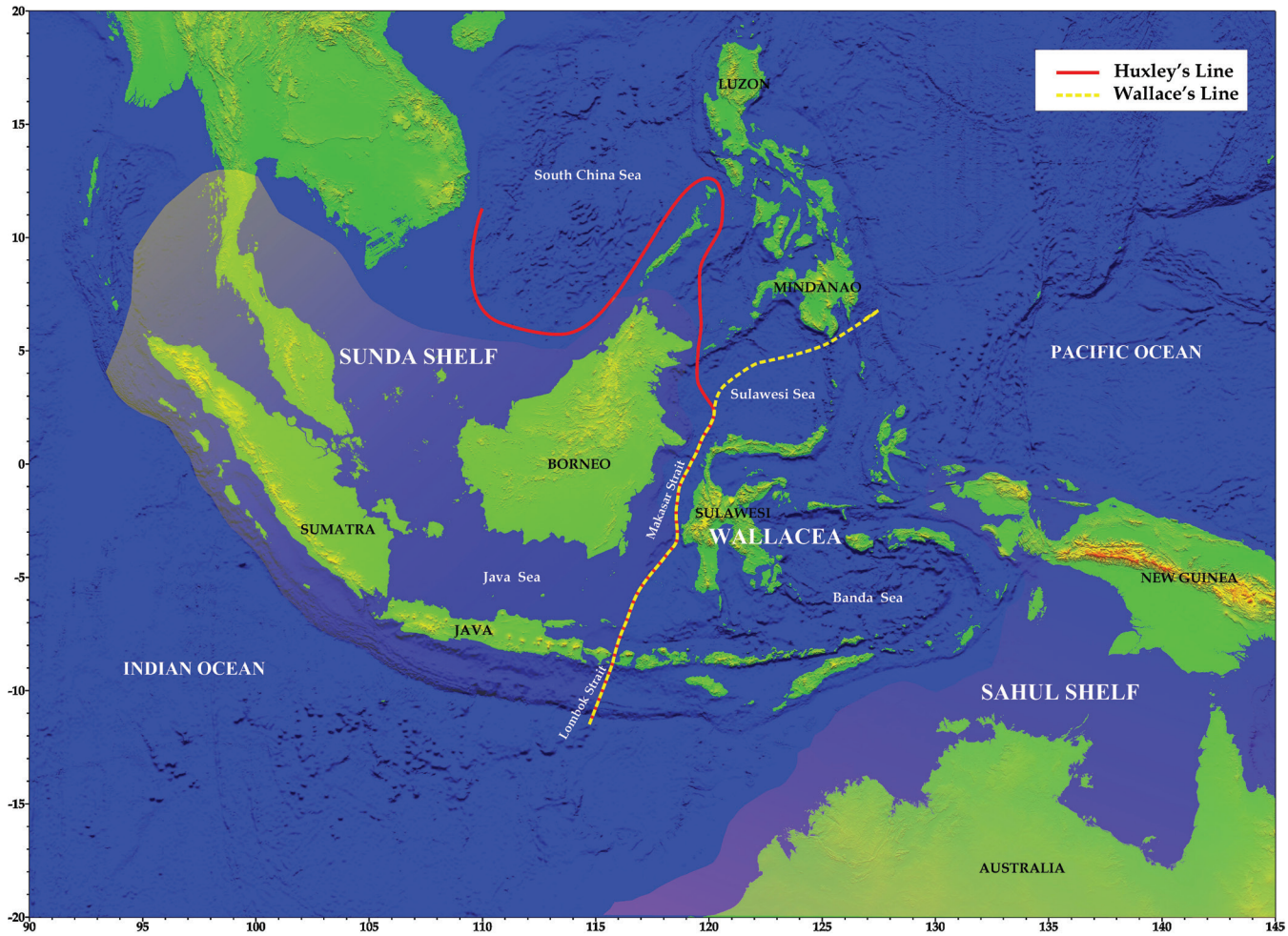

Fig. 1. Map of the IMPA region, showing the major regions including the Sunda Shelf, Sahul Shelf and Wallacea, which are delimited by shelf edges. The major faunal discontinuities represented by Wallace's Line (original in yellow and as modified and published by Huxley [1868] in red) are included to show the equivocal position of the Philippines.

finding general explanations for the high diversity. In this sense previous biogeographic studies in the IMPA region are both taxon- and habitat biased because they deal with a limited range of taxa (mostly corals, fishes and molluscs) and a single habitat type (coral reefs).

The paper aims to address the imbalance of taxonomic knowledge of a major benthic group by documenting the history of discovery of polychaete species of the seas and coastal regions of the IMPA and providing a comprehensive bibliography of publications on the polychaetes of the region. It represents a first step towards providing the basic biodiversity data required for ongoing check-listing and taxonomic studies of polychaetes in the region.

MATERIAL & METHODS

Taxonomic scope. Considering the historical aspects of polychaete discoveries, we have used in this paper the traditional concept of polychaetes, which is a non-monophyletic taxon without inclusion of clitellates, siboglinids, echiurans, sipunculans and myzostomids. In general, we have excluded these other taxa from this review because their literature is often quite separate from that of polychaetes; the exceptions are the siboglinids, echiurans, and sipunculans, monographed in the *Siboga* series, and the myzostomids, which were monographed in the *Challenger* Reports.

Geographical scope. The IMPA region under consideration includes the coasts and adjacent seas of Indonesia, Brunei, Singapore, peninsular Thailand/Malaysia, Timor Leste, the Philippines, and New Guinea (Fig. 1). Excluded are the island groups to the west of Peninsular Malaysia (Andaman and Nicobar Islands), the non-coastal areas of the Gulf of Thailand and the South China Sea and the northern seas of Australia (Arafura and Timor seas and Torres Strait).

Abbreviations. Institutional repositories for IMPA polychaete specimens are listed below; they largely follow those of the Australian Faunal Directory (https://biodiversity.org.au/afd/home): AM: Australian Museum, Sydney, Australia; BMNH: Natural History Museum (formerly British Museum [Natural History]), London, England; CAS: California Academy of Sciences, San Francisco, USA; LIPI: Lembaga Ilmu Pengetahuan Indonesia, Jakarta, Indonesia; PMBC: Phuket Marine Biological Center, Phuket, Thailand; PMJ: Phyletisches Museum, Jena, Germany; MNINGA: Muzeul National de Istorie Naturala "Grigore Antipa," Bucharest, Romania; MPW: Muzeum Przyrodnicze

Fig. 2. Georg Eberhand Rumphius, engraved portrait as reproduced in Rumphius (1705).

Wroclaw, Uniwersytet Wroclawski, Wroclaw, Poland; MZB: Museum Zoologicum Bogoriense, Bogor, Indonesia; MNHN: Muséum National d'Histoire Naturelle, Paris, France; NBCL: Naturalis Biodiversity Center, Leiden; NRS: Naturhistoriska Riksmuseet, Stockholm, Sweden; RM: Raffles Museum, Singapore; PMBC: Phuket Marine Biological Center, Phuket, Thailand; RMNH: Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, the Netherlands (collection now now housed at NBCL); SMF: Naturmuseum und Forschungsinstitut, Senckenberg, Frankfurt am Main, Germany; USNM: United States National Museum, Smithsonian Institution, USA; ZMA: Zoölogisch Museum, Universiteit van Amsterdam, Amsterdam, the Netherlands (collection now housed at NBCL); ZMB: Museum für Naturkunde an der Universität Humbolt zu Berlin, Berlin, Germany; ZMUC: Zoological Museum, University of Copenhagen, Copenhagen, Denmark.

RESULTS

The collection and discovery of polychaetes in IMPA can be broadly divided into three, partially overlapping, phases. First, a period of mainly shore-collecting by early European naturalists from the seventeenth century to the end of the nineteenth century, a nineteenth and twentieth century period of European voyages of discovery, and a post-1960's period of collaborative discovery involving countries within the region such as Indonesia, Philippines, and Thailand, and the Dutch, French and the United States. The first period involved amateur and professional naturalists visiting or living in Indonesia (including government officials and missionaries), who often donated specimens to polychaete taxonomists in Europe for study; the earliest collections pre-dated modern Museums, and ended up in 'Curiosity Cabinets' of European naturalists. Nevertheless, unlike marine vertebrates and large, colourful invertebrates (especially molluscs), polychaetes were less frequently collected by the early naturalists and in some expeditions, as described in the following sections, they were completely overlooked.

Early years: shore collecting by European naturalists. Marine biodiversity exploration of the IMPA began in Indonesian seas probably in the seventeeth century with the work of German-born Georg Eberhard Rumpf (1627–1702), Latinised as Rumphius, who was stationed on Ambon as an agent for the Dutch United East Indian Company (van Aken, 2005) (Fig. 2). In his spare time, Rumphius studied and illustrated all types of terrestrial and marine organisms (Rumphius, 1705; Beekman, 1999). His most significant contribution to polychaete biology was his detailed account of the swarming and capture of the *Wawo* worm, which he gave the Latin name *Vermiculi Marini*, but because this name predates Linnaeus, it is not considered valid. The species was later formally described by Horst (1905) as *Lysidice oele*, a member of Eunicidae, which includes the other famous swarming polychaete, *Palola viridis* Gray in Stair, 1847. Rumphius noted that there were two or three forms of *wawo* that swarmed in the Mollucas (Beekman, 1999). This was confirmed many years later by Martens et al. (1995), who described 13 species, including the true *wawo* (Eunicidae), *L. oele* and *Palola viridis* swarming simultaneously in March 1991 in Ambon. The composition of Wawo worms was further investigated by Pamungkas (2015a) and Pamungkas & Glasby (2015), who documented additional species of Eunicidae and Nereididae.

The first formally described polychaete species from the region was *Amphinome rostrata*, which was described by German naturalist Peter Simon Pallas in *Miscellanea Zoologica* (Fig. 3; Pallas, 1766; originally described as *Aphrodita rostrata*). The material described by Pallas in *Miscellanea Zoologica,* which included new vertebrate species, was sourced from Dutch collections, including the most famous of the time, the zoological cabinet of Stadholder William V of Holland, part of the Museum of the Princes of Orange. The specimen of *Amphinome rostrata* was collected from the 'ultimo Orientis Oceano' or Far East Ocean, probably Ambon, by amateur natural historian and physician Dr Cornelius van Hoey of The Hague. It is the only polychaete species from the region described by Pallas. Under Aernout Vosmaer, the Museum's director from 1756 to 1795, the collections expanded greatly as a result of purchases at auctions, including the famous cabinet of Albertus Seba and shipments sent from the Dutch colonies in the East Indies (Pieters, 1980). In 1795, following French occupation of

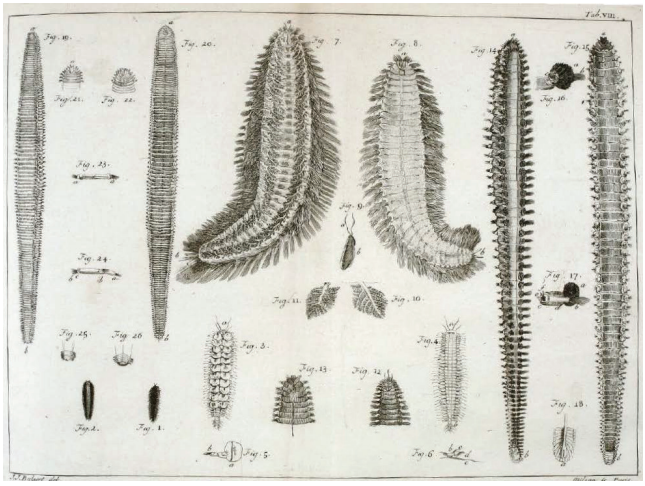

Fig. 3. *Amphinome rostrata*, original illustrations from Pallas (1766), pl. 8, figs. 14–18.

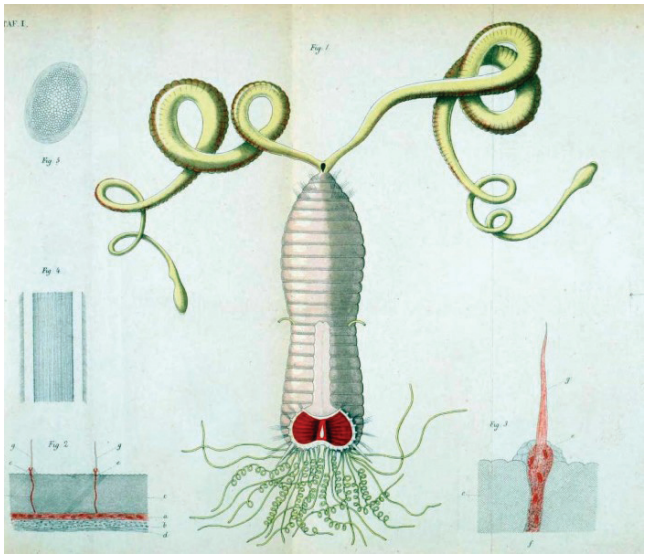

Fig. 4. *Sternapis spinosa*, original illustrations from Sluiter (1882: pl. 1).

the Netherlands, the museum collection was dismantled and many specimens went to the MNHN, Paris; following the reformation of the Kingdom of the Netherlands, the collection was then returned to Leiden University, and later to RMNH, Leiden after its formation in 1820; unfortunately amid this turmoil the types of *A. rostrata* appear to have been lost.

Apart from Rumphius, other professional and amateur naturalists based in Indonesia and the Philippines during the seventeenth and eighteenth centuries, collected and described marine species from the area (Strack, 1993), but polychaetes appear not to have been targeted. Soon after the East Indies became a colony of the Netherlands for the second time in 1815 (after a period of French rule), the Dutch established the Natuurkundige Commission in order to study and collect the natural products of the area, and return the collections to the RMNH (Fransen et al., 1997). However, again few polychaetes were reported until about the 1860s, when Dirk Samuel Hoedt was employed to make collections in the East Indies for the RMNH—he made extensive collections from 1862 to 1922 mainly in the Moluccas, Misool (Raja Ampat Islands), and Ambon (Fransen et al., 1997), including a collection of reproductive nereidids described many years later by Pamungkas & Glasby (2015).

During the same period (1884–1885) Johannes Brock was collecting polychaetes in the Bay of Batavia [Jakarta] and Amboina [Ambon] (Fransen et al., 1997); he would have been familiar with polychaetes due in part to his being the assistant of E. Ehlers at the University of Göttingen. Sluiter made dredge collections mainly in the Bay of Batavia, discovering and describing a new species of *Sternapsis*, *S. spinosa* Sluiter, 1882. The species is remarkable for having a pair of long palp-like appendages, which have not been reported for any other species in the family (Fig. 4). Other early naturalist collectors operating in the region include van Kampen, who made fisheries observation and collected zoological samples in the Java Sea to the west of the Thousand Islands, off Jakarta, and in the Philippines, German zoologist and ethnologist, Carl Semper, made extensive study and collecting expeditions to the Philippines and Palau from 1858 to 1865.

The polychaete material collected by these and other later naturalists based in or visiting the region, was mostly sent to Europe, whereupon it was studied mainly by German and French polychaete systematists including Quatrefages (1866), Grube (1868, 1881), Ehlers (1920), and Augener (1933a, b, c, d, 1934) resulting in the description of many new species. Semper's Philippine collections formed the basis of the seminal work of Grube's (1878) *Anneliden fauna der Philippinen* and the myzostomids were reported by von Graff (1884).While most of the type specimens remained in European collections such as the MPW (Wiktor, 1980), ZMB (Hartwich, 1993), and NMNH (Solís-Weiss et al., 2004), a few specimens appear to have stayed within region, including museums in Singapore (RM) and Indonesia (MZB) (Monro, 1931; Augener, 1933d). Indeed, the MZB specimens of *Amphinome rostrata* from Madura Strait, East Java (Augener, 1933d) can be used to propose a neotype for the species; the species is currently without types (Borda et al., 2012).

In 1890, a Swiss expedition to the region led by zoologists Maurice Bedot and Camille Pictet collected many marine animal groups, mainly in and around Ambon Bay. The polychaetes, including three new species and a new genus, were described by Malaquin & Dehorne (1907). Unfortunately the whereabouts of the type material is unknown; it is not listed in the polychaete catalogue of the NMNH (Solís-Weiss et al., 2004), where much of the type material described by French taxonomists is housed. Possibly the material is at the University of Lille, where both Malaquin and Dehorne worked when they published their paper or perhaps at the Natural History Museum of Geneve, where Bedot served as director at the time.

The German zoologist, Willy Kükenthal, collected in many areas in Southeast Asia in the late nineteenth century on both oceanographic (next section) and land-based expeditions. Kükenthal was professor of phylogeny at the University of Jena (now Friedrich-Schiller University) from 1889 until about 1897. Both the Jena University and the Senckenberg Natural History Society supported his fieldtrip to the Sunda Islands, Molluccas and Borneo, Indonesia (1892–1894) where he collected polychaetes on the island of Ternate; from this material 12 new species and 2 new varieties were described by Fischli (1903). According to Fiege & Wehe (2004) after Fischli's study the material was returned to SMF in 1907, but today the only material that can be accounted for is a single jar of unidentified polychaetes, and the holotype of *Alcyonosyllis xeniaecola*, which was later described by Hartmann-Schröder (1993) as *Haploysyllis*. Correspondence with the Curator in charge of Annelids at PMJ, Dietrich von Knorre (21 January 2017), also suggests that Kükenthal's polychaete material is not present in that collection. The mystery of their whereabouts of the type material is currently being investigated by one of us (CJG).

Polychaetes collected on the zoological expedition to the Aru and Kei Islands by German zoologist Hugo Merton and Jean Roux in 1907–1908 were described by Ehlers (1918); the four new species are currently housed in the SMF (Fiege & Wehe, 2004). The Dutch polychaetologist, Horst, also received polychaete material collected by amateur naturalists in Indonesia and later oceanographic expeditions for description (e.g., Horst, 1909, 1918b).

Voyages of discovery: the first deep sea collections. Early scientific voyages around the world by the French, British, Swedes and Dutch often stopped in IMPA waters, but mainly they had hydrographic or oceanographic objectives (van Aken, 2005). Although biologists were on board, polychaetes appear not to have been collected, or at least not studied, possibly because they lacked the gear to sample the sea floor. The French vessels *L'Uraine* (1818–1819), *La Coquille* (1823) and *L'Astrolabe* (1826–1829) made important collection of fish in the Raja Ampat Group (Allen & Adrim, 2003), but no polychaetes appear to have been described; this is despite the presence on the *L'Astrolabe* of notable biologists J.R.C. Quoy and J.P. Gaimard, who later described a pelagic tomopterid from the Straits of Gibraltar. The German vessel *Novara* also stopped in the region on her voyage around the world between 1857 and 1859, but no annelids appear to have been described from IMPA, apart from a leech from Singapore (Grube, 1868).

The first voyage of discovery to collect polychaetes from IMPA appears to have been the Swedish Frigate *Eugenie*, which stopped in the East Indies whilst circumnavigating the World between 1851–1853, and samples were collected in Manila, Singapore and Jakarta (Table 1; Hartman, 1948). Bangka Strait was an important shipping route connecting Java with Sumatra and the peninsular Malaysia. Several polychaete species were collected from Bangka Strait [Selat Bangka], Indonesia, Manila and Singapore, and described later by J.G.H. Kinberg (1856, 1865, 1866, 1910), who was the physician and zoologist on board the *Eugenie*. The specimens are now in the NRS (Hartman, 1948) and many were redescribed by Hartman (1948).

A combined Prussian/German Expedition to East Asia (1859–1862) known as the 'Japan or Ostasiatische Expedition' had primarily diplomatic/trade goals between Germany and Japan, but the expedition, using the frigate *Thetis*, also collected scientific material for study in several places in the IMPA, including the Sunda Straits, the Philippines, Sulawesi and Java and Singapore. On board was the well-known naturalist and malacologist Eduard Karl von Martens, who in 1859 became curator of invertebrates at the ZMB, and later (1887) its director. This material went back to ZMB, but it is unknown how much, if any, represented polychaetes, especially as Martens departed the expedition in March 1862, after which he continued his own collecting in Southeast Asia (Bauer, 2016). Marten's later land-based collecting yielded a specimen of *Neanthes larentukana* from Larantuka, Flores, East Nusa Tenggara, which was described by Grube (1881), some syntypes of which now reside in the ZMB, which holds Grube's private donated collection (CG pers. obs. 1986; Hartwich, 1993); other syntypes of this species are part of Grube's official collection in the MPW, Wroclaw (Salazar-Vallejo, 2014).

Dredging for marine organisms in IMPA waters began in earnest in 1875 with two separate circum-navigational expeditions: the German ship S.M.S. *Gazelle* (1874–1876) and the British ship H.M.S. *Challenger* (1873–1876) (Table 1). The *Gazelle* took deep water sediment samples at 12 stations within or near the Indonesian seas around Kupang [Timor], Ambon, the Ombai Strait, the Banda Sea and the Ceram Sea (Hydrografisches Reichs-Marine Amt, 1889). Grube (1877) reported on six polychaete species collected by the S.M.S. *Gazelle*, including four that were new to science (Table 1). The material is probably in the ZMB where his private collection is housed, although some of his specimens were lost during World War II (G. Hartwich pers. comm., 1986; Hartwich, 1993), and others probably went to MPW (Wiktor, 1980). The H.M.S. *Challenger* expedition took dredge and trawl samples at many stations in eastern Indonesia and Philippine waters, which yielded 23 species of polychaetes (20 new to science), including the bizarre branching syllid, *Syllis ramosa* McIntosh (Fig. 5; Table 1). McIntosh's specimens were collected in 140 fathoms (256 m) from off the Kei Islands, Indonesia (Station 192) and in 95 fathoms (174 m) near Cebu, Philippines (Station 209). The polychaetes were described by McIntosh (1885) and the specimens, including types, are in the BMNH. In addition, several new species of myzostomids were described from the IMPA by von Graff (1884).

During its circumnavigating trip the Italian corvette *Vettor Pisani* (1882–1885) passed through the region in 1885, and collected polychaetes at a few stations, including around the Philippines and Hong Kong. The Opheliidae were reported by Kükenthal (1887), who published a few papers on this family of polychaetes but otherwise is mainly known for his work on octocorals. He described three species from the

Table 1. Scientific Expeditions to IMPA seas that collected polychaetes, arranged chronologically; references to polychaetes collected on the expeditions, and repository.

Expedition (Ship)	Leader or Institution	Year	Nationality	Reference to polychaetes	Repository
Eugenie		1851–1853	Swedish	Kinberg (1856, 1865, 1866, 1910)	NRS
SMS *Gazelle*	Von Schleinitz	1874–1876	German	Grube (1877)	ZMB?
Challenger	Wyville Thompson	1872–1876	British	McIntosh (1885); von Graff (1884)	BMNH
Deutsche Tiefsee–Expedition, *Valdivia*	Karl Chun	1898–1899	German	Ehlers (1906)	SMF
Siboga	Max Weber	1899–1900	Dutch	Sluiter (1902); Horst (1903, 1910, 1911, 1912, 1913, 1915, 1916, 1917, 1919, 1921, 1923, 1924); Mesnil & Fauvel (1939); Caullery (1914, 1944); Southward (1961–pogonophores); Pettibone (1970); Hutchings & McRae (1993); Aguado et al. (2008)	RMNH, ZMA, NBCL, USNM
Koninklijk Nederlandsch Aardrijkskundig Genootschap	C.C.F.M. Le Roux	1904	Dutch	Horst (1918a)	RMNH, NBCL?
USS *Albatross* Philippine Expedition	H.M. Smith	1907–1910	USA	Hoagland (1920); Treadwell (1920)	USNM
'Danish Expedition'–*Amboina*	Th. Mortensen	1922	Danish	None	ZMUC
Dana Expedition	Johannes Schmidt	1928–1930	Danish	None	ZMUC
Limnologischen Sunda–Expedition	Albrecht Thienemann	1929–1930	German	Pflugfelder 1932, 1933); Feuerborn (1931, 1935)	ZMB?
Snellius, H.M.S *Willebrord Snellius*	P.M. van Riel	1929–1930	Dutch	None	RMNH, NBCL
Galathea	Anton F. Bruun	1950–1951	Danish	Kirkegaard (1956a, 1956b, 1995, 1995[1996])	ZMUC
Te Vega Indian Ocean Expedition	Stanford University	1963	US	Kohn & Lloyd (1973)	USNM
Rumphius Expedition I	National Institute of Oceanology	1973	Indonesian	None	LIPI
Rumphius Expedition II	National Institute of Oceanology	1975	Indonesian	None	LIPI
Rumphius Expedition III–RV *Samudera*	National Institute of Oceanology	1977	Indonesia and other nations?	Soemodihardjo et al. (1980)–polychaetes identified by J. Schochet and J. Tetelepta	LIPI

Expedition (Ship)	Leader or Institution	Year	Nationality	Reference to polychaetes	Repository
Musorstom Oceanographic Cruises	Allain Crosnier	1976–1985	France	León-González & Salazar-Vallejo (2003)	MNHN
RV Alpha Helix, Smithsonian Philippines Expedition	University of California	1979	US	None	USNM
Rumphius Expedition IV		1980	Indonesia	None	RMNH, NBCL
Snellius II RV *Tyro;* RV *Samudera*		1984–1985	Dutch and Indonesian	van der Land & Sukarno (1986); Aguado et al. (2008)	RMNH, NBCL
MNINGA Expedition	Antipa Museum	1991	Romania	None	Unknown
Karubar *Baruna Jaya* 1	Kasim Moosa	1991	Indonesian-French	None	LIPI
Expedition Anambas *Baruna Jaya* VIII	Abdul Gani Ilahude	2002	Indonesia and neighbouring countries	al Hakim & Glasby (2004)	MZB

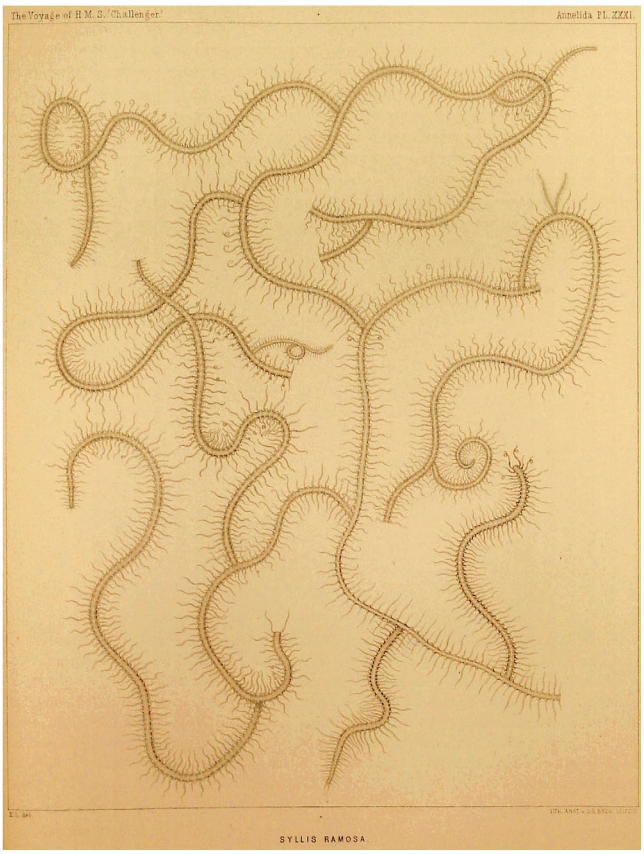

Fig. 5. *Syllis ramosa*, original illustration of McIntosh (1885, pl. 31).

region in the inhouse journal of the Phyletisches Musuem, Jena. Correspondence with the Curator in charge of Annelids at PMJ, Dietrich von Knorre (21 January 2017) suggests that Kükenthal's polychaete material from *Vettor Pisani* is not present in the collection, adding further uncertainty surrounding the fate of the collections of this biologist.

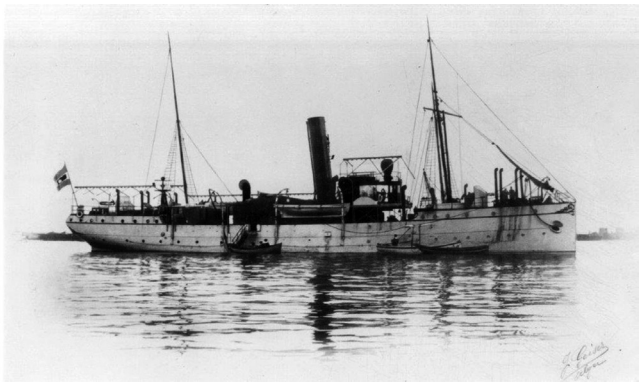

Fig. 6. Gunboat *Siboga*, 1898. Bijzondere Collecties van de Universiteit van Amsterdam, as reproduced on Wikipedia.

By the end of the nineteenth century, another two circumnavigating expeditions visited Indonesian waters. In 1899, the *Valdivia* of the Deutsche Tiefsee-Expedition (1898–1899) passed through the inland sea between Mentawei Islands and the west coast of Sumatra, arriving at Padang on 22 January 1899 (Chun 1900). *Valdivia* collected polychaetes at eleven stations in Indonesian water (St. 185–203), which were later described by Ehlers (1906). The collections of the Deutsche Tiefsee-Expedition are held in the SMF and other German institutions (Fiege & Wehe, 2004). In the same year, the Dutch gunboat, *Siboga*, outfitted for zoological collecting, surveyed seas of Indonesia (Weber, 1903; Fig. 6). This expedition was highly significant for two reasons: firstly for the vast number of polychaetes collected and subsequently described, and secondly because shallow waters (as well as deep waters) were seriously sampled for the first time. The 323 stations in eastern Indonesia from the intertidal to almost 500 m, yielded 782 polychaetes species, 269 which were considered new to science (Bleeker & van der Spoel, 1992; table 1). This material has been described

in nine separate issues of the *Siboga* monographs, viz. Sluiter (1902; sipunculans and echiurans), Horst (1912, 1917, 1924), Mesnil & Fauvel (1939), Caullery (1944a, b), Southward (1961; pogonophores) and Pettibone (1970). Other papers describing *Siboga* polychaetes were published separately—notable among them, Caullery (1914, 1915a, b), Horst (1903, 1910, 1911, 1913, 1915, 1916, 1919, 1921, 1923) on several families, Hutchings & McRae (1993) on Aphroditidae, and Aguado et al. (2008) on Syllidae. Most of the *Siboga* polychaetes were deposited in the ZMA (as Prof. Max Weber, Director ZMA at the time was the main driving force behind the expedition), but exchanges were later made with the RMNH and USNM (L. Ward, pers. comm.). The RMNH and ZMA collections were later studied by Augener (1933a–c), and eventually the two collections were amalgamated into one at NBCL, Leiden.

Nearly 30 years later, the Dutch *Snellius* Expedition (1929–1930) visited Indonesian waters and sampled in roughly the same area as the *Siboga*. Although the focus of this expedition was mainly oceanographic and geological of deep seas and reefs, biological samples were taken, especially in the plankton and on coral reefs (van Riel, 1937); the polychaetes from this expedition are now mostly in the RMNH, although some duplicate vouchers and part of the types are catalogued at the USNM (L. Ward, pers. comm). The only polychaetes reported in publication from this expedition appear to have been collected outside Indonesian water (Støp-Bowitz, 1977).

The U. S. Fisheries steamer *Albatross*, a purpose-built research vessel, surveyed the waters of the IMPA for about two years from late 1907. Most of the sampling was done in the Gulf of Tomini (northern Sulawesi) and in Philippines waters (the expedition was known as the Philippines expedition), but she also visited the northern coast of Borneo and the Moluccas. Hoagland (1920), and Treadwell (1920, 1926, 1931) described the polychaetes collected, which are now housed in the USNM (L. Ward, pers. comm.). Two other US-based research vessels collected polychaetes in IMPA waters: the RV *Te Vega* International Indian Ocean Expedition, 1963 (operated by Stanford University), and the RV *Alpha Helix* Smithsonian Philippines Expedition (operated by University of California) in 1979. Some of the polychaetes collected in the former expedition were described by Kohn & Lloyd (1973), but those of the latter remain unstudied; material from both expeditions is housed at the USNM, but some may be uncatalogued (L. Ward, pers. comm.).

Danish exploration of IMPA seas began in 1922 with Th. Mortensen's expedition, which utilised the steamer *Amboina* for dredging operations (Mortensen, 1923; Table 1). The expedition sampled stations at Ambon, Kei Islands, Banda, Macassar, Java Sea, and Sunda Strait, from the intertidal down to about 400 m. One of the main goals of the expedition was to locate a suitable site for a tropical marine biological station that provided easy access for deep sea exploration; in this latter respect the Kei Islands (particularly the island of Doe Roa) was considered most favourable, especially because of the existence of a rich abyssal fauna in relatively shallow water. The expedition was also significant because it was perhaps the first time a diver was used to collect samples, thus supplementing dredge collecting. In total, collections were made from 122 stations, but judging from Mortensen's (1923) remarks associated with each station, few polychaetes were collected. Those that were collected are now in the ZMUC and remain undescribed. Among them are probably the *Nereis* and *Marphysa* species from intertidal coral rock habitats on Ambon, and spionids resembling *Scolelepis squamata* Müűller, 1806 in the black volcanic sand of the beaches of Krakatau, which both warranted special mention by Mortensen (1923). Polychaete specimens from Mortensen's subsequent Java-South Africa Expedition (1929–19-30) are also in the ZMUC, but it was not possible to ascertain if any were collected from the IMPA region.

The Danish Expedition *Dana* sampled 97 stations in Indo-Malay waters in 1929 (Dana Report, 1934), and polychaetes were undoubtedly collected but none of this material appears to have been studied; it should all be in the ZMUC. The Danish *Galathea II* Expedition around the world (1950–1952) sampled approximately 200 stations in Southeast Asia including Java Sea, Celebes Sea, Makassar Strait, Banda Sea and Arafura Sea. The *Galathea II* expedition was the last large-scale circumnavigation investigating the deep-water fauna to visit Southeast Asia. The polychaetes (and pogonophores) were all deep sea forms and were described in a series of *Galathea* reports by Kirkegaard (Table 1). The material is in the ZMUC.

Oceanographic expeditions were not the only ones that collected polychaetes—a few polychaete species were also collected on limnological expeditions to Indonesia. Two in particular are notable: the 1904 Koninklijk Nederlandsch Aardrijkskundig Genootschap (Royal Netherlands Geographic Society) expedition to South-west New Guinea (West Papua) in which a new freshwater species of Nereididae was described by Horst (1918a), and the 1929–1930 German Limnologische Sunda-Expedition, which yielded further freshwater nereidid species (Pflugfelder, 1932, 1933; Feuerborn, 1931, 1935).

Post 1960: collaborative research expeditions. Danish-Thai collaborative expeditions began in the mid-twentieth century. The first one to undertake zoological collecting was the Fifth Thai-Danish Expedition of 1966 (Seidenfaden et al., 1968). The material collected on this expedition appears to have been split between the ZMUC and PMBC and was check-listed by Phasuk (1992). Also during this expedition, the idea arose to establish a marine research facility at Phuket, although the facility wasn't officially opened until 1983 (Phasuk, 1992; Hylleberg, 2013). Danish-Thai collaboration continued with the BIOSHELF Project. It resulted in benthic collections from the west coast of Thailand, Andaman Sea, by the *RV Chakratong Tongyai* from 1996–2000 (Aungtonya et al., 2000) and 1996 –1997 during an international workshop in Phuket (Eibye-Jacobsen, 2002). The later collection was described in a series of papers contained in the 2002 Phuket Marine Biological Center Special Publication 24; in total 132 named species were described (Eibye-Jacobsen, 2002). The

material, including types, is mostly divided between PMBC and ZMUC, but some is also housed in the museums of the workshop participants (Aungtonya & Eibye-Jacobsen, 2002).

In the 1970s, the National Institute of Oceanology, Indonesian Institute of Sciences initiated a series of cruises (Rumphius Expeditions I–IV), which resulted in further collecting and discovery of polychaetes (Table 1), although not much appears to be documented. The first (Rumphius Expedition I) was carried out in 1973. In 1977, with the Rumphius III expedition using the vessel, *Samudera* of the National Institute of Oceanology, Indonesian Institute of Sciences. The main objective of this exploration was to survey the biota of the coastal waters of the Aru and Kei island groups (Soemodihardjo et al., 1980). The expedition reported more than 62 polychaetes species, although no new species were described. The material collected is currently stored at LIPI, Jakarta.

In 1991, the MNINGA organised a collecting expedition to Indonesia in collaboration with colleagues at the MZB. They collected marine invertebrates including polychaetes at 64 stations at five shallow water localities: Pari Island, near Jakarta; Bunaken Island, near Manado, Sulawesi; Maros, Sulawesi; Bontang, Kalimantan; and Sanur Beach near Denpasar, Bali (Gutu, 1997). The material appears to have been taken back to MNINGA, and sorted in later years, but the polychaetes appear not to have been described; it includes more than 1300 molluscs representing 300 species (http://icr.ro/pagini/major-collectors-and-their-collections-at-the-grigore-antipa-national-museum-of-natural-history). The polychaetes from this collection could not be located during a visit to MNINGA by CJG in June 2016; possibly vouchers were lodged with the MZB.

In 1984–1985, the joint Dutch-Indonesian expedition, *Snellius* II was initiated by the Indonesian government through LIPI. The expedition surveyed the central and eastern Indonesian waters, in particular the Banda Sea and SE Java Sea. Polychaetes were collected as part of the 'Coral Reefs' research theme, with special emphasis on Serpulidae (van der Land & Sukarno, 1986). The material was deposited in the RMNH and is now housed in the NBCL. At least two publications have described polychaetes from this expedition (Aguado et al., 2008; Martin et al., in prep.), but otherwise the polychaetes remain unstudied.

In 1990 the Dutch initiated the Rumphius Biohistorical Expedition to Ambon with the primary aim to collect marine invertebrates at the localities that Rumphius sampled about 300 years earlier (Strack, 1993). Although polychaetes would have undoubtedly been encountered among the thousands of sample lots collected, the group is conspicuously not mentioned in the general account. The polychaete material, if any exist, should be in RMNH. In November 1996, a joint Dutch-Indonesian expedition—Fauna Malesiana Marine Project—to survey the invertebrates of the coastal region of Ambon and Seram was undertaken. Although polychaetes were not included in the official list of taxa inventoried (van der Land, 1996), they were collected as by-catch and the small number of specimens is now held in the RMNH.

Recent Dutch-Indonesian collaboration has focused on the cryptic marine biota of eastern Indonesia. The 2007 Raja Ampat Expedition (Expedisi Widya Nusantara of LIPI) sampled marine biota in a variety of under-sampled habitats including marine lakes and sandy reef slopes, paying particular attention to symbiotic and species with cryptic habitats (Hoeksema & van der Meij, 2008). Three-hundred-and-fifty-three polychaete specimens were collected belonging to 25 families, with the Nereididae and Syllidae being the most diverse. The material, which is housed in the RMNH, has yet to be fully identified.

Collaborative Indonesian and French deep sea marine biological exploration in the region began with the first three Musorstom Cruises (I, 1976; II, 1980; and III, 1985), which although focussing on french territories in the West Pacific, also collected in the Philippines. Many polychaetes were collected, particularly on the third cruise, but almost all of it remains unregistered, and largely unstudied, in the MNHN (Salazar Vallejo, unpub. ms). Only one polychaete species appears to have been described from the collections, a nereidid *Neanthes philippensis* (León-González & Salazar-Vallejo, 2003). The Musorstom Cruises program, under the leadership of Alain Crosnier continues to today under the name 'Tropical Deep-Sea Benthos Program'. The results of the program are published in monographs under the same names; about one-third of the papers concern Crustacea (Richer de Forges et al., 2013).

Indonesian-French collaboration continued into the early 1990's with the commissioning of three research vessels, the French-built *Baruna Jaya* I, II, III. One of the first expeditions was the joint French-Indonesian Karubar Expedition (1991) using *Baruna Jaya* 1 (Crosnier et al., 1997). The Karubar expedition sampled a total of 91 stations, of which 85 were successful, near the Kei and Tanimbar Islands, at depths between 200 and 1,200 m. Many polychaetes were collected on this expedition, but none appear to have been described; the specimens remain unregistered in the MNHN (Salazar Vallejo, unpub. ms). *Baruna Jaya* VII and VIII are used by LIPI for coastal resources surveys including benthic sampling (Rudiyanto, 2002). In March 2002 the *Baruna Jaya* VIII was involved in the Expedition Anambas, a biodiversity program of the WMPC-SCS, which surveyed waters around Anambas and Natuna Islands from 12–19 March 2002 (Fig. 7; Ng et al., 2004); polychaetes were sampled on the trip and described in al Hakim & Glasby (2004). Baruna Jaya VII and VIII have been used extensively to sample for benthic invertebrates, but the polychaetes collected most of which are in LIPI, Jakarta, have yet to be described.

US-Philippine collaboration includes the 2011 Hearst Philippine Biodiversity Expedition (Williams & Gosliner, 2014), a collaboration between the CAS and the University of the Philippines. The subsequent 2014 Coral Triangle Expedition has yet to be published. The Hearst Expedition

Fig. 7. *Baruna Jaya VIII*, 2015. Photo: LIPI, Jakarta.

resulted in polychaetes being collected but only three new species have been published to date (Álvarez-Campos et al., 2014; Piotrowski, 2014; Salazar-Vallejo, 2014). Specimens from both expeditions are deposited in the CAS.

The only Australian-Indonesian collaborative cruise of note involving polychaete collection was the Museum of Tropical Queensland, *Tethyana Expedition*, 1999, which was sponsored by LIPI (Wallace et al., 2000). This expedition had modest goals, and only sampled the coralline habitats in the Togian Islands, Bay of Tomini, Sulawesi by SCUBA diving. A range of polychaetes was collected but only the terebellids identified to family by P.A. Hutchings. The material is in the AM. Also in this museum are notable polychaete collections from the Madang region, PNG.

Miscellaneous polychaete records from the IMPA. Numerous other records of IMPA polychaetes cannot be associated with early European Exploration, voyages of discovery or collaborative expeditions. These records can be categorised as belonging to either taxon revisionary or review studies (Jones, 1969, 1974; Petersen & Britayev, 1997; Glasby, 1999; Glasby & Hsieh, 2006; Williams, 2001, 2004, 2007; Tan & Chou, 1994), and or regional, faunistic accounts (Holly, 1934, 1935; Treadwell, 1940, 1942, 1943; Pillai, 1965; Rosito, 1980, 1983; Rosito & Gualberto, 1984; Palpal-latoc, 1981; Palpal-latoc & Gonzales, 1981; Tan & Chou, 1993), or single species accounts (Rullier, 1969; Hartmann-Schröder, 1993; Tan & Chou, 1994, 1996; Nishi, 2001; Barnich & Steene, 2003; Pamungkas, 2015b). This list is not exhaustive and of course will continue to grow.

DISCUSSION

This historical and bibliographic synthesis of polychaete discovery in the IMPA represents a first step toward documenting the polychaete diversity of the IMPA bioregion, which includes the mega-diverse Coral Triangle. It will hopefully facilitate the compilation of a complete checklist of IMPA polychaetes, identify gaps in our taxonomic knowledge, promote the development of regional or revisionary studies, and contribute to a better understanding of the diversity and distribution of the group in the region. Compiling a bioregional checklist is unfortunately not a trivial exercise, because existing databases such as WoRMS Polychaeta (http://www.marinespecies.org/polychaeta/), although comprehensive and accurate for species names, often lack comprehensive information on species distribution. This is currently being addressed (G. Read, pers. comm.) but for the present, checklist compilation will have to be done with reference to the primary literature, as supplied here.

ACKNOWLEDGEMENTS

CJG and IH would like to thank Dr Bert Hoeksema, NBCL, for facilitating this study through a Naturalis Fellowship (CG) and participation on the Raja Ampat Expedition (IH). CG also thanks Luis Popa, Director "Grigore Antipa" National Museum of Natural History, and Dr Victor Surugiu (researcher, MNINGA) for supporting his visit in 2016, and discussions about the collection. We thank Linda Ward for information on the Smithsonian holdings of IMPA polychaetes, and Dieter Fiege for information on the whereabouts of the Kükenthal material.

LITERATURE CITED

Aguado MT, San Martin G & ten Hove HA (2008) Syllidae (Annelida: Polychaeta) from Indonesia collected by the *Siboga* (1899–1900) and *Snelius II* (1984) expeditions. Zootaxa, 1673: 1–48.

al Hakim I & Glasby CJ (2004) Polychaeta (Annelida) of the Natuna Islands, South China Sea. Raffles Bulletin of Zoology, Supplement 11: 25–45.

Allen GR & Adrim M (2003) Coral reef fishes of Indonesia. Zoological Studies, 42: 1–72.

Álvarez-Campos P, San Martín G & Piotrowski C (2014) A new species of *Myrianida* Milne Edwards, 1845 (Autolytinae: Syllidae: Annelida) from Luzón, Philippine Islands. In: Williams GC & Gosliner TM (eds.) The Coral Triangle: The 2011 Hearst Philippine Biodiversity Expedition. California Academy of Sciences, San Francisco, California., Ppp. 145–154.

Augener H (1933a) Polychaeten aus den Zoologischen Museen von Leiden und Amsterdam. Zoologische Mededeelingen Rijks Museum van Natuurlijke Historie Leiden, 15: 177–260.

Augener H (1933b) Polychaeten aus den Zoologischen Museen von Leiden und Amsterdam. II. Zoologische Mededelingen Rijks Museum van Natuurlijke Historie Leiden, 16: 107–128.

Augener H (1933c) Polychaeten aus den Zoologischen Museen von Leiden und Amsterdam. III. Zoologische Mededelingen Rijks Museum van Natuurlijke Historie Leiden, 16: 129–162.

Augener H (1933d) Polychaeten und Hirudineen aus dem Zoologischen Museum in Buitenzorg. Treubia, 14(2): 173–206.

Augener H (1934) Polychaeten aus den Zoologischen Museen von Leiden und Amsterdam. IV Schluss. Zoologische Mededelingen Rijksmuseum van Natuurlijke Historie Leiden, 17: 67–160.

Aungtonya C, Thaipal S & Tendal O (2000) A preliminary report on the Thai–Danish BIOSHELF surveys (1996–2000) of the west coast of Thailand, Andaman Sea. Phuket Marine Biological Center Research Bulletin, 63: 53–76.

Aungtonya C & Eibye-Jacobsen D (2002) Introduction to the Thai–Danish BIOSHELF sampling project and the polychaete workshop held in Phuket, Thailand, June–August 1997. Phuket Marine Biological Center Special Publication, 24: 1–12.

Barnich R & Steene R (2003) Description of a new species of *Polyodontes* Renieri in Blainville, 1828 (Polychaeta: Acoetidae)

from Papua New Guinea. The Beagle, Records of the Museum & Art Gallery of the Northern Territory, 19: 91–96.

Bauer AM (2016) Southeast Asian and Australasian Herpetological collections from the eighteenth and nineteenth centuries in the Zoological Museum of Berlin. In: Das I & Tuen AA (eds.) Naturalists, Explorers and Field Scientists in South-East Asia and Australasia. Topics in Biodiversity and Conservation, Volume 15., Ppp. 89–1089.

Beekman EM (1999) The Ambonese Curiosity Cabinet. Yale University Press, New Haven, 672 pp. [Translation of Rumphius GE (1705) D'Amboinsche Rariteitkamer. François Halma, Amsterdam]

Bellwood DR & Meyer CP (2009) Searching for heat in a marine biodiversity hotspot. Journal of Biogeography, 36: 569–576.

Bellwood P (2007) Prehistory of the Indo–Malaysian Archipelago. Third Edition. The Australian National University Press, Canberra, 384 pp.

Bleeker J & van der Spoel S (1992) Catalogue of the Polychaeta collected by the *Siboga* Expedition and type specimens of Polychaeta in the Zoological Museum of Amsterdam. Bulletin Zoologisch Museum, Universiteit van Amsterdam, 13(13): 121–166.

Borda E, Kudenov JD, Bienhold C & Rouse GW (2012) Towards a revised Amphinomidae (Annelida, Amphinomida): Description and affinities of a new genus and species from the Nile deep-–sea fan, Mediterranean Sea. Zoologica Scripta, 41: 307–325.

Briggs JC (1974) Marine Zoogeography. McGraw-Hill, The University of California, 475 pp.

Carpenter KE & Springer VG (2005) The center of the center of marine shore fish biodiversity: The Philippine Islands. Environmental Biology of Fishes, 72: 467–480.

Caullery M (1914) Sur les Siboglinidae, type nouveau d'invertébrés receuilli par l'expédition du Siboga. Bulletin de la Société Zoologique de France, 39: 350–353.

Caullery M (1915a) Notes preliminaires sur les polychetes sedentaires du *Siboga*. 3. Sur les polychètes du genre *Prionospio* Malmgr. Bulletin de la Société Zoologique de France, 40: 355–361, 352 figs.

Caullery M (1915b) Sur les *Terebellides* Malmgren du *Siboga* et les Terebelliens voisins. Bulletin de la Société Zoologique de France, 40: 111–116, 113 figs.

Caullery M (1944a) Polychete sedentaire de l'Expedition du Siboga: Ariciidae, Spionidae, Chaetopteridae, Chloraemidae, Opheliidae, Oweniidae, Sabellariidae, Sternaspidae, Amphictenidae, Ampharetidae, Terebellidae. Siboga-Expeditie, Leiden, 24: 1–204.

Caullery M (1944b). *Siboglinum* Caullery, 1914. Type nouveau d'invertebres, d'affinites a preciser. Siboga-Expeditie, Leiden Monographie, 138, 25(2): 1–26.

Chun C (1900) Aus den Tiefen des Weltmeeres. Schilderungen von der Deutschen Tiefsee-Expedition. G. Fischer, Jena, 549 pp.

Crosnier A, Richer de Forges B & Bouchet P (1997) La campagne KARUBAR en Indonesie, au large des Iles Kai et Tanimbar. Resultats des Campagnes Musorstom, Volume 16. Memoires de Museum National Histoire Naturelle, Series A, 172: 9–26.

Dana Report (1934) The Carlsberg Foundation's Oceanographic Expedition round the World 1928–30 and previous 'Dana'-expeditions under the leadership of the Late Professor Johannes Schmidt. Vol. 1. No. 1. Introduction to the reports from the Carlsberg Foundation's Oceanographic Expedition round the World 1928–30. CA Reitzels Forlag, Copenhagen: pp. 1–130, pls 1–7.

Ehlers E (1906) Die bodensässigen Anneliden aus den Sammlungen der deutschen Tiefsee-Expetition. Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer Valdivia, 16: 1–169.

Ehlers E (1918) Polychaete Anneliden von den Aru-und Kei-Inseln. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, 35(2): 229–259.

Ehlers E (1920) Polychaeten von Java und Amboina. Ein Beitrag zur Kenntnis der maliischen Strandfauna. Abhandlungen der königlichen Gesellschaft der Wissenschaften zu Gőttingen, Mathematisch-Physikalische Klasse, 10(7): 1–73.

Eibye-Jacobsen D (2002) Proceedings of the International Workshop on the Polychaetes of the Andaman Sea, June–August 1997, Phuket Marine Biological Center, Department of Fisheries, Thailand. Phuket Marine Biological Center Special Publication, 24: 1–423.

Ekman S (1953) Zoogeography of the Sea. Sigwick & Jackson, London, 417 pp.

Fauchald K (1976) A review of the need for work on polychaete systematics on Indo-Pacific coral reefs. Micronesica, 12(1): 165–167.

Fauvel P (1953) The Fauna of India, including Pakistan, Ceylon, Burma and Malaya. Annelida Polychaeta. The Indian Press, Allahabad, 507 pp.

Feuerborn HJ (1931) Eine Rhizocephale und zwei Polychaeten aus dem Suesswasser von Java und Sumatra. Verhandlungen der International Vereinigung für theoretische Limnologie, Stuttgart, 5: 618–660.

Feuerborn HJ (1935) Mitteilung ueber einen Einbuergerungsversuch mit *Lycastis ranauensis* im Skutem-See. Verhandlungen der Internationale Vereinigung der theoretische Limnologie, Stuttgart, 7: 255–262.

Fiege D & Wehe T (2004) Type catalogue of the Annelida: Polychaeta in the collections of the Senckenberg-Museum in Frankfurt am Main, Germany. Senckenbergiana biologica, 84: 27–43.

Fischli H (1903) Polychäten von Ternate. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, 25: 90–136.

Fransen CHJM, Holthuis LB & Adema JPHM (1997) Type-catalogue of the decapod Crustacea in the collections of the Nationaal Natuurhistorische Museum, with appendices of pre-1900 collectors and material. Zoologiische Verhandelingen, 311: xvi + 1–344 pp.

Glasby CJ (1999) The Namanereidinae (Polychaeta: Nereididae). Part 1. Taxonomy and Phylogeny. Records of the Australian Museum, Supplement 25: 1–129.

Glasby CJ & Hsieh HL (2006) New species and new records of the *Perinereis nuntia* species group (Nereididae: Polychaeta) from Taiwan and other Indo-West Pacific shores. Zoological Studies, 45: 553–577.

Glasby CJ, Lee Y-L & Hsueh P-W (2016) Marine Annelida (excluding clitellates and siboglinids) from the South China Sea. Raffles Bulletin of Zoology, Supplement 34: 395–451

Grube AE (1868) Anneliden. Reise der Österreichischen Fregatte *Novara* um die Erde in den Jahren 1857, 1858, 1859. Unter den Befehlen des Commodore B. von Wüllerstorf-Urbair. Zoolgischer Theil, 2(3): 1–46.

Grube AE (1877) Anneliden-Ausbeute S.M.S. *Gazelle*. Monatsberichte der Kőniglich Preussischen Akademie der Wissenschaften zu Berlin, 1877: 509–554.

Grube AE (1878) Annulata Semperiana. Beiträge zur Kenntniss der Annelidenfauna der Philippinen. Memoires de L''Academie Imperiale des Sciences de St. Petersbourg, Series 7, 25(8): 1–300.

Grube AE (1881) Beschreibung von neuen Anneliden des zoologischen Museums zu Berlin. Sitzungsberichte der Gesellschaft naturforschender Freunde Berlin, 1881: 109–117.

Gutu M (1997) Data concerning the areas and collecting stations of the marine samples of microbenthos. Travaux du Museum National d'Histoire Naturelle Grigore Antipa, 38: 15–27.

Hartman O (1948) The marine annelids erected by Kinberg with notes on some other types in the Swedish State Museum. Arkiv für Zoologi, 42A(1): 1–137, 118 figs.

Hartman O (1974) Polychaetous annelids of the Indian Ocean including an account of species collected by members of the International Indian Ocean Expeditions, 1963–1964 and a catalogue and bibliography of the species from India. Part II. Journal of the Marine Biological Association of India, 16(2): 609–644.

Hartmann-Schröder G (1993) *Haplosyllis xeniaecola*, ein neuer polychaet (Syllidae) von den Molukken (Indonesien). Helgoländer Meeresuntersuchungen, 47(3): 305–310.

Hartwich G (1993) Die Polychaeten-Typen des Zoologischen Museums in Berlin. Mitteilungen aus dem Zoologischen Museum in Berlin, 69(1): 73–154.

Hoagland RA (1920) Polychaetous annelids collected by the United States Fisheries steamer "Albatross" during the Philippine expedition of 1907–1909. Bulletin of the United States National Museum, 100: 603–635.

Hoeksema BW (2007) Delineation of the Indo-Malayan centre of maximum marine diversity: The Coral Triangle. In: Renema W (ed.), Biogeography, Time and Place: Distributions, Barriers and Islands. Springer, Dordrecht. Pp. 117–178.

Hoeksema BW & van der Meij SET (eds.) (2008) Cryptic marine biota of the Raja Ampat Island group: Preliminary results of the Raja Ampat Expedition, 17 November–17 December 2007. Expedisi Widya Nusantara (E-Win) of the Indonesian Institute of Sciences (LIPI) and National Museum of Natural History Naturalis, 73 pp.

Holly M (1934) Polychaeten von den Philippinen. Erste Mittheilung ueber Polychaeten. Zoologischer Anzeiger, 105: 147–150, 142 figs.

Holly M (1935) Polychaeten von Philippinen. Zweite Mittheilung ueber Polychaeten. Zoologischer Anzeiger, 111: 96–100, figs 101–106.

Horst R (1903) New species of the *Euphrosyne* from the *Siboga*-Expedition, with a table of the species hitherto known. Notes from the Leiden Museum, 23: 213–222.

Horst R (1905) Over de 'wawo' (*Lysidice oecle* n. sp.). Rumphius Gedenkbook Kolon Museum Haarlem, 1905: 105–108.

Horst R (1909) On freshwater nereids from the botanical gardens at Buitenzorg belonging to *Lycastis hawaiïensis* Johnson. Bulletin du Departement de l'Agriculture aux Indes Nerlandaises, 25: 1–5.

Horst R (1910) On the genus *Chloeia* with some new species from the Malay Archipelago, partly collected by the *Siboga*-Expedition. Notes from the Leiden Museum, 32: 169–175.

Horst R (1911) On the genus *Notopygos*, with some new species from the Malay-Archipelago collected by the *Siboga*-Expedition. Notes from the Leiden Museum, 33: 241–247.

Horst R (1912) Polychaeta errantia of the *Siboga* Expedition. Part 1, Amphinomidae. Siboga-Expeditie, Leiden, 24a: 1–43.

Horst R (1913) On two remarkable species of Aphroditidae of the Siboga-Expedition. Notes from the Leiden Museum, 35: 161–168.

Horst R (1915) On new and little-known species of Polynoinae from the Netherland's East-Indies. Zoologische Mededeelingen, Leiden, 1: 2–20.

Horst R (1916) On a new genus of Aphroditidae from the Netherlands East Indies. Zoologische Mededeelingen, Leiden, 2: 63–64.

Horst R (1917) Polychaeta Errantia of the Siboga Expedition. Part 2. Aphroditidae and Chrysopetalidae. Siboga-Expeditie, Leiden, 24b: 1–140.

Horst R (1918a) On a species of *Lycastis* and three aberrant forms of Nereidae from the Dutch East Indies. Zoologische Mededeelingen, Leiden, 4: 246–250.

Horst R (1918b) On a remarquable [sic] fresh-water polychaete, *Nereis nouhuysi* from the East-Indies. Zoologische Mededeelingen, Leiden, 4: 143–145.

Horst R (1919) Three new *Nereis*-species from the Dutch East Indies. Zoologische Mededeelingen, Leiden, 5: 59–64.

Horst R (1921) A review of the family of Hesionidae with a description of two new species. Zoologische Mededeelingen, Leiden, 6: 73–83.

Horst R (1923) On three remarkable Annelida Polychaeta. Zoologische Mededeelingen, Leiden, 7: 221–224.

Horst R (1924) Polychaeta errantia of the *Siboga*-Expedition. Part III. Nereidae and Hesionidae. Siboga-Expedition Leiden, 99 (Monograph 24): 145–198.

Hutchings PA & McRae J (1993) The Aphroditidae (Polychaeta) from Australia, together with a redescription of the Aphroditidae collected during the *Siboga* Expedition. Records of the Australian Museum, 45: 279–363.

Hutchings PA & Yerman M (2010) Class Polychaeta Claparède, 1864. Australian Faunal Directory, Australian Biological Resources Study. https://biodiversity.org.au/afd/taxa/polychaeta;annelida. (Accessed 4 August 2017)

Huxley TH (1868) On the classification and distribution of the Alectoromorphae and Heteromorphae. Proceedings of the Zoological Society of London, 1868: 294–319.

Hydrografisches Reichs-Marine Amt (1889) Die Forschungsreise S.M.S. "Gazelle" in den Jahren 1874 bis 1876: unter Kommando des Kapitän zur See Freiherrn von Schleinitz. Volume 3,. Zoologie und Geologie. Ernst Siegfried Mittler & Sohn, Berlin, 406 pp.

Hylleberg J (2013) Phuket Marine Biologial Center (PMBC) and Thai-Danish cooperation summarized by a former Danish advisor with emphasis on the early history. Phuket Marine Biological Center Special Publication, 32: 13–303.

Jones ML (1969) Boring of shell by *Caobangia* in freshwater snails of Southeast Asia. American Zoologist, 9: 829–835.

Jones ML (1974) On the Caobangiidae, a new family of the Polychaeta, with a redescription of *Caobangia billeti* Giard. Smithsonian Contributions to Zoology, 175: 1–55.

Kinberg JGH (1856) Nya slägten och arter af Annelider. Öfversigt af Köngliga Vetenskapsakademiens förhandlingar, Stockholm, 12(9–10): 381–388.

Kinberg JGH (1865) Annulata nova. Öfversigt af Köngliga Vetenskapsakademiens förhandlingar, Stockholm, 22(2): 167–179.

Kinberg JGH (1866) Annulata nova. [Continuatio]. Öfversigt af Köngliga Vetenskapsakademiens förhandlingar, Stockholm, 23(9): 337–357.

Kinberg JGH (1910) Kongliga svenska fregatten Eugenies resa omkring jorden under befäl af C. A. Virgin åren 1851–1853. Vetenskapliga iakttagelser. II, Zoologi. 3 Annulater. Kungliga Svenska Vetenskapsakademien, Stockholm, 78 pp.

Kirkegaard JB (1956a) Benthic Polychaeta from depths exceeding 6000 meters. Galathea Report, 2: 63–75.

Kirkegaard JB (1956b) Pogonophora. Galathea Report, 2: 79–83.

Kirkegaard JB (1995) Bathyal and abyssal polychaetes (errant species). Galathea Report, 17: 7–56.

Kirkegaard JB (1995/) 1996) Bathyal and abyssal polychaetes (sedentary species I). Galathea Report, 17: 57–77.

Knox GA (1957) The distribution of polychaetes within the Indo-Pacific. Proceedings of the Eighth Pacific Science Congress, 3: 403–411.

Kohn AJ & Lloyd MC (1973) Polychaetes of truncated reef limestone substrates on eastern Indian Ocean coral reefs: Diversity, abundance and taxonomy. Internationale Revue der gesammten Hydrobiologie, 58(3): 369–400.

Kükenthal W (1887) Die Opheliaceen der Expedition der Vettore Pisani. Jenaische Zeitschrift für Naturwissenschaft, 21: 362–373.

León-González JA de & Salazar-Vallejo SI (2003) Four new nereidid species (Annelida, Polychaeta) collected during the MUSORSTROM cruises in the Indo-Pacific Ocean. Zoosystema, 25(3): 365–376.

Lohman DJ, de Bruyn M, Page T, von Rintelen K, Hall R, Ng PKL, Shih H-T, Carvalho GR & von Rintelen T (2011) Biogeography of the Indo-Australian Archipelago. Annual Review of Ecology and Evolutionary Systematics, 42: 205–226.

Malaquin A & Dehorne A (1907) Les annélides polychètes de la Baie d'Amboine. Revue Suisse de Zoologie, 15: 335–400.

Martens JM, Heuer U & Hartmann-Schröder G (1995) Massenschwärmen des Südsee-Palolowurms (*Palola viridis* Gray) und weiterer Polychaeten wie *Lysidice oele* Horst und *Lumbrineris natans* n.sp. auf Ambon (Molukken; Indonesien). Mitteilungen aus dem Zoologischen Institut und Zoologische Museum der Universität Hamburg, 92: 7–34.

Martin D, Aguado MT & Britayev TA (2009) Review of the symbiotic genus *Haplosyllides* (Polychaeta: Syllidae), with description of a new species. Zoological Science, 26: 646–655.

McIntosh WC (1885) Report on the Annelida Polychaeta collected by H.M.S. 'Challenger' during the years 1873–76. Report of the Scientific Results of the Exploring Voyage of H.M.S. Challenger 1873–76, 12: 1–554, 55 + 39 pls.

Mesnil F & Fauvel P (1939) Polychètes sédentaires de l'expédition du *Siboga*. Maldanidae, Cirratulidae, Capitellidae, Sabellidae et Serpulidae. Siboga Expeditie, 24(2): 1–42.

Monro CCA (1931) On a collection of Polychaeta in the Raffles Museum, Singapore. Bulletin of the Raffles Museum, Singapore, 5: 33–46.

Mortensen T (1923) The Danish expedition to the Kei Islands 1922. Videnskabelige meddelelser fra Dansk Naturhistorisk Forening i Kjoebenhaven, 76: 55–99.

Müller, OF, Abildgaard, PC, Vahl , M, Holten, JS & Rathke, J (1806) Zoologiae Danica seu Animalium Daniae et Norvegiae rariorum ac minus notorum. Descriptiones et historia. Volume IV. Volume Atlas. N. Christensen: Havniae [Copenhagen], 1–2, 46 pp., pls. 121–160.

Ng PKL, Ilahude AG, Sivasothi N & Yeo DCJ (2004) Expedition Anambas: An overview of the scientific marine exploration of the Anambas and Natuna Archipelago, 11–22 March 2002. The Raffles Bulletin of Zoology, Supplement 11: 1–17.

Nishi E (2001) A new species of scaleworm, *Grubeulepis malayenisis* (Annelida: Polychaeta: Eulepethidae), from Morib Beach, Malaysia, living in chaetopterid tubes. Species Diversity, 6: 1–9.

Pallas PS (1766) Miscellanea zoologica. Quibus novae imprimis atque obscurae animalium species describuntur et observationibus iconibusque illustrantur. Petrum van Cleef. Hagí Comitum, xii + 224 pp., 14 pls.

Palpal-latoc VS (1981) Inventory of polychaetous annelids from Tayabas Bay. Zoological Papers, National Museum Manila Philippines, 9: 1–55.

Palpal-latoc VS & Gonzales PC (1981) New records of polychaete worms (Polychaeta: Chaetopteridae) from Natunawan Cove, Tabaco, Albay. Zoological Papers of the National Museum, Manila, Philippines, 11: unpaginated.

Pamungkas J (2015a) Species richness and macronutrient content of wawo worms (Polychaeta, Annelida) from Ambonese waters, Maluku, Indonesia. Biodiversity Data Journal, 3: e4251.: 1–8

Pamungkas J (2015b) The description of a new species *Polymastigos javaensis* n. sp. (Annelida: Capitellidae) from the Segara Anakan mangroves, Central Java, Indonesia. Zookeys, 3980: 279–285.

Pamungkas J & Glasby CJ (2015) Taxonomy of reproductive Nereididae (Annelida) in multispecies swarms at Ambon Island, Indonesia. Zookeys, 520: 1–25.

Paxton H & Chou LM (2000) Polychaetous annelids from the South China Sea. Raffles Bulletin of Zoology, Supplement 8: 209–232.

Petersen ME & Britayev TA (1997) A new genus and species of polynoid scaleworm commensal with *Chaetopterus appendiculatus* Grube from the Banda Sea (Annelida: Polychaeta), with a review of commensals of Chaetopteridae. Bulletin of Marine Science, 60(2): 261–276.

Pettibone MH (1970) Polychaeta Errantia of the Siboga Expedition. Part IV. Some additional polychaetes of the Polynoidae, Hesionidae, Nereidae, Goniadidae, Eunicidae, and Onuphidae, selected as new species by the late Dr Hermann Augener with remarks on other related species. Siboga Expedition, 24(1): 199–270.

Pflugfelder O (1932) Beschreibung einiger neuer Acoetinae–Mit einem Anhang uber eigenartige epitheliale Sinnesorgane dieser Formen. Zoologischer Anzeiger, 98(11/12): 281–295.

Pflugfelder O (1933) Landpolychaten aus Niederlandisch-Indien. Zoologischer Anzeiger, 105(3/4): 65–76.

Phasuk B (1992) Preliminary report on the polychaetes from the Fifth Thai-Danish Expedition along the Andaman Coast of Thailand. Phuket Marine Biological Center Research Bulletin, 57: 77–87.

Pieters FFJM (1980) Notes on the menagerie and zoological cabinet of Stadholder William V of Holland, directed by Aernout Vosmaer. Journal of the Society for the Bibliography of Natural History, 9(4): 539–563.

Pillai TG (1965) Annelida Polychaeta from the Philippines and Indonesia. Ceylon Journal of Science, 5(2): 112–177.

Piotrowski C (2014) A new scaleworm, *Iphione malifera* (Polychaeta: Iphionidae), from a coral reef in the Philippine Islands. In: Williams GC & Gosliner TM (eds.) The Coral Triangle: The 2011 Hearst Philippine Biodiversity Expedition. California Academy of Sciences, San Francisco, California. Pp. 155–164.

Quatrefages, A de (1866). Histoire naturelle des Annelés marins et d'eau douce. Annélides et Géphyriens. Librarie Encyclopédique de Roret, Paris, Volume 1: 1–588;, Volume 2(1): 1–336;, Volume 2(2): 337–794.. Librarie Encyclopédique de Roret, Paris

Richer de Forges B, Chan T-Y, Corbari L, Lemaitre R, Macpherson E, Ahyong ST & Ng PKL (2013) The Musorstom-TDSB deep-sea benthos exploration programme (1976–2012): An overview of Crustacean discoveries and new perspectives on deep-sea zoology and biogeography. In: Ahyong ST, Chan T-Y, Corbari L & Ng PKL (eds.) Tropical Deep-Sea Benthos 27. Muséum national d'Histoire naturelle, Paris. Pp. 13–66.

Rosito RM (1980) Polychaeta from shallow waters off Mactan, Cebu, Part 1. The Philippine Scientist, 17: 1–35.

Rosito RM (1983) Polychaeta from shallow waters off Mactan, Cebu. Part 2. The Philippine Scientist, 20: 11–38.

Rosito RM & Gualberto EP (1984) New records of pelagic polychaetous annelids from Mactan Island, Cebu, central Philippines. The Philippine Scientist, 21: 1–10.

Rullier F (1969) Une nouvelle espece d'annelide polychete *Lumbriconereis malaysiae.* Bulletin de la Société Zoologique de France, 94(1): 133–135.

Rudiyanto A (2002) A Critical Appraisal of Marine and Coastal Policy in Indonesia including Comparative Issues and Lessons Learnt from Australia. Unpublished PhD Thesis, University of Wollongong.

Rumphius GE (1705) D'Amboinsche Rariteitkamer. François Halma, Amsterdam, 548 pp. ([see Beekman [(1999)]).

Salazar-Vallejo S (2014) *Sternaspis piotrowskiae* sp. nov. (Polychaeta: Sternapsidae) from the Philippine Islands. In: Williams GC & Gosliner TM (eds.) The Coral Triangle: The 2011 Hearst Philippine Biodiversity Expedition. California Academy of Sciences, San Francisco, California. Pp. 165–169.

Salazar-Vallejo SI, Carrera-Parra LF, Muir AI, de León-González JA, Piotrowski C & Sato M (2014) Polychaete species (Annelida) described from the Philippines and China Seas. Zootaxa, 3842: 1–68.

Seidenfaden, G, Smitinand, T & Thorson G (1968). Report on the Fifth Thai-Danish Expedition 1966. Natural History Bulletin of the Siam Society, 22: 245–261.

Sluiter, CPHh (1882). Ueber einen indischen *Sternaspis* und seine Verwandschaft zu den Echiuren. Natuurkundig tijdschrift voor Nederlandsch Indië uitgegeven door de Natuurkundige Vereeniging. Batavia, 41: 235–287, 3 pls.

Sluiter, CPHh (1902) Die Sipunculiden und Echiuriden der Siboga-Expedition, nebst zusammenstellung der ueberdies aus dem Indischen Archipel bekannten arten. Siboga-Expeditie Monographie, 25 (8): 1–53.

Soemodihardjo S, Burhanuddin Djamali A, Toro V, Azaz A, Sulistijo, Sumadhiharga OK, Horridge GA, Cals P, Dunn DF & Schochet J (1980) Laporan ekspedisi Rumphius III. Oseanologi di Indonesia, 13: 1–60.

Solís-Weiss V, Bertrand Y, Helléouet M-N & Pleijel F (2004) Types of polychaetous annelids at the Museum national d'Histoire naturelle, Paris. Zoosystema, 26(3): 377–384.

Soota TD, Misra A & Chakraborty RK (1980) Polychaete fauna of Andaman and Nicobar Islands. Records of the Zoological Survey of India, 77(1–4): 55–69.

Southward EC (1961) Pogonophora. Siboga-Expeditie Monographie, 25(3): 1–22.

Spalding MD, Fox HE, Allen GR, Davidson N, Ferdaña ZA, Finlayson M, Halpern BS, Jorge MA, Lombana A, Lourie SA, Martin KD, McManus E, Molnar J, Recchia C A & Robertson J (2007) Marine Ecoregions of the World: A Bioregionalization of Coastal and Shelf Areas. Bioscience, 57(7): 573–583.

Stair JB (1847). An account of Palolo, a sea-worm eaten in the Navigator Islands, with a description by J.E. Gray. Proceedings of the Zoological Society of London, 15: 17–18.

Støp-Bowitz C (1977) Polychètes pelagiques des expeditions du *Willem Barendsz* 1946–1947 et 1947–1948 et du *Snellius* 1929–1930. Zoologische Mededeelingen, Leiden, 51(1): 1–23.

Strack HL (1993) Results of the Rumphius Biohistorical Expedition to Ambon (1990). Zoologische Verhandelingen Leiden, 289: 1–72.

Tan LT & Chou LM (1993) Checklist of polychaete species from Singapore waters (Annelida). Raffles Bulletin of Zoology, 41(2): 279–295.

Tan LT & Chou LM (1994) A new species of polychaete worm, *Tylonereis heterochaeta* (Polychaeta: Nereididae) from Singapore. Raffles Bulletin of Zoology, 42(3): 663–668.

Tan LT & Chou LM (1996) *Diopatra bulohensis*, a new species of Onuphidae (Polychaeta) from Sungei Buloh, Singapore. Raffles Bulletin of Zoology, 44(2): 357–362.

Tomascik T, Mah AJ, Nontji A & Moosa MK (1997) The Ecology of the Indonesian Seas. Part 1. Periplus, Singapore, 746 pp..

Treadwell AL (1920) Polychaetous annelids collected by the United States Fisheries steamer "Albatross" on the waters adjacent to the Philippine Islands in 1907–1910. Bulletin of the United States National Museum, 100: 589–602.

Treadwell AL (1926) Contributions to the biology of the Philippine Archipelago and adjacent regions. Additions to the polychaetous annelids collected by the U.S. Fisheries steamer Albatross, 1907–1910, including one new genus and three new species. Bulletin of the United States National Museum, 100: 183–193.

Treadwell AL (1931) Contributions to the biology of the Philippine Archipelago and adjacent regions. Four new species of polychaetous annelids collected by the United States Fisheries Steamer Albatross during the Philippine Expedition, 1907–1910. Bulletin of the United States National Museum, 100: 313–321.

Treadwell AL (1940) A new genus and two new species of polychaetous annelids from Texas and one new species from the Philippine Islands. American Museum Novitates, 1089: 1–4, 13 figs.

Treadwell AL (1942) Polychaetous annelids from lower California and the Philippine Islands in the collections of the American Museum of Natural History. American Museum Novitates, 1172: 1–5.

Treadwell AL (1943) Polychaetous annelids from the Philippine Islands in the collections of the American Museum of Natural History. American Museum Novitates, 1220: 1–4, 7 figs.

van Aken HM (2005) Dutch oceanographic research in Indonesia in Colonial times. Oceanography I, 18(4): 30–41.

van der Land J & Sukarno, DEH (1986) The Snellius-II expedition progress report. Theme IV. Coral reefs, Pt I. R.V. *Tyro* and K.M. *Samudera*, September – November 1984. Royal Netherlands Academy of Arts and Sciences, Amsterdam/Indonesian Institute of Sciences, Jakarta, pp 1–76.

van der Land J (ed) (1996) Fauna Malesiana Marine. Maluku Expedition 1996. Unpublished Progress Report.

van Riel PM (1937) The *Snellius*-Expedition in the eastern part of the Netherlands East-Indies 1929–1930 under leadership of PM Van Riel director of the Amsterdam branch office of the Royal Netherlands Meteorological Institute. Programme of research and preparations. E.J. Brill, Leiden, 1(1): 1–37, pls 1–8.

von Graff, L. (1884) Report on the Myzostomida collected during the voyage of H.M.S. Challenger during the years 1873–76. Report of the Scientific Results of the Exploring Voyage of H.M.S. Challenger 1873–76, 27: 1–82, 16 plates.

Wallace AR (1860) On the zoological geography of the Malay Archipelago. Journal of the Proceedings of the Linnean Society, Zoology, 4: 172–184.

Wallace AR (1869) The Malay Archipelago: The Land of the Orang-Utan and the Bird of Paradise: A Narrative of Travel, with Studies of Man and Nature. London: Macmillan & Co., 478 pp.

Wallace CC, Paulay G, Hoeksema BWH, Bellwood DR, Hutchings P, Barber P, Erdman M & Wolstenholme J (2000) Nature and origins of unique high diversity reef faunas in the Bay of Tomini, Central Sulawesi: the ultimate centre of diversity? Proceedings of the 9th International Coral Reef Symposium, Bali, Indonesia, 23–27 October, 2000, 1:p 185–192.

Weber M (1903) Introduction et description de l'expedition. Siboga Expeditie, I: 1–159.

Wiktor J (1980) Type-specimens of Annelida Polychaeta in the Museum of Natural History of the Wroclaw University. Annales Zoologici, Warszawa, 35: 267–284.

Williams GC & Gosliner TM (eds) (2014) The Coral Triangle: The 2011 Hearst Philippine Biodiversity Expedition. California Academy of Sciences, San Francisco, California, USA, 592 pp.

Williams JD (2001) *Polydora* and related genera associated with hermit crabs from the Indo-West Pacific (Polychaeta: Spionidae), with descriptions of two new species and a second polydorid egg predator of hermit crabs. Pacific Science, 55(4), 429–465.

Williams JD (2004) Reproduction and morphology of *Polydorella* (Polychaeta: Spionidae), including the description of a new species from the Philippines. Journal of Natural History, 38(11): 1339–1358.

Williams JD (2007) New records and description of four new species of spionids (Annelida: Polychaeta: Spionidae) from the Philippines: The genera *Dispio, Malacoceros, Polydora*, and *Scolelepis*, with notes on palp ciliation patterns of the genus *Scolelepis*. Zootaxa, 1459: 1–35.