



GLYCERIFORMIA (ANNELIDA: POLYCHAETA) FROM ANDAMAN AND NICOBAR ISLANDS

AISWARYA GOPAL, N. SARAVANANE



**Centre for Marine Living Resources & Ecology
Ministry of Earth Sciences
July 2021**

GLYCERIFORMIA (ANNELIDA: POLYCHAETA) FROM ANDAMAN AND NICOBAR ISLANDS

AISWARYA GOPAL & N. SARAVANANE



सत्यमेव जयते

**CENTRE FOR MARINE LIVING RESOURCES & ECOLOGY
MINISTRY OF EARTH SCIENCES, GOVERNMENT OF INDIA
ATAL BHAVAN, PUTHUVYPE, KOCHI – 682508.**

JULY 2021



Prof. Rosamma Philip
UGC-BSR Faculty

Lake Side Campus, Fine Arts Avenue
Cochin - 682 016, Kerala, India



FOREWORD

Polychaetes which are one of the dominant members of the benthic community constitute fundamental components in benthic-pelagic coupling through remineralization of organic matter besides primarily forming food source for demersal fishes and shell fishes. Limited information on the polychaetes seen around the island ecosystems warrants the development of regional identification guides. Efforts taken by Centre for Marine living Resources and Ecology (CMLRE) in documenting the biodiversity of our seas has resulted in the process of bringing numerous taxonomic checklists and catalogues. The present catalogue "Glyceriformia (Annelida: Polychaeta) from Andaman and Nicobar Islands" provides a taxonomic account of polychaetes collected through various cruises of FORV *Sctgar Sampada* around the archipelago. Members of the suborder Glyceriformia are one of the dominant forms and are widely distributed in the sandy sediments. The book would also serve as a ready reckoner and field guide for the budding taxonomists and students in identifying these ecologically important organisms. Heartly congratulations to the authors for their hard work and dedication on documenting the diversity of polychaetes from the vast seas of our country and bringing out this volume, a great contribution to the benthic taxonomy.

Rosamma Philip
UGC- BSR Faculty

& Former Dean, Faculty of Marine Sciences

PREFACE

Polychaetes commonly called as segmented worms, are the most abundant and diverse group among invertebrates in marine sediments. They are distributed world-wide, from intertidal to deep sea habitats, with few species adapted to survive in extreme environments like hydrothermal vents and cold seeps. They play a major role in marine realm forming an integral part in the benthic-pelagic coupling. The species composition of polychaetes has been well studied in the continental margin of peninsular India (Arabian Sea and Bay of Bengal). But studies on polychaetes around oceanic island margins (Andaman and Nicobar Islands, Lakshadweep Islands) of Indian EEZ are very limited. This necessitate the development of regional identification guides of polychaetes with descriptions, illustrations, photographs of the respective regions. This catalogue is based on the species collected in benthic surveys conducted around Andaman and Nicobar Islands (50-200 m depth) under Marine Living Resources Programme (MLRP), Centre for Marine Living Resources (CMLRE). The catalogue includes 18 species recorded under the suborder Glyceriformia, with information on collection, preservation techniques, systematics and distribution in Indian Ocean etc. This catalogue will serve as an identification guide for the researchers and students working on benthic organisms.

ACKNOWLEDGEMENTS

This publication is an outcome of dedicated benthic biodiversity surveys around Andaman and Nicobar archipelago through the Marine Living Resources Program (MLRP) of the Ministry of Earth Sciences, Govt. of India. The support and encouragement of the Dr. M. Rajeevan, Secretary, Ministry of Earth Sciences, Govt. of India is acknowledged with deepest gratitude. The authors wish to thank Dr. G. V. M. Gupta, Director and former Directors Dr. M. Ramanamurthy, Dr. M. Sudhakar, Dr. P. Madeswaren and Dr. V. N. Sanjeevan for providing a platform for benthic biodiversity surveys (FORV *Sagar Sampada*) and constant support for the documentation of diversity of polychaetes. The support provided by the Principal Investigators Dr. Sherine Sonia Cubelio (Scientist E), Dr. Anilkumar Vijayan (Scientist E) are acknowledged with gratitude. The guidance provided by Dr. Abdul Jaleel K. U. (Scientist, CSIR-National Institute of Oceanography) for the identification of marine polychaetes is gratefully acknowledged. I genuinely acknowledge the assistance and persistent support of benthos team members Dr. Usha V. Parameswaran, Dr. Jini Jacob, Mrs. Shruthi Venugopal and Mrs. Chippy Khader. The support and cooperation from the FORV *Sagar Sampada* cruise participants rendered during sampling are gratefully acknowledged. I sincerely thank Ms. Aswathy K. M. for the illustration of polychaete species.

CONTENTS

INTRODUCTION	01
STUDY AREA	02
COLLECTION AND PRESERVATION OF POLYCHAETES	03
CLASSIFICATION OF GLYCERIFORMIA POLYCHAETES	04
IDENTIFICATION CHARACTERS OF THE GLYCERIFORMIA POLYCHAETE FAMILIES	05
DESCRIPTIVE ACCOUNT OF GLYCERIFORMIA POLYCHAETES	
<i>Glycera alba</i> (O.F. Müller, 1776)	09
<i>Glycera benguellana</i> Augener, 1931	10
<i>Glycera lancadivae</i> Schmarda, 1861	11
<i>Glycera lapidum</i> Quatrefages, 1866	12
<i>Glycera longipinnis</i> Grube, 1878	13
<i>Glycera natalensis</i> Day, 1957	14
<i>Glycera nicobarica</i> Grube, 1866	15
<i>Glycera papillosa</i> Grube, 1857	16
<i>Glycera subaenea</i> Grube, 1878	17
<i>Glycera tessellata</i> Grube, 1863	18
<i>Glycera tridactyla</i> Schmarda, 1861	19
<i>Goniada emerita</i> Audouin & H Milne Edwards, 1833	20
<i>Goniada maculata</i> Örsted, 1843	21
<i>Goniadella gracilis</i> (Verrill, 1873)	22
<i>Goniadides carolinae</i> Day, 1973	23
<i>Glycinde capensis</i> Day, 1960	24
<i>Glycinde kameruniana</i> Augener, 1918	25
<i>Paralacydonia paradoxa</i> Fauvel, 1913	26
SUMMARY	27
REFERENCES	28

INTRODUCTION

Polychaetes (poly=many, chaeta=bristles) is a class under Phylum Annelida with usually marine forms distributed widely from poles to tropics. Majority of the polychaetes species are benthic forms, while some pelagic species. Based on the body structure, feeding habits etc. polychaetes are of two different types - Errants and Sedents. Errants have well-developed parapodia, which make them fast crawlers and swimmers and are scavengers or predators as they possess strong jaws. Sedents are tube dwelling or burrowing forms, with reduced parapodia (uncini), mainly feeding on deposited organic matter (deposit feeders) on the sediment or suspended particles (suspension feeders) in the water column (Fauchald and Jumars, 1979). The substratum, mainly sediment texture and grain size along with organic matter in the sediments, are main factors for their establishment in a region (Gray and Elliott, 2009) along with bottom water dissolved oxygen, temperature and salinity. In addition, bottom currents also play a major role in their colonisation.

Polychaetes play a key role in benthic-pelagic coupling in the marine realm (Griffith *et al.*, 2017). They are major contributors of secondary production, as they obtain energy by feeding on other organisms or detritus falling on the sediments. They form a key link in the energy transfer between primary producers and tertiary consumers especially by

forming food of demersal fishes and shellfishes (Parulekar *et al.*, 1980). Organic matter falling on the sediments are ingested by polychaetes and egested as faecal pellets. These faecal pellets are degraded by microorganisms and release nutrients back to water column. The reworking of sediment particles by polychaetes through movement, tube building and sediment engulfing enhances pore ventilation, and mixing of organic matter to deeper layers of sediments, which makes the organic matter available for microbial remineralization – a process termed as ‘bioturbation’ (Hutchings, 1998). Most of the polychaetes have meroplanktonic larval stages, thereby connects benthic and pelagic realms.

Polychaetes are found in extreme environmental environments like hydrothermal vents, methane seeps, cold seeps, and oxygen minimum zones etc. as certain species are well adapted to these conditions (Levin, 2003). Due to the sedentary nature and their ability to respond environmental stress, polychaetes can be used as indicators of organic enrichment, organic contaminants, heavy metals etc. Polychaetes, being nutritionally wholesome, are used as feed for crustaceans and fish in aquaculture industry. They are also used as fresh bait in sport and commercial fishing. Chemists have isolated and characterised more than 121 compounds from polychaetes (Coutinho *et al.*, 2018).

STUDY AREA

The Andaman and Nicobar Islands are one of the significant oceanic islands in the northern Indian Ocean. It lies between 6° N and 14° N latitude and 92° E to 94° E longitude. The Andaman and Nicobar Islands, comprise of 572 islands and the island arc separates Bay of Bengal and Andaman Sea. These islands are volcanic in origin, located on the Andaman Nicobar Ridge system, at the edge of the Burma plate. The islands are covered by fringing reefs (Brown, 2007) and the uniqueness of the Andaman and Nicobar Islands, is that it houses rich biodiversity, with tropical rainforest and coral reefs. The position of this archipelago among repositories of biodiversity like the Indian subcontinent, Myanmar, Malay Archipelago, Sumatra and coral triangle through Malacca Strait, makes it an exceptional biodiversity hotspot.

The first organized oceanographic and marine biological investigations around the Andaman and Nicobar Islands were made by the expeditions of the Royal Indian Marine Survey Ship 'Investigator' (Wood-Mason and Alcock, 1891; Alcock, 1902; Sewell, 1925) and the International Indian Ocean Expedition (IIOE, 1962-1965). Quantitative aspects of bottom fauna around the Andaman and Nicobar Islands were first studied by Parulekar and Ansari (1981). The pioneer study on the qualitative aspects of benthic fauna in the insular margin of Andaman and Nicobar Islands were done during FORV *Sagar*

Sampada benthic biodiversity surveys. Exceptional diversity of polychaetes (606 species) have been reported from the Andaman and Nicobar archipelago (Gopal *et al.*, 2020) which formed the highest ever recorded polychaete species in northern Indian Ocean.

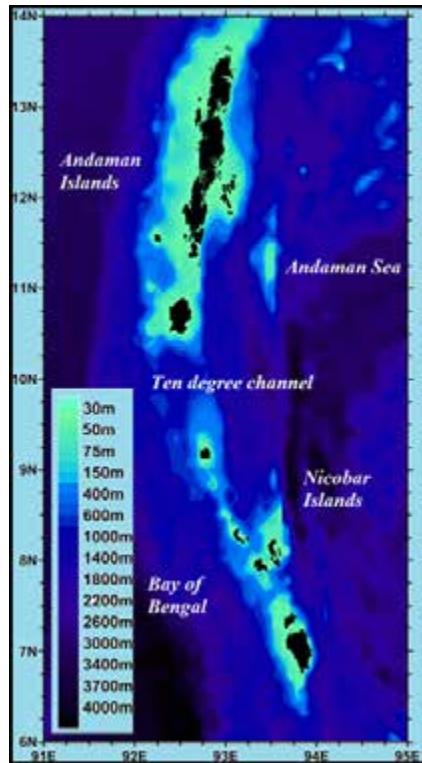


Fig. 4. Map of Andaman and Nicobar Islands.

COLLECTION AND PRESERVATION OF POLYCHAETES

Systematic stratified sampling was carried out onboard Fishery and Oceanographic Research Vessel (FORV) *Sagar Sampada* along the insular margin of the Andaman and Nicobar archipelago in three depth strata - 50m, 100m and 200m. A modified Smith-McIntyre grab was used for collecting sediments (Eleftheriou, 2013). Test sieve of 300 μ m were used for separating polychaetes and the residual sediments were collected in a tray. The organisms were narcotised using magnesium chloride solution. Then the organisms were preserved in 8% buffered formalin solution and labelled. Polychaetes were stained using Rose Bengal solution. The pink colour stained polychaetes were sorted out of the sediments using fine forceps.

Polychaetes were identified to family and genus level using

stereozoom microscope (Leica EZ4) and up to species level using compound microscope (Leica DM1000). The identification of polychaetes up to family and genus levels was done using standard keys of Fauchald (1977) and Rouse and Pleijel (2001). Species identification was done using standard keys (Fauvel, 1953; Day, 1967), taxonomic revisions (Böttgeman, 2002, 2005) and species reported from Andaman Sea (Böttgeman and Eiby-Jacobsen, 2002) and other areas of the world in the tropical zone (e.g. Uebelacker and Johnson, 1984). Validity and status of taxa (species, genera etc.) were checked and updated using the World Register of Marine Species (WoRMS, 2021). The distribution of species was based on the records of Ocean Biogeographic Information System (OBIS) and WoRMS.



Fig. 2a. Smith-McIntyre Grab



Fig. 2b. Test sieve with sediment

CLASSIFICATION OF GLYCERIFORMIA POLYCHAETES

Kingdom: Animalia
Phylum: Annelida
Class: Polychaeta Grube, 1850
Subclass: Errantia Audouin & H Milne Edwards, 1832
Order: Phyllodocida Dales, 1962
Suborder: Glyceriformia

Glyceriformia includes 4 families

Glyceridae Grube, 1850

Genus *Glycera* Lamarck, 1818
Genus *Glycerella* Arwidsson, 1899
Genus *Hemipodia* Kinberg, 1865
Genus *Proboscidea* Lesueur in Blainville, 1825

Goniadidae Kinberg, 1866

Genus *Bathyglycinde* Fauchald, 1972
Genus *Bookhoutia* Mohammad, 1973
Genus *Eone* Malmgren, 1865
Genus *Glycinde* Müller, 1858
Genus *Goniada* Audouin & H Milne Edwards, 1833
Genus *Goniadella* Hartman, 1950
Genus *Goniadides* Hartmann-Schröder, 1960
Genus *Goniadopsis* Fauvel, 1928
Genus *Ophioglycera* Verrill, 1885
Genus *Progoniada* Hartman, 1965

Paralacydoniidae Pettibone 1963

Genus *Paralacydonia* Fauvel, 1913

Lacydoniidae Bergström, 1914

Genus *Lacydonia* Marion, 1874

IDENTIFICATION CHARACTERS OF FAMILIES

Glyceridae are called as blood worms, which are found venomous causing inflammations in the skin after the bite (Böggemann, 2002). They are distributed from intertidal to abyssal depths. Glyceridae and Goniadidae possess elongate body, with numerous segments giving them a visual similarity. But there are remarkable variations in their body appendages and proboscis.

In Glyceridae, the prostomium is long, annulated and conical bearing 4 antennae at its tip. Proboscis is very long, with dense papillae of different types arranged in a manner. The jaw supports or ailerons are V shaped, which vary in shapes among species. In Goniadidae, the prostomium is similar to Glyceridae, but marked variations are present in the case of proboscis. Proboscis bears papillae, with jaws supported by large teeth or macrognaths and denticles or micrognaths which forms a circle around the mouth. V shaped chevrons are arranged in longitudinal row on either side of proboscis is a sole feature in Goniadidae. The number and shape of macrognaths, micrognaths and chevrons (number only) vary among species which form the major identification character.

In Glyceridae, the first chaetiger bears uniramous parapodia and rest of the body bears biramous parapodia while in Goniadidae, the anterior re-

gion bears uniramous parapodia and posterior region with biramous parapodia. Branchiae is present in Glyceridae while it is absent in Goniadidae. Both families have capillaries as notochaetae and compound spinigers as neurochaetae.

The families Paralacydoniidae and Lacydoniidae have similarities among each other, as the Paralacydonia was under the family Lacydoniidae, later it was erected as separate family (Pettibone, 1963). Prostomium truncate in Paralacydoniidae, whereas rounded in Lacydoniidae with both bearing a pair of antennae and palps. Large, single pair of eyes in Lacydoniidae while small subdermal eyes in Paralacydoniidae. In Lacydoniidae, a pair of cirri present in peristomium with next 2-3 segments uniramous and subsequent segments with biramous parapodia. In Paralacydoniidae, cirri absent with peristomium being apodus, with next one segment only uniramous and all other segments bears biramous parapodia. Both families bear notochaetae as simple capillaries and neurochaetae as compound spinigers.

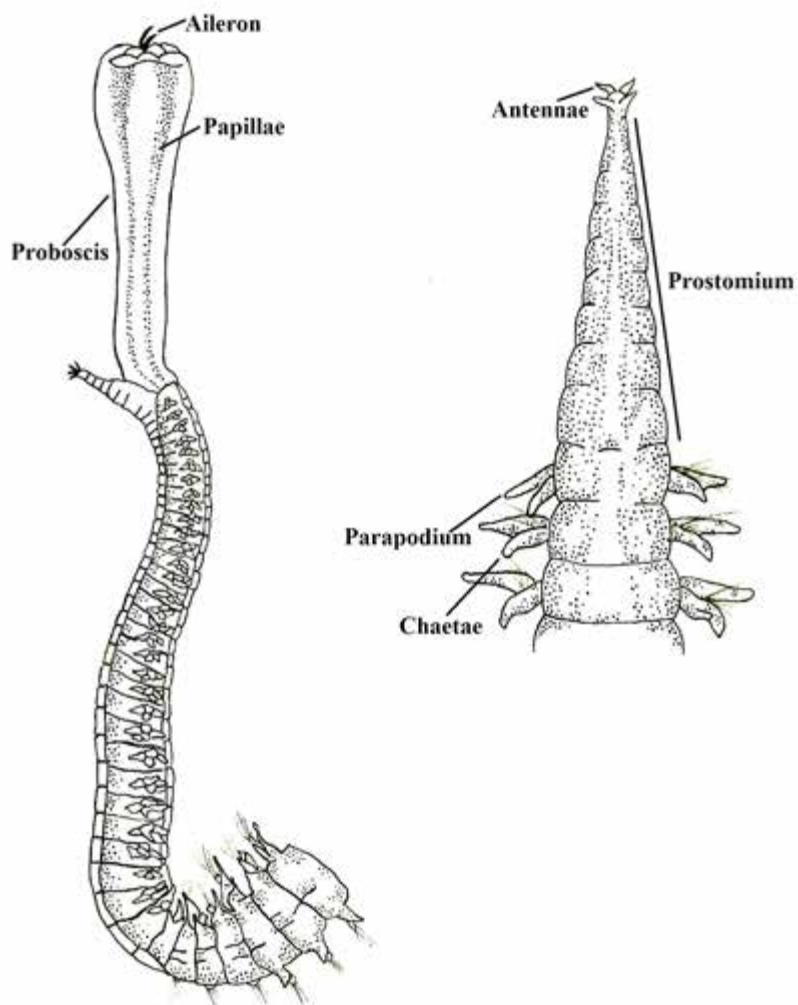


Fig. 3. Identifications characters of the family Glyceridae

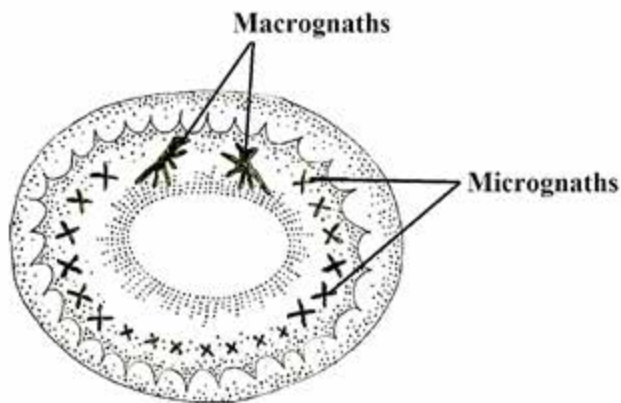
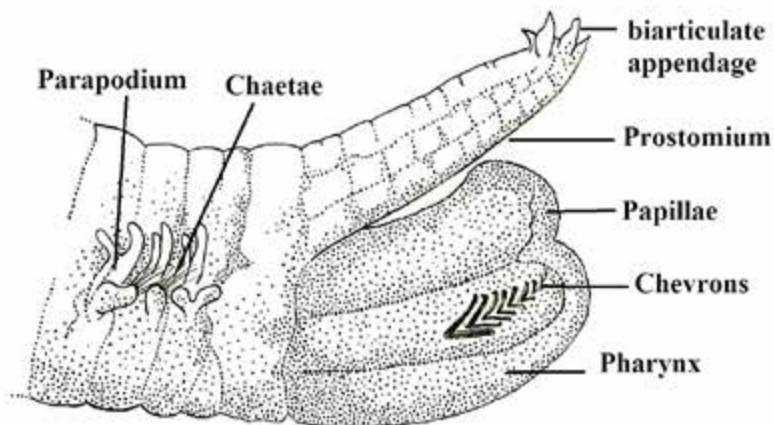


Fig. 4. Identification characters of the family Goniadidae and the cross section of the jaw

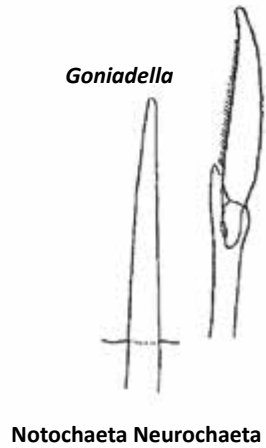
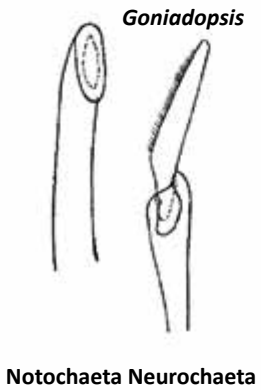
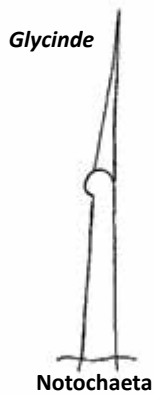
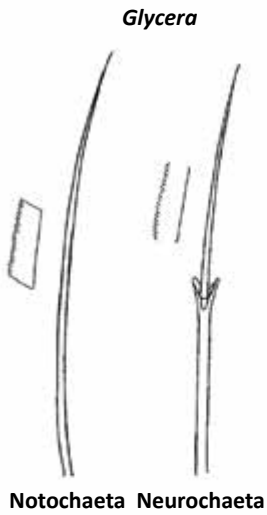


Fig. 5. Chaetae in different genera of Glyceriformia polychaetes

DESCRIPTIVE ACCOUNT OF THE POLY- CHAETES OF THE ANDAMAN AND NICOBAR ISLANDS

Family: Glyceridae Lamarck, 1818

Glycera alba (O.F. Müller, 1776)

Type locality: Norwegian EEZ

Description: Prostomium (9-11 rings) conical in shape. Proboscis bearing 3 types of papillae: 1) numerous papillae with terminal fingernail structure with long stalk and some longitudinal ridges on nail; 2) less numerous digitiform papillae with straight, median longitudinal ridge; 3) isolated, broader, oval to globular papillae without ridges. The base of ailerons is pointed and triangular. The parapodia of first 2 segments are uniramous while all other chaetigers bear biramous parapodia. The parapodia middle portion bears 2 slender triangular to digitiform prechaetal lobes of about same length and two shorter postchaetal lobes,

with slender triangular short notopodial lobe, more or less rounded neuropodial lobe. Dorsal cirri conical to oval in shape, starting from chaetiger 3 inserted on body wall slightly above parapodial base. Ventral cirri slender, triangular to digitiform in shape. It is as long as neuropodial postchaetal lobe in the anterior chaetigers whereas in posterior parapodia it becomes slender and elongated. Branchiae simple and digitiform situated dorsal side of parapodia, starting from chaetiger 17-23 as long as prechaetal lobe.

Distribution: Red Sea, Madagascar, Thailand, India - Arabian Sea, Andaman and Nicobar Islands

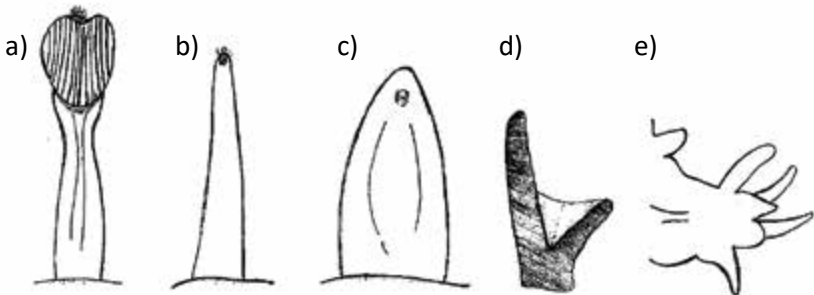


Fig. 6. *Glycera alba* a, b, c) Proboscideal papillae, d) Aileron, e) Parapodium

Glycera benguellana Augener, 1931

Type locality: Norwegian EEZ

Description: Prostomium long, with numerous indistinct rings. Proboscis with 2 types of papillae 1) few broadly conical papillae and 2) numerous digitiform ones with 10-16 rings. Aileron are blade-like, the shorter limb being a mere expansion at the base of the other. Parapodia with two triangular prechaetal lobes with superior one is slightly shorter in the middle of the body and in posterior segments. The postchaetal lobe is low and rounded.

Dorsal cirrus is relatively large and arises in the junction of the parapodium with the body. Branchiae absent.

Distribution: Africa, India - Arabian Sea, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

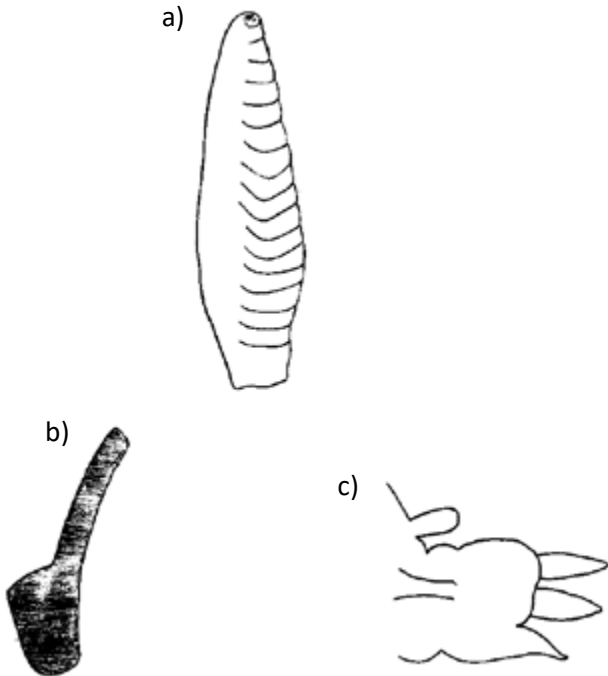


Fig. 7. *Glycera benguellana* a) Proboscideal papilla, b) Aileron, c) Parapodium

***Glycera lancadivae* Schmarda, 1861**

Type locality: Sri Lanka

Description: Prostomium (9-12 rings) conical in shape. Proboscis bearing 2 types of papillae: 1) numerous digitiform papillae with undulating ridges, 2) few shorter and broader, conical to oval papillae without ridges. Ailerons with slight dent in pointed triangular base. The parapodia of first 2 segments are uniramous while following chaetigers bear biramous parapodia. Two slender, triangular to digitiform prechaetal lobes and neuropodial lobes were twice longer than notopodial lobes. One short rounded post-

chaetal lobe. Dorsal cirri oval to globular in shape, starting from chaetiger 3 inserted on body wall above parapodial base. Ventral cirri slender, triangular to digitiform in shape, about as long as postchaetal lobe whereas in posterior parapodia it becomes slender and elongated. Branchiae absent.

Distribution: Red Sea, Madagascar, India - Arabian Sea, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands



Fig. 8. *Glycera lancadivae* Parapodium

Glycera lapidum Quatrefages, 1866

Type locality: Berwick Bay, England

Description: Prostomium conical in shape and long (as long as 9 chaetigers), consisting of about 9-12 rings. Proboscideal papillae of two types 1) numerous, digitiform papillae sometimes with discreet undulating ridge, 2) isolated, shorter and broader, conical papillae without ridges. Aileron with slight bent in pointed triangular base. The parapodia of first 2 chaetigers uniramous, following parapodia biramous, with two triangular to digitiform prechaetal lobes. Notopodial lobe usually small. Neuropodial lobe twice longer than notopodial lobe.

Single, short and rounded postchaetal lobe. Dorsal cirrus oval to round in shape, inserted dorsolaterally on body wall far from parapodial base starting from 3rd chaetiger. Ventral cirrus triangular to digitiform slightly smaller than postchaetal lobe, starting from first parapodium. Notosetae simple capillaries covered with minute serrations. Neurosetae compound spinigers with smooth shafts and blades with minute serrations Branchiae absent. Pygidium rounded with dorsal anus.

Distribution: Australia, Indonesia, India – Arabian Sea, Andaman and Nicobar Islands

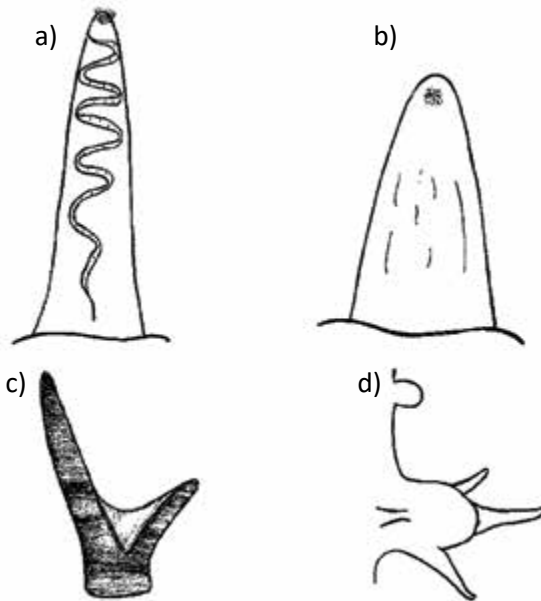


Fig. 9 . *Glycera lapidum* a, b) Proboscideal papillae, c) Aileron, d) Parapodium

Glycera longipinnis Grube, 1878

Type locality: Philippines

Description: Prostomium (12 rings) conical in shape. Proboscis with 2 types of papillae 1) long cylindrical papillae without rings 2) few stout forms. Aileron with two long slender rami, one twice the length of the other and narrowly united at the base. Prechaetal lobes elongate, pointed and subequal whereas postchaetal lobes single low, rounded or faintly bilobed structure. Dorsal cirrus ovoid. Ventral cirrus triangular, much shorter than

the prechaetal lobes. Notochaetae and neurochaetae with rows of minute spinules along the blades. Branchiae present from the 20th chaetiger. Branchiae is a single filament situated on the dorsal edge of the parapodia longer than the prechaetal lobes.

Distribution: Red Sea, Sumatra, India - Arabian Sea, Bay of Bengal, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

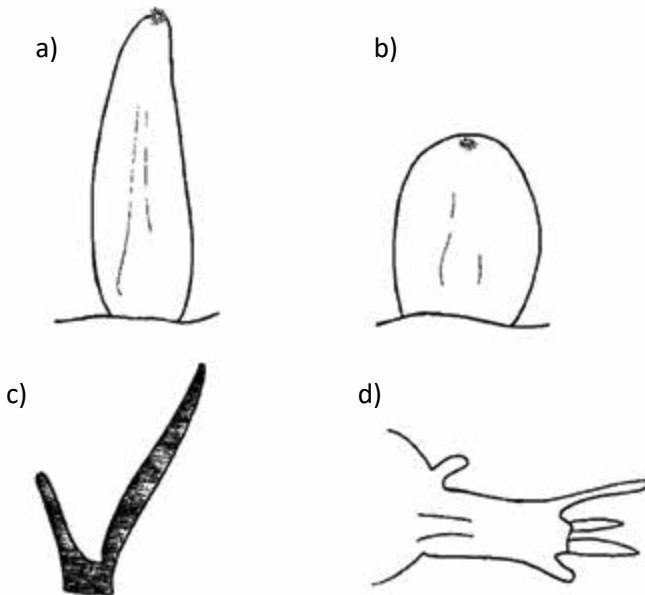


Fig. 10. *Glycera longipinnis* a, b) Proboscideal papillae, c) Alieron, d) Parapodium

Glycera natalensis Day, 1957

Type locality: Durban, South Africa

Description: Prostomium (16-21 rings) conical in shape. Proboscis bearing 3 types of papillae: 1) numerous papillae with terminal fingernail structure with long stalk with V shaped ridges and some longitudinal ridges on nail, 2) less numerous digitiform papillae with indistinct straight, median longitudinal ridge; 3) isolated, broader, oval to globular papillae without ridges. The base of ailerons is triangular. The parapodia of first 2 segments are uniramous while all other chaetigers bear biramous parapodia. The parapodia bears 2 slender triangular to digitiform prechaetal lobes of about same length. Two shorter postchaetal lobes with rounded lobes in the anterior region whereas in the following chaetigers

notopodial lobe slender triangular and slightly longer than rounded neuropodial lobe. Dorsal cirri conical to oval in shape, starting from chaetiger 3 inserted on body wall slightly above parapodial base. Ventral cirri slender, triangular to digitiform in shape, about as long as neuropodial postchaetal lobe whereas in posterior parapodia it becomes slender and elongated. Branchiae simple and digitiform, situated termino-dorsally on parapodia, starting from chaetiger 32-53rd chaetiger to near posterior end.

Distribution: Africa, Sri Lanka, India - Arabian Sea, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

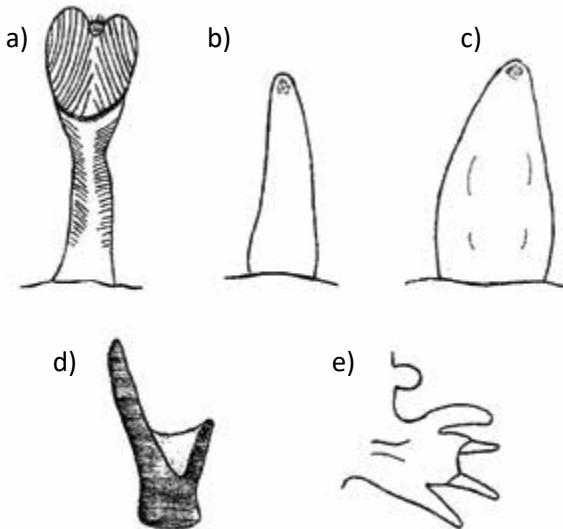


Fig. 11 . *Glycera natalensis* a, b, c) Proboscideal papillae, d) Aileron, e) Parapodium

Glycera nicobarica Grube, 1866

Type locality: Nicobar Islands

Description: Conical prostomium consisting of about 9–11 rings. Proboscis with two types of papillae 1) numerous conical papillae with 3 U shaped ridges, 2) isolated, broader and globular papillae without ridges. Ailerons with triangular base. First 2 parapodia uniramous, following parapodia biramous. Biramous parapodia consists of 2 slender triangular to digitiform prechaetal lobes of about same length. Two shorter postchaetal lobes present with slender triangular notopodial and shorter, rounded neuropodial post-

chaetal lobe. Dorsal cirri from chaetiger 2, conical to oval, inserted on body wall slightly above parapodial base. Ventral cirri slender triangular to digitiform, about as long as neuropodial postchaetal lobe whereas in posterior parasodia slender and elongated, situated termino-ventrally on parapodia. Branchiae simple and digitiform starting from 16–30th parapodium to near posterior end, situated medially on anterior side of parapodia, which may extend beyond prechaetal lobes in the middle portion of the body.

Distribution: Australia, Thailand, India - Andaman and Nicobar Islands

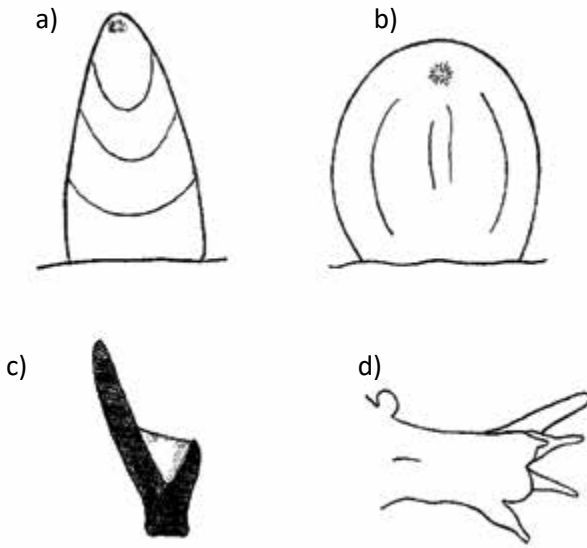


Fig. 12. *Glycera nicobarica* a, b) Proboscideal papillae, c) Aileron, d) Parapodium

Glycera papillosa Grube, 1857

Type locality: Chile

Description: Prostomium conical with 8 rings. The papillae on the proboscis includes 2 types 1) a few ovoid forms and 2) numerous long, slender forms without rings. Aileron are deeply forked and slender, the shorter limb being half the length of the longer one and united to it. The superior prechaetal lobe is small, the inferior one large and pointed. Single rounded postchaetal lobe present. Dorsal cirrus is small

arises from body wall above the parapodium. Ventral cirrus has a length of postchaetal lobe. Branchiae absent.

Distribution: India - Arabian Sea, Bay of Bengal, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

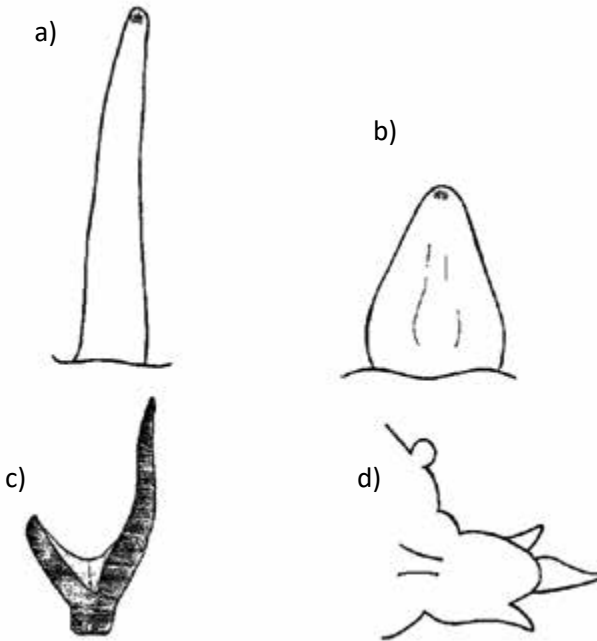


Fig. 13 . *Glycera papillosa* a, b) Proboscideal papillae, c) Aileron, d) Parapodium

Glycera subaenea Grube, 1878

Type locality: Philippines

Description: Prostomium with 8 rings. Aileron with one well developed prong and the other prong short and completely united to the first by an oblique shelf. Proboscis with 2 types of papillae 1) numerous bluntly conical papillae with 1-2 rings 2) subspherical papillae without rings. Parapodia with 2 long, equal pointed prechaetal lobes. The superior postchaetal lobe is pointed, the inferior one is shorter and

blunt. Branchiae starting from chaetiger 12 situated on the anterior end of parapodium, with 2 to 5 branched digitiform lobes.

Distribution: Australia, Madagascar, India - Arabian Sea, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

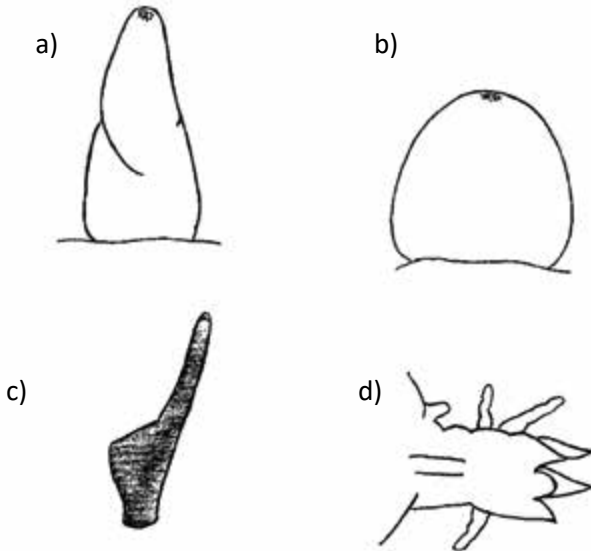


Fig. 14. *Glycera subaenea* a, b) Proboscideal papillae, c) Aileron, d) Parapodium

Glycera tessellata Grube, 1863

Type locality: Mediterranean Sea

Description: Prostomium conical, long (as long as first 12 chaetigers) with indistinct rings. Proboscideal papillae of two types 1) numerous digitiform papillae posteriorly with straight, median, longitudinal ridge 2) isolated, shorter and broader, conical papillae, posteriorly with more or less distinctly straight, median, longitudinal ridge. Anterior margins of both papillae smooth. Aileron with deeply incised base. Parapodia of first 2 chaetigers uniramous, with single prechaetal and postchaetal lobe. The parapodia in the subsequent chaetigers biramous, with 2 triangular to digitiform prechaetal lobes of about same length. Notopodial lobe slightly shorter than the neu-

ropodial lobe on anterior to median parapodia whereas notopodial lobe usually slightly shorter than neuropodial lobe on median to posterior parapodia. Two short, rounded postchaetal lobes, about same length, but both lobes becoming slender on posterior parapodia. Dorsal cirrus conical to oval in shape, inserted on body wall near parapodial base starting from chaetiger 3. Ventral cirrus triangular to digitiform, shorter than the postchaetal lobes. Parapodia with simple capillary notochaetae and compound spinigerous neurochaeta. Branchiae absent.

Distribution: Red Sea, Madagascar, India - Arabian Sea, Bay of Bengal, Andaman and Nicobar Islands

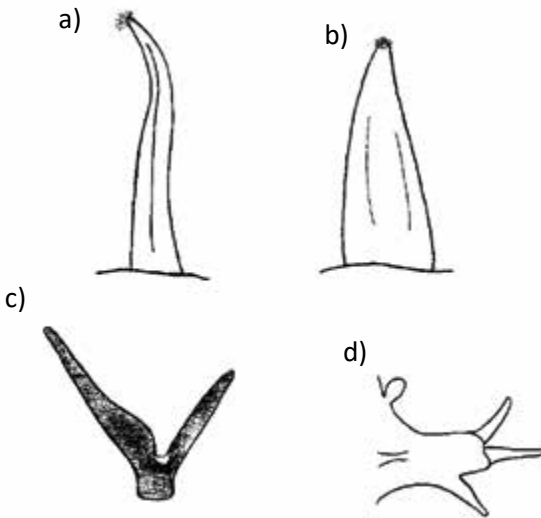


Fig. 15. *Glycera tessellata* a, b) Proboscideal papillae, c) Aileron, d) Parapodium

Glycera tridactyla Schmarda, 1861

Type locality: Atlantic Ocean

Description: Conical prostomium (13–15 rings) terminal ring with 4 appendages. Proboscis with 3 types of papillae: 1) numerous papillae with terminal fingernail structure on posterior surface, with short stalk and some longitudinal ridges on nail; 2) less numerous and slightly shorter conical papillae; 3) isolated, broader, oval to globular papillae without ridges. Proboscis with 4 hook-shaped jaws. Ailerons with triangular base. The parapodia in first two chaetigers uniramous while in following chaetigers parapodia biramous. Two triangular to digitiform prechaetal lobes of about same length. Two shorter postchaetal lobes, anteriorly both lobes rounded and in following parapodia notopodial lobe elongated and slender triangular, distinctly longer than rounded. Neuro-podial lobe blunt and triangular. Notopod-

dial lobe in posterior parapodia slender and elongated. Dorsal cirri is conical to oval in shape, inserted on body wall slightly above parapodial base starting from 3rd chaetiger. Ventral cirri slender, triangular to digitiform in shape, about as long as neuropodial postchaetal lobe in the anterior chaetigers. In posterior parapodia, ventral cirri is slender and elongated. Notopodia and neuropodia each with a single acicula. Notochaetae capillaries. Neurochaetae compound spinigers with blades of different lengths. Branchiae digitiform starting from about 21- 32nd parapodium to near posterior end, situated termino-dorsally on parapodia. Pygidium with dorsal anus and terminal pair of slender, elongated cirri.

Distribution: Red Sea, Gulf of Oman, Gulf of Aden, Africa, Madagascar, Australia, India - Arabian Sea, Bay of Bengal, Andaman and Nicobar Islands

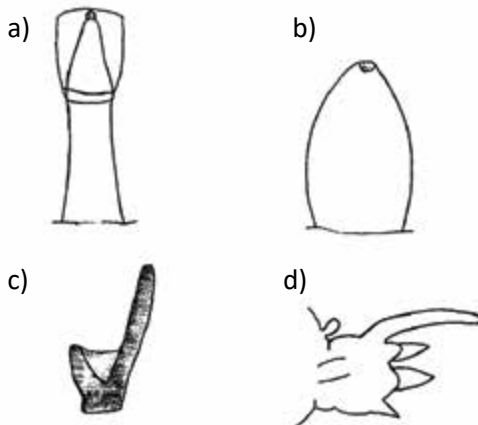


Fig. 16. *Glycera tridactyla* a, b) Proboscideal papillae, c) Alieron, d) Parapodium

Family: Goniadidae Kinberg, 1866

Goniada emerita Audouin & H Milne Edwards, 1833

Type locality: Mediterranean Sea

Description: Prostomium (9–10 rings) with terminal annulus bearing biarticulate appendages. Proboscis dorsally with large number of irregularly arranged papillae, lateral and ventral parts with few papillae in more or less distinct longitudinal rows. Basal papillae rounded to heart-shaped. Dorsal papillae heart-shaped to rectangular with broadly rounded tip on short stalks. Lateral papillae smaller heart-shaped with slightly laterally bent tip on short stalks. Ventral papillae smaller heart-shaped to rounded papillae on short stalks. Terminal papillae all small, rounded and without stalks. Macrognaths tridentate to hexadentate. Dorsal and ventral compound micrognaths present. Proboscis with 4–26 chevrons on each side.

First segment partially apodous and achaetous, with a pair of small lateral cirri. First chaetiger with one neuropodial prechaetal and one postchaetal lobe. Anterior chaetigers uniramous while following parapodia biramous with conical to triangular notopodial lobes. Parapodia is enlarged from middle chaetiger with clearly separated

notopodia and neuropodia. Neuropodial postchaetal lobes slightly elongated. In posterior parapodia notopodial lobes, lower neuropodial prechaetal lobes and neuropodial postchaetal lobes shorter and upper neuropodial prechaetal lobes slightly more slender. Dorsal cirri on anterior chaetigers digitiform, about as long as neuropodial postchaetal lobes or slightly shorter. In biramous parapodia, dorsal cirri more conical and about as long as notopodial lobe. In the posterior parapodia dorsal cirri is slender, elongated and digitiform. Ventral cirri in anterior parapodia digitiform, about as long as neuropodial postchaetal lobes or slightly longer. In posterior parapodia, ventral cirri is slender, elongated and digitiform, about as long as upper neuropodial prechaetal lobes. Acicular notochaetae with straight tip, situated between dorsal cirrus and notopodium. Neurochaetae compound spinigers with blades of different lengths.

Distribution: Madagascar, Australia, India - Arabian Sea, Bay of Bengal, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands



Fig. 17. *Goniada emerita* a) Proboscideal papilla, b) anterior parapodium, c) posterior parapodium

Goniada maculata Örsted, 1843

Type locality: Denmark

Description: Prostomium (9–10 rings) with terminal annulus bearing biarticulate appendages. Proboscis dorsally with irregularly arranged papillae, lateral and ventral parts with fewer papillae arranged in longitudinal rows. Pillow-like papillae in dorso-basal part below prostomium and rounded papillae with about tiny teeth in ventro-basal part. Basal papillae rounded on short stalks, with tiny teeth and terminal papillae small, rounded and without stalks. Macrognaths quadri- to octodentate. Dorsal arc with 4 smaller, inverted Y-shaped micrognaths with bifid tips and ventral arc with compound micrognaths. 3-11 chevrons on each side of proboscis.

Anterior chaetigers with a single neuropodial prechaetal and postchaetal lobe. The upper prechaetal lobe digitiform, longer while postchaetal lobe is shorter and triangular. Middle chaeti-

gers with biramous parapodia, bearing conical to triangular notopodial lobes and lower neuropodial prechaetal lobes more digitiform. Dorsal cirri on uniramous parapodia digitiform, about as long as neuropodial postchaetal lobes or slightly shorter and ventral cirri is slightly longer than neuropodial postchaetal lobes. In biramous parapodia dorsal cirri are conical and about as long as notopodial lobes and ventral cirri is conical, about as long as neuropodial postchaetal lobes. In posterior parapodia, ventral cirri is slender elongated and digitiform, about as long as upper neuropodial prechaetal lobes or slightly shorter. Notochaetae capillary chaetae and neurochaetae compound spinigers.

Distribution: Red Sea, India - Arabian Sea, Bay of Bengal, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

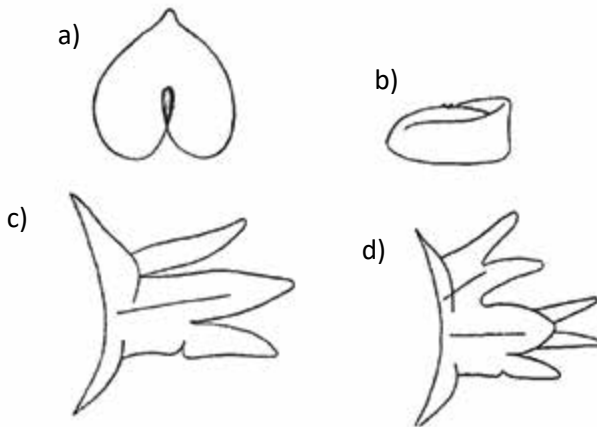


Fig. 18. *Goniada maculata* a, b) Proboscideal papillae, c) anterior parapodium, d) posterior parapodium

Goniadella gracilis (Verrill, 1873)

Type locality: : Massachusetts

Description: Prostomium (8 rings) having terminal annulus with biarticulate appendages. Proboscis with papillae of different types 1) dorsal rows with numerous heart-shaped papillae on short stalks 2) lateral ones few in number, smaller heart-shaped with slightly laterally bent tip on shorter stalks, 3) ventral rows with few small bifid rectangular papillae without stalks, 4) few small distally rounded papillae present around chevrons and in basal and terminal proboscis parts 5) in dorso-basal part pillow-like papillae were present below prostomium. Macrognaths bidentate to quadridentate. Dorsal and ventral compound micrognaths present. 4–32 chevrons on each side of proboscis, each one with slender arms and a pointed tip. First segment apodous and achaetous, with a pair of small lateral cirri. Anterior chaetigers with uniramous parapodia. The following sub-bira-

mous parapodia, with one digitiform neuropodial prechaetal lobe and one short, rounded postchaetal lobe. Notopodial lobes absent. Dorsal cirri on anterior chaetigers conical, about as long as neuropodial postchaetal lobes. In sub-biramous parapodia, dorsal cirri slender triangular, shorter than notopodial postchaetal lobes. Ventral cirri on anterior and median chaetigers digitiform, about as long as neuropodial postchaetal lobes or slightly shorter. Straight acicular notochaetae, with slightly bent tip. In posterior parapodia, ventral cirri is slender and digitiform, about as long as neuropodial prechaetal lobes or slightly shorter. Neurochaetae compound with blades of different lengths.

Distribution: India - Arabian Sea, Bay of Bengal, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

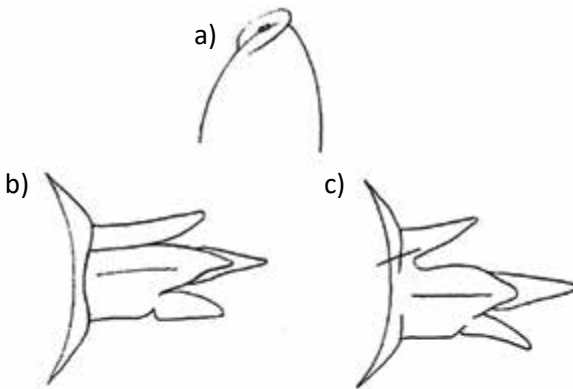


Fig. 19. *Goniada gracilis* a) Proboscideal papilla, b) anterior parapodium, c) posterior parapodium

Goniadides carolinae Day, 1973

Type locality: North Carolina

Description: Prostomium (8 rings) with terminal annulus having biarticulate appendages. Proboscis with different types of papillae, arranged in distinct longitudinal rows 1) long, unidentate, fang-shaped papillae with bent tip and broad base, 2a) slightly shorter, unidentate, fang shaped papillae with slightly bent tip and smaller base, 2b) shorter, unidentate, more or less straight, conical papillae with slender base, 3) small, stout conical papillae, 4) slightly smaller, stout conical to globular papillae, 5) distinctly smaller, globular to rounded papillae, 6) without papillae; small rounded papillae without cilia in dorso-basal part below prostomium. Macrognaths tridentate to hexadentate, 3-14 dorsal and 0-3 ventral compound micrognaths. Chevrons absent.

First segment apodous and achaetous,

only with a pair of small lateral cirri. Anterior 7-9 chaetigers with uniramous parapodia, following region with sub-biramous parapodia, with one pointed digitiform neuropodial prechaetal lobe and one short, rounded postchaetal lobe, notopodial lobes absent. Dorsal and ventral cirri pointed digitiform, of same length, both shorter than neuropodial postchaetal lobes. In posterior parapodia, dorsal and ventral cirri slender and elongated. 2 acicular notochaetae with curved tip, arising from body wall dorsal to dorsal cirri. Neurochaetae compound with blades of different lengths, uppermost and lowermost ones falcigers with short blades and middle ones spinigers with longer blades.

Distribution: Madagascar, Thailand, India - Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

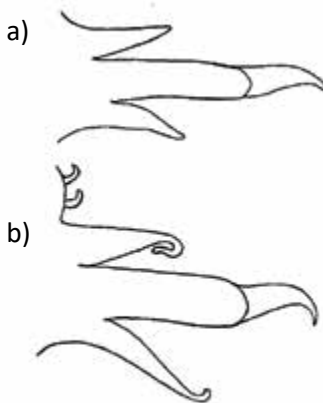


Fig. 20. *Goniadides carolinae* a) anterior parapodium, b) posterior parapodium

Goniadella gracilis (Verrill, 1873)

Type locality: South Africa

Description: Prostomium (10 rings) terminal annulus with biarticulate appendages. Proboscis with several different types of papillae, arranged in distinct longitudinal rows 1) one row of small teapot-shaped papillae with laterally directed beak 2) short, tridentate papillae with broad base; longer fang-shaped papillae of decreasing in length, bases becoming slender and tips less curved; unidentate papillae; bidentate papillae with decreasing distance between distal and subdistal tooth 3) one row of small, rectangular papillae with narrow base and more or less developed short lateral beaks 4) one row of duckfoot-shaped papillae 5) one row of straight conical papillae, tip sometimes appears to be separated 6) without papillae; double row of spatulate papillae in dorso-basal part below prostomium and small conical papillae without cilia in ventro-basal part. Macrognaths tri- to quinquedentate, 4–26 dorsal and 0 ventral compound micrognaths. Chevrons absent. Anterior chaetigers with conical to digitiform neuropodial prechaetal lobe

and short rounded to conical postchaetal lobe. Anterior region with uniramous chaetigers, following parapodia biramous with conical notopodial prechaetal lobes and distinctly shorter rounded postchaetal lobes. Middle chaetiger parapodia slightly enlarged and with notopodia and neuropodia clearly separated, lobes of about same shape. In posterior parapodia, notopodial prechaetal lobes and neuropodial postchaetal lobes shorter and neuropodial prechaetal lobes slightly more slender. Dorsal cirri on biramous parapodia is more conical and about as long as notopodial prechaetal lobes or slightly longer. Ventral cirri on biramous parapodia is conical and shorter than neuropodial postchaetal lobes. Notochaetae stout, hooked at tip and with terminal pointed hood. Neurochaetae compound spinigers with blades of different lengths.

Distribution: Africa, India - Arabian Sea, Bay of Bengal, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

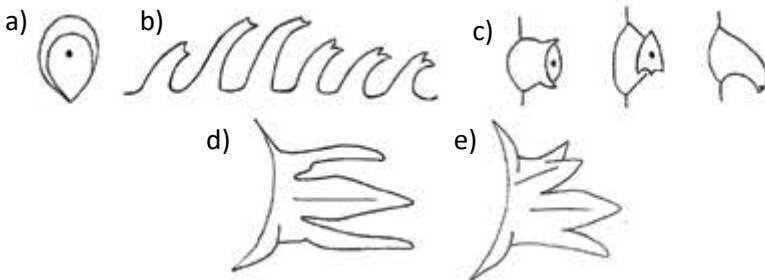


Fig. 21. *Glycinde capensis* a, b, c) Proboscideal papillae, d) anterior parapodium, e) posterior parapodium

Glycinde kameruniana Augener, 1918

Type locality: West Africa

Description: Prostomium (8–10 rings) having terminal annulus with biarticulate appendages. Proboscis with several different types of papillae, arranged in distinct longitudinal rows and best developed in median proboscoidal part; 1) one row of small teapot-shaped papillae with lateral directed beak; 2) short, unidentate papillae with broad base; longer fang-shaped papillae decreasing in length, bases becoming slender and tips less curved; unidentate papillae; bidentate papillae with decreasing distance between distal and subdistal tooth, 3) one row of small, rectangular papillae with narrow base and more or less developed short lateral beaks 4) one row of duckfoot-shaped papillae 5) one row of straight conical papillae, tip sometimes appears to be separated 6) without papillae; double row of more globular papillae without cilia in dorso-basal part below prostomium. Macrognaths tri- to quinquedentate, 4 small dorsal and 0 ventral micrognaths, with globular bases. Chevrons

absent.

Anterior region with uniramous chaetigers, following parapodia biramous with conical notopodial prechaetal lobes and distinctly shorter rounded postchaetal lobes. Middle chaetiger parapodia slightly enlarged and with separated noto and neuropodia, with lobes of about same shape. In posterior parapodia notopodial prechaetal lobes and neuropodial postchaetal lobes shorter and slender neuropodial prechaetal. Dorsal cirri on biramous parapodia, dorsal is conical and slightly longer than notopodial prechaetal lobes. Ventral cirri on biramous parapodia is conical, shorter than neuropodial postchaetal lobes. Notochaetae stout, hooked at tip and with terminal pointed hood. Neurochaetae compound spinigers with blades of different lengths.

Distribution: Australia, Madagascar, India - Arabian Sea, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

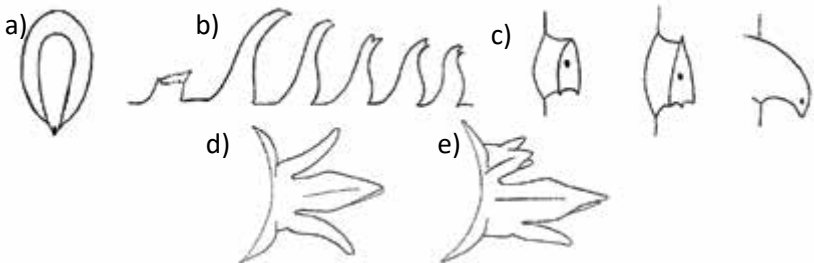


Fig. 22. *Glycinde kameruniana* a, b, c,) Proboscideal papillae, d) anterior parapodium, e) posterior parapodium

Family: Paralacydoniidae Pettibone, 1963

Paralacydonia paradoxa Fauvel, 1913

Type locality: Monaco, Mediterranean Sea

Description: Prostomium subconical with 4 small subequal frontal antennae. Peristome reduced and without parapodia. Peristomium without appendages, with ventral mouth. First chaetiger uniramous with bilobed prechaetal lobe and conical postchaetal lobe, with compound spinigerous chaetae and few simple chaetae. Ventral cirrus present. All other chaetigers bears biramous parapodia. The parapodium of 2nd chaetiger with a well separated dorsal and ventral rami, with dorsal ramus being shorter than ventral one. Middle parapodium with elongate notopodium with shorter rounded postchaetal lobe and unequally bilobed prechaetal lobe with upper part short, rounded and lower part longer, papilliform, extending ventrally. Notopodium with a well-devel-

oped chaetigerous lobe with a rounded chaetal lip and a larger notched postchaetal lamella. Neuropodium larger than the notopodium with a low rounded prechaetal lip, a fan of neurochaetae and a large notched postchaetal lamella and a digitiform ventral cirrus. Dorsal cirri short, digitiform, dorsal to notopodia and ventral cirri cylindrical, extending distally to end of neuropodial lobe. Notochaetae are all simple capillaries. Neurochaetae are heterogomph spinigers with one side of stem-head produced as a spine and the blade serrated on one margin along with 1-2 simple capillaries inferiorly.

Distribution: Australia, Sumatra, India - Arabian Sea, Andaman and Nicobar Islands

Remarks: First report from Andaman and Nicobar Islands

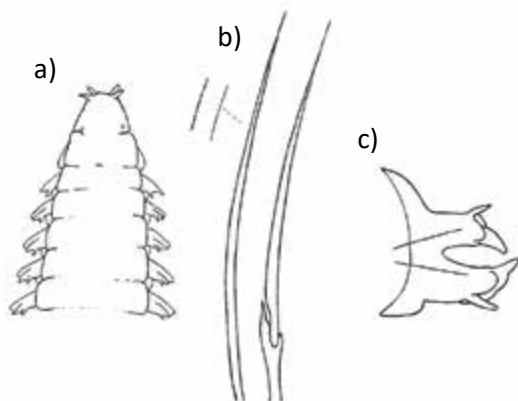


Fig. 23. *Paralacydonia paradoxa* a) Anterior end of the body, b) notochaeta, c) neurochaeta, d) Parapodium

SUMMARY

The catalogue on “Glyceriformia (Annelida: Polychaeta) from Andaman and Nicobar Islands” provides descriptions and illustrations of 18 polychaete species from the archipelago. The order Glyceriformia includes segmented worms with well-developed jaws and macrognaths, which includes blood worms with venomous glands. They are widely distributed in the world oceans forming food source for demersal fishes. They are also used as bait in capture fisheries. Among the 18 polychaete species, 12 species are reported for the first time from the insular margin of the Andaman and Nicobar Islands. Among the four families of Glyceriformia, 3 families viz. Glyceridae, Goniadidae, Paralacydoniidae are represented around the Island ecosystem. The family Glyceridae is most speciose with 11 species. Family Goniadidae represents new records of the genera *Goniada*, *Glycinde* and *Goniadella* from Andaman and Nicobar Islands. Family Paralacydoniidae is found to be a new record from the archipelago. These findings highlight the importance of continuous systematic biodiversity surveys around the Islands ecosystems to unearth the ecologically important polychaetes.

REFERENCES

- Böggemann, M. (2002). Revision of the Glyceridae Grube 1850 (Annelida: Polychaeta). *Abhandlungen der Senckenbergischen naturforschenden Gesellschaft*. 555, 1-249
- Böggemann, M. (2005). Revision of the Goniadidae (Annelida: Polychaeta). *Abhandlungen des Naturwissenschaftlichen Vereins in Hamburg. (Neue Folge)* 39, 1-354.
- Böggemann, M. and Eibye-Jacobsen, D. (2002). The Glyceridae and Goniadidae (Annelida: Polychaeta) of the BIOSHELF Project, Andaman Sea, Thailand. *Phuket Marine Biological Center Special Publication*, 24, 149-196.
- Brown. (2007). Coral reefs of the Andaman Sea- An integrated perspective In: *Oceanography and marine biology: an annual review* (Eds. Gibson RN, Atkinson RJA & Gordon JD). CRC press 45, 173-194.
- Coutinho, M. C. L., Teixeira, V. L., Santos, C. S. G. (2018). A review of “polychaeta” chemicals and their possible ecological role. *Journal of chemical ecology* 44(1), 72-94.
- Day, J. H. (1967). A monograph on the Polychaeta of Southern Africa. Part 1. *Errantia*. British Museum (Natural History), London. 458 pp.
- Eleftheriou, A. (2013). *Methods for the study of marine benthos*. 4th edn. John Wiley & Sons, UK.
- Fauchald, K. (1977). The polychaete worms. Definitions and keys to the orders, families and genera. *Natural History Museum of Los Angeles County, Science Series*. 28, 1-190.
- Fauchald, K., and Jumars, P. A. (1979). The diet of worms: a study of polychaete feeding guilds. *Oceanography and marine biology: an annual review*. 17, 193-284.
- Fauvel, P. (1953). The Fauna of India including Pakistan, Ceylon, Burma and Malaya. *Annelida Polychaeta*. Indian Press, Allahabad, 12, 507pp.
- Gopal, A., Abdul Jaleel, K. U., Parameswaran, U. V., Sanjeevan, V. N., Saramma, A. V., Vijayan, A., Saravanan, N., Gupta, G. V. M. and Sudhakar, M. (2020). Distinctive community patterns with exceptional diversity of polychaetes around a tectonically active archipelago in the tropical Indian Ocean. *Frontiers in Marine Science*, 7, 710.
- Gray, J.S. and Elliott, M. (2009). *Ecology of marine sediments: from science to management*. 2nd edn. Oxford University Press on Demand. 256 pp.
- Griffiths, J. R., Kadin, M., Nascimento, F. J., Tamelander, T., Törnroos, A., Bonaglia, S., Bonsdorff, E., Brüchert, V., Gårdmark, A., Järnström, M. and Kotta, J. (2017). The importance of benthic–pelagic coupling for marine ecosystem functioning in a changing world. *Global Change Biology* 23(6), 2179-2196.
- Hutchings, P. (1998). Biodiversity and functioning of polychaetes in benthic sediments. *Biodiversity and Conservation*, 7(9), 1133-1145.
- Imajima, M. (2003). Polychaetous Annelids from Sagami Bay and Sagami Sea collected by the Emperor Showa of Japan and deposited at the Showa Memorial Institute, National Science

- Museum, Tokyo (II). Orders included within the Phyllodocida, Amphinomida, Spintherida and Eunicida. National Science Museum Monographs. 23, 1-221.
- Levin. (2003). Oxygen minimum zone benthos: Adaptation and community response to hypoxia. In: Oxygen minimum zone benthos: adaptation and community response to hypoxia (Eds. Gibson RN & Atkinson RJA, 2003), *Oceanography and marine biology: an annual review* 41, 1-45.
- Parulekar, A. H., Harkantra, S. N. and Ansari, Z. A. (1982). Benthic production and assessment of demersal fishery resources of the Indian seas. *Indian Journal of Marine Science*, 11, 107-114.
- Rouse, G. and Pleijel, F. (2001). *Polychaetes*. Oxford University Press. 354 pp.
- Sewell, R. B. S. (1925). Geographic and oceanographic research in Indian waters. Part II. A study of the nature of the sea bed and of the deep-sea deposits of the Andaman Sea and Bay of Bengal. *Memories of the Asiatic Society of Bengal Calcutta*, 9 (2): 27-50, 2 pls.
- Uebelacker, J. M. and Johnson, P. G. (1984). Taxonomic guide to the polychaetes of the Northern Gulf of Mexico (Vol. 5). Barry A. Vittor & Associates. 32-34.
- Wood-Mason, J. and Alcock, A. (1891). Natural history notes from HM Indian marine survey steamer 'Investigator,' Commander RF Hoskyn, RN, commanding. On the results of deep-sea dredging during the season 1890-91. *Journal of Natural History* 8(46), 268-286.
- WoRMS (2021). World Polychaeta Database. Glyceriformia. Accessed through: World Register of Marine Species at: <http://www.marinespecies.org/aphia.php?p=taxdetails&id=929> on 2021-07-20

Centre for Marine Living Resources and Ecology (CMLRE)
Atal Bhavan, Ministry of Earth Sciences, Government of India
LNG Road, Puthuvypin South, Ochanthuruthu P.O, Kochi-682508