ภาควิภาคเปรียบเทียบของหอยทากบกบางชนิดในป่าชายเลนบริเวณอ่าวไทยตอนบน

นายสราวุธ คลอวุฒิมันตร์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
สาขาวิชาสัตววิทยา ภาควิชาชีววิทยา
คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2543

ISBN 974-346-544-8

An39

โครงการ BRT ชั้น 15 อาคารมหานครยิบซั่ม
539/2 ถนนศรีอยุธยา เขตราชเทวี กรุงเทพฯ 10400

16 พ.ย. 2543

กายวิภาคเปรียบเทียบของหอยทากบกบางชนิดในป่าชายเลนบริเวณอ่าวไทยตอนบน

นายสราวุธ คลอวุฒิมันตร์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
สาขาวิชาสัตววิทยา ภาควิชาชีววิทยา
คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2543

ISBN 974-346-544-8

COMPARATIVE ANATOMY OF SOME LAND PULMONATE SNAILS IN A MANGROVE HABITAT OF UPPER GULF OF THAILAND

Mr. Sravut Klorvuttimontara

A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Science in Zoology

Department of Biology

Faculty of Science

Chulalongkorn University

Academic Year 2000

ISBN 974-346-544-8

542027

Thesis Title	Comparative anatomy of some land pulmonate snails in a mangrove habitat of upper gulf of Thailand
By	Mr. Sravut Klorvuttimontara
Department	Biology
Thesis Advisor	Associate Professor Dr. Somsak Panha

Accepted by the Faculty of Science, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master' s Degree

.....Dean of Faculty of Scie

(Associate Professor Dr. Wanchai Phothiphichitr)

THESIS COMMITTEE

..... Chairman

(Professor Dr. Siriwat Wongsiri)

..... Thesis Advisor

(Associate Professor Dr. Somsak Panha)

..... Member

(Associate Professor Dr. Kumpol Isarankura)

..... Member

(Dr. Sukamol Srikwan)

Acknowledgement

I wish to express my sincere gratitude to my thesis advisor, Associate Professor Dr. Somsak Panha, for their invaluable suggestions, guidances, patiences, and for providing funds throughout the study.

My grateful thank to Professor Dr. Siriwat Wongsiri, chairman of thesis committee for his precious advice. I wish to express my grateful thank to Associate Professor Dr. Kumpol Isarankura for his advice and reading manuscript. I also would like to express my appreciation to Dr. Sukamol Srikwan for her kind suggestions in several aspects of phylogenetic analysis.

Very special thanks to Mr. Boonrod Klorwuttimon, Mr. Sanya Chootrakul and Angkanavisalya family for their generosity and in taking care of me while I stay in Bangkok.

Very special thanks for Ms. Jirawan Charuppat, Royal Forest Department, for her very useful landscape map of the mangrove area. Very special thanks to Assistant Professor Dr. Chantima Lohachit for her helping in specimens comparison in Faculty of Tropical Medicine, Mahidol University.

Many thank to Mr. Talay Arunpoem for his kindness and helpful in Ko Chang, Trat; and to Mr. Umporn Phattayasas and his villagers for their friendliness and easiness during specimens collecting in Prednai, Trat.

I would like to thank the Department of Biology, Faculty of Science, Khonkean University for the use of camera lucida. Many thanks are due to Ajarn Preeyawut Vatcharanon for his advice in drawing technique.

I must thank for their helping hands to Mr. Wattana Patanakul, Mr. Nattapot Warrit, Mr. Sakboworn Tumpeesuwan, Mr. Thanakhom Bundhitwongrat, Mr. Pornchai Uttaruk, Miss Kanya Anukulthanakorn, Ms. Kuntima Suwannawong, Mr. Chirasak Sutcharit, Mr. Pongrat Dhamongrojwatttana, Miss Chanidaporn Vorajak, Miss Anchira Maneewong, Miss Chatnaree Meesukkho, Miss Piyorose Tongkird, Miss Monruedee Chaiyapo and students of the Department of Biology, Faculty of Science, Chulalongkorn University.

I am indebted to the Biodiversity Research and Training program (BRT) for a supported research grant BRT542027.

I would like to dedicate my thesis to my father, my mother and everyone in Klorvuttimontara family. Finally, I would like to express my deepest gratitude to all my teachers, for their guidance and training that leading me towards this success.

Content

List of Tables

List of Figures

List of Figures (cont.)

List of Abbreviations

AG	=	albumen gland
AVD	=	anterior vas deferens
BC	=	bursa corpulatrix
C	=	cerebral ganglion
CDG	=	Common duct gland
CP	=	Cerebroparietal ganglion
EPD	=	Epiphallus duct
EPG	=	Epihallus gland
Fl	=	flagellum
HD	=	Hermaphroditic duct
MG	=	mucous gland
MS	=	Muscular sheath
OT	=	ovotestis
Pa	=	parietal ganglion
Pa1	=	left anterior parietal ganglion
Pa2	=	left posterior parietal ganglion
Pe	=	pedal ganglion
PE	=	penis
PER	=	penial retractor muscle
PP	=	Pleuroparietal ganglion
PS	=	penial sheath
Pl	=	pleural ganglion
SV	=	seminal vesicle
SO	=	spermoviduct
V	=	visceral ganglion

Chapter 1

Introduction

Mangrove ecosystem is the most biodiverse marine wetland on earth. The plants grow in the intertidal areas and estuary. Natural environmental factors that affect mangrove ecosystem are sea level, temperature, salinity, ocean currents, storms, shore-slope, and soil-substrate. Effect of physical factor is the cause of the zonation of mangrove plant species. Mangroves provide suitable habitats for various marine and terrestrial flora and fauna. Most of juvenile fishes, shrimps, crabs, and mollusks use mangrove forest as refuge and nursery grounds. Indo-Malayan region exhibits the greatest diversity of the mangrove flora and fauna. Two hundred and eleven species were recorded from Southeast Asia area (Aksornkoae, 1998; Field, 1995).

The Gulf of Thailand is a semi-enclosed tropical sea, where the Chao Phraya, Tha Chin, Mea Klong, and Bang Pakong rivers enter the gulf including many small rivers flowing into the coasts. The gulf is a part of the Sunda Shelf. The central area is the deepest at about 83 meters below the lowest low water. The average depth is about 50 meters (Snidvong, 1998). Mangrove areas of upper Gulf of Thailand from Trat to Phetchaburi Provinces (in 1996) is 180.64 square kilometers or 10.77% of total mangrove area (Aksornkoae, 1998).

Pulmonate is a group of air breathing mollusk that their lungs are derived from the mantle. High diversity of mangrove habitats may lead to snails' diversification. Ellobiidae, the most primitive pulmonate, shows a varieties of morphological characters adapted to different habitats (Hubendick, 1978). Siphonariidae, a cap-shaped shells adapted to live on rocky shore. Amphibolidae, its operculum is present in adult. Onchidiidae, a slug has regressive evolution of shell and considered an unique character in slug order, Systellommatophora. Pulmonate snails of the mangrove live in many microhabitats e.g. under logs or large substrates, on mud surface, in rotten logs, on stones, on leaves, etc. They are primary consumer and are eaten by reptiles, birds and small mammals (Panha, 1998). Local people utilize many species as food i.e. *Ellobium aurismidae*, good protein source for people in eastern Thailand (Panha, 1998). The studies of mangrove pulmonate snails in Thailand are mainly on shell taxonomy. Brandt monograph (1974)

on the non-marine aquatic mollusks of Thailand is an important paper, which reported 20 ellobiid species found in Thailand.

Objective

The main purpose of this research is to study and compare anatomical characters of some pulmonate snails in the mangrove habitats of the upper Gulf of Thailand. Their phylogenic relationships were reconstructed by those characters.

Chapter 2

Literature review

2.1 Biology and taxonomy of land pulmonate snails

Land pulmonate snails were classified basically by the gill types and alimentary tracts as follows;

Kingdom Animalia

Phylum Mollusca Cuvier, 1795

Subphylum Adenopoda Salvini-Plawen, 1971

Class Gastropoda Cuvier, 1797

Subclass Pulmonata Cuvier, 1817

(Salvini-Plawen, 1980, Haszprunar, 1988, Vaught, 1989, and Burch and Pearce, 1990)

Pulmonate snail is the gastropod which its name derived from the conversion of mantle cavity into a air-breathing lung. The edges of mantle cavity have become sealed to the back of animal except for a small opening on the body-side called the pneumostome (respiratory pore). That it's opening and closing controlled by carbondioxide levels within the pallial lung cavity. The gill disappeared and the roof of the mantle cavity developed a network of high vascularized blood vessels. Generally, a shell presents spirally-coiled of various shape from heliciform to a patelliform or flatten disk. Sometimes the shell is wholly enveloped by mantle, or totally lost. An operculum is lacking (except in amphibolids). The radula has numerous teeth usually a small central and many laterals and marginals. The radula serves as a brushing, browsing, scraping, rasping, shoveling, boring, cutting, or piercing instrument (Salvini-Plawen, 1988). The anus is ordinarily situated near the pneumostome. The nervous system usually is euthyneurous showing a marked tendency to shortening for the visceral portions and concentration of the ganglia around esophagus.

Members of the group are hermaphroditic; male and female gonoducts are adjacent and form a spermoviduct, or are separated into a distinct oviduct and sperm duct (Thiele, 1963, Boss, 1982, Barnes, 1987, and Morton, 1988)

Subclass Pulmonata contains 4 orders, Archaeopulmonata, Basommatophora, Systellommatophora (Soleolifera), and Stylommatophora (Vaught, 1989).

Archaeopulmonates is the most primitive group. They bear a pair of retractile tentacles, which eye at the base and kidneys lack a conspicuously developed ureter, which present in others. Members of other 3 orders, Basommatophora, Systellommatophora, and Stylommatophora were classified by position of eyes, number of pairs of tentacles, and contraction of tentacles. Basommatophorans have a pair of retractile tentacles bearing eye at the base. Systellommatophorans have 2 pairs of tentacles, upper ones form contractile stalks bearing eye at the tip and the lower ones are tactile. Stylommatophorans have 2 pairs of usually invaginable tentacles, the upper ones are cylindrical, retractile, and bear eyes at the tips, and lower tentacles are usually cylindrical, tactile, sensory, and retractile tentacles (Boss, 1982).

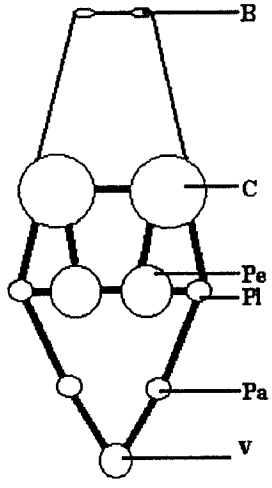


Fig. 2-1 Basic pattern of central nervous system of pulmonate. (B, buccal ganglia; C, cerebral ganglia; Pa, parietal ganglia; Pe, pedal ganglia; Pl, pleural ganglia; V, visceral ganglia) (modified from Barnes, 1987).

The central nervous systems of pulmonates compose of 5 pairs of ganglia (cerebral, pleural, pedal, parietal, and buccal ganglia), and an unpaired visceral ganglion which connected by two commissures (Fig. 2-1) (Martins, 1996a). A tough layer of connective tissues surrounds

the ganglia and nerves. A pair of cerebral ganglia lie on the dorsoposterior of the esophagus and give rise to nerves that connect anteriorly to the eyes, tentacles, statocysts, and a pair of buccal ganglia, which are located in the back wall of the buccal cavity. The buccal ganglia innervates the muscle of the radula and other structure in this vicinity. A nerve cord issues ventrally from each cerebral ganglion on each side of the esophagus. These are two pedal connectives, which extend ventrally to a pair of ganglia. A second pair of cords leaves the pleural ganglion and extends posteriorly until it terminates on a visceral ganglion that is located in the visceral mass that supplies organs in this region. A pair of parietal ganglia innervates the gills and osphradium. Concentrated ganglia is advanced character (Barnes, 1987, Bishop, 1978, and Purchon, 1968).

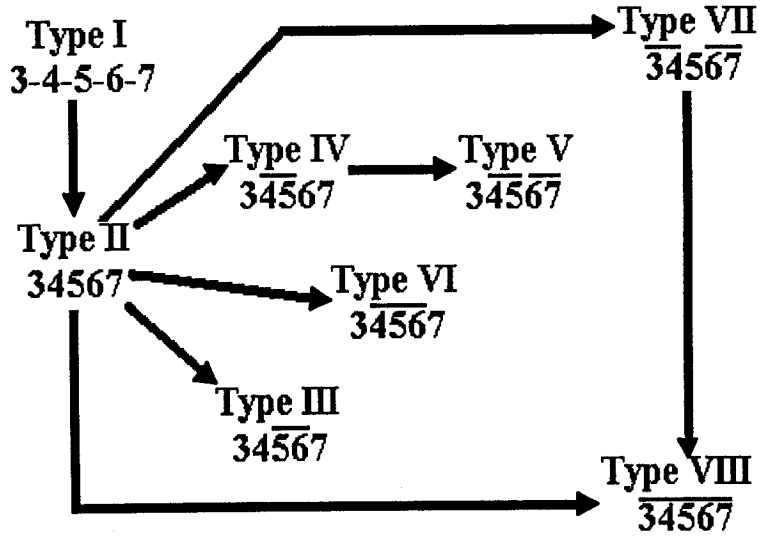


Fig. 2-2 Patterns of ganglia fusion of the visceral chain of pulmonate snails and most probable pathways of fusion in phylogeny. Abbreviations; hyphens represent connectives, bars represent fusion, numbers represent ganglia; 3, left pleural; 4, left parietal; 5, visceral; 6. Right parietal; 7, right pleural (after Bishop, 1978).

The general pattern and the variability of the basommatophoran genital system resemble that of stylommatophora, which are also hermaphrodite. A description of the basic pattern is represent in fig. 2-3. Male and female gametes are produced in the single ovotestis, which is located in the apical part of the visceral hump. When released, both male and female gametes pass anteriorly through the tiny hermaphroditic duct (spermoviduct, gonoduct). In the next part of the system, male and female gametes are transport via separate paths. These may be either functionally separate channels within a common duct, or 2 separate ducts of which the degree of

separation varies. The junction of the hermaphroditic duct and the male and female duct is often called carrefour. Here also opens the albumen gland. An associate with the carrefour is the fertilization pocket (receptaculum seminis), which shows considerable variation in size and structure. The female duct is large and glandular. Its main roles are to secrete material for the formation of eggs and egg masses and to receive the sperm from a copulated partner and transport it to the fertilization site. The principle function of the male duct is to transport sperm and to transfer it to the partner during copulation. A prostate gland is usually presented and sometimes also a sperm duct, located posteriorly to the prostate gland. The ciliated vas deferens, which opens into the penis, is anterior to the prostate gland. The male copulatory organ normally consists of a penis traversed by the vas deferens and enclosed in a penial sheath, through the terminal opening of which the penis can be everted. It must be stressed that there is a wide range of species-specific variation in structure and shape of the copulatory organ (Geraerts and Joose, 1984).

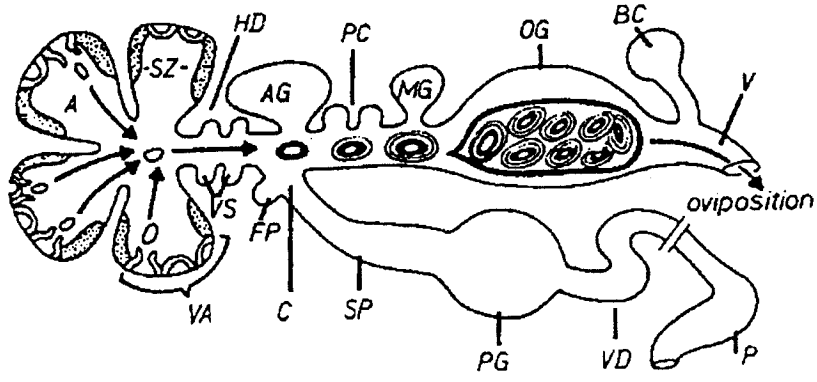


Fig. 2-3 Diagrammatic representation of the functional anatomy of the basommatophoran reproductive system by shows ovulation, eggs, and mass formation. Abrreviaton; A, acinus of the ovotestis; AG, albumen gland; BC, bursa copulatrix; C, carrefour; FP, fertilization pocket; HD, hermaphroditic duct; MG, muciparous gland; OG, oothecal gland; P, penis; PC, pars contarta; PG, prostate gland; SP, sperm duct; SZ, spermatogenic zone; V, vagina; VA, vitellogenic area; VD, vas deferens; VS, vesiculae seminales (from Gerraerts and Joose, 1984).

The first pulmonate snails attain a level considered as "Primitive pulmonate stock" gives risen to urbasommatophora and marine Basommatophora (Siphonariidae, Trimusculidae, and Amphibolidae). An urbasommatophora gives risen to Ellobiidae, Otinidae, and other higher Basommatophora (Harry, 1964). Within the Pulmonata, the subclass Basommatophora forms a

comparatively heterogeneous unit comprising a number of rather clearly defined groups. Hubendick (1978) suggested considerable phylogenetic gaps exist between the groups, and probably it will never be possible to elucidate their relationships. It is very doubtful whether the Basommatophora represent a truly monophyletic group. Nevertheless, many of the 11 families are obviously related to each other, and all can be ranked with regard to probable degree of relationship (Hubendick, 1978).

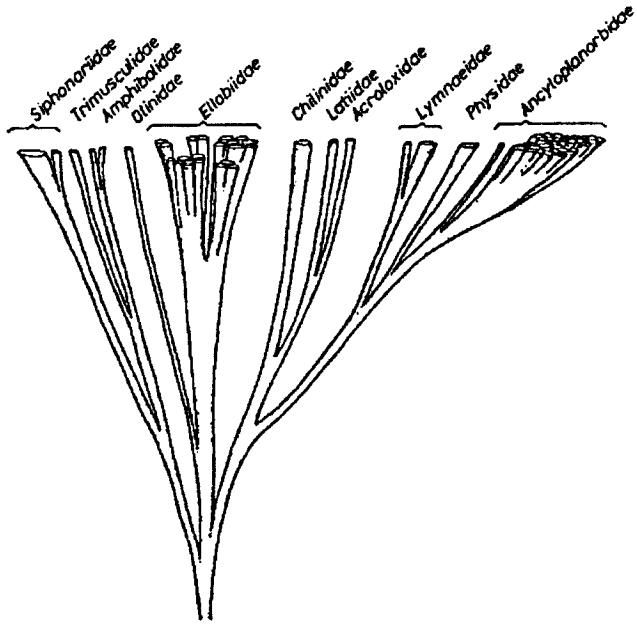


Fig. 2-4 Diagram of probable relationships between basommatophoran families (after Hubendick, 1978).

2.2 Mangrove pulmonate snails in Thailand

Brandt (1974), Isarankura (1976), and Tuntanasiriwong (1978) reported the occurrence of pulmonate snails in the mangroves of Thailand. There are 2 orders and 4 families presented in mangrove. Order Basommatophora has 3 families, Ellobiidae, Siphonariidae, Amphibolidae and Order Systellommatophora has 1 family, Onchidiidae.

The Family Ellobiidae is said to be most primitive group among pulmonate snails (Hubendick, 1978). Recently it was classified in Order Archaeopulmonata (Vaught, 1989). Their shells have both marine and terrestrial forms. The marine form often has an external appearance

similar to the shells of prosobranchs. The terrestrial form of Ellobiidae often posses an alabastrine appearance (Hubendick, 1978). The shell is more or less high and short spire, ovate to cylindrical in shape, mostly dextral, and varies in size from extremely minute to nearly 10 cm in length. The shell of *Pythia plicata* has variation of color pattern which is seldom occurred in Basommatophora (Brandt, 1974, and Cook, 1996). The inner walls of the whorls are mostly resorbed. Shell aperture has parietal, palatal, and columella teeth; the outer margin is often denticulate. The cerebral commissure is longer than the pedal, with the left pleural ganglion closer to the pedal ganglion than the right and the visceral commissure is short. Members are hermaphrodite and protandrous; the retractable penis usually united with the genital opening via a furrow. The penis is provided with a chitinous stylet, a seminal receptacle is present in the oviduct. An ellobiid, *Melampus bidentatus*, have annual reproductive period between early June and mid July, with normally three egg-laying cycles. Each cycle has a definite semilunar periodicity with egg-laying strictly confined to four days in phase with the spring tides. Taking full or new moon as day 0, the patterned behavioral sequence involves aggregation (day -1), copulation (+1), egg-laying (+2 through +6), and dispersion (+6 through +8). Egg laying and hatching shows semilunar synchrony (Apley *et al.* , 1967, and Russell-Hunter *et al.* , 1972).

There are 20 species of ellobiids that were reported in Thailand by Brandt in 1974, only 16 of them present in the Gulf of Thailand i.e. *Auriculastra elongata*, *A. subula*, *Cassidula aurisfelis*, *Ca. mustelina*, *Cylindrotis quadrasi*, *Cy. siamensis*, *Ellobium aurisjudae*, *E. aurismidae*, *Laemodonta monilifera*, *L. punctatostriata*, *L. punctigera*, *L. siamensis*, *Melampus pulchellus*, *M. siamensis*, *Pythia plicata*, and *Py. trigona.*

Family Siphonariidae; the shell is cap-shaped, patelliform, and irregularly oval to elliptical in outline; the apex is blunt, and generally central or placed slightly posterior; the surface has radial striation or ribs. The pedal muscle scar is almost circular, somewhat horse-shoe shaped. The head is wide, tentacles are lacking, the foot is large and rounded. The broad pulmonary cavity has an inserted gill in the posterior portion, the secondary gill consists of numerous triangular leaves, and osphradium is present. The jaws are arched and constructed of small rods. The nervous system is concentrates, and both ganglia of the visceral commissure are united with the pleural ganglion. The kidneys are large on the left side of the body and open near the pneumostome. The gonad is on the right, hermaphroditic, and sometimes protandric, and has

a common opening on the right behind the head. Sperms are contained in chitinous spermatophore (Boss, 1982).

Siphonariids live in intertidal seashore. All siphonariids consume algae as their primary food source. This is shown to have a powerful effect on the structure of shallow-water marine communities and, in at least some instances, appear to have influenced algal evolution (Branch, 1985). Their ecological niche is primary consumer and their predators are other snails (ex. *Thais claigera*) and starfish (*Coscinasterias* spp.) (Isawaki, 1993). Some chemical substance, such as norsiphorienone A, isosiphorienolone, 2-deoxysiphorieforanone, and isopectinone extracted from *Siphonaria pectinata* may be used for medicine. Biological activities of polypropionate compounds are mainly antibiotic and cytotoxic (Paul *et al.*, 1997). On the other hand their secondary metabolites can defend themselves from their predators. McQuaid *et al.* (1999) proved that by counting the total number of eaten limpets (*Patella granularis* Linn. and *Siphonaria capensis* (Quay & Gaimard)) only 12% (from 331 limpets) were *Siphonaria.* Whelks refused the tissue of *Siphonaria* while accepting of *Patella.* Gobies eat *Siphonaria* tissues, but were reluctant to feed again.

Suvatti (1938) reported one genus *Siphonaria* collected from Rayong Province. Tantanasiriwong (1978) reported 3 siphonariids from Andaman seashores, they are *Siphonaria atra*, *S. kurracheensis*, and *Anthrosiphonaria sirius*.

The Family Amphibolidae is so unique in being the only pulmonate snails, which retain the operculum in adult. Shell is spirally coiled, rounded in shape, dextral, small to medium in size, rarely exceeding 30 mm in height, and wide umbilicate; the spire is short and conical, with an large body whorl. The aperture is large and tooth lacking. The operculum is corneous, oval and has a rapidly expanding spiral and a subcentral nucleus (paucispiral).

The head is large. The eyes are at the base of the short tentacles, the pulmonary cavity is extensive, lacks a gill, but has an osphradium. In living snail the pulmonary cavity is filled with water; the hypobranchial gland is spongy. Jaw is absent. The radula has a central tooth with fine sharp denticles and a small accessory plate behind. The intermediate tooth with three sharply pointed denticles while the lateral is sharp, rather elongate and simple, and oblique arranged. The

stomach has a muscularized gizzard-like portion; the intestine is convoluted; the anus is located in a lobe near the pallial respiratory aperture. The nerve collar is anterior to the pharynx; the visceral commissure is very short, with three ganglia. The kidney is triangular and situated in the mantle, and opens near the pneumostome. Members are hermaphroditic, and monaulic or diaulic: a muscularized penis and a large prostate are present; the gonopores are near the right tentacle. Bursa copulatrix are lacking. The eggs are encapsulated and the veliger stage is passed in the capsule; the velum degenerates before hatching (Boss, 1982, and Hubendick, 1978).

A reported species of Amphibolid was *Salinator burmana* from Andaman seashores (Tantanasiriwong, 1978).

The Family Onchidiidae; the animals are oval, rarely rounded, naked, slug-like, and without a shell. The dorsal surface of the body is covered by the mantle, which is smooth, or uneven with papillae or tubercles containing unusual accessory eyes and respiratory bush like processes, siliceous spicules and peripheral repulsive gland or repugnatorial glands are present. Anteriorly, below the mantle edge and above the mouth, a strong, roof-like frontal shield cover the head, with a pair of cylindrical, retractile, and invaginable eye-bearing tentacles, usually with the eye on the outer side. The lower pair are fleshy lobes called sensory tentacles. The sides form a hyponotum or girdle like border continuous with the dorsal notum, but separated from it by a groove, the perinotum. The foot is large and broad, the median sole is truncated in front with narrow and rounded behind. The foot has fine longitudinal and transverse furrows.

The pulmonary cavity is in the posterior portion of the body. The small pneumostome opening is mostly located medially behind the anus and slightly to its right. Jaw is very thin, and transparent. The radula is broad, and the teeth are obliquely disposed. The central teeth is tricuspid, the lateral and marginal teeth are elongate and usually numerous with an outer denticles. The stomach has a muscular gizzard and funnel-shaped digestive portion. The intestine is long and coiled and widened posteriorly. The anus opens behind the end of the foot sole in the median line.

Members are hermaphroditic with widely separated male and female genital pores. The female gonopore is near the posterior extremity. The penis has denticulations and commonly

with an accessory gland. The male gonopore and penis are on the right side of the head, either inside or outside right of the cephalic tentacles. The ovotestis is multilobed. The embryo had a coiled shell. The pelagic veliger larva is two-lobed (Britton, 1984, Boss, 1982, and Solem, 1959).

Onchidiid are resistance to desiccation fairly well and often found making a long journey exposed in warm air. Some species have repugnatorial gland that produced some depsipeptides (polypeptides that contain ester bonds as well as peptides) such as onchidin and onchidin B. Both depsipeptides are cytotoxic metabolites, especially onchidin B can inhibited growth of tumor Kb cells (human epidermoid carcinoma cells) by 97% inhibition to Kb cells at 10 μg/ml. (Morton, 1967, and Fernandez *et al.* , 1996).

A reported genus of Onchidiidae was *Onchidium* sp., recorded as mangrove tree fauna (Isarankura, 1976).

Chapter 3

Materials and methods

Mangrove areas in the upper gulf of Thailand (in Trat, Chantaburi, Rayong, Chonburi, Chachoengsao, Samutprakan, Bangkok, Samutsakon, Samutsongkram, and Phetchaburi Provinces) were surveyed. Snails were collected from June 1998 to January 2000 by eyes searching from each type of mangrove trees as well as on mud surfaces. Specimens were collected from different habitats for completely malacofauna species. Collectings have been done in triplicate sets both in wet (May to October) and dry (November to April) season.

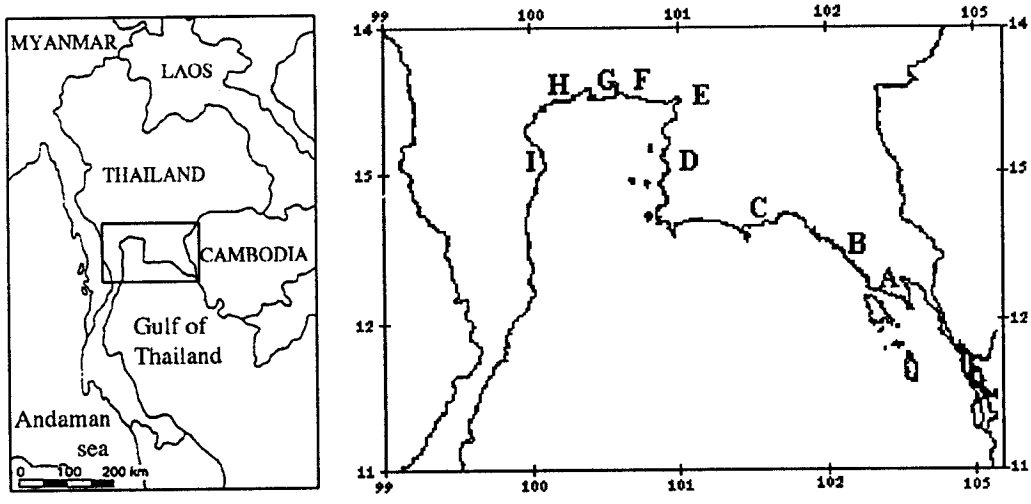


Fig. 3-1 Map of the upper Gulf of Thailand indicating the mangrove areas of study (A, Trat; B, Chantaburi; C, Rayong; D, Chonburi; E, Chachoengsao; F, Samutprakan; G, Bangkok; H, Samutsongkram; I, Phetchaburi).

Specimens were suffocated in bottle for 24 hrs and preserved in 70% ethanol. The large size specimens (shell or body length are more than 6-8 cm) were injected by 95% ethanol to their body cavity. Specimens were labeled for recorded including the collection number, scientific name, locality, collected date, collector, number of specimens and habitats.

Specimens were identified by comparison with Brandt's collection at Faculty of Tropical Medicine, Mahidol University and Raffle Museum, National University of Singapore and using

the according main literatures, Britton, 1984, Brandt 1974, Habe, 1964, Hubendick, B. 1964, and Vermeulen and Whitten, 1998

Shell morphology of ellobiids and ampibolids including shell length (SL), shell width (SW), body whorl length (BWL), aperture length (AL), aperture width (AW), and spire length (SRL) were measured in millimeters. These parameters are illustrated in figure 3-2.

- shell length is measured from apex to base of shell,
- shell width is measured from widest part of shell,
- body whorl length is measured from last whorl to base of shell,
- aperture length is measured from upper most of aperture to base of aperture,
- aperture width is measured from center of columella to each margin of aperture in vertical plan and
- spire length is calculated from shell length minus body whorl length.

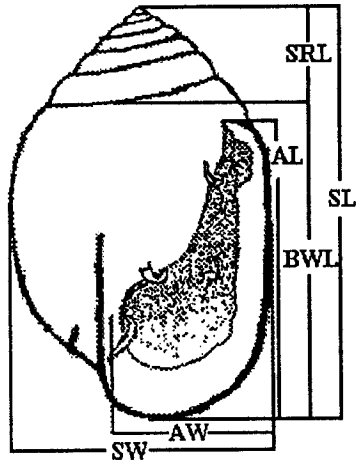


Fig. 3-2 Terminology of shell measurement of Ellobiidae and Amphibolidae using shell of genus *Cassidula* as a representative.

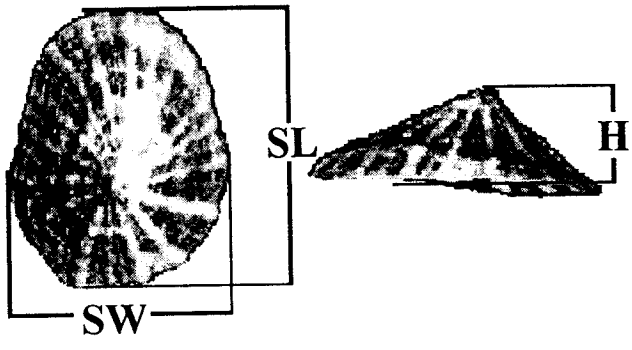


Fig. 3-3 Terminology of shell measurement of Siphonariidae

Shell morphology of siphonarriid (shell length; SL, shell width; SW, and shell height; H) were measured. Shell length is a distance from anterior to posterior margin; shell width is a distance from left to right margin and shell height is a distance from apex to the base of shell.

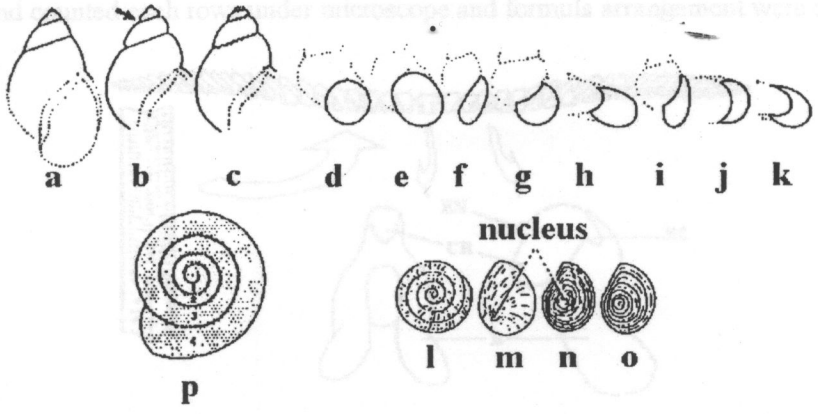


Fig. 3-4 Shell terminology. A, suture slightly indented; b, suture strongly indented; c, crenulate sutures; d, round aperture; e, oval aperture; f, narrowly oval aperture; g, roundly lunate aperture; h, ovate-lunate aperture; i, narrowly ovate-lunate aperture; j, broadly lunate aperture; k, deeply lunate aperture; l, multispiral operculum; m, paucispiral operculum; n, concentric operculum; o, concentric operculum with spiral nucleus; p, method of counting whorls (After Burch, 1962).

External morphology of onchidiid (body length; BL , body width; BW , foot length; FL , and foot width; FW) were measured as follows; body length is measured by anterior to posterior body edge, body width is measured by left to right body edge, foot length is measured by anterior to posterior foot edge and foot width is measured by left to right foot edge.

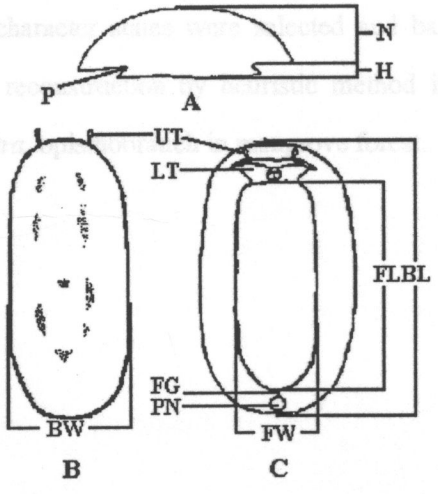


Fig. 3-5 Morphological terminology of measurement of Onchidiidae A) cross section of body B) dorsal and C) ventral view.

Radulae were removed from buccal masses and placed in warm 10% NaOH. They were washed in water and dehydrated in 95% ethanol, stained in lactophenol blue then washed in absolute ethanol before clearing in xylene and mount in Canada Balsum. Radula teeth types were investigated and counted each rows under microscope and formula arrangement were determined.

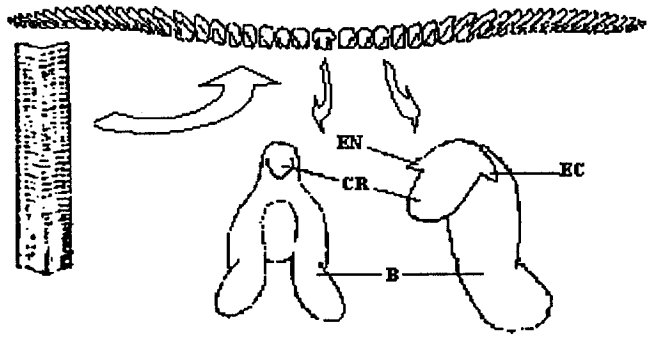


Fig. 3-6 Terminology of radula. Above is a single row of radular teeth, below left is radular sheath, and the two rights are central and lateral teeth (B, base; CR, crown; EN, endocone; EC, ectocone).

The whole animals were dissected under dissecting microscope for separation of reproductive organ, stomach, and nerve ganglia. Each organ was drawn, scaling and then kept in 70% ethanol respectively. Uncleared penis and nerve ganglia samples were stained by methylene blue solution before drawing. Collection number and number of dissected specimens and radulae are shown in appendix III.

Nine characters and character states were selected and based on Martins (1996) and Tillier (1989) for phylogenic reconstruction by heuristic method in PAUP (Swofford, 1991). Outgroup is *Haminoeo symnistra*, opisthobranch in mangrove forest.

Table 3-1 List of characters used to reconstruct the phylogenic relationship. Character 1-6 refer from Martins (1996a) and Character 6-9 refer from Tillier (1989)

NO.	Character	Character states	Type	Weight
1	Auly	0 = monauly 1 = incipient semidiauly 2 = advanced semidiauly 3 = diauly	Ordered	4
2	Glandular cover of pallial gonoducts	0 = entirely covered 1 = partly covered 2 = naked	Ordered	4
3	Position of insertion of bursa duct	0 = near female genital opening 1 = on anterior third of oviduct 2 = on posterior third of oviduct	Ordered	3
4	Status of sperm groove	0 = opened 1 = closed	Ordered	4
5	Parietovisceral connectives	0 = <0.90 1 = 0.90-1.9 2 = 2.0-4.0 3 = >4.0	Unordered	1
6	chiastoneury	0 = present 1= absent	Ordered	4
7	Length of cerebral commisure (CC)	1 = greater than 1.1 x right cerebral ganglion width 2 = between 1.1-0.9 x right cerebral ganglion width 3 = less than 0.9 x right cerebral ganglion width	Ordered	1
8	Length of the right cerebro-pedal connective (CPD)	1 = longer than twice the width of the right cerebral ganglion 2 = between 1-2 times right cerebral ganglion width 3 = shorter than right cerebral ganglion width	Ordered	1
9	Ratio between the lengths of the cerebro-pedal connectives (Left /right) (CPR)	1 = less than 0.9 2 = from 0.9-1.1 3 = from 1.1-1.5 4 = from 1.5-2.5	Ordered	1

Chapter 4

Results

Four Orders, 5 Families, 12 Genera and 18 species were collected, classified and identified. The list is shown in table 4-1. The descriptions of each species are presented below.

Table 4-1 list of pulmonates species in mangrove of upper Gulf of Thailand.

Order	Family	Genus	Species
Archeopulmonata	Ellobiidae	*Auriculastra*	*A. elongata*
		Cassidula	*Ca. aurisfelis*
			Ca. mustelina
		Cylindrotis	*Cy. siamensis*
		Ellobium	*E. aurisjudae*
			E. aurismidae
		Laemodonta	*L. punctigera*
			L. siamensis
			Laemodonta sp.
		Melampus	*M. siamensis*
		Pythia	*Py. plicata*
			Py. trigona
Basommatophora	Siphonariidae	*Siphonaria*	*Si. laciniosa*
	Amphibolidae	*Salinator*	*Salinator* sp.
Systellommatophora	Onchidiidae	*Onchidium*	*Onchidium* sp1.
			Onchidium sp2.
		Platevindex	*Platevindex* sp.
Stylommatophora	Succineidae	*Succinea*	*Succinea* sp.

Auriculastra elongata (Küster, 1844)

(Fig. 4-1, 4-2)

1844 Auricula *elongata* Küster, Conch. Cab. , 1, 16: 53, pl. 3 Fig. 6-8 (Sandwich Island).

1875 *Auricula elongata* Küster, Morelet, Sér. Conch. , 4: 93 (Maurice)

1898 *Auriculastra elongata* (Küster), Koblelt, Conch. Cab. , 1, 16: 96, pl. 15 Fig. 17-18 (von Mauritius bis zu den Sandwich Island)

1964 *Auriculastra elongata* (Küster), Habe, Shell of the western Pacific in color II pl. 44 Fig. 6 (Amami islands).

1974 *Auriculastra elongata* (Küster), Brandt, Arch. Moll. , 105: 423 (Trat).

Shell is 9.9 - 16.4 mm long and 4.3 - 6.2 mm wide, thick elongated oval, solid, pale yellow color and glossy. Spire height is 1.8 – 4.5 mm, conic with pointed apex (generally eroded) and slightly indented suture. Shell surface is smooth and polished with very fine, low radial ribs. There are about 6-8 whorls. The largest part of body whorl is about 0.76 of shell length. Aperture height is about 0.78 of body whorl length, elongated oval, white color inside, ear-shaped. Parietal wall has a strong parietal tooth and 2 small teeth. Columella simple, truncated at the base with a small tooth. Palatal wall is smooth (Fig. 4-1a). Animal has creamy white or cream color with subcylindrical tentacles, tapering. Foot and mantle skirt is creamy white.

The formula of radula is (28-36) + 1 + (28-36) with a small central tooth; wide base, triangular, emarginated, short crown, unicuspid and round shaped. Lateral teeth base is rhombic shaped, crown bicuspid; mesocone rounded and broader than endocone. Marginal teeth base is quadrangular and elongated with bicuspid crown; mesocone rounded and elongated. Sizes of outer lateral teeth are about a half of lateral teeth (Fig. 4-2).

Reproductive system contains conical, pale yellow with brown ovotestis and short hermaphroditic duct. Albumen gland is multilobed, white. Seminal vesicle is convoluted, long (Fig. 4-1e). Penial complex is moderately long; vas deferens is separated from penial sheath and entered penial structure at penis base. Penis is oval, blunt. Penial sheath is about 2 times of penial length. Penial retractor muscle is thin, about 2 times longer than penial sheath (Fig. 4-1d).

Nervous system composed of large lobed cerebral ganglia and unlobed parietal, pedal, pleural and visceral ganglia. Cerebral ganglia is the largest, which diameter is about 0.26 – 0.43 mm. Pedal ganglia is almost the same size as cerebral ganglia, and round shaped. Visceral ganglia are rounded, about half size of pedal ganglia. Pleural and parietal ganglia, except right parietal ganglion, are long and round shape but smaller than visceral ganglia. Statocysts present at posterior part of pedal ganglia. Left cerebropedal and cerebropleural commissures are about 2 times longer than the right. Right pleuroparietal commissure is 2 times longer than left commissure and vice versa in parietovisceral commissure (Fig. 4-1c).

Habitat notes: *A. elongata* frequently crawls on mud surface at high tide of the mangrove and nipa palm forests. Sometimes they hide themselves under log or substratum.

Distribution in upper Gulf of Thailand: Chonburi, Samutprakan, Samutsongkram and Phetchaburi Provinces

World distribution: Japan, Sandwich Island, Thailand, Maurice, Mauritius.

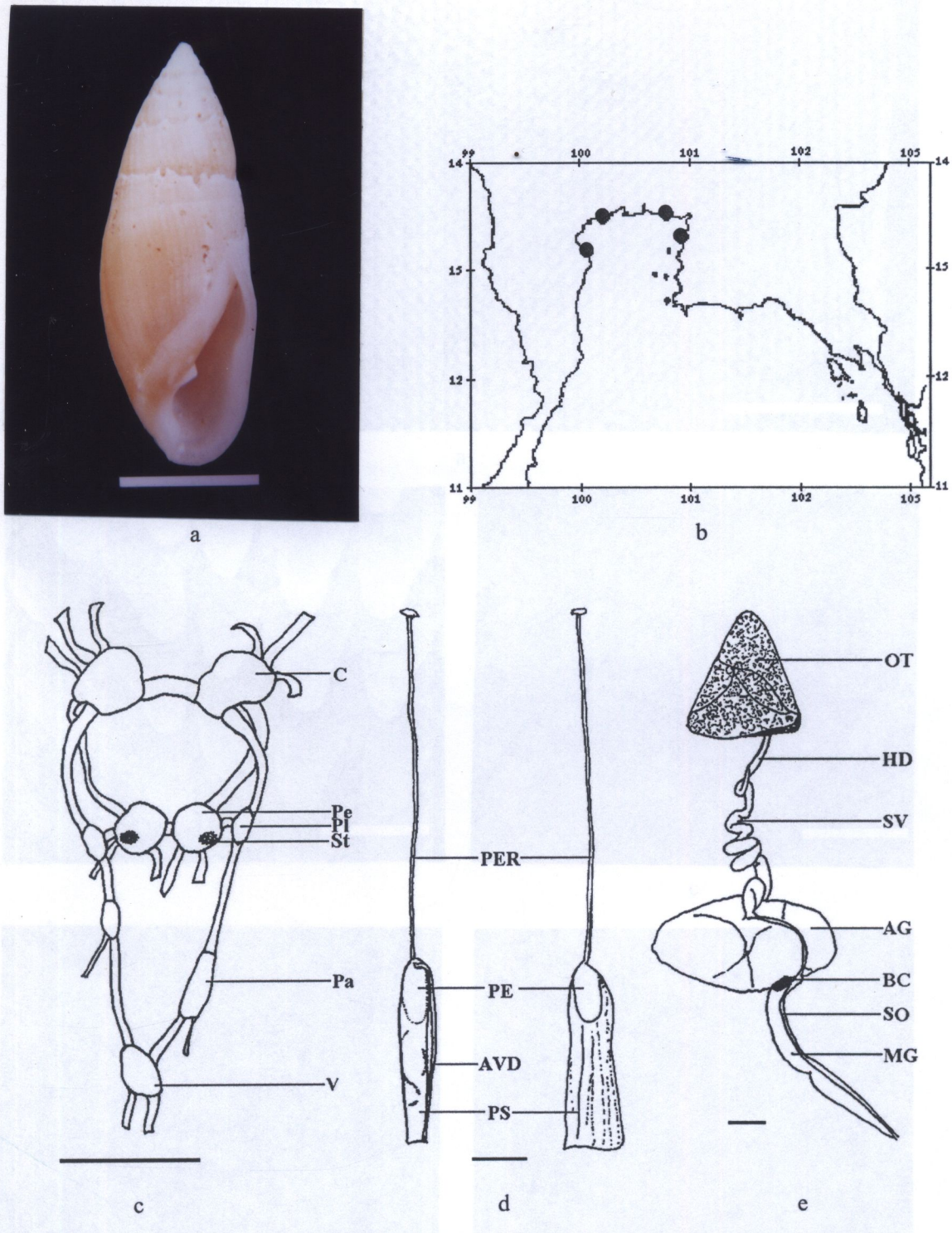
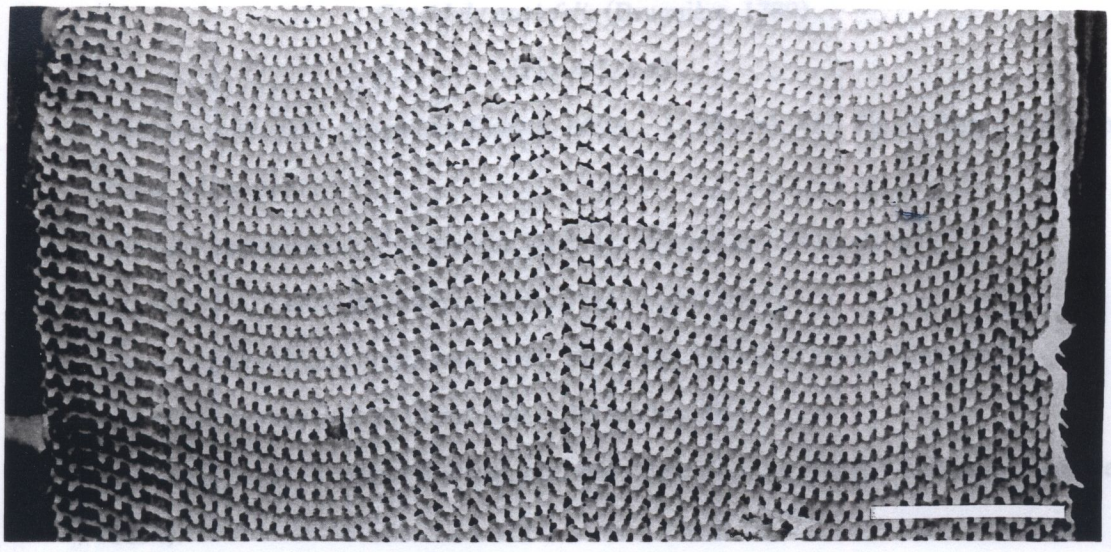
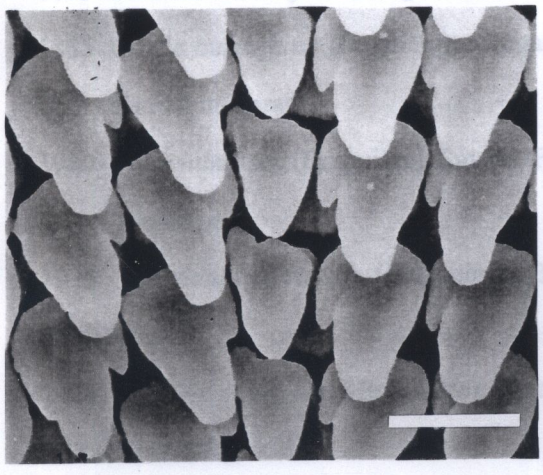


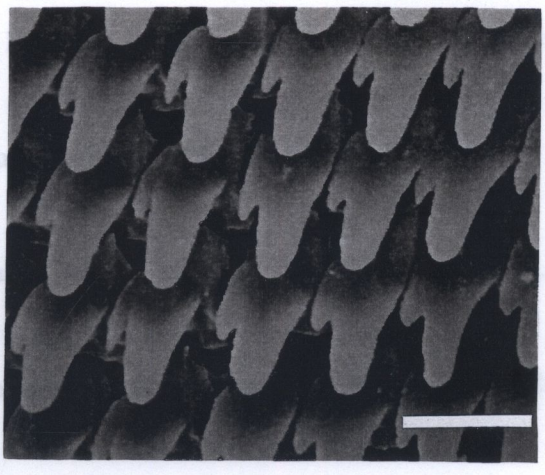
Fig. 4-1 *Auriculastra elongata* ; a) Shell, b) distribution in upper Gulf of Thailand, c) nerve ganglia, d) penial complex, and e) female reproductive organ. Scale bars = 1mm.



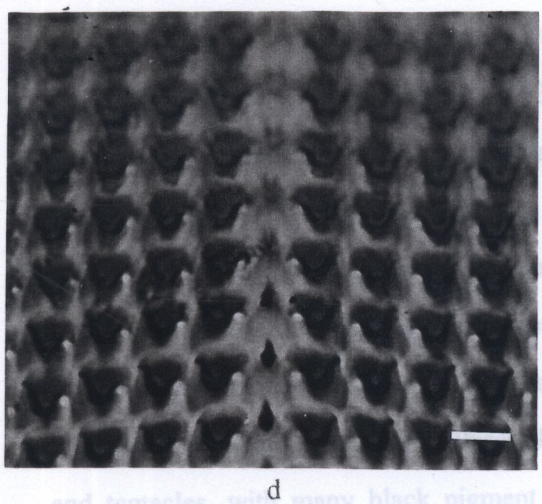
a



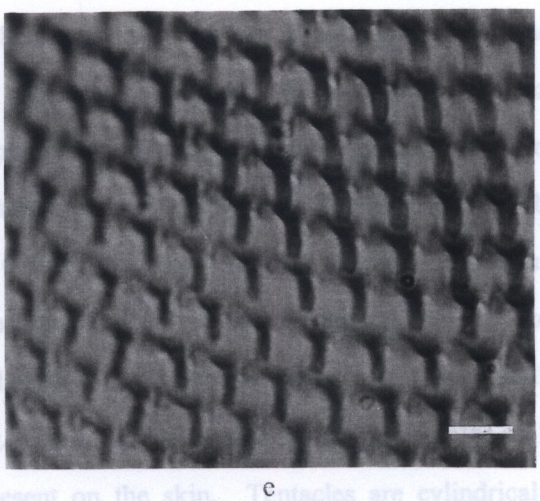
b



c



d



e

Fig. 4-2 Radula of *A. elongata*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a) and 10 μm in (b) - (e).

Cassidula aurisfelis (Bruguière, 1789)

(Fig. 4-3, 4-4)

1789 *Bulinus auris-felis* Bruguière, Encycl. Méth. , 1: 343. pl. 460 Fig. 5 (Mers des grandes Indes, Mers du Sud).

1798 *Ellobium inflammatum* Bolten, Mus. Bolten. : 106; ed. alt. :74 (no locality).

1819 *Auricula felis* Lamardk. Anim. s. vert. , 6 (1) : 2 (Sin. pers.).

1825 *Voluta coffeae* Wood, Index test. : 102, pl. 19 Fig. 15 [non *V. coffea* Linnaeus].

1837 *Cassidula chemnitzi* Bck, Index moll. : 105 (no locality).

1841 *Auricula fusca* Hombron & Jacquinot, voy. Pole Sud: pl. 9 fig 7-9 (text see Rousseaus 1854).

1875 *Cassidula auris felis* (Bruguière), Morelet, Sér. Conch. , 4: 373 (Cocinchine: Baria)

1885 *Sidula auris-felis* (Bruguière), Morgan, Bull. Soc. zool. France, 10: 394 (P. Tikous; Bukit Tamboun. Perak).

1950 *Cassidula felex* (Bruguière), Suvatti, Fauna Thailand , 105: 423 (Khan nu Paknam; Tachalom).

1974 *Cassidula aurisfelis* (Bruguière), Brandt, Arch. Moll. , 105: 423, pl. 16 Fig. 86 (Thailand).

1976 *Cassidula aurisfelis* (Bruguière), Tantanasiriwong, Phuket Mar. Biol. Center Res. Bull. 10: 22, Fig. 257.

Shell is 19.2-28.9 mm long and 9.4-18.9 mm wide, ovate, thick, solid and light brown to dark brown color. Spire height is 2.1-3.9 mm, conic, slightly indented suture. In young specimens, the shells cover with a cuticular periostracum, some with hairy character on growth line in juveniles and always lose in adults. There are about 5-7 whorls. The largest part of body whorl and aperture length is about 0.87 and 0.80 of the shell length, respectively. Aperture is narrow, ear-shaped. Narrow umbilicus present, surrounded by a carina. Parietal wall has 2 teeth, vertical and horizontal arrangement. Columellar tooth is twisted and bifurcated. Palatal wall has a vertical keel with 11-13 small calluses (Fig. 4-3a). Animal has yellowish white color on head and tentacles, with many black pigment present on the skin. Tentacles are cylindrical and tapering with eye at inside of tentacular base. Foot is thick, rounded anteriorly, acute posteriorly.

The formula of radula is (69-86)+1+(69-86) for a longer row. Every 4 rows left or right marginal teeth of the 2 short rows are reduced. Central tooth is small about a half of inner lateral teeth. Base of central tooth is subquadragular shaped, elongated, emarginate with lateral projections; crown is unicuspid and triangular shaped. Lateral teeth have is subquadrangular shaped, elongate, crown is unicuspid, elongated, rounded end. Marginal teeth have elongated bicuspid crown; endocone is small, sharp; mesocone is about 3 times wider than endocone (Fig. 4-4).

Reproductive system contains conical, with pale brown spots on brownish ovotestis. Seminal vesicle is long, yellow with dark brown dot, convoluted in posterior part. Albumen gland is white, multilobed. Mucous gland is long, simple, white (Fig. 4-3e). Penial complex is long; anterior vas deferens is separated from penial sheath and entered penial structure at penis base; penis is elongated oval, distinct vertical muscular fold, pointed; penial sheath is about 2.5 times longer than penis; penial retractor muscle is about 3 times longer than penis (Fig. 4-3d).

Nervous system composed of round lobed cerebral ganglia, and round unlobed parietal, pedal, pleural, and visceral ganglia. Cerebral and pedal ganglia are almost similar in size, diameter at about 0.37 – 0.50 mm. Visceral ganglion is a half the size of cerebral ganglia. Pleural and parietal are about 1/3 of cerebral ganglia. Left parietal ganglia are smaller than the right. Left cerebropleural commissure is longer than the right while that of the left parietovisceral are shorter. Statocysts are located at anterior part of visceral ganglion (Fig. 4-3c).

Habitat notes: *Ca. aurisfelis* is often crawling on mud, and other substrata in mangrove and nipa palm forests. At high tide they usually move to higher place such as on plant stems and *Bruguiera* pneumatophore.

Distribution in upper Gulf of Thailand: Trat, Rayong, Chonburi, Chachoengsao, Samutprakan, Samutsongkram and Phetchaburi Provinces.

World distribution: Philippines, Indonesia, Vietnam, Malaysia, Thailand, Myanmar, Sri Lanka, India.

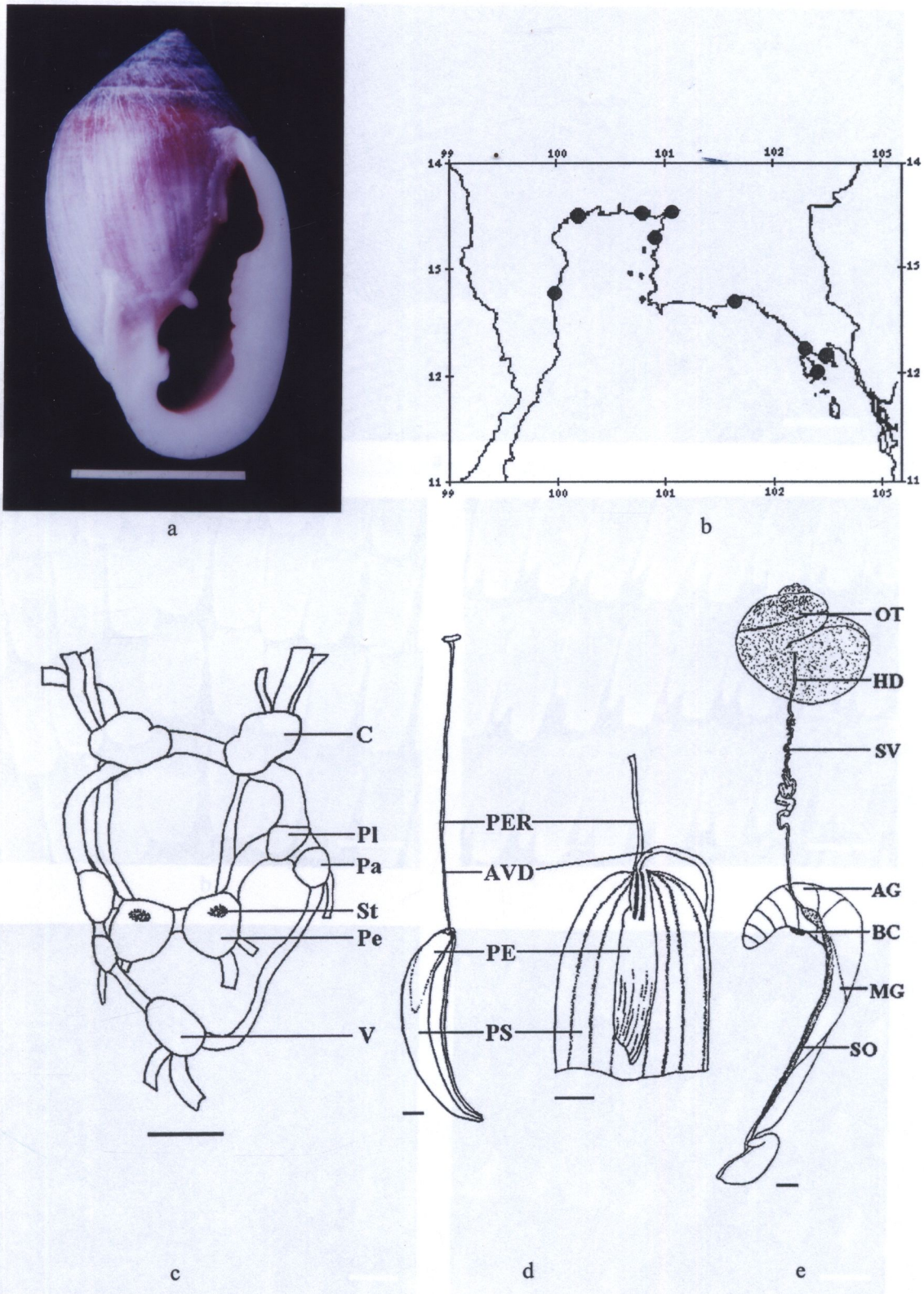
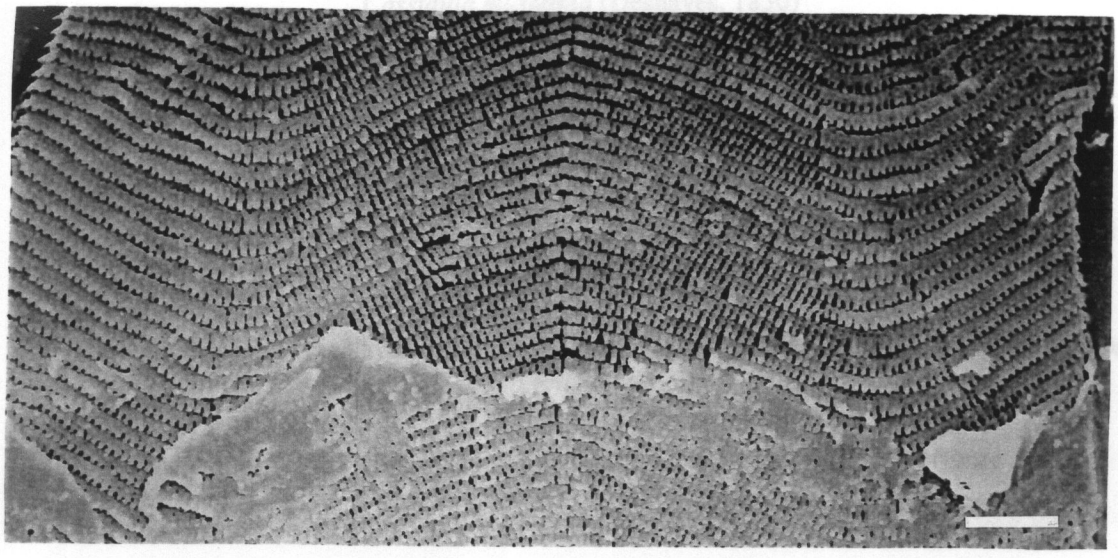
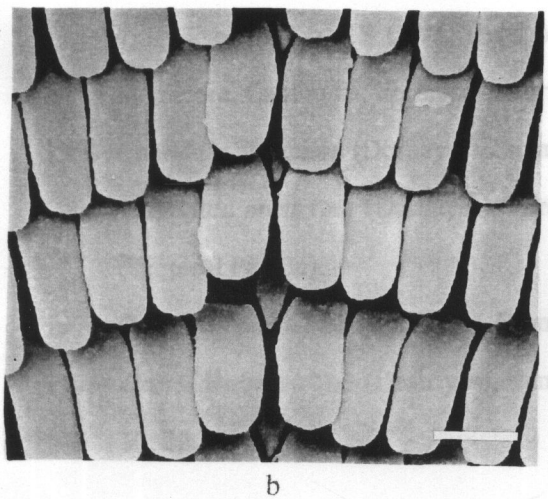


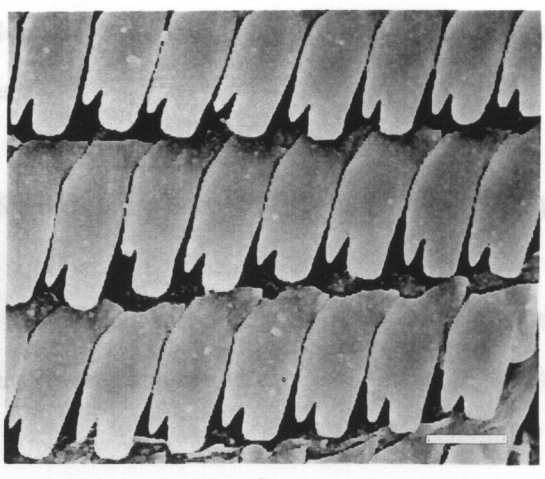
Fig. 4-3 *Cassidula aurisfelis*; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglia, d) penial complex, and e) female reproductive organ. Scale bar = 1 cm in (a) and 1mm in (c) to (e).



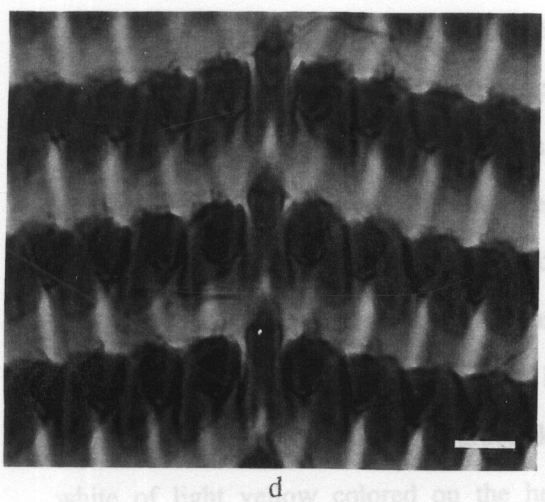
a



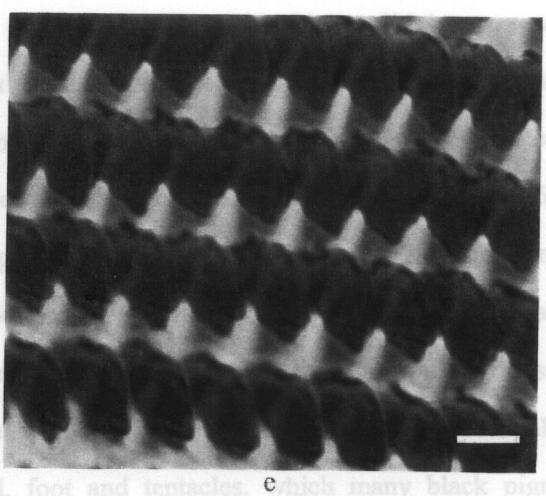
b



c



d



e

Fig. 4-4 Radula of *Ca. aurisfelis*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a) and 10 μm in (b) – (e).

Cassidula mustelina (Deshayes, 1830)

(Fig. 4-5, 4-6)

1830 *Auricula mustelina* Deshayes, Encycl. Méth. , Vers. , 2: 92 (New Zealand).

1834 *Cassidula mustelae* Beck, Index moll. : 105 (O. pf. N. Zealand).

1854 *Auricula rhodostoma* Rousseau in Hombron & Jacquinot, Voy. Pole sud: 33, pl. 9 Fig. 1-3 (New Guinea).

1885 *Sidula mustelina* (Deshayes), Morgan, Bull. Soc. zool. France, 10: 394 (Singapore, Penang, Wellesley).

1889 *Cassidula mustelina* (Deshayes), Morelet, J. de Conch. , 37 : 129 (Entre Kampot et Bangkok).

1897 *Cassidula mustelina* (Deshayes), Martens in Weber, Zool. Ergebon. Reise Niederl,-Ostind., 4: 144. pl. 8 Fig. 15 (Java, Borneo, Sumatra, Aru Isl. , New Guinea, Siam, Penang, Singapore, Cambodia, Formosa, mauritius).

1950 *Cassidula mustelina* (Deshayes), Suvatti, Fauna Thailand:88 (Tachin).

1962 *Cassidula mustelina* (Deshayes), Kira, Shell of the western Pacific in color pl. 69 Fig. 5 (Tropical Pacific).

1974 *Cassidula mustelina* (Deshayes), Brandt, Arch. Moll. , 105: 423 pl. 16 Fig. 88 (Thailand).

1976 *Cassidula mustelina* (Deshayes), Tantanasiriwong, Phuket Mar. Biol. Center Res. Bull. 10: 22, Fig. 259.

Shell is 9.2 - 21.6 mm long, and 6.2 - 13.0 mm wide, ovate, thick, solid, brown to dark brown, and some shells with 3-4 whitish spiral bands. Spire height is 0.8 – 9.4 mm, cone shaped and slightly indented. In young specimens, the shells cover with a cuticular periostracum, some with hairy character on growth line in juveniles that always lose in adults. There are about 6 – 7 whorls. The largest part of body whorl and aperture length is about 0.86 and 0.72 of shell length, respectively. Umbilicus narrows, small, surrounded by a carina. Aperture is narrow, ear-shaped. Parietal wall has 2 teeth in vertical and horizontal arrangement. Columellar wall has a small simple tooth. Palatal wall has a vertical keel with 11-12 fine calluses (Fig. 4-5a). Animal has white of light yellow colored on the head, foot and tentacles, which many black pigment presented on the skin. Tentacles are subcylindrical and tapering with eyes at the inside of the tentacular base. Foot is thick, rounded anteriorly and acute posteriorly.

The formula of radula is (80-90)+1+(80-90) with a long and slender central tooth; long and slender, crown, unicuspid; base is subquadrangular, elongated. Lateral-teeth base is subquadrangular, elongate; crown unicuspid with elongated and rounded end. Marginal teeth are tricuspid and shorter than lateral teeth. Mesocone is broad, blunt and longer than other cusps; endocone is sharp, short; ectocone is small, blunt and shortest (Fig. 4-6).

Reproductive system contains conical, brown ovotestis and short hermaphroditic duct. Albumen gland is white and multilobed. Seminal vesicle is long, convoluted (Fig. 4-5e). Penial complex is long. Anterior vas deferens is separated from penial sheath and entered penial structure at the penis base. Penis is elongate with many fine horizontal muscular folds and blunt end. Penial retractor muscle is as long as penis length. Penial sheath is a little longer than the penis with fine, longitudinal groove in side (Fig. 4-5d).

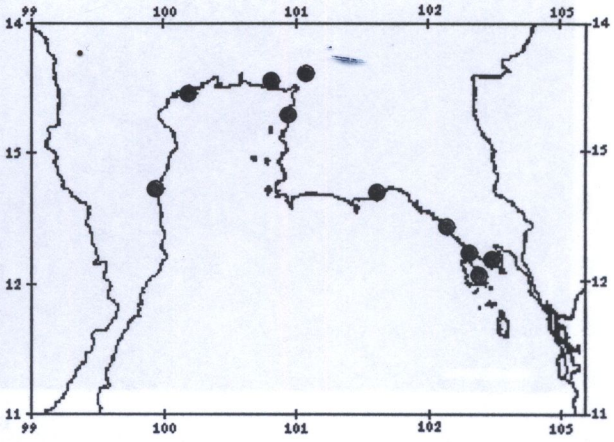
Nervous system composed of round lobed cerebral ganglia and round unlobed parietal, pedal, pleural and visceral ganglia. Cerebral and pedal ganglia are almost similar in size. The diameter of cerebral ganglia is about 0.40 – 0.96 mm. Parietal, pleural and visceral ganglia are smaller than cerebral and pedal ganglia. Left cerebropleural commissure is longer than the right but left parietovisceral are shorter than the right. Statocysts are located at the anterior part of pedal ganglion (Fig. 4-5c).

Habitat notes: *Ca. mustelina* is often found on mud, and other substrata in mangrove and nipa-palm forests. At high tide they usually move to higher places such as on plant stems and *Bruguiera* pneumatophores.

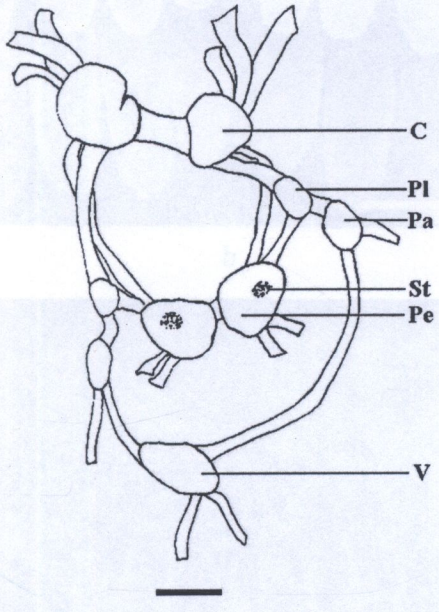
Distribution in upper Gulf of Thailand: Trat, Chantaburi, Rayong, Chonburi, Chachoengsao, Samutprakan, Bangkok, Samutsongkram and Phetchaburi Provinces.

World distribution: Philippines, Indonesia, Taiwan, New Zealand, Australia, Cambodia, Malaysia, Singapore, Thailand, Mauritius.

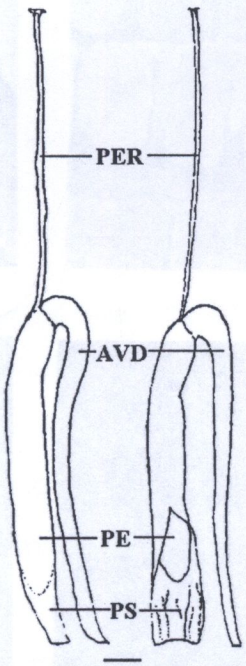
a



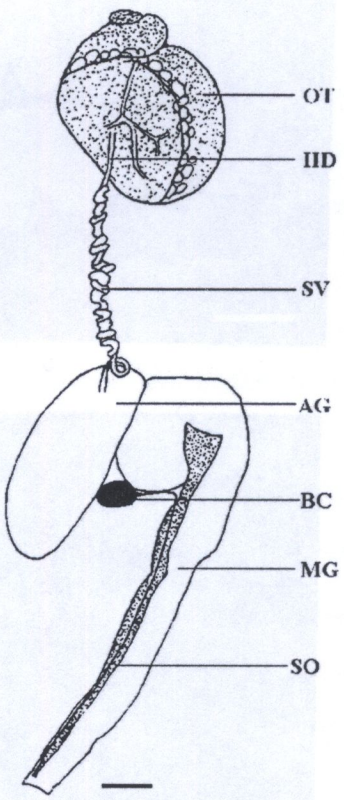
b



c

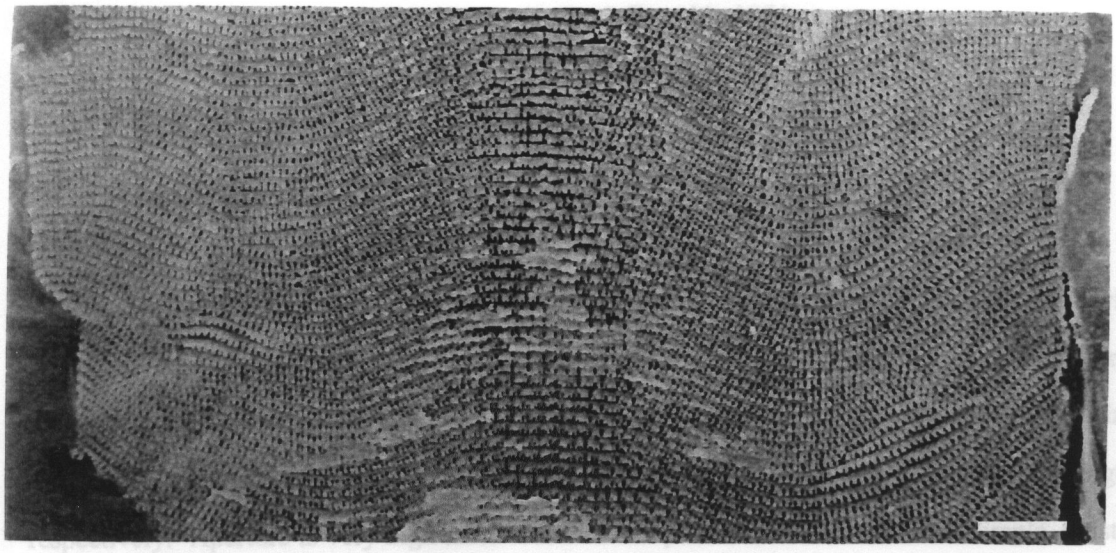


d

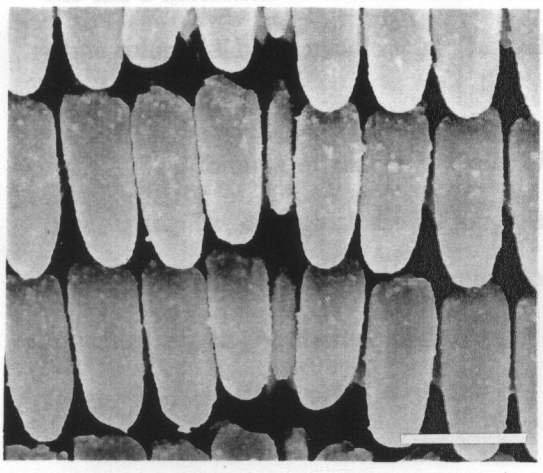


e

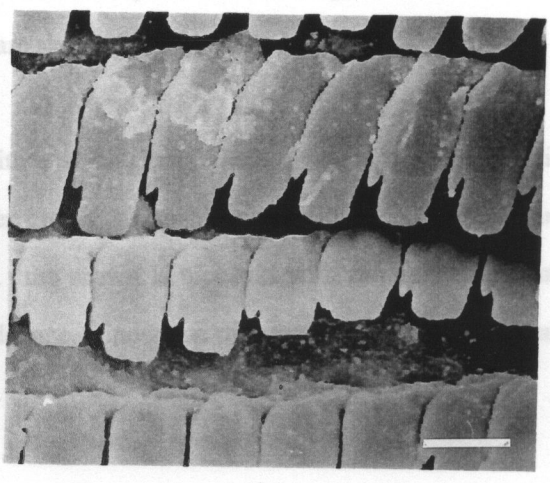
Fig. 4-5 *Cassidula mustelina* ; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglion, d) penial complex, and e) female reproductive organ. Scale bar = 1cm in (a) and 1 mm in (c)-(e).



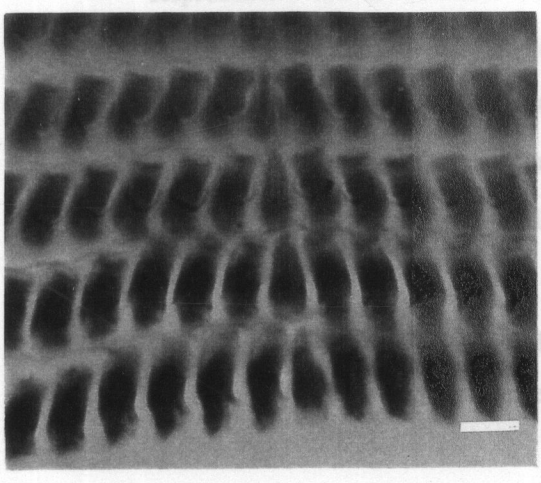
a



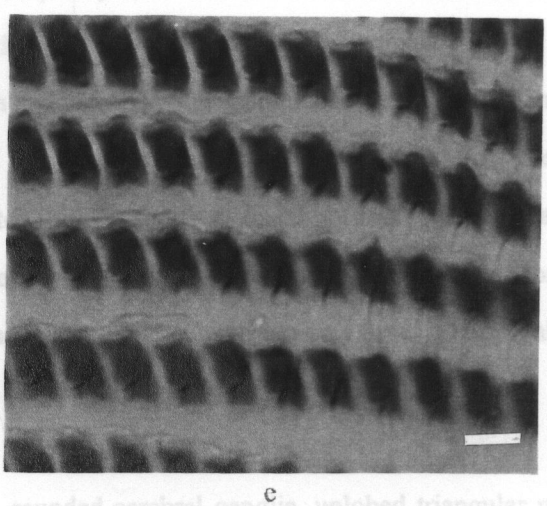
b



c



d



e

Fig. 4-6 Radula of *Ca. mustelina*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a) and 10 μm in (b) – (e).

Cylindrotis siamensis Brandth, 1974

(Fig. 4-7, 4-8)

1974 *Cylindrotis siamensis* Brandt, Arch. Moll. , 105: 423 pl. 16 Fig. 85 (Klung Harbour, Chantaburi Province).

Shell is 5.1 – 7.4 mm long and 2.5 –3.6 mm wide, cylindrical, slender, thin, smooth, with corneous, transparent, glossy and yellowish-brown colored. Spire height is 0.1 – 1.0 mm, dome shaped and moderately indented suture. There are about 4 – 5 whorls that increase rapidly in size. The largest part of body whorl and aperture length is about 0.95 and 0.88 of shell length, respectively. Aperture is very high narrow and ear-shaped. Base of columella is simple, twisted and has a horizontal columellar tooth. Palatal wall has a parietal tooth (Fig. 4-7a). Animal has white color with black mantle skirt. Tentacles are short, thick, black and blunt end.

The formula of radula is 27+1+27 with a small, long, slender central tooth with wide base, triangular, emarginated, and long slender crown, unicuspid and pointed. Lateromarginal teeth are 2-3 times broader than central tooth. the crown is bicuspid with rhombic , large and round mesocone and short or slightly short endocone. Endocone of marginal teeth are larger and longer than lateral teeth (Fig. 4-8).

Reproductive system contains conical, pale yellow ovotestis and short hermaphroditic duct. Seminal vesicle is long and convoluted. Bursa duct run along anterior mucous gland and opposite the prostate gland and jointed with oviduct near the genital pore. Prostate gland is slightly dark yellow. Lobed albumen gland and mucous gland are yellow (Fig. 4-7e). Penial complex is small. Penial sheath is long, dilated in three fourth of distal portion. Penial retractor muscle is slender and about 1/3 of penial sheath. Anterior vas deferens is about 2 times longer than penial sheath, which separated from penial sheath and entered at penis base. Penis is about 1/3 of penial sheath, slender with pointed end (Fig. 4-7d).

Nervous system composes of lobed, rounded cerebral ganglia, unlobed triangular pedal ganglia and unlobed rounded parietal, pleural and visceral ganglia. Cerebral ganglia have short cerebral commissure, which measures about 2/3 of the ganglia. Cerebral ganglia is the largest with diameter about 0.31 mm. Cerebral and pedal ganglia are similar in size. Left cerebropedal

and cerebropleural commissure is longer than the right. Right pleuroparietal commissure is 2 times longer than the left. Left pleuroparietal commissure is about 3 times longer than the right. Statocysts are located at anterior part of pedal ganglia (Fig. 4-7c).

Habitat notes: *Cy. siamensis* inhabit under rotten log in mangrove forest.

Distribution in upper Gulf of Thailand: Chonburi and Samutsongkram Provinces.

World distribution: Thailand.

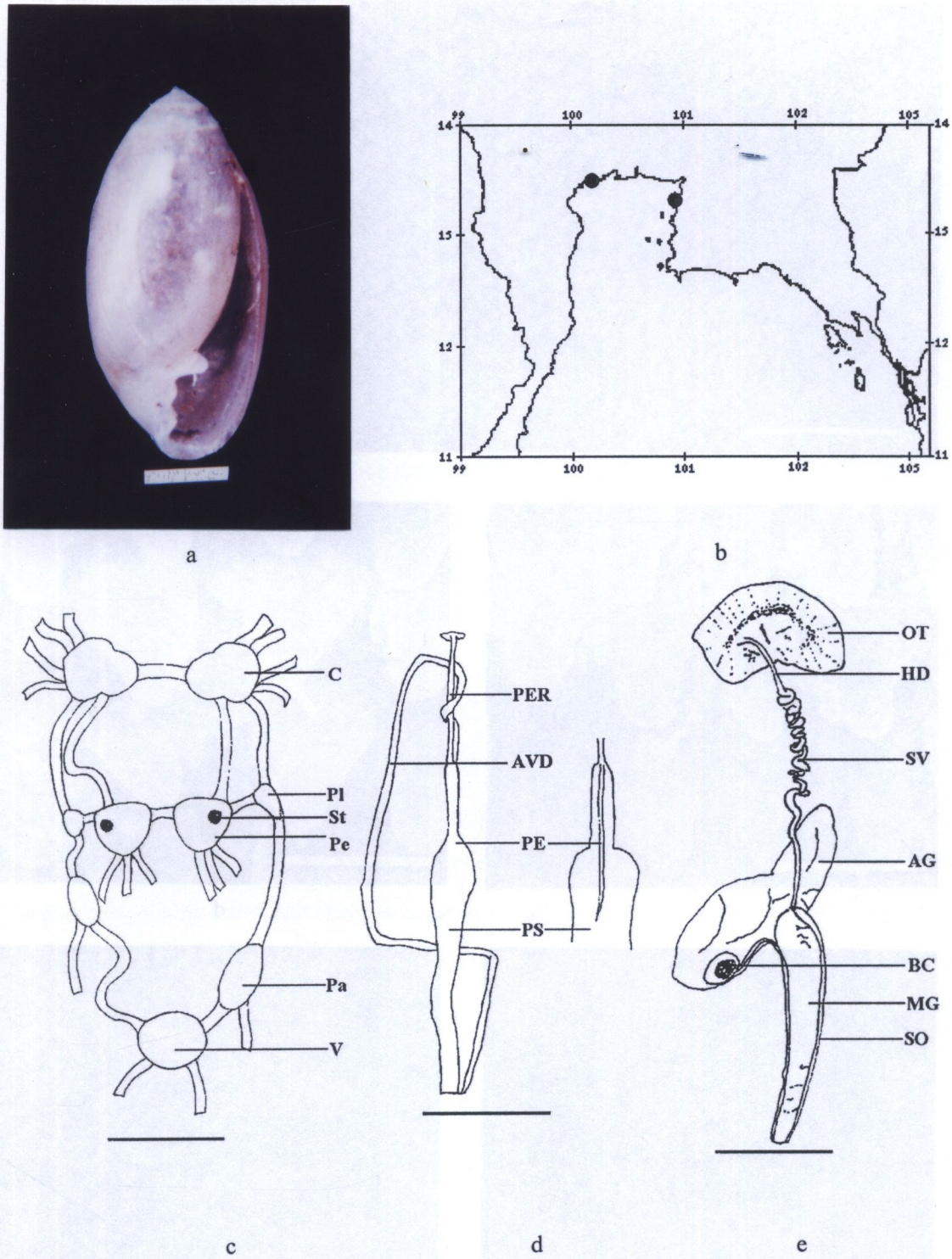
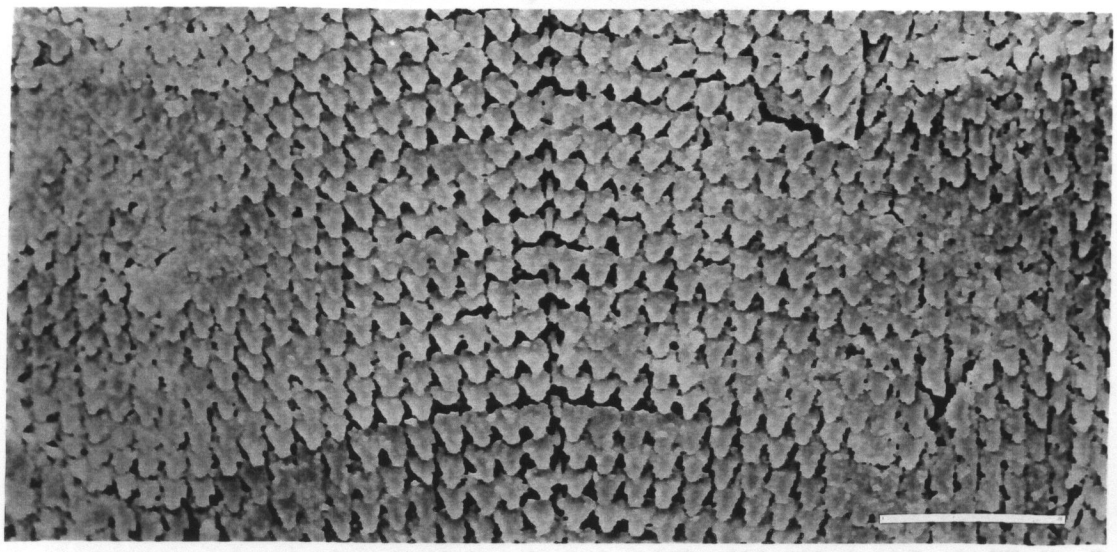
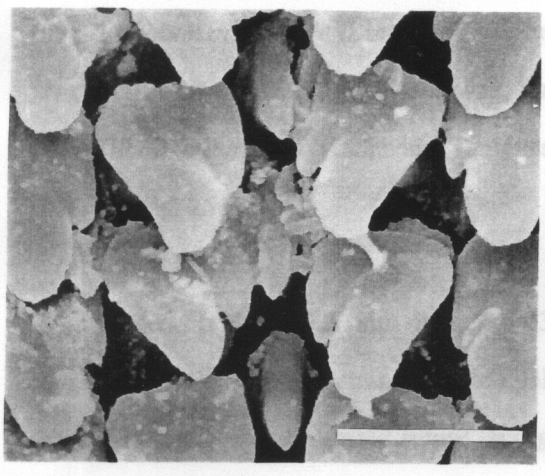


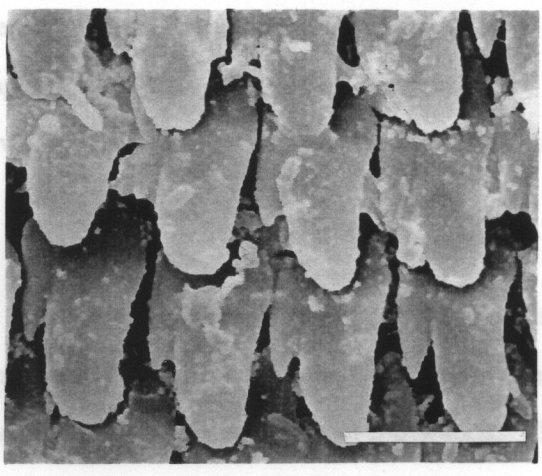
Fig. 4-7 *Cylindrotis siamensis*; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglia, d) penial complex, and e) female reproductive organ. Scale bars = 1 mm.



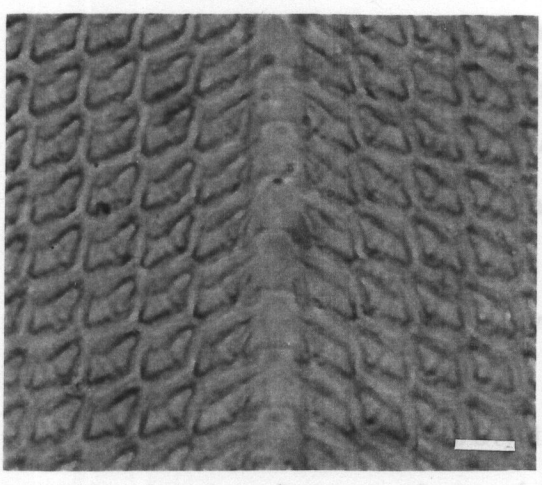
a



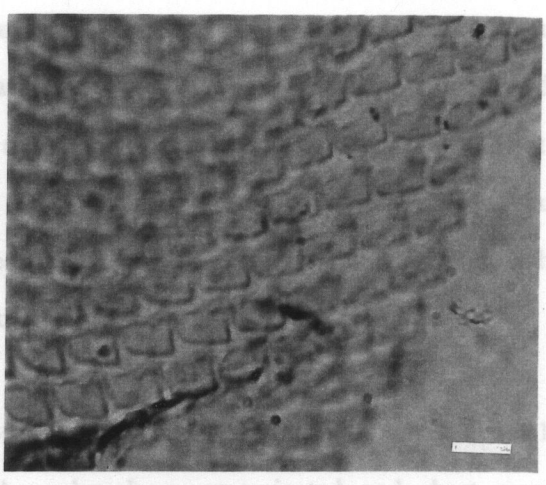
b



c



d



e

Fig. 4-8 Radula of *Cy. siamensis*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 50. μm in (a), and 10 μm in (b) – (e).

Ellobium aurisjudae (Linneus, 1758)

(Fig. 4-9, 4-10)

1758 *Bulla auris judae* Linnaeus, Syst. Nat. , ed. 10: 728 (no locality).

1798 *Ellobium labrosum* and *E. subtile*Röding, Mus. Bolten. : 105 (no locality).

1817 *Auricula recticulata* Schumacher, Essai nouv. syst. : 229 (no locality).

1854 *Auricula dactylus* and *A. turrita* Pfeifer, Nov. conch. , 1: 15, pl. 5 fig. 15-16 (Borneo), pl. 4 fig. 8-9 (Philippines).

1889 *Auricula dactylus* (Linnaeus), Morelet, J. de Conch. , 37: 129 (Kampot, Kep. Cambodge).

1950 *Auricula auris-judae* (Linnaeus), Suvatti, Fauna Thailand:88 (Singora, Bandan, Koh Samui, Chantaburi estuary, Tachin).

1974 *Ellobium aurisjudae* (Linnaeus), Brandt, Arch. Moll. , 105: 423 pl. 16 fig. 94 (Thailand).

1998 *Ellobium aurisjudae* (Linnaeus), Vermeulen & Whitten, Fauna Malaysiana guide to land snails of Bali , 164, fig. 39 (Sarawak, Singapore).

1976 *Ellobium aurisjuda* (Linnaeus),Tantanasiriwong, Phuket Mar. Biol. Center Res. Bull. 10: 22, fig. 256.

Shell is 19.7-57.3 mm long 6.6-23.2 mm wide, cylindrical, thick, solid and white, covered by brownish periostracum which pale brown in juvenile. Spire high 3.9-1.9 mm, cone-shaped, blunt, slightly indented suture, and generally eroded. There are about 5-6 whorls. The largest part of body whorl and aperture length is about 0.85 and 0.64 of shell length, respectively. Umbilical area is marked by shallow excavation. Some shells are very shallow. Aperture is ear-shaped. Columella wall has a simple columellar tooth. Parietal wall has a horizontal tooth and a vertical tooth. Palatal wall is smooth (Fig. 4-9 a). Animal has a creamy or pinky white. Foot is thick with white or black pigment spots on its skin. Tentacles are subcylindrical shaped, acute tip, swollen nears the tip, red color in some specimens. Mantle skirt is creamy white and fleshy. Eyes located at the base of tentacles and covered by thick skin.

The formula of radula is (30-37)+1+(30-37) with a small central tooth, which about 1/3 of first lateral tooth; narrow base, subquadrangular, long, emarginated and short crown, unicuspid, slender and rounded. Lateral teeth base is narrow, long, and rhombic, crown tricuspid; mesocone large, broad and rounded; endocone and ectocone are very weak and blunt. Marginal teeth are smaller than lateral teeth; crown unicuspid (Fig. 4-10).

Reproductive system contains flat, dark yellow ovotestis, which enclosed by large hepatopancreases and short hermaphroditic duct. Seminal vesicle is long and straight. Bursa duct connects to oviduct on anterior third. Albumen gland and mucous gland are bright yellow and lobed except anterior part of mucous gland (Fig. 4-9 e). Penial complex is very long; anterior vas deferens is very tiny, attach to the penial sheath; penis is long, narrow except at the base, which is swelling, chitinous and convoluted at the proximal part; penial sheath is slightly thick, as long as the penis; penial retractor muscle is short and thick (Fig. 4-9 d).

Nervous system composed of rounded cerebral and pedal ganglia, slightly elongate rounded pleural, parietal and visceral ganglia. Diameter of cerebral ganglia is about 0.05-0.60 mm. Pedal and visceral ganglia are almost the same size as cerebral ganglia. Left parietal ganglia are divided into anterior and posterior portion which connect by a short commissure. Left pleuroparietal commissures are very long and shorter than the right. Left parietovisceral commissure is longer than the right. Statocysts are located at anterior part of pedal ganglia (Fig. 4-9 c).

Habitat notes: *E. aurisjudae* usually live in and under rotten logs. Sometimes they appear crawling on the mud surface.

Distribution in upper Gulf of Thailand: Trat, Chantaburi, Chonburi, Samutprakan and Samutsongkram Provinces.

World distribution: Philippines, Indonesia, Australia, Thailand, Myanmar, India, Moluccas.

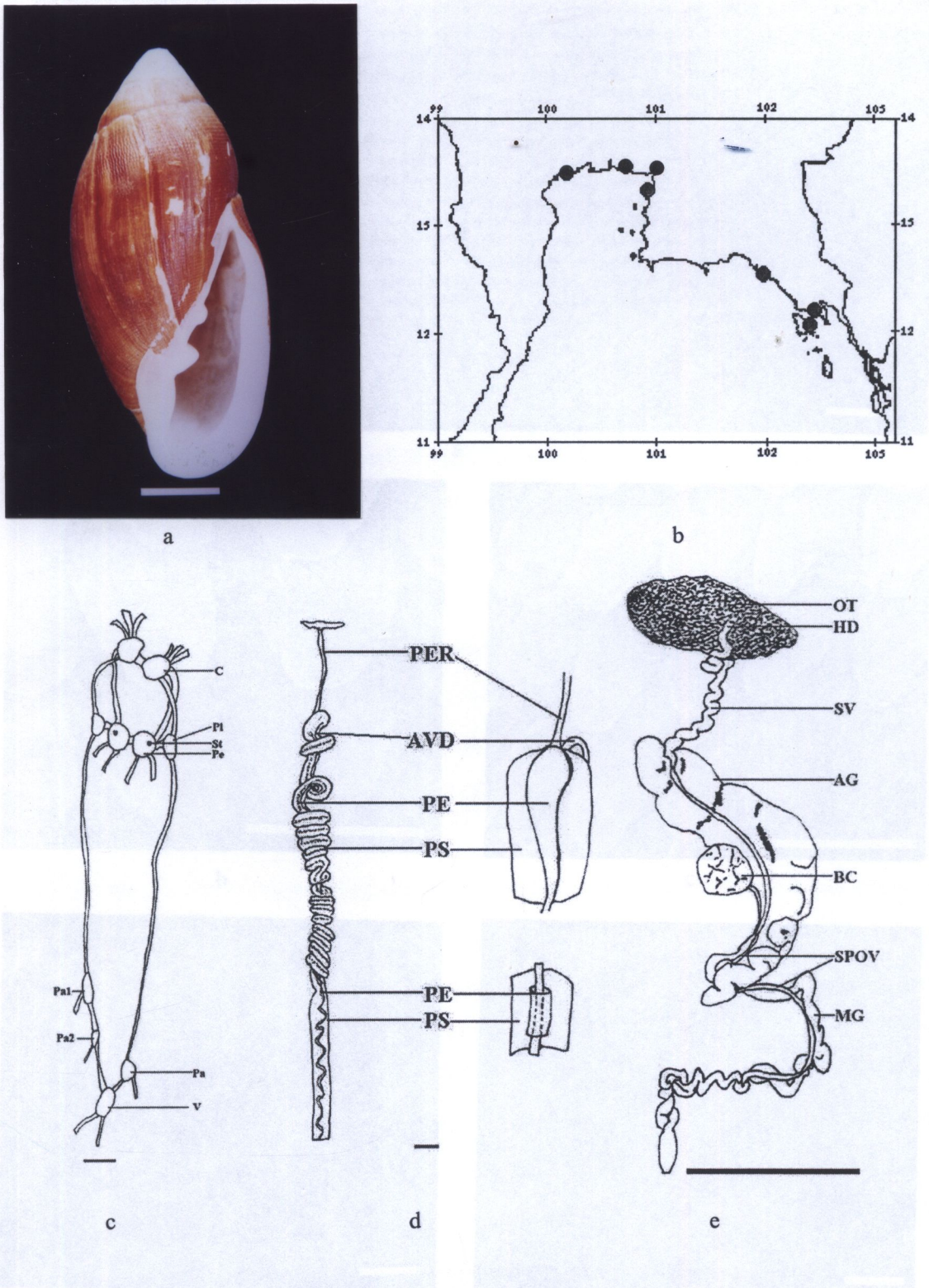


Fig. 4-9 *Ellobium aurisjudae*; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglia, d) penial complex, and e) female reproductive organ, scale bars = 1 cm.

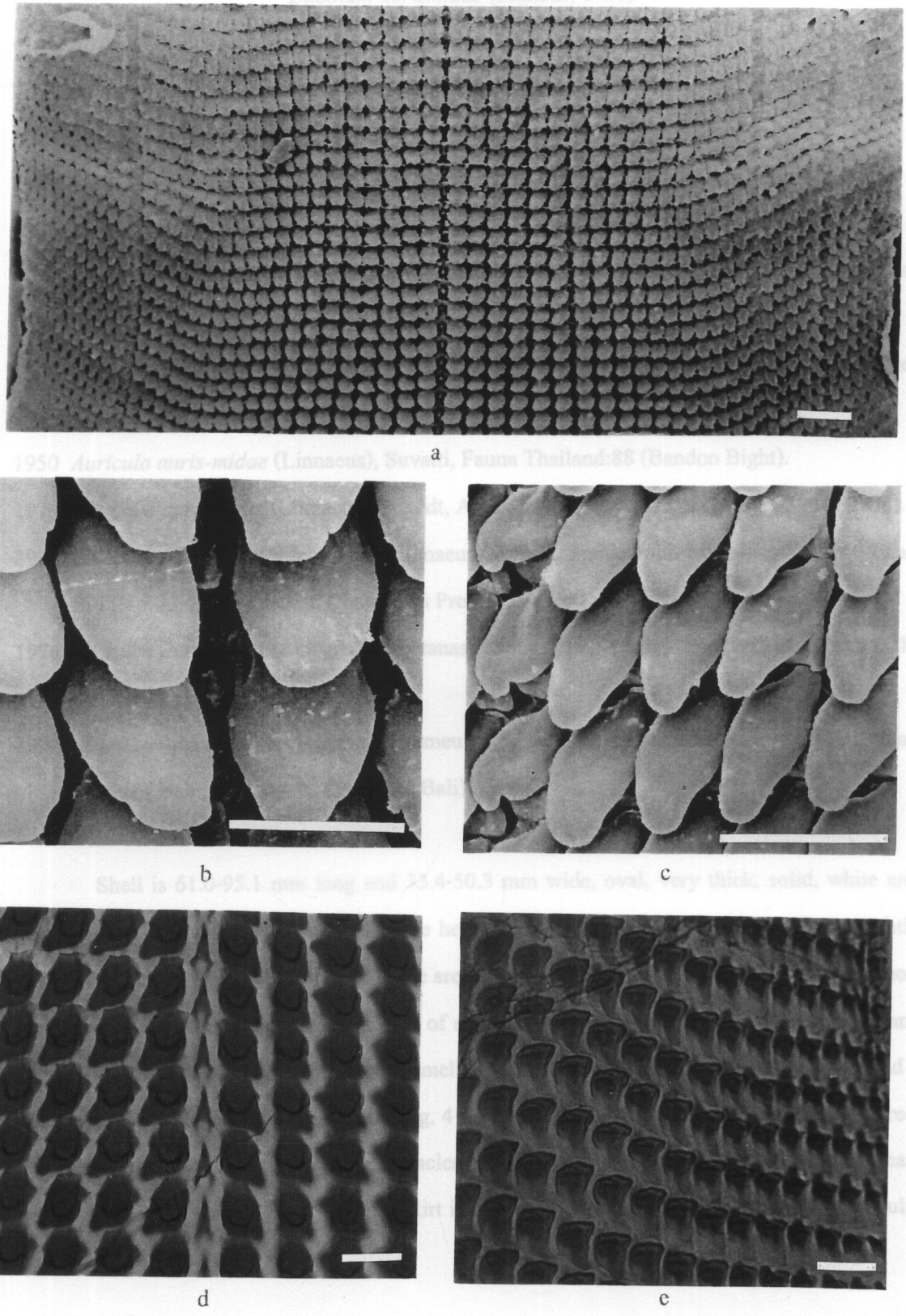


Fig. 4- 10 Radula of *E. aurisjudae*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a), (d) and (e), and 50μm in (b) and (c).

Ellobium aurismidae (Linneus, 1758)

(Fig. 4-11, 4-12)

1758 *Bulla auris judae* Linnaeus, Syst. Nat. , ed. 10: 728 (no locality).

1798 *Ellobium midae* Röding, Mus. Bolten. : 105 (no locality).

1798 *Ellobium ceramense* and *E. tumidum* Röding, Mus. Bolten. : 105 (no locality).

1801 *Auricula midae* Lamarck, Syst. anim. s. vert. : 92 (no locality).

1889 *Auricula auris-midae* (Linnaeus),Morelet, J. de Conch. , 37: 129 (de Hatien à Kampot, Cambodia).

1904 *Auricula auris-midae* (Linnaeus), Fisher & Dautzenberg. Miss. Pavie, 3: 413 (Canbodge, Tonkin, Bangkok, Kompong-Som).

1950 *Auricula auris-midae* (Linnaeus), Suvatti, Fauna Thailand:88 (Bandon Bight).

1974 *Ellobium aurismidae* (Linnaeus), Brandt, Arch. Moll. , 105: 423 pl. 16 fig. 93 (Thailand).

1966 *Ellobium (Ellobium) aurismidae* (Linnaeus), Solem, Spolia zool. Mus. haun. , 24:40 (Kao Soi Dao, Makham District; Chantaburi Prov.).

1976 *Ellobium aurismidae* (Linnaeus), Tantanasiriwong, Phuket Mar. Biol. Center Res. Bull. 10: 22.

1998 *Ellobium aurismidae*(Linnaeus), Vermeulen & Whitten, Fauna Malaysiana guide to land snails of Bali , 164, fig. 40 (Sumatra, Bali).

Shell is 61.0-95.1 mm long and 33.4-50.3 mm wide, oval, very thick, solid, white and covered with brownish periostracum. Spire height is 6.5-19.9 mm, cone-shaped, blunt, slightly indented suture and generally eroded. There are about 6-7 whorls. The largest part of body whorl and aperture length is about 0.85 and 0.73 of shell length, respectively. Umbilicus is deep and narrow. Columella wall has a simple columellar tooth. Parietal wall has a vertical tooth and a horizontal tooth. Palatal wall is smooth (Fig. 4-11 a). Animal has creamy white or flesh-colored, with strips of white or black or both. Tentacles are subcylindrical, acute at the tip, swollen nears the tip, brown-red and tapering. Mantle skirt is white and fleshy. Eyes are located at tentacular base and covered by thick skin.

The formula of Radula is (42-51)+1+(42-51) with a small central tooth; narrow base, triangular and emarginated, short crown with unicuspid and triangular. Lateral teeth base is rhombic shaped and large, crown tricuspid; mesocone is large and rounded, endocone and

ectocone are very short and rounded. Marginal teeth base is subquadrangular, long. the crown has 2-4 small, rounded cusps (Fig. 4-12).

Reproductive system contains flat, brown to orange ovotestis, which enclosed by large hepatopancreases and short hermaphroditic duct. Bursa duct connects to oviduct towards the center of oviduct. Albumen gland and mucous gland are bright yellow, lobed exception of the anterior mucous gland (Fig. 4-11e). Penial complex is very long and thick. The penial sheath is about 2 times longer than the penis with thick and dilates at the proximal part. Anterior vas deferens is very small and attached to penial sheath. Penial retractor muscle is as long as penial length. The penis is slender and pointed (Fig. 4-11d).

Nervous system composed of rounded cerebral and pedal ganglia, slightly elongate and rounded pleural, parietal and visceral ganglia. Diameter of cerebral ganglia is about 0.09-0.75 mm. Pedal and visceral ganglia are almost the same size of cerebral ganglia. Left parietal ganglia are divided into anterior and posterior portion, which connected by a short commissure. Pleuroparietal commissures are very long, the left one is shorter than the right one. Left parietovisceral commissure is longer than the right. Statocysts are located at anterior part of pedal ganglia (Fig. 4-11c).

Habitat note: *E. aurismidae* usually lives in and under rotten log in terrestrial zone of mangrove.

Distribution in upper Gulf of Thailand: Trat Province.

World distribution: Vietnam, Indonesia, Cambodia, Australia, Thailand, Malaysia, Singapore.

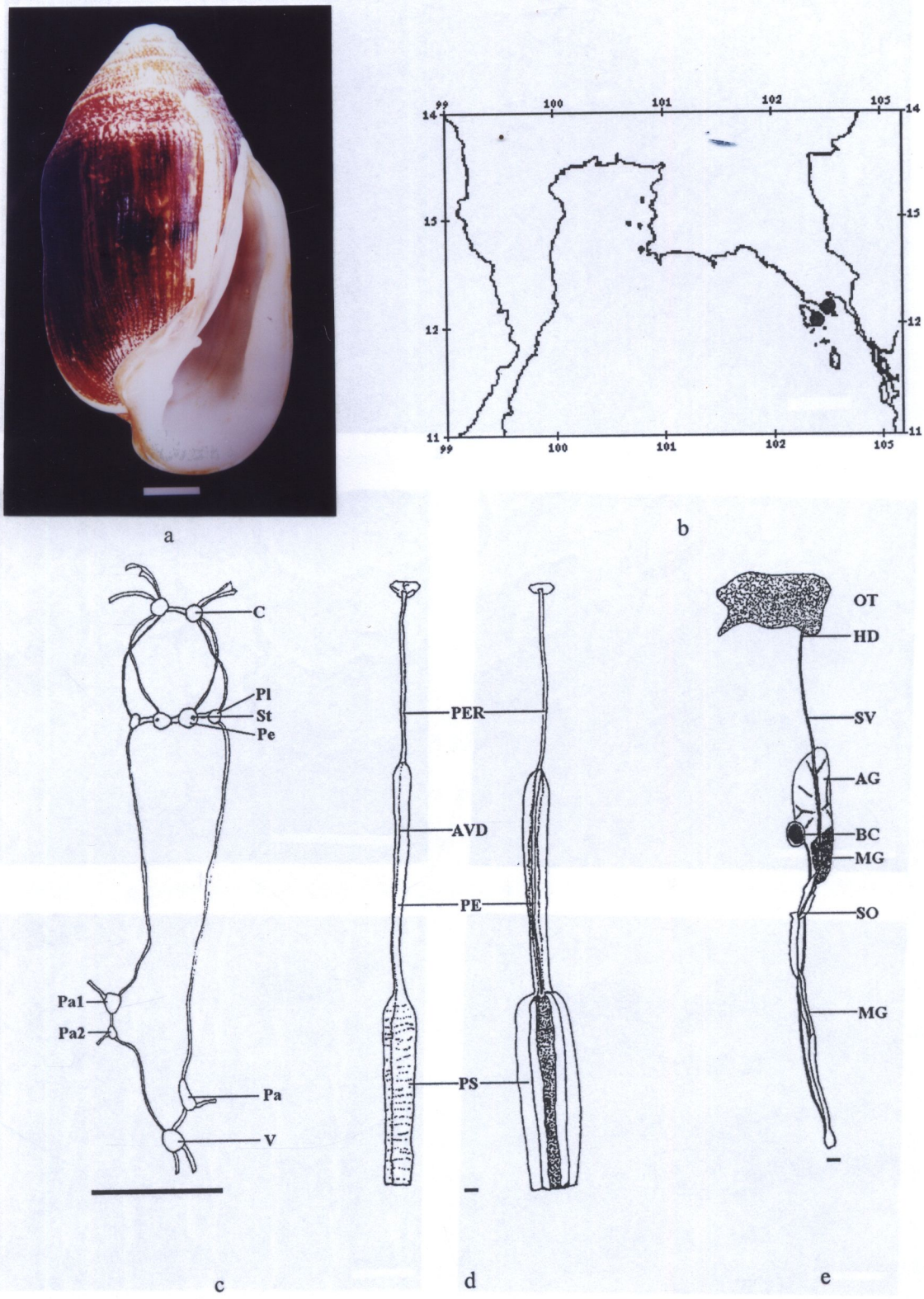
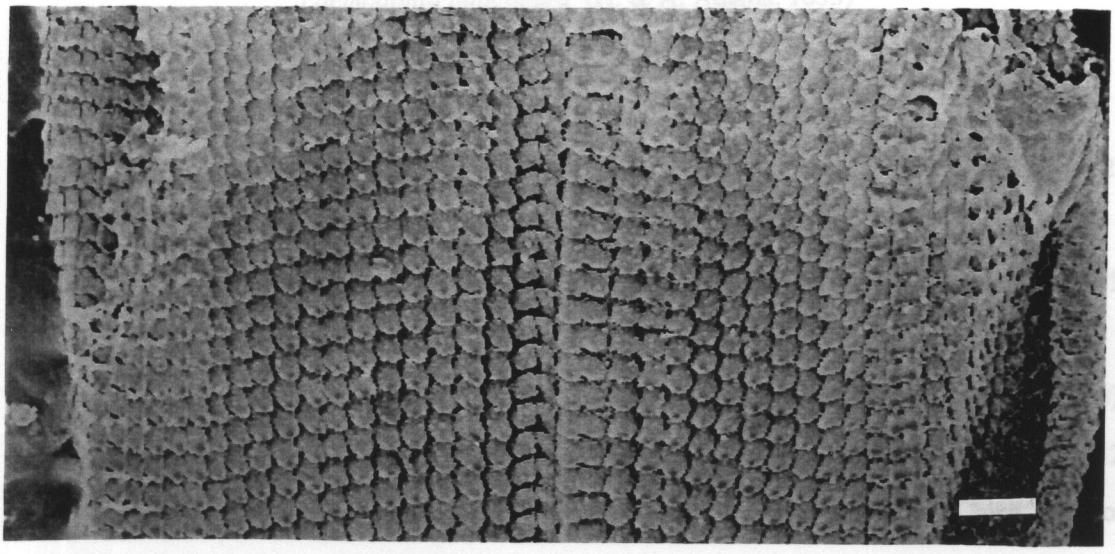
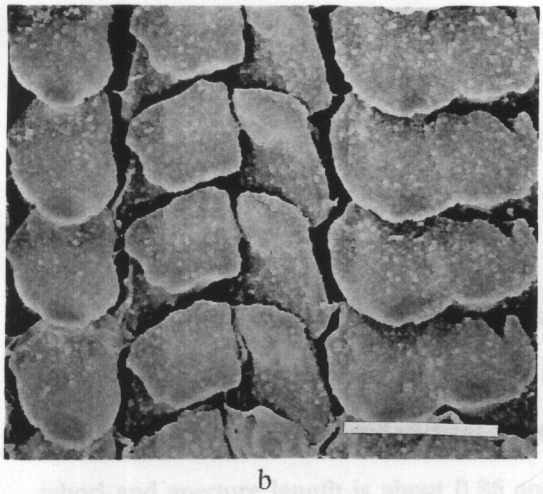


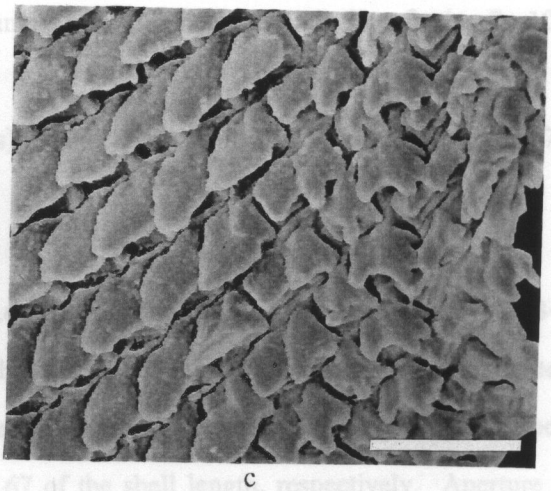
Fig. 4-11 *Ellobium aurismidae*; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglion, d) penial complex, and e) female reproductive organ, scale bars = 1 cm.



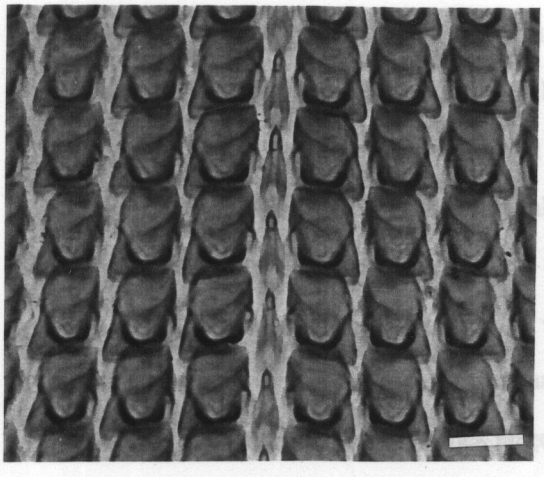
a



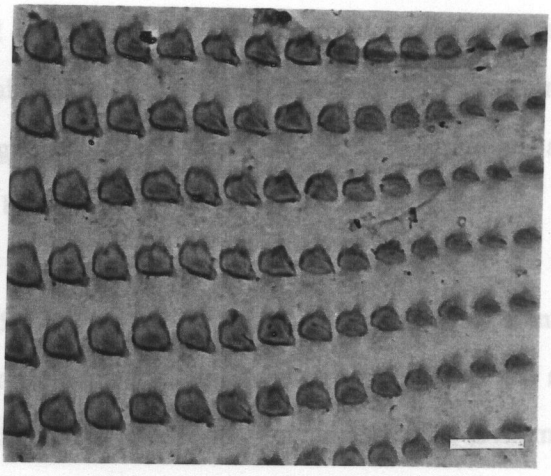
b



c



d



e

Fig. 4-12 Radula of *E. aurismidae*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 500 μm in (d) and (e), 100 μm in (a), and 50 μm in (b) and (c).

Laemodonta punctigera (H. & A. Adams, 1853)

(Fig. 4-13, 4-14)

1853 *Plecotrema punctigerum* H. & A. Adams, Proc. zool. Soc. London, 21: 120 (Borneo)

1853 *Plecotrema imperforatum* H. & A. Adams, H. & A. Adams, Proc. zool. Soc. London, 21: 120 (Negros, Philippines).

1864 *Plecotrema punctigera* H. & A. Adams, Crosse & Fisher, J. de Conch. , 12: 330 (Embouchure de Vaico, Cochinchine).

1875 *Plecotrema punctigera* H. & A. Adams, Morelet, Sér. Conch. , 4: 273 (Siam; Cochinchine).

1956 *Plecotrema punctigera* H. & A. Adams, Hubendick, Proc. malac. Soc. London, 32: 120 (Bandr, N of Bombay; Vizagapatam; Iravady delta; Coasts of the South China sea from Singapore to Swatow; Philippines).

1959 *Laemodonta punctigera* (H. & A. Adams), van Benthem Jutting, Beaufortia, 7: 107 (Tandjong Tiram, Sumatra).

1974 *Laemodonta punctigera* (H. & A. Adams), Brandt, Arch. Moll. , 105: 423 pl. 15 fig. 79 (Thailand).

Shell is about 5.7 - 8.7 mm long and 3.6 - 6.1 mm wide, oval, solid, pale brown with 3-4 brown bands on body whorl. Spire height is about 0.5 – 1.8 mm, dome-shaped, slight indented suture. Umbilicus is deep and vertical. There are about 8 - 10 whorls. The largest part of body whorl and aperture length is about 0.86 and 0.67 of the shell length, respectively. Aperture is narrowly ovate-lunate. Parietal wall has 2 teeth, vertical and horizontal arrangement and bifurcated. Columellar tooth is simple. Palatal wall has 2 horizontal teeth (Fig. 4-13 a). Animal has creamy white head and foot with black pigments on their skin. Tentacles are cylindrical and tapering. Eyes located inside of the tentacular base.

The formula of radula is (16-18) + (9-12) + 1 + (9-12) + (16-18) with a small central tooth. The tooth has a wide base, triangular and emarginated, small crown, unicuspid narrow and round. Lateral teeth are about 3 times larger than the central teeth. Lateral teeth base is rhombic shaped with tricuspid crown; mesocone is largest and rounded; ectocone and endocone are short and pointed. Marginal teeth are about 2 – 3 times larger than lateral teeth; large crown, tricuspid, large mesocone and rounded; ectocone and endocone are short and pointed. The radula sheath

composed of a short row, with central and lateral teeth and a complete row of central, lateral and marginal teeth in alternating along the sheath (Fig. 4-14).

Reproductive system contains conical, cream colored ovotestis and short hermaphroditic duct. Seminal vesicle is convoluted and long. Albumen gland is short, lobed and transparent. Mucous gland are very long, unlobed and transparent. Bursa duct joined to oviduct near the female genital pore (Fig. 4-13 e). Penial complex is cylindrical, small; penial sheath is about 3-4 times longer than penis; penial retractor muscle is about 1/3 of penial sheath; penis is short, round, cylindrical; anterior vas deferens attached to the penial sheath at the distal part and entered to penial structure at the base (Fig. 4-13 d).

Nervous system composes of large round lobed cerebral ganglia and round unlobed parietal, pedal, pleural and visceral ganglia. Cerebral and pedal ganglia is almost similar in size, which diameter is about 0.2 – 0.3 mm. Pleural ganglia are smallest and slightly elongated. Parietal ganglia are about 2 times larger than pleural ganglia. Right cerebropedal and cerebropleural are as long as the left. Left pleuroparietal commissure shorter than the right and vice versa in parietovisceral. Statocyst located at the anterior part of the pedal ganglia (Fig. 4-13c).

Habitat notes: *L. punctigera* frequently found on mud surface in mangrove and nipa palm forest.

Distribution in upper gulf of Thailand: Trat, Chonburi, Chachoengsao, Samutprakan, Samutsongkram and Phetchaburi Provinces.

World distribution: Vietnam, Philippines, Indonesia, Cambodia, Malaysia, Thailand, Singapore, Myanmar and India.

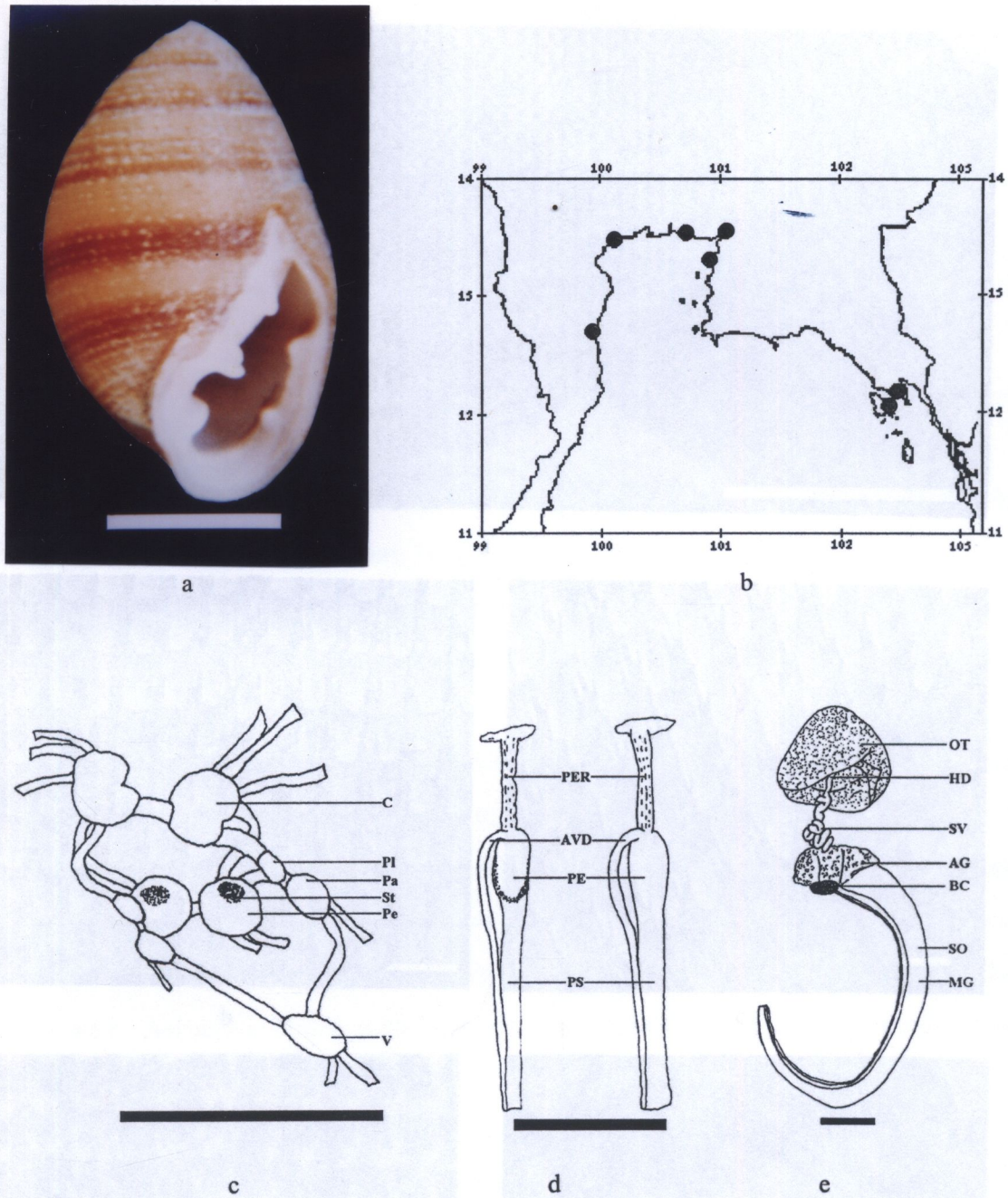
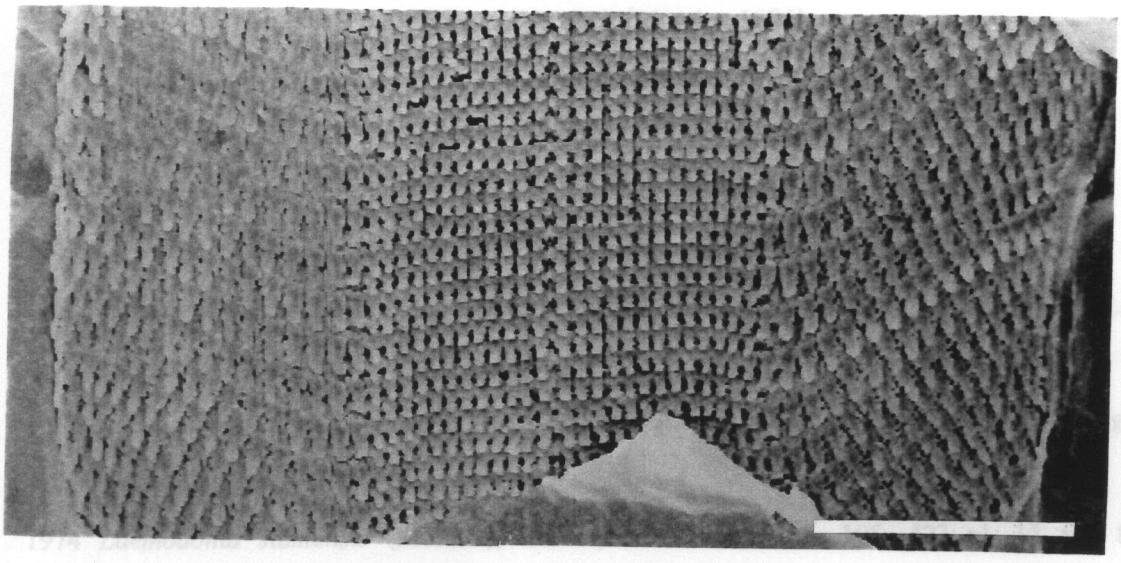
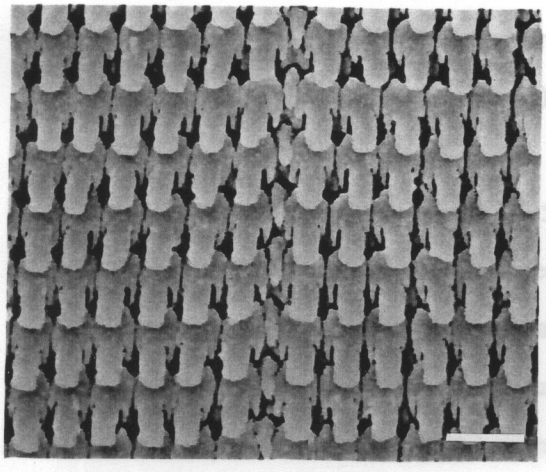


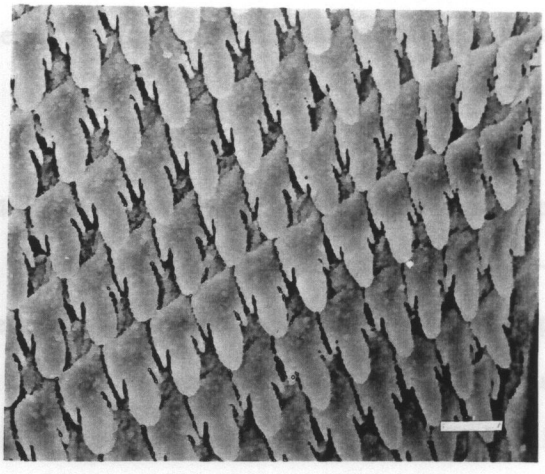
Fig. 4-13 *Laemodonta punctigera*; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglia, d) penial complex, and e) female reproductive organ, scale bar = 5mm in (a) and 1 mm in (c) to (e).



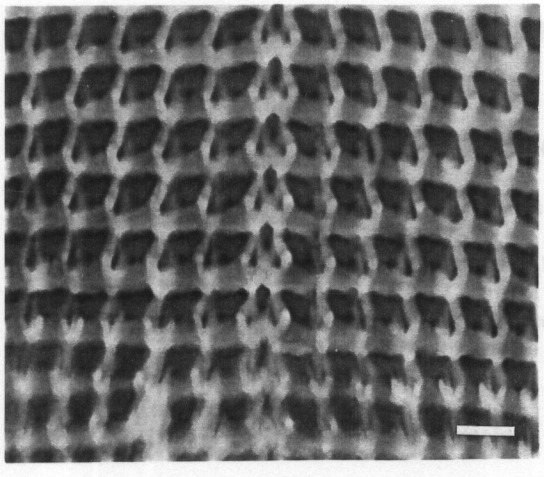
a



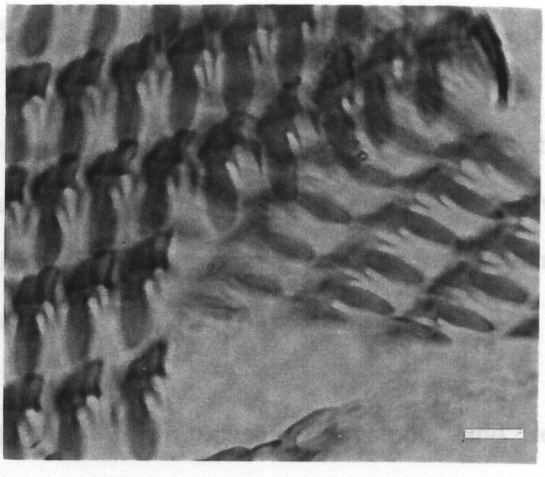
b



c



d



e

Fig. 4-14 Radula of *L. punctigera*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a), and 10 μm in (b) – (e).

Laemodonta siamensis (Morelet, 1875)

(Fig. 4 – 15, 4-16)

1875 *Plecotrema siamensis*, Morelet, Sér. Conch. , 4: 273, pl. 13 fig. 6 (Siam).

1891 *Plecotrema siamensis* Morelet, Fischer, Bull. Soc. Hist. Mat, Autun, 4:40 (Siam).

1895 *Plecotrema siamensis* Morelet, Sykes, Proc. malac. Soc. London, 1: 245 (Siam).

1956 *Plecotrema siamensis* Morelet, Hubendick, Proc. malac. Soc. London, 32: 121, pl. 23 fig. 6 (Borneo, Celebes, Philippines, Korea).

1959 *Laemodonta siamensis* (Morelet), van Benthem Jutting, Beaufortia, 7 (83) : 108 (Sibloga, Tapanuli, sumatra).

1974 *Laemodonta siamensis* (Morelet), Brandt, Arch. Moll. , 105: 423 pl. 15 fig. 81 (Chantaburi, Rayong, Chonburi, Trad).

1998 *Laemodonta siamensis* (Morelet), Vermeulen & Whitten, Fauna Malaysiana guide to land snails of Bali , 164, fig. 59 (Sumbawa).

Shell is 6.1 - 9.3 mm long and 3.3 – 5.4 mm wide, oval, solid, brown, unicolored. Spire height is about 0.5 – 1.6 mm, dome-shaped, slightly indented suture. There are about 6 – 8 whorls. The largest part of body whorl and aperture length is about 0.86 and 0.66 of shell length, respectively. Umbilicus is shallow, narrow and vertical. Aperture is narrow, ear-shaped. Parietal wall has 2 teeth, vertical and horizontal arrangment. Columellar tooth is simple. Palatal wall has 1 - 2 teeth. Animal has creamy white body with black cylindrical and tapering tentacles. Eyes locate at the inside of tentacular base (Fig. 4- 15 a).

The formula of radula with (44-46) + 1 + (44-46), with a small central tooth, which is about a half of first lateral tooth. The tooth has a wide base, triangular, emarginated, short crown, unicuspid and pointed. Lateromarginal teeth have bicuspid crown; mesocone is large and rounded; endocone is short, pointed with rectangular and long base (Fig. 4-16).

Reproductive system contains yellowish brown, conoidal ovotestis and long hermaphroditic duct. Seminal vesicle is long and convoluted. Albumen gland and mucous gland are transparent (Fig. 4- 15 e). Penial complex is small and long. Penial retractor muscle and anterior vas deferens are as long as penial sheath length. Anterior vas deferens run along the

penial sheath and entered to penial structure at the penis base. Penis is rounded and short about 1/8 of penial sheath (Fig. 4-15d).

Nervous system composed of large round lobed cerebral ganglia, round unlobed parietal, pedal, plural and visceral ganglia. Cerebral ganglia is the largest, which diameter is about 0.24 - 0.36 mm. Visceral and pedal ganglia are almost similar in size, which is about ¾ of cerebral ganglia. Parietal are about ½ - 1/3 of pedal ganglia and about 2 times larger than pleural ganglia. Right and left cerebropedal and cerebropleural are similar in length. Statocyst located at anterior part of pedal ganglia (Fig. 4-16).

Habitat notes: *L. siamensis* usually found on mud surface in mangrove and nipa palm forest.

Distribution in upper Gulf of Thailand: Chonburi, Chachoengsao, Samutprakan, Bangkok, Samutsongkram and Phetchaburi Provinces.

World distribution: Korea, Philippines, Indonesia, Malaysia, Thailand and Singapore.

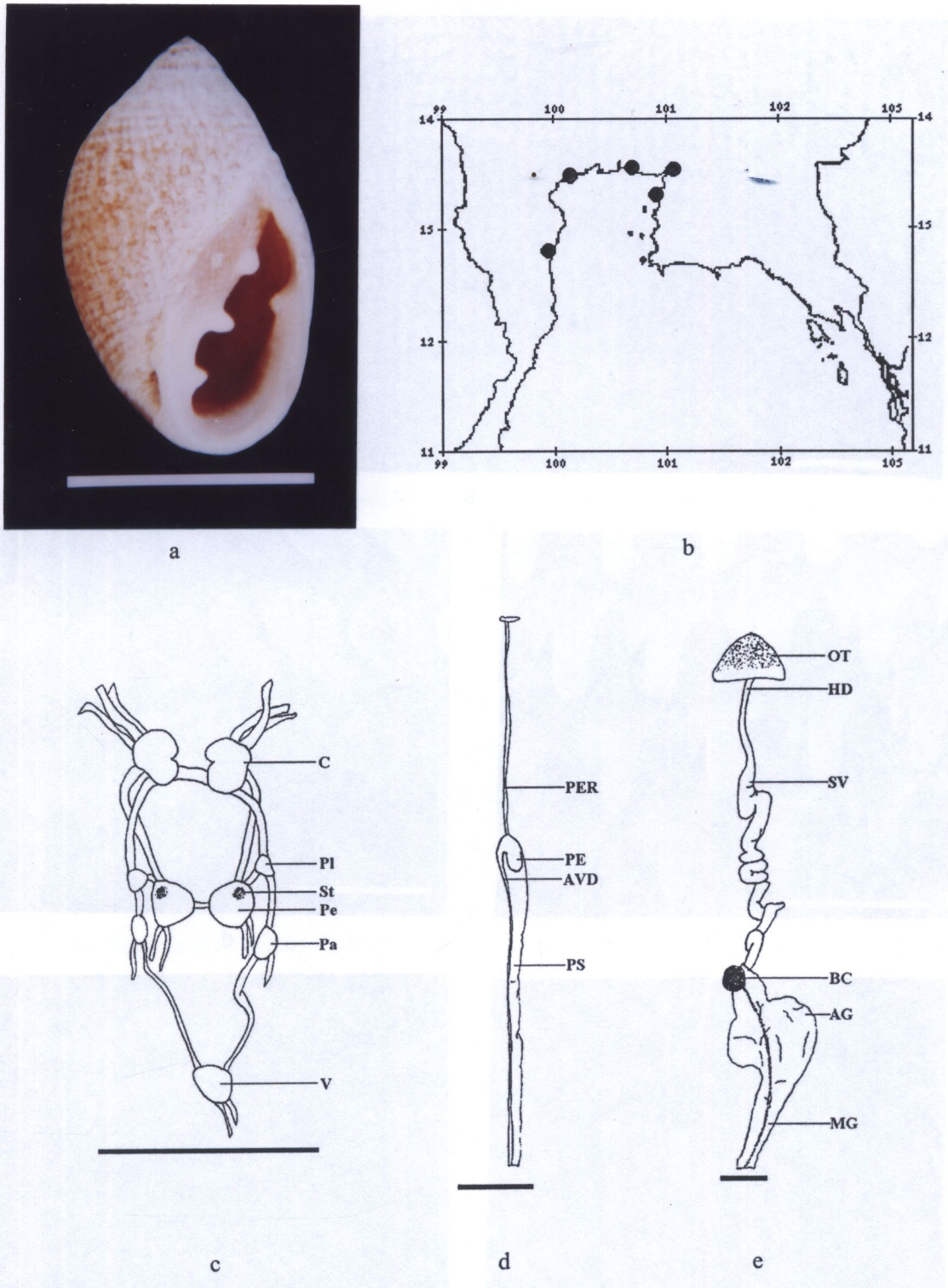
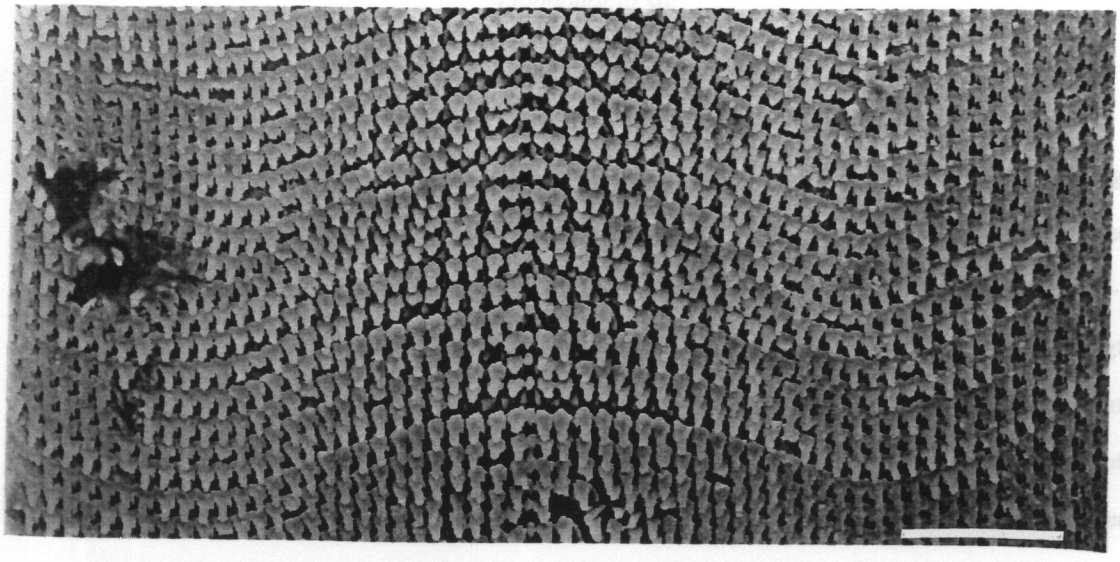
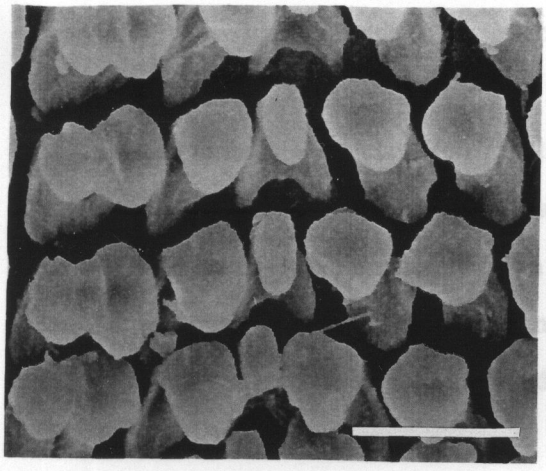


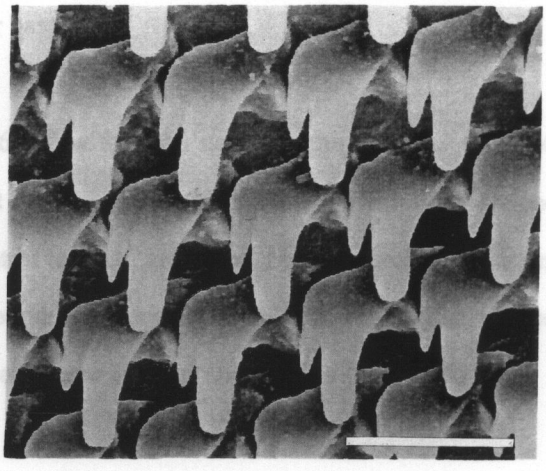
Fig. 4-15 *Laemodonta siamensis*; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglion, d) penial complex, and e) female reproductive organ, scale bar = 5mm in (a) and 1 mm in (c) to (e).



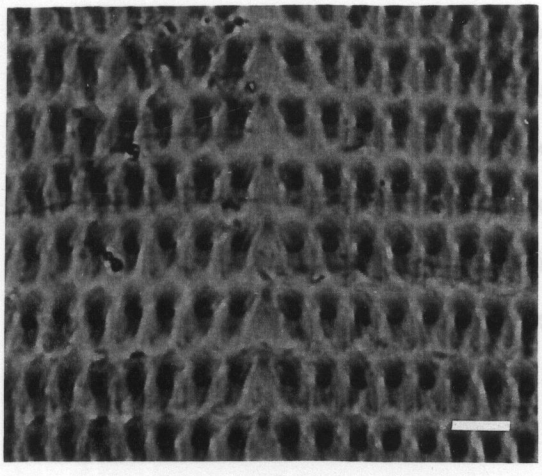
a



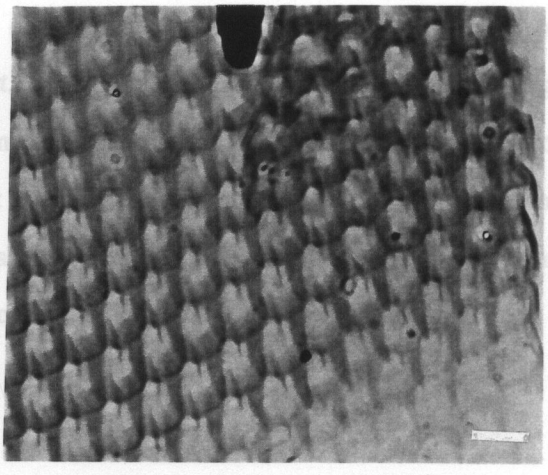
b



c



d



e

Fig. 4-16 Radula of *L. siamensis*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 50 μm in (a), and 10 μm in (b) - (e).

Laemodonta sp.

(Fig. 4-17, 4-18)

Shell is 9.3 - 12.2 mm long and to 6.0-7.5 mm wide, oval, solid and brown. Spire height is about 0.6 – 1.4 mm, cone shaped with generally eroded and slightly indented suture. Shell surface is generally smooth but some shells have hairy periostracum. There are about 6 – 9 whorls. The largest part of body whorl and aperture length is about 0.91 and 0.73 of shell length, respectively. Aperture is narrowly ovate-lunate. Parietal wall has 2 teeth with vertical and horizontal arrangment. Columellar tooth is simple. Palatal wall has a long vertical tooth. Umbilicus is narrows and shallow (Fig. 4-17 a). Animal has creamy white head and foot. Head and tentacles have black pigmented. Mantle skirt is thin and white. Tentacles are cylindrical, tapering with eye located inside of the tentacular base.

The formula of radula is (66-71)+1+(66-71) with small narrow central tooth. the tooth has a wide base, triangular, emarginated, short crown, unicuspid, narrow and rounded shaped. Lateral teeth are about 2-3 times wider than central tooth. Lateral teeth base is quadrangular and long; crown unicuspid triangular shaped and rounded. Marginal teeth base is rhombic shaped; crown bicuspid; mesocone is long and rounded; endocone is short and pointed (Fig. 4-18).

Reproductive system contains light brown and conical ovotestis and short hermaphroditic duct. Seminal vesicle is long and convoluted. Albumen gland is lobed, yellow and transparent. Mucous gland is simple, yellow and transparent. Prostate gland is dark yellow. Oviduct enlarges near genital opening (Fig. 4-17 e). Penial complex is short; anterior vas deferens separate from penial sheath, thick, enter to penial structure at the base of penis and about 1.5 times longer than the penial sheath. Penis is about 2/3 of penial sheath, oval, thick and short. Penial sheath is thin, constricted at distal end which thick and vertical grooves. Penial retractor muscle is as long as penial sheath and relatively thick (Fig. 4-17 d).

Nervous system composed of round lobed cerebral ganglia, round unlobed parietal, pleural, pedal, and visceral ganglia. Cerebral ganglia is the largest, which diameter is 0.39 - 0.45 mm. Pedal and visceral ganglia are almost similar in size. Visceral ganglion is about 2/3 of cerebral ganglia. Parietal ganglia are rounded and about 2 – 3 times longer than pleural ganglia.

Left cerebropedal, cerebropleural and parietopedal commissures are as long as the right. Left pleuroparietal commissure is longer than the right. Statocysts located at the anterior part of pedal ganglia (Fig. 4-17c).

Habitat notes: *Laemoodonta* sp. is often found on mud surface in mangrove.

Distribution in upper Gulf of Thailand: Chonburi, Samutsongkram and Phetchaburi Provinces.

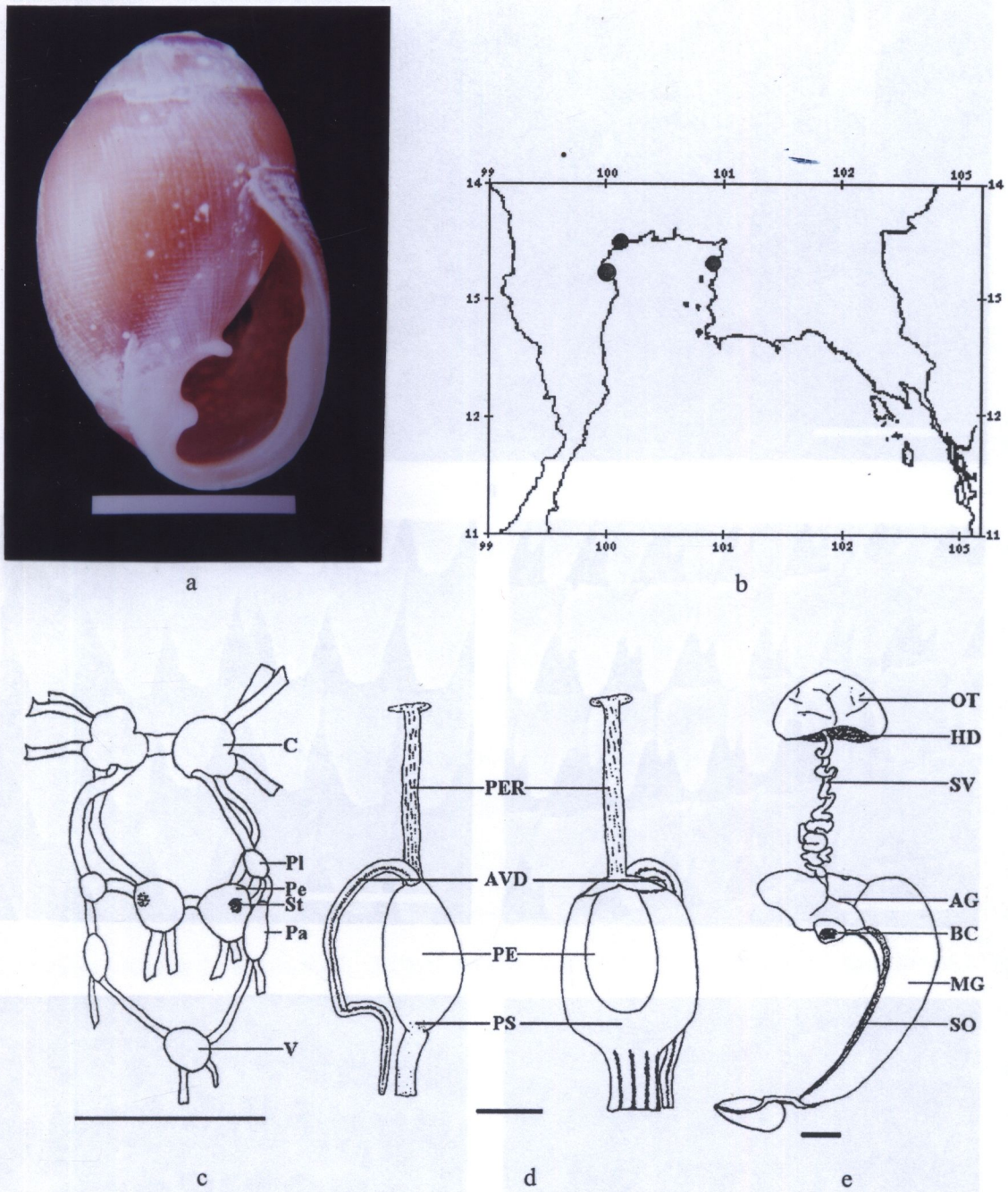
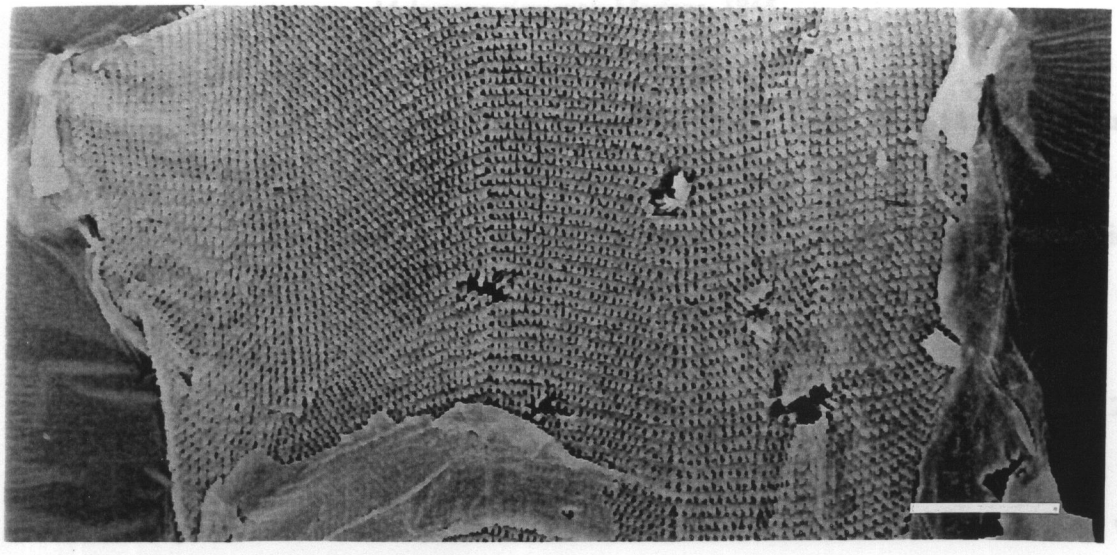
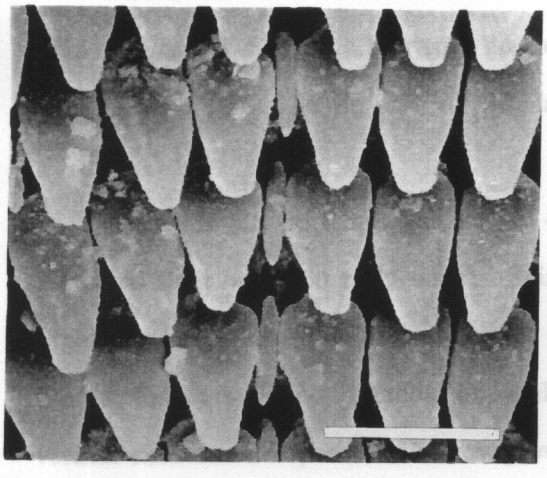


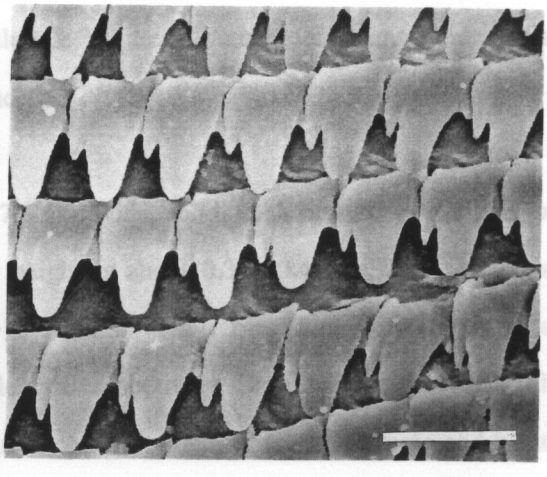
Fig. 4-17 *Laemodonta* sp. ; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglion, d) penial complex, and e) female reproductive organ, scale bar = 5 mm in (a) and 1 mm in (c)-(e).



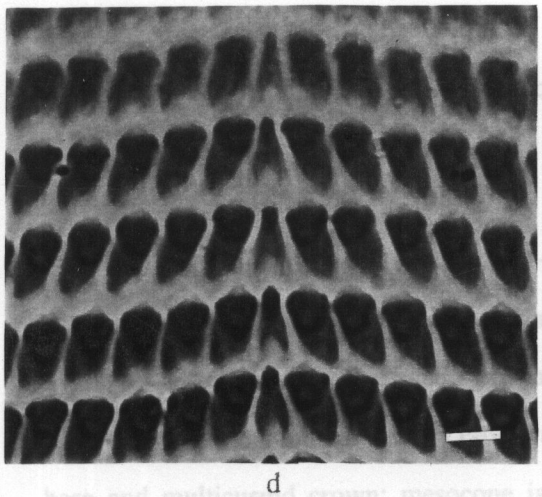
a



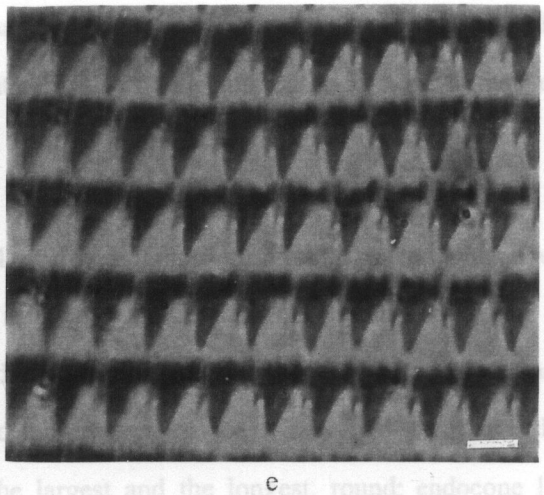
b



c



d



e

Fig. 4-18 Radula of *Laemodonta* sp. ; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a) and 10 μm in (b) – (e).

Melampus siamensis Martens, 1865

(Fig. 4 – 19, 4-20)

1865 *Melampus siamensis* Martens, Martens, Mber. Akad. Wiss. Berlin, 1865: 54 9 (Petchaburi, Siam).

1874 *Melampus siamensis* Martens, Jickeli, Act. nov. Leop. , 37: 176, pl. 7 fig 2 (Schech Said, Dahlak Ins.).

1875 *Melampus siamensis* Martens, Morelet, Sér. Conch. , 4: 271 (Siam).

1898 *Melampus siamensis* Martens, Kobelt, Conch. Cab. , 1 (16, 2) : 197, pl. 22 fig. 18, pl. 23 fig. 25-26 (Am vorderen Indischen Ozean, von Hinterindien bis zum RothenMeer).

1974 *Melampus siamensis* Martens, Brandt, Arch. Moll. , 105: 423 pl. 16 fig. 92 (Coast of Indian and western Pacific Ocean).

1998 *Melampus siamensis* Martens, Vermeulen & Whitten, Fauna Malaysiana guide to land snails of Bali , 164, fig. 57 (Bali, Thailand).

Shell is 7.0 - 13.1 mm long and 4.6 – 7.6 mm wide, solid, oval, brown, some shells have 2-4 spiral light bands on body whorl. Spire height is about 0.3 – 0.4 mm, cone-shaped and slightly indented suture. There are about 8-10 whorls. The largest part of body whorl and aperture length is about 0.92 and 0.84 of shell length, respectively. Umbilical area is very shallow vertical excavation. Aperture is narrowly ovate-lunate. Columellar tooth is simple and twisted. Parietal wall has 2 vertical teeth. Palatal wall has 4-7 horizontal teeth, which varies in size (Fig. 4–19a). Animal has gray color with black head and foot edge. Tentacles are cylindrical, blunt ended and black color at the tip. Eyes are located inside of tentacular base. Foot has a transverse groove at the anterior part.

The formula of radula is (41-46)+1+(41-46) with large central tooth; the tooth has a wide base, triangular, emarginated, small crown, is about half of the first lateral teeth which are tricuspid; outer cusps are short and stout; median cusp is round and longer than the outer cusps. Lateral teeth have round unicuspid crown and long rectangular base. Marginal teeth have short base and multicuspid crown; mesocone is the largest and the longest, round; endocone long narrow and pointed, which has 1-2 cusps; ectocone short and pointed, which have 6-8 cusps (Fig. 4-20).

Reproductive system contains light brown conical ovotestis and short convoluted hermaphroditic duct. Seminal vesicle is long and convoluted. Albumen gland is lobed. Bursa copulatrix is long, with pointed end. Insertion of bursa duct is position on the posterior of oviduct (Fig. 4 – 19e). Penial complex is long and narrow; penial sheath is very long and constricted near penial retractor muscle; penial retractor muscle is as long as penial sheath; anterior vas deferens is about 2/3 of penial sheath, separated from penial sheath and entered to penial structure near penial retractor muscle; penis is lacking (Fig. 4 – 19d).

Nervous system composes of large and rounded cerebral and pedal ganglia and small, rounded parietal, pleural and visceral ganglia. Cerebral ganglia is the largest, which diameter is about 0.28 – 0.40 mm. Pedal ganglia is almost the same size as cerebral ganglia that about 2 times larger than parietal and visceral ganglia and about 4 times larger than pleural ganglia. Left cerebropedal and cerebropleural commissures are longer than the right. Left and right parietovisceral and pleuroparietal commissures are similar in length. Pedal commissures are very short. Statocysts located at the anterior part of pedal ganglia (Fig. 4 – 19c).

Habitat notes: *M. siamensis* usually crawling on mud surface in mangrove. Sometimes hide themselves under variant substrata.

Distribution in upper gulf of Thailand: Trat, Chonburi, Chachoengsao, Samutprakan, Bangkok, Samutsongkram and Phetchaburi Provinces.

World distribution: Thailand, Malaysia, coast of India Ocean, and Western Pacific Ocean.

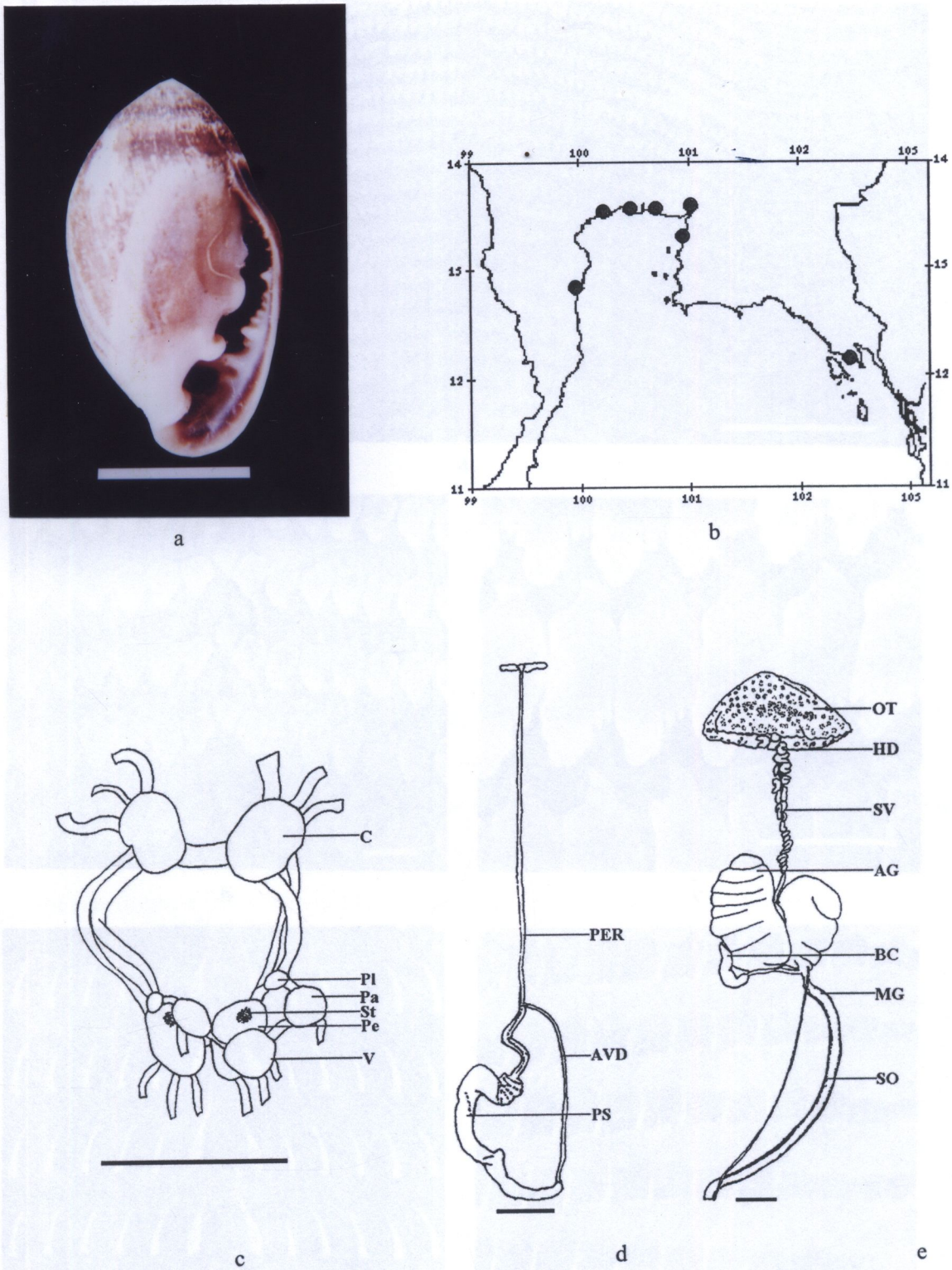
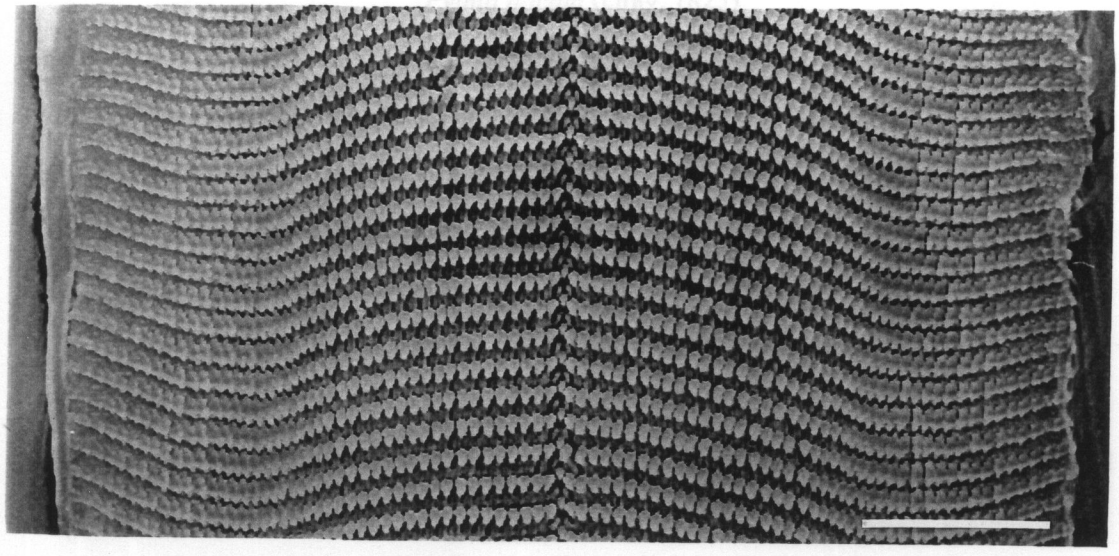
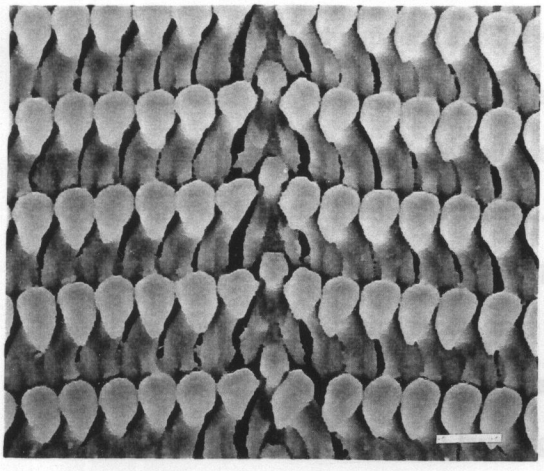


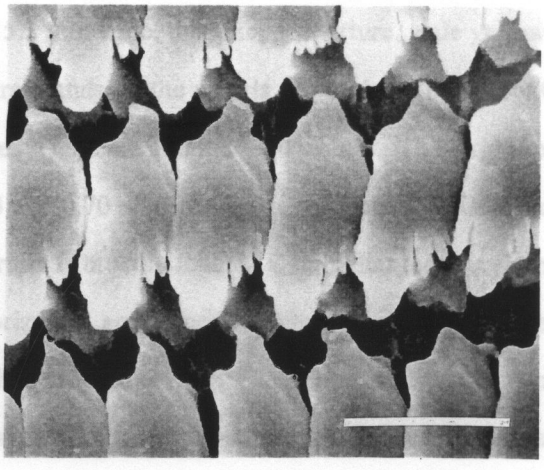
Fig. 4-19 *Melampus siamensis*; a) Shell, b) distribution in upper Gulf of Thailand, c) nerve ganglion, d) penial complex, and e) female reproductive organ; scale bar = 5 mm in (a) and 1 mm in (c)-(e).



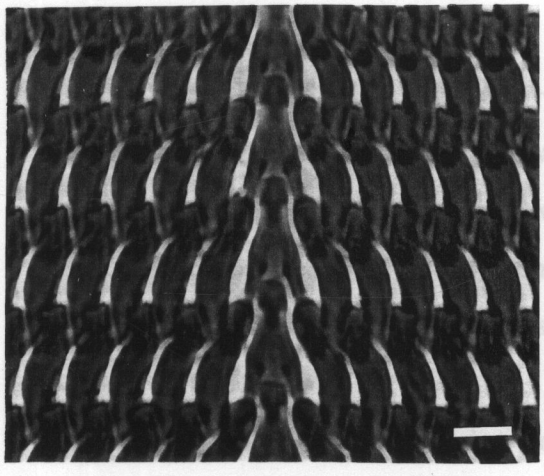
a



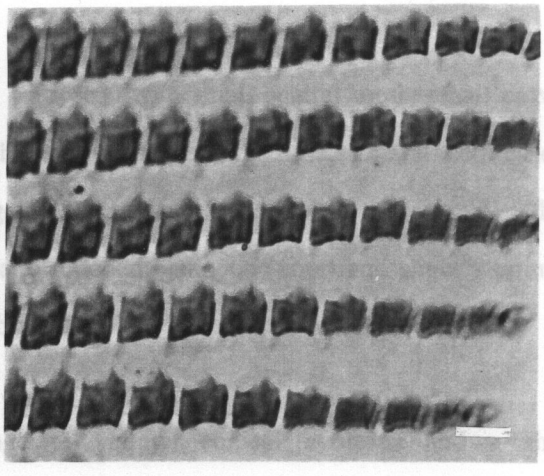
b



c



d



e

Fig. 4-20 Radula of *M. siamensis*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a), and 10 μm in (b) – (e).

Pythia plicata (Gray, 1825)

(Fig. 4-21, 4-22)

1825 *Scarabus plicatus* Gray, Ann. Phil. , 25: 415 (Bengal).

1836 *Scarabus triangularis* Benson, J. asiat. Soc. , 5: 354 (Bengal).

1844 *Scarabus plicatus* Gray, Küster, Coonch. Cab. , 1 (16): 9, pl. 1 dig 3-4 (Bengal).

1854 *Pythia inflata* Pfeifer, Novit, Conch. , 1:7, pl. 3 fig. 3-4 (Borneo).

1875 *Scarabus plicatus* (Gray), Morelet, Sér. Conch. , 4: 270 (Petburi, Thailand).

1950 *Pythia plicata* (Gray), Suvatti, Fauna Thailand:88 (Pakpun).

1974 *Pythia plicata* (Gray), Brandt, Arch. Moll. , 105: 423 pl. 15 fig. 82 (Coast of Indian and western Pacific Ocean).

Shell is 7.8 – 21.4 mm long and 5.6 – 15.2 mm wide, thin except aperture, pale yellow to brown, some shells are purple, usually with spiral bands on the whorls. Spire height is about 0.4 – 4.5 mm, conic shaped, slightly indented suture. There are about 8 – 10 whorls. The largest part of body whorl and aperture length is about 0.83 and 0.70 of shell length, respectively. Umbilicus is triangular, imperforated and horizontal. Aperture is broadly lunate. Columellar tooth is simple. Parietal wall has 3 teeth with vertical and horizontal arrangment. Palatal wall has 6-8 teeth, horizontal and vertical (Fig. 4-21a). Animal has gray color with black head and white mantle skirt. Tentacles are cylindrical and tapering with black tips. Eyes located inside of tentacular bases and covered by thin black skin.

The formula of radula is (56-63) + 1 + (56-63) with small central tooth; small crown, unicuspid, triangular; wide base, triangular with deeply concave at the base. Lateral teeth base is elongated rectangular; crown unicuspid, hexagonal or rounded. Marginal teeth are smaller than lateral teeth; crown bicuspid; mesocone long and rounded; endocone short and slightly pointed with quadrangular base. Transitional teeth is about 20^{th} – 23^{rd} of radular row (Fig. 4-22)

Reproductive system contains orange to yellow, conical ovotestis and a short hermaphroditic duct. Seminal vesicle is long and convoluted. Albumen gland is lobed. Posterior mucous gland is lobed but anterior mucous gland is simple. Bursa duct joined to oviduct near female genital opening (Fig. 4-21e). Penial complex is moderately short; anterior vas deferens adheres to penial sheath and enters to penial structure at the base; penis is cylindrical. short and

blunt end; penial retractor muscle is as long as penial sheath. Penial sheath is about 3 times longer than penis, without longitudinal groove (Fig. 4-21d).

Nervous system composes of large, round lobed cerebral ganglia, round unlobed pedal, pleural and parietal ganglia and small lobed visceral ganglion. Cerebral ganglia is the largest about 0.30 - 0.54 mm. Pedal ganglia is almost the same size as cerebral ganglia. Visceral ganglia is about 1/3 of pedal ganglia and is about 2 times larger than parietal and pleural ganglia. Left cerebropedal and cerebropleural are longer than the right. Right visceroparietal commissure is longer than the left. Statocysts located on the anterior part of pedal ganglia (Fig. 4-21c).

Habitat notes: *Py. plicata* frequently hide themselves under leaves of rotten log in nipa palm forest. They crawl to higher place during the time of raining.

Distribution in upper Gulf of Thailand: Chachoengsao, Samutprakan and Phetchaburi Provinces.

World distribution: Indonesia, Malaysia, Thailand and Singapore.

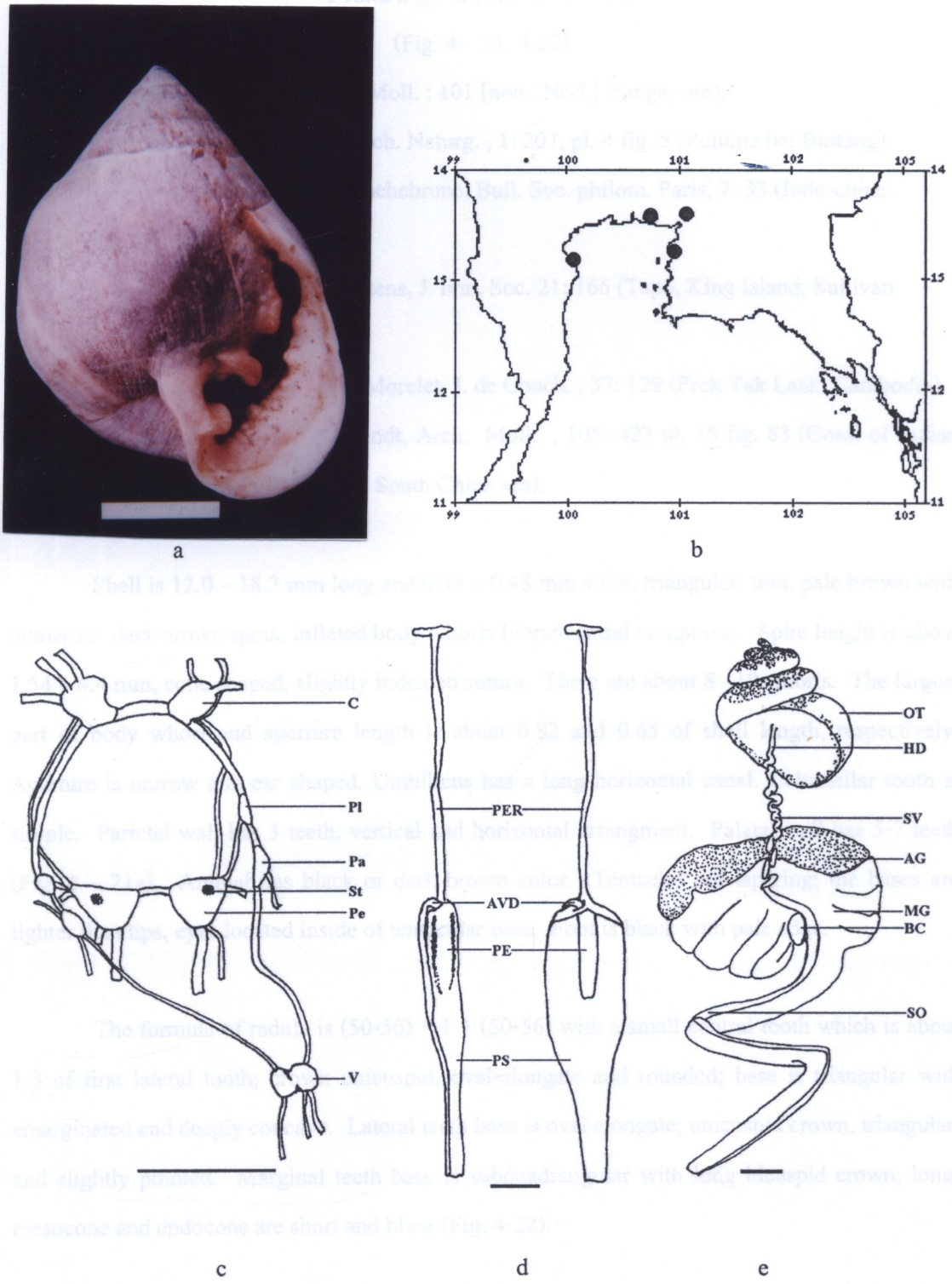


Fig. 4-21 *Pythia plicata*; a) shell, b) live snail, c) distribution in upper Gulf of Thailand, d) nerve ganglion, e) penial complex, and f) female reproductive organ, scale bar = 5 mm in (a) and (d)-(e) are 1 mm.

Pythia trigona (Troschel, 1838)

(Fig. 4 – 21, 4-22)

1837 *Polydonta carinata* Beck, Ind. Moll. : 101 [nom. Nod.] (Singapore).

1838 *Scarabus trigonus* Troschel, Arch. Naturg. , 1: 207, pl. 4 fig. 5 (Pululoz bei Bintang).

1881 *Scarabus trigonus* Troschel, Rochebrune, Bull. Soc. philom. Paris, 7: 33 (Indo-chine: Saigon).

1887 *Pythia trigona* (Troschel), Martens, J. linn. Soc. 21: 166 (Tapo, King Island; Sullivan Island, Pegu).

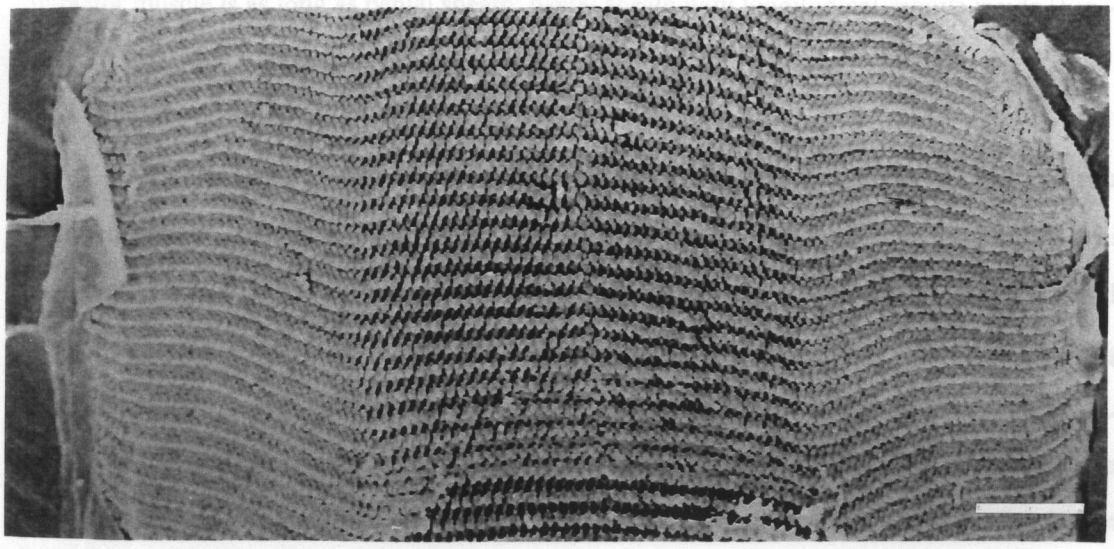
1889 *Scarabus trigonus* (Troschel), Morelet, J. de Conch. , 37: 129 (Prek Tuk Laak, Cambodia).

1974 *Pythia trigona* (Troschel), Brandt, Arch. Moll. , 105: 423 pl. 15 fig. 83 (Coast of Indian Ocean and western Pacific and South China sea).

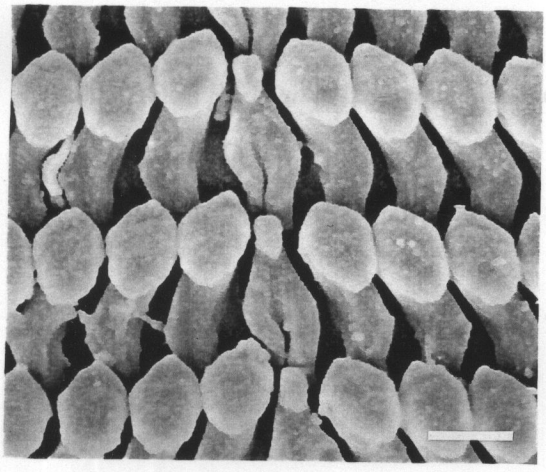
Shell is 12.0 – 18.3 mm long and 0.33 – 0.48 mm wide, triangular, thin, pale brown with numerous dark brown spots, inflated body whorls (dorsoventral compress). Spire height is about 1.54 – 4.4 mm, cone shaped, slightly indented suture. There are about 8 –10 whorls. The largest part of body whorl and aperture length is about 0.82 and 0.65 of shell length, respectively. Aperture is narrow and ear shaped. Umbilicus has a long horizontal canal. Columellar tooth is simple. Parietal wall has 3 teeth, vertical and horizontal arrangment. Palatal wall has 5-7 teeth (Fig. 4 – 21a). Animal has black or dark brown color. Tentacles are tapering; the bases are lighter than tips, eyes located inside of tentacular base. Foot is black with pale edge.

The formula of radula is (50-56) + 1 + (50-56) with a small central tooth which is about 1/3 of first lateral tooth; crown unicuspid, oval-elongate and rounded; base is triangular with emarginated and deeply concave. Lateral teeth base is oval elongate; unicuspid crown, triangular, and slightly pointed. Marginal teeth base is subquadrangular with long bicuspid crown, long; mesocone and endocone are short and blunt (Fig. 4-22).

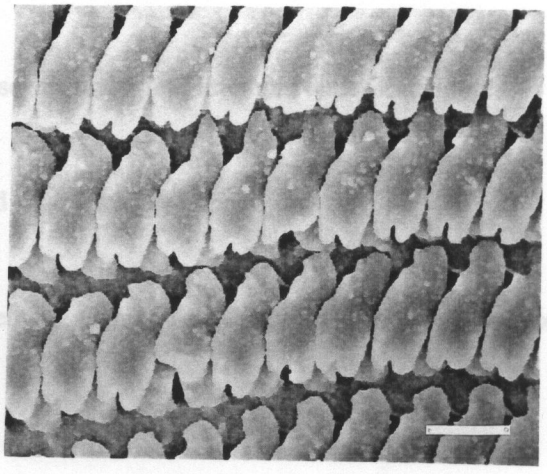
Reproductive system contains conical, yellowish brown with brown spots ovotestis, which cover posterior portion of stomach and short hermaphroditic duct. Seminal vesicle is long and convoluted. Albumen gland is spiral (Fig. 4 – 21e). Pallial gland is presented. Penial complex is moderately short; anterior vas deferens adhere to penial sheath and enter to penial structure at the base; penis is about 3/4 of penial sheath, cylindrical, slender with blunt end; penial



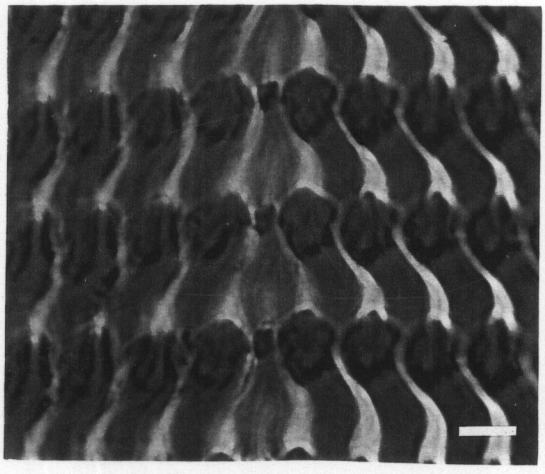
a



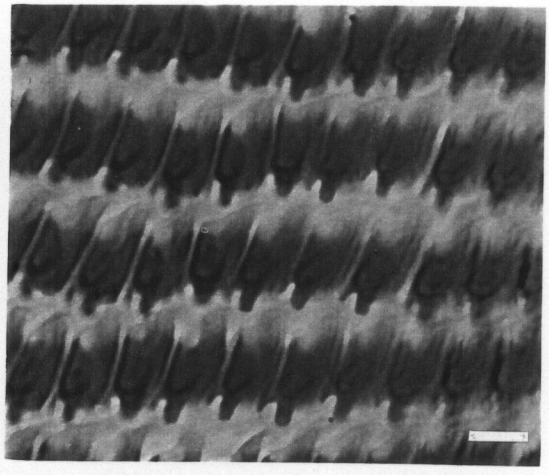
b



c



d



e

Fig. 4-22 Radula of *Py. plicata*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a), and 10 μm in (b) – (e).

retractor muscle is as long as penial sheath; penial sheath with longitudinal groove inside (Fig. 4 – 21d).

Nervous system composes of large, slightly round lobed cerebral ganglia and round unlobed parietal, pedal, pleural and visceral ganglia. Cerebral ganglia is the largest, which diameter is about 0.33 – 0.48 mm. Pedal ganglia is almost the same size as cerebral ganglia. Visceral ganglia is about half size of pedal ganglia and about 2 times larger than pleural and right parietal ganglia. Right parietal ganglion is about 2-3 times larger than the left. Left cerebropleural and pleuroparietal commissures are longer than the right. The right visceroparietal commissure is longer than the left. Statocysts located on anterior part of pedal ganglia (Fig. 4 – 21c).

Habitat notes: *Py. trigona* frequently hide themselves under leaf litter and under rotten log.

Distribution in upper Gulf of Thailand: Trat and Chantaburi Provinces.

World distribution: Philippines, Indonesia, Vietnam, Cambodia, Malaysia, Thailand, Singapore, Myanmar, Sri Lanka and India.

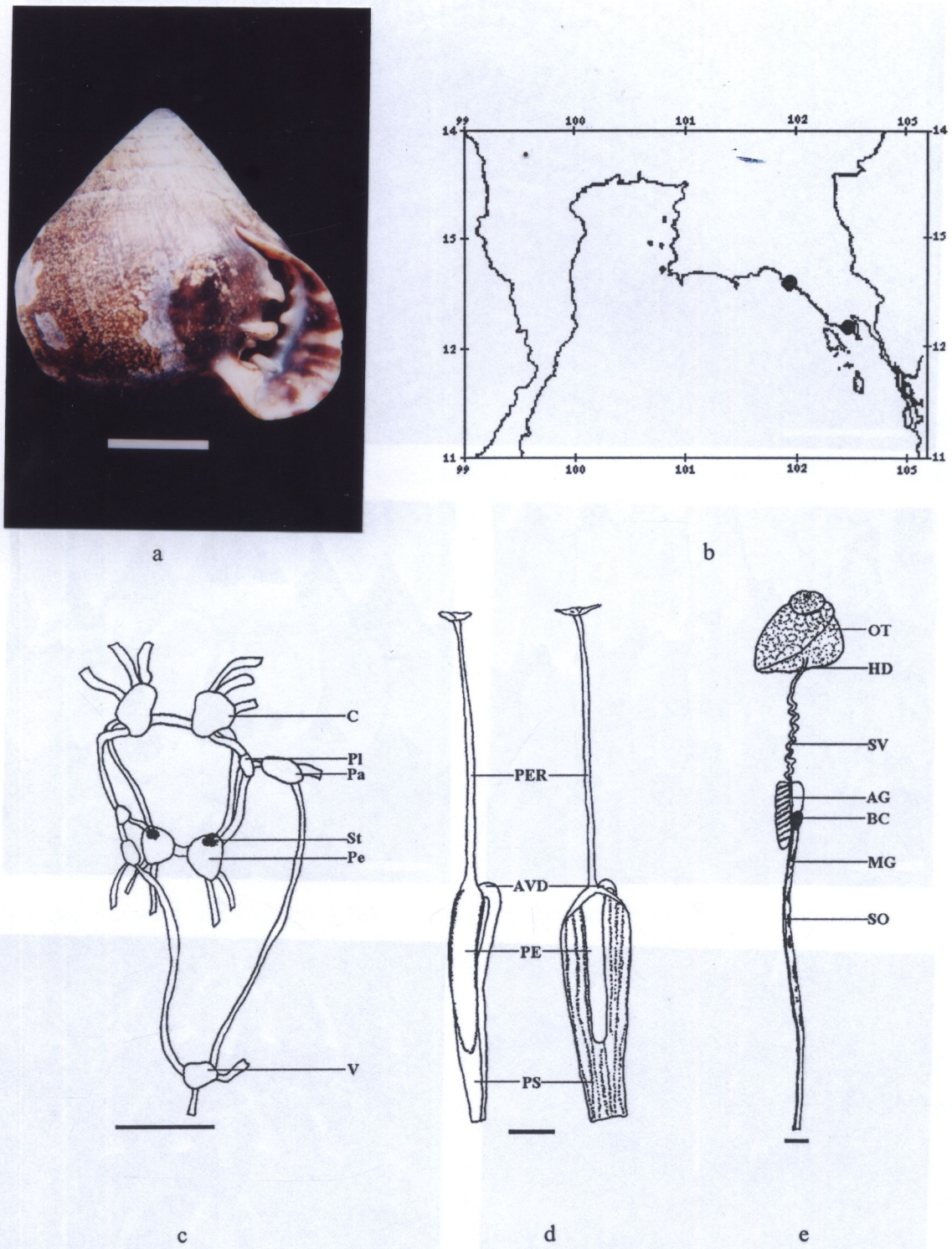


Fig. 4-23 *Pythia trigona*; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglion, d) penial complex, and e) female reproductive organ, scale bar = 5 mm in (a) and (c)-(e) are 1 mm.

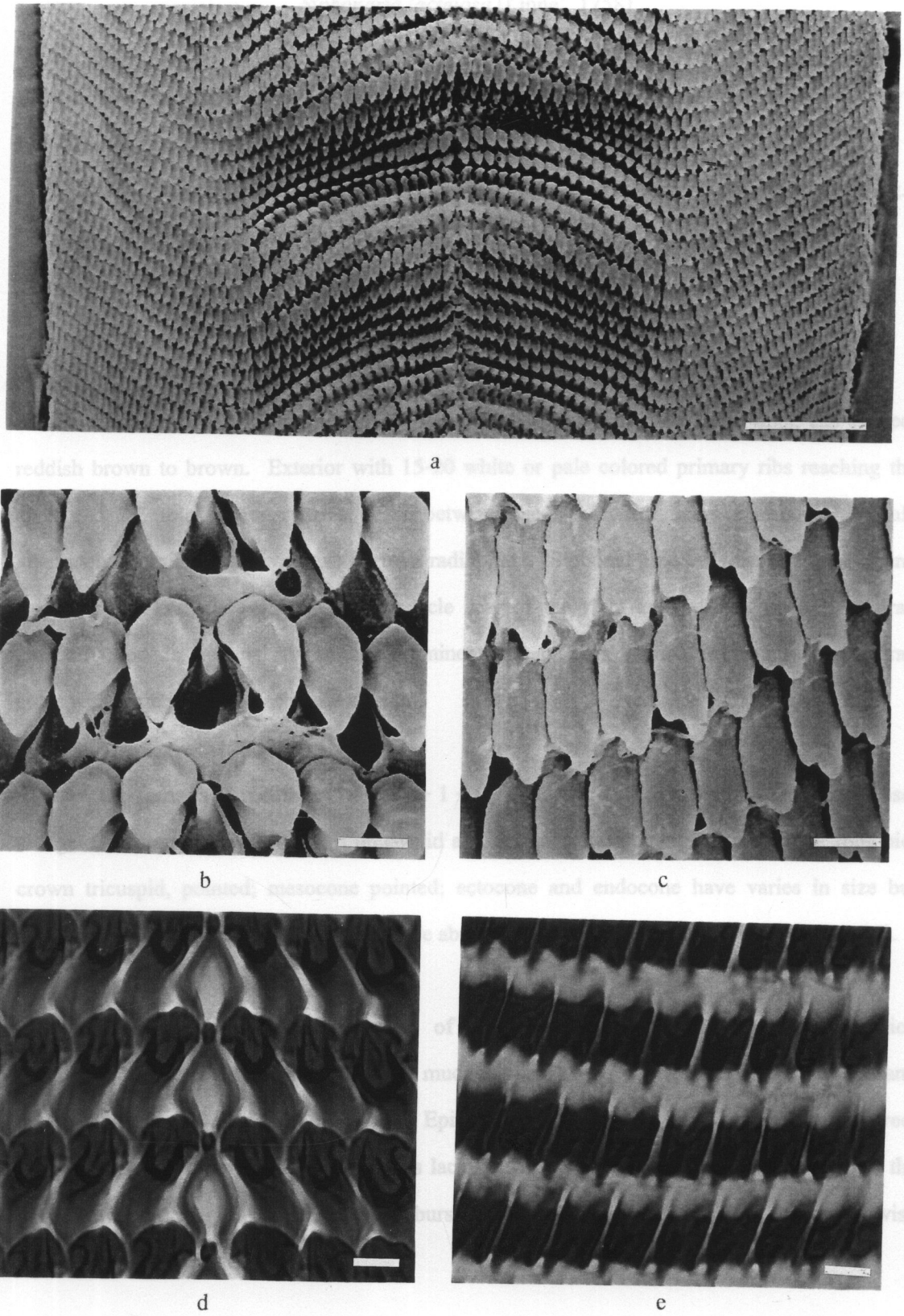


Fig. 4- 24 Radula of *Py. trigona*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a) and 10 μm in (b) – (e).

Siphonaria laciniosa (Linne', 1758)

(Fig. 4 – 25, 4-26)

1946 *Siphonaria laciniosa* (Linne', 1758), Hubendick, Kungl. Sv. Vet. Akademiens Handlingar, 23: 5, pl. 3 fig. 16-19. (Sunda Islands)

1962 *Siphonaria laciniosa* (Linne', 1758), Kira, Shells of the western Pacific in color, pl. 69 fig. 11. (tropical Pacific area up to Honshu)

1964 *Siphonaria laciniosa*, - Habe, Shells of the western Pacific in color vol. II, pl. 44 fig. 16. (Honshû to Amami and Ryukyu islands)

Shell is 3.9 – 14.4 mm long, 2.6 – 10.4 mm wide and 1.4 – 5.8 mm high, cap-shaped, reddish brown to brown. Exterior with 15-20 white or pale colored primary ribs reaching the apex and 2-3 thin secondary ribs occur between them. Interior bears a brownish spatula alternately marginated by white and brown radial bars. Siphonal groove is usually distinct and interrupts the horseshoe-shaped pedal muscle scar of the right side. Apex pointed, central, generally eroded. Siphonal ribs slightly prominent (Fig. 4-25 a). Animal is creamy white to gray color with large foot. Tentacles are absent.

The formula of radula is (17 – 32) + 1 + (17 – 32) with small central tooth; narrow base, elongate, emarginated; short crown unicuspid and pointed. Lateromarginal teeth base rhombic; crown tricuspid, pointed; mesocone pointed; ectocone and endocone have varies in size but smaller than mesocone. First lateral teeth are about 3 times larger than central tooth (Fig. 4-26).

Reproductive system composed of yellow, conical ovotestis and short, thick hermaphroditic duct. Albumen gland and mucous gland large, white, anterior to ovotestis and envelop the seminal vesicle (Fig. 4-25f). Epiphallus gland large, lobed, white cream colored. Flagellum is white, long and thin. Penis is lacking. Bursa copulatrix is rounded and enters the genital atrium through a long thin, white bursa duct (Fig. 4-25e). Spermatophore is yellowish brown and translucent (Fig 4-25d).

Nervous system with rounded cerebral, pedal, pleuroparietal and visceral ganglia. Cerebral ganglia is the largest, which diameter is about 0.2 - 0.35 mm. Cerebral, pedal, right pleuroparietal and visceral ganglia are similar in size. Left pleuroparietal ganglion is about 3

times smaller than cerebral ganglia. Cerebral commissure is about 4 – 5 times longer than cerebral width. Left cerebropleural commissure is about 2 times longer than the right. Left parietovisceral commissure is about 4 times longer than the right. Statocysts located at anterior part of pedal ganglia (Fig. 4-25c).

Habitat notes: *Si. laciniosa* usually found on rock surface in seaward zone.

Distribution: Chonburi Province.

World distribution: Japan, Philippines, China, Indonesia, Australia, Malaysia, Thailand, Mauritius

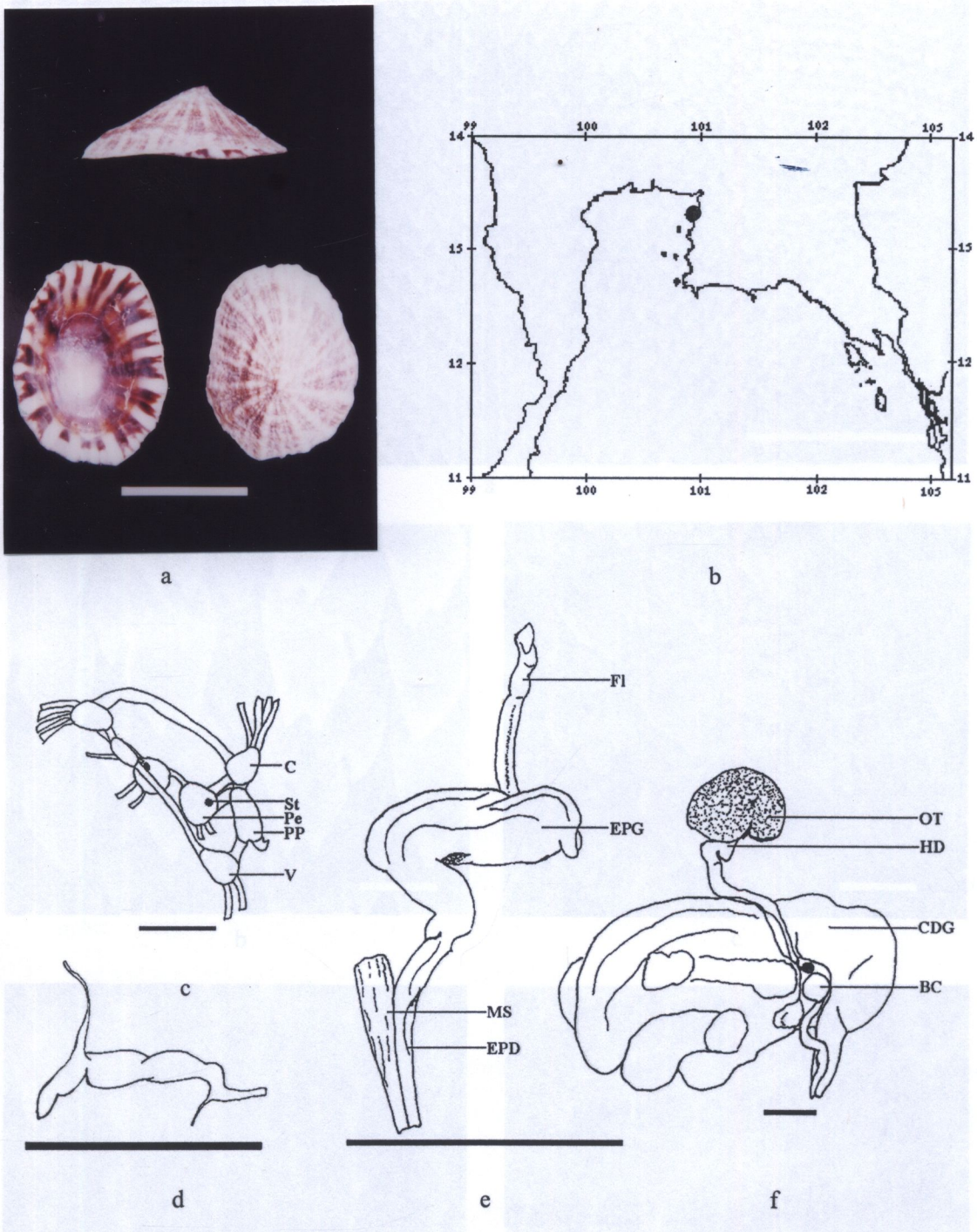
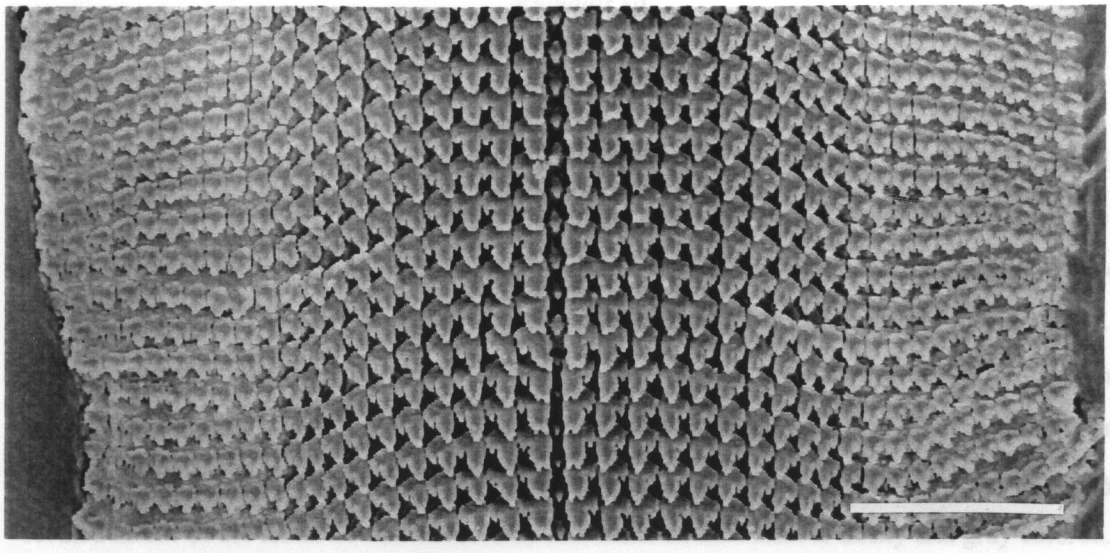
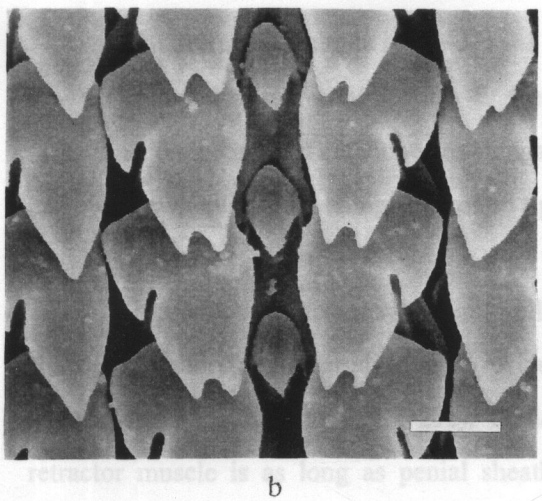


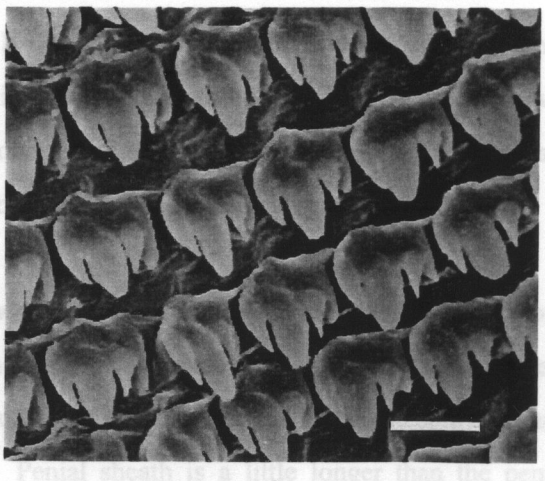
Fig. 4-25 *Siphonaria laciniosa*; a) shells, b) distribution in upper Gulf of Thailand, c) nerve ganglia, d) spermatophore, e) penial complex, and f) female reproductive organ, scale bar = 1 cm in (a) and are 1 mm in (c) – (f).



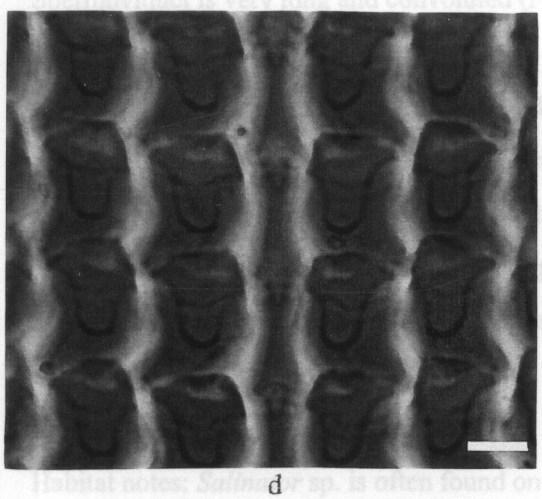
a



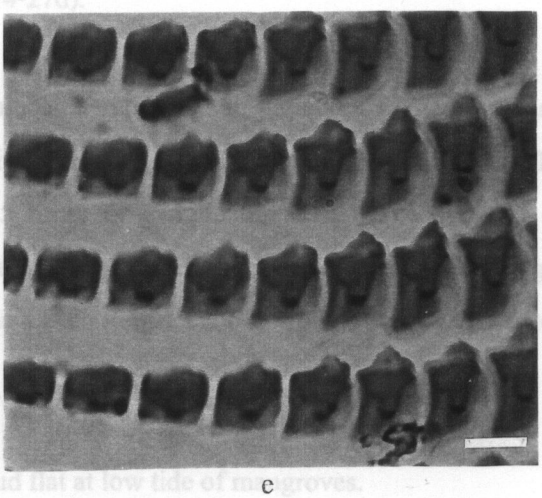
b



c



d



e

Fig. 4-26 Radula of *Si. laciniosa*; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a) and 10 μm in (b) – (e).

Salinator sp.

(Fig. 4-27, 4-28)

Shell is 8.3 - 11.8 mm long and 6.3 - 11.3 mm wide, thin, fragile, light brown or reddish brown, some shells have 1-2 spiral bands on subglobose body whorl, whorl rapidly increase in size. Spire height is 0.05 – 1.36 mm, cone shaped, strongly indented suture. Umbilicus deep, rounded, vertical. There are about 4-5.whorls. The largest part of body whorls is about 0.92 of the shell length. Aperture is roundly lunate lacking aperture tooth and is about 0.72 of shell length. Operculum is thin, brown color, transparent and paucispiral (Fig. 4-27a). Animal is gray to black with thick white foot and large black head. Tentacles are very short and blunt. Eyes located inside of the tentacles and covered by thin skin. Mantle skirt is fleshy and gray colored.

The formula of radula is (24-37) + 1 + 1 + 1 + (24-37) with wide central teeth; crown has 9 – 15 rounded cusps, central cusp is the biggest. Lateral tooth is wide, tricuspid crown; mesocone, endocone and ectocone are elongated, rounded and equally in size. Marginal teeth are narrow, crown unicuspid, elongated, round tip, base quadrangular and elongated (Fig. 4-28).

Reproductive system with light yellow ovotestis covered by black mantle, spiral, cone shaped and short hermaphroditic duct. Albumen gland and mucous gland is white, transparent and not distinctly separate (Fig. 4-27e). Penial complex is short. Penis is lobed and spiny. Penial retractor muscle is as long as penial sheath. Penial sheath is a little longer than the penis. Spermoviduct is very long and convoluted (Fig. 4-27d).

Nervous system composed of round unlobed cerebropleural, parietal, pedal and visceral ganglia. Cerebropleural and pedal ganglia are similar in size. Cerebropleural ganglia is triangular and rounded with long commissure, about 1.5 times of ganglia diameter. The diameter of cerebropleural is about 0.2-0.4 mm. Right pleuroparietal commissure is about 2-3 times longer than the left. Left parietovisceral commissure is a little longer than the right. Statocysts located at the posterior of pedal ganglia (Fig. 4-27c).

Habitat notes: *Salinator* sp. is often found on mud flat at low tide of mangroves.

Distribution in upper Gulf of Thailand: Chonburi and Phetchaburi Provinces.

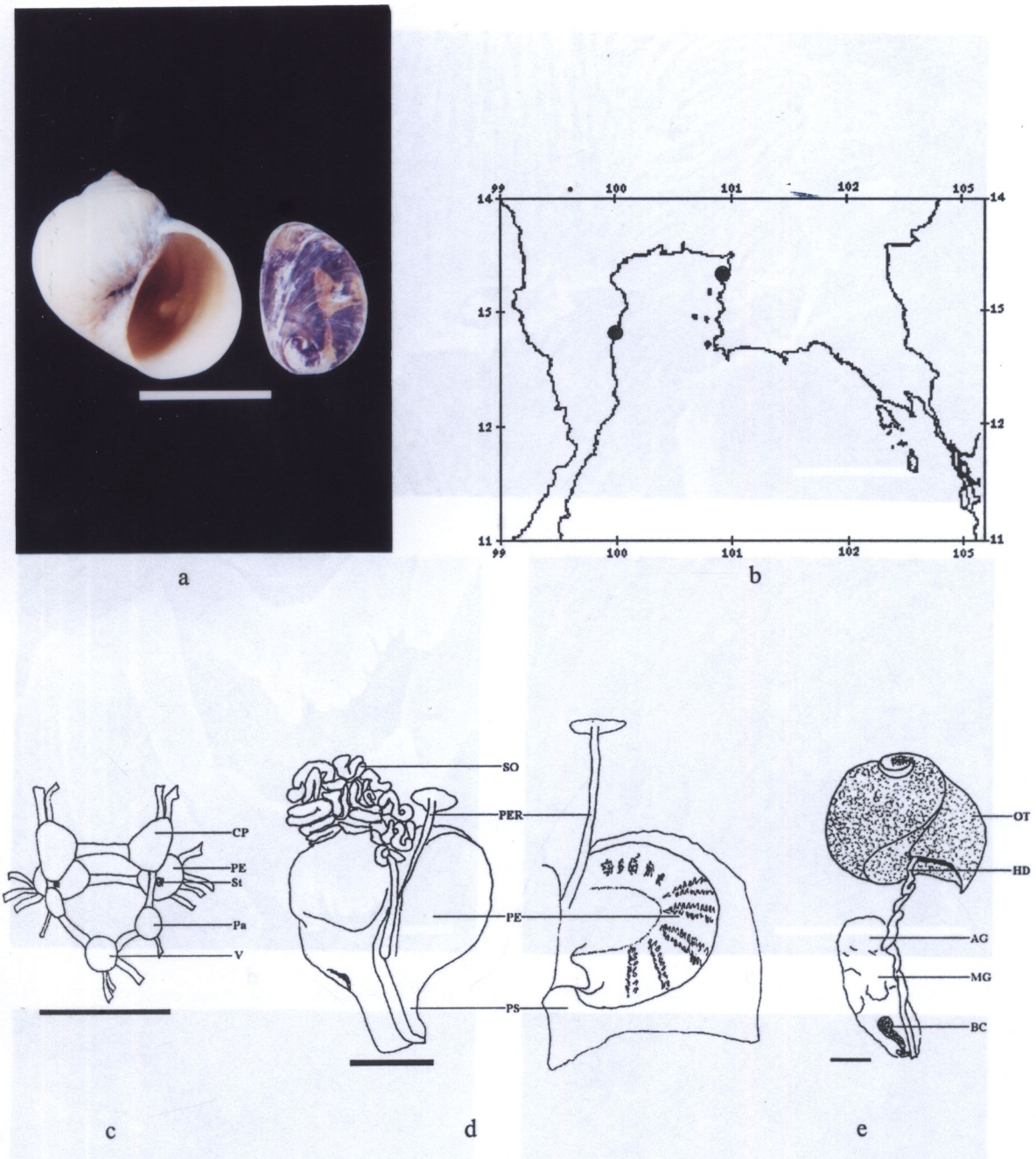
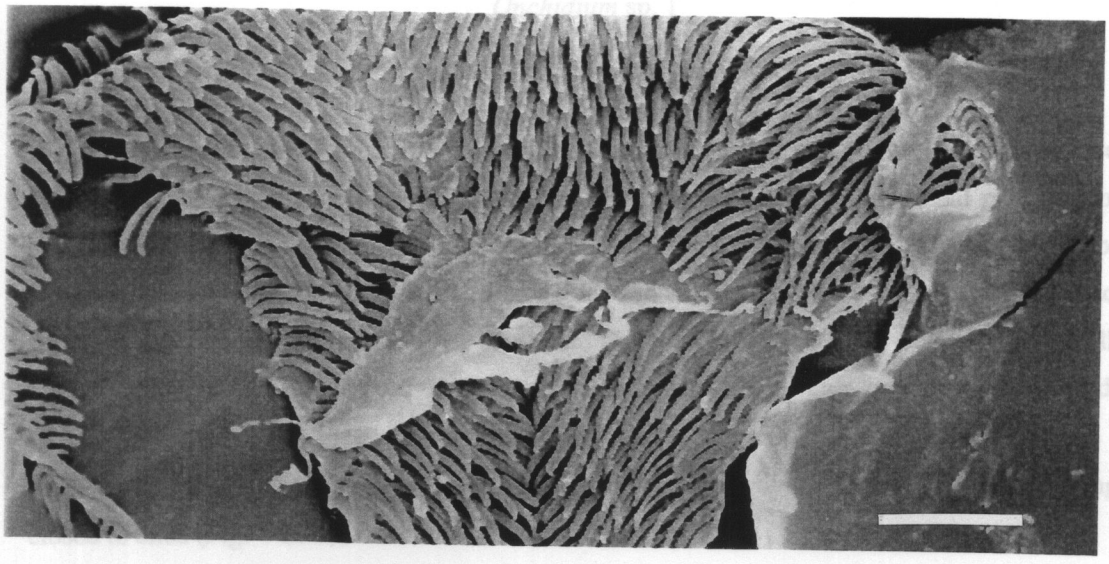
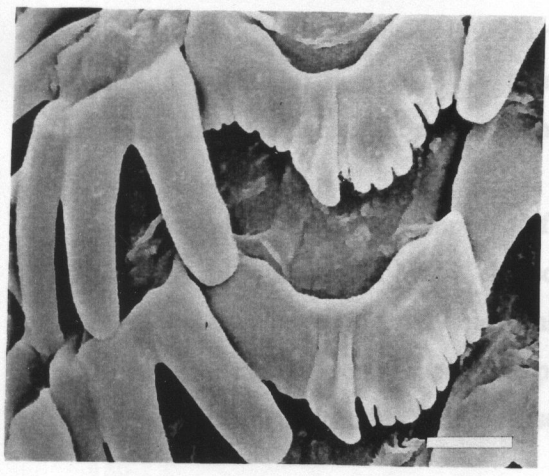


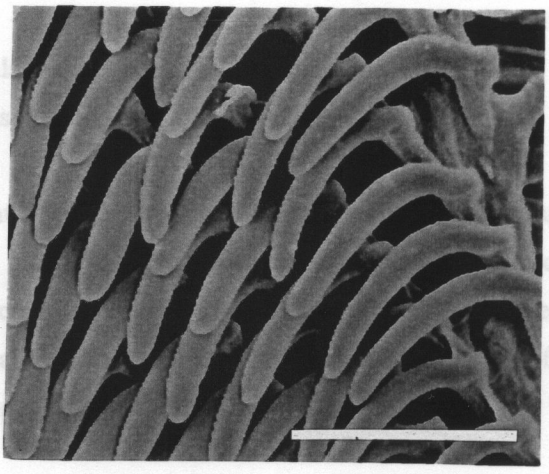
Fig. 4-27 *Salinator* sp.; a) shell, b) distribution in upper Gulf of Thailand, c) nerve ganglion, d) penial complex, and e) female reproductive organ, scale bar = 1 cm in (a) and (c)-(e) are 1 mm.



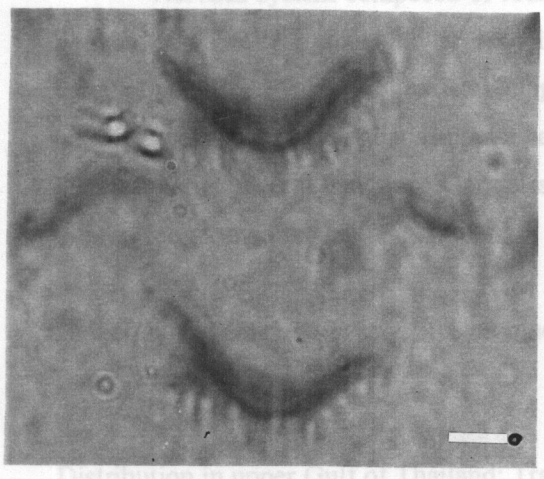
a



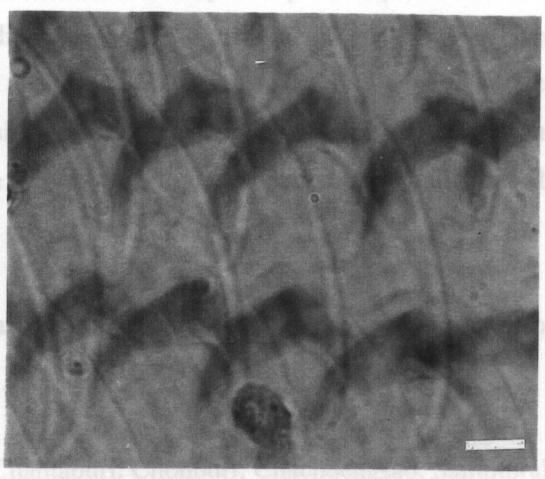
b



c



d



e

Fig. 4-28 Radula of *Salinator* sp. ; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 100 μm in (a) and 10μm in (b) – (e).

Onchidium sp. 1

(Fig. 4-29, 4-30)

Preserved animal is 31.0 - 48.4 mm long and 21.0 – 30.0 mm wide. Body is soft, round to oval elongate when relaxed state. Notum is gray colored with 2 longitudinal pale brown or pale red bands in some specimens. Foot is 27.5 – 46.0 mm long and 13.9 – 21.9 mm wide (about 3/5 of body width), with many fine transverse lines and white or yellow color. Head and tentacles are black colored. Lower tentacles are broad and flatten. Notum has many size of notal papillae. Some papillae have a dorsal eye. Hyponotum is smooth, white or pale gray, with mottling dark spots. Male opening is located near right of the tentacular base. Pneumostome and anus are located in midline and posterior of body. The anus is covered by tip of foot. Female opening is closed to anus (Fig. 4-29 a).

The formula of radula is (79-95) + 1 + (79-95) with tricuspid central tooth of pointed cusps and equal in size; base is triangular and wide. Lateromarginal teeth base is subquadrangular and long. The crown is unicuspid, long and rounded (Fig. 4-30).

Reproductive system composed of flat, oval ovotestis and a short hermaphroditic duct. Albumen gland is large and lobed. Mucous gland is large and unlobed. Bursa copulatrix is spherical and very large (Fig. 4-29 e). Penial complex composed of penis, anterior vas deferens, penial retractor muscle, penial sheath and penial gland. Penial retractor muscle is about a half of penial sheath. Penial gland has a large muscular sac (Fig. 4-29 d).

Nervous system composed of round, unlobed cerebral, parietopleural, pedal and visceral ganglia. Cerebral ganglia is the largest with diameter 0.4 – 1.0 mm. Pedal ganglia is as large as cerebral ganglia. Pleural and parietal ganglia are fused and closed to cerebral ganglia. Visceral and right paritopleural ganglia is about a half sized of cerebral ganglia which about 3 times longer than left parietopleural ganglion. Commissure of right parietopleural and visceral ganglia is about 2 times longer than the left (Fig. 4-29 c).

Habitat notes: *Onchidium* sp. 1 live on mud surface, under large litter in mangrove and nipa palm forest.

Distribution in upper Gulf of Thailand: Trat, Chantaburi, Chonburi, Chachoengsao, Samutprakan, Samutsongkram and Phetchaburi Provinces.

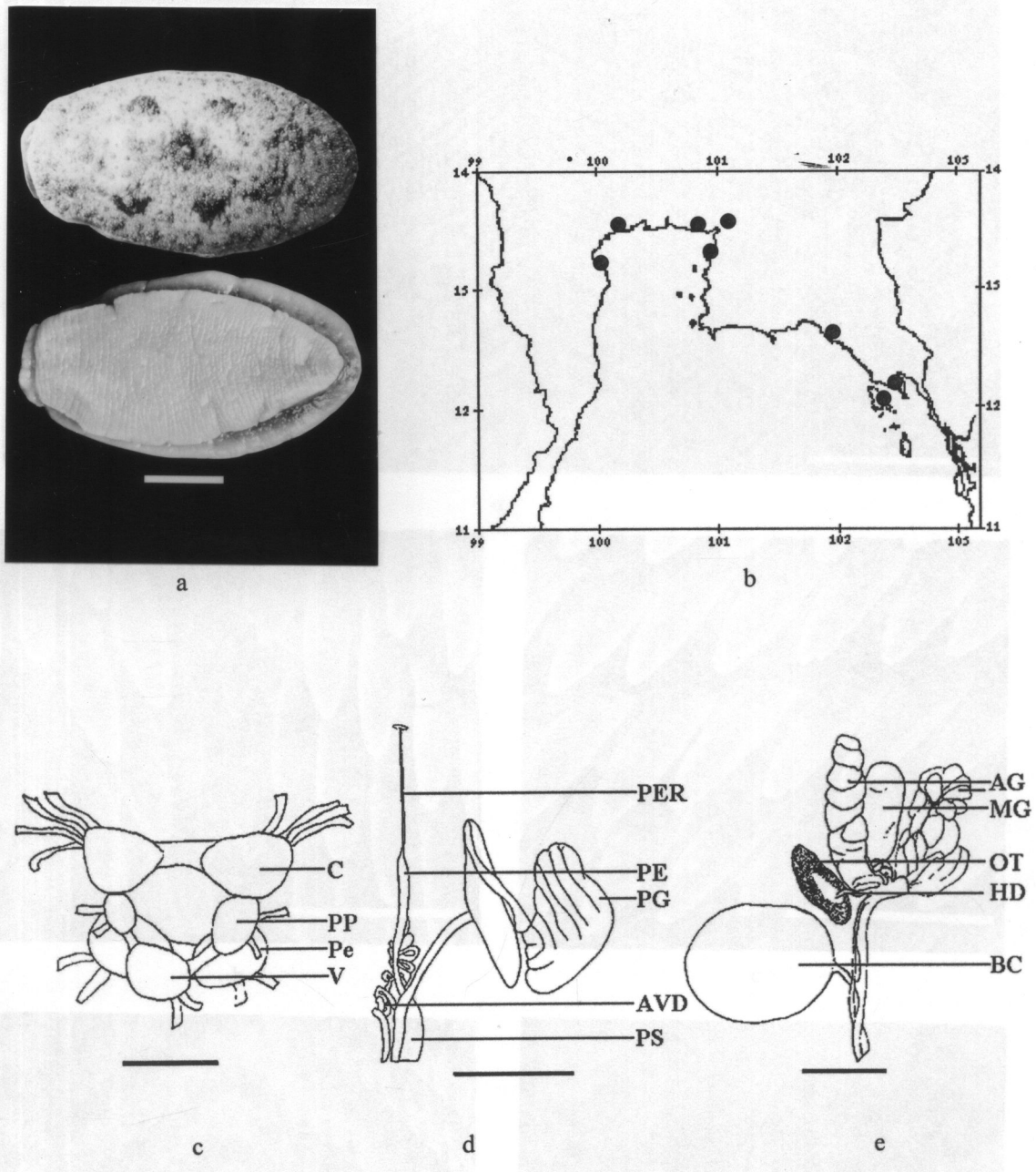


Fig. 4-29 *Onchidium* sp. 1; a) dorsal view of body, b) distribution in upper gulf of Thailand, c) nerve ganglia, e) penial complex and f) female reproductive system, scale bar = 1 cm in (a), 1 mm in (c) and 5 mm in (d), (e).

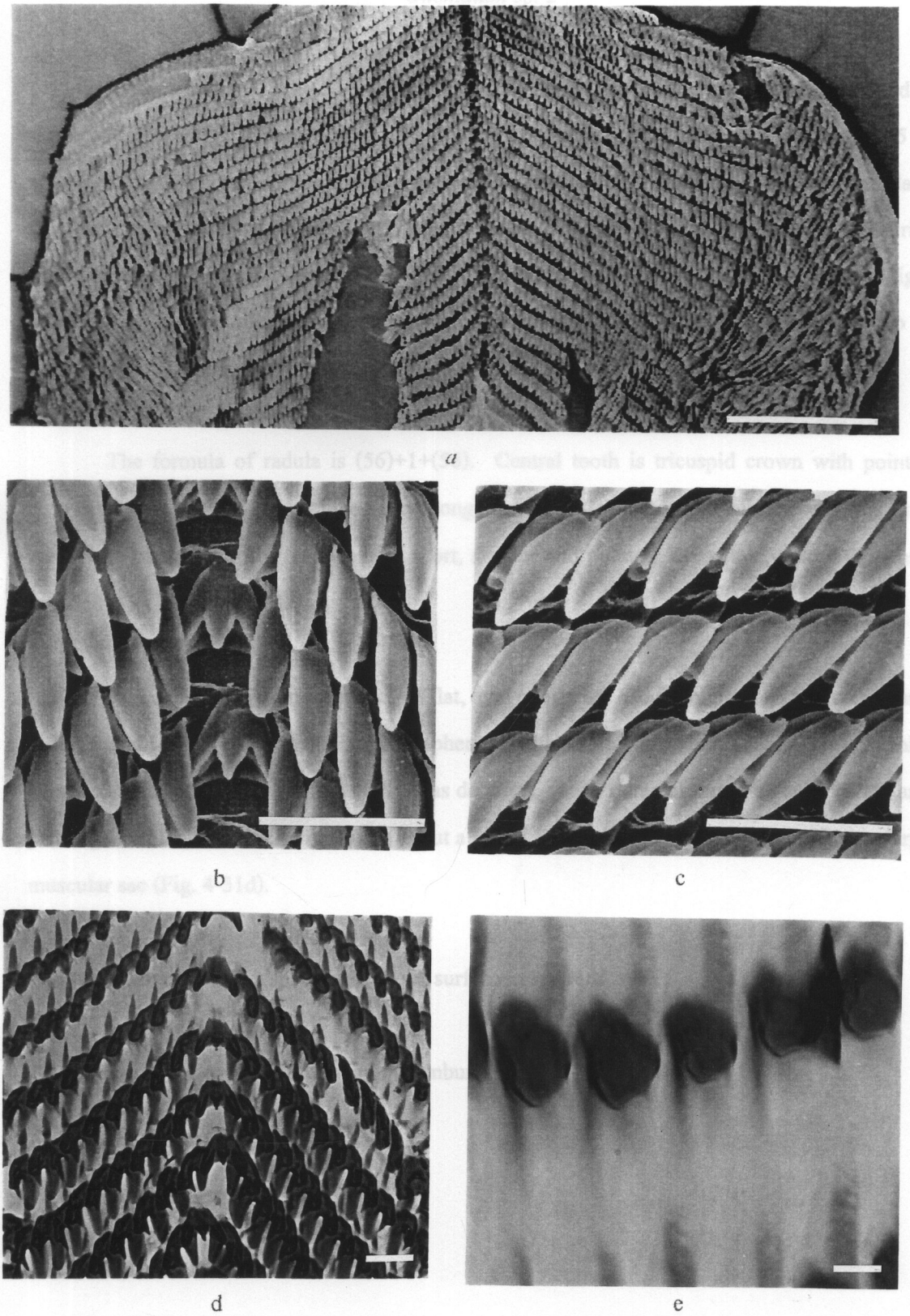


Fig. 4-30 Radula of *Onchidium* sp. 1; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 500 μm in (a), 50 μm in (b) and (c) and 10 μm in (d) and (e).

Onchidium sp. 2

(Fig. 4-31, 4-32)

Preserved animal is 20.87 mm long and 17.30 mm in wide. Body is soft, oval to round in shape when crawling. Notum is gray. Foot is 16.24 mm long and10.84 mm wide (about 3/5 of body width), with many fine transverse grooves and white color. Head and tentacles are black colored. Lower tentacles are broad and flatten. Notum has many sizes of notal papillae. Posterior end of notum has finger like notal papillae. Hyponotum is smooth. Male opening near right tentacular base. Pneumostome and anus are positioning in the midline, anus covered by tip of foot. Female opening closed to anus (Fig. 4-31a).

The formula of radula is (56)+1+(56). Central tooth is tricuspid crown with pointed cusps and equal in size. Lateral teeth have long, slender and pointed unicuspid crown. Marginal teeth have bicuspid crown; endocone is short, slender and pointed; mesocone is large long and rounded (Fig. 4-32).

Reproductive system composed of flat, oval ovotestis. Albumen gland and mucous gland is large and lobed. Bursa copulatrix is spherical with short bursa duct (Fig. 4-31e). Penial complex composed of penis with anterior vas deferens, penial retractor muscle, penial sheath and penial gland. Penial retractor muscle is about a 1/7 of penial sheath. Penial gland without a large muscular sac (Fig. 4-31d).

Habitat notes: *Onchidium* sp. 2 live on rock surface in seaward zone.

Distribution in upper Gulf of Thailand: Chonburi Province.

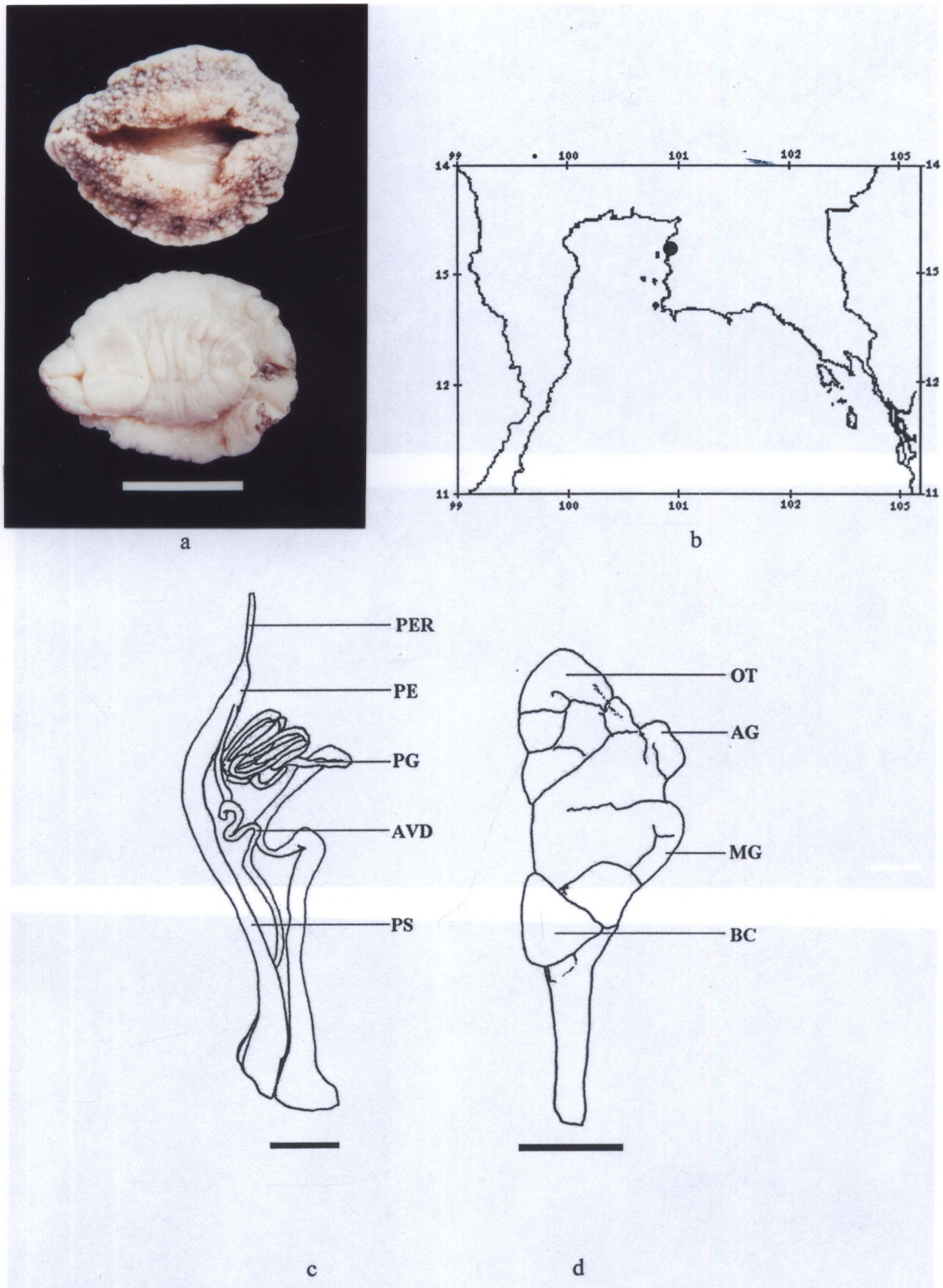
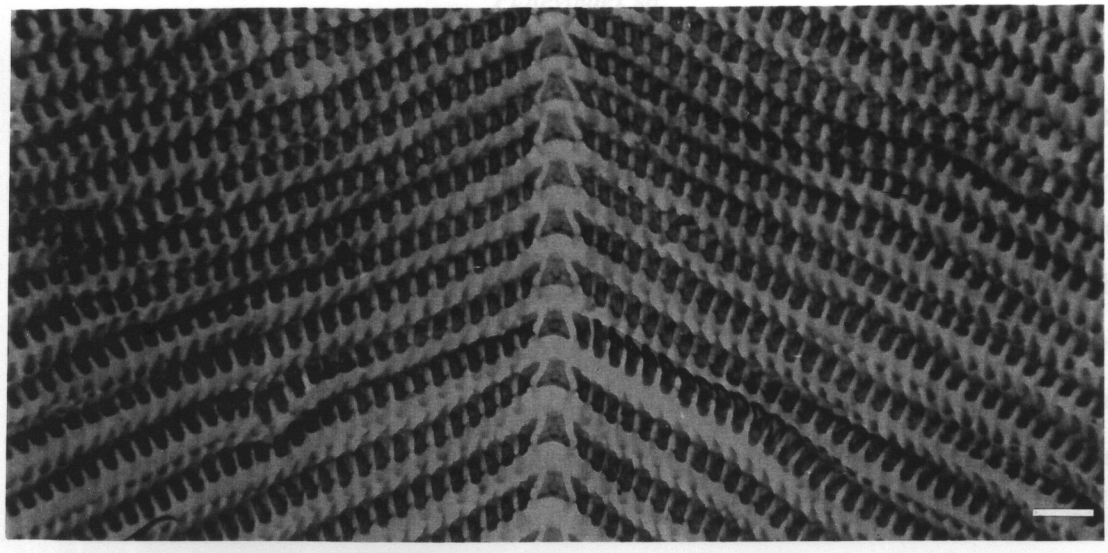


Fig. 4-31 *Onchidium*sp. 2; a) shell, b) distribution in upper Gulf of Thailand, c) penial complex, and d) female reproductive organ, scale bar = 1 cm in (a) and 1 mm in (c) – (e).



a

b

c

Fig. 4-32 Radula of *Onchidium* sp. 2; a) radula rows, b) central and lateral teeth, c) marginal teeth, scale bars are 100 μm in (a) and 10 μm in (b) and (c).

Platevindex sp.

(Fig. 4-33, 4-34)

Preserved animal is 15.11 – 46.84 mm long and 9.2 – 32.16 mm wide. Body is rigid, rounded to oval. Notum is gray to dark brown. Foot is 11.33 – 36.04 mm long and 1.49 – 14.94 mm wide (about 2/5 of body width), with many fine transverse grooves and white or yellow colored. Head and tentacles are black colored. Lower tentacles are broad and flatten. Notum has many small notal papillae. Some papillae have a dorsal eye. Hyponotum is smooth and white or pale gray color, with mottling dark spots. Male opening located near the right tentacular base. Pneumostome and anus are located in the midline and posterior of the body. The anus is covered by the posterior part of foot. Female opening is closed to anus (Fig. 4-33a).

The formula of radula is (106-118)+1+(106-118). Central tooth has tricuspid crown, each cusp are similar in size. Lateromarginal teeth have unicuspid crown long and blunt (Fig. 4-34).

Reproductive system composed of lobed round ovotestis and short hermaphroditic duct. Albumen gland is large and lobed. Bursa copulatrix is large and spherical (Fig. 4-33e). Penial complex composed of penis, penial retractor muscle, anterior vas deferens and penial sheath. Penial retractor muscle is about 1/3 of penial sheath. Penial gland is absent (Fig. 4-33 d).

Nervous system composed of round unlobed cerebral, parietopleural, pedal and visceral ganglia. Cerebral ganglia is the largest with diameter 0.6 – 0.9 mm. Pedal ganglia is as large as cerebral ganglia. Pleural and parietal ganglia are fused and closed to cerebral ganglia. Visceral and paritopleural ganglia is about a half sized of cerebral ganglia with about 3 times longer than left parietopleural ganglion. Commissure of right parietopleural and visceral ganglia is about 2 times longer than the left (Fig. 4-33 c).

Habitat notes: *Platevindex* sp. lives on mud surface, under large litter in mangrove and nipa palm forest.

Distribution in upper Gulf of Thailand: Trat, Chantaburi, Chonburi, Chachoengsao, Samutprakan, Samutsongkram and Phetchaburi Provinces.

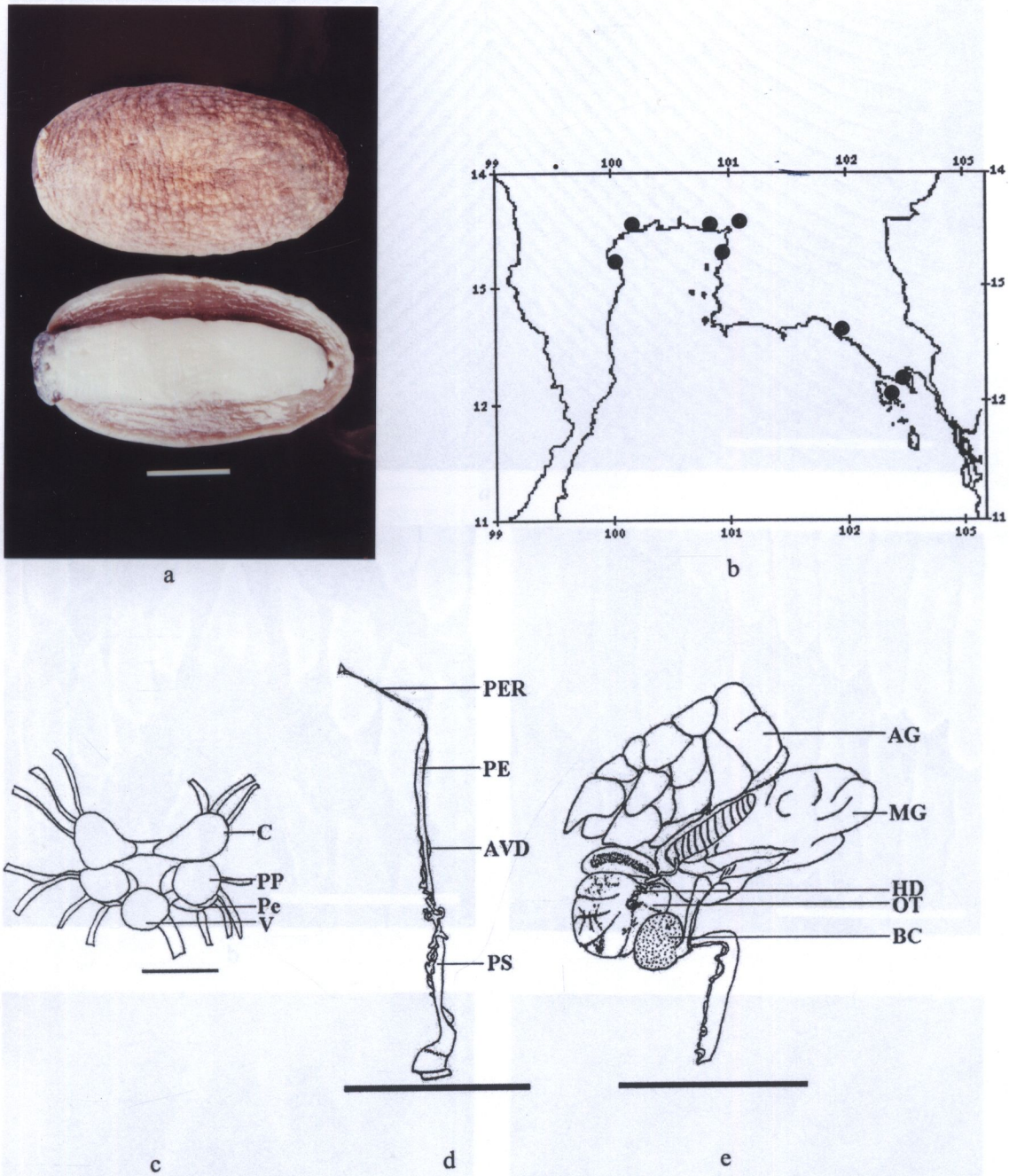


Fig. 4-33 *Platevindex* **sp.**; a) shell, b) live snail, c) distribution in upper Gulf of Thailand, d) nerve ganglion, e) penial complex, and f) female reproductive organ, scale bar = 1 cm in (a) and 1 mm in (c) – (e).

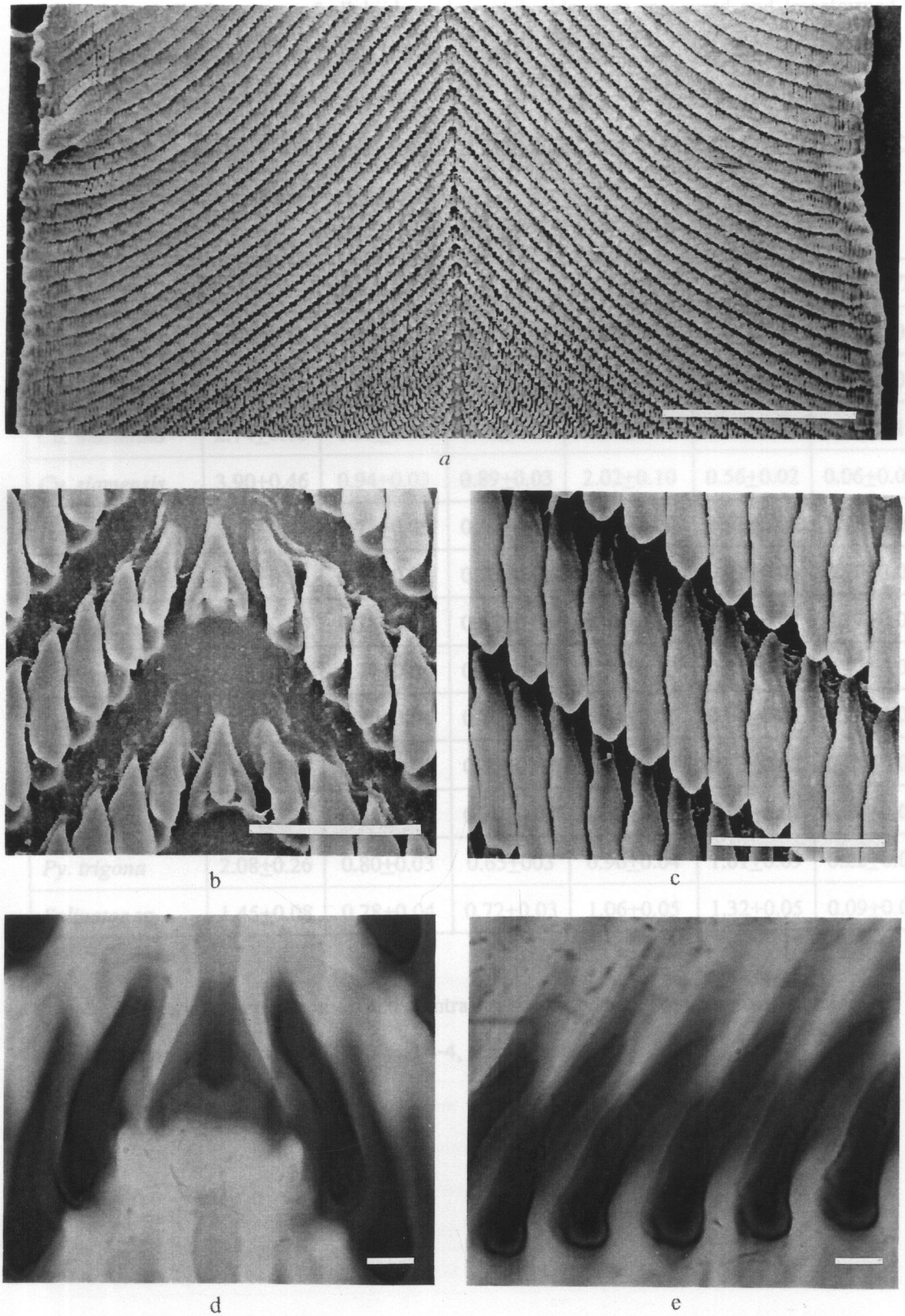


Fig. 4-34 Radula of *Platevindex* sp. ; a) radula rows, b) and d) central and lateral teeth, c) and e) marginal teeth, a) - c) are SEM photograph, d) and e) are LM photograph, scale bars are 500 μm in (a), 50 μm in (b) and (c) and 10 μm in (d) and (e).

The shell characters of ellobiids and amphibolids were measured and transformed by many parameters (table 4-1).

Table 4-2 Mean ratio of shell characters in 12 ellobiids and 1 amphibolids (mean ± SD.). Abbreviations are shown in page13.

Species	AL/AW	AL/BWL	AL/SL	SL/SW	SW/AL	SRL/BWL
A. elongata	2.97±0.28	0.78±0.04	0.59±0.05	2.56±0.26	0.67±0.04	0.32±0.06
Ca. aurisfelis	2.37±0.18	0.92±0.02	0.80±0.02	1.80±0.16	0.70±0.54	0.15±0.01
Ca. mustelina	2.74±0.18	0.93±0.08	0.82±0.03	1.68±0.07	0.73±0.03	0.14±0.11
Cy. siamensis	3.90±0.46	0.94±0.03	0.89±0.03	2.02±0.10	0.56±0.02	0.06±0.06
E. aurisjudae	2.75±0.24	0.75±0.05	0.64±0.05	2.62±0.28	0.61±0.07	1.73±0.04
E. aurismidae	2.57±0.13	0.85±0.02	0.73±0.02	1.78±0.07	0.77±0.03	0.19±0.04
L. punctigera	2.27±0.20	0.78±0.04	0.67±0.03	1.66±0.11	0.91±0.07	0.17±0.05
L. siamensis	2.23±0.26	0.77±0.04	0.66±0.04	1.74±0.13	0.88±0.09	0.17±0.04
Laemodonta sp.	2.00±0.14	0.80±0.04	0.73±0.03	1.64±0.05	0.84±0.04	0.10±0.02
M. siamensis	3.44±0.31	0.92±0.02	0.86±0.03	1.61±0.07	0.73±0.02	0.08±0.03
Py. plicata	2.11±0.21	0.84±0.04	0.70±0.04	1.35±0.05	1.07±0.07	0.21±0.04
Py. trigona	2.08±0.26	0.80±0.03	0.65±003	0.96±0.04	1.61±0.09	0.22±0.04
Salinator sp.	1.45±0.08	0.78±0.04	0.72±0.03	1.06±0.05	1.32±0.05	0.09±0.03

The radula, reproductive and central nervous system of mangrove pulmonates are compared and shown in table 4-2, 4-3 and 4-4, respectively.

Table 4- 3 Comparative radular morphology of mangrove pulmonates.

Species	Crown of central tooth	Crown of lateral teeth	Crown of marginal teeth
A. elongata	Unicuspid, rounded	about 2 times larger than CT, bicuspid (pointed and rounded)	same as LT
Ca. aurisfelis	Unicuspid, pointed	about 2 times larger than CT, unicuspid (rounded)	as large as LT, bicuspid (Pointed and rounded)
Ca. mustelina	Unicuspid, narrow, rounded	about 3 times larger than CT, unicuspid (rounded)	as large as LT, bicuspid (Pointed and rounded)
Cy. siamensis	Unicuspid, pointed	about 6-8 times larger than CT, bicuspid (pointed and rounded)	about 1/3 longer than LT, bicuspid (pointed and rounded)
E. aurisjudae	Unicuspid, narrow, rounded	about 5-7 times larger than CT, unicuspid (rounded)	about ½-1/3 larger than LT, unicuspid (rounded)
E. aurismidae	Unicuspid, narrow, rounded	about 2-4 times larger than CT, unicuspid (rounded)	about ½-1/3 larger than LT, 2-4 cusps (rounded)
L. punctigera	Unicuspid, long, slightly pointed	about 4-5 times larger than CT, tricuspid (pointed, rounded)	about 2 times larger than LT, tricuspid (pointed, rounded)
L. siamensis	Unicuspid, rounded	about 2-3 times larger than CT, bicuspid (pointed, rounded)	as large as LT, bicuspid (pointed, rounded)
Laemodonta sp.	Unicuspid, long, narrow, rounded	about 4 times larger than CT, unicuspid (rounded)	about 1-2 times larger than LT, bicuspid (pointed and rounded)
M. siamensis	Tricuspid, rounded	about 2 times larger than CT, unicuspid (rounded)	about 1-1½ times larger than LT, multicuspid (pointed)
Py. plicata	Unicuspid, rounded	about 3-4 times larger than CT, unicuspid (rounded)	about 2 times larger than LT, bicuspid (rounded)
Py. trigona	Unicuspid, narrow, rounded	about 5-6 times larger than CT, unicuspid (slightly pointed)	as large as larger than LT, bicuspid (rounded)
Si. laciniosa	Unicuspid, pointed	about 4 times larger than CT, tricuspid (pointed)	about ½ larger than LT, tricuspid (pointed)
Salinator sp.	Multicuspid, rounded	as large as CT, tricuspid (rounded)	about 1/2 larger than LT, unicuspid (rounded)
Onchidium sp.1	Tricuspid, pointed	about ½-1 times larger than CT, unicuspid (rounded)	
Onchidium sp.2	Tricuspid, pointed	as large as CT, unicuspid (rounded)	as large as LT, bicuspid (pointed and rounded)
Platevindex sp.	Tricuspid, pointed	as large as CT, unicuspid (rounded)	

* CT = central tooth, LT = lateral teeth, MT = marginal teeth

Table 4-4 Comparative reproductive systems of mangrove pulmonates.

Species	Ovotestis shape	Sperm groove	Bursa shaped	Anterior vas deferens
A. elongata	Cone shaped	Closed	Spherical	As long as penial sheath, not adhere to the penial sheath
Ca. aurisfelis	Cone shaped	Closed	Spherical	Slightly shorter than penial sheath, not adhere to the penial sheath
Ca. mustelina	Cone shaped	Closed	Spherical	As long as penial sheath, not adhere to the penial sheath
Cy. siamensis	Cone shaped	Closed	Spherical	Longer than penial sheath, not adhere to the penial sheath
E. aurisjudae	Leaf like shaped	Closed	Spherical	As long as penial sheath, adhere to the penial sheath
E. aurismidae	Leaf like shaped	Closed	Spherical	Longer than penial sheath, adhere to the penial sheath
L. punctigera	Cone shaped	Closed	Spherical	As long as penial sheath, adhere to the penial sheath in some part
L. siamensis	Cone shaped	Closed	Spherical	As long as penial sheath, not adhere to the penial sheath
Laemodonta sp.	Cone shaped	Closed	Spherical	Longer than penial sheath, not adhere to the penial sheath
M. siamensis	Cone shaped	Closed	Elongated and pointed	Shorter than penial sheath, not adhere to the penial sheath
Py. plicata	Cone shaped	Opened	Spherical	As long as penial sheath, adhere to the penial sheath
Py. trigona	Cone shaped	Opened	Spherical	As long as penial sheath, adhere to the penial sheath
Si. laciniosa	Cone shaped	Closed	Spherical	-
Salinator sp.	Cone shaped	Closed	Spherical	Very long, not adhere to the penial sheath
Onchidium sp1.	Lobed, spherical shaped	Closed	Spherical	As long as penial sheath, adhere to the penial sheath
Onchidium sp2	Lobed, spherical shaped	Closed	Spherical	As long as penial sheath, adhere to the penial sheath
Platevindex sp.	Lobed, spherical shaped	Closed	Spherical	As long as penial sheath, adhere to the penial sheath

Table 4-5 Comparative nerve ganglia of mangrove pulmonates.

Species	Cerebral ganglia	Visceral ganglia	Left parietal ganglia	Fusion of ganglia
A. elongata	Rounded, lobed	Rounded, unlobed	Undivided	None
Ca. aurisfelis	Rounded, lobed	Rounded, unlobed	Undivided	None
Ca. mustelina	Rounded, lobed	Rounded, unlobed	Undivided	None
Cy. siamensis	Rounded, lobed	Rounded, unlobed	Undivided	None
E. aurisjudae	Rounded, unlobed	Rounded, unlobed	Divided to anterior and posterior part	None
E. aurismidae	Rounded, unlobed	Rounded, unlobed	Divided to anterior and posterior part	None
L. punctigera	Rounded, lobed	Rounded, unlobed	Undivided	None
L. siamensis	Rounded, lobed	Rounded, unlobed	Undivided	None
Laemodonta sp.	Rounded, lobed	Rounded, unlobed	Undivided	None
M. siamensis	Rounded, lobed	Rounded, unlobed	Undivided	None
Py. plicata	Rounded, lobed	Rounded, bilobed	Undivided	None
Py. trigona	Rounded, lobed	Rounded, bilobed	Undivided	None
Si. laciniosa	Rounded, unlobed	Rounded, unlobed	Undivided	Parietal and pleural ganglia fused
Salinator sp.	Rounded, unlobed	Rounded, unlobed	undivided	Cerebral and parietal ganglia fused
Onchidium sp1.	Rounded, unlobed	Rounded, unlobed	Undivided	Parietal and pleural ganglia fused
Onchidium sp2	Rounded, unlobed	Rounded, unlobed	Undivided	Parietal and pleural ganglia fused
Platevindex sp.	Rounded, unlobed	Rounded, unlobed	Undivided	Parietal and pleural ganglia fused

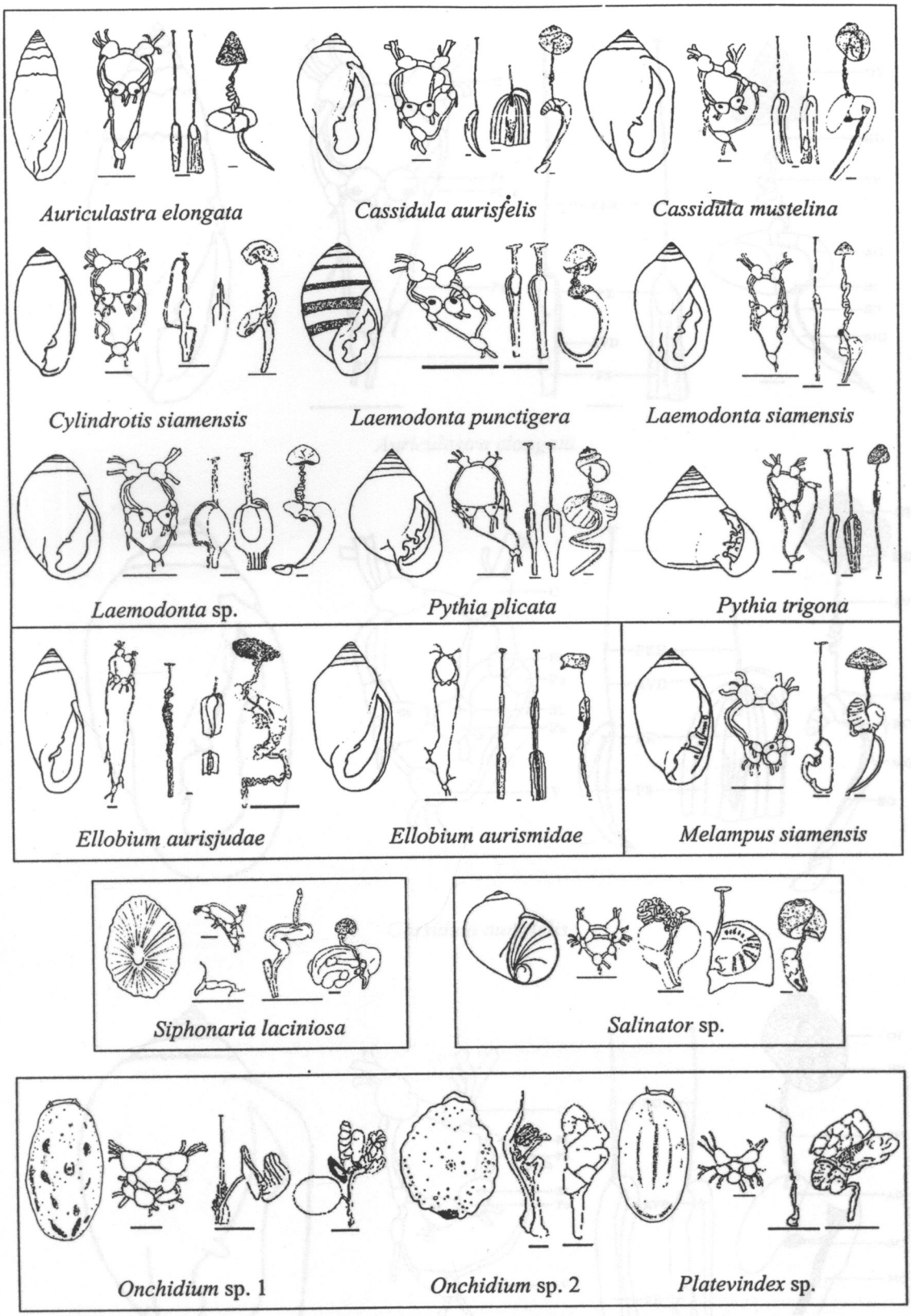
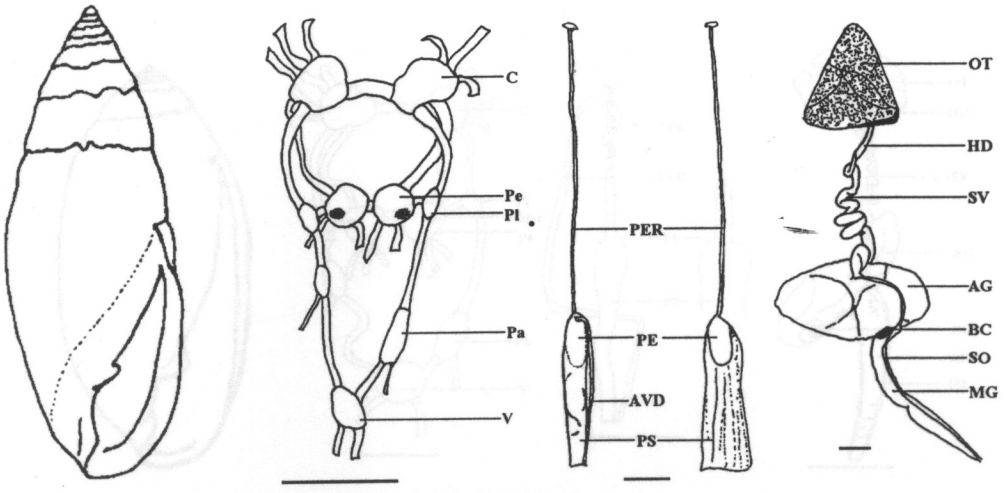
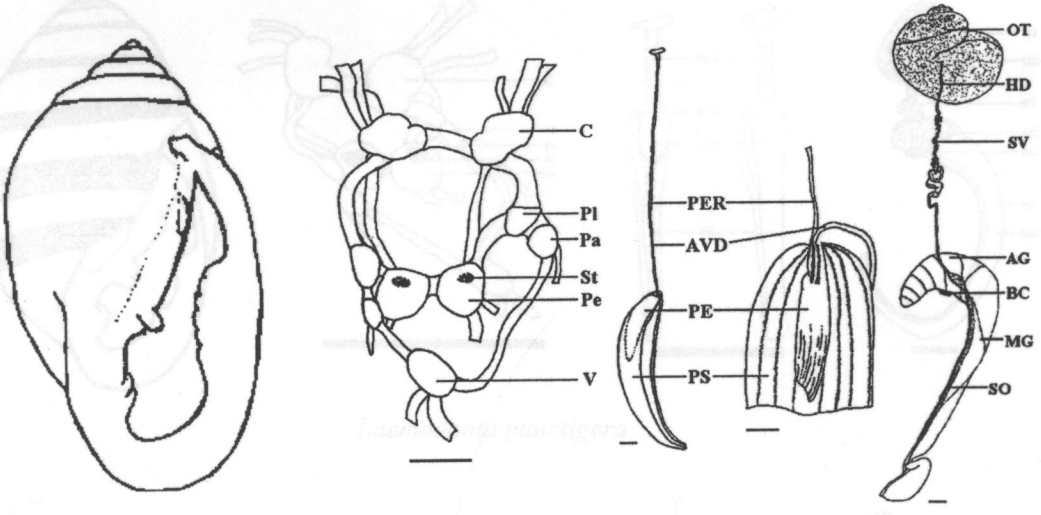


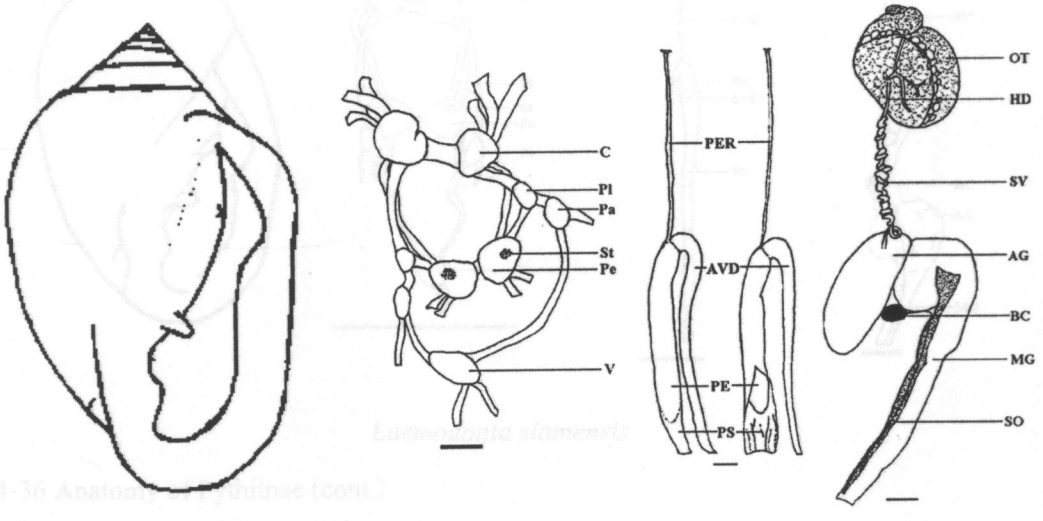
Fig. 4-35 Compare morphology of mangrove pulmonate. Upper one is Ellobiidae, middle right is Amphibolidae, middle left is Siphonariidae and lower one are Onchidiidae.



Auriculastra elongata

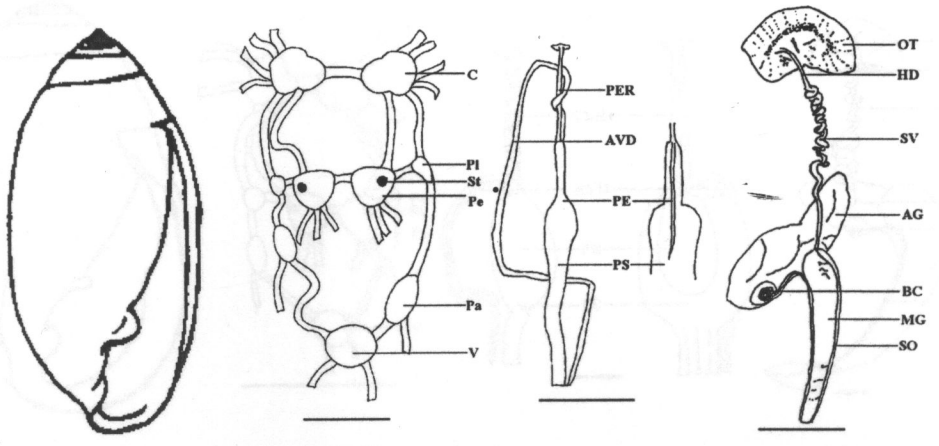


Cassidula aurisfelis

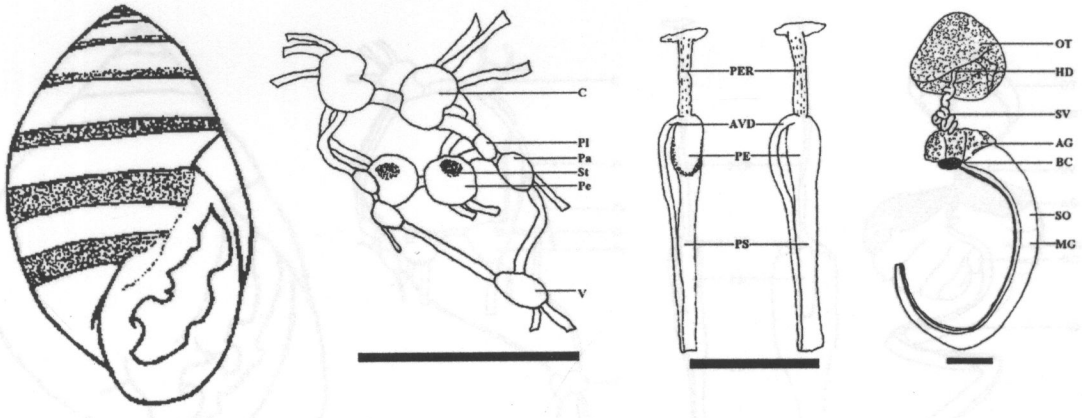


Cassidula mustelina

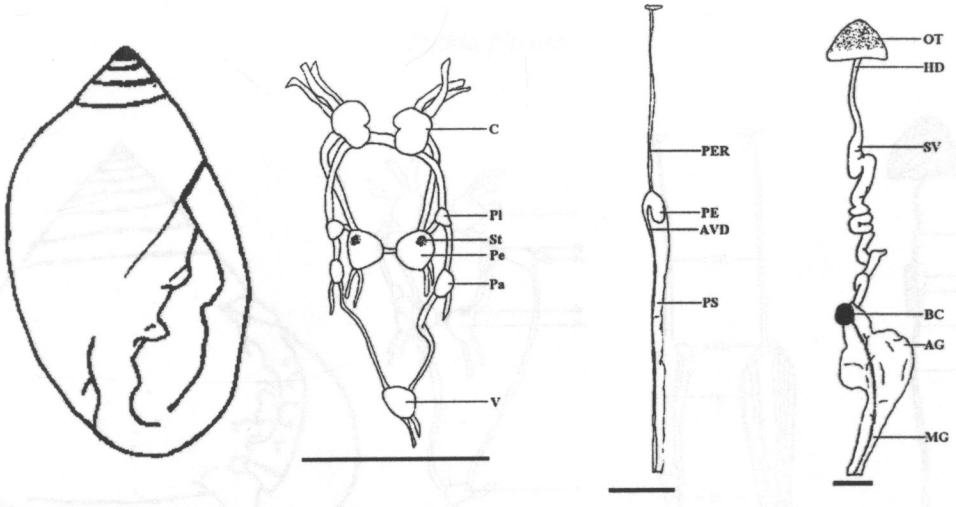
Fig. 4-36 Anatomy of Pythiinae



Cylindrotis siamensis

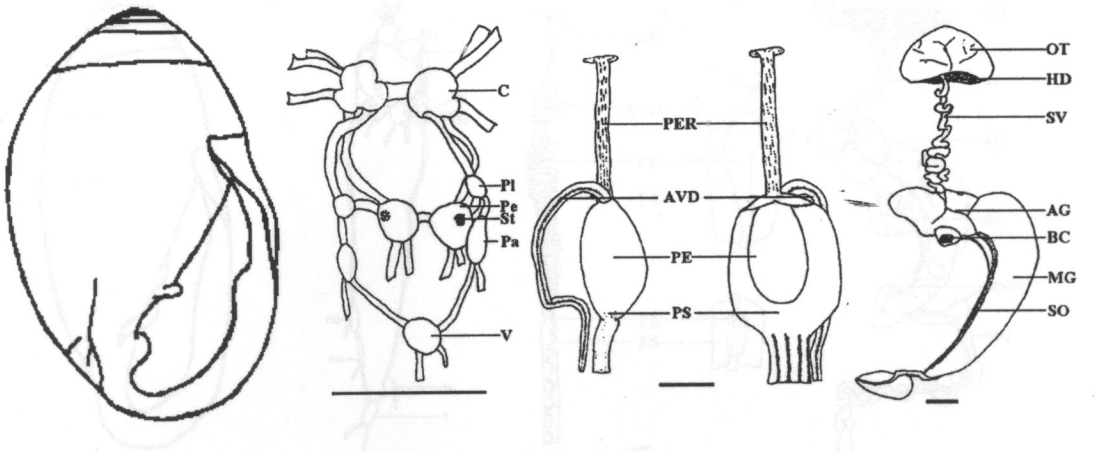


Laemodonta punctigera

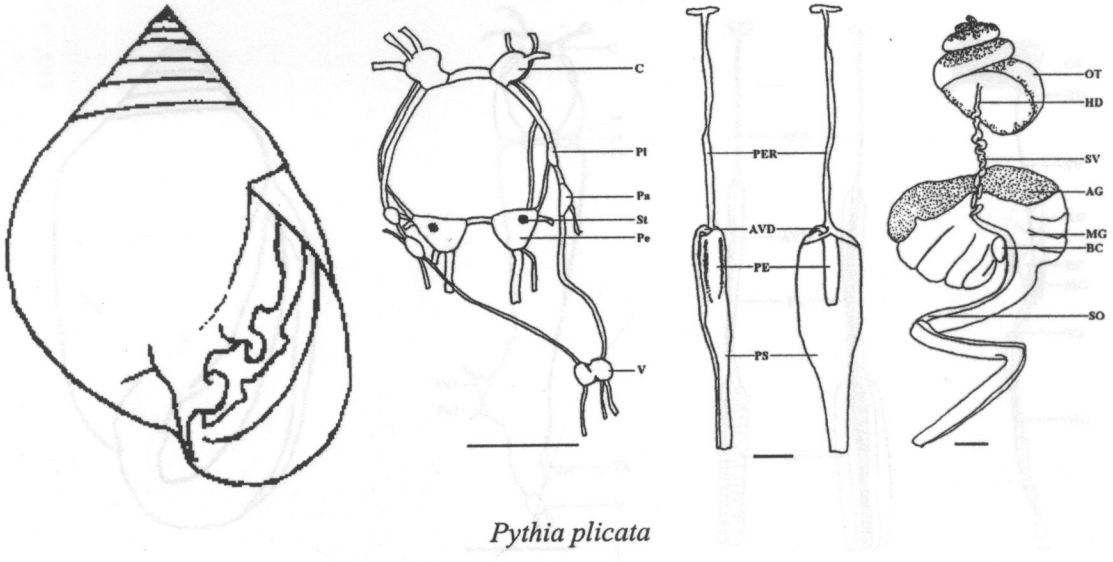


Laemodonta siamensis

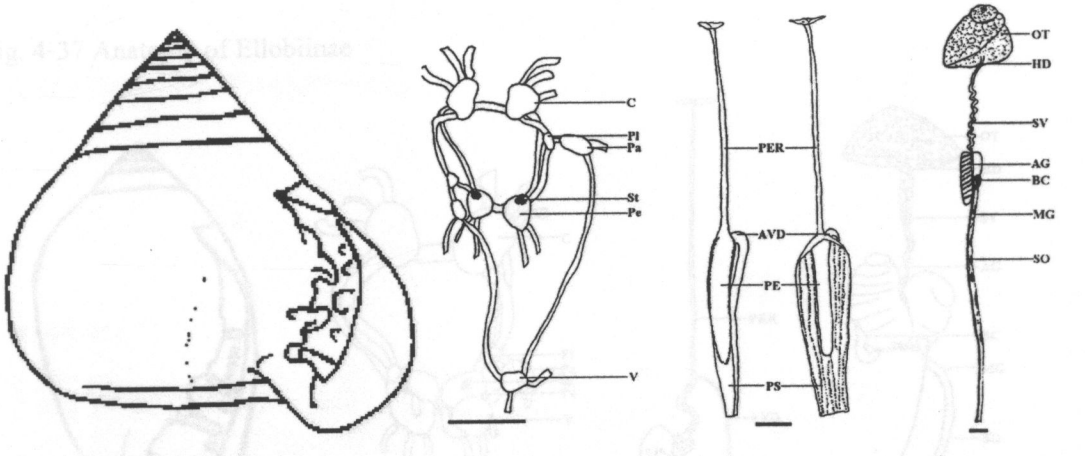
Fig. 4-36 Anatomy of Pythiinae (cont.)



Laemodonta sp.

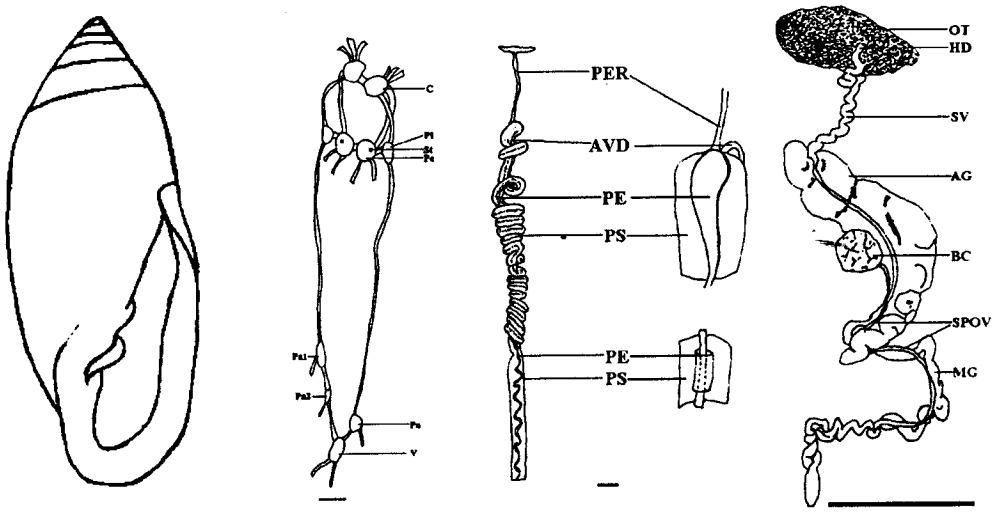


Pythia plicata

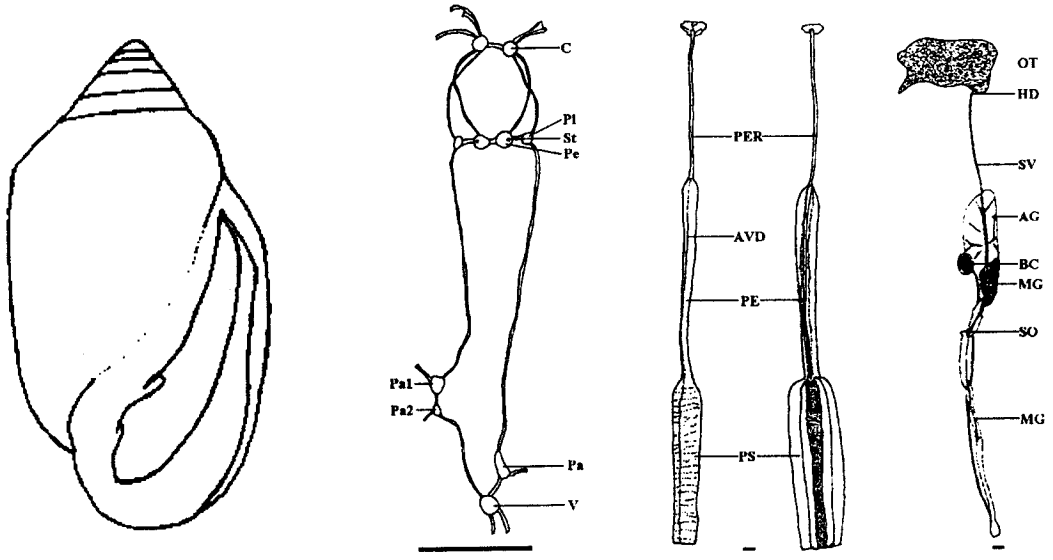


Pythia trigona

Fig. 4-36 Anatomy of Pythiinae (cont.)

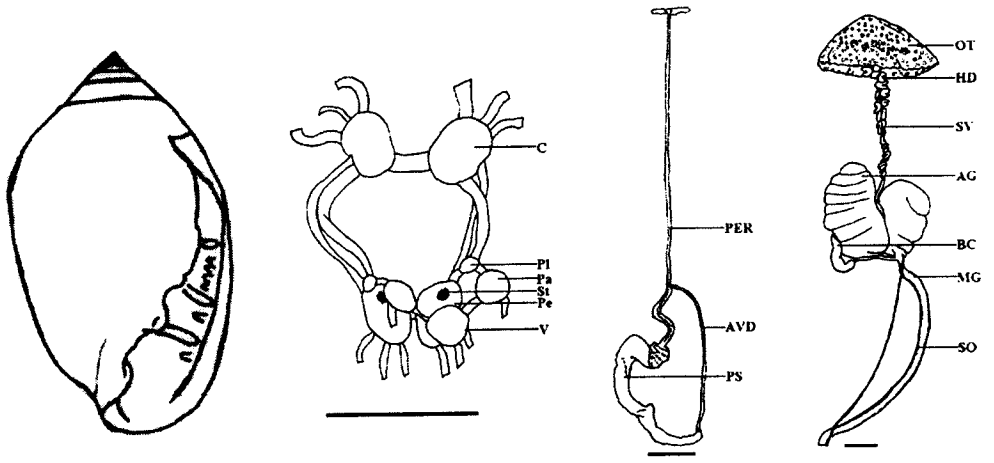


Ellobium aurisjudae



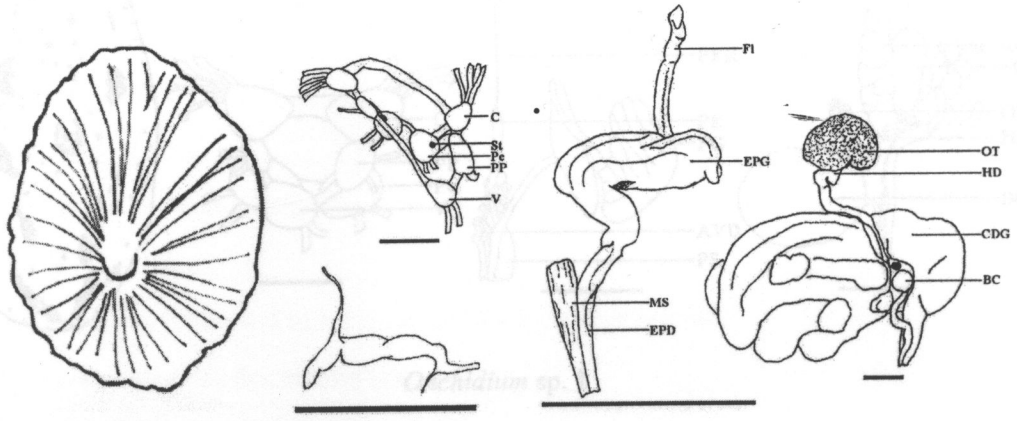
Ellobium aurismidae

Fig. 4-37 Anatomy of Ellobiinae



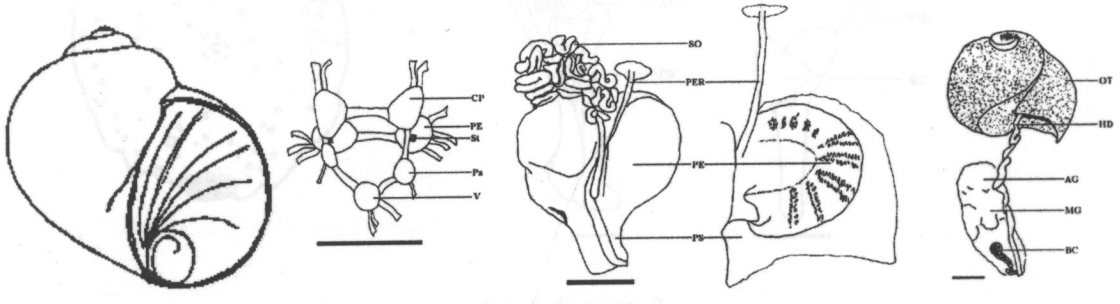
Melampus siamensis

Fig. 4-38 Anatomy of Melampinae



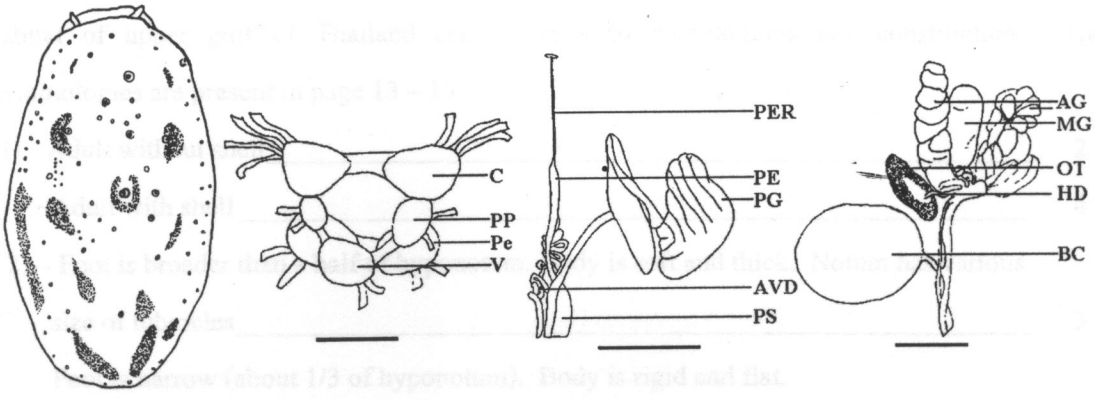
Siphonaria laciniosa

Fig. 4-39 Anatomy of Siphonariidae

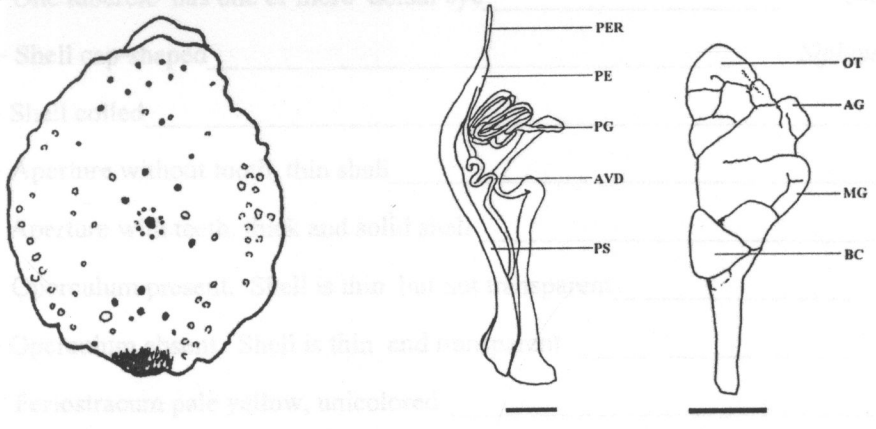


Salinator sp.

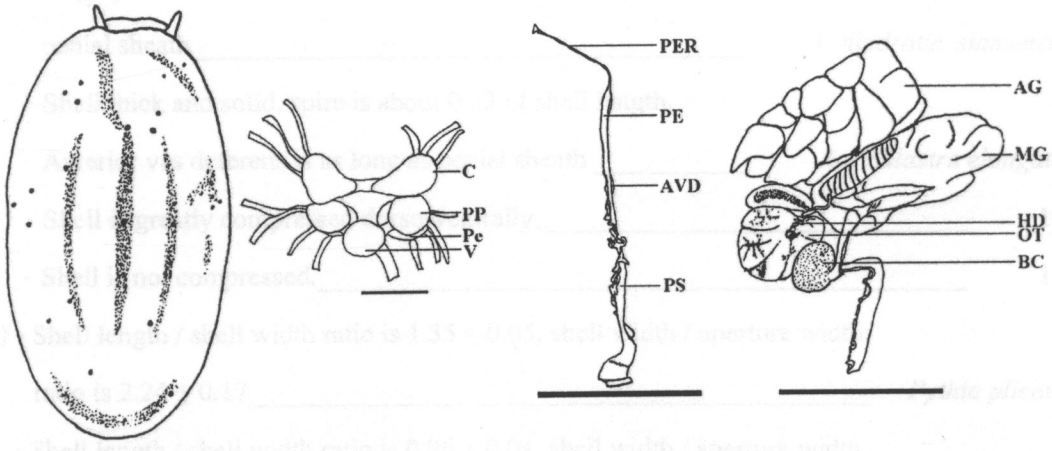
Fig. 4-40 Anatomy of Amphibolidae



Onchidium sp. 1



Onchidium sp. 2



Platevindex sp.

Fig. 4-41 Anatomy of Onchidiidae

Morphological and anatomical characteristics of land pulmonate snails in mangrove habitat of upper gulf of Thailand can be used to dichotomous key construction. The terminologies are present in page 13 – 15.

1) - Adult without shell _____ 2

- Adult with shell _____ 4

2) – Foot is broader than a half of hyponotum. Body is soft and thick. Notum has various size of tubercles _____ 3

- Foot is narrow (about 1/3 of hyponotum). Body is rigid and flat. Notum has tubercles that similar in size _____ *Platevindex* sp.

3) - One tubercle has 1 dorsal eye _____ *Onchidium* sp. 1

- One tubercle has one or more dorsal eye _____ *Onchidium* sp. 2

4) - Shell cap-shaped _____ *Siphonaria laciniosa*

- Shell coiled _____ 5

5) - Aperture without tooth, thin shell _____ 6

- Aperture with teeth, thick and solid shell _____ 7

6) - Operculum present. Shell is thin but not transparent _____ *Salinator* sp.

- Operculum absent. Shell is thin and transparent _____ *Succinea* sp.

7) - Periostracum pale yellow, unicolored _____ 8

- Periostracum brown to dark brown, shell with or without band _____ 9

8) - Shell thin, fragile, spire very short (about 0.03 of shell length). Anterior vas deferens is about 2 times longer than penial sheath _____ *Cylindrotis siamensis*

- Shell thick and solid, spire is about 0.23 of shell length. Anterior vas deferens is as long as penial sheath _____ *Auriculastra elongata*

9) - Shell is greatly compressed dorso-ventrally. _____ 10

- Shell is not compressed. _____ 11

10) - Shell length / shell width ratio is 1.35 $\pm$ 0.05, shell width / aperture width ratio is 2.24 $\pm$ 0.17 _____ *Pythia plicata*

- Shell length / shell width ratio is 0.96 $\pm$ 0.04, shell width / aperture width ratio is 3.32 $\pm$ 0.3 _____ *Pythia trigona*

11) - Shell sculpture have spiral and transverse striated or pitted _____ 12

- Shell sculpture is smooth, without striated or pitted _____ 14

12) - Shell thin, palatal tooth is long ridge, body whorl is about 10 times longer than spire length _____ *Laemodonta* sp.

- Shell thick and solid, palatal teeth are notch or bud, body whorl longer is about 5-6 times than spire length _____ 13

13) - Shell unicolored, parietal wall with 2 simple teeth, lower parietal tooth simple, sculpture with transverse and spiral striae. Radula have not reduction of marginal teeth _____ *Laemodonta siamensis*

- Shell has spiral bands, a bifurcated parietal tooth and sculpture pitted. Radula have reduction of marginal teeth _____ *Laemodonta punctigera*

14) - Palatal wall is smooth, without tooth _____ 15

- Palatal wall has teeth _____ 16

15) - Aperture length / body whorl length ratio is 0.75 $\pm$ 0.05, aperture length / shell length ratio is 0.64 $\pm$ 0.05, shell length / shell width ratio is 2.62 $\pm$ 0.28 _____ *Ellobium aurisjudae*

- Aperture length / body whorl length ratio is 0.85 $\pm$ 0.02, aperture length / shell length ratio is 0.73 $\pm$ 0.02,shell length / shell width ratio is 1.77 $\pm$ 0.07 _____ *Ellobium aurismidae*

16) - Palatal wall with more than a horizontal tooth _____ *Melampus siamensis*

- Palatal wall with a vertical tooth which indented edge _____ 17

17) - Suture is strongly indented. Shell length / shell width ratio is 1.80 $\pm$ 0.16. Aperture length / aperture width ratio is 2.37 $\pm$ 0.18. Radula with reduction of marginal teeth _____ *Cassidula aurisfelis*

- Shallowly suture or flat whorl, shell length/shell width ratio is 1.68 $\pm$ 0.07, aperture length / aperture width ratio is 2.74 $\pm$ 0.18. radula with not reduction of marginal teeth _____ *Cassidula mustelina*

Anatomical characters that were chosen for phylogenic construction are recorded in table 4 – 6. The phylogenic trees computed by PAUP from data in table 4-6 and shown in fig. 4 – 35.

Table 4 – 6 Data matrix of anatomical characters.

Species	Characters								
	1	2	3	4	5	6	7	8	9
A. elongata	0	0	0	1	2	1	3	1	2
Ca. aurisfelis	0	0	0	1	0	1	3	1	2
Ca. mustelina	0	0	0	1	0	1	3	1	2
Cy. siamensis	0	0	0	1	0	1	3	2	3
E. aurisjudae	3	0	1	1	3	0	1	1	3
E. aurismidae	3	0	1	1	3	0	1	1	3
L. punctigera	0	0	0	1	1	1	3	2	2
L. siamensis	0	0	0	1	1	1	3	2	2
Laemodonta sp.	0	0	0	1	0	1	3	2	3
M. siamensis	2	2	2	1	0	1	3	2	1
Py. plicata	0	0	0	0	0	0	3	1	3
Py. trigona	0	0	0	0	0	0	3	1	2
Haminoeo symnestra	0	0	0	0	3	0	3	3	1

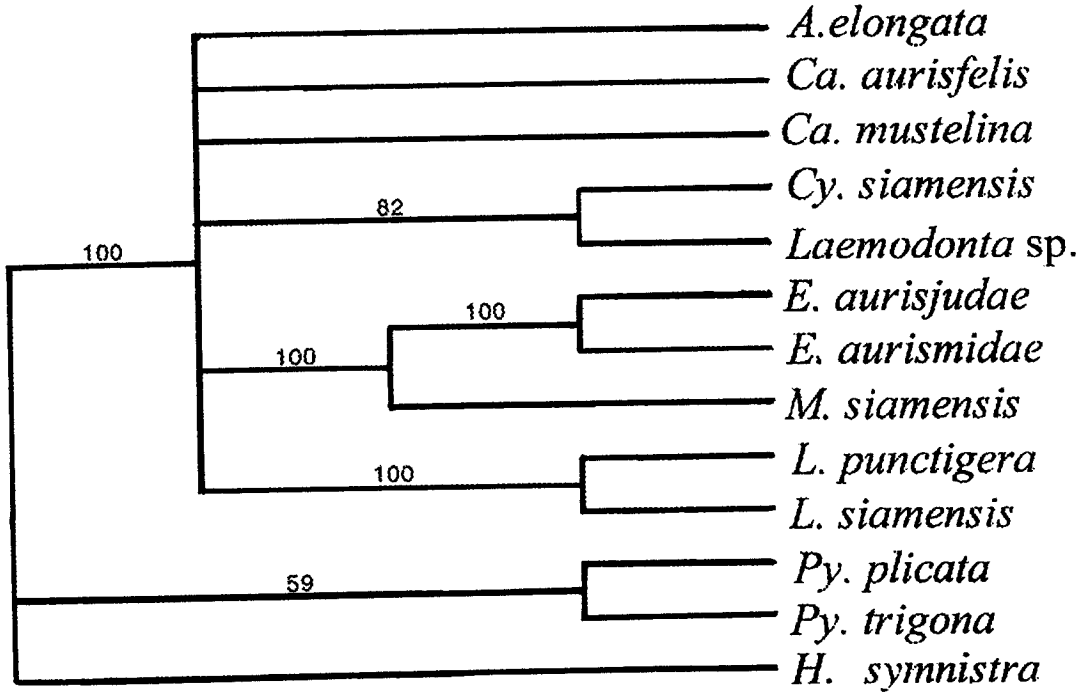


Fig. 4 – 42 Consensus tree of ellobiids generated from data in table 4 - 6. The numbers indicated the percentile of Majority rule value.

Data from table 4-7 are analyzed by heuristic method (PAUP program). The 22 family trees are reconstructed and consensus by majority rule 50% (Fig. 4- 42). The first node contains 3 branches, outgroup, *Pythia* spp., and others which are grouped by closed sperm groove. The 6 branches generated from the third group. The *Ellobium* - *Melampus* group is separated from others by derived character of monauly and the position of insertion of bursa duct. Other taxa in the last node are not grouped, except *Cylindrotis siamensis* and *Laemodonta* sp., which grouped by the ratio of left / right cerebropedal connectives length (about 1.1 – 1.5).

Chapter 5

Discussion

Eighteen species of mangrove pulmonates of the upper Gulf of Thailand were recorded in this study. Two species are first record to Thailand i. e. *Laemodonta* sp. and *Platevindex* sp., while *Salinator* sp. is a first record in the Gulf. *Laemodonta* sp. distributes along both coastal Gulf of Thailand and Andaman seashore. Five ellobiid species reported by Brandt in 1974 were not found in this study. They are *Auriculastra subula*, *Cylindrotis quadrasi*, *Laemodonta monilifera*, *L. punctatostriata*, and *Melampus pulchellus*. Habitat destruction and pollution may be the cause of species disappearance and emigration.

It is shown in the present study that shell morphometry of ellobiids can be used to identified at the species level in some genera (Table 4-1). *Ellobium aurisjudae* and *E. aurismidae* were identified by aperture length / body whorl length ratio, aperture length / shell length ratio, and shell length / shell width ratio. *Pythia* spp. were identified by shell width / aperture length ratio. In genus *Laemodonta*, *Laemodonta* sp. is distinctly different from each other by spire length / body whorl length ratio. Shell of *L. punctigera* and *L. siamensis* are very similar except color and apertural teeth. *L. punctigera* has light brown color with dark brown bands on body whorl and a bifurcated parietal tooth. *L. siamensis* has brown color without dark bands and a simple parietal tooth. Certain genera can also be identified by shell morphometry i. e. *Ellobium* and *Pythia*. In genus *Cassidula*, it may not be easily identified to species by shell morphometry but they possess other distinct different morphological characteristics. *Ca. aurisfelis* has strongly indented suture and bifurcated columellar tooth while *Ca. mustelina* has slightly indented suture and a simple columellar tooth.

Radula is a species-specific character for identification of pulmonate in upper gulf of Thailand. In onchidiid, three cusps of central tooth is a unique form. The variated 9-15 cusps of central tooth with long narrow crown marginal teeth are the patterns of the *Salinator* sp. (Amphibolidae), while *Siphonaria laciniosa* (Siphonariidae) possesses the long narrow radular sheath with single lateral tooth. Radula of Thai *Salinator* sp. differs from *Sa. fragilis* and *Sa. solida* of Australia, by their pentacuspid central tooth with a small unicuspid lateral tooth (covered by 2nd lateral tooth) (Thiele, 1963 and Smith and Stanistic,1998). Ellobiids' radula (Melampinae and Ellobiinae) is rather uniform but it varies within Pedipedinae and Pythiinae (Martins, 1996b). *E. aurisjudae* and *E. aurismidae* differ in shape of the central tooth-base and number of cusps of marginal teeth. *Melampus siamensis* has unique multicuspid marginal teeth that similar to others *Melampus* (a small endocone, a large mesocone and a number of small ectocone) (Hubendick, 1978 and Martins, 1996a). *Pythia plicata* differs from *Py trigona* by the size and crown shape of lateral and marginal teeth. The crown of lateral teeth of *Py. colmani* , the Papua New Guinea species, is similar to *Py. trigona*, which is deeply emarginate of central tooth base and pointed crown of lateral teeth.

Morphology of ovotestis are different within the Families. In Families Amphibolidae and Ellobiidae contain unlobed and cone shaped ovotestis, which located at the apex position, except in the two *Ellobium* species, which are flattened and enclosed by hepatopancreas. Family Onchidiidae have a large and lobed ovotestis at the posterior end of the body.

The penial complex among mangrove pulmonate snail species shows great diversity. Family Ellobiidae were classified into 5 subfamilies by reproductive and central nervous system morphology (Morton, 1955, Martins, 1996a and Martins, 1996b). There are 3 subfamilies presented in Thai mangrove. Subfamily Ellobiinae, *Ellobium* spp. has a long muscular penial sheath and a tiny anterior

vas deferens attach along penial sheath. The penis of *E. aurisjudae* is convoluted with cartilage-like substance in the wall which is the most specialized character of *Ellobium* (Morton, 1955). *E. aurismidae*, Indo-Pacific species, is lacking this character as *E. (Auriculodes) dominicense* of Western Atlantic (Martins, 1996a). Subfamily Pythiinae, *Auriculastra*, *Cassidula*, *Cylindrotis*, *Laemodonta* and *Pythia* present a generalized character of penis. *Cassidula* differ from other genera by its anterior vas deferens, which is large, and not attach to penial sheath. *Cy. siamensis* has a unique penial complex with a very long anterior vas deferens (about 2 times of penial sheath) and not attach to penial sheath. It's penis is about 1/3 of penial sheath but about 2/3 in *Cy. quadrasi* (Fukuda, 1994). In this study *Laemodonta* sp. shows distinctly different from *L. punctigera*, *L. siamensis* and *L. cubensis* (Martins, 1996a) by its anterior vas deferens which is large and not adhere to penial sheath. This is very similar to the genus *Cassidula*. Subfamily Melampinae, *M. (Micromelampus) siamensis* is very similar to the Western Atlantic species, *M. (Detracia) bullaoides* and *M.(D.) floridanus*. They possess a short anterior vas deferens and not adhered to penial sheath. *Si. laciniosa* is lacking of penis but spermatophore is present. Penial complex of *Salinator* sp., which is found in this study, is similar to *Amphibola australis* more than other species in genus *Salinator*. In Onchidiidae, the present or absent of penial gland is an important character for onchidiid genera identification. Penial gland is present in genera *Labella*, *Onchidium*, *Peronia*, *Peronina*, *Quoyella* and *Seperoncis*, but absent in genera *Hoffmanola*, *Lessonia*, *Onchidella*, *Onchidina*, *Paraonchidium* and *Platevindex* (Britton, 1984 and Hyman, 1999).

The general pattern of central nervous system of pulmonate snails are composed of 11 ganglia, which tends to be concentrated into a cerebral ring around esophagus (Hubendick, 1978, Boss, 1982 and Smith and Stanisic, 1998). The concentration and fusion of the ganglia are derived characters (Morton, 1955, Bishop, 1978, Haszprunar, 1988 and Martins 1996b). *E. aurisjudae* and *E. aurismidae* have derived character of parietal ganglia that is divided into posterior and anterior

part. In *Pythia*, slightly chiastoneury is considered a primitive condition. *Siphonaria laciniosa* and *Salinator* sp. show more advanced condition by more concentrated nerve ring. The most advanced mangrove pulmonates are onchidiid slugs, *Onchidium* sp. and *Platevindex* sp. which exhibit a close contact of ganglia and fusion of parietal and pleural ganglia. Bishop (1978) proposed 8 patterns of ganglia fusion of visceral chain (cited in Bargmann, 1930) and hypothesized pathways of ganglia fusion of pulmonate snails. The ellobiids and *Salinator* sp. present in this study should be classified as visceral nerve chain type I of Bargman because of its ganglia of visceral chain are separated by long commissure, while *Siphonaria laciniosa* and onchidiids are classified as visceral nerve chain type VII of Bargman by left and right parietal and pleural fusion. Visceral nerve chain type I is the most primitive, while *Salinator* sp. is more advanced than ellobiids by the fusion cerebral and pleural fusion. The fusion pathway of nerve ganglia in onchidiid slugs is probably derived from type II of Bargman (Bishop, 1978).

The phylogenic tree in Fig. 4 - 42 show radiation of ellobiids at most upper branch. Morton (1955) assumed ellobiids appear in 350 M. Y. (Carboniferous period). Thus, *Pythia* were speciated during 350 – 400 M. Y. and other ellobiids were radiated about 265 M. Y. (Permian period). *Melampus* and *Ellobium* were diversed at 176 M. Y. (Jurassic period). Martins (1996b) discussed about the origin of Ellobiinae and Melampinae. The Melampinae arose from the common Pythiinian ancestor but Ellobiinae diversed very early from the ancestral stock that give rise to Pythiinae. Speciation of *Laemodonta*, *Ellobium* and *Pythia* may occurred in Cretaceous period. The position of *Laemodonta* sp. on the family tree are grouped with *Cylindrotis siamensis* by esophageal nerve ring morphology (character 7-9). The length of commissure is not as good as reproductive system for family tree reconstruction. Better understanding of the evolutionary tree will need more characters such as morphology of shell, alimentary tract, embryo, development process and pallial organ including more taxa (other subfamilies) and habitats.

The most primitive ellobiid, *Pythia* contains many primitive character such as sperm groove, penis structure, development of accessory genital gland, radula, nervous system (less concentration and chiastoneury) while its pallial organ is considered an advance character (Morton, 1955 and Martins, 1996b). *Melampus* contains some primitive character, such as pallial organ, but the combination of ganglionic concentration and non-glandular, advanced semidiaulic pallial gonoduct indicated that the Melampinae are the least primitive ellobiids.

Chapter 6

Conclusions and Suggestions

1) The mangrove in the upper Gulf of Thailand appears 4 orders, 5 families, 12 genera and 18 species of pulmonate snails. *Laemodonta* sp. and *Platevindex* sp. are considered as new record in Thailand. Five species reported by Brandt (1974) are not found at this time.

2) Shell morphology is distinctly different among mangrove pulmonate snails. There are 4 key characters using for most ellobiid snails identification i. e. shape, aperture, aperture-dentition, and suture of shell. Foot width, dorsal papillae and number of dorsal eyes are important characters in Onchidiids identification.

3) Shell morphometry is not informative for species identification of the genus *Laemodonta*.

4) Radula may be character for identification pulmonate species in mangrove of upper gulf of Thailand. The number and shape of cusps and base of the teeth, the arrangement of radular teeth and the reduction of marginal teeth are considered.

5) Penial complexes show a wide range of variation and are categorized into 3 subfamilies in Ellobiidae. *Ellobium aurisjudae* show the most advanced penial complex in all mangrove pulmonates by its wall of the penis possesses cartilage-like substance. *Melampus* and *Siphonaria* show a derived penial complex by lacking penis.

6) Concentration and fusion of pleural and parietal ganglia of Onchidiids show the most advanced nervous system among pulmonate in mangrove habitats. Left parietal ganglion of genus *Ellobium* shows a derived character by divided into anterior and posterior part.

7) Cladograms of ellobiids show a wide radiation of Pythiinae. The ancestor of Ellobiinae and Melampinae may arise from Pythiinae. More characters and more taxa are required for a better and complete family tree reconstruction.

References

Aksornkoae, S. 1998. **Mangroves: Ecology and management.** 2nd edition. Bangkok: Kasetsart University Press. (In Thai).

Apley, M. L. , Russell-Hunter, W. D. , and Avolizi, R. J. 1967. Annual reproductive turnover in the salt-marsh pulmonate snail, *Melampus bidentatus*. **Biol. Bull.** 133: 455-456.

Awati, P. R. , and Karankdikar, K. R. 1948. ***Onchidium verraculatum* Cuv. (anatomy, embryology, and bionomics).** Bombay: Examiner Press.

Barnes, R. D. 1987. **Invertebrate zoology**. Fifth edition. USA: Saunders College Publishing.

Berry, A. J. 1975. Molluscs colonizing mangrove trees with observation on *Enigmonia rosea* (Anomiidae). **Proc. Malac. Soc. Lond.** 41: 589-600.

Bishop, M. J. 1978. The value of pulmonate central nervous system in phylogenetic hypothesis. **J. Moll. Stud.** 44: 116-119.

Boss, K. J. 1982. Mollusca. In S. P. Parker (ed.). **Synopsis and classification of living organisms. Vol. 1**, pp. 945-1,166. USA. : McGraw-Hill.

Branch, G. M. 1985. Limpet: Evolution and adaptation. In E. R. Trueman, and M. R. Clarke (eds.). **The mollusca vol. 10 evolution**, pp. 187-220. Florida: Academic Press.

Brandt, R. A. M. 1974. The Non-marine aquatic mollusca of Thailand. **Arch. Moll.** 105 (1-4): 1-423.

Britton, K. M. 1984. The Onchidiacea (Gastropoda: Pulmonata) of Hongkong with world wild review of the genera. **J. Moll. Stud.** 50: 179-191.

Burch, J. B. 1962. **How to know the eastern land snails**. USA. : Wm. C. Brown.

Burch, J. B. , and Pearce, T. A. 1990. Terrestrial gastropoda. In L. Dindal. (ed.) . **Soil biology guide**, pp. 201-309. USA. : John Wiley & Sons.

Cook, L. M. 1996. Colour variation in *Pythia plicata* (Fe'russac) (Gastropoda: Ellobioidea). **J. Moll. Stud.** 62: 127-129.

Fernandez, R. , Roddriguezz, J. , Quinoa, E. Riguera, R. , Monoz, L. , Fernandezsuarez, M. , and Debites, C. 1996. Onchidin B -a new cyclodepsipeptide from the mollusk *Onchidium* spp. **J. Am. Chem. Soc.** 118 (46): 11635-11643.

Field, C. D. 1995. **Journey amongst mangroves.** The International Society for Mangrove Ecosystem. Hong Kong: South China Printing.

Fukuda, H. 1994. The anatomy of *Cylindrotis quasrasi* from Okinawa island, Japan and the Subfamilial position of the Genus *Cylindrotis* Möllendorff, 1895 (Archeopulmonata: Ellobiidae). **J. Moll. Stud.** 60: 69-81.

Geraerts, W. P. M. , and Joose, J. 1984. Freshwater snails (Basommatophora). In A. S. Tompa (ed.). **The mollusca vol. 7 reproduction**, pp. 141-207. New York: Academic Press.

Habe, T. 1964. **Shells of the western Pacific in color vol. II**. Japan: Hoikusha Publishing.

Harry, H. W. 1964. The anatomy of *Chilina fluctuosa* Gray reexamined, with prolegomina on the phylogeny of the higher limnic Basommatophora (Gastropoda: Pulmonata). **Malacologia** 1(3): 355-385.

Haszprunar, G. 1988. On the origin and evolution of major gastropod groups, with special reference to the streptoneura. **J. Moll. Stud.** 54: 367-441.

Hubendick, B. 1964. Kungl. Systematics monograph of the Patelliformia. **Sv. Vet. Akademiens Handlingar**. 23 (5) : 1-99.

Hubendick, B. 1978. Systematics and comparative morphology of the Basommatophora. In V. Fretter, and J. Peake (eds.). **Pulmonates Vol. 2A. ; Systematics, evolution and ecology.** New York: Academic Press.

Hyman, I. T. 1999. A comparison of two onchidiid species (Mollusca, Pulmonata). **Moll. Res.** 20 (1): 61-72.

Isarankura, K. 1976. Faunistic aspects of mangrove forest in Thailand. In National Research Council of Thailand. **Proceeding of the First Thai National Seminar on Mangrove Ecology Part 2 Vol. 1**, pp. 139-166.

Iwasaki, K. 1993. Analyses of limpet defense and predator offense in the field. **Mar. Biol.** 116 (2): 277-289.

Kira, T. 1962. **Shells of the western Pacific in color**. Japan: Hoikusha Publishing.

Martins, A. M. F. 1995. A new species of *Pythia* Roding, 1798 (Pulmonata, Ellobiidae), from New Ireland, Papua New Guinea. **Moll. Res.** 16: 59-67.

Martins, A. M. F. 1996a. Anatomy and systematics of the western Atlantic Ellobiidae (Gastropoda: Pulmonata). **Malacologia** 37 (2) : 163-332.

Martins, A. M. F. 1996b. Relationships within the Ellobiidae. In J. Taylor (ed.), **Origin and evolutionary radiation of the Mollusca,** pp. 285-294. London: Oxford Univesity Press.

McQuaid, C. D. , Cretchley, R. , and Rayne, J. L. 1999. Chemical defence of the intertidal pulmonate limpet *Siphomaria capensis* (Quay & Gaimard) against natural predators. **J. Exp. Mar. Biol. Ecol.** 237 (1) : 141-154.

Morgan, G. J. , and Hailstone, T. S. 1986. Distribution of gastropods in a mangrove habitat in South-East Queensland. **J. Malac. Soc. Aust.** 7 (3-4): 131-140.

Morton, J. E. 1955. The evolution of the Ellobiidae with a discussion on the origin of the Pulmonata. **Proc. Zool. Soc. Lond.** 125 (1): 127-168.

Morton, J. E. 1967. **Mollusc.** England: Anchor Press.

Morton, J. E. 1988. The palial cavity. In E. R. Trueman, and M. R. Clarke (eds.). **The mollusca vol. 11 form and function,** pp. 253-286. New York: Academic Press.

Panha, S. 1998, June. Associate professor, Department of Biology, Faculty of Science, Chulalongkorn University. Interview.

Paul, M. C. , Zubia, E. , Ortega, M. J. , and Salva, J. 1997. New polyproprionate from *Siphonaria pectinata.* **Tetrahedron** 53 (6): 2303-2308.

Purchon, R. D. 1968. **The biology of the mollusca.** Hungary: Pergamon Press.

Russell-Hunter, W. D. , Apley, M. L. , and Hunter, R. D. 1972. Early life-history of *Melampus* and the significance of semilunar synchrony. **Biol. Bull.** 143: 623-656.

Salvini-Plawen, L. V. 1980. A reconsideration of systematics in the mollusca (phylogeny and higher classification). **Malacologia** 19 (2) : 249-278.

Salvini-Plawen, L. V. 1988. The structure and function of digestive systems. In E. R. Trueman, and M. R. Clarke (eds.). **The mollusca vol. 11 form and function,** pp. 301-379. New York: Academic Press.

Smith, B. J. , and Stanisic, J. 1998. Pulmonata. In P. L. Beesley, G. J. B. Ross, and A. Wells (eds.). **Mollusca: Fauna of Australia vol. 5,** pp. 1037-1125. Melbourne: CSIRO Publishing.

Snidvong, A. 1998. The oceanography of the Gulf of Thailand: Research and management priority. In D. M. Johnston (ed.) . **SEAPOL integrated studies of the Gulf of Thailand vol. 1.** pp. 1-68. Bangkok: Innomedia.

Solem, A. 1959. **Fieldiana Zool. vol. 48.** Chicago: Chicago Natural History Museum.

Suvatti, C. 1938. **Molluscs of Siam.** Bangkok: Bureau of Fisheries.

Suvatti, C. 1950. **Fauna of Thailand.** pp. 32- 126. Bangkok: Department of Fisheries.

Swofford, D. L. 1991. **PAUP: Phylogenetic Analysis Using Parsimony, Version 3.03.** Computer program distributed by the Illinois Natural History Survey, Champaign, Illinois. ,

Tantanasiriwong, R. 1978. An illustrated checklist of marine shelled gastropods from Phuket islands, Western Peninsular Thailand. **Phuket Mar. Biol. Center Res. Bull.** 10: 1-22.

Taylor, D. W. , and Sohl, N. F. 1962. An outline of gastropod classification. **Malacologia** 1 (1) : 7-32.

Thiele, J. 1963. **Handbook of systematic malacology: part 2 (Gastropoda: Opisthobranchia & Pulmonata)** . India: Amrind Publishing.

Tillier, S. 1989. Comparative morphology, phylogeny and classification of land snails and slugs (Gastropoda: Pulmonata: Stylommatophora). **Malacologia** 30: 1-303.

Vaught, K. C. 1989. **A classification of the living mollusca.** R. T. Abbott, and K. J. Boss (eds.). Florida: American Malacologist.

Vermeulen, J. J. , and Whitten, A. J. 1998. **Fauna Malaysiana guide to land snails of Bali.** Netherlands: Backhuys.

Appendices

Appendix I

Specimens collection

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0001	*Ellobium aurisjudae*	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	12 D.
PMR 0002	*Cassidula mustelina*	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	8 D.
PMR 0003	*Leamodonta* sp.	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	4 D.
PMR 0004	*Auriculastra elongata*	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	6 D.
PMR 0005	*Assiminea* sp.	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	329 D.
PMR 0006	*Laemodonta punctigera*	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	30 D.
PMR 0007	*Leamodonta* sp.	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	4D.
PMR 0008	*Laemodonta siamensis*	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	8D.
PMR 0009	*Melampus siamensis*	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	8D.
PMR 0010	*Platevindex* sp.	Bangkaew Moung Samutsongkram	Mud surface	19/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	1 IND.
PMR 0011	*Assiminea* sp.	Bangkhuntean Bangkok	Mud surface	23/04/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	44 D.
PMR 0012	*Littorinopsis melanostoma*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	4 D.
PMR 0013	*Cassidula mustelina*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	1 D.
PMR 0014	*Melampus siamensis*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	1 D.
PMR 0015	*Neritina violacea*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	3 D.
PMR 0016	*Melampus siamensis*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	1 D.
PMR 0017	*Cassidula aurisfelis*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	4 D.
PMR 0018	*Laemodonta siamensis*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	3 D.
PMR 0019	*Laemodonta punctigera*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	1 D.
PMR 0020	*Assiminea* sp.	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	12 D.
PMR 0021	*Littorinopsis scabra*	Pomprajullajomklaw Bangkok	?	02/05/1998	Sravut Klorvuttimontara	Teerapon Petpipat	16 D.
PMR 0022	*Siphonaria*sp.	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	14 IND.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0023	*Chicoreus capucinus*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0024	*Cerithidea cingulata*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	59 D.
PMR 0025	*Assiminea* sp.	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0026	*Onchidium* sp.	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0027	*Littorinopsis melanostoma*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0028	*Littorinopsis scabra*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	32 D.
PMR 0029	unidentified	Angsila Chonburi	rock surface	05/05/1998		Sravut Klorvuttimontara	15 D.
PMR 0030	*Nerita planospira*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0031	*Planaxis sulcatus*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	14 D.
PMR 0032	*Monodonta labio*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	23 D.
PMR 0033	*Hydrocena*sp.	Angsila Chonburi	rock surface	05/05/1998	Somsak Panha	Sravut Klorvuttimontara	4 D.
PMR 0034	*Salinator* sp.	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvutfimontara	31 D.
PMR 0035	*Cellana radiata*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	69 D.
PMR 0036	*Clithon oualaniensis*	Angsila Chonburi	rock surface	05/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	237 D.
PMR 0037	*Ellobium aurisjudae*	Moungmai Chonburi	Log	06/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0038	*Ellobium aurismidae*	Moungmai Chonburi	Log	06/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0039	*Assiminea* sp.	Moungmai Chonburi	Mud surface	06/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	75 D.
PMR 0040	*Laemodonta siamensis*	Moungmai Chonburi	Mud surface	06/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	76 D.
PMR 0041	*Laemodonta punctigera*	Moungmai Chonburi	Mud surface	06/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	11 D.
PMR 0042	*Salinator* sp.	Anglisa Chonburi	Log	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	15 D.
PMR 0043	*Ellobium aurisjudae*	Klongprong Chonburi	Log	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.
PMR 0044	*Ellobium aurismidae*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0045	*Laemodonta siamensis*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	285 D.
PMR 0046	*Laemodonta punctigera*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	17 D.
PMR 0047	*Assiminea sp.*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	110 D.
PMR 0048	*Chicoreus capucinus*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6D.
PMR 0049	*Littorinopsis melanostoma*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	26 D.
PMR 0050	*Littorinopsis scabra*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	11 D.
PMR 0051	*Cerithidea quadrata*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0052	*Cerithidea obtusa*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0053	*Auriculastra elongata*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	37 D.
PMR 0054	*Melampus* sp.	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	252 D.
PMR 0055	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	70 D.
PMR 0056	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	88 D.
PMR 0057	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	60 D.
PMR 0058	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	54 D.
PMR 0059	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	87 D.
PMR 0060	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	73 D.
PMR 0061	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	86 D.
PMR 0062	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	71 D.
PMR 0063	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	77 D.
PMR 0064	*Cassidula mustelina*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	71 D.
PMR 0065	*Cassidula aurisfelis*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	40 D.
PMR 0066	*Platevindex* sp.	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	27 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0067	*Onchidium* sp.	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	75 IND.
PMR 0068	*Cylindrotis siamensis*	Klongprong Chonburi	Mud surface	08/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0069	*Laemodonta siamensis*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	79 D.
PMR 0070	*Littorinopsis scabra*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0071	*Cerithidea obtusa*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0072	*Littorinopsis melanostoma*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	18 D.
PMR 0073	*Onchidium* sp.	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 IND.
PMR 0074	*Platevindex* sp.	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0075	*Cerithidea cingulata*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	15 D.
PMR 0076	*Haminea symmesta*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0077	unidentified	Moung Chonburi	Log	15/05/1998		Sravut Klorvuttimontara	10 D.
PMR 0078	*Assiminea* sp.	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0079	*Neritina violacea*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	75 D.
PMR 0080	*Ellobium aurismidae*	Moung Chonburi	Log	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0081	*Ellobium aurisjudae*	Moung Chonburi	Log	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.
PMR 0082	*Cassidula mustelina*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	72 D.
PMR 0083	*Cassidula mustelina*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	55 D.
PMR 0084	*Cassidula mustelina*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	70 D.
PMR 0085	*Cassidula aurisfelis*	Moung Chonburi	Mud surface	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	9 D.
PMR 0086	*Indoplanorbis exustus*	Moung Chonburi	Log	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 S.
PMR 0087	*Melampus siamensis*	Moung Chonburi	Log	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0088	*Stenothyra moussoni*	Moung Chonburi	Log	15/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0089	*Siphonaria* sp.	Angsila Chonburi	Rock	17/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	107 IND.
PMR 0090	*Siphonaria* sp.	Angsila Chonburi	Rock	17/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0091	*Onchidium* sp.	Angsila Chonburi	Rock	17/05/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0092	*Onchidium* sp.	Kungkrabane Bay Chantaburi	Mud surface	29/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	6 IND.
PMR 0093	*Platevindex* sp.	Kungkrabane Bay Chantaburi	Mud surface	29/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	1 IND.
PMR 0094	*Clithon oualaniensis*	Kungkrabane Bay Chantaburi	Mud surface	29/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	6 D.
PMR 0095	*Cassidula mustelina*	Kungkrabane Bay Chantaburi	Mud surface	29/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	268 D.
PMR 0096	*Littorinopsis scabra*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	11 D.
PMR 0097	*Assiminea* sp.	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	311 D.
PMR 0098	unidentified	Samutprakarn	Nipa palm forest	31/05/1998		MALACO. LAB. CU.	231 D.
PMR 0099	*Neritina violacea*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	51 D.
PMR 0100	*Cassidula aurisfelis*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	136 D.
PMR 0101	*Cassidula mustelina*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	117 D.
PMR 0102	*Cerithidea* sp.	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	1 D.
PMR 0103	*Pythia plicata*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	428 D.
PMR 0104	*Laemodonta punctigera*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	137 D.
PMR 0105	*Laemodonta siamensis*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	2 D.
PMR 0106	*Melampus siamensis*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	124 D.
PMR 0107	*Ellobium aurisjudae*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	8 D.
PMR 0108	*Cerithidea obtusa*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	2 D.
PMR 0109	*Onchidium* sp.	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	3 IND.
PMR 0110	*Platevindex* sp.	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	61 IND.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0111	*Auriculastra elongata*	Samutprakarn	Nipa palm forest	31/05/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	1D.
PMR 0112	*Ellobium aurismidae*	Sungei Buloh Singapore	?	30/06/1998	Sravut Klorvuttimontara	D. H. Murphy	2 D.
PMR 0113	*Ellobium aurisjudae*	Mandi Besar Singapore	?	30/06/1998	Sravut Klorvuttimontara	D. H. Murphy	1 D.
PMR 0114	*Cassidula aurisfelis*	Mandi Besar Singapore	?	30/06/1998	Sravut Klorvuttimontara	D. H. Murphy	1D.
PMR 0115	*Pythia plicata*	Mandi Besar Singapore	?	30/06/1998	Sravut Klorvuttimontara	D. H. Murphy	4 D.
PMR 0116	*Onchidium* sp.	Mandi Besar Singapore	?	30/06/1998	Sravut Klorvuttimontara	D. H. Murphy	1 IND.
PMR 0117	*Pythia plicata*	Mandi Besar Singapore	?	30/06/1998	Sravut Klorvuttimontara	D. H. Murphy	1 D.
PMR 0118	*Assiminea* sp.	Moung Samutprakarn	Mud surface	05/07/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0119	*Enigmonia* sp.	Moung Samutprakarn	Nipa palm, rock	05/07/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	23 IND.
PMR 0120	*Neritina violacea*	Moung Samutprakarn	Rock	05/07/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	11 IND.
PMR 0121	*Littorinopsis scabra*	Moung Samutprakarn	Stem	05/07/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0122	*Littorinopsis melanostoma*	Moung Samutprakarn	Stem	05/07/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0123	*Littorinopsis melanostoma*	Bangtaboon Patchaburi	Stem	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0124	*Neritina violacea*	Bangtaboon Patchaburi	lower part of tree	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 IND.
PMR 0125	unidentified	Bangtaboon Patchaburi	mud flat, seaward zone	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0126	*Assiminea* sp.	Bangtaboon Patchaburi	Mud surface	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	44 D.
PMR 0127	*Stenothyra moussoni*	Bangtaboon Patchaburi	mud flat, seaward zone	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	103 D.
PMR 0128	*Haminea symmesta*	Bangtaboon Patchaburi	Mud surface	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	42 IND.
PMR 0129	*Cassidula aurisfelis*	Bangtaboon Patchaburi	lower part of tree	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1D.
PMR 0130	*Cassidula mustelina*	Bangtaboon Patchaburi	lower part of tree	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0131	*Cerithidea obtusa*	Bangtaboon Patchaburi	Mud surface	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0132	*Cerithidea cingulata*	Bangtaboon Patchaburi	Mud surface	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0133	*Melampus* sp.	Bangtaboon Patchaburi	mud, lower part of tree	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0134	*Onchidium sp.*	Bangtaboon Patchaburi	mud, terrestrial zone	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 IND.
PMR 0135	*Laemodonta siamensis*	Bangtaboon Patchaburi	mud, lower part of tree	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	14 D.
PMR 0136	*Laemodonta punctigera*	Bangtaboon Patchaburi	mud, lower part of tree	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	43 D.
PMR 0137	*Salinator* sp.	Bangtaboon Patchaburi	mud, seaward zone	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	52 D.
PMR 0138	*Cylindrotis siamensis*	Klongprong Angsila Chonburi	under log, on mud	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0139	*Cassidula mustelina*	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	15 D.
PMR 0140	*Cassidula aurisfelis*	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0141	*Melampus siamensis*	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0142	*Laemodnota siamensis*	Klongprong Angsila Chonburi	Mud surface, under log	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0143	*Laemodonta punctigera*	Klongprong Angsila Chonburi	Mud surface, under log	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0144	*Auriculastra* sp.	Klongprong Angsila Chonburi	Mud surface, under log	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	20 D.
PMR 0145	*Assiminea* sp.	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0146	*Ellobium aurisjudae*	Klongprong Angsila Chonburi	rotten rock	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0147	*Chicoreus capucinus*	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0148	unidentified	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0149	*Littorinopsis scabra*	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0150	*Littorinopsis melanostoma*	Klongprong Angsila Chonburi	Mud surface, stem	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0151	*Littorinopsis* sp.	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0152	*Cerithideasp.*	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0153	*Cerithidea quadrata*	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0154	*Cerithidea siamensis*	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0155	*Onchidium* sp.	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0156	*Onchidium* sp.	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 IND.
PMR 0157	*Onchidium* sp.	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 IND.
PMR 0158	*Platevindex* sp.	Klongprong Angsila Chonburi	Mud surface	07/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0159	*Pythia plicata*	Bangpakong Chacheangsau	under nipa palm leaf	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0160	*Cassidula aurisfelis*	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0161	*Cassidula mustelina*	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0162	*Melampus* sp.	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.
PMR 0163	*Laemodonta punctigera*	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	19 D.
PMR 0164	*Laemodonta siamensis*	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0165	*Enigmonia* sp.	Bangpakong Chacheangsau	on nipa palm stem	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0166	*Assiminea* sp.	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0167	*Assiminea* sp.	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0168	*Neritina violacea*	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0169	*Onchidium* sp.	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0170	*Platevindex* sp.	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0171	*Platevindex* sp.	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0172	*Platevindex* sp.	Bangpakong Chacheangsau	on mud surface	17/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 IND.
PMR 0173	*Platevindex* sp.	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	2 IND.
PMR 0174	*Auriculastra elongata*	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	5 D.
PMR 0175	*Assiminea* sp.	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	2 D.
PMR 0176	*Pythia plicata*	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	2 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0177	*Ellobium aurisjudae*	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	4 D.
PMR 0178	*Cassidula mustelina*	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	18 D.
PMR 0179	*Cassidula aurisfelis*	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	1 D.
PMR 0180	*Laemodonta siamensis*	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	14 D.
PMR 0181	*Assiminea* sp.	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	3 D.
PMR 0182	*Laemodonta punctigera*	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	4 D.
PMR 0183	*Onchidium* sp.	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	5 IND.
PMR 0184	*Onchidium* sp.	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	6 IND.
PMR 0185	*Neritina violacea*	Khaosammuk bridge Chonburi	?	29/09/1998	Sravut Klorvuttimontara	Somsak Panha	3 D.
PMR 0186	*Telecoscopium telecoscopium*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	2 D.
PMR 0187	*Isognomon ephippium*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	1 IND.
PMR 0188	*Laemodonta punctigera*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	3 D.
PMR 0189	*Assiminea* sp.	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	46 D.
PMR 0190	*Cerithidea* sp.	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	4 D.
PMR 0191	*Neritina violacea*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	5 D.
PMR 0192	*Nerita maxima*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	4 D.
PMR 0193	*Littornopsis melanostoma*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	7 D.
PMR 0194	*Cassidula aurisfelis*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	40 D.
PMR 0195	unidentified	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	2 IND.
PMR 0196	*Chicoreus capucinus*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	9 D.
PMR 0197	*Littorinopsis scabra*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	2 D.
PMR 0198	*Platevindex* sp.	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	3 IND.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0199	*Cassidula mustelina*	Roadside Pang-Nga	?	13/11/1998	Sravut Klorvuttimontara	Somsak Panha	6 D.
PMR 0200	*Pythia trigona*	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0201	*Platevindex* sp.	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0202	*Neritina violacea*	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0203	*Ellobium aurisjudae*	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0204	*Cerithidea* sp.	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	16 D.
PMR 0205	*Cassidula aurisfelis*	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0206	*Cassidula mustelina*	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0207	*Laemodonta punctigera*	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	11 D.
PMR 0208	*Melampus* sp.	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	17 D.
PMR 0209	*Terebrallia pillustris*	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0210	*Telecoscopium telecoscopium*	Laem Ngob Trat	mud surface	27/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0211	*Platevindex* sp.	Ao Saladkok Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 IND.
PMR 0212	*Isognomon ephippium*	Ao Saladkok Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0213	*Ellobium aurisjudae*	Ao Saladkok Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0214	*Cerithidea quadrata*	Ao Saladkok Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.
PMR 0215	*Cassidula aurisfelis*	Ao Saladkok Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0216	*Littorinopsis scabra*	Ao Saladkok Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0217	*Onchidium* sp.	Had Sinedang Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0218	*Pythia trigona*	Had Sinedang Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0219	*Cassidula aurisfelis*	Had Sinedang Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0220	*Ellobium aurisjudae*	Had Sinedang Ko Chang Trat	mud surface	28/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	11 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0221	*Terebrallia pillustris*	Had Sinedang Ko Chang Trat	on ground	29/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0222	*Ellobium aurismidae*	Trat	rotten log, terrestrial zone	30/11/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	11 D.
PMR 0223	*Leamodonta* sp.	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	11 D.
PMR 0224	*Cylindrotis siamensis*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	1 D.
PMR 0225	*Onchidium* sp.	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface, under log	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	3 IND.
PMR 0226	*Onchidium* sp.	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface, under log	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	3 IND.
PMR 0227	*Platevindex* sp.	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface, under log	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	6 IND.
PMR 0228	*Platevindex* sp.	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface, under log	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	2 IND.
PMR 0229	*Ellobium aurisjudae*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	under log	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	2 D.
PMR 0230	*Cerithidea obtusa*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	2 D.
PMR 0231	*Neritina violacea*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	2 D.
PMR 0232	*Littorinopsis melanostoma*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on *Rhizophora* root	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	8 D.
PMR 0233	*Cerithidea* sp.	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	4 D.
PMR 0234	*Melampus siamensis*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	11 D.
PMR 0235	*Laemodonta punctigera*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	98 D.
PMR 0236	*Laemodonta siamensis*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	20 D.
PMR 0237	*Auriculastra elongata*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	3 D.
PMR 0238	*Assiminea* sp.	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	5 D.
PMR 0239	*Cassidula mustelina*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	152 D.
PMR 0240	*Cassidula aurisfelis*	Ban Chuche,Bangjakrang,Moung,Samutsongkram	on mud surface	03/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	124 D.
PMR 0241	*Leamodonta* sp.	Ao Pang-Nga, Pang-Nga	?	10/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	9 D.
PMR 0242	*Ellobium aurisjudae*	Ao Pang-Nga, Pang-Nga	?	10/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	29 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0243	*Chicoreus capucinus*	Ao Pang-Nga, Pang-Nga	?	10/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	20 D.
PMR 0244	*Cassidula aurisfelis*	Ao Pang-Nga, Pang-Nga	?	10/12/1998	Sravut Klorvuttimontara	MALACO. LAB. CU.	1 D.
PMR 0245	*Littoinopsis melanostoma*	Angsila Chonburi	on plant stem, leaf, on mud	18/01/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0246	*Neritina violacea*	Angsila Chonburi	on mud	18/01/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	9 D.
PMR 0247	*Littorinopsis scabra*	Angsila Chonburi	on plant stem	18/01/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0248	*Assiminea* sp.	Angsila Chonburi	on mud	18/01/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0249	*Cerithidea obtusa*	Angsila Chonburi	on mud	18/01/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0250	*Cerithidea cingulata*	Angsila Chonburi	on mud	18/01/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0251	unidentified	Angsila Chonburi	on mud	18/01/1999		Sravut Klorvuttimontara	1 D.
PMR 0252	*Cassidula aurisfelis*	Angsila Chonburi	on mud	18/01/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0253	*Ellobium aurisjudae*	Angsila Chonburi	on mud	18/01/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0254	*Littorinopsis melanostoma*	near Pakpanung delta Nakonsrithammarat	on mangrove plant	07/02/1999	Sravut Klorvuttimontara	บัญชิต สิบัณฑิตสมิต	4 D.
PMR 0255	*Littorinopsis scabra*	near Pakpanung delta Nakonsrithammarat	on mangrove plant	07/02/1999	Sravut Klorvuttimontara	บัญชิต สิบัณฑิตสมิต	11 D.
PMR 0256	*Cerithidea cingulata*	near Pakpanung delta Nakonsrithammarat	on mangrove plant	07/02/1999	Sravut Klorvuttimontara	บัญชิต สิบัณฑิตสมิต	51 D.
PMR 0257	*Leamodonta* sp.	Bangtaboon Petchaburi	on mud	29/08/1998	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0258	*Monodonta labio*	Danmai Ko Chang Trat	on mud	03/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0259	*Nerita maxima*	Danmai Ko Chang Trat	on mud	03/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0260	*Littorinopsis scabra*	Danmai Ko Chang Trat	on mangrove plant	03/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	13 d
PMR 0261	*Cerithidea cingulata*	Danmai Ko Chang Trat	on mud	03/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0262	*Cerithidea* sp.	Danmai Ko Chang Trat	on mangrove plant	03/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.
PMR 0263	unidentified	Danmai Ko Chang Trat	onmud	03/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0264	*Planaxis sulcatus*	Danmai Ko Chang Trat	on mud, on mangrove plant	03/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0265	*Clithon oualaniensis*	Saladphet Ko Chang Trat	on mud	06/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0266	*Littorinopsis scabra*	Saladphet Ko Chang Trat	on pneumatophore	06/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0267	*Neritina violacea*	Saladphet Ko Chang Trat	on mud	06/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0268	*Cerithidea quadrata*	Saladphet Ko Chang Trat	on mud	06/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0269	*Cerithidea cingulata*	Saladphet Ko Chang Trat	on mud	06/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0270	*Ellobium aurisjudae*	Saladphet Ko Chang Trat	under log	06/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0271	*Cassidula aurisfelis*	Saladphet Ko Chang Trat	on mud	06/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0272	*Teredo* sp.	Saladphet Ko Chang Trat	log	06/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1
PMR 0273	*Patella* sp.	Tanmayom Ko Chang Trat	attach on rock	09/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 IND.
PMR 0274	*Cerithidea* sp.	Tanmayom Ko Chang Trat	on rocky beach	09/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0275	*Littorinopsis scabra*	Tanmayom Ko Chang Trat	*Avicennia* puematophore	09/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0276	*Siphonaria* sp.	Tanmayom Ko Chang Trat	attach on rock	09/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 IND.
PMR 0277	*Isognomon ephippium*	Tanmayom Ko Chang Trat	attach on rock	09/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 IND.
PMR 0278	*Ellobium aurismidae*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0279	*Melampus sp.*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.
PMR 0280	*Ellobium aurisjudae*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0281	*Clithon oualaniensis*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0282	*Neritina violacea*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0283	*Pythia* sp.	Saladkok Ko Chang Trat	under leaf litter	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0284	*Cerithidea quadrata*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0285	*Littorinopsis scabra*	Saladkok Ko Chang Trat	on plant stem	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0286	*Cerithidea alata*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0287	unidentified	Saladphet Ko Chang Trat	on mud	07/03/1999		Sravut Klorvuttimontara	6 D.
PMR 0288	*Laemodona punctigera*	Talaynoi Klang Rayong	on mud	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0289	*Littorinopsis scabra*	Talaynoi Klang Rayong	on *Rhizophora* prop root	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0290	*Enigmonia* sp.	Talaynoi Klang Rayong	on Nipa palm leaf	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 IND.
PMR 0291	*Neritina violacea*	Talaynoi Klang Rayong	on *Rhizophora* prop root	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0292	*Cerithidea cingulata*	Talaynoi Klang Rayong	on *Rhizophora* prop root	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0293	*Cerithidea quadrata*	Paknamprasare Klang Rayong	on mud	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0294	*Neritina violacea*	Paknamprasare Klang Rayong	on mud	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.
PMR 0295	*Assiminea sp.*	Paknamprasare Klang Rayong	on mud	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0296	*Cassidula aurisfelis*	Paknamprasare Klang Rayong	on mud	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0297	*Cassidula mustelina*	Paknamprasare Klang Rayong	on mud	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0298	*Cerithidea cingulata*	Paknamprasare Klang Rayong	on mud	13/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	13 D.
PMR 0299	*Succinea* sp.	Saladkok Ko Chang Trat	on plant stem, leaf	04/03/1999	Somsak Panha	Sravut Klorvuttimontara	4 D.
PMR 0300	*Polymedusa proxima*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0301	*Placuna placenta*	Saladkok Ko Chang Trat	on mud	04/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	
PMR 0302	*Neritina violacea*	Tanode Dam Tamai Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0303	*Ellobium aurisjudae*	Tanode Dam Tamai Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0304	*Platevindex* sp.	Tanode Dam Tamai Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0305	*Onchidium* sp.	Tanode Dam Tamai Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0306	*Cassidula aurisfelis*	Tanode Dam Tamai Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0307	*Pythia trigona*	Tanode Dam Tamai Chantaburi	under leaf litter	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0308	*Laemodonta punctigera*	Tanode Dam Tamai Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0309	*Chicoreus capucinus*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0310	*Clithon oualaniensis*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	20 D.
PMR 0311	*Cerithidea cingulata*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0312	*Assiminea* sp.	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	23 D.
PMR 0313	*Littorinopsis scabra*	Kungkrabane Bay Chantaburi	on mud,plant stem and root	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	25 D.
PMR 0314	*Nerita planorspira*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0315	unidentified	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0316	*Cerithidea alata*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0317	*Ellobioum aurisjudea*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0318	*Cassidula mustelina*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	21 D.
PMR 0319	*Laemodonta punctigera*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	9 D.
PMR 0320	*Laemodonta siamensis*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0321	*Melampus sp.*	Kungkrabane Bay Chantaburi	on mud	18/03/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0322	*Laemodonta siamensis*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	9 D.
PMR 0323	*Enigmonia* sp.	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0324	*Littorinopsis melanostoma*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0325	*Littorinopsis scabra*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.
PMR 0326	*Neritina violacea*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0327	*Cerithidea cingulata*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0328	*Chicoreus capucinus*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0329	*Assiminea sp.*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0330	unidentified	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0331	*Haminea symmesta*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0332	*Onchidium* sp.	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	9 IND.
PMR 0333	*Platevindex* sp.	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 IND.
PMR 0334	*Ellobium aurisjudae*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.
PMR 0335	*Cassidula aurisfelis*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0336	*Cassidula mustelina*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	15 D.
PMR 0337	*Melampus siamensis*	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.
PMR 0338	*Salinator* sp.	Klongprong Angsila Chonburi	on mud	08/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	45 D.
PMR 0339	*Enigmonia* sp.	Donhoylod Maeklong Samutsongkram	on nipa palm stem	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0340	*Haminea symmesta*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0341	*Neritina violacea*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0342	*Cerithidea obtusa*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0343	*Littorinopsis melanostoma*	Donhoylod Maeklong Samutsongkram	on mud, attachon plant stem	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	13 D.
PMR 0344	*Assiminea* sp.	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	14 D.
PMR 0345	*Onchidium* sp.	Donhoylod Maeklong Samutsongkram	on mud, under log	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0346	*Platevindex* sp.	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0347	*Cassidula aurisfelis*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0348	*Cassidula mustelina*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	15 D.
PMR 0349	*Melampus siamensis*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0350	*Laemodonta punctigera*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	17 D.
PMR 0351	*Laemodonta siamensis*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0352	*Auriculastra elongata*	Donhoylod Maeklong Samutsongkram	on mud	22/05/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0353	*Neritina violacea*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0354	*Neritodryas dubia*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0355	*Assiminea* sp.	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0356	*Assiminea* sp.	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0357	*Onchidium* sp.	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0358	*Platevindex* sp.	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0359	*Pythia plicata*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0360	*Laemodonta punctigera*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.
PMR 0361	*Melampus siamensis*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	11 D.
PMR 0362	*Auriculastra elongata*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0363	*Cassidula mustelina*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0364	*Cassidula aurisfelis*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0365	*Ellobium aurisjudae*	Bangwou Bangpakong Chachoengsao	on mud	12/06/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.
PMR 0366	*Cassidula multiplicata*	Lamnamkraburi NP. Ranong	staying on mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	20 D.
PMR 0367	*Ellobium aurisjudae*	Lamnamkraburi NP. Ranong	staying on rotten log	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0368	*Littorinopsis melanostoma*	Lamnamkraburi NP. Ranong	attach on plant stems	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0369	*Cerithidea obtusa*	Lamnamkraburi NP. Ranong	staying on mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0370	*Cerithidea cingulata*	Lamnamkraburi NP. Ranong	staying on mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0371	*Cerithidea quadrata*	Lamnamkraburi NP. Ranong	staying on mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0372	*Nerita chamaeleon*	Lamnamkraburi NP. Ranong	staying on mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0373	*Neritina violacea*	Lamnamkraburi NP. Ranong	staying on mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0374	*Assiminea* sp.	Lamnamkraburi NP. Ranong	staying on mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0375	*Enigmonia* sp.	Lamnamkraburi NP. Ranong	attach on plant stems	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0376	*Pisidium* sp.	Lamnamkraburi NP. Ranong	in sandy mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0377	*Telecoscopium telecoscopium*	Lamnamkraburi NP. Ranong	staying on mud	10/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0378	*Nerita planorspira*	Tachang Ban-Ngaw Moung Ranong	staying on mud	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	7 D.
PMR 0379	*Assiminea sp.*	Tachang Ban-Ngaw Moung Ranong	staying on mud	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0380	*Nassarius* sp.	Tachang Ban-Ngaw Moung Ranong	staying on mud	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0381	*Cerithidea cingulata*	Tachang Ban-Ngaw Moung Ranong	staying on mud	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0382	*Cerothidea obtusa*	Tachang Ban-Ngaw Moung Ranong	staying on mud	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0383	*Littorinopsis melanostoma*	Tachang Ban-Ngaw Moung Ranong	attach on Rhizophora prop root	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0384	*Littorinopsis* sp.	Tachang Ban-Ngaw Moung Ranong	attach on Rhizophora prop root	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0385	*Cassidula multiplicata*	Tachang Ban-Ngaw Moung Ranong	staying on mud	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.
PMR 0386	*Enigmonia* sp.	Tachang Ban-Ngaw Moung Ranong	attach on plant stems	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0387	*Isognomon ephippium*	Tachang Ban-Ngaw Moung Ranong	attach on Rhizophora prop root	11/07/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0388	*Telebrelia palustris*	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0389	*Cerithidea quadrata*	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.
PMR 0390	*Littorinopsis scabra*	Prednai Moung Trat	attach on plant stems	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0391	*Onchidium* sp.	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 IND.
PMR 0392	*Onchidium* sp.	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 IND.
PMR 0393	*Platevindex* sp.	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0394	*Ellobium aurisjudae*	Prednai Moung Trat	attach on rotten log	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.
PMR 0395	*Ellobium aurismidae*	Prednai Moung Trat	attach on rotten log	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0396	*Cassidula mustelina*	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0397	*Cassidula aurisfelis*	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	11 D.
PMR 0398	*Melampus siamensis*	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	49 D.
PMR 0399	*Pythia trigona*	Prednai Moung Trat	staying on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	28 D.
PMR 0400	unidentified	Prednai Moung Trat	burrowing in mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 IND.
PMR 0401	*Cerithidea obtusa*	Prednai Moung Trat	on mud	02/08/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0402	*Cerithidea cingulata*	Bangkhuntian Bangkok	staying on mud	27/09/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	13 D.
PMR 0403	*Littorinopsis melanostoma*	Tamrhou Bangpu Samutprakan	attach on Avicenia stem	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0404	*Assiminea sp.*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0405	*Ellobium aurisjudae*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	17 D.
PMR 0406	*Auriculastra elongata*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0407	*Cassidula aurisfelis*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	12 D.
PMR 0408	*Cassidula mustelina*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	9 D.
PMR 0409	*Laemodonta siamensis*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0410	*Laemodonta punctigera*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0411	*Melampus siamensis*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	20 D.
PMR 0412	*Ellobium sp.*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0413	*Onchidium sp.*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0414	*Platevindex sp.*	Tamrhou Bangpu Samutprakan	staying on mud	30/10/1999	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 IND.
PMR 0415	*Cassidula aurisfelis*	Donhoylod Maeklong Samutsongkram	?	30/01/2000	Thanakom Bundhitwongrut	Sravut Klorvuttimontara	3 D.
PMR 0416	*Littorinopsis scabra*	Kungkrabane Bay Chantaburi	attach on plant stems	11/03/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	6 D.
PMR 0417	*Chicoreus capucinus*	Kungkrabane Bay Chantaburi	staying on mud	11/03/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0418	*Cerithidea cingulata*	Kungkrabane Bay Chantaburi	staying on mud	11/03/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.

COLL. NO.	SCIENTIFIC NAME	LOCALITY	HABITAT	DATE	IDENTIFIED BY	COLLECTOR	REMARK
PMR 0419	*Assiminea sp.*	Kungkrabane Bay Chantaburi	staying on mud	11/03/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 D.
PMR 0420	*Clithon oualaniensis*	Kungkrabane Bay Chantaburi	staying on mud	11/03/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	50 D.
PMR 0421	*Cassidula aurisfelis*	Kungkrabane Bay Chantaburi	staying on mud	11/03/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	13 D.
PMR 0422	*Assiminea sp.*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0423	*Nerita maxima*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	1 D.
PMR 0424	*Littorinopsis melanostoma*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0425	*Littorinopsis scabra*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	4 D.
PMR 0426	*Chicoreus capucinus*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0427	*Salinator sp.*	Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	16 D.
PMR 0428	*Siphonaria laciniosa*	Angsila Chonburi	attached on rock surface	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	5 IND.
PMR 0429	*Ellobium aurisjudae*	Klongprong Angsila Chonburi	rotten rock	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 D.
PMR 0430	*Cassidula aurisfelis*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	3 D.
PMR 0431	*Cassidula mustelina*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	10 D.
PMR 0432	*Platevindex sp.*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	2 IND.
PMR 0433	*Onchidium sp.*	Klongprong Angsila Chonburi	staying on mud	22/04/2000	Sravut Klorvuttimontara	Sravut Klorvuttimontara	8 IND.

Abbreviation:

COLL. NO. refers Collection number

D. refers dextral shell

IND. Refers individual

MALACO. LAB. CU. refers Malacology Laboratory of Chulalongkorn University

S refers sinistral shell

Appendix II

Morphology measurement

Shell of *Auriculastra elongata*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0053	no.1	16.48	6.14	12.96	8.87	3.38	3.52
PMR0053	no.2	15.43	5.36	11.9	8.92	3.2	3.53
PMR0053	no.3	15.36	4.98	10.94	8.76	2.44	4.42
PMR0053	no.4	13.84	4.64	10.17	7.6	2.67	3.67
PMR0053	no.5	15.64	5.6	11.92	9.69	3.09	3.72
PMR0053	no.6	12.3	4.7	9.99	7.98	2.89	2.31
PMR0053	no.7	14.1	4.79	9.72	7.03	30.5	4.38
PMR0053	no.8	15.92	4.82	11.5	8.69	2.86	4.42
PMR0053	no.9	14.99	5.28	11.14	7.98	2.52	3.85
PMR0053	no.10	14.71	4.82	11.18	7.82	3.01	3.53
PMR0053	no.11	15.08	5.69	11.51	8.35	2.86	3.57
PMR0053	no.12	14.7	4.91	10.66	7.62	2.08	4.04
PMR0053	no.13	9.98	4.34	7.72	6.12	1.88	2.26
PMR0053	no.14	12.26	4.83	9.28	7.2	2.08	2.98
PMR0053	no.15	11.56	5.18	9.11	7.39	2.18	2.45
PMR0053	no.16	10.34	4.65	8.02	6.43	1.99	2.32
PMR0053	no.17	11.3	5.22	9.31	7.75	2.22	1.99
PMR0053	no.18	10.24	4.86	8.12	6.92	2.38	2.12
PMR0053	no.19	9.9	4.38	7.38	6.35	1.88	2.52
PMR0053	no.20	16.38	6.21	11.91	9.24	3.22	4.47
PMR0053	no.21	12.96	5.67	10.03	8.39	2.72	2.93
PMR0053	no.22	11.18	4.96	8.93	7.38	2.34	2.25
PMR0053	no.23	13.16	5.18	9.86	7.9	2.56	3.3
PMR0053	no.24	13.18	5.45	9.68	7.9	2.61	3.5
PMR0053	no.25	14.78	5.99	10.6	8.32	2.86	4.18
PMR0053	no.26	12.96	5.29	9.85	7.72	2.66	3.11
PMR0053	no.27	15.36	5.88	11.36	8.53	2.86	4
PMR0053	no.28	12.9	5.56	10.42	8.37	2.88	2.48
PMR0053	no.29	12.46	5.13	9.67	7.49	2.6	2.79
PMR0053	no.30	14.61	5.62	10.92	8.24	2.98	3.69
PMR0053	no.31	13.19	5.4	10.46	8.19	2.87	2.73
PMR0053	no.32	14.12	5.06	9.98	7.4	2.72	4.14
PMR0053	no.33	14.88	5.93	11.52	9.16	3.29	3.36
PMR0053	no.34	14.47	5.16	10.15	6.8	2.52	4.32
PMR0053	no.35	13.02	5.26	10.04	7.54	2.67	2.98
PMR0053	no.36	13.12	5.36	10.26	8.08	2.6	2.86
PMR0053	no.37	13.88	5.76	10.32	7.95	3	3.56

Shell of *Auriculastra elongata* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0053	no.38	12.68	4.87	9.38	7.28	2.35	3.3
PMR0053	no.39	13.88	5.02	10.22	8.01	2.72	3.66
PMR0053	no.40	13.42	5.73	10.68	8.64	2.9	2.74
PMR0053	no.41	13.18	5.21	9.89	7.74	2.56	3.29
PMR0053	no.42	12.76	4.72	9.16	7.48	2.3	3.6
PMR0053	no.43	12.96	5.2	10.13	7.48	2.84	2.83
PMR0053	no.44	12.97	5.24	9.64	7.6	2.75	3.33
PMR0053	no.45	13.94	5.3	9.88	6.77	2.58	4.06
PMR0053	no.46	12.52	5.25	9.6	7.82	3	2.92
PMR0053	no.47	10.37	4.68	8.59	7.04	2.24	1.78
PMR0053	no.48	12.68	4.9	9.4	7.06	2.49	3.28
PMR0053	no.49	12.11	4.94	9.49	7.62	2.89	2.62
PMR0053	no.50	14.6	6.07	10.69	8.81	2.78	3.91

Shell of *Cassidula aurisfelis*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0059	no.1	24.92	13.35	21.8	20.56	8.08	3.12
PMR0059	no.2	25.28	14.18	22.42	20.64	8.96	2.86
PMR0059	no.3	20.97	11.52	18.44	17.22	5.38	2.53
PMR0059	no.4	25.3	14.32	21.86	20.51	8.36	3.44
PMR0059	no.5	24.66	14.29	21.35	20.36	8.34	3.31
PMR0059	no.6	25.22	13.89	21.92	20.06	8.26	3.3
PMR0059	no.7	25.9	13.79	22.11	20.78	8.04	3.79
PMR0059	no.8	25.74	14.53	22.75	20.79	8.78	2.99
PMR0059	no.9	26.06	15.3	22.98	20.92	9.1	3.08
PMR0059	no.10	26.49	15.08	23.33	21.56	9.15	3.16
PMR0059	no.11	26.94	15	23.78	21.58	8.45	3.16
PMR0059	no.12	28.14	15.92	24.8	22.37	9.58	3.34
PMR0059	no.13	25.36	14.64	22.04	20.29	7.96	3.32
PMR0059	no.14	28	14.67	24.74	22.58	9.76	3.26
PMR0059	no.15	27.18	14.94	23.62	21.86	8.53	3.56
PMR0059	no.16	27.22	15.95	23.96	21.23	9.02	3.26
PMR0059	no.17	27.75	15.91	23.85	21.28	8.97	3.9
PMR0059	no.18	27.3	14.69	23.44	20.68	9.42	3.86
PMR0059	no.19	24.96	14.24	21.6	19.88	8.9	3.36
PMR0059	no.20	26.63	15.07	22.8	21.14	9.13	3.83
PMR0059	no.21	25.48	9.4	22.02	20.63	8.17	3.46
PMR0059	no.22	27.37	15.18	23.6	21.4	9.12	3.77

Shell of *Cassidula aurisfelis* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0059	no.23	25.92	18.99	22.56	20.74	8.64	3.36
PMR00519	no.24	23.38	12.57	20.4	18.78	8.97	2.98
PMR0059	no.25	28.86	15.52	24.96	22.98	9.26	3.9
PMR0059	no.26	26.51	14.92	23.02	20.6	9.56	3.49
PMR0059	no.27	24.91	15.3	21.98	19.54	8.84	2.93
PMR0059	no.28	25.64	14.38	22.65	20.84	9.06	2.99
PMR0059	no.29	25.98	14.42	22.22	20.48	9.1	3.76
PMR0059	no.30	27.79	15.2	23.89	22.24	9.49	3.9
PMR0059	no.31	25.26	13.76	21.8	20.02	7.86	3.46
PMR0059	no.32	26.66	15.2	23.52	21.28	8.46	3.14
PMR0059	no.33	24.33	14.12	21.3	19.34	8.66	3.03
PMR0059	no.34	20.42	12.32	17.84	15.89	6.51	2.58
PMR0059	no.35	26.32	14.85	22.42	20.37	9.3	3.9
PMR0059	no.36	26.38	14.89	23.17	21.22	9.5	3.21
PMR0059	no.37	27.06	14.79	23.97	22.54	9.74	3.09
PMR0059	no.38	26.48	14.78	23.48	21.54	9.51	3
PMR0059	no.39	26.5	14.71	23.03	20.1	9.74	3.47
PMR0059	no.40	26.76	15.18	23.64	21.41	9.98	3.12
PMR0059	no.41	26.79	14.56	23.18	21.24	9.39	3.61
PMR0059	no.42	26.01	14.62	23.18	21.76	9.28	2.83
PMR0059	no.43	27.18	15.41	24.01	21.7	9.68	3.17
PMR0059	no.44	27.52	15	23.62	21.36	9.67	3.9
PMR0059	no.45	25.24	13.57	21.48	19.89	8.6	3.76
PMR0059	no.46	24.92	13.54	21.74	20.01	8.47	3.18
PMR0059	no.47	26.2	14.54	23.12	21.24	9.22	3.08
PMR0059	no.48	26.44	14.33	22.88	20.74	9.02	3.56
PMR0059	no.49	23.92	13.24	21	19.22	8.06	2.92
PMR0059	no.50	19.19	11.43	17.08	15.48	5.61	2.11

Shell of *Cassidula mustelina*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0055	no.1	20.75	12.62	19.51	17.72	6.04	1.24
PMR0055	no.2	20.8	12.04	17.92	17.06	6.8	2.88
PMR0055	no.3	19.48	11.3	16.46	15.18	5.68	3.02
PMR0055	no.4	20.02	11.1	17.06	15.8	5.76	2.96
PMR0055	no.5	15.92	9.86	13.94	13.2	4.76	1.98
PMR0055	no.6	20.38	11.41	16.82	15.62	5.84	3.56
PMR0055	no.7	15.68	9.4	13.73	12.5	5.08	1.95

Shell of *Cassidula mustelina* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0055	no.8	16.89	10.28	15.2	14.3	5.18	1.69
PMR0055	no.9	16.67	9.96	14.84	14.01	5.34	1.83
PMR0055	no.10	20.14	11.96	17.78	16.07	6.11	2.36
PMR0055	no.11	17.2	10.26	15.08	13.48	5.09	2.12
PMR0055	no.12	16.42	9.98	14.65	13.46	4.68	1.77
PMR0055	no.13	15.21	9.22	13.5	12.51	4.32	1.71
PMR0055	no.14	20.31	12.15	17.94	16.66	5.84	2.37
PMR0055	no.15	19.72	11.08	10.67	15.35	5.56	9.05
PMR0055	no.16	15.9	10.58	14.01	12.6	4.6	1.89
PMR0055	no.17	16.93	10.64	15.38	13.93	5.35	1.55
PMR0055	no.18	19.78	11.04	16.79	15.59	5.58	2.99
PMR0055	no.19	16.46	10.15	14.74	14.02	4.82	1.72
PMR0055	no.20	15.84	9.61	14.24	13.2	4.78	1.6
PMR0055	no.21	15.28	8.98	14.04	12.46	4.54	1.24
PMR0055	no.22	15	9.49	13.56	12.38	4.37	1.44
PMR0055	no.23	13.57	8.12	12.48	10.6	3.92	1.09
PMR0055	no.24	13.18	7.92	11.92	10.95	4.31	1.26
PMR0055	no.25	17.86	10.78	15.78	14.31	5.42	2.08
PMR0055	no.26	11.93	7.68	10.58	9.82	3.14	1.35
PMR0055	no.27	9.18	6.16	8.34	7.83	2.54	0.84
PMR0055	no.28	21.07	12.26	19.75	17.38	6.34	1.32
PMR0055	no.29	21.22	13.01	20.22	17.76	6.19	1
PMR0055	no.30	20.08	11.98	18.2	16.66	5.74	1.88
PMR0055	no.31	20.58	12.74	19.5	17.53	5.99	1.08
PMR0055	no.32	21.64	12.51	20.22	18.34	6.84	1.42
PMR0055	no.33	20.12	11.74	17	15.58	5.86	3.12
PMR0055	no.34	20.76	11.92	18.45	17.18	6.56	2.31
PMR0055	no.35	19.54	10.75	16.7	15.51	5.65	2.84
PMR0055	no.36	21.14	12.35	19.9	17.6	6.5	1.24
PMR0055	no.37	17.28	10.02	15.31	14.13	5.36	1.97
PMR0130	no.38	21.28	12.85	19.74	17.61	6.78	1.54
PMR0130	no.39	18.22	11.28	16.46	15.18	4.36	1.76
PMR0130	no.40	20.44	11.67	18.02	17.08	6.27	2.42
PMR0130	no.41	19.48	11.74	17	15.82	5.48	2.48
PMR0130	no.42	19.65	10.6	16.2	14.89	5.86	3.45
PMR0130	no.43	17.49	10.68	15.45	14.51	5.6	2.04
PMR0130	no.44	17.9	10.73	15.83	14.71	5.78	2.07

Shell of *Cassidula mustelina* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0130	no.45	16.88	9.68	14.82	13.22	5.29	2.06
PMR0130	no.46	20.38	12.31	17.57	16.3	5.88	2.81
PMR0130	no.47	17.78	10.62	15.57	14.58	5.44	2.21
PMR0130	no.48	16.92	9.76	14.72	13.6	5.09	2.2
PMR0130	no.49	20.95	12.26	18.66	17.1	6.8	2.29
PMR0101	no.50	18.55	11.52	16.82	15.81	5.62	1.73

Shell of *Cylindrotis siamensis*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0068	no. 1	7.38	3.58	6.37	6.3	1.6	1.01
PMR0068	no. 2	7	3.26	6.68	6.09	1.48	0.32
PMR0136	no. 3	6.13	3.19	6.02	5.48	1.65	0.11
PMR0136	no. 4	5.12	2.52	5.01	4.75	1.05	0.11
PMR0224	no. 5	5.84	3.04	5.63	5.31	1.47	0.21

Shell of *Ellobium aurisjudae*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR167	NO. 1	51.3	23.2	44.05	31.86	11.06	7.25
PMR167	NO. 2	44.15	15.24	37.64	27.36	8.52	6.51
PMR167	NO. 3	51.8	16.34	43.2	31.46	10.52	8.6
PMR167	NO. 4	50.26	20.2	43.24	30.32	11.66	7.02
PMR167	NO. 5	46.88	16.74	40.88	30.2	10.44	6
PMR167	NO. 6	52.14	20.22	45.76	32.28	11.78	6.38
PMR167	NO. 7	40.86	14.58	34.92	26.38	10.66	5.94
PMR167	NO. 8	45.39	16.02	40.48	31.42	10	4.91
PMR167	NO. 9	36.72	13.68	31.98	26.86	7.86	4.74
PMR167	NO. 10	53.14	17.94	44.64	32.62	13.18	8.5
PMR167	NO. 11	51.16	19.51	43.83	30.88	11.39	7.33
PMR167	NO. 12	47.76	17.05	42.36	30.74	10.96	5.4
PMR167	NO. 13	53.4	19.86	43.6	30.68	11.8	9.8
PMR167	NO. 14	47.12	17.38	40.8	31.4	12.06	6.32
PMR167	NO. 15	53.56	20	44.42	30.62	12.34	9.14
PMR167	NO. 16	54.46	20.38	45.93	32.6	12.73	8.53
PMR167	NO. 17	46.09	17.78	40.14	28.19	11.58	5.95
PMR167	NO. 18	47.2	16.82	40.23	27.46	10.34	6.97
PMR167	NO. 19	47.3	19.54	41.24	30.31	11.63	6.06
PMR167	NO. 20	50.8	18.14	41.78	30.01	12.38	9.02
PMR167	NO. 21	49.59	16.66	40.64	29.61	10.34	8.95
PMR167	NO. 22	40.11	14.2	35.57	30.14	9.82	4.54

Shell of *Ellobium aurisjudae* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR167	NO. 23	50.58	17.63	42.78	31.84	11.83	7.8
PMR0043	NO. 24	44.98	16.84	37.8	27.63	10.86	7.18
PMR0043	NO. 25	54.5	20.43	44	30.22	12.36	10.5
PMR0043	NO. 26	51.52	20.24	42.78	29.78	11.34	8.74
PMR0043	NO. 27	45.11	16.45	40.41	29.98	10.56	4.7
PMR0043	NO. 28	49.56	16.42	41.2	29.88	10.82	8.36
PMR0043	NO. 29	53.99	17.55	42.42	29.26	11.09	11.57
PMR0043	NO. 30	50.94	19.98	45.15	36.06	13.62	5.79
PMR0043	NO. 31	51.15	16.76	43.29	32.49	11.32	7.86
PMR0043	NO. 32	47.59	15.65	40.5	31.32	11.44	7.09
PMR0043	NO. 33	43.94	16.67	38.08	30.66	10.42	5.86
PMR0043	NO. 34	19.68	6.58	15.81	13.35	4	3.87
PMR0043	NO. 35	52.76	20.27	40.9	29.14	12.11	11.86
PMR0043	NO. 36	50.46	21.14	43.98	31.03	11.54	6.48
PMR0043	NO. 37	54.24	22.15	44.74	31.85	12.66	9.5
PMR0043	NO. 38	49.55	20.14	42.64	30.58	11.76	6.91
PMR0043	NO. 39	49.63	20.62	41.55	29.54	11.31	8.08
PMR0043	NO. 40	42.92	19.16	37.51	28.14	10.06	5.41
PMR0043	NO. 41	57.32	23.06	48.61	34.06	13.6	8.71
PMR0043	NO. 42	47.42	20.22	40.84	32.49	12.48	6.58
PMR0043	NO. 43	41.08	18.66	36.51	27.58	10.58	4.57
PMR0043	NO. 44	41.42	18.28	35.46	27.54	9.8	5.96
PMR0043	NO. 45	42.04	19.17	37.48	30.52	10.93	4.56
PMR0043	NO. 46	45.77	19.24	39.61	30.02	11.92	6.16
PMR0043	NO. 47	40.54	18.18	34.8	26.87	9.32	5.74
PMR0043	NO. 48	46.37	20.53	40.7	33.12	10.62	5.67
PMR0043	NO. 49	39.66	18.1	34.52	28.92	9.1	5.14
PMR0043	NO. 50	37.96	17.88	33.52	26.96	9.19	4.44

Shell of *Ellobium aurismidae*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0112	no.1	84.8	45.3	69.35	58.58	22.66	15.45
PMR0112	no.2	85.34	46.19	71.9	59.18	23.6	13.44
PMR0222	no.3	76.9	44.22	63.4	55	20.94	13.5
PMR0222	no.4	80.56	43.7	68.1	60.9	23.02	12.46
PMR0222	no.5	72.88	41.8	61.95	52.56	21.26	10.93
PMR0222	no.6	67.06	39.2	58.22	49.58	17.98	8.84
PMR0222	no.7	72.22	41.78	64.06	53.8	21.8	8.16

Shell of *Ellobium aurismidae* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0222	no.8	72.7	39.24	60.95	54.14	19.82	11.75
PMR0222	no.9	69.08	39.78	57.8	48.99	19.92	11.28
PMR0222	no.10	72.32	43.6	65.84	55.38	22.16	6.48
PMR0222	no.11	79.27	43.82	66.73	57.4	23.12	12.54
PMR0222	no.12	80.8	45.56	67.94	56.98	24.43	12.86

Shell of *Laemodonta* sp.

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0007	no.1	10.4	6.44	9.44	7.35	3.72	0.96
PMR0007	no.2	11.11	6.96	10.2	8.36	3.94	0.91
PMR0007	no.3	10.66	6.32	9.98	7.68	3.35	0.68
PMR0007	no.4	11.28	6.93	10.22	8.08	4.2	1.06
PMR0223	no.5	10.33	6.48	9.72	7.21	3.79	0.61
PMR0223	no.6	11.39	6.74	10.32	8.16	4.02	1.07
PMR0223	no.7	12.2	7.2	10.95	8.63	4.49	1.25
PMR0223	no.8	11.9	7.46	10.96	8.4	4.47	0.94
PMR0223	no.9	10.53	6.42	9.78	7.58	3.7	0.75
PMR0223	no.10	10.68	6.45	9.54	7.56	3.32	1.14
PMR0223	no.11	9.29	6	8.52	6.98	3.6	0.77
PMR0223	no.12	10.98	6.41	9.6	8	4.34	1.38
PMR0223	no.13	11.24	7.1	10.31	8.06	4.27	0.93
PMR0223	no.14	11.2	6.88	10.16	8.41	4.54	1.04
PMR0223	no.15	11.9	6.98	10.46	9.4	4.47	1.44

Shell of *Laemodonta punctigera*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0046	no. 1	7.63	4.32	6.83	4.91	2.08	0.8
PMR0046	no. 2	6.91	4.31	5.92	4.74	1.9	0.99
PMR0046	no. 3	6.54	3.99	5.98	4.53	1.84	0.56
PMR0046	no. 4	7.73	4.44	6.24	5.03	1.99	1.49
PMR0046	no. 5	7.4	4.78	6.54	5.07	2.07	0.86
PMR0046	no. 6	7.67	4.62	6.4	5.08	2.5	1.27
PMR0046	no. 7	6.62	3.92	5.88	4.32	2.15	0.74
PMR0046	no. 8	6.57	6.13	5.49	4.77	2.04	1.08
PMR0046	no. 9	6.64	4.14	5.52	4.36	1.92	1.12
PMR0046	no. 10	6.76	3.98	5.6	4.35	1.79	1.16
PMR0046	no. 11	7.11	4.47	6.24	4.84	2.2	0.87
PMR0046	no. 12	7.06	4.16	6.19	4.66	2	0.87
PMR0046	no. 13	6.47	4.07	5.92	4.46	2.02	0.55

Shell of *Laemodonta punctigera* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0046	no. 14	7.23	4.02	6	4.36	2.46	1.23
PMR0046	no. 15	8.07	4.57	6.89	5.31	2.15	1.18
PMR0046	no. 16	7.29	4.24	6.19	5.41	2.12	1.1
PMR0046	no. 17	6.5	4.2	5.77	4.52	1.71	0.73
PMR0046	no. 18	8.02	4.52	6.89	5.22	2.13	1.13
PMR0046	no. 19	6.85	4.02	5.63	4.82	2.26	1.22
PMR0046	no. 20	6.63	4.11	5.87	4.83	2.03	0.76
PMR0046	no. 21	7.2	4.31	6.25	4.91	2.21	0.95
PMR0046	no. 22	8.65	5.08	7.05	5.5	2.51	1.6
PMR0046	no. 23	7.74	4.57	6.46	5.11	2.34	1.28
PMR0046	no. 24	7.12	4.32	6.32	5.1	2.02	0.8
PMR0046	no. 25	6.36	4.04	5.79	4.39	1.67	0.57
PMR0046	no. 26	7.01	4.28	6.39	4.96	2.13	0.62
PMR0046	no. 27	6.31	3.95	5.59	4.53	1.84	0.72
PMR0046	no. 28	8.45	4.67	6.76	5.1	2.5	1.69
PMR0046	no. 29	7.12	4.33	6.27	4.93	1.98	0.85
PMR0046	no. 30	5.78	3.63	5.14	4.09	2.08	0.64
PMR0046	no. 31	7.03	4.41	6.15	4.67	2.19	0.88
PMR0046	no. 32	6.9	4.25	5.88	4.54	2.11	1.02
PMR0046	no. 33	7.25	4.55	6.39	4.61	2.1	0.86
PMR0046	no. 34	7.37	4.4	6.04	4.92	1.98	1.33
PMR0046	no. 35	7.42	4.54	6.01	4.89	1.87	1.41
PMR0046	no. 36	7.1	4.35	5.99	4.7	2.36	1.11
PMR0046	no. 37	7.98	4.69	7.07	5.45	2.58	0.91
PMR0046	no. 38	6.97	4.11	5.92	4.32	2.21	1.05
PMR0046	no. 39	7.75	4.45	6.56	4.92	2.18	1.19
PMR0046	no. 40	6.37	4.16	5.52	4.6	2.34	0.85
PMR0046	no. 41	7.21	4.41	5.84	4.85	2.24	1.37
PMR0046	no. 42	6.43	3.96	5.47	4.55	2.08	0.96
PMR0046	no. 43	7.37	4.46	5.95	4.81	2.19	1.42
PMR0046	no. 44	8.31	4.6	6.53	5.15	2.32	1.78
PMR0046	no. 45	7.38	4.26	5.93	4.45	2.12	1.45
PMR0046	no. 46	7.19	4.25	6.09	4.59	2.09	1.1
PMR0046	no. 47	7.25	4.11	5.96	4.47	2.19	1.29
PMR0046	no. 48	7.28	4.29	6.3	4.76	2.23	0.98
PMR0046	no. 49	7.31	4.16	6.2	4.77	2	1.11
PMR0046	no. 50	7.1	3.86	5.99	4.6	2.08	1.11

Shell of *Laemodonta siamensis*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0045	no. 1	8.91	4.76	7.73	6.45	2.9	1.18
PMR0045	no. 2	7.58	4.01	6.23	5.24	2.08	1.35
PMR0045	no. 3	9.08	4.04	7.58	6.05	2.29	1.5
PMR0045	no. 4	7.04	3.32	6.1	4.88	1.86	0.94
PMR0045	no. 5	7.63	4.61	6.7	5.54	2.26	0.93
PMR0045	no. 6	7.22	4.01	6.59	5.15	1.86	0.63
PMR0045	no. 7	8.44	4.4	7.46	6.02	2.63	0.98
PMR0045	no. 8	6.08	3.41	5.61	4.2	1.4	0.47
PMR0045	no. 9	6.96	3.92	6.06	4.8	2.15	0.9
PMR0045	no. 10	8.28	4.9	7.44	5.81	2.28	0.84
PMR0045	no. 11	7.64	4.34	6.56	5.14	2.58	1.08
PMR0045	no. 12	7.5	4.38	6.29	4.84	2.22	1.21
PMR0045	no. 13	8.22	4.45	7.16	5.44	2.43	1.06
PMR0045	no. 14	8.32	4.92	7.52	5.87	2.44	0.8
PMR0045	no. 15	6.91	4.28	5.88	4.68	2.04	1.03
PMR0045	no. 16	8.27	4.52	6.78	5.78	2.26	1.49
PMR0045	no. 17	9.25	5.38	7.72	5.47	2.72	1.53
PMR0045	no. 18	8.53	4.8	6.92	5	2.84	1.61
PMR0045	no. 19	7.28	4.33	6.47	4.94	2.32	0.81
PMR0045	no. 20	7.68	4.54	6.6	5.18	2.24	1.08
PMR0045	no. 21	9.11	5.17	7.56	5.82	2.59	1.55
PMR0045	no. 22	8.27	4.96	7.22	5.84	2.62	1.05
PMR0045	no. 23	8.64	4.93	7.17	5.42	2.23	1.47
PMR0045	no. 24	7.94	4.55	6.72	5.42	2.14	1.22
PMR0045	no. 25	9	4.84	7.38	5.74	2.49	1.62
PMR0045	no. 26	8.57	5.07	7.08	5.4	2.4	1.49
PMR0045	no. 27	8.84	5.34	7.26	5.75	2.88	1.58
PMR0045	no. 28	8.02	4.88	6.6	4.78	2.5	1.42
PMR0045	no. 29	7.78	4.86	6.7	5.27	2.32	1.08
PMR0045	no. 30	7.64	4.78	6.61	5.1	2.37	1.03
PMR0045	no. 31	7.62	4.48	6.67	4.82	2.41	0.95
PMR0045	no. 32	7.28	4.3	6.3	4.66	2.31	0.98
PMR0045	no. 33	8.61	5.14	7.46	5.77	2.92	1.15
PMR0045	no. 34	7.34	4.2	6.38	4.73	2.29	0.96
PMR0045	no. 35	9.14	5.22	7.64	5.78	2.69	1.5
PMR0045	no. 36	7.28	4.04	6.28	4.17	2.09	1
PMR0045	no. 37	8.84	5.1	7.34	5.62	2.6	1.5

Shell of *Laemodonta siamensis* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0045	no. 38	8.74	5.3	7.51	4.95	2.58	1.23
PMR0045	no. 39	6.98	4.42	6.02	4.58	2.42	0.96
PMR0045	no. 40	8.07	4.56	6.76	5.46	2.32	1.31
PMR0045	no. 41	7.38	4.09	6.18	4.62	1.98	1.2
PMR0045	no. 42	8.41	4.94	7.16	5.28	2.33	1.25
PMR0045	no. 43	8.93	4.78	7.62	5.76	2.84	1.31
PMR0045	no. 44	7.42	4.24	6.56	5.48	2.29	0.86
PMR0045	no. 45	8.32	5.15	7.29	5.56	2.89	1.03
PMR0045	no. 46	7.49	4.41	6.24	4.67	2.4	1.25
PMR0045	no. 47	7.22	4.54	6.24	4.64	2.52	0.98
PMR0045	no. 48	8.16	4.97	7.26	5.3	2.48	0.9
PMR0045	no. 49	6.52	4.77	5.52	4.34	1.95	1
PMR0045	no. 50	7.96	4.53	6.78	5.11	2.04	1.18

Shell of *Melampus siamensis*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0054	no.1	10.08	6.56	9.51	8.33	2.36	0.57
PMR0054	no.2	9.6	6.06	8.84	8.16	2.5	0.76
PMR0054	no.3	9.74	5.98	9.18	8.43	2.44	0.56
PMR0054	no.4	7.58	4.78	6.99	6.48	2.05	0.59
PMR0054	no.5	9.74	5.77	9.23	8.12	2.66	0.51
PMR0054	no.6	9.38	5.84	8.7	8.11	2.3	0.68
PMR0054	no.7	9.42	6.12	9	8.26	2.37	0.42
PMR0054	no.8	9.47	6.32	9.1	8.12	2.72	0.37
PMR0054	no.9	9.3	5.54	8.82	7.76	2.29	0.48
PMR0054	no.10	9.68	6.08	8.79	8.27	2.16	0.89
PMR0054	no.11	9.88	6.12	9.04	8.37	2.64	0.84
PMR0054	no.12	9.57	6.3	8.76	8.26	2.78	0.81
PMR0054	no.13	10.5	6.9	9.87	9.18	2.96	0.63
PMR0054	no.14	11.61	6.9	11.08	10.04	3.04	0.53
PMR0054	no.15	10.92	6.96	10	9.21	2.86	0.92
PMR0054	no.16	10.25	6.04	9.51	8.7	2.51	0.74
PMR0054	no.17	11.58	7.32	10.96	10.07	2.67	0.62
PMR0054	no.18	7.92	4.98	7.41	6.77	1.83	0.51
PMR0054	no.19	9.44	5.54	8.72	8.04	2.18	0.72
PMR0054	no.20	10.34	6.39	9.76	8.94	2.22	0.58
PMR0054	no.21	9.42	6.02	8.68	8.26	2.08	0.74
PMR0054	no.22	9.61	5.78	8.98	7.94	2.2	0.63

Shell of *Melampus siamensis* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0054	no.23	11.2	6.96	10.26	9.36	2.52	0.94
PMR0054	no.24	9.68	5.92	9.02	8.38	2.42	0.66
PMR0054	no.25	9.58	5.94	8.88	7.98	2.12	0.7
PMR0054	no.26	11.38	6.95	10.64	9.62	2.6	0.74
PMR0054	no.27	10.82	6.38	9.89	9.25	2.38	0.93
PMR0054	no.28	9.77	6.34	8.9	8.36	2.14	0.87
PMR0054	no.29	9.78	6	8.98	8.15	2.3	0.8
PMR0054	no.30	9.46	6.01	9.17	8.51	2.24	0.29
PMR0054	no.31	11.1	6.73	10.18	9.36	2.52	0.92
PMR0054	no.32	9.71	6	9.12	8.27	2.31	0.59
PMR0054	no.33	9.34	5.68	8.58	8	2.12	0.76
PMR0054	no.34	10.52	6.31	9.82	9.02	2.43	0.7
PMR0054	no.35	11.04	6.81	10.04	9.12	2.74	1
PMR0054	no.36	9.39	5.82	8.57	7.97	2.44	0.82
PMR0054	no.37	10.57	6.64	9.74	9	2.72	0.83
PMR0054	no.38	9.1	5.66	8.42	7.66	2.06	0.68
PMR0054	no.39	9.92	5.91	9.24	8.3	2.4	0.68
PMR0054	no.40	10.05	5.98	9.3	8.44	2.42	0.75
PMR0054	no.41	10.18	6.33	9.3	8.66	2.52	0.88
PMR0054	no.42	9.98	5.94	9.26	8.42	2.48	0.72
PMR0054	no.43	9.31	5.81	8.62	8.29	2.17	0.69
PMR0054	no.44	8.74	5.42	8.12	7.52	1.88	0.62
PMR0054	no.45	9.42	6.02	8.54	7.93	2.42	0.88
PMR0054	no.46	7.64	4.88	7.21	6.92	1.9	0.43
PMR0054	no.47	8.48	5.12	7.82	7.18	1.92	0.66
PMR0054	no.48	9.32	6.13	8.93	8.17	2.4	0.39
PMR0054	no.49	8.72	5.36	7.99	7.38	1.94	0.73
PMR0054	no.50	9.28	6.11	8.89	8.22	2.42	0.39

Shell of *Pythia plicata*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0103	no.1	13.16	9.89	11.2	9.35	4.29	1.96
PMR0103	no.2	11.68	8.4	9.64	8.12	3.92	2.04
PMR0103	no.3	16.84	11.38	13.08	10.76	5.58	3.76
PMR0103	no.4	11.55	8.57	9.71	8.08	3.36	1.84
PMR0103	no.5	17.12	11.59	14.51	11.36	5.92	2.61
PMR0103	no.6	13.9	10.39	11.11	9.37	4.86	2.79
PMR0103	no.7	16.44	11.74	13.75	11.12	5.68	2.69

Shell of *Pythia plicata* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0103	no.8	14.41	10.66	11.26	9.96	5.18	3.15
PMR0103	no.9	14.28	10.66	12	9.71	4.6	2.28
PMR0103	no.10	14.79	10.51	12.34	9.98	4.8	2.45
PMR0103	no.11	14.99	10.76	12.4	10.45	4.98	2.59
PMR0103	no.12	14.34	10.54	12	10.32	4.06	2.34
PMR0103	no.13	13.27	9.88	11.07	9.06	4.09	2.2
PMR0103	no.14	15.26	11.58	12.84	10.5	5.24	2.42
PMR0103	no.15	14.58	10.56	11.94	10.42	5.3	2.64
PMR0103	no.16	13.18	9.78	10.91	9.02	4.65	2.27
PMR0103	no.17	15.4	11.45	12.83	10.5	5.35	2.57
PMR0103	no.18	12.52	9.48	10.35	6.64	4.34	2.17
PMR0103	no.19	14.25	11	11.18	9.88	4.86	3.07
PMR0103	no.20	12.74	10.1	10.51	8.9	4.92	2.23
PMR0103	no.21	13.32	10.64	10.94	9.15	4.28	2.38
PMR0103	no.22	12.62	9.14	10.42	9.06	3.94	2.2
PMR0103	no.23	13.45	9.74	11.23	9	4.34	2.22
PMR0103	no.24	14.26	10.24	11.71	9.82	4.54	2.55
PMR0103	no.25	15.08	11.14	12.64	9.88	5.17	2.44
PMR0103	no.26	15.79	11.76	13.8	11.28	5.38	1.99
PMR0103	no.27	14.52	11.3	11.95	9.48	4.94	2.57
PMR0103	no.28	13.22	10.41	11.36	9.97	5.12	1.86
PMR0103	no.29	13.47	9.94	10.89	9.37	4.48	2.58
PMR0103	no.30	13.62	9.6	10.82	8.95	4.41	2.8
PMR0103	no.31	12.94	9.68	10.62	9.16	4.56	2.32
PMR0103	no.32	13.08	9.74	10.82	8.78	4.62	2.26
PMR0103	no.33	11.44	8.31	9.29	7.83	4.28	2.15
PMR0103	no.34	11.34	8.14	9.51	8.29	3.62	1.83
PMR0103	no.35	12.67	9.64	10.28	8.94	4.14	2.39
PMR0103	no.36	13.82	10.68	11.29	10	4.76	2.53
PMR0103	no.37	13.04	9.36	10.48	9.08	3.76	2.56
PMR0103	no.38	11.08	8.52	9.39	8.16	3.54	1.69
PMR0103	no.39	12.34	8.89	10.51	8.96	4.32	1.83
PMR0103	no.40	11.7	8.85	9.86	8.6	4.05	1.84
PMR0103	no.41	11.41	8.28	9.41	8.24	3.36	2
PMR0103	no.42	11.47	8.74	9.74	8.45	3.6	1.73
PMR0103	no.43	9.28	6.54	7.61	6.6	2.8	1.67
PMR0103	no.44	8.6	6.67	7.36	6.48	2.465	1.24

Shell of *Pythia plicata* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0103	no.45	8.3	6.31	6.91	6.06	2.87	1.39
PMR0103	no.46	9.04	7	7.74	6.85	3.28	1.3
PMR0103	no.47	7.84	5.59	6.4	5.67	2.39	1.44
PMR0103	no.48	10.18	7.46	8.19	7.26	3.12	1.99
PMR0103	no.49	10.18	7.43	8.54	7.2	3.12	1.64
PMR0103	no.50	10.94	8.15	10.5	7.84	3.52	0.44
PMR0103	no.51	21.42	15.18	16.89	13.49	7.93	4.53

Shell of *Pythia trigona*

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0200	no.1	12.64	13.85	10.15	7.93	4.11	2.49
PMR0218	no. 2	15.58	16.65	12.25	10.13	5.35	3.33
PMR0307	no. 3	18.29	20.18	13.89	11.92	6.1	4.4
PMR0399	no. 4	15.14	16.08	12.01	9.41	5	3.13
PMR0399	no. 5	14.81	16.15	13.02	9.99	5.11	1.79
PMR0399	no. 6	13.84	13.61	11.29	9.05	4.12	2.55
PMR0399	no. 7	13.64	14.12	11.38	9	4.44	2.26
PMR0399	no. 8	14.58	16.3	12.34	10.11	4.96	2.24
PMR0399	no. 9	13.41	13.55	10.96	9.2	4.07	2.45
PMR0399	no. 10	15.56	16.68	12.74	10.1	5.46	2.82
PMR0399	no. 11	14.78	16.16	12.64	9.68	5.14	2.14
PMR0399	no. 12	15.24	15.54	12.36	10.19	5.2	2.88
PMR0399	no. 13	13.68	15.35	11.54	8.88	4.68	2.14
PMR0399	no. 14	16.94	17.18	12.97	10.84	5.92	3.97
PMR0399	no. 15	15.48	16.41	12.68	10.17	4.8	2.8
PMR0399	no. 16	12.83	14.2	10.72	8.31	4.09	2.11
PMR0399	no. 17	11.98	11.7	10.44	8.38	2.6	1.54
PMR0399	no. 18	15.82	16.62	12.26	10.2	5.3	3.56
PMR0399	no. 19	13.58	13.52	10.92	9.13	4.3	2.66
PMR0399	no. 20	13.62	14.9	11.14	8.81	4.37	2.48
PMR0399	no. 21	13.18	14.62	11.38	8.94	3.77	1.8
PMR0399	no. 22	14.86	15.32	11.81	10.26	4.35	3.05
PMR0399	no. 23	14.28	14.74	12.22	9.02	4.36	2.06
PMR0399	no. 24	13.82	13.33	11.25	8.9	4.45	2.57
PMR0399	no. 25	13.24	14.38	10.74	8.74	3.9	2.5
PMR0399	no. 26	13.34	13.43	11.31	9.01	4.19	2.03
PMR0399	no. 27	15.26	14.89	11.96	9.48	4.48	3.3
PMR0399	no. 28	15.69	15.85	12.8	9.14	4.48	2.89

Shell of *Pythia trigona* (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0399	no. 29	13.28	13.81	10.97	9.12	4.1	2.31
PMR0399	no. 30	12.62	13.02	10.15	8.19	3.74	2.47
PMR0399	no. 31	15.03	15.56	12.27	9.18	5.24	2.76

Shell of *Salinator* sp.

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0042	no. 1	11.11	10.18	9.9	7.99	5.76	1.21
PMR0042	no. 2	11.7	11.1	10.94	8.4	5.85	0.76
PMR0042	no. 3	11.51	10.63	10.83	7.76	5.56	0.68
PMR0042	no. 4	10.93	9.81	10.1	7.6	5.49	0.83
PMR0042	no. 5	11.83	11.29	10.88	8.47	5.95	0.95
PMR0042	no. 6	11.51	10.79	10.43	7.83	5.53	1.08
PMR0042	no. 7	10.61	10.45	10.08	7.47	5.44	0.53
PMR0042	no. 8	10.79	9.66	9.81	7.37	5.2	0.98
PMR0042	no. 9	10.01	9.33	9.59	7.64	5.16	0.42
PMR0042	no. 10	10.5	9.95	9.68	7.05	5.03	0.82
PMR0042	no. 11	11.05	11.17	10.05	8.24	5.75	1
PMR0042	no. 12	10.28	10.46	9.86	7.56	5.08	0.42
PMR0042	no. 13	11.01	9.87	10.23	7.54	4.88	0.78
PMR0042	no. 14	9.61	9.33	8.33	7	4.52	1.28
PMR0042	no. 15	9.77	9.65	8.54	7.21	5.23	1.23
PMR0137	no. 16	10.35	10.72	10.05	8.05	5.77	0.3
PMR0137	no. 17	10.16	9.2	9.1	7.15	4.19	1.06
PMR0137	no. 18	8.27	8.25	7.85	6.41	4.39	0.42
PMR0137	no. 19	9.61	8.32	8.55	6.62	4.62	1.06
PMR0137	no. 20	10.4	9.85	9.63	7.77	5.43	0.77
PMR0422	no. 21	11.5	10.18	10.44	7.42	3.73	1.06
PMR0422	no. 22	11.52	10.16	10.34	7.9	5.52	1.18
PMR0422	no. 23	9.97	8.91	8.93	6.68	4.78	1.04
PMR0422	no. 24	8.82	7.76	8.24	5.71	3.9	0.58
PMR0422	no. 25	9.92	8.58	9.32	6.68	4.14	0.6
PMR0422	no. 26	9.99	7.94	9	6.65	4.05	0.99
PMR0422	no. 27	10.03	8.76	9.98	6.98	4.65	0.05
PMR0422	no. 28	10.97	9.68	10.28	7.26	5.7	0.69
PMR0422	no. 29	11.26	9.82	10.66	7.78	5.92	0.6
PMR0422	no. 30	10.04	9.18	9.35	7.14	5.53	0.69
PMR0422	no. 31	9.86	9.18	8.92	6.62	5.04	0.94
PMR0422	no. 32	9.02	8.25	7.66	6.54	4.3	1.36

Shell of *Salinator* sp. (continue)

CODE	NO.	Shell length	Width	Body whorl length	Aperture length	Aperture width	Spire length
PMR0422	no. 33	11.89	10.02	10.65	7.53	5.2	1.24
PMR0422	no. 34	10.27	9.52	9.58	7.28	5.05	0.69
PMR0422	no. 35	9.02	8.36	8.11	6.65	4.78	0.91
PMR0422	no. 36	10.42	9.54	9.54	6.98	4.53	0.88

Shell of *Siphonaria laciniosa*

CODE	NO.	Length	Width	Height
PMR0022	no.1	14.38	10.36	5.67
PMR0022	no. 2	13.89	10.18	5.57
PMR0022	no. 3	13.61	10.43	5.17
PMR0022	no. 4	14.39	10.21	5.8
PMR0022	no. 5	6.67	4.84	2.99
PMR0022	no. 6	7.08	4.76	2.48
PMR0022	no. 7	7.18	4.7	3.18
PMR0022	no. 8	5.43	4.18	2.05
PMR0022	no. 9	5.88	3.88	2.13
PMR0022	no. 10	6.38	4.35	2.31
PMR0022	no. 11	4.78	3.36	1.99
PMR0022	no. 12	4.83	3.44	1.8
PMR0022	no. 13	4.06	2.84	1.59
PMR0022	no. 14	3.91	2.56	1.41
PMR0089	no. 15	10.85	7.44	4.1
PMR0089	no. 16	9.31	6.68	3.99
PMR0089	no. 17	9.01	6.5	3.88
PMR0089	no. 18	9.61	7.58	3.48
PMR0089	no. 19	9.7	6.72	3.62
PMR0089	no. 20	8.6	6	3.06
PMR0089	no. 21	9.82	7.16	3.37
PMR0089	no. 22	9.85	6.96	3.21
PMR0089	no. 23	9.1	6.64	3.09
PMR0089	no. 24	7.55	5.16	3.28
PMR0089	no. 25	11.17	6.41	4.05
PMR0089	no. 26	10.32	7.02	3.2

Shell of *S. laciniosa* (continue)

CODE	NO.	Length	Width	Height
PMR0089	no. 27	7.73	5.7	2.92
PMR0089	no. 28	5.32	3.68	2.17
PMR0089	no. 29	5.84	3.78	2.08
PMR0089	no. 30	5.4	3.65	2.11
PMR0428	no. 31	12.28	9.46	4.3
PMR0428	no. 32	11.43	8.04	4.27
PMR0428	no. 33	11.36	7.67	4.53
PMR0428	no. 34	11.6	8.34	4.8
PMR0428	no. 35	11.71	8.52	4.12

Morphology of *Onchidium* sp.1

CODE	NO.	Foot length	Foot width	Body length	Body width
PMR0345	no.1	31.44	12.88	32.56	21.16
PMR0345	no. 2	31.52	15.84	32.24	20.82
PMR0345	no. 3	34.17	15.3	36.26	26.74
PMR0345	no. 4	27.88	14.04	30.01	22.85
PMR0357	no. 5	46.04	15.68	48.4	29.98
PMR0357	no. 6	15.92	6.46	15.92	9.38
PMR0332	no. 7	27.5	16.18	30.98	22.8
PMR0332	no. 8	31.42	13.88	33.16	21.06
PMR0332	no. 9	32.42	21.5	41.38	25.4
PMR0332	no. 10	31.42	16.7	34.78	21.88
PMR0392	no. 11	40.18	17.76	43.82	28.37
PMR0392	no. 11	40.18	17.76	43.82	28.37
PMR0433	no. 12	36.14	19.44	42.05	26.14
PMR0433	no. 13	36.43	18.66	39.96	23.58
PMR0433	no. 14	41.96	20.64	44.76	28.22
PMR0433	no. 15	41.34	20.76	43.76	29.36
PMR0433	no. 16	37.42	21.9	45.38	29.19

Morphology of *Onchidium* sp.2

CODE	NO.	Foot length	Foot width	Body length	Body width
PMR0091	no.1	16.24	10.84	20.87	17.32

Morphology of *Platevindex* sp.

CODE	NO.	Foot length	Foot width	Body length	Body width
PMR0333	no. 1	25.4	8.23	32.76	23.18
PMR0346	no. 2	11.33	4.24	15.11	9.78
PMR0346	no. 3	12.26	4.36	15.68	9.2
PMR0358	no. 4	25.04	8.1	27.08	18.1
PMR0358	no. 5	16.63	6.18	20	12.82
PMR0010	no. 6	33.96	12.34	36.48	25.38
PMR0074	no. 7	19.42	8.32	24.8	18.25
PMR0066	no. 8	23.16	7.36	29.82	22.62
PMR0066	no. 9	19.45	7.64	25.14	15.83
PMR0066	no. 10	27.92	7.68	33.68	21.42
PMR0066	no. 11	27.06	8.1	35.07	21.32
PMR0066	no. 12	21.96	7.18	26.81	17.29
PMR0066	no. 13	23.77	7.72	29.6	22.54
PMR0201	no. 14	19.92	5.67	24.35	16.68
PMR0211	no. 15	29.22	8.16	35.46	20.32
PMR0211	no. 16	24.7	7.08	31.86	20.59
PMR0158	no. 17	20.3	6.63	28.42	16.9
PMR0158	no. 18	29.24	9.66	39.89	28.3
PMR0393	no. 19	26.41	6.36	29.54	16.94
PMR0414	no. 20	36.02	14.94	46.84	32.16
PMR0414	no. 21	34.42	13.74	44.13	29.72
PMR0432	no. 22	32.84	11.49	38.34	21.66

Appendix III

Dissected specimens and radula

Species	Dissected specimens		Radula	
	Collection number	Number	Collection number	Number
A. elongata	PMR 0004	2	PMR 0053	2
	PMR 0053	7	PMR 0144	2
	PMR 0144	3	PMR 0352	1
	PMR 0352	1		
	PMR 0362	1		
Ca. Aurisfelis	PMR 0007	1	PMR 0065	3
	PMR 0100	7	PMR 0100	3
	PMR 0160	3	PMR 0160	3
	PMR 0240	6	PMR 0240	3
	PMR 0296	1	PMR 0296	1
	PMR 0397	3		
Ca. Mustelina	PMR 0082	8	PMR 0082	3
	PMR 0095	10	PMR 0095	5
	PMR 0101	10	PMR 0101	2
	PMR 0130	3	PMR 0130	1
	PMR 0161	1	PMR 0240	3
	PMR 0297	1		
Cy. Siamensis	PMR 0138	1	PMR 00138	1
			PMR 0224	1
E. aurisjudae	PMR 0037	1	PMR 0043	5
	PMR 0242	10	PMR 0107	2
	PMR 0334	2	PMR 0220	11
	PMR 0394	1	PMR 0229	2
	PMR 0229	1	PMR 0365	2
	PMR 0081	3		
E. aurismidae	PMR 0112	1	PMR 0112	1
	PMR 0222	4	PMR 0222	4
	PMR 0278	2		
	PMR 0395	2		

Species	Dissected specimens		Radula	
	Collection number	Number	Collection number	Number
L. punctigera	PMR 0006	9	PMR 0104	3
	PMR 0046	2	PMR 0163	2
	PMR 0104	10	PMR 0182	1
	PMR 0136	10		
	PMR 0163	3		
	PMR 0207	1		
	PMR 0218	1		
L. siamensis	PMR 0069	10	PMR 0164	1
	PMR 0135	5	PMR 0040	2
	PMR 0164	1	PMR 0135	3
	PMR 0351	2		
	PMR 0409	1		
Laemodonta sp.	PMR 0223	7	PMR 0223	2
	PMR 0241	2	PMR 0241	3
M. siamensis	PMR 0009	3	PMR 0054	3
	PMR 0054	10	PMR 0141	1
	PMR 0133	2	PMR 0234	2
	PMR 0106	10		
	PMR 0398	2		
	PMR 0361	2		
Py. plicata	PMR 0117	1	PMR 0103	4
	PMR 0115	1	PMR 0115	1
	PMR 0159	1		
	PMR 0103	11		
Py. trigona	PMR 0339	10	PMR 0339	6
Si. laciniosa	PMR 0081	15	PMR 0081	5
Salinator sp.	PMR 0137	8	PMR 0034	6
	PMR 0338	6	PMR 0137	5

Species	Dissected specimens		Radula	
	Collection number	Number	Collection number	Number
Onchidium sp.1	PMR 0392	1	PMR 0067	3
	PMR 0433	2	PMR 0092	2
	PMR 0092	1	PMR 0134	2
	PMR 0109	1		
	PMR 0067	10		
Onchidium sp.2	PMR 0091	1	PMR 0091	1
Platevindex sp.	PMR 0066	5	PMR 0066	4
	PMR 0110	10	PMR 0110	5
H. symnistra	PMR 0076	1	-	-
	PMR 0128	9	-	-
	PMR 0340	1	-	-

Biography

Mr. Sravut Klorvuttimontara was born on the 20th of January 1975 in Pakchong District, Nakonratchasima Province. He graduated his bachelor's degree of science in Biology in 1994 from the department of Biology, Faculty of Science, Khonkean University. He continued his graduated study for Master's degree of Science in Zoology at the Chulalongkorn University in 1998.