

THE OCTOPOD FAUNA (CEPHALOPODA: OCTOPODA) OF THE ANDAMAN SEA, THAILAND

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ABSTRACT

Twelve species of Octopoda are recognized from the waters off the Andaman Sea coast of Thailand. Ten species in the genus *Octopus*, and one species in each of the genera *Argonauta* and *Cistopus*. Apart from the latter two species and the previously recorded deep-sea octopus, *Alloposus mollis* Verrill, 1880 (= *Haliphron atlanticus* Steenstrup, 1861), all ten species of the genus *Octopus* are new records in this area. A key and illustrations of the species are provided.

INTRODUCTION

No overview has previously been published on the octopodid fauna of the territorial waters of the Andaman Sea coast of Thailand. Few reports have referred to some octopuses found in this area, e.g., Sithigorngul (1974), Chotiyaputta (1993), Chotiyaputta *et al.* (1992), and Nateewathana (1995), but none have dealt with the octopuses in particular. Literature records from the nearby areas are also scarce. There are about five publications on the octopuses in the Andaman Sea, i.e., Goodrich (1896), Robson (1932a), Adam (1938, 1939), and Pickford (1974). The present paper is based primarily on material collected in the Andaman Sea, Indian Ocean by many persons and all specimens have been deposited in the PMBC Reference Collection during the last 20 years. It should be noted that the material was not collected uniformly throughout the national waters of the Thai Exclusive Economic Zone in the Andaman Sea. The present report mainly deals with the species down to 200 m depth. Species diversity of the octopods in this area is expected to be higher than the present recording when the deep sea is included in future investigations.

MATERIALS AND METHODS

The octopod material was collected by different kinds of fishing gear, such as otter trawl, push net, bottom longline applied from fishing boats and research vessels. Collections from the intertidal areas, local fish

markets and fish landings were also carried out along the 740 km Andaman Sea coastline of Thailand.

The octopod collections were preserved in 10% neutralised formalin. Most of the octopods were not relaxed or killed prior to preservation since they were dead after capture. The fixed-specimens were later transferred to 75% ethyl alcohol for permanent storage. All descriptions of colour are based upon specimens preserved in ethyl alcohol. However, a few colour notes were made of living specimens.

All specimens were examined, and measurements, body proportions, counts and indices were obtained from the whole body as described by Roper & Voss (1983). Diagram and summary of measurements, counts and indices are shown in Figs. 1A & 1B and Tab. 1. The mantle of the specimens was opened to permit examination of the internal anatomy and to count gill lamellae. The funnel and spermatophores were dissected, described, and illustrated for each species, except *O. exannulatus* where I only had one specimen on loan from the Zoological Museum, University of Copenhagen (Denmark). The buccal mass was removed from some specimens of each species and the beaks and radulae extracted, cleaned, and illustrated. The beaks, radulae and spermatophores were drawn with the aid of a camera lucida. The enlargement section of the spermatophores and most of the radulae were stained in

methylene blue in order to get higher contrast during examination and illustration in the compound microscope.

Voucher material is lodged in the PMBC

Reference Collection, Phuket Marine Biological Center, P.O.Box 60, Phuket 83000, Thailand.

A KEY TO THE OCTOPOD FAUNA OF THE ANDAMAN SEA, THAILAND

1. Body gelatinous (Family Alloposidae).....*Haliphron atlanticus*
 1. Body firm.....2
2. Males very small (smaller than females); hectocotylus (left third arm) temporarily coiled in sac below eye, with extremely long filamentous tips; females with dorsal arm I each with broad, membranous flap that secretes and holds a thin, shell-like egg case (Family Argonautidae).....*Argonauta hians*
 2. Males with left or right third arm hectocotylized (never in pockets); females without dorsal flaps; egg case always absent (Family Octopodidae).....3
3. Water pouches and pores present between bases of arms on oral surface of webs.....*Cistopus indicus*
 3. Water pouches and pores absent.....4
4. Ocelli present, one on each lateral face of arm crown between bases of arms II and III.....5
 4. Ocelli absent.....9
5. Ocellus a plain oval black spot lacking ring.....*O. exannulatus*
 5. Ocellus with ring.....6
6. Dorsal mantle with four distinct dark longitudinal stripes, each extending anteriorly along the dorsal side of the arms.....*O. ocellate* sp. C
 6. Dorsal mantle without longitudinal stripes.....7
7. Ocellus plain black oval spot surrounded by pale ring and outer dark ring, iridescent ring absent.....*O. cyanea*
 7. Ocellus with an iridescent ring.....8
8. Ocellus with an iridescent pink/purple ring, skin rough and warty, short longitudinal black bar through eye
*O. ocellate* sp. A
 8. Ocellus with an iridescent blue ring, skin smooth, no black longitudinal bar through eye.....*O. ocellate* sp. B
9. Dorsal pair of arms longer than the other pairs.....*O. luteus*
 9. Dorsal pair of arms shorter and more slender than other arms.....10
10. Pale longitudinal stripe along midline of dorsal mantle, spermatophore armed with teeth and hook.....*O. aegina*
 10. Pale longitudinal stripe along midline absent, spermatophore unarmed.....11
11. Arms conspicuously much longer than the mantle (~5-6 times ML).....*O. cf. niveus*
 11. Arms moderately longer than the mantle (<4 times ML).....12
12. A single cirrus present posterior to each eye, ligula small to moderately long.....*O. marginatus*
 12. Several (1-4) large warts present above each eye, ligula very small.....*O. cf. vulgaris*

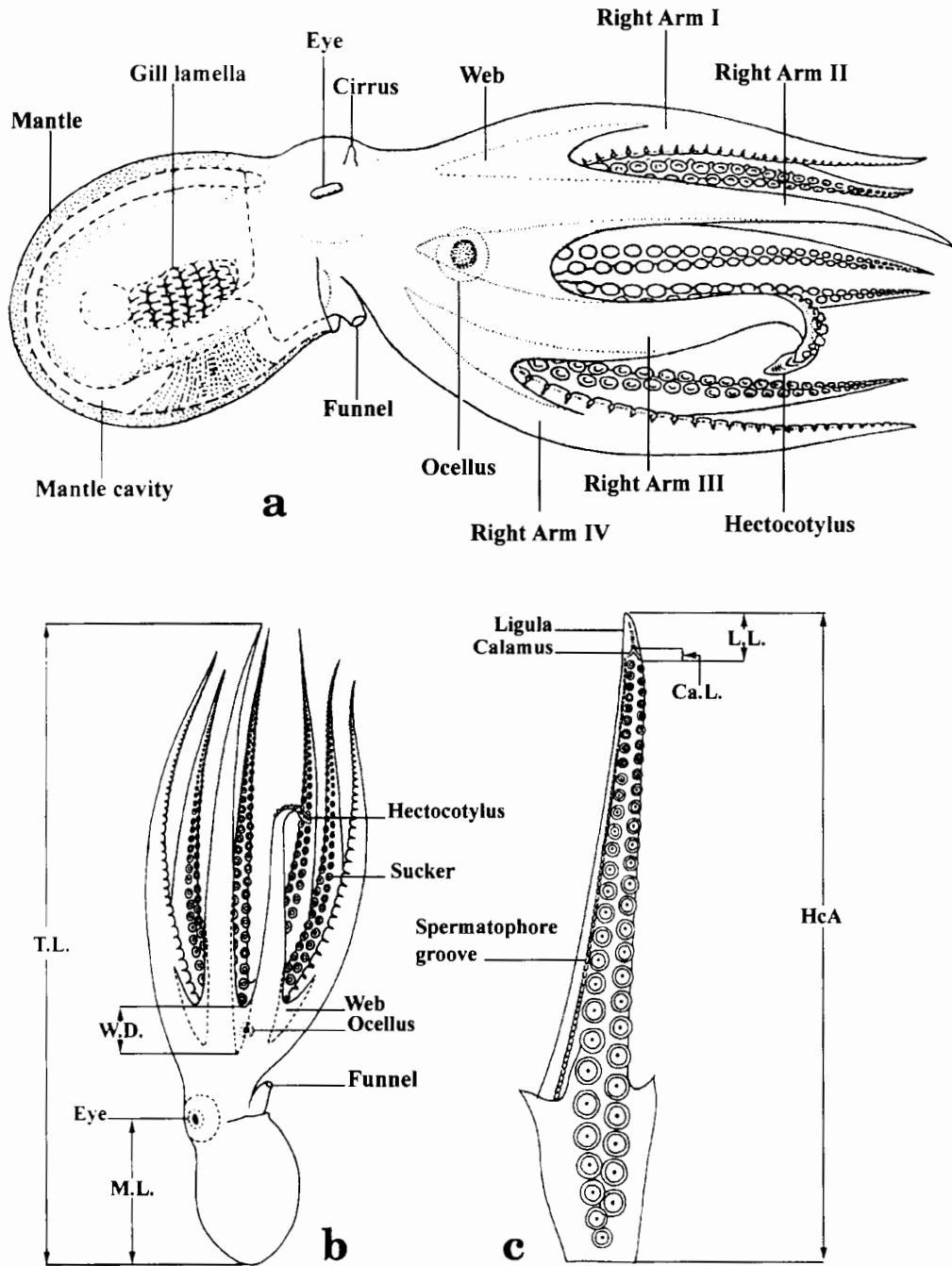


Figure 1A. (a) Schematic drawing of an octopus showing characters for identification. (b) measurements of the octopod; T.L. = Total length, M.L. = Mantle length, W.D. = Web depth. (c) measurements of hectocotylyzed arm; HcA = Hectocotylyzed arm, L.L. = Ligula length, Ca.L. = Calamus length. (a) modified from Voss & Williamson (1971); (b) and (c) after Roper & Voss (1983).

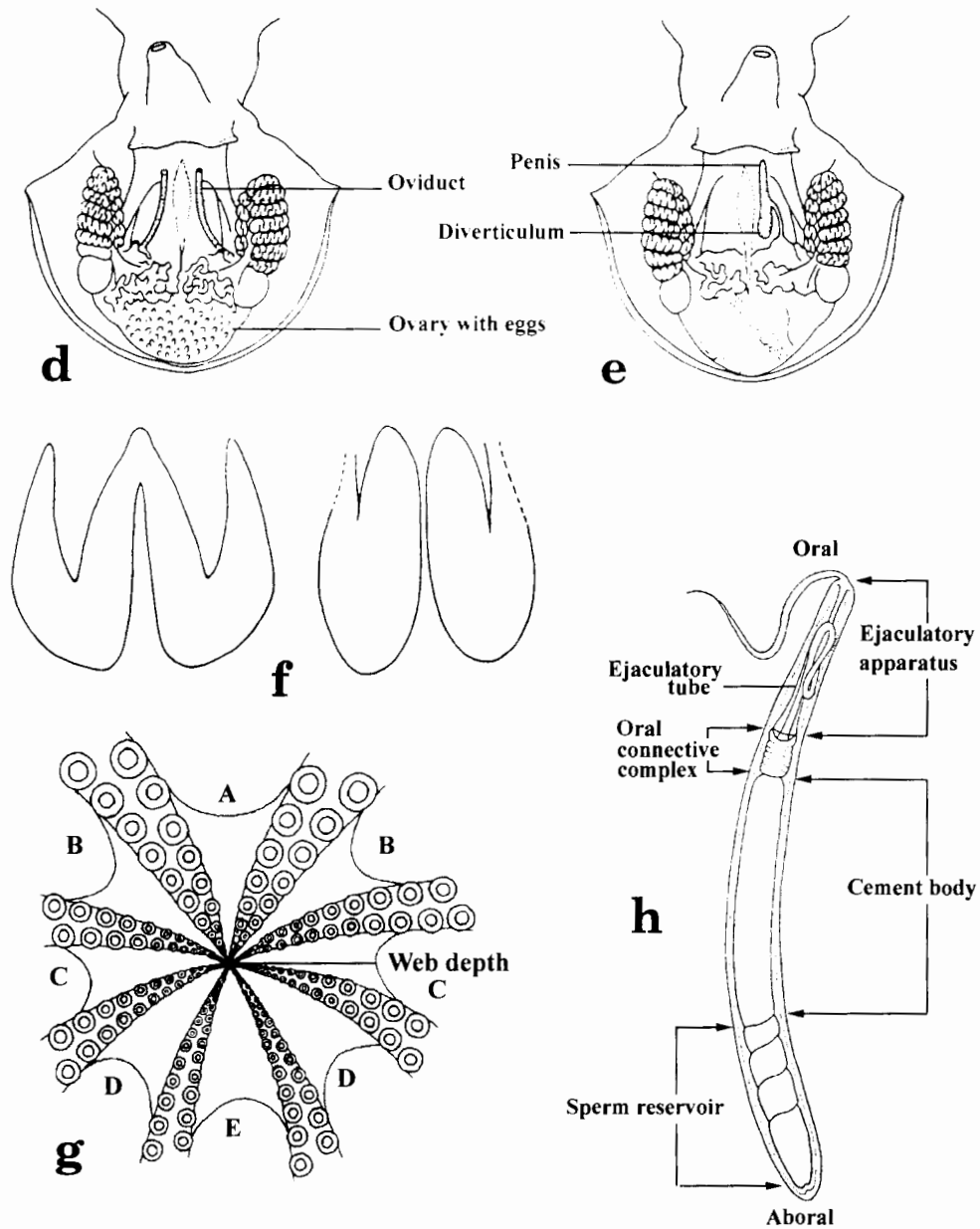


Figure 1B. (d) Mantle cavity contents of female and (e) of male. (f) type of funnel organ. (g) oral view of arms and webs. (h) components of spermatophores. (d-f and h after Voss & Williamson 1971).

Table 1. Specification of measurements and indices.

Mantle Length	ML	Dorsal mantle length, measured from midpoint between eyes to posterior end of mantle.
Total Length	TL	Measured from end of longest arm to posterior end of mantle.
Mantle Width Index	MWI	Greatest straight-line (dorsal) width of mantle as a percentage of mantle length.
Ventral Mantle Length	VML	Ventral mantle length measured from anterior border of mantle at ventral midline, to apex of mantle or tip of united fins, whichever is longest.
Head Width Index	HWI	Greatest width of head at level of eyes as a percentage of mantle length. (Same as interocular distance in octopods.)
Mantle Arm Index	MAI	Mantle length as a percentage of longest arm.
Arm Length Index	ALI	Length of arm measured from beak to tip of arm. (Arm I, dorsal; II, dorso-lateral; III, ventro-lateral; IV, ventral).
Arm Width Index	AWI	Width of stoutest (right) arm at mid-point of arm length as a percentage of mantle length (measurement exclusive of webs and membranes).
Arm Formula	AF	Comparative length of arms expressed numerically in decreasing order, e.g., 3 .4. 2. 1., 3. 2. 4 = 1. or III.IV.II.I. etc.
Web Depth Index	WDI	Measurement of deepest (most extensive) sector of web measured from mouth to midpoint of sector between arms as a percentage of longest arm. (Web sector A, dorsal to dorsal arm; B, dorsal to dorso-lateral; C, dorso-lateral to ventro-lateral; D, ventro-lateral to ventral; E, ventral to ventral.)
Web Formula	WF	Comparative depth of each web sector measured from mouth to midpoint of sector between arms expressed alphabetically in decreasing order (e.g., B. C. D. = A. E.).
Arm Sucker Count	ASC	Total sucker count for intact arm with the highest sucker count.
Hectocotylied Arm Sucker Count	HcASC	Number of suckers on hectocotylied arm.
Hectocotylied Arm Index	HcAI	Length of hectocotylied arm measured from proximal-most armature, or defined proximal point, to tip as a percentage of mantle length.
Opposite Arm Index	OAI	Length of hectocotylied arm as a percentage of its fellow arm on opposite side.
Ligula Length Index	LLI	Length of ligula measured from distal-most sucker to tip of arm as a percentage of length of hectocotylied arm.
Calamus Length Index	CaLI	Length of calamus measured from last (distal-most) sucker to its distal tip as a percentage of ligula length.
Spermatophore Length Index	SpLI	Length of spermatophore as a percentage of mantle length.
Spermatophore Width Index	SpWI	Greatest width of spermatophore as a percentage of spermatophore length.
Sperm Reservoir Index	SpRI	Length of sperm reservoir as a percentage of total spermatophore length.
Egg Length Index	EgLI	Length of (mature) egg as a percentage of mantle length.
Funnel Length Index	FuLI	The length of the funnel from the anterior funnel opening to the posterior border measured along the ventral midline as a percentage of mantle length.
Free Funnel Index	FFuI	The length of the funnel from the anterior opening to the point of dorsal attachment to the head as a percentage of mantle length.

SYSTEMATIC ACCOUNT

Order Octopoda Leach, 1818

Suborder Incirrata Grimpe, 1916

Family Argonautidae

Genus *Argonauta* Linné, 1758

Diagnosis: Epipelagic octopods. Female secretes an elaborate egg case with the enlarged web of dorsal arms; calcareous egg case (shell) thin, laterally with one chamber and a flat keel fringed by two rows of tubercles; lateral sides of shell with radial ribs; shell center is pressed in or bent outward into a sharp "horn"; suckers small, in two rows. Males tiny, dwarf, third right arm hectocotylized.

Argonauta hians Solander, 1786
(Fig. 2, Table 2)

Argonauta hians - Robson 1932b: 192; - Sasaki 1929: 20, pl. III, figs. 3-6, pl. VIII, figs. 9, 10, textfig. 6; - Voss 1963: 167; - Voss & Williamson 1971: 105, pl. 33, figs. 43,44.

MATERIAL EXAMINED: PMBC no. 542. 1 shell, diameter 45.0 mm. Phuket shell shop. Coll. P. Tantichodok. 19 February 1979. PMBC no. 543. 2 mature females, shell diameter 54.8-61.8 mm, 31.6-34.4 mm ML. South of Ko Similan. Coll. A. Nateewathana and P. Tantichodok. 22 March 1979. PMBC no. 6607. 2 mature females, shell diameter 38.5 mm (one shell damaged), 25.0-32.0 mm ML. Tab Lamoo, Takuapa, Phang-nga. Det. J. Knudsen. 16 March 1989. PMBC no. 11796. 78 mature female specimens, shell diameter 30-50 mm. Ao luk Fish Market. Krabi. Coll. A. Nateewathana. 27 March 1993.

DESCRIPTION: Mantle (Fig. 2, a) cylindrical, widest anteriorly, slightly bent upward posteriorly; at a few mm from the ventral mantle margin, a distinct transverse sulcus present on inner and outer surface of ventral mantle. Head small, indistinct, deeply embedded within the mantle. Eyes large and protruding. Funnel robust, long and free in its one-third of anterior end; dorsal funnel organ inverted v-shaped, two elongate ventral pads. Funnel cartilage (Fig. 2, b) small, ovate, cartilaginous, with a deep pit in the middle;

mantle cartilage (Fig. 2, c) conical, knob-like, slightly curved posteriorly. Arms unequal in order of II.III.I.IV. Arm I long, thick, laterally compressed; with conspicuous, thin, wing-like dorsal lappet on its distal half. Arms II and III broadened at base, tapering rapidly distally and attenuated to a fine distal tip. Arm IV shortest, slightly robust. Web shallow, in the formula (WF) = A.B.D.E.C. Suckers biserial throughout; somewhat unequal, enlarged on proximal part and greatly reduced to distal end; numbering approximately 30 pairs on arm I, 50 pairs on arm II, 40 pairs on arm III and 20 pairs on arm IV. Beaks with strong upper mandible (Fig. 2, d) and lower mandible (Fig. 2, e). Radula (Fig. 2, f) with 7 transverse rows of unicuspid teeth and 2 marginal plates. Gills with 10 lamellae per demibranch. Eggs very small, numerous.

Shells (Fig. 2, g-i) rather small, inflated, slightly longer than wide; shell center pressed in and no horn; aperture wide, about 50 % of the shell length; about 30-35 distinct radial ribs present on lateral sides, short and long arranged alternately, every second terminating in a tubercle on keel; keel wide, each edge with a sparse series of rounded tubercles, each numbering about 15-16. Colour whitish-brown on anterior, brownish black staining in the knobs and adjacent ribs on posterior shell.

DISTRIBUTION: Cosmopolitan in tropical and subtropical waters.

REMARKS: The present material contains only mature females. Almost all (except

Table 2. Means, standard deviations and ranges of selected measurements and indices (in percent) of *Argonauta hians* (females).

Index	n	mean	s.d.(n-1)	Range
ML(mm)	5	31.9	5.0	27.0-37.4
MWI	5	53.9	4.2	49.7-59.0
HWI	5	47.6	7.0	39.0-58.1
AL _I	5	162.3	18.4	139.1-180.3
AL _{II}	5	195.1	41.9	139.6-251.6
AL _{III}	5	164.1	17.5	148.9-191.7
AL _{IV}	5	137.9	12.3	125.5-158.6

PMBC no. 542) carried numerous small eggs in the shells. Sometimes, the species were collected in a large quantity and sold in the local markets along the Andaman coast. The price is about 15 Baht/kg (0.6 US\$). The present species agrees well with the previous descriptions, except the length of arm I which is slightly shorter than arm II. This might be due to the preserved condition.

Family Octopodidae

Genus *Cistopus* Gray, 1849

Diagnosis: Mantle saccular, without fins. Eight arms lacking cirri, arms with biserial suckers, third right arm of male hectocotylized. Eight small water pouches and pores on the oral surface of the webs surrounding the mouth, one between each arm base.

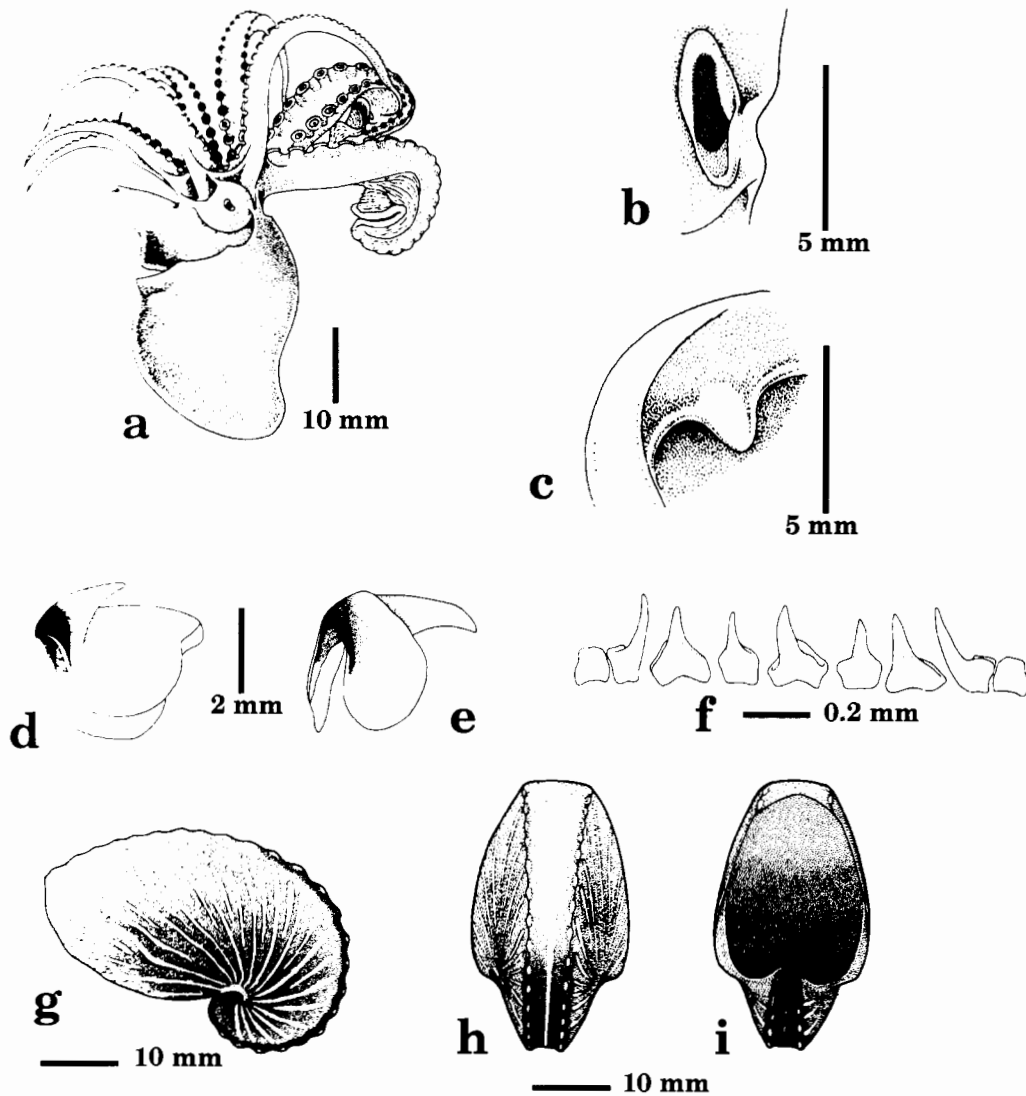


Figure 2. *Argonauta hians*. (a), lateral view of 34.9 mm ML female. (b), funnel locking cartilage. (c), mantle locking cartilage. (d), upper beak. (e), lower beak. (f), radula. (g), lateral view of shell. (h), dorsal view of shell. (i), ventral view of shell.

Cistopus indicus (Rapp, 1835 in Ferussac and d'Orbigny, 1834-1848)
(Figs. 3 A & B, Table 3)

Cistopus indicus - Robson 1929: 182-184, text-fig.70; - Voss 1963: 165-166; - Voss & Williamson 1971: 96-97, pl.32, fig. 40; - Roper *et al.* 1984: 216; - Norman & Hochberg 1994: 144-146, fig.1 A-B.

MATERIAL EXAMINED: PMBC no. 11940. 11 specimens; 9 males, 49.6-97.5 mm ML; 2 females, 54.7-59.7 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 14 February 1996. PMBC no. 11941. 3 males, 65.7-66.1 mm ML. Pak Bara Fish Landing, Satun. Coll. A. Nateewathana. 6 December 1995. PMBC no. 11942. 5 specimens; 4 males, 49.6-79.2 mm ML; 1 female, 49.5 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 15 December 1994. PMBC no. 11943. 2 males, 48.3-80.8 mm ML. La-oon Fish Market, Ranong. Coll. A. Nateewathana. 13 December 1994. PMBC no. 11944. 3 specimens; 2 males, 84.7-89.0 mm ML; 1 female, 85.3 mm ML. Trang Fish Market, Trang. Coll. A. Nateewathana. 25 March 1993. PMBC no. 11945. 3 males, 53.3-70.0 mm ML. Satun Fish Market. Coll. A. Nateewathana. 28 January 1996. PMBC no. 11946. 2 females, 69.3-76.5 mm ML. Ranong Fish Landing. Coll. A. Nateewathana. 30 January 1996. PMBC no. 11947. 1 male, 78.7 mm ML. Krabi Fish Landing. Coll. A. Nateewathana. 2 July 1991. PMBC no. 11948. 2 males, 57.4-74.6 mm ML. Ko Yao Yai. R/V Pramong 10. Shrimp trawl. Coll. K. Yoodee. 25 May 1995. PMBC no. 11949. 1 male, 77.6 mm ML. South of Ko Lanta. R/V Pramong 10. Trawl. Coll. K. Yoodee. 30 May 1995. PMBC no. 11950. 1 male, 83.4 mm ML. Ko Panak, Phang-nga Bay. Coll. S. Utsaha. 9 September 1990. PMBC no. 11974. 3 females, 89.0-106.0 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 17 August 1996.

DESCRIPTION: Moderate to large size octopods, mantle length to 106 mm in material examined. Mantle elongate (Fig. 3A, a), widest posteriorly, separated from head by a narrow neck region; dorsal mantle and head skin varied from smooth to slightly rugose. Head and eyes small. Funnel moderately long, stout; funnel organ W-shaped (Fig. 3A, b), limbs thin, outer limbs three-quarters as long as median limbs. Arms very long, stout, tapering to narrow and attenuate tips. Arm length, unequal in the order of I.II.III.IV. Arm suckers biserial throughout;

sucker count approximately 102-145 on normal arms, 6th to 7th suckers usually largest and enlarged on arms I.II. and IV. in males. Third right arm of male hectocotylized, somewhat shorter than its opposite arm (OAI 87.6); ligula very small (Fig. 3A, c), approximately 1.4 % of third right arm length; ligula groove short and inconspicuous, without transverse ridges; calamus very short and sometimes inconspicuous; hectocotylized arm with 75-124 suckers. Web shallow (WDI 12.3-12.5) with eight water pouches, each located in between the interbrachial membrane near the base of the arms (Fig. 3A, d); web formula A=B.C.D.E. Upper beak (Fig. 3B, e) with a short hooked rostrum and narrow hood. Lower beak (Fig. 3B, f) with short and sharp rostrum, narrow hood, slightly wide wings and long lateral walls separated in posterior half. Radula (Fig. 3B, g) with 7 transverse rows of teeth; rachidian tooth unicuspid. Gill lamellae 9-10. About 29 spermatophores (Fig. 3B, h-j) in each sperm sac. Spermatophores moderately long (SpLI 20.5-40.3). About 100 large eggs (Fig. 3B, k) in mature female. Eggs measured about 11.0-15.0 mm. Colour brownish in alcohol and dull grayish in live specimens.

DISTRIBUTION: Indo-Pacific.

REMARKS: The unique character of the genus *Cistopus* is the presence of the water pouches on the oral surface of the web adjacent to the mouth. The function is not known but each pouch opens to the surface adjacent to the third or fourth proximal sucker. At present the genus contains only one species, *C. indicus*. However, Norman & Sweeney (in press) suggest that more than one species of *Cistopus* exists. They pointed out that the genuine *C. indicus* is characterized by water pouches, dorsal arms longer than ventral arms (AF 1.2.3.4), tiny ligula (LLI ~0.5) absence of a calamus, 9-10 gill lamellae per demibranch, sucker counts of approximately 185 on normal arms and approximately 110-130 on hectocotylized arm, and absence of enlarged suckers in males. These characters of the type specimen from

Sulawesi, Indonesia matched the specimens from the Philippines. The second undescribed species occurs on muddy bottoms on the mainland coasts of Asia from at least Singapore west to southern India and the species harvested in Hong Kong waters might be included in the second species or turn out to be a third undescribed species.

The second undescribed species is distinguished from *C. indicus* in that mature males possess one to two enlarged sucker(s) on arms I, II and IV (never III), lower sucker counts on the hectocotylyzed arm (60-80 vs. >120) and slightly higher gill lamellae counts (10-11 vs. 9-10). The Andaman material is close to the sec-

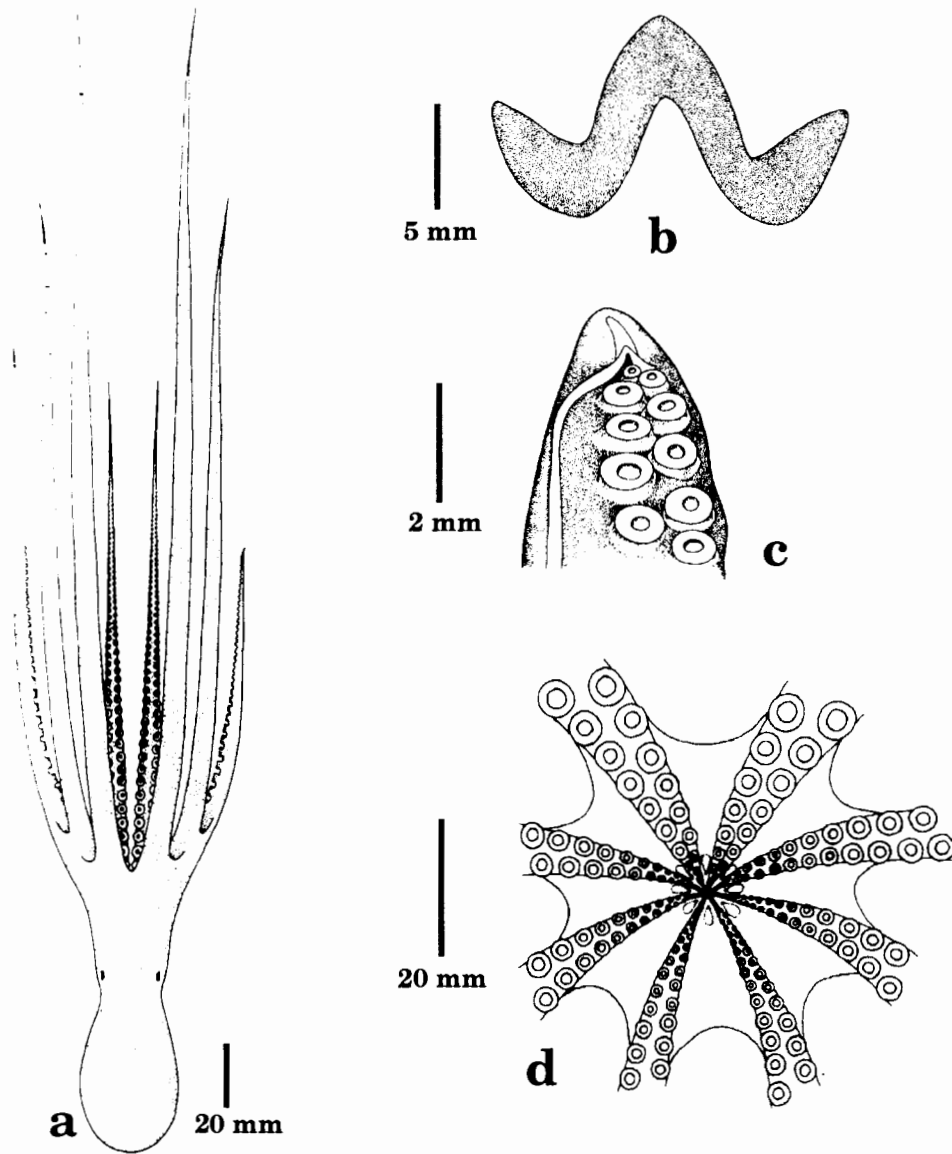


Figure 3A. *Cistopus indicus*. (a), dorsal view of 65.5 mm ML male. (b), funnel organ of 67.2 mm ML of male. (c), hectocotylus of 74.3 mm ML male. (d), water pouches of 65.5 mm ML of male.

ond undescribed species of Norman & Sweeney (in press). The mature male possess enlarged suckers on arms I, II, and IV, but the other two characters are not exactly the same. Since the specimen from different areas were not examined in this study and

the resolution of their identity is not solved, the present material should be classified as *C. indicus* (s.l.).

Eventhough most of the characters of the Andaman materials are in accordance with those described in *C. indicus*, it should be

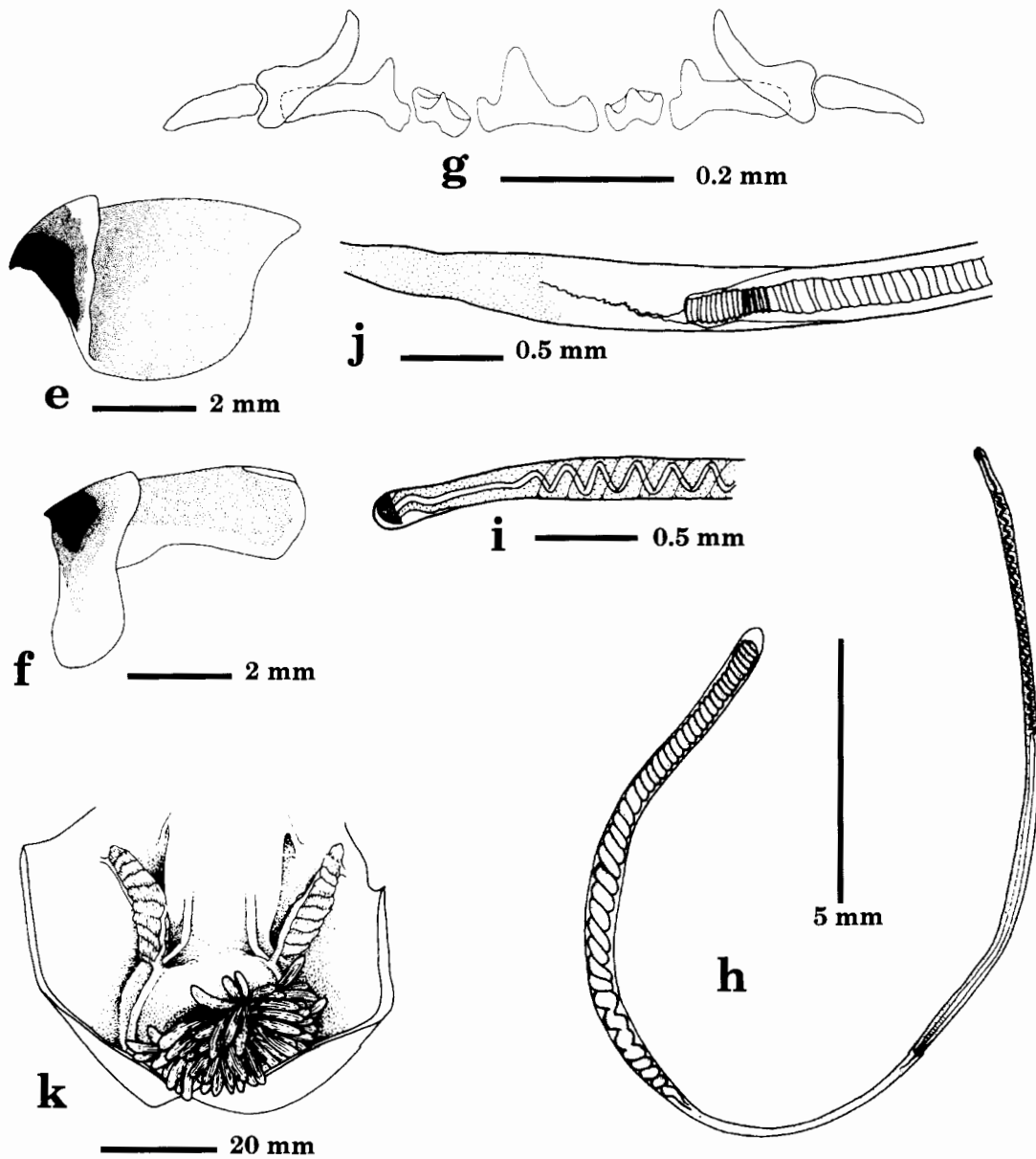


Figure 3B. *Cistopus indicus*. (e), upper beak of 67.2 mm ML of male. (f), lower beak of 67.2 mm ML male. (g), radula of 67.2 mm male. (h), whole spermatophore of 67.2 mm ML male. (i), enlargement of oral cap. (j), enlargement of cement body.

Table 3 . Means, standard deviations and ranges of selected measurements and indices (in percent) of *C. indicus* from the Andaman Sea, Thailand.

Index	MALES				FEMALES			
	n	mean	s.d.(n-1)	Range	n	mean	s.d.(n-1)	Range
ML(mm)	4	80.4	12.9	67.2-98.0	6	68.7	19.4	46.2-93.8
TL(mm)	4	469.0	144.4	305.0-641.0	6	393.8	68.0	278.0-460.0
MWI	4	56.7	9.5	47.6-65.4	6	64.7	11.7	45.5-77.3
VML(mm)	4	63.4	8.6	54.9-73.8	6	47.4	14.5	33.1-65.3
HWI	4	29.8	11.1	22.2-46.4	6	34.9	9.9	19.6-46.5
MAI	4	22.7	6.5	13.5-28.5	6	22.3	4.5	18.6-30.5
AL _I	4	476.9	176.8	351.2-738.6	5	482.8	109.8	339.0-623.8
AL _{II}	4	400.0	69.2	349.7-502.0	6	456.8	106.3	292.4-604.3
AL _{III}	4	341.6	115.3	204.1-368.7	6	436.3	79.5	327.5-536.1
AL _{IV}	4	360.3	26.8	336.7-398.7	6	360.1	53.7	269.0-411.2
AWI	4	15.7	3.6	11.2-20.1	6	15.2	2.2	12.6-17.7
WDI	4	12.5	2.5	10.0-16.0	6	12.3	2.1	8.8-14.4
ASC	4	132.0	24.0	102.0-135.0	6	136.0	14.0	108.0-145.0
HcASC	4	107.0	22.0	75.0-124.0				
HcAI	4	273.3	28.3	232.1-296.7				
OAI	4	87.6	33.9	61.7-137.5				
LLI	4	1.4	0.6	0.6-1.9				
SpLI	3	32.7	11.1	20.5-42.3				
SpWI	3	2.2	0.4	1.7-2.5				
SpRI	3	48.6	11.9	37.3-61.1				
FuLI	4	34.0	9.3	28.1-44.8	5	40.1	6.5	33.0-49.5
FFuI	4	22.6	3.7	19.1-27.8	5	24.9	7.4	13.1-33.3

noted that the ligula of many specimens poses a very small, distinct calamus (Fig. 3B, c). *C. indicus* is one of the major commercial octopod species, both in the Gulf of Thailand and the Andaman Sea coast of Thailand (Chotiyaputta 1993).

Genus *Octopus* Lamarck, 1798

Diagnosis: Benthic octopodids. Mantle saccular, without fins. Eight arms lacking cirri, arms with biserial suckers, third right arm of males hectocotylized with end of arm modified into ligula and calamus. Web well developed. Ink sac present. Mantle aperture wide. Internal shell cartilaginous and vestigial.

Octopus aegina Gray, 1849

(Figs. 4 A & B, Tab. 4)

Octopus dollfusi - Robson 1928: 43; - Voss & Williamson 1971: 82, 84, fig. 33, pl. 25; - Roper *et al.* 1984: 199; - Silas *et al.* 1986a: 34, pl.X,D.

Octopus aegina - Norman & Hochberg 1994: 149-150, fig. 3A.

MATERIAL EXAMINED: PMBC no. 11898. 4 specimens, 3 males, 35.5-44.4 mm ML, 1 female, 45.0 mm ML. East of Ko Yao Yai, Phang-nga Bay. R/V Pramong 10. Shrimp trawl. Coll. K. Yoodee. 25 May 1995. PMBC no. 11899. 2 specimens. 1 male, 41.8 mm ML. 1 female, 56.0 mm ML. In front of Ko Dam Kwan, Phang-nga Bay. R/V Pramong 10. Shrimp trawl. Coll.

K. Yoodee. 22 May 1995. PMBC no. 11900. 4 specimens. 1 male, 52.6 mm ML. 3 females, 46.4-62.2 mm ML. South of Ko Lanta. R/V Pramong 10. Shrimp trawl. Coll. K. Yoodee. 30 May 1990. PMBC no. 11901. 1 female, 59.3 mm ML. Lat. 06°51'3" N, Long. 98°31'6" E. M/V Paknam. Trawled, depth 95 m. Coll. A. Nateewathana. 16 March 1989. PMBC no. 11902. 1 male, 40.0 mm ML. East of Ko Lanta. R/V Pramong 10. Shrimp trawl. Coll. K. Yoodee. 31 May 1990. PMBC no. 11903. 3 males, 31.3-

43.7 mm ML. Phang-nga artificial reef between Ko Kainok and Ko Lipi. R/V Pramong 10. Shrimp trawl. Coll. K. Yoodee. 24 May 1994. PMBC no. 11904. 7 specimens. 2 males, 45.0-52.2 mm ML. 5 females, 23.8-60.0 mm ML. Ranong artificial reef. Ban Kampuan. Shrimp trawled, depth 20 m. R/V Pramong 10. Coll. K. Yoodee. 10 December 1990. PMBC no. 11905. 4 specimens. 2 males, 41.5-44.8 mm ML. 2 females, 32.3-43.3 mm ML. Ko Pai, Phang-nga Bay. R/V Pramong 10.

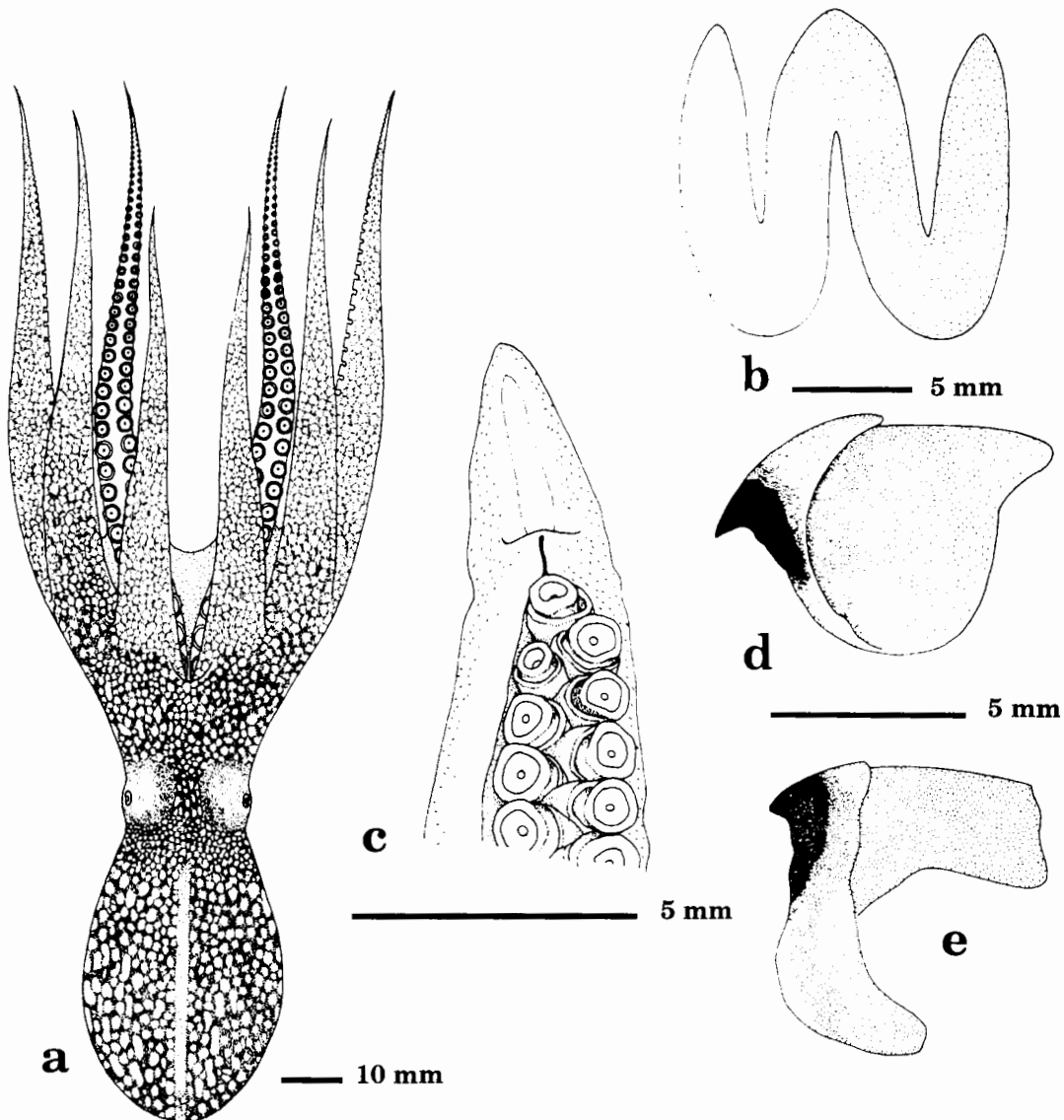


Figure 4A. *Octopus aegina*. (a), dorsal view of 57.8 mm ML of female. (b), funnel organ of 57.8 mm ML of female. (c), hectocotylus of 43.0 mm ML of male. (d), upper beak of 57.8 mm ML of female. (e), lower beak of 57.8 mm ML of female.

Trawl. Coll. K. Yoodee. 4 September 1990. PMBC no. 11906. 1 male, 35.5 mm ML. Krabi Fish Landing. Coll. A. Nateewathana. 2 June 1990. PMBC no. 11907. 1 female, 38.3 mm ML. Laem Yamu. Phuket. R/V Pramong 10. Trawl. Coll. K. Yoodee. 3 September 1990. PMBC no. 11908. 4 females. 26.5-51.0 mm ML. Ko Panak, Phang-nga Bay. R/V Pramong 10. Trawl. Coll. K. Yoodee. 4 September 1990. PMBC no. 11909. 1 female, 21.7 mm ML. Ko Yao Yai. Lat. 08° 07' 30" N, Long. 98° 30' 15" E. R/V Pramong 10. Trawled, depth 18 m. Coll. K. Yoodee. 20 May 1995. PMBC no. 11910. 1 male, 43.1

mm ML. Thalane, Phang-nga Bay. Push net. Coll. S. Utsaha. 23 July 1989.

DESCRIPTION: Moderate size animals (ML to 60 mm; TL to 193 mm). Mantle (Fig. 4A, a) elongate-oval to oblong (MWI 59.5-65.7), mantle wall muscular. Pallial aperture wide, slightly greater than the mantle width. Head small (HWI 34-37), slightly narrower than the mantle. Eye small, inconspicuous, without eye cirrus. Funnel long, tubular with slightly broadened base (FuLI 35-36) with free portion

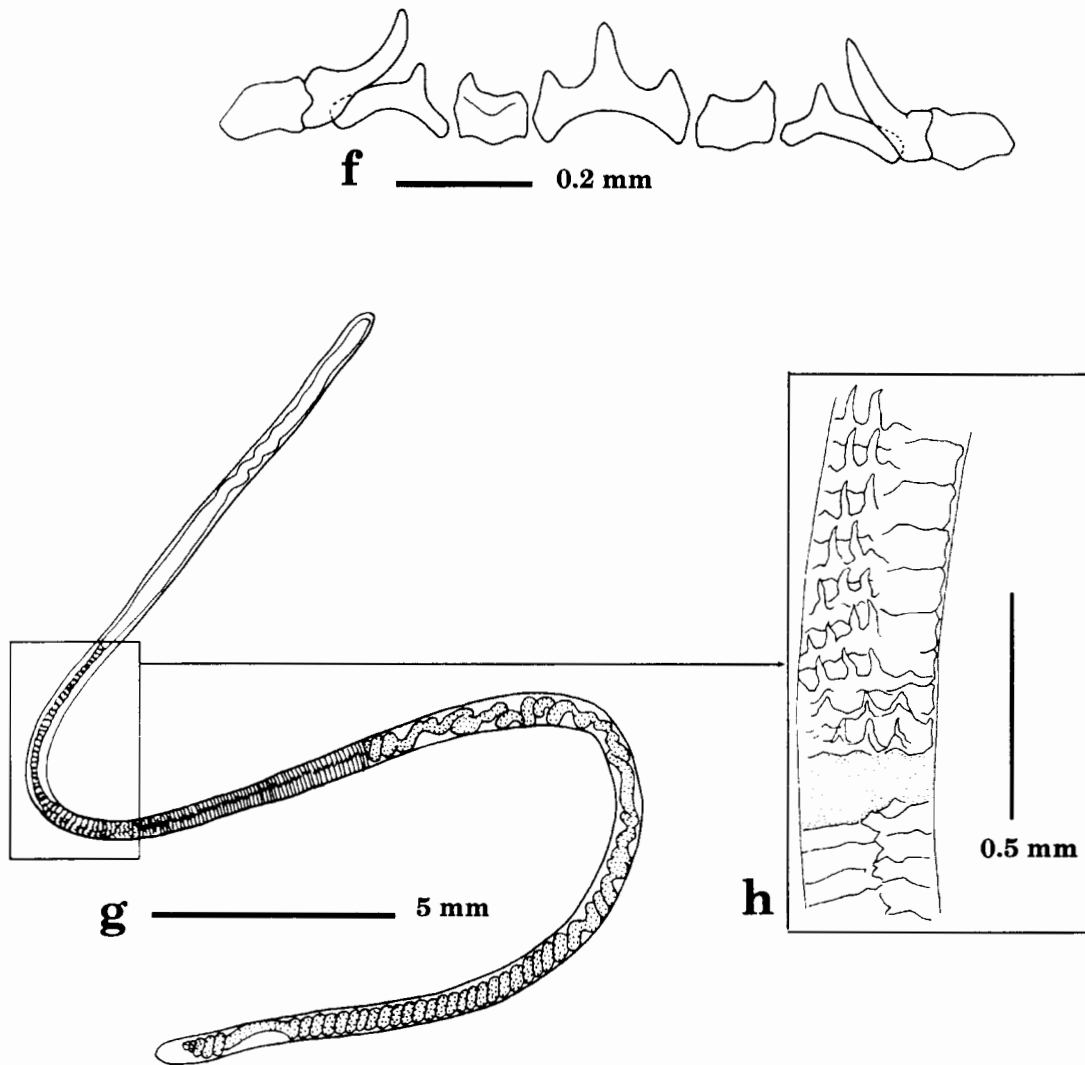


Figure 4B. *Octopus aegina*. (f), radula of 57.8 mm ML of female. (g), whole spermatophore of 37.0 mm ML of male. (h), enlargement of armed spermatophore.

Table 4. Means, standard deviations and ranges of selected measurements and indices (in percent) of *O. aegina*. from the Andaman Sea, Thailand.

Index	MALES				FEMALES			
	n	mean	s.d.(n-1)	Range	n	mean	s.d.(n-1)	Range
ML(mm)	5	42.3	7.9	34.7-51.2	5	46.8	13.0	32.8-59.4
TL(mm)	5	147.1	26.7	118.0-178.0	5	161.8	42.1	96.0-193.0
MWI	5	65.7	5.8	55.7-69.5	5	59.5	9.7	43.6-67.1
VML(mm)	5	34.2	10.4	24.6-50.0	5	38.1	13.8	21.5-54.0
HWI	5	36.8	5.2	31.2-43.0	5	34.0	6.2	25.3-41.2
MAI	5	43.7	3.8	41.1-50.2	5	43.7	3.9	38.1-47.9
AL _I	5	180.4	29.5	148.4-217.6	5	181.1	13.9	162.2-196.7
AL _{II}	5	209.9	29.1	162.1-237.2	5	210.9	25.6	188.8-250.0
AL _{III}	5	228.6	21.4	191.4-243.2	5	230.0	21.2	208.7-262.2
AL _{IV}	5	225.6	16.3	199.2-243.1	5	226.9	20.0	207.1-259.1
AWI	5	16.9	2.9	13.0-20.8	5	16.1	2.7	11.8-18.3
WDI	5	25.3	5.2	20.0-32.8	5	24.3	2.8	20.0-27.2
ASC	5	115.0	11.0	96.0-124.0	5	123.0	7.0	115.0-132.0
HcASC	5	61.0	2.0	59.0-64.0				
HcAI	5	189.4	24.2	159.4-217.6				
OAI	5	83.2	10.4	65.5-89.7				
LLI	5	7.3	1.3	5.5-8.5				
CaLI	5	22.7	4.3	17.6-28.0				
SpLI	3	107.2	12.0	93.4-115.1				
SpWI	3	1.6	0.1	1.5-1.8				
SpRI	3	51.3	5.3	47.9-57.4				
EgLI					2	2.8	0.8	2.3-3.4
FuLI	5	35.5	8.4	27.7-48.8	5	36.5	3.8	32.2-42.1
FFuLI	5	24.6	4.1	18.9-29.0	5	23.4	3.9	18.4-27.7

variable in length (FFuLI 22-23). Funnel organs well-developed (Fig. 4A, b), W-shaped with broad limbs; outer limbs slightly shorter than medial limbs. Arms moderately long, about 2-3 times of the mantle length, stout and robust proximally (AWI 16-17) and tapering evenly to the distal end. Arms subequal, dorsal arm shortest, ventrolateral arm (arm III) longest, slightly greater than the ventral arm, almost equal in some specimens (AF III.IV.II.I. or III=IV.II.I). Arm suckers cup-like, typically biserial; normal suck-

ers large at the base, become smaller progressively along the arm length, minute at the tips; a few slightly enlarged suckers at the base of arms II and III in males; about 115-123 suckers per intact normal arm in both sexes (ASC 96-132). Web deep (WDI 24-25), lateral webs deepest (WF typically D.C=B.E.A). Right third arm in males hectocotylized (Fig. 4A, c), slightly shorter than opposite arm (OAI 83.2), with approximately 61 suckers. Copulatory organ moderately long (LLI 7.3), thin, roughly cylindrical with slightly deep groove and mod-

erate calamus (CaLI 22.7). Gills with 8-9 lamellae on each demibranch, terminal lamella small. Upper beak (Fig. 4A, d.) with short, curved rostrum and small hood. Lower beak (Fig. 4A, e) with sharp rostrum, narrow hood, widely expanded wings and long, slightly curved lateral walls. Radula (Fig. 4B, f) with 7 transverse rows of teeth and marginal plates: rachidian tooth with 2 lateral cusps on each side of large curved medial cusp; lateral teeth and marginal tooth unicuspidate; marginal plate oval. Ink sac present. Female with numerous small eggs (EgLI 2.3-3.4). Male reproductive system with elongated, slender penis and a large coiled diverticulum curved toward the midline; spermatophore (Fig. 4B, g-h) long and slender, armed with small teeth on anterior part of the midsection.

Integumental sculpture consists of numerous, large warts interspersed with smaller papillae covering the dorsal surface of mantle, head and arms, less prominent on the ventral side; a thin, longitudinal ridge present along the dorsal midline of the mantle.

Colour in alcohol dull cream; reticulate pattern of dark brown on dorsal and lateral mantle, and dorsal surface of head and arms, the inside of each cell of reticulate pattern bears an oval lighter brown papilla; ventral mantle, funnel and ventral arms light brown; cream longitudinal stripe along dorsal midline present in some specimens.

DISTRIBUTION: Tropical coastal waters of Southeast Asia from the Philippines to at least Madras, India, primarily in shallow water on muddy bottoms (Norman & Sweeney, in press).

REMARKS: *Octopus aegina* has been described as *O. dollfusi* by several authors (see synonyms). Recently, Norman & Hochberg (1994) and Norman & Sweeney (in press) examined the type material and they concluded that *O. hardwickei* Gray, 1849 and *O. dollfusi* Robson, 1928 are junior synonyms of *O. aegina*. The structure of armed spermatophores, distinct colour pattern and the skin sculpture are the unique characters of the species. The present material is in

accordance with *O. aegina* described by them.

Octopus cyanea Gray, 1849
(Figs. 5 A&B, Tab. 5)

Octopus cyanea - Norman 1991 (full synonyms): 21-34, figs. 2-3; - Norman 1992 b: 311, figs. 1g, 2a-d, 15a.

MATERIAL EXAMINED: PMBC no. 11975. 1 male, 110.0 mm ML. In front of PMBC vicinity. Intertidal reef, in rock crevices. Coll. S. Utsaha. 10 February 1996. PMBC no. 11976. 1 female, 172.0 mm ML. From the Phuket Public Aquarium, PMBC. Coll. O. Bhatiyasevi. 1 August 1990.

DESCRIPTION: The present description is based on two specimens, 1 male and 1 female. Large robust ocellate octopus (ML to 172 mm, TL to 1126 mm); mantle broadly ovoid, thick and muscular (MWI 57.1, 81.4) (Fig. 5A, a); head wide, slightly narrower than mantle (HWI 33.1, 37.1), demarcated by a slight constriction; eyes large, prominent and slightly projecting above surface of head. Funnel large, broad base, bluntly tapered; funnel organ W-shaped with broad limbs, outer limbs almost as long as median limb. Arms very long (MAI 18.8, 19.2)(4-6 times ML), robust, tapering to narrow tips. Arm length subequal, arm order IV.III.II.I. Arm suckers biserial, all suckers similarly sized, without sucker enlargement; normal arms usually with many suckers, more than 400 suckers on each arm. Third right arm of male hectocotylized, equal to opposite arm (OAI 100); ligula very small, conical and bluntly pointed (Fig. 5A, b); ligula groove wide with fine transverse ridges; calamus short and distinct (CaLI 41); hectocotylized arm with 260 suckers. Web well-developed (WDI 12.5, 14.2), web formula C.B.D=E.A. Upper beak (Fig. 5A, c) with short curved rostrum, narrow hood, slightly concave cutting edge, large lateral walls with marked concave posterior margin. Lower beak (Fig. 5A, d) with short blunt rostrum, narrow hood, widely spread wings and narrow lateral walls. Radula (Fig. 5B, e) with seven

rows of teeth and two marginal plates on each transverse row; rachidian tooth with 1 and 2 small lateral cusps alternatively on either side; first lateral teeth small and unicuspidate; second lateral teeth conical with long, slightly curved base; third lateral teeth long, rod-shaped, slightly curved; marginal

plates oblong. Ink sac present. Gill lamellae 10. No female egg could be observed in this material. Male with moderately long penis and single coiled diverticulum; spermatophores (Fig. 5B, f-g) numerous, relatively short (SpLI 26.9), aboral end widest (SpWI 1.9), sperm reservoir approxi-

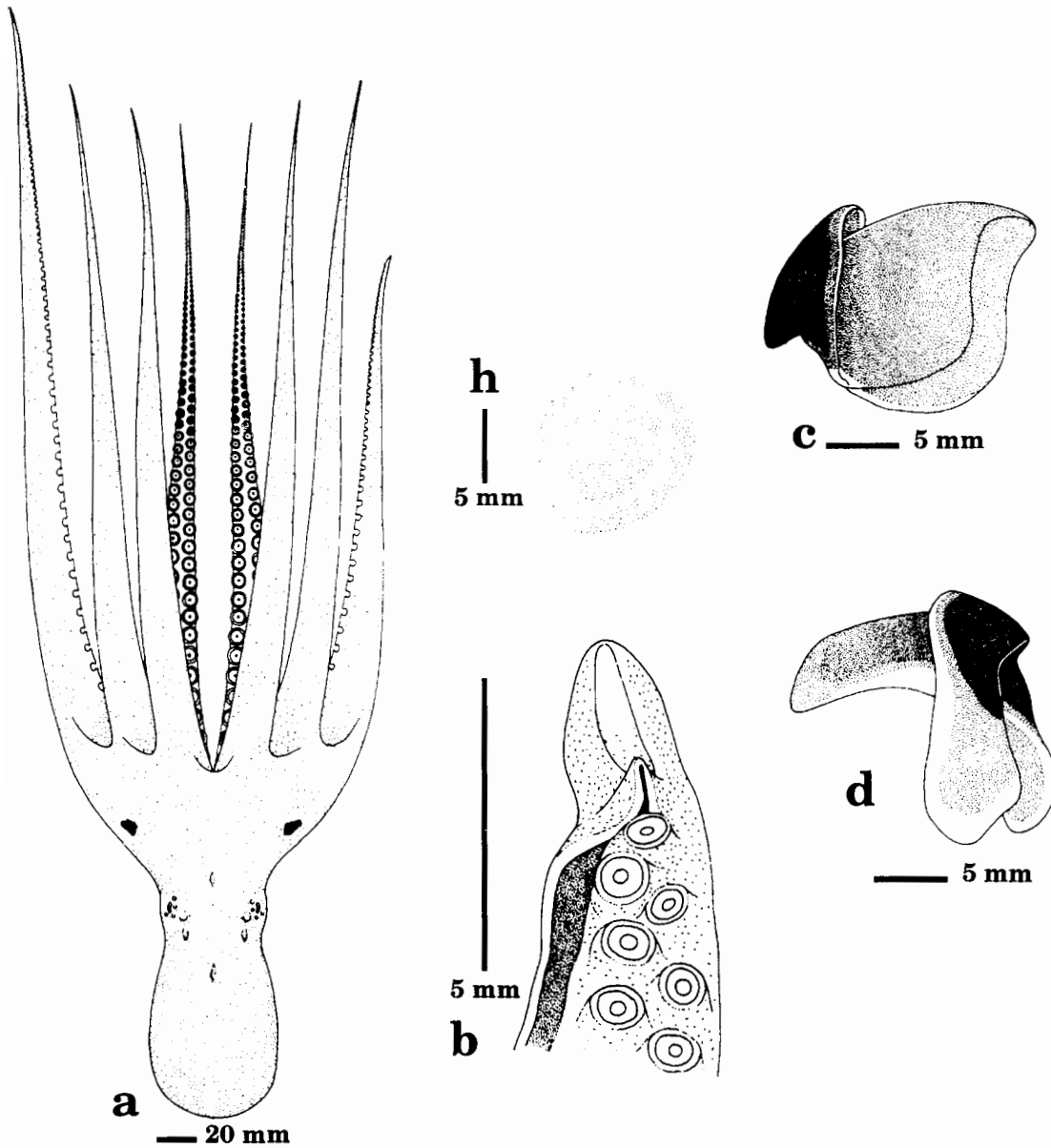


Figure 5A. *Octopus cyanea*. (a), dorsal view of 110 mm ML of male. (b), hectocotylus. (c), upper beak. (d), lower beak. (h), ocellus.

mately one-third of spermatophore length (SpRI 35.3).

Integumental sculpture with fine reticulations forming irregular patch and groove system over body, arm crown and along the arms; somewhat large tubercles widely spread over eyes, head, mantle and arm crown. Colour in preserved ethyl alcohol maroon dorsally and paler ventrally.

Ocellus ovoid, black surrounded by pale, uniridescent ring and thin dark outer ring (Fig. 5A, h).

DISTRIBUTION: Tropical Indo-West Pacific: from Hawaii to the east African coast (Norman 1992 b).

REMARKS: *Octopus cyanea* is a large ocellate octopod species. Revision, synonymy and affinities of the species are given by

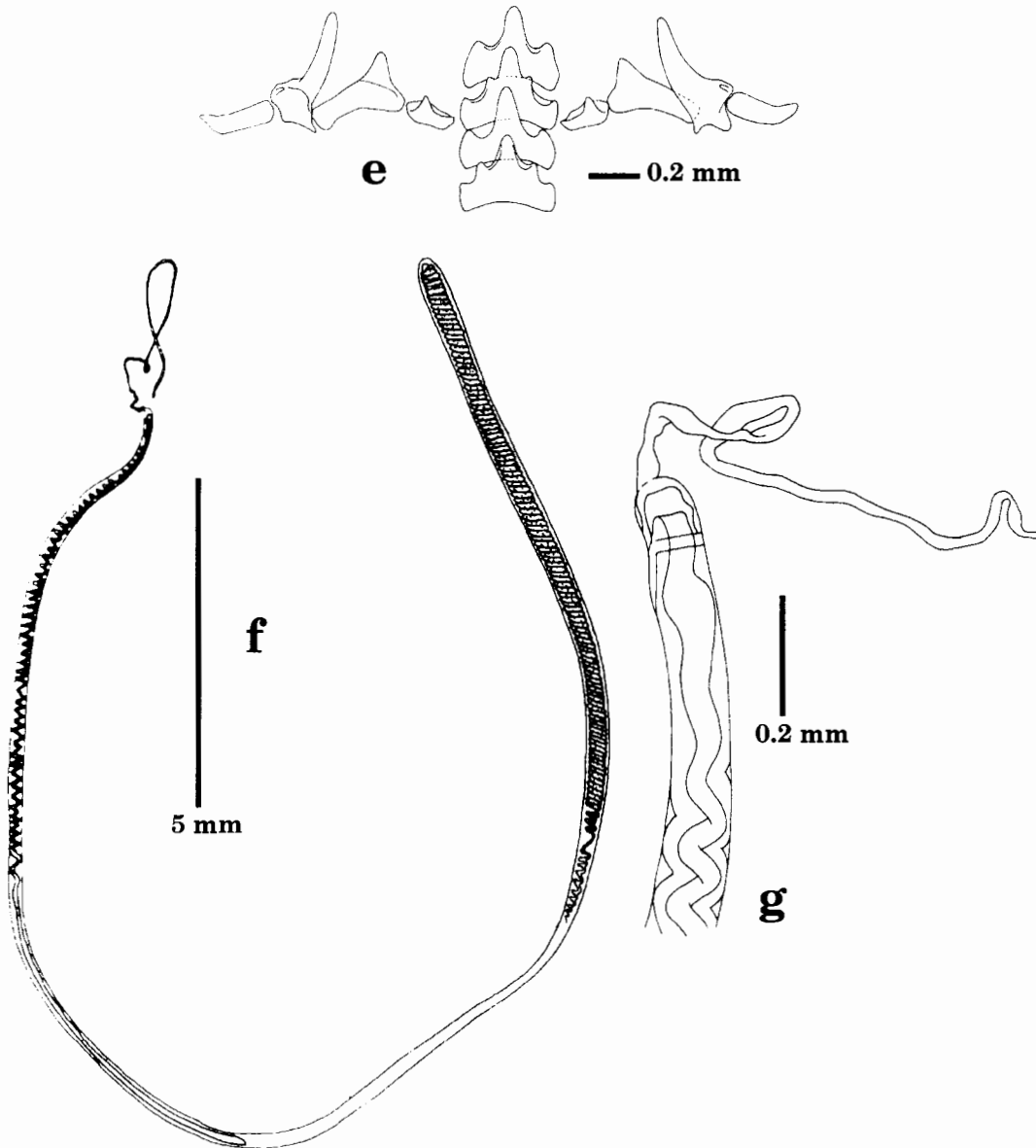


Figure 5B. *Octopus cyanea*. (e), radula. (f), whole spermatophore. (g), enlargement of oral cap.

Table 5. Measurements and indices (in percent) of *O. cyanea* from the Andaman Sea, Thailand.

Index	n	Value	n	Value
ML(mm)	1	110.0	1	172.0
TL(mm)	1	621.0	1	1126.0
MWI	1	57.1	1	81.4
VML(mm)	1	79.8	1	131.0
HWI	1	37.1	1	33.1
MAI	1	19.2	1	18.8
AL _I	1	375.4	1	485.5
AL _{II}	1	521.8	1	520.3
AL _{III}	1	404.5	1	500.0
AL _{IV}	1	388.2	1	532.6
AWI	1	17.4	1	22.2
WDI	1	12.5	1	14.2
ASC	1	450.0	1	480.0
HcASC	1	260.0		
HcAI	1	404.5		
OAI	1	100.0		
LLI	1	3.5		
CaLI	1	41.0		
SpLI	1	26.9		
SpWI	1	1.9		
SpRI	1	35.3		
FuLI	1	39.1	1	32.6
FFuI	1	31.7	1	19.8

Norman (1992b). The present material are in accordance with his description.

Octopus exannulatus Norman, 1992.
(Fig. 6, Tab. 6)

Octopus exannulatus - Norman 1992b: 321-329, figs. 1e, 7-10, 15c

MATERIAL EXAMINED: ZMUC: 1 female, 25.4 mm ML. Lat. 08°22' N, Long. 98°15' E. R/V Thanarat. The 5th Thai-Danish Expedition. St. no. 1176, Amphioxus-sand. Triangular dredge. Coll. B. Muus, K. Ockelmann & G. Thorson. 9 March 1966.

DESCRIPTION: The following description

is based on a single immature female. Small ocellate animal, ML 25.4 mm. Mantle round to ovoid (Fig. 6 a). Head of moderate width (HWI 46.7), narrower than mantle, demarcated from mantle by moderate constriction; eyes large and slightly projecting above surface of head. Funnel moderately long (FuLI 38), tubular with broad base; funnel organs W-shaped with broad limbs, outer limbs slightly shorter than median limb. Arms moderately long (1.5-2 times ML), robust, tapering to fine tips. Arms subequal, arm order IV.III.II.I. Arm suckers biserial, all suckers similarly sized, without sucker enlargement; normal arm with approximately 110 suckers. Webs moderately deep (WDI 24.4), web formula D.C.E.B.A. Gill lamellae 7. Radula was not dissected in the present study.

Integumental sculpture with a pattern of small oval to round papillae covering the mantle, head and arm crown; single large branching papilla above and slightly behind each eye. Colour in ethyl alcohol uniformly

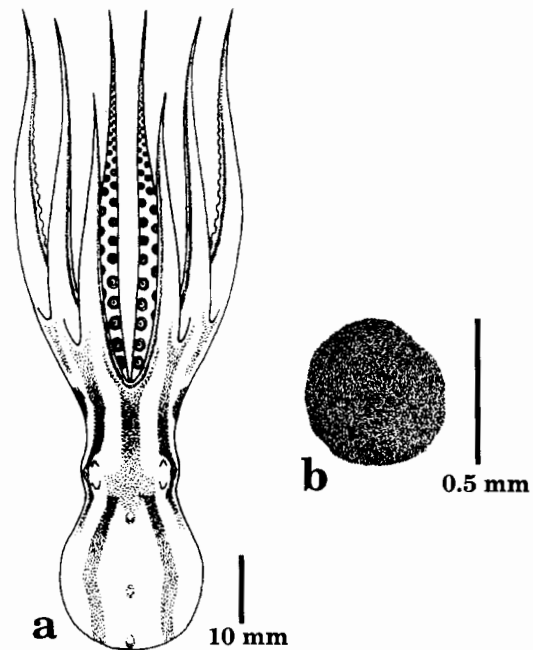


Figure 6. *Octopus exannulatus*. (a), dorsal view of 25.4 mm ML of female. (b), ocellus.

Table 6. Measurements and indices (in percent) of *Octopus exannulatus* from the Andaman Sea, Thailand.

Index	Value
ML(mm)	25.5
TL(mm)	85.3
MWI	80.4
VML(mm)	19.1
HWI	46.7
MAI	42.6
AL _I	166.3
AL _{II}	211.8
AL _{III}	233.7
AL _{IV}	234.9
AWI	16.5
WDI	24.4
ASC	110.0
FuLI	38.0
FFuI	18.0

brown dorsally, light brown ventrally; four longitudinal dark bars on dorsal mantle, extending onto arm crown and as a narrow dark line down dorsal edges of all arms. Ocellus simple, black without iridescent ring (Fig. 6, b).

DISTRIBUTION: Tropical Australian waters (Norman 1992b), the Philippines (Norman & Sweeney, in press), the Andaman Sea.

REMARKS: *O. exannulatus* is characterized by having black ocellus without iridescent ring and the unique pattern of colour. The immature female of the present study fits well with the type-description of Norman (1992b).

Octopus luteus Sasaki, 1929
(Figs. 7 A & B, Tab. 7)

Polypus luteus - Sasaki 1929: 45-47, text-fig. 160; pl. XXVIII, figs. 6-9; pl. XXIX, figs. 4,5.

Octopus macropus - Voss & Williamson 1971: 86,88, text-fig. 35, pl. 27.

Octopus luteus - Norman & Hochberg 1994: 151-152, fig. 2A.

MATERIAL EXAMINED: PMBC no. 11961. 2 males, 54.0-54.9 mm ML. East of Ko Yao Yai. R/V Pramong 10. Shrimp trawl. Coll. K. Yoodee. 25 May 1995. PMBC no. 11962. 4 specimens; 3 males, 65.0-83.1 mm ML; 1 female, 65.5 mm ML. Satun Fish Market. Coll. A. Nateewathana. 26 March 1993. PMBC no. 11963. 1 male, 46.0 mm ML. Klong Kokkai, Phang-nga Bay. Push net. Coll. S. Utsaha. 21 June 1988. PMBC no. 11964. 1 female, 43.7 mm ML. La-oon Fish Market, Ranong. Coll. A. Nateewathana. 13 December 1994. PMBC no. 11965. 1 male, 55.2 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 4 September 1995. PMBC no. 11966. 1 female, 22.3 mm ML. Ko Raya Ring, Phang-nga Bay. Push net. Coll. S. Utsaha. 20 June 1988. PMBC no. 11967. 1 male, 53.7 mm ML. Satun Fish Market. Coll. A. Nateewathana. 28 January 1996. PMBC no. 11968. 1 female, 43.0 mm ML. Lat. 06°51'3" N, Long. 98°31'36" E. M/V Paknam. Trawled, depth 95 m. Coll. A. Nateewathana. 16 March 1989. PMBC no. 11969. 6 specimens; 3 males, 56.6-58.9 mm ML; 3 females, 45.0-83.0 mm ML. Phuket Fish Market. Coll. A. Nateewathana. 25 December 1994. PMBC no. 11970. 2 females, 44.4-114.3 mm ML. Kantang Fish Landing. Coll. A. Nateewathana. 15 December 1994. PMBC no. 11971. 2 specimens; 1 male, 79.8 mm ML; 1 female, 80.0 mm ML. Pak Bara Fish Landing, Satun. Coll. A. Nateewathana. 5 December 1995. PMBC no. 11972. 15 specimens; 5 males, 42.3-71.9 mm ML; 10 females, 45.0-54.6 mm ML. Kantang Fish Landing. Coll. A. Nateewathana. 14 February 1996. PMBC no. 11973. 13 specimens; 1 male, 99.9 mm ML; 12 females, 75.4-144.8 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 17 August 1996.

DESCRIPTION: Medium to large sized animals (ML to 147 mm, TL to 813 mm); mantle elongate-oval (Fig. 7A, a) (MWI 44.0-47.8); head small, narrower than mantle (HWI 22.8-25.9), separated from mantle by moderate constriction; eyes small, prominent but not projecting from the surface of head. Funnel moderately large, stout, bluntly tapered (FuFI 32.5-41.2); funnel organ W-shaped, limbs thin, outer limbs three-quarters as long as median limbs (Fig. 7A, b). Arms very long (MAI 21.9-22.9) (5-8 times ML), slender, tapering to narrow tips. Arms unequal, arm order I.II.III.IV. Arm suckers biserial, 7th to 11th pairs enlarged on arm I in male, uniform on all arms in fe-

males. Third right arm of males hectocotylized (Fig.7A, c), shorter than its opposite arm (OAI 42.3-69.1); ligula 7-10% of ML; ligula groove long, well marked, with

transverse ridges; calamus very distinct, conical, almost triangular-shaped (CaLI 24.6-43.2); hectocotylized arm with 86-106 suckers. Web shallow (WDI 8.6-14.7), web

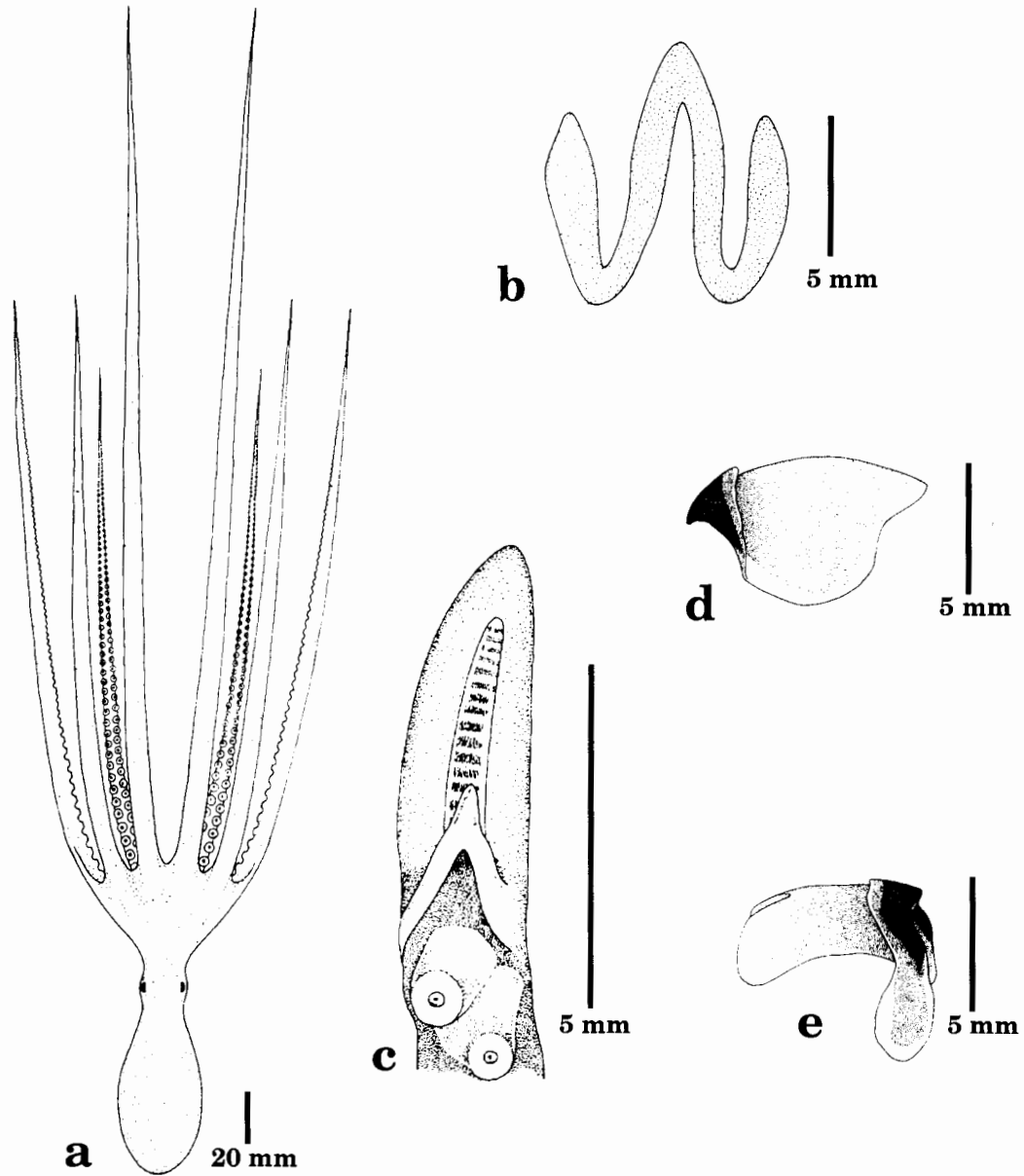


Figure 7A. *Octopus luteus*. (a), dorsal view of 78.5 mm ML of male. (b), funnel organ of 40.2 mm ML of male. (c), hectocotylus of 65.5 mm of male. (d), upper beak of 86.0 mm ML of male. (e), lower beak of 86.0 mm ML of male.

formula A.B.D.C.=E. or A.B.D.E.C. Upper beak (Fig. 7A, d) with short, conical, slightly curved rostrum and narrow hood. Lower beak (Fig. 7A, e) with short, blunt rostrum, narrow hood, widely spread wings and long, slightly curved lateral walls. Radula with seven teeth and two marginal plates in each transverse row (Fig. 7B, f); rachidian tooth

with two lateral cusps on either side of moderate short, robust medial cone; first lateral teeth short, unicuspidate with slightly broader base; second lateral teeth unicuspidate, with long, curved base; lateral marginal teeth long, slightly curved and robust; marginal plates oblong. Gill lamellae 10-13. Mature females with numerous small eggs

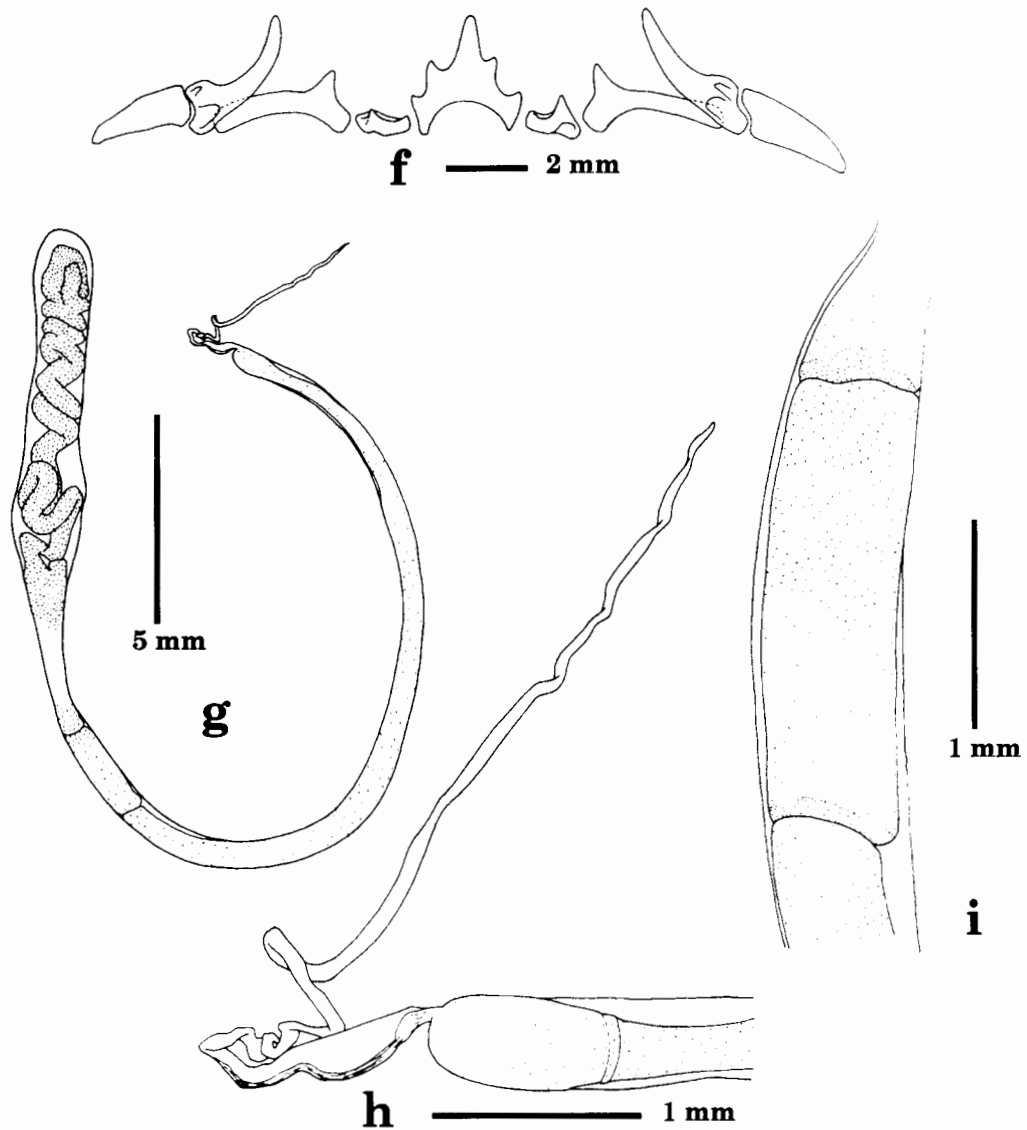


Figure 7B. *Octopus luteus*. (f), radula of 86.0 mm ML of male. (g), whole spermatophore of 86.0 mm ML of male. (h), enlargement of oral cap. (i), enlargement of cement body.

Table 7. Means, standard deviations and ranges of selected measurements and indices (in percent) of *O. luteus* from the Andaman Sea, Thailand.

Index	MALES				FEMALES			
	n	mean	s.d.(n-1)	Range	n	mean	s.d.(n-1)	Range
ML(mm)	5	78.5	16.9	54.5-99.8	5	102.9	33.0	70.5-147.0
TL(mm)	5	475.6	148.8	293.0-695.0	5	561.2	167.3	403.0-813.0
MWI	5	44.0	4.2	38.3-48.9	5	47.8	9.3	31.9-56.4
VML(mm)	5	61.6	8.7	50.0-72.4	5	69.5	20.9	44.2-87.5
HWI	5	25.9	8.7	16.9-35.6	5	22.8	2.8	20.7-27.8
MAI	5	21.9	2.3	18.4-24.7	5	22.9	1.5	21.1-25.2
AL _I I	5	460.6	51.5	404.6-544.1	5	398.9	44.4	347.5-448.3
AL _{II} I	5	369.4	28.9	337.6-405.6	5	394.5	65.7	300.4-473.2
AL _{III} I	5	338.3	22.2	318.5-373.2	5	360.7	61.2	258.3-411.6
AL _{IV} I	5	310.5	24.9	277.8-343.1	5	301.3	60.8	227.0-379.9
AWI	5	13.2	3.5	9.3-17.2	5	14.8	4.5	9.3-18.9
WDI	5	8.6	1.9	6.3-11.0	5	14.7	4.6	6.7-17.6
ASC	5	197.0	38.0	132.0-230.0	5	177.0	31.0	133.0-208.0
HcASC	5	94.0	8.0	86.0-106.0				
HcAI	5	214.0	13.0	200.0-231.2				
OAI	5	61.3	10.9	42.3-69.1				
LLI	5	8.2	1.4	7.2-10.6				
CaLI	5	34.8	7.6	24.6-43.2				
SpLI	4	38.8	11.4	29.1-55.0				
SpWI	4	4.1	0.6	3.3-4.6				
SpRI	4	34.9	5.8	28.9-42.8				
FuLI	4	41.2	7.1	31.8-49.4	5	32.5	6.9	21.9-41.1
FFuI	4	20.9	2.7	17.8-23.5	5	21.6	5.9	12.6-28.3

(approximately 4 mm long). Male with short, very stout penis; spermatophores (Fig. 7B, g-i) long (SpLI 29.1-55), slightly thick (SpWI 3.3-4.6), with short, coiled sperm reservoir (SpRI 28.9-42.8); few spermatophores in each male, usually less than 10 (2-8).

Integumental sculpture with small fine patches distributed on dorsal mantle and head, however the skin rather smooth in most specimens. Colour in preserved ethyl alcohol reddish brown throughout with irregular darker blotches dorsally, lighter

ventrally.

DISTRIBUTION: Taiwan, Hong Kong and the Andaman Sea.

REMARKS: *O. luteus* is very similar to *Cistopus indicus* in general appearance. The two species are often confused, and mixed together in fish markets and fish landings. However, *O. luteus* can easily be separated from *C. indicus*. *O. luteus* lacks water pouches, possess prominent ligula and distinct calamus, small-egg type and few spermatophores (less than 10).

Octopus marginatus Taki, 1964
(Figs. 8 A & B, Tab. 8)

Octopus marginatus - Taki 1964: 304-307, text-figs. 47-48, pl. 5; - Norman & Hochberg 1994: 152-153, fig. 2B.

Octopus aegina - Robson 1929: 113-115, pl. V, fig. 1, text-figs. 31-32; - Voss & Williamson 1971: 80, 82, text-fig. 32, pl. 24; - Roper *et al.* 1984: 192; - Silas *et al.* 1986a: 34-35.

MATERIAL EXAMINED: PMBC no. 11911. 2 males, 46.5-47.2 mm ML. Phang-nga artificial reef between Ko Kainok and Ko Lipi. R/V Pramong 10. Shrimp trawl. Coll. K. Yoodee. 20 March 1995. PMBC no. 11912. 3 males, 47.7-93.1 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 4 September 1995. PMBC no. 11913. 2 males, 47.7-104.0 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 15 December 1994. PMBC no. 11914. 33 specimens; 13 males, 26.6-62.3 mm ML; 20 females, 33.2-90.0 mm ML.

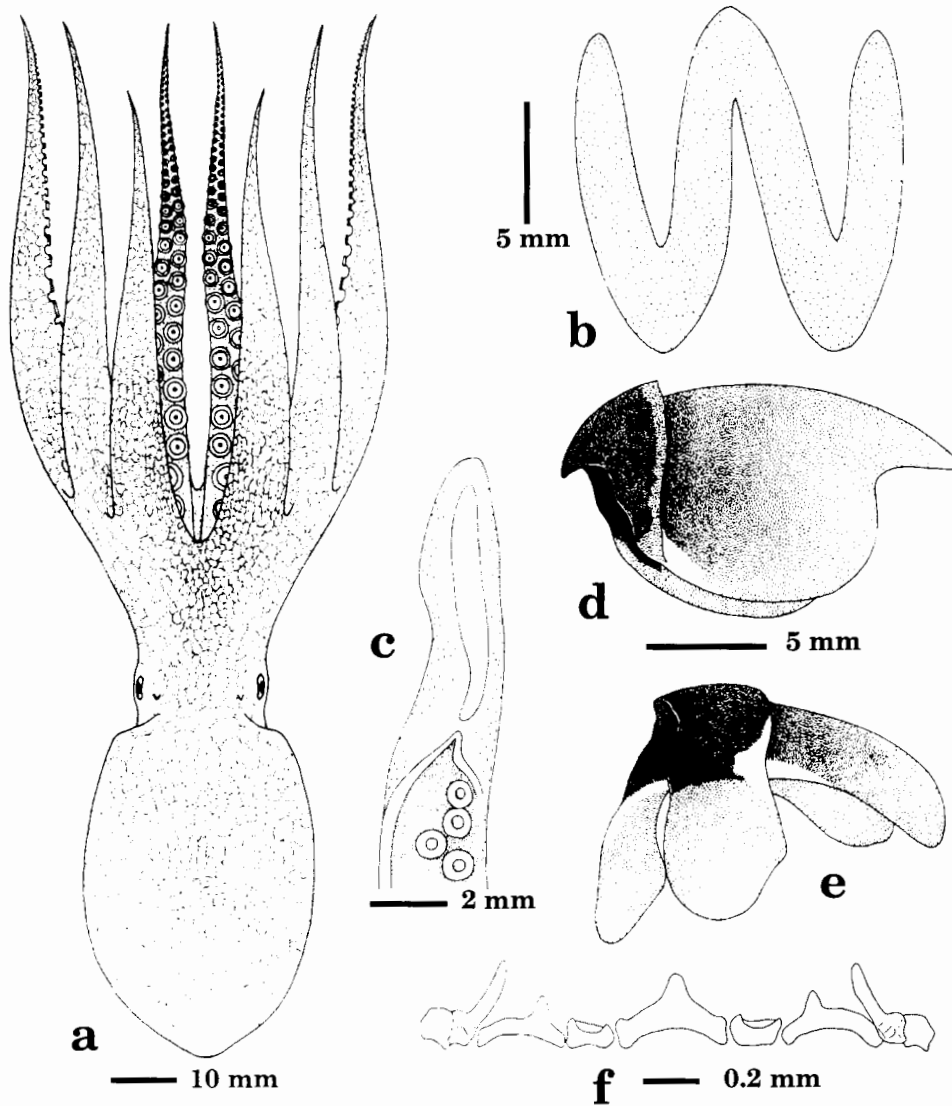


Figure 8A. *Octopus marginatus*. (a), dorsal view of 54.6 mm ML of male. (b), funnel organ of 50.8 mm ML of male. (c), hectocotylus of 64.8 mm ML of male. (d), upper beak of 95.4 mm ML of female. (e), lower beak of 95.4 mm ML of female. (f), radula of 95.4 mm ML of male.

Kantang Fish Landing, Trang. Coll. A. Nateewathana. 14 February 1996. PMBC no. 11915. 13 specimens; 5 males, 33.4-48.6 mm ML; 8 females, 30.6-59.0 mm ML. Phuket Fish Market. Coll. A. Nateewathana. 25 December 1994. PMBC no. 11916. 1 female, 89.0 mm ML. Fishing boat. Trawled between Thai-Malaysian border. Coll. S. Utsaha. 19 December 1994. PMBC no. 11917. 6 specimens; 5 males, 44.0-56.5 mm ML; 1 female, 53.3 mm ML. Takuapa Fish Market, Phang-nga. Coll. A. Nateewathana. 23 June 1989. PMBC no. 11918. 1 female, 45.7 mm ML. Phang-nga Bay. Push net. Coll. S. Utsaha. 18 August 1988. PMBC no. 11919. 1 female, 39.0 mm ML. Tabli Fish Market, Ranong. Coll.

A. Nateewathana. 2 July 1991. PMBC no. 11920. 1 male, 79.0 mm ML. Ranong Fish Market. Coll. A. Nateewathana. 30 January 1996. PMBC no. 11921. 4 specimens; 1 male, 48.6 mm ML; 3 females, 57.9-58.0 mm ML. Jabelung Fish Landing, Satun. Coll. A. Nateewathana. 8 June 1991. PMBC no. 11922. 2 males, 58.5-64.7 mm ML. Kuraburi Fish Landing, Phang-nga. Coll. A. Nateewathana. 10 June 1991. PMBC no. 11923. 2 males, 38.4-50.9 mm ML. La-oon Fish Market, Ranong. Coll. A. Nateewathana. 5 July 1994. PMBC no. 11924. 1 female, 46.6 mm ML. Ao Luk, Krabi. Push net. Coll. S. Utsaha. 23 June 1987.

DESCRIPTION: Moderately sized animals.

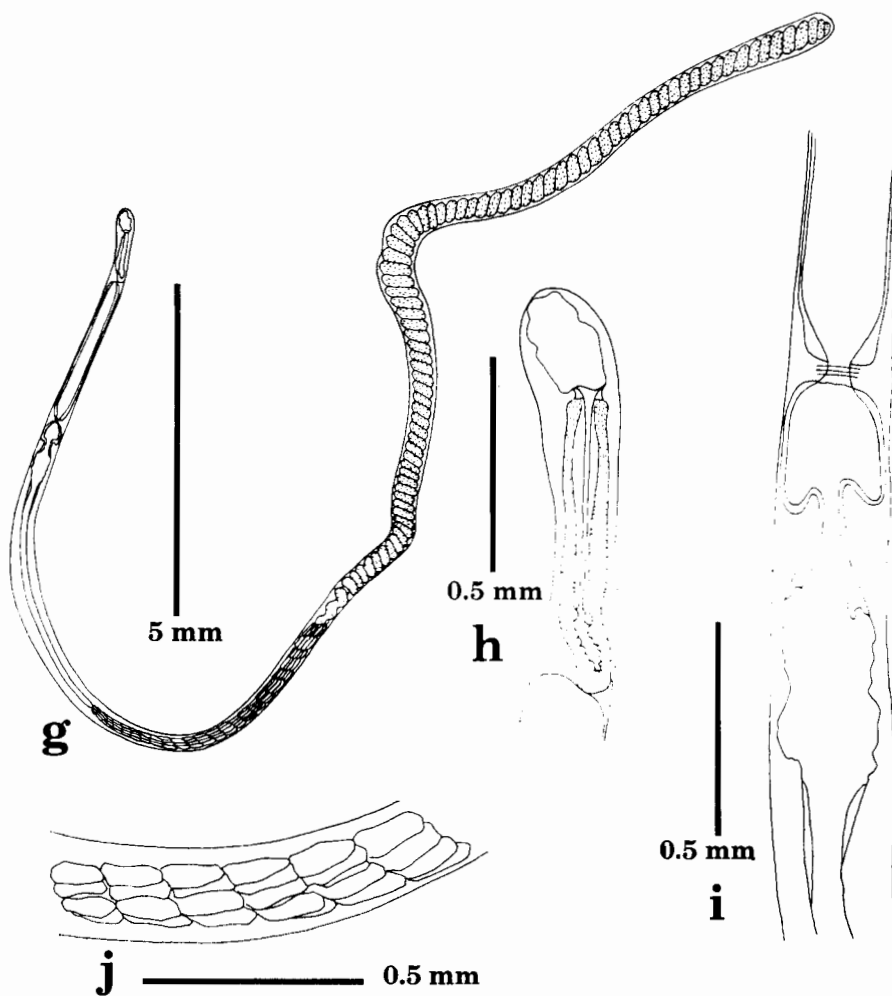


Figure 8B. *Octopus marginatus*. (g). whole spermatophore of 56.0 mm ML of male. (h), enlargement of oral cap. (i)-(j), enlargement of cement body.

Table 8. Means, standard deviations and ranges of selected measurements and indices (in percent) of *O. marginatus* from the Andaman Sea, Thailand.

Index	MALES				FEMALES			
	n	mean	s.d.(n-1)	Range	n	mean	s.d.(n-1)	Range
ML(mm)	5	63.0	17.2	48.7-92.8	5	77.5	8.6	66.3-88.6
TL(mm)	5	232.9	63.3	172.0-244.8	5	299.2	25.8	261.2-324.6
MWI	5	48.9	3.1	43.7-51.9	5	56.4	6.0	35.5-59.4
VML(mm)	5	41.7	8.6	33.9-56.1	5	56.2	6.3	49.4-66.0
HWI	5	24.3	5.6	18.0-31.6	5	20.9	1.6	19.0-23.0
MAI	5	33.6	6.5	22.3-38.3	5	36.5	3.7	30.1-39.5
AL _I I	5	206.9	15.6	187.3-226.3	5	212.0	42.5	160.7-270.0
AL _{II} I	5	241.2	30.6	215.6-294.2	5	250.7	42.9	185.6-303.2
AL _{III} I	5	237.0	40.3	168.7-268.3	5	260.0	39.2	231.5-327.3
AL _{IV} I	5	256.5	27.1	209.6-279.3	5	266.1	44.9	206.5-331.8
AWI	5	16.1	3.4	13.3-21.3	5	13.9	1.8	11.4-16.5
WDI	5	24.2	1.4	22.8-26.4	5	21.2	3.7	17.3-26.3
ASC	5	122.0	16.0	105.0-142.0	5	129	7.0	120.0-140.0
HcASC	5	63.0	4.0	58.0-68.0				
HcAI	5	183.9	27.1	154.0-224.5				
OAI	5	79.7	18.9	61.8-108.4				
LLI	5	4.5	1.4	3.2-6.3				
CaLI	4	28.4	13.7	14.1-42.8				
SpLI	3	104.0	12.9	89.4-113.9				
SpWI	3	1.2	0.6	0.7-1.9				
SpRI	3	68.6	12.4	57.8-82.1				
FuLI	5	35.2	5.2	31.6-44.4	5	32.7	3.7	29.1-38.9
FFuI	5	22.6	4.4	15.8-27.5	5	28.6	4.3	21.4-31.8

Mantle rounded to oval (Fig. 8A, a). Head small, with a narrow neck region. Eyes prominent, a single cirrus dorsal and slightly posterior to each eye, rather indistinct in the small specimens. Funnel rather short, bluntly tapered, free portion about half of its length; funnel organ inconspicuous, W-shaped (Fig. 8A, b) with thick median limbs, outer limbs slightly shorter than the median limb. Arms long and robust, subequal in length, in the order of IV.III.II.I. Arm I conspicuously shorter than the others. Arm suckers biserial throughout, cup-like and without chitinous ring; normal suckers large

at the base, gradually smaller to distal tips; a few slightly enlarged suckers at the base of the arms in males. Web very shallow between arm I, usually in order of D.E.C.B.A. Right arm III of male hectocotyized (Fig. 8A, c), shorter than other arms (HcAI 184); ligula rather short (LLI 4.5) with very shallow groove and without ridges, calamus very small and distinct. Male genital organ with long, slender penis and a long diverticulum together forming a U-shape structure terminating with additional secondary loop. Gill lamellae 7-10. Upper beak (Fig. 8A, d) with small hood and short, curved rostrum.

Lower beak (Fig. 8A, e) with rather short rostrum, narrow hood, slightly larger wings and long slightly curved lateral walls. Radula (Fig. 8A, f) with seven transverse rows of teeth; rachidian tooth tricuspid; first and second lateral teeth with broad and narrow base; lateral marginal *tooth long and slender; marginal plate* oval. Spermatophores (Fig. 8B, g-j) long and unarmed. Ink sac present.

Integumental sculpture consists of small tubercles or a fine papillae and fine reticulate pattern on the dorsal surface, finer on the ventral surface. Colour in alcohol brownish red to dark brown on dorsal, paler on ventral side; papillae surrounded by a circle of very minute reddish brown chromatophores on the mantle; dark brown to purple angular reticulations present on lateral arm crown.

DISTRIBUTION: It is a wide-ranging tropical species found in muddy coastal waters of the Indian Ocean and Southeast Asia, from the Red Sea to the Coral Sea (Norman & Sweeney, in press).

REMARKS: *Octopus marginatus* was first described, based on a single immature female from southern Japan, by Taki (1964). He placed the species in the species group of *O. aegina*. Recently, Norman & Hochberg (1994) and Norman & Sweeney (in press) pointed out that Voss & Williamson (1971) treat this species from Hong Kong under the name *O. aegina*. In addition *O. striolatus* from China described by Dong (1976) is considered to be a junior synonym of *O. marginatus*.

The present material agrees with previous descriptions by Norman & Hochberg (1994) and Norman & Sweeney (in press). *O. marginatus* is one of the most common species in the markets along the coasts.

Octopus ocellate sp. A
(Figs. 9 A & B, Tab. 9)

Octopus sp. 5 - Norman & Hochberg 1994: 156-157.

Octopus sp. 1 - Norman & Sweeney (in press): figs. 4 f-g.

MATERIAL EXAMINED: PMBC no. 11925. 1 female, 61.8 mm ML. In front of Ko Dam Kwan, Phangnga Bay. R/V Pramong 10. Trawled. Coll. K. Yoodee. 22 May 1994. PMBC no. 11926. 5 females, 15.9-22.3 mm ML. Lat. 06°52'3" N, Long 98°30'5" E. M/V Paknam. Trawled, depth 100 m. Coll. A. Nateewathana. 17 March 1989. PMBC no. 11927. 1 female, 40.7 mm ML. Lat. 07°47'3" N, Long. 98°50'1" E. *Ko Phi Phi Don*. R/V Pramong 10. Trawled, depth 25 m. Coll. K. Yoodee. 23 June 1989. PMBC no. 11928. 3 specimens; 2 females, 36.5-51.5 mm ML; 1 male, 39.2 mm ML. Lat. 06°43' .6 N, Long. 98°25' .0 E. M/V Paknam. Trawled, depth 76 m. Coll. A. Nateewathana. 17 March 1989. PMBC no. 11929. 1 male, 33.4 mm ML. Lat. 17°14'37" N, Long. 94°21'04" E. R/V Chulabhorn. Trawled, depth 56 m. Coll. A. Nateewathana. 19 November 1989. PMBC no. 11930. 4 specimens; 2 males, 28.5-41.0 mm ML; 2 females, 21.4-31.7 mm ML. Lat. 06°58'13" N, Long. 98°48'52" E. M/V Paknam. Trawled, depth 78 m. Coll. A. Nateewathana. 15 March 1989. PMBC no. 11931. 7 specimens; 3 males, 33.8-51.0 mm ML; 4 females, 36.5-54.9 mm ML. Lat. 08°59'72" N, Long. 97°43'29" E. R/V Chakratong Tongyai. Trawled, depth 80.7 m. Coll. S. Bussarawit. 20 April 1996. PMBC no. 11932. 5 specimens; 2 males, 49.8-61.0 mm ML; 3 females, 41.5-75.0 mm ML. Lat. 09°32'5" N, Long. 97°38'0" E. R/V Chakratong Tongyai. Trawled, depth 82.7 m. Coll. S. Bussarawit. 19 April 1996. PMBC no. 11933. 3 specimens; 1 male, 56.3 mm ML; 2 females, 40.3-43.9 mm ML. Lat. 09°31'32" N, Long. 97°37'92" E. R/V Chakratong Tongyai. Triangular dredge, depth 86.7 m. Coll. S. Bussarawit. 19 April 1996. PMBC no. 11934. 1 female, 35.3 mm ML. Lat. 07°59'1" N, Long. 98°30'0" E. R/V Pramong 10. Trawled, depth 29 m. Coll. K. Yoodee. 25 June 1989. PMBC no. 11935. 9 specimens; 6 males, 36.8-37.5 mm ML; 3 females, 23.3-40.0 mm ML. Lat. 07°04'4" N, Long. 98°53'5" E. M/V Paknam. Trawled, depth 70 m. Coll. A. Nateewathana. 15 March 1989. PMBC no. 11936. 3 specimens; 1 male, 31.0 mm ML; 2 females, 33.1-41.7 mm ML. Lat. 09°33'7" N, Long. 97°49'0" E. R/V Chakratong Tongyai. Triangular dredge, depth 70 m. Coll. S. Bussarawit. 18 April 1996. **DESCRIPTION:** Medium-sized animals (ML to 76 mm; TL to 212 mm). Mantle (Fig. 9A, a) elongate ovoid (MWI 53.8-61.3); Head wide, slightly narrower than mantle (HWI 30.8-37.8), demarcated from mantle by con-

striction; eye small, conspicuous, projecting above surface of head. Funnel moderately large, slender, bluntly tapered (FuLI 32.5-34.5); funnel organ W-shaped, outer limbs

about 95 % of medial limbs. Arms moderately long (MAI 40-43) (2-3 times ML), robust, tapering to narrow tips. Arms unequal, arm order IV.III.II.I. Arm suckers biserial

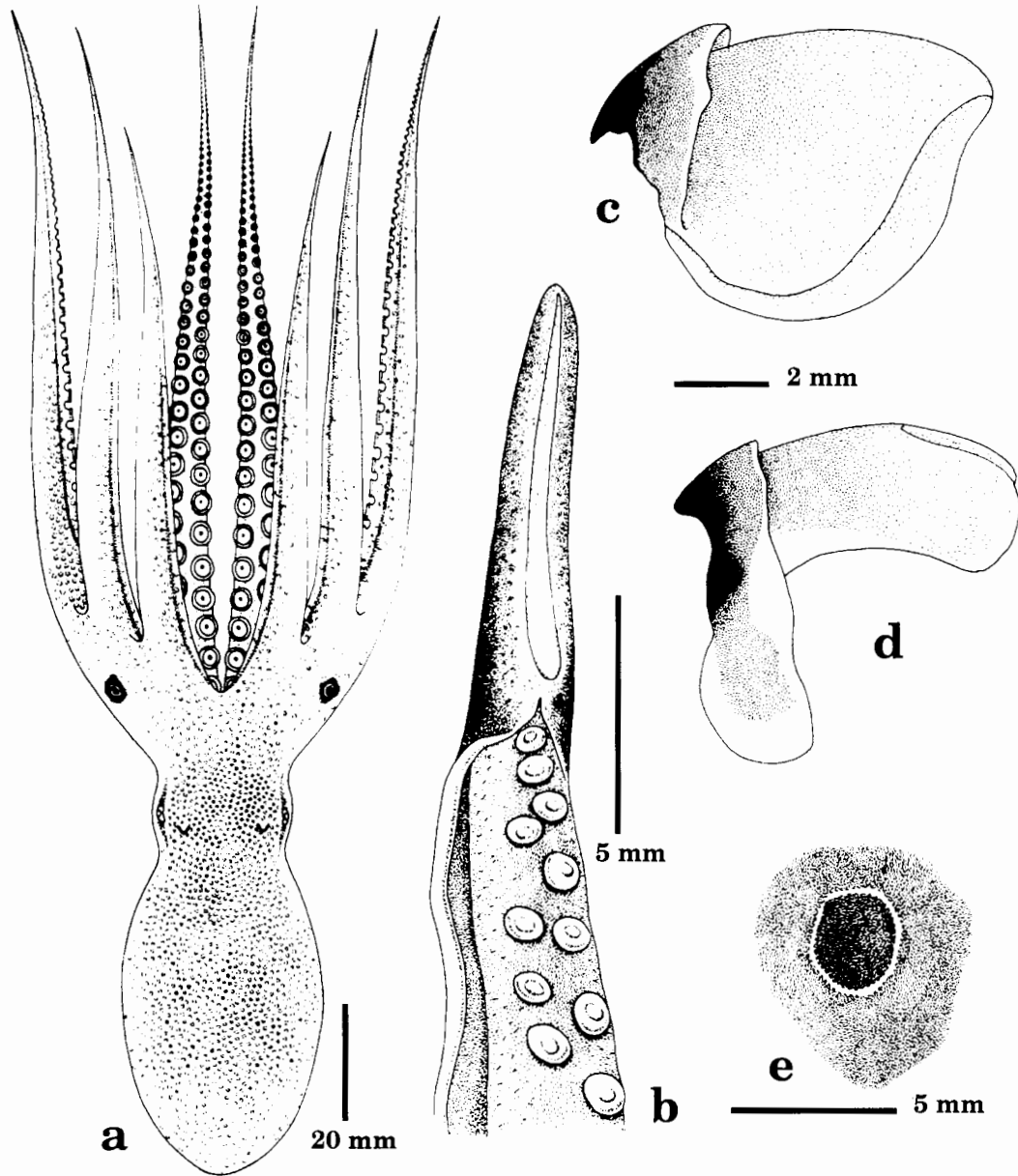


Figure 9A. *Octopus ocellate* sp. A. (a), dorsal view of 59.9 mm of female. (b), hectocotylus of 62.2 mm ML of male. (c), upper beak of 69.2 mm ML of female. (d), lower beak of 69.2 mm ML of female. (e), ocellus of 59.9 mm ML of male.

throughout, all suckers in female similarly sized, 3rd and 4th pairs of suckers in male enlarged. Third right arm of males hectocotylized somewhat shorter than its

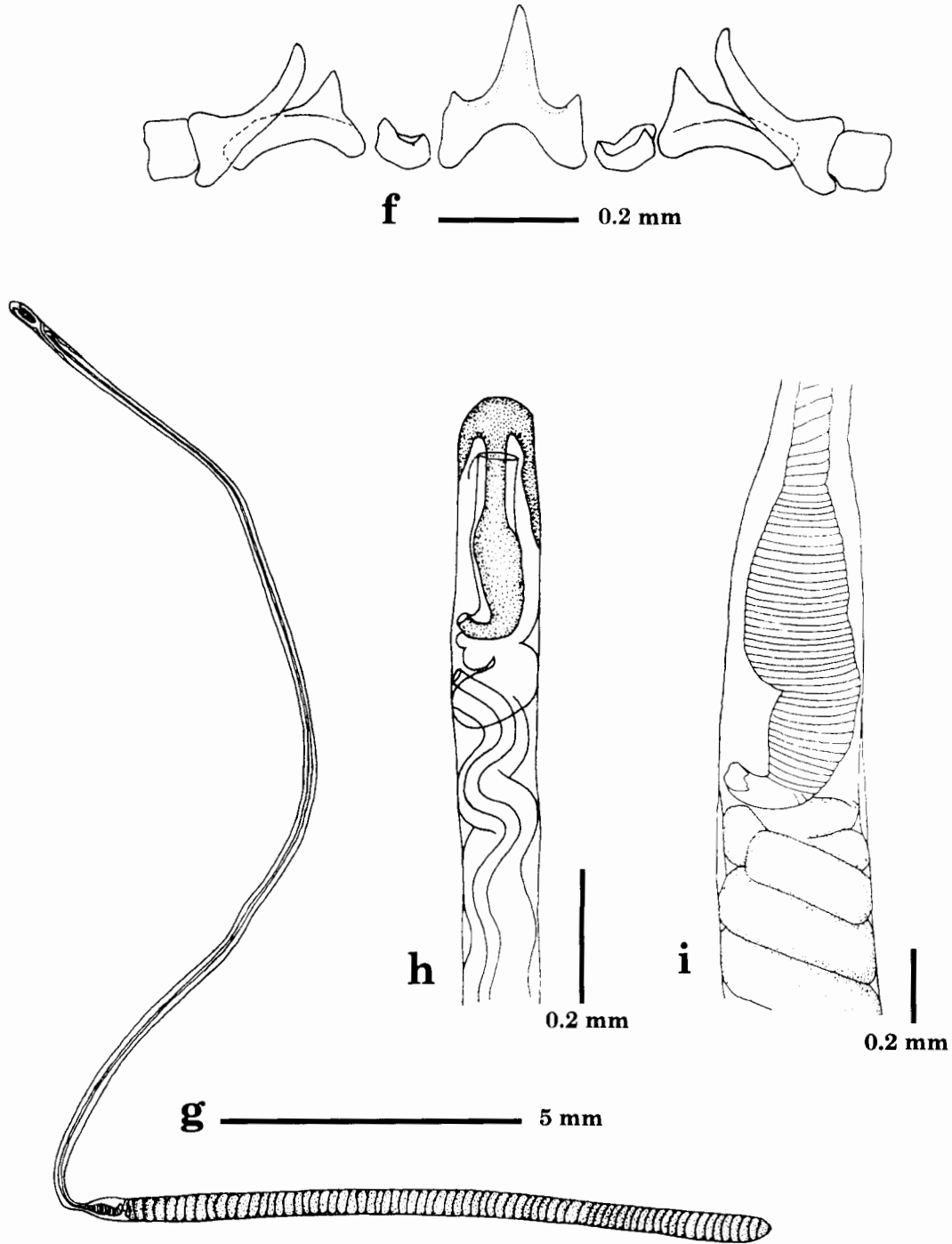


Figure 9B. *Octopus ocellate* sp. A. (f), radula of 69.2 mm ML of female. (g), whole spermatophore of 61.0 mm ML of male. (h), enlargement of oral cap. (i), enlargement of cement body.

Table 9. Means, standard deviations and ranges of selected measurements and indices (in percent) of *Octopus ocellate* sp. A from the Andaman Sea, Thailand.

Index	MALES				FEMALES			
	n	mean	s.d.(n-1)	Range	n	mean	s.d.(n-1)	Range
ML(mm)	5	50.7	7.6	39.8-61.0	5	55.8	13.7	42.7-76.2
TL(mm)	5	174.5	20.1	147.0-203.0	5	188.7	24.3	149.0-212.0
MWI	5	61.3	15.5	48.6-81.6	5	53.8	6.5	44.2-62.2
VML(mm)	5	38.2	6.1	32.5-45.2	5	44.1	10.7	33.8-60.4
HWI	5	37.8	5.3	32.5-45.1	5	30.8	5.4	21.9-34.9
MAI	5	40.0	3.5	36.6-45.3	5	43.4	9.9	32.9-58.8
AL _I I	5	182.3	28.8	157.6-229.4	5	161.1	33.4	131.2-218.2
AL _{II} I	5	216.5	26.5	186.1-243.9	5	189.3	43.1	139.6-257.7
AL _{III} I	5	243.5	25.4	203.1-267.2	5	198.2	21.3	162.7-217.1
AL _{IV} I	5	251.2	21.4	220.7-272.9	5	239.6	50.5	170.1-303.9
AWI	5	17.4	5.7	14.1-27.5	5	13.8	2.1	11.6-17.3
WDI	5	27.8	4.1	22.7-32.5	5	21.9	4.9	15.7-29.3
ASC	5	147.0	21.0	134.0-184.0	5	177.0	22.0	140.0-198.0
HcASC	5	73.0	8.0	63.0-82.0				
HcAI	5	198.7	21.3	164.7-221.3				
OAI	5	82.2	11.0	65.5-96.1				
LLI	5	19.1	5.0	15.1-27.6				
CaLI	5	14.7	2.4	11.2-17.5				
SpLI	3	51.8	6.8	44.6-58.2				
SpWI	3	2.0	0.2	1.8-2.2				
SpRI	3	46.0	3.2	42.4-48.5				
FuLI	5	34.5	5.6	29.9-43.2	5	32.5	3.9	27.0-38.0
FFuI	5	22.1	8.4	15.0-35.7	5	19.3	3.7	13.8-23.4

opposite arm (OAI 82.2); ligula greatly elongated (LLI 15.1-27.6) with very shallow groove (Fig. 9A, b); calamus short, distinct (CaLI 11.2-17.5); hectocotylized arm with 63-82 suckers. Webs moderately deep (WDI 21.9-27.8), web formula D.E.C.B.A. Upper beak (Fig. 9A, c) with moderate hood and slightly curved rostrum, concave on cutting edge. Lower beak (Fig. 9A, d) with conical rostrum, narrow hood, long wings and slightly curved lateral wall. Radula with seven and two marginal plates in each transverse row (Fig. 9B, f); rachidian tooth with 1 lateral cusp on either side of a moderately

long medial cone; first lateral teeth small with cusps at lateral edges; second lateral teeth unicuspidate, conical-shaped with curved base; lateral marginal teeth unicuspidate, long and curved; marginal plates rectangular. Ink sac present. Gill lamellae 6-9. Mature female with numerous small eggs (2-3 mm long; 0.9-1.0 mm wide). Male with very long penis and a small coiled diverticulum; spermatophores (Fig. 9B, g-i) long (SpLI 44.6-58.2), slender (SpWI 1.8-2.2), with long, coiled reservoir (SpRI 42.4-48.5); number of spermatophores low, about 11-16.

Integumental sculpture consists of a pattern

of fine, rounded and closely set epidermal tubercles; tubercles cover dorsal and ventral surfaces of arms, head and mantle; a slightly enlarged tubercle present above each eye. Colour in ethyl alcohol reddish-brown on dorsal surfaces of head, arms and mantle, white and cream on ventral surfaces; a short longitudinal brownish black bar through eye; narrow dark stripe along dorso-lateral face of arms I-III; ocellus with a small pink/purple iridescent ring (Fig. 9A, e) on the base between arms II and III.

DISTRIBUTION: Hong Kong(?), Gulf of Thailand(?), the Philippines, and the Andaman Sea.

REMARKS: *Octopus ocellate* sp. A. is an ocellate octopod which is characterized by having the ocellus with an iridescent ring, greatly elongated ligula, and a narrow dark longitudinal line along the dorsal edges of arms I-III. The present material is similar to the material from Hong Kong and the Philippines, described as *Octopus* sp. 5 and *Octopus* sp. 1 by Norman & Hochberg (1994) and Norman & Sweeney (in press), respectively. They mentioned that it is an undescribed species and the specimens from the Philippines may be conspecific with a similarly undescribed form found in Indonesia and in the Gulf of Thailand where it is harvested in commercial quantities.

Eventhough the species is rather common on the continental shelf along the Andaman Sea coast of Thailand, it seems to be an undescribed species. It is in accordance with the *Octopus* sp. 5 and *Octopus* sp. 1 in the region. A systematic revision of the ocellate species will be published in the near future (Norman, pers comm.). In consequence, the present species is referred to as *Octopus ocellate* sp. A.

Octopus ocellate sp. B
(Figs. 10 A & B, Tab. 10)

Octopus membranaceus - Roper *et al.* 1984: 206; - Sithigorngul 1974: 150-156, text-figs. 46-48, pl. 19.1.

Octopus "membranaceous" Quoy & Gaimard 1832" - Chotiyaputta *et al.* 1992: 82, fig. 34.

MATERIAL EXAMINED: PMBC no. 11951. 33 specimens; 17 males, 47.5-59.3 mm ML; 15 females, 51.9-63.7 mm ML. Thai-Malaysian border. Trawled, depth 80-90 m. Coll. S. Utsaha. 17 December 1994. PMBC no. 11952. 30 specimens; 21 males, 52.8-64.8 mm ML; 8 females, 43.5-61.4 mm ML. Thai-Malaysian border. Trawled, depth 80-90 m. Coll. S. Utsaha. 19 December 1994. PMBC no. 11953. 11 specimens; 4 males, 50.0-53.0 mm ML; 7 females, 46.0-55.2 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 15 December 1994. PMBC no. 11954. 13 specimens; 11 males, 44.8-53.0 mm ML; 2 females, 53.0-63.3 mm ML. Ranong Fish Landing. Coll. A. Nateewathana. 30 January 1996. PMBC no. 11955. 8 specimens; 4 males, 58.2-59.9 mm ML; 4 females, 43.8-50.6 mm ML. Trang Fish Market. Coll. A. Nateewathana. 27 January 1996. PMBC no. 11956. 26 specimens; 15 males, 47.5-47.9 mm ML; 11 females, 32.2-54.3 mm ML. Krabi Fish Market. Coll. A. Nateewathana. 14 February 1996. PMBC no. 11957. 6 specimens; 5 males, 32.8-51.9 mm ML; 1 female, 62.5 mm ML. Kantang Fish Landing, Trang. Coll. A. Nateewathana. 3 July 1991. PMBC no. 11958. 1 male, 44.3 mm ML. La-oon Fish Market, Ranong. Coll. A. Nateewathana. 5 July 1994. PMBC no. 11959. 1 female, 44.5 mm ML. Off Ko Phuket. R/V Chulabhorn. Trawled, depth 88 m. Coll. A. Nateewathana. 18 March 1995. PMBC no. 11960. 1 male, 57.0 mm ML. Artificial reef between Ko Kai Nok and Ko Lipi. R/V Pramong 10. Shrimp trawl. Coll. K. Yoodee. 20 March 1995.

DESCRIPTION: Medium-sized animals (ML to 64 mm; TL 272 mm); mantle saccular to elongate ovoid (Fig. 10A, a); head small and narrower than mantle (HWI 28.5-35.4), demarcated from mantle by moderate constriction; eyes small, not projecting above surface of head. Funnel large, robust (FuLI 37.3-38.6), bluntly tapered with moderately long free portion (FFuI 24.1-24.5); funnel organ W-shaped (Fig. 10A, b), limbs thick, outer limbs almost as long as median limbs. Arms long (MAI 33.6-35.0) (2-3 times ML), slender and narrow tips. Arm lengths subequal, arm order IV.III.II.I. Arm suckers biserial, 3rd and 4th pairs of suckers enlarged on arms II and III in males, uniformly in females. Third right arm in male hectocotylized (Fig. 10A, c), slightly shorter than its opposite arm (OAI 73.8-99.3); ligula slender, long (LLI 21.9-33.5); ligula groove

long with incomplete transverse ridges; calamus short, slightly pointed (CaLI 7.9-14.1); hectocotylied arm with 51-70 suckers. Web moderately deep (WDI 19.0-20.6); web formula D.=E.C.B.A. Upper beak (Fig.

10A, e) with long, curved rostrum, concave on cutting edge and short hood. Lower beak (Fig. 10A, f) with conical, short rostrum, narrow hood, widely spread wings and long, slightly curved lateral walls. Radula with

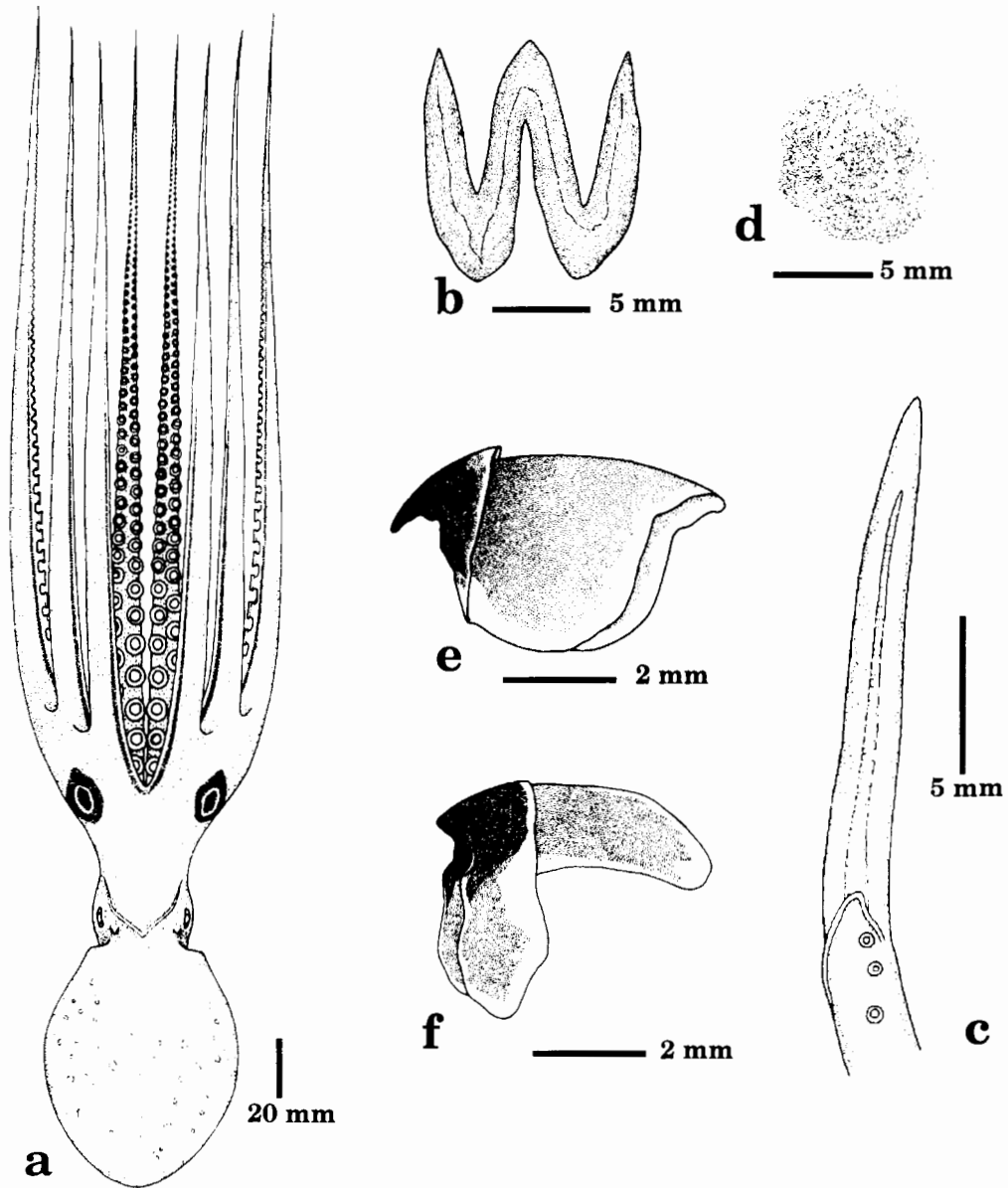


Figure 10A. *Octopus ocellate* sp. B. (a), dorsal view of 49.7 mm ML of male. (b), funnel organ of 49.7 mm ML of male. (c), hectocotylus of 49.7 mm ML of male. (d), ocellus. (e), upper beak of 49.7 mm ML of male.

seven teeth and two marginal plates in a single transverse row (Fig. 10B, g); rachidian tooth with one lateral cusp on either side of a moderate medial cone; first lateral teeth with two small cusps on lateral edges; second lateral teeth unicuspidate and short with long, slightly curved base; lateral marginal teeth long and slender; marginal plates oblong. Ink sac present. Gill lamellae 7-8. Mature female with numerous, small eggs.

Male with long penis and a single coiled diverticulum; spermatophores (Fig. 10B, h-j) long (SpLI 34.8-39.8), slender (SpWI 2.2-3.2) with relatively short, coiled sperm reservoir (SpRI 22.4-50.0).

Integumental sculpture with small, close-set tubercles over head, mantle and arms; 1-2 cirri over each eye. Live specimens brownish-green colour dorsally and paler white ventrally; numerous small, rounded white

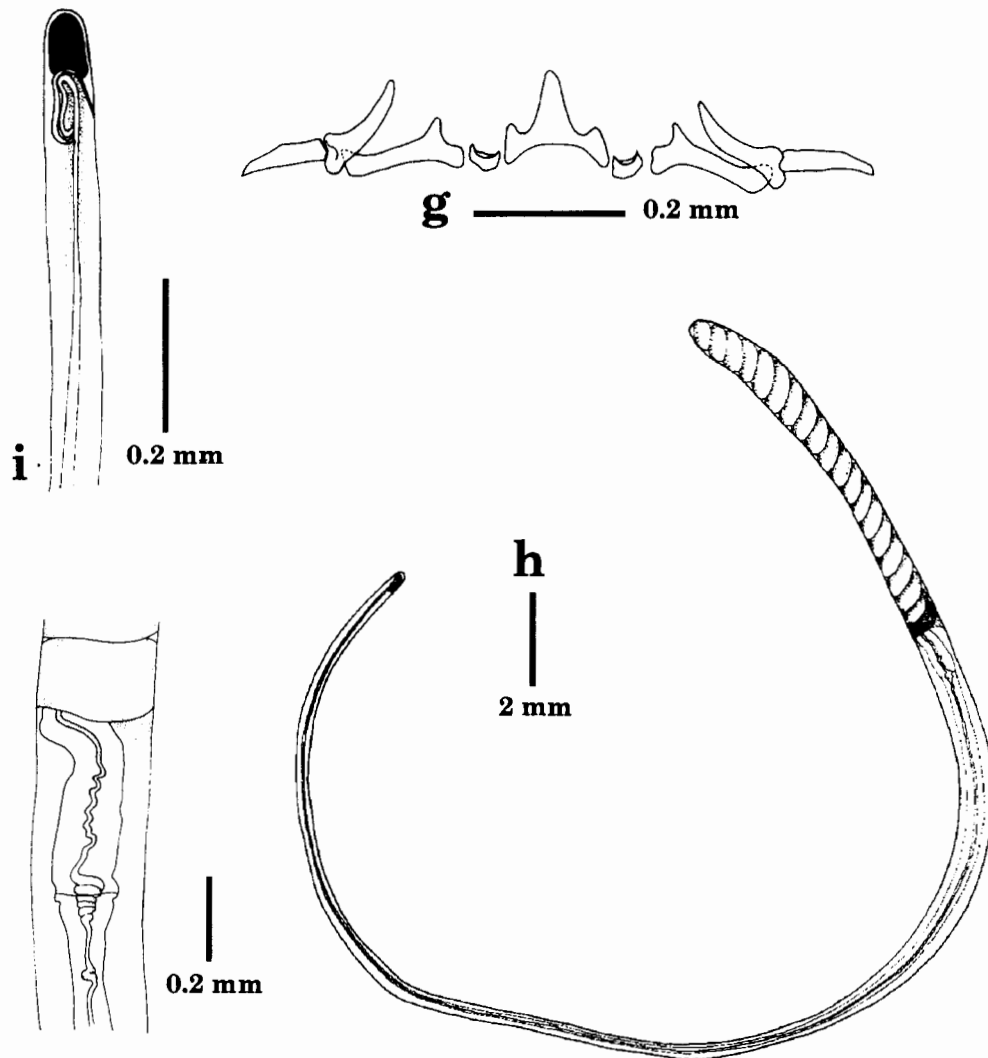


Figure 10B. *Octopus ocellate* sp. B. (f), lower beak of 49.7 mm ML of male. (g), radula of 49.7 mm ML of male. (h), whole spermatophore of 49.7 mm ML of male. (i), enlargement of oral cap. (j), enlargement of cement body.

Table 10. Means, standard deviations and ranges of selected measurements and indices (in percent) of *Octopus ocellate* sp. B from the Andaman Sea, Thailand.

Index	MALES				FEMALES			
	n	mean	s.d.(n-1)	Range	n	mean	s.d.(n-1)	Range
ML(mm)	5	51.3	6.1	44.4-58.5	5	60.2	7.1	47.8-64.5
TL(mm)	5	211.0	24.3	178.0-238	5	251.4	36.7	186.0-272.0
MWI	5	71.9	3.3	68.0-75.7	5	69.6	3.6	64.2-73.8
VML(mm)	5		2.5	33.1-39.8	5	43.8	4.5	36.0-46.9
HWI	5	35.4	4.1	29.1-40.4	5	28.5	3.4	24.4-32.2
MAI	5	35.0	1.0	33.6-36.4	5	33.6	2.1	30.3-35.9
AL _I I	5	238.7	12.4	225.6-257.2	5	211.3	25.5	181.5-249.2
AL _{II} I	5	258.7	18.3	230.8-280.4	5	247.1	26.1	206.2-273.8
AL _{III} I	5	283.3	8.2	274.7-295.6	5	267.0	21.3	241.0-297.3
AL _{IV} I	5	271.8	25.8	242.7-297.8	5	297.1	19.4	278.2-329.5
AWI	5	15.4	1.4	13.5-17.1	5	14.5	1.1	13.0-16.1
WDI	5	20.6	2.1	17.1-22.3	5	19.0	2.0	16.9-22.3
ASC	5	119.0	6.0	110.0-125.0	5	136.0	10.0	119.0-143.0
HcASC	5	58.0	7.0	51.0-70.0				
HcAI	5	240.6	26.2	209.5-275.0				
OAI	5	85.0	11.2	73.8-99.3				
LLI	5	29.0	4.3	21.9-33.5				
CaLI	5	10.8	2.8	7.9-14.1				
SpLI	4	37.5	2.0	34.8-39.8				
SpWI	4	2.6	0.4	2.2-3.2				
SpRI	4	37.5	11.5	22.4-50.0				
EgLI					1	7.0		
FuLI	5	38.6	3.8	34.5-43.7	5	37.3	1.4	34.9-38.6
FFuI	5	24.1	4.3	19.3-30.2	5	24.5	3.1	20.1-27.3

spots distributed on dorsal mantle; a narrow, small, slightly u-shaped longitudinal stripe present between eyes. Ocellus with blue/purple iridescent ring (Fig. 10A, d). Colour in preserved ethyl alcohol brownish and inconspicuous white spots and longitudinal stripe between eyes (usually absent).

DISTRIBUTION: Indo-Pacific: Indian Ocean to Japan, China, Philippines, and southward to Australia (Roper *et al.* 1984).

REMARKS: *Octopus ocellate* sp. B is one of the most dominant and abundant ocellate octopuses in Thai waters, both in the

Andaman Sea and in the Gulf of Thailand. It is a major commercial species in the country, usually caught in large quantities by trawlers (Chotiyaputta 1993). The species is normally referred to *Octopus membranaceus* Quoy and Gaimard, 1832. The species has been reported widely throughout the Indo-West Pacific. Recently, Norman (1992b) examined the type-material which is lodged in the Muséum d'Histoire Naturelle, Paris and he pointed out that the name of the species "*O. membranaceus*" is proposed as *nomen dubium*. Since fifteen species and three

subspecies of ocellate octopuses have been described from Indo-West Pacific waters and most of these are inadequately described, lack type material or are synonymous with others, further study will be required to resolve the specific status of these taxa (Norman 1992b).

Octopus ocellate sp. C
(Fig. 11, Tab. 11)

Polypus areolatus - Massy 1916: 193-195.

Octopus areolatus - Jothinayagam 1987: 68-70, fig. 25.

MATERIAL EXAMINED: PMBC no. 11979. 3 specimens; 2 males, 41.5-47.1 mm ML; 1 female, 64.7 mm ML. Ranong Fish Landing. Coll. A. Nateewathana. 30 January 1996.

DESCRIPTION: Medium-sized animals (ML to 64 mm; TL to 195 mm); mantle (Fig. 11, a) broadly ovoid (MWI 57.8-82.8); head small (HWI 22.3-27.0), demarcated from mantle by prominent constriction; eyes small, not projecting above surface of head. Funnel large, stout, bluntly tapered (FuLI 35.5-40.5); funnel organ W-shaped (Fig. 11, b), outer limbs as long as median limbs. Arms moderately long (MAI 26.1-47.9) (2-3 times ML), stout, tapering to narrow tips. Arm lengths subequal, arm order IV.III.II.I. Arm suckers biserial, 3rd and 4th pairs of suckers enlarged on arms II and III in males, uniform in female. Third right arm of males hectocotylized (Fig. 11, c), shorter than its opposite arm (OAI 75.2-78.1); ligula short (LLI 9.3-10.1); ligula groove shallow without transverse ridges; calamus very short, conical; hectocotylized arm with 56-61 suckers. Web deep (WDI 19.2-34.8), web formula D.C.B.E.A or D.=C.B.E.A. Upper beak (Fig. 11, f) with sharp, curved rostrum, narrow hood, slightly concave on cutting edge. Lower beak (Fig. 11, g) with short, blunt rostrum, narrow hood, widely spread lateral wings and long, slightly curved lateral walls. Radula with seven rows of teeth and two marginal plates on each trans-

verse row (Fig. 11, e); rachidian tooth tricuspidate with a long, conical unicus and 1 lateral cusp on either side; first lateral teeth small and unicuspidate; second lateral teeth unicuspidate, conical and long, curved base; lateral marginal teeth curved and long; marginal plates oblong. Ink sac present. Gill lamellae 7-8. Female with numerous small eggs. The male genitalia were damaged and could not be studied. Integumental sculpture with small papillae surrounded by circle of very minute reddish brown chromatophores over mantle, head and arm crowns, similar pattern as in *O. marginatus* but without fine reticulation on arm crowns; two to three small tubercles above each eyes and somewhat smaller tubercles on neck. Live specimens with brown base and uniformly spreads, reddish brown chromatophores dorsally, smaller and more dense ventrally; four dark longitudinal stripes on mantle, head, and eyes through the base of arm lengths. Ocellus (Fig. 11, d) with iridescent white ring present in two specimens; black ocellus without ring present in one male specimen.

DISTRIBUTION: The Andaman Sea of Thailand

REMARKS: The species belongs to the ocellate species group. The unique characters are four longitudinal stripes on the mantle, head and lateral borders of the arms, the presence of ocellus with white ring and tubercles above eyes. The species resembles *P. areolatus* described by Massy (1916) and *O. areolatus* described by Jothinayagam (1987) from the Indian Ocean in having the same structures of ocellus and integumental sculptures as mentioned by Massy. However, none of them mentioned the four dark longitudinal stripes on the body.

It is also similar to *O. exannulatus* Norman 1992 and *O. areolatus* d'Orbigny, 1839. It differs from *O. exannulatus* by having distinct ocellus with iridescent ring though one specimen possess a black

ocellus without ring, and the structures of integumental sculpture. *O. areolatus* bears a gold or green metallic colour in the iridescent ring of the ocellus and so far the species is recorded only from Japan to Hong Kong (Norman 1992b). The

present study contains only 3 specimens and the male genitalia are incomplete, more material is needed for further study. The species might be an undescribed ocellate species.

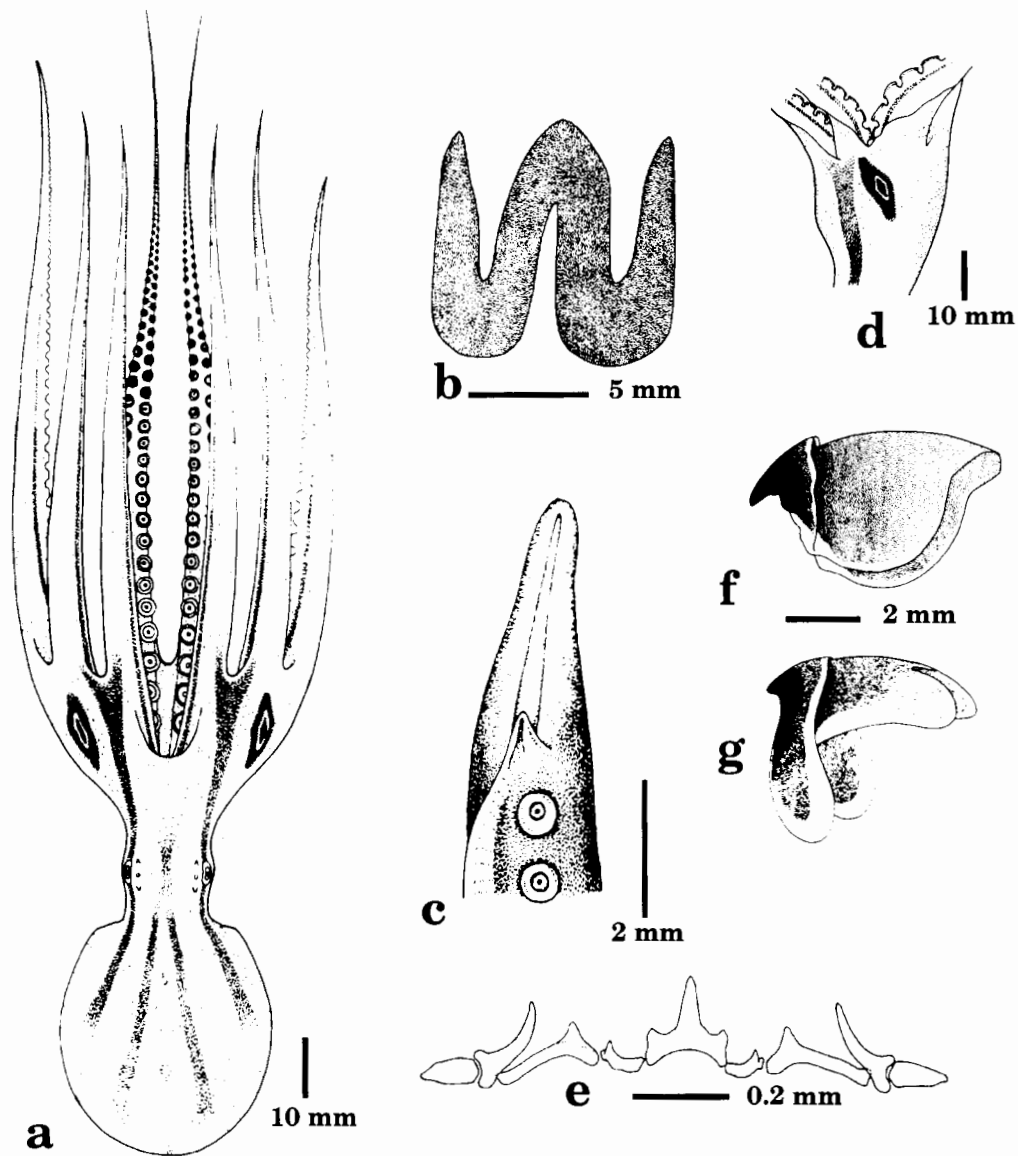


Figure 11. *Octopus ocellate* sp. C. (a), dorsal view of 48.6 mm ML of male. (b), funnel organ of 48.6 mm ML of male. (c), hectocotylus of 49.3 mm ML of male. (d), ocellus. (e), redula of 48.6 mm ML of male. (f), upper beak of 48.6 mm ML of male. (g), lower beak of 48.6 mm ML of male.

Table 11. Means, standard deviations and ranges of selected measurements and indices (in percent) of *O. ocellate* sp. C from the Andaman Sea, Thailand.

Index	MALES				FEMALES	
	n	mean	s.d.(n-1)	Range	n	Value
ML(mm)	2	44.3	3.9	41.5-47.1	1	64.7
TL(mm)	2	192.5	3.5	190.0-195.0	1	195.0
MWI	2	75.6	10.2	68.4-82.8	1	57.8
VML(mm)	2	34.8	0.6	34.4-35.3	1	43.3
HWI	2	24.6	3.3	22.3-27.0	1	22.7
MAI	2	28.0	2.8	26.1-30.0	1	47.9
AL _I I	2	227.6	32.3	204.8-250.5	1	187.8
AL _{II} I	2	264.3	4.5	261.1-267.5	1	208.6
AL _{III} I	2	344.6	34.0	320.6-368.7	1	182.4
AL _{IV} I	2	358.2	35.2	333.3-383.1	1	194.7
AWI	2	19.9	2.0	18.5-21.4	1	11.4
WDI	2	20.6	2.0	19.2-22.0	1	34.8
ASC	2	118.0	25.5	100.0-136.0	1	96.0
HcASC	2	58.5	3.5	56.0-61.0		
HcAI	2	263.8	18.8	250.5-277.1		
OAI	2	76.6	2.0	75.2-78.1		
LLI	2	9.7	0.6	9.3-10.1		
FuLI	2	38.5	2.8	36.5-40.5	1	35.5
FFuI	2	26.7	4.8	23.3-30.1	1	22.7

Octopus cf. niveus Lesson, 1830
(Figs. 12 A & B, Tab. 12)

Octopus aculeatus - Goodrich 1896: 20.

Polypus aculeatus - Massy 1916: 191-192.

Octopus (Octopus) niveus - Robson 1929: 141-143, text-fig. 50a,b; - Adam 1939: 88-96, pl.I, fig.1.

MATERIAL EXAMINED: PMBC no. 11937. 3 specimens; 2 males, 45.6-55.5 mm ML; 1 female, 54.0 mm ML. In front of PMBC. Intertidal reef flat. Coll. S. Utsaha. 21 August 1996. PMBC no. 11938. 4 specimens; 2 males, 42.3-46.0 mm ML; 2 females, 52.8-55.5 mm ML. In front of PMBC. Intertidal reef flat. Coll. T. Songmuang. 20 December 1995. PMBC no. 11939. 2 males, 30.7-31.0 mm ML. In front of PMBC. Intertidal reef flat. Coll. S. Utsaha. 2 April 1986.

DESCRIPTION: Moderately sized species, males to at least 45 mm ML, females to 55 mm ML, TL to 332 mm. Mantle (Fig. 12A, a) ovoid (MWI 49.0-58.9) with muscular wall. Pallial aperture wide, slightly less than half of mantle width. Head of moderate width (HWI 33-38), demarcated from mantle by moderate constriction. Eyes large, prominent projecting above surface of head. Funnel large (FuLI 35-38), stout, bluntly tapered, almost reaching the base of arm IV; funnel organs W-shaped (Fig. 12A, b), limbs thick, outer limbs almost three-quarters as long as median limbs. Arms very long (MAI 17.3-19.8) (~4-6 times ML), stout, tapering to slender, attenuated tips. Arm lengths subequal, in the order of III.IV.II.I. Arm

suckers biserial, 5th to 8th suckers usually enlarged on all arms in males, no enlarged suckers on arms of females. Third right arm of males hectocotylized, shorter than its opposite arm (OAI 81); ligula well-developed (Fig. 12A, c) (LLI 6.5-11.0) with transverse

ridges; calamus short (CaLI 25.0-26.0); hectocotylized arm with 104-167 suckers. Web shallow (WDI 11.3-11.9), web formula C.B=D.A.E. Upper beak (Fig. 12A, d) with moderate hood and short curved rostrum. Lower beak (Fig. 12A, e) with conical, blunt

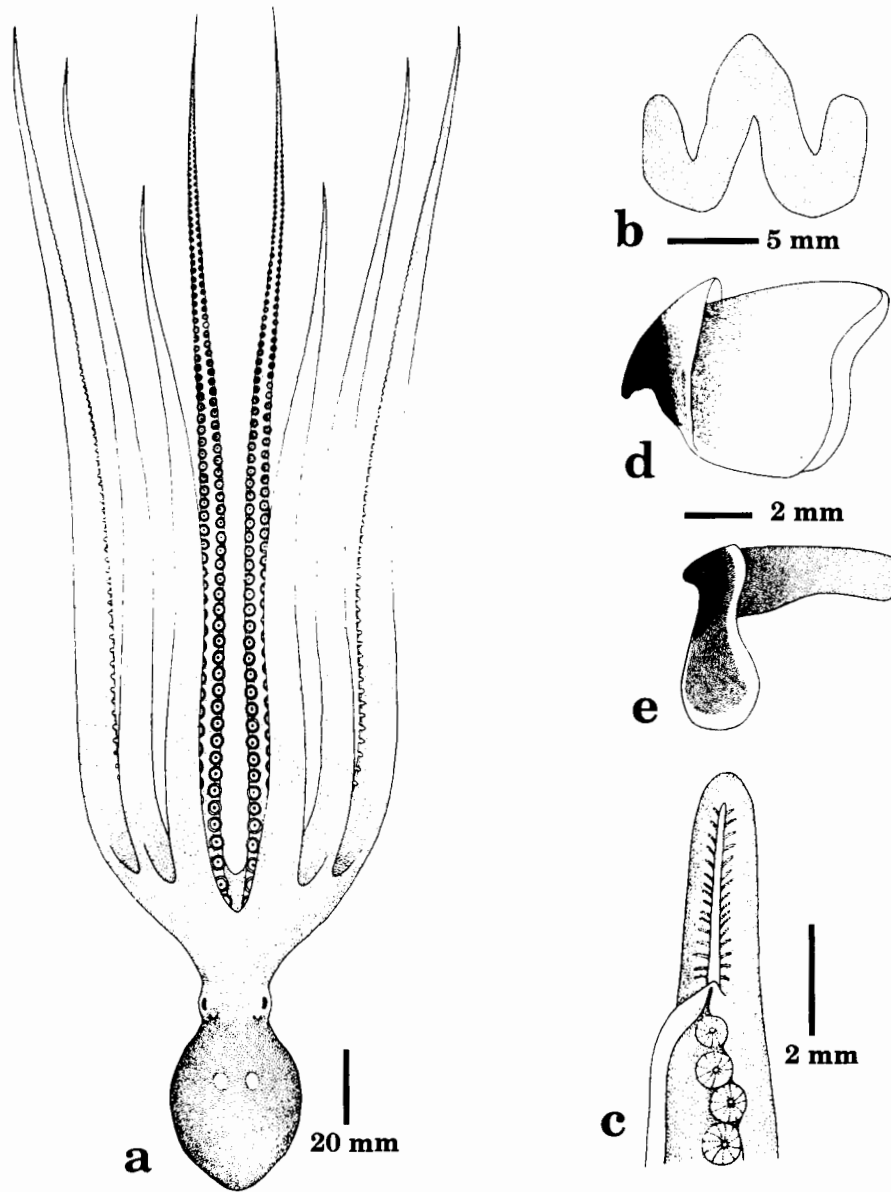


Figure 12A. *Octopus cf. niveus*. (a), dorsal view of 54.8 mm ML of male. (b), funnel organ of 45.6 mm ML of male. (c), hectocotylus of 53.6 mm ML of male. (d), upper beak of 54.8 mm ML of male. (e), lower beak of 54.8 mm ML of male.

rostrum, somewhat narrow hood, widely spread wings and long lateral walls. Radula with seven transverse rows of teeth and two marginal plates (Fig. 12B, f); rachidian tooth

has one lateral cusp on each side of medial cone; lateral and marginal teeth unicuspidate; marginal plates slender and oblong. Ink sac present. Gill lamellae 6. Mature fe-

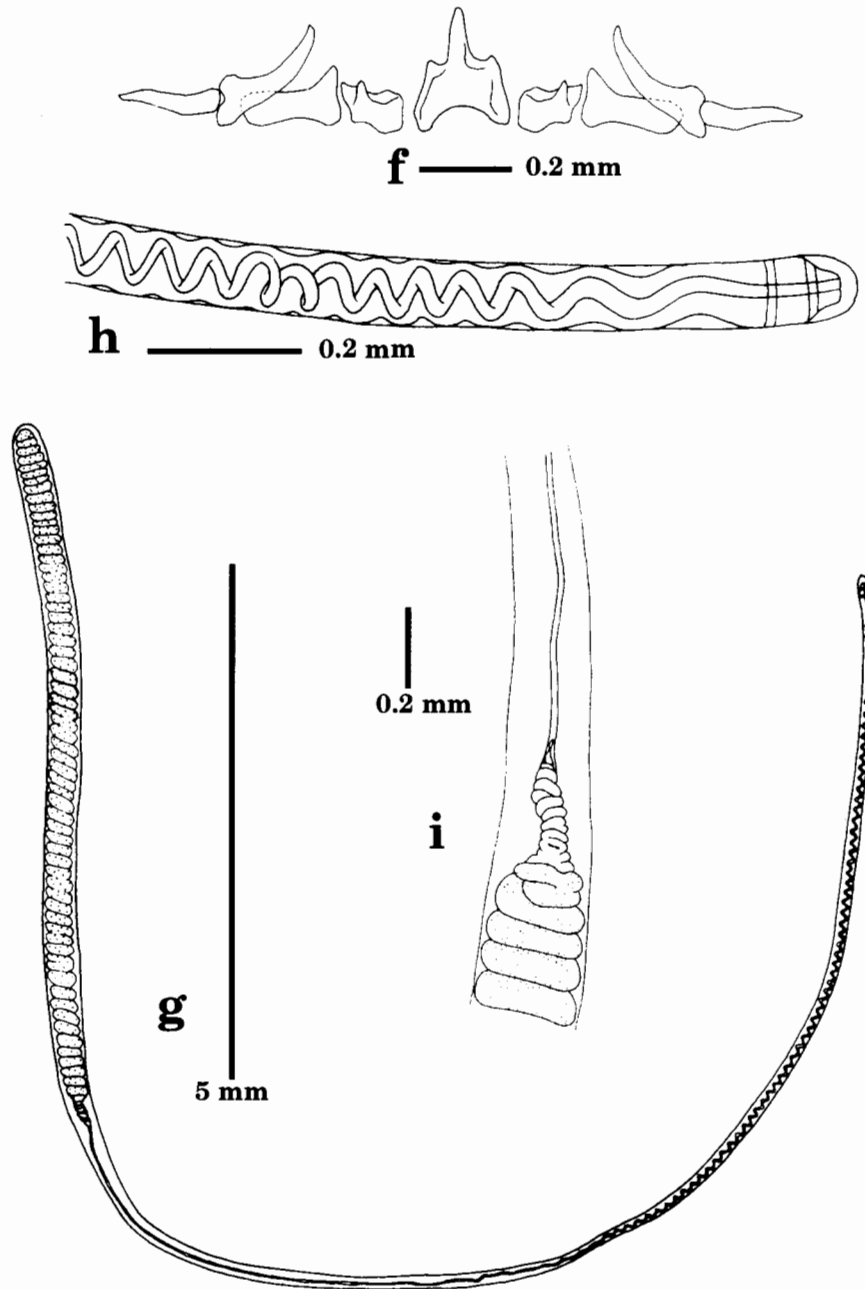


Figure 12B. *Octopus* cf. *niveus*. (f), radula of 54.8 mm ML of male. (g), whole spermatophore of 56.3 mm ML of male. (h), enlargement of oral cap. (i), enlargement of cement body.

Table 12. Means, standard deviations and ranges of selected measurements and indices (in percent) of *O. cf. niveus* from the Andaman Sea, Thailand.

Index	MALES				FEMALES			
	n	mean	s.d.(n-1)	Range	n	mean	s.d.(n-1)	Range
ML(mm)	4	41.1	7.2	30.7-46.0	3	54.1	1.3	52.8-55.5
TL(mm)	4	262.0	50.1	187.0-290.0	3	328.3	3.5	325.0-332.0
MWI	4	58.9	5.6	54.1-67.1	3	49.0	12.1	41.4-63.0
VML(mm)	4	28.8	6.4	21.0-36.6	3	40.4	3.1	36.9-43.0
HWI	4	38.6	5.7	34.3-46.6	3	33.3	3.1	30.7-36.7
MAI	4	19.0	1.1	17.3-19.8	3	19.7	0.2	19.5-19.8
AL _I	4	376.5	30.3	348.5-409.0	3	392.3	14.5	382.6-409.0
AL _{II}	4	475.3	28.1	452.2-513.2	3	475.0	33.3	439.6-505.7
AL _{III}	4	521.5	39.7	489.0-579.2	3	490.1	24.3	462.1-505.6
AL _{IV}	4	503.7	13.6	489.4-517.5	3	479.3	38.6	437.5-513.5
AWI	4	22.2	5.9	16.7-28.5	3	17.7	3.0	14.4-20.4
WDI	4	11.3	3.0	8.3-15.5	3	11.9	1.5	10.2-12.8
ASC	4	215.0	27.0	174.0-230.0	3	221.0	11.0	209.0-230.0
HcASC	2	135.0	44.0	104.0-167.0				
HcAI	2	400.5	176.7	279.1-521.9				
OAI	2	81.0	36.3	55.3-106.7				
LLI	2	8.7	3.2	6.5-11.0				
CaLI	2	25.5	0.7	25.0-26.0				
SpLI	3	39.8	5.4	35.0-45.6				
SpWI	3	1.8	0.1	1.7-1.9				
SpRI	3	34.1	3.3	31.7-37.9				
FuLI	4	36.7	8.8	28.7-49.3	3	35.3	3.0	33.1-38.7
FFuI	4	21.5	3.3	17.3-24.8	3	20.9	6.4	16.9-28.3

male with small and numerous eggs. Mature male with long penis; spermatophores (Fig. 12B, g-i) very long (SpLI 35.0-45.6), slender (SpWI 1.7-1.9), with large, coiled sperm reservoir (SpRI 31.7-37.9); sperms count approximately 38.

Integumental sculpture consists of a pair of distinct papilla on the head, slightly behind eyes; many minute papillae sparsely distributed on dorsal mantle, head and aboral arms. Preserved specimens in ethyl alcohol mottled gray-brown to dark/black dorsally and with a pair of lighter blotches on the dorsal mantle, cream to light brown with numer-

ous small reddish-brown chromatophores ventrally.

DISTRIBUTION: Indian Ocean: Little Cocos Island, Andaman Islands, Malacca Straits, Myanmar, Andaman Sea coast of Thailand.

REMARKS: *O. niveus* is placed in a group of typically small day-active intertidal, or shallow subtidal rock or coral reef species. The group is the so-called "*Octopus horridus*" group and the group members occur throughout the tropical Indo-West Pacific. The group consists of the following described species, *O. horridus* Ferussac, 1826, *O. niveus* Lesson, 1830, *O. filamentosus* Blainville,

1826, *O. aculeatus* d'Orbigny, 1834, and a recently described species, *O. abaculus* Norman & Sweeney (in press). Most of these species are ill-defined and encompass many inappropriate names. Many attempts have been tried to resolve the status of these nominal species (Robson 1929; Adam 1939; Voss 1963). *O. aculeatus* and *O. abaculus* are distinct species described from the Philippines by Norman & Sweeney (in press). *O. horridus* is a large-egg species restricted to the western Indian Ocean and the Red Sea, and *O. niveus* from the Society Islands lacks a type specimen (Norman, pers. comm.). Even though the present material is similar to *O. aculeatus* from the Philippines, it is also very close to *O. niveus* from the Indian Ocean described by Adam (1939). The structure of spermatophores in text-fig. 14 (Adam 1939, p. 93), the picture of the whole body (pl. I, fig. 1) and most of the characters are the same as in the present material. Since the affinities of these species are still unresolved, the present material is referred to *O. cf. niveus*.

The species lives in the intertidal reef flats, occupying lairs in coral rubbles. During low tide the local fishermen collect the animals for cooking.

Octopus cf. vulgaris Cuvier, 1797
(Figs. 13 A & B, Tab. 13)

Octopus vulgaris - Roper *et al.* 1984: 211.

MATERIAL EXAMINED: PMBC no. 11977. 1 male, 108.0 mm ML. Lat. 98°07' N, Long. 06°28' E. R/V Fishery Research no. 4. Bottom vertical longline, depth 220 m. Coll. W. Pokapunt. 3 May 1993. PMBC no. 11978. 1 female, 193.9 mm ML. Lat. 06°26'0" N, Long. 98°00'0" E. R/V Fishery Research no. 4. Bottom vertical longline, depth 200 m. Coll. W. Pokapunt. 25 March 1992.

DESCRIPTION: Large sized animals (ML to 108 mm; TL to 560 mm); mantle ovoid (Fig. 13A, a) (MWI 54.6-76.8); head moderately wide, narrower than mantle (HWI 30.3-37.3); eyes small, not projecting above the head. Funnel large, slen-

Table 13. Measurements and indices (in percent) of *O. cf. vulgaris* from the Andaman Sea, Thailand.

Index	MALES		FEMALES	
	n	Value	n	Value
ML(mm)	1	108.0	1	93.9
TL(mm)	1	560.0	1	492.0
MWI	1	76.8	1	54.6
VML(mm)	1	77.4	1	67.9
HWI	1	30.3	1	37.3
MAI	1	25.2	1	26.1
AL _I	1	301.8	1	225.8
AL _{II}	1	396.3	1	364.2
AL _{III}	1	379.6	1	382.3
AL _{IV}	1	315.7	1	296.1
AWI	1	20.3	1	17.0
WDI	1	17.1	1	17.7
ASC	1	201.0	1	228.0
HcASC	1	135.0		
HcAI	1	304.6		
OAI	1	80.2		
LLI	1	4.1		
CaLI	1	38.6		
SpLI	1	38.0		
SpWI	1	1.5		
SpRI	1	47.4		
FuLI	1	32.6	1	32.9
FFuI	1	23.4	1	29.6

der with truncate tip; funnel organ obscure could not be seen in the present material. Arms long (MAI 25.2-26.1) (2-3 times ML), stout, tapering to narrow tips. Arm lengths subequal, arm order II.III.IV.I. in male and III.II.IV.I. in female. Arm suckers biserial, 7th to 10th pairs of proximal suckers enlarged on arms II and III in male, uniform in female. Third right arm of male hectocotylized (Fig. 13A, b), shorter than its opposite arm (OAI 80.2); ligula very small (LLI 4.1), spoon-shape; ligula groove moderate, shallow without transverse ridges; calamus short, conical (CaLI 38.6); hectocotylized arm with 135

suckers. Web shallow (WDI 17.1-17.7), web formula C.D.B.=E.A. Upper beak short, curved rostrum, narrow hood, small wings and expanded lateral walls (Fig. 13A, c). Lower beak short rostrum, narrow hood, large lateral wings and long, slightly curved lateral walls (Fig. 13A, d). Radula

with seven transverse rows of teeth and two marginal plates (Fig. 13B, e); rachidian tooth with two lateral cusps on each side of the medial cone; first lateral teeth unicuspidate; second lateral teeth unicuspidate with long, slightly curved base; lateral marginal teeth long, robust; mar-

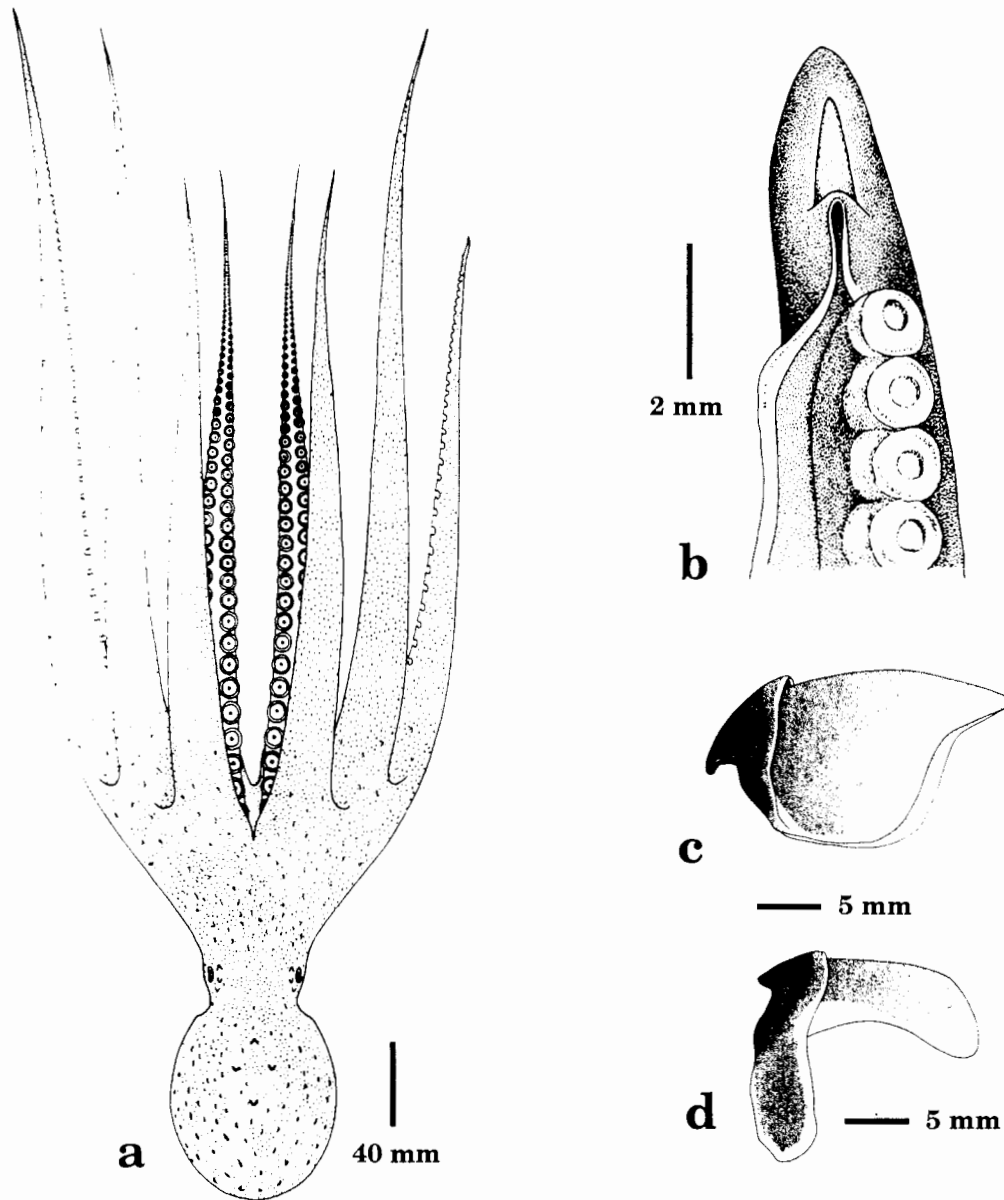


Figure 13A. *Octopus cf. vulgaris*. (a), dorsal view of 108.0 mm ML of male. (b), hectocotylus. (c), upper beak. (d), lower beak.

ginal plates oblong. Ink sac present. Gill lamellae 9-10. Female with numerous small eggs. Male with long penis and a coiled diverticulum; spermatophores long (SpLI 38), slender (SpWI 1.5) with moderately long, coiled sperm reservoir (SpRI 47.4) (Fig. 13B, f-g).

Integumental sculpture consists of three pairs of tubercles dorsally on the head and located slightly before, between and behind each eye. A set of 4 tubercles in a diamond shaped configuration on dorsal mantle. Light red basic colour in ethyl alcohol. Reddish-brown, rounded to oval,

fine, rather uniform patches cover the whole dorsal mantle, head and arms. Ventrally, plain light brown without patches.

DISTRIBUTION: Worldwide in temperate and tropical waters.

REMARKS: *O. vulgaris* has been reported widely throughout the temperate and tropical waters around the world (Robson 1929). Since it is widely distributed, its taxonomic and geographic parameters still are not precisely defined (Roper *et al.* 1984). The genuine *O. vulgaris* is restricted to the Atlantic Ocean (Norman, pers

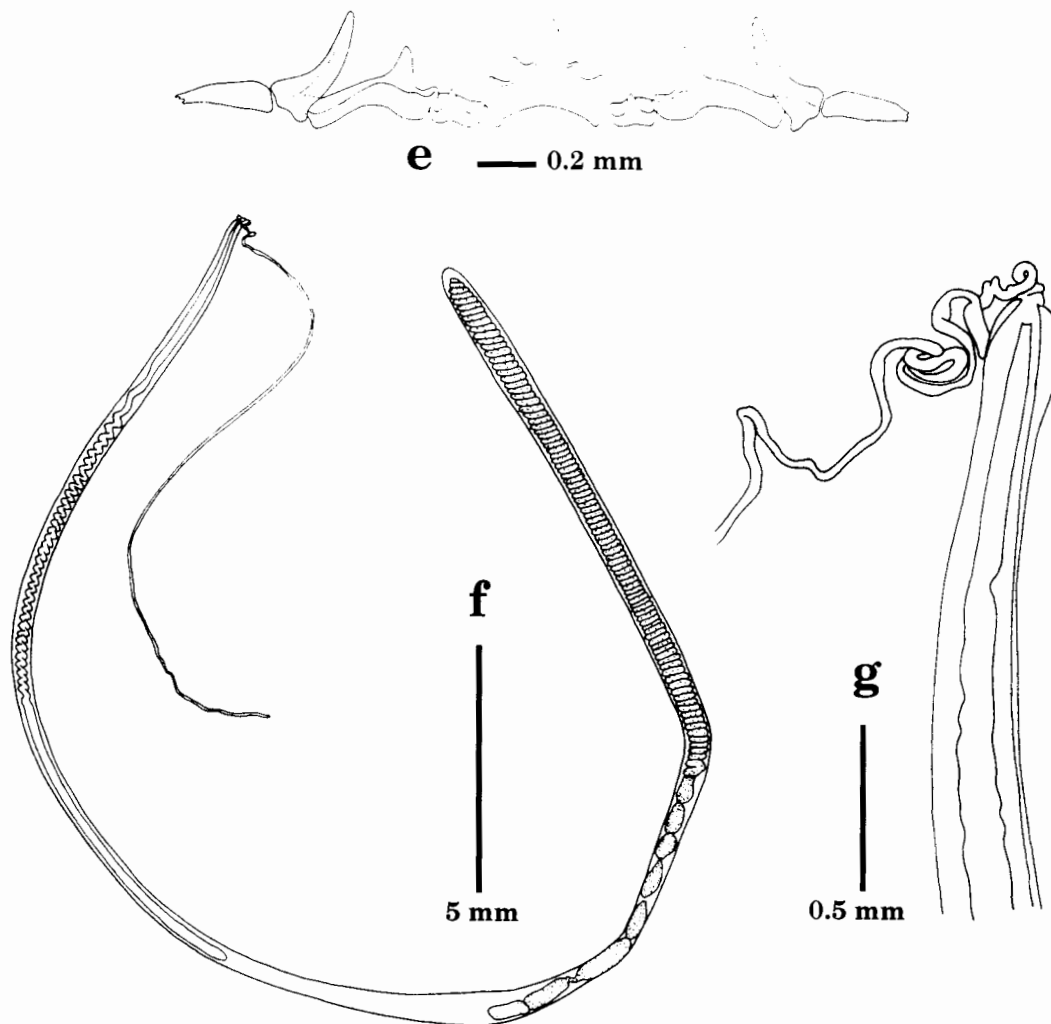


Figure 13B. *Octopus cf. vulgaris*. (e), radula. (f), whole spermatophore. (g), enlargement of oral cap.

comm.). The present material is similar to *O. vulgaris* as described by Roper *et al.* (1984). Further clarification of the species-complex is much needed.

The present material was collected by bottom vertical longline at the outer edge of the continental shelf of the Andaman Sea at the depths between 200-220 m. The bottom is usually covered with rocks. It is the deepest living species in the present study.

DISCUSSION

Thirteen species of the octopodid fauna are presently recorded from the Andaman Sea, Thailand. Nateewathana (1995) recorded a species of deep sea octopod, *Alloposus mollis* Verrill, 1880 at the depth of 340 m in the Andaman Sea. The species was reported as a junior synonym of *Haliphron atlanticus* Steenstrup, 1861 by Kristensen & Knudsen (1983) and Willassen (1986). According to Hochberg *et al.* (1992), the above synonymy and the family name (Alloposidae = Haliphronidae) have not been proposed to the ICZN commission, and the name *A. mollis* has been applied by the majority of cephalopod researchers since 1880. Hochberg *et al.* (1992) used this as an argument to retain the species name *A. mollis* (the rule of conservation of name). In the present paper I accept the synonymy proposed by Willassen (1986) (the rule of priority) and used the species name *H. atlanticus* for the specimen from the Andaman Sea described as *A. mollis* by Nateewathana (1995). The other twelve species recorded in the present report comprise three genera, *Argonauta*, *Cistopus* and *Octopus*. Hochberg *et al.* (1992) mentioned that six species of the genus *Argonauta* are recognized based primarily on differences in the "brood shell". Of these species, four are reported from the Indian Ocean (Silas 1968), *i.e.*, *A. argo* Linnaeus, 1758; *A. bottgeri* Maltzan, 1881; *A. hians* Solander, 1786, and *A. nodosa* Solander, 1786. Only *A. bottgeri* was reported from the Andaman Sea by Massy (1916) and Sithigorngul (1974). However, *A. hians* is the only species represented in the Andaman Sea, Thailand in the present study. The species has also been recorded in this area, and in the Gulf of Thailand by Chotiyaputta *et al.* (1992).

They mentioned that *A. hians* lives in the open ocean in the depth greater than 50 m and it migrates to the coastal waters for spawning during March and April. *A. hians* was captured only as bycatch in purse seines and squid light-luring. There is no commercial fishery in the area. *Cistopus indicus* is a valid species recorded in Thailand and it is one of the important octopuses in the Thai fishery along the coasts. According to Chotiyaputta (1993), three species of the octopuses, *O. "membranaceous"*, *O. "dollfulsi"* and *C. indicus*, are the common, abundant and widely distributed species in the Andaman Sea and in the Gulf of Thailand. The catch of these octopuses in the Andaman Sea was up to 3141 metric tons in 1985. They were captured by mainly two types of fishing gear, otter trawl and pair trawl. Since *O. luteus* is very similar to *C. indicus* (see remarks to *O. luteus*) they are always mixed together in the catches, in the future the two species should be recorded separately in the fishery statistics of the country.

The genus *Octopus* constitutes one of the most complicated and ill-defined species groups in the Order Octopoda. Major revisions of the Octopoda have been made by Robson (1929, 1932). Other studies of the octopuses in the Asian Pacific waters have been reported from the Philippines by Voss (1963) and from Hong Kong waters by Voss & Williamson (1971). Roper *et al.* (1984) presented some octopod species of interest to fisheries in the region. Silas (1968) listed 30 species of *Octopus* in the Indian Ocean. Of these about 28 species occur in the Indian Seas including Andaman and Lakshadweep Seas (Silas *et al.* 1986b). Some species are described for the first time in the Indian Ocean, especially from the Andaman Islands, *e.g.*, *Octopus* (= *Hapalochlaena*) *nierstraszi* Adam, 1938; *O. macrophthalmus* Goodrich, 1896; *O. prashadi* Adam, 1939. Recently, many species of the octopodid fauna in the Indo-West Pacific have been revised and the affinities of some species have been solved. Major works are Stranks (1988, 1990), Stranks & Norman (1992), Norman (1991, 1992a & b, 1993), Norman & Hochberg (1994), Norman & Sweeney (in press), and Norman *et al.* (in press). However, these studies are mainly restricted to the Australian

and South West Pacific Ocean, not in the Indian Ocean. The last publication in connection with some octopods in this Ocean was presented by Jothinayagam (1987). He reported only six species of the genus *Octopus* from the Madras coast of India. The majority of the octopods in the Indian Ocean are poorly-diagnosed and the former publications include many inappropriate names of species (Norman, pers comm). The genus *Octopus* described in the present report are, therefore, primarily based on those publications of the octopodid species revised from the Indo-West Pacific.

The genus *Octopus* in the present study comprises ten species and the ocellate octopuses are highest in species richness. Five species of ocellate octopuses, *O. cyanea*, *O. exannulatus*, *O. ocellate* sp. A, *O. ocellate* sp. B and *O. ocellate* sp. C, have been encountered in the Andaman Sea of Thailand. *O. cyanea* is widely distributed throughout tropical waters of the Indian and Pacific Oceans. The species affinities have been revised by Norman (1991). *O. exannulatus* was first described from the Australian waters by Norman (1992b), later the species was reported from the Philippines (Norman & Sweeney, in press) and from the Andaman Sea in the present report. *O. ocellate* sp. A, B and C might be undescribed species. Most of the ocellate octopuses have been reported widely throughout the Indo-West Pacific and usually under the name *O. membranaceus* Quoy & Gaimard, 1832. *O. membranaceus* has been designated *nomen dubium* in Norman (1992b). *O. ocellate* sp. B in the present report is one of the most important commercial species in Thailand. However, the species is normally recorded as *O. membranaceus* Quoy & Gaimard, 1832 or *O. "membranaceus"* by most of the authors in the country (Sithigorngul 1974; Chotiyaputta *et al.* 1992; Chotiyaputta 1993). Norman (1992b) has discussed the species affinities of the ocellate octopuses recorded in this region, but without additional material I am unable to study this species complex.

The other two commercial species of *Octopus* are *O. aegina* and *O. marginatus*. Previous recording of these species in Thailand are referred to *O. dollfulsi* and *O. aegina* respectively. After re-

visions of the species affinities in the region by Norman & Hochberg (1994), and Norman & Sweeney (in press), the status of these two species are resolved and confirmed. The common intertidal octopus, *O. cf. niveus*, and the subtidal octopus, *O. cf. vulgaris*, are still in need of revision.

Since the present report is the first study of the octopodid fauna in this area, the number of species is certainly too low since only a part of the area has been sampled. It is in accordance with Norman & Sweeney (in press) who pointed out that the tropical waters of Southeast Asia contain a rich but poorly-studied octopodid fauna. The majority of these species are either poorly-diagnosed or new to science, despite the fact that they form the basis of both subsistence and commercial fisheries. I agree with Norman & Sweeney (in press) that additional material and information on behaviour, habitat preferences, activity patterns, diet, life cycles and distributions will allow a more complete description of this diverse fauna and delineation of its members. Co-operation among the cephalopod researchers within and outside the regions is necessary and should be strengthened in the future.

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