

# Crustacea Decapoda : On a collection of Nephropidae from the Indian Ocean and Western Pacific

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## ABSTRACT

Nephropidae collected by expeditions to several localities in the Indian and West Pacific oceans have been examined. One species of *Acanthacaris*, five species of *Metanephrops* and eight species of *Nephropsis* have been identified. In

addition, a new species of *Metanephrops* (*M. mozambicus*) and two new species of *Nephropsis* (*N. acanthura* and *N. sulcata*) are described. A revision of the genus *Nephropsis* in the Indian and Pacific oceans is also provided.

## RÉSUMÉ

**Crustacea Decapoda : Sur une collection de Nephropidae de l'Océan Indien et du Pacifique occidental.**

Plusieurs campagnes françaises dans les océans Indien et Ouest-Pacifique ont permis la récolte d'une espèce d'*Acanthacaris*, de cinq espèces de *Metanephrops* et de huit espèces de *Nephropsis*. Une espèce nouvelle de *Metanephrops* (*M. mozambicus*) et deux espèces nouvelles de *Nephropsis* (*N. acanthura* et *N. sulcata*) sont décrites. À l'occasion de cette étude, une révision de l'ensemble des espèces de *Nephropsis* des océans Indien et Pacifique est faite.

*Metanephrops mozambicus* sp. nov. se trouve dans le sud de l'océan Indien occidental ; il est proche de *M. andamanicus*

(Wood Mason) de la mer d'Andaman et des Philippines avec lequel on l'a fréquemment confondu. Les deux espèces se différencient, entre autres, par la forme et l'ornementation de l'abdomen.

*Nephropsis acanthura* et *N. sulcata* spp. nov. se trouvent aussi bien dans l'océan Indien que dans l'Ouest-Pacifique. *N. acanthura* est proche de *N. occidentalis* Faxon de la côte occidentale d'Amérique, ces deux espèces étant les seules du genre à présenter une épine dorsale sur le telson ; elles se distinguent l'une de l'autre par, en particulier, la forme des pleurons. *N. sulcata* est très semblable à *N. atlantica* Norman, de l'Atlantique, dont elle se différencie principalement par le rostre et la longueur des articles des périoïpodes.

## INTRODUCTION

In recent years the Institut français de Recherche scientifique pour le Développement en Coopération (ORSTOM) and the Muséum national d'Histoire naturelle, Paris, have carried out numerous cruises and taken samples in various areas of the Indian and West Pacific oceans : Madagascar (CROSNIER & JOUANNIC, 1973 ; VON COSEL, 1987), Central Indian Ocean (Cruise SAFARI II, MONNIOT, 1984), Philippines (Cruises MUSORSTOM 1, 2 and 3, FOREST, 1981, 1985, 1989), Indonesia (Cruise CORINDON 1 and 2, MOOSA, 1984), Chesterfield Islands (Cruise MUSORSTOM 5, RICHER DE FORGES *et al.*, 1986) and New Caledonia (Cruises BIOCAL, LÉVI, 1986, and BIOGEOCAL, COTILLON & MONNIOT, 1987 ; see also RICHER DE FORGES, this volume p. 9-54). These expeditions have furnished a varied and interesting collection of nephropid lobsters.

The family Nephropidae has been extensively studied in the Atlantic Ocean (HOLTHUIS, 1974). However, in the Pacific and Indian oceans, despite numerous papers (see below for references), a number of difficulties still remain unresolved. One species of *Acanthacaris* and five species of *Metanephrops* are studied herein. Furthermore, a revision of the genus *Nephropsis* in the Pacific and Indian oceans is presented.

The measurements given in this paper refer to carapace length including the rostrum. The terminology for the morphological characters used in the present study and the measurements applied, illustrated in Figure 1, were given by HOLTHUIS (1974).

The abbreviations for the institutions whose collections were used in this study are as follows :

- BMNH : British Museum (Natural History).  
London.  
MNHN : Muséum national d'Histoire naturelle,  
Paris.  
RMNH : Rijksmuseum van Natuurlijke Historie.  
Leiden.  
USNM : National Museum of Natural History  
(Smithsonian Institution). Washington.  
ICM : Instituto de Ciencias del Mar. Barcelo-  
na.  
CM : Cambridge Museum.  
JCU : James Cook University. Queensland.

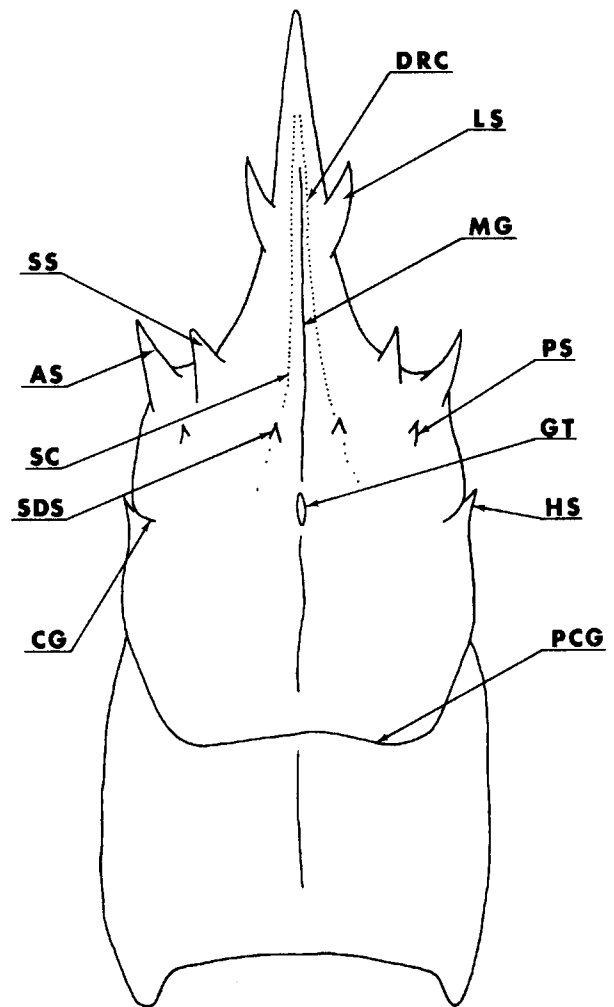


FIG. 1. — Schematic dorsal and lateral views of Nephropid carapace. AS : antennal spine ; CG : cervical groove ; DRC : dorsal rostral carina ; GT : gastric tubercle ; HS : hepatic spine ; LS : lateral spine ; MG : median groove ; PCG : postcervical groove ; PS : postsupraorbital spine ; SC : subdorsal carina ; SDS : subdorsal spine ; SS : supraorbital spine.

LIST OF STATIONS. — The list of the stations of MUSORSTOM 1, 2, 3, 5 Cruises where Nephropidae have been collected is given here.

Detailed data concerning other collections taken into account in this paper are given with the list of material from each species.

In the list, CP = beam trawl ; CC and CH = otter trawl.

MUSORSTOM 1. **Philippines.**

- Station 10. — 19.03.1976, 20 h 55, 13°59.8' N-120°18.2' E, 187-205 m (CP) : *Metanephrops thomsoni*.
- Station 11. — 20.03.1976, 8 h 55, 13°59.8' N-120°23.7' E, 217-230 m (CC) : *Metanephrops thomsoni*.
- Station 12. — 20.03.1976, 10 h 40, 14°00.8' N-120°20.5' E, 187-210 m (CC) : *Metanephrops thomsoni*.
- Station 20. — 21.03.1976, 10 h 10, 13°59.2' N-120°20.3' E, 208-222 m (CP) : *Metanephrops thomsoni*.
- Station 21. — 21.03.1976, 11 h 15, 14°01' N-120°22.8' E, 174-223 m (CP) : *Metanephrops thomsoni*.
- Station 24. — 22.03.1976, 8 h 00, 14°00' N-120°18' E, 189-209 m (CP) : *Metanephrops thomsoni*.
- Station 25. — 22.03.1976, 9 h 37, 14°02.7' N-120°20.3' E, 191-200 m (CP) : *Metanephrops thomsoni*.
- Station 26. — 22.03.1976, 11 h 10, 14°00.9' N-120°16.8' E, 189 m (CP) : *Metanephrops thomsoni*.
- Station 30. — 22.03.1976, 20 h 25, 14°01.3' N-120°18.7' E, 177-186 m (CP) : *Metanephrops thomsoni*.
- Station 31. — 22.03.1976, 21 h 55, 14°00' N-120°16' E, 187-195 m (CP) : *Metanephrops thomsoni*.
- Station 32. — 23.03.1976, 7 h 58, 14°02.2' N-120°17.7' E, 184-193 m (CP) : *Metanephrops thomsoni*.
- Station 34. — 23.03.1976, 11 h 42, 14°01' N-120°15.8' E, 188-191 m (CP) : *Metanephrops thomsoni*.
- Station 35. — 23.03.1976, 13 h 37, 13°59' N-120°18.5' E, 186-187 m (CP) : *Metanephrops thomsoni*.
- Station 40. — 24.03.1976, 8 h 12, 13°57.4' N-120°27.8' E, 265-287 m (CP) : *Metanephrops thomsoni*.
- Station 42. — 24.03.1976, 11 h 10, 13°55' N-120°28.6' E, 379-407 m (CP) : *Metanephrops sinensis*.
- Station 43. — 24.03.1976, 14 h 52, 13°50.5' N-120°28' E, 448-484 m (CP) : *Metanephrops andamanicus*.
- Station 44. — 24.03.1976, 17 h 17, 13°46.9' N-120°29.5' E, 592-610 m (CP) : *Metanephrops andamanicus*, *Nephropsis ensirostris*.
- Station 47. — 25.03.1976, 8 h 02, 13°40.7' N-120°30' E, 685-757 m (CP) : *Nephropsis stewarti*.
- Station 49. — 25.03.1976, 15 h 45, 13°49' N-119°59.8' E, 750-925 m (CP) : *Nephropsis acanthura*, *N. sulcata*.
- Station 50. — 25.03.1976, 17 h 50, 13°49.2' N-120°01.8' E, 415-510 m (CP) : *Metanephrops andamanicus*, *Nephropsis stewarti*.
- Station 51. — 25.03.1976, 20 h 08, 13°49.4' N-120°01.8' E, 170-200 m (CP) : *Metanephrops thomsoni*, *Nephropsis stewarti*.
- Station 54. — 26.03.1976, 9 h 07, 13°54.2' N-119°57.9' E, 975-1 075 m (CP) : *Nephropsis acanthura*.
- Station 65. — 27.03.1976, 15 h 05, 14°00' N-120°19.2' E, 194-202 m (CC) : *Metanephrops thomsoni*.
- Station 69. — 27.03.1976, 20 h 08, 13°58.8' N-120°17.3' E, 187-199 m (CC) : *Metanephrops thomsoni*.

MUSORSTOM 2. **Philippines.**

- Station 1. — 20.11.1980, 11 h 00, 14°00.3' N-120°19.3' E, 188-198 m (CP) : *Metanephrops thomsoni*.
- Station 2. — 20.11.1980, 13 h 28, 14°01' N-120°17.1' E, 184-186 m (CP) : *Metanephrops thomsoni*.
- Station 10. — 21.11.1980, 10 h 01, 14°00.1' N-120°18.5' E, 188-195 m (CP) : *Metanephrops thomsoni*.
- Station 11. — 21.11.1980, 13 h 39, 14°00.4' N-120°19.7' E, 194-196 m (CP) : *Metanephrops thomsoni*.
- Station 13. — 21.11.1980, 16 h 48, 14°00.5' N-120°20.7' E, 193-200 m (CP) : *Metanephrops thomsoni*.
- Station 18. — 21.11.1980, 10 h 35, 14°00' N-120°18.6' E, 188-195 m (CP) : *Metanephrops thomsoni*.
- Station 19. — 22.11.1980, 12 h 21, 14°00.5' N-120°16.5' E, 189-192 m (CP) : *Metanephrops thomsoni*.
- Station 24. — 23.11.1980, 7 h 33, 13°37.2' N-120°42.3' E, 640-647 m (CP) : *Nephropsis ensirostris*.
- Station 25. — 23.11.1980, 9 h 00, 13°39' N-120°42.6' E, 520-550 m (CP) : *Nephropsis ensirostris*.
- Station 26. — 23.11.1980, 12 h 00, 13°49.6' N-

- 120°50' E, 299-320 m (CP) : *Metanephrops sinensis*.
- Station 36. — 24.11.1980, 17 h 20, 13°31.4' N-121°23.9' E, 569-595 m (CP) : *Metanephrops andamanicus*.
- Station 44. — 26.11.1980, 9 h 18, 13°23.2' N-122°20.7' E, 760-820 m (CP) : *Nephropsis ensirostris*, *N. stewarti*.
- Station 50. — 27.11.1980, 7 h 25, 13°36.7' N-120°33.7' E, 810-820 m (CP) : *Acanthacaris tenuimana*, *Nephropsis sulcata*.
- Station 55. — 27.11.1980, 20 h 32, 13°53.7' N-119°58.5' E, 865 m (CP) : *Nephropsis sulcata*.
- Station 56. — 28.11.1980, 7 h 40, 13°53.7' N-119°56.3' E, 970 m (CP) : *Nephropsis sulcata*, *N. acanthura*.
- Station 63. — 29.11.1980, 9 h 00, 14°07.3' N-120°15' E, 215-230 m (CP) : *Metanephrops thomsoni*.
- Station 64. — 29.11.1980, 10 h 50, 14°01.5' N-120°18.9' E, 191-195 m (CP) : *Metanephrops thomsoni*.
- Station 66. — 29.11.1980, 13 h 34, 14°00.6' N-120°20.3' E, 192-209 m (CP) : *Metanephrops thomsoni*.
- Station 67. — 29.11.1980, 14 h 38, 14°00.1' N-120°18.5' E, 193-199 m (CP) : *Metanephrops thomsoni*.
- Station 72. — 30.11.1980, 14 h 21, 14°00.7' N-120°19.4' E, 182-197 m (CP) : *Metanephrops thomsoni*.
- Station 74. — 30.11.1980, 17 h 20, 13°53.2' N-120°26.2' E, 300-370 m (CP) : *Metanephrops andamanicus*, *M. sinensis*.
- Station 75. — 01.12.1980, 6 h 30, 13°50.5' N-120°30.3' E, 300-330 m (CP) : *Metanephrops andamanicus*, *M. sinensis*, *Nephropsis stewarti*.
- Station 78. — 01.12.1980, 12 h 10, 13°49.1' N-120°28' E, 441-550 m (CP) : *Metanephrops andamanicus*.
- Station 82. — 02.12.1980, 6 h 16, 13°46.1' N-120°28.4' E, 550 m (CP) : *Nephropsis ensirostris*.
- Station 83. — 02.12.1980, 8 h 00, 13°55.2' N-120°30.5' E, 318-320 m (CP) : *Metanephrops sinensis*.
- MUSORSTOM 3. Philippines.**
- Station 86. — 31.05.1985, 9 h 00, 14°00' N-120°18' E, 187-192 m (CP) : *Metanephrops thomsoni*.
- Station 87. — 31.05.1985, 10 h 24, 14°00' N-120°19' E, 191-197 m (CP) : *Metanephrops thomsoni*.
- Station 91. — 31.05.1985, 16 h 00, 14°00' N-120°18' E, 190-203 m (CP) : *Metanephrops thomsoni*.
- Station 92. — 31.05.1985, 20 h 25, 14°03' N-120°12' E, 224 m (CP) : *Metanephrops thomsoni*.
- Station 98. — 01.06.1985, 12 h 30, 14°00' N-120°18' E, 194-205 m (CP) : *Metanephrops thomsoni*.
- Station 99. — 01.06.1985, 13 h 50, 14°01' N-120°19' E, 196-204 m (CP) : *Metanephrops thomsoni*.
- Station 101. — 01.06.1985, 16 h 35, 14°00' N-120°19' E, 194-196 m (CP) : *Metanephrops thomsoni*.
- Station 103. — 01.06.1985, 20 h 30, 14°00' N-120°18' E, 193-200 m (CP) : *Metanephrops thomsoni*.
- Station 105. — 01.06.1985, 23 h 25, 13°52' N-120°30' E, 398-417 m (CP) : *Metanephrops andamanicus*, *Nephropsis stewarti*.
- Station 116. — 03.06.1985, 9 h 03, 12°32' N-120°46' E, 804-812 m (CP) : *Nephropsis sulcata*.
- Station 118. — 03.06.1985, 17 h 15, 11°58' N-121°06' E, 448-466 m (CP) : *Metanephrops andamanicus*, *Nephropsis stewarti*.
- Station 119. — 03.06.1985, 19 h 40, 11°59' N-121°13' E, 320-337 m (CP) : *Metanephrops sinensis*.
- Station 120. — 03.06.1985, 22 h 00, 12°06' N-121°15' E, 219-220 m (CP) : *Metanephrops thomsoni*.
- Station 122. — 04.06.1985, 6 h 42, 12°20' N-121°42' E, 673-675 m (CP) : *Nephropsis stewarti*, *N. ensirostris*.
- Station 123. — 04.06.1985, 9 h 09, 12°10' N-121°45' E, 700-702 m (CP) : *Metanephrops andamanicus*, *Nephropsis stewarti*, *N. ensirostris*.
- Station 125. — 04.06.1985, 14 h 12, 11°58' N-121°29' E, 388-404 m (CP) : *Metanephrops sinensis*.
- Station 128. — 05.06.1985, 6 h 51, 11°50' N-121°41' E, 815-821 m (CP) : *Nephropsis stewarti*, *N. ensirostris*.
- Station 135. — 05.06.1985, 22 h 30, 11°59' N-122°02' E, 486-551 m (CP) : *Metanephrops andamanicus*, *Nephropsis stewarti*.
- Station 143. — 07.06.1985, 4 h 15, 11°28' N-

- 124°12' E, 205-214 m (CP) : *Metanephrops thomsoni*.
- MUSORSTOM 5. **Chesterfield Islands.**
- Station 323. — 14.10.1986, 9 h 35, 21°18.52' S-157°57.62' E, 970 m (CP) : *Nephropsis acanthura*.
- Station 324. — 14.10.1986, 12 h 20, 21°15.01' S-157°51.33' E, 970 m (CP) : *Nephropsis acanthura*.
- Station 386. — 22.10.1986, 9 h 15, 20°56.21' S-160°52.14' E, 755-770 m (CP) : *Nephropsis sulcata*.
- Station 387. — 22.10.1986, 11 h 33, 20°53.41' S-160°51.14' E, 650-660 m (CP) : *Nephropsis sulcata*.

## SYSTEMATIC ACCOUNT

Genus *ACANTHACARIS* Bate, 1888*Acanthacaris tenuimana* Bate, 1888

- Acanthacaris tenuimana* Bate, 1888, pl. 21. — HOLTHUIS, 1974 : 752 ; 1984 (unnumbered pages and figure). — PHILLIPS *et al.*, 1980 : 67. — HAYASHI & OGAWA, 1985 : 220, fig. 1. — BURUKOVSKY & CKREHKO, 1986 : 93, text-fig.
- Acanthocaris tenuimana* - BATE, 1888, pl. 22 (incorrect original spelling).
- Acanthacaris tenuimanus* - BRUCE, 1974 : 303, figs. 1, 2.
- Acanthacaris opipara* Burukovsky & Musij, 1976 : 1811, figs 1, 2. — BURUKOVSKY & CKREHKO, 1986 : 94, text-fig.
- Acanthacaris opipera* - PHILLIPS *et al.*, 1980 : 67 (erroneous spelling).
- Acanthacaris* sp. - VON COSEL, 1987 : 20, pl. 3, fig. F (photo in colour).
- Phoberus tenuimanus* - BATE, 1888 : 171.
- Phoberus caecus* - ALCOCK, 1899 : 33 ; 1901a : 156 ; 1902 : 127, 168, 264 (not A. Milne-Edwards, 1881).
- Phoberus caecus* var. *tenuimanus* - ALCOCK & MCARDLE, 1903, pl. 60. — BOUVIER, 1925 : 416.
- Phoberus caecus* var. *sublevis* Wood-Mason, 1891 : 197. — ALCOCK & ANDERSON, 1894 : 161. — ANDERSON, 1896 : 96.
- Neophoberus caecus tenuimanus* - FIRTH & PEQUEGNAT, 1971 : 81.
- MATERIAL EXAMINED. — **Madagascar.** *Vauban* : CH 108, 22°18.9' S-43°01.1' E, 735-760 m, 30.11.1973 : 1 ♂ 128 mm (MNHN-AS 436). — CH 116, 22°13.6' S-43°02.1' E, 670-710 m, 02.12.1973 : 1 ♀ ov. 110 mm (MNHN-AS 543). — CH 133, 13°02' S-48°02' E, 1 000-1 525 m, 21.01.1975 : 1 ♂ 101 mm (without rostrum) (MNHN-AS 442).
- Mascareignes III* : CH 102, 22°17' S-43°02' E, 790 m, 24.11.1986 : 1 ♂ 153 mm ; 1 ♀ ov. 185 mm (MNHN-AS 439, 441). — CH 105, 22°18.3' S-43°01.4' E, 700 m, 25.11.1986 : 1 ♀ ov. 137 mm (MNHN-AS 438). — CH 110, 22°24.2' S-43°03' E, 620-640 m, 26.11.1986 : 1 ♂ 212 mm (MNHN-AS 440). — CH 122, 22°16.8' S-43°02.7' E, 600 m, 30.11.1986 : 1 ♀ 68 mm (MNHN-AS 437).
- Philippines.** MUSORSTOM 2 : stn CP 50, 810-820 m : 1 juv. 18 mm (MNHN-AS 444).
- New Caledonia.** BIOCAL : stn CP 57, 23°44' S-166°58' E, 1 490-1 620 m, 01.09.1985 : 1 juv. 18 mm (MNHN-AS 443).
- Indonesia.** *Challenger* : stn 191, 05°41' S-134°04'30" E, 1 480 m, 23.09.1874 : 1 ♀, holotype, 97 mm (BMNH).
- Acanthacaris tenuimana* was described by BATE from one female caught off Indonesia. Subsequently the species has been cited from the Arabian and Laccadive seas (WOOD-MASON, 1891 ; ALCOCK & ANDERSON, 1894 ; ALCOCK, 1899, 1901 ; ANDERSON, 1896) either under the name of the other species in the genus, *A. caeca* (A. Milne-Edwards, 1881), or as a variety (*sublevis*) of the species described by BATE. Recently, BRUCE (1974), HOLTHUIS (1974), and HAYASHI and OGAWA (1985) reported the species from the

China Sea, Indonesia, and Sea of Japan, respectively.

Comparison of the material of *A. tenuimana* with several specimens of *A. caeca* (Atlantic Ocean : 1 ♀ 93 mm, RMNH 22555 — 1 ♂ 124 mm, RMNH 22523 — 1 ♂ 111 mm, RMNH 15463 — 1 ♂ 126 mm, RMNH 23436 — 1 ♂ 159 mm BMNH 1939.4.24.1) showed the two species to be readily distinguishable because of the shape of the first pereopods. In *A. caeca* the hand is slightly shorter than the fingers, as HOLTHUIS (1974) pointed out. This ratio stays quite constant (0.8-0.9) over the entire size range of *A. caeca*. In contrast, the ratio is quite variable in *A. tenuimana*; it was 0.8 in the smallest specimens examined (CL = 18 mm), 0.66 in the holotype (97 mm), and 0.5 or less in specimens larger than 140 mm.

The differences suggested by several authors (HOLTHUIS, 1974; HAYASHI & OGAWA, 1985), e.g., the shape of the pleura of the abdominal segments, the shape and spinulation of the telson, and the number of spines on the rostrum, present a certain variability in the specimens

examined. They should therefore be used with caution.

The number of spines on the rostrum in *A. tenuimana* is variable and unrelated to individual size or sex. The dorsal border bears 0-4 spines, the ventral margin 4-6 spines.

BURUKOVSKY and MUSIJ (1976) described a new species (*A. pipara*) from a female caught off Madagascar. The character used to differentiate *A. pipara* from the other species of the genus (finger length = twice palm length) is not valid in view of the variability observed in this character. Therefore, as HOLTHUIS (1984) pointed out, this name should be considered a junior synonym of *A. tenuimana* Bate.

SIZE. — The females examined ranged from 97 to 185 mm in length; the males from 128 to 212 mm. The two juveniles measured 18 mm.

DISTRIBUTION. — Japan, China Sea, Philippines, Indonesia, New Caledonia, Arabian and Laccadive Seas, Madagascar. Muddy bottoms between 600 and 1 620 m in depth.

### Genus *METANEPHROPS* Jenkins, 1972

#### *Metanephrops andamanicus* (Wood-Mason, 1892)

Figs 2 c-d, 3 c-d

*Nephrops andamanicus* Wood-Mason, 1892 : pl. 4. — ALCOCK, 1894a : pl. 8, fig. 5; 1894b : 226. — ORTMANN, 1897 : 273. — DE MAN, 1916 : 99, pl. 3, fig. 15. — BALSS, 1925 : 207. — DRAGOVICH, 1969 : 19. — JENKINS, 1972 : 162. — BURUKOVSKY, 1974 : 111 (key) (ed. 1983 : 157). — SAKAI, 1978 : 9, fig. 4.

*Nephrops Andamanicus* - CHUN, 1900 : 364, 500, fig. 368; 1903 : 535.

*Nephrops andamanica* - ALCOCK, 1901b : 66. — LONGHURST, 1970 : 286.

*Nephrops thomsoni* var. *andamanica* - ALCOCK, 1901a : 153; 1902 : 147, 148, 260.

*Metanephrops andamanicus* - JENKINS, 1972 : 171. — GEORGE, 1983 : figs 19, 20. — CHAN & YU, 1987 : 184 (key).

not *Nephrops andamanicus* - GILCHRIST, 1921 : 4;

1922 : 7; 1925 : 24. — CALMAN, 1925 : 22. — BARNARD, 1927 : 127. — BERRY, 1969 : 5, fig. 1. — CROSNIER & JOUANNIC, 1973 : 13 (= *Metanephrops mozambicus* sp. nov.).

not *Nephrops andamanica* - BARNARD, 1950 : 528, fig. 99 a. — SANKARANKUTTY & SUBRAMANIAN, 1976 : 20, pl. 2. — KENSLEY, 1981 : 29 (= *Metanephrops mozambicus* sp. nov.).

not *Metanephrops andamanicus* - WEAR, 1976 : 119, fig. 3f, g. — IVANOV & KUYLOV, 1980 : 288. — ANONYMOUS, 1981 : 3. — HOLTHUIS, 1984 : (unnumbered pages and figures). — VON COSEL, 1987 : 13 (= *Metanephrops mozambicus* sp. nov.).

MATERIAL EXAMINED. — **Philippines.** MUSORTOM 1 : stn 43, 448-484 m : 1 ♀ 28 mm (MNHN-AS 454). — Stn 44, 529-610 m : 1 ♀ 20 mm (MNHN-AS 451). — Stn 50, 415-510 m : 1 ♀ 29 mm (MNHN-AS 455).

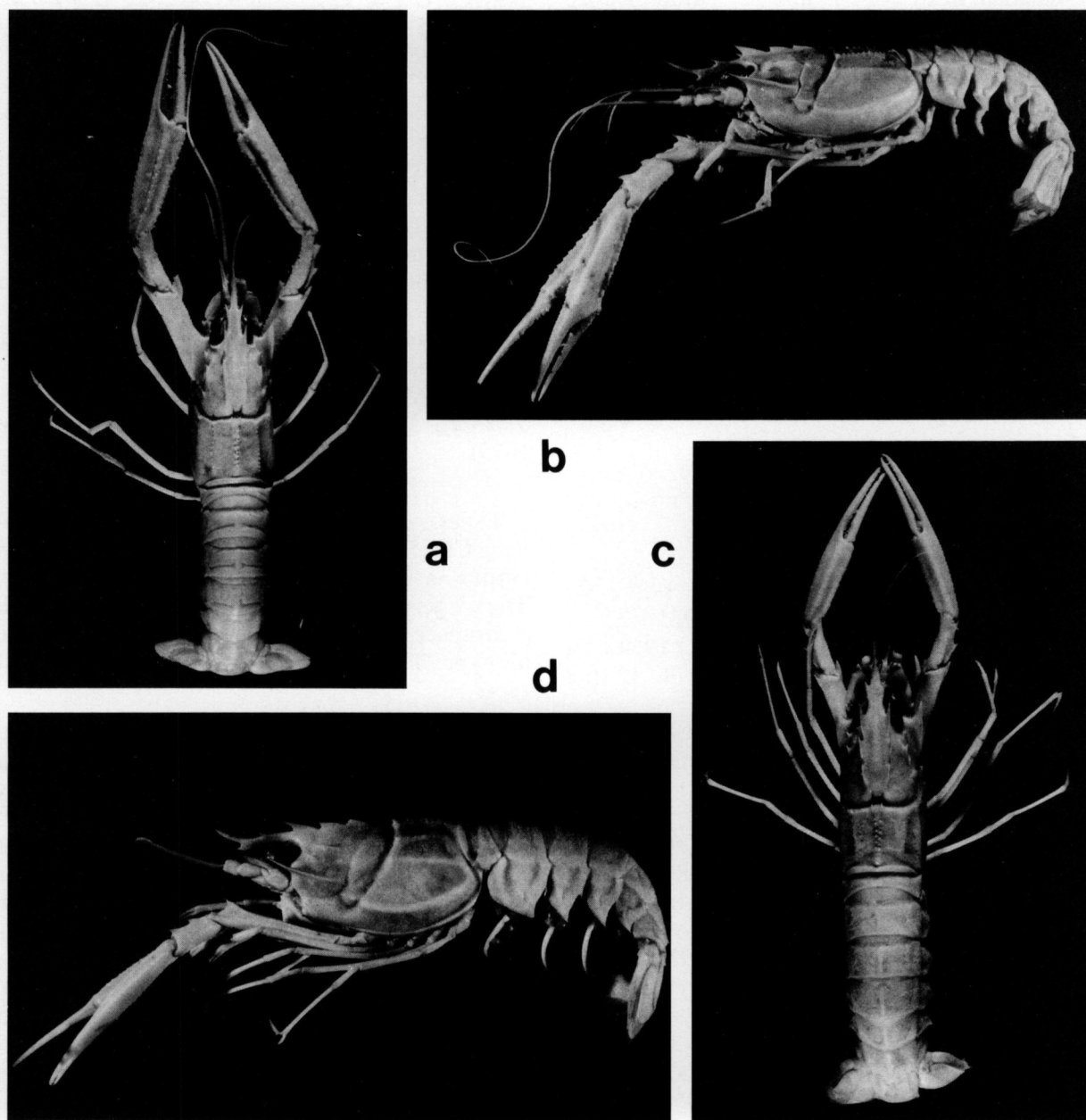


FIG. 2a-b. — *Metanephrops mozambicus* sp. nov., holotype ♂ 88 mm, *Vauban*, Madagascar, CH 56, 395-410 m (MNHN-AS 457) : General appearance, a, dorsal view; b, lateral view.

FIG. 2c-d. — *Metanephrops andamanicus* (Wood-Mason), ♀ 69 mm, MUSORSTOM 3, Philippines, Stn 123, 700-702 m (MNHN-AS 452) : General appearance, c, dorsal view; d, lateral view.

MUSORSTOM 2 : stn CP 36, 569-595 m : 1 ♀ 36 mm (MNHN-AS 456). — Stn CP 74, 300-370 m : 1 ♀ 45 mm (MNHN-AS 450). — Stn CP 75, 300-330 m : 4 ♂ 59 to 77 mm ; 5 ♀ 38 to 74 mm ; 1 ♀ ov. 73 mm (MNHN-AS 447). — Stn CP 78, 441-550 m : 1 ♀ 31 mm (MNHN-AS 453).

MUSORSTOM 3 : stn CP 105, 398-417 m : 1 ♀ ov. 67 mm (MNHN-AS 445). — Stn CP 118, 448-466 m : 5 ♂ 31-86 mm ; 3 ♀ 31-68 mm (MNHN-AS 448, 449). — Stn CP 123, 700-702 m : 1 ♀ 69 mm (MNHN-AS 452). — Stn CP 135, 486-551 m : 1 ♀ 46 mm ; 1 ♀ ov. 82 mm (MNHN-AS 446).

**Andaman Sea** : 342-749 m : 1 ♀ 74 mm (BMNH). — 11°31'40" N-92°46'50" E, 348-370 m : 1 ♂ 64 mm (BMNH) (Indian Museum exchange).

**REMARKS.** — The specimens collected in the Philippine Islands are similar to those from the Andaman Sea and agree with the description and figures provided by WOOD-MASON and ALCOCK. However, the cervical spine (sensu HOLTHUIS, 1974) is more developed in the specimens from the Indian Ocean. In the specimens from the Philippines this spine is clearly smaller and in several specimens is reduced to a granule.

The species has been recorded from the Andaman Sea, Indonesia and the Philippines, at depths of from 289 to 749 m.

*Metanephrops mozambicus* sp. nov.

Figs 2 a-b, 3 a-b

*Nephrops andamanicus* - GILCHRIST, 1921 : 4 ; 1922 : 7 ; 1925, 24. — CALMAN, 1925 : 22. — BARNARD, 1927 : 127. — BERRY, 1969 : 5, fig. 1. — CROSNIER & JOUANNIC, 1973 : 13 (not Wood-Mason, 1892).

*Nephrops andamanica* - BARNARD, 1950 : 528, fig. 99a. — SANKARANKUTTY & SUBRAMANIAN 1976 : 20, pl. 2. — KENSLEY, 1981 : 29 (not Wood-Mason, 1892).

*Metanephrops andamanicus* - WEAR, 1976 : 119, fig. 3f, g. — IVANOV & KUYLOV, 1980 : 288. — ANONYMOUS, 1981 : 3. — HOLTHUIS, 1984 (unnumbered pages and figures). — VON COSEL, 1987 : 13 (not Wood-Mason, 1892).

**MATERIAL EXAMINED.** — **Madagascar.** *Vauban* : CH 19, 12°38.0' S-48°15.5' E, 393-403 m, 18.01.1972 : 1 ♀ ov. 77 mm (MNHN-AS 463). — CH 25, 12°26.2' S-48°13.0' E, 600-605 m, 19.01.1972 : 3 ♂ 55 to 68 mm ; 2 ♀ 43 and 49 mm (MNHN-AS 462). — CH 33, 12°28.1' S-48°12.2' E, 600-605 m, 13.09.1972 : 1 ♂ 45 mm (MNHN-AS 467). — CH 45, 15°20.5' S-46°9.0' E, 310-350 m, 07.11.1972 : 1 ♂ 65 mm (MNHN-AS 461). — CH 48, 15°18.0' S-46°12.1' E, 480-510 m, 08.11.1972 : 2 ♂ 53 and 63 mm ; 3 ♀ 42 to 58 mm (MNHN-AS 469). — CH 56, 23°36.0' S-43°31.6' E, 395-410 m, 26.02.1973 : 2 ♂ 73 and 88 mm ; 1 ♀ ov. 83 mm (MNHN-AS 457, 458, 459).

*Macareignes III* : CH 4, 22°25.8' S-43°05.8' E, 400-410 m, 20.12.1985 : 1 ♀ 37 mm (MNHN-AS

349). — CH 6, 22°27.5' S-43°06.2' E, 425-450 m, 21.12.1985 : 1 ♀ 35 mm (MNHN-AS 355). — CH 33, 22°23.4' S-43°04' E, 450-500 m, 20.01.1986 : 2 ♂ 73 and 82 mm ; 1 ♀ ov. 77 mm (MNHN-AS 354). — CH 61, 22°25.8' S-43°05' E, 550 m, 19.10.1986 : 1 ♀ 61 mm (MNHN-AS 464). — CH 65, 22°26.1' S-43°4.6' E, 520 m, 20.10.1986 : 2 ♂ 59 and 59 mm (MNHN-AS 460, 464). — CH 78, 22°20.5' S-43°3.1' E, 530 m, 24.10.1986 : 1 ♀ 57 mm (MNHN-AS 466).

North of Tulear : 1 ♂ 78 mm ; 1 ♀ ov. 81 mm (MNHN-AS 353).

**Mozambique.** Summer 1965 : 1 ♂ 85 mm ; 2 ♀ ov. 72 and 75 mm (MNHN-AS 56).

**South Africa.** *Africana* : stn T02, 29°46.6' S-31°23' E, 290 m, 24.08.1986 : 1 ♂ 78 mm (ICM 1035).

**TYPES.** — One male from Madagascar (*Vauban*, CH 56) with a carapace length of 88 mm (MNHN-AS 457) has been selected as the holotype. The ovigerous female from the same station with a carapace length of 83 mm (MNHN-AS 458) is the allotype. The remaining specimens are the paratypes.

**DESCRIPTION** — Carapace smooth, pubescent. Except for the furrows, abdomen almost entirely without pubescence.

Rostrum reaching distinctly beyond the end of the antennular peduncle, being slightly longer than the distance between the orbit and the postcervical groove. Proximally curved downwards and upwards after it passes the end of the scaphocerite. Lateral carina well-developed, extending from the apex of the rostrum and continuing along the ventro-posterior orbital margin. Lower margin with one tooth near the level of the apex of the scaphocerite. Two dorsal rostral carinae diverging behind the end of the rostrum, bearing a pair of teeth over the orbit, pointing anterodorsally and slightly outwards. Three pairs of postrostral teeth behind the orbit directed anterodorsally, but not outwards. Surface between the two dorsal rostral carinae concave, with a furrow between the pre- and postorbital pairs of teeth.

A well-developed dorsal cardiac ridge behind the postcervical groove, with a pair of forwardly directed spines anteriorly. Two rows of spinules along the cardiac ridge between the postcervical



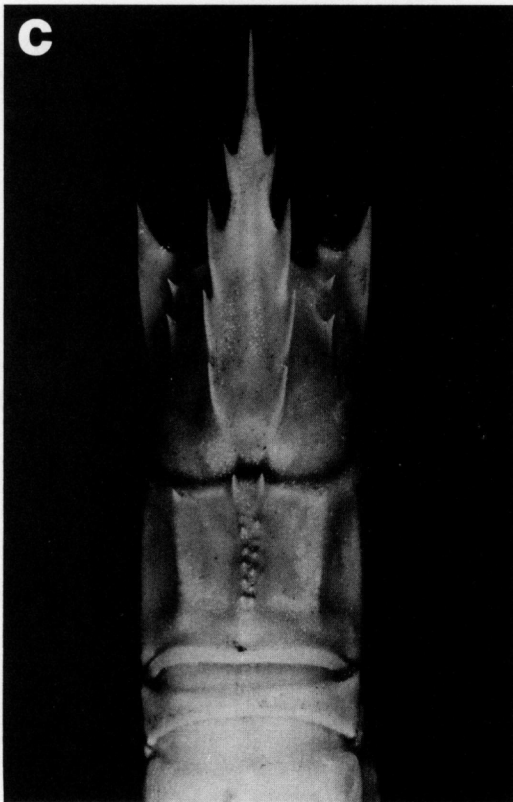
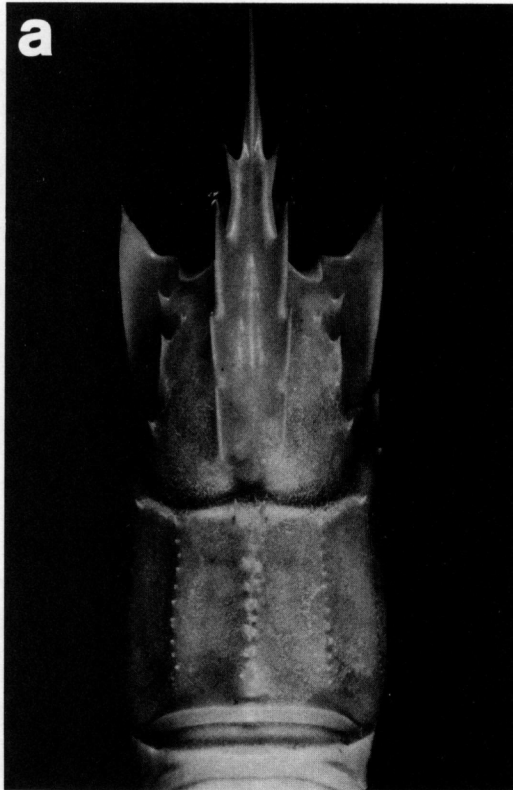


FIG. 3a-b. — *Metanephrops mozambicus* sp. nov., holotype ♂ 88 mm, *Vauban*, Madagascar, CH 56, 395-410 m (MNHN-AS 457) : a, carapace, dorsal view ; b, abdomen, dorsal view.

FIG. 3c-d. — *Metanephrops andamanicus* (Wood-Mason), ♀ 68 mm, MUSORSTOM 3, Philippines, Stn 123, 700-702 m (MNHN-AS 452) : c, carapace, dorsal view ; d, abdomen, dorsal view.

groove and the posterior margin, without a furrow between the rows.

Antennal spine large with outer margin convex, directed anteriorly and dorsally, nearly reaching the end of the eyes. Three small postorbital spines between the postrostral tooth and the antennal spines, the largest at the level of the second postrostral spine.

Cervical groove distinct, starting below the antennal spine and curving upwards just before the hepatic spine. Postcervical groove pubescent, very distinct. Upper part closer to the posterior border of the carapace than to the postorbital margin. Lower portion curving anteriorly below the hepatic spine and then upwards, merging with the cervical groove. Lateral surface of the carapace bearing three conspicuous lateral ridges behind the postcervical groove. Upper ridge granulate, situated slightly upper end of the cervical groove, the anterior portion terminating in a small spine. Middle ridge thicker than the other two ridges, located at a level between the postorbital and antennal spines, also terminating in a small spine; no conspicuous granules along the ridge. Lowest ridge smooth, convex ventrally, reaching the postcervical groove behind the hepatic spine, and ending in a small spine similar in size to those of the other two ridges.

Lateral and posterior margins broadened.

Antennal peduncle slightly overreaching the antennular peduncle.

Scaphocerite laminar, outer margin slightly convex. Anterior and inner margins rounded, with long setae. A minute tooth on the anterior end of the outer margin.

Eyes large and subspherical, diameter approximately equal to scaphocerite length.

Third maxilliped overreaching the end of the scaphocerite by the length of the dactylus.

First pereopods subequal, the left chela being slightly longer than the right. Ischium smooth. Merus rather triangular, dorsal border bearing minute granules. Inner and dorsal margins terminating anteriorly in a strong spine, outer margin ending in a rounded point. Carpus subcylindrical, about one-half merus length, covered with small granules, and bearing a small spine medially on the outer surface, one large spine on the anterior end of the outer margin, and another on the anterior edge of the dorsal border. Palms of chelae bearing five longitudinal granulate or denticulate ridges, without spines. Fingers dorso-

ventrally flattened, ending at the same level, with minute granules, each tip terminating in a sharp, inwardly curving tooth. Cutting edges with a single row of denticles, those on the movable finger smaller. One well-developed tooth on the proximal half of the fixed finger. Basal portion of the cutting edge of the movable finger fringed with setae. Fixed finger with setae on the proximal two-thirds of the cutting edge. Sometimes a medial brush of setae along the proximal half of the free finger ventrally.

Other pereopods smooth and subcylindrical. Second pereopod overreaching the apex of the rostrum by about the length of the fingers. Third pereopod slightly overreaching the second. Fourth pereopod overreaching the second by the length of the dactylus. Fifth pereopod barely surpassing the end of the scaphocerite. Chelae of second and third pereopods, dactylus of fourth, and subchela of fifth with rows of setae.

Terga of abdominal segments with smooth articular surfaces and lacking a carina on the median line. Non-articular surfaces smooth, with transverse, pubescent grooves. Non-articular surface of first somite with a small, short, transverse groove laterally. Second and third somites with a well-developed groove extending medially from near the hinge with the posterior segment almost to the midline; the grooves on the fourth and fifth segments extending a shorter distance laterally. Sixth segment without grooves. Distinction between tergum and pleura well-marked on the 2nd to 5th segments. Lower borders of terga forming a ridge extending from hinge to hinge. Pleura of second segment broad and acutely pointed posteriorly. Third to fifth pleurae acute but less broad, decreasing in size posteriorly. Sixth tergite bearing a triangular elevation armed with a spine on each anterolateral portion. Central region of sixth segment with a medial spine on the posterior margin. A spine on the posterolateral angle of the tergite.

Telson subrectangular. Lateral and posterior margins slightly concave. Posterolateral angles with well-developed single spines. Dorsal surface with two acute spines on the proximal quarter. Centre of dorsum occupied by a triangular depression with the apex directed anteriorly.

Basal segment of uropod bearing a spine. Lateral border of exopodite and endopodite ending in an acute spine. Posterior margin of caudal fan fringed with long setae.

First pleopod strong, subcylindrical, curved anteriorly and ventrally, and produced into an acute process. Other pleopods well-developed and biramose.

REMARKS. — *Metanephrops mozambicus* belongs to the "japonicus" group of the genus (JENKINS, 1972; CHAN & YU, 1987), characterized in that the carapace is smooth between the ridges, except for several large spines. The chela of the first pereopod is heavily ridged and spinulose, and the surface of the abdominal tergites is conspicuously sculptured.

Among the species of the group (*M. formosanus*, *M. japonicus*, *M. sagamiensis*, and *M. andamanicus*), the closest is *M. andamanicus* (Wood-Mason, 1892), with which it has often been confused. However, examination of numerous specimens of *M. andamanicus* (see above) has shown these two species to be clearly differentiated by :

(a) Abdominal segments densely covered with short hairs in *M. andamanicus*, this pubescence practically absent in the new species. Carapace also more pubescent in *M. andamanicus*.

(b) 2nd to 5th abdominal segments clearly carinate along the median line and sculptured in *M. andamanicus*; midline clearly smooth and segments less sculptured in *M. mozambicus*.

(c) Dorsal surface of rostrum between lateral rostral carinae at the level between the two pairs of rostral spines bearing a distinct groove in the new species; rostrum in *M. andamanicus* more compressed without a groove between rostral carinae.

(d) Rostrum more downwardly directed in *M. andamanicus* than in the new species.

(e) Rostral and postrostral teeth more outwardly directed in *M. andamanicus* than in *M. mozambicus*.

(f) Spines on the carapace more acute and developed in the new species than in *M. andamanicus*.

(g) Carinae behind postcervical groove spinier in the new species.

SIZE. — The males examined ranged between 45 and 88 mm (carapace length). The females ranged from 37 to 83 mm. BERRY (1969) reported the onset of sexual maturity to take place at around 47 mm (carapace length excluding the rostrum) in females. The length of the longest

specimens (total length, rostrum-telson) caught in the Mozambique Channel was 205 mm (male) and 200 mm (female).

COLOUR. — Carapace and abdomen pinkish. Chelae banded with pink.

DISTRIBUTION. — This species is distributed along the continental shelf and slope from Natal to Kenya on muddy bottoms at depths between 200 and 750 m. Nevertheless, maximum concentrations are located between 400 and 500 m (BERRY, 1969; CROSNIER & JOUANNIC, 1973; HOLTHUIS, 1984; VON COSEL, 1987). Females carry from 600 to 1 400 eggs. Hatching of eggs has been recorded from March until July, with a peak in May (BERRY, 1969). VON COSEL (1987) found the major share of ovigerous females between 350-450 m during December-January, with the proportion of males and non-ovigerous females increasing in deeper waters.

#### *Metanephrops neptunus* (Bruce, 1965)

*Nephrops neptunus* Bruce, 1965 : 274, pls 13-15 ; 1966b : 256. — JENKINS, 1972 : 163. — BURUKOVSKY, 1974 : 110 (key) (ed. 1983 : 155). *Metanephrops neptunus* - JENKINS, 1972 : 171. — PHILLIPS *et al.*, 1980 : 65. — GEORGE, 1983 : 19. — CHAN & YU, 1987 : 184 (key).

MATERIAL EXAMINED. **Indonesia (Makassar).** CORINDON II : stn. 214, 0°31.4' N-117°50.1' E, 595 m, 01.11.1980 : 1 ♀ ov. 119 mm (MNHN-AS 257).

REMARKS. — The specimen from the Makassar Strait agrees with the original description and figures. This species is readily distinguished from the other species of the genus due to the armature of the carapace, the region between the postrostral carinae being heavily spinulose.

The specimens described by BRUCE were caught in the South China Sea at 740-805 m. This new occurrence off Indonesia extends its distribution range southwards.

#### *Metanephrops sinensis* (Bruce, 1966)

*Nephrops sinensis* Bruce, 1966a : 155, pls 10-12 ; 1966b : 284. — KABATA, 1966 : 10. — JENKINS,

1972 : 163. — BURUKOVSKY, 1974 : 111 (key) (ed. 1983 : 158).

*Metanephrops sinensis* - JENKINS, 1972 : 171. — PHILLIPS *et al.*, 1980 : 65. — CHAN & YU, 1987 : 184 (key).

**MATERIAL EXAMINED.** — **Philippines.** MUSORSTOM 1 : stn 42, 379-407 m : 1 ♂ 32 mm ; 1 ♀ 26 mm (MNHN-AS 375).

MUSORSTOM 2 : stn CP 26, 299-320 m : 6 ♂ 47 to 66 mm ; 2 ♀ 39 to 55 mm (MNHN-AS 374). — Stn CP 74, 300-370 m : 1 ♂ 52 mm (MNHN-AS 371). — Stn CP 75, 300-330 m : 1 ♂ 63 mm ; 1 ♀ 53 mm (MNHN-AS 373). — Stn CP 83, 318-320 m : 1 ♀ 48 mm ; 1 ♀ ov. 67 mm (MNHN-AS 369).

MUSORSTOM 3 : stn CP 119, 320-337 m : 12 ♂ 43 to 68 mm ; 6 ♀ 43 to 66 mm ; 5 ♀ ov. 47 to 50 mm (MNHN-AS 372). — Stn CP 125, 388-404 m : 9 ♂ 32 to 63 mm ; 6 ♀ 26 to 61 mm (MNHN-AS 370).

**REMARKS.** — BRUCE (1966a) gave a clear and complete description of the species. *M. sinensis* is closely related to *M. thomsoni* (Bate) from the Western Pacific (see below) in view of the transverse furrows present on the 2nd to 5th abdominal tergites and the weakly ridged and finely granulate chelae of the first pereopods. The transverse furrow on the first abdominal tergite, absent in *M. thomsoni*, is difficult to discern in juveniles. The other specific characters are constant in all the specimens examined.

This species has so far been found only on the edge of the continental shelf south of the Gulf of Tonkin (203-396 m). The specimens from the Philippines were collected at depths between 299 and 407 m.

*Metanephrops thomsoni* (Bate, 1888)

*Nephrops thomsoni* Bate, 1888 : 185 (in part, only male), pl. 25, fig. 1, pl. 26. — STEBBING, 1893 : 202. — HUTTON, 1904 : 253. — ESTAMPADOR, 1937 : 497 ; 1959 : 43. — YOSHIDA, 1941 : 34, pl. 10, fig. 2. — LIU & HSU, 1963 : 309. — KUBO, 1965 : 629, fig. 1030. — CHANG, 1965 : 48, unnumbered figure. — BRUCE, 1966a : 164 ; 1966b, 284 ; 1966c : 535. — JENKINS, 1972 : 162. — KIM & PARK, 1972 : 210. — BURUKOVSKY, 1974 : 111 (key) (ed. 1983 : 156). — MIYAKE, 1975 : 106, unnumbered figure. —

KIM, 1977 : 346, figs 155, 156, pls 38, 77. — MOTOH *et al.*, 1978 : 22. — SAKAI, 1978 : 8, fig. 3.

*Nephrops thomsoni* - DE MAN, 1916 : 96, 99. *Nephrops tomsoni* - ALCOCK, 1902 : 147. *Nephropsis thomsoni* - ANONYMOUS, 1954 : 756, fig. 2178. — TUNG *et al.*, 1958 : 166.

*Metanephrops thomsoni* - JENKINS, 1972 : 171. — UCHIDA & DOTSU, 1973 : 23, figs 1-7. — PHILLIPS *et al.*, 1980 : 65. — MIYAKE, 1982 : 77, pl. 26, fig. 2. — BABA, 1986 : 151, 280, fig. 102. — CHAN & YU, 1987 : 184 (key).  
not *Nephrops thomsoni* - BATE, 1888 : 185 (in part, only female), pl. 25, fig. 2 [= *M. challengerii* (Balss, 1914)].

**MATERIAL EXAMINED.** — **Philippines.** MUSORSTOM 1 : stn 10, 187-205 m : 1 ♂ 24 mm ; 2 ♀ 55 and 63 mm (MNHN-AS 399, 420). — Stn 11, 217-230 m : 9 ♂ 36 to 64 mm ; 11 ♀ 34 to 63 mm (MNHN-AS 384, 391, 393). — Stn 12, 187-210 m : 3 ♂ 57 to 68 mm ; 1 ♀ 40 mm (MNHN-AS 383). — Stn 20, 208-222 m : 1 ♂ 58 mm ; 3 ♀ 44 to 68 mm ; 1 ♀ ov. 56 mm (MNHN-AS 397). — Stn 21, 174-223 m : 2 ♀ 68 and 70 mm (MNHN-AS 395). — Stn 24, 189-209 m : 1 ♀ 33 mm (MNHN-AS 417). — Stn 25, 191-200 m : 1 ♂ 66 mm (MNHN-AS 388). — Stn 26, 189 m : 1 juv. 13 mm (MNHN-AS 421). — Stn 30, 177-186 m : 2 ♀ 26 and 33 mm (MNHN-AS 413). — Stn 31, 187-195 m : 1 juv. 14 mm ; 1 ♀ 32 mm (MNHN-AS 415). — Stn 32, 184-193 m : 2 ♂ 39 and 69 mm (MNHN-AS 402). — Stn 34, 188-191 m : 1 ♂ 33 mm (MNHN-AS 416). — Stn 35, 186-187 m : 1 ♀ 35 mm (MNHN-AS 418). — Stn 40, 265-287 m : 1 ♀ 30 mm (MNHN-AS 419). — Stn 69, 187-199 m : 1 ♀ 34 mm (MNHN-AS 414). — Stn 51, 170-200 m : 1 ♂ 66 mm ; 2 ♀ 56 and 62 mm (MNHN-AS 403). — Stn 65, 194-202 m : 1 ♂ 56 mm (MNHN-AS 392).

MUSORSTOM 2 : stn CP 1, 188-198 m : 1 ♂ 44 mm (MNHN-AS 406). — Stn CP 2, 184-186 m : 1 ♀ ov. 67 mm (MNHN-AS 422). — Stn CP 10, 188-195 m : 1 ♂ 58 mm ; 1 ♀ 46 mm ; 3 ♀ ov. 57 to 62 mm (MNHN-AS 404). — Stn CP 11, 194-196 m ; 4 ♂ 47 to 62 mm ; 1 ♀ ov. 53 mm (MNHN-AS 401). — Stn CP 13, 193-200 m : 1 ♀ ov. 67 mm (MNHN-AS 389). — Stn CP 18, 188-195 m : 5 ♂ 45 to 68 mm ; 1 ♀ ov. 63 mm (MNHN-AS 396). — Stn CP 19, 189-192 m : 1 ♀ 72 mm (MNHN-AS 424). — Stn CP 63, 215-230 m : 1 ♂ 62 mm (MNHN-AS 423). — Stn CP 64, 191-195 m : 2 ♂ 50 and 62 mm (MNHN-AS 382). — Stn CP 66, 192-209 m : 3 ♂ 37

to 56 mm; 2 ♀ ov. 55 and 65 mm (MNHN-AS 380, 381). — Stn CP 67, 193-199 m : 1 ♀ 13 mm (MNHN-AS 408). — Stn CP 72, 182-197 m : 1 ♀ 43 mm (MNHN-AS 405).

MUSORSTOM 3 : stn CP 86, 187-192 m : 1 ♀ ov. 70 mm (MNHN-AS 385). — Stn CP 87, 191-197 m : 3 ♂ 36 to 63 mm; 3 ♀ 55-72 mm; 1 ♀ ov. 57 mm (MNHN-AS 400). — Stn CP 91, 190-203 m : 1 juv. 13 mm; 1 ♂ 36 mm; 1 ♀ ov. 57 mm (MNHN-AS 378, 409). — Stn CP 92, 224 m : 1 ♂ 62 mm; 2 ♀ ov. 67 and 73 mm (MNHN-AS 386). — Stn CP 98, 194-205 m : 2 ♂ 56 and 59 mm (MNHN-AS 387). — Stn CP 99, 196-204 m : 1 juv. 13 mm; 1 ♂ 54 mm; 4 ♀ ov. 56 to 61 mm (MNHN-AS 390, 412). — Stn CP 101, 194-196 m : 1 ♂ (broken); 1 ♂ 54 mm (MNHN-AS 407, 379). — Stn CP 103, 193-200 m : 2 juv. 14 and 15 mm; 3 ♂ 64 to

69 mm; 2 ♀ 40 and 66 mm; 3 ♀ ov. 59 to 70 mm (MNHN-AS 377, 411). — Stn CP 120, 219-220 m : 1 juv. 18 mm; 4 ♂ 49 to 59 mm; 3 ♀ ov. 57 to 65 mm (MNHN-AS 376, 410). — Stn CP 143, 205-214 m : 1 ♂ 60 mm (MNHN-AS 394).

Taiwan : 1 ♂ 37 mm; 1 ♀ 55 mm (MNHN-AS 344) (D.-A. LEE leg.).

REMARKS. — The characters are constant in the specimens examined and agree quite well with the description and illustrations given by the different authors.

This species has been recorded from the Philippines and Taiwan, the China Sea to Japan, and the Tasman Sea. Depths between 50 and 509 m.

#### Genus *NEPHROPSIS* Wood-Mason, 1873

The genus comprises thirteen species, five of which are found in the Atlantic Ocean : *N. agassizii* A. Milne Edwards, 1880; *N. aculeata* Smith, 1881; *N. atlantica* Norman, 1882; *N. rosea* Bate, 1888; and *N. neglecta* Holthuis, 1974. Eight more species are indigenous to the

Pacific and Indian oceans : *N. stewarti* Wood-Mason, 1872; *N. carpenteri* Wood-Mason, 1885; *N. suhmi* Bate, 1888; *N. occidentalis* Faxon, 1893; *N. ensirostris* Alcock, 1901; *N. malhaensis* Borradaile, 1901; *N. acanthura* sp. nov.; and *N. sulcata* sp. nov.

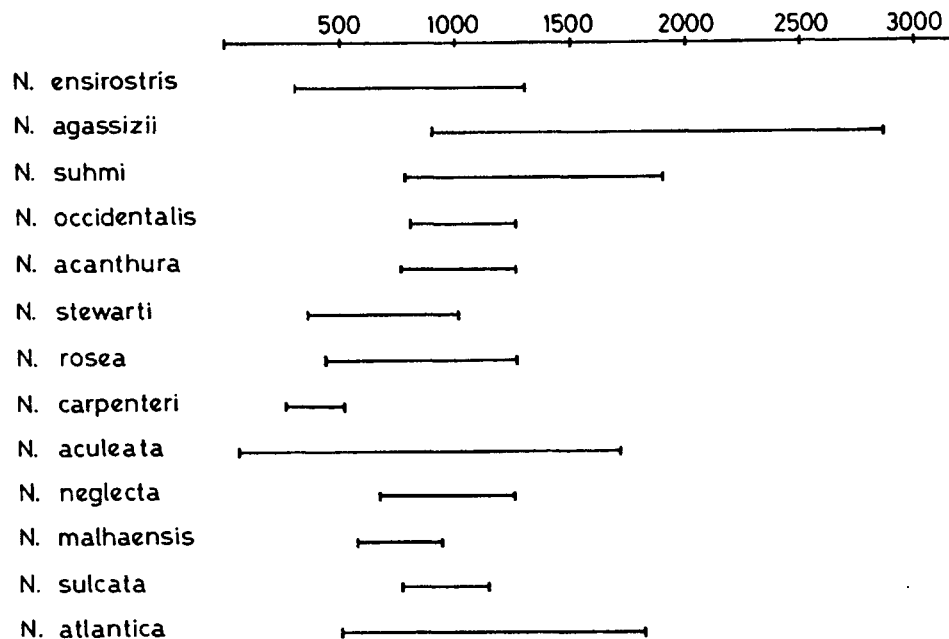


FIG. 4. — Depth distribution of the species of the genus *Nephropsis* depth in meters).

The species of the genus *Nephropsis* normally dwell on muddy bottoms, generally at depths greater than 400 m, although the depth range is quite broad (Figure 4). The species inhabiting the shallowest depths is *N. aculeata*, reported to occur in waters shallower than 100 m (HOLTHUIS, 1974), and *N. agassizii* is the species dwelling at the greatest depths (2 867 m). In the Indian and Pacific oceans *N. carpenteri* dwells in the shal-

lowest waters (250-503 m), *N. suhmi* in the deepest (786-1 900 m).

HOLTHUIS (1974) published a complete description of the genus and a comprehensive revision of Atlantic species, calling attention to a large number of new specific characters. This paper presents a review of the rest of the species of the genus reported in the Indian and Pacific oceans, in order to complete the revision of the genus.

#### Key to the species of the genus *Nephropsis*

1. Rostrum without lateral spines ..... *N. ensirostris*
- Rostrum with lateral spines ..... 2
2. Exopod of uropod with <sup>out</sup> a diaeresis ..... 3
- Exopod of uropod with ~~out~~ a diaeresis ..... 4
3. Dactylus of fifth pereopod less than one-half propodus length ; in adult specimens the distance between the orbital border and the postcervical groove around twice the distance between the postcervical groove and the posterior border of the carapace ..... *N. agassizii*
- Dactylus of fifth pereopod more than one-half propodus length ; in adult specimens the distance between the orbital border and the postcervical groove is 1.5 times the distance between the postcervical groove and the posterior border of the carapace ..... *N. suhmi*
4. Dorsal surface of telson with a well-developed spine ..... 5
- Dorsal surface of telson without spines ..... 6
5. Anterior border of second abdominal pleura clearly convex, ending in a short, acute point ; no postsupraorbital spine ..... *N. occidentalis*
- Anterior border of second abdominal pleura slightly convex, ending in a long, acute point ; postsupraorbital spine sometimes present .....  
..... *N. acanthura*
6. Rostrum with one pair of lateral spines ..... 7
- Rostrum with two pairs of lateral spines ..... 10
7. Abdomen without a median carina ..... *N. stewartii*
- Abdomen with a median carina ..... 8
8. Distance between the supraorbital spine and the gastric tubercle around two-thirds the distance between the gastric tubercle and the postcervical groove ; a postsupraorbital spine behind the supraorbital spine ....  
..... *N. rosea*
- Distance between the supraorbital spine and the gastric tubercle equal to or less than one-half the distance between the gastric tubercle and the postcervical groove ; no spine behind the supraorbital spine ..... 9
9. Carpus of second pereopod shorter than the palm ; length of rostrum one-third the rest of carapace (not including rostrum itself) .....  
..... *N. carpenteri*
- Carpus of second pereopod longer than the palm ; length of rostrum slightly less than one-half the rest of carapace ..... *N. aculeata*

10. Anterior margin of abdominal pleura without spines..... *N. neglecta*  
 — Anterior margin of at least the second abdominal pleuron with a strong spine ..... 11
11. Abdomen without a median carina ..... *N. malhaensis*  
 — Abdomen with a median carina ..... 12
12. Rostrum with a median groove clearly overreaching the anterior pair of lateral spines; distance between the supraorbital spine and the gastric tubercle one-half the distance between the gastric tubercle and the postcervical groove..... *N. sulcata*  
 — Rostrum with a median groove that does not overreach the anterior pair of lateral spines; distance between the supraorbital spine and the gastric tubercle around two-thirds the distance between the gastric tubercle and the postcervical groove..... *N. atlantica*

*Nephropsis ensirostris* Alcock, 1901

Figs 5 a, 6, 8 a-b, 16 a

*Nephropsis ensirostris* Alcock, 1901a : 158 (key), 162, pl. 1, fig. 2. — ALCOCK & MCARDLE, 1902 : pl. 58, figs 1, 1 a. — LLOYD, 1907 : 4. — DE MAN, 1916 : 97, 112 (key). — BOUVIER, 1917 : 20. — BALSS, 1925 : 208. — BURUKOVSKY, 1974 : 109 (key) (ed. 1983 : 153). — PHILLIPS *et al.*, 1980 : 66.

*Nephropsis suhmi* - RAMADAN, 1938 : 125 (in part, only Stn 33) (not Bate, 1888).

**MATERIAL EXAMINED.** — **Philippines.** MUSORSTOM 1 : stn 44, 592-610 m : 2 ♀ ov. 26 and 27 mm (MNHN-AS 496, 499).

MUSORSTOM 2 : stn CP 24, 640-647 m : 1 ♀ 15 mm (MNHN-AS 498). — Stn CP 25, 520-550 m : 2 ♀ 22 and 28 mm (MNHN-AS 502). — Stn CP 82, 550 m : 1 ♀ 31 mm (MNHN-AS 501).

MUSORSTOM 3 : stn CP 122, 673-675 m : 1 ♂ 21 mm (MNHN-AS 500). — Stn CP 123, 700-702 m : 2 ♀ 17 and 26 mm (MNHN-AS 495). — Stn CP 128, 815-821 m : 2 ♂ 25 and 26 mm ; 1 ♀ 34 mm (MNHN-AS 494).

*Albatross* : stn 5487, 10°02'45" N-125°05'33" E, 1 318 m, 31.07.1909 : 1 ♂ 19 mm ; 1 ♀ 23 mm (USNM).

**Indonesia.** CORINDON 2 : stn CH 201, 01°11' S-117°06' E, 21 m, 30.10.1980 : 1 ♀ 12 mm (MNHN-AS 505). — Stn CH 214, 00°31' N-117°50' E, 595 m, 01.11.1980 : 1 ♂ 20 mm (MNHN-AS 504).

CORINDON 4 : stn 2-1, 03°18' S-128°16' E, 315-483 m, 14.04.1981 : 1 ♀ 25 mm (MNHN-AS 497).

**Sri Lanka.** SAFARI 2 : stn CP 06, 08°11' N-

79°03' E, 1 035 m, 28.07.1981 : 2 ♂ 35 and 40 mm (MNHN-AS 503).

**Gulf of Aden.** JOHN MURRAY EXP. : stn 33, 13°41'00" N-48°17'00" E, 1 295 m, 15.10.1933 : 1 ♀ 10 mm (BMNH 1937.12.7.210-215).

**DESCRIPTION.** — Carapace finely granulate. Rostrum without lateral spines. Rostral length between one-half and two-thirds the length of the rest of the carapace (not including the rostrum itself), in some small specimens as long as the rest of the carapace. Each subdorsal carina bearing two spines, one near the base of the rostrum and the other just anterior to the gastric tubercle. Some more or less acute granules between these two spines. Median groove overreaching the midpoint of the rostrum. Gastric tubercle located slightly closer to the orbital border than to the postcervical groove. Supra-orbital and antennal spines well-developed and similar in size. Postsupraorbital spine smaller than these and located at the level of the proximal subdorsal spine. Grooves on carapace distinct. Postcervical groove deep, passing the dorsal midline of the carapace. Faint carinae present behind the postcervical groove. A pair of dorsal spines just behind the postcervical groove. Distance between the orbital border and the postcervical groove a little less than twice the distance between the postcervical groove and the posterior border of the carapace.

Abdomen pubescent, particularly in the grooves. Abdominal tergites on 1st to 5th segments with a conspicuous transverse groove. A dorsal carina on the abdominal tergites, barely distinct on the

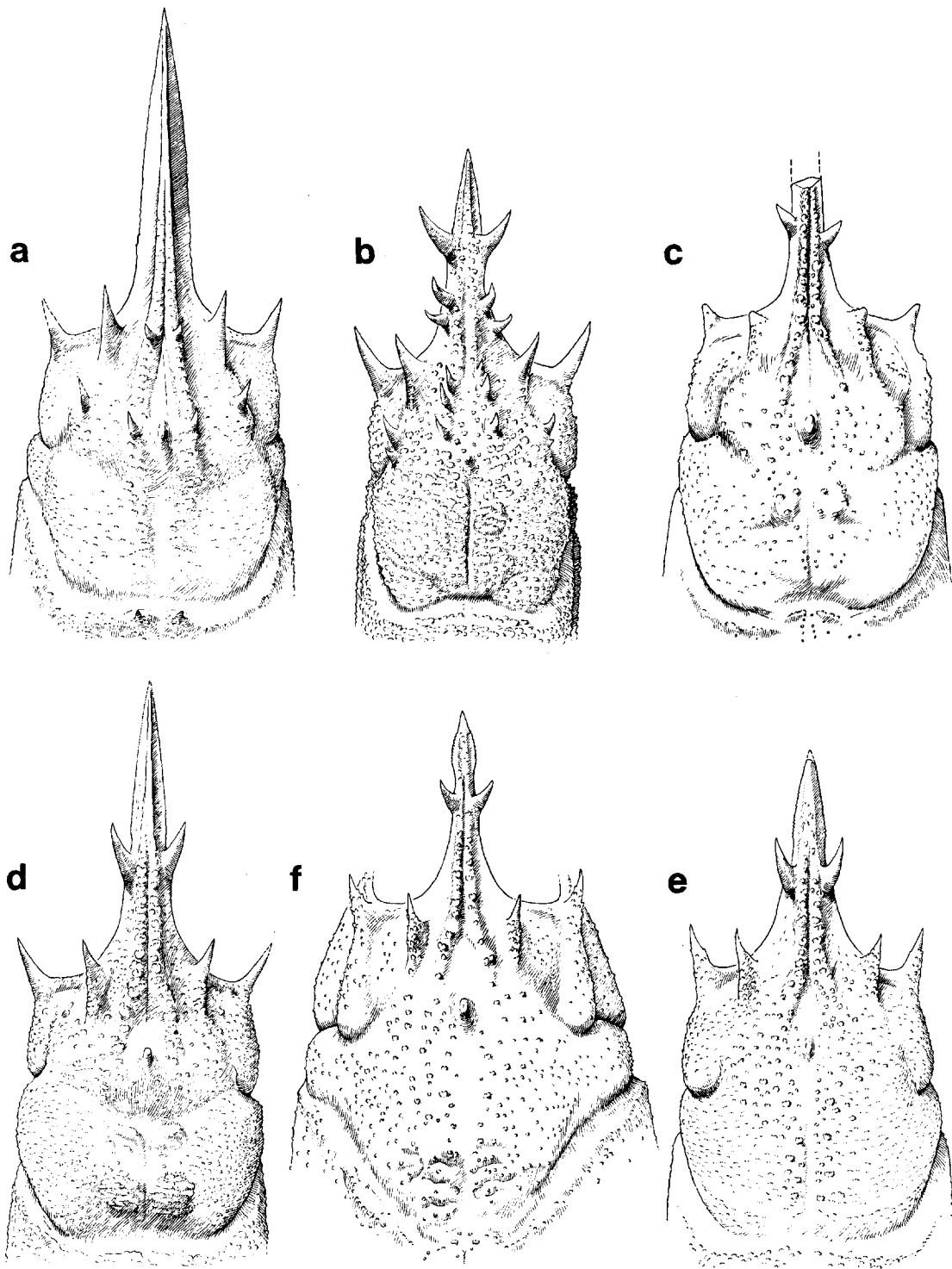


FIG. 5. — Anterior part of the carapace, dorsal view ; a, *Nephropsis ensirostris* Alcock, ♀ 34 mm, MUSORSTOM 3, Philippines, Stn 128, 815-821 m (MNHN-AS 494) ; b, *N. suhmi* Bate, ♀ 33 mm, *Vauban*, Madagascar, CH 131, 1 490-1 600 m (MNHN-AS 506) ; c, *N. occidentalis* Faxon, ♀ 38 mm, Peru, 800 m (USNM 170556) ; d, *N. acanthura* sp. nov., holotype, ♂ 36 mm, MUSORSTOM 2, Philippines, Stn 56, 970 m (MNHN-AS 546) ; e, *N. stewartii* Wood-Mason, ♂ 39 mm, *Vauban*, Madagascar, CH 33, 600-605 m (MNHN-AS 435) ; f, *N. carpenteri* Wood-Mason, ♂ 30 mm, Bay of Bengal, 357 m (BMNH 1894.5.4.4).



2nd and 3rd segments. Anterior and posterior borders of pleura granulate, spineless, terminating in a long, acute point. Anterior border of pleura of second segment more convex than those of the pleura on the remaining segments.

Chelipeds with little pubescence. Carpus with a strong anterodorsal and anteroventral spine, an inner dorsal spine at mid-length, an outer spine on terminal half, and a strong spine on inner border near palmar articulation. Carpus of second pair of pereiopods slightly longer than the palm. Hand of third pereiopod 1.5 times carpus length. Dactylus of fourth and fifth pereiopods about two-thirds propodus length.

Coxa of second pereiopod of males and females with a rounded process. Coxa of third pereiopod of males with a process bearing a long, curved spine.

Incision on anterior border of thelycum of females rather shallow, hence thelycum not bilobate. Posterior incision broad and deep.

Exopodite of uropod with a distinct but incomplete diaeresis. External border of exopod and endopod terminating in a spine.

REMARKS. — *N. ensirostris* is readily distinguishable from the other species of the genus on account of the absence of lateral spines on the rostrum.

RAMADAN (1938), in his study of the Astacura from the John Murray Expedition, mentioned a specimen (Stn 33) without spines on the rostrum or on the anterior borders of the abdominal pleurae. Comparison of this specimen (classified as *N. suhmi*) with the specimens of *N. ensirostris* examined showed them to be conspecific, the specimen from that station in fact being a juvenile of *N. ensirostris*.

SIZE. — The males examined ranged from 17 to 40 mm long, the females from 10 to 34 mm. Ovigerous females from 26 mm.

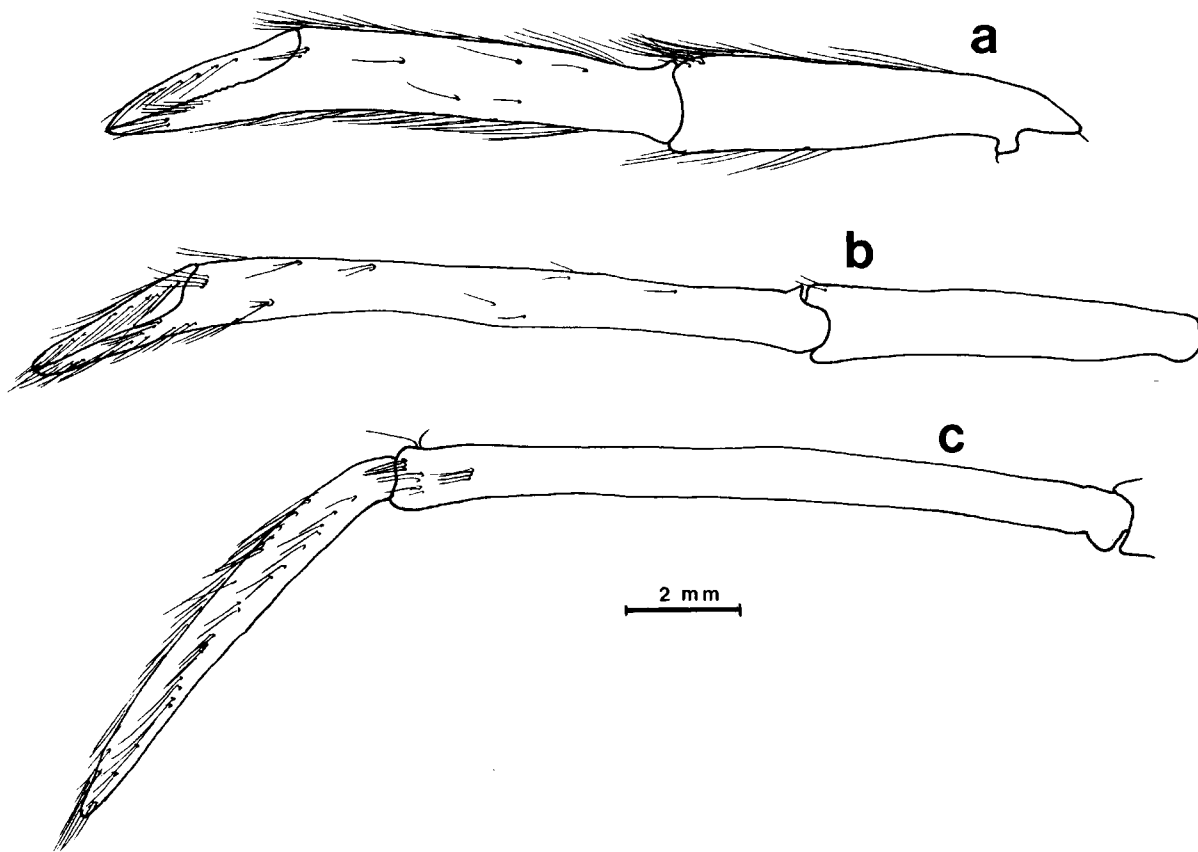


FIG. 6. — *Nephropsis ensirostris* Alcock, ♀ 34 mm, MUSORSTOM 3, Philippines, Stn 128, 815-821 m (MNHN-AS 494) : a, second pereiopod ; b, third pereiopod ; c, fourth pereiopod.

**DISTRIBUTION.** — Known from the Gulf of Aden, Arabian Sea, northern Laccadive Sea, south of Sri Lanka, Bay of Bengal, Andaman Sea, Indonesia and the Philippine Islands. Depths between 315 and 1 300 m.

*Nephropsis suhmi* Bate, 1888

Figs 5 b, 7 d-f, 8 c-d, 16 b

*Nephropsis suhmi* Bate, 1888 : 181, pl. 13, fig. 3, pl. 24, fig. 2. — ANDERSON, 1897 : 96. — RAMADAN, 1938 : 125 (in part, only Stn. 62 and 158). — BURUKOVSKY, 1974 : 109 (key) (ed. 1983 : 154). — PHILLIPS *et al.*, 1980 : 66. *Nephropsis Suhmi* - ALCOCK, 1899 : 33 ; 1901a : 158 (key), 163. — DE MAN, 1916 : 97, 112 (key), 114. — BOUVIER, 1917 : 21. — BALSS, 1925 : 208. *Nephrosis orientalis* Bate, 1888 : 171, 175 (nomen nudum).

**MATERIAL EXAMINED.** — **Madagascar.** *Vauban* : CH 126, 17°50' S-43°07' E, 1 475-1 530 m, 16.01.1975 : 4 ♂ 24 to 59 mm ; 6 ♀ 26 to 47 mm (MNHN-AS 507). — CH 131, 13°46' S-47°33' E, 1 490-1 600 m, 20.01.1975 : 2 ♂ 36 and 43 mm ; 4 ♀ 25 to 33 mm (MNHN-AS 506). — CH 141, 13°40.3' S-47°32.5' E, 1 600-1 725 m, 28.02.1975 : 1 ♀ 28 mm (MNHN-AS 508).

**New Caledonia.** BIOCAL : stn CP 69, 23°52' S-167°58' E, 1 220-1 225 m, 03.09.1985 : 1 ♂ 31 mm (MNHN-AS 509).

BIOGEOCAL : stn CP 238, 21°27.64' S-166°23.41' E, 1 260-1 300 m, 13.04.1987 : 1 ♂ 39 mm (MNHN-AS 529).

**Indonesia.** *Challenger* : stn 191, 05°41' S-134°4'30" E, 1 464 m, 23.09.1874 : 1 juv., holotype, 10.1 mm (BMNH 88.22).

**Arabian Sea.** JOHN MURRAY EXP. : stn 62, 22°53'30" N-64°56'10" E, 1 893 m, 18.11.1933 : 4 ♂ 9 to 26 mm ; 6 ♀ 9 to 24 mm (BMNH 1937.12.7.210-215).

**Maldive Sea.** JOHN MURRAY EXP. : stn 158, 4°42'30" N-72°42'30" E, 786-1 170 m, 7.04.1934 : 1 ♀ 8 mm (BMNH 1937.12.7.210-215).

**Australia.** CIDARIS 1 : stn 18-1, 17°45.44' S-148°01.03' E, 1 132-1 147 m, 10.05.1986 : 1 ♂ 38 mm. — Stn 30-2, 17°18.96' S-147°11.16' E, 1 402-1 406 m, 12.05.1986 : 1 ♀ 33 mm. — Stn 30-4, 17°19.12' S-147°11.20' E, 1 285-1 403 m, 12.05.1986 : 1 ♂ 45 mm. — Stn 32-2, 17°05.89' S-

147°11.85' E, 1 517-1 539 m, 13.05.1986 : 4 ♂ 31 to 46 mm ; 1 ♀ 22 mm. — Stn 35-3, 16°50.83' S-147°10.61' E, 1 607-1 609 m, 13.05.1986 : 1 ♀ 22 mm. — Stn 35-4, 16°54.54' S-147°14.35' E, 1 473-1 590 m, 14.05.1986 : 2 ♀ 33 and 37 mm (JCU).

**DESCRIPTION.** — Carapace covered with numerous granules of varying size, more numerous on the anterior half and more developed in adults than in juveniles. Rostrum bearing two pairs of strong lateral spines, sometimes one or two additional spines as well. Terminal pair located somewhat behind the midpoint of the rostrum. Median groove failing to reach the distal pair of lateral spines. Rostral length more than one-half the length of the rest of the carapace. Distance between the orbital border and the postcervical groove about 1.5 times the distance between the postcervical groove and the posterior border of the carapace (sometimes a little longer in the smallest specimens examined). Each subdorsal carina with two-three spines and several granules. Gastric tubercle closer to the supraorbital spine than to the postcervical groove. Supraorbital spine well-developed. Postsupraorbital spine present (in the holotype on the left side only), placed somewhat in front of the gastric tubercle. Usually a small spine present behind the postsupraorbital spine.

Conspicuous grooves on carapace. Postcervical groove deep, crossing the dorsal midline. Carinae posterior to the postcervical groove indistinct.

Abdominal segments bearing some granules smaller than those on the carapace. Some tufts of short setae scattered on the dorsa of the tergites. Abdominal tergites on 1st to 5th segments with a distinct transverse groove dorsally that is discontinuous medially. Abdominal pleura of 2nd to 5th segments slightly convex, with a well-developed spine terminating in a long, acute point on the anterior border, occasionally absent on the fifth segment.

Chelipeds bearing numerous granules on all articles together with long setae, more densely packed on the fingers. Carpus with a well-developed anterodorsal spine. Outer surface of carpus bearing several spines (the anteriormost the strongest) medially and another spine on the anteroventral angle. Inner surface with a spine on the anteroventral angle and another medially

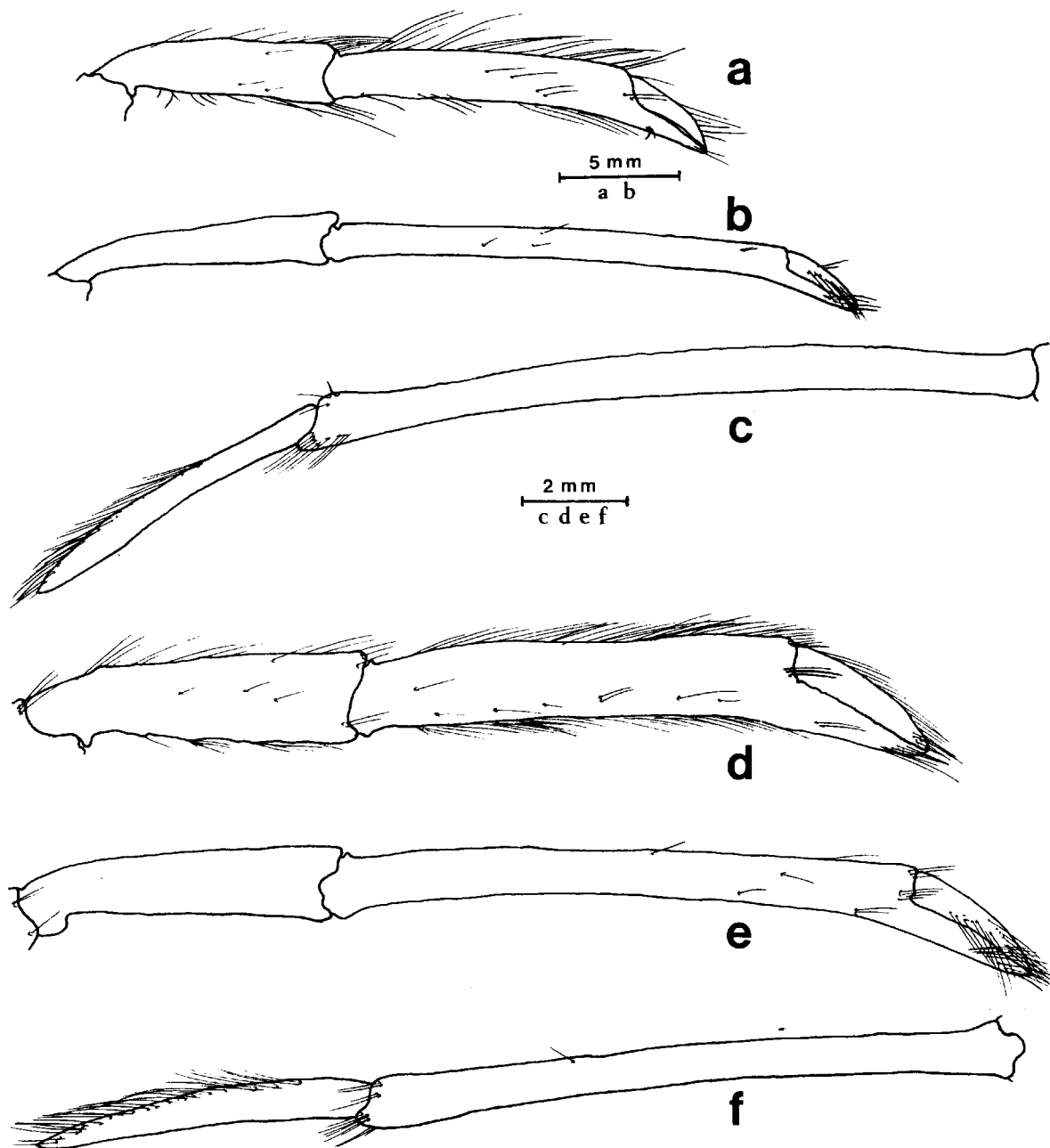


FIG. 7a-c. — *Nephropsis agassizii* A. Milne Edwards, ♀ 42 mm, Gulf of Mexico (USNM 173390) : a, second pereiopod ; b, third pereiopod ; c, fifth pereiopod.

FIG. 7d-f. — *Nephropsis suhmi* Bate, ♀ 33 mm, Vauban, Madagascar, CH 131, 1 490-1 600 m (MNHN-AS 506) : d, second pereiopod ; e, third pereiopod ; f, fifth pereiopod.

below the upper border. Distal half of upper border with a row of spines differing in size. Inner anterior angle bearing a spine. Hand somewhat less than twice as long as high. Carpus of second pereopod more than two-thirds hand length. Carpus of third pereopod somewhat more than one-half hand length. Dactyli of fourth and fifth pereopods somewhat more than one-half propodus length.

Coxal process on second pair of pereopods of males and females terminating in a more or less acute angle. Coxal process on third pair of pereopods terminating in three to five well-developed teeth in males, in a single tooth in females.

Thelycum of females located between the fourth pair of pereopods and bearing a deep median furrow over the entire length. The two lobes on the anterior border rather indistinct. A broad, triangular incision on the posterior portion.

Granules on outer surface of exopod and endopod of uropod. Exopod lacking a diaeresis.

REMARKS. — *N. agassizii* Smith, from the Northwest Atlantic, is the closest species to *N. suhmi* (Fig. 7). These two species differ from the other species of the genus in lacking a diaeresis on the exopod of the uropod. *N. agassizii* (1 ♂, RMNH 26371; 1 ♀, 1 ♂, RMNH 30406; 1 ♀, RMNH 29412; 1 ♀, RMNH 29408; 1 ♀ ov., RMNH 29508; 2 ♀, 1 ♂, RMNH 29406; 1 ♂, 1 ♀, USNM 173390) is readily differentiable from *N. suhmi* by such features as :

(a) Dactylus of fifth pereopod more than one-half propodus length in *N. suhmi*, less than one-half in *N. agassizii*.

(b) In adult specimens (> 30 mm carapace length) the distance between the orbital margin and the postcervical groove about 1.5 times the distance between the postcervical groove and the posterior margin of the carapace in *N. suhmi*, about 2 times in *N. agassizii*.

SIZE. — The holotype measures 10.1 mm in length (rostrum 4.3 mm). The males examined ranged from 9 to 59 mm, the females from 8 to 47 mm.

DISTRIBUTION. — The species has been reported from Indonesia, New Caledonia, Arabian Sea, Maldives, and Madagascar. Depths between 786 and 1 893 m.

*Nephropsis occidentalis* Faxon, 1893

Figs 5 c, 8 e-f, 9 a-c, 16 c

*Nephropsis occidentalis* Faxon, 1893 : 195; 1895 : 127, pl. D, figs 1, 1 a, 1 b. — DE MAN, 1916 : 97 (key). — BOUVIER, 1917 : 20 (key). — BALSS, 1925 : 208. — BAHAMONDE, 1959 : 224, figs 1-4; 1963 : unnumbered page. — MAN-NING, 1970 : 867, figs 1-3; 1982 : 359, unnumbered figure. — DEL SOLAR, 1972 : 10. — BURUKOVSKY, 1974 : 109 (key) (ed. 1983 : 154). — RETAMAL, 1977 : 359, unnumbered fig.; 1981 : 17, fig. 45. — LUKE, 1977 : 22. — PHILLIPS *et al.*, 1980 : 66. — WICKSTEN & MENDEZ, 1982 : 110.

MATERIAL EXAMINED. — **Mexico.** *Albatross* : stn 3418, 16°33' N-99°52'30" W, 1 221 m, 11.04. 1891 : 1 ♂ 43 mm; 1 ♀ 47 mm (syntypes, RMNH 25623).

**Peru.** 10°45.8' S-78°36.4' W, 824 m, 15.05.1971 : 1 ♂ 43 mm; 1 ♀ 46 mm (RMNH 27212). — 03°51' S-81°18' W, 800 m, 01.1971 : 2 ♀ 38 and 43 mm (USNM 170556).

DESCRIPTION. — Carapace subsmooth, pubescent. Rostrum less than one-half the length of the rest of the carapace. A single pair of lateral spines placed midway along the rostrum. Rostral median groove overreaching the level of the lateral spines without overreaching the terminal third of the rostrum. Subdorsal carinae granulate. Supraorbital spine present, somewhat smaller than the lateral rostral spines in size. No postsupraorbital spine. Distance between the level of the supraorbital spines and the gastric tubercle a little more than one-half the distance between the gastric tubercle and the postcervical groove. Distinct grooves and carinae on carapace. Postcervical groove shallow, crossing the dorsal midline. Carinae behind the postcervical groove low and faint. Distance between the orbital border and the postcervical groove about twice the distance between the postcervical groove and the posterior border of the carapace.

Tergites on abdominal segments pubescent. A median carina on the 2nd to 6th segments. Pleura slightly pubescent. Anterior border of pleuron on second segment much more convex than those on the pleura on the other segments. All pleura ending in a short, acute point. Anterior borders granulate, without spines, less convex