

**Four new species of the genus *Rhopalophthalmus*
(Mysidacea: Crustacea) from the north west coast of India**

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Abstract

Four species belonging to the genus *Rhopalophthalmus* - *R. mumbayensis*, *R. anishi*, *R. murudana*, *R. vijayai* - are described as new to science. All four species are distinguishable from each other and from other related species by the combination of characters afforded by the number of spines on the antennal sympod, number of carpopodal segments of the thoracic endopods, relative length of the vestigial endopod of the eighth thoracic limb, number of lateral spines on the telson and the relative length of the distal spines.

Key words: Crustacea, Mysidacea, taxonomy, *Rhopalophthalmus*, new species, India.

Introduction

The genus *Rhopalophthalmus* was instituted by Illig (1906) for the reception of type species *R. flagellipes* captured by the S.S. *Valdivia* off Banana in the Congo Estuary. Of the 18 species which have up to the present been referred to this genus, only five species - *R. chilensis* Tattersall 1951, *R. kempfi* Tattersall 1957, *R. tattersallae* Pillai 1961, *R. indicus* Pillai, 1961 and *R. macropsis* Pillai 1964 - have been recorded from Indian waters. By the present work four more species, *R. mumbayensis*, *R. anishi*, *R. murudana*, and *R. vijayai*, have been added to the list, which are all new to science. The study area included coastal waters off Murud, Daman, Dahej and creeks around Mumbai (Dharamtar, Thane, Bassein, Kasheli). Current within the creek system are almost entirely due to the tidal ebb and flow and the temporal and spatial variations in salinity are governed by the quantum of sea water influx and the riverine fresh water flow. The interior part of this complex creek systems is fringed by rich mangrove vegetation and salt marsh and recives large quantities of waste water thereby enhancing the nutrient level which in turn support high plankton production. Kasheli the area of study is the mid estuarine zone of Ulhas estuary. The materials were collected with a Heron-Tranter Net (Tranter *et al.* 1972) having a mouth area of 0.25 m² and a mesh size of 0.33 mm. The common and specific characteristics of the known species of *Rhopalophthalmus* from the coastal waters of India are given in Table I. All the type specimens are stored in the reference collection of Indian Ocean Biological Centre (RC, NIO, Kochi). The descriptive terminology employed follows to a great extent Pillai (1973).

Genus *Rhopalophthalmus* Illig, 1906

***Rhopalophthalmus mumbayensis* sp. nov.**

(Figures 1-27)

Material

Holotype, adult male (IOBC-0503-10-50-1999). Allotype, adult female (IOBC-0503 A-10-50-1999). Paratypes, five adult males and five adult females (IOBC-0503 B-10-50-1999).

Dharamtar: (18°42'00" N, 73°01'80" E); October – November 1984, 34 adult males, 46 adult females, 12 immature males, 24 immature females and 8 juveniles.

Thane: (19°11'20" N, 72°59'20" E); March 1990, 4 adult males, 1 adult female and

2 immature females. Bassein: (19°18'80"-19°19'20" N; 72°44'70"-72°51'20" E);

April 1989, January 1990. Large number of males and females of all stages. Daman:

(20°24'70 N, 72°50'11 E); February 1990, 32 adult males, 7 immature males, 46 adult females and 4 immature females.

Description

Body robust and strongly built. Carapace with dorso-median nodules; anterior margin lacking rostrum, postorbital spines prominent, keels prominent, cheeks sinuous. Eyes stout, extending to distal end of first segment of antennule, cornea occupying little more than half of eye and wider than stalk (Figures 1, 2).

Antennule more robust in male, first segment longer than rest of peduncle, outer distal angle drawn out and armed with few stout plumose setae, outer margin armed with row of ten long curved plumose setae, inner margin with five to six short slender plumose setae; second segment short and armed with two long and three short hooked setae on inner distal angle, four setae on outer distal angle and three setae on

dorsal margin; third segment broader and armed with one spinous seta on outer margin, and four hooked setae and group of seven long plumose setae on inner distal margin; mid dorsal lobe between flagella present, base of outer flagellum swollen and thickly hirsute (Figure 3). In female antennular peduncle longer, first segment with row of thirteen long curved plumose setae along outer margin; second segment with setae on outer and inner distal angles and on mid dorsal margin; third segment with group of long plumose setae extending from inner distal angle to inner middle margin, hooked setae absent (Figure 4). Antennal scale slightly over-reaching antennular peduncle, nearly five times as long as broad, outer margin straight and terminating in strong spine extending beyond rounded apex; antennal peduncle short, less than half of scale; inner distal angle of sympod armed with two long and two short spines, second spine longest (Figure 5). In young and immature specimens one or two secondary spinules present on second longest spine.

Labrum wider than long with transverse anterior margin and without any process in front (Figure 6). Mandibular palp slender, second segment four times as long as third and with row of barbed setae; third segment armed with group of modified setae on distal border (Figures 7, 8). Inner lobe of maxillule with five plumose setae and three stout barbed spines, outer lobe with nine strong spines on distal border (Figure 9). Maxilla with large basal lobe and deeply cleft distal lobe; exopod relatively small (Figure 10).

Basis of first thoracic endopod with prominent lobe, claw present (Figure 11) second; thoracic endopod stout, dactylus armed with strong peculiarly barbed spiniform setae (Figure 12). Endopods of third to seventh thoracic limbs slender, becoming longer in posterior pairs; third and fourth endopods with three to four, fifth

endopod with four to five and sixth and seventh endopods with five to six propodal segments (Figures 13-16). All endopods profusely setose, setae on seventh endopod spinulose (Figure 17); outer distal corner of basal plate of exopod rounded, flagelliform part 11-14 segmented. Endopod of eighth limb three-segmented, second segment short with five long plumose setae on inner margin, third segment long and bent, shorter than basal segment of exopod lacking setae (Figure 18). In female, endopod unsegmented, tapering, shorter than basal plate of exopod and armed with short simple seta on inner margin (Figure. 19).

In male first abdominal segment with semicircular pleural plates. Pleopods biramous; first pleopod with 11 segmented exopod, and unsegmented endopod (Figure 20); second pleopod with 11 segmented endopod and 15 segmented exopod, first ten segments with usual pair of plumose setae, distal five segments without setae, terminal segment longest and armed with three long barbed setae (Figure 21). Third and fourth pleopods with 11-segmented and fifth with ten- segmented rami (Figure 22).

In female, pleopods simple, rod-like, becoming longer towards posterior and with row of plumose setae (Figures 23, 24).

Telson broad, 1.3 times longer than last abdominal segment, 2.3 times as long as basal width, abruptly constricted near base to form waist, slightly broadening towards middle and gradually narrowing towards broadly rounded apex; lateral margins armed along distal half with 11-12 stout spines in male, gradually increasing in length towards posterior, apex with two pairs of long stout spines, outer pair slightly longer than inner pair and nearly one-fourth length of telson, each spine with row of bilaterally arranged subsidiary teeth progressively getting more flattened

towards tip of spine (Figures. 26, 27). In female, lateral margin of telson armed with 12-14 pairs of spines.

Uropods longer than telson, two-segmented and setose all round; endopod with stout spine near middle on inner margin; exopod longer than endopod (Figure 25).

Length, adult male 8.3-11 mm, adult female 9-12 mm.

Etymology

This species was collected from areas around Mumbai and hence the species name *mumbayensis*.

Remarks

Rhopalophthalmus mumbayensis sp. nov. is related to *R. kemp*i O.Tattersall, 1951, *R. orientalis* O. Tattersall, 1957, *R. tattersallae* Pillai, 1961, *R. macropsis* Pillai, 1964 and *R. longipes* Li, 1964 in having two long and two short spines on the antennal sympod, but they differ from the new species in the following points. In *R. kemp*i, there are only three carpopropodal segments in the third to seventh thoracic endopods, and the vestigial endopod of the eighth thoracic limb of both sexes is longer than the basal plate of the exopod. In *R. tattersallae*, one of the long spines on the antennal sympod is barbed; thoracic endopods three to seven have only four carpopropodal segments and the inner pair of apical spines of the telson are longer than the outer pair. In *R. macropsis* and *R. longipes*, the carpopropodus is four segmented and the telson is long and narrow. In *R. orientalis* there are four carpopropodal segments, and the telson has 15-16 lateral spines and the apical pairs of the telson spines are equal in length. The combination of characters afforded by the spines on the antennal sympod,

the carpopropodal segments of the thoracic endopods and the armature of the telson will serve to identify this species.

Ecological note

At Bassein, this species occurred in large numbers during April. Ninety five percent of the samples were constituted by adult males and females, and 80% of the females were carrying 6–20 eggs or larvae in the brood pouch. It occurred at 5-10 m depth, where the bottom sediment was sandy or silty clay. The temperature and salinity recorded ranged from 21–33°C and 29.4-38.0 respectively. Its occurrence at 5-10 m depth proves it is a littoral species, and the large number of specimens in the samples indicate that this species is a gregarious form.

Rhopalophthalmus anishi sp. nov.

(Figures 28-40)

Material

Holotype, adult male (IOBC-0504-10-50-1999). Allotype, adult female (IOBC-0504 A-10-50-1999). Paratypes, two adult males and two adult females (IOBC-0504 B-10-50-1999).

Kashelli: (19°14'30" N; 73°00'20" E) December 1996, 13 adult males, 13 adult females, eight immature males, seven immature females and 33 juveniles.

Description

General form slender. Carapace broadly rounded in front, covering basal part of antennules, post orbital spines small, continuing backward into faint keels; antero lateral angles produced into strong spines; cheeks sinuous. Eyes stout, reaching

beyond first antennular segment; cornea as broad as stalk and occupying distal third of eye (Figure 28).

Basal segment of antennule in male as long as rest of peduncle, third segment short and stout but short, basal part of outer flagellum swollen and hirsute (Figure 29). In female, basal segment much longer than rest of peduncle. Antennal scale long and narrow reaching clearly beyond antennular peduncle, five times as long as broad; antennal peduncle short, less than half length of scale; sympod with two long and two short spines (Figure 30).

Mouth parts and first and second thoracic endopods as in *R. mumbayensis* sp. nov.

Thoracic endopods three to seven with three to five carpopodal segments (Figures 31 - 33). Vestigial endopod of male eighth thoracic limb straight, three-segmented, almost as long as basal segment of exopod, second segment with three to four plumose setae on outer distal corner, apex broadly rounded (Figure 34). In female, eighth endopod longer than basal segment of exopod, slender, straight and unsegmented, distal end produced at apex into minute cusp with short seta (Figure 35).

Pleopods in male biramous, first pleopod with unsegmented endopod and ten-segmented exopod (Figure 36); second pleopod with ten-segmented endopod and 12-segmented exopod, distal segment of exopod with third long barbed setae (Figure 37); third, fourth and fifth pleopods similar with ten-segmented exopod and endopod (Figure 38).

Telson moderately broad, longer than last abdominal segment, about twice as long as broad at base, distal half armed with 11 pairs of graduated spines, spines on

distal border long and sharply pointed, outer pair distinctly longer than inner pair, subsidiary teeth sharp (Figure 39).

Uropods longer than telson, two-segmented, endopod with single stout spine on middle inner margin; exopod longer than endopod (Figure 40).

Length, adult male 9.7 - 11 mm; adult female 9.6 – 11.7 mm.

Etymology

This species is named after the first author's son, Anish.

Remarks

This species can be readily distinguished by the combinations of the following characters: (1) thoracic endopods have three to five carpopropodal segments (2) vestigial endopod of eighth thoracic limb is longer than the basal segment of the exopod in female and in male almost as long as the basal segment of exopod (3) spines on the distal border of the telson are sharply pointed and the outer pair of spines are distinctly longer than the inner pair.

Rhopalophthalmus kempi O.Tattersall, 1957 is the only other species of the genus in which the endopod of the eighth thoracic limb in both sexes is longer than the basal segment of the exopod. But *R. kempi* differs from the new species in having a shorter antennal scale, only three carpopropodal segments, and the inner pair of distal spines on the telson are longer than the outer pair.

Ecological note

The new species is a shallow water form and the temperature and salinity recorded at the time of collection were 25.4°C and 16.4psu respectively.

***Rhopalophthalmus murudana* sp. nov.**

(Figures 41-52)

Material

Holotype, adult male (IOBC-0505-10-50-1999). Allotype, adult female (IOBC-0505 A-10-50-1999).

Murud: (18°16'39" - 18°18'30" N; 72°55'28" - 72°59'72" E); March 1990, six adult males, eight adult females, 13 immature males, six immature females and nine juveniles.

Description

General form robust. Carapace anteriorly produced into broad triangular rostrum covering basal part of eye stalks; dorsal median nodules present, Eyes stout, as long as first antennular segment, cornea wider than stalk (Figure 41). First segment of male antennule little longer than rest of peduncle, base of outer flagellum swollen and hirsute and all segments furnished with long plumose setae (Figure 42). In female, peduncle long and slender than male, first segment 1.5 times longer than rest of peduncle. Antennal scale as long as antennular peduncle, five times as long as broad; antennal peduncle one third length of scale; antennal sympod with two long and two short spines (Figure 43).

Mouthparts and first and second thoracic endopods as in *R. mumbayensis*. Third to seventh endopods slender, third with two, and fourth to seventh with three, propodal segments (Figures 44, 45). Eighth endopod three-segmented; second segment short with five long plumose setae on outer distal margin; third segment cylindrical and bent at right angle, with one stout seta at tip and two on inner margin,

when straightened shorter than basal segment of exopod (Figure 46). Eighth endopod in female unsegmented, straight, shorter than basal segment of exopod (Figure 47).

Pleopods in male biramous, first pleopod with unsegmented endopod and ten segmented exopod (Figure 48). Endopod of second pleopod 11- segmented; exopod long and 12- segmented, segments becoming longer posteriorly, distal segment with three long barbed setae (Figure 49). Pleopods third to five with ten- segmented exopod and endopod (Figure 50). In female, pleopods simple, unsegmented and rod shaped becoming longer in posterior pairs.

Telson 1.5 times longer than last abdominal somite, 2.7 times as long as broad at base, more than distal half of lateral margin armed with 15- 16 slender spines gradually increasing in length distal wards, first two spines very small; inner pair of distal spines slightly longer than outer pair, subsidiary teeth becoming flattened distally (Figure 51).

Uropods longer than telson, two segmented, endopod with stout spine on inner margin, exopod longer than endopod (Figure 52).

Length, adult male and female 8.5-9.3 mm.

Etymology

This species is named after the type locality.

Remarks

This species closely resembles *R. orientalis*, O.Tattersall. The vestigial endopod of the eighth thoracic limb, the number of carpopropodal segments of three to seventh thoracic endopods and the spines on the telson are very much similar in the two species. But in *R. orientalis* the rostrum is relatively low, eyes are longer and the subsidiary teeth on the telson are broader and truncate. This species also resembles *R.*

mumbayensis sp. nov. but differs in having fewer number of carpopropodal segments, spines on the lateral border of the telson are slender and more in number and the inner pair of distal spines on the telson are longer than the outer pair. ***Ecological note***

This species occurred in temperature and salinity of 25.2-28.5°C and 35.7-36.3psu respectively and was collected from 5-9 m depth where the bottom was clayey silt.

***Rhopalophthalmus vijayai* sp. nov.**

(Figures 53-64)

Material

Holotype, adult male (IOBC-0506-10-50-1999). Allotype, adult female (IOBC-0506 A-10-50-1999).

Dahej: (21°40'00"-21°43'30" N; 72°29'45"-72°32'00" E); November 1996, nine adult males, 30 adult females, three immature males, nine immature females and 478 juveniles.

Description

General form slender. Carapace short, leaving last three thoracic somites exposed; anteriorly produced into broadly rounded rostrum covering basal one-fourth of antennular peduncle and basal part of eyestalks; two small dorso- median nodules present, postorbital spines small, cheeks sinuous. Eyes extending to distal end of first antennular segment, cornea occupying one fourth of eye and little narrower than stalk (Figure 53).

Antennule robust in male, first segment as long as distal two segments combined and with row of nine to ten plumose setae on outer margin, outer distal corner produced and tipped with few setae; second segment short with two hooked

setae on inner margin, outer distal corner produced and tipped with setae; third segment broad with one spinous seta on outer margin, four hooked setae on inner margin and five to six long plumose setae on inner distal angle; dorsal lobe tipped with few setae; base of outer flagellum swollen and densely hirsute (Figure 54). In female antennular peduncle slender and longer, first segment longer than other two segments combined, hooked setae absent; third segment with seven long plumose setae on inner distal angle and four setae on inner margin. Antennal scale as long as antennular peduncle, 4.6 times as long as broad, outer margin straight, terminating in spine projecting beyond rounded apex, inner margin setose; antennal peduncle extending to middle of scale; antennal sympod with two long and two short spines on inner distal corner (Figure 55).

Mouth parts and first and second thoracic endopods as in *R.mumbayensis* .

Endopods of third to seventh thoracic limbs slender, increasing in length posteriorly; propodus three segmented in third and five segmented in fourth to seventh endopods (Figures 56, 57). Eighth endopod in male three- segmented, shorter than proximal segment of exopod, second segment short with three long plumose setae on outer distal corner, second segment long and finger like with single simple seta at tip (Figure 58). In female eighth endopod unsegmented with two simple setae and shorter than proximal segment (Figure 59).

Pleopods biramous and natatory. First pleopod with ten- segmented exopod; endopod unsegmented and short, sympod with three plumose setae on inner distal margin and row of long plumose setae along mid dorsal line (Figure 60). Second pleopod with ten segmented endopod; exopod 13- segmented, segments increasing in length posteriorly, first five segments with usual pair of plumose setae, distal eight

segments without setae, terminal segment ending in three long barbed setae, two at tip, one slightly away from tip (Figure 61). Third to fifth pleopods in male similar, endopod and exopod ten-segmented. Pleopods in female simple unsegmented and rod shaped, progressively increasing in length distal pairs. (Figure 62).

Telson 1.4 times longer than last abdominal somite, 2.3 times as long as maximum width at base, abruptly narrowing near base to form waist, lateral margins almost parallel up to distal half and gradually narrowing towards rounded apex and armed along distal half with seven slender subequal spines, distal margin with two pairs of long sub-equal spines, inner pair of spines with 12 and outer pair with ten pairs of closely set subsidiary teeth, proximal teeth spiniform and distal teeth broader (Figure 63).

Uropods: exopod and endopod two segmented, setose all round and longer than telson. Endopod with one strong spine on inner margin (Figure 64).

Length, adult male 6.6 mm, adult female 8.6 mm.

Etymology

This species is named in honour of Dr. Vijayalakshmi. R. Nair, Scientist (Rtd.), NIO,

Remarks

This species can be easily distinguished from all the other species of the genus except *R. africana* O. Tattersall, 1957 by its slender form and in having fewer spines on the lateral border of the telson. In *R. africana*, the lateral margin of the telson is armed with six to eight spines only, but differs from the new species in having only two large spines on the antennal sympod, four carpopropodal segments in third to seventh thoracic endopods and in its more robust form. The largest male and female of *R.*

africana measured is 10 mm and 10.2 mm respectively whereas the maximum size of the present species is only 8.6 mm.

Ecological note

The specimens were collected from depths between 8 and 25m. Where the bottom was silty sand and occurred in the temperature and salinity ranging from 26.9-29.0°C and 23.1 to 29.8, psu respectively.

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Table I - Common and specific characteristics of species of *Rhopalophthalmus* from the coastal waters of India

	<i>R. chilkenis</i>	<i>R. kemp</i>	<i>R. indicus</i>	<i>R. tattersallae</i>	<i>R. macropsis</i>	<i>R. mumbayensis</i> sp. nov.	<i>R. anishi</i> sp. nov.	<i>R. murudana</i> sp. nov.	<i>R. vijayai</i> sp. nov.
Presence of nodules on carapace	-	-	+	+	+	+	+	+	+
Spines on antennal sympod	3 Subsimilar	4 Two long and two short	5 Dissimilar arranged like a cone.	4 Two long and two short Third spine with strong barbs	4 Two long and two short	4 Two long and two short	4 Two long and two short	4 Two long and two short	4 Two long and two short
Propodal segments of thoracic endopods three to seven	3-5	2	4-5	3	4	4-6	2-4	2-3	3-5
Eighth thoracic endopod of male	Longer than basal segment of exopod	Longer than basal segment of exopod	Shorter than basal segment of exopod	Shorter than basal segment of exopod	Shorter than basal segment of exopod	Shorter than basal segment of exopod	As long as basal segment of exopod	Shorter than basal segment of exopod	Shorter than basal segment of exopod
Eighth thoracic endopod of female	Shorter than basal segment of exopod	Longer than basal segment of exopod	As long as	Shorter	Shorter	Shorter	Longer	Shorter	Shorter
Number of spines on lateral margin of telson	15-16	14	14	13	12	11-12	11	15-16	7
Apical spines of telson	Inner pair long	Inner pair long	Outer pair long	Inner pair long	Outer pair long	Outer pair long	Outer pair long	Inner pair long	Sub-equal
Length of adult (mm)	9-11.4	10.2	15-17	13.3	7.8	8-12	9.6-11.7	8.5-9.3	6.6-8.6

Legend to Figures

Rhopalophthalmus mumbayensis sp. nov. (male)

- Figure 1. Anterior part of body
- Figure 2. Carapace – lateral view
- Figure 3. Antennule
- Figure 4. Antennule of female
- Figure 5. Antenna
- Figure 6. Labrum
- Figures 7-8. Mandible
- Figure 9. Maxillule
- Figure 10. Maxilla

Rhopalophthalmus mumbayensis sp. nov. (male)

- Figure 11. First thoracic endopod
- Figure 12. Second thoracic endopod
- Figure 13. Third thoracic endopod
- Figure 14. Same, tip of endopod
- Figure 15. Fifth thoracic endopod
- Figure 16. Seventh thoracic endopod
- Figure 17. Same, one propodal segment
- Figure 18. Eighth thoracic limb
- Figure 19. Eighth thoracic limb of female

Rhopalophthalmus mumbayensis sp. nov. (male)

- Figure 20. First pleopod
- Figure 21. Second pleopod
- Figure 22. Third pleopod
- Figure 23. First pleopod of female
- Figure 24. Fifth pleopod of female
- Figure 25. Posterior part of body
- Figure 26. Telson
- Figure 27. Apical spines of telson

Rhopalophthalmus anishi sp. nov. (male)

- Figure 28. Anterior part of body
- Figure 29. Antennule
- Figure 30. Antenna
- Figure 31. Third thoracic endopod
- Figure 32. Fifth thoracic limb
- Figure 33. Seventh thoracic endopod
- Figure 34. Eighth thoracic limb
- Figure 35. Eighth thoracic limb of female

Rhopalophthalmus anishi sp. nov. (male)

- Figure 36. First pleopod
- Figure 37. Second pleopod
- Figure 38. Third pleopod
- Figure 39. Telson
- Figure 40. Posterior part of body

Rhopalophthalmus murudana sp. nov. (male)

- Figure 41. Anterior part of body
- Figure 42. Antennule
- Figure 43. Antenna
- Figure 44. Third thoracic endopod
- Figure 45. Seventh thoracic endopod – distal part
- Figure 46. Eighth thoracic limb
- Figure 47. Eighth thoracic limb of female

Rhopalophthalmus murudana sp. nov. (male)

- Figure 48. First pleopod
- Figure 49. Second pleopod
- Figure 50. Third pleopod
- Figure 51. Telson
- Figure 52. Posterior part of body

Rhopalophthalmus vijayai sp. nov. (male)

- Figure 53. Anterior part of body
- Figure 54. Antennule
- Figure 55. Antenna
- Figure 56. Third thoracic endopod
- Figure 57. Fifth thoracic limb
- Figure 58. Eighth thoracic limb
- Figure 59. Eighth thoracic limb of female

Rhopalophthalmus vijayai sp. nov. (male)

- Figure 60. First pleopod
- Figure 61. Second pleopod
- Figure 62. Third pleopod
- Figure 63. Telson
- Figure 64. Posterior part of body

















