

Morphometric studies on the seed of penaeid prawns of Ratnagiri coast (Maharashtra, west coast of India)

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Twenty one morphometric ratios belonging to 7 size-groups were worked out in the seed of 11 species viz. *Penaeus* (*Penaeus*) *monodon*, *P. (P.) semisulcatus*, *P. (Fenneropenaeus) merguensis*, *P. (F.) indicus*, *P. (Marsupenaeus) japonicus*, *Metapenaeopsis* sp., *Metapenaeus dobsoni*, *M. monoceros*, *M. affinis*, *M. moyebi* and *Parapenaeopsis cornuta*. The analysis of results shows that conspicuous changes occur at 10, 14, 22, 32, 40 and 50 mm sizes in almost all species. The genus *Metapenaeopsis* differed from the other genera by its shortest postorbital distance of epigastric tooth while *P. (F.) merguensis* can be easily identified by its extremely long and slender rostrum. Splitting of the genus *Penaeus* into subgenera is found to be perfectly valid and the necessity of providing separate generic status to *Metapenaeus dobsoni* is justifiable.

Although considerable work has been reported¹ on the adults, larvae and postlarvae of penaeid prawns, not much information is available on the correct identification of their juvenile or seed stages (size : generally 6 to 60 mm). This might be possibly due to the perplexing variety of size-linked variations in their colouration, morphological, meristic and morphometric characters²⁻¹⁶. The present work concentrates on the morphometrics which is considered as an important tool in elucidating several taxonomic controversies and doubts¹⁷.

Materials and Methods

The present study was based on the seed collected from several brackishwater bodies in and around Ratnagiri town (16° 59' 10" N; 73° 16' 25" E). It was carried out in the following 11 species viz. *Metapenaeopsis* sp.; *Parapenaeopsis cornuta* (Kishinouye, 1900); *Metapenaeus monoceros* (Fabricius, 1798); *M. dobsoni* (Miers, 1878); *M. moyebi* (Kishinouye, 1896); *M. affinis* (H.Milne Edwards, 1837); *Penaeus (Marsupenaeus) japonicus* Bate, 1888; *P. (Penaeus) semisulcatus* De Haan, 1844; *P. (P.) monodon* Fabricius, 1798; *P. (Fenneropenaeus) merguensis* De Man, 1888; *P. (F.) indicus* H. Milne Edwards, 1837. Only the seed of last species i.e. *P. (F.) indicus* was collected from the CIBA hatchery at Narakkal near Ernakulam (Kerala State). The method of seed collection was followed as described earlier¹⁸. Details of morphometric features are depicted in Figs. 1-5. The appendages were measured with the help of an ocular mi-

crometer at different magnifications depending on their sizes with a view to maintain maximum possible accuracy. Morphometric analysis was carried out based on the following 21 ratios¹²⁻¹⁷ :

$$MO 1 = \frac{\text{Rostrum length}}{\text{Carapace length}}$$

$$MO 2 = \frac{\text{Rostrum length}}{\text{Rostrum breadth}}$$

$$MO 3 = \frac{\text{Rostrum length}}{\text{Antennular peduncle length}}$$

$$MO 4 = \frac{\text{Rostrum length}}{\text{Antennal scale length}}$$

$$MO 5 = \frac{\text{Dorsal distal gap length}}{\text{Distance between last two teeth}}$$

$$MO 6 = \frac{\text{Rostrum length}}{\text{Dorsal distance gap length}}$$

$$MO 7 = \frac{\text{Rostrum length}}{\text{Ventral distal gap length}}$$

$$MO 8 = \frac{\text{Postorbital distance of epigastric tooth}}{\text{Distance between epigastric and first rostral tooth}}$$

$$MO 9 = \frac{\text{Eye stalk length}}{\text{Cornea length}}$$

$$MO 10 = \frac{\text{Cornea length}}{\text{Cornea breadth}}$$

$$MO 11 = \frac{\text{Length of first two segments of antennular peduncle}}{\text{Length of basal segment of antennular peduncle}}$$

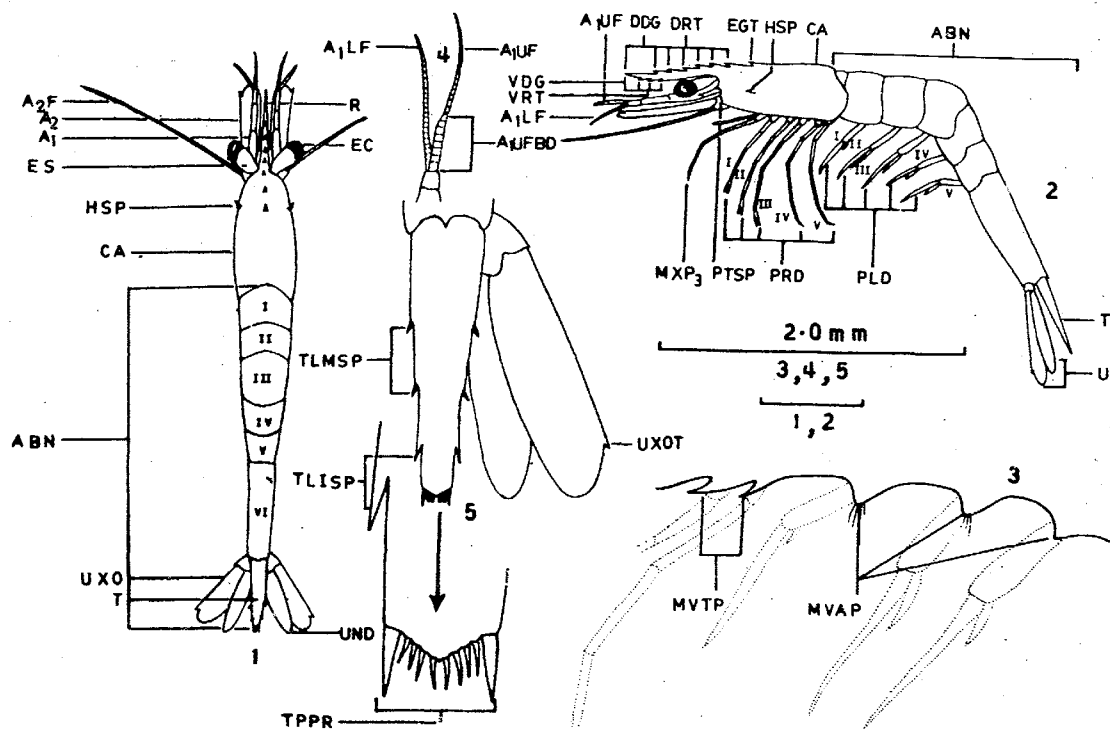
$$MO 12 = \frac{\text{Length of lower flagellum of antennule}}{\text{Length of upper flagellum antennule}}$$

$$MO 13 = \frac{\text{Length of upper flagellum of antennule}}{\text{Length of antennular peduncle}}$$

$$MO 14 = \frac{\text{Length of lower flagellum of antennule}}{\text{Length of antennular peduncle}}$$

$$MO 15 = \frac{\text{Length of dactylus of third maxilliped}}{\text{Length of propodus of third maxilliped}}$$

$$MO 16 = \frac{\text{Height of mid-ventral process between first pleopods}}{\text{Length of longest cilia on mid-ventral process}}$$



Figs. 1 to 5 —(1) Dorsal view of a typical penaeid prawn seed : R-rostrum; EC-cornea of eye; ES-eye stalk; A₁-antennule; A₂-antennal scale; A₂F-antennal flagellum; CA-carapace; HSP-hepatic spine; ABN (I-VI)-first to sixth abdominal segments; T-telson; UXO-uropod exopod; UND-uropod endopod.
 (2) Lateral view of a typical penaeid prawn seed : DRT-dorsal teeth of rostrum; DDG-dorsal distal gap of rostrum; VRT-ventral teeth of rostrum; VDG-ventral distal gap of rostrum; EGT-epigastric tooth; HSP-hepatic spine; PTSP-ptyergostomal spine; A₁VF-upper flagellum of antennule; A₁LF-lower flagellum of antennule; MXP₃-third maxilliped; PRD (I-V)-first to fifth pereopods; PLD (I-V) first to fifth pleopods; T-telson; U-uropods.
 (3) Lateral view of sternum at the junction of carapace (cephalothorax) and abdomen : MVTP-midventral thoracic processes between 4th and 5th pairs of pereopods; MVAP-midventral abdominal processes between 1st, 2nd and 3rd pairs of pleopods.
 (4) Antennular flagella : A₁UF-upper flagellum; A₁UFBD-basal dilated portion of upper flagellum; A₁LF-lower flagellum.
 (5) Telson and uropods : TLMSP-lateral movable spines; TLISP-lateral immovable spine; TPPR—posterior processes; UXOT—outer tooth of uropod exopod.

Table 1—Comparison of various morphometric ratios in the 6 to 10 mm size-group of penaeid prawn seed along the Ratnagiri coast.

Ratio Code	<i>Metapenaeopsis</i> sp.	<i>Parapenaeopsis cornuta</i>	<i>Metapenaeus monoceros</i>	<i>Metapenaeus dobsoni</i>	<i>Metapenaeus moyebi</i>	<i>Metapenaeus affinis</i>	<i>Penaeus japonicus</i>	<i>Penaeus (P.) semisulcatus</i>	<i>Penaeus (P.) monodon</i>	<i>Penaeus (F.) merguensis</i>	<i>Penaeus (F.) indicus</i>
MO 1	0.45-0.53 (0.49)	0.29-3.8 (0.33)	0.49-0.55 (0.51)	0.19-0.22 (0.21)	0.43-0.53 (0.48)	0.34-0.46 (0.38)	0.18-0.22 (0.20)	-	-	0.51-0.59 (0.56)	0.74-0.90 (0.85)
MO 2	3.50-3.79 (3.68)	3.00-4.44 (3.66)	4.20-5.00 (4.60)	1.29-1.57 (1.45)	3.08-3.75 (3.45)	2.50-3.47 (3.02)	2.18-2.71 (2.52)	-	-	5.57-6.71 (6.24)	7.00-8.00 (7.49)
MO 3	0.63-0.69 (0.65)	0.44-0.54 (0.48)	0.71-0.82 (0.76)	0.27-0.32 (0.30)	0.57-0.67 (0.62)	0.44-0.59 (0.49)	0.22-0.30 (0.25)	-	-	0.54-0.64 (0.58)	0.93-1.13 (1.05)
MO 4	0.58-0.62 (0.60)	0.40-0.50 (0.45)	0.71-0.82 (0.77)	0.25-0.30 (0.28)	0.56-0.67 (0.60)	0.46-0.59 (0.50)	0.20-0.26 (0.24)	-	-	0.51-0.60 (0.55)	0.81-1.00 (0.93)
MO 5	0.80-2.00 (1.23)	0.80-1.20 (1.00)	1.00-2.66 (1.68)	1.00-1.67 (1.44)	1.00-2.00 (1.39)	1.00-2.00 (1.31)	1.50-3.00 (2.42)	-	-	2.71-3.67 (2.99)	2.92-3.67 (3.29)
MO 6	7.00-13.25 (9.28)	4.00-11.33 (7.12)	4.40-8.66 (6.53)	3.60-4.50 (4.18)	8.00-15.00 (10.82)	7.60-17.0 (11.12)	2.50-4.00 (3.11)	-	-	1.91-2.13 (1.98)	1.92-2.41 (2.17)
MO 7	X	X	X	X	X	X	X	-	-	X	3.50-5.25 (4.65)
MO 8	0.67-0.94 (0.74)	1.04-1.11	1.08-1.14 (1.09)	1.27-1.55 (1.39)	1.09-1.25 (1.18)	1.20-1.35 (1.29)	1.50-1.79 (1.69)	-	-	1.31-1.46 (1.35)	1.20-1.33 (1.25)
MO 9	1.10-1.30 (1.19)	0.97-1.20 (1.10)	1.12-1.30 (1.22)	1.20-1.38 (1.29)	1.06-1.84 (1.22)	1.21-1.34 (1.29)	1.54-2.25 (1.87)	-	-	1.72-2.13 (1.87)	1.36-1.71 (1.62)
MO 10	1.43-1.70 (1.54)	1.42-1.69 (1.52)	1.40-1.50 (1.45)	1.27-1.37 (1.33)	1.45-1.67 (1.60)	1.37-1.56 (1.45)	1.27-1.44 (1.33)	-	-	1.00-1.07 (1.01)	1.00-1.25 (1.16)
MO 11	1.28-1.36 (1.32)	1.28-1.38 (1.31)	1.18-1.30 (1.27)	*	1.33-1.41 (1.36)	1.36-1.41 (1.40)	1.42-1.76 (1.50)	-	-	1.39-1.48 (1.43)	1.36-1.39 (1.37)
MO 12	1.22-1.55 (1.32)	1.38-1.74 (1.51)	*	1.25-1.45 (1.37)	1.03-1.18 (1.08)	0.94-0.97 (0.96)	1.40-1.50 (1.47)	-	-	1.16-1.47 (1.29)	1.13-1.24 (1.17)
MO 13	0.17-0.28 (0.24)	0.35-0.43 (0.39)	0.24-0.32 (0.27)	0.29-0.35 (0.31)	0.31-0.36 (0.33)	0.41-0.45 (0.42)	0.21-0.24 (0.23)	-	-	0.23-0.32 (0.27)	0.35-0.41 (0.38)
MO 14	0.27-0.34 (0.31)	0.52-0.61 (0.59)	0.34-0.40 (0.37)	0.40-0.45 (0.43)	0.33-0.38 (0.36)	0.38-0.42 (0.41)	0.30-0.36 (0.33)	-	-	0.30-0.38 (0.35)	0.41-0.49 (0.45)
MO 15	*	*	*	*	*	*	*	-	-	0.50-0.57 (0.53)	0.48-0.62 (0.57)
MO 16	*	*	*	*	*	*	0.50-0.87 (0.70)	-	-	0.44-0.55 (0.49)	0.58-0.76 (0.65)
MO 17	1.06-1.31 (1.16)	1.09-1.18 (1.14)	1.09-1.20 (1.11)	1.07-1.14 (1.11)	1.06-1.24 (1.15)	0.90-1.04 (0.96)	1.31-1.66 (1.53)	-	-	1.43-1.50 (1.48)	1.38-1.55 (1.48)
MO 18	1.61-1.71 (1.67)	1.33-1.50 (1.41)	1.61-1.84 (1.74)	1.61-1.66 (1.64)	1.73-2.03 (1.89)	1.75-1.92 (1.84)	1.64-1.82 (1.71)	-	-	1.74-1.83 (1.79)	1.74-1.85 (1.79)
MO 19	1.20-1.83 (1.53)	1.58-2.30 (1.85)	1.12-1.84 (1.43)	1.21-1.57 (1.40)	1.56-2.00 (1.78)	2.45-2.82 (2.68)	1.10-1.43 (1.30)	-	-	0.8-1.20 (0.91)	1.25-1.60 (1.38)
MO 20	*	*	*	*	3.10-3.57 (3.34)	3.37-4.00 (3.72)	*	-	-	*	*
MO 21	0.96-1.02 (0.99)	1.00-1.04 (1.02)	0.93-0.97 (0.95)	1.00-1.03 (1.01)	1.05-1.11 (1.03)	1.00-1.06 (1.02)	0.98-1.06 (1.03)	-	-	1.00-1.05 (1.03)	1.00-1.01 (1.01)

The numbers within parenthesis indicate averages; — indicates specimens not represented in the collection; x indicates absence of concerned character; * indicates character not studied.

Table 2.—Comparison of various morphometric ratios in the 10 to 14 mm size-group of penaeid prawn seed along the Ramagiri coast.

Ratio Code	<i>Metapenaeopsis cornuta</i> sp.	<i>Parapenaeopsis cornuta</i>	<i>Metapenaeopsis monoceros</i>	<i>Metapenaeopsis dobsoni</i>	<i>Metapenaeopsis mayebi</i>	<i>Metapenaeopsis affinis</i>	<i>Penaeus (M.) japonicus</i>	<i>Penaeus (P.) semisulcatus</i>	<i>Penaeus (P.) monodon</i>	<i>Penaeus (F.) merguensis</i>	<i>Penaeus (F.) indicus</i>
MO 1	0.48-0.56 (0.52)	0.36-0.44 (0.39)	0.50-0.62 (0.56)	0.24-0.30 (0.27)	0.41-0.47 (0.44)	0.27-0.28 (0.27)	0.20-0.32 (0.28)	0.74-0.91 (0.84)	0.46-0.73 (0.61)	1.10-1.67 (1.28)	0.98-1.09 (1.04)
MO 2	3.16-4.40 (3.76)	3.46-4.14 (3.79)	4.15-5.57 (4.75)	1.62-2.05 (1.78)	*	*	2.41-3.63 (2.99)	7.09-8.76 (7.95)	6.37-8.11 (7.39)	5.46-13.07 (8.35)	7.76-8.92 (8.47)
MO 3	0.64-0.71 (0.67)	0.47-0.52 (0.51)	0.75-0.84 (0.79)	0.34-0.40 (0.36)	0.56-0.63 (0.59)	0.30-0.40 (0.37)	0.28-0.55 (0.43)	0.85-1.09 (1.00)	0.55-0.96 (0.75)	1.18-1.77 (1.48)	1.26-1.36 (1.32)
MO 4	0.62-0.69 (0.65)	0.47-0.53 (0.51)	0.73-0.81 (0.76)	0.30-0.36 (0.33)	*	*	0.25-0.49 (0.37)	0.79-0.95 (0.90)	0.51-0.80 (0.66)	1.06-1.52 (1.31)	1.09-1.17 (1.14)
MO 5	0.71-1.33 (1.01)	0.85-1.33 (1.04)	1.33-2.00 (1.61)	1.25-2.50 (1.57)	*	*	1.33-3.33 (2.24)	2.28-3.27 (2.90)	2.31-3.91 (3.29)	1.41-3.00 (2.14)	3.12-3.53 (3.29)
MO 6	7.60-13.66 (10.75)	6.57-14.00 (9.65)	6.20-11.66 (8.58)	4.10-6.50 (5.31)	*	*	3.30-6.86 (5.35)	2.32-2.81 (2.63)	2.28-3.22 (2.55)	2.43-4.29 (2.97)	1.93-2.58 (2.24)
MO 7	X	X	X	X	X	X	4.33-5.33 (4.82)	4.33-5.00 (4.60)	2.65-5.26 (3.63)	-	5.61-8.13 (6.82)
MO 8	0.81-0.90 (0.86)	1.06-1.16 (1.11)	1.05-1.21 (1.12)	1.36-1.54 (1.42)	*	*	1.75-2.00 (1.86)	1.47-1.61 (1.53)	1.22-1.56 (1.38)	1.16-1.35 (1.29)	1.22-1.50 (1.36)
MO 9	1.00-1.03 (1.01)	1.00-1.13 (1.04)	1.05-1.29 (1.16)	1.16-1.40 (1.27)	*	*	1.21-1.52 (1.35)	1.46-1.55 (1.51)	1.29-1.77 (1.53)	1.53-1.76 (1.60)	1.25-1.58 (1.43)
MO 10	1.70-1.75 (1.73)	1.40-1.62 (1.51)	1.26-1.59 (1.47)	1.36-1.52 (1.42)	*	*	1.36-1.60 (1.46)	1.10-1.21 (1.16)	1.10-1.25 (1.17)	1.00-1.24 (1.14)	1.18-1.52 (1.34)
MO 11	1.31-1.35 (1.34)	1.38-1.46 (1.41)	1.24-1.34 (1.28)	*	*	*	1.36-1.44 (1.39)	1.43-1.51 (1.47)	1.56-1.78 (1.66)	1.29-1.45 (1.36)	1.30-1.36 (1.34)
MO 12	1.18-1.22 (1.24)	1.15-1.26 (1.21)	1.11-1.39 (1.21)	1.21-1.50 (1.34)	1.07-1.21 (1.13)	1.02-1.03 (1.03)	1.09-1.30 (1.18)	1.26-1.54 (1.35)	1.65-2.09 (1.84)	1.00-1.21 (1.12)	1.08-1.20 (1.15)
MO 13	0.24-0.29 (0.27)	0.48-0.54 (0.51)	0.25-0.28 (0.33)	0.26-0.34 (0.31)	0.27-0.28 (0.27)	0.34-0.37 (0.35)	0.28-0.34 (0.31)	0.26-0.33 (0.30)	0.22-0.30 (0.26)	0.37-0.58 (0.47)	0.42-0.51 (0.47)
MO 14	0.32-0.35 (0.33)	0.39-0.65 (0.62)	0.33-0.44 (0.40)	0.38-0.47 (0.42)	0.29-0.34 (0.31)	0.35-0.39 (0.36)	0.36-0.38 (0.37)	0.40-0.42 (0.41)	0.44-0.52 (0.48)	0.43-0.65 (0.52)	0.50-0.56 (0.54)
MO 15	*	*	*	*	*	*	*	*	*	0.47-0.58 (0.52)	0.52-0.62 (0.57)
MO 16	X	X	X	X	X	X	0.75-1.75 (1.15)	0.75-1.00 (0.89)	0.46-1.85 (0.57)	0.70-2.00 (1.12)	0.52-0.67 (0.60)
MO 17	0.89-1.05 (0.97)	0.97-1.12 (1.03)	0.95-1.17 (1.09)	1.10-1.23 (1.15)	1.06-1.17 (1.12)	1.00-1.06 (1.03)	1.38-1.64 (1.55)	1.30-1.47 (1.39)	1.56-1.79 (1.68)	-	1.43-1.62 (1.52)
MO 18	1.61-1.74 (1.68)	1.49-1.54 (1.51)	1.64-1.86 (1.72)	1.60-1.82 (1.68)	*	*	1.53-1.65 (1.55)	2.25-2.33 (2.29)	2.61-3.00 (2.75)	1.52-1.87 (1.77)	1.70-1.78 (1.73)
MO 19	1.21-1.34 (1.28)	1.63-2.78 (1.97)	1.25-2.33 (1.68)	1.31-1.81 (1.50)	1.40-1.69 (1.56)	2.13-2.50 (2.28)	1.11-1.57 (1.34)	1.14-1.31 (1.23)	0.80-1.25 (1.05)	0.76-1.20 (0.93)	1.23-2.00 (1.48)
MO 20	*	*	*	*	*	*	*	*	*	*	*
MO 21	1.00-1.01 (1.00)	1.00-1.04 (1.02)	0.95-1.04 (0.98)	1.01-1.08 (1.04)	*	*	1.04-1.08 (1.06)	0.98-1.00 (0.99)	0.97-1.00 (0.99)	1.03-1.13 (1.06)	1.04-1.08 (1.06)

The numbers within parenthesis indicate averages — indicates specimens not represented in the collection; × indicates absence of concerned character; * indicates character not studied.

Table 3—Comparison of various morphometric ratios in the 14 to 22 mm size-group of penaeid prawn seed along the Ratnagiri coast.

Ratio Code	<i>Metapenaeopsis</i> sp.	<i>Parapenaeopsis cornuta</i>	<i>Metapenaeus monoceros</i>	<i>Metapenaeus dobsoni</i>	<i>Metapenaeus moyebi</i>	<i>Metapenaeus affinis</i>	<i>Penaeus japonicus</i>	<i>Penaeus semisulcatus</i>	<i>Penaeus monodon</i>	<i>Penaeus (F.) merguensis</i>	<i>Penaeus (F.) indicus</i>
MO 1	0.54-0.66 (0.56)	0.40-0.51 (0.46)	0.54-0.62 (0.58)	0.27-0.46 (0.36)	0.43-0.52 (0.48)	0.33-0.46 (0.39)	0.32-0.43 (0.37)	0.92-0.96 (0.94)	0.72-0.96 (0.88)	1.25-1.73 (1.58)	0.91-1.25 (1.10)
MO 2	3.76-4.41 (4.06)	3.64-4.81 (4.23)	4.00-5.31 (4.76)	1.81-2.95 (2.27)	3.07-4.18 (3.58)	2.50-3.47 (3.10)	3.20-4.46 (3.67)	7.36-8.40 (7.88)	6.86-8.50 (7.54)	11.67-15.10 (12.23)	7.83-9.85 (8.49)
MO 3	0.63-0.71 (0.67)	0.51-0.65 (0.57)	0.69-0.86 (0.79)	0.35-0.63 (0.46)	0.57-0.69 (0.63)	0.44-0.59 (0.51)	0.47-0.69 (0.59)	1.12-1.15 (1.14)	1.00-1.32 (1.22)	1.68-2.15 (1.82)	1.10-1.56 (1.38)
MO 4	0.63-0.67 (0.64)	0.49-0.64 (0.57)	0.66-0.83 (0.76)	0.32-0.55 (0.42)	0.55-0.68 (0.61)	0.45-0.59 (0.51)	0.41-0.61 (0.52)	0.97-1.01 (0.99)	0.85-1.05 (0.97)	1.44-1.84 (1.57)	0.95-1.32 (1.06)
MO 5	0.75-2.00 (1.13)	1.00-2.00 (1.44)	1.33-2.50 (1.63)	1.20-3.50 (2.52)	1.00-2.00 (1.52)	1.00-2.00 (1.36)	1.50-3.50 (2.34)	2.68-2.75 (2.72)	2.86-4.13 (3.34)	1.00-3.00 (1.71)	1.71-3.47 (2.69)
MO 6	8.33-17.66 (12.13)	6.16-16.00 (9.06)	7.27-13.71 (10.14)	3.18-7.33 (4.68)	7.62-15.00 (10.80)	7.60-17.00 (11.64)	4.00-7.16 (4.99)	2.47-2.54 (2.50)	2.13-2.94 (2.53)	2.10-5.96 (3.63)	1.89-3.50 (2.45)
MO 7	X	X	X	X	X	X	3.90-6.00 (4.67)	4.20-4.67 (4.43)	3.26-5.15 (4.65)	*	9.33-15.22 (11.78)
MO 8	0.85-0.92 (0.88)	1.09-1.20 (1.15)	1.05-1.22 (1.13)	1.36-1.54 (1.45)	1.08-1.18 (1.16)	1.20-1.42 (1.31)	1.89-2.36 (2.08)	1.57-1.62 (1.59)	1.38-1.73 (1.61)	1.25-1.55 (1.39)	1.35-1.63 (1.53)
MO 9	0.94-1.15 (1.03)	0.98-1.15 (1.08)	1.02-1.26 (1.15)	1.15-1.35 (1.25)	1.05-1.31 (1.15)	1.21-1.37 (1.29)	1.14-1.51 (1.33)	1.28-1.37 (1.33)	1.29-1.63 (1.40)	1.21-1.76 (1.42)	1.13-1.50 (1.26)
MO 10	1.51-1.76 (1.64)	1.38-1.68 (1.54)	1.41-1.60 (1.50)	1.38-1.53 (1.45)	1.35-1.66 (1.57)	1.28-1.36 (1.42)	1.36-1.54 (1.45)	1.18-1.23 (1.20)	1.12-1.34 (1.22)	0.90-1.27 (1.07)	1.36-1.61 (1.48)
MO 11	1.32-1.46 (1.38)	1.40-1.51 (1.45)	1.30-1.43 (1.37)	1.27-1.33 (1.31)	1.33-1.42 (1.37)	1.36-1.45 (1.40)	1.28-1.40 (1.35)	1.41-1.45 (1.43)	1.42-1.61 (1.49)	1.28-1.59 (1.32)	1.30-1.37 (1.34)
MO 12	1.11-1.31 (1.24)	0.95-1.13 (1.05)	0.91-1.18 (1.03)	1.08-1.48 (1.34)	1.03-1.18 (1.07)	0.94-1.08 (0.99)	1.06-1.19 (1.10)	1.13-1.25 (1.19)	1.21-1.72 (1.39)	1.00-1.21 (1.07)	0.88-1.01 (0.95)
MO 13	0.23-0.34 (0.27)	0.51-0.68 (0.59)	0.36-0.47 (0.41)	0.34-0.46 (0.38)	0.30-0.36 (0.33)	0.40-0.45 (0.43)	0.30-0.36 (0.33)	0.35-0.38 (0.37)	0.27-0.42 (0.37)	0.48-0.77 (0.64)	0.70-0.83 (0.76)
MO 14	0.30-0.37 (0.31)	0.57-0.69 (0.62)	0.36-0.45 (0.43)	0.43-0.55 (0.47)	0.33-0.39 (0.36)	0.38-0.42 (0.40)	0.34-0.39 (0.36)	0.43-0.45 (0.44)	0.43-0.57 (0.51)	0.51-0.81 (0.69)	0.65-0.83 (0.75)
MO 15	*	*	*	*	*	*	*	*	*	0.45-0.55 (0.47)	0.41-0.60 (0.54)
MO 16	X	X	X	X	X	X	X	1.00-1.75 (1.37)	0.60-1.50 (1.05)	0.80-8.00 (1.96)	1.43-3.00 (1.87)
MO 17	1.06-1.22 (1.15)	1.09-1.35 (1.20)	X	X	1.25	1.07-1.17 (1.13)	1.47-1.58 (1.53)	1.30-1.34 (1.33)	1.33-1.88 (1.51)	*	1.37-1.59 (1.50)
MO 18	1.50-1.70 (1.59)	1.43-1.56 (1.50)	X	X	1.77	1.64-1.78 (1.68)	1.54-1.61 (1.56)	2.21-2.22 (2.21)	2.08-2.80 (2.33)	1.66-1.84 (1.77)	1.72-1.81 (1.77)
MO 19	1.25-1.60 (1.38)	1.64-2.41 (2.12)	1.70-1.79 (1.73)	X	1.56-2.00 (1.78)	2.45-2.81 (2.67)	1.10-1.70 (1.56)	1.15-1.57 (1.36)	0.89-1.44 (1.05)	0.77-1.20 (0.92)	1.11-1.86 (1.34)
MO 20	*	*	*	*	3.10-3.55 (3.31)	3.46-4.00 (3.74)	*	*	*	*	*
MO 21	0.98-1.03 (1.01)	1.00-1.07 (1.02)	0.98-1.07 (1.01)	1.03-1.12 (1.07)	1.01-1.06 (1.03)	1.00-1.06 (1.02)	1.05-1.10 (1.08)	1.00-1.02 (1.01)	1.00-1.07 (1.02)	1.04-1.19 (1.12)	1.04-1.16 (1.13)

The numbers within parenthesis indicate averages — indicates specimens not represented in the collection; x indicates absence of concerned character;

* indicates character not studied

Table 4—Comparison of various morphometric ratios in the 22 to 32 mm size-group of penaeid prawn seed along the Ratnagiri coast

Ratio Code	<i>Metapenaeus</i> sp.	<i>Parapenaeo-opsis cornuta</i>	<i>Metapenaeus monoceros</i>	<i>Metapenaeus dobsoni</i>	<i>Metapenaeus moyebi</i>	<i>Metapenaeus affinis</i>	<i>Penaeus japonicus</i>	<i>Penaeus (P.) semisulcatus</i>	<i>Penaeus (P.) monodon</i>	<i>Penaeus (F.) merguensis</i>	<i>Penaeus (F.) indicus</i>
MO 1	0.60-0.61 (0.61)	0.45-0.53 (0.49)	0.52-0.68 (0.60)	0.40-0.63 (0.53)	0.51-0.62 (0.57)	0.43-0.59 (0.50)	0.39-0.52 (0.46)	-	0.84-1.00 (0.91)	1.42-2.00 (1.67)	-
MO 2	4.21-4.35 (4.28)	4.12-5.61 (4.62)	4.50-5.66 (5.13)	2.52-3.75 (3.16)	3.65-5.00 (4.40)	3.42-4.46 (3.99)	4.00-5.15 (4.51)	-	6.36-7.75 (6.89)	10.35-13.68 (11.83)	-
MO 3	0.70-0.74 (0.73)	0.56-0.64 (0.61)	0.73-0.88 (0.80)	0.52-0.83 (0.69)	0.65-0.77 (0.72)	0.53-0.71 (0.62)	0.66-0.85 (0.75)	-	1.17-1.37 (1.28)	1.67-2.00 (1.83)	-
MO 4	0.68-0.72 (0.70)	0.57-0.64 (0.62)	0.70-0.86 (0.75)	0.46-0.72 (0.62)	0.62-0.78 (0.70)	0.54-0.74 (0.63)	0.58-0.74 (0.66)	-	0.90-1.08 (0.98)	1.38-1.66 (1.57)	-
MO 5	0.75-1.60 (1.25)	0.83-2.50 (1.65)	1.00-2.50 (1.71)	2.43-6.16 (3.79)	1.20-2.66 (1.69)	1.00-1.83 (1.37)	1.50-4.66 (2.20)	-	2.50-3.88 (2.94)	0.65-2.39 (1.43)	-
MO 6	8.25-12.42 (10.22)	5.00-13.20 (7.40)	7.5-14.67 (10.65)	2.00-3.68 (2.72)	7.50-16.40 (10.08)	7.64-12.57 (9.90)	3.81-7.00 (5.15)	-	2.30-3.25 (2.84)	2.48-6.93 (4.56)	-
MO 7	X	X	X	X	X	X	3.32-5.71 (4.31)	-	3.32-5.53 (4.44)	*	-
MO 8	0.81-0.92 (0.86)	1.10-1.25 (1.18)	1.09-1.28 (1.18)	1.44-1.68 (1.55)	1.12-1.22 (1.19)	1.32-1.42 (1.36)	2.00-2.31 (2.14)	-	1.46-1.88 (1.70)	1.40-1.58 (1.51)	-
MO 9	1.03-1.28 (1.14)	1.06-1.18 (1.11)	1.10-1.36 (1.21)	1.17-1.37 (1.27)	1.10-1.27 (1.16)	1.18-1.34 (1.26)	1.25-1.57 (1.37)	-	1.23-1.58 (1.41)	1.19-1.43 (1.31)	-
MO 10	1.40-1.62 (1.54)	1.41-1.64 (1.53)	1.35-1.60 (1.49)	1.33-1.50 (1.42)	1.52-1.63 (1.56)	1.33-1.59 (1.47)	1.39-1.61 (1.50)	-	1.13-1.40 (1.25)	1.13-1.38 (1.25)	-
MO 11	1.43-1.45 (1.44)	1.46-1.53 (1.49)	1.36-1.50 (1.42)	1.30-1.40 (1.35)	1.33-1.43 (1.38)	1.42-1.46 (1.45)	1.31-1.40 (1.35)	-	1.37-1.46 (1.41)	1.27-1.33 (1.30)	-
MO 12	1.08-1.14 (1.11)	0.97-1.05 (1.02)	0.86-0.98 (0.92)	1.08-1.36 (1.24)	0.93-1.08 (0.99)	0.89-0.96 (0.91)	0.97-1.12 (1.02)	-	1.10-1.37 (1.23)	0.96-1.26 (1.04)	-
MO 13	0.30-0.36 (0.32)	0.60-0.68 (0.63)	0.42-0.50 (0.46)	0.38-0.50 (0.43)	0.31-0.39 (0.36)	0.45-0.51 (0.49)	0.30-0.35 (0.33)	-	0.38-0.52 (0.46)	0.61-0.95 (0.82)	-
MO 14	0.35-0.36 (0.36)	0.62-0.67 (0.65)	0.40-0.46 (0.43)	0.46-0.59 (0.54)	0.33-0.39 (0.36)	0.40-0.46 (0.43)	0.29-0.36 (0.33)	-	0.49-0.63 (0.46)	0.78-0.94 (0.82)	-
MO 15	*	*	*	*	*	*	*	-	*	0.38-0.52 (0.43)	-
MO 16	X	X	X	X	X	X	X	-	0.80-5.00 (2.03)	1.25-5.00 (3.24)	-
MO 17	1.13-1.29 (1.20)	1.12-1.39 (1.25)	X	X	X	X	X	-	1.26-1.50 (1.41)	-	-
MO 18	1.45-1.52 (1.49)	1.42-1.56 (1.48)	X	X	X	X	X	-	2.10-2.41 (2.30)	1.68-1.81 (1.75)	-
MO 19	1.43-1.69 (1.55)	1.40-2.35 (1.86)	X	X	X	X	1.30-2.00 (1.72)	-	1.00-1.27 (1.10)	0.77-1.37 (0.92)	-
MO 20	*	*	*	*	2.96-3.39 (3.17)	3.55-3.96 (3.77)	*	-	*	*	-
MO 21	1.01-1.02 (1.01)	1.00-1.03 (1.01)	1.03-1.08 (1.05)	1.06-1.12 (1.09)	1.04-1.09 (1.06)	1.01-1.10 (1.04)	1.04-1.25 (1.08)	-	0.98-1.11 (1.02)	1.16-1.24 (1.20)	-

The numbers within parenthesis indicate averages— indicates specimens not represented in the collection; × indicates absence of concerned character; * indicates character not studied.

Table 5 — Comparison of various morphometric ratios in the 32 to 40 mm size-group of penaeid prawn seed along the Ratnagiri coast.

Ratio Code	<i>Metapenaeopsis</i> sp.	<i>Parapenaeopsis cornuta</i>	<i>Metapenaeus monoceros</i>	<i>Metapenaeus dobsoni</i>	<i>Metapenaeus moyebi</i>	<i>Metapenaeus affinis</i>	<i>Penaeus (M.) japonicus</i>	<i>Penaeus (P.) semisulcatus</i>	<i>Penaeus (P.) monodon</i>	<i>Penaeus (F.) merguensis</i>	<i>Penaeus (F.) indicus</i>
MO 1	-	0.53-0.63 (0.57)	56-0.70 (0.65)	0.59-0.73 (0.66)	0.64-0.70 (0.66)	0.52-0.66 (0.61)	0.48-0.54 (0.51)	0.84-0.94 (0.89)	0.78-0.93 (0.87)	1.33-1.64 (1.53)	-
MO 2	-	4.81-5.71 (5.16)	5.07-6.31 (5.64)	3.36-4.66 (3.80)	4.87-5.71 (5.20)	4.00-5.26 (4.83)	4.29-5.54 (4.84)	6.61-7.92 (7.27)	5.88-6.62 (6.26)	9.31-11.58 (10.36)	-
MO 3	-	0.64-0.75 (0.70)	0.78-0.89 (0.88)	0.77-0.98 (0.86)	0.76-0.86 (0.82)	0.67-0.84 (0.76)	0.78-0.91 (0.84)	1.06-1.17 (1.12)	1.14-1.33 (1.23)	1.59-1.85 (1.72)	-
MO 4	-	0.65-0.78 (0.73)	0.77-0.88 (0.82)	0.67-0.86 (0.75)	0.74-0.86 (0.81)	0.67-0.83 (0.75)	0.67-0.78 (0.71)	0.90-1.00 (0.95)	0.86-1.03 (0.90)	1.40-1.61 (1.48)	-
MO 5	-	1.55-2.62 (2.18)	1.20-2.00 (1.67)	3.44-6.28 (4.39)	1.00-2.00 (1.47)	1.00-2.00 (1.42)	1.76-3.20 (2.47)	2.54-2.83 (2.69)	2.05-3.83 (2.85)	0.59-1.76 (1.23)	-
MO 6	-	3.81-5.50 (4.79)	6.66-13.33 (9.26)	2.16-2.46 (2.10)	7.67-13.50 (10.74)	6.07-13.50 (8.76)	3.31-5.27 (4.07)	2.61-3.03 (2.82)	2.28-3.07 (2.72)	2.96-9.69 (4.94)	-
MO 7	-	X	X	X	X	X	3.22-4.58 (3.84)	3.96-4.78 (4.37)	3.40-5.41 (4.52)	*	-
MO 8	-	1.15-1.20 (1.04)	1.15-1.27 (1.20)	1.52-1.70 (1.61)	1.12-1.26 (1.18)	1.20-1.45 (1.31)	2.02-2.33 (2.20)	1.87-1.91 (1.89)	1.57-1.96 (1.86)	1.53-1.83 (1.60)	-
MO 9	-	0.97-1.17 (1.08)	1.18-1.34 (1.23)	1.22-1.40 (1.29)	1.12-1.34 (1.22)	1.20-1.43 (1.28)	1.29-1.49 (1.40)	1.20-1.21 (1.21)	1.29-1.58 (1.46)	1.26-1.53 (1.41)	-
MO 10	-	1.41-1.59 (1.51)	1.36-1.52 (1.34)	1.27-1.50 (1.35)	1.39-1.56 (1.54)	1.40-1.61 (1.49)	1.42-1.58 (1.48)	1.30-1.32 (1.31)	1.09-1.35 (1.27)	1.16-1.38 (1.28)	-
MO 11	-	1.50-1.52 (1.51)	1.45-1.53 (1.49)	1.29-1.39 (1.34)	1.39-1.49 (1.43)	1.46-1.54 (1.49)	1.29-1.38 (1.34)	1.44-1.50 (1.47)	1.33-1.47 (1.40)	1.26-1.35 (1.31)	-
MO 12	-	1.01-1.08 (1.04)	0.85-0.93 (0.90)	1.04-1.32 (1.17)	1.12-1.26 (1.19)	1.21-1.45 (1.31)	2.02-2.33 (2.21)	0.78-0.84 (0.81)	1.57-1.96 (1.86)	1.53-1.83 (1.60)	-
MO 13	-	0.62-0.73 (0.67)	0.44-0.53 (0.48)	0.46-0.55 (0.52)	0.38-0.48 (0.41)	0.45-0.52 (0.48)	0.29-0.36 (0.33)	0.55-0.56 (0.50)	0.45-0.56 (0.50)	0.86-1.03 (0.94)	-
MO 14	-	0.68-0.76 (0.69)	0.38-0.50 (0.44)	0.55-0.68 (0.61)	0.35-0.42 (0.38)	0.41-0.46 (0.43)	0.29-0.35 (0.32)	0.43-0.47 (0.45)	0.48-0.66 (0.56)	0.82-1.06 (0.94)	-
MO 15	-	*	*	*	*	*	*	*	*	0.43-0.54 (0.47)	-
MO 16	-	X	X	X	X	X	X	X	X	X	-
MO 17	-	1.17-1.29 (1.22)	X	X	X	X	X	X	X	X	-
MO 18	-	1.44-1.51 (1.46)	X	X	X	X	X	X	X	1.71-1.76 (1.74)	-
MO 19	-	1.85-2.86 (2.27)	X	X	X	X	1.33-1.94 (1.70)	X	X	1.12-1.22 (1.17)	-
MO 20	-	*	*	*	3.00-3.17 (3.07)	3.55-3.97 (3.73)	*	*	*	*	-
MO 21	-	1.00-1.08 (1.04)	1.03-1.12 (1.09)	1.07-1.18 (1.10)	1.01-1.09 (1.06)	1.02-1.11 (1.04)	1.07-1.15 (1.09)	1.10-1.15 (1.12)	0.99-1.04 (1.01)	1.16-1.27 (1.21)	-

The numbers within parenthesis indicate averages. — indicates specimens not represented in the collection, x indicates absence of concerned character; * indicates character not studied.

Table 6—Comparison of various morphometric ratios in the 40 to 50 mm size-group of penaeid prawn seed along the Ratnagiri Coast.

Ratio Code	<i>Metapenaeopsis cornuta</i> Sp.	<i>Metapenaeopsis monoceros</i>	<i>Metapenaeus dobsoni</i>	<i>Metapenaeus moyebi</i>	<i>Metapenaeus affinis</i>	<i>Penaeus (M.) japonicus</i>	<i>Penaeus (P.) semisulcatus</i>	<i>Penaeus (P.) monodon</i>	<i>Penaeus (F.) merguensis</i>	<i>Penaeus (F.) indicus</i>
MO 1	-	0.64-0.80 (0.72)	0.65-0.77 (0.71)	0.59-0.74 (0.69)	0.67-0.76 (0.72)	0.51-0.60 (0.55)	-	0.80-0.88 (0.84)	1.33-1.74 (1.52)	-
MO 2	-	5.62-6.67 (6.18)	3.56-4.50 (4.05)	4.45-6.11 (5.42)	5.00-5.89 (5.49)	4.47-5.81 (5.08)	-	5.74-6.50 (6.07)	8.16-9.93 (8.93)	-
MO 3	-	0.85-1.00 (0.92)	0.88-1.07 (0.98)	0.76-0.92 (0.87)	0.83-0.97 (0.90)	0.82-0.96 (0.89)	-	1.15-1.27 (1.21)	1.55-1.69 (1.66)	-
MO 4	-	0.82-0.98 (0.90)	0.78-0.93 (0.86)	0.78-0.90 (0.86)	0.80-0.93 (0.89)	0.73-0.95 (0.79)	-	0.90-0.96 (0.92)	1.32-1.47 (1.40)	-
MO 5	-	1.14-2.17 (1.55)	3.80-7.86 (5.06)	1.00-2.00 (1.42)	1.20-1.70 (1.36)	1.25-3.50 (2.29)	-	2.05-3.85 (2.89)	0.85-2.42 (1.36)	-
MO 6	-	6.61-12.66 (9.34)	1.75-2.41 (2.03)	7.14-15.33 (10.36)	6.54-9.63 (7.75)	3.03-5.86 (3.92)	-	2.08-3.18 (2.71)	3.02-9.68 (5.04)	-
MO 7	-	X	X	X	X	2.96-4.93 (3.58)	-	3.51-5.21 (4.54)	-	-
MO 8	-	1.12-1.25 (1.20)	1.56-1.75 (1.66)	1.13-1.23 (1.19)	1.30-1.36 (1.34)	2.00-2.29 (2.16)	-	1.76-1.95 (1.83)	1.50-1.77 (1.63)	-
MO 9	-	1.17-1.34 (1.26)	1.25-1.42 (1.32)	1.15-1.27 (1.23)	1.25-1.41 (1.35)	1.25-1.52 (1.38)	-	1.34-1.42 (1.40)	1.34-1.63 (1.46)	-
MO 10	-	1.31-1.48 (1.43)	1.21-1.41 (1.31)	1.31-1.50 (1.41)	1.28-1.45 (1.39)	1.37-1.54 (1.48)	-	1.25-1.31 (1.27)	1.18-1.41 (1.30)	-
MO 11	-	1.43-1.55 (1.49)	1.33-1.46 (1.39)	1.37-1.48 (1.45)	1.49-1.55 (1.50)	1.33-1.39 (1.35)	-	1.34-1.45 (1.39)	1.31-1.34 (1.32)	-
MO 12	-	0.80-0.92 (0.88)	1.08-1.22 (1.16)	0.81-0.95 (0.90)	0.81-0.91 (0.88)	0.86-1.00 (0.94)	-	1.08-1.17 (1.12)	0.84-0.96 (0.91)	-
MO 13	-	0.44-0.54 (0.52)	0.47-0.67 (0.57)	0.39-0.51 (0.43)	0.53-0.59 (0.56)	0.31-0.37 (0.34)	-	0.49-0.57 (0.53)	0.87-1.04 (0.95)	-
MO 14	-	0.40-0.49 (0.45)	0.57-0.76 (0.68)	0.33-0.40 (0.38)	0.45-0.52 (0.49)	0.28-0.34 (0.31)	-	0.54-0.62 (0.59)	0.78-0.95 (0.86)	-
MO 15	-	*	*	*	*	*	-	*	0.43-0.49 (0.46)	-
MO 16	-	X	X	X	X	X	-	X	X	-
MO 17	-	X	X	X	X	X	-	X	X	-
MO 18	-	X	X	X	X	X	-	X	X	-
MO 19	-	*	*	2.92-3.25 (3.08)	3.40-3.95 (3.60)	*	-	*	*	-
MO 20	-	1.07-1.15 (1.10)	1.07-1.14 (1.11)	1.04-1.10 (1.06)	1.02-1.12 (1.09)	1.05-1.16 (1.12)	-	1.00-1.03 (1.01)	1.19-1.31 (1.23)	-
MO 21	-	-	-	-	-	-	-	-	-	-

The numbers within parenthesis indicate averages.— indicates specimens not represented in the collection; × indicates absence of concerned character; * indicates character not studied.

Table 7—Comparison of various morphometric ratios in the 50 to 60 mm size-group of penaeid prawn seed along the Ratnagiri coast.

Ratio Code	<i>Metapenaeopsis</i> <i>Sp.</i>	<i>Parapenaeo-opsis</i> <i>cornuta</i>	<i>Metapenaeus</i> <i>monoceros</i>	<i>Metapenaeus</i> <i>dobsoni</i>	<i>Metapenaeus</i> <i>mayebi</i>	<i>Metapenaeus</i> <i>affinis</i>	<i>Penaeus (M.)</i> <i>japonicus</i>	<i>Penaeus (P.)</i> <i>semisulcatus</i>	<i>Penaeus (P.)</i> <i>monodon</i>	<i>Penaeus (F.)</i> <i>merguensis</i>	<i>Penaeus (F.)</i> <i>indicus</i>
MO 1	-	-	0.68-0.78 (0.74)	0.71-0.80 (0.76)	0.65-0.76 (0.71)	0.72-0.82 (0.76)	0.53-0.59 (0.55)	-	0.80-0.83 (0.82)	1.27-1.61 (1.37)	1.14-1.26 (1.20)
MO 2	-	-	5.63-6.80 (6.29)	3.96-4.76 (4.34)	5.23-6.55 (5.75)	5.38-6.95 (5.68)	4.60-5.61 (4.92)	-	5.83-6.00 (5.92)	6.85-8.85 (7.98)	6.80-6.96 (6.88)
MO 3	-	-	0.87-1.03 (0.96)	1.01-1.12 (1.06)	0.84-0.97 (0.89)	0.92-1.04 (0.97)	0.85-1.01 (0.92)	-	1.14-1.23 (1.19)	1.44-1.67 (1.59)	1.41-1.56 (1.49)
MO 4	-	-	0.86-1.03 (0.95)	0.88-0.98 (0.93)	0.84-0.97 (0.89)	0.91-1.00 (0.94)	0.74-0.90 (0.82)	-	0.90-0.98 (0.94)	1.18-1.38 (1.32)	1.25-1.32 (1.28)
MO 5	-	-	1.00-2.25 (1.49)	4.26-7.55 (6.12)	1.00-2.50 (1.39)	1.27-1.57 (1.44)	1.54-3.17 (2.45)	-	2.57-4.00 (3.06)	0.66-1.34 (1.05)	2.12-4.00 (3.06)
MO 6	-	-	6.25-17.66 (10.80)	1.53-2.03 (1.79)	5.62-13.10 (9.34)	6.23-6.31 (6.27)	2.84-5.11 (3.78)	-	2.31-2.59 (2.48)	3.92-10.40 (7.02)	2.13-2.57 (2.35)
MO 7	-	-	X	X	X	X	2.79-3.88 (3.39)	-	3.66-4.24 (4.04)	*	8.17-18.89 (13.53)
MO 8	-	-	1.17-1.30 (1.24)	1.63-1.84 (1.73)	1.15-1.27 (1.21)	1.32-1.36 (1.34)	2.10-2.45 (2.26)	-	1.84-1.89 (1.86)	1.53-1.73 (1.66)	1.67
MO 9	-	-	1.12-1.29 (1.20)	1.26-1.39 (1.33)	1.15-1.30 (1.22)	1.30-1.47 (1.40)	1.27-1.56 (1.45)	-	1.37-1.44 (1.40)	1.35-1.57 (1.45)	1.27-1.29 (1.28)
MO 10	-	-	1.29-1.46 (1.40)	1.11-1.35 (1.24)	1.30-1.47 (1.37)	1.44-1.48 (1.46)	1.35-1.50 (1.42)	-	1.29-1.31 (1.30)	1.16-1.31 (1.25)	1.33-1.38 (1.36)
MO 11	-	-	1.46-1.57 (1.51)	1.38-1.45 (1.42)	1.43-1.50 (1.46)	1.52-1.57 (1.55)	1.33-1.40 (1.36)	-	1.37-1.39 (1.38)	1.26-1.34 (1.31)	1.28-1.35 (1.32)
MO 12	-	-	0.86-0.93 (0.89)	1.08-1.14 (1.10)	0.83-0.96 (0.91)	0.86-0.92 (0.89)	0.89-0.97 (0.93)	-	1.09-1.16 (1.12)	0.89-0.95 (0.91)	0.75-0.77 (0.76)
MO 13	-	-	0.46-0.56 (0.52)	0.56-0.81 (0.69)	0.42-0.56 (0.47)	0.56-0.58 (0.57)	0.32-0.36 (0.34)	-	0.59-0.61 (0.59)	0.85-0.97 (0.91)	1.26-1.38 (1.32)
MO 14	-	-	0.44-0.50 (0.46)	0.68-0.86 (0.77)	0.35-0.53 (0.43)	0.49-0.53 (0.51)	0.30-0.33 (0.32)	-	0.64-0.71 (0.67)	0.76-0.83 (0.81)	1.07-1.14 (1.10)
MO 15	-	-	*	*	*	*	*	-	*	0.42-0.51 (0.48)	0.49-0.50 (0.50)
MO 16	-	-	X	X	X	X	X	-	X	X	X
MO 17	-	-	X	X	X	X	X	-	X	X	X
MO 18	-	-	X	X	X	X	1.30-1.95 (1.58)	-	X	X	X
MO 19	-	-	*	*	2.97-3.33 (3.19)	3.32-3.47 (3.39)	-	-	*	*	*
MO 20	-	-	1.06-1.15 (1.11)	1.00-1.14 (1.10)	1.04-1.12 (1.08)	1.09-1.10 (1.08)	1.09-1.14 (1.12)	-	1.00-1.01	1.12-1.32 (1.22)	1.19-1.23 (1.20)
MO 21	-	-	-	-	-	-	-	-	-	-	-

The numbers within parenthesis indicate averages — indicates specimens not represented in the collection; × indicates absence of concerned character; * indicates character not studied.

$$\text{MO 17} = \frac{\text{Length of 6th abdominal segment}}{\text{Telson length upto base of 1st posterior process}}$$

$$\text{MO 18} = \frac{\text{Telson length upto base of 1st posterior process}}{\text{Length of telson base to base of 1st lateral spine}}$$

$$\text{MO 19} = \frac{\text{Distance between bases of 1st and 2nd lateral spines of telson}}{\text{Distance between bases of 2nd and 3rd lateral spines of telson}}$$

$$\text{MO 20} = \frac{\text{Telson length upto tip}}{\text{Telson breadth}}$$

$$\text{MO 21} = \frac{\text{Uropod exopod length}}{\text{Uropod endopod length}}$$

Keeping in view the size-linked variations, 5 specimens each belonging to every 2 mm size-group, starting right from 6 mm size, were specially examined in order to properly understand the exact nature of changes¹⁸.

Results and Discussion

It was interesting to note that like colouration, morphological and meristic features, even the results of morphometric ratios revealed that while highly conspicuous changes take place at 14, 22 and 32 mm sizes, some significant changes were also found to occur at 10, 40 and 50 mm sizes of seed. In view of this, the ratios have been categorised under 7 size-groups viz. 6-10 mm, 10-14 mm, 14-22 mm, 22-32 mm, 32-40 mm, 40-50 mm and 50-60 mm (Tables 1 to 7) to have a meaningful understanding of size-linked morphometric changes¹⁸.

Out of the 4 genera, to which the 11 species dealt within the present work belong, only *Metapenaeopsis* stands apart in possessing a unique MO 8 ratio, indicating the distinctiveness of that genus by the least postorbital distance of its epigastric tooth. Although, in the present work, this ratio is not studied beyond 32 mm size seed, it is known to remain unique for the genus even in the adult stage¹⁹. The genus *Parapenaeopsis*, on the other hand, shows non-overlapping ratios for MO 8 up to 10 mm and MO 18 up to 14 mm.

The genus *Penaeus* stands out due to its distinctly longer 6th abdominal segment (MO 17). Some recent studies²⁰⁻²³ have proposed splitting of this genus into several subgenera of which 3 are covered in the present work. It is seen that the ratios MO 1, 3 and 8 are unique for the subgenus *Marsupenaeus*, indicating in it the presence of shortest rostrum and greatest postorbital distance of epigastric tooth. In the subgenus *Penaeus*, the ratios MO 1 and 3 are unique, indicating a medium-sized rostrum which is longer than in *Marsupenaeus* but shorter than in *Fenneropenaeus*. The subgenus *Fenneropenaeus* is characterised by a distinctly long rostrum and upper flagellum of antennule (MO 1-4 and MO 13). The uniqueness of each of the above subgenera not only reveals the diversity of *Penaeus* but also supports recognition of different subgenera within that genus.

The heterogeneity of *Metapenaeus* is clearly revealed by the morphometrics of its members which do not exhibit any unique ratios excepting in *M. dobsoni* wherein MO 6 stands out highlighting the characteristic rostrum of that species. This particular observation further corroborates the creation of a separate genus for *M. dobsoni*, the possibility of which has already been discussed by several workers^{19,24-27}.

When the morphometrics is applied individually to each of the 11 species, without taking into account their generic affiliations, more than 80 non-overlapping ratios could be recognised, which have been highlighted as rectangular boxes in Tables 1-7. While the distinctiveness of *Metapenaeopsis* sp. is already discussed, the seed of banana prawn *P. (F.) merguensis*, which is the main candidate species for prawn culture in the area, can be easily segregated from the remaining species by its characteristically long and slender rostrum.

Acknowledgement

The authors are grateful to Dr. K.N. Sankolli and Dr. Shakuntala Shenoy for their encouraging guidance. Special thanks are also due to Mr. D.I. Pathan for his assistance.

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