ON THE MARINE CRABS (DECAPODA : BRACHYURA) OF BOMBAY STATE*

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PART II

(*With one coloured and five line plates, and one text-figure*)

(*Continued from p.* 439 *of this volume*)

Family *PINNOTHERIDAE*

Subfamily PINNOTHERINAE

Genus **Pinnotheres** Latreille

Pinnotheres placunae Hornell & Southwell

(Plate 12)

Pinnotheres placunae, Hornell & Southwell, *Rep. Marine Zool. Okhamandal*, p. 99 (1909).

Numerous specimens, of both sexes, were found living as commensals within the mantle-cavity of the bivalve *Placuna placenta* at Bombay. The majority were found near the anus. The dimensions of two specimens are given below, in terms of divisions—each division = 0.125 mm.

Male :

length of carapace	... 50 divs.	(or 6.25 mm.)
breadth of carapace	... 58 divs.	(or 7.25 mm.)
ratio of length : breadth of carapace	... 0.862	
Cheliped :—length of dactylus	... 13 divs.	
length of upper border of palm	... 20 divs.	
greatest width of palm	... 13 divs.	
ratio of length of dactylus : length of upper border of palm	... 0.65	
ratio of length of dactylus : width of palm	1.1	

Walking legs :—

	ischium & merus	carpus	propodus	dactylus	Total
Right : length of 1st leg	35	12	14	7	... 68 divs.
length of 2nd leg	40	13	20	9	... 82 divs.
length of 3rd leg	40	12	22	15	... 89 divs.
length of 4th leg	21	7	12	12	... 52 divs.

ratio of propodus : dactylus of 4th right leg ... 1:1

* as it existed up to 31st October, 1956.

		ischium & merus	carpus	propodus	dactylus		Total
Left :	length of 1st leg	35	9	12	8	...	64 divs.
	length of 2nd leg	38	16	18	10	...	82 divs.
	length of 3rd leg	43	12	22	17	...	94 divs.
	length of 4th leg	19	9	10	12	...	50 divs.
ratio of propodus : dactylus of 4th left leg					... 0.833		

Female :

length of carapace	... 60 divs.	(or 7.5 mm.)
breadth of carapace	... 90 divs.	(or 11.25 mm)
ratio of length : breadth of carapace	... 0.666	
Cheliped :—length of dactylus	... 16 divs.	
length of upper border of palm	25 divs.	
greatest width of palm	... 14 divs.	
ratio of length of dactylus : length of upper border of palm	... 2:3	
ratio of length of dactylus : width of palm	... 1.14	

Walking legs .—

		ischium & merus	carpus	propodus	dactylus		Total
Right :	length of 1st leg	33	9	12	10	...	64 divs.
	length of 2nd leg	36	17	18	11	...	82 divs.
	length of 3rd leg	40	16	21	14	...	91 divs.
	length of 4th leg	30	11	16	18	...	75 divs.
ratio of propodus : dactylus of 4th right leg					... 0.88		
Left :	length of 1st leg	35	10	13	9	...	67 divs.
	length of 2nd leg	37	16	20	12	...	85 divs.
	length of 3rd leg	39	19	23	18	...	99 divs.
	length of 4th leg	30	11	14	16	...	71 divs.
ratio of propodus : dactylus of 4th left leg					... 0.87		

In the female, the body is soft and membranous. The carapace is broader than long, circular, smooth and flat. The antero-lateral angles, though rounded, are pronounced. The external maxillipeds have the antero-internal angle of the ischium-merus rounded ; the dactylus does not extend to the apex of the propodus.

The legs increase in size posteriorly, except the last pair, which are smaller than the first. The dactyli of the last two pairs are 1½ times as long as those of the first two, those of the last pair being more hairy at the tips. There is a thick tuft of hair at the distal end of the propodite of the last pair.

In the male, the carapace is smooth, and harder than in the female. The legs are slender. The first pair is about equal in length to the chelipeds, the second pair is longer than the first by slightly more than a dactylus, and the third is longer than the second by a dactylus. There is a thick tuft of hair at the distal end of the propodite of the last pair. The abdomen is narrow. Colour light pinkish.

This species is similar to *Pinnotheres similis* Burger, which too lives in *Placuna placenta*, but differs from it in the following :

(1) the front is not setose ;
(2) there are no spinules on the dactylus of the last leg ;
(3) the proportions of the lengths of the legs are different.

The anterior male abdominal appendages are long, cylindrical, and rod-like. Their tips are bent at the end in the shape of a claw, and bear coarse hairs near both margins.

According to Hornell and Southwell, the dactyli of the chelipeds are as long as their palm; in the specimens in the present collection, they are only three-fourths as long as their palm. Also, the anterior male abdominal appendages, according to these authors, always project from beneath the abdomen. In none of the present specimens can this be seen.

From 10 shells of *Placuna placenta* opened, four contained a male as well as a female crab; five contained a female, and one gave negative results. Almost all the females were berried.

This species has been previously recorded from Okha.

Pinnotheres vicajii Chhapgar

(Plate 12)

Pinnotheres vicajii, Chhapgar, *Rec. Ind. Mus.* liii (in press) (1955).

Female: Body soft, carapace subquadrate, anterior angles pronounced but with rounded corners, no pigment spots.

Merus-ischium of external maxillipeds is a broad plate with the inner (posterior) margin slightly concave and the antero-internal angle pronounced: propodus elongate, broad and spatulate, it reaches farther than the inner angle of the merus. Dactylus minute, styliform, inserted at inner margin of propodus, just over-reaching the inner angle of the merus, and reaching to the end of the propodus.

Third pair of walking legs the longest, last pair longer than the first; propodites with a few silky hairs distally; dactyli of the first two pairs subequal in length, strongly hooked, those of the third and fourth pairs about twice as long as the first two, subequal, hairy and slender, regularly curved.

Abdomen of seven joints.

Male: Carapace smooth, well calcified, circular, without any trace of anterior angles, covered with minute, scattered pigment spots on the anterior half of the carapace up to a line joining the bases of the second pair of walking legs.

Merus-ischium and propodus of external maxillipeds similar to those of the female, except that the propodus is abruptly narrowed in the distal half. The dactylus does not even reach the antero-internal angle of the merus, as it does in the female. There is a brush of hairs at the tip of the last joint of the exognath of the external maxillipeds, but no hairs along the sides of this joint.

Third pair of walking legs the longest, the last pair shortest: inner borders of carpus and propodus of the second and third pairs of legs, as also all borders of the last pair fringed with silky hairs. A fringe of hair runs diagonally from the inner border of the proximal end of the carpus to the outer border of the distal end of the propodus of the second and third pairs of legs. Dactyli of first three pairs of legs subequal, those of the last pair slightly shorter; all hairy.

Abdomen seven-jointed, narrow, no fringe of hair on its borders.

Colour yellow; in the male the carapace is covered with minute black pigment spots.

Four females (two of them berried), and two males represent the present collection. Both sexes were obtained from the bivalve *Paphia malabarica* at Bombay, each crab living separately in a shell.

The measurements of the type specimens in millimetres are given in the following table :

		Type female.		Type male.	
Length of carapace	...	5·6		4·0	
Breadth of carapace	...	6·4		4·0	
Breadth of front	...	1·3		1·1	
Breadth of anterior border of carapace		4·1		—	
		left	right	left	right
1st walking leg					
	merus ...	0·75	0·75	0·84	0·84
	carpus ...	0·45	0·47	0·34	0·36
	propodus ...	0·66	0·67	0·47	0·49
	dactylus ...	0·28	0·28	0·20	0·23
2nd walking leg					
	merus ...	1·13	1.14	1·00	1·07
	carpus ...	0·50	0·56	0·45	0·45
	propodus ...	0·75	0·79	0·50	0·52
	dactylus ...	0·28	0·29	0·20	0·24
3rd walking leg					
	merus ...	1·69	1·13	1·70	1·73
	carpus ...	0·84	0·66	0·44	0·47
	propodus ...	1·28	0·90	0·60	0·75
	dactylus ...	0·46	0·38 (regenerated)	0·26	0·28
4th walking leg					
	merus ...	0·84	1·03	0·71	0·70
	carpus ..	0·41	0·52	0·37	0·33
	propodus ...	0·73	0·75	0·49	0·47
	dactylus ...	0·47	0·51	0·23	0·22

This species is allied to *Pinnotheres quadratus* Rathbun in the pigmentation of the male carapace and the small size of the dactylus of the external maxillipeds, but differs from it mainly in the circular male carapace, covered only in the anterior half with minute pigment spots, and without any trace of anterior angles, hirsute nature of the dactyli of all the legs, and narrow abdomen.

Family *OCYPODIDAE*

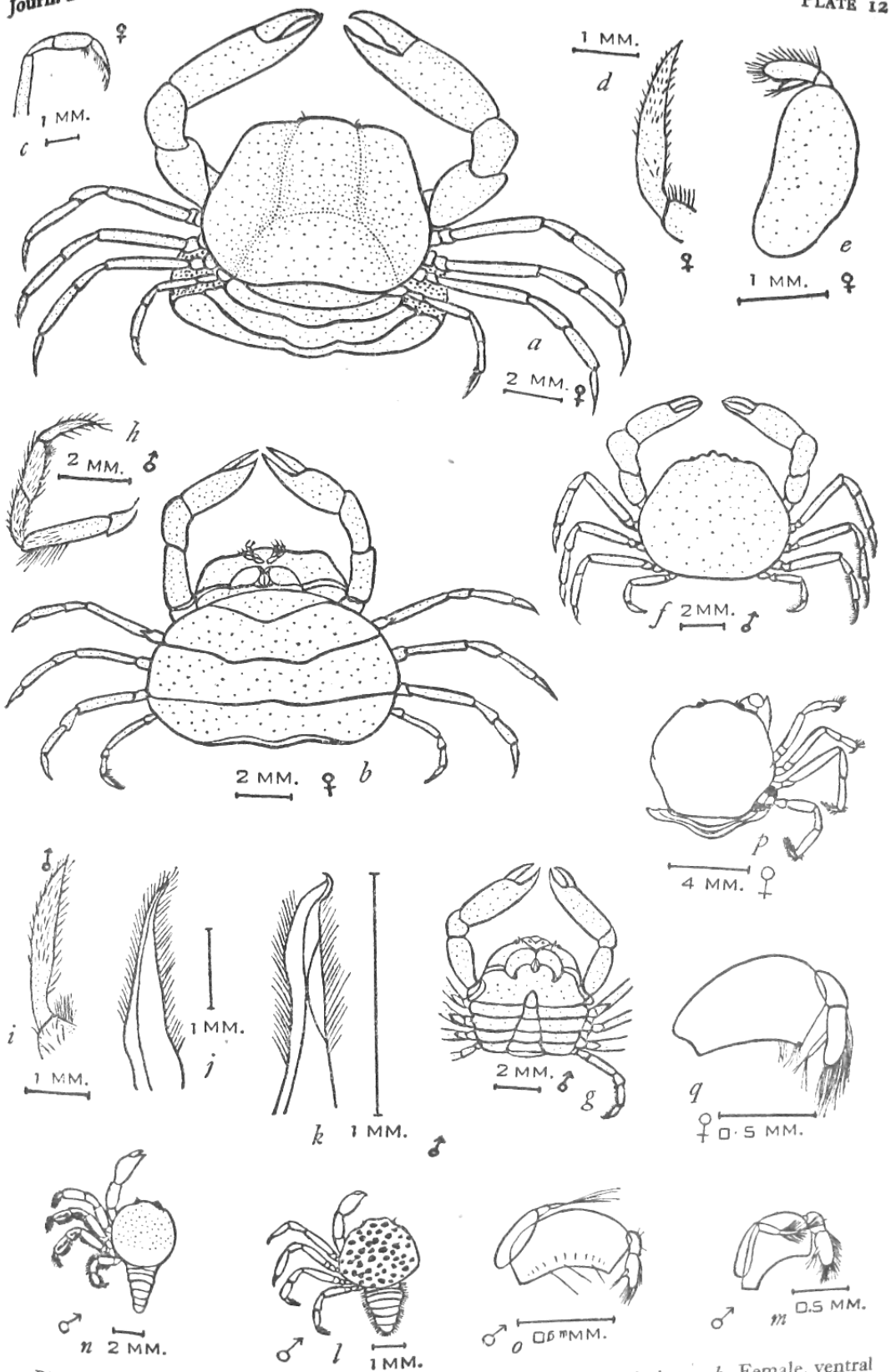
Subfamily OCYPODINAE

Genus **Ocypoda** Fabricius

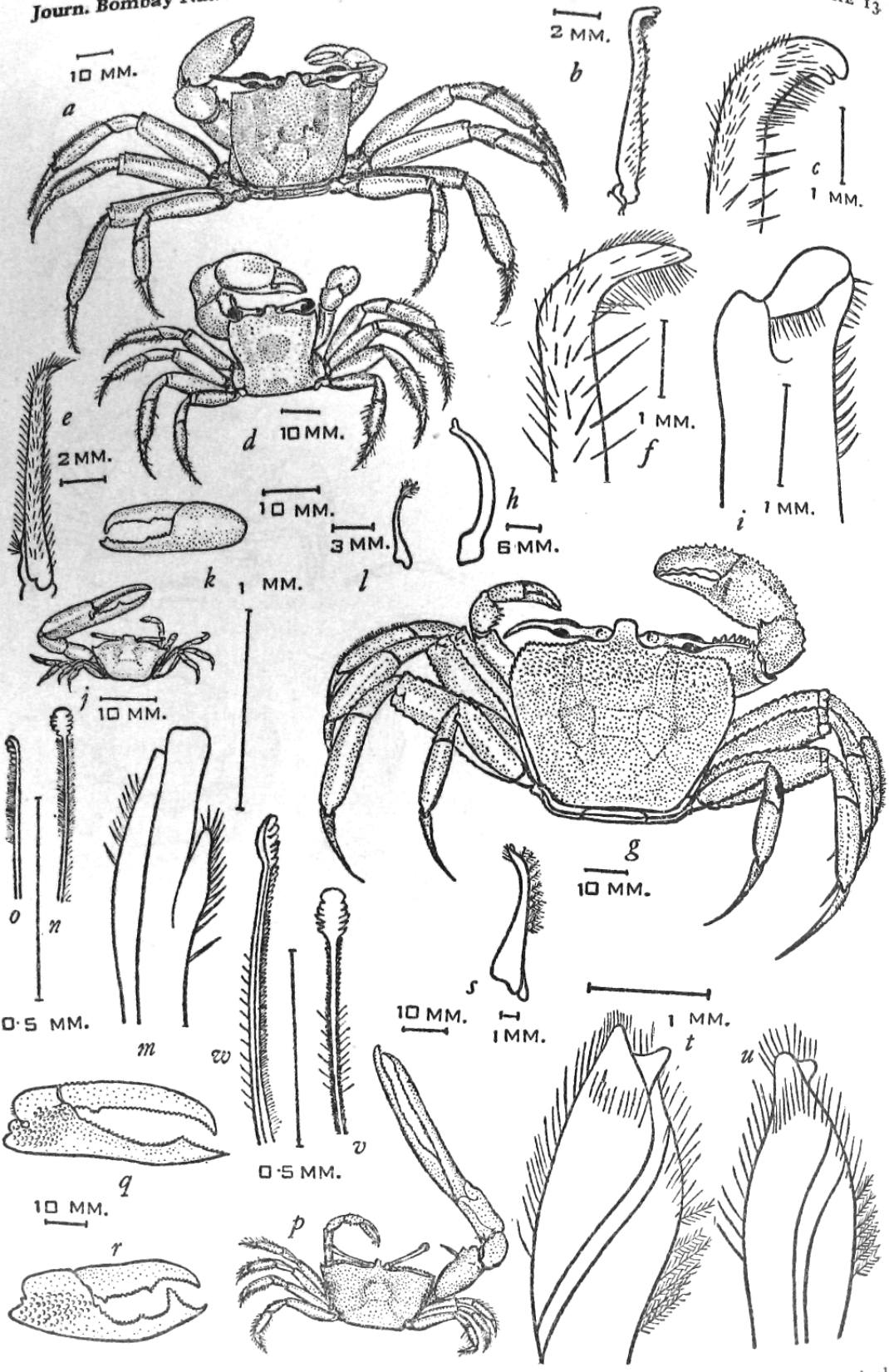
Ocypoda ceratophthalma (Pallas)

(Plate 13)

Ocypode ceratophthalmus, Barnard, *Ann. S. Afr. Mus.* xxxviii, p. 86 (1950).
Ocypode ceratophthalma, Lanchester, *Proc. Zool. Soc. London*, p. 751 (1900).
Ocypoda ceratophthalma, Haswell, *Catalogue Austr. Crust.*, p. 94 (1882).
de Man, *Journ. Linn. Soc. London (Zool.)* xxii, p. 107 (1887).
Walker, *Journ. Linn. Soc. London (Zool.)* xx, p. 110 (1890).
Henderson, *Trans. Linn. Soc. London (Zool.)* v, p. 387 (1893).
Alcock and Anderson, *Journ. As. Soc. Bengal* lxiii, p. 202 (1894).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 345 (1900).



Pinnotheres placunae Hornell and Southwell : *a*. Female, dorsal view. *b*. Female, ventral view. *c*. 4th walking leg of female. *d*. Tip of same, enlarged. *e*. 3rd maxilliped of female. *f*. Male, dorsal view. *g*. Male, ventral view. *h*. 4th walking leg of male. *i*. Tip of same, enlarged. *j*. 1st left abdominal appendage of male. *k*. Tip of same, enlarged. *l*. Dorsal view of male *Pinnotheres quadratus* Rathbun. *m*. External maxilliped of same. *n*. Dorsal view of male *Pinnotheres vicajii* Chhapgar, with abdomen extended. *o*. External maxilliped of same. *p*. Dorsal view of female *Pinnotheres vicajii* Chhapgar. *q*. External maxilliped of same.



Ocypoda ceratophthalma (Pallas) : *a*. Dorsal view of crab. *b*. 1st left abdominal appendage of male. *c*. Tip of same, enlarged. *Ocypoda cordimana* Desmarest : *d*. Dorsal view of crab. *e*. 1st left abdominal appendage of male. *f*. Tip of same, enlarged. *Ocypoda rotundata* Miers : *g*. Dorsal view of crab. *h*. 1st left abdominal appendage of male. *i*. Tip of same, enlarged. *Gelasimus annulipes* Latreille : *j*. Dorsal view of male. *k*. Cheliped of male. *l*. 1st left abdominal appendage of male. *m*. Tip of same, enlarged. *n*. Spooned hair on 2nd maxilliped, front view. *o*. Same, side view. *Gelasimus marionis* (Desmarest), and *Gelasimus marionis nitidus* Dana : *p*. Dorsal view of male *Gelasimus marionis*. *q*. Cheliped of same. *r*. Cheliped of male *Gelasimus marionis nitidus*. *s*. 1st left abdominal appendage of same. *t*. Tip of same, of *Gelasimus marionis* enlarged. *u*. Tip of same, of *Gelasimus marionis nitidus* enlarged. *v*. Spooned hair on 2nd maxilliped, front view. *w*. Same, side view.

Laurie, *Ceylon Pearl Oyster Fish. Report* (5) p. 426 (1906).
Parisi, *Atti. Soc. It. Sc. Nat.* lvii, p. 96 (1918).
Tesch *Siboga Exped. Rep.* xxxix, p. 36 (1918).
Gravely, *Bull. Madras Govt. Mus.* i, p. 148 (1927).
Chopra and Das, *Rec. Ind. Mus.* xxxix, p. 418 (1937).
Tweedie, *Bull. Raffles Mus. Singapore* 13, p. 27 (1937).
Sakai, *Yokendo Ltd. Tokyo*, p. 614 (1939).
Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 153 (1950).
Tweedie, *Bull. Raffles Mus. Singapore* 21, p. 127 (1950).

Numerous specimens, of both sexes, were collected from Bombay, Karwar, Kolak, and Umarsadi. They live in burrows in sand. An average male measures:

length of carapace	...	29 mm.
breadth of carapace	...	33 mm.

This species is distinguished by the eyestalks prolonged to form a style, the presence of a stridulating organ consisting of tubercles passing into striae, and the anterior surface of the propodites of the first two pairs of legs being furnished with a brush of hairs.

Colour whitish, the inner border of the arm of the chelipeds cherry-red.

In the specimens in the present collection, the brush of hairs on the propodites of the second pair of legs is much sparser than that on the first.

The 'spooned' hairs found on the second maxillipeds in *Gelasimus* and *Macrophthalmus* are surprisingly absent in all *Ocypoda*, although the mode of feeding is similar.

The anterior male abdominal appendages are sharply bent near the tip, which is rounded and consists of two somewhat flattened and distally rounded lobes, separated by a narrow incision between them.

This species occurs from Tahiti to the east coast of Africa, and has also been recorded from the Bay of Bengal. This is the first record from the west coast of India.

Ocypoda cordimana Desmarest

(Plate 13)

Ocypode (*Ocypode*) *cordimana*, De Haan, *Fauna Japonica* v p. 57 (1850).
Ocypode cordimanus, Barnard, *Ann. S. Afr. Mus.* xxxviii, p. 84 (1950).
Ocypode cordimana, Lanchester, *Proc. Zool. Soc. London*, p. 752 (1900).
Ocypoda cordimana, Haswell, *Catalogue Austr. Crust*, p. 95 (1882).
de Man, *Journ. Linn. Soc. London* (*Zool.*) xxii, p. 108 (1887).
Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 387 (1893)
Alcock and Anderson, *Journ. As. Soc. Bengal* lxiii, p. 202 (1894).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 349 (1900).
Parisi, *Atti. Soc. It. Sc. Nat.* lvii, p. 96 (1918).
Tesch, *Siboga Exped. Rep.* xxxix, p. 35 (1918).
Kohli, *Proc. Lahore Phil. Soc.* iii, p. 84 (1921-1922).

Gravely, *Bull. Madras Govt. Mus.* i, p. 148 (1927).
Chopra and Das, *Rec. Ind. Mus.* xxxix, p. 420 (1937).
Tweedie, *Bull. Raffles Mus. Singapore* 13, p. 141 (1937).
Sakai, *Yokendo Ltd. Tokyo*, p. 613 (1939).
Shen, *Bull. Fan Mem. Inst. Biol.* (*Zool.*) x, p. 91 (1940).
Tweedie, *Bull. Raffles Mus. Singapore* 21, p. 126 (1950).
Pillai, *Bull. Central Inst. Travancore* ii, p. 27 (1951).

The present collection is represented by a male specimen from Umarsadi. It lives in burrows in sand. It measures :

length of carapace	...	23 mm.
breadth of carapace	...	24 mm.

This species is distinguished by the absence of a stridulating ridge and by the eyestalks not being prolonged to form a style.

Colour grey.

In the anterior male abdominal appendages there is no deep incision separating the two lobes at the tip, though the lobes are well differentiated.

This species has been previously recorded from the Bay of Bengal and Travancore. It occurs from Tahiti and Japan to the Red Sea. This is the first record from Bombay State.

Ocypoda rotundata Miers

(Plate 13)

Ocypoda rotundata, Alcock, *Journ. As. Soc. Bengal* lxix, p. 348 (1900).

A male from Okha is in the present collection. It lives in burrows in sand. It measures :

length of carapace	...	42 mm.
breadth of carapace	...	49 mm.

This species in distinguished by the antero-lateral angles being rounded off, and the length of the stridulating organ being much less than half the greatest breadth of the palm.

Colour white.

The anterior male abdominal appendages are curved throughout their length. The tip somewhat resembles a camel's head and bears a ridge with hairs. There are hairs also on the distal part of the outer border.

This species has been previously recorded from Cutch, Sind, and Baluchistan. This is the first record from Bombay State.

Genus **Gelasimus** Latreille

Gelasimus annulipes Latreille

(Plate 13)

Uca annulipes, Lanchester, *Proc. Zool. Soc. London*, p. 754 (1900).
Barnard, *Ann. S. Afr. Mus.* xxxviii, p. 97 (1950).
Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 153 (1950).
Tweedie, *Sarawak Mus. Journ.* v, p. 356 (1950).
Gelasimus annulipes, de Man, *Journ. Linn. Soc. London* (*Zool.*) xxii, p. 118 (1887).
Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 388 (1893).

Alcock and Anderson, *Journ. As. Soc. Bengal* lxiii, p. 202 (1894).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 353 (1900).
Laurie, *Ceylon Pearl Oyster Fish. Report* (5), p. 425 (1906).
Kemp, *Mem. Ind. Mus.* v, p. 221 (1915–1924).
Gravely, *Bull. Madras Govt. Mus.* i, p. 148 (1927).
Tweedie, *Bull. Raffles Mus. Singapore* 13, p. 141 (1937).
Sakai, *Yokendo Ltd. Tokyo*, p. 616, (1939).
Pillai, *Bull. Central Inst. Travancore* ii, p. 28 (1951).

Numerous specimens, of both sexes, were collected at Bombay, Karwar, Okha, Kolak, and Umarsadi. They live in burrows in sandy mud. An average male measures:

length of carapace	... 10 mm.
breadth of carapace	... 18 mm.
breadth of front	... 3 mm.
length of larger hand	... 29 mm.

This species is distinguished by the subquadrilateral carapace with moderately convergent lateral borders, the front being a fifth to a sixth its breadth. The tip of the thumb of the chelipeds appears notched-truncate due to the presence of an enlarged tooth. An oblique granular ridge along the dentary edge of the thumb, and another along its lower edge, are present.

The anterior male abdominal appendages are bilobed at the tip, the larger lobe being blunt, the smaller one pointed; both bear hairs.

There are peculiar 'spooned' hairs on the posterior half of the merus and the inner side of the tip of the palp of the second maxillipeds, used probably for feeding. The 'spoon' consists of about five rounded lobes on each side, continuing into hairs.

This species has been previously recorded from both the coasts of India. This is the first record from Bombay State.

Gelasimus marionis (Desmarest)

(Plate 13)

Uca marionis, Tesch, *Siboga Exped. Rep.* xxxix, p. 38 (1918).
Barnard, *Ann. S. Afr. Mus.* xxxviii. p. 90 (1950).
Gelasimus marionis, Alcock, *Journ. As. Soc. Bengal* lxix, p. 359 (1900).
Gravely, *Bull. Madras Govt. Mus.* i, p. 148 (1927).
Chopra and Das, *Rec. Ind. Mus.* xxxix, p. 422 (1937).
Tweedie, *Bull. Raffles Mus. Singapore*-13, p. 143 (1937).
Shen, *Bull. Fan Mem. Inst. Biol.* (*Zool.*) x, p. 90 (1940).
Pillai, *Bull. Central Inst. Travancore* ii, p. 29 (1951).

Numerous specimens were collected from Bombay. They live in burrows in sandy mud. An average specimen measures:

length of carapace	... 17 mm.
breadth of carapace	... 27 mm.
breadth of front	... 1.5 mm.
length of larger hand	... 45 mm.

In this species, the front is less than a fifteenth the breadth of the carapace. The upper surface of the wrist is granular, the fingers are compressed and blade-like, and the edge of the thumb has a simple S-shaped curve.

Colour in spirit blackish, claws white.

The smaller male cheliped is hairy. The larger hand is less than thrice the carapace length.

The anterior male abdominal appendages are suddenly sharp at the tip, which bears numerous long hairs. There is a lobe near the tip, from which a wide groove passes towards the base.

The spooned hairs on the second maxillipeds are present. The 'spoon' is wider than in *Gelasimus annulipes* and consists of about five lobes, the proximal three of which are pointed.

This species has been previously recorded from both the Bay of Bengal and the Arabian Sea. It ranges from Samoa and Fiji to the east coast of Africa and the Red Sea. This is the first record from Bombay State.

Gelasimus marionis nitidus Dana

(Plate 13)

Uca marionis var. *nitidus*, Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 154 (1950).
Tweedie, *Sarawak Mus. Journ.* v, p. 356 (1950).
Gelasimus marionis var. *nitidus*, Alcock, *Journ. As. Soc. Bengal* lxix, p. 360 (1900).
Gravely, *Bull. Madras Govt. Mus.* i, p. 148 (1927).
Chopra and Das, *Rec. Ind. Mus.* xxxix, p. 422 (1937).
Tweedie, *Bull. Raffles Mus. Singapore* 13, p. 143 (1937).
Gelasimus marionis nitidus, Sakai, *Yokendo Ltd. Tokyo*, p. 622 (1939).
Shen, *Bull. Fan Mem. Inst. Biol* (*Zoot.*) x, p. 91 (1940).

This variety is distinguished from *Gelasimus marionis* by the cutting edge of the thumb being thrown into a W-shaped curve owing to the strong projection of two large triangular lobes.

Colour, locality, size, distribution, anterior male abdominal appendages and spooned hairs same as in *Gelasimus marionis*.

Opinions differ as to the validity of this variety. Tesch (1918) calls this variety as only a claw-variation of *Gelasimus marionis*. According to Tweedie it is probably a case of 'geographically local dimorphism confined to the males'. The females in the two forms are inseparable. This view is confirmed by the similarity of the anterior male abdominal appendages in the two forms.

Gelasimus dussumieri Milne-Edwards

(Plate 14)

Uca dussumieri, Lanchester, *Proc. Zool. Soc. London*, p. 753 (1900).
Tesch, *Siboga Exped. Rep.* xxxix, p. 39 (1918).
Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 153 (1950).
Tweedie, *Sarawak Mus. Journ.* v, p. 356 (1950).
Gelasimus dussumieri, Haswell, *Catalogue Austr. Crust.*, p. 93 (1882).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 361 (1900).
Shen, *Bull. Fan Mem. Inst. Biol.* (*Zool.*) x, p. 91 (1940).

Numerous specimens of both sexes were collected from Kolak and Umarsadi. They live in burrows in mud. An average male measures :

length of carapace	... 21 mm.
breadth of carapace	... 34 mm.
breadth of front	... 2 mm.

In this species, the front is less than a fifteenth the greatest breadth of the carapace, which is at the acute, wing-like, antero-lateral angles. The fingers of the chelipeds end in simple hooked tips, and the meropodites of the last pair of legs are not foliaceous.

Colour in spirit chocolate-brown, chelipeds reddish yellow.

The anterior male abdominal appendages are split into two lobes at the tip.

The ' spoon ' is long and narrow, consisting of about 13 large, well-separated, rounded lobes, followed by 13 smaller lobes. The five distal lobes are squarish, the others saw-like and anteriorly directed.

According to Rathbun, *Gelasimus acutus* of Stimpson is synonymous with this species. This species is very closely allied to *Gelasimus urvillei* Milne-Edwards, the latter being distinguished by the accessory row of granules on the lower orbital border. But de Man (1891) has recorded specimens showing traces of this accessory row, which in other respects (shape of carapace, etc.) resemble typical *dussumieri*. One of the specimens in the present collection also shows traces of this row of granules.

This species has been previously recorded from Mergui, the Andamans and Nicobars, and Bimlipatam. This is the first record from the west coast of India.

Subfamily SCOPIMERINAE

Genus **Dotilla** De Haan

Dotilla myctiroides (Milne-Edwards)

(Plate 14)

Scopimera myctiroides, Lanchester, *Proc. Zool. Soc. London*, p. 760 (1900).
Dotilla myctiroides, Walker, *Journ. Linn. Soc. London* (*Zool.*) xx, p. 111 (1890).
Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 390 (1893).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 368 (1900).
Laurie, *Ceylon Pearl Oyster Fish. Report* (5), p. 426 (1906).
Kemp, *Mem. Ind. Mus.* v, p. 227 (1915–1924).
Tesch, *Siboga Exped. Rep.* xxxix, p. 43 (1918).
Kemp, *Rec. Ind. Mus.* xvi, p. 326 (1919).
Gravely, *Bull. Madras Govt. Mus.* i, p. 149 (1927).
Tweedie, *Bull. Raffles Mus. Singapore* 13, p. 147 (1937).
Pillai, *Bull. Central Inst. Travancore* ii, p. 29 (1951).

Numerous specimens, of both sexes, from Bombay and Karwar represent the present collection. They live in muddy regions in colonies. An average specimen measures :—

length of carapace	... 9 mm.
breadth of carapace	... 8 mm.

This species is distinguished by the absence of any sculpture except the lateral grooves on the carapace, which is slightly longer than broad. The chelipeds are at least three times the length of the carapace. Tympana are present on all segments of the sternum.

Colour pinkish, chelipeds white.

There is no ' brain-convolution ' sculpture in this species.

The anterior male abdominal appendages are club-shaped at the tip, which bears tufts of hairs.

This species has been previously recorded from Mahe, Marmagao, Travancore, Rameswaram I., Tuticorin, Ennur, Chilka Lake, Tavoy and Mergui, the Andamans, Singapore, Java, Gaspar Straits and Billiton I., and Mindanao.

Subfamily MACROPHTHALMINAE

Genus **Macrophthalmus** Latreille

Macrophthalmus pectinipes Guerin

(Plate 14)

Macrophthalmus pectinipes, Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 389 (1893).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 377 (1900).
Tesch, *Zool. Meded. Leiden* i, p. 156 (1915).
Kemp, *Rec. Ind. Mus.* xvi, p. 385 (1919).

Numerous specimens, of both sexes, were collected from Kolak and Umarsadi. An average male measures:

length of carapace	...	32 mm.
breadth of carapace	...	52 mm.

This species is distinguished by the carapace, the length of which is six-elevenths its breadth, being studded with large pearly granules. The eyestalks do not project beyond the antero-lateral angles. In the first three pairs of legs, the meropodites, carpopodites, and propodites are scabrous and serrated.

Colour a uniform grey, the tubercles pearly white.

This species is also known by the synonym *Macrophthalmus simplicipes* Guerin.

In the specimens in the present collection, there is a spine or two on the ischium of the legs on the ventral border.

The anterior male abdominal appendages bear two lobes at the tip—the inner one straight and slender, the outer bent outwards. Both bear hairs, each hair being striped with alternate brown and white bands.

There are three types of hairs on the second maxillipeds in all *Macrophthalmi*, viz. very long smooth hairs, shorter barbed hairs, and very short spooned hairs. The ' spoon ' is very long and narrow, and consists of irregular lobes. The last lobe is bent at right angles when seen in a side view.

This species has been previously recorded from Sind, Karachi, Bombay, Cuttack (or Cutch ?), and Penang.

Macrophthalmus sulcatus Milne-Edwards

(Plate 14)

Macrophthalmus sulcatus, Alcock, *Journ. As. Soc. Bengal* lxix, p. 379 (1900).
Tesch, *Zool. Meded. Leiden* i, p. 165 (1915).
Kemp, *Rec. Ind. Mus.* xvi, p. 388 (1919).
Barnard, *Ann. S. Afr. Mus.* xxxviii, p. 101 (1950).

A mutilated male specimen from Umarsadi and another from Bombay represent the present collection. The specimen from Bombay measures:

length of carapace	... 7 mm.
breadth of carapace	... 17 mm.

In this species the true first antero-lateral tooth appears to belong to the upper border of the orbit, so that the antero-lateral angle of the carapace is formed by the much larger second tooth, which also is the apparent outer orbital angle. The eyes reach not only beyond the orbits, but also beyond the antero-lateral angles.

The tip of the anterior male abdominal appendage is rounded and broadened like a drum-stick, and bears coarse hairs.

At the upper border of the inner angle of the wrist is a sharp spinule, and there is another exactly below it on the lower border.

The 'spoon' is short and broad, and consists of about five backwardly-directed saw-like lobes.

This species has been previously recorded from Cutch, Mauritius, and Australia. The last locality, according to Kemp (1919), seems to be erroneous.

Macrophthalmus latreillei Desmarest

(Plate 14)

Macrophthalmus latreillei, Laurie, *Ceylon Pearl Oyster Fish. Report* (5), p. 427 (1906).
Tesch, *Zool. Meded. Leiden* i (1915).
Sakai, *Yokendo Ltd. Tokyo*, p. 626 (1939).
Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 154 (1950).

The present collection is represented by three males and two females from Bombay. An average male measures:

length of carapace	... 23 mm.
breadth of carapace	... 31 mm.

In this species, the shape of the carapace varies from nearly equilateral to transversely elongated. The whole surface is covered with large granules and, in the young, hairs. There are four teeth on the lateral borders, and the front is one-tenth the breadth of the carapace. The chelipeds of the male are remarkably small. The finger has a tooth near the base, and the thumb is curved downward in the adult, but in line with the palm in the young. A spine is present at the distal end of the meropodites of the last pair of legs.

Colour uniformly grey. The dactyli and the distal half of the propodites of the first three pairs of legs are tinged with a faint violet.

The anterior male abdominal appendages are straight and thick. The tip is narrowed to a sting-like point and bears long hairs.

The 'spoon' is very long and narrow, and consists of lobes of gradually decreasing size.

This species has been previously recorded from Madagascar, Malacca, Luzon, Philippines, Hong Kong, New Caledonia, Japan, Singapore, Gulf of Manaar, Siam, and Makassar. This is the first record from the west coast of India.

Macrophthalmus pacificus Dana

(Plate 15)

Macrophthalmus pacificus, Tesch, *Zool. Meded. Leiden* i, p. 190 (1915).
Kemp, *Rec. Ind. Mus.* xvi, p. 391 (1919).
Sakai, *Yokendo Ltd. Tokyo*, p. 628 (1939).

The present collection is represented by a male from Okha. It measures:

length of carapace	...	11 mm.
breadth of carapace at external orbital angles	...	13 mm.
greatest breadth of carapace	...	16 mm.
breadth of front	...	2 mm.

The carapace is smooth, and two-thirds as long as broad. The lateral borders are divergent posteriorly, and have three teeth. The eyes do not reach the orbital teeth. On each branchial region are two longitudinal, parallel, granular eminences, with a third near the postero-lateral angle.

Colour uniform grey.

The anterior male abdominal appendages are thick and slightly curved, densely covered with barbed hairs along the outer margin. The tip is blunt and angular, and bears a brush of smooth hairs.

There is almost no 'spooning' on the hairs of the second maxillipeds, which consist of numerous lobes.

This species has been previously recorded from Portuguese India, Nicobars, Penang, Loo Choo Is., Australia, and Samoa.

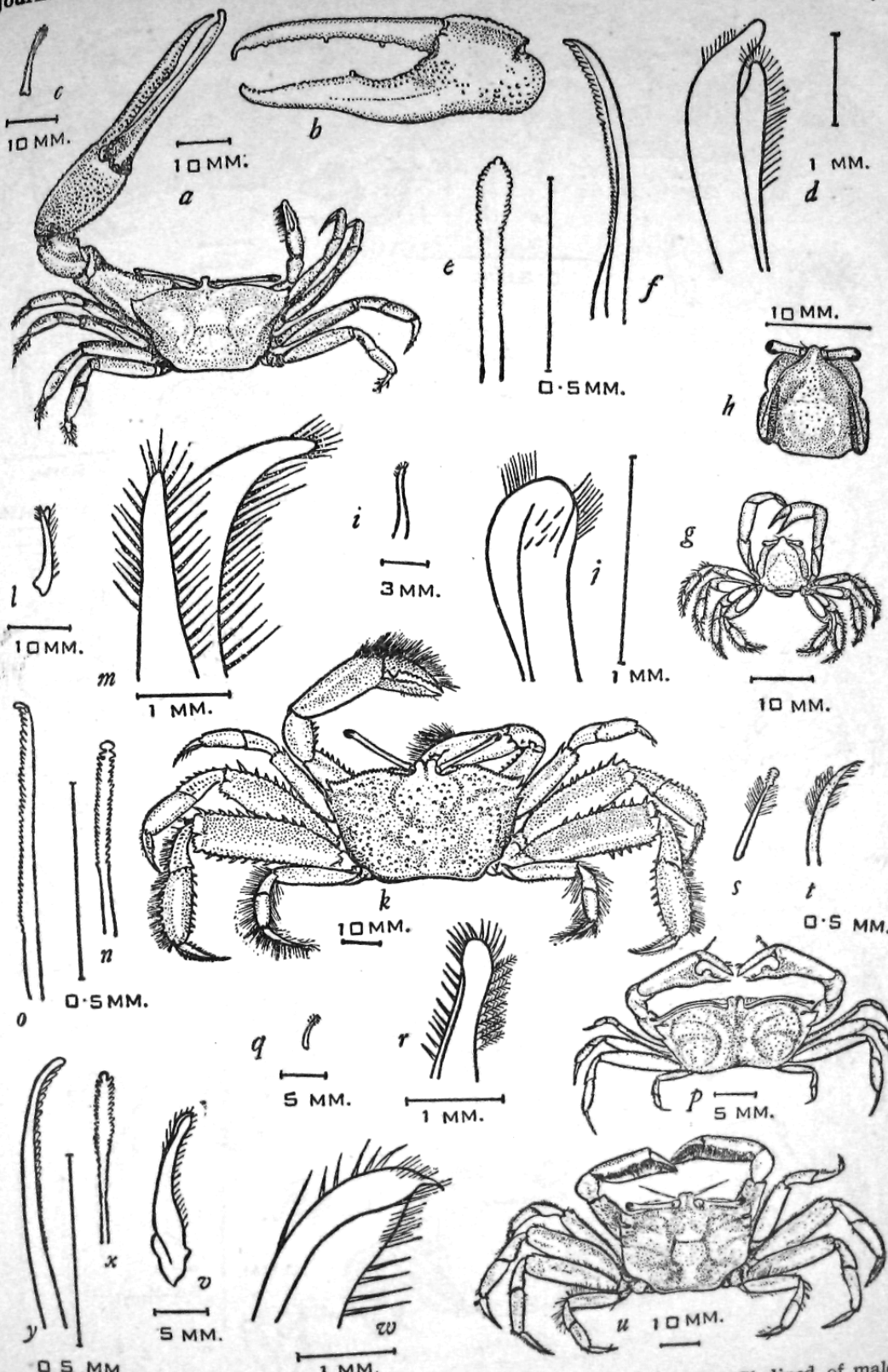
Macrophthalmus depressus Rüppell

(Plate 15)

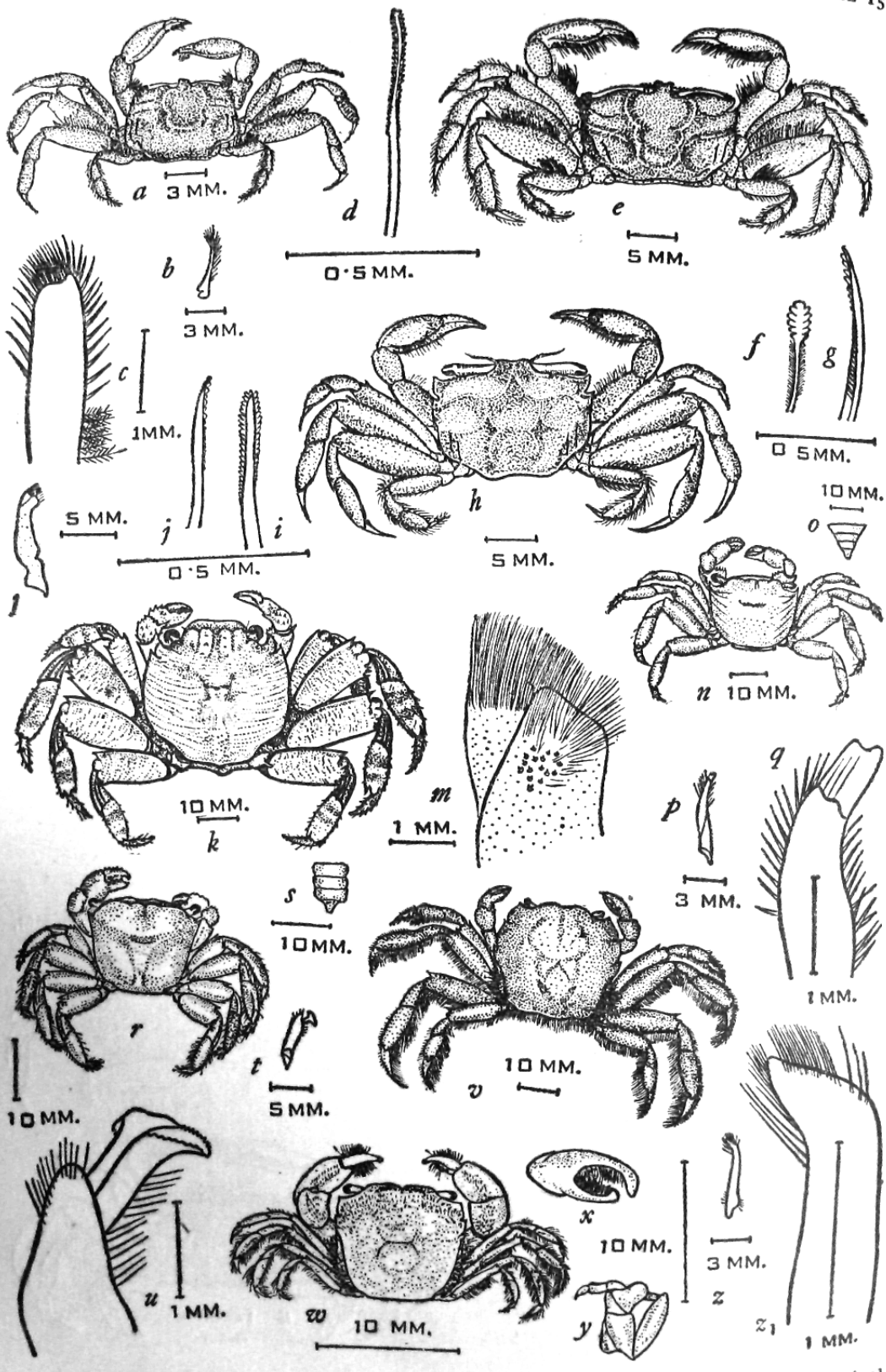
Macrophthalmus depressus. de Man, *Journ. Linn. Soc. London* (*Zool.*) xxii, p. 124 (1887).
Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 389 (1893).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 380 (1900).
Tesch, *Zool. Meded. Leiden* i, p. 196 (1915).
Kemp, *Rec. Ind. Mus.* xvi, p. 392 (1919).
Gravely, *Bull. Madras Govt. Mus.* i, p 150 (1927).
Shen, *Bull. Fan Mem. Inst. Biol.* (*Zool.*) x, p. 94 (1940).

The present collection is represented by a female from Bombay, and another from Kolak. The larger one measures:

length of carapace	...	12 mm.
breadth of carapace	...	20 mm.
breadth of front	...	3 mm.



Gelasimus dussumieri Milne-Edwards: *a*. Dorsal view of male. *b*. Cheliped of male *c*. 1st left abdominal appendage of male. *d*. Tip of same, enlarged. *e*. Spooned hair on 2nd maxilliped, front view. *f*. Same, side view. *Dotilla myctiroides* (Milne-Edwards): *g*. Dorsal view of crab. *h*. Carapace, enlarged. *i*. 1st left abdominal appendage of male. *j*. Tip of same, enlarged. *Macrophthalmus pectinipes* Guerin: *k*. Dorsal view of male. *l*. 1st left abdominal appendage of male. *m*. Tip of same, enlarged. *n*. Spooned hair on 2nd maxilliped, front view. *o*. Same, side view. *Macrophthalmus sulcatus* Milne-Edwards: *p*. Dorsal view of male. *q*. 1st left abdominal appendage of male. *r*. Tip of same, enlarged. *s*. Spooned hair on 2nd maxilliped, front view. *t*. Same, side view. *Macrophthalmus latreillei* Desmarest: *u*. Dorsal view of male. *v*. 1st left abdominal appendage of male. *w*. Tip of same, enlarged. *x*. Spooned hair on 2nd maxilliped, front view. *y*. Same, side view.



Macrophthalmus pacificus Dana: *a*. Dorsal view of male. *b*. 1st left abdominal appendage of male. *c*. Tip of same, enlarged. *d*. Spooned hair on 2nd maxilliped, front view. *Macrophthalmus depressus* Ruppell: *e*. Dorsal view of crab. *f*. Spooned hair on 2nd maxilliped, front view. *g*. Same, side view. *Macrophthalmus crinitus* Rathbun: *h*. Dorsal view of crab. *i*. Spooned hair on 2nd maxilliped, front view. *j*. Same, side view. *Grapsus strigosus* (Herbst): *k*. Dorsal view of crab. *l*. 1st left abdominal appendage of male. *m*. Tip of same, enlarged. *Metopograpsus messor* (Forskal): *n*. Dorsal view of crab. *o*. Male abdomen. *p*. 1st left abdominal appendage of male. *q*. Tip of same, enlarged. *Metopograpsus maculatus* Milne-Edwards: *r*. Dorsal view of crab. *s*. Male abdomen. *t*. 1st left abdominal appendage of male. *u*. Tip of same, enlarged. *Varuna litterata* (Fabricius): *v*. Dorsal view. *Pseudograpsus intermedius* Chhapgar: *w*. Dorsal view of male. *x*. External view of chela of male. *y*. External maxilliped. *z*. 1st left abdominal appendage of male. z_1. Tip of same, enlarged.

In this species, the carapace is studded with minute granules. The lateral borders are parallel, and the antero-lateral angle is a square-cut lobe. On the epibranchial region are two nearly parallel, obliquely longitudinal, finely granular lines.

Colour greyish.

The 'spoon' is short and broad, consisting of about six rounded lobes.

This species has been previously recorded from the Red Sea, Persian Gulf, Bombay, Pondicherry, and Rameswaram I.

Macrophthalmus crinitus Rathbun

(Plate 15)

Macrophthalmus crinitus, Tesch, *Zool. Meded. Leiden* i, p. 192 (1915).
Kemp, *Rec. Ind. Mus.* xvi, p. 390 (1919).
Macrophthalmus (?) crinitus, Tweedie, *Sarawak Mus. Journ.* v, p. 360 (1950).

Three females from Okha represent the present collection. An average specimen measures :

length of carapace	... 9 mm.
breadth of carapace	... 11 mm.
breadth of front	... 3 mm.

In this species the carapace is $\frac{3}{4}$ as long as broad, being widest behind the tip of the first antero-lateral tooth. The lateral borders are parallel. The orbital teeth are not very sharp, and their outer margins are parallel.

Colour greyish.

The hairs on the second maxillipeds are very thick, and almost without spooning.

This species is closely related to *Euplax bosci*. It has been previously recorded from Halmaheira, Amboina, Mergui, and Singapore. This is the first record from India.

Family GRAPSIDAE

Subfamily GRAPSINAE

Genus **Grapsus** Lamarck

Grapsus strigosus (Herbst)

(Plate 15)

Grapsus strigosus, Haswell, *Catalogue Austr. Crust.*, p. 97 (1882).
de Man, *Journ. Linn. Soc. London* (*Zool.*) xxii, p. 148 (1887).
Walker, *Journ. Linn. Soc. London* (*Zool.*) xx, p. 110 (1890).
Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 390 (1893).
Alcock & Anderson, *Journ. As. Soc. Bengal* lxiii, p. 202 (1894).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 393 (1900).
Lanchester, *Proc. Zool. Soc. London*, p. 755 (1900).
Tesch, *Siboga Exped. Rep.* xxxix, p. 71 (1918).

Maccagno, *Ann. Mus. Stor. nat. Genova* lix, p. 178 (1935-1937).
Tweedie, *Bull. Raffles Mus. Singapore* 12, p. 45 (1936).
Chopra & Das, *Rec. Ind. Mus.* xxxix, p. 425 (1937).
Sakai, *Yokendo Ltd. Tokyo*, p 650 (1939).
Tweedie, *Bull. Raffles Mus. Singapore* 18, p. 28 (1947).
Barnard, *Ann. S. Afr. Mus.* xxxviii p. 115 (1950).
Tweedie, *Bull. Raffles Mus. Singapore* 21, p. 94 (1950).
Pillai, *Bull. Central Inst. Travancore* ii, p. 34 (1951).

Numerous specimens, of both sexes, were collected at Bombay and Okha. An average male measures :

length of carapace	...	31 mm.
breadth of carapace	...	34 mm.
length of upper border of palm	...	5.5 mm.
length of upper border of dactylus	...	9 mm.

This species is distinguished by the breadth of the front being 39-40 per cent of the distance between the external orbital angles, its free edge being not distinctly crenulate. The tooth at the inner angle of the orbit is subacute, and keeled. The tooth at the inner angle of the wrist of the chelipeds is nearly straight, not talon-like ; the length of the upper border of the palm is nearly two-thirds the length ot the dactylus. The first pair of legs is about as long as the last pair. The greatest breadth of the meropodites of the last pair is half its length. The distal part of the posterior margin of the last legs is dentate.

Colour dark reddish brown and white.

The propodites in all the legs have a terminal spine on the posterior border.

The anterior male abdominal appendages are very thick and have two lobes at the tip. The inner lobe bears a thick brush of dark brown hairs, while the outer bears lighter straw-coloured hairs and a patch ot spinules.

This species is common in the Indian coastal waters, both in the Bay of Bengal and the Arabian Sea. Its range extends from the east coast of Africa to Polynesia and possibiy to the west coast of America also.

Genus **Metopograpsus** Milne-Edwards

Metopograpsus messor (Forskal)

(Plate 15)

Metopograpsus messor, de Man, *Journ. Linn. Soc. London* (*Zool.*) xxii, p. 144 (1887).
Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 390 (1893).
Alcock & Anderson, *Journ. As. Soc. Bengal* lxiii, p. 202 (1894).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 397 (1900).
Calman, *Trans. Linn. Soc. London* (*Zool.*) vii, p. 24 (1900).
Laurie, *Ceylon Pearl Oyster Fish. Report* (5), p. 429 (1906).
Tesch, *Siboga Exped. Rep.* xxxix, p. 79 (1918).
Gravely, *Bull. Madras Govt. Mus.* i, p. 147 (1927).
Maccagno, *Ann. Mus. Stor. nat. Genova* lix, p. 178 (1935-1937).

Sakai, *Yokendo Ltd. Tokyo*, p. 654 (1939).
Tweedie, *Bijdragen tot de Dierkunde* 28, p. 469 (1949)
Barnard, *Ann. S. Afr. Mus.* xxxviii, p. 118 (1950).
Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 156 (1950).
Pillai, *Bull. Central Inst. Travancore* ii, p. 35 (1951).

Numerous specimens, of both sexes, were collected at Bombay, Okha, and Umarsadi. It lives among rocks and is very active. An average male measures:

length of carapace	... 15 mm.
breadth of carapace	... 19 mm.
breadth of front	... 11 mm.

In this species the carapace is four-fifths as long as broad. There are some fine transverse markings on the post-frontal region. The front is about three-fifths the greatest breadth of the carapace; its free edge is sinuous and thin, but hardly laminar. The orbits are little oblique, the inner angle of their lower border being denticulate. The finger of the chelipeds is not much longer than the upper border of the palm. In the last three pairs of legs the greatest breadth of the merus is half its length. The terminal segment of the male abdomen is simply triangular.

Colour dark bottle-green; the claws in some adult males are a brilliant violet, in others bright orange, dull in the female; the legs are striped with alternate light and dark bands.

The male abdomen narrows gradually from the base to the terminal segment.

The anterior male abdominal appendages are in the form of a brown chitinous tube with its tip slightly bilobed and straw-coloured. Both the borders bear hairs at the distal end.

This species has been previously recorded from both the coasts of India, including Bombay. It ranges in distribution from the Red Sea to Australia.

Metopograpsus maculatus Milne-Edwards

(Plate 15)

Metopograpsus maculatus, de Man, *Journ. Linn. Soc. London (Zool.)* xxii, p. 145 (1887).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 398 (1900).
Tesch, *Siboga Exped. Rep.* xx xix, p. 80 (1918).
Pillai, *Bull. Central Inst. Travancore* ii, p. 35 (1951).

A few specimens, of both sexes, from Kolak and Umarsadi, are in the present collection. Habits and habitat same as *Metopograpsus messor*. An average male measures:

length of carapace	... 23 mm.
breadth of carapace	... 28 mm.
breadth of front	... 17 mm.

This species is distinguished by the carapace being seven-eighths as long as broad, with markedly convergent sides and the absence of transverse markings on the post-frontal region. The front is nearly three fourths the greatest breadth of the carapace; its free edge is nearly straight

and laminar. The orbits are oblique, and the inner angle of their lower border is not dentate. The fingers of the chelipeds are much longer than the upper border of the palm. Except in the last pair of legs, the greatest breadth of the meropodites is decidedly less than half their length. The terminal male abdominal segment has a three-lobed appearance.

The segments of the male abdomen from the first to the penultimate are of the same width, their sides being parallel ; the last segment suddenly narrows to a point.

The anterior male abdominal appendages are coarse and thick ; the tip is a separate hammerhead-shaped lobe with serrated margins.

This species has been previously recorded from both the coasts of India, Ceylon, Mergui, and East Indies. This is the first record from Bombay State.

Subfamily VARUNINAE

Genus **Varuna** Milne-Edwards

Varuna litterata (Fabricius)

(Plate 15)

Trichopus litteratus, De Haan, *Fauna Japonica* v, p. 32 (1850).
Varuna litterata, Miers, *Catalogue New Zealand Crust.*, p . 40 (1876).
Haswell, *Catalogue Austr. Crust.*, p. 103 (1882).
Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 391 (1893).
Alcock and Anderson, *Journ. As. Soc. Bengal* lxiii, p. 202 (1894).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 401 (1900).
Calman, *Trans. Linn. Soc. London* (*Zool.*) viii, p. 24 (1900).
Lanchester, *Proc. Zool. Soc. London*, p. 756 (1900).
Kemp, *Mem. Ind. Mus.* v, p. 232 (1915).
Parisi, *Atti. Soc. It. Sc. Nat.* lvii, p. 105 (1918).
Tesch, *Siboga Exped. Rep.* xxxix, p. 85 (1918).
Gravely, *Bull. Madras Govt. Mus.* i, p. 147 (1927).
Hora, *Proc. Zool. Soc. London*, p. 881 (1933).
Tweedie, *Bull. Raffles Mus. Singapore* 12, p. 49 (1936).
Sakai, *Yokendo Ltd. Tokyo*, p. 665 (1939).
Shen, *Bull. Fan Mem. Inst. Biol.* (*Zool.*) x, p. 99 (1940).
Barnard, *Ann. S. Afr. Mus.* xxxviii, p. 122 (1950).
Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 156 (1950).
Pillai, *Bull. Central Inst. Travancore* ii, p. 36 (1951).

The present collection is represented by numerous females from Bombay and Kolak. The largest measures:

length of carpace	...	38 mm.
breadth of carpace	...	41 mm.

In this species the carapace is depressed and is very little broader than long. The legs have the three terminal joints compressed, dilated, and plumed. Colour mottled black and brown.

This species is commercially important in Bengal where it is eaten by the poor people, and where its numbers compensate for its small size (Hora, 1933).

It has been previously recorded from the east coast of Africa to New Zealand, Australia, and Japan. It is frequently found clinging to logs of driftwood in the open sea, which accounts for its wide distribution.

Genus **Pseudograpsus** Milne-Edwards

Pseudograpsus intermedius Chhapgar

(Plate 15)

Pseudograpsus intermedius, Chhapgar, *Rec. Ind. Mus.*, liii (in press) (1955).

Carapace squarish, flat, depressed, very little broader than long. Anterior half of carapace up to the cervical groove covered with minute, scattered, fine, brownish hairs, which are more profuse on the front, orbits, epigastric lobes, and lateral borders. Regions of carapace not well indicated except in the middle of the carapace where the grooves are disposed in the shape of the letter H. Cervical groove distinct but not very deep, semicircular. The antero-lateral borders are lined with profuse hair and cut into three distinct, flat teeth (including the external orbital angle) which decrease in size from before backward and are not serrate.

Buccal cavern square. External maxillipeds gaping, but not very widely : their exognath is narrower than the ischium : their merus shorter, but anteriorly much broader, than the ischium : it is auriculate (expanded) at the outer angle, so that the palp articulates near the middle of the merus.

The space between the fingers is covered with a thick matt of long entangled, silky hairs, under which, at the base of the fingers, is hidden a white fleshy lobe. The borders of the joints of all the legs, particularly the posterior border of the merus and both borders of the carpus and propodus, thickly fringed with long, dusky hairs. The anterior male abdominal appendages are stout and straight, but bent suddenly at the tip, which bears brushes of hairs.

Colour chestnut.

Ten males and four females (two of them berried) from Bombay city represent the present collection. They were caught in mud under stones.

The measurements of the type specimens are given below :

	male	female
length of carapace ...	10.0 mm.	6.75 mm.
breadth of carapace ...	11.0 mm.	7.25 mm.
breadth of front ...	4.0 mm.	2·60 mm.

Tesch[1], in the discussion of the *Grapsidae*, divides the species of *Pseudograpsus* into two different groups, viz.

(1) large species (up to 4 cm.), chestnut coloured. Cervical groove very deep, semicircular. Three last joints of the legs with a fur of black hairs ;

(2) small species (up to 1.5 cm.), white. Cervical groove indistinct, nearly straight. Legs naked.

It will be seen that this species offers a combination of the characters of the above two groups. Although it is a small species (measuring only up to 1 cm.), the specimens are chestnut coloured. Again, the cervical groove, though semicircular, is not very deep. The legs, too, are covered with dusky hair.

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[1] Tesch, J. J., *Siboga Exped. Rep.* xxxixc, pp. 97, 98 (1918).

Subfamily SESARMINAE

Genus **Sesarma** Say

Subgenus **Sesarma**

Sesarma (Sesarma) quadrata (Fabricius)

(Plate 16)

Grapsus (*Pachysoma*) *quadratus*, De Haan, *Fauna Japonica* v, p. 62 (1850).
Sesarma (*Parasesarma*) *plicata*, Tesch, *Zool. Meded. Leiden* iii, p. 187 (1917).
Sesarma (*Sesarma*) *quadratum*, Pillai, *Bull. Central Inst. Travancore* ii, p. 36 (1951).
Sesarma quadratum, Alcock, *Journ. As. Soc. Bengal* lxix, p. 413 (1900).
Gravely, *Bull. Madras Govt. Mus.* i, p. 147 (1927).
Sesarma quadrata, de Man, *Notes Leyden Mus.* xii, p. 99 (1890).
Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 392 (1893).
Alcock and Anderson, *Journ. As. Soc. Bengal* lxiii, p. 202 (1894).
Lanchester, *Proc. Zool. Soc. London*, p. 756 (1900).
Sesarma (*Sesarma*) *quadrata*, Shen, *Bull. Fan Mem. Inst. Biol.* (*Zool.*) x, p. 96 (1940).

Numerous specimens, of both sexes, were collected at Karwar, Kolak, and Umarsadi. It is a rock-dweller. An average male measures :—

length of carapace	... 17·5 mm.
breadth of carapace	... 20 mm.

This species is distinguished by the deep carapace which is broader than long, and without any tooth on the lateral borders behind the orbital angle. The front is more than half the greatest breadth of the carapace. The inner border of the arm bears a large tooth at its distal end. On the upper surface of the palm are two oblique pectinated ridges, and the dorsal surface of the male finger is milled with 11 to 19 blunt, transverse lamellae.

Colour mottled grey, the fingers cherry-red.

The anterior male abdominal appendages are bent outwards at the extreme tip, which bears hairs along both borders.

This species has been previously recorded from the coasts of India, Ceylon, the Andamans and Nicobars. This is the first record from Bombay State.

Sesarma (Sesarma) oceanica de Man

(Plate 16)

Sesarma oceanicum, Alcock, *Journ. As. Soc. Bengal* lxix, p. 423 (1900).
Sesarma (*Sesarma*) *rotundata*, Tesch, *Zool. Meded. Leiden* iii, p. 193 (1917).

Numerous specimens, of both sexes, from Kolak are in the present collection. An average male measures :

length of carapace	... 36 mm.
breadth of carapace	... 31 mm.
breadth of front	... 17 mm.
length of merus of leg	... 26 mm.
breadth of merus of leg	... 11 mm.

This species is distinguished by the shallow, depressed carapace, which is longer than broad, and has two teeth on the lateral borders behind the outer orbital angle. The post-frontal lobes of the gastric region are smooth. The fingers of the chelipeds have no milling. The meri of the legs are more than three times as long as broad, and the dactyli are short.

Colour of the carapace and legs varying from light violet to almost black. The palm and fingers of the chelipeds orange to cherry-red, finger tips white, extreme tips horny.

The carapace in its anterior half is covered with little dense tufts of hair resembling tubercles, amid a finer fur resembling granules.

The palm of the chelipeds is almost smooth, except for two granular ridges, one extending along the lower border up to the base of the immobile finger, the other along the inner edge of the same finger. The angular lobe near the far end of the inner border of the arm is hardly prominent, being a blunt projection. The inner angle of the wrist is pronounced but not dentiform; close to and parallel to it runs a ridge; a smooth ridge runs outside the granular ridge at the upper border of the palm. On the upper border of the dactylus are two horny teeth; the tips of the fingers are cut off diagonally, resembling tongs. The meropodites of the legs are only $2\frac{1}{2}$ times as long as broad. The male abdomen is long and narrow.

The anterior male abdominal appendages are straight up to the tip, which bears numerous long hairs.

This species has been previously recorded from the Nicobars. This is the first record from the west coast of India.

Sesarma (Sesarma) taeniolata White

(Plate 16)

Sesarma taeniolatum, Alcock, *Journ. As. Soc. Bengal* lxix, p. 419 (1900).
Sesarma taeniolata, Lanchester, *Proc. Zool. Soc. London*, p. 756 (1900).
Sesarma (*Sesarma*) *taeniolatum*, Shen, *Bull. Fan Mem. Inst. Biol.* (*Zool.*) x, p. 96 (1940).
Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 157 (1950).
Sesarma (*Sesarma*) *taeniolata*, Tesch, *Zool. Meded. Leiden*, iii, p. 201 (1917).
Tweedie, *Bull. Raffles Mus. Singapore* 12, p. 53 (1936).

The present collection is represented by a mutilated male from Ratnagiri. It measures:

length of carapace	...	24 mm.
breadth of carapace	...	25 mm.

This species is distinguished by the deep, square carapace, covered with tufts of hair, and with a tooth on the lateral borders behind the orbital angle. There is a finely pectinated ridge on the upper surface of the palm, and another transverse granular ridge on its inner surface. The upper border of the finger in the male has a milled crest of 40-60 fine lamellae. The dactyli of the legs are two-thirds, or more, the length of the propodites.

Colour brown.

The anterior male abdominal appendages are slightly curved, with a bulge covered with hair near the tip.

This species has been previously recorded from Mergui, the Andamans, Malaya, Singapore, Thailand, and China. This is the first record from the west coast of India.

Sesarma (Sesarma) minuta de Man

(Plate 16)

Sesarma (*Sesarma*) *minuta*, Tesch, *Zool. Meded. Leiden* iii, p. 127 (1917).

A berried female was obtained from Bombay, clinging to the bivalve *Paphia malabarica*. It measures :

length of carapace	...	2·5 mm.
breadth of carapace	...	3·2 mm.

This species can be distinguished by its minute size, the carapace being broader than long. The upper border of the palm of the chelipeds has no longitudinal pectinated crest. The posterior borders of the meropodites of the legs are serrated near the carpus.

Colour lemon yellowish.

This species has been previously recorded from Batavia. This is the first record from India.

Genus **Metaplax** Milne-Edwards

Metaplax indica Milne-Edwards

(Plate 16)

Metaplax indica, Alcock, *Journ. As. Soc. Bengal* lxix, p. 432 (1900).
Shen, *Bull. Fan Mem. Inst. Biol.* (*Zool.*) x, p. 95 (1940).

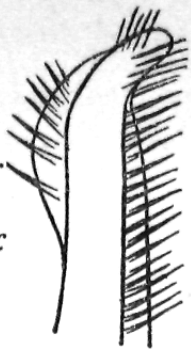
The present collection is represented by a male from Kolak. It measures :—

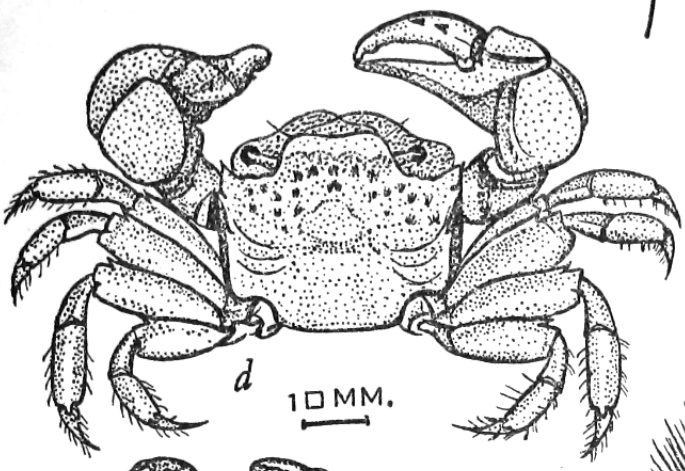
length of carapace	...	12 mm.
breadth of carapace	...	18 mm.

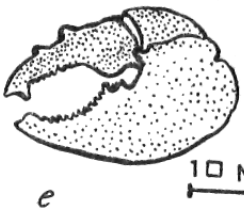
This species is distinguished by the equal sized male chelipeds, which are less than three times the length of the carapace. The finger has no prominent lobe on its dentary edge. The anterior borders of the carpopodites and propodites of the legs are smooth. The third, fourth, and fifth male abdominal segments are fused. There are seven to nine teeth on the male infra-orbital ridge beginning with four or five small teeth, followed by two larger rounded lobules, that are separated by a large inter-space from three very small tubercles in the lateral part of the ridge.

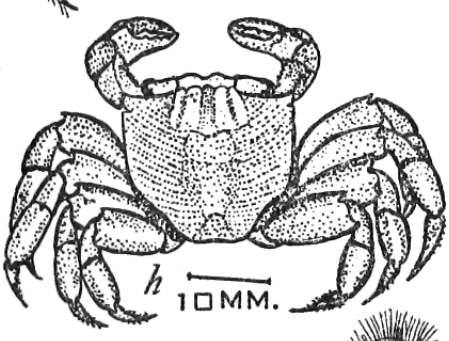
Colour grey, legs and chelipeds pink, the fingers a darker pink.

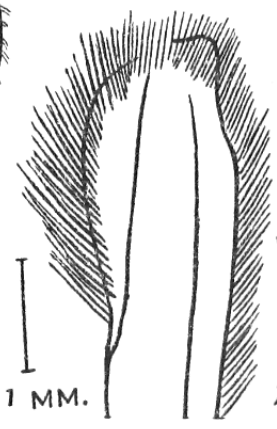
In the specimen in the present collection, the inner border of the arm, lower border of the hand, and teeth of the antero-lateral borders are serrated. The front is bilobed. The meropodites of all the legs, and the propodites and carpopodites of the middle two are densely hairy only on the anterior border. The third, fourth, and fifth male abdominal segments are only partly fused.

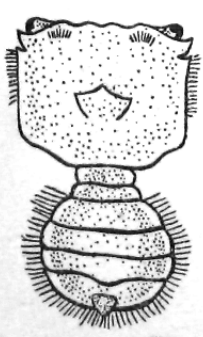


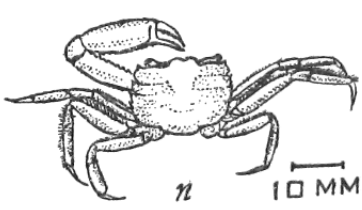


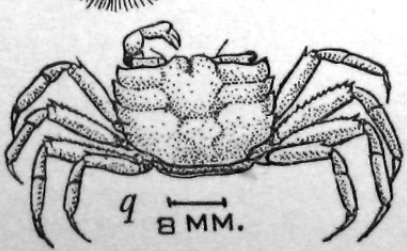


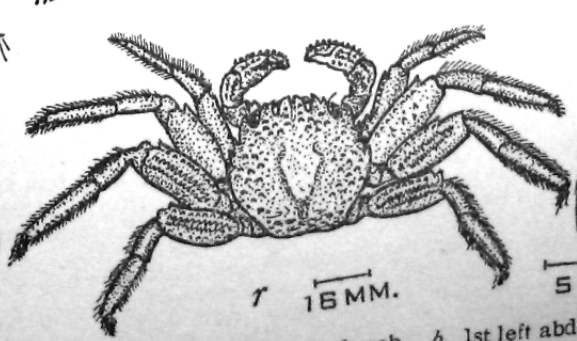


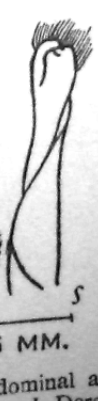












Sesarma (*Sesarma*) *quadrata* (Fabricius): *a*. Dorsal view of crab. *b*. 1st left abdominal appendage of male. *c*. Tip of same, enlarged. *Sesarma* (*Sesarma*) *oceanica* de Man: *d*. Dorsal view of crab. *e*. Cheliped, external view. *f*. 1st left abdominal appendage of male. *g*. Tip of same, enlarged. *Sesarma* (*Sesarma*) *taeniolata* White: *h*. Dorsal view of crab. *i*. 1st left abdominal appendage of male. *j*. Tip of same, enlarged. *Sesarma* (*Sesarma*) *minuta* de Man: *k*. Dorsal view of female, with abdomen extended. *l*. Cheliped of female. *m*. 3rd walking leg. *Metaplax indica* (Milne-Edwards): *n*. Dorsal view of male. *o*. 1st left abdominal appendage of male. *p*. Tip of same, enlarged. *Metaplax distincta* Milne-Edwards: *q*. Dorsal view of female. *Plagusia depressa tuberculata* (Lamarck): *r*. Dorsal view of crab. *s*. 1st left abdominal appendage of male.

In the anterior male abdominal appendages, there is a minute tooth at the extreme end of the broad tip. There are hairs along both the borders. This species has been previously recorded from Karachi. This is the first record from Bombay State.

Metaplax distincta Milne-Edwards

(Plate 16)

Metaplax distinctus, de Man, *Journ. Linn. Soc. London* (*Zool.*) xxii, p. 158 (1887).
Metaplax distincta, Henderson, *Trans. Linn. Soc. London* (*Zool.*) v, p. 391 (1893).
Alcock, *Journ. As. Soc. Bengal* lxix, p. 432 (1900).

The present collection is represented by a female from Karwar. It measures :

length of carapace	... 18 mm.
breadth of carapace	... 24 mm.

In this species the carapace is slightly less than three-fourths as long as broad. The lower border of the orbit in the male is prolonged to the level of the second notch in the lateral border. The lobules of the infra-orbital ridge are from 25 to 30 ; the lobules of the orbital portion (10-12) are small, and gradually decrease in size from within outward. The anterior border of the meropodites of the legs is armed, in the first and last pairs with a subterminal spine, in the middle two with several spines. The male abdomen consists of seven separate segments.

Colour a uniform grey.

In the specimen in the present collection, a small vestige of a fifth tooth is indicated, on careful examination, by a nick in the lateral borders. The posterior borders of the legs are microscopically beaded. The front is bow-shaped and obliquely deflexed. There is no tomentum on the legs. The carapace, on the front half and the sides, is granular.

This species has been previously recorded from Madras, Coconada, Mergui, and the Nicobars. This is the first record from the west coast of India.

Subfamily PLAGUSIINAE

Genus **Plagusia** Latreille

Plagusia depressa tuberculata (Lamarck)

(Plate 16)

Plagusia squamosa, Alcock and Anderson, *Journ. As. Soc. Bengal* lxiii, p. 202 (1894).
Plagusia depressa var. *squamosa*, Alcock, *Journ. As. Soc. Bengal* lxix, p. 438 (1900).
Borradaile, *Fauna Geog. Maldive Laccadive Archipel.* (5) i, p. 432 (1903).
Pillai, *Bull. Central Inst. Travancore* ii, p. 38 (1951).
Plagusia depressa var. *tuberculata*, Kemp, *Mem. Ind. Mus.* v, p. 241 (1915-1924).
Montgomery, *Journ. Linn. Soc. London* (*Zool.*) xxxvii, p. 457 (1931).

Rathbun, *U. S. Nat. Mus. Bull.* 97 p. 334 (1917).
Tesch, *Siboga Exped. Rep.* xxxix, p. 129 (1918).
Tweedie, *Bull. Raffles Mus. Singapore*, 12, p. 69 (1936).
Suvatti, *Dept. of Fisheries, Bangkok, Thailand*, p. 158 (1950).

The present collection is represented by a male from Kodinar. It measures :

length of carapace	...	52 mm.
breadth of carapace	...	55 mm.

This crab is distinguished by the absence of a true front, so that the antennular fossae are visible in a dorsal view as deep clefts in the anterior border of the carapace. The regions of the carapace are distinct, and covered with flat pearly or squamiform tubercles. The antero-lateral borders are cut into four teeth. The chelipeds are massive, and have tubercles on the upper surface of the palm and finger arranged in longitudinal rows.

Colour reddish brown.

The specimen in the present collection is sparsely covered with weeds.

The anterior male abdominal appendages are stout, with a blunt tip covered with a thick brush of hairs.

The use of Herbst's name *squamosa* by Alcock, Stebbing, and others has been criticized by Laurie.

Distribution: Indo-Pacific, extending to the west coast of America.

Key to the Identification of the Marine Crabs of Bombay State

1.	Mouth frame (buccal cavity) triangular (Oxystomata)	2.	
	Mouth frame (buccal cavity) more or less quadrate	10.	
2.	Carapace short, leaving the first two or three abdominal segments exposed. Last two pairs of legs dorsal in position, ending in hook-like dactyli (Dorippidae)	*Dorippe astuta*	p. 409
	Abdomen not visible dorsally. Legs normal in position	3.	
3.	Inhalant branchial openings in front of chelipeds. Gills nine. Male genital openings coxal (Calappidae)	4.	
	Inhalant branchial openings at bases of third maxillipeds. Gills less than nine. Male genital openings sternal (Leucosiidae)	6.	
4.	External maxillipeds not closing the buccal cavity completely, palp not concealed. Legs not adapted for swimming (Calappinae) ...	*Calappa lophos*	p. 404
	External maxillipeds completely covering the buccal cavity, palp concealed. Legs natatory, distal joints flattened and expanded (Matutinae).	5.	
5.	A distinct spine at the angle of the hand where it comes in contact with the external angle of the arm. Carapace covered with minute red dots ...	*Matuta lunaris*	p. 405
	Only a tubercle at the angle of the hand where it touches the external angle of the arm. Carapace covered with red spots, rings and vermicular lines	*Matuta planipes*	p. 406

6.	Carapace convex and subglobular, its surface smooth and polished	7.
	Carapace rhomboidal, its margins with large spines and tubercles	*Arcania septemspinosa* p. 408
7.	Front narrow. Exopodites of external maxillipeds narrow, with the outer margins straight (*Leucosia*)	8.
	Front broad. Exopodites of external maxillipeds broad, their outer borders forming a semicircle (*Philyra*)	9.
8.	Carapace longer than broad	*Leucosia pubescens* p. 406
	Carapace broader than long	*Leucosia sima* p. 407
9.	Carapace smooth, its regions hardly defined ...	*Philyra globosa* p. 407
	Regions of carapace forming independent swellings, covered with large granules ...	*Philyra corallicola* p. 408
10.	Last pair of legs modified, situated dorsally. Female genital openings coxal. First pleopod present in female. Gills usually numerous (Dromiacea)	11.
	Last pair of legs normal, rarely reduced, and only exceptionally dorsal in position. Female genital openings sternal. First pleopod absent in female. Gills few (Brachygnatha) ...	12.
11.	Last pair of legs shorter than the first two pairs.	*Dromia dormia* p. 401
	Last pair of legs longer than the first two pairs...	*Pseudodromia integrifrons* p. 402
12.	Carapace triangular, narrowed in front, usually with a distinct rostrum. Orbits generally incomplete (Oxyrhyncha)	13.
	Carapace broad in front, rostrum reduced or wanting. Orbits well developed (Brachyrhyncha).	19.
13.	Carapace flat, weakly calcified. Male genital openings on last thoracic sternite (Hymenosomidae)	*Elamena cristatipes* p. 409
	Carapace not flat, strongly calcified. Male genital openings on fifth coxopodites ...	14.
14.	Basal antennal joint well developed, generally fused with epistome and sometimes also with the sides of the rostrum. Chelipeds usually not vastly larger than legs (Maiidae)	15.
	Basal antennal joint very small, not fused with epistome or front. Chelipeds usually much longer and more massive than legs (Parthenopidae) ...	18.
15.	Eyes without true orbits. Eyestalks very short or obsolescent, concealed beneath a supraocular spine or sunk in the sides of a large rostrum (Acanthonychinae)	*Menaethius monoceros* p. 410
	Orbits partly defined. Postocular process present, hollowed for the partial retraction of the short eyestalks (Pisinae)	16.
	Orbits complete enough to entirely conceal the cornea dorsally (Maiinae)	17.
16.	Rostral spines long and divergent, separate from their base	*Hyastenus planasius* p. 411
	Rostral spines short, fused in their basal half ...	*Doclea gracilipes* p. 412
17.	Carapace armed with five long spines in the middle line. Rostral spines long and divergent, simple	*Paramithrax (Chlorinoides) aculeatus* p. 413
	Carapace with tubercles, but without spines, in the middle line. Rostral spines short, each with a small accessory spine on its outer border ...	*Schizophrys aspera* p. 414

18. Carapace broadly triangular, not laterally expanded	*Lambrus* (*Platylambrus*) *prensor*	p. 415
Carapace pentagonal, with large lateral vaulted expansions which completely conceal the legs ...	*Cryptopodia angulata*	p. 415
19. Palp of external maxillipeds inserted at or near the antero-internal angle of the merus. Carapace usually transversely oval	20.	
Palp of external maxillipeds inserted at the summit of the antero-external angle of the merus. Carapace usually squarish ...	47.	
20. Last pair of legs flattened for swimming (Portunidae)	21.	
Last pair of legs not flattened (Goneplacidae and Xanthidae)	28.	
21. Antero-lateral borders of carapace cut into nine teeth	22.	
Antero-lateral borders of carapace cut into six teeth (*Charybdis*)	24.	
Antero-lateral borders of carapace cut into five teeth (*Thalamita*)	27.	
22. Teeth on antero-lateral borders equal in size ...	*Scylla serrata*	p. 416
Last tooth on antero-lateral borders enlarged in the form of a long spine (*Neptunus*) ...	23.	
23. No spine on the posterior border of the arm of the chelipeds	*Neptunus* (*Neptunus*) *sanguinolentus*	p. 417
A spine at the far end of the posterior border of the arm of the chelipeds	*Neptunus* (*Neptunus*) *pelagicus*	p. 418
24. No spine on the posterior border of the arm of the chelipeds (subgenus *Goniosoma*) ...	25.	
A spine at the end of the posterior border of the arm of the chelipeds	*Charybdis* (*Goniohellenus*) *hoplites*	p. 423
25. Teeth on antero-lateral borders subequal in size. Large or medium-sized crabs	26.	
Last tooth on antero-lateral borders longer than the rest. Small crabs	*Charybdis* (*Goniosoma*) *callianassa*	p. 421
Second tooth on carapace rudimentary ...	*Charybdis* (*Goniosoma*) *orientalis*	p. 422
26. First tooth on antero-lateral borders anteriorly truncated and notched. Sixth abdominal tergum of male with curved and gradually convergent sides. One or two inconspicuous denticles near the far end of the posterior border of the propodites of the last pair of legs. A brown cross on the carapace	*Charybdis* (*Goniosoma*) *cruciata*	p. 419
First tooth on the antero-lateral borders acute. Sixth abdominal tergum of the male with its sides parallel or even slightly divergent. Posterior border of the propodites of the last pair of legs strongly serrated throughout. Four whitish spots on the carapace	*Charybdis* (*Goniosoma*) *lucifera*	p. 420
First tooth on the antero-lateral borders acute. Sixth abdominal tergum of male with its sides parallel. Posterior border of propodites of last pair of legs serrated in a large part of its extent. Legs with annular bands	*Charybdis* (*Goniosoma*) *annulata*	p. 420

27. Teeth on antero-lateral borders subequal in size ... ... *Thalamita crenata* p. 423
Fourth tooth on antero-lateral borders rudimentary ... ... *Thalamita prymna* p. 424

28 A. (part, family Goneplacidae) :
Carapace hairy, edge of front distinctly curved ... 29.
Carapace not hairy, edge of front cut straight and square ... ... *Eucrate crenata dentata* p. 437

28 B. (part, family Xanthidae) :
Ridges defining the efferent branchial channels either absent, or confined to the posterior part of the buccal cavity (Hyperolissa) ... ... 30.
Ridges defining the efferent branchial channels continued up to the anterior border of the buccal cavity (Hyperomerista) ... ... 41.

29. Antero-lateral borders with three teeth ... *Litocheira angustifrons* p. 438
Antero-lateral borders with two teeth ... *Litocheira setosa* p. 439

30. The front and antero-lateral borders form a convex arch, postero-lateral borders strongly convergent. Male abdomen with five segments (segments 3–5 fused) ... ... 31.
Carapace nearly quadrilateral (arch of front and antero-lateral borders less convex). Male abdomen with seven segments ... ... *Galene bispinosa* p. 431

31. Carapace convex both fore and aft, and from side to side ... ... 32.
Carapace convex fore and aft, flat from side to side ... ... 37.

32. Antero-lateral borders entire, crested ... 33.
Antero-lateral borders cut into teeth, not crested... 36.

33. Carapace smooth, hardly any indication of regions (*Atergatis*) ... ... 34.
Carapace granular, regions well indicated ... *Platypodia cristata* p. 427

34. Edges of antero-lateral borders sharp, forming a ridge at the lateral epibranchial angles ... 35.
Edges of antero-lateral borders thick and blunt, without any ridge ... ... *Atergatis roseus* p. 426

35. Carapace with a smooth, even surface ... *Atergatis integerrimus* p. 425
Carapace with the surface lumpy ... ... *Atergatis floridus* p. 426

36. Fingers of chelipeds with broad, hoof-like extremities ... ... *Etisus lævimanus* p. 431
Fingers of chelipeds pointed ... ... *Actaea savignyi* p. 432

37. Antero-lateral borders prolonged beneath the orbit to the angle of the buccal cavity ... *Medaeus granulosus* p. 430
Antero-lateral borders not prolonged beyond the orbit ... 38.

38. Fingers of chelipeds blunt-tipped (*Leptodius*) ... 39.
Fingers of chelipeds sharp ... *Xantho* (*Lophoxanthus*) *scaberrimus baccalipes* p. 427

39. Five teeth on antero-lateral borders ... *Leptodius crassimanus* p. 429
Four teeth on antero-lateral borders ... 40.

40. Carapace only slightly areolated ... ... *Leptodius exaratus* p. 428
Carapace completely areolated (as in *Actaea*) ... *Leptodius euglyptus quadrispinosus* p. 429

41. Fronto-orbital border half, or less than half, the greatest breadth of the carapace ... ... 42.
Fronto-orbital border just $\frac{3}{4}$rd the greatest breadth of the carapace ... ... 44.
Fronto-orbital border more than $\frac{3}{4}$th the greatest breadth of the carapace ... ... *Eriphia laevimana smithii* p. 437

42. Basal antennal joint not reaching the front ... *Myomenippe hardwickii* p. 432

Basal antennal joint broadly in contact with front ... ... 43.

43. Antero-lateral borders thin and sharp ... *Epixanthus frontalis* p. 434

Antero-lateral borders not thin and sharp ... *Ozius rugulosus* p. 433

44. Carapace hairy, regions well defined (*Pilumnus*). 45.

Carapace not tomentose, regions ill defined ... 46.

45. A subhepatic spine, just below the outer orbital angle ... ... *Pilumnus vespertilio* p. 434

No subhepatic spine ... ... *Pilumnus longicornis* p. 435

46. Indications of areolation on the carapace anteriorly, front bilobed ... *Heteropanope laevis* p. 436

Carapace without any trace of regions, front cut straight and square ... ... *Eurycarcinus orientalis* p. 436

47. Small crabs living as commensals, mostly in bivalve molluscs (Pinnotheridae) ... 48.

Free living crabs ... ... 49.

48. Dactylus of external maxillipeds in the female does not extend to the apex of the propodite. Dactyli of third and fourth legs in the female 1¼ times as long as those of the first and second. Colour pink ... ... *Pinnotheres placunae* p. 503

Dactylus of external maxillipeds in the female reaches to the end of the propodite. Dactyli of third and fourth legs in the female twice as long as those of the first two. Colour yellow ... *Pinnotheres vicajii* p. 505

49. Orbits wider, often much wider, than front. External maxillipeds meeting, or nearly so, in the middle line. Carapace squarish or transversely oblong (Ocypodidae) ... ... 50.

Front at least as wide as, usually wider than, orbit. A large, rhomboidal gap between the external maxillipeds. Carapace square (Grapsidae) ... ... 62.

50. A hairy-edged pouch between the bases of the second and third pairs of legs (Ocypodinae) ... 51.

No pouch between the second and third pairs of legs ... ... 57.

51. Chelipeds slightly unequal in both sexes. Cornea large, ventral, occupying the greater part of the surface of the eyestalks (*Ocypoda*) ... 52.

Chelipeds in the female equal and small; in the male one is vastly larger than the other. Eyes small, terminal on the long slender eyestalks (*Gelasimus*) ... ... 54.

52. A stridulating ridge on the inner surface of the palm. Eyestalks prolonged beyond the eyes as a style ... ... 53.

No stridulating ridge on the palm. Eyestalks not prolonged beyond the eyes ... ... *Ocypoda cordimana* p. 507

53. Antero-lateral angles of carapace pronounced ... *Ocypoda ceratophthalma* p. 506

Antero-lateral angles of carapace rounded ... *Ocypoda rotundata* p. 508

54. Front $\frac{1}{5}$th to $\frac{1}{6}$th the greatest breadth of the carapace ... ... *Gelasimus annulipes* p. 508

Front less than $\frac{1}{15}$th the greatest breadth of the carapace ... ... 55.

55. Inner border of the arm of the larger male cheliped ends in a sharp tooth or spine ... 56.

Arm of the larger male cheliped ends in a constricted lobe, but there is no sharp tooth on its inner border ... ... *Gelasimus dussumieri* p. 510

56. Cutting edge of the thumb of the cheliped with a single, smooth curve ... .. *Gelasimus marionis* p. 509

Cutting edge of the thumb of the cheliped scalloped into two lobes ... ... *Gelasimus marionis nitidus* p. 510

57. Membranous spaces (tympana) on meropodites of legs. Fourth abdominal segment of male fringed with bristles ... ... *Dotilla myctiroides* p. 511

No tympana on legs. Abdomen normal (Macrophthalminae) ... ... 58.

58. Eyestalks projecting beyond the antero-lateral angles of the carapace ... ... *Macrophthalmus sulcatus* p. 513

Eyestalks not projecting beyond the antero-lateral angles of the carapace ... ... 59.

59. Sides of carapace convergent posteriorly ... *Macrophthalmus pectinipes* p. 512

Sides of carapace divergent posteriorly ... *Macrophthalmus pacificus* p. 514

Sides of carapace parallel ... ... 60.

60. Four teeth on the lateral borders of the carapace ... ... *Macrophthalmus latreillei* p. 513

Three teeth on the lateral borders of the carapace ... ... 61.

61. Carapace $\frac{2}{3}$rd as long as broad. Front $\frac{1}{7}$th the breadth of the carapace ... ... *Macrophthalmus depressus* p. 514

Carapace $\frac{3}{4}$ths as long as broad. Front $\frac{1}{4}$th the breadth of the carapace ... ... *Macrophthalmus crinitus* p. 515

62. Antennules fold beneath the front in the usual manner ... ... 63.

Antennules fold longitudinally in deep notches in the front, visible dorsally ... ... *Plagusia depressa tuberculata* p. 523

63. No oblique hairy ridge on the external maxillipeds ... ... 64.

An oblique hairy ridge on the external maxillipeds ... ... 68.

64. A very wide gap between the third maxillipeds, exopodites of these narrow. Male abdomen occupying all the space between the bases of the last legs (Grapsinae) ... ... 65.

A moderate gap between the third maxillipeds, exopodites of these broad. Male abdomen does not occupy the whole space between the bases of the last pair of legs (Varuninae) ... 67.

65. Front less than half the greatest breadth of the carapace ... ... *Grapsus strigosus* p. 515

Front more than half the greatest breadth of the carapace (*Metopograpsus*) ... ... 66.

66. Front not laminar, sinuous. Fine transverse markings on the post-frontal region. Last segment of male abdomen triangular ... *Metopograpsus messor* p. 516

Front straight and laminar. No transverse markings on the post-frontal region. Last segment of male abdomen three-lobed ... *Metopograpsus maculatus* p. 517

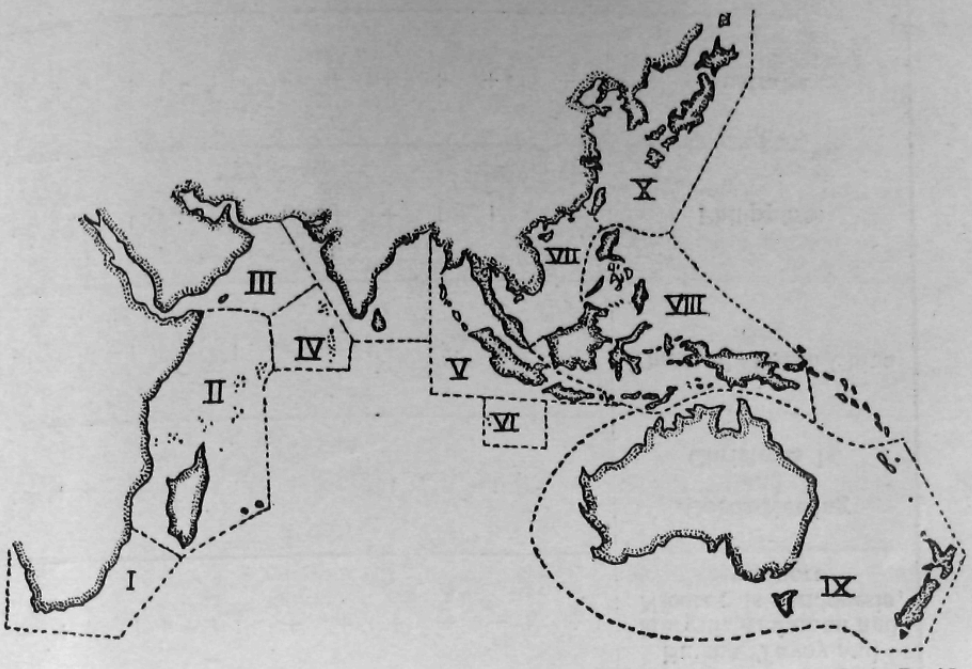
67. Last three joints of legs compressed and plumed for swimming. No fleshy lobe at the base of the fingers of the chelipeds ...	*Varuna litterata*	p. 518
Legs hairy but not compressed. A fleshy lobe at the base of the fingers of the chelipeds ...	*Pseudograpsus intermedius*	p. 519
68. Carapace nearly square. Pterygostomian regions with a sieve-like reticulation (*Sesarma*) ...	69.	
Carapace much broader than long. No reticulation on the pterygostomian regions (*Metaplax*).	70.	
69. No teeth on the lateral borders behind the orbital angles. Two oblique pectinated ridges on the palms of the male chelipeds. Upper surface of the dactylus in the male with a milled ridge of 11–19 lamellae	*Sesarma* (*Sesarma*) *quadrata*	p. 520
One tooth on the lateral borders behind the orbital angles. One pectinated ridge on the palms of the chelipeds. A milled crest with 40-60 teeth on the dactylus of the male ...	*Sesarma* (*Sesarma*) *taeniolata*	p. 521
Two teeth on the lateral borders behind the orbital angles. A granular (not pectinate) ridge on the palms of the chelipeds. Dactylus without any milled ridge	*Sesarma* (*Sesarma*) *oceanica*	p. 520
One tooth on the lateral borders behind the orbital angles. No pectinate crests on the palms of the chelipeds. Posterior borders of the meropodites of the legs serrated near the carpus. Extremely small crabs	*Sesarma* (*Sesarma*) *minuta*	p. 522
70. Third to fifth segments of the male abdomen fused	*Metaplax indica*	p. 522
Male abdomen with seven separate segments ...	*Metaplax distincta*	p. 523

Geographic Distribution of Crabs occurring in the Bombay State, in the Indo-Pacific Region

The foregoing taxonomic account records 81 species and subspecies of crabs from different localities in the Bombay State. Perusal of similar account of crabs from different maritime countries of the Indo-Pacific region indicates that many of these species occur over an extensive range and are common in several areas in the region. Such wide geographic distribution is natural in marine crabs where inter-connecting oceans do not serve as barriers to dispersal except the thermal differences to some extent. It is, therefore, interesting to note what species and percentage of the total Brachyuran fauna of this State occur in other areas of the Indo-Pacific region. These are indicated below in Tables I and II.

The scattered localities where these species occur have been recorded by several authors such as Laurie (1907-1915), Barnard (1950), Borradaile (1902-1903), Estampador (1937), Tweedie (1935-1950), Miers (1876), Haswell (1882), Sakai (1936-1939), Shen (1931-1948), etc., in the Indo-Pacific region. While studying the Brachyuran fauna of the Australian coast, Montgomery had arbitrarily divided this region into several zones.

The same system of dividing regions has been followed here with a few modifications to suit the present study. The zones are as under :—



Text-figure 3. Map showing the different geographical areas in the Indo-Pacific Region with which the Crabs of the Bombay Coast have been compared.

I. South Africa.
II. East Coast of Africa, Madagascar, Mauritius, and Seychelles I.
III. Red Sea, Persian Gulf.
IV. Laccadives and Maldives.
V. Burma, Tavoy and Mergui, the Andaman and Nicobar Is., Indonesia and Singapore.
VI. Cocos-Keeling and Christmas Is.
VII. Thailand, South China Sea.
VIII. Philippines.
IX. Australia (including Torres Straits).
X. Japan, China.

Out of the 81 species and subspecies, three are new to science, and the geographic distribution of the remaining species can be studied from the table. It will be seen that 21 species occurring on the coasts of Bombay State are widely distributed throughout the Indo-Pacific region, ranging from South Africa in the west to Australia in the east. Eight species, though not occurring in South Africa, are found from the east coast of Africa to Australia. Nine species do not occur outside India and appear to be strictly confined to this region. Three species, viz. *Gelasimus annulipes* Latreille, *Plagusia depressa tuberculata* (Lamarck), and possibly *Grapsus strigosus* (Herbst), extend to the west coast of America. The occurrence of these leads us to another problem of distribution. Sewell (1947) states: ' Ocean currents provide a means of transportation for both bottom-dwelling and pelagic animals. Floating weeds and logs of wood

TABLE I

Forms from the coast of Bombay State described in the present paper	South Africa	East coast of Africa, Madagascar, Mauritius, Seychelles I.	Red Sea, Persian Gulf	Laccadives and Maldives	Burma, Tavoy and Mergui, Andaman and Nicobar Is., Indonesia, Singapore	Cocos-Keeling and Christmas Is.	Thailand, South China Sea	Philippines	Australia	Japan, China
Dromia dormia (Linnaeus) ...	–	+	+	+	+	–	+	+	+	+
Pseudodromia integrifrons Henderson ...	–	+	+	+	+	–	+	+	+	+
Calappa lophos (Herbst) ...	–	+	+	+	+	–	+	+	+	+
Matuta lunaris (Forskal) ...	–	+	+	+	+	–	+	+	+	+
Matuta planipes Fabricius...	–	–	–	–	+	–	+	+	+	+
Leucosia pubescens Miers ...	–	–	+	–	+	–	+	+	+	+
Leucosia sima Alcock ...	–	–	+	–	+	–	+	+	+	+
Philyra globosa (Fabricius)...	–	–	–	–	+	–	+	+	+	+
Philyra corallicola Alcock...	–	–	–	–	–	–	–	–	–	–
Arcania septemspinosa (Fabricius) ...	–	–	+	–	+	–	+	+	+	+
Dorippe astuta Fabricius ...	–	–	–	–	+	–	+	+	+	+

Elamena cristatipes Gravely	−	−	−	−	−	−	−	−	−	−
Menaethius monoceros Latreille	+	+	+	+	+	+	+	+	+	+
Hyastenus planasius (Adams and White)	−	−	−	−	+	−	+	−	−	−
Doclea gracilipes Stimpson...	−	−	−	−	+	−	+	−	−	−
Paramithrax (*Chlorinoides*) *aculeatus* (Milne-Edwards)	−	−	−	−	+	−	+	−	+	−
Schizophrys aspera (Milne-Edwards)	+	+	+	+	+	+	−	−	+	+
Lambrus (*Platylambrus*) *prensor* Herbst ...	−	−	−	−	+	−	−	−	−	−
Cryptopodia angulata Milne-Edwards and Lucas ...	−	−	−	−	−	−	−	−	−	−
Scylla serrata (Forskal)	+	+	+	−	+	−	+	+	+	+
Neptunus (*Neptunus*) *sanguinolentus* (Herbst) ...	+	+	+	−	+	−	+	+	+	+
Neptunus (*Neptunus*) *pelagicus* (Linnaeus) ...	+	+	+	−	+	−	+	+	+	+
Charybdis (*Goniosoma*) *cruciata* (Herbst) ...	+	−	−	−	+	−	+	+	+	+
Charybdis (*Goniosoma*) *lucifera* (Fabricius) ...	−	−	−	−	+	−	+	−	−	+
Charybdis (*Goniosoma*) *annulata* (Fabricius) ...	+	+	−	−	+	−	+	−	−	+

TABLE I—(*Contd.*)

Forms from the coast of Bombay State described in the present paper	South Africa	East coast of Africa, Madagascar, Mauritius, Seychelles I.	Red Sea, Persian Gulf	Laccadives and Maldives	Burma, Tavoy and Mergui, Andaman and Nicobar Is., Indonesia, Singapore	Cocos-Keeling and Christmas Is.	Thailand, South China Sea	Philippines	Australia	Japan, China
Charybdis (Goniosoma) callianassa (Herbst)	+	+	+	+	+	+	+	+	+	+
Charybdis (Goniosoma) orientalis (Dana)	+	+	+	+	+	+	+	+	+	+
Charybdis (Goniohellenus) hoplites (Wood-Mason) ...	+	+	+	+	+	+	+	+	+	+
Thalamita crenata Milne-Edwards	+	+	+	+	+	+	+	+	+	+
Thalamita prymna (Herbst)	+	+	+	+	+	+	+	+	+	+
Alergatis integerrimus (Lamarck)	+	+	+	+	+	+	+	+	+	+
Alergatis floridus (Rumph)...	+	+	+	+	+	+	+	+	+	+
Alergatis roseus (Ruppell) ...	+	+	+	+	+	+	+	+	+	+
Platypodia cristata (Milne-Edwards)	+	+	+	+	+	+	+	+	+	+

Xantho (*Lophoxanthus*) *scaberrimus baccalipes* Alcock	–	–	–	–	–	–	–	–	–	–
Leptodius exaratus (Milne-Edwards)	–	+	+	–	+	–	+	+	+	+
Leptodius crassimanus Milne-Edwards	–	–	–	–	+	–	–	–	+	–
Medaeus granulosus (Haswell)	+	–	+	–	+	–	+	–	+	+
Etisus laevimanus Randall	–	+	+	+	+	+	–	+	+	+
Galene bispinosa (Herbst) ...	–	–	–	–	+	–	–	–	–	+
Actaea savignyi (Milne-Edwards)	+	+	+	+	+	–	+	–	+	+
Myomenippe hardwickii (Gray)	–	+	–	–	+	–	+	–	–	–
Ozius rugulosus Stimpson ...	–	–	+	–	+	–	–	–	–	+
Epixanthus frontalis (Milne-Edwards)	–	+	+	–	+	–	+	+	+	+
Pilumnus vespertilio (Fabricius)	–	+	+	–	+	–	–	–	–	–
Pilumnus longicornis Hilgendorf	–	+	–	–	–	–	+	–	–	+
Heteropanope laevis (Dana)	–	–	–	–	–	–	–	–	–	–
Eurycarcinus orientalis (Milne-Edwards) ...	–	–	–	–	+	–	+	–	–	–

TABLE I—(*Contd.*)

Forms from the coast of Bombay State described in the present paper	South Africa	East coast of Africa, Madagascar, Mauritius, Seychelles I.	Red Sea, Persian Gulf	Laccadives and Maldives	Burma, Tavoy and Mergui, Andaman and Nicobar Is., Indonesia, Singapore	Cocos-Keeling and Christmas Is.	Thailand, South China Sea	Philippines	Australia	Japan, China
Eriphia laevimana smithii Macleay	+	+	+	+	+	+	+	+	+	+
Eucrate crenata dentata (Stimpson)	+	+	+	+	+	+	+	+	+	+
Litocheira angustifrons Alcock	+	+	+	+	+	+	+	+	+	+
Litocheira setosa (Milne-Edwards)	+	+	+	+	+	+	+	+	+	+
Pinnotheres placunae Hornell and Southwell ...	+	+	+	+	+	+	+	+	+	+
Ocypoda ceratophthalma (Pallas)	+	+	+	+	+	+	+	+	+	+
Ocypoda cordimana Desmarest	+	+	+	+	+	+	+	+	+	+
Ocypoda rotundata Miers ...	+	+	+	+	+	+	+	+	+	+

Gelasimus annulipes Latreille	+	+	+	–	+	–	+	+	+	+
Gelasimus marionis (Desmarest)	+	+	+	–	+	–	+	+	+	+
Gelasimus marionis nitidus Dana	+	+	+	–	+	–	+	+	+	+
Gelasimus dussumieri Milne-Edwards	–	–	–	–	+	–	+	+	+	–
Dotilla myctiroides (Milne-Edwards)	–	–	–	–	+	–	–	–	–	–
Macrophthalmus pectinipes Guerin	–	–	–	–	+	–	–	–	–	–
Macrophthalmus sulcatus Milne-Edwards ...	+	+	–	–	+	–	–	–	+ ?	–
Macrophthalmus latreillei Desmarest	–	+	–	–	+	–	+	+	+	+
Macrophthalmus depressus Ruppe	–	–	+	–	–	–	–	–	+ ?	–
Macrophthalmus crinitus Rathbun	–	–	–	–	+	–	+	–	–	–
Macrophthalmus pacificus Dana	–	–	–	–	+	–	–	–	+	–
Grapsus strigosus (Herbst) ...	+	+	+	–	+	+	+	+	+	+
Metopograpsus messor (Forskal)	+	+	+	–	+	–	+	+	+	+

TABLE I—(*Contd.*)

Forms from the coast of Bombay State described in the present paper	South Africa	East coast of Africa, Madagascar, Mauritius, Seychelles I.	Red Sea, Persian Gulf	Laccadives and Maldives	Burma, Tavoy and Mergui, Andaman and Nicobar Is., Indonesia, Singapore	Cocos-Keeling and Christmas Is.	Thailand, South China Sea	Philippines	Australia	Japan, China
Metopograpsus maculatus Milne-Edwards ...					+			+		
Varuna litterata (Fabricius)	+	+			+		+	+	+	+
Sesarma (*Sesarma*) *quadrata* (Fabricius)		+			+			+		+
Sesarma (*Sesarma*) *oceanica* de Man					+					
Sesarma (*Sesarma*) *taeniolata* White					+					
Sesarma (*Sesarma*) *minuta* de Man					+					
Metaplax indica Milne-Edwards										
Metaplax distincta Milne-Edwards					+					
Plagusia depressa tuberculata (Lamarck) ...	+	+	+	+	+	+	+	+	+	+

may be carried along with ocean currents and the forms that cling to them are also taken along with them. Thus weed-clinging littoral forms may be carried away and dispersed widely.' Chilton (1910) has also called attention to the role of the movements of ships in the dispersal of larger Crustacea like crabs and Amphipoda, and remarks: 'Naturally, the Crustaceans that are suitable for dispersal by ships can also be dispersed by floating logs; in that case, however, they would follow the tracks of the prevailing currents.' The accidental transport of these foreign species taken from harbours where foreign ships dock for several weeks cannot have any geographic significance of scientific value.

The homogeneity of the Indo-Pacific Brachyuran fauna has been stressed by Laurie (1915), who states: 'The homogeneity of the Indo-Pacific region is illustrated by the fact that in places so far apart as Seychelles and Hawaii the percentage of crabs common to the Red Sea is very similar, approximately 33% in each case, that this percentage occurs at Ceylon and a fairly similar one at the Maldives and Laccadives. India is below, and Torres Straits distinctly above, this average figure.* His conclusion is that 'the Indo-Pacific figures suggest that one may prophesy with a probable error of $\pm$ 5 or 6 that 35 is the most likely percentage of species common to the Red Sea which will be found in a collection of . . . . . crabs from hitherto unexplored, or insufficiently explored, portion of the Indo-Pacific region.'

The Bombay State crab fauna gives a percentage of 43, which is somewhat high.

It will be noted from the table that the different families of crabs vary considerably in the 'percentage of homogeneity'; this may be noted also in Laurie's table. The Xanthidae, as might be expected, are above the average, and the Portunidae come next. It may be remarked, too, that it is the extremely widespread species which bring the percentage of homogeneity up.

Table II deals with the percentage of homogeneity of the different families of Brachyura as occurring in Bombay State and in India.

Observations on Ecological Adaptations

Observations on the natural habitats of crabs indicate that they are found in a variety of ecological conditions and manifest interesting morphological and physiological adaptations to suit their varying environments. The different tribes and families can be grouped according to the environmental conditions in which they live and to which they respond.

The majority of crabs are marine, but many can tolerate brackish water; others live in entirely fresh water, while a considerable number are amphibious, living partly on land and partly in water. Most of the marine crabs inhabit littoral and shallow water, but many others live at great depths.

The shore crabs display the widest range of variation in their adaptations. Some of the extreme adaptations are almost inexplicable, but most of them are elucidated below in relation to their ecological significance, and the part they play in preserving and perpetuating the species.

* In estimating the significance of these percentages, it should be remembered that some areas having been fairly explored are a good standard; on the other hand, other populations may have been sampled under different conditions.

TABLE II

Tribe/Family	Red Sea species (based on Laurie)	Total Indian species (based on Alcock)	Number common to Red Sea	Percentage common to Red Sea	Total Bombay species (based on the present paper)	Number common to Red Sea	Percentage common to Red Sea
Oxystomata	30	113	17	15	9	5	55
Calappidae	5	15	5	33	3	2	67
Leucosiidae	23	82	10	12	5	3	60
Dorippidae	1	11	1	9	1	0	0
Raninidae	1	5	1	20	...	...	...
Dromiacea	8	29	6	20	2	1	50
Dromiidea	8	21	6	28	2	1	50
Homolodromiidae ...	...	1	0	0	...	...	...
Dromiidae	8	18	6	33	2	1	50
Dynomenidae	...	2	0	0	...	...	...
Homolidea	...	8	0	0	...	...	...
Homolidae	...	6	0	0	...	...	...
Latreillidae	...	2	0	0	...	...	...
Brachygnatha	222	459	117	25	70	28	28
Oxyrhyncha	34	112	18	16	8	2	25
Hymenosomidae ...	1	5	0	0	1	0	0

Maiidae	22	76	13	17	5	2	40
Parthenopidae	11	31	5	16	2	0	0
Brachyrhyncha ...	188	347	99	28	63	26	41
Corystidae	...	1	0	0	...	...	...
Portunidae	35	63	22	34	11	6	54
Potamonidae	...	...	...	...	4	...	...
Atelecyclidae	...	4	0	0	...	...	...
Trichiidae	...	...	...	...	...	...	...
Cancridae	...	...	...	...	...	...	...
Xanthidae	107	147	56	38	19	11	58
Goneplacidae	5	29	3	10	3	1	33
Pinnotheridae	12	11	1	9	1	...	...
Ptenoplacidae	...	1	0	0	...	...	...
Palicidae	2	5	2	40	...	...	...
Grapsidae	11	48	6	12	11	3	30
Gecarcinidae	...	5	0	0	...	...	...
Ocypodidae	15	33	9	27	14	5	36
Hapalocarcinidae ...	1	...	...	...	...	...	...
Total species ...	260	601	140	23	81	35	43

The spider-crabs (Oxyrhyncha) comprise a group by themselves, a majority of them being adapted specially for life amongst weeds, mostly in the inter-tidal zone. They are sluggish and inoffensive and depend for their survival on camouflage. They are curiously coloured and sculptured so as to resemble the patterns of broken shells and eroded rocks among which they live. Their bodies are specially adapted for gathering weeds and small organisms, being provided with knob-like processes, hooks, and spines, on which algae, sponges, worms, etc. can get a hold. Alcock (1901) states: 'Some species purposely attach pieces of seaweed and fragments of shell on their bodies so as to escape notice.' They have long, tapering legs by which they can walk through entangled shore algae or cling tightly to the rocks or algae in which they dwell. They have no other defence and, when removed from their surroundings, quiver their legs helplessly. A typical example is *Paramithrax* (*Chlorinoides*) *aculeatus*.

Most of the Oxystomata are burrowing crabs. They live in sand or mud, some remaining buried till only their eyestalks show above the surface. Their carapace is coloured to blend with the sandy background. The Calappidae have peculiarly modified chelae. When held close to the body, the flattened claws together form a sort of buckler protecting the body (e.g. *Calappa lophos*). The Matutinae have all their legs modified to form paddles by means of which they swim with ease and speed (e.g. *Matuta lunaris*). The Leucosiidae are so coloured and shaped as to resemble pellets of mud so as to escape detection (e.g. *Leucosia pubescens*). Many of the Dorippidae carry about a house of their own by roofing themselves over with a shell, held by the last two pairs of legs (e.g. *Dorippe astuta*).

This peculiar habit is also common to the Dromiacea, or sponge-crabs, in which too the last two pairs of legs are usually adapted for holding a piece of sponge or shell over the body (e.g. *Dromia dormia*). They are primitive crabs, connecting the higher Brachyura with the Macrura.

The Portunidae, or swimming crabs, are pelagic forms, living either in open seas or in creeks or estuaries. They have the last pair of legs modified to form paddles, and they are active creatures. When swimming, they often hold one chela extended, and the other folded in, so that one might mistake them for a fish. They rely for defence on speed, but are also able to use their claws to great effect, and the larger forms are greatly feared by fishermen. They are also coloured slaty blue or grey, which is the general colour of sea-water below the surface [e.g. *Neptunus* (*Neptunus*) *pelagicus*].

The Xanthidae are mostly rock-dwellers, or live in mud under stones. Their carapace, which may be so convex as to be almost subglobular, or flat, is very strongly calcified. They are sluggish forms and, when disturbed, do not scuttle away. Although having powerful chelae, it is surprising that they do not use them. On being handled, they fold up their legs and chelae against the body, a position peculiar to the Xanthidae (e.g. *Ozius rugulosus*).

The Pinnotheridae are a peculiar group of crabs, living as commensals in the body-cavities of bivalves and Holothurians, undergoing degeneration. They are feeble crabs, with soft bodies and tiny eyes. The males may live freely or as commensals (e.g. *Pinnotheres placunae*).

The Ocypodinae are amphibious. They are gregarious and live close to the seashore in burrows, and can breathe air so long as their gill-chambers are moist, but die when forcibly submerged in water for a long

time. They are some of the most intelligent of all the crabs. They are extremely fast and active on land, their speed equalling, if not exceeding, a running man's (e.g. *Ocypoda ceratophthalma*).

The Scopimerinae are soft, feeble crabs, living in colonies, burrowing in mud. They are also called 'soldier-crabs', from their habit of 'marching in formation' (e. g. *Dotilla myctiroides*).

The Macrophthalminae are pelagic or mud-dwellers.

The Grapsidae are rock-dwellers, mostly living on stone embankments. They are vigilant and intelligent creatures and trust to their speed and craft to escape their enemies, it being very difficult to pursue them (e.g. *Grapsus strigosus*). A member of their family, *Eriocheir sinensis*, is important in that its natural distribution is China, but it has colonized in Germany.

The Varuninae make their home on drift timber or drift seaweed, and are well adapted for swimming, this accounting for their wide distribution (e.g. *Varuna litterata*).

The size of the body in crabs is also extremely variable, exhibiting a wide range. In large specimens of *Scylla serrata*, the carapace attains a breadth of 211 mm. (or 8 inches), and the span of the chelipeds measures 810 mm., whereas the other extreme in size is met with in *Sesarma* (*Sesarma*) *minuta*, which has the tiniest carapace, the breadth of which, in the adult, is 3.2 mm.

In some crabs there are sufficiently well-marked 'secondary' sexual characters, e.g. differences in the size and sculpture of the chelipeds of adult males and adult females or immature males (e.g. *Gelasimus annulipes*). Several genera (e.g. *Matuta*, *Ocypoda*, *Metaplax* male) possess organs of stridulation for attracting the opposite sex.

Crabs play an important role in nature's economy in two ways:

(1) They are one of the principal sources of food for numerous fishes (especially sting rays), frogs, crocodiles, swimming and wading birds, jackals, and other carnivorous animals, and last but not least, man.

(2) They are important as scavengers of the seashore, making up in numbers what they lack in size.

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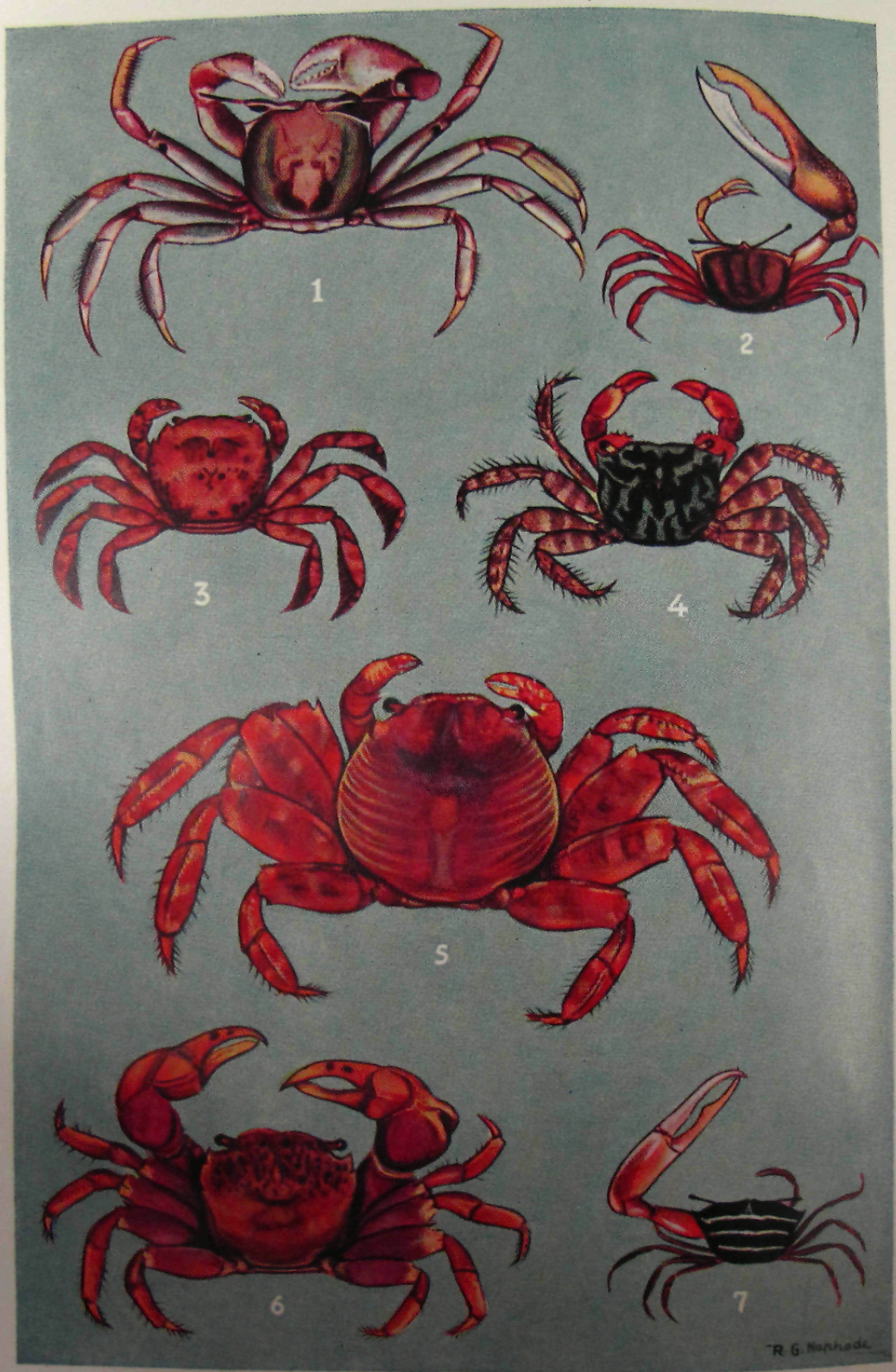

1. *Ocypoda ceratophthalma* × $\frac{2}{3}$.
2. *Gelasimus marionis nitidus* × $\frac{1}{2}$.
3. *Varuna litterata* × $\frac{2}{3}$.
4. *Metopograpsus messor* × 1.
5. *Grapsus strigosus* × 1.
6. *Sesarma* (*Sesarma*) *oceanica* × $\frac{3}{4}$.
7. *Gelasimus annulipes* × 1.