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ON CEPHALOPODS OF PAKISTAN

BY

Sharif Ahmad Ashraf,
Marine Biological Research Laboratory,
and

Zoological Survey Department, Karachi.

The mollusks form an important shell-fishery resources after the shrimps, prawns and lobsters. They are extensively fished in certain countries and serve as a nutrient diet for millions of people. The fishing of cuttle-fishes squids and devil fishes are no less important than cockles, clams and oyster fisheries. The cephalopods are highly specialised and have adapted for a free swimming existence. In Pakistan, the fishing of cephalopod group is not extensive and the small catches which are brought by the fishing trawlers are consumed by a certain groups of people alone.

The systematic study of cephalopods of Karachi coast has so far received a little attention by the previous workers namely Adam 1939, Hoyle 1904, Robson 1926 and Massy 1916. The present study is based upon a collection in the Zoological Survey Department made from the year 1947—1968 by the author as well as other staff. It enumerates a study of eight genera and ten species which are mainly from littoral zone.

Sepia aculeata Hasselt 1834

Specimens examined :

- (a) Patiani Creek Coast (Arabian Sea) Sind (West Pakistan),
1 Male, (C. 210), 4th January 1965.
- (b) Teknaf Island (Bay of Bengal), East Pakistan, 1 Male (C. 211),
6th March 1955.

Diagnosis :

This is characterised by an ovate-oblong body with somewhat pointed posterior end. This is smooth, slaty above and light pink below. Fins are broad, thick and commencing somewhat behind the front edge. Arms are elongate, unequal and being in the order of 4.3.2.1. The arms

cups are globular and the rings are minutely toothed around ; the largest teeth being in the distal half of the circumference. Tentacular clubs are beset with cups in rows of 10 to 12, with distant acute teeth on the rings. The hectocotylus is present on the proximal half of the 4th left ventral arm. The first four rows are normal and are followed by six rows of very minute suckers. The region of minute suckers has an obliquely placed deep (about 3 mm.) cavity in whose depth these suckers are also visible. The shell is ovate, oblong with round ends and a callosity on the inner cone. An acute beak projecting obliquely upward from the posterior end is present.

Remarks :

The dentition of arm suckers seems irregular ; the distal suckers usually possess close short blunt teeth all round the ring ; the central suckers generally have six to thirty long, sharp pointed denticles, all free or fused in four or five groups on the distal half of the ring. The fusion was observed in the central suckers of lateral arms of C. 211.

Maximum Length = 141 mm.

Sepia pharaonis Ehrenberg 1831.

Specimens examined :

- (a) Auction Hall Fish Harbour, Karachi (W. Pakistan), 2 Female (C. 203 & C. 204), 3rd December 1959.
- (b) Near About 25 miles West of Manora, Karachi, (W. Pakistan), 3 Female, (C. 205, C. 206 & C. 207) .

Diagnosis :

A larger, massive, ovate and oblong species with dorsal surface violet mixed with grey and shaded with dark grey. Light violet mixed with buff stripes are visible on its dorsal surface. The horny rings of proximal region of arm suckers hardly possess any tooth but small distal suckers have prominent teeth on one-third or more of its ring. The inner edge membrane of each tentacular club differs in being much flattened than the other. Unlike the previous species, it possesses two projections on the edge of membrane at the tip of each tentacle. The long oval shell is thickened underneath posteriorly. It is bounded on either side by a broad expanse of the chitinous margin. A very thick convex diaphragm occupies all the extremity of the cavity (inner cone) and has a short blunt beak.

Maximum Length = 553 mm.

Sepiella inermis Orbigny 1840.

Specimens examined:

- (a) Auction Hall, Fish Harbour, Karachi. (W. Pakistan), 1 Male, 2 Female, (C. 218, C. 219, C. 220), 4th February 1952.
- (b) Dongi Island Near Korangi Creek, Karachi, (W. Pakistan), 4 Female, 2 Male (C. 212, C. 222, C. 213, C. 216, C. 221, C. 215); 7th February 1966.

Diagnosis:

This species is characterised in having an oblong body, the breadth of which is usually two-third of the mantle-length. The average breadth of mantle ranges from 52% to 72% of mantle length. The fins usually begin at a short distance from the mantle margin and become wider posteriorly. The head is comparatively broad, being 38% to 50% of mantle length in males and 41% to 49% in females. The umbrella is highest laterally and absent between the ventral arms. The arm suckers are small, the rings entire on the narrow edge and finely toothed on the broad edge. The small club suckers of tentacles are arranged irregularly and the two distal suckers may be comparatively larger than the rest suckers of the distal region (C. 212 and C. 214). The dentition of club suckers is variable which depends on mantle length. The hectocotylus is present on the proximal part of the 4th left arm extending half or more of the arm length. The shell is oblong, breadth being 33% to 40% of its total length. In preserved specimens the entire ground colour is greyish-violet (C. 214) or buff with greyish shades (C. 217) and the spots are dark-brown.

Maximum Length = 176 mm.

Loligo duvaucelli Farussac and Orbigny 1839.

Specimens examined:

About ten miles, West of Manora, Karachi. 5 Male, (C. 231, C. 232, C. 233, C. 234, C. 235 & Others), 21st March 1966.

Diagnosis:

It is characterised by its elongated, stout, oblong body with rhombic fins usually half of the mantle-length. The third pair of sessile arms is the largest. The order of arms being 3.4.2.1 or 3.2.4.1 etc. The rings of arm suckers possess 3-8 or 9 blunt truncated teeth on each half of the ring, the rest being smooth. The clubs of tentacular arms are much

enlarged bearing distant acute teeth on the ring. The hectocotylus is shown on the distal half of the fourth ventral arm. Its normal sucker, stalked suckers and papillae rather depend upon the age and mantle length of animal. The entire surface is reddish brown with dark brown spots. The shell is pennate.

Remarks :

The rhombic fin is usually more than half (about 60%) of the mantle-length. The number of teeth varies with the length of mantle. A specimen with 181 mm. mantle length (C. 232) has usually 3-7 teeth and a specimen with 277 mm. mantle length (C. 235) has 6-8 teeth. The distal small suckers of the tentacle (C. 232) has 4-5 teeth and the largest suckers have 15-17 small pointed teeth around the ring.
Maximum Length=326 mm.

***Loliolus investigatoris* Goodrich 1896**

Specimens examined :

- (a) Dongi Island near Korangi Creek, Karachi, 1 Female, 1 Male, (C. 293, C. 294), 7th February 1966.
- (b) Patiani Creek Coast, Sind W. Pakistan, 10 Female and 12 Male, (C. 277, C. 288, C. 280, C. 291, C. 278), C. 251, C. 290, C. 282, C. 286, C. 283, C. 287, C. 289, C. 250, C. 281, C. 276, C. 275, C. 284, C. 279, C. 292, C. 253, C. 254, C. 252), 16-20.1.1950.

Diagnosis :

The mantle is of conical shape and with a rounded apex. The fins have rounded anterior and lateral edges ; the two together form a heart like figure which is continued beyond the mantle apex. The head is large and provided with a transverse olfactory crest below the eye. The horny rings of arm suckers are provided with three large blunt teeth. The horny rings of tentacular arms are armed with sharp teeth on its distal border. The hectocotylization is shown by sickle shaped 4th left ventral arm of the male whose upper row of suckers is modified into papillae, and the lower ventral row of suckers is entirely absent.

Remarks :

The head is large, being 32-39% of the mantle length. The arm suckers are provided with 2-5 large, broad, blunt teeth, the rest being smooth. The tentacular ring possesses about 35 teeth, of which usually eight distal ones are much prominent than the others. In the preserved specimens brown-reddish spots are scattered irregularly all over the yellowish buff ground colour of dorsal surface of head, mantle and arms.

Maximum Length = 87 mm.

Argonauta hians Solander 1850

Specimens examined :

A single incomplete shell (C. 201) collected while floating, nearly at a distance of about 200 miles west of Karachi, West Pakistan.

Diagnosis :

The shell is semiorbicularly involute, whitish-brown in colour. There are 36 ribs in all, half of which are complete. The smaller begins from 6th rib onward, from the axial point (columella) and the last half portion also has two smaller ribs between the two complete ribs. It has 22 moderately large blunt carinal knobs, and are arranged distantly. The extremities of the knobs and auricles are comparatively darkish in colour. The knobs of one row are not in opposite but are alternating. The aperture is wide and its sides projecting onwards thus making small auricles.

Nautilus pompilius Linn. 1767.

Specimens examined :

St. Martin Island (Bay of Bengal), E. Pakistan, 2 Shells only, (C. 202 and C. 204), 25.11.1956.

Diagnosis :

The shell is semi-orbicular, whitish in colour. Posteriorly transversely streaked with yellowish-rust. The streaks are broad and at distances. The shell is non umblicated (inconspicuous umbilicous) and the place of umbilicus being covered with a deposit of callous pearl mother.

Octopus vulgaris Lamark 1798

Specimens examined :

Manora Island, Karachi. West Pakistan, 1 Female, (C. 58) 1954.

Diagnosis :

The body is usually broadly oval. The head is narrower than the body. The arms are in the order 3.2.4.1. (3.4.2.1. being a common alternative) and on an average of 78% of the total length. The suckers usually attain a maximum diameter of 13% of the mantle length. The web has an average index of 20, which may be regarded as shallow. Its formula is C.D.B.E.A. or C.D.E.B.A. but it is variable. The funnel organ is regularly W shaped.

Octopus horridus Orbigny 1826*Specimens examined:*

Three: one Female & two Male (C. 54, C. 59, C. 61), from Manora Island, Karachi, West Pakistan, 20th August 1951.

Diagnosis:

The shape is more or less quadrangular or ovoid. The arms are long, constituting 80-85% of the total length. The fourth pair of arms are actually the longest, and the formula 4.3.2.1. occurs very frequently. The web is very variable in shape and tends to have the formula C-D-E.B.A. It is uniformly shallow and never exceeds 15% of the arm in depth. The ligula of the hectocotylized arm is small, being about 3.9% of the arm in length:

Remarks:

The arms are long, constituting 80.25 to 86.2% of the total length. The web is shallow ranging from 13.6% to 16.6% of its arm. The hectocotylus is small being 1.47% to 1.63% of its arm. The colour is mostly dark-grey above and reddish-brown minute chromatophores on the pale ground ventral surface.

Cistopus indicus Orbigny 1840*Specimens examined:*

- (a) About 50 miles (Deep Sea) West of Karachi, West Pakistan, 3 Female, (C. 3, C. 8, C. 10) and one Male (C. 6).
- (b) Alla (Trawler) collection Karachi, W. Pakistan, 30 Female (C. 18, C. 48, C. 52), 1949.

Diagnosis:

The velar interspaces are occupied by a series of pouches imbedded in the web and opening on the oral surface of each interspace. The arm formula and web formula is usually 1.2.3.4. and A.B.C.D.E. respectively.

Remarks:

Cistopus indicus is represented by many specimens in our department. The morphological intra-specific characters are so varied that their variations may better be studied by dividing the specimens into two sub-groups while each of the sub-group maintains its own identity.

They are as follows ;

Sub-Group I :

Both the sexes have elongated ovoid mantle. The head is always narrower than the body ; the former being on an average of 70% of the latter. The average breadth of mantle and head is nearly 48% and 30% of mantle's length respectively. The 10th, 11th, or 12th sucker of 1st and 2nd pairs of arms (C. 3 & C. 8) and first pair only (C. 7) is considerably enlarged. It is notable that 2nd and 3rd arms of C. 7 are much reduced and probably this abnormality causes the absence of enlarged suckers on the 2nd pair. Further, 4th right arm instead of the 3rd is hectocotylized. The sucker index hardly increases 10. The web depth is usually more than 15% and less than 20% of the length of the arm.

Robson (Monograph I, page 184) states that males are narrower than females and presumes this difference as sexual in origin. I have a good many specimens at my disposal and I don't find this effect of sex on breadth of mantle. Further, all the males, have tenth or eleventh suckers of 1st and 2nd pair of arms markedly enlarged than others and a few females also don't have this special enlargement. It is, therefore, also difficult to conclude whether or not, this specialization is effected by sex.

Sub-Group II :

Specimens of sub-group II have the following differentiating characters :--

1. The arms stouter, web thicker and infolding of velar membrane to form seminal channel comparatively more perfect.
2. These are more rugose and warty as compared with the elongated mantle specimens. Sculpture may be studied under high magnification in best preserved specimens (C. 18 and C. 48).
3. The arms of all the specimens contract and bend backward over the head and mantle but those of sub-group I don't contract in this way and are almost straight.
4. In sub-group I the maximum width index is 50 but here it may reach as much as 92 (C. 18).
5. In sub-group I the interocular index is nearly 30 and does not reach beyond 35 but in purse shaped mantle specimens it is usually above fifty and may reach up to 65 (C. 18).
6. In sub-group I the suckers are linear to diagonal in arrangement but here they are diagonal to biserial in arrangement.

7. The web index, in forms, with elongated mantle is usually more than 15 and less than 20 but in specimens with purse shaped mantle it is usually more than 20.
8. Sub-group I specimens are light pink mixed with grey but those of sub-group II are yellowish buff and upper side shaded with light-grey colour.

About the status of the species of the genus *Cistopus*. I am great confusion. The specimens of sub-group I greatly differ from specimens of sub-group II, not only in general appearance, but also in sculpture, width and web indicus etc. Therefore, I would like to remark as *C. indicus var. elongata* for elongated mantle specimens (S.G.I.) and *C. indicus var. rotunda* for purse-shaped mantle specimens (S. G. II).

Acknowledgement :

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Loligo duvaucelli

Loliolus investigator is

C. 231	C. 232	C. 233	C. 234	C. 235	C. 250	C. 251	C. 252	C. 253	C. 254
Male	Male	Male	Male	Male	Female	Female	Female	Female	Male
116	181	236	229	277	46	43	43	38	37
109	171	220	213	268	41	40	40	35	32
35	45	54	42	52	8	8	7	7	6
38	42	52	41	52	8	8	8	7	6
—	—	60	58	60	15	—	13	—	11
50	43	55	55	—	15	13	20	16	10
18+	45	68	52	75	21	26	19	—	23
54	49	70	65	—	22	18	19	15	19
44	49	56	54	62	22	19	19	20	23
42	48	62	52	61	22	19	20	20	20

O.
C. 58

	Female
Sex
End of body to eye	38
End of body to mantle-margin	25
Eye to dorsal web	30
Breadth of body	31
Breadth of head	26
1st right arm	155
1st left arm	152
2nd right arm	154
2nd left arm	174
3rd right arm	157
3rd left arm	185
4th right arm	186
4th left arm	170
Hectocotylus	—
Web between 1st arms	30
Web between 1st and 2nd arm right	38

MEASUREMENTS

Name of Species	S. aculeata				S. Pharaonis				S. Pharaonis				S. Pharaonis		
	Reference No.	C.210	C. 211	C. 203	3. 204	C. 205	C. 206	C. 213	C. 212	C. 213	C. 214	C. 215	C. 216	C. 215	C. 216
Sex	Male	Male	Female	Female	Female	Female	Female	Female	Male	Male	Female	Female	Female	Female	Female
Dorsal mantle length	88	90	200	225	166	155	260	50	54	60	70	47			
Ventral mantle length	79	81	176	205	140	135	248	42	47	54	62	40			
1st right arm	34+	44	63	76	51	37+	121	17	32	29	20	20			
1st left arm	34	40	66	57	48	61+	128	20	34	22	20	17			
2nd right arm	31	46	72	82	52	73	105	17	30	20	19	22			
2nd left arm	30+	48	63	70	52	57	112	22	28	20	21	22			
3rd right arm	35	47	74	83	64	75	138	25	30	18	23	22			
3rd left arm	42	50	69	86	61	63+	124	22	36	24	21	22			
4th right arm	40	51	82	89	70	46+	—	23	33	26	27	25			
4th left arm	42	50	72	125	72	67	—	23	36	31	35	34			
Tentacular arm right	—	—	—	—	181	194	293	72	—	75	—	122			
Tentacular arm left	—	—	225	—	188	—	285	66	63	66	69	111			
Tentacular club right	—	—	44	—	29	38	72	20	—	31	—	18			
Tentacular club left	—	—	50	48	28	—	70	20	20	27	25	16			
Length of shell	—	—	196	—	—	165	258	48	57	—	—	47			
Breadth of shell	—	—	73	—	—	59	81	16	19	—	—	19			
Maximum thickness of shell	—	—	16	—	—	15	—	7	8	—	—	7			

TABLE II
MEASUREMENT IN MILLIMETRES

Name of Species Reference	O. vulgaris		C. horridus		Cistopus indicus						
	C. 58	C. 54	C. 59	C. 61	C. 18	C. 48	C. 52	C. 3	C. 6	C. 8	C. 10
Sex			Female	Male	Male	Male	Male	Male	Female	Male	Male
End of body to eye	38	42	40	37	63	54	140	82	89	88	89
End of body to mantle-margin	25	36	30	27	50	40	79	70	59	65	63
Eye to dorsal web	30	29	27	27	82	39	105	68	83	69	52
Breadth of body	31	33	25	23	58	38	50	45	48	46	41
Breadth of head	26	24	19	16	41	35	57	29	31	28	26
1st right arm	155	135	104	130	295	220	—	—	361	380	290
1st left arm	152	60+	110	110	303	240	—	—	295	420	—
2nd right arm	154	170+	110	140+	270	210	—	—	330	155	172+
2nd left arm	174	66+	148	145	238	230	—	—	290	350	312
3rd right arm	157	203	155	122	81	100	188	173	254	180	122
3rd left arm	185	165	74+	175	175	—	—	372	—	260	144
4th right arm	186	263	145	155	175	188	—	215	—	290	260
4th left arm	170	150	175	154	136	170	—	225	—	233	200
Hectocotylus	—	3	—	2	2	2	2	2	—	2	2
Web between 1st arms	30	17	21	20	64	56	98	57	66	62	42
Web between 1st and 2nd arm right	38	27	22	26	45	52	71	55	56	53	55

TABLE—*concl'd.*

MEASUREMENT IN MILLIMETRES

Name of Species Reference	O. vulgaris			C. horridus			Cistopus indicus				
	C. 58	C. 54	C. 59	C. 61	C. 18	C. 48	C. 52	C. 3	C. 6	C. 8	C. 10
Web between 1st and 2nd arm left	25	23	23	26	41	51	80	53	62	73	59
Web between 2nd and 3rd arm right	45	34	25	24	30	50	49	49	55	54	46
Web between 2nd and 3rd arm left	36	33	27	34	31	50	75	52	63	49	63
Web between 3rd and 4th arm right	45	27	25	23	23	43	58	40	52	54	36
Web between 3rd and 4th arm left	31	36	29	30	22	50	60	48	50	45	51
Web between 4th arms ..	34	32	25	17	19	40	50	44	33	43	39
Length of funnel ..	14	15	10	9	25	24	34	26	27	28	28
Diameter of the largest sucker ..	4	6	3	3	16	11	17	11	7	10	8
<i>FARMULAE</i>											
Arm Formula ..	4.3.2.1	4.3.2.1	4.3.2.1	4.3.2.1	1.2.3.4	1.2.3.4	—	—	—	1.2.3.4	2.1.4.3
Web Formula ..	C.D. B.E.A.	D.C. E.B.A.	D.C. E.B.A.	C.D. B.A.E.	A.B. C.D.E.	A.B. C.D.E.	A.B. C.D.E.	A.B. C.D.E.	A.B. C.D.E.	A.B. C.D.E.	B.C. D.A.E.
Indices :											
Width index ..	81.5	78.5	62.5	62	92	70.3	42.5	55	53.9	52	46
Inter-ocular index ..	68.4	57	47.5	43	65	64.8	41	35.5	34.8	32	29
Web index ..	24.1	13.5	10.7	15.2	21.1	23.3	25.4	16.4	18.3	17.3	18.9
Sucker index ..	10.5	14.2	7.5	8.1	25.4	20.3	12.1	13.1	7.8	10.1	8.9
<i>Hectocotylus index</i> ..	—	1.4	—	2.5	2.4	2	1.06	—	—	1.1	1.6

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ON A COLLECTION OF POLYCHAETES
IN THE ZOOLOGICAL SURVEY MUSEUM, KARACHI

BY

SYED ASHRAF AHMAD

Zoological Survey Department, Karachi.

A check on the polychaete fauna of Karachi coast reveals that the earlier studies of this group had been mainly the efforts of Bindra (1927) and N. D. Aziz (1938). Bindra has described only the genus *Eurythoe* while N. D. Aziz has gone further and have reported polychaete forms comprising 23 genera and 34 species. All the species reported by them were from Manora and "Oyster" Islands off Keamari. Azhar Hasan (1960) has made a study on Polychaetes from the intertidal zone of Karachi coast and has described 17 genera and 18 species. Since a comprehensive study of this group along the Karachi coast has not been attempted so far, the present series of works deal with the study in detail of the polychaete forms inhabiting the littoral zone. The study has been based on a collection of Zoological Survey, made by the author as well as by the staff of this Department. The present work includes a study of 11 genera and 17 species which contain some forms namely *Stylarioides*, *Phyllochaetopterus* and *Serpulid spp*; till now not reported from the coastal belt of Karachi.

FAMILY : CHLORAEMIDAE

(I) *Stylarioides parmatum* Grube.

Stylarioides parmatum : Willey, 1905, Roy. Sec. Rep. on Pearl Oyster Fisheries, Suppl. Re. XXX, p. 289, pl. viii, fig. 5.

The worm usually measures from 26 mm to 55 mm. The body is swollen anteriorly and abruptly tapers beyond the middle into a filiform tail like structure. On the dorsum it bears an oval shield coated with sand; the rest of the body is naked. There occurs two stout palps and the gills are numerous, filiform, all alike, and inserted over a long peduncle which is retractile. The skin papillae are in circular rows. A cephalic cage in the first three segments is formed of much longer, slender, annulated and iridescent setae. This is preceded by long, capillary, annulated, non-iridescent dorsal setae and ventral hooks.

L. 1427(70)Z.S.

Remarks :

This worm is generally found in the crevices of rocks, and also from a mixture of sandy and muddy habitat. It is an uncommon animal.

Material Examined :

5 Specimens from Manora and Bhit Island.

(II) *Stylarioides bengalensis* Fauvel

Stylarioides bengalensis Fauvel, 1932, Mem. Ind. Mus. Calcutta, XII, No. 1, p. 180, Fig. 30, a-f.

This differs from the previous species in being large and the body tapers to a filiform process in the posterior two-third of the body which is coiled. The body segments are feebly distinguishable. Dorsal shield is absent, instead it possesses globular papillae which covers the entire body and are non-adhesive to sand particles. The buccal tube is frilled. The branchiae are set in several rows over a membranous horse-shoe shaped branchial lobe. Mouth trilobed. There occurs two canaliculate palps with sinuous edges. A cephalic cage in the first three segments bear three close set concentric circles. Each of these segments bear 3 to 5 bristles in a bundle which are long, stout, ringed and beautifully iridescent. On the next three succeeding segment, very small and slender dorsal capillary setae and a few fine ventral capillaries are present. This is preceded by sigmoid ventral hooks.

Remarks :

The habitat is the same and is an uncommon animal.

Material Examined :

7 specimens from Bhit Island, Baba Island and Native-jetty.

FAMILY : CHAETOPTERIDAE

Phyllochaetopterus elioti Crossland.

Phyllochaetopterus elioti Crossland, 1903, Proc. Zool. Soc. London, I, p. 172, pl. XVI, fig. 1, 3, 8, pl. XVIII, fig. 10—13.

This worm has usually a range of 115 mm to 210 mm. in length, possessing two anterior larger palps and two posterior small tentacles with lateral eyes. Body is divided into three regions, the anterior most composed of 9 segments with uniramous oar-shaped setae. The fourth foot with 2-3 stout cylindrical setae. Middle region consists of 20—25 segments

and the posterior with numerous segments. The dorsal rami in the posterior segment with lanceolate setae. Posteriorly the feet are biramous with distinct cylindrical dorsal rami and uncinigerous ventral rami.

Remarks :

It occurs in the sandy habitat in a parchment-like tube encrusted with sand which is U-shaped and is uncommon animal.

Material Examined :

21 specimens from Baba Island and Native-jetty.

FAMILY : SERPULIDAE

Serpula vermicularis Linnaeus.

Serpula vermicularis Pixell, 1913, Tran. Linn. Soc. of London (Zool.) XVI, P. 71, pls. VIII—IX.

This species has a variable range of 18 mm. to 44 mm. in length. Anteriorly there occurs a collar which is trilobed. The setae in this region are bayonet-shaped with two conical processes at the base. Uncini with 4—7 teeth, the lower are stouter and blunt. Operculum with numerous radii. The gill is funnel-shaped composed of two semi-circular lobes. The gills are filamentous with two rows of barbules. The tube is wrinkled, with about 5 ridges and is bell-shaped at the mouth.

Remarks :

The calcareous tube of this animal is found attached to the under side of the rocks which are situated in small pools. It is a common animal.

Material Examined :

3 specimens from Native-jetty and Buleji.

FAMILY : AMPHINOMIDAE

(I) *Eurythoe indica* (Schmarda).

Eurythoe indica Kinberg, 1867, Ofver. af Kongl. Vetén. Akad. Forhand, No. 3.

A dorso-ventrally flattened worm measuring from 80 mm. to 190 mm. in length. Buccal segments are four in number and the branchiae begin from second segment and continued up to the last segment. Caruncle is truncated anteriorly and terminates on the fourth segment. An anal funnel is present which contains the anus. The terminal segment is devoid of

parapodia. There occurs three incomplete posterior segments. The setae on the dorsal side are bifid, harpoon, sword-shaped and simple spine like, and on the ventral side they are furcate, slender bifid, long-straight, hair like, and spine like.

Remarks :

It generally occurs in the sandy habitat of the small pools beneath the rocks. They are very sluggish in movement. When rocks are turned they want to escape the intensity of light and hide themselves in irregular burrows under stones and boulders. It is a very common animal.

Material Examined :

110 specimens from Manora and Buleji.

(II) *Eurthoe complanata* (Pallas).

Eurythoe complanata Kinberg, 1867, Ofver, af kongl. Vetén. Akad. Forhand, No. 3.

This species like the previous one has a range of 90 mm. to 160 mm. It differs from the above in possessing five buccal segments and also by the absence of anal funnel. This species has all the segments completely developed. Caruncle is notched anteriorly.

Remarks :

The habitat is the same and is a very common animal.

Material Examined :

72 specimens from Manora Island and Buleji.

(III) *Eurythoe matthaii* (Bindra).

Eurythoe mathuii Bindra, 1927, Mem. Dept. Zool., Punjab Univ. Vol. I, p. 12, pl. II, fig. 4.

This species has a measuring length of 45 mm. to 115 mm. and differs from the above two by the commencement of branchiae on the first segment. The caruncle ends on the second segment rather than on fourth. The anus is terminal.

Remarks :

The habitat is the same. It is an uncommon animal.

Material Examined :

6 specimens from Manora Island.

(IV) *Eurythoe macrotricha* (Schmarda).

Eurythoe macrotricha Kinberg, 1867, Ofver, af kongl. Akad. Vetén. Forhand., No. 3.

This worm measures from 95 mm. to 110 mm. and differs from the above three in the absence of eyes, the caruncle extends upto 5th segment in this species alone. The branchiae are very poorly developed and the last two segments bear no branchiae.

Remarks :

The habitat is the same and is an uncommon animal.

Material Examined :

2 specimens from Manora Island.

(V) *Eurythoe karachiensis* (Bindra).

Eurythoe karachiensis, Bindra, 1927, Mem. Dept. Zool., Punjab Univ. Vol. I, p. 13, pl. II, fig. 6.

A smaller of all the species measuring 55 mm. to 80 mm. in length and differs in the shape of the caruncle which is tripartite. The gill—filaments are short and thick. The gill—tufts are relatively more developed than in any of the previous species. The last three segments are devoid of branchiae.

Remarks :

The habitat is the same. It is an uncommon animal.

Material Examined :

1 specimen from Manora Island.

FAMILY : HESIONIDAE

Hesione pantherina Risso

Hesione pantherina, Saint Joseph, 1898, Ann. Sei. nat. Paris, (8) V, p. 329, pl. xix, figs. 131—134.

A cylindrical worm measuring from 38 mm. to 66 mm. in length. Parapodia uniramous and 16 in number. Dorsal cirri are long and articulate, borne on a large cirrophore. Ventral rami are large, cylindrical and hollow with black spines. Setae are compound, the terminal piece of each heterogomph seta is sickle-shaped, bidentate at the apex with a sub-apical spine.

Remarks :

It is generally found swimming freely in the shallow water pools under the rocks or living temporarily in crevices of rocks. It is a common animal.

Material Examined :

18 specimens from Manora and Buleji.

FAMILY : EUNICIDAE

(I) *Aglaurides fulgida* Savigny.

Aglaurides fulgida Fauvel, 1930, Bull. Madras Govt. Mus., I, No. 2, pt. I, p. 31-32.

This worm is the largest of all forms so far recorded and attains a variable range of 296 mm. to 780 mm. in length. Prostomium is small and conical. Tentacles short, three in numbers with rounded tips, the median longer than the lateral ones. Dorsal cirri chopper-shaped. Setigerous lobe bears two unequal ligules, the anterior ligule is short rounded and the posterior long and leaf-like. Setae are simple and capillary like.

Remarks :

This worm occurs in an ad-mixture of sandy and muddy habitat near low water mark and is a common animal.

Material Examined :

47 specimens from Native-jetty and Bhit Island.

(II) *Diopatra neapolitana* Dell Chiaje.

Diopatra neapolitana Ehlers, 1868, Die Borstenwurmer, II, p. 285, pl. xii, figs. 6—20.

This worm measures 85 mm. to 160 mm. in length. Body is somewhat rounded anteriorly, depressed and brittle in the posterior region. Palps are small and globular. Gills on the 4th—5th foot are very large, plume-shaped but decreases in size and disappear altogether from the 35th—40th foot. First 4—5 setigerous segments are simple with winged setae and pseudo-compound bristles. This is preceded by simple setae and comb-setae. Acicular setae with bi-dentate tips.

Remarks :

This worm occurs in muddy sand or sandy mud, at a depth of about two feet below the surface. The tubes are large and thick-walled formed of mud and sand upon a membranous base. It is an uncommon animal.

Material Examined:

18 specimens from Native-jetty and G. M. Hut.

(III) *Lumbriconereis heteropoda*, Marenzeller.

Lumbriconereis heteropoda, Izuka, 1912, J. Coll. Sci. Tokyo, xxx, p. 141, pl. iv, fig. 19.

This worm has usually a range of 95 mm. to 500 mm. in length. Prostomium is conical. Parapodia increase in length posteriorly, with posterior ligule long and erect. The anterior feet possess only simple capillary setae. This is preceded by winged setae and crotchets which bear a single large hook beset with small teeth above the main fang.

Remarks:

This worm is generally found in a mixture of sand and mud and is a common animal.

Material Examined:

51. specimens from Native-jetty, Majia & Baba Island.

FAMILY: CIRRATULIDAE

Audouinia ancylochaeta (Schmarda).

Audouinia ancylochaeta Fauvel, 1930, Bull. Madras. Govt. Mus. I, No. 2, Pt. I, p. 541.

This worm measures from 12 mm. to 52 mm. in length. A pair of lateral gill-filments is present on every setigerous segment. Tentacular filaments are inserted in two clusters on the 4th setigerous segment. Simple capillary setae and 5-6 hooks are present on each ramus. The distance between the point of gill insertion and the dorsal ramus is shorter than the distance between the rami.

Remarks:

It generally occurs in the muddy-cum-sandy habitat and is a very common animal.

Material Examined:

238 specimens from Native-jetty.

FAMILY: SABELLIDAE

(I) *Dasychone cingulata* Grube.

Dasychone cingulata, Fauvel, 1930, Bull. Madras. Govt. Mus., I, No. 2, pt. 1, p. 62.

This worm has a measuring length of 12 mm. to 76 mm. in length (excluding the branchial crown). Body is stout, much broader for a greater length of the body but abruptly tapers at the posterior third. It bears numerous dark pigment spots over the general surface. Gill filaments possess long and slender dorsal stylodes. There are eight thoracic segments with eight fascicles and seven tori.

Remarks :

It constructs a fine muddy tube on the rocky substratum or in crevices of rocks exposed to bright sunshine and to the action of smaller waves. It is a very common animal.

Material Examined :

356 specimens from Native-jetty.

(II) *Dasychone serratibranchis* Grube.

Dasychone serratibranchis, Grube, 1878, Mem. Acad. Imp. Sci. St. Petersburg xxv, p. 262, pl. xiv, fig. 7.

A smaller, of the previous species measuring 26 mm. to 47 mm. in length (excluding the branchial crown) and differs by its slender, gradually tapering body and also by the absence of pigment spots. Dorsal stylodes are short and appressed. There occurs six thoracic segments with six fascicles and five tori.

Remarks :

The habitat is the same and is an uncommon animal.

Material Examined :

15 specimens from Majia Island.

(III) *Sabellastarte indica* Savigny.

Sabellastarte indica Augener., 1914, Faun. Sudwest—Australiens, V, p. 115, pl. I, fig. 20.

This worm has a variable range of 35 mm. to 91 mm. in length (excluding the branchial crown). Body is stout, dark—brown consisting of 8 thoracic segments. Gill-filaments which are numerous and densely crowded bear no stylodes. In the thoracic tori there is a single row of avicular uncini. Pick-axe-shaped setae are absent. Setae are all of one type, simple and winged.

Remarks :

It constructs a fine muddy tube on a membranous base on the rocky substratum and is a common animal.

Material Examined :

29 specimens from Buleji and G. M. Hut.

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ECHINODERMS OF PAKISTAN COASTS

BY

Mohd. Monirul Hoque

Marine Biological Research Laboratory and
Zoological Survey Department, Karachi.

The taxonomy of echinoderms in Indian waters have been studied by numerous scientists. The collections of the Indian Marine Survey Ship 'Investigator' and those of the Indian Museum have been worked out by Wood-Mason and Alcock (1891), Alcock (1893), Anderson (1894), Koehler (1898-1927), Koehler & Vaney (1905-1908), & A. H. Clark (1909-1932). D.B. James (1967), has contributed much by studying the echinoderms in the reference collections of the Central Marine Fisheries Research Institute of India. A good number of reports have been published by Bell (1886, 1837), Doderlein, Pearson (1903), Chadwick (1904), Herdman (1904), & H. L. Clark (1915). Bell has described the echinoderms of the Andamans (1887), Bengal (1888), including present East Pakistan region Laccadives & Maldives (1902). Bell's identification of echinoderms of Maldiv Islands have been revised by A. M. Clark & P. S. Davices (1965). The echinoderms fauna of the west coast of the Pak-Indo sub-continent, however, has not received much attention in the past, except for the records by Kurian (1953), of the echinoderms of Travancore (South India). The vast area north of this almost up to the Persian Gulf has remained unexplored, except for stray, record of few specimens from Karachi, Honavar & Mangalore by Koehler (1927), and for the work of Patil (1953). at Karwar.

Koehler's record of echinoderms from Karachi coast is just a preliminary touch of the faunistic information. Hence I happen to study the echinoderm collections of Zoological Survey of Pakistan. I have the privilege to study & identify 24 species of five living classes of *Phylum Echinodermata* examining nearly five hundred collected specimens of the Department. Since most of the specimens identified are the first record in the echinoderms history of Pakistan, I feel it obliged to discuss the locality & the distribution in Pakistan with nutshell salient ecological features and distinctive characters of the specimens,

ASTEROIDEA

Only six identified species of the sea-stars from the collections are included in the present report, namely :—

- Astropecten indicus* Doderlein.
Astropecten euryacanthus Lütken.
Anthenea rudis Koehler.
Luidia maculata Müller & Troschel.
Asterina lorioli Koehler.
Asterina burtonii Gray.

The sandy starfishes, *Astropecten* spp., are found usually half buried in sand, exposed at low-tide. From November to February, they are generally abundant and during the rest of the year they are only occasionally found on the shores. They have also been collected in abundance by dredging up to 50 fms. *Astropecten* species is easily recognised by its five slender arms bordered by a row of large plates. These marginal plates are conspicuous bearing spines on their outside. In *Astropecten indicus* there are numerous supero-marginal spines and relatively broad paxillar areas in relation to the width of the supero-marginal plates. In some *A. indicus*, the supero-marginal spines are fewer and relatively broader supero-marginal plates. *Astropecten* species possesses sucker less tube-feet which are pointed at their tips. There is no anus. The oral surface is either whitish or light yellowish in colour. The aboral is greyish. The arms of *Astropecten euryacanthus* is comparatively more flat with well developed supero-marginal erect spines than that of *A. indicus*.

The disc in *Asterina* spp. are large and more or less flat. The papillae are distributed over the whole of the upper surface; the skeletal plates of which are thick, crescent shaped and imbricated. Body swollen or slightly swollen. These are proterandric hermaphrodite species.

The sub-pentagonal common species, *Asterina lorioli*, possesses stout, dorsally slightly swollen and orally flat rays, The spines are small with no crest along the mid-dorsal line, if any, indistinct. The colour of the animal is shady orange. *Asterina burtonii*, is swollen dorsally, having 2 or 3 spines on each ventro-lateral plate. The number of arms may be 8 and this form with more than 5 arms are usually juvenile and more or less obviously in process of regeneration with the increase of age. Crest is present along the mid-dorsal line. The

colour is greyish, orange or light yellow. Both the species are mainly littoral, living under stones, but may be found among algae, *Zostera* etc., and also in the deep-sea.

The disc in *Anthenea rudis*, is flat and the underside is somewhat convex. The five arms are blunt distally. This is a massive and rather is creamy yellow or orange. This remains attached to the rocks in the inter-tidal zone. This is an uncommon species.

Luidia maculata has long, narrow and fragile arms, regularly tapering towards the distal end and with smaller disc. The infero-marginal plates are separated from the ambulacral plates by a small intermediate plate throughout the ray. The colour, when living, is mouse dorsally and yellowish white ventrally. This is said to be shallow-water specimen (common within 20 fathoms), generally in sandy-bed. But there is a record of collection of the species upto the depth of 200 fathoms. This is a rare species in my collection.

OPHIUROIDEA

The ophiuroid collection of the department presently includes five species ;

Ophioplocus imbricatus Müller & Troschel.

Ophiopeza fallax Peters.

Macrophiothrix aspidota Müller & Troschel.

Ophionereis dubia Müller & Troschel.

Amphiura tenuis. (H. L. Clark).

Among them *Ophioplocus imbricatus* and *Macrophiothrix aspidota* are very common on our coasts in intertidal zone. They have been recorded from some depth too. *Ophiopeza fallax* and *Ophionereis dubia* are littoral, and not so common in the collection. *Amphiura tenuis* is very rare species. So far I have collected this specimen twice or thrice.

Ophioplocus imbricatus is readily distinguished by the multiple plates in place of dorsal arm plates. The disc is covered with imbricating scales. Dorsally the colour of species is grey and ventrally is creamy or whitish yellow. The arms are transversely brown banded (not so deep in colour) dorsally. This is collected from mud under stone.

The disc of *Ophiopeza fallax* is covered with coarsed polygonal granules, having 19|20 granules per linear mm. in the centre of the disc. The granulation, on the ventral side of the disc, continues upto the pentagonal oral shields. A partly naked supplementary oral shield is visible and one or two distinctly enlarged, more or less semicircular scales are

found on removing the granulation. The species possesses only two genital slits in each inter-radius, one to three naked disc plates opposite to the base of each arm and sometimes also an inter-radial marginal plate. The disc is greyish brown dorsally and creamy ventrally. The arms are marked with sharply defined dark brown bands. Collected from mud under stone.

The colour of *Macrophiothrix aspidota* is purple with dark spots on the arm-spines. The arm-spines are well-developed, stiff and stout. The dorsal arm plates are broad fan-shaped. The disc-diameter is variable from 10 to 14 mm. and the radial shields are conspicuous, long and abruptly naked. The stumps on the disc scales are cylindrical and multifold. The species is usual dweller of mud under stone.

The soft bodied species, *Ophionereis dubia*, has a small and pentagonal disc and the arm-spines are transversely banded with alternating colour of dark-brown and cream. The arms are fragile. Abactinal surface of disc is paved with large to medium size irregular polygon-shaped plates. There are ten mouth papillae to each jaw angle, five on each side. These papillae are short, thick, with wide, blunt and slightly rounded distal margin. Collected from mud under stone.

The small, naked & more or less spherical disced species, *Amphiura tenuis*, possesses extremely delicate, slender, fragile and very long thread-like arms. The disc is somewhat incised above each arm. The arm-spines are short, stout, and solid. The colour of the specimen is light-yellow or creamy. This has been recorded from mixed soil (sandy and muddy) and from the mud under stone.

ECHINOIDEA

Six echinoid species have been identified from the present stock collection :

Echinometra mathaei de Blainville.

Echinostrephus molaris de Blainville.

Stomopneustes variolaris Lamarck.

Temnopleurus torenmaticus Leske.

Clypeaster rarispinus de Meijere.

Arachnoides placenta Linnaeus.

Echinometra mathaei and *Stomopneustes variolaris* are common on our coasts and said to be littoral species. *Temnopleurus torenmaticus* and *Echinostrephus molaris* are rare in my collection, collected from low-tide

mark and also from deep-sea. *Clypeaster rarispinus* and *Arachnoides placenta* have been collected from the shore as well as from deep-sea, upto the depth of 40 fathoms.

The ambulacra of *Echinometra mathaei*, near the actinostome, is more or less petaloid. The primary spines are stout and conical while the secondary ones are fine. The colour of the spines is dull purplish or greenish, the test is a shade-dark or violet-black. This lives either on the rocks or in the caves of the soft rock from which it is often impossible to remove it intact without breaking the rock.

The spines in *Echinostrephus molaris* are smooth, slender and are stout and the test is broadest near the top. The spines are banded alternatively by deep brown and violet colour and are arranged beautifully towards the dorsal direction. They live attached to rocks.

Stomopneustes variolaris is recognised by big tubercles on its corona and broad ambulacral areas. The gibbous test is circular and the lantern has no bridges linking the vertical members at the upper end. The spines are long, thick and deep-violet in colour. The species inhabits in the clefts of the coral rock or sub-merged rocks.

The small sized *Temnopleurus toreumaticus* possesses very slender and fragile spines, banded with grey and brown colour. The species has deep-pits at the ends of the horizontal sutures. The plates are united by small knobs and sockets. The corona is semicircular, having the bigger transverse diameter than the perpendicular one. The species lives in the crevices of rocks or in mud under stone, algae etc.

Clypeaster rarispinus is easily recognised by its depressed test. The medreporite plate is in the centre of the aboral surface. The five petaloid ambulacral area radiates from this. Ambulacral area are coloured light yellow, spines greenish yellow in smaller specimen but duller in larger one. This has been collected from sandy or muddy shore at the low-tide mark.

The sand-dollar, *Arachnoides placenta* is well characterized by exceedingly flattened test, disc-like, which is nearly circular in outline, but slightly indented at one point indicating the anus. The test is closely covered with minute spines which are nearly uniform. The spines are reddish brown or purplish brown in colour. The colour of the test is grey. The species has been recorded from sandy or muddy shore at the low-tide mark.

HOLOTHURIOIDEA

The holothuroids of the present collection are presented by five species. Further study of the group is likely to reveal the facts for more species. The species are:

Stereoderma forbesi Bell.

Staurothyone rosacea Semper.

Stolus buccalis Stimpson.

Actinopyga mauritiana Quoy & Gaimord.

Synapta inhaerens Muller.

Except *Synapta inhaerens*, which is very rare, the other four species are common in my inter-tidal zone collection. However, *Actinopyga mauritiana* is not so common.

The body of *Stereoderma forbesi* is somewhat cylindrical. The tube-feet are in distinct tetra or penta series in the five ambulacra. The encasing skin is rough, thick and leathery. Of the ten tentacles, the ventral two are smaller. The body is whitish, tentacles dark-brown and the tube-feet is creamy. The species remains attached the underneath of rocks or in the crevices of rocks in the littoral zone and is also recorded from some depth.

The tube-feet in *Staurothyone rosacea* are scattered. The body is cylindrical and sharply tapering at the both ends. Skin is soft, smooth and thin. The body is light yellowish, the tentacles are purple or yellow. Collected from rocky shore.

The skin of *Stolus buccalis* is thick and rigid. In spirit, the body becomes stiffed. Tube-feet are not confined to the radii but scattered over the entire body surface. Tentacles are ten, deep-brown or more dark in colour, the ventral pair is smaller. Tentacles look like a crown. Colour of the body, in life, is light purple, white in alcohol. Collected from rocky shore where it remains attached to the rocks.

Actinopyga mauritiana, when living, is quite large, elongate, usually somewhat constricted anteriorly and widest posteriorly, The mouth is ventral, bordered by a conspicuous papillose collar. The number of tentacles is more than 20, in some species 24 to 26. The tentacles are closely crowded and widely peltate. The pedicels are restricted to the flattish ventral surface and are packed closely together without definite arrangement. In one specimen, I have found that the ventral pedicels are in four close series. The dorsal papillae are much numerous and irregularly

distributed. Peristome is wide and conspicuous. The colour is with a shade of brown or deep-olive brown dorsally, light pinkish brown ventrally. The tube-feet are raw-umber and the tentacles brown. This has been collected from rocky inter-tidal zone but not found in coral reef.

The interesting sea-cucumbr (echinoderm), *Synapta inhaerens*, is flexible, worm-like & slender. The skin is thin & transparent. There are numerous calcareous minute structures, the anchors, in the skin of the body (characteristic of the species). The anchors serve in locomotion and also in defence & adhesion. The tube-feet are absent (pecularity to phylum), the twelve oral tentacles alone represent the external appendages of the ambulacral system. Colour is light yellow or grey. This lives buried in sand, black-mud, gravel, clear-mud or in mixed soil (sandy & muddy). This often exposes between tides where sand is still wet. There is a record of collection upto the depth of 100 fathoms also.

CRINOIDEA

The crinoid collection available in the museum (Zoological Survey of Pakistan) includes only the feather-stars of the family Comasteridae, sub-family Comasterinae, species, *Comanthus parvicirrus* A.H. Clark & *Comanthus samoanus* A. H. Clark.

Both the species have been collected from sandy beach. However, they are generally bottom dwellers but occasionally come to the shore along with current.

Comanthus parvicirrus usually possesses 20 to 25 arms of 75 to 80 mm. length (matured specimen). Centrodorsal is large, hemispherical 11-12 mm. in diameter. The disc is concave bearing calcareous nodules about the anal tube, the mouth is generally marginal & radial (in some species mouth is inter-radial). The anal area is very large & the anal tube is central. In alcohol, the colour of the species is chocolate, deep brown or light brown.

In shape, size and colour *Comanthus samoanus* is similar to *C. parvicirrus* which is apparently always confusing. *Comanthus samoanus* differs from *C. parvicirrus* in the more numerous stouter, stronger, well-developed & curved cirri all round the centro-dorsal and the excessive development of minute spines on the distal edges of the brachials and the pinnule segments. These excessive spines give *C. samoanus*. especially when preserved in alcohol, a characteristic "dry" feeling which is quite different from the "soft" feeling of *C. parvicirrus*.

PAKISTAN COASTS AND COASTAL WATERS ECHINODERM FAUNA
LIST WITH DISTRIBUTION.

Name	Locality	Recorded Distribution in Pakistan.
CLASS.—ASTEROIDEA.		
Family : <i>Astropectinidae.</i>		
<i>Astropecten indicus</i> Doderlein	Keamari Coast Karachi.	East Pakistan : Sonadia Island, Cox's Bazar Coast, St. Martin Island, Muheshkhali Island. West Pakistan : Sind, Karachi and Mekran Coasts.
<i>Astropecten euryacanthus</i> Lutken.	Cox's Bazar Coast. District Chittagong East Pakistan.	East Pakistan : Only recorded from Cox's Bazar and Sonadia Island.
Family : <i>Goniasteridae.</i>		
<i>Anthenea rudis</i> koehler	.. Oyster Island, Karachi.	West Pakistan : Karachi and Mekran Coasts.
Family : <i>Luidiidae.</i>		
<i>Luidia maculata</i> Muller and Troachel.	Off Monora Island, Karachi.	Collected only form Karachi Coastal waters by dredging upto 15 fathoms.
Family : <i>Asterindae.</i>		
<i>Asterina lorioli</i> Koehler.	Native, Jetty, Karachi.	East Pakistan : St. Martin Island. West Pakistan : Throughout the entire coasts.
<i>Asterina burtonii</i> Gray	.. Ormara, Mekran Coast, West Pakistan.	West Pakistan : Karachi, Mekran Coasts.
CLASS. OPHIUROIDEA.		
Family : <i>Ophiolepidadae.</i>		
<i>Ophioplocus imbricatus</i> Muller and Troschel.	Monora Island, Karachi.	East Pakistan : St. Martin Island Cox's Bazar. West Pakistan : Karachi, Mekran and Sind Coasts.
Family : <i>Ophiodermatidae.</i>		
<i>Ophiopeza fallax</i> Peters	.. Bulejee Village Coast, Karachi.	Collected only from Karachi Coasts
Family : <i>Ophiotrichidae.</i>		
<i>Macrophiothrix aspidota</i> Muller and Troschel.	Manora Island, Karachi.	East Pakistan : St. Martin Island. West Pakistan : Throughout the entire coasts.
Family : <i>Ophiolithonidae.</i>		
<i>Ophionereis dubia</i> Muller and Troschel.	Bulejee Village Coast, Karachi.	Karachi Coast.

Name	Locality	Recorded	Distribution in Pakistan
Family : <i>Amphiuridae</i> .			
<i>Amphiura (Ophiopeltis) tenuis</i> H. L. Clark.	Baba Island, Karachi.	Recorded only	from Karachi Coast.
CLASS.—ECHINOIDEA.			
Family : <i>Echinometridae</i> .			
<i>Echinometra mathaei</i> de Blainville.	Astola Island, Mekran Coast, West Pakistan.	East Pakistan :	St. Martin Island.
		West Pakistan :	Karachi and Mekran Coasts.
CLASS.—ECHINOIDEA.			
Family : <i>Echinometridae</i> .			
<i>Echinostrephus molaris</i> de Blainville.	Astola Island, Mekran Coast, West Pakistan.	West Pakistan :	Karachi and Mekran Coasts.
Family : <i>Stomopneustidae</i> .			
<i>Stomopneustes variolaris</i> Lamarck.	Bulejee Village Coast, Karachi.	East Pakistan :	St. Martin Island.
		West Pakistan :	Karachi and Mekran Coasts.
Family : <i>Temnopleuridae</i> .			
<i>Temnopleurus tereumaticus</i> Leske	Pateka Panj Karachi.	Recorded only from	Karachi coastal waters by dredging up to 15 fms.
Family : <i>Clypeasteridae</i> .			
<i>Clypeaster varispinus</i> de Meijere.	Pateka Panj Karachi.	East Pakistan :	Sonadia Island and Muheshkhali Island.
		West Pakistan :	Karachi coast, and by dredging too, up to 10 fms.
Family : <i>Arachnoididae</i> .			
<i>Arachnoides placenta</i> Linnaeus.	Sonadia Island East Pakistan.	East Pakistan :	Sonadia Island and Muheshkhali Island.
		West Pakistan :	Karachi Coast, 2 By dredging too, up to 10 fms.
CLASS.—HOLOTHURIOIDEA.			
Family : <i>Cucumariidae</i> .			
<i>Steroedoernia forbesi</i> Bell ..	Cape Mounze, Karachi.	East Pakistan :	St. Martin Island.
		West Pakistan :	Karachi and Mekran Coasts.
<i>Staurothyone rosacea</i> Semper.	Bulejee Village Coast, Karachi.	East Pakistan :	St. Martin Island.
		West Pakistan :	Karachi and Mekran Coasts.
<i>Stolus buccalis</i> Stimpson ..	Do. ..	Do.	Do.

Name	Locality	Recorded Distribution in Pakistan.
Family : <i>Holothuriidae</i> .		
<i>Actinopyga mauritiana</i> Quoy and Gaimord	Cape-Mounze, Karachi.	Karachi and Mekran Coasts.
Family : <i>Synaptidae</i> .		
<i>Synapta inhaerens</i> Muller. ..	Bulejee Village Coast, Karachi.	Recorded only from Karachi Coast.
CLASS.—CRINOIDEA.		
Family : <i>Comasteridae</i> .		
<i>Comanthus parvicirrus</i> A. H. Clark.	Jewani, Mekran Coast, West Pakistan.	East Pakistan St. Martins Island. West Pakistan : Jewani, Gwadar, Mekran Coasts.
<i>Comanthus samoanus</i> A. H. Clark	Do. ..	Do.

Acknowledgement.

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A NEW TREMATODE PARASITE *ACEROINTESTINECOLA KARACHI-ENSIS* N. G. N. SP. (SUB. FAMILY STOMACHICOLINAE YAMAGUTI, 1934) FROM THE INTESTINE OF A FISH.

BY

ISHRAT JAHAN

Zoological Survey of Pakistan

In a survey of trematodes of marine fishes, a new parasitic form was recovered from the intestine of a fish of the genus *Cybium*. These fishes were obtained from the landing of fishes at Karachi Fish Harbour and also from various local fish markets. This new form simulate the characteristics of the sub-family *Stomachicolinae* and differs in a very many characteristics from the described genera *Stomachicola* (Yamaguti 1934) and *Allostomachicola* (Srivastava 1939). The four specimens collected exhibit a marked difference in character from the two already described genera, more especially in the general outline of the body, size and position of various organs. This suggests that this parasite be proposed as *Acerointestinecola* n.g. All the specimens were fixed in 70 per cent. alcohol and prepared for studies by staining with Borax carmine. The measurements are in mm.

Description :

(With characteristics of the genus based on four specimens from one host).

Body long, slender, 10 mm—43 mm in length. Anterior extremity somewhat conical; posterior extremity broadly attenuate. Body gradually tapering, smooth, unarmed, widest midway between the oral sucker and the acetabulum: 1.054—1.87 mm in maximum width. Oral sucker terminal without pre-oral lobe; 0.136×0.153 — 0.476×0.34 mm in diameter and feebly curved ventrally. Acetabulum about $1/10$ the distance from the anterior end, very much muscular, five times larger than the oral sucker; 0.596×0.646 — 0.935×1.105 mm in diameter. Genital pore at the level of pharynx. Excretory pore at the posterior extremity. Pre-pharynx lacking. Pharynx globular with well defined circular muscles and lie immediately close behind the oral sucker: 0.05—0.323 mm in length. Oesophagus elongate, tubular: 0.225—0.425 mm in length. Intestinal caeca simple, straight, equal, extending almost to posterior end of the body, and without upward buldge at the pharyngeal level. Testes spherical, oblique, sub-equal, far behind the acetabulum, mostly extracaecal and separated by uterine coils. Anterior testis situated laterally and close to the middle line of the seminal vesicle; posterior testis

much closer to the posterior margin: 0.289—0.323 mm in diameter. Seminal vesicle large ovoid post-acetabular, intercaecal: 0.714×0.493 —0.782 $\times 0.51$ mm in size. Cirrus and cirrus sac lacking. Ovary kidney shaped, unlobed, situated behind the anterior testis and on the right side of posterior testis: 0.73×0.595 , in size, intercaecal, not overlapped by vitelline ducts. Vitellaria of seven coils arising from the shell gland and extend from near the base of seminal vesicle to a much distance proximally: 2.125—3.2179 mm; neither inter-twinning with the uterine loops nor turning into the caeca. Uterus simple, between genital pore and acetabulum, uterine coils both extra and intracaecal and extending up to the middle of the body. Hermaphroditic duct long muscular with simple coil in the pre-acetabular zone. Excretory arms united in front.

Host: *Cybium* sp.

Habitat: Intestine.

Locality: Karachi, Arabian Sea.

Holotype deposited in the Zoological Survey Department Museum, Karachi, Reg. No. 3612.

Discussion:

The sub-family *Stomachicolinae* comprises the genera *Stomachicola* (Yamaguti 1934) and *Allostomachicola* (Srivastava 1939). The new genus *Acerointestinecola* shows a much closer affinity in certain characters to *Stomachicola*, particularly in the prolongation and shape of caeca, characteristic of ovary, absence of pre-pharynx, position of seminal vesicle and the number of vitelline tubes. Its resemblance to *Allostomachicola* is apparently marked in the position of testes, the genital pore and vitelline tubes. The most distinguishing feature enabling this specimen to be called as a new genus is very well augmented in characters, such as, the absence of pre-oral lobe, the lacking of pre-pharynx, comparatively larger size of oesophagus, unshouldered caeca, five times larger size of the acetabulum, shape and position of the seminal vesicle, inconspicuous pars-prostatica and receptaculum seminis, oblique testes, unlobed kidney-shaped ovary extension of uterine coils, and position of genital pore.

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Explanation of the Figures:

- I. *Acerointestinecola karachiensis*, n.g.n.sp.
- II. Anterior end of the body.
- III. Uterine portion of the body.

Abbreviations :

Eo—Cesophagus : Ic—Intstinal caeca : O—Ovary : O.S.—Oral sucker :
 Ph—Pharynx : S.V.—Seminal vesicle : T—Testes : U—Uterus : V—
 Vitellaria : **V.S**—Ventral sucker (Acetabulum).

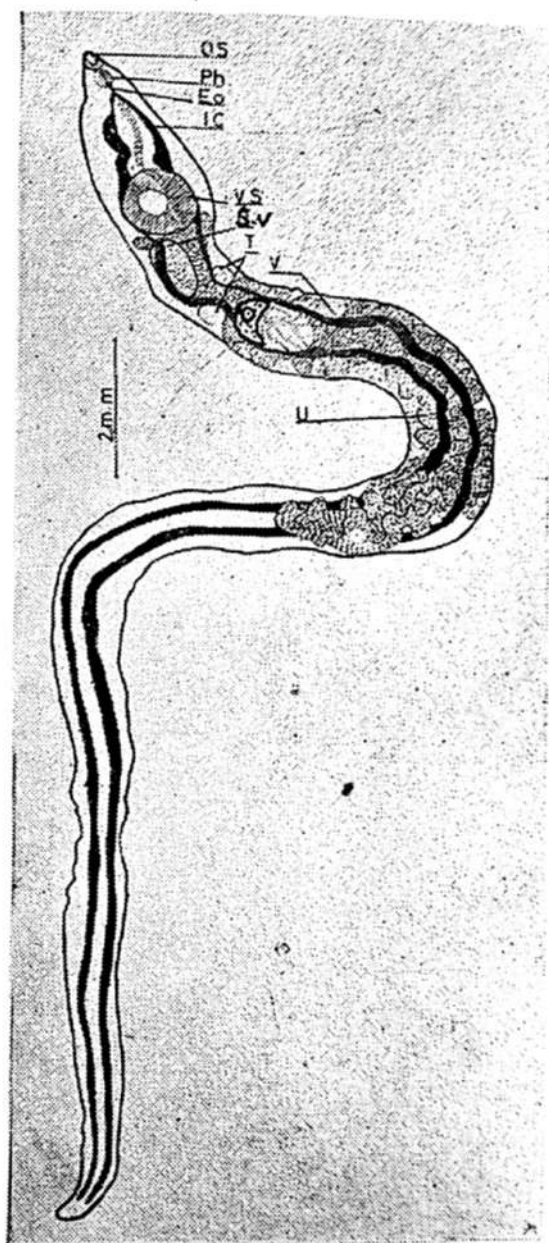


Fig. 1

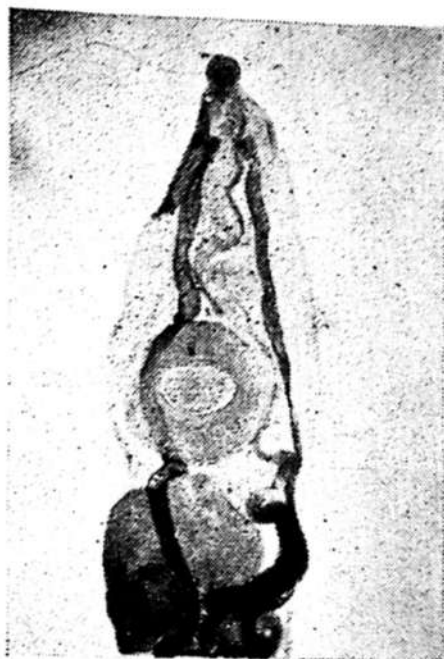


Fig. 2



Fig. 3



ON A COLLECTION OF FLIES OF THE FAMILY CALLIPHORIDAE
(DIPTERA) IN THE ZOOLOGICAL SURVEY MUSEUM, KARACHI.

BY

NOOR-UDDIN,

Zoological Survey Department

Live-stock a valuable and formidable source to our agricultural economy is being continuously confronted and poised to the attack of multitude of arthropod parasites. These pests from their direct or indirect injuries cause huge economic losses in such forms as lower production, morbidity and mortality. Green-bottles, blue bottles or blow flies have always posed a serious problem to the successful raising of sheep farming industries by the blowing off the wool as well as by causing myiasis. The annual loss due to the attack of the arthropod and the arachnid parasites together, on domesticated animals in India has been estimated to be four crores of rupees. The loss to our national wealth is in no way less and calls for a careful understanding on our part to counteract such a menace by initiating systematic studies of all such parasites. The Genera *Lucilia* and *Calliphora* are by far the most important. Patton and Cragg (1913) and Patton (1922) noted that *L. cuprina* (*L. argyrocephala*) occasionally cause myiasis. Sinton (1921) noted that *L. cuprina* as well as *L. sericata* and *L. caesar* also lay eggs on ulcer. Sen Gupta, Menon and Basu (1951) recorded several cases of wound myiasis caused by *L. cuprina* in India. Dasgupta (1962) also reported the laying of eggs by *L. porphyrina* on living toads. Haddow and Thomson (1937) reported *L. illustris* only as a secondary invader in cases of sheep myiasis and usually lay eggs on carcasses but Dasgupta and P. Roy (1969) found laying of eggs by this insect on the living experimental hosts. Harvey (1934) reported cases of myiasis by *Calliphora erythrocephala*. The various arthropod parasites of economic importance with their record and distribution in different regions of Pakistan has not received much attention so far, and the present work aims to describe the parasitic and non-parasitic insects of the family Calliphoridae from Karachi region.

Key to the Genera of Calliphoridae :

1. Blue or green flies exhibiting an exceedingly brilliant metallic colour ; thoracic macrochaetae larger beset with hairs on dorsum ; post-scutellar numerically greater and arranged along the margin, bristless on posterior abdominal segments weaker soft and invisible to the naked eye except the last segment ; femora on the whole lower surface with a comb-like row of bristles, tibia without any definite arrangement of spines, usually

less and smaller; parafacialia bare, frontal bristles smaller, but numerically greater; vein III bristly above and below almost to the anterior cross vein.

Generally purple, less brilliant, velvety brown or pale ochreous brown flies; macrochaetae on thorax rarely developed, it may be either bare or with minute soft decumbent hairs, post-scutellar bristles present or absent; bristles on posterior abdominal segment much larger and divided into marginal and discal bristles; femora on the lower surface without comb-like row of bristles, spines larger and lesser, tibial spines large and arranged in a comb-like row of spines; parafacialia with black hairs; frontal bristles larger and less; vein III with spines on node only or bristly for varying distances up to cross vein.....3.

2. Stout, stumpy, comparatively larger blue-flies with a sheen of green all along the body; face and parafacialia covered mostly by golden tomentum, frons and parafrontalia, with silvery grey tomentum; convexity above meta-thoracic spiracle with long erect hairs.....
Hemipyrellia Townsend.

Medium size, less stout green flies with a purplish or coppery sheen all along the body; face and parafacialia covered greatly by silvery tomentum and also with a few golden hairs; frons and parafrontalia with silvery white tomentum, convexity above metathoracic spiracle downy
..... Lucilia, Robineau-Desvoidy.

3. Large, mostly purple, less brilliant flies, thorax with decumbent hairs only, no bristles, eyes nearly holoptic in male; vein III bristly on node only, tibia without any definite arrangement of spines.....
..... Galliphora, Robineau-Desvoidy.

Moderately large, dull, velvety-brown or pale-brown ochreous flies, thorax without decumbent hairs, but with well developed macrochaetae; abdomen and head densely hairy, eyes dichoptic in both sexes, vein III, bristly up to varying distances of the cross vein only; the fore-tibia with a definite comb-like row of spines..... Bengalia Robineau-Desvoidy

Genus Hemipyrellia Townsend, 1918.

Hemipyrellia Tnsd. Insec. Insict. Mens. vi, p. 154, 1918.

Head.—Eyes bare, dark red, either holoptic or dichoptic frons rather narrow in male but wider in female and varying from reddish brown to black, face, parafrontalia, parafacialia and jowls covered with golden or silvery tomentum, occiput with a silvery white band, inner and outer, verticals present, fronto-orbital bristles 2.

Thorax.—Convexity above meta-thoracic spiracle with long erect hairs, dorsocentrals bristles 2—3, acrostichals, 3—2; humerals; 3, presutural 1, notopleural 2, scutellars-marginals, 8, discals 2.

Abdomen.—Nearly all segments with dark fasciae along the posterior margin; 3rd and 4th with long macrochaetae along the lateral margin; bristles more conspicuous on the last segment; genitalia more prominent in male.

Wings— with brown infuscation; vein III bristly above and below, almost to anterior cross vein; sub-coastal sclerite with short bristles; squamae white.

Legs.—Brown to black; middle tibia with one antero dorsal bristle.

Hemipyrellia ligurriens (Wiedmann), 1830

Musca ligurriens Wied. Auss. Zweift. Ins. ii. p. 655 (1830).

Musca solia Walk., List Dip. Brit. Mus. iv. p. 887 (1894).

Musca fortunata Walk., Jour. Proc. Linn. Soc. iv. p. 137 (1860).

Somomyia caeruleolimbata. Big., Bull. Soc. Zool. France, xii. p. 599 (1887).

Lucilia ballardii Patton., Ind. Jour. Med. Res. ix, p. 573 (1922).

Lucilia albopilosa Sen. Wh., Rec. Ind. Mus. xxiii, p. 130 (1926).

Hemipyrellia orientalis Tnsd., Suppl. Ent. xci, p. 56 (1927).

Hemipyrellia cyaneo-marginata Mall. (nec Macq) Proc. Linn. Soc. N. S.W. iii, p. 320 (1927).

Hemipyrellia ligurriens Auber. Proc. Zool. Soc. Lond. 1 p. 504 (1931).

Type of the genus *Lucilia fernandica* Macquart.

MALE:

Eyes reddish, contiguous in male and separated at point of closest approximation by a distance greater than width of 3rd antennal joint, Frons much narrower obliterated quite for a long space; parafrontalia rather wide with golden tomentum, as appears to the naked eye but in bright reflected light silver grey. Occiput with a silvery white band and long black hairs, Palpi orange. Proboscis dark brown with black hairs. Antennae tawny yellow, arista long and plumose. Vibrissae ascend about half way the facialia.

Dorsum shining green to deep purple heavily dusted anteriorly with silver grey pollen; hypopleura dusted on the lower part; pleurae with bristles and long hairs. Scutellum with less hairs but the bristles more conspicuous.

Abdomen shining green to purple; abdominal segments with darkened apical fasciae; 1st and 2nd abdominal tergites and sternites less hairy; the rest of the segments more hairy and denser; Hypopygium rather prominent, mesolobe divergent to a considerable distance; paralobe long slender pointed; lateral lobe elongate covering both meso and paralobes. Genitalia less hairy. Wings hyaline, costal margin and basicostal scales setulose. Legs deep brown to black.

FEMALE

Eyes reddish, not contiguous; Frons wide nearly one-fourth of the head width with silver grey tomentum. Parafrontalia and parafacialia as in males. Jowls well defined, covered with silver grey tomentum. Antennae and arista as in male. Palpi and proboscis of the same colour. Thorax as in male green to purple.

Abdomen like male, the greenish colour more conspicuous Hypopygium less prominent Wings similar to male. Legs alike in both sexes.

Material examined:

35 Specimens. 15 female, 20 male Karachi, on garbage human excreta and decomposing fruits and vegetables.

Genus *Lucilia* Robineau Desvoidy, 1830.

Lucilia R.D., Essai sur les Myodaires, p. 452, 1830.

Sonomyia Rond. part., Dipt. Ital. Prod. iv, p. 9, 1861.

Phaenicia R.D., Posth., ii, p. 750, xxx, p. 750, 1863.

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LUCILIA PAPUENSIS MACQUART, 1842.

Lucilia papuensis Macq., Mem. Soc. Roy. Sdi. Agri. Art. Lille, p. 298, 1842.

Lucilia papuensis Macq., Dipt. Exot. ii, p. 141, 1842.

Musca metilia Walk., List. Dipt. Brit. Mus. iv, p. 898, 1849.

Musca lifata Walk., List Dipt. Brit. Mus. iv, p. 871, 1849.

Lucilia cyaneo-marginata Macq., Dipt. Exot. Suppl. iv, p. 248, 1851.

id; Mem. Soc. Roy. Sci. Agri. Arts. Lille, p. 221, 1851.

Musca inducta Walk., Dipt. Saunders., p. 335, 1852.

Lucilia azurea Dol., nec. R.D. Tijdschr., Ned. Ind. xvii, p. 111, 1858.

Musca marginifera Walk., Jour Proc. Linn. Soc. iii, p. 105, 1859.

Musca inscribens Walk., Jour. Proc. Linn. Soc. iv, p. 136, 1860.

Musca nitescens Walk., Jour. Proc. Linn. Soc. v, p. 302, 1861.

Lucilia azurea Dol., nec. R.D. Nat. Tijdschr., Ned Ind. xvii, p. 111, 1857.

Somomyia nebulosa Big., (Part) Bull. Soc. Zool. Fr. p. 604, 1887.

Lucilia albopilosa S.W., Rec. Ind. Mus. xxviii, p. 131, 1926.

Lucilia claviceps Bezzi., Bull. Ent. Res. xvii, p. 233, 1927.

Lucilia papuensis D. Aub., Jour. Linn. Soc. Lond. xxxviii, p. 406, 1932—34.

Lucilia papuensis S.W., Fanna. Brit. India. 1, p. 5., 1940.

Male :

Head; Eyes bare, dull red, nearly holoplic but not totally approximated and separated at point of closet approximation by a distance equal to the width of third antennal segment. Frons obliterated at point of approximation; Parafrontals narrow, tomented silver white. Parafacialia, jowls and cheeks more or less yellowish with silver pruinescence Occiput darkened with small hairs; Palpi and proboscis brown, Antennae brown, arista plumose.

Thorax.—Shining green; very lightly dusted with silver pollen anteriorly; two pairs of post-sutural acretichal bristles inserted at the level of two posterior pairs of dorsocentral bristles.

Abdomen.—Brilliant shining green, the second and third segments less hairy and with some what darkened apical fasciae, Genitalia inconspicuous; mesolobe pointed and slightly divergent, paralobe inconspicuously haired. Lateral margin of tergites and sternite more hairy.

Wings.—Infuscated with brown more deeply at the base Basicoastal scale black: Squama dirty white.

Legs.—Blackish brown, middle tibia with one anterodorsal bristle.

Habitat.—Garden, nursery etc.

Loc.—Govt. Nursery, Karachi.

Female:

Eyes dichoptic, Frons wide, nearly equal the width of para-frontalia together, and toment silver grey., Para-frontalia wide, silver grey; Parafacilic cheek and jowls like male., Antennae, arista and other characters as in male. Thorax Shining, green to purple., chaetotaxy as in male, dorsum dusted with silver grey pollen.

Abdomen shining green to purple; second and third segments with dark apical fasciae, posterior segments dusted silver grey and with larger hairs; the remaining characters as in male. Wings like wise in male.

Legs similar to male except the female has two well developed bristles on the middle tibia—

Material examined; 10 specimens, 3 male, 7 female, Grassland and Nursery, Karachi.

Lucilia sericata (Meigen), 1826.

Musca serieata Mg., Besch. V, p. 53, 1826.

Musca tegularia Wd., Ausser, Zweifl, Ins. ii, p. 655, 1830.

Lucilia chloris Hal., Ent. Mag. i, p. 165, 1833.

Lucilia basalis Macq., Men. Soc. Roy. Agri. Arts, Lille, p. 305, 1842 id., Dipt. Exot. ii, p. 148, 1842.

Lucilia flavipennis Macq. (nec. kram) Mem. Soc. Roy. Agri. Arts, lille, p. 296, 1842; id., Dipt. Exot. iii, p. 139, 1842.

Musca lagyra Walk., List. Dipt. Brit. Mus, vi. p. 858, 1849.

? *Lucilia sayi* Jaen., Abh. Senck, Ges. vi, p. 395, 1867.

Lucilia barberi Tnsd; Smirrs. Misc. li, p. 121, 1908.

Luccilia giraulti Tnsd., Smiths. Misc. li. p. 121, 1908.

Lucilia serricata D. Aub. Jour. Linn. Soc. Lond. xxxviii, p. 411. 1932—34.

Lucilia serricata S. Wh. et al. Fauna. Brit. Ind. I, p. 54, 1940.

Male :

Head; Eyes bare, dull red, sub-holoptic and separated at point of closest approximation by a distance two times or slightly more than the width of third antennal segment. Frons narrow, more narrower posteriorly in the form of a furrow; praefrontal with fine hairs as well as frontal bristles. Face, parafacialia and jowls faint yellowish with silvery pruinescence, Antennae dark brown, Palpi orange. Proboscis brown, vibrissae not ascending the facilia. Occiput with a whitish band and black hairs.

Thorax brilliant green with silver pollen anteriorly; three postsutural acrostichal bristles. Abdomen bronzy green; anterior segments sparsely hairy, no macrochaetae on the margin of the second abdominal segment. Posterior segments and venter more hairy; hypopygium inconspicuous. Wings hyaline; more infuscated at the base; basicostal scale yellow: sub-costal selerite, with dark brown decumbent pubescence; squama white. Legs black middle tibia with one antero-dorsal bristle.

Female :

Eyes dichoptic, the distance between them nearly one third of head-width Frons wide, nearly twice the width of one parafrontalia. Frontal stripe blackish brown with silvery pruinescence, on either side. Parafrontalia silvery grey covered with bristles. Palpi orange; other characters as in male.

Thorax like-wise male.

Abdomen shiny coppery green; edges of tergites and venters with uniform hairs, hypopygium inconspicuous.

Wings as in male.

Legs similar to male.

Material examined:

25 specimens; 10 male; 15 female Burns Garden, Sewage Farm; Karachi in grassy land.

Lucilia cuprina (Wielmann), 1830.

Musca cuprina Wd., Auss. Zweifl. Ins. ii, p. 654, 1830.

Lucilia amica R.D., Moydaires, p. 453, 1830.

Lucilia elegans R.D., Myodaires, p. 458, 1830.

Lucilia argyricephala Macq., Mem. Soc. Roy. Agri. Arts, Lille, p. 326, 1846, id; Dipt. Export. Suppl. i, p. 198, 1846.

Musca fucina Wlk., List. Dipt. Brit. Mus. iv, p. 883, 1849.

Musca serenissima Wlk., Ins. Saund. pt. iv, p. 340, 1852.

Musca temperata Wlk., Ins. Saund. pt. Iv, p. 340, 1852.

Somomyia pallifrons Big., Ann. Soc. Ent. Fr. (5) vii, p. 258, 1877.

Lucilia vallescens Shn., Ins. Mens. xii, p. 76, 1924.

Strongyloneura nigricornis Sen. Wh., Spob. Zeyl. xiii, p. 115, fig. 3-1924.

Lucilia cuprina D. Aun. Jour. Linn. Ioc. Lond. xxxviii, p.—, 1932—34.

Lucilia cuprina Sen. Wh., et. al., Fauna Brit. Ind; i, p. 55, 1940.

Male:

Head; Eyes bare, dull red rather sub-holoptic and separated at the point of closest approximation by a distance three to four times the width of third antennal segment. Frons nearly twice the width of para-frontalia and tomented with silvery pruinescence. Parafacialia with fine hairs outside the frontals. Parafacialia, Face and Cheek with silvery pruinescence. Parafacialia bare. Palpi orange. Proboscis brown, Occiput with a silvery white band; Aantennae brownish, arista long and plumose.

Thorax Shining green; three post-sutural acrostichal bristales. Abdomen shining green with a coppery sheen: abodmen some what arched; sides of tergites and sternites with bunches of long hairs, Hypopygium rather prominent. Wings Hayline, basally some what brownish yellow basicostal scale pale yellow; sub-costal sclerite without upstanding hairs. Legs, Black, middle tibia with one-antero-dorsal bristle.

Female:

Eyes dichoptic, separated by a space nearly one, third of head width, Frons rather wide some-what blackened with silvery pruinescence; Para-frontalia bare; Parafacialia, face and genae with silvery pruniescence, other characters as in male.

Thorax similar to male.

Adbomen shining green to coppery; less hairy; pubescence somewhat conspicuous on the last abdominal segment; hypopygium less prominent. Wings like male; Squama white. Legs similar to male.

Material examined:

15 specimens; 4 male, 11 female, Grassland and Nursery around Karachi.

Genus *Calliphora* Romineau-Desvoidy, 1830.

Calliphora R-D, Myodaires, p. 433, 1830.

Mufetia R-D, Myodaires, p. 431, 1830.

Mya Rond. N, Ann. Sci. Nat. Bologna (3), ii, p. 175, 1851.

Somomiya Rond, N. (Part) Atti. Acad. Sci. Bologna p. 4, 1861.

Compsomiya Rond, N. (part) Ann. Mus. Genov. vii, p. 425, 1875.

Eucamiphora Tnsd., Smiths. Misc. Coll. ii, p. 118, 1908.

Trycyclopsis Vill., Rev. Zool. Afr. xv, p. 388, 1927.

Pseudo-calliphora Mall, Suppl. Ent. xvi, p. 51, 1927.

Aldrichiella Rond, N. Zool. Anz. xcv, p. 177, 1931.

Aldrichina Tnsd, Man. Myio. v. p. 135, 1937.

Calliphora Sen. Wh., Fauna. Brit. Ind., i, p. 32, 1940.

Type to the genus *Musca erythrocephala*.

Head.—Large size metallic purplish flies. Eyes in male nearly holoptic and in female dichoptic. Frons greatly narrowed in male broader in female. Parafrontalia silver grey. Jowls and epistome reddish or black. Arista long plumose. Verticals strong and crossed in male. Outer verticals absent. Female with two fronto-orbitals.

Thorax—Acrostichals 2 : 3, Dorsocentrals 3 : 3, Humeralis 4, Posthumeralis 2, Notopleurals 2, Supra-alars 4, Postalars 2, Sternopleurals 2:1, Scutellars—Marginals 10, Discals 2.

Abdomen.—Purplish with one marginal bristles on 3rd segment, discal and marginal bristles on 4th segments are much more prominent. Hypopygium inconspicuous.

Wings.—Dusty hyaline, vien III bristly on node only, squama with long hairs.

Legs.—Black

Calliphora erythrocephla (Meigen), 1826.*Musca erythrocephla* Mg., Syst. Besch., v, p. 62, 1826.*Musca erythrocephla* Weid., Auss. Zweifl. Ins. ii, p. 395, 1830.*Calliphora littoralis* R-D., Myodaires., p. 435, 1830.*Calliphora vicina* R-D., ibid., p. 435, 1830.*Calliphora monospelica* R-D., ibid., p. 436, 1830.*Calliphora musca* R-D., ibid., p. 436, 1830.*Calliphora nana* R-D., ibid., p. 436, 1830.*Calliphora scutellata* Macq., Soc. Sci. Lille., p. 161, 1833-34.*Musca aucta* Walk., nec. Patton., Ins. Saund., p. 334, 1852.*Calliphora insidiosa* R-D., Posth., ii, p. 695, 1863.*Musca vomitoria auctt.*, nec. Linn.*Calliphora erythrocephala* Sn. Wh., Rec. Ind. Mus., xxviii, p. 129, 1926.*Calliphora erythrocephla* Sn. Wh. et. al., Fauna. Brit. Ind., I, p. 33, 1940.**Female :**

Head ; Eyes testaceous brown and not contiguous, separated by a distance nearly one-third of head width. Frons pale yellowish with silvery grey pruinescence. Parafrontalia silver grey. Face yellowish red ; parafacialia reddish grey. Jowls dull reddish grey, epistome reddish, check with few black bristles. Occiput with a narrow silvery grey band. Palpi pale yellow, proboscis reddish brown. Antenna reddish brown.

Thorax.—Dull blackish blue dusted with silver grey pollen anteriorly.

Abdomen.—Greenish blue with slaty blue reflections and silver pollen. bristly all over ; the bristles larger on 3rd and 4th segments, venter less spinulose, hypopygium less conspicuous. Wings hyaline darkened at the base, basicostal scale deep brown, subcostal sclerite with tawny pubescence, squama dull brown with whitish edge. Legs black.

Material examined:

2 specimens female from Karachi.

Genus *Bengalia* Robineau-Desvoidy, 1830.

Bengalia R-D, *Myodaires.*, p. 425, 1830.

Ochromyia Macq., *Suit. a Buff.*, ii, p. 248, 1835.

Anisomyia Walk., *Proc.*, Linn. Soc. Lond. iv, p. 135, 1860.

Homodixia Bigot., *Ann. Soc. Ent. France.* (6) v, Bull. p. 26, 1885.

Bengalia Sen. Wh., et. al., *Fauna. Brit. Ind.* i, p. 83, 1940.

Type of the genus *Homodexia obscuripennis* Biggot.

Head—Eyes widely separated in both sexes. Frons densely hairy and nearly one-third of head width. Parafrontalia bristly, face with pubescence. Prelabrum large and projecting. Vibrassae conspicuous and ascends the epistomal margin. Antennae long, arista plumose almost to tip. Proboscis well developed with long hairs. Inner and outer verticals present.

Thorax.—Acrostichals I pair, Dorsocentrals 2 : 4 pairs, Humeralis 2 pairs, Notopleurals 2 pairs, Presuturals i pair, Supra-alar 4 pairs, Postalar 2 pairs, Scutellars-apical I pair and marginal 2 pairs, Sternopleural I:I pair.

Abdomen; Pubescent, yellowish or velvety brown in colour, macrochaetae on 3rd and 4th segments visible.

Wings; Vein iv strongly angled and joining the costa before wing margin, 1st posterior cell almost closed, vein III spinulose for varying distances of cross vein, squama large.

Legs; Mid-femur with a comb-like set of bristles ventral side of fore.tibia armed with 5-6 spines, with fringes of hairs in male only.

Bengalia jejuna, var *quadrinotata* (Bigot), 1887

Musca jejuna Fab., *Ent. Syst.* iv, p. 312, 1794.

Musca torosa Wd., *Zool. Mag.* iii, pp. 21-9, 1819.

Ochromyia quadrinotata, Big., *Bull Soc. Zool. Fr.* p. 608, 1887.

Bengalia jejuna var *quadrinotata*, Sen. Wh. et. al., *Fauna. Brit. Ind.* vi, p. 90-91. 1940.

Male :

Head ; Eyes black separated by a distance nearly one-third of head width. Frons hairy and yellowish grey. Parafrontalia more greyish rather pubescent and bristly. Face yellowish white and parafacialia shimmering white. Buccae yellowish grey. Occiput whitish grey covered with greyish hairs. Proboscis ochreous, palpi yellowish with black hairs. Antennae 1st and 2nd segments ochreous, 3rd darker and brownish grey, arista long and plumose up to the tips.

Thorax ; Ochreous brown with greyish tomentum and black bristles, pleurae concolorous and densely hairy.

Abdomen ; Pale yellowish brown, tomented and more darkened posteriorly ; 1st and 2nd segments with indistinct black bands ; 3rd with an irregular broad blackish band which is also apparent on 4th. Venter 1st and 2nd segments shimmering whitish-yellow rest of venter and dorsum concolours to the end segment, marginal macrochaetae begin from 3rd segment ; 4th segment with a distal macrochaeta.

Wing ; Clear infuscated at the base, basicostal scale yellowish brown, subcostal sclerite yellowish, squama yellowish white.

Legs ; Upper surface of femora greyish black, which is apparent on the fore and the mid femora, the hind femora conspicuously more yellowish fore tibia in male with 5 pre and 2 post median spines, tarsal tips darkened.

Material examined ; I specimen male from Karachi.

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Parasitology. 52, 63-5.
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