RECENT BIOLOGICAL INVESTIGATIONS IN THE RED SEA ALONG THE A.R.E. COASTS

I- On Some Demersal Fishes of Economic Importance from the Red Sea with notes on migration of fish through the Suez Canal.

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INTRODUCTION

Biological knowledge of the important economic fishes is sometimes hindered by the lack of complete and comprehensive taxonomical work. The Red Sea and the Gulf of Suez are in this respect the least studied areas in the Indo-Pacific region.

Earlier works in the Red Sea as Luksch (1901) Vercelli (1925) Sanzo (1930), Mabahiss (The John Murray Expedition 1933-1934), as well as the Cambridge Expedition to the Suez Canal Fox (1926) are mainly hydrological ones.

From the biological and taxonomical aspects the Red Sea had by no means been explored. Our knowledge of its fauna goes back to the time of Forskal (1775), Rüppel (1837), Klunzinger (1870, 1884), Gunther (1870), Keller (1882) and Steindachner (1898).

After the opening of the Suez Canal in 1869 several fishes have entered the canal and its lakes from both the Red and the Mediterranean Seas. The most earlier note in this respect might be on the fishes sent to the British Museum (Natural History) in 1871. Tillier (1902) recorded about 80 species of fish in the Suez Canal. The exchanges between the fish fauna of the Mediterranean and the Red Sea have posed an important problem however little work have been done. This problem has been worked by Norman (1927 and 1929); Chabanaud (1931, 1932, 1933 and 1934); Gruvel and Chabanaud (1937); Bertin (1943); Haas and Steinitz (1947); Kosswig (1950); Tortonese (1953 and 1964); Clark and Gohar (1953); Ben Tuvia (1953, 1963 and 1966) and Gohar (1954).

Recently the North Western Red Sea area as well as the Gulf of Suez and the Gulf of Aqaba have been the subject for study of some groups of Fish from the morphological and physiological point of view.

Mention may be made of Al-Hussaini (1947) Gohar (1948), Melouk (1949), 1953 and 1957), Marshall (1952), Hamdy (1952 and 1956), El-Toubi and Hamdy (1959), Gohar and Bayoumi (1959), Gohar and Latif (1959), Nassef (1961), Gohar and Mazhar (1964 a and b), Badawi (1964), El-Kholy (1965), Gorgy (1966), Latif (1967) and Bayoumi (1967 a and b and 1969).

Research has been in progress on some of the economic fishes in the area including families Synodontidae, Mullidae, Scaridae, Lethrinidae, Sparidae, Sphyraenidae, Carangidae and Platycephalidae. The results of these studies will be published in due time.

Neverthless from the above mentioned historical review, it is clear that the Fish Fauna of the Red Sea has been neglected for a long time, and a comprehensive survey and continued study of the fauna of this area and neighbouring waters are badly needed. Therefore, with the facilities of the Institute of Oceanography and Fisheries the author has been studying the fish fauna of the North-western Red Sea, the Gulf of Suez as well as the Suez Canal and its Lakes. The results of such investigation will be published in a series.

Sampling stations, Aim and Scope of work :

The present work is based on the collection of Fish in the Red Sea Institute of Oceanography and Fisheries, and the collection which has been made by the author from 1963 - 1967 during his work at the Suez branch of the Institute. It is also based on the results of trawling carried on board the R.V. Ichthyolog during its Scientific investigation in the north-western part of the Red Sea, the Gulf of Suez and Suez Canal and its Lakes (in the summer of 1966).

The present study covers the stations named in Table I and Fig. 1, where trawling took place. Although these stations do not cover the whole area of the Gulf which extends about 4000 square kilometeres, but it is hoped that the study will throw some light on the fauna of the Red Sea.

It deals with some of the demersal fishes, with notes on the commonest types among the catch. A comment is being given on the distribution of some of these fishes. with reference to their migration through the Suez Canal.

Most of the specimens obtained were determined on board the research vessel. The length of fishes in mm. (standard length) unless otherwise stated. Observations on ecology, feeding habits and spawning were given for some of the fishes described.

Physical Conditions of the Red Sea :

Clark and Gohar (1953), Gohar (1954) described the topography of the Red Sea. The greatest depths are about 2000 meters in areas extending along the long axis of the sea, parallel to the sides and more to the east. However, in the south it is separated from the Indian Ocean by a narrow shallow about 100 meters deep which lies north to the Straits of Bab-el-Mandab.

In the North, the Red Sea ends on the east in the Gulf of Aqaba which is closed and has no water connection with marine area. On the North-west, the Red Sea leads to the Gulf of Suez which is connected with the Mediterranean through the Suez Canal (162 Kms.). The Gulf of Suez is shallow when compared to the Gulf of Aqaba. At the entrance of the former the recorded depth is about 80 meters decreases to 60 meters in the main part of the Gulf, then it decreases gradually towards the head where sedimentation is continually going on. The Suez Bay is shallow, with great amount of mud and sand, the depth is not more than 18 meters in the middle, and very shallow near the shore line.

Bottom samples were taken by a modified Petersen grap. The characters of the bottom are tabulated in Table I, where it is stated against the individual stations. It is found that the bottom of the Gulf of Suez and the Red Sea is formed of sand, clay and calcareous deposits and sediments as mentioned in Table I.

The physical condition of the Gulf of Suez and the North-western part of of the Red Sea was carried out by (El-Sabeh, 1968, 1969). The highest salinity in the Gulf and the north-western part of the Red Sea is around 42 g/kg and 41g/kg respectively. The average surface water temperature is about 27 C and 26.5 C in summer and 16 C and 15 C in winter.

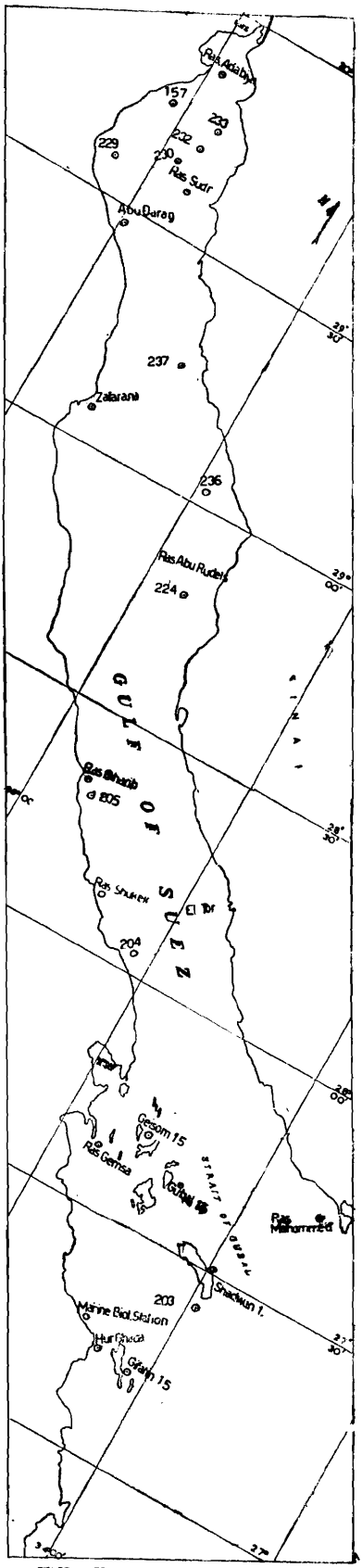

FIGURE 1. TRAWLING STATIONS IN THE GULF OF SUEZ.

TABLE 1.—List of Stations

St. No.	Date	Time Beginning-End	N. Lat.	E. Long.	Depth	Gear	Wind force and its direction	Atmos. pressure	Swell	Ground
157	2/9/66	11.03—12.40	29° 54'2"	32° 29'	38	Bottom trawl	2 NNW	767.3	1	blackish-grey deposits.
199	14/9/66	11.10—12.00	26° 42' 1"	33° 56' 9"	35	,,	Calm	765.8	0	Somewhat dark clay deposits.
203	14/9/66	20.03—21.25	27° 25'	34° 01' 9"	640	Pelagic trawl	2 NW	766.2	1	Whitish grey calcareous mud.
204	15/9/66	07.40—09.20	28° 03' 4"	33° 27'	86	,,	5 NW	768	3	Blackish grey silt & free light calcareous.
205	15/9/66	12.25—14.20	28° 20'	33° 9' 5"	60	Bottom trawl	4 NW	768.5	3	Blackish grey calcareous silt deposit.
224	19/9/66	13.10—14.45	28° 48' 6"	33° 6' 2"	55	,,	7 NW	768	5	pale brick-like silt and clay.
229	20/9/66	6.55—8 .30	29° 34'	32° 24' 6"	44	,,	2 NNW	771	1	blackish grey silt sediments.
230	20/9/66	9.47—10.50	29° 37'	32° 32'	60	,,	1 NW	771	0	
231	20/9/66	11.30—13.00	29° 38' 4"	32° 27'	40	,,	1 NW	772	0	
232	20/9/66	13.55—15.32	29° 41' 5"	32° 36'	39—42	,,	light wind	771	0	brownish grey.
233	20/9/66	15.38—17.00	29° 44' 4"	32° 37' 5"	42	,,	2 N	770	1	greenish grey silt.
236	21/9/66	6.53—08.00	29° 4'	33° 2' 2"	44	,,	2 N	770	1	strawish grey clay.
237	21/9/66	10.30—12.00	29° 15' 2"	32° 50' 8"	36	,,	1 N	779	0	pale brown silt.

The Red Sea is characterised by its isohaline and isothermal nature of the water below 200 meters and the complete absence of cold deep water layer.

Systematic Synopsis of Material Collected

In this synopsis the demersal specimens collected during the investigation are listed, however, the present paper will deal only with those fish of economical importance. The others will be the subject of another paper which will be published in the future.

Family Plotosidae

Plotosus anguillaris (Lacepede)

Family Synodontidae

* *Saurida undosquamus* (Richardson)
* *Sauridae tumbil* (Bloch)
* *Synodus indicus* (Day)
* *Trachinocephalus myops* (Schneider)

Family Bothidae

Bothus pantherinus (Ruppell)

amily Cynoglossidae

Cynoglossoides gilchristi (Regan)

Family Parapercidae

Parapercis nebulosa Quoy and Gaimard

Family Callionymidae

Callionymus persicus Regan

amily Serranidae

* *Epinephelus fario* (Thunberg)
* *E.—tiauvina* (Forskal)
* *Serranus cabrilla* (Linn.)

Family Carangidae

* *Decapterus sanctae-helenae* (Cuvier)
Caranx mate (Cuvier)

Family Mullidae

* *Upeneus vittatus* (Forskal)
U. sulphurus Cuv. and Val.
U. bensasi (Schlegel)
* *Mulloidichthys auriflamma* (Forskal)
* *Upeneus tragula* (Richardson)

Family Leiognathidae

* *Leiognathus bindus* (Cuv. and Val.)

Family Gerridae

Gerres rappi (Barnard)

Family Nemipteridae

* *Nemipterus japonicus* (Bloch)
* *N. marginatus* (Cuv. and Val.)

Family Pomadasyidae

Rhonciscus striatus (Gilchrist and Thompson)
* *R. stridens* (Forskal)

Family Scolopsidae

Parascolopsis eriomma (J. and Richardson)

Family Caesiodidae

Caesio caerulaureus (Lacépède)

Family Pomacentridae

* *Pomacentrus jerdoni* Day

Family Sparidae

* *Argyrops spinifer* (Forsk.)
A. filamentosus (Val.)
* *Crenidens crenidens crenidens* (Forsk.)
Diplodus noct (Cuv. and Val.)

Family Labridae

Cheilinus diagrammus Lacépède

Family Scomberomoridae

* *Scomberomorus commersonii* (Lacépède)

Family Platycephlidae

Platycephalus indicus (Linn.)
P. tuberculatus (Cuv. and Val).
P. pristis (Peters)

Family Triglidae

Lepidotrig a longipinnis Alcock

Family Aluteridae

* *Alutera monoceros* (Linn.)

Family Tetraodontidae

Lagocephalus suezensis Clark and Gohar
L. lunaris Bloch and Schneider

Family Scorpaenidae

Dendrochirus brachypterus (Cuv.)
Apistus carinatus (Bloch)

* The commonest economic fishes studied in this paper.

Decapterus and *Caranx* though not demersal fishes but they appeared in large quantities among the catch.

Species composition

The above mentioned systematic synopsis represents a record of demersal fishes comprising the trawl catch, as well as some fishes as *Decapterus* and *Caranx*, which though of pelagic nature, are known to undergo diurnal vertical migration. However, of the many species taken the lizard-fish *Saurida undosquamus* were the most important economically followed by the horse-mackerel, *Decapterus sanctae-helenae* and the sea - breams, *Argyrops spinifer* and then the red mullet, *Upeneus vittatus*, then comes *Rhonciscus stridens* followed by *Nemipterus japonicus* as well as *Alutera monoceros* and *Scomberomorus commersonii.*

These fishes are caught throughout the year, but in different quantities, during the fishing season, which lasts for nine months starting from October till June, in the Gulf of Suez.

Analysis of the catch Table II reveals thst during the investigation (August and Sptember, 1966), the percentage of the different species of commercial importance were as follows: *Saurida undosquamus* form 31.6% of the catch, *Decapterus sanctae-helenae* 31.5%, *Argyrops spinifer* 11.8%, *Upeneus vittatus* 10%, *Rhonciscus stridens* 5.8%, *Nemipterus japonicus* 3.5%, *Alutera monoceros* 2%, and *Scomberomorus commersonii* about 2%. The rest of the catch are fishes of little importance economically.

TABLE 2.– SPECIES COMPOSITION OF THE CATCH*

Station	Total catch in kgm	1	2	3	4	5	6	7
157	90.39	34%	41%	10%	—	—	—	—
199	20.80	30%	20%	10%	5%	25%	2%	1%
203	14.60	21%	38%	10%	12%	—	3%	—
204	36.50	45%	3%	11%	14%	2%	—	—
205	24.28	32%	40%	12%	10%	1%	—	—
224	34.45	20%	38%	10%	10%	—	10%	8%
229	138.61	21%	32%	10%	6%	—	14%	10%
230	69.72	42%	24%	15%	10%	—	8%	—
231	34.65	40%	22%	14%	12%	—	—	7%
232	71.06	24%	40%	10%	—	—	(20)	±+ 4%
233	28.57	30%	16%	9%	—	(15)=	(6)	±+ 22%
236	20.95	43%	3 5%	7%	12%	—	5%	18%
237	16.24	41%	4.0%	12%	14%	10%	8%	6%
		31.6 %	31.5 %	11.8 %	10%	2%	3.5 %	5.8 %

* This composition of the catch is limited to August and September of 1966.

1— *Saurida undosquamus*

2— *Decapterus sanctae-helenae*

3— *Argyrops spinifer*

4— *Upeneus vittatus*

±+ *Scomberomorus commersonii*

5— *Upeneo*

5— *Nemipterus japonicus*

7— *Rhonciscus stridens*

= *Alutera monoceros*

The Length Frequency of the Four Commonest Species

A knowledge of the size of fish comprising the commerical catch is essential, although this type of study is beyond the scope of this paper, yet a brief account may be given here.

Standard length of 1400 specimens of *Sauridae undosquamus*, 1250 of *Decapterus sanctae-helenae*, 900 of *Argyrops spinifer* and 600 of *Upeneus vittatus* were taken. The average length of *Sauridae* during that period of the year was 105 mm., and of *Decapterus* 125 mm., that of *Argyrops* was 112 mm. and of *Upeneus* 95 mm.

Annotated List of The Demersal Species of economic importance in The Gulf of Suez :

Family Synodontidae

Trachinocephalus myops (Schneider), Arabic local name 'Haret' *Salmo myops* Schneider Bloch, 1801, Syst. Icth. : 421 *Synodus* (*Trachinocephalus*) *myops* Steindachner, 1907, Denks. Ak. Wiss. Wien, vol 71, pt. 1 p. 154.

Synodus myops, Steindachner, 1907, p. 166 (South Arabia).

Trachinocephalus myops Ben-Tuvia and Steinitz, 1952, Israel Dep. F. Sea Res. Bull. No. 2, p. 4.

The gill-rakers of this fish are in the form of clusters of small sharp denticles, teeth are sharp, some are more or less caninelike, the swim-bladder is small and deeply situated in the body cavity. Colour : It is light yellowish brown, with 6 slightly bluish long stripes on the back. The dorsal fin is yellowish with slightly dark spots.

This species is not so common among the catch, it only forms about 1% of the total catch of lizard-fish, however, it is often met with when fishing in areas of sandy patches among rocky corals covered bottoms, where the water is not more than 20 meters deep.

Saurida undosquamus (Richardson) local Arabic name "Haret".

Saurida undosquamus Richardson, 1884, Zool. voy. Erebus and terror, Fish, p. 138 pl. 51.

Saurida undosquamus Norman, 1939, John Murray Exped. Rep., vol. 7 No. 1, p. 23.

Colour : Greyish brown above, body silvery white or yellowish below, on the side there are several dark spots scattered irregularly. The fins are blackish terminally, anal and pelvic fins are yellowhish.

It is the most common species of lizard-fish among the catch throughout the year in the area investigated, and is equally distributed in most of the areas of the Gulf of Suez.

Saurida tumbil (Bloch) local Arabic name "Haret".

Salmo tumbil Bloch, 1795, Naturgesch, Aust. Fische, vol. 9 p. 112, pl. 430.

Saurida tombil Valencienne, 1849, Hist. Nat. Poiss. vol. 22.

Saurida tumbil Klunzinger, 1871, Verh. Zool. bot. Ges. Wien, vol. 21, p. 591 (Koseir and Red Sea).

The lower jaw is slightly shorter than the upper, the mouth is somewhat oblique, teeth are sharp and the anterior ones are smaller than the innermost. The outer band of teeth of the palatine are not in two rows, which is similar to that of *S. tumbil* from Japan. (Matsubara and Iwai, 1951). However, Norman (1935) stated that these bands of teeth are set in three or more rows anteriorly.

The eye is relatively larger than in *S. undosquamis*. The male of *S. tumbil* has an elongated filamentous second dorsal ray in specimens larger than 200 mm. standard length. Such elongation of the second dorsal ray cannot be seen in any other species of lizardfish obtained during our survey.

Colour: brownish above, becoming lighter or whitish on belly, black dots are scattered on the dorsal, pectoral and caudal fins.

Family Serranidae

Epinephelus fario (Thunberg)

Perca fario Thunberg, Kon. Vet. Acad. Nya Handl. Stockholm, 1793, vol. 4 p. 296.

Epinephelus maculatus Peters, Akad. Wiss. Berlin, Monatsb., 1877, p. 831.

Serranus fario Fowler and Bean, U.S. Nat. Mus. Bull. No. 100 vol. 10 p. 249, 1930.

The lateral line is slightly curved anteriorly becoming more or less straight, The preoperculum is evenly serrated with a couple of large spines on the angle. the caudal fin is slightly emarginate.

Colour: It is brownish generally with yellowish spots over the head and body, which are equal in size to the pale interspaces. The pectoral fin is yellowish and the tips of the dorsal fin blackish.

This differs from the colour described for *Serranus fario* from Fiji (Fowler, 1959), who stated that the spots on head and body and fins are blackish, and the fins are all shaded more or less darker than the body colour or with neutral tint.

This fish was obtained from the Gulf of Suez off Ras - Ghareb, however, it is not very common in the Red Sea. It differs in colour from that of Seychelles described by Smith in 1963, also the tail in our specimens is emarginatein contrary to the truncate tail in Seychelles specimens.

Epinephelus tauvina (Forskal) local Arabic name "Koshar Taweenah".

Serranus malabaricus Schneider

Epinephelus malabaricus Schneider

Epinephelus multinotatus Peters

It is similar to *E. tauvina* described in other work on the Red Sea. There is nothing in particular concerning this species.

Serranus cabrilla (Linnaeus)

The dorsal spines are graduated, with the first two notably shorter than the remaining eight. The dorsal fin is not notched and the ninth and tenth spines are subequal. The caudal fin is shallow and forked, when it is moderately expanded the edge is a little concave like a half-moon. The anal spines are graduated, the first is shortest, the second thickest and the third slightly longer.

The body is more or less yellowish-grey to reddish-grey. It is characterised by the presence of 9 vertical brownish bars followed by three horizontal yellowish stripes below them. There are three similar horizontal orange or pale violet strip. es on each cheek. The posterior edge of the caudal fin is darker than the anter. ior part.

We collected the present specimens from the Bitter lakes and the northern region of the Gulf of Suez, however, it is rarely met with in its southern region, and none of them are caught from Al-Ghardaqa.

Family Mullidae

Upeneus vittatus (Forskal) local Arabic name "Barbouni".

Mullus vittatus Forskal, Descr. Animal., 1775, p. 31.

Upenoides vittatus Day, Fishes of India. London, 1878, p. 120 ; vol. 2p. 25.

Upenoides vittatus Herre and Montalban, Phillipene Jour. Sci., 1928, vol. 36, p. 105.

Upeneus vittatus Weber and Beaufort, The Fishes of Indo-Australian Archipelago, 1931, vo VI p. 365.

The eye is almost in the middle of the head, the lateral line 35 - 38, preorbitals without scales.

Colour : When alive it is brownish on upper side, with bluish tinge on sides, the belly is bright yellow with four longitudinal reddish bands on sides of the body, is brownish redir. The tip of the first and second dorsal fins is black with yellowish black bands in the first, the pectoral fin is pinkish, the caudal is yellow with four oblique yellowish black bars or bands on both lobes, the pelvics and anal fins are yellow.

This species is a small fish not exceeding more than 120 mm., however, Blegvad (1944) specimens from the Iranian Gulf were 148 mm, and it is said that it reaches 300 mm on the coast of Queensland (Marshall, 1964). Our species is

common in the Gulf of Suez, though it was not obtained in large quantities during our investigation, but it forms part of the trawl catch from 40 - 60 meters deep, throughout the year, decreasing at the end of the season (May - July).

Fowler in 1959 also stated that this species reaches about 270 mm long in Tahiti, however the largest specimen we obtained from the Gulf of Suez was 120 mm long.

It is distributed throughout the Indian Ocean Malay, Phillipines, Japan, Tahiti, Fiji, Samoa Islands Seychelles and the Gulf of Suez.

Upeneus tragula (Richardson) local Arabic name "Barbouni".

Upeneus tragula Richardson, Rep. Brit. Assoc., 1846 p. 220.

Upenoides tragula, Day, Fishes of India London, 1878, p. 121, vol. II p. 26;

Norman, Trans. Zool. Soc. London, 1927, 22 (12)., p. 380;Kosswig, Festschrift Kleinschmidt. Akad. Verlag. Leipzig, 1950, 203 - 212.

The lateral line is 31, preorbital scaly. The first dorsal fin is more or less equal in height that of the second, contrary to what was mentioned by Blegvad (1944) for the same species from the Iranian Guf.

Colour: The dominant colour is reddish stained with brown on the upper side of the head and back, the abdoman is silvery with reddish tinge. A longitudinal orange-red band is found along the side nearer to the dorsal surface than the ventral. it extends from the anterior tip of the head passing across the eye till the base of the tail. Vermilion spots are seen in alive specimens scattered on the side of the body, they disappear very rapidly. The tip of the first dorsal is blackish followed by vermilion cross bars, which also are present in the second dorsal as well as the caudal fin. The pelvic and anal fins have several pinkish-brown spots which take the arrangement of irregular bars.

Specimens of *U. tragula*, have been caught during the present survey from the Suez Canal, and its Lakes, as it forms part of the catch.

In General, *U. tragula*, from our areas do not reach more than 130mm. However, while the same size is found in the Iranian Gulf (Blegvad, 1944)it is said to grow to about 320 mm in Queensland (Marshall, 1964) The specimens caught from the eastern Mediterranean coast are from 50 - 138 mm long (Ben-Tuvia, 1966).

Distribution: Indian Ocean, Malaya, Southern China and Japan, Australia, Queensland and New South Wales, Gulf of Suez, Suez Canal, and East Mediterranean.

Mulloidichthys auriflamma (Forskal) local Arabic name "Inber Baladi"

Mullus auriflamma Forskal, Descr. Anim., 1775

Mulloides Flavolineatus Day, Fishes of India, London, 1878.

Mulloidichthys auriflamma Weber and Beaufort, The Fishes of the Indo-Australian Archipelago, 1931, vol. VI

The eye is nearer to the hinder edge of the head than to the snout and the mouth is sub-terminal. The body is moderately compressed, the barbels are long. The teeth are in the form of villiform bands on both jaws, the Palatine without teeth.

Colour: It is light reddish above, whitish on sides, belly yellow, a slightly red spot is present in the operculum. Two brilliant yellow bands pass from the operculum to the base of the tail. The fins are more or less colourless with very faint yellowish background, 2 or 3 rows of yellowish pigments appear on the dorsals The upper half of the caudal fin is reddish and the lower one is yellowish. However, the colour of this species is variable and a discussion concerning that part will be the subject of another paper.

This species is larger than the previous two and is caught mainly from the northern A.R.E. coast of the Red Sea. It is a seasonal fish-becoming abundant from May till August it appears in large quantities in shallow water off the Institute at Al-Ghardaqa. It is said that it migrates for feeding and spawing in more or less very peculiar way related to the lunar activity.

M. auriflamma is not common from the Gulf of Suez and no specimens were obtained by us during the present investigation, but it is the commonest red-mullet in the Northern part of the Red Sea.

Recently, Boraey (1969) studied the red-mullet from the Red Sea and he stated that *M. auriflamma* are inhabitants of the coral reef area along the north-western Red Sea at Al-Ghardaqa and that this fish is rarely met with in the trawl during winter months. Occasionally, few specimens can be obtained by hook and line or hand line from waters surrounding the reefs. The fish migrate during summer for feeding and spawning.

Blegvad (1944) stated that *M. auriflamma* is the common mullet in the Iranian Gulf, where it reaches lengths between 133 - 165mm. The largest specimen obtained by Fowler from Tahiti was 300 mm. long. In our area this fish grows to large sizes, the largest specimen recorded is 480 mm. the average is between 250-380 mm.

Family Leiognathidae.

Leiognathus bindus (*Cuvier* and *Valenciennes*)

Bindo karah Russell, Description and figures of two hundered fishes collected on the coast of Coromandel vol. 1- 2 fig. 64, 1803.

Equula bindus Cuv. and Valenc., Histoire Naturelle des Poissins, 1835, vol. X p. 78.

Leiognathus bindus (Cuv. and Valenc.) Weber and Beaufort, 1931.

The body is very compressed and the eye is big. Dorsal profile is a little less convex than the ventral, rostro-dorsal profile ascending in a more or less straight line. The mouth is small protractile, forming a tube which is directed downwards. The head without scales and the lateral line ending behind the end of dorsal fin.

Colour: It is silvery with numerous dark spots in the back, the spinous part of the dorsal fin has orange spots. It is similar to the specimens described by Blegvad in 1944 from the Iranian Gulf.

This fish is small not exceeding more than 90 mm. and it forms a good part of the catch during our investigation, from areas off Safaga, El-Sokhna and Abu-Znema. This may suggest its even distribution in the area of survey, but on account of its small size it is of inferior importance as food fish.

Specimens of *Leiognathus* were recorded from the Suez Canal or its Lakes (Tillier, 1902; Norman, 1929; Chabanaud, 1933; Cruvel and Chabanaud, 1937; Bertin, 1943 and Tortonese, 1948). It is alsos aid that it has penetrated through the Canal into the Mediterranean Coast up till Turkey (Kosswig, 1950). Ben-Tuvia (1966) stated that *Leiognathus klunzingeri* is one of the most common bottom species in the eastern Mediterranean. It is also said that this species is found in the Aegean Sea, in rare occasions.

Family Nemipteridae

Nemipterus japonicus (Bloch) local Arabic same "Sareh"

Sparus japonicus Bloch, Naturgeschichte der auslandischen Fische, 1791, vol. V p. 110.

Synagris japonicus Day, 1878 p. 92

Nemipterus japonicus Weber and Beaufort, 1936 vol. VII p. 369.

It is a slender fish, with deeply forked caudal fin, both lobes are tapering into filamentous prolongation which is longer on the upper lobe than the lower, in both sexes. The Lateral line 50, three transverse rows are found on the preoperculum. Colour: It is pinkish becoming lighter on the sides offhe belly with faint yellow,

Colour: It is pinkish becoming lighter on the sides of the belly with faint yellow colouration on the abdoman. The dorsal and anal fins with yellowish green streaks, with reddish tips, the caudal is pink with yellow prolongations. On the sides several silvery stripes shine in light.

When the body cavity is opened, the peritoneum is orange in colour completely covering the viscera, it separates the swim bladder from the alimentary canal. The stomach is usually protruding in the pharyngeal cavity when hauling the fish out of water. The swim bladder is a tough thick walled sac covered by a thick layer of fat. It has a well developed gas gland and retia mirabilia, and is firmly attached to the ribs. The gill rakers are small (7 in number) with fine bristle-like processes.

This species is abundant in the whole area of the Gulf of Suez, but few were obtained from Safaga. It can be considered one of the important economic fishes and needs further investigation regarding biological and fisheries studies. The branchial cavity was often found occupied with parasitic Isopods, which sometimes are big and numerous. In some of the specimens the gills were more or less affected by the presence of the parasite.

Nemipterus japonious in our area grows to about 350 mm long with the average length between 170—230 mm.

Habitat : Zanizibar, Red Sea, Iranian Gulf, Indian Seas, Malaya. Archi pelago, phillipines, China and Japan.

Nemipterus marginatus (Cuv. and Valenc.) local Arabic name 'Fares'

Dentex marginaatus Cuv. and Valenc.

D. nematopus Bleeker.

Synagris nematopus Gunther

This species is similar to the previous one in most of the characters, with the exception that the caudal fin is without filamentous prolongations and the pelvic fin has the first ray produced into a filament reaching the anal.

Family Pomadasyidae

Rhonciscus stridens (Forskal) local Arabic name 'Shokhrum'

Sciaena stridens Forskal, 1775, p. 50 (Red Sea)

Pristipoma stridens (Forskal) Day, 1878, p. 72.

P. nageb Day, 1878, pl. 18, fig. 8.

Pomadasys stridens Blegvad, 1944 Danish Exp. Iran. Gulf, vol. III p. 124.

The interorbital space is slightly less than the diameter of the eye, the preoperclar margin is serrated and the caudal fin is emarginate. The fourth spine of the dorsal fin is the longest, the second anal spine is a little shorter than the third.

Colour : It is greyish green on the back whitish below, three blackish brown bands are present on the upper part of each side. The lowest of which extends from the eye to the middle of the caudal fin. There is a dark spot on the operculum.

The gill rakers are short and simple, this species forms part of the catch in the Gulf of Suez but it is not very common in the north western part of the Red Sea; few are obtained off Safaga. *Rhonciscus striatus* is mixed with *R. stridens* but the latter is much more common in the Gulf of Suez than the former.

This fish is known to produce sound when coming out of the water such sound is in the form of grunts. The sound producing mechanism of this fish will be the subject of another paper.

Tillier (1902) reported the presence of specimens of *Pristipoma stridens* (= *Rhonciscus stridens*) in the Suez Canal and stated that it reached till Lake Timsah but not north of it, and that this species is very common in the Gulf of Suez. Tilliers specimen was 200 mm long but none of our specimens reached such length (80—140 mm). Blegvad (1944) stated that *P. stridens* from the Iranian gulf is a small fish, and mentioned that the largest one was 228 mm long.

Family Sparidae

Argyrops spinifer (Forskal) local Arabic name 'Morgan'

Sparus spinifer Forskal, 1775, p. 32 (Red Sea)

Pagrus spinifer Day, 1878, p. 138; 1888, p. 787.

Chrysophrys spinifer Boulenger, 1887, p. 658 (Muscat).

D XII 10, A III 8, the lateral line 54 56. Scales are found between the eyes. The first two dorsal spines are short, the third till the seventh are elongated with filamentous prolongations, which are longer in young specimens (twice as body length or more). Blegvad (1944), gave a different count for the dorsal spines of *Sparus; spinifer* (= *Argyrops spinifer*), he stated that there are ten spines this may be due to the fact that he might missed to count the two short anterior ones. He also stated that the 5th—6th first rays are produced into filamentous prolongations, but in our speciment it is always the third till the seventh rays that have long filaments.

The profile of the head is very steep, and the head itself becomes heavy with age.

Colour: It is pinkish on the back becoming lighter on the abdomen, in young, specimens five reddish cross bars are seen on the back and upper side of the body becoming faint with increasing age.

Soliman has been carrying out research on family Sparidae from the Red Sea, since 1966 (Under supervision of Prof. Gohar and the author), the results of that work will be published later. However, in the present paper a brief account on the biology of these fishes is given.

Argyrops spinifer, is characterised by the arrangement of the teeth which are in the form of crushing molars on the inner side of the jaws, canines are found infront on both the upper and lower jaw. The food consists mainly of crustacea, with very few small fishes. The number of pyloric caeca is variable among the members of Sparidae; 4 caecae are present in *A. spinifer* and 5 in *A. filmentosus*. The stomach in this later species has an outgrowth coming out from the blind caecum at its junction with the duodenum. The swim bladder in *A. spinifer* as in all sparids is surrounded by the ribs forming a sort of basket like structure, and the ribs cling firmly to the bladder's wall so that it is fixed in its place.

Argyrops spinifer, is very common in the Gulf of Suez and the North-western coastal areas of the Red Sea. The fishes taken in the trawl are much smaller than those taken by hand line. The average size of fishes in the trawl catch from the Gulf of Suez is between 130—240 mm. standard length; while those taken by hand line are between 200—400 mm. long. The largest fish was obtained off the Institute at Al Ghardaqa (480 mm) The fishing season extends from October till the begining of June, where the fish are almost found near the shore in the areas of coral reefs. During the summer months they are known to go to deeper waters.

Marshall (1952) recorded *A. spinifer* from the Gulf of Aqaba, he got one specimen only 357 mm by hand line at a depth of 10 fathoms.

Crenidens crenidens crenidens (Forskal)

Sparus crenidens Forskal, 1775, p. 15 (type locality Red Sea Djidda to Suez).
Crenidens indicus Day, 1878, p. 132.
Crenidens forskalii Cuv. and Valenc. Day, 1878 p. 133.
Crenidens forskatlii Day, 1889 vol. II, p. 35.
Crenidens crenidens Blegvad 1944, p. 143.
Crenidens crenidens crenidens Marshall. 1952, p. 234.

D XI 11, A III 10, lateral line 55 - 60, the dorsal and ventral profile of the body is curved.

Colour: It is silvery with greyish colour all over the body, the dorsal fin has black margin, pectorals pelvics and anal are yellowish.

This species is not very common in the Gulf of Suez, more fish are caught from the northern part and Suez Bay. All catches were taken from shallow water not so far from the shore line. It is also obtained from the Bitter Lakes, as we collected several specimens during the present cruise.

The teeth of this species are unique among the Sparidae. On the upper jaw there is a row of 8 compressed broad teeth with crenulated edges followed by a second row of smaller and numerous teeth; then comes 2-3 rows of granular teeth. On the lower jaw the teeth are smaller than those on the upper, they are arranged in two rows only.

DISCUSSION

From the above study it may be concluded that, in the area investigated, the bottom of the Red Sea is a suitable habitat for bottom life. A great variety of fish species live in the area and although the number of species is great, some of them are repesented in the catch by small—sized fish, which are not suitable for the market.

Three species of lizard-fish are found among the catch of which *Saurida undosquamus* dominates the Gulf of Suez; where it is mostly taken from depths between 60-80 meters. *Saurida tumbil* is not abundant in the northern half of the Gulf; it is more frequent near the southern part, and it seems that its population is concentrated in the north-western coast of the Red Sea. The third species *Trachinocephalus myops*, is not very common in our areas. This species differs from that of Queensland described by Marshall in 1964 in the number of the dorsal fin rays, as well as the pattern of colour. The Red Sea species, described from our area (live specimens), does not have the black blotch on the shoulder as that of Queensland.

A fourth species, *Synodus variegatus*, is known to inhabit the Gulf of Aqaba and the northern part of the Red Sea (Marshall, 1952). However, we could not come across any specimen of this species during our cruise. therefore, the presence of this species is not certain as Marshall's record was based on one specimen

only from the Gulf of Aqaba, and there is no record in our collection. There is the possibility that this species might have been confused with *Trachinocephalus myops*. Both *Synodus variegatus* and *Trachinocephalus* are inhabitants of shallow sandy patches among coral reefs covered bottom (not more than 20 meters deep). Both genera are very close to each other but *Trachinocephalus* has laterally compressed head and body (Norman, 1935).

Ben-Tuvia (1966) stated that *Saurida undosquamus* has succeeded to migrate into the east Mediterranean coast, where it formed about 19.1% of the trawl catch in 1963. This may be attributed to the fact that *S. undosquamus* is adapted to live in cooler waters. This also agrees with our findings, being found in water of 35-85 meters deep or even down to 100 meters.

Family Serranidae have well established species in the Red Sea as well as in the Mediterranean Sea. Some have been recorded from the Suez Canal e.g. *Epinephelus chlorostigma* which is of Red Sea origin and *E. aeneus* which is of Mediterranean origin, the latter is also said to inhabit the bitter lakes (Chabanaud, 1932). Tillier (1902), recorded *E.* tauvina from the Suez Canal and he also stated that *Serranus cabrilla* is common in the Gulf of Suuez and that it is found at Alexandria but not at Port Said. He addaed that S. *cabrilla* was only known from the Metdierranean since the time of Cuvier, but it is possible that the specimen send to the British Museum have entered the Red Sea after the opening of the canal. Norman (1927) stanted that *E.* aeneus is a Mediterranean species found at Port Said and it does not extend in its penetration in the Canal beyond lake Timsah. Although this might be true for *E. aeneus*, it differs in case of *S. cabrilla*, as there are some arguement concerning its presence in the Red Sea.

Klunzinger (1884) recorded *Serranus cabrilla* from the Red Sea as for as Masawa. Kossman and Rauber (1877) also recorded it from the Red Sea under the synonym *Psudoserranus bicolor*. But it did not appear in the work of Ruppell (1828) on the Red Sea. Tillier (1902) stated that this species is common in the Gulf of Suze as mentioned before. However, during our survey we were able to collect specimens of *Serranus cabrilla* from the Bitter Lakes, as well as the Gulf of Suez. The Characters of this species does not differ from individuals of the Mediterranean. Therefore it can be concluded that although *Serranus cabrilla*, is not found in commercial amounts, it has succeeded in penetrating through the Canal and established a population in the Northern part of the Gulf of Suez. however, it is in its way to penetrate more to the south and few specimens are now caught from the Southern part of the Gulf near its entrance in the Red Sea proper. This species may prefer somewhat deeper water than other species of Serranidae. Small specimens are often caught in the trawl when fishing in areas not more than 30 meters deep; larger specimens (280 mm in length) are caught by hand line in deeper waters near El-Soukhna and Abu-Zenema. There is no record of this fish from the Gulf of Aqaba or the Northwestern coast of the Red Sea.

Of the three species of Mullidae described here, *Upeneus vittatus* is found in the Gulf of Suez in large amounts among the catch. Morphologically these fishes are delicate, their colour is one of the important characters to differentiate the species and great care should be taken to notice the colour of the fish while it

is still alive. This appears clearly in the case of *Upeneus tragula* which has a lateral stripe. which we recognized in live specimens from the Gulf of Suez, as orange-red. Day (1878) and Weber and Beaufort (1931) gave different descriptions of colour for *U.* tragula which is apparently based on material preserved in alcohol. The same may also apply on the description of Marshall in 1964, who stated that there is a longitudinal dark lateral stripe.

Lachner (1954) stated that the characters of *U.* tragula overlap with that of *U. oligospilus* from the Persian Gulf. Ben Tuvia (1966) examined 51 specimens from the eastern Mediterranean coast and came to the conclusion that their characteristies are of range which cover both *U.* tragula and U. *oligospilus,* however, Tortonese (1953) was of the opinion that the species found in the Mediterranean coast is *U. tragula.* Therefore, a thorough revision and comparison of Specimens from the Gulf of Suez and East Mediterranean is badly needed, before any definite conclusion can be reached.

Upeneus tragula, forms part of the catch from the northern part of the Gulf of Suez, becoming less in areas south to Ras-Ghareb a fact which coincides with the results of the commercial catch during the months starting from March to June when the fishing boats prefer to go to the southern parts of the Gulf, and the amount of *U. tragula* decreases very much. Norman (1927) recorded the presence of *U. tragula* in the Suez Canal and it is said that it has reached as far as Iskenderun in the eastern Mediterranean Coast (Tortonese, 1953; Fowler and Steinits 1956 and Ben-Tuvia, 1966). Its penetration to the above mentioned areas is not in commercial quantities, but it is often common in shallow water on sandy bottoms, it is also often found in stomachs of *Saurida undosquamus* and *Euthynnus alletteratus.* The absence of *U. tragula* popluation from the southern areas of the Gulf of Suez and the concentration of the catch in the northern part, its presence in the Suez Canal and along the East Mediterranean Coast may suggest that this species is in its way to establish a commercial population in the new areas. It can be considered as an immigrant from the Red Sea into the Mediterranean.

Mulloidichthys auriflamma is a seasonal fish which spends the greater part of the year hidden among the corals and frequent the shallow coastal areas during the summer months (May-August). Although this fish was recorded by Gruvel and Chabanaud (1937), from the Suez Canal, we could not come across specimens in the Gulf of Suez. Inspite this fact some authors have mentioned that et has migrated through the Suez Canal and it has formed and established population in the east Mediterranean coast (Haas and Steinitz, 1947; Serbetis, 1947; Laskaridis, 1948; Ben-Tuvia, 1953; Tortonese, 1953; wirszubski, 1953 Gohar, 1954; and Tortonese, 1964) Recently, Ben-Tuvia (1966) corrected that, and stated that the species found in the east Mediterranean trawl catch is *Upeneus moluccensis* and that the previous authors were confused due to the superficial resemblance of the two speccies, both have a bright yellow longitudinal band on the lateral side of the body.

Therefore, judging from the fact that *M. auriflamma.* is rarely met with in our collection from the Gulf of Suez, I am inclined to say that *M. auriflamma* cannot be considered as an immigrant to the east Mediterranean coast.

Leiognathus sp. is distributed evenly in the area of our investigation, although it is not an economic fish, yet it is important as standing crop for other fishes.

Leiognathus klunzingeri, has succeeded to penetrate the Eastern Mediterranean area (Tortonese, 1964 ; Ben-Tuvia, 1966) and is said that it has reached the Aegean Sea (Kosswig, 1950). A single specimen was reported to be collected from the Western coast near Tunisia (Ben-tuvia, 1966). Our species *Leiognathus bidus*, is widely distributed in the North-western Coast of the Red Sea. Chabanaud (1934) stated that *Leiognathus* species has been collected from the Suez Canal since the time of Tillier in 1902 and that *L. klunzingeri* which is found in the Canal is not *L. lineolatus* of Norman (1929), obtained 13 miles from Port Said.

Two species of *Rhonciscus* are differentiated in the area investigated, but *Rhonciscus stridens* is more common than *R. striatus*. The former might be considered as an endemic to the Gulf of Suez as it is rarely fished from the Red Sea proper. It forms a great part of the trawl catch during the whole fishing season. Specimens are also caught from the Suez Canal, the Bitter Lakes and Lake Timsah, however, it is not known from Port Said. Probably it has penetrated through the Canal but could not establish any population in the Mediterranean Sea. though it was known to inhabit the Suez Canal (Tillier, 1902 ; Norman, 1927 ; and Chabanaud, 1932).

Nemipterus japonicus and *N. marginatus*, are common in the area investigated, but the two species seem to be more numerous in the Gulf of Suez than in the North-western part of the Red Sea. However, N. *japonicus* is more abundant than *N. marginatus*. The former is easily distinguished by the greatly elongated filamentous upper lobe of the caudal fin. Such prolongation is more conspicuous than that described by Day (1878), moreover, the silvery stripes on the sides of the body were not shown in Day's description.

It is noticed that these fishes are largely infected by a parasitic Isopods which are sometimes of large size. The parasite is found in the branchial cavity ane it might be dangerous to the population of Nemipteridae in the Gulf, as it is always seen causing great damage to the gills.

We found during our investigation that sea-breams, belonging to family Sparidae are of the most important demersal fishes in the area. *Argyrops spinifer* is obtained from more deep water than the other species *Crenidens crenidens* and *Diplodus noct*, both of the latter prefer shallow water and are taken near the shore. *Argyrpos* is predominate in the Gulf of Suez as far as the areas investigated are concerned, while *Crenidens* is common in the northern region of the Gulf where it is caught in considerable amounts by set nets, however, in the trawl catches are small and sparse. From the collection made by the author (1963 - 1967) it is noticed that *Argyrops spinifer* has been very common in the whole area of the Gulf. Few other species are caught but *A. filamentosus* and *Acanthopagrus bifasciatus* were rarely met with in the Gulf of Suez.

Marshall (1952) examined specimens of *Crenidens crenidens* from Aden and Karachi as well as from the Gulf or Suez and Suez Canal. He stated that the specimens of the Red Sea are seperable from those of Karachi (Indian Ocean). Therefore, he divided them into two subspecies; *C. crenidens crenidens* as typified for the Indian Ocean. Our species described here, is similar to that described by Marshall in 1952 and Smith, 1950; and it belongs to the subspecies *C. crenidens crenidens*.

Tillier (1902) stated that *Crenidens crenidens* penetrated the Suez Canal and reached Port Said, bout it did not enter the sea. He also added that the fish is very common in the Canal, and many of them migrate towards the Red Sea in April and then return back in July. The author noticed that the amount of catch in the northern part of the Suez Gulf increases dring the period from the mid of April till nearly the end of July; and this coincides with its migration period as stated by Tillier.

The presence of this species in the Mediterranean Sea has been raising some arguement. Tillier (1902) was of the opinion that *C. forskalii* (= *C. crenidens crenidens*) passed through the Canal from the Red Sea and remained near the entrance of the Canal. Norman (1927) said that this species definitely passed through the Canal and has established itself in the sea in the opposite side. Chabanaud (1932, 1934) obtained 16 specimens from the Bitter Lakes and three from Lake Timsah. However, recently there is no record of this fish in the East Mediterranean other than that of Keller in 1882, who recorded it from lake Menzalah.

It is also said that *Diplodus noct* occur both in the Red and Mediterranean Seas (Gunther, 1859; and Tillier, 1902). However, Norman in 1927 could not see any specimen from the Mediterranean Sea and stated that it is possible that this species is confused with *Diplodus sargus*. Marshall (1952) compared specimens of *D.* noct from the Red Sea with those from Karachi and Persian Gulf labelled *D. noct*. He came to the conclusion that the Red Sea material is different from Karachi ones, and that the latter are actually *Diplodus sargus* (Linnaeus). He also added that *D. noct* is endemic and confined to the Red Sea, and that there is good agreement between specimens of *Diplodus sargus* from the Mediterranean and those from Muscat and the Persian Gulf. Tortonese (1964), mentioned that *Diplodus sargus* is a Mediterranean-Atlantic species. Kosswig (1950) stated that *Sargus noct* was recorded by Steinitz from the coast of Palestine in 1927. However, Ben-Tuvia (1966) stated that there is no record of this species in Steinitz's paper.

During our investigation we collected several specimens of *Diplodus noct* from the Bitter lakes. The fishermen, usually take this fish along the coasts of the Canal and in the Bitter lakes, but it is not common in Port Said. I am of the opinion to say that this species thas not succeeded to penetrate to the Mediterranean Coast.

Therefore, it may be concluded that four of the demersal fishes encountered in this study, have reached the Mediterranean Coast. These are: *Saurida undosquamus*, *Upeneus tragula Leiognathus* sp. and *Crenidens crenidens*

crenidens. One of them, *Saurida undosquamus* has well established itself in the Eastern Mediterranean Coast and is considered of the important commercial fishes in that area. *Upeneus tragula*, is in its way to establish a population, while *Crenidens crenidens crenidens* has not reached the Eastern basin, but is often met with along the A.R.E. Cosat of the Mediterranean.

However, we must conclude that several problems concerning the exchange between the Mediterranean and the Red Sea fishes remain unsolved. The dispersal in any direction deserves thorough and comprehensive studies, which can only be fulfilled through field researches.

SUMMARY

1 – A biological investigation was carried out on board the R.S. 'Icthyolog' during August and September 1966. The survey took place in the Gulf of Suez, the Bitter Lakes as well as the North-western part of the Red Sea.

2 – Species composition of the catch shows that the percentage of their presence is as follows: *Saurida undosquamus* form 31.6% of the catch, *Decapterus sanctae-helena* 31.5%, *Argyrops spinifer* 11.8%, *Upeneus vittatus* 10%, *Phonciscus* stridens 5.8%, *Nemipterus japonicus* 3.5%.

3 – An annotated list of 15 demersal species of economic importance was given. The main characters, distribution and the possibility of its migration through the Suez Canal were discussed.

4 – Four species of these demersal fishes have reached the Mediterranean Coast: *Saurida undosquamus*, *Upeneus tragula Leiognathus* sp. and *Crenidens crenidens crenidens*.

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