PLATE II.

Fig. 1. *Neptis jordani*, sp. n.
(For genitalia *vide* fig. in text p. 33.)
2. *Euptera elabontas mweruensis* ♂, subsp. n.
3. *Brenthis excelsior katangæ* ♂, subsp. n.
4. *Aphnæus questiauxi* Auriv., ♀.
5. *Lycænesthes gemmifera* ♂, sp. n.
6. *Pseudaletis mazanguli* ♀, sp. n.
7. *Spindasis trimeni* ♂, sp. n.
8. *Aphnæus marshalli* ♂, sp. n.
9, 10. *Catachrysops cupreus* ♂ ♀, sp. n.
11. *Deudorix kafuensis* ♂, sp. n.
12. „ *bemba* ♀, sp. n.

PLATE III.

Fig. 1. *Belenois picta*, dry ♂, sp. n.
2. „ „ wet ♂.
3. „ *crawshayi* f. *lata*, ♂, f. nov.
4, 5. *Abantis lofu* ♂ ♀, sp. n.
6. *Platylesches lamba* ♂, sp. n.
7. „ *robustus* ♂, sp. n.
8. *Kedestes lema* ♂, sp. n.
9. *Parnara chambezi* ♂, sp. n.
10. „ *saxicola* ♂, sp. n.
11. *Sarangesa maxima*, ♂, sp. n.
12. *Kedestes malua* ♂, sp. n.
13. *Parnara larea* ♂, sp. n.
14. *Cyclopides kambove* ♂, sp. n.
15. „ *wallacei* ♂, sp. n.
16. *Sarangesa nox* ♂, sp. n.

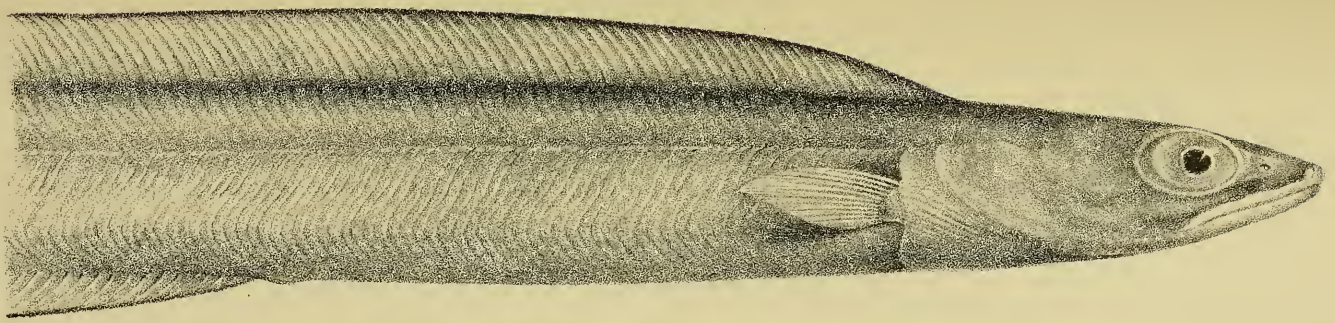
2. On the Marine Fishes and Invertebrates of St. Helena. By J. T. CUNNINGHAM, M.A., F.Z.S. With Description of new Species of Hydrozoa and Porifera, by R. KIRKPATRICK, F.Z.S.

(Plates IV.–VII.*, and Text-figures 3–6.)

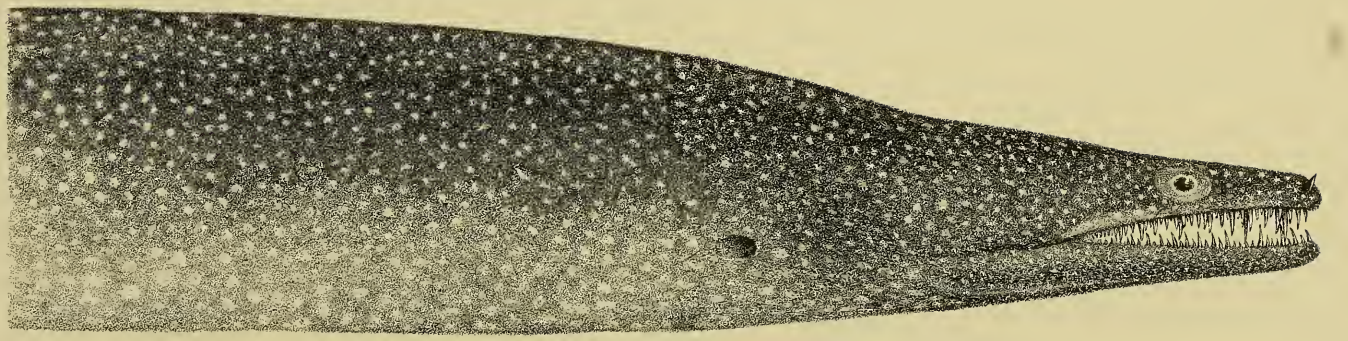
[Received November 1, 1909.]

At the beginning of February this year Mr. Alfred Mosely, C.M.G., went with a small party of experts to the island of St. Helena in order to make some enquiries into the industries and resources of the island, with the object of developing as far as possible the means by which the population could support itself. Until recently the people have been to a great extent dependent on the market and the employment afforded by the garrison and various Government works in the island. In 1903 the Boer prisoners left the island, and not long afterwards the Imperial Government decided to withdraw the whole of the garrison. To prevent distress among the inhabitants the Government has taken steps to develop the manufacture of lace and of New Zealand flax, and Mr. Mosely's attention was directed to agriculture and fisheries. I was invited to accompany him in order to assist

* For explanation of the Plates see pp. 130 & 131.



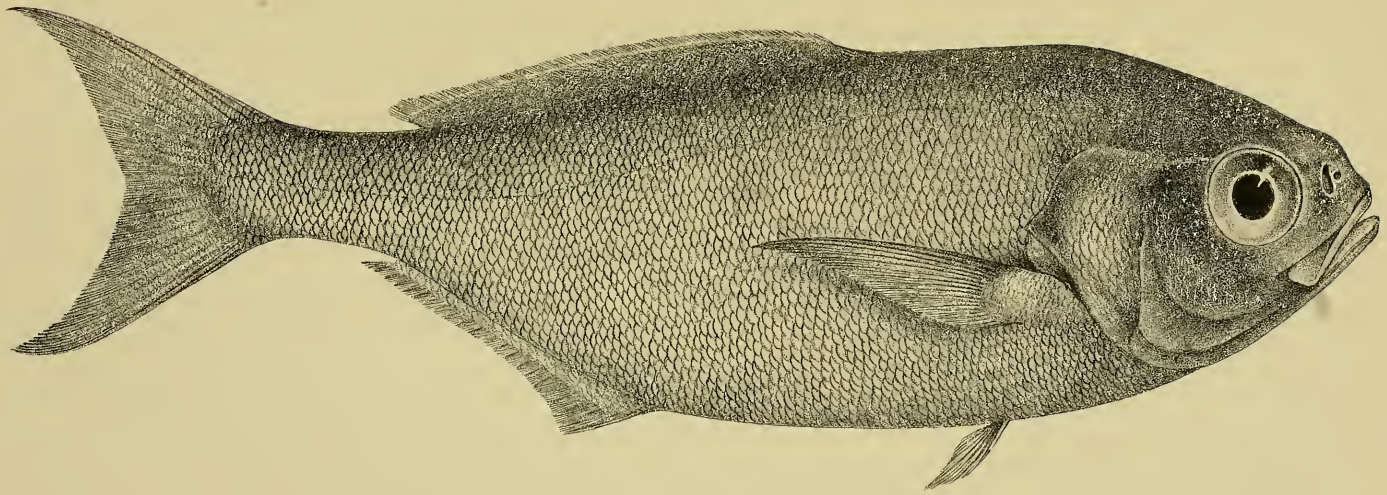
1.



2.

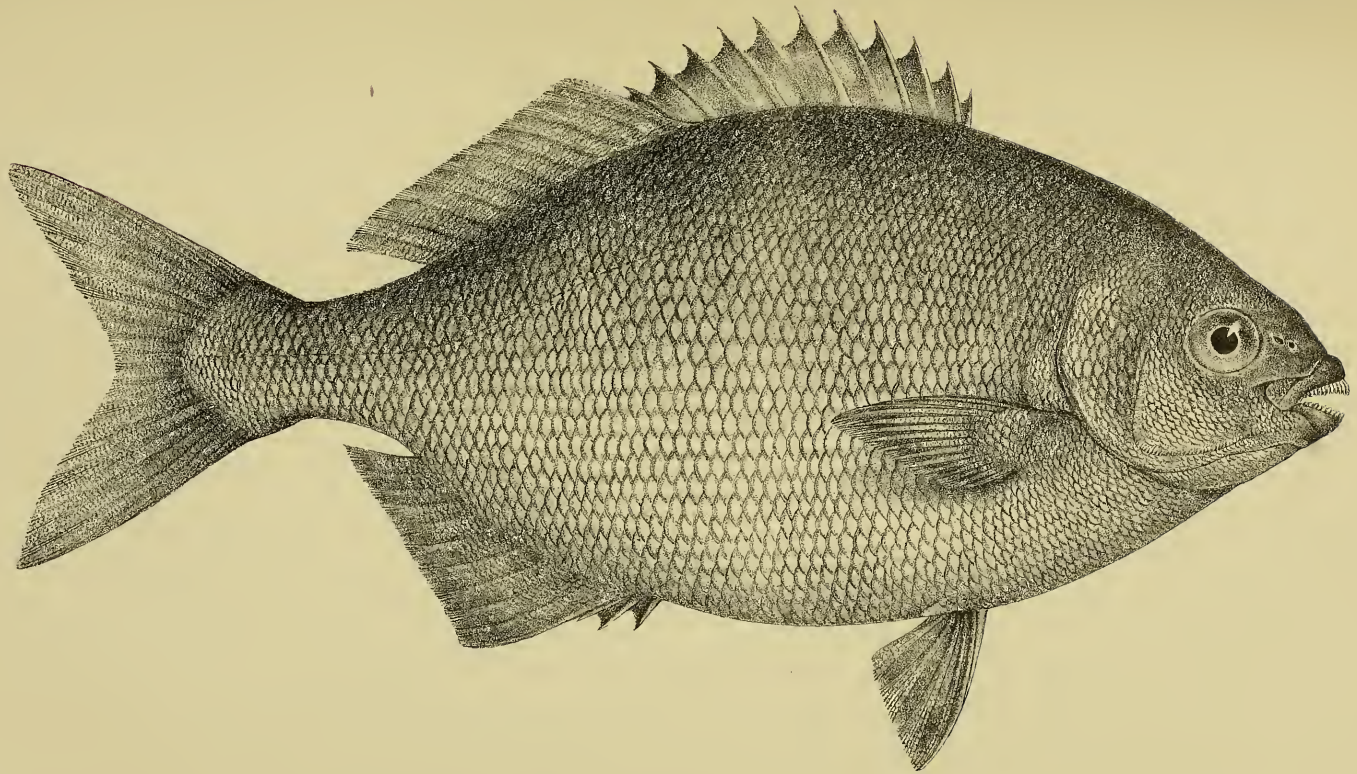
J. Green del lith. et imp.

1. CONGROMURÆNA MELLISSII. 2. MURÆNA SANCTÆ HELENÆ.



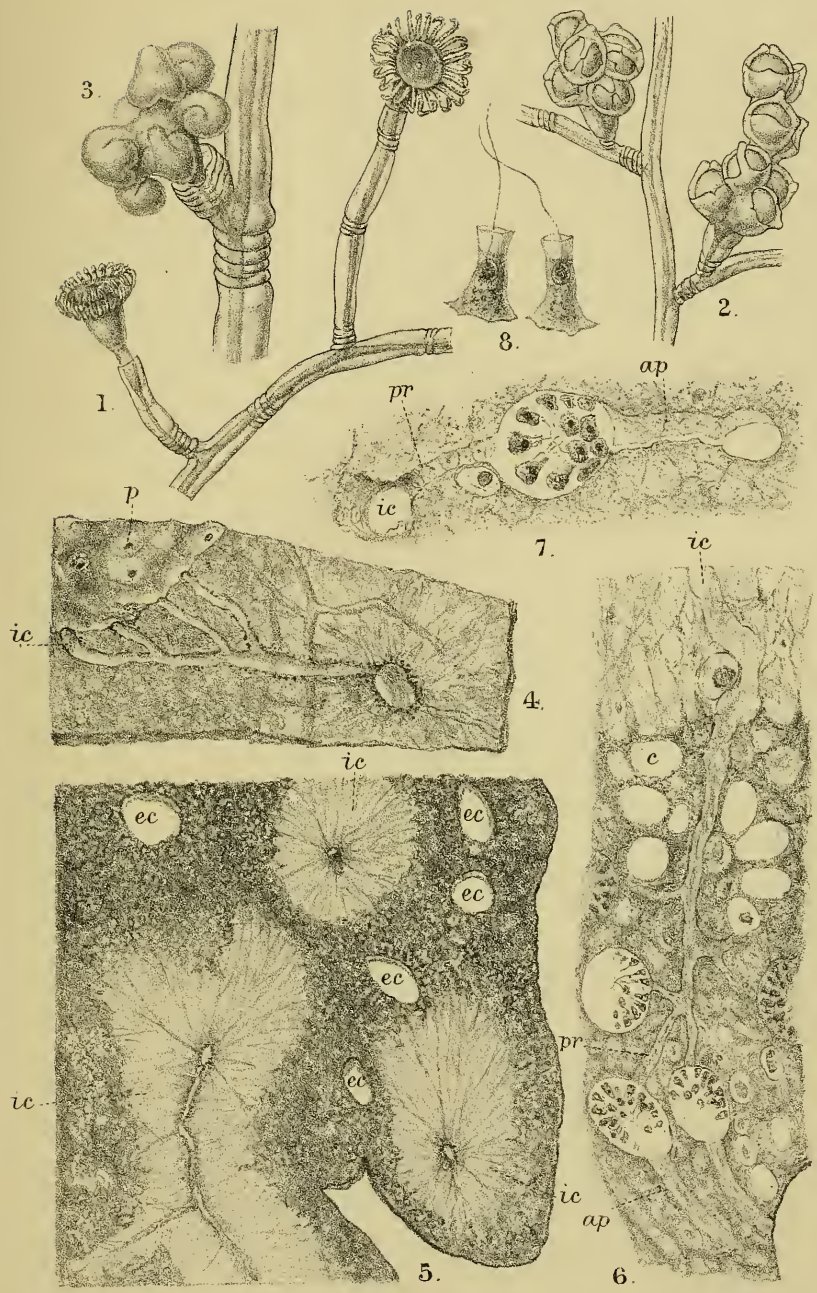
J.Green del.lith.et imp.

LEIRUS MOSELII.



J. Green del. lith. et imp.

PIMELEPTERUS GALLVEII.



P. Highley del. et lith. J. Green imp.

1–3. EUDENDRIUM CUNNINGHAMI sp.n.
4–8. CHONDROSIA PLEBEJA O. Schmidt.

him in his enquiries concerning the fisheries and to make a Report to the Colonial Office on the results of those enquiries. My Report on the practical and commercial aspect of the subject has been already sent to the Secretary of State for the Colonies; but Mr. Mosely gave me every facility for collecting specimens and doing as much scientific work as was possible in the time available, and the following paper contains the results of my investigations from the scientific point of view.

I took with me a number of nets of the kinds used in England for the purpose of ascertaining by experiment how far English methods and apparatus would be successful in the waters of St. Helena; these consisted of a small otter trawl 15 feet wide at the mouth, a trammel 20 fathoms long and 6 feet deep, a seine 10 fathoms long and 8 feet deep, and two mackerel drift-nets each 20 yards long. I also took a small tow-net of silk bolting cloth. A small spirit tank for carrying preserved specimens was lent to me by the Fish Department of the British Museum (Natural History); and when my collection grew too large for this I was able to obtain tin-lined cases in the island, which were repaired and soldered down when full by a skilled workman whom Mr. Mosely had taken with him to carry out the curing of mackerel and other fish.

We left Southampton on Feb. 6th and arrived at Ascension on Saturday, Feb. 20th, at 4.30 a.m. We landed for a couple of hours and saw the turtle ponds. The female turtle land on the sandy beaches of the island from January to June and are captured by being turned over; they are used as food for the garrison, or rather crew, for Ascension is treated as a ship belonging to the Navy and under the control of the Admiralty. Here also I was interested in the extraordinary numbers of *Balistes* which swarmed around the ship to feed on the orange-peel, pieces of bread, and other refuse thrown overboard. Before arriving at Ascension, soon after passing Cape Verde, we saw for two whole days large numbers of *Velella* at the surface of the sea. They seemed about 4 inches in diameter with the vertical semicircular crest 3 or 4 inches above the surface of the water and of a bright pink colour along its border. I was not able to obtain any specimens, and south of Ascension none were seen. Flying-fish of course were seen in large numbers; they first appeared after we had passed Cape Verde, and continued to be abundant till we were approaching St. Helena, but during my stay at that island I never saw one. I endeavoured to decide for myself the question whether these fishes move their wings in flight, and convinced myself that the pectoral fins were rapidly vibrating or quivering at the moment when the fish left the water, but that afterwards during the flight they were perfectly motionless, so that the motion of the fish is like that of an aeroplane.

We arrived at St. Helena on Monday, Feb. 22nd, a little before midnight, and I spent five weeks on the island. Much of my time was spent in the native fishing-boats, making observations on the different kinds of fishing. The boats are all small

and open; the largest are whale-boats about 30 feet long and sharp at both ends: these carry a movable mast on which a sail can be hoisted, but they are more often propelled by oars. These are used chiefly for the albacore-fishing which is carried on off the south-west point of the island; each boat carries a crew of four men. The other boats are a little smaller and have square sterns; they are used for catching mackerel and various other fish, chiefly at night, the albacore-fishing being carried on in daylight. The island is roughly oblong and extends from north-east to south-west, and as it lies in the region of the trade winds blowing always from the south-east, the north-west coast is the lee side, and the sea on this side is always smooth or moderate; hence the open boats are perfectly safe on this side, and here the fishing is usually carried on. Seining was impossible, as there are no smooth sloping beaches on which to draw a seine; at the mouths of the valleys including Jamestown there are beaches of small extent, but they are very steep, are composed of large pebbles, and there is usually a strong surf breaking on them. This surf is due to large smooth waves, locally known as 'rollers,' which come from the north-west, that is, in the direction opposite to that of the wind; their size and force varies greatly from unknown causes, and when they are heavy, landing and embarking at the wharf at Jamestown are rendered somewhat difficult.

I made one trial of the trammel-net, setting it in the evening in about four fathoms of water off Banks' Valley to the east of Jamestown. When hauled a little after sunrise the next morning it contained 11 soldiers (*Holocentrum*), 4 gurnards (*Scorpæna*), 2 flounders (*Platophrys*), 2 rockfish (*Scarus*), 1 stone-brass (*Caranx sanctæ helenæ*), a large *Panulirus*, locally known as long-legs, one *Cidaris* and one feather-star. I only once had an opportunity of going to the windward coast of the island when a small steam-launch belonging to Messrs. Solomons, the shipping agents, towing a whale-boat, took a party as far as a small islet on the south-east coast, called George Island. It had been intended to circumnavigate the island, but the wind and sea increased so much that we were obliged to make for a sheltered bay called Prosperous Bay, where I was able to make a few hauls of the otter trawl. I also trawled on the leeward side a little to the west of Jamestown from the town down to Lemon Valley at a depth of about 30 fathoms, where the net brought up large quantities of the massive coarse sponge identified by Mr. Kirkpatrick as *Chondrosia plebeja* along with the species of *Eudendrium* described below, six specimens of the flat-fish *Platophrys podas*, locally called flounders, three *Scorpæna*, several *Cidaris*, two *Linckia*, and a specimen of *Umbraculum mediterraneum*.

The shores of the island consist everywhere, except at the pebble-beaches at the mouths of the valleys, of black volcanic rock. The cliffs are vertical or nearly so, rising to a height of 700 feet on either side of Jamestown, and at the bases of them is a flat ledge of rock. The tide rises and falls only about two

feet, so that there is little room for shore-collecting. One of the most characteristic features is the absence of *Fucus*, *Laminaria*, and all other large seaweeds; the surface of the rock is covered in the rock-pools with green *Ulva* and *Enteromorpha*, and a reddish calcareous alga. There is also another alga, dirty brown in colour, and of small size. Almost everywhere the surface of the rock is closely studded with the holes inhabited by the black boring sea-urchin *Echinometra subangularis*, and on the underside of overhanging ledges the large dark-coloured anemone *Phymactis sanctæ helenæ* is very common.

I did not pay special attention to the terrestrial fauna, but it may be worthy of record here that frogs have been introduced into the island. There were none in 1875 when Melliss' book was published, but at the time of my visit they were abundant in the neighbourhood of the Government House at Plantation and in the stream that runs down the Jamestown Valley, as far as the boundary of the town. The species has been identified by Mr. Boulenger from the specimens which I brought home as *Rana grayi* Smith. This is one of the most abundant species in South Africa, and is common in the neighbourhood of Cape Town, whence specimens were brought to St. Helena some years ago by Miss Moss, a member of one of the resident families, in order that they might furnish a supply of food for ducks. My attention was first drawn to these frogs by hearing their voices in the neighbourhood of Government House. The sound suddenly became audible a little before sunset when it began to rain; it seemed to me like the musical clink produced by tapping glass with a metal rod, in fact it rather suggested numbers of fairy anvils, and was unlike anything I had previously associated with frogs.

There is one species of lizard in the island, doubtless the *Hemidactylus frenatus* Schleg. mentioned by Melliss. I saw one specimen on the veranda of the house where I lodged; it ran into the sitting-room and disappeared into a hole in the wainscot. Two or three large turtles were caught by fishermen and brought to market during my stay; I was informed that they are caught when in the act of copulation, the male and female remaining connected for several days, and when they are in this condition a boat can be brought close to them and one or both of the animals can be easily captured. The method of capture is to seize the animal with a gaff by one of the legs and then to pass a rope round the limb, and so either hoist the turtle into the boat or tow it from the stern. I myself saw a couple of turtles at the surface of the water when I was in a boat rowing down the leeward coast, and we rowed up to the animals, but having no gaff on board were unable to capture them. There are no sandy beaches at St. Helena as at Ascension, and I never heard of any turtles going ashore to lay eggs at the former island. I saw the two giant tortoises which live at Plantation; they are mentioned by Melliss as having been there a century or more in 1875, but the exact date of their introduction is unknown. They came in

all probability from one of the Mascarene islands; Melliss suggests that they are of the species *Testudo indica*, but this species is stated by Lydekker to be extinct, and I was not able to ascertain the species with more certainty.

The commonest sea-birds were *Gygis candida* and *Anous stolida*. The former was fairly abundant in the neighbourhood of Jamestown, and some were always to be seen on the ledges of the vertical cliffs at the back of the wharf. It seemed to me that they were breeding there, but I did not confirm this supposition. Melliss states that the bird at St. Helena nests in rocky cliffs and dykes away from the sea, although in other parts of the world it nests in trees. At the request of the late Dr. Bowdler Sharpe I obtained two specimens of a Petrel which he identified as *Oceanodroma castro*; I found it breeding at Egg Island off the coast some miles west of Jamestown, and this was the first evidence of its breeding at St. Helena.

Among land-birds I noticed a mynah, not the species mentioned by Melliss, *Gracula religiosa*, which has become extinct, but *Acridotheres tristis*; the ground-dove *Geopelia tranquilla* from New South Wales; the Java sparrow, *Padda oryzivora*; the so-called cardinal, really the Madagascar weaver, *Foudia madagascariensis*; *Serinus flaviventris*, often called the St. Helena seed-eater, from South Africa; and the wax-bill, known in the island as the avadavat, *Astrilda astrild*, also from South Africa. The latter species is seen in flocks about cultivated lands in the interior of the island. Melliss states that he introduced among other birds 26 London sparrows; but I am glad to say I saw no signs of this impudent little bird, which if it flourished would probably exterminate others much more desirable. For kind assistance in identifying these few birds I am indebted to Mr. Frank Finn.

I have myself worked out the fishes which I collected, but for the identification and annotation of the various groups of invertebrates I am indebted to specialists of the staff of the Natural History Museum. Dr. Calman examined the Crustacea, Mr. E. A. Smith the few Mollusca, chiefly shells inhabited by *Pagurus*, Mr. Jeffrey Bell the Echinoderms, and Mr. Kirkpatrick the specimens of sponge and Hydroid. To all these gentlemen I wish to express my heartiest thanks for their courtesy and assistance. I have thought it best to incorporate their reports in my paper, partly because the specimens in each group were few in number, partly because there is an advantage in keeping the results of my observations on the fauna of the island together. I have also to thank Mr. Boulenger for much friendly help and advice in reference to my work on the fishes. All the expenses of collecting the specimens and bringing them home were borne by Mr. Mosely, and to me personally his generosity and kindness were unfailing. To the Governor, Lieut.-Colonel Gallwey, my sincere thanks are due for his hospitality and for the very friendly interest he took in my work. I have also to thank the residents of the island for much hospitality and the officials for all kinds of help.

Relations of the Fish-fauna of St. Helena.

There are 33 species in my collection, while Melliss in his book, published in 1875, mentions 68. Of those which I obtained the following are peculiar to the island:—

Congromuræna mellissii.
Ophichthys regius.
Leirus moselii.
Pimelepterus gallveii.
Chætodon sanctæ helenæ.
Julis sanctæ helenæ.
Scarus strigatus.
Tetrodon cutaneus.

The rest may be divided into two divisions; those which are confined to the Atlantic, and those which occur also in the tropical and subtropical Pacific.

Species confined to the Atlantic.

Muræna unicolor.
Muræna moringa.
Muræna sanctæ helenæ.
Holocentrum longipinne.
Epinephelis ascensionis.
Sargus capensis (also Muscat).
Caranx dentex.
Lichia glauca.
Platophrys podas.
Scorpæna scrofina.
Salarias textilis.
Ostracion quadricornis.

Species common to the Atlantic and Pacific.

Saurus myops.
Priacanthus boops.
Priacanthus cruentatus.
Cossyphus pectoralis.
Caranx sanctæ helenæ.
Caranx ascensionis.
Scomber colias.
Thynnus alalonga.
Thynnus albacora.
Thynnus obesus.
Gymnosarda alleterata.
Thyrsites prometheus.
Balistes buniva.

In order to ascertain in a general way the affinities of the St. Helena fishes, we may enquire what species that island has in common with the Cape, with the West Indies, and with the Mediterranean. The following lists show which of the species collected by me occur in these several regions.

Species found also at the Cape.

Epinephelus ascensionis.
Priacanthus boops.
Sargus capensis.
Lichia glauca.
Scomber colias.
Thynnus alalonga.

Species found also in the Mediterranean.

Muræna unicolor.
Caranx dentex.
Lichia glauca.
Scomber colias.
Thynnus alalonga.
Gymnosarda alleterata.
Platophrys podas.

Species found also at the West Indies.

Muræna sanctæ helenæ (Bermudas).
Muræna moringa.
Holocentrum longipinne.
Epinephelus ascensionis.
Priacanthus cruentatus.
Sargus capensis (Bermudas).
Caranx dentex (Bermudas).
Scomber colias.
Thynnus albacora.
Thyrsites prometheus (Bermudas).
Platophrys podas (Cuba ?).
Balistes buniva.

According to E. A. Smith in his paper on the Marine Mollusca of St. Helena, P. Z. S. 1890, the molluscan fauna of the island resembles that of the West Indies, fifty per cent. of the specimens from St. Helena being common to the two localities. The similarity shown by my small collection of fishes is not nearly so great, the proportion of West Indian species, including those found at the Bermudas, being only 11 out of 33, and if we exclude the Bermudas and omit *Platophrys podas*, which is doubtful, we have only 6 out of 33. A few of the species occur both in the Mediterranean and at the Cape, namely *Lichia glauca*, *Scomber colias*, *Thynnus alalonga*, and probably *Caranx dentex*, which certainly occurs at Port Natal (Durban). The few remaining species show no special affinity of the St. Helena fauna with either the Mediterranean or the Cape. On the other hand, a vast number of Mediterranean and South African species do not occur at St. Helena, these being northern and southern temperate forms which are probably excluded by temperature. In fact, if we omit the oceanic forms of wide distribution, such as the species of *Thynnus*, the shallow-water fishes of St. Helena are few in number of species; and the fact that such a large proportion are peculiar to the island, shows how isolated the fish-fauna is, in spite of the fact that the eggs and larvæ are pelagic. The fauna belongs to the tropical Atlantic, but comparatively few of the species of this fauna have established themselves on this small and isolated area in mid-ocean, and the arrival of new individuals from other regions must be a rare occurrence.

With regard to the species common to the Atlantic and Pacific, it is an interesting question whether there is any interchange of individuals between the two oceans or whether the populations of the same species have been isolated since the oceans were separated by the elevation of the Isthmus of Panama. If there is any interchange it must take place round the Cape of Good Hope, as warm-water fishes are not likely to travel round the cold shores of Cape Horn, and at the African cape the cold Benguela current from the Antarctic offers an obstacle. *Scomber colias* is common at the Cape, but not known in the Indian Ocean. *Thynnus alalonga* occurs in South African waters, but the other species of *Thynnus* are not recorded. *T. albacora* occurs at Muscat, and both this species and *Gymnosarda alleterata* are taken on the coasts of India and the East Indies, but not at the Cape.

CONGROMURÆNA MELLISSII. (Plate IV. fig. 1.)

Congromurœna mellissii Günther, B. M. Cat. Fishes, viii. p. 42; Melliss.

The Silver Eel, Melliss.

I obtained one specimen of this species, which was caught on a bottom line from a boat moored off Egg Island in about 35 fms.; it was 18 inches long, of uniform yellowish grey colour. This species is peculiar to St. Helena, and only a single specimen of it, presented by Melliss, was in the National Collection until mine was added.

MURÆNA SANCTÆ HELENÆ. (Plate IV. fig. 2.)

Muræna sanctæ helenæ, Günther, B. M. Cat. Fishes, viii. p. 115; Melliss.

The Bird's-eye Conger, Melliss.

I bought a specimen of this species in the market. It was 34 inches long; it has speckled markings on a chocolate ground, each mark being a group of white dots. It was a female nearly ripe, the eggs about 1 mm. in diameter, opaque, without oil globules, with thick vitelline membrane. On the inner surface of the peritoneum were oval white bodies apparently of parasitic nature. Günther gives the length of the head as $\frac{2}{5}$ that of the trunk, which means the length from the gill-opening to the anus; if we take the length from snout to anus, the head is contained in this $3\frac{1}{2}$ times. The markings in Melliss' specimen which is in the Museum are larger and more conspicuous than in mine. The long teeth are hinged so as to bend down flat inwards and posteriorly.

Melliss states that this species is peculiar to the island, but there is now in the Museum a specimen from the Bermudas and another received from the Smithsonian Institution. The Madeira form *Muræna anatina* is similar but distinct.

MURÆNA UNICOLOR.

Muræophis unicolor De la Roche, Ann. Mus. xiii. 1809, p. 359, fig. 15.

Muræna unicolor Risso, Ichth. Nice, p. 368; Günther, B. M. Cat. Fishes, viii. p. 125; Melliss.

The Brown Eel or Grig, Melliss.

My specimen of this species was also bought in the market. It is 31 inches long. It agrees with Günther's description except that he does not mention the vertical ascent of the forehead above the eyes; the top of the head forms a hemispherical enlargement which is continued behind into a very thick neck, while the snout is pointed and narrow. There is a narrow edging of yellow round the vertical fins posteriorly from the anus and the opposite dorsal point to the caudal extremity. When the specimen was handled I noticed a liquid running from it which

appeared to be milt; under the microscope particles were seen in this liquid which resembled the heads of spermatozoa, but none of them possessed tails. When the specimen was opened a narrow testis was found on each side not more than $\frac{1}{4}$ inch in breadth. When a piece of the testis was teased up and examined microscopically, particles like those seen in the supposed milt were seen, and I concluded that these were ripe spermatozoa which had undergone partial decomposition, the specimen having been dead some time. I concluded that the specimen was a male which had spawned and was almost entirely spent, and as it had been taken with bait and its stomach was full of food, it is evident that this species of *Muræna* does not die after spawning like the common conger and the freshwater eel of Europe.

It occurs also in the Mediterranean, at Madeira, and the Azores.

Muræna moringa.

Muræna moringa Cuv. Règne Anim.; Günther, B. M. Cat. Fishes, viii. p. 120; Melliss.

Murænophis rostrata Casteln. Anim. Am. Sud, Poissons, p. 80, pl. xlii. fig. 1.

Murænophis curvilineata ibid. p. 81, pl. xlii. fig. 2.

Common Conger, Melliss.

This species has innumerable confluent brownish-black spots separated by a fine network of the white ground-colour. The teeth are uniserial with a diastema behind large canines in the mandible and two long vomerine teeth which are hinged. I obtained a single specimen $32\frac{1}{2}$ inches long from an albacore-boat when I was out in another; it occurs also at Bahia and the West Indies. All the Murænas are called congers at St. Helena and this one is known as the common conger, but the true *Conger vulgaris* of Europe, according to Melliss, is also abundant, although I did not meet with a specimen. This species occurs in various parts of the tropical Atlantic; specimens in the National Collection come from Bahia, Ascension, Jamaica, Cuba, and St. Helena.

Ophichthys regius.

Ophisurus regius (Shaw) Richards. Voy. 'Erebus' and 'Terror,' Fishes, p. 106.

Ophichthys regius Günther, B. M. Cat. Fishes, viii. p. 66; Melliss.

Sea-Snake, Melliss.

This species is characterized by the single series of large conspicuous brown spots on a grey ground along each side of the body, with smaller spots in between. I obtained only one specimen, which was caught on a mackerel-line off Egg Island; it is $27\frac{1}{2}$ inches long.

Peculiar to St. Helena.

Saurus myops.

Salmo myops (Forster) Bloch Schn. Syst. 1801, p. 421 ; Forst. Descr. Anim. ed. Lichtenst. p. 412.

Saurus trachinus Schleg. Fauna Japonica, Poiss. p. 231, pl. cvi. fig. 2 ; Cantor, Malay. Fish. p. 271.

Saurus myops Cuv. Règne Animal ; Cuv. & Val. xxii. p. 485 ; Melliss.

Sand-spear, Melliss.

I caught one specimen of this species about a foot long in about 20 fms. in Flagstaff Bay. It is cylindrical in shape with a dorsal fin in the middle of the back and a small adipose fin further back. The ventral fin is extensive, reaching from the anus to the root of the tail. The pectorals are small, the pelvics much larger and thoracic in position ; the mouth is enormous, extending far behind the eyes which are placed close together on the top of the head ; the gill-openings also are very wide. Small pointed teeth in a single row on the jaws and some on the tongue. The scales are of moderate size. The back is dark brownish with seven darker transverse bands ; on the sides are several longitudinal lines of yellow. The specimen was a male with nearly ripe milt. This description is from the notes I made when I examined the fresh specimen, and the colours described may not be visible in spirit specimens. The fish lives in the sand with its eyes protruding.

Leirus moselii, sp. n. (Plate V.)

B. 6 ; D. I, 25 ; A. II, 21 ; P. 22 : V. I, 5. Lat. line 95. Sc. trans. 20/32.

The most peculiar character is the posterior position of the dorsal fin which commences at a point whose distance from the end of the snout is $1\frac{1}{2}$ times the length of the head.

Anterior part of the dorsal surface in front of the dorsal fin flat and scaled, with no trace of fin structures ; a fleshy elevation at the commencement of the fin, the base of which and of the anal is imbedded and covered with scales. The single dorsal spine and the two anal spines not separate from the rest of the fin and imbedded so that they could only be detected by dissection. Anus at about the middle of the body and ventral fin (anal) commencing immediately behind it. Length of head $3\frac{2}{5}$ in length of body measured from end of snout to end of middle caudal rays. Front of head very obtuse, skin of its upper surface and round the eye scaleless and porous, but the pores not so conspicuous as in *Leirus perciformis*. Preoperculum with radiating ridges which project from the edge as very minute spines ; edge of operculum with still more minute spinules. Operculum and preoperculum partially scaled. Eye large, its diameter $3\frac{3}{5}$ in length of head ; no vertical lids, but a circular ridge round the orbit. Upper rays of pectoral fin elongated,

reaching a quarter of their length beyond the commencement of the dorsal; pelvic (ventral) fins about half the length of the pectoral. Caudal emarginate and wide. Caudal peduncle very nearly half the length of the head, its height contained $1\frac{1}{4}$ times in its length. Body oblong ovate, slightly compressed. Mouth rather small, angle of the gape extending to below the vertical from anterior margin of orbit. Posterior end of maxilla exposed with small supplemental bone. Coloration brown above, paler below.

The above description is taken from a single specimen measuring from the snout to the end of the middle caudal rays 72 cm. or $28\frac{1}{4}$ inches, its greatest depth of body being 21·5 cm. or $8\frac{2}{5}$ inches. It was brought to me by some fishermen who called it a cod and said it had been taken in an albacore-boat, which would imply that it had been caught at a depth of 70 to 80 fathoms off the south-west point of the island. It was already eviscerated when I received it, even the gills having been cut away. I was therefore unable to examine the œsophagus to ascertain whether the tooth-bearing lateral sacs were present; but the external characters are so similar to those of other members of the family Stromateidæ that there can be no doubt that the fish belongs to that family. The peculiar character of the dorsal fin is so different from that of previously known species that I was for some time inclined to propose a new genus for the fish, but in its other characters it agrees so closely with the species of *Leirus* that I have decided for the present to place it in that genus. The generic characters of the Stromateidæ, as given by Tate Regan in his revision of the family, are in most cases not very strongly marked; thus my specimen in many of its characters resembles species of *Seriolella*, especially *S. velaini* as described and figured by Sauvage, as much as it does the species of *Leirus*. It has similar falciform pectorals and the scales are not deciduous; these characters occur, however, also in some species of *Leirus*. In fact, the only character distinguishing *Leirus* and *Centrolophus* from *Seriolella* and other genera is that in the two former the lateral line becomes straight before reaching the caudal peduncle, and my specimen possesses this character. The spines of the dorsal fin are reduced and variable in the family generally and in *Leirus* in particular, and it is possible that in younger and smaller specimens of the St. Helena species an anterior spinous portion of the dorsal may exist, although there is no sign of this in my specimen, and in other species, such as *Leirus ovalis*, the larger specimens have not lost the anterior spines; on the other hand, these spines are known to disappear with age in some species of the Carangidæ. The separation of *Centrolophus* from *Leirus* is not founded on very well marked characters, but merely on the greater elongation of the body and the slipping of the maxilla under the preorbital which is a matter of slight degree. Regan adds another character, namely, that each scale is pierced by a pore, but I have found on examination of specimens in the

Natural History Museum that this is not the case; the scales are not pierced, but when the scale is removed and the thin membrane beneath it also, a cavity is visible in the centre of the scale-area.

I have named the new species in honour of Mr. Alfred Mosely.

Holocentrum longipinne.

Holocentrum longipinne Cuv. & Val. iii. p. 185; vii. p. 496; Günther, B. M. Cat. Fishes, i. p. 28; Melliss.

The Soldier, Melliss.

Certain sexual differences exist in this species which are not mentioned in Günther's Catalogue. In the male the pelvic fins reach only two-thirds of the distance from their base to the anus, in the female they extend to the anus; in the male their length is contained more than $3\frac{3}{4}$ in the total length exclusive of the caudal fin, in the female it is contained only 3 times in the total length. The body is shorter and stouter in the female than in the male; in the former the height of the body is contained twice in the total length without caudal, in the male 3 times.

This species is regularly seen in the market, where I obtained my first specimens. It is taken in shallow water along the coast in company with *Scorpæna scrofina*; in my experiment with the trammel off Banks' Valley I caught eleven specimens, but in the trawl I caught none, from which it would appear that it occurs only in the shallowest water close to the shore.

It occurs also at Ascension, the Bermudas, the West Indies, and the coast of Brazil.

Epinephelus ascensionis.

Trachinus ascensionis Osbeck, Voy. China, ii. p. 96; Cuv. & Val. vi. p. 517.

Serranus impetiginosus Müll. & Trosch. in Schomburgk's Hist. Barb. p. 665; Melliss, p. 103.

Epinephelus ascensionis Jord. & Swain., Proc. U.S. Nat. Mus. vii. 1884, p. 391; Boulenger, B. M. Cat. Fishes, 2nd ed. i. p. 228.

St. Helena Jack, Melliss.

This species is marked with reddish-brown spots regularly distributed all over the body. It is common and considered a very good table-fish; it occurs close to the shore as well as in moderate depths, and is caught either by fishing from the rocks or from a boat. The first specimen I saw was obtained from a man who had been fishing from the landing-steps in the early morning; it was 9 inches long, and was a female not ripe. Others were caught on the windward side of the island, off George Island and in Prosperous Bay. It appears to be confined to the tropical and subtropical Atlantic, having been taken at Ascension, Barbados, Trinidad, and Bahia; also at the Cape.

Priacanthus boops.

Anthias boops (Forst.) Bloch Schn. Syst. 1801, p. 308.

Priacanthus boops, part., Cuv. & Val. iii. p. 103; Boulenger, B. M. Cat. Fishes, 2nd ed. i. p. 357; Melliss.

Priacanthus japonicus Cuv. & Val. iii. p. 106; Schleg. Faun. Japon., Pisces, p. 20.

The Deep-water Bull's-eye, Melliss.

This species is distinguished from all the others of the genus by the last dorsal spine being more than twice as long as the second. The membrane of the pelvic fins is black, but there is little black on the sides. I saw some of these fishes caught when I was out in an albacore-boat moored in about 80 fms.: when alive they were of a beautiful crimson-red all over except the belly, and the enormous eyes were perfectly clear and transparent, fully justifying the name Bull's-eye, suggesting the convex lens of a bull's-eye lantern. I opened one of the eyes and found there was no black pigment visible on the inner surface, but a bright silvery argenteum over the whole of the choroid. The black pigmented epithelium of the retina would appear to be also wanting, since, if present, it would lie in front of the choroid. This condition is evidently related to vision in a dim light, and is comparable to the tapetum of crepuscular and nocturnal mammals such as the Felidæ. It has been suggested that the retina in such eyes is more sensitive in the presence of slight diffused light reflected from the tapetum, but it seems possible that the tapetum or argenteum may have the power of rendering dark rays more visible by altering their refrangibility at the moment of their impact on the tapetum which is in contact with the rods and cones of the retina: in other words, the tapetum may be fluorescent.

In the British Museum Catalogue this species is not recorded from the West Indies, but from the South Atlantic, S. America, Cape of Good Hope, Muscat, and Japan.

Priacanthus cruentatus.

Labrus cruentatus Lacépède, Poissons, iii. p. 522.

Priacanthus carolinus Less. Voy. Coquille, Poissons, p. 224.

Priacanthus boops Val. in Webb & Berthelot, Iles Canar., Ichth. p. 12.

Priacanthus blochii, part., Günther, B. M. Cat. Fishes, i. p. 218; Day, Fish. Ind. p. 48, pl. viii. fig. 2.

Priacanthus cruentatus Boulenger, B. M. Cat. Fishes, 2nd ed. i. p. 352.

Priacanthus sp.? Melliss.

The Bull's-eye, Melliss.

D. X, 13; V. III, 14. Lat. line over 100.

The above numbers are from a single specimen 10 inches long in my collection. Both this species and *P. boops* are abundant at St. Helena, this one being usually taken by fishing from the rocks or near the shore at night, while the other is taken in deep

water, 70 to 100 fms., in daytime. Both are excellent table-fish, but the present species is only about half the size of the Deep-water Bull's-eye, not usually exceeding a foot in length. Both are of a general red colour, but in *cruentatus* the colour is darker and there is more black on the sides. In the present species the scales are smaller and the lateral line has a much steeper curve behind the head; the eye is larger in proportion to the head and the rays of the dorsal and ventral are not so rough, in fact the soft rays are quite smooth. According to the British Museum Catalogue, *P. cruentatus* occurs in the tropical and subtropical Atlantic, as well as in the Pacific and Indian Oceans, the localities mentioned being Bermuda, Jamaica, West Indies, west coast of Mexico; also Zanzibar, Samoa, Tahiti, and the East Indies.

Pimelepterus gallveii, sp. n. (Plate VI.)

D. XI, 12; A. III, 11. Lat. line 80+. Trans. sc. 13 or 14/20.

Soft portion of dorsal much higher than last spine; head $4\frac{1}{4}$ in total length, measured to end of middle caudal rays; eye $4\frac{1}{4}$ in length of head. Height $2\frac{1}{2}$ times in total length. Horizontal portion of teeth $1\frac{1}{2}$ times as long as the vertical measured inside, equal in length to the vertical measured externally.

Length of single specimen examined $15\frac{1}{4}$ inches to end of middle caudal rays.

I obtained only one specimen of this genus, and it does not appear to agree with any of the species previously described. It differs from *P. boscii* Lacép., which occurs at Madeira, in having smaller scales and a smaller eye; in *fuscus* Lacép., which is found at the Cape, the end of the spinous portion of the dorsal and the soft dorsal are about equal in height, whereas in my specimen the soft portion is much higher than the last spine; it differs from *P. elegans* Peters, in having smaller scales with their posterior apices more pointed and the body is less elongated. It resembles *P. analogus* Gill most closely, but in the latter there is less difference in height between the end of the spinous and the beginning of the soft portion of the dorsal, and the colour in my specimen is a bluish grey, while that of *analogus* is reddish brown. In *P. leutescens* Jordan & Gilbert, again, the eye is larger and the posterior apices of the scales more pointed.

The specimen was called a bream by the fisherman from whom I bought it, the English name usually applied to fishes of the family Sparidæ. Melliss mentions a fish known as the bream at St. Helena, but he saw no specimens; it does not seem to be caught very often.

I have named the species in honour of the Governor of St. Helena, Lieut.-Colonel Gallwey.

Sargus capensis.

Sargus capensis Smith, Ill. Zool. S. Africa, Fishes, pl. 23. fig. 2; Günther, B. M. Cat. Fishes, i. p. 442; Melliss.

Old Wife, Melliss.

I brought back two specimens, one 10 inches long, the other 7 inches, which agree with Günther's description, except that in the larger the pectoral extends only to the commencement of the ventral, not to the second soft ray of that fin. This is one of the most abundant fishes at St. Helena, occurring along the shore and everywhere at moderate depths. I caught specimens off the wharf, to the east of Jamestown and on the windward side off George Island. It is common at the Cape and along the coast of S. Africa, and occurs also at the Bermudas and at Muscat, on the coast of Arabia.

CHÆTODON SANCTÆ HELENÆ.

Chætodon sanctæ helenæ Günther, B. M. Cat. Fishes, vol. ii. MS.; Melliss.

The Cunning-fish, Melliss.

The colours of this Chætodont, although pretty, are not so conspicuous as in the majority of the species in other parts of the world, a fact which is perhaps related to the absence of corals and the sombre colours of the rocks at St. Helena. The sides are silvery white ventrally, light mauve dorsally, and a band of bright yellow passes all round the body along the dorsal and ventral fins and across the caudal peduncle, the caudal fin itself being almost colourless. The fish is very abundant and very fearless, although at the same time not easy to capture by hook and line, as its mouth is small and it seems to know how to avoid the hook and tear away the bait, hence its local name of Cunning-fish. In ordinary circumstances not one may be seen in the water from the wharf or the landing steps, but as soon as any refuse is thrown in dozens or hundreds appear to feed on it. I tried to catch them with a small seine shot round the fishermen's steps, but as soon as the net was hauled in they simply escaped under its lower edge. I then used a mackerel-net, keeping the foot-line on the steps and the buoyed head-rope some distance out with the loose net hanging below the surface of the water; then by means of bait I enticed the fish over the net, and by raising the edge which had been under water I captured more than a hundred at one haul. I found they were almost ready to spawn, milt or eggs running from many of them when the abdomen was squeezed. Some of the eggs were ripe enough to float in sea-water; they were transparent, about 1 mm. in diameter, with a single yellowish oil-globule.

This species and *C. dichrous* Günther, of which I did not obtain a specimen, are peculiar to St. Helena, being found nowhere else in the world, while at the same time they are the only species of the genus which occur at the island.

JULIS SANCTÆ HELENÆ.

Julis sanctæ helenæ Cuv. & Val. xiii. p. 382; Günther, B. M. Cat. Fishes, iv. p. 191; Melliss.

The Green-fish, Melliss.

The following are the notes I made from the examination of a fresh male specimen at St. Helena:—The colours are chiefly bright blue and green; the dorsal and ventral fins are blue with a red band running along the middle of each fin for its whole length. The tail has a vertical edge in the middle, but the dorsal and ventral rays are prolonged for about $1\frac{1}{4}$ inch. A dark, almost black, colour covers the top of the head and extends as a broad band along the side dorsally, but above this band at the base of the fin the colour is bright blue. A narrow band of bright blue extends from the base of the eye to the angle of the mouth, and behind the eye on the operculum is a dull brick-red band. The operculum is blue, the belly is green inclining to yellow. The testes were narrow and elongated, but apparently ripe; in the stomach was an unidentified crustacean with curiously toothed chelæ. I did not carefully compare this male with a female with regard to the prolongation of the caudal lobes, and the two specimens I brought home are not sufficiently well preserved to show the sex with certainty; but in one of them, $10\frac{1}{4}$ inches long, which appears to be female, the caudal lobes extend only $\frac{5}{8}$ in. beyond the posterior margin of the fin.

This species is very common about the wharf at St. Helena, and makes the capture of other fishes with rod and line difficult by its propensity to seize the bait as soon as it is put into the water. It is used as food. It is peculiar to St. Helena.

Cossyphus pectoralis.

Harpe pectoralis Gill, Proc. Acad. Nat. Sc. Philad. 1862, p. 141.
Cossyphus pectoralis Günther, B. M. Cat. Fishes, iv. p. 110.

Originally described from the coasts of Lower California. Günther states that the colour is brownish yellow, which is the colour of a specimen $9\frac{1}{2}$ inches long which I brought home. Gill says that the colour during life is blue. This species, like the Green-fish, is taken from the wharf or the rocks by hook and line, but is less common.

Scarus strigatus.

Scarus strigatus Günther, B. M. Cat. Fishes, iv. p. 212; Melliss.

The Rock-fish, Melliss.

I obtained one specimen among a mixed lot of fish bought from a man who had been fishing with rod and line from the landing-steps at the wharf. It was rather less than a foot in length. In colour it does not agree with Günther's description, "olive (in spirits)," although the specimens from St. Helena in the Museum collection, collected by Bannerman, resemble mine. The general colour of my specimen is a light brick-red; on the posterior half of the side below the lateral line is a violet-black patch not extending to the ventral edge; the snout is black dorsally, with patches of cream-colour, the chin is violet; each scale has a darker centre. The scales are very large, and the teeth form a beak

divided above and below. The body was deep and the abdomen swollen, but no spawn exuded on pressure. On opening the abdomen I found that the specimen was female, with enlarged roes, but the eggs were not ripe; the largest were still opaque, with several oil-globules, probably pelagic with a single oil-globule when ripe. The contents of the intestine consisted of dark grey sandy matter, in which, under the microscope, were found triradiate sponge-spicules, one small crustacean, and numbers of curious elongated structures of colourless granular appearance and variable breadth. They may have been vegetable growths living in the intestine or perhaps in the sand that the fish swallows; they were certainly not Gregarines.

The habitat of the original single specimen in the British Museum Collection was not known, but two specimens were subsequently received from St. Helena. It seems to be confined to the shores of this island, not having been recorded from any other locality.

CARANX SANCTÆ HELENÆ.

Caranx sanctæ-helenæ Cuv. & Val. ix. p. 37.

Caranx jacobæus Cuv. & Val. ix. p. 42.

Caranx muroadsi Temminck & Schlegel, Fauna Japonica, Pisces, p. 108, pl. 58. fig. 1; Günther, B. M. Cat. Fishes, ii. p. 425; Melliss.

Kingston and Stonebrass, Melliss.

The Stonebrass and Kingston are identical, the latter being the adult. Average specimens which I brought home measured $10\frac{3}{4}$ and $15\frac{1}{4}$ inches respectively. A single posterior ray of the dorsal and ventral fins is detached, forming a rather long finlet; the posterior scales of the lateral line are keeled.

The young of this species, known as Stonebrass, are very abundant at St. Helena. Whenever I was out fishing for mackerel off Egg Island, swarms of these fishes could be seen around the boat feeding greedily on the pounded mackerel or "mince" thrown over to attract the mackerel. They were never caught on the mackerel-hooks, probably because these were too large for their mouths, but when mackerel were scarce the men fished for Stonebrass by two different methods: one method was with a bamboo-rod and short line furnished with a small hook and baited with mackerel; the other was to collect a number of the fishes in a dense shoal by throwing over a handful of mince, and then to draw rapidly through them a bunch of sharp hooks on the end of a short line weighted with a lead: in this way the Stonebrass were foul-hooked. Stonebrass are of little value in the market, and are caught usually when mackerel are scarce, as bait for albacore-fishing.

Kingstons are occasionally caught on the mackerel-lines; but I saw very few caught in this way, namely three on March 6th and one on March 10th; the latter was a ripe male exuding

milt, so that the fish evidently spawns in March, but I did not identify the eggs.

This species is widely distributed in the Pacific as well as in the Atlantic, occurring in Japan, at Tahiti, Raratoa, and Jalisco, Mexico.

Caranx muroadsi Schlegel, of Japan and China, is very closely allied, differing only in the fin-ray formula by one or two rays, and by having a few more keeled scales in the lateral line.

Caranx dentex.

Scomber dentex Bloch Schn. Syst. 1801, p. 30.
Caranx dentex Cuv. & Val. ix. p. 87; Günther, B. M. Cat. Fishes, ii. p. 441; Melliss.
Caranx analis Cuv. & Val. ix. p. 88; Webb & Berthelot, Iles Canar., Poiss. p. 57, pl. xii.

The Cavally, Melliss.

The specimen which I brought home agrees with Günther's description, except that there are no teeth on the tongue, and the head is contained 3 times in the total length instead of $3\frac{3}{4}$; the latter difference is apparently due to the fact that Günther measured to the end of the forked tail while I measured to the end of the middle caudal rays. The Museum specimen which I compared, one collected by Melliss at St. Helena, is $14\frac{1}{2}$ inches long, while mine is 17 inches. The Museum specimen has a few median teeth at the front of the tongue; these teeth are therefore deciduous. The lips both above and below are thick and fleshy and covered with papillæ; the upper jaw is protrusible.

This fish is plentiful at St. Helena and considered one of the best table-fish. I saw two caught on a bottom line in an albacore-boat moored in about 80 fms. off the S.W. point of the island, and another on the windward side off George Island, as well as others landed by the fishermen. It is a species of wide distribution in the Atlantic, being well known in the Mediterranean, and occurring also on the coast of Brazil, the Cape Verde Islands, Madeira, Canary Islands, the Bermudas, and Port Natal.

Caranx ascensionis Cuv. & Val. ix. p. 102, pl. 249, occurs at St. Helena, Kingsmill Island, Samoa, Ascension, and St. Paul's Rocks, but I did not get a specimen. Melliss sent it from St. Helena, but it is not mentioned in his book.

"Neck very much elevated" seems the principal character in Günther's description.

Lichia glauca.

Scomber glaucus Linn. Syst. Nat. i. p. 494.
Lichia glaucus Risso, Eur. Mérid. iii. p. 429.
Lichia glauca Günther, B. M. Cat. Fishes, ii. p. 477; Melliss.

The Silver-fish, Melliss.

Length of specimen examined $9\frac{1}{2}$ inches. This species is common at St. Helena and forms part of the regular fish-supply, being caught near the shore either from the rocks or from a moored

boat. The first fishes I caught at the island were two Silver-fish which were meshed in mackerel-nets with which I was experimenting on the eastern side of Jamestown. I opened one of them and found it had a large simple air-bladder, long gill-rakers on the first gill-bar but not on the others; in the intestine I recognized a Copepod. It was a male, the testes being large and ripe, with milt running from them, so that this species, like several others at St. Helena, spawns in February and March; probably small pelagic eggs with a single oil-globule, which I found in the tow-net collections taken at the time the fishes were caught, belonged to this species. It is caught at night, and its appearance when first taken from the water is beautifully silvery. The species has a wide distribution in the Atlantic, ranging from the south coast of England to the Cape; it is common in the Mediterranean, and is found at Madeira, Cape Verde, Ascension, Mogador, and the coast of Brazil.

Scomber colias.

Scomber colias Gmelin, Syst. Nat. 1788 (Sardinia); Cuv. & Val. viii. p. 39, 1831; Storer, Fishes Massachusetts, 1839; Steindachner & Döderlein, Beiträge zur Kenntniss der Fische Japans, iii., 1885; Kitahara, Journ. Fish. Bur. Tokyo, 1897.

Scomber pneumatophorus de la Roche, Ann. Mus. Hist. Nat. xiii., 1809; Cuv. & Val. viii., 1831; Günther, B. M. Cat. Fishes, ii. 1860 (St. Helena, Madeira); Poey, Enum. Pisc. Cubens. 1875; Jordan & Gilbert, Proc. U.S. Nat. Mus. 1880 (Monterey Bay).

Scomber macrophthalmus Rafinesque, Indice d'Ittiologia Siciliana, 1810.

Scomber grex Mitchill, Trans. Lit. & Phil. Soc. N. Y. 1815.

Scomber diego Ayers, Proc. Cal. Acad. Sci. 1856.

It is generally agreed that the union of *S. colias* and *pneumatophorus* by Steindachner is correct, and the literature above quoted shows that the species has a very extensive range, from the Mediterranean to Japan through the southern parts of the Atlantic and Pacific. It is mentioned under the name *pneumatophorus* in Gilchrist's South African list, and was stated, under the name *S. grex*, by Cuvier to be very common at the Cape. Cuvier also received specimens from St. Helena. It is recorded by Steindachner from the coast of Chili; but on the other hand has not been observed in Indian or East Indian seas; Day (Fishes of India), and Bleeker (Verh. Batav. Genootsch. xxiv. 1852) make no mention of it.

At St. Helena mackerel are taken only by hook and line and the fishing is carried on only at night, that is after sunset. My experiments showed that they do not bite in daylight and that it is not possible to catch them in the English method by drift-nets. Evidently these fishes are nocturnal and remain in deep water during the daytime, rising to the surface at night. The fishing is carried on from a moored boat, and loose bait, consisting of boiled mackerel pounded to a pulp, is thrown overboard from

time to time to attract the fish ; this bait the native fishermen call "mince." The water is wonderfully transparent, and even when there is no moon it is never quite dark. I was able to see the bait on the hook to a depth of three fathoms, and there is no doubt that the mackerel were able to see my nets and avoid them ; the largest number I caught in the nets at one time was five. These nocturnal habits explain why the eyes in *Scomber colias* are so much larger than in *S. scombrus*, and this is therefore an instance of a specific character which is adaptive.

In my specimens the diameter of the eye is contained $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of the head. The presence of the air-bladder may also be adaptive, enabling the fish to adapt itself to great changes of depth. The mackerel at St. Helena are mostly from 11 to 13 inches in length : the largest I measured was $13\frac{1}{2}$ inches long and weighed $1\frac{1}{4}$ lb.

When I arrived at St. Helena at the end of February the mackerel were nearly ripe, but I never obtained any quite ripe and spawning, doubtless because they cease to feed for a time when in this condition. In the material collected by the tow-net were eggs with a single oil-globule, some of which probably belonged to the mackerel, but I was not able to identify them with certainty. After March 10th fewer mackerel were caught, and on March 24th I opened a dozen in which the roes and milts were small and collapsed and apparently spent ; I concluded that these had recently spawned and that spawning takes place in March.

Mackerel are caught at St. Helena all the year round. In February and March the fishing was carried on off a small island called Egg Island near the western point of St. Helena, but later in the year they are also caught off Jamestown and to the east. They are always counted and sold in dozens ; sometimes they bite very eagerly and are caught quickly, at others only a few may be taken in a whole night. The largest number caught by one boat during my visit was 59 dozen, the crew consisting of six men.

Genus Thynnus.

Three kinds of albacore are constantly distinguished by the fishermen of St. Helena, as was stated by Melliss in 1875 ; they are called the long-fin, the bastard, and the coffrey, the first being regarded as the typical form, and the term bastard being used in the sense of variety, but the origin or meaning of the third name I was unable to discover. The majority of recent writers recognize only one species of long-finned tunny, the *Scomber germo* of Lacépède, *Thynnus alalonga* of Cuvier & Valenciennes. The revision of the Scombridæ of America and Europe by Dresslar and Fesler, Bull. U. S. Fish. Comm. 1887, only recognizes one species of long-finned tunny, which is named *Albacora alalonga*, the common tunny being placed in the same genus as *Albacora thynnus*. Jordan and Evermann, in 'Fishes of North

and Middle America' 1896, adopt a somewhat different arrangement and nomenclature; they also recognize only one long-finned species but call it *Germo alalonga*, with which they consider the *Thynnus balteatus*, *pacificus* and *argentivittatus* of the 8th vol. of Cuvier and Valenciennes to be synonymous; the Tunny they make generically distinct and call it *Thunnus thynnus*. It is easy to recognize in the figures given by Cuvier and Valenciennes and by Dresslar and Fesler the form called the bastard at St. Helena; not only the length but the shape of the pectoral prove this: it reaches to the end of the anal fin or to the first finlet beyond it, and is very narrow and shaped like a scythe.

I was much interested to discover that the three forms I saw at St. Helena were described as distinct species by Lowe at Madeira so long ago as 1839 in our 'Proceedings.' The one he names *Thynnus alalonga* Cuv. & Val., is the bastard of St. Helena, its chief character being the great length of the pectorals, which are one-third of the total length of the body and reach to the end of the anal or to the first spurious finlet behind it. Another species described by Lowe as *Thynnus albacora* is the ordinary albacore or long-fin of St. Helena. He calls this a very distinct species and gives as its chief character the elongation in the vertical direction of the anterior part of the second dorsal and the anal, a feature which was very conspicuous in the specimens that I saw at St. Helena. The pectoral is described as from one-fifth to one-fourth of the total length, reaching to the middle of the second dorsal. The third species of Lowe, named by him *Thynnus obesus*, agrees exactly with the coffrey of St. Helena; it is described as differing from the others by the shorter and stouter shape and by the larger eyes, the pectorals being from one-sixth to one-fourth of the total length and reaching to the end of the second dorsal. As at St. Helena, the fishermen of Madeira distinguish the three species by separate names, *alalonga* being called 'atum avoador,' *albacora* 'atum albacora,' and *obesus* 'atum patudo.' Two of Lowe's species were entered in the British Museum Catalogue by Dr. Günther, namely *Thynnus alalonga* and *T. albacora*, but *T. obesus* is mentioned only in a footnote as a doubtful species.

It is necessary to consider whether the characters of these three forms are due to age or sex. With regard to age there can be no doubt that it is not the cause of the differences. The different characters were developed in fishes of about the same size, and both small and large specimens of the three kinds were easily distinguished. In one form—namely, the common albacore of the inhabitants of St. Helena—there are considerable changes in the course of growth; but these changes do not lead to any approximation to the other forms but rather to the greater development of the special features: in a small specimen somewhat less than 3 feet in length the second dorsal and the first ventral fins were scarcely higher than in the other two forms, while in larger specimens the great vertical elongation of these fins is very characteristic. With

regard to sex it is obvious that there are not three sexes, and although I cannot say that I examined males and females of each form, I certainly saw specimens of different forms which were of the same sex, and came to the conclusion that sex had nothing to do with the matter. Moreover, sexual dimorphism is not known in the family.

All recent writers seem to have ignored the species *albacora* and *obesus* of Lowe. Dresslar and Fesler give *Thynnus albacora* Lowe as a synonym of *Thynnus alalonga*, although in their diagnosis they state that the dorsals and anals are of height equal to the length of the second dorsal; whereas Lowe specially mentions the great height of the second dorsal and anal, which in large specimens are nearly three times as high as the length of the base of the second dorsal.

The three species of Cuvier and Valenciennes—*Thynnus balteatus*, *T. pacificus*, and *T. argentivittatus*—are regarded by Dresslar and Fesler as synonyms of *alalonga*, but to me they seem to be insufficiently characterized, and *balteatus* is described only from a drawing. I therefore omit them from the synonymy.

As in many other cases, the application of the rules of nomenclature has caused great diversity of opinion on the question of the generic names of Scombridæ in general and of the tunnies in particular; scarcely two writers can be found to agree on the subject. *Thynnus*, the specific name of Linnæus, was made the generic name by Cuvier; and Lowe, as mentioned above, calls the three species here considered *T. alalonga*, *T. albacora*, and *T. obesus*. In the 'Règne Animal,' 1817, Cuvier used the name *Orcynus* for the species *alalonga*, and this has been adopted by several writers. The American writers Dresslar and Fesler have discovered that both these names are preoccupied, *Thynnus* having been used by Fabricius for a genus of butterflies, and *Orcynus* by Rafinesque in 1815 for the *Scombroides* of Lacépède. They therefore adopt the name *Albacora*, proposed by Jordan in 1889. As the names *Thynnus* and *Orcynus* have been applied to the well known tunny from the times of the ancients, it seems to me absurd on pedantic grounds of priority to allow them to be confined to a genus of butterflies or another genus of fishes, and I propose to follow Lowe in using the name *Thynnus* for these species, placing them in the same genus as the Common Tunny, which therefore becomes *Thynnus thynnus*. The generic characters are:—Body entirely covered with scales, which are larger in the anterior part and sometimes form a distinct corselet; vomer and palatines with villiform or minute teeth; teeth in jaws slender, subconical; body robust, not compressed.

It appears that only one of these three species, namely *Thynnus alalonga*, occurs to the north of Madeira. The others have never been identified on the coasts of Europe or North America, and only *alalonga* is mentioned in the King of Portugal's "Pesca do atum no Algarve en 1898," published in 1899 as the first memoir of 'Resultados das Investigações scientificas feitas a bordo do Yacht

'Amelia.'' Only *alalonga* has hitherto been recognized in the Mediterranean and on the east coast of North America. It is possible that all three species occur in the West Indies; in fact, Poey in his Enum. Pisc. Cubens. 1875 mentions *Orcynus albacora* Lowe and another species, *subulatus*, in which the length of the pectoral is contained five times in the total length to base of caudal. This *subulatus* may be identical with Lowe's *obesus*, but Poey's description is insufficient to prove it. All the three species exist in the Pacific Ocean. In Temminck and Schlegel's 'Fauna Japonica,' Pisces, published in 1850, two species are described as occurring off the coasts of Japan, *Thynnus macropterus* and *T. sibi*. The former is seen, both from the description and the figure, to be identical with *T. albacora* of Lowe and with the common albacore of St. Helena. The elongation of the second dorsal and the ventral (anal), and the yellow colour of these fins and of the finlets, are specially mentioned and well shown in the figure. The corselet is stated to be still less distinct than in *T. sibi*. The pectorals are a little more than a fourth of the total length, and in the figure reach to the middle of the second dorsal and are broad in the proximal half. Jordan and Evermann, in 'Fishes of North and Middle America,' give this *T. macropterus* as a synonym of *Germo alalonga*. The *Thynnus sibi* of Schlegel appears to be identical with the coffrey of St. Helena, the *T. obesus* of Lowe. The characters given are:—Second dorsal and anal not elongated, first false fins united to second dorsal and anal, pectorals shorter than in *alalonga*, fins blackish, 8 free finlets above and 8 below. Schlegel suggests that this form may be the Pacific representative of *alalonga*.

In 1897 Kitahara, a Japanese naturalist, identified and figured not only the *T. sibi* and *T. macropterus* of Temminck and Schlegel, but also the *alalonga*, under the name *Orcynus germo* Lacép., and the common tunny. In the English descriptions the characters are not given in much detail, but the large size of the eye in *T. sibi* is mentioned ("eye about one-sixth in the head"), and the pectoral reaching to below the end of the first dorsal. This length of pectoral, both in description and figure, is rather less than in the coffrey of St. Helena; but the fish shows distinctly the stouter form of body which characterizes the coffrey. None of the figures, not even that of the common tunny, show a corselet. The figure of *macropterus* shows the characteristic elongation of the second dorsal and ventral, but that of *Orcynus germo* (=*alalonga*) does not show the pectoral so narrow or so curved as in the bastard of St. Helena, although it shows the characteristic length.

In 1905 Jordan and Seale mention, in a list of the fishes of Samoa (Bull. U.S. Bur. Fish. vol. xxv.), the species *alalonga* under the name *Germo germo*, and consider it synonymous with the *Thynnus sibi* of Schlegel, but distinguish *Germo macropterus* of Schlegel, mentioning its elevated second dorsal and anal and the citron-yellow colour of its finlets. On the coast of California only *alalonga* has been identified, under the name *Orcynus pacificus*,

by Cooper in Proc. Cal. Acad. Nat. Sci. 1863, who, however, represents the pectoral as larger than that described by other writers, namely, half the length of the body. Thus the three species are known with certainty to occur together only at St. Helena, Madeira, and Japan; while *albacora* has been identified at Samoa. It is possible that all three occur in the intermediate tropical oceans—that is to say, in the Indian Ocean, but they have not yet been all recognized there. Only *alalonga* is mentioned in Gilchrist's 'Catalogue of Fishes of South Africa' (Marine Inv. in S. Africa, Cape Depart. Agriculture, 1902).

T. albacora is mentioned by Day among the fishes of India, and by Bleeker as occurring at Batavia.

Thynnus alalonga. (Text-fig. 3.)

Orcynus alalonga Cuvier, Règne Anim. 1817.

Thynnus alalonga Cuvier & Val. Hist. Nat. Poissons, vol. viii., 1831; Lowe, Supp. to Synopsis of Fishes of Madeira, Proc. Zool. Soc. 1839; id. Trans. Zool. Soc. iii. 1849.

Germo alalonga Jordan & Evermann, Fishes of North and Middle America, Bull. U.S. National Museum, No. 47.

Albacora alalonga Dresslar & Fesler, Review of Mackerels of America and Europe, Bull. U.S. Fish. Comm. for 1887, 1889.

Orcynus germo Kitahara, Scombridæ of Japan, Journ. Fish. Bur. Tokyo, vol. vi., 1897.

Germo germo Jordan & Seale, Fishes of Samoa, Bull. U.S. Bur. Fish. vol. xxv., 1905.

Scaled all over. General appearance silvery with scarcely any yellow colour on dorsal and ventral fins, a trace of it in the middle

Text-fig. 3.

Thynnus alalonga, 3 ft. 2½ in. long. From a photograph by the Author.

of the dorsal finlets, none on the ventral. Second dorsal and first ventral scarcely higher than first dorsal, with no yellow colour. Pectoral very long, narrow, pointed, scythe-shaped, reaching to posterior border of first ventral fin and fitting into depression on

side of body. Nine dorsal finlets, first two rudimentary ; 8 ventral, first one small. Length of specimen examined 3 ft. $2\frac{1}{2}$ ins.

Called the bastard at St. Helena, where it seems less common than *T. albacora*.

THYNNUS ALBACORA. (Text-fig. 4.)

Thynnus albacora Lowe, Proc. Zool. Soc. 1839 ; id. Trans. Zool. Soc. iii. 1849 ; Günther, B. M. Cat. Fishes, ii. p. 365.

Thynnus macropterus Temminck & Schlegel, Fauna Japonica, 1850.

Orcynus macropterus Kitahara, Journ. Fish. Bur. Tokyo, vol. vi. no. 1, 1897.

Germo macropterus Jordan & Seale, Fishes of Samoa, Bull. U.S. Bur. Fish. vol. xxv., 1905.

Pectorals reaching to the middle of the second dorsal but not to the beginning of the ventral, about one-fourth of the total length; second dorsal and ventral much elevated, pointed, falciform ; distal

Text-fig. 4.

Thynnus albacora, young specimen, nearly 3 feet long. From a photograph by the Author.

and posterior parts of these fins strongly tinted with bright yellow colour. Dorsal and ventral finlets also coloured yellow, without black border or only a very narrow line of black. The specimen which I examined had 8 finlets above and 9 below ; Kitahara gives 9 dorsal and 9 ventral, but his figure shows the first dorsal small and united to the second dorsal fin. I saw many specimens, but the one which I obtained for special examination was small and young, less than 3 feet in length, and had the second dorsal and first ventral scarcely more produced than in the other species ; the colour of these fins and of the finlets and the length and shape of the pectoral were sufficient, however, to identify it.

This species is the commonest of the three at St. Helena, and it reaches a large size. I bought in the island a photograph of the largest specimen landed in recent years, but could not get its exact dimensions and weight; judging from the photograph, it

was between 7 and 8 feet in length, and I was told that it weighed about 400 lbs.

This species is regarded at St. Helena as the typical or common form and has no special name, but is merely called the long-fin or the albacore. It is mentioned by Day as occurring in Indian waters, and by Bleeker (Verh. Batav. Genootsch. xxiv. 1852), who saw one specimen in the market of Batavia.

Lowe suggests that the figure given by Pennant (Brit. Zool. ed. 1, iii. pl. lii.), which according to the text is taken from a specimen 7 ft. 10 ins. long, weighing 460 lbs., taken at Inveraray, really represents a specimen of his *T. albacora*, not of the common tunny. The figure represents the prolonged second dorsal and ventral fins, and the description states that these fins were high and falciform and that the finlets were of a rich yellow colour. This description and figure could scarcely apply to any other species, although this species does not appear to have been recognized in the British Islands subsequently. Lowe also refers to Sloane's albacore, mentioned and figured in his 'History of Jamaica' published in 1727 (Tab. i. fig. 3), as possibly representing this species. This figure also shows the prolonged and pointed second dorsal and ventral. Cuvier and Valenciennes (vol. viii. p. 148, 1831) describe this fish, not from specimens, but from Sloane's description and figure, and consider it to be an Auxis, on account of the interval between the first and second dorsal, heading their discussion with the names "L'Auxide de Sloane. *Scomber Sloanei* nob." This should evidently be *Auxis sloanei* nob., as they have already defined the genus *Auxis* for fishes of this character. But in all probability the first dorsal is not correctly represented in Sloane's figure, as the posterior spines are short and can only be seen by forcibly raising them from the deep dorsal groove which receives this fin when it is depressed. These spines may well have been overlooked by an observer in those early days of ichthyology. Dresslar and Fesler consider *Scomber sloanei* Cuv. & Val. as a synonym of the common tunny. These imperfect records are interesting historically, and because they suggest that the species occurs in the West Indies, and that a specimen has occurred in Scotland; but as Lowe was the first accurately to distinguish the species from others, his name must be accepted.

In the published form of Günther's British Museum Catalogue the description of this species is merely copied from Lowe, and no specimens are recorded; but in the MS. additions in the interleaved copy used in the Fish Department there are now three specimens registered as follows:—

a.	Adult, stuffed.	Madeira.
b.	,, ,,	Muscat.
c.	Skeleton.	Muscat.

It is evident, therefore, that the species occurs at the mouth of the Persian Gulf. Another stuffed specimen is exhibited in the

public Fish Gallery of the Museum, but the origin of this specimen is unknown.

THYNNUS OBESUS. (Text-fig. 5.)

Thynnus obesus Lowe, Fishes of Madeira, Proc. Zool. Soc. 1839; id. Trans. Zool. Soc. iii. 1849.

Thynnus sibi Temminck & Schlegel, Fauna Japonica, 1850.

Orcynus sibi Kitahara, Scombridæ of Japan, Journ. Fish. Bur. Tokyo, 1897.

This species is distinguished in the first place by its stouter, more robust shape and by its larger eye; the stouter form is evident also in the figure of *Orcynus sibi* given by Kitahara. The first dorsal in the specimen which I examined had 13 rays; finlets, 9 dorsal, the first small but not rudimentary, and 9 ventral,

Text-fig. 5.

Thynnus obesus, 3 ft. 9½ in. long. From a photograph by the Author.

all with distinct yellow colour in the middle and broad black border. Second dorsal and first ventral also with some black at edges, but little or no yellow, not prolonged as in *albacora*. Pectorals reaching to past the beginning of the second dorsal but not to the beginning of the first ventral; pointed and triangular, broad at base. According to Kitahara the pectoral reaches to the end of the first dorsal or to the origin of the second, and is therefore rather shorter than in my specimen, which was 3 ft. 9½ ins. in length. Kitahara says it grows in Japan as large as the common tunny, that is, 6 or 7 feet in length: but I do not know whether this is the case at St. Helena. Known to the St. Helena fishermen as the coffrey.

GYMNOSARDA ALLETERATA.

Scomber alleteratus Rafinesque, Caratteri alcuni Generi, &c., 1810.

Thynnus thunnina Cuv. & Val. viii., 1831; Temminck &

Schlegel, Fauna Japonica, 1850; Günther, B. M. Cat. Fishes, ii. 1860; Bleeker, Verh. Batav. Genootsch. Makr. xxiv., 1852.

Scomber quadripunctatus Geoffroy St.-Hilaire, Descr. Egypte, Poissons, 1827.

Euthynnus alliteratus Jordan & Gilbert, Syn. Fish. N. Amer., Bull. U.S. Nat. Mus. No. 16, 1882.

Gymnosarda alleterata Dresslar & Fesler, Bull. U.S. Fish. Comm. vol. vii., 1889.

Thynnus thunnina Kitahara, Journ. Fish. Bur. Tokyo, 1897.

It is evidently desirable to separate the bonitos, in which the body is entirely scaleless behind the corselet, from the tunnies; and for this genus I have adopted the name *Gymnosarda*, originally proposed by Gill in 1862 and used by Dresslar and Fesler and by Jordan and Evermann.

The distribution of this species seems to be very similar to that of the three species of albacore. It is mentioned by Kitahara under the name *Thynnus thunnina* as being not very common on the coasts of Japan. Also by Day in his 'Fishes of India'; he says it is often seen in the markets of Bombay in the cold weather. It is stated by Bleeker to occur in the Malay Archipelago; but it is absent from Gilchrist's South African list. It has long been known to occur in the Mediterranean.

I saw only one specimen at St. Helena, and this was entangled in a mackerel-net of English make with which I was experimenting for the capture of *Scomber colias*. The specimen was 2 ft. $6\frac{1}{4}$ ins. long, a female. Bonitos of this species are occasionally taken by the albacore-boats of the island, but they are not much esteemed as food, and are of far less value than albacore.

Thyrsites prometheus.

Thyrsites prometheus Günther, B. M. Cat. Fishes, ii. p. 351; Melliss.

Prometheus atlanticus Lowe, Proc. Zool. Soc. 1839, p. 78; id. Trans. Zool. Soc. ii. p. 181.

Gempylus prometheus Webb & Berthelot, Iles Canar., Poiss. p. 51, pl. xi.

Night Serpent, Melliss.

D. 17; V. 19, not 18/21 as in Günther. Spines representing pelvic fins very minute. I obtained only one specimen of this fish, which was caught on a mackerel-line at night off Egg Island; it was 13 inches long to the end of the middle caudal rays, 14 inches to the end of the lobes of the forked tail. It is of a uniform black colour, and is not eaten. It occurs both in the Atlantic and the Pacific, namely at Madeira, the Bermudas, off the coasts of Japan, and very young specimens taken by the 'Challenger' north of the Sandwich Islands have been identified as of this species.

Platophrys podas.

Pleuronectes podas De la Roche, Ann. Mus. xiii. p. 354, 1809.

Pleuronectes mancus Risso, Ichth. Nice, p. 317, 1810.

Rhombus rhomboides Bonaparte, Fauna Italica, iii. Pesci, 1832–41 (male).

Rhombus podas, ibid. (female).

Rhomboidichthys mancus Günther, B. M. Cat. Fishes, iv. p. 432, 1862 (male).

Rhomboidichthys podas, ibid. (female).

Bothus podas Steindachner, Ichth. Bericht. Sechste Fortsetzung, S.B. Akad. Wien, 1868.

Rhombus maderensis Lowe, Proc. Zool. Soc. 1833, p. 143.

Rhombus serratus Valenciennes in Webb & Berthelot, Iles Canar., Poissons, p. 82, 1835–50.

Platophrys podas Jordan & Goss, Flounders & Soles Amer. & Europe, Bull. U.S. Fish. Comm. for 1886 (1889).

Rhomboidichthys sp., Melliss.

The specimens which I brought back from St. Helena are 8 in number, 4 large males, 2 large females, and 2 smaller females; the largest male is $8\frac{3}{8}$ ins. long, the largest female $8\frac{5}{8}$ ins.; the two smaller females are $6\frac{1}{2}$ and $6\frac{1}{8}$ ins. respectively. In the males there is a spine on the anterior end of the maxilla and another on the antero-superior angle of the lower orbit, also one on the antero-inferior angle of the upper orbit, but this last is less prominent. As in other cases of sexual dimorphism the male characters are slightly developed in the largest females; in this case the interorbital space is greater than the diameter of the orbit but much less than in the adult male. The colour of the St. Helena specimens is very dark, almost black, marked with ocelli consisting of rings of minute bluish-white spots; no dark spot on the lateral line is visible. In the British Museum is a specimen from Ascension, $8\frac{1}{4}$ ins. long, much lighter in colour than my specimens and with much more conspicuous ocelli; it is labelled *R. ocellatus* but is certainly of the same species as mine, the true *ocellatus* of Agassiz having the pectoral elongated in the male, while in *podas* it is not elongated. I have no doubt that the various species of the genus described under different names from the Mediterranean, Madeira, and the Canaries are all one species and that the species found at St. Helena and Ascension is the same, but in some of these localities there appear to be local peculiarities which must be considered. In the British Museum specimens from St. Helena collected by Melliss are labelled by Dr. Günther *R. mancus* var. The dark colour of the St. Helena specimens is evidently due to the dark volcanic material of which the sea-bottom consists, and is probably not permanent since we know that flat-fishes change their colour according to the ground on which they live; this darkness conceals the characteristic black mark on the lateral line, which cannot therefore be said to be absent. Mediterranean examples in the British Museum are old and not in very good condition, but those from St. Helena agree closely with the figures given of Mediterranean specimens by Bonaparte in his 'Fauna Italica.' The St. Helena examples seem, however, to reach a larger size; Bonaparte states that the

female is a little more than 5 ins. in length, the male about 6 ins.; but Carus in his 'Fauna Mediterranea' gives the maximum length as 22 cm. or $8\frac{4}{5}$ ins., which is as great as at St. Helena. Specimens from Madeira in the British Museum seem more different from mine. Two of the three seem to have been allowed to dry at some time, but the third is well preserved; it is a male only $6\frac{1}{8}$ ins. long and yet with the sexual characters fully developed, and it seems, therefore, that the species does not reach so large a size at Madeira. In these specimens also the anterior profile of the head is more vertical than in mine, and the top of the head is nearly level with the highest point of the dorsal edge of the body, while in mine it is distinctly lower than the latter. In these Madeira specimens the upper eye forms a projecting angle in the profile, which is much less the case in mine. Steindachner states that the colour and markings vary considerably in examples from different localities: in specimens from Teneriffe the ground-colour is very dark violet-brown, the large bluish spots usually absent, and there are instead numerous small blue specks. Valenciennes describes his *R. serratus* of the Canary Isles as "sans aucune tache" and not the same as the *maderensis* of Lowe. He gives its length as 14 or 15 cm. or up to 6 inches.

The species is not uncommon at St. Helena, but at the same time not very abundant. I caught them in a small otter-trawl worked from a steam-launch. On March 15th, I obtained six in one haul and one in another at about 30 fathoms, from Jamestown westwards to Lemon Valley; the trawl brought up no stones or gravel but quantities of the coarse sponge mentioned elsewhere in this paper. On March 19th, I caught about a dozen specimens in 15 fathoms in Prosperous Bay on the windward side of the island, and a single specimen in a haul in 10 fathoms. So far as I could ascertain a trawl had never before been used at St. Helena and so many specimens of this fish, locally known as the flounder, had never before been seen; in fact many of the residents had never seen it before.

This species is not known to occur outside the Atlantic, but it is possible that the *R. spinosus* of Poey found at Cuba is the same species. One of the characters of *P. podas* is the presence of minute spines at the bases of the dorsal and ventral fins, formerly described as belonging to scales, but now known to be projections of the tips of the interspinous bones; these occur in Poey's species but in no others. Most of the other species have the rays of the pectoral of the upper side elongated in the male, but this character is wanting in *podas*.

SCORPÆNA SCROFINA.

Scorpæna scrofina Cuv. & Val. ix. p. 465; Melliss.
Mail or Rock Gurnard, Melliss.

D. XI; I. 10; V. III, 6; P. 21; Plv. 6; Sc. 46; Br. 7.

Height of body $3\frac{1}{2}$ in total length. Length of head just over 3 in total length. Snout from front of orbit to end of upper

jaw $\frac{1}{3}$ the length of the head. Width between orbits $\frac{1}{5}$ length of head. Cheeks and upper part of operculum with rudimentary scales. Teeth on vomer and palatines. Most of the scales in the dorsal and lateral regions fringed with a thin flap of skin; no orbital tentacles.

My first specimens of this species were obtained in the fish-market, to which they are brought regularly; afterwards I caught four specimens in a small trammel set in about 4 fathoms of water off Banks' Valley, and three in a haul of the small otter-trawl in about 30 fathoms from Jamestown to Lemon Valley. I also caught two or three specimens in Prosperous Bay on the windward side of the island at a depth of about 10 fathoms.

This species was described by Cuvier and Valenciennes from specimens obtained from Brazil, and no specimens were in the British Museum collection until Melliss sent some from St. Helena.

Salarias textilis.

Salarias textilis (Quoy & Gaimard), Cuv. & Val. xi. p. 307; Günther, B. M. Cat. Fishes, iii. p. 248.

D. XII, 15; V. I, 6.

I obtained a single small specimen $2\frac{1}{2}$ ins. long from a rock-pool below the wharf at Jamestown. It agrees with Günther's description. The first dorsal is almost completely separated from the second by a deep notch. There is a tentacle with several filaments above the orbit, another at the nostril, and a small one on the neck on each side of the dorsal median line; 12 transverse brown bands on the sides and others on the tail, oblique brown bands on the dorsal fin, a square spot above the pectoral representing the first transverse stripe; second dorsal much higher than the first and than the ventral.

This species was previously known only from Ascension; two specimens from that island presented by Dr. McCloy are in the British Museum.

Balistes buniva.

Balistes ringens Osbeck, Voy. Chin. ii. p. 93 (not Linn.).
Baliste buniva Lacép. v. p. 669, pl. 21. fig. 1.
Balistes buniva Günther, B. M. Cat. Fishes, viii. p. 228; Melliss. File-fish, Melliss.

I brought two specimens of this species home with me, one from St. Helena and one from Ascension; the former was 9 ins. long, the other 10 ins. They agree with the description given in Günther's Catalogue except the following details: the white line along the bases of the dorsal and ventral fins is blue in the fresh fish; in the larger specimen there is a black intra-marginal line edged externally by a thin white or blue line along the border of the caudal fin, and the dorsal and ventral extremities of this fin are slightly prolonged, the posterior edge of the fin being concave;

in the smaller specimen there is no intra-marginal line and the edge of the fin is straight, the corners not being prolonged. On examining the generative organs I found that the smaller specimen was a female and the larger a male, the organs in both being large and well developed. The slight differences described would thus appear to be sexual, but in *Balistes vetula*, of which I brought a specimen $14\frac{1}{4}$ ins. long from Ascension, the dorsal and ventral caudal rays and also the anterior rays of the second dorsal are much prolonged, and the specimen is female. It is of course not unusual to find a character confined to the male in one species present in both sexes in another.

Balistes buniva is not very common at St. Helena; I obtained one specimen from the fishermen, and another was caught on a ground-line off George Island on the windward side of the main island. At Ascension it is very abundant; on the outward voyage when the ship anchored off Georgetown shoals of these fishes came alongside to feed on pieces of orange-peel and other fragments thrown overboard. I went down the boat ladder with some pieces of biscuit to try to catch one, and when I had no more biscuit simply moved my fingers about at the surface of the water; a number of the fishes crowded round my hand and I was able to seize one and lift it into the boat. On the return voyage some were caught by passengers with hook and line, and on one line let down to a greater depth was caught the specimen of *Balistes vetula* mentioned above, the bait used being pieces of raw beef. Both these species have a thin patch of skin covered by angular scutes instead of scales just above and behind the base of the pectoral fin; beneath this membrane is an air-cavity and the whole forms a drum by which a sound is produced. I heard this sound when I held a specimen of either species in the hand, and noticed that when it was produced the pectoral was moved rapidly to and fro over the membrane; when I held the pectoral motionless in a forward position the fish was unable to produce the sound. Möbius (SB. d. Berlin. Akad. der Wissenschaften, 1889, p. 999) attributes the sound in *B. aculeatus* of Mauritius to stridulation between the postclavicle and a longitudinally grooved area on the inner surface of each cleithrum; both these bones he states are in intimate relation with the air-bladder and a portion of the lateral walls of the bladder is in contact with the skin, which visibly shares in the vibratory movement of the bladder when the sounds are emitted. I cannot disprove the truth of this explanation, but it seemed to me as though the pectoral actually set the membrane of the drum in vibration, and in any case I satisfied myself that the movement of the pectoral is necessary for the production of the sound. *Balistes vetula*, but not *B. buniva*, also made another quite distinct sound of a grating character apparently from the inside of its mouth, perhaps by the rubbing together of pharyngeal teeth, but I was not able to trace the origin of this sound more precisely. In both species the first dorsal spine is firmly locked when erected and can only

be depressed by first pushing back the slender second spine. (See Otto Thilo, Journ. Anat. and Phys. vol. xxxv. p. 207.)

This species is widely distributed, occurring in the West Indies (Jamaica), Zanzibar, the coast of China, Sandwich Islands, St. Paul's Rocks, and Ceylon.

Ostracion quadricornis, var. notacanthus.

Ostracion quadricornis Linn. Syst. Nat. i. p. 409.
Ostracion lister Lacép. i. p. 468, pl. 23. fig. 2.
Ostracion notacanthus Bleek. Ned. Tijds. Dierk. ii. p. 298, fig.
Ostracion quadricornis Bleek. Atl. Ichth. v. p. 32.

Melliss states that this fish is not very common at St. Helena, but I found it quite common although not so abundant as the cunning-fish, with which it was usually to be seen swimming about the landing steps of the wharf. I caught specimens with a rod and line using a small hook and mackerel as bait. It was of a beautiful blue colour when first caught, each hexagonal scute having a spot of darker blue in the centre. All that I saw had the spine on the dorsal edge which distinguishes the variety *notacanthus*, which is peculiar to St. Helena.

The species is confined to tropical parts of the Atlantic, and occurs at the Bermudas, West Indies, coasts of Brazil, Ascension, and West Africa. A specimen from Rio Janeiro in the Museum has no dorsal spine; Günther remarks that specimens from the West Indies often have an indication of this spine. In all cases the spines are outgrowths of the centres of single scales, although the dorsal spine and the two ventral spines suggest the idea that they are the vestiges of the first dorsal and the pelvic fins.

Bleeker considers the *notacanthus* of St. Helena a distinct species, although he says that the dorsal spine exists sometimes in *quadricornis*; but he says there are other differences: the back in *quadricornis* is more compressed and more elevated, the profile more perpendicular, the eyes smaller, the head smaller, the scutes of the side more numerous, and a spine at the end of the carapace above the caudal peduncle. A very good figure of the St. Helena variety is given by Bleeker. The colours are apparently from a spirit specimen, as I find the characteristic blue colour which I saw in the fresh specimens at St. Helena vanishes after they have been in spirit.

Tate Regan (Proc. Zool. Soc. 1902, ii. p. 291) adopts *Lactophrys* Swainson (Lardner's Cyclopædia, Fishes, vol. ii. 1839, p. 324) for those with only three ridges, and makes *Ostracion* four- or five-sided. But the original *Ostracion* of Linnæus was three-sided.

Tetrodon cutaneus.

Tetrodon cutaneus Günther, B. M. Cat. Fishes, viii. p. 287 (1868).

This species was named by Günther, and has been found only

at St. Helena. It is well known to the fishermen of the island under the name of 'bottle-fish.' I obtained only one specimen, which I caught myself when out in an albacore-boat moored in about 90 fathoms off the south-west point of the island. I was fishing with a bottom line with two rather small hooks attached to the sinker; the hooks were baited with mackerel. Feeling a bite, I hauled up and found the line cut and one of the hooks gone: the men said this was done by a bottle-fish, and when I put the line down again I caught one. When it came to the surface it was almost spherical, the abdomen being distended not with air but with water. As the fish lay in the bottom of the boat it discharged the water in gushes from its mouth and gill-apertures until it was completely collapsed, the skin of the abdomen becoming flaccid and showing loose longitudinal folds.

Günther (Study of Fishes, 1880, p. 687), after remarking that when a globe-fish is inflated with air its skin is stretched to its utmost extent and the spines protrude and form a defensive armour, proceeds as follows:—"However, it is probable that the spines are a protection not only when the fish is on the surface and able to take in air, but also when it is under water. Some Diodonts at any rate are able to erect the spines about the head by means of cutaneous muscles; and perhaps all fill their stomach with water instead of air for the same purpose and with the same effect." It is not clear whether this means that some are known to do so with certainty or that it is only a probability in every case. I have shown that it is at least true for *Tetrodon cutaneus*, and in this species the effect is not to erect spines, for there are none. There is no evidence that this species ever inflates itself with air; I never heard of it being taken except at the bottom in deep water.

CRUSTACEA*.

There is a fishery for Crustaceans at St. Helena, the edible forms being the crayfish, *Panulirus guttatus*, known as the 'long-legs,' and the Scyllarid *Scyllarus latus*, which is called the 'stump.' The latter is caught in traps of elongated cylindrical shape made of strips of bamboo fastened together by iron hoops, each end of the trap being fitted with a reentrant cone open at the apex; the trap is thus similar in principle to one type of lobster-pot used in Britain, especially on the east coast. Only one boat was engaged in this fishing during my visit, and I went out for a night's fishing in her. The traps, which the fishermen call nets although no net is used in their construction, were put down in about 15 fathoms of water off Sugar-loaf Point. They were weighted with iron bars and baited with albacore-heads. Each trap was sunk separately and the line attached to it was buoyed first with a bamboo spar and at the end of the line with an empty cubical

* Species identified by Dr. W. T. Calman, F.Z.S.

paraffin can. On the occasion to which I refer we put down four or five traps, and when they were hauled in the morning each contained four or five 'stumps,' the usual price for which is 3d. each; they are used as food and also as bait for inshore fishing, this bait being for some kinds of fishes, such as silver-fish and old-wives, much more effective than the flesh of mackerel or other fishes. Some hermit-crabs were also caught in the traps, but no long-legs, as these creatures seldom or never enter the traps but are occasionally caught on fishing lines; in the trammel which I shot on the same occasion, besides the fishes which are mentioned elsewhere in this paper, I caught one large specimen of *Panulirus* but no stumps.

Family Palinuridæ.

Panulirus guttatus.

Palinurus guttatus Latr. Ann. du Muséum, iii. p. 393.

Panulirus guttatus Spence Bate, Voy. Challenger, Macrura, p. 78, pl. X*a*; Benedict, Proc. U.S. Nat. Mus. vol. xvi. p. 540, 1893; Bouvier, Bull. Mus. Océan. Monaco, no. 29, p. 5, 1905.

This species is mentioned in Melliss' book as the long-legs and *Palinurus* sp. It has a wide distribution in the Atlantic, occurring on the American coast, on the African coast at the Cape Verde Islands, Liberia, etc. The 'Challenger' specimens described as a variety by Spence Bate were taken at St. Paul's Rocks. It has not been identified at St. Helena before.

Family Scyllaridæ.

Scyllarus latus.

Scyllarus latus Latr. Hist. Nat. Crust. et Insectes, vol. vi. p. 182.

Recorded by Melliss under the above specific name on the authority of Spence Bate and the local name 'stump,' but this record seems to have been overlooked by carcinologists. It occurs also in the Mediterranean and at the Canaries (Ortmann, Zool. Jahrb., Abth. Syst. x. p. 269, 1897).

Family Paguridæ.

Pagurus imperator. (Text-fig. 6.)

Pagurus imperator Miers, Ann. Mag. Nat. Hist. (5) viii. p. 275, 1881.

This species was hitherto known only from the two type specimens in the British Museum described by Miers, both from St. Helena, one presented by H. E. Dresser, Esq., the other by Melliss. I obtained and brought back a number of specimens caught in the traps set for 'stumps.' They were inhabiting shells of *Cassis testiculus*, *Bursa cœlata*, *Septa nodifera*, and *Eugyrina*

gigantea. I was at first struck with the narrowness of the shell opening in the *Cassis* and wondered how the crab could protrude its head through it; I found that the anterior part of the crab was much flattened, and this seemed to be an adaptation to the narrow opening of the shell; but the species occurs also in the

Text-fig. 6.

Pagurus imperator.

other shells mentioned which have large rounded openings. The species is common enough at St. Helena, but has not been found anywhere else, and has not previously been figured. Melliss mentions only one hermit-crab in his book on the island under the name *Pagurus bernhardus*, a species which certainly does not occur there.

Pagurus arrosor.

Cancer arrosor Herbst, Krabben und Krebse, ii. Supp. 1794, p. 170, pl. xliii. fig. 1.

Pagurus striatus Latr. Hist. Nat. Crust. et Insectes, v. p. 163.

Pagurus arrosor A. Milne-Edwards & Bouvier, Exp. Travailleur & Talisman, Crust. Decap. pt. i. p. 178, 1900; Alcock, Cat. Crust. Indian Mus. pt. ii. fasc. i. Pagurides, p. 168, 1905.

This species, in marked contrast to the preceding, has an almost

world-wide distribution, having been recorded from the Mediterranean, Cadiz, Madeira, Cape Verde Islands, Senegambia, West Indies, Brazil, Philippines, Japan, and S.E. Australia. It was taken by me with the other species at St. Helena inhabiting *Septa nodifera* and other shells.

Family Dromiidæ.

Dromia vulgaris.

Dromia vulgaris H. Milne-Edwards, Hist. Nat. des Crust. ii. p. 173, pl. xxi. figs. 5–8; A. Milne-Edwards & Bouvier, Exp. Travailleur et Talisman, Crust. Decap. pt. i. p. 17 ; Melliss, p. 203.

I obtained one specimen of this species but am not quite sure how it was caught, whether in the trawl or the stump-traps, but believe it was by the former. Its distribution is similar to that of *Panulirus guttatus*, namely, Mediterranean, Senegal, Cape Verde Islands, Florida, W. Indies. It has also been taken on the south coast of England. In recording this species from Senegal and the Cape Verdes, Milne-Edwards and Bouvier state that it had not previously been taken so far south, overlooking the fact that it had been recorded at St. Helena by Melliss.

Family Grapsidæ.

Grapsus grapsus Linn.

This little black crab, mentioned by Melliss as the common Black Crab, is very abundant and resembles in colour the volcanic rocks over which it runs, living more out of the water than in it. It seems to be endowed with almost supernatural cunning and intelligence, numbers collecting to feed on a piece of fish or offal in a few minutes where none were previously visible and disappearing with equal celerity when one approaches. The boys have a curious method of catching them by dangling a stone attached to a string beneath one, and so driving it up to the top of the quay ; in this case the crab seems to be more afraid of the stone close below it than of the human enemy above, though it often suddenly lets go altogether and drops into the water. Its distribution is circumtropical.

Plagusia depressa Herbst.

This crab is less common than the preceding and lives about the edge of the water ; it is much larger than the *Grapsus* and of a reddish colour, a fact which seems to show that the protective resemblance of the other is accidental. This seems to be the species mentioned by Melliss (p. 206) as locally known by the names Purple Rock Crab and Peeling Crab. Like the *Grapsus*, it is found all round the world in the tropics.

MOLLUSCA *.

Class GASTROPODA.

Order **Pectinibranchia.**

Lotoriidæ.

Bursa cælata Broderip.

Ranella cælata E. A. Smith, Marine Mollusca of St. Helena, P. Z. S. 1890, p. 268; Melliss, p. 124.

This species occurs at Ascension and is common on the coast of Panama. I presume this means the Pacific coast of Panama, as Mr. Smith remarks in the paper quoted above that it is extremely remarkable that it should occur at St. Helena. This and the following three species are represented in my collection only by shells inhabited by *Pagurus imperator*.

Eugyrina gigantea.

Ranella gigantea Lamarck; Tryon, Manual of Conchology, vol. iii. p. 42.

According to Mr. Smith this has not been previously recorded outside the Mediterranean.

Septa nodifera.

Triton nodiferus Lamarck.

Mr. Smith recorded *Triton tritonis* from St. Helena in his P. Z. S. paper above quoted, but from a single specimen in a very worn and broken condition. He thinks it was probably this species, which has a very wide distribution, extending from the Mediterranean to Natal in the Atlantic and from Japan to New Zealand in the Pacific. Melliss does not mention this species, but includes two others of this genus, viz. *Triton variegatus* Lamarck, and *T. olearium* Linn.

Family Cassididæ.

Cassis testiculus.

Cassidea testiculus Melliss, p. 124.

Cassis testiculus var., E. A. Smith, Marine Mollusca of St. Helena, P. Z. S. 1890, p. 257.

The typical form of this species occurs in the West Indies and on the West African coast. The St. Helena form is stated in Mr. Smith's paper to be the *C. crumena* of Bruguière, but he does not consider this to be a distinct species.

* Species identified by E. A. Smith, I.S.O., F.Z.S.

Order Opisthobranchia.

Umbraculum mediterraneum.

Umbrella mediterraneum Lamarck; E. A. Smith, Marine Mollusca of St. Helena, P. Z. S. 1890, p. 299.

This large opisthobranch is common in the Mediterranean, and occurs also at Madeira and the Cape Verde Islands. It is not mentioned by Melliss, but was first recorded from St. Helena by E. A. Smith. I obtained a single specimen in the trawl at about 30 fathoms to the west of Jamestown; it was alive and adult.

Class CEPHALOPODA.

Octopus occidentalis.

Octopus vulgaris var. *americanus* d'Orbigny, Moll. Cuba, p. 14, tab. i.

Octopus occidentalis Steenstr. MS., Hoyle, 'Challenger' Report, xvi. p. 77, 1886.

This is doubtless the species mentioned by Melliss as *Octopus* sp. I obtained one small specimen which was brought to me by boys with some crabs from the shore rocks. It has not been identified at St. Helena before, but the 'Challenger' obtained one specimen at Ascension. It occurs at Cuba, and was found by Alex. Agassiz in the Pacific at the Galapagos Islands. My specimen was identified by Mr. W. E. Hoyle, F.Z.S., Director of the National Museum of Wales, Cardiff.

ECHINODERMATA *.

Class ECHINOIDEA.

Cidaris tribuloides.

Cidarites tribuloides Lamarck.

Cidaris tribuloides Blainville, Zooph., Dict. Sci. Nat. 1830.

I caught several specimens of *Cidaris* in the trawl at 30 fathoms to the west of Jamestown, and all that I brought home were identified by Mr. Jeffrey Bell as of this species. It is not mentioned by Melliss, who says the thick-spined sea-egg of the island is *C. metularia* Lamarck. This is not correct, *C. metularia* being the Pacific species, extending from the Sandwich Islands to the Cape of Good Hope. *C. tribuloides* occurs also at Cape de Verde, on the west coast of Africa at Cape Palmas, at Florida, and on the coast of Brazil.

Tripneustes ventricosus.

Tripneustes ventricosus L. Agassiz, Mon. Echin. Scut. 1841.

Hipponoë esculenta A. Agassiz, Revision Echini, 1872–74.

This species is not mentioned by Melliss; I am not quite sure

* Species identified by F. Jeffrey Bell, M.A., F.Z.S.

of the exact locality where I obtained it, but think it was caught in the trammel in 4 fathoms, off Banks' Valley, to the east of Jamestown. It is common in the West Indies.

ECHINOMETRA SUBANGULARIS.

Cidaris subangularis Leske, 1778.

Echinometra subangularis Desmoulins, Actes Soc. Linn. Bordeaux, 1837.

Echinometra acufera Blainville, 1834; Melliss.

This is the species which is mentioned by Melliss under the name *E. acufera* Blainville. He refers to its abundance and to the fact that it lives in holes bored by itself in the solid basaltic rock. The rocks along the shores are everywhere studded with the holes inhabited by this urchin, which is of a black colour like the rock itself, and the animal is so firmly attached in its hole that it is difficult to dislodge it. A large number of sea-urchins are known to have this power and habit of excavating cavities in hard rock in which they dwell. In the Natural History Museum is a fine photograph of limestone rocks full of such holes inhabited by *Strongylocentrotus lividus*, at Bundoran, South Donegal, in Ireland. It is held that the boring is effected by the action of the animal's teeth and spines, and it seems that the animal never quits its hole even to feed. Apparently the sea-urchin obtains enough nourishment from the organic substances which are washed into its cavity. Simroth gives a good account of the habits of the boring form *Toxopneustes lividus*, apparently a synonym of *Strongylocentrotus lividus*, in the Azores. Möbius states that at Mauritius the holes of two boring species are narrower at the apertures than in the interior, so that it is impossible for the animal to quit the cavity. At St. Helena, and in some other cases, the cavities are only a little deeper than the diameter of the animal; but at Croisic and Douarnenez, on the coast of France, according to Caillaud, the holes are 30 to 50 cm. deep. The object of the habit is evidently to protect the animal against the force of the breakers by which, if exposed, it would run the risk of being killed, and on the coasts of oceanic islands like St. Helena the necessity for such protection is very obvious. (For a summary of the subject and its literature see Bronn's 'Thierreich,' Bd. ii. Abth. 3, p. 1296.)

E. subangularis occurs apparently everywhere in the tropical Atlantic, at the West Indies and Gulf of Mexico, the Bermudas, the whole coast of Brazil, the west coast of Africa, Cape de Verde Islands, and Ascension.

Class ASTEROIDEA.

LINCKIA.

Two specimens belonging to this genus were taken in the trawl at 20 fms. west of Jamestown, but according to Mr. Jeffrey Bell they are too young for specific determination.

Class CRINOIDEA.

ANTEDON CARINATA.

Comatula carinata Lamarck.

Antedon carinata Carpenter, Voyage of 'Challenger,' Report on Crinoidea, pt. ii.

This is doubtless the species mentioned by Melliss as *Comatula* sp. He says it is occasionally taken in rock pools at the West Rocks, *i. e.* to the west of the wharf at Jamestown, but that it is extremely rare. I took one specimen in my haul of the trammel off Banks' Valley, and should think it is by no means rare. It has a wide distribution, occurring in the tropical Atlantic, the Indian Ocean, and the Eastern Pacific; the localities are Mauritius, Seychelles, Ceylon, the coast of Brazil, and the coast of Chile. A specimen from St. Helena, according to Carpenter, is in the British Museum.

ANTHOZOA.

ACTINIARIA.

PHYMACTIS SANCTÆ HELENÆ.

Actinia sanctæ helenæ Lesson, Voy. Coquille, 1830, p. 74, Zoophytes, p. 74, pl. ii. fig. 1.

Phymactis sanctæ helenæ H. Milne-Edwards, Coralliaires, Tome i. p. 275.

This species is chiefly distinguished from other species of the genus by its colour, which on the outside of the column is very dark, almost black; Milne-Edwards calls it a very obscure reddish brown. This colour harmonises with that of the volcanic rocks on which it lives, adhering usually to the under side of overhanging masses. The species has been known at St. Helena since Lesson's circumnavigating voyage in 1830, and is mentioned by Melliss. Allied species occur on the coast of Brazil, at the Cape of Good Hope, and at Cape Verde.

MADREPORARIA.

MÆANDRINA (PLATYGYRA) ASCENSIONIS.

Platygyra ascensionis S. O. Ridley, Report on Collection made by Mr. T. Conry in Ascension Island, Ann. & Mag. Nat. Hist. (5) viii. 1881.

I found only one species of coral on the island. It was growing in small rounded masses of from 2 to 6 inches in diameter in rock pools at Prosperous Bay on the windward side. I was unable to detach living colonies, but found dry skeletons on the shore. This is evidently the same species that is mentioned under the name *Mæandrina* sp. ? by Melliss, whose specimens were

identified by Dr. Gray and Mr. Saville Kent of the British Museum. The species is evidently identical with that described by S. O. Ridley, from Ascension, but the name *Platygyra* is rejected by later writers on the Madreporaria, *e. g.* Martin Duncan, "Revision of the Madreporaria," Journ. Linn. Soc. xviii. 1885. The latter author admits only one genus, *Mœandrina* with *Cœloria* as a sub-genus; but whether the present species is to be placed in the main genus or the subgenus I have not decided. It is characteristic of the typical *Mœandrina* that the calycles are not distinct, but united into long grooves with parallel sides from which the septa project; in the species here considered the calycles are usually distinct, but in many parts, especially in larger colonies, two or three are united, so that they present a stage towards the condition which is typical of *Mœandrina*, a condition which is really due to incomplete division of the zooids.

HYDROZOA AND PORIFERA.

By R. Kirkpatrick, F.Z.S.

HYDROZOA.

Family Eudendriidæ.

Eudendrium cunninghami, sp. n. (Plate VII. figs. 1–3.)

Several specimens are growing out of the sponge *Chondrosia plebeja*. The largest example is 9 cm. in height. The growth of the colony is arborescent, with dark horn-coloured fasciculated main stems. The terminal polyp-bearing branchlets have from one to three groups of annular markings between base and summit.

The few polyps remaining on the specimens are scarcely well enough preserved to enable their characters to be determined, but 24 tentacles were counted in one instance. Nearly all the colonies are female, but one is hermaphrodite.

The special branches bearing the clusters of female gonophores arise on the upper side of branches or of polypiferous branchlets. The gonophoral branches are shorter than those bearing the nutritive polyps, and funnel-shaped, *i. e.* they broaden out distally; sometimes they are annulated throughout, sometimes only on the proximal half. The male sporosacs arise in a double row from an aborted polyp. They are stalked and monothalamic, the stalk curving round and dividing into two lateral wings.

The ovate gonophores, about 375 μ in long diameter, are in clusters of 3–8, closely adnate to each other and arranged spirally round a central axis. Each gonophore has a carina around the vertical central plane. When burst the empty sac resembles a hemispherical basket with a handle—the distal half of the carina—

arching over it, but sometimes the handle also is ruptured in the centre.

I have not been able positively to identify this form with any known species; at the same time many of the latter appear to be founded on insufficient characters. For the fasciculation or non-fasciculation of the stem may depend on the age of the colony, and the degree of annulation of the stems is usually, but not always, a variable character. The mode of growth, arrangement, and structure of the gonophores is a more important feature, but many species have been described from colonies the gonophores of which are unknown.

The nearest related species is *E. carneum* S. F. Clarke, from Chesapeake Bay (Mem. Boston Soc. N. H. iii. 1887, p. 137, pl. vii. figs. 10–17). In the North American form several groups of female sporosacs spring from a branchlet and the semicircular band does not appear to exist at the distal end. Again, the male sporosacs are spherical and polythalamic.

The genus is cosmopolitan. Numerous species occur in the Atlantic; seven are known in the British area.

The specific characters of *E. cunninghami* are as follows:—The arborescent growth, fasciculated main stem, one to three groups of annuli on the polypiferous branchlets, the short infundibuliform branches bearing the oval, carinate, sessile female gonophores, and the male sporosacs with bifid covers.

PORIFERA.

Family Chondrosidæ F. E. Schulze.

Chondrosia plebeja O. Schmidt. (Plate VII. figs. 4–8.)

Mr. Cunningham's collection includes one large complete specimen of *Chondrosia plebeja* O. Schmidt, and several fragments, some of which have been fixed in corrosive acetic mixture.

The specimens were dredged from 30 fathoms off Jamestown, St. Helena.

The original specimens, on which Schmidt founded his species in 1868, came from Algiers. Schmidt distinguished *C. plebeja* from *C. reniformis* Nardo on account of the irregularity of the surface of the former and the presence of foreign bodies on the surface and in the interior.

Schulze, in his memoir on the Chondrosidæ (1877), accepted *C. plebeja* as a species distinct from *C. reniformis*. He had not, however, seen examples of Schmidt's species. Indeed no further description of *C. plebeja* has been given since Schmidt's time. Accordingly it is interesting to meet with well-preserved material and to be able to supplement the original description.

The complete specimen, which is shaped like a large mug with a piece out of the wall, is 14·5 cm. high, 13·5 cm. in diameter across the mouth, and has walls 3·5 cm. thick. The colour in

spirit is black on the surface and whitish in section, but the black colour is due to decomposition, for Mr. Cunningham reports that in life specimens are buff-coloured with faint reddish-brown patches on outstanding parts, and paler buff in section. The sponge is rather tough but yet breakable, slightly compressible but inelastic, and differing greatly in texture from the tough leathery *C. reniformis*. The surface varies in character, being smooth here and there, but mostly irregular, deeply pitted, reticulate or tuberculated, the differences being due to the amount and kind of foreign material. The numerous incurrent pores, which are all closed and barely perceptible, are scattered over the surface. They are visible, however, in thick clarified sections at the beginnings of the incurrent canals. The oscules also are scattered and flush with the surface. They occur mostly on the inner wall of the cup. They vary in diameter from 2–8 mm., and are provided with a membranous sphincter.

The ectosome forms a very thin delicate skin, very different from the tough thick cortex of *C. reniformis*. Worm tubes and root-fibres and stems of *Eudendrium* project above the surface or may be skinned over by the ectosome. These and other foreign bodies are abundant in the interior.

The Canal System.—A slightly stained, well clarified thick section presents a most striking appearance (Pl. VII. fig. 5). The fine initial incurrent canals pass in obliquely from the surface pores and meet at various angles to form larger inhalants. These systems of initial—they can hardly be called intra-cortical—canaliculi are not regularly arranged like the pore systems in *C. reniformis*, but are irregularly dendritic (fig. 4). The larger incurrent canals, as they ramify down into the sponge, are mapped out very distinctly, owing to their having a wide tubular central axis whence much finer canals radiate out at right angles. This most remarkable arrangement may be compared in appearance to the fine brushes used for cleaning test-tubes, only one must imagine the brush to branch continually, and many of the radiating bristles also. The end branches of the "bristle" canals abut on the choanosomal mass. The terminal main axes of the incurrent canals end in terminal tufts of branching "bristle" canals. It is so unusual to find innumerable very fine canals passing off at right angles from much wider canals, that at first in thin sections of the sponge I mistook the "bristle" canals for strands of connective tissue. The ends of the branching "bristle" canals form the prosodi of the flagellated chambers. These terminal canaliculi are so extremely fine and delicate as to be barely perceptible at first, for they consist of a single layer of pavement epithelium. Accordingly the canal system is diplodal (figs. 6, 7). The existence of diplodal canal systems has been denied *, but the photographs of sections of *Corticium candelabrum*, *Chondrilla nucula*, and *Oscarella lobularis* published by Schulze clearly

* E. Topsent, "Étude Monographique des Spongiaires de France," Archives Zool. Exp. 1895 (3) iii. p. 522.

demonstrate the presence of prosodi*. My own sections also show the prosodi and aphodi. One would expect *a priori* that in highly developed canal systems with aphodi, prosodi also would, in some cases, tend to arise. For the same development of the choanosome which would lead to the formation of minute excurrent canals lined with epithelium, would lead also to the canalisation of terminal parts of the incurrent system and to their continuity with the pores in the walls of the flagellated chambers.

The flagellated chambers are spheroidal or pear-shaped, and about $30 \times 24\ \mu$ in their longer and shorter diameters respectively. The aphodi open either directly into an excurrent canal or join with one or more aphodi.

The excurrent canals closely surrounded by dense masses of flagellated chambers appear dark by contrast with the larger incurrent canals surrounded by the "bristle" canals and loose tissue.

From the above account it will be seen that there are six distinct systems in the total canal system of *Chondrosia plebeja*, viz.:—(1) the initial pore canals; (2) the larger incurrent canals; (3) the radiating "bristle" canals terminating in prosodi; (4) the cordon of flagellated chambers; (5) the aphodi; and (6) the larger excurrent canals terminating in oscules.

Pigment-cells occur but are not abundant; thesocytes are numerous. Along the walls of the incurrent canals are the cells of what seems to be a unicellular alga.

There appear to be five or possibly six known good species of *Chondrosia*, viz.:—

C. reniformis Nardo.
C. plebeja O. Schmidt.
C. ramsayi Lendenfeld (? *C. reniformis*).
C. debilis Thiele.
C. corticata Thiele.
C. reticulata Carter.

C. collectrix Lendenfeld is, as Topsent surmised, a synonym of *C. reticulata* Carter, of which latter species *C. spurca* Carter is also a synonym.

Distribution of *C. plebeja*:—Algiers; off Porto Santo Island facing the Atlantic coast of Morocco, 60 fathoms (*Kirkpatrick coll.*); Grand Canary, on rocks at low tide (*Topsent*); St. Helena, 30 fathoms (*Cunningham*).

Specimens from Christmas Island, which I had named *C. plebeja* (P. Z. S. Lond. 1900, p. 129), belong to *C. corticata* Thiele.

* F. E. Schulze, "Über diplodale Spongienkammern," Sitzungsb. Akad. Wiss. Berlin, 1896, ii. p. 891.

EXPLANATION OF PLATES IV.–VII.

PLATE IV.

Fig. 1. *Congromuræna mellissii* Günther.
2. *Muræna sanctæ helenæ* Günther.

PLATE V.

Leirus moselii, sp. n.

PLATE VI.

Pimelepterus gallveii, sp. n.

PLATE VII.

Fig. 1. *Eudendrium cunninghami*, sp. n. Branchlets with polyps. × 18.
2. The same. Female sporosacs. × 18.
3. The same. Male sporosacs. × 50.
4. *Chondrosia plebeja* O. Schmidt. Surface and vertical section showing pores and pore-canals. *p*, pore; *ic*, incurrent canal. × 50.
5. The same. Thick slice parallel to and a little below surface. *ic*, incurrent canals; *ec*, excurrent canals. × 15.
6. Flagellated chamber: *pr*, prosodus; *ap*, aphodus. × 750.
7. Flagellated chambers. × 425.
8. Collar-cell. × 1000.

3. Report on the Deaths which occurred in the Zoological Gardens during 1909. By H. G. PLIMMER, F.L.S., F.Z.S., Pathologist to the Society.

[Received January 18, 1910.]

On January 1, 1909, the number of animals in the Zoological Gardens was 3307, and during the year 1996 animals were admitted, making a total of 5303 for the year.

The number of deaths during the year has been 1492, that is about 28 per cent.; but if from the above total we subtract 548 animals which did not live for six months after their arrival in the Gardens—that is, roughly, the time at which we find they have got entirely used to their new environment—the percentage of deaths is reduced to 17·8, that is practically the same as the death-rate of 1908. In 1909 the total number of animals was 305 less than in 1908, and the number of deaths 245 less. The weather conditions of 1909 were not at all good, so that the percentage of deaths is really more satisfactory than in 1908.

Of the 1492 animals which died, 1171 have been examined; of the rest, 131 were killed by order or by companions, 8 were preserved entire for anatomical purposes, and 182 were too decomposed for examination.

The following Tables show the facts ascertained in outline, and following them are some notes on the most important points.

Table I. sets forth the actual causes of death in each of the three great classes of animals. Under Reptiles are included batrachians and fishes.