

ANNEXE II

CONTRIBUTIONS TO THE KNOWLEDGE OF PALESTINE SEA FISHES

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PART I

The Palestine coast has not, up to recent years, been the subject of systematic ichthyological investigation. The first step was taken by Steinitz (1) in the spring of the years 1924 and 1925; but as his investigation was mainly devoted to the Haifa Bay and its immediate vicinity, and did not last longer than two to three months, many and even some of the most important and common fishes have not been recorded; and, for the same reason, observations on migration, spawning, etc., are lacking. Our relatively longer experience, extending along the whole coast, enables further facts and observations pertaining to occurrence, migration and biology to be included, and to deal with many other species not hitherto recorded from the Palestine coast.

Palestine fisheries, on which this work is based, are chiefly concentrated around the two main harbours: Haifa in the north, and Jaffa in the south. The local fisheries are purely of an inshore character and their activities do not extend beyond the 10-fathom line; this makes it easy to record the shoreward migration of fishes. On the other hand, a number of Italian trawlers work in the south in summertime, exploiting the deeper waters. This latter fact should be taken into consideration when using the statistical material (2) for the determination of the occurrence and migration of fish, as it often happens that the apparent scarcity of certain species is due to the absence of trawling activities in these regions. Weather conditions should not be ignored either, as all fishing craft used is of the small type and does not work in rough weather a drop in catch is often due to this circumstance as, for example, the constantly recurring drop in catch during February. In brief, the occurrence and migration of local fishes can only be determined by observations made over a lengthy period and only after taking into consideration all relevant factors.

(1) STEINITZ W. — Beitrage zur Kenntniss der Kuestenfauna Palaestinas, *Public. Staz. Zool. Neapoli*, Vol. 8, 1927.

(2) *Report of the Department of Agriculture and Forests* for the years 1927 to 1930, Jerusalem.

This paper deals chiefly with the more common fishes, most of which play a considerable role in local fisheries. Besides stating their importance in supplying the local markets, short notes are added on their peculiarities, occurrence and migration, the latter often being correlative with their spawning season.

CLASS : PISCES

Sub-Class .. ELASMOBRANCHII.
Order..... PLAGIOSTOMI.
Sub-Order.. SELACHII.
Family SPHYRNIDÆ.
Genus..... SPHYRNA.

Sphyrna Zygaena, Linn. — Hammer-head Shark. This peculiar fish is not rare on the Palestine coast. It causes much trouble to the fishermen, tearing their nets, without being of any considerable value to them as their meat is little esteemed. Most specimen caught are 1-1 1/2 metres long, those of 2-3 metres being somewhat rare.

Family SPINACIDÆ.
Genus..... SQUALUS.

Squalus Acanthias L. (*Acanthias vulgaris*, Riss.). — The Dog-Fish are common on the whole Palestine coast, though far more abundant in the south, where they play an important role in fisheries. They are preferred above all other Elasmobranchs, which are not much appreciated as a food fish.

Family RHINIDÆ.
Genus..... SQUATINA.

Squatina Squatina, Linn. — The Angel-Shark is rather rare in our waters but seems to be more frequent on the Syrian coast. Maximum length observed : over one metre.

Sub-Order.. BATOIDEI.
Family RHINOBATIDÆ.
Genus..... RHINOBATUS.

Rhinobatus Cemiculus, Geoffr. — Shark-Ray : Large specimen reaching over a metre in length are often caught on our coast; the fish is very common in the south as well as in the north. Like all other Elasmobranchii, it lives chiefly on sandy grounds, which it resembles in colour. Its economic value is not considerable.

Family RAIIDÆ.
Genus..... RAJA.

Raja Asterias, Delacr. and *Raja Miraletus*, Linn. — Are the only two Rays recorded up to now in Palestine. They are frequent along the whole coast.

Family TORPEDINIDÆ.
Genus..... TORPEDO.

Torpedo Ocellata, Rafin. — The Electric Ray appears both in the northern as

well as in the southern markets in winter. Its electric properties are well known and feared by the local fishermen. It is a rather rare kind and of no value as a food fish.

Family TRYGONIDÆ.

Genus TRYGON.

Trygon Pastinaca, Linn. — Sting-tailed Ray: This fish is quite abundant on all sandy grounds though, like other Selachii, it is more frequently caught in the south. Its tail contains a sting which causes painful wounds and the local fishermen therefore cut it off as soon as the fish is taken out of the net.

Sub-Class .. TELEOSTOMI.

Order TELEOSTEI.

Sub-Order.. MALACOPTERYGII.

Family CLUPEIDÆ.

Genus CLUPEA.

Two species of Sardines have so far been recorded on the Palestine coast, both well distinguished by the local fishermen. The first is probably, like the second, an immigrant from the Red Sea. They are the most abundant fishes in our waters, which is the more remarkable since their migration from the Red Sea is of relatively recent date, at any rate not prior to the opening of the Suez Canal. This would suggest that conditions in the Mediterranean are very favourable for them. They are most important economically and their catches increase from year to year.

Clupea Venulosa, Steinitz. — Is far more abundant than the species mentioned further on. The total length never exceeds about 20 cm. and averages 17 cm.

Clupea Kowal, Gunthr. — Reaches over 25 cm. in length but does not usually exceed the previous kind in size.

Though both these kinds are caught along our coast the whole year round, a marked seasonal migration is observed, like with other Sardines.

The first big shoals appear quite regularly near the shores just after the winter rains, in March. That month and the month of April are the gathering period, when the fish assemble in the shallow waters for the purpose of laying their eggs, which commences in the middle of May and lasts with both species till the end of September. This period — March to September — is the main fishing season for Sardines. In the following two to three months there is a general scarcity of them in the shallow belt of the sea. During the winter, bigger shoals again appear in fine weather following the heavy rains, which carry a lot of debris and food into the inshore waters. These are feeding shoals very often composed of young Sardines mixed with the fry of other fish. The appearance of the winter shoals is irregular and indeterminable and varies from year to year.

Sardine fishing in Palestine is still practised in a very primitive manner, small seines being practically the only gear used for their catch. This is the reason why this fish does not play as important a role here as in other Mediterranean countries.

Sub-Order.. APODES.
Family ANGUILLIDÆ.
Genus..... ANGUILLA.

Anguilla Anguilla, Linn. — The Eel. Male eels are caught in the sea, especially in the vicinity of the mouths of rivers. The migration of ripe females into the sea for ovoposition was observed in the autumn (end of August-October). The fish is common in rivers entering the sea but it is despised by the local population.

Family MURÆNIDÆ.
Genus..... MURÆNA.

Muraena Helena, Linn. — The Moray is very rare on our coast. This species is reported from Egypt and Syria.

Sub-Order.. HAPLOMI.
Family SCOPELIDE.
Genus..... SAURUS.

Saurus Griseus, Lowe. — Is a denizen of the deeper waters and hence caught by trawlers only, which work at a considerable distance from the shore. This fish is not more than 20-25 cm. long and of a good quality. Equally common in Palestine and Syria.

Sub-Order.. PERCESOCES.
Family SCOMBRESOCIDÆ.
Genus..... BELONE.

Belone Belone, Brun, Linn. (*B. Acus*, R.). — The Gar-Pike is quite a common and fine fish. It lives the whole year round on our coasts, though — like many other fishes — is more abundant at the end of the winter and in the spring. Reaches the length of nearly one metre. It is highly esteemed as a food fish.

Genus..... HEMIRHAMPHUS.

Hemirhamphus Marginatus, Bleek. — The Half-Beak. This species is a migrant from the Red Sea. It appears near the shores mainly in spring but is not as abundant as the previous fish. The largest specimen observed do not exceed 40 cm. in length.

Genus..... EXOCÆTUS.

Exocætus Volitans, Linn. — Flying-fish are seldom met with except in the open sea. Only in nice, calm autumn days can they be observed near the shore; it is the time when they approach the shores in shoals for oviposition and when they are seen on the market.

Family MUGILIDÆ.
Genus..... MUGIL.

*Grey Mullet*s are very common in Palestine waters throughout the year and play a most important role in local fisheries owing to the inshore character of the latter. They occupy the second place after Sardines in quantity caught, and held first place until lately. During the summer the shallow waters teem with young and

half-grown individuals, but in the autumn and winter, shoals of mature fish approach the shores for spawning. This lasts with some small differences among single species from October till March. They are very valued as a food-fish.

Mugil Cephalus, Cuv. and *Mugil Oer*, Forsk. — Are the largest of all local species and are not as abundant as the others, especially the second, which originates from the Red Sea.

Mugil Labrosus, Risso (*M. Chelo*, Cuv.), *Mugil Auratus*, Risso, *Mugil Saliens*, Risso. — These three species are the most common on our coast throughout the year. During the summer their fry and young are very plentiful in shallow water supply the fish-markets, which are then poorly stocked.

They reach from 40 to 50 cm. in length.

Mugil Ramada, Risso (*M. Capito*, C.). — This is the rarest and smallest of the Grey Mulletts described.

Family SPHYRÆNIDÆ.
Genus SPHYRÆNA.

Sphyræna Vulgaris, Cuv. — The Sea-Pike is one of our most common fishes appearing mostly in big shoals. It follows those of smaller fishes and Sardines, and its main appearance in shallow waters coincides with that of the latter.

Spawning season:— mid and end of summer. It is very appreciated as a food fish and can attain one metre in length.

Sub-Order . . ANACANTHINI.
Family GADIDÆ.
Genus MERLUCCIUS.

Merluccius Merluccius, Linn. — The Hake emerges from deep waters in winter and spring and then appears on the markets in fair quantities. Its chief food is composed of Sardines whose shoals it follows and devours ravenously. The specimen caught in Palestine are rather small, no bigger examples than some of 40-50 cm. in length having been observed, though it is known to reach nearly double this size. It spawns on our coast at the end of winter and the beginning of spring (January-March). Recorded from Syria and Egypt.

Sub-Order . . ACANTHOPTERYGII.
Division PERCIFORMES.
Family SERRANIDÆ.
Genus MORONE.

Morone Labrax, Linn. — This Sea-Perch is rather scarce on the Palestine shores of the Mediterranean. Quite big examples reaching a metre in length are sometimes caught. It is highly esteemed as a food fish.

Genus SERRANUS.

Serranus Scriba, Cuv. et Val. — Lives on rocky grounds; its appearance on the market coincides with its spawning season, which lasts from August till December. This species is known for its hermaphroditism.

Genus..... EPINEPHELUS.

Four species of these Sea-Perches have so far been recorded from the Palestine coast. One of them, *Epinephelus coromandelicus*, Gunth., does not belong to the Mediterranean fauna but migrated there through the Suez Canal. They are fished mainly by hook and line and are very common throughout the year, playing a considerable role in supplying the local markets. Their meat is of a very luscious quality.

Epinephelus Coromandelicus, Gunth. (*E. Dayi*, Bleek). — Lives in the south as well as in the north. It is chiefly caught in spring and summer. Does not generally exceed some 30 cm. in length.

Epinephelus Gicas, Vaill. — Reaches one metre in length and is common along the whole coast. It is remarkable for its ability to change its colour quickly.

Epinephelus Aeneus, Doderl. — This species is similar to the previous in size and distribution.

Epinephelus Alexandrinus, Doderl. — Is the rarest of the species described.

Family SCIÆNIDÆ.

Genus..... SCIÆNA.

Sciæna Aquila, Risso. — The Meagre. This widely-spread fish is the most plentiful and important during the rainy season, when it appears in big shoals near our shores. The bulk of catches consists of fish ranging between 30 and 40 cm. in length but examples of over a metre are not rare. In summer it disappears from the shallow waters. It is a very fine and highly esteemed fish. According to the fishermen it enters the Kishon and other partially brackish rivers.

Genus..... CORVINA.

Corvina Nigra, Cuv. et Val. — Is rare on our coasts. Reported from Egypt and Syria. It is some 30 cm. to 40 cm. long.

Genus..... UMBRINA.

Umbrina Cirrosa, Cuv. — Is quite common in our seas but not nearly to such an extent as the Meagre. It does not exceed about one metre in length.

Family GERRIDÆ.

Genus..... EQUULA.

Equula Klunzingeri, Steind. — This fish is a migrant from the Red Sea and now very abundant in Palestine and Syria. Its transit through the Suez Canal has not been observed though it probably took place to a great extent as its abundance in Palestine waters proves.

This fish is very small, the largest individuals seldom reaching slightly more than 10 cm. in length (caudal included). It has been observed along the whole coast and is one of the most common fishes in Palestine. It lives in shoals on muddy and sandy grounds in deeper water, though it is found close to the shore during the cooler season. It is rarely seen on the market as, owing to its smallness, it is thrown back into sea by the fishermen. There is some evidence that this species did not appear in Palestine waters earlier than about ten years ago.

Family SPARIDÆ.

The Sea-Breams are represented in Palestine by a great number of species and are caught in abundance throughout the year in the immediate vicinity of the shore. Some of them are the finest and most appreciated fishes of the country. Hermaphroditism is common in this family.

Genus DENTEX.

Dentex vulgaris, Cuv.; *Dentex Macrophthalmus*, Bloch. — These two kinds, of which the first reaches nearly one metre, are rather rare in Palestine.

Genus CHRYSOPHRYS.

Chrysophrys Aurata, Cuv. et Val. — Is much commoner than the former two. Its flesh, like that of the two previous kinds, is very fine.

Genus PAGRUS.

Pagrus Pagrus, Linn. (*Pagrus vulgaris*, Cuv. et Val.). — One of the chief marketed fishes; very abundant, mostly in smaller specimen. It forms a considerable part of trawl-fishery.

Pagrus Ehrenbergi, Cuv. et Val. — This beautifully pink and blue-coloured Wrasse appears along the coast mainly during winter and spring, in medium and big-sized individuals. It is the most appreciated of all sea-fishes, owing to its snow-white, fine flesh. It reaches the length of one metre.

Genus PAGELLUS.

Pagellus Mormyrus, Cuv. et Val. — Is very common in shallow waters throughout the year. A small decrease in catch is observed during June to September, which is its spawning season. Greatest length observed : 25 cm.

Genus CHARAX.

Charax Puntazzo, Cuv. et Val. — Is rather rare, especially in the north. Hitherto recorded from the Cyclades.

Genus SARGUS

This genus is represented in Palestine by four species of which only one has hitherto been recorded here. They are all very common fishes, some of considerable importance for local fisheries. Their flesh is not of prime quality.

Sargus Annularis, Linn. — Is the smallest of its kind and quite common along our coast. Reported from the Cyclades and Egypt.

Sargus vulgaris, Geoffr. — Occurs in the north as well as in the south where, however, it is much more abundant. Like the previous, is reported from the Cyclades and Egypt.

Sargus Fasciatus, Cuv. et Val. — The biggest of Palestine Sargidæ; is rare in the northern markets but quite common in Jaffa.

Sargus Sargus, Linn. (*S. Rondeletti*, Cuv. et Val.). — Is the most frequent and abundant of the species enumerated and, being a shore-fish, caught the whole year round along our coast. Its spawning season lasts from March till May inclusively.

Genus..... BOX.

This genus is represented by two species:

Box Boops, Bonap. (*B. vulgaris*, Cuv.). — Which is quite common along our coasts, and

Box Salpa, Cuv. et Val. — Which is much rarer.

Genus..... OBLATA.

Oblata Melanura, Cuv. et Val. — Often appears together with the previous at the same places and periods. Spawns from March till May inclusively. Is not much appreciated as a food fish.

Family MULLIDÆ.

Genus..... MULLUS.

Mullus Surmulletus, Linn. — Red Mullet. This pretty and tasty fish is very abundant on muddy and sandy grounds. During winter and spring it approaches the shores but in the warmer period retires to deeper waters. It is one of the chief objects of trawl-fishing practised during the summer in the south.

Family TEUTHIDIDÆ.

Genus..... TEUTHIS.

Teuthis Sigana, Gunth. — This species occurs along the whole coast, particularly during the summer; is feared for its sharp spines and is not appreciated as a food fish. It penetrated into the Mediterranean from the Red Sea. Length: up to 15 cm.

Division.... SCOMBRIFORMES.

Family GARANGIDÆ.

The fishes of this family are represented in Palestine by a good number of species. They are of considerable economic importance as some of them belong to the most abundant and common species. They are all migratory fishes and appear on our shores at quite regular intervals.

Genus..... CARANX.

Caranx Rhonchus, Geoffr. — Is the only Mediterranean form hitherto recorded on our coast, where it appears in spring.

Caranx Cala, Cuv. et Val.; *Caranx Kiliche*, Cuv. et Val. — Both fishes, similar in appearance to each other, are of Erythraean origin. They approach the coast some what irregularly the spring shoals only appearing at stated times. The appearance of the latter coincides with reproduction, which for both species lasts during April and May.

Genus..... TEMNODON.

Temnodon Saltator, L. — Blue-fish. This kind occupies a very important place in fisheries during the rainy season. It then appears in big shoals along the shores — like the Meagre — and is similarly caught by set nets. It reaches 1/2 metre in

length though the majority of the individuals range between 30 and 40 cm. In the warm season it is very scarce in shallow waters. Spawns in autumn (September-October).

Genus..... SERIOLA.

Seriola Dumerili, Risso. — Yellow-Tail :— appears regularly in spring and autumn shoals, the latter being much more abundant. They are often a metre long and constitute a food of supreme quality.

Genus..... LICHIA.

Lichia Glauca, Risso; *Lichia Amia*, Cuv. — Both live on our coast; the first is quite common, especially during the spring; the second is rare.

Family SCOMBRIDÆ.

Genus..... SCOMBER.

Scomber Scomber, Linn.; *Scomber Colias*, Linn. — Mackerels appear near the shore during the winter and spring but are not abundant on the whole. It is difficult to state at present whether these fish do not abound more in off-shore waters, as pelagic fishing is not practised in this country and they are known to live in off-shore regions. Both kinds are also reported from Syria.

Thynnus Thunnina, Cuv. et Val. — This Tunny appears regularly in March and April in big shoals in Palestine waters, more rarely in autumn and then in far smaller quantities. During the rest of the year only few examples are caught. It does not exceed some 50 cm. in length and bigger individuals — up to 1 metre — are rare. The catch of Tunny and related kinds is still practised here in a primitive manner, the only gear used being the local shore seine, but the fish nevertheless play a considerable role in our fisheries.

The species is reported from Egypt and the Aegean Sea.

Genus..... PELAMYS.

Pelamys Sarda, Bl. Bonito; *Pelamys Bonaparte*, Ver. (*P. Unicolor*, Guech.). — Both kinds appear at the species is quite scarce, whereas the somewhat smaller Bonito is often caught in big quantities. The bulk of the catch consists in both kinds, chiefly of individuals of some 50 cm. length. Both kinds are found in the neighbouring countries.

Family TRICHIURIDÆ.

Genus..... TRICHIURUS.

Trichiurus Haumela, Forsk. — Hairtail. The penetration of this Red Sea fish through the Suez Canal into the Mediterranean was first reported by TILLIER (1) in 1902. At that time the fish was not only found in the Canal but was very common in the harbour of Port Saïd and spread in the Mediterranean at least as far as Alexandria. Its penetration into this sea has lately been confirmed by NORMAN (2).

(1) TILLIER J.-B. — Le Canal de Suez et sa Faune Ichthyologique. *Mém. Soc. Zool. de France*, Vol. 15, 1902.

(2) NORMAN J.-R. — Report on Fishes collected by the Cambridge Expedition to the Suez Canal *Trans. Zool. Soc.*, 1927.

The fish occurs along our whole coast. In wintertime it lives close to the shore but during warmer season it retires into deeper waters. Medium sized and grown-up individuals are found in the markets.

Division.... ZEORHOMBI.
Family ZEIDÆ.
Genus..... ZEUS.

Zeus Faber, Linn. John-Dory. — Is often found on the fish-markets of Jaffa and Haifa in winter but is generally scarce. Recorded from Syria.

Family..... PLEURONECTIDÆ.

The Mediterranean is not nearly as rich in flat-fish as the North-European seas, and their scarcity seems to increase towards the East. Palestine is no exception and there are only two kinds of sole of economic value.

Genus..... RHOMBOIDYCHTHYS.

Rhomboidychthys Podas, Gunth. — Rather scarce in our seas; appears in shallow waters during the rainy season. It is a small fish of no value.

Genus..... EUCITHARUS.

Eucitharus Linguatula, Linn. — Is quite rare in shallow waters but considerable quantities are caught by trawlers at greater depths. It does not exceed some 20 cm. in length; common along the whole coast of Palestine and Syria.

Genus..... SOLEA.

Solea Impar, Benn. — The Sole is commoner in shallow waters than the previous kind. Its chief fishing seasons are winter and spring, when it approaches the shore for egg deposition; this lasts from January till April. During the rest of the year it retires to deeper waters. Reaches 30 cm. in length; its flesh is excellent.

Division.... SCLEROPAREI.
Family SCORPÆNIDÆ.
Genus..... SCORPÆNA.

Scorpæna Porcus, Linn.; *Scorpæna Scrofa*, Linn. — Are fairly rare on the market; they live chiefly on rocky ground and are feared on account of their poisonous spines.

Family TRIGLIDÆ.
Genus..... TRIGLA.

Trigla Hirundo, Linn. — The Tub lives on our coasts and is numerous on sandy and muddy grounds. It is one of the chief fishes caught by trawlers. Spawns in spring.

Family DACTYLOPTERIDÆ.
Genus..... DACTYLOPTERUS.

Dactylopterus Volitans, Linn. — The Flying Gurnard is not nearly as abundant as the previous, though quite common along the coast. It has never been observed « flying » by me.

Division.... JUGULARES.
Family TRACHINIDÆ.
Genus..... TRACHINUS.

Trachinus Draco, Linn.; *Trachinus Vipera*, Cuv. et Val. — Both species of Weevers live on sandy grounds and are feared on account of their poisonous spines. The first is quite common; the second rare.

Sub-Order.. PLECTOGNATHI.
Division.... SCLERODERMI.
Family BALISTIDÆ.
Genus..... BALISTES.

Balistes Capriscus, Linn. — The Trigger-Fish is quite rare on our coast. Specimen are sometimes found in the markets during the winter. Greatest size observed : over 30 cm. Furthest eastern point of distribution reported : Dalmatia, Messina.

Genus..... MONACANTHUS.

Monacanthus Setifer, Benn. — This species, which resembles the previous one, is an immigrant from the Red Sea and rather in our Mediterranean waters. In winter it appears near the shore.

Maximum size observed : about 15 cm.

When taken from the water this fish produces sounds similar to those of a young pig. For this reasons, and on account of the form of its head, it is locally known as Khanzir (Pig).
