

## Anchovies in the English Channel.

By

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### I. NATURAL HISTORY OF THE ANCHOVY.

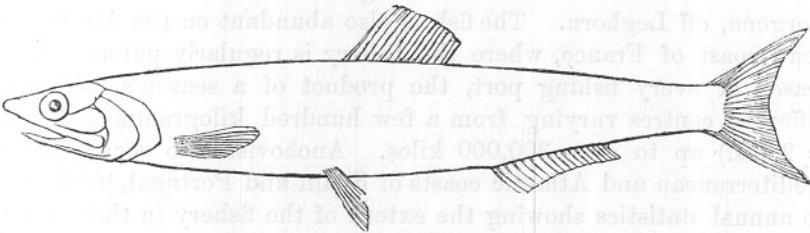
THE anchovy belongs to the same family of fishes as the herring, pilchard, and sprat, the family Clupeidæ. But whereas the herring, pilchard, and sprat have so many structural features in common that they are placed in a single genus, namely *Clupea*, the anchovy is in many respects so peculiar that it is placed in the distinct genus *Engraulis*. There are many species of *Engraulis* in various parts of the world, but only one on the coasts of Europe, and that one, commonly known as the anchovy, is called by zoologists *Engraulis encrasicolus*. The origin of these names dates back to a very early period. Both are used by ancient classical Greek authors. The derivation of ἐγγραυλις is not known; ἐγκρασίχολος is derived from χόλος, bile, and ἐγκράσις, infusion, and was given to the fish on account of its bitter flavour; the name means infused with bile, the taste of the fish suggesting to the ancients that its flesh was infused with bile. It is stated in Yarrell's *British Fishes*, and in Day's more recent work on the same subject, that the anchovy was in old times said to have its gall in its head. This statement is evidently derived from erroneous interpretations by mediæval zoologists of the name *encrasicolus*. In the French translation of Rondelet's work *Des Poissons*, published at Lyons in 1558, livre vii, chap. iii, it is stated that anchovies "sont nommés Encrasicoli à cause qu'ils ont le fiel en la teste." This shows that Rondelet derived the word from ἔν and κράς, the head; the dative singular of κράς is κράτι, and the dative plural κράσι: the root is κρατ, and the word if thus derived would have been ἐγκρατίχολος. The derivation I have previously given from ἐγκράσις is that given in Liddell and Scott's *Greek Lexicon*, and is doubtless correct.

The derivation of the modern word anchovy, which under various forms occurs in a number of modern European languages, has not been satisfactorily traced. In the most recent philological English

dictionary two derivations are given, but neither seems in the least degree probable. According to Diez the Italian *acciuga* is derived from a Latin word *apya*, which is altered from *aphya*, and this represents the Greek *ἄψυη*. This last word was applied to small fishes, which may have included the anchovy. The "ga" of the Italian word Diez considers as a suffix. In many Italian dialects the name is *anjova* or *anjoa*. Another theory is that the Spanish *anchova* is derived from the Basque name *anchoa*, which is identified with *antzuia*, meaning dry; so that anchovy means the dried fish. But there is no evidence that anchovies were used in the dried state. It seems more probable that the modern names are all derived from an unknown Latin name.

The identification of the fish called *encrasicholus* by ancient Greek authors with the anchovy is, according to Rondelet, proved by the fact that the modern Greeks in his time still called it *encrasicholus*.

Mediæval naturalists continued to call the species *encrasicholus*. Linnæus placed it in his system as *Clupea encrasicholus*, and Cuvier afterwards removed it to the position it now holds in a separate genus under the name *Engraulis encrasicholus*.



The anchovy is at once distinguished from any species of *Clupea*, from a herring, pilchard, or sprat, by the large and peculiar mouth. The depth of the gape in the anchovy is very large in proportion to the size of the fish. In the species of *Clupea* the angle of the mouth is below the middle of the eye; in the anchovy the angle of the mouth is a long way behind the eye, farther behind the eye than the eye is from the end of the snout. In the species of *Clupea* the apex of the upper jaw is at the end of the snout, so that the mouth is terminal; in the anchovy the mouth is on the lower side of the head as in a shark, and the snout projects forwards beyond the jaws. In the species of *Clupea* when the mouth is opened the lower end of the maxillary bone is drawn forwards, so that the sides of the gape are closed; in the anchovy the maxillary bone does not move in this way, and when the mouth is opened the sides of the long gape are open. The fins of the anchovy are very similar to those of the species of *Clupea*; there is a single dorsal fin as in all

*Clupeidæ*, and a single somewhat long anal fin. The dorsal fin is at the centre of the back; the pelvic fins are inserted in front of the dorsal fin, as in the sprat; the pectoral fins are close behind the gill openings. The gill openings are very large, their upper angles extending almost to the dorsal edge of the head. There is nothing very remarkable about the scales; they are rather larger than those of the herring, and, as in most Clupeoids, are very deciduous: there are no keeled scales along the ventral edge. The skin is much more delicate than that of any species of *Clupea*, and the flesh also in the fresh state is very tender, though when salted it has considerable firmness. The fish never exceeds 8 inches in length; Risso gives the maximum at Nice as 2 decimetres, or  $7\frac{7}{8}$  inches, and Mr. Dunn says he has obtained it 8 inches long off the coast of Cornwall. But 5 to 6 inches is the more usual length. Those I have obtained from the south coast of England are from 5 to  $5\frac{1}{4}$  inches long.

The range of distribution of the anchovy extends from the Mediterranean to the south coast of Norway and the entrance of the Baltic. It is common on both sides of the Italian peninsula, and at all the Italian fishing centres there is a regular anchovy fishery in the summer months. One of the largest fisheries is at the island of Gorgona, off Leghorn. The fish is also abundant on the Mediterranean coast of France, where the fishery is regularly pursued in its season at every fishing port, the product of a season's fishing at different centres varying from a few hundred kilogrammes (1 kilo. = 2 lbs.) up to over 300,000 kilos. Anchovies also occur on the Mediterranean and Atlantic coasts of Spain and Portugal, but I have no annual statistics showing the extent of the fishery in these countries. There are anchovy fisheries also along the Atlantic coast of France, on the coast of the Bay of Biscay. In the French official statistics we find that at Bayonne in 1884 the total catch of anchovies was 30,000 kilos.; and at Quimper, at the northern end of the Bay of Biscay, the catch in the same year was 683,000 kilos. On the Channel coast of France anchovies are not mentioned in the French official statistics among the products of the fisheries, and I have found no mention of any anchovy fishing on the coast of Belgium. But on the Dutch coast there is a regular anchovy fishery in the estuary of the Schelde and in the Zuyder Zee. The annual catch in the Zuyder Zee according to the Dutch official statistics varies from 2000 to 100,000 *ankers*, an anker containing 50 kilos.

On the coasts of the British Islands no anchovy fishery has ever been carried on, but the species has long been known to occur on these coasts, especially on the south coast of England. It was first recorded in England by Ray, who obtained specimens from the estuary of the Dee. Donovan, in his *British Fishes*, published in 1804,

gives a figure of the anchovy, and states that he possessed a specimen caught a few years previously on the coast of Hampshire. According to Day, Mr. Peach obtained it from the herring nets off Wick; and there is one in the Newcastle Museum found in 1834 among sprats in the Durham market. It is frequently taken in the stow-nets in the river opposite Lynn, in Norfolk. It has also been recorded from the coast of Essex and the mouth of the Thames. Mr. Dunn, as quoted by Day, says that it is quite a common fish in the autumn from Polperro to Falmouth. The same observer informed Day, and he has also stated the same to myself, that in November, 1871, he witnessed the capture of at least 150,000 in a pilchard seine at Mevagissey; these were sold for almost nothing as manure. In Wales it has been recorded off Glamorganshire, and as abundant in some seasons at Swansea. It has also been taken on the Irish coast. Couch, in his *Fishes of the British Islands*, vol. iv, published in 1864, gives a figure and a chapter on the anchovy. I cannot do better than quote what he says on the subject:—"In the westmost portion of the British Channel these fish are often taken in drift-nets employed in the fishery for herrings and pilchards; but this is only when they are sufficiently large to become entangled in the meshes as these chance to be doubled together; and there is sufficient evidence to show that if nets of finer twine, with meshes of proper size, were employed, sufficient might be taken on the coast of Cornwall to supply the full amount of what is consumed in our own country, the whole of which, as sent to us from the Mediterranean, has been so much as, with a tax on the importation of twopence in the pound, to bring into the Exchequer year by year the sum of £1764. As regards the time when these fish are near us, I have met with an example in March from the stomach of a mackerel; in summer they are found at St. Ives, in the ground seans employed in catching launce."

The mode of reproduction and development of the anchovy was first ascertained by a Dutch zoologist, K. F. Wenckebach, in 1886. The investigation was carried out at the Zoological Station of the *Nederlandsche Dierkundige Vereeniging* (Dutch Zoological Association) established in the summer of that year at Nieuwediep, which is on the west side of the entrance of the Zuyder Zee. Prof. C. K. Hoffmann had previously ascertained that the anchovies in the Zuyder Zee were sexually ripe in the months of June and July, that the eggs taken from the ripe ovaries were of oval form, about 1 mm. long and perfectly transparent; but he had not succeeded either in finding fertilized eggs undergoing development in the natural conditions, nor in artificially fertilizing them. Wenckebach inferred from the transparency of the eggs that they were probably pelagic, and developed while suspended in the surface waters of the sea. He therefore tried

to obtain the developing eggs in the beginning of July, 1886, from the surface of the sea by means of a fine surface tow-net, and at once succeeded. He found that the floating eggs of the anchovy were to be found in July all over the Zuyder Zee. The eggs hatched at the end of the third day after fertilization, but unfortunately Wenckebach does not mention the temperature of the sea from which the eggs were taken nor the temperature of the water in which they were kept under observation. The egg is distinguished by the following characters: the form is, as already mentioned, oval or sausage-shaped, and about 1 mm. in length; this is alone sufficient to distinguish it, for no other pelagic fish egg is known which has an elongated oval form. The whole of the yolk is divided up into a number of polygonal segments, in which respect the anchovy's egg resembles that of the pilchard,\* and there are no oil-globules. The blastoderm is situated at one end of the egg, and the larva when hatched is without pigment and extremely transparent, like that of the herring and pilchard.

The Italian zoologist, Dr. Fed. Raffaele, found the ova of the anchovy abundant in the Gulf of Naples from May to September. According to Wenckebach the ova are not to be found in the Zuyder Zee after July 19th, so that we may infer that the period of reproduction lasts longer at Naples than in Holland—in the former extending through the months of June, July, and August, in the latter only through June and the first half of July. Raffaele says that hatching took place after two or three days, but he also neglects to give the temperature of the sea in which the eggs develop.

We have now to consider the conditions of life of the anchovy.

Like other Clupeoids it is a truly pelagic fish, a fish which lives and feeds entirely in the open waters, having no direct relation to the bottom or the shores of the sea. It feeds on other pelagic creatures, probably chiefly on Copepods and other pelagic Crustacea. It swims in shoals, and the shoals are constantly moving about. The important point is to obtain some evidence as to the extent and periods of the movement of the shoals. The theory of the great annual migration of the herrings has been generally abandoned, but we still occasionally find the view expressed that the anchovies which are found every year in the Schelde and the Zuyder Zee travel thither from the Atlantic Ocean through the English Channel and the North Sea. For instance, Professor Ewart, in a letter published in the *Times* on January 21st of the present year, calling attention to the fact that anchovies were caught in considerable numbers in the Moray Firth in December last, says, "Perhaps further inquiries may show that the migration northwards of the

\* See my paper on *Teleostean Ova* in this Journal, New Ser., No. 1, 1889.

anchovies is in some way related to the mildness of the winter. It is most desirable to ascertain whether the anchovies have reached the Moray Firth with the warm Atlantic water that during western winds rushes through the Pentland Firth, or by travelling along the east coast through the cold Arctic water that wells up from the bottom in the vicinity of the Dogger Bank." I am inclined to think that further inquiries will show that the anchovies in the Moray Firth come neither the one way nor the other, but that these fish are permanent residents in the North Sea.

The migration theory receives some apparent support from the fact that the anchovy fishery in Holland takes place in the summer months, namely May and June, while the anchovies have only been taken on the south coast of England in the winter, from November to January. But, on the other hand, as we have seen above, anchovies breed in summer from May to September at Naples, and doubtless at other places of the Mediterranean coast of Europe. It is exceedingly improbable that the anchovy should breed only at the extreme north and the extreme south of its range, and not at any intermediate point. Are we to believe that all the anchovies which live in the Mediterranean breed near the north coast of that sea, and never migrate beyond the Straits of Gibraltar, and that all the anchovies which live in the Atlantic Ocean travel to Holland to shed their eggs? Or are we to suppose that all the anchovies after breeding migrate to the ocean, and when the spawning period returns half of them travel to Holland to breed, and the other half enter the Mediterranean and shed their eggs there? Risso, in his *Ichthyologie de Nice* (1810), states that some anchovies reside constantly at the mouth of the Var, while others come in to the neighbourhood of Nice regularly as migrants.

It is probable that the anchovy will be found to breed in summer on all the coasts where it occurs. This has not yet been ascertained—in fact, I have not yet succeeded in finding whether the fishery for anchovies on the west coast of France takes place in summer or in winter. Ripe anchovies have, however, been obtained on the west coast of England. Mr. Jackson, of Southport, on June 9th, 1878, took some dozens in a shrimp trawl off that place, which were distended with ripe ovaries. I have not been able yet to obtain any information concerning the natural history of anchovies, or the anchovy fisheries on the coasts of Spain and Portugal.

Some extremely interesting researches have been carried out by the Dutch zoologist Prof. C. K. Hoffmann,\* on the rate of growth of

\* *Contributions to our Knowledge of the Life-history and Reproduction of the Anchovy.* Published as Appendix II to the Verslag van den Staat der Nederlandsche Zeevisscherijen over 1885. 'S Gravenhage, 1886.

the anchovy in the Zuyder Zee, and the relation of the temperature of the water to the abundance of the fish and the success of the fishery in different summers. Prof. Hoffmann shows from a comparison of the variations of summer temperature, and of the product of the anchovy fishery from 1857 to 1885, variations which he exhibits graphically by curves in carefully constructed diagrams, that a high temperature in one summer is followed by a large catch of anchovies in the *following* summer. He finds that the anchovy grows very rapidly, and that the reason of the fact just stated is, that in a warm summer more young anchovies are produced than in a cold one, and these returning to the Zuyder Zee in the following year, when they are already adult, afford the fishermen a heavy spoil. The young anchovies are hatched in June, and by October, according to Hoffmann, have reached the length of  $4\frac{3}{4}$  inches.

## II. THE PROSPECTS OF AN ANCHOVY FISHERY IN ENGLAND.

In November, 1889, paragraphs in various newspapers stated that the fishermen of Dover and Deal had been catching large numbers of anchovies in their nets, and had thrown them overboard through ignorance of their nature and value. Professor Lankester instructed me to go to Dover and make inquiries into this matter, as it seemed to him advisable to ascertain whether anchovies could be regularly obtained in English waters, and if so, to endeavour to establish a trade in them which would benefit both the fishermen and the community generally. Accordingly I went to Dover, and found that the fish believed to be anchovies had been caught by the sprat-fishermen. The nets used at that place for the capture of sprats are drift nets containing sixty-four meshes to the yard, that is, meshes about half an inch square. These nets are worked by open boats rigged with mainsail, foresail, and mizen, the mast being moveable. The nets are usually shot about a mile from the shore near the Admiralty Pier, towards the end of the flood tide, and they drift eastwards. Sprats are only caught in autumn and winter, chiefly in November and December. I was told that some boats had obtained at one shot 4000 sprats and 1000 anchovies. One man said he had seen anchovies among the sprats every winter, but never in such abundance as last season. I was unable to get any specimens of the anchovies on this occasion at Dover, for the sprat-fishing was temporarily suspended; some men had tried for them during the previous week, but had caught none. The reason of this, according to the fishermen, was that the weather was too quiet and the water too clear, so that their nets were visible on account of the phosphorescence on them in the water. They said that the best weather for

their fishing was a moderate south-west breeze, because then the water was "thick." However, from the description given by both the fishermen and a dealer whom I consulted, there could be no doubt that the fish called anchovies were really of that species.

I sent a letter to the *Times* describing the results of my visit to Dover, and giving a summary of what is stated in books on fish and fisheries concerning the distribution of anchovies, the condition of the anchovy fishery in various countries, and the occurrence of the fish in English waters. At the conclusion of my letter I asked for information concerning the capture of anchovies at any other parts of the English coast. This letter was published on December 12th, and the *Times* commented on it in a leading article, calling attention to the importance of the attempt to start a regular anchovy-fishery in England.

Among the letters I received in response to my public appeal for information the most important was one from Mr. Whitehead, of Torquay, who informed me that large quantities of anchovies had for some weeks before the date of his letter, December 13th, been taken among the sprats in Torbay. He could not say what proportion the anchovies bore to the sprats, but he noticed in one lot that about one fifth consisted of the former; he did not send me any specimens. On January 3rd, 1890, I received some actual specimens in spirit from Mr. Whitehead, together with another letter, in which he said that they were still being taken in the proportion of one fifth anchovies to four fifths sprats. These specimens placed beyond doubt the identity of the fish described by Mr. Whitehead as anchovies. They were genuine anchovies, and it was thus proved that during last November, December, and January a large quantity of anchovies were landed at Torquay. I shall discuss subsequently the question of what was done with these anchovies.

As Mr. Dunn, of Mevagissey, Cornwall, had previously noted the capture of anchovies at that place, I wrote to him on December 13th asking if any had been taken there this season, and if he could send me specimens. In reply he very kindly sent me eight specimens in spirit, and a letter saying that anchovies were plentiful off that part of the coast in the autumn of every year, that this season they had been present during the three previous months, but that very few were usually caught, only a few being occasionally meshed in the pilchard-nets; the greatest catch amounted to only about a dozen specimens, because the mesh of the pilchard-nets was too large, and the anchovies were only taken in parts of the nets which got entangled. It is evident that the capture of a few specimens in a pilchard-net indicates that the anchovies are present in the sea in large numbers.

In consequence of Mr. Dunn's information I inquired on December 17th of the pilchard-fishers at Plymouth if they ever caught anchovies, and they answered that they frequently caught a few specimens, but always threw them away. They promised in future to bring me all they caught. About the same time I borrowed a sprat drift-net and arranged to have it shot by our own men from our own boat, both inside and outside the Sound, thinking that a sprat-net, having a smaller mesh, might catch more anchovies than the pilchard-net.

As the result of my application to the Plymouth pilchard-fishers a number of anchovies taken in pilchard-nets in the neighbourhood of the Eddystone were brought to me in December, 1889, and January, 1890. These were brought in lots of from one to six specimens at a time. But I caught no anchovies in my sprat-net, from which it may be inferred that anchovies occur off Plymouth at some distance from land, about the Eddystone, but not in the inshore waters either inside the Sound or immediately outside it. The nearest places from which I got specimens were the south side of the Mewstone and a mile or so south of Penlee Point.

It was thus evident that although anchovies might possibly in the future be caught by suitable nets in marketable quantities off Plymouth and Mevagissey, that at the time they were actually landed in marketable quantities only at Torquay. I wrote to Mr. Whitehead at the beginning of January asking him to get me 5000 anchovies and send them to me at Plymouth, where I arranged with an Italian fish-curer to have them cured. But, unfortunately, fishing operations were entirely suspended during nearly the whole of the month of January by continuous stormy weather. On January 29th, when moderate weather at last set in, I went to Torquay to procure if possible a considerable quantity of anchovies. I found there that sprats were not taken with drift-nets as at Dover and Deal, but in large seines worked by means of several boats, one of them, into which the net is drawn, being a large barge-like boat moored in shallow water. The purse of a seine of this kind consists of very small meshes, so that it is impossible that any anchovies escape through the net; the net is as well adapted for catching anchovies as for catching sprats, and the two kinds of fish are caught in the net together. I saw one of these seines worked, and about a dozen bushels of sprats were taken in it, but among them were very few anchovies; I picked out about a dozen, but the total number was too small to make it worth while to sort the two kinds completely. I was told by the fishermen that in the past season as many as thirty bushels of anchovies had been caught at one haul of the seine.

On January 15th I had a letter from a gentleman at Sidmouth

asking me to send him some specimens of anchovies in order that he might ascertain whether the fish called by the local fishermen "Caplin," and caught together with sprats, were of that species. I sent him specimens, and he found that the so-called Caplin were anchovies.

On January 21st Professor Cossar Ewart, in a letter in the *Times*, stated that at the end of the previous December anchovies were abundant in the Moray Firth off Troup Head, on the east coast of Scotland, and had been caught in considerable numbers in the herring nets of the Buckie fishermen.

It is evident from these facts that anchovies were during last winter present in large numbers off the south coast of England, from Dover to Mevagissey, and apart from the question whether they could be taken in marketable quantities by the use of nets not now actually in use, it is a fact that they have been taken in marketable quantities at various places by means of nets regularly used every winter for the capture of sprats. The question, therefore, presents itself, why should these anchovies have been wasted while large numbers of imported anchovies are sold in this country at high prices? For these anchovies were practically wasted. When mixed with sprats at Torquay they are usually sold with them at the ordinary price of sprats, and the buyers object to them because they cause the sprats to "turn off." At Dover they were either thrown away or sold with the sprats unsorted. The average price paid to the fishermen for sprats at Torquay is 4s. a bushel. Anchovies may not be so plentiful every winter as they were last winter, but even if they only occurred at all once in five years or so, they might nevertheless be used in the proper manner instead of being sold as sprats. For anchovies when properly preserved are a valuable delicacy and always fetch a high price. In order to try to create a market for English anchovies I wrote a letter to the *Times*, which was published about January 10th, asking the importers of foreign anchovies into England whether any of them would be willing to purchase English anchovies. But I did not receive a single answer. I then wrote to Messrs. Burgess and Son, the Strand, London, who supply the English market with the most esteemed anchovies and anchovy preparations. They replied that if I sent them some English anchovies they would report upon them. Accordingly I sent them a few of the fish from Torquay on January 30th, and they reported that such fish would be perfectly useless to them for any of their manufactures. I then called at the warehouse and found that the firm imported all their anchovies from Gorgona preserved in brine, and that they had not found the size and flavour of the Torquay anchovies equal to those of the Gorgona fish.

I also wrote to Mr. Dunn, who is connected with a fish-curing factory at Mevagissey, and he told me that he had been trying experiments on them, but the results were still to be proved. He did not say whence he got the anchovies, but when I was at Torquay on January 30th I was told by a fish-buyer there that he had sent some barrels of anchovies to Mr. Dunn, who was willing to take more, but at that time no more could be got.

I have also examined the different preparations of anchovies sold in England. Anchovy sauce and anchovy paste could be made from English anchovies as well as from imported. Entire anchovies in brine are sold in small bottles; a bottle of those prepared by Burgess and Son costs 10½d. and contains about seventeen fish. French anchovies prepared in Paris are also sold in England. These are preserved in oil and put up in smaller bottles than Burgess's Gorgona anchovies; each bottle contains a smaller weight of fish, but the price is the same. The individual French anchovies are smaller than Burgess's and no larger than those I have obtained at Plymouth and Torquay. Then there is another kind of preserved fish sold as "Norwegian anchovies." These are small fish packed in little wooden barrels, and preserved in salt and bay leaves and pepper. When I was at Torquay, Mr. Slade, who kindly assisted me greatly in my inquiries there, told me that these "Norwegian anchovies" were not anchovies at all. I had never looked at them myself, so I bought a barrel and examined its contents, and to my surprise found that the fish it contained were nothing but sprats. All the fish in the barrel were of the same kind, all were without exception of the species *Clupea sprattus*. I paid 1s. 9d. for this barrel and found it contained 111 sprats weighing 2 lbs. 5 oz. Fresh sprats are sold retail in England at 1d. per lb. I bought another barrel in Plymouth and examined its contents with the same result. So here we have the curious anomaly that at Torquay genuine anchovies are caught and wasted, while sprats brought from Norway are being sold at about 8d. per lb. These barrels of "Norwegian anchovies" are labelled merely "Finest selected, C. L. & S." The contents are not otherwise described. But, as far as I understand the Merchandise Marks Act, goods imported into this country must now be labelled with a true and accurate description of their character, and I hope the proper authorities will not be long in compelling the Norwegian exporters to label their pretended anchovies as sprats. When that is done there will be more prospect of obtaining a sale for genuine English anchovies.

It seems to me that the creation of a trade in English anchovies lies with Mr. Dunn, of Mevagissey. His energy and experience will enable him without difficulty to prepare anchovies in such a way as to

make them as palatable if not more so than Gorgona or French anchovies. I therefore advise all fish buyers in future who meet with anchovies at Torquay or elsewhere to communicate with Mr. Dunn. Other manufacturers will follow Mr. Dunn's lead, and the time may come before long when anchovies will be sought with special nets along the whole south coast, instead of being taken as now accidentally along with sprats. The anchovies imported by Burgess and Son from Gorgona are somewhat larger than the English specimens I have seen, but I do not believe they have any real superiority in quality. I have eaten the English anchovies boiled in the fresh condition and found them delicious, and I have no doubt that when salted they would be as good as the Italian or French fish. Dutch anchovies are sent in the salted condition to Germany, Belgium, and other countries, but not to England.