XXVII.—THE FISHERIES OF SWEDEN.*

By Dr. Rudolph Lundberg.

The herring fisheries.—The herring fisheries are, on the whole, the most valuable of the fisheries of Sweden. In this respect, however, they have to compete with the eel fisheries, and on the west coast of Skane with the cod and flounder fisheries. To the fishermen of the west coast the herring fisheries are of special importance because they are carried on during only a small part of the year, and because the income therefrom comes more "in a lump," as the saying is. On the herring fisheries the fishermen rely for their stock of fish for the year, and the result of these fisheries is, therefore, of the greatest importance to the coast population.

Among the herring on the coast of Skane several varieties may be distinguished; and as these different forms of herring caused Prof. Sv. Nilsson, more than 50 years ago, to advance his opinion regarding the varieties or races of the herring, they are of special interest, and I therefore deem it proper to give a short account of the same, and dwell on the significance which it seems to me they possess.

The most important question to explain is how the herring, after the year 1808, disappeared from the coast of Bohuslän; and Professor Nilsson (who could not approve of the opinion which was prevalent during the last century, that the proper home of the herring was the Arctic Ocean, whence they emigrated to the more southern seas in enormous schools) arrived at a totally different conclusion, namely, that every basin of the sea had its own kind of herring, which had become stationary there and had consequently its peculiar character, or in other words had developed into a separate "race." As regards the Skane herring he distinguished[1] three races, namely, the "Kulla herring," the "Rabo herring," and the "Cimbrisham herring" or "Kivik herring." [Kulla, Rabo, &c., are names of different localities in Skane.] Later[2] he defined the first-mentioned variety as a sort of transition form between the "sea herring" and the "Baltic herring." The south-coast

* "*Meddelanden rörande Sveriges Fiskerier*," Stockholm, 1883. Translated from the Swedish by Herman Jacobson.

[1] *Prodromus ichthyologiæ Scandinavicæ*. Lund, 1832.

[2] *Skandinaviska Fauna*, p. 493.

herring and the east-coast herring he considered as the same kind, and called it the "Kivik herring." He thought that it formed the connecting link between the South Baltic herring and the "*strömming*" or North Baltic herring. Nilsson, however, has never given a proper scientific distinction to these different varieties. Among the contemporary Swedish naturalists his opinion was for a long time the only accepted one. Occasionally doubts were uttered as to the correctness of the hypothesis relative to the different varieties of herring, but these doubts were based not so much on special investigations as on mere supposition. For the last few years a German naturalist, Fr. Heincke,[3] has treated this whole question of the different races of the herring in the most careful and thorough manner. The result at which he arrived is that there are several varieties of the herring, and among these again some local kinds, therefore on the whole the same as Nilsson's opinion, although Heincke divides the races differently.

The question as to the races of the herring is doubtless an exceedingly difficult one, somewhat owing to the fact that the definition of the term "race" is by no means absolutely certain. During my journeys I have had occasion to give some attention to this matter, and during the last year I caused the superintendents of the fisheries to gather herring from the neighborhood of Kullen and from the east coast of Skane. I have, however, not been able to convince myself that among the herring from the Baltic and Cattegat, which I examined according to the method employed by Heincke, there are different races. It would require a separate treatise to give my investigation in detail, but I deem it proper to direct attention to various matters connected with the question of the varieties of the herring which deserve to be studied more than has been done hitherto. First of all it should be clearly understood what is meant by the term "race." Opinions are divided on this subject, but every one will agree with me that races in a scientific sense cannot be distinguished by a greater or less degree of fatness or a different flavor, or, in other words, by qualities which are taken into consideration when the herring are sorted as articles of merchandise. Care should also be taken not to consider as marks of differences of race those variations that are caused by the age of the fish; for if this was done herring of different ages would form separate races. It may with good reason be questioned whether the distinctive marks of the different races are not simply caused by differences of age, the greater or less development of the sexual organs, &c. Every one knows that in the Baltic there is found a smaller kind of herring (the *strömming*), and the opinion is very general that the *strömming*, which sometimes (especially when salted) has a different flavor from the common herring, must be another kind of herring. It is a fact that in the Baltic there are

[3] Fr. Heincke: "*Die Varietäten des Herings.*" I and II annual report of the commission for the scientific investigation of the German sea near Kiel. Vol. iv–vi, Berlin, 1878, and vol. vii–xi, part 1, Berlin, 1882.

likewise found herring as large as the largest Norwegian herring, which they resemble very much, and that these large Baltic herring are found not only here and there, but along the entire Swedish coast of the Baltic, though in comparatively small numbers, so that in many places they do not form the object of special fisheries, and consequently are not often seen in the market. These large herring cannot be anything else than old, full-grown specimens of the common Baltic herring. To consider these large herring, when found in the Baltic, as a separate, larger race of the *strömming* (as has sometimes been done) does not seem to be a satisfactory explanation. With the same reason pike weighing a number of pounds would have to be considered as a different race from those of light weight. These large herring are caught on our coasts early in the spring as soon as the ice begins to break, and in certain localities even in the middle of summer, when, at least in the northern portion of the Stockholm coast, they have been observed to spawn. It is stated that they are also caught late in autumn on the outer coast. On the Baltic coast of Skane these herring do not form the object of special fisheries, but, as an old and experienced Ystad fisherman told me, unusually large herring are frequently caught[4] there in autumn after a storm, and such herring are also caught in early spring during the salmon fisheries at Sandhammar. In answering the question of size of the herring caught on different coasts, the method of fishing and the size of the meshes of the nets should be taken into consideration, for it largely depends on these things as to what size of herring will be caught. In net fisheries the herring caught are of a tolerably even size, as fish of a larger size will not stick in the meshes because they cannot get their heads in far enough, while smaller fish will slip through the meshes. In seine fisheries, where also fish are caught which do not stick in the meshes, the case is different, and the fish caught will vary very much in size. In endeavoring to solve the question simply on the basis of the average size of the herring caught on a certain coast, there is great chance of arriving at an erroneous conclusion. Fishermen try to arrange their apparatus in such a manner as to obtain the greatest possible quantity of fish, but the majority of the fish caught are not large, but young and small ones, because most of them never reach a very great age. If large herring are not as a general rule caught on a certain coast, this does not therefore prove that no such herring are found near that coast, or that the herring of that region never grow any larger.[5] The actual facts show that the

[4] They are caught in special nets, having 20 meshes to the yard.

[5] The objection may be made to what has been said above, that, as a general rule, none of the very large herring referred to are caught in the seine fisheries on the Baltic coast. This, however, is caused by the circumstance that the old herring do not spawn at the same time as the younger ones, and generally during spring and summer keep in deep water where they cannot easily be caught with seines. In winter some are occasionally caught in seines, because the old herring keep near the coast at that time, and in spring again go into deep water.

opinion that the large herring which are found in the Baltic retain the same characteristics which distinguish the younger herring[6] is erroneous. It is certainly true that the Baltic herring, or *strömming*, because they do not get such rich food, do not grow as rapidly as the North Sea herring, and are not found in such large quantities, and that, therefore, the number of full-grown fish in the Baltic must be smaller than in the North Sea; but it seems to me that this does not by any means prove that these herring, viewed from a zoological standpoint, must belong to separate races, even if, as articles of merchandise, they are considered as different kinds.[7] Accordingly, I cannot share George Winther's opinion[8] that in the Sound there are found no less than three races of herring, namely, a small variety spawning in spring, the Sound herring proper, which, "owing to its being confined in a small basin, never reaches any considerable size;" the Cattegat herring; and the Baltic herring; each of which come into the Sound from their original place of sojourn, and spawn in autumn. On the other hand, Winther may be perfectly correct in his opinion that the Baltic herring occasionally goes into the Cattegat and the Cattegat herring into the Baltic. Near Kullen and Torekov I have heard complaints that the genuine "Kulla herring" is not found there every year, but that its place is sometimes taken by smaller and leaner herring, which are supposed to come from the Baltic. Nothing but investigation carried on for several years can definitely decide this question. The only noticeable difference between the "Kulla herring," "Ystad herring," and "Cimbrisham herring," which I had occasion to examine, consists in this, that the first-mentioned herring have generally a smaller head in proportion to the length of their body than the last two. But, as Heincke has shown, the proportion of the head to the length of the body depends on the age, and is probably caused by the circumstance that the head, with its firm framework of bones, does not grow in the same proportion as the rest of the body.

The region in which the Skane fishermen carry on the herring fisheries extends in a northerly and westerly direction as far as the Falkenberg region and the Secland Reef, and in a southerly and easterly direction through the Sound as far as Möen and Bornholm, and north as far as the Hano Bay. The most important fishing stations are near Hallands-Waedero and Kullaberg, Flintrannan, and the regions south of these localities as far as Skanor and near Bornholm, but herring are more or less caught along the entire coast. As regards the method

[6] Nilsson's *Fauna Fiskarna*, see p. 512, where it is called a variety of the *strömming*. Nilsson's comparison between the great herring from Geflo and an equally large herring from the Cattegat (*Observationes Ichthyologicæ*, p. 11) was made between two specimens, one of each kind, and therefore does not prove anything.

[7] I have never heard it stated that the so-called "Halmstad salmon" and the "Baltic salmon" are of different races, although as articles of merchandise they are considered different.

[8] "*Om Sundets Silderacer*," in *Nordisk Tidsskrift for Fiskeri*, vol. ii, 1876.

employed in these fisheries, and the time when they are carried on, the coast of Skane may be divided into two districts, each of which has its peculiarities. The Falsterbo peninsula forms the boundary line between these two districts.

North of Falsterbo (that is, in the Cattegat and Sound) the so-called "*närdingar*" are used in the herring fisheries. This is a kind of net distinguished from the herring net used in the Baltic (the so-called "*mansorna*") principally by the fact that in the former the meshes are not fastened directly to the hanging-rope (Fig. 1, *b*), but run loose on a sort of hanging-twine (Fig. 1, *a*), which at every fourth mesh is fastened to the hanging-rope, so that there are three loose meshes between the points of fastening. The distance between these is called a "*skod.*" At every sixth or eighth *skod* a cork float is placed. Half of the upper meshes are made of coarser yarn. The meshes are fastened in this manner all round the net, even on the side-line and anchor-line. At the corners the ropes are laid so that they form loops, by means of which the nets are joined one to the other when they are set. On the anchor-line there are so-called stone-ropes, to which the stones which hold the net are attached. In the Baltic herring nets, however, the meshes are fastened to the hanging-rope. The net is by means of tolerably long ropes fastened to a separate strong rope, to which the floats are attached (Fig. 2, *a*, *b*). Even in mackerel and cod nets the meshes are fastened in the same manner, and this arrangement gives to the nets a great degree of elasticity, which proves of great advantage when the fish push against them. Both the *närdingar* and the *mansorna* are used as bottom nets and as floating nets. In all the Skane fishing stations north of Helsingborg, bottom nets are used exclusively in the herring fisheries.

The difference between floating-net fisheries and fisheries with stationary nets is this, that in the first-mentioned method the net is fastened to the boat and allowed to float with the current, at a greater or less distance from the surface, while in the second method the nets are held to the bottom by grapnels.

The bottom nets which the fishermen employ in Skane north of Helsingborg are in a certain sense floating nets, as the nets are not so firmly anchored but that the current can drag them along the bottom; they are not, however, fastened to the boats.

In employing this method of bottom-net fishing the nets are set in the following manner: At one end of the row of nets there is placed, in order to hold it at the bottom, a tolerably heavy stone, weighing about 18 pounds or more. To an iron peg driven into this stone there is fastened a strong rope (Fig. 3 and Fig 4, *a* and *b*) running up to a buoy which marks the beginning of the net, and is called the "head buoy" (Fig. 3, *c*, and Fig. 5); and to this peg is also attached a short line three fathoms long, to the other end of which the net is fastened (Fig. 3 and Fig. 4, *b*). At every ninth net a thinner line is fastened, which runs up to a

smaller buoy (Fig. 3, *d*), while at the end of the entire row of nets there is again a large stone, from which a strong line runs up to a large buoy. These buoys, which indicate the place where the nets are set, consist of boat-shaped pieces of wood 2 or 3 feet long, which in front have an iron hook to which the rope is fastened, and at the back a short peg to which a stone is attached, to prevent the buoy from being upset (Fig. 5). To the upper side of each of the large buoys there is attached a twig, with a small flag or rag, or sometimes only a bunch of branches, at the top, so that it can be seen at a distance. In place of these buoys small barrels are also used (Fig. 6), and recently our fishermen have begun to use buoys made of cork disks (Fig. 7), which are considered better than barrels, because the barrels become leaky and thereby useless. South of Helsingborg and on the Baltic coast iron grapnels are used to hold the nets at the bottom, instead of the stone mentioned above. The method of fastening nets in the manner described above can be traced back to a very remote period.

The so-called *närdingar* are also used as floating nets, as was stated before, but this is done only in the Sound south of Helsingborg. It seems that this manner of using these nets has been introduced recently. During the famous Skanor fisheries in the Middle Ages floating nets were doubtless also employed, but probably the nets then in use were arranged in the same manner as the *mansorna*. As an old and experienced fisherman from the fishing station of Raa told me, the fishermen of that locality did not begin to use floating nets till the year 1838. They were generally cruising, their nets floating near the surface, partly off the coast of Raa and partly in the Ise-fiord. Not till 1842 did they begin to go as far south as Flintrannan. They learned this method of fishing from the Blekinge fishermen who came about that time as far as Malmö and began to fish near that coast. The Skanor fishermen fished prior to this time in the Flintrannan, but in 1838 they had only 3 boats with small, coarse, and tarred nets. Near Limhamn there was in 1836 only one fisherman. Even the *närdingar* were smaller at that time, as they were only 100 meshes deep, while at present they are 260, 300, and more meshes deep. Those which are used in the floating-net fisheries in the Sound are very long (from 50 to 60 fathoms), and are divided into two or three parts, which, when the nets are set, are joined together by a band. They are held up by small buoys (Fig. 8), generally with very short straps (only two feet long). The row of nets therefore floats quite near the surface of the water, which is almost necessary on account of the shallow water in the Flintrannan, as the net is almost three fathoms deep. On the Limhamn boats the number of nets used is generally 10. In that case there are next to the boat four *närdingar* with a buoy; these are followed by three *närdingar*, then again a buoy; and finally at the other end of the row of nets a buoy with a light (Fig. 9 and Fig. 10). The row of nets is attached to the boat by a line fastened to the first net. In calm weather this line is quite short (2 or 3

fathoms), while in rough weather it is somewhat longer (6 or 7 fathoms). In the northern part of the sound, between Helsingborg and the island of Hven, the Raa fishermen use sinkers to keep their nets a few fathoms (occasionally as much as 4 or 5) below the surface, which prevents their being disturbed by vessels. A peculiar difference between the method of setting the nets employed in the Baltic by the Blekinge and Skane fishermen and the method used in the sound is this, that in the last-mentioned method the net is paid out by using small sails on the boat, and that the row of nets is set against the current. The stones are previously tied to the ropes, and the nets are laid in a trough, ready to be paid out. All that has to be done, therefore, is to loosen them and let them run out. When the net is to be hauled in one takes hold of both lines and draws it into the boat over a roller fastened to the gunnel.

When the Blekinge nets, or so-called *mansorna*, are used, the mast is taken down and the boat is allowed to drift with the current; the stones are tied to the ropes while the net is set, which is not a very quick process, as the boat does not go any faster than current and wind will drive it. The row of nets is, therefore, often placed in a position lengthwise the current, which is not an advantage. When the net is hauled in it is drawn over the side of the boat by the cork-line. These nets (the *mansorna*) are generally 20 fathoms long and 3 fathoms deep. Barrels are not used as buoys, but blocks of wood pierced at one end. These nets are set near the bottom, off the coast, in spring and autumn. No stones are used, but iron grapnels, one of these to every fourth net. Each net has a small buoy, and at both ends of the row of nets there are large buoys.

The above will be sufficient to give an idea of the apparatus and method employed in the herring fisheries.

The so-called *närdingar* are, as far as I know, peculiar to the coasts of Skane and Halland, and seem not to be in use anywhere else.[9] In the Sound they can still be used as floating nets, but in the Baltic, with its greater depth, the fishermen consider the *mansorna* as better adapted to their purpose, as it is easier to let them down into deep water. The *mansorna* are also used in Blekinge and near Bornholm. Among the Swedish herring nets they resemble the Gothland nets, and among foreign nets those used by the Dutch in the North Sea; although our nets are of course not nearly so deep and are not made of as strong twine. Our Swedish fishermen do not use a hanging-rope to which all the nets are attached, but make the cork-rope do service instead; and the hang-

[9] It deserves to be mentioned that in the fishing stations near Kullen the nets are not colored or tanned, because it is alleged that when used as bottom nets they will attract the fish less than the light-colored nets. Whether there is any reason for this I cannot state, but according to Collin (*Nordisk Tidsskrift for Fiskeri*, vol. i, p. 353) the Danish fishermen are of the same opinion. In all other places the nets are colored by being dipped in a decoction of birch bark and soda. Near Raa they count a *kanna* (about 3 quarts) of bark and about 9 pounds of soda to each net, and enough water to dip the entire net in it.

ing-twine is attached only to the nearest net. For our circumstances the apparatus described above is doubtless the best. In the Baltic deeper floating nets can be used, but with our small boats they are difficult to handle. From what has been said it appears that on the Skane coast of the Cattegat and the Sound so-called *närdingar* are used, which on the coast north of Helsingborg are exclusively used as bottom nets, while in the Sound they are also used as floating nets. On the Baltic coast of Skane the *mansorna* are used exclusively, both as floating nets and as bottom nets.

Even with regard to the fishing boats each coast has its peculiar type of boats. Skane, however, has no boat peculiar to that province. The Skane fishing boats show three forms. The Sound boat is principally used in the fishing on the Cattegat and the Sound; the Bornholm boat, which gradually begins to come into use on the east coast of Skane and seems destined to take the place of the third form; the Blekinge boat, which, however, is still in general use on the south and east coast of Skane.

At present the Sound boats are generally covered, with the exception of the Torekov and Mölle boats, which even when of considerable size are open, because they are also used for carrying lumber, &c. The smaller boats, however, are all open, as is the case with all the fishing boats used on the east coast of Skane. Most of the Sound boats are at present built at Viken, north of Helsingborg. Their general dimensions are as follows: Length from stem to stern, 30 feet; length of keel, 19.5 feet; breadth back of the mast, 12 or 13 feet; depth of hold, 4.5 feet; height of the mast, 32 feet. Generally they have only one mast, with a boom and jib. They also have a top-sail, fastened to a pole attached to the top of the mast.

A common open Bornholm boat, such as is used on the east coast of Skane, measures 26 feet from stem to stern, by 3 feet in breadth back of the mast, and has a hold 4 feet deep. Their sails are, as a general rule, like those of the Blekinge boats. These boats are built in Bornholm.

The Blekinge boats vary in size, the largest ones being of the same size as the Bornholm boats. They have only one mast and one square-sail, which can be hoisted and let down very rapidly. They are good sailers, but there is always some danger of their being upset.

It will be hard to say which of these three forms is the best, as each has its peculiar advantages and disadvantages. It applies to boats as well as to fishing apparatus, that even a poor boat, in the hands of a person who understands how to use it to the best advantage, can do better service than a more perfect one whose advantages are not fully understood. On the east coast the open boats will doubtless gradually be replaced by covered boats, which are an absolute necessity for the salmon fisheries in winter.

The total number of boats belonging to the Skane fishing stations in

1882 was 1,581, and the average price was as follows: Covered herring boats from 300 to 1,200 crowns [$80.40 to $321.60], and open herring boats from 150 to 1,200 crowns [$40.20 to $321.60].

The herring fisheries on the Baltic coast of Skane generally begin early in spring, and the time of course varies according to whether spring is early or late. The beginning is made by setting bottom nets near the coast in March or April. At that season of the year it is still too cold for the men to stay out at sea in open boats during the night, and the floating-net fisheries therefore do not begin till the end of April or during the first half of May, and at some fishing stations not till the beginning of June. Floating-net fisheries are then carried on all through the summer till September, when they come to an end, and bottom nets are again used near the coast for catching spawning herring. These last-mentioned fisheries are continued till the autumn storms bring them to a close. The sea near this coast is very rough, and during a storm the waves are high. The spawning-herring fisheries, especially in spring, are not very important, and the best fishing season is generally in summer (during July and August). In August the fisheries are frequently hindered by the "blooming of the water," as the fishermen call it, large masses of algæ (of the family *Nostochaceæ*) filling the water. The fish avoid the places where these algæ are found, and prefer to stay in the open spaces. Herring spawning in spring are caught principally at the fishing stations near Blekinge, and they become more scarce the farther south one goes. According to the statement of the fishermen, several years may pass without any such herring making their appearance. Nilsson says that these herring are somewhat smaller than those which spawn in autumn, but are otherwise exactly like them. The Sound herring which spawn in spring, and which Winther considers as a race of herring peculiar to the Sound, are generally small herring. The Swedish fishermen on the coast of the Sound have no knowledge of herring which spawn in spring in these waters, and in no portion of the Swedish side of the Sound do the spring herring form the object of any very important fisheries.[10] It is true that some small herring are caught all the year round, principally to supply bait for line-fishing, but the herring fisheries proper in the Sound and the Cattegat do not begin till the middle or end of August or the beginning of September, and last

[10] According to statements made to Dr. Schagerström by fishermen, the herring spawn in the Sound near Landskrona, as early as March. This statement, however, is not absolutely reliable. G. Winther states that on the Danish side of the Sound the spawning season occurs about the end of May, when small spawning herring are caught between the islands of Amager and Seeland. These herring are doubtless nothing but young herring. It is a common occurrence with other fish than herring that the fry and young fish keep near the land, and it is difficult to understand why with the herring this peculiarity should give rise to the opinion that these young fish are a separate species of fish. As the herring spawn very early in life, when measuring only 190 or 200 millimeters, the circumstance that herring spawn is no reason why they should not be young herring.

till the middle or end of October. The majority of the herring caught are not at the height of their spawning period; *i. e.*, they are full of roe and milt, but these are not fully matured or in a flowing condition. I have been assured that spawning herring are very rarely caught during the fishing season proper, but that after the close of the fisheries late in autumn, at the end of October or the beginning of November, schools of these herring seek shelter near the mountainous coast of Kulla, especially when the wind is north, and are then caught near the coast. These fish are salted and are used by the fishermen themselves. That the herring are thus caught before they spawn is of the greatest importance for their market value; and the herring from the west coast of Skane—the "Kulla herring"—have from time immemorial enjoyed a very high reputation, and have always brought good prices.

In dividing the fish which have been caught, there is this difference between the east and the west coasts of Skane, that on the west coast the division is made according to the number of nets belonging to a boat, while on the east coast every one takes whatever fish stick in his net. Each one takes his turn in setting the net. Other persons besides the population of the fishing stations take part in the fisheries; in West Skane, however, this is the case only during the herring fisheries. Old sea-captains, and widows of captains or of fishermen, keep a boat and net, or either, and hire people to engage in the fisheries. These people get half of all the fish they catch. Near Mölle, the owner of the boat, who is always the mate, receives for two nets two shares more than the other fishermen. If, for example, there are six nets, the owner receives eight shares, and, besides, every eleventh crown when the fish are sold. The number of the crew varies according to the size of the boats, from five or six to ten men, and one or two boys. These boys in the first year receive one net share, and in the second year two. They also get those herring that fall off when the net is hauled in and which are dipped up with hand-nets. Every fisherman has a girl as an assistant, who mends and dries the nets and pulls the herring from the net, for which she gets her board and one net share. Every boat has two extra nets, and the fish caught in these fall to the share of poor widows and children.

Near Viken, when the owner of the boat supplies the buoys and the lines, he gets a whole share, otherwise only half a share per boat. If the girl (who acts as assistant) has a net, she gets whatever is caught in it, otherwise she receives half a net share.

At the fishing stations on the south coast, where the crew generally are only two or three men per boat, who have equal shares in the boats and nets, they divide all the fish which are caught evenly among themselves. On the east coast, near Skillinge, the boat owner gets one man's share. The girl gets whatever is caught in a net which is set specially for her. As has already been mentioned, the fish caught

are not divided according to the number of nets, but every fisherman takes whatever fish have been caught in his net.

The fishermen have therefore, besides the expense for buying and repairing boats and nets, various losses from their income derived from the fisheries, so that the net income is not quite so large as would seem at first sight.

The fishermen of the Kulla region never stay near their nets over night, even if the weather is fine, but sail home as soon as they have set their nets, and go out again early in the morning to haul them in. It of course depends on wind and weather how early they come home with the fish. Frequently they do not get home till noon, and even later. As soon as the boat touches the shore, the nets are carried on land in their troughs, and are spread out on a sort of pavement specially made of small stones. The women then take off the fish. The fishermen carry the dry nets down to the boat, and after eating a meal they again go out to set their nets. Especially in the beginning of the fisheries, when the weather is still warm, it does not improve the herring to let them lie on the ground exposed to sunshine and rain. At all the Skane fishing stations the fish are sold exclusively in a fresh condition.

The herring dealers come with horses and wagons to the fishing stations, and the herring which they buy from the fishermen they take farther inland, where they are sold wherever a chance offers. The country people salt their own supply of herring for the winter. In August, while the harvest is still going on, the farmers have no time to salt herring, and in fact would not do it at all during the dog-days. At that season of the year, therefore, the sales are not so large, and the number of buyers is smaller. Under these circumstances it may happen that when the boats which come home late bring in a considerable quantity of herring (from 16,000 to 24,000) a great fall in prices is produced thereby, so that sometimes 80 fish (a so-called *val*) will bring 2½ crowns [67 cents] in the morning and only from 25 to 50 ore [6.7 to 13.4 cents] in the evening, which gives rise to stories of enormously rich catches and low prices, and tends prematurely to lower the price of herring. Under such circumstances the fishermen must sell at any price they can get, because they cannot, without neglecting their fisheries, sail to more distant markets, and because the herring would suffer if carried for any great distance. During the good herring years it would certainly pay on the coast of Skane to establish salt-houses and smoke-houses; and the competition which would be a natural consequence would prove an advantage to fishermen. It is difficult for some of the simple-minded fishermen to understand that the price of herring, like that of any other article of commerce, must be regulated by the supply and demand, and one often hears the wish expressed that the price might be regulated by some law, so as not to go below a certain minimum. There has been considerable difference between

the average price of herring on the east and on the west coasts of Skane, which is hardly sufficiently explained by the better quality and greater size of the Kulla herring (on the west coast). It is to be hoped that the easier communication with the interior by means of the recently opened Cimbrisham railway will create a better market for the fish caught on the east coast of Skane. That the construction of railroads has already exercised a beneficial influence on the income derived from the fisheries has been fully demonstrated in other parts of Skane. Thus old fishermen from Ystad have assured me that since the opening of the railroad the fisheries are continued later into autumn and are carried on far more energetically than formerly. Besides the herring which are sold on the spot, fresh fish are every day sent by railway to Malmö, and, slightly salted, as far as Estof and Jönköping.[11] The same will doubtless be the case on the east coast as soon as better means of communication are provided.

The herring on the east coast of Skane are of exactly the same kind as the so-called Bornholm herring, and if carefully treated they could doubtless bring a better price and find a more extended market than is the case at present. The experience of Blekinge and Bornholm is a sufficient guaranty for this. Besides other difficulties (as that the best herring are caught during the hottest part of summer), the efforts to give the Baltic herring a good reputation are counteracted by the circumstance that spawning herring unsuitable for salting are often introduced into the market under the same name as the better kinds of herring, which decreases their reputation and price, and throws difficulties in the way of persons who are desirous of preparing a better article. If the Skane salt herring are to get a better name and more extended market, it is absolutely necessary to introduce a better system of sorting the herring and of stamping the barrels. It is also very desirable that our business men should give some attention to the matter. It is hardly to be expected that the Skane fisheries can be made to compete successfully with the great fisheries of the world; but that they deserve greater attention, and that business men will here find a fruitful field for enterprise, will be seen from the following data:

Years.	Number of herring caught on the coast of Skane.	Income from the Skane herring-fisheries.		Number of fishermen, nets, and boats.		
		Crowns.	Dollars.	Fishermen.	Nets.	Boats.
1879	34, 333, 280	374, 784	100, 442. 11	2, 166	35, 865	520
1880	77, 768, 320	604, 161	161, 915. 14	2, 303	36, 569	786
1881	72, 207, 280	641, 191	171, 839. 18	2, 437	38, 334	758

Unfortunately we do not possess data from a sufficient number of years to show the changes to which the herring fisheries have been sub-

[11] In Ystad there is a smoke-house, owned by a German, and smoked herring and eels are exported thence to Germany.

ject. From the information obtained from old fishermen it appears, however, that such changes have always taken place. The following data from Raa, in the central part of the Skane Sound coast, and from Limhamn, in the southern part of the same coast, have been obtained independent of each other. N. Björk, an old Raa fisherman, states that from 1866 to 1868 there were very good herring fisheries in the Sound, the best that he can remember; the herring were small, and sold for 25 ore (6.7 cents) per 80 herring; and that they gradually increased in size till 1872, when the herring fisheries came to a close. In 1871 the greatest number of herring caught in the Sound were caught near Raa, but not one-fourth the number caught in 1868. In 1872 no herring were found in the Sound, and the Raa fishermen had to go as far south as the Danish island of Möen in order to catch fish. Several Limhamn fishermen have stated that during the period from 1867 to 1869 there were very good small-herring fisheries, while in 1870 the herring were somewhat larger, and in 1871 considerably larger; from 1873 to 1875 the fisheries were very poor; in 1876 and 1877 there were some fisheries; in 1878 and 1879 the fisheries were tolerably good; and in 1880 and 1881 they were very good.

In his treatise on the species of herring in the Sound, Winther states that after some years' poor fishing, the fisheries became very good in 1867, when a large number of small herring made their appearance in the Sound, and increased in size till 1873, when the majority of herring were large. They grew still larger in 1874, and after that year disappeared from the Sound, so that in 1875 only a small number of little herring were caught. Another Danish author, J. Collin, states that in the Sound, north of Helsingör, the best herring-fisheries of recent times occurred in the period from 1865 to 1870, the climax being reached during the years 1867 and 1868. Similar rich fisheries occurred in 1836, and in 1848 and 1849.

It is a well-known fact that good years alternate with bad years in the fisheries; but not till the Norwegian naturalist, Axel Boecks, made the history of the Norwegian spring-herring fisheries the subject of exhaustive investigations, was an actual periodicity in the appearance of the herring fully demonstrated. A similar regular increase and decrease of the fisheries was assumed for the Sound herring-fisheries by Winther. He presumed that the length of each period was about eight years, counted from the best year, till the fisheries again became poor. According to his calculations there were poor fisheries for two years, showing, however, a tendency to become better; then four years good fisheries, followed by two years poor fisheries with a tendency to become worse. By continuing these statistics for a considerable number of years it could be shown whether the actual facts bear out Winther's view.

It is a noteworthy fact, mentioned by all our informants, that the herring towards the end of good fish years increase in size, decreasing at the same time in number from year to year, until they disappear

entirely. In explanation of this circumstance Winther states that the small Baltic herring, which in 1867 came into the upper part of the Sound in large numbers, found that the deep basin south of the island of Hven was no longer inhabited by the large Sound herring. The Baltic herring therefore remained in that locality, increasing in size from year to year till they reached the size of the Kulla herring, when they became too large for the Sound and went out into the Cattegat. This explanation, however, is hardly satisfactory, as it is well known that the herring from the Cattegat and the Baltic enter the Sound every year towards the beginning of the spawning season in autumn, that at no other season are there any important herring-fisheries in the Sound, and that at other times no large herring whatever are caught there.

The recent changes in the Skane herring-fisheries naturally have drawn attention to the rich fisheries near Skanor and Falsterbo during the Middle Ages, and it may be of interest to state briefly what is known relative to these fisheries, and how they compare with the present Sound fisheries.

In the *Knytlinga Saga* (written in the beginning of the thirteenth century) it is stated that Canute the Holy (died 1086), during the war with the Skanians, brought them into subjection by threatening to exclude them from the herring fisheries. Saxo, in his Danish History (written soon after 1206), relates: "At that time there was such an enormous number of herring in the Sound that they could be caught with the hands, and it was almost impossible for a boat to make its way through the dense masses of fish." During the first years of the thirteenth century the Germans seem to have taken a share in the Skane herring-fisheries. According to the historian Hvitfeld, the Lubeckers, in 1203, obtained the privilege from the Danish king, Waldemar Seier, of engaging in fishing, and they were to begin on the coast of Skane. According to Sartorius (a German historian) they did not secure these privileges in due form till the year 1343. These privileges were confirmed in 1365, when their right to carry on a retail trade was taken away and not restored till 1370. The most important provision of these privileges, according to Sartorius, allowed the Lubeckers to sell cloth, linen, &c., by the yard; in other words, to carry on a retail trade, a privilege but rarely granted to foreigners. During these troubled times, and during the reigns of worthless kings, the Hanse Towns succeeded in getting the entire control of the Skane fisheries and trade. The principal trading and fishing stations were Skanor and Falsterbo, and also Ellenbogen (the present city of Malmö). Here large markets were held during the autumn herring fisheries. The Danish historian C. F. Allen estimates the number of persons who at that time visited the coast of Skane at from 60,000 to 70,000. Another Danish historian, Styff, says that at Skanor and Falsterbo the so-called Biscay fleet, on its return from the southwest of Europe, met the mer-

chants fromPrussia and Livonia. All the important sea towns belonging to the Hanseatic League, from Kampen and Harderwyk, on the Zuyder Zee, as far as Reval, on the present Baltic coast of Russia, had lots on the Skane coast, where they erected booths and stores. At a certain season of the year the Hanse Towns sent prefects to the coast of Skane to defend their old rights and privileges. The Danish kings appointed a person both at Skanor and Falsterbo to see to it that their rights were not infringed upon. The Hanse prefects, however, stood their ground, and within the districts controlled by them no foreigner was allowed. No German was to salt herring for the King, Danes, or other foreigners; nor were the Hanse men to let their herring be salted by foreigners. According to their privileges they were to have full liberty to carry on the fisheries, to have their own workmen, &c. Sartorius states that the Hanse merchants even seem to have prevented foreigners from obtaining good barrels, with the view to limit their sale of fish. At that period the Hanse Towns controlled nearly the entire trade of the north of Europe, and it was very difficult for the inhabitants of Scandinavia to compete with them. It was forbidden to salt herring on board vessels, in order to prevent smuggling. The duties paid to the Danish Crown, however, were ludicrously low. All herring exported from Skane by way of the Sound were free of duty. Besides the duties, the King had the right of the so-called "royal purchase;" that is, every fisherman, no matter whether he fished on his own account or for others, must sell to the Crown 240 herring at half the ruling price. For curing these fish the Danish Crown maintained large salt-houses at Skanor, Falsterbo, Dragor, and on the island of Möen, and from the accounts kept at these establishments we get our data relative to the yield of the herring fisheries. According to Allen, there were in 1518 salted in the royal salt-house at Dragor 180 *tunnor* [= 297 hectoliters] of herring. F. Trebban, the royal superintendent at Falsterbo, in his report to King Christian III for the year 1537, states that at Falsterbo there were salted 96,000 *tunnor*, or barrels [= 158,400 hectoliters], of herring, and estimates the entire number of herring caught in the Danish Monarchy during that year at 360,000 *tunnor* [= 594,000 hectoliters]. According to the report of the Lubeck prefect at Falsterbo, the number of persons engaged in the Skanor and Falsterbo herring-fisheries during the first years of the reign of King Frederick I [1523–1533] was 37,500, and the number of boats employed by them, 7,515. The average price of one *tunna* of herring [= 1.65 hectoliters] was 2 florins. The above-mentioned quantity of herring would therefore represent a value of 720,000 florins, or 1,440,000 ounces of silver, an enormous sum, says Allen, if we take into consideration that silver was worth more than it is nowadays. According to Hallenberg, a barrel of Skane herring in 1539 cost 16 Danish marks [$3.21]. The value of the entire Danish herring-fisheries calculated on this basis would have amounted to 4,320,000 crowns [$1,157,760]. If we consider that

the Danish sea fisheries yield about 5,000,000 crowns [$1,340,000], of which a very large percentage doubtless belongs to the herring fisheries, the above-mentioned sum does not seem so enormous, when compared with the present fisheries, as Allen supposes. From the statement that 92,000 barrels [151,800 hectoliters] of herring were salted in Falsterbo alone, we cannot draw any conclusion as to the quantity of herring caught in the Sound and on the eastern coast of Skane during the great fisheries; and as we have no data from the Danish side of the Sound we are also unable to calculate how many are caught at the present time. Without fear of exaggeration, the quantity of herring caught on the Danish side in 1881 may be estimated at at least 50,000 *tunnor* [82,500 hectoliters]. If we take into consideration that the salting business was during the Middle Ages concentrated in a few places, on account of the customs duties; that owing to the presence of numerous foreigners the number of boats and fishermen was considerably larger than it is now; and that, if the circumstances were the same, as many herring would be caught nowadays during good years, it seems probable that the quantity of herring which came near the coast during the Middle Ages was not so much larger than it is at the present time, even if the data from those times are not exaggerated. Several circumstances seem to favor this view of the relation which the fisheries of our times hold to the so-called "great fisheries" of former centuries.

The natural conditions on the coast of Skane were nearly the same then as they are now. Styffe remarks that even in those days the water near the coast was very shallow, so that large vessels (though large merchant vessels like those of the present time were unknown) had to anchor some distance from the coast in the so-called Holeviken, and nothing but boats could come up to Skanor. The location where the fisheries were carried on was the same as it is now. Allen says that the fisheries were carried on in the Sound south of the island of Hven, off Malmö and Skanor, on the south coast, and later near Bornholm. The season for the fisheries was the same as it is now, and they were carried on exclusively in autumn. They began on the 10th, 15th, or 24th of August and continued till the end of October, probably extending into that month as much as they do now. According to the old Skanor law, no fisherman had the right to leave the coast before the 9th of October. That the fisheries then as now generally began in good earnest by the 1st of September seems probable from the fact that the market was not properly opened till September 8, and lasted till November 1. There is therefore nothing to show that the circumstances were different in these respects from what they are now.

That the fisheries even in those times were subject to considerable changes appears from the information which we possess. Allen states on the most reliable authority that the Sound herring-fisheries were unusually good during the period from 1482 to 1495, particularly during the years 1492 and 1493, when a number of fish, owing to the lack of

salting-vessels, had to be thrown away. Other writers state that the fisheries were poor during that period, and that about the year 1434 the herring left the Baltic and went to the North Sea. Both Sartorius and Allen, however, doubt the reliability of these last-mentioned statements; and Sartorius says distinctly that the best authorities do not speak of any interruption of the herring fisheries or mention anything regarding a decrease of the herring.

By a special agreement between Denmark and Lubeck the Hanse Towns in 1560 lost their privilege of carrying on herring fisheries on the coast of Skane, and therewith the great herring fisheries came to an end. This circumstance, that the herring should have disappeared at the same time when the Hanse fisheries came to a close, seems so strange that serious doubts have arisen in my mind as to whether the so-called "great fisheries" were really so enormous in comparison with our present fisheries as has generally been supposed. As late as the year 1530 (as appears from the report of the Lubeck prefect for 1537) the fisheries were very good, and nothing is said regarding a decline towards the end of that period. But about that time the Hanse Towns lost their commercial supremacy in the north of Europe, and about the year 1560 they had lost their foothold in most places in Scandinavia, and could not regain it in spite of strenuous efforts made by them during the war which followed soon after.

As Styffe remarks, Skanor and Falsterbo have never been towns of importance, but simply trading places. "Between the great market seasons but little business was done, and the number of permanent inhabitants was very small," says Styffe. He also directs attention to the fact that it was not merely the fisheries, but the general trade, which attracted the Hanse merchants to Skane, and probably trade was the greater attraction of the two, which explains the fact that they continued to visit the coast of Skane even when the fisheries were poor. It will easily be understood, however, that when the Hanse merchants, who controlled considerable capital for fitting out boats for the fisheries, left the coast the fisheries would decline, being left entirely in the hands of the sparse and poor coast population; while it is highly improbable that the herring left the Skane coasts at the same time with the Hanse merchants. It will also be difficult to find any instance where fisheries were successful on a coast for over three hundred years, and then became poor for several hundred years. That the Skane herring-fisheries became less important, and are after that period rarely mentioned by the historians, cannot, in my opinion, be ascribed to the circumstance that the herring left the coast, but to various other causes, principally to the fact that, owing to the want of capital and energy, the fisheries were no longer carried on in the same spirit of enterprise as was the case when the Hanse merchants managed affairs. When the country became more cultivated, other industries began to spring up, and the fisheries lost much of their former importance.

It is natural that the coming together of so many people made it necessary to have proper rules and regulations. According to Schlyter, the first rules of this kind were made by King Waldemar Atterdag (1340–1375); the exact year, however, is not known. A fuller code was promulgated by Erik of Pomerania, and Queen Margaret (1396–1412). The few data we possess relative to the manner in which the fisheries were carried on in those days are taken from these and other laws of that period.

As at the present time, the fisheries were carried on partly with floating-nets and partly with bottom-nets. It was strictly forbidden to stretch a net from the surface to the bottom so as to hinder the herring from reaching other nets. It seems that each fisherman could have only a certain limited number of nets. We find in these laws many regulations to prevent the exportation or sale of herring without paying duty to the Crown. Thus it was prohibited to salt herring on board vessels or boats or on the strand; no herring could be sold on the shore or carried away from the shore in sacks or baskets, but must be conveyed in carts and wagons, each having a full load. It was forbidden to take up bottom-nets except in the day-time, or to leave the port at night-time. It was strictly prohibited to put any damaged herring into the barrels; and any woman who threw the herring direct from the troughs into the barrels, instead of laying them carefully, had to pay the death penalty. According to Allen, King Hans in 1508 ordered the Dantzic fishermen to use only the fine white Lüneburg salt instead of the "Bay salt" (salt from the region of the Loire in France) and other coarse salt, from the use of which the Skane herring had become of poorer quality from year to year. The Dantzic fishermen, however, did not obey this order, and King Hans, who was engaged in numerous wars, did not find time to enforce it.

The sprat (*Clupea sprattus*) is certainly found near the coasts of Skane, but, with the possible exception of the Cattegat, not in any considerable quantity, and does not to any great extent form the object of fisheries.

THE EEL FISHERIES.—These fisheries are remunerative on the east coast of Skane, and in several places exceed the herring fisheries in importance. The fishermen distinguish three kinds of eels, but only two of these are of any importance, namely, the so-called "*drif* eel" (or "*blank* eel") and the "grass eel." The former are taken mainly with the *hommor*, a kind of fish-basket, and the latter are taken near the coast all the year round, but these last-mentioned fisheries are comparatively of little importance. The *drif* eel is distinguished from the grass eel by being larger and fatter, and principally by being white or silverish gray on the belly, while the belly of the grass eel has a more or less yellow color, and is also smaller and leaner. The *drif* or *blank* eel is (as I have shown in my treatise "*Om Ålfisket*," &c., in "Transactions of the Royal Agricultural Academy," 1881) an eel which comes from fresh

water and is going to its spawning place. In going over all the observations regarding the *hommor* eel fisheries on the Baltic coast of Sweden and in the sounds and the belts, we find that this is the actual fact, as shown by the very way in which the apparatus is placed, and the time when the fisheries are carried on. The *hommor* on the east coast of Sweden are so set that the eels must come from the north; on the south coast of the Skane, so that they must come from the east; and in the Sound and the belts, from the south. As in the last-mentioned localities the eel fisheries commence much later than on the east coast of Sweden, it may be considered as certain that the eels really travel along the coast to the more salty waters of the Cattegat; and, as this migration takes place at a certain season of the year, it is in the highest degree probable that it is in some way connected with the propagation of the eels, although for the time being we do not know where and how the propagating process is carried on. By the discovery made by Syrskis in relation to the male generative organs of the eel, and the discovery by Hermes of these organs in the male of the sea-eel (*Conger vulgaris*), it has been settled beyond dispute that both sexes are found among the eels, and that eels do not give birth to live young ones, as was thought in former times. Some progress has therefore been made toward solving the old problem of the propagation of the eel. That the eel for this purpose seeks salter water is as easily explained as that other migratory fishes, as the salmon, seek fresh water for the same purpose. The circumstance that this migration of the eels is noticed mainly in these portions of the Baltic which are nearest to the Cattegat is easily explained by the fact that eels from different localities must gather here in considerable numbers. The objection might be made that in that case the richest eel-fisheries must be in the Sound and not on the east coast of Skane and Blekinge; but it should be remembered that the nature of the coast, the currents, &c., doubtless exercise a considerable influence on the eel fisheries, and that on such circumstances it will principally depend whether, in their migrations, the eels come so near the coast that they can be caught with *hommor;* and also that the considerable eel-fisheries which take place before the eels reach the Sound must certainly decrease their number, as eels are not found in such enormous schools as herring and cod. The eels in their migrations pass the two northernmost fishing stations on the east coast of Skane, namely, Tosteberga and Landon, but are caught along the entire east coast as far as Sandhammar. On the south coast the eels go as far as Kaseberga, but no eels are found near Ystad, which is explained by an old Ystad fisherman, who says that along that part of the coast the eels go farther out at sea. Some eels are caught near Smyge and Bedinge, but going west no eels are found until the Kampinge Bay and the south side of the Falsterbo Peninsula are reached. On the west side of this peninsula and in the Holeviken (Hole Bay) north of it, no "blank eels" are found, and the same is the case at all

the fishing stations on the Swedish side of the Sound as far north as Raa, where eel fisheries are carried on with *hommor*, and along the coast as far north as Viken. North of that place there are no more eel fisheries. Of late years attempts have been made to carry on eel fisheries with *hommor* near Landskrona and also in the Schelderviken (the Schelder Bay), but without any success whatever. At Mölle, near the Kullen promontory, it is thought eel fisheries with *hommor* could be established if the bottom was more suitable for the purpose, so as to allow the *hommor* to be put in position; but the reason why the attempts made near Landskrona proved failures was not the nature of the bottom, for there it is well-adapted to the purpose, but simply the fact that the eels in their migration through that and the southern part of the Sound do not go along the Swedish coast, but along the Danish coast where the water is shallower, and where eel fisheries with *hommor* are carried on from the neighborhood of Copenhagen as far north as Helsingör. I have been informed by fishermen that such fisheries are also carried on in the Bay of Kjöge (south of Copenhagen).

What can be the reason that the eels during their migration pass by certain portions of the coast? Probably several causes contribute toward this result. If one observes the nature of the coast in those places where eels come near it, it will be found that these places are either in the offing or along an open coast. The eels ascend toward the coast from the depths, come close to the shore, pass along it for some distance, and again return to deep water. The best places for eel fisheries are in bays toward promontories which turn toward the places from which the eels come. A glance at the map will show that there are eel fisheries in the province of Blekinge near Horvik, and in other places of the peninsula of Listerland, but not in the Bays of Hellevik and Solvesborg. On the coast of Skane the eel fisheries commence at Åhus and extend south of that place, the best place for catching them being in the shallow bay extending from Åhus to Stenshufvud. Outside this bay which is passed by the eels there are many small islands. If we get to Falsterbo, we find that the best eel-fisheries are in the Kampinge Bay and along the south side of the Falsterbo promontory, but from that point the eels take a westerly direction and go toward the Danish coast. That the eels do not go over from the Bay of Kjöge to the Malmö coast is easily explained by the fact that they follow the shallow channel between the islands of Amager and Saltholm. The explanation given above, why the "blank eels" do not approach the coast near Ystad, or that the eels in ascending toward the shore turn back again when they find shallow water farther out, seems to be justified, and is also confirmed by information furnished by Grisleham fishermen. They state that the best places for catching eels are always on the north side of promontories; and the farther these jut out into the sea the better will be the fisheries.

Besides the "blank eel" and the "grass eel" the fishermen distinguish

a third variety, the so-called *slukålen*, which has a dark color, a broad nose, and tolerably large protuberances on the sides of the head, producing a furrow which runs along the middle of the head, and gives the fish an ugly appearance, for which reason it is also called *grymål*—the "ugly eel." This variety is found among the other eels, but not in very large numbers, and does not give rise to any special fisheries.[12] The "grass eel" and the "ugly eel" are exceedingly voracious, and remnants of fish are often found in their stomachs. The "horn eel," on the other hand, has generally an empty stomach, or only some reddish-yellow slime in it, so that it seems that, like the salmon and some other fish, it eats nothing or but little during its migration. Near Oro, on the Kalmar coast, where many eels are salted, and where they therefore have to be cut open, it was noticed as peculiar that nothing was ever found in the stomach of a "blank eel;" while the reverse was the case with the "grass eel." The few observations which I have made regarding this subject confirm this. These facts still further corroborate the opinion that eels do not come near the shore to seek food, but that herein they resemble the salmon, which on their journey toward the rivers also go along the shore. There is no doubt that a large number of the migratory eels come from fresh water, but a large number of eels are found in the Baltic near the shore and in the inlets all the time, and are caught there all the year round.

[12] As regards the relation between these different varieties of eels, opinions are still divided. Yarrell and some older zoologists give them as separate varieties. Among the Scandinavian naturalists Ekström distinguishes two varieties, the large-nosed (*Muræna platyrhina*) and the small-nosed eel (*Muræna oxyrhina*). Kröyer distinguishes three kinds: *Anguilla migratoria*, *A. acutirostris*, and *A. latirostris*. In Nilsson's Fauna these are given as varieties of the common eel. Günther in his large work, "Catalogue of Fishes in the British Museum," says that of all these varieties only the *Anguilla latirostris* can be considered as a separate kind, principally because the proportion between the length of the fins and the length of the head is very different from that found in the other eels. With the common eel the length of the head is equal to or less than the distance between the roots of the dorsal and of the anal fins, while in the *Anguilla latirostris* the length of the head is greater than the above-mentioned distance. I have examined a few (10) specimens of Skane eels. No. 5, which, as regards the position of the fins, resembles the *Anguilla latirostris*, had a very pointed nose. No. 3 had a comparatively broad nose. The lower jaw was found to protrude most in No. 1 and No. 3, and little or not at all in the smaller eels which I examined. The young eels caught near Limhamn had an unusually broad nose, especially the largest one. The color of the belly was a lively yellowish green. The stomach and intestinal canal of the larger eel which I examined were full of remnants of small crustaceans. Young eels are often caught in considerable numbers in the fish-pots used for catching various crustaceans. The quantity of the spawn bears a certain relation to the size of the fish, and on close examination can be discerned with the naked eye. The ovaries did not, however, entirely fill the abdominal cavity, and were probably far from being fully matured. The roe in the fish which I examined was generally larger than what Rathke found in full-grown female eels. Sundevall states that in September he found female eels containing roe, each grain of which measured ½ millimeter, therefore resembling those which I had observed. In No. 1, examined by me, the breadth of the ovarium was 18 millimeters, and in No. 2, 12 millimeters.

Nevertheless, no "blank eels" are caught except late in summer and in autumn; and the stationary eels, the "grass eels," have never been noticed to migrate any distance. It has not yet been fully explained what relation exists between the stationary and the migratory eels. A Danish gentleman, T. Leth, who has given some attention to this subject, has in the *Fiskeritidende* advanced the opinion that the "blank eel" is nothing but the "grass eel" in its "wedding dress." He has in the Copenhagen fish-market examined a large number of eels and found many transition stages from the yellow-colored "grass eel" to the white or silver-gray "blank eel." Many circumstances favor Mr. Leth's opinion, and the difference of color among eels deserves to be studied more thoroughly, especially in our inland waters, where yellow eels are also found.

As has already been stated, the "grass eels" do not form the object of any considerable fisheries. They are caught principally with lines, and on the east coast sometimes in wicker fish-baskets. But these fisheries are very unimportant when compared with the autumn fisheries for migratory eels, when *hommor*, a sort of fish-baskets, are used.

The best season for the eel fisheries is late in summer and in autumn. The fishermen consider dark nights the best for eel fishing, because on moonlight nights the eels keep in the depths. On the east coast of Skane the fisheries begin in the middle or toward the end of August. The best fisheries are generally in September and October. In the Sound the eel fisheries begin toward the end of September, and the best fishing is generally in October. As soon as snow begins to fall and cold weather sets in, the eel fisheries come to an end.

The result of the Skane eel-fisheries during the three years 1879 to 1881, inclusive, was as follows:

Year.	Pounds.	Value.
1879	440,634	$44,284.03
1880	232,853	23,248.19
1881	147,293	16,073.56

The most of the eels caught are sold fresh, and only a few are salted or smoked. The eels caught on the east coast of Skane are mainly bought up by German fish-dealers who have sailing vessels which from the central station of Kivik visit the neighboring stations and receive the eels before nightfall. The average price paid by these merchants is about $2 for 18½ pounds.

THE COD AND FLOUNDER FISHERIES.—The cod and also the plaice and other varieties of the flounder are found near the coast of Skane all the year round and form the object of fisheries, except during the season of the herring fisheries, when only old persons who can no longer engage in the herring fisheries continue to catch cod and flounders. The farther away one gets from the Cattegat and the Sound the less important do

these fisheries become, partly because the number of these fish is not as large, and partly owing to the greater distance from the great Copenhagen fish-market; for the greater portion of the cod and flounders caught on the coast of Skane are sold fresh, and it is simply for home consumption that any of these fish are salted or dried. Cod fisheries on a larger scale might pay even in the Baltic, where, at least during some years, the number of these fish is very considerable, and where a good article of cod in brine might be prepared.

Cod fishing goes on all the year round, unless prevented by ice. On the east coast of Skane, however, the more remunerative salmon fisheries (carried on with lines) have placed the cod fisheries in the background. The cod fisheries are exclusively carried on with lines, both on the coast of Skane and in the Sound, wherever a sufficient supply of suitable bait can be obtained. For bait are used a kind of snail (*Fusus* and *Buccinum*), crabs (*Palæmon squilla*), or, if these cannot be obtained, *Crangon vulgaris*. An excellent bait is *Arenicola piscatorum*, and also herring cut up. Near Raa the fishermen have transformed their boats into small vessels in which the cod are brought ashore alive. Here they are kept in a sort of fish-baskets until larger vessels come and take them to Copenhagen. Live codfish there sell for from 53 cents to $1.07 per 18½ pounds. Dead fish are sold by the score, and are of course cheaper. Of late years some codfish and flounders have during winter even been sent by railroad as far as Stockholm. In the Sound cod are caught both in shallow and deep water. Large codfish, weighing from 12 to 20 pounds, are caught, but seldom in the Sound. The codfish caught in the Sound generally weigh only about 37 pounds per score, and the larger kind about 54 pounds per score.

Of late years, since 1878, fishermen from Raa on the coast of Skane have begun to visit the waters near the small island of Anholt in the Cattegat. In the first year the number of vessels engaged in the flounder fisheries near Anholt was 4, which in 1881 had increased to 28. We possess no statistics regarding these Anholt fisheries except for the last-mentioned year, when the 28 vessels engaged in these fisheries had crews numbering 130 men and used 2,600 flounder-nets and caught fish to the value of $11,524. The flounders caught near Anholt are larger than those of the Sound and the coast of Skane, but their meat is coarser and does not have the delicate flavor of the small flounders. These Anholt fisheries begin in April and last till the middle of August, when people begin to get ready for the herring fisheries.

In the sound the cod and flounder fisheries commence as soon as the herring fisheries have come to a close in autumn, and continue, unless hindered by ice, through the entire winter. Three fishermen generally go shares in a boat, each with from 800 to 1,000 hooks. The fish caught are divided at the end of every week. The owner of the boat gets a separate share, and the remainder is equally divided among the fishermen. On the south coast of Skane there are always two men to each

boat, one owning the boat and the apparatus, while the other is his assistant and receives one-fourth of the quantity of fish caught. On the south and east coast of Skane *Zoarces viviparus* and *Ammodytes* are extensively used as bait in line-fishing. In the cod fisheries nets are not used as much as lines. These lines are as long as flounder lines. In the Sound they have generally 100 hooks each, and tufts 2 feet long at intervals of 4½ or 5 feet, thus making the length of the entire line from 75 to 80 fathoms. They have generally six floats and as many sinkers (stones) attached to lines 3 feet long. The line is thus kept at some distance from the bottom, which is an advantage. The flounder lines have neither floats nor sinkers, but rest on the bottom of the sea. The hooks are of brass. The codfish lines used on the east coast of Skane are 80 fathoms long and have 120 hooks, but no floats. They are generally set in the afternoon a few miles from the coast, and are hauled in the following morning. The same kind of lines are also used in the eel fisheries.

On the east coast the flounder fisheries do not begin till June. The best time for these fisheries, however, is in winter and spring, and for the cod fisheries in autumn and winter. It is said that both the cod and the different kinds of flounders stop spawning in March and April, but on the east coast of Skane the spawning season continues somewhat later.

THE SALMON FISHERIES.—These fisheries belong exclusively to the east and south coasts of Skane. In the Sound and on the west coast there are no salmon fisheries, although salmon are occasionally caught there with bottom-nets and codfish-nets. It therefore seems that the salmon do not migrate from the Baltic to the Cattegat and *vice versa*. Salmon are caught in the sea with seines, floating nets, and lines, each of these apparatus being peculiar to some part of the coast.

The floating-net fisheries begin early in spring, toward the end of March or in April, and continue till the end of May or the beginning of June. These nets are made of hemp, are about 20 fathoms long and 3 fathoms deep, the size of the meshes being 2.5 decimeters. They have cork floats but no sinkers, because even without these they are sufficiently heavy. Each boat has a crew of 3 men, and from 30 to 40 nets. One of these nets costs 10 crowns [$2.68].

The line fisheries begin in autumn after the herring fisheries have come to a close, and are continued throughout the winter, as long as the weather does not interfere with them. These lines (Fig. 18) are constructed so that they can float near the surface, and are fastened only at one end, while the other is free and is swayed by the current. That portion which holds the apparatus in its place is called the rope, and is fastened at the bottom by a large stone. After the stone has been sunk, about a fathom of the rope is hauled up, and a glass float is fastened to it. About 12 fathoms above this a second float is fastened, and about 5 fathoms below this the line is attached to the rope. It is

kept floating near the surface by four wood or cork floats. At present each line, measuring 30 fathoms, has only three hooks. These hooks, of tinned-iron wire, are tolerably large (8 centimeters long and with a span of about 4 centimeters), and are baited with herring, which are cut back of the anal aperture, and are fastened to the hook so that its point passes through the eyes and protrudes at the side. The salmon lines are set with a sufficiently large distance between them to prevent their becoming entangled when they are swayed to and fro by the current. The first glass float serves to keep the rope up in the water, and to prevent the current from carrying it too far from its original position. These lines are set at a depth of from 20 to 30 fathoms; the farther from the coast the better. As long as the water is still warm in autumn the hooks have to be baited afresh every day. When the water gets colder the herring keep three or four days without turning sour. If the bait is not entirely fresh, the salmon will not bite. In the autumn fisheries four men go out in a boat with from 40 to 60 salmon-lines.

During the stormy and dark season of the year these fisheries are both dangerous and uncertain, but pay well because the apparatus is cheap, as a line costs only from 3 to 5 crowns [80 cents to $1.34]. The success of these fisheries greatly depends upon the weather. The salmon also seem in some years to leave one part of the Baltic and go to another. On the south coast of Skane the method of catching salmon with lines has been almost entirely abandoned, because scarcely any were caught.

In some places on the south coast, during spring, salmon are caught with seines. These fisheries begin about the end of March or during the first week in April, and continue till the middle or end of May. These seines generally belong to the owners of the coast, who hire fishermen to carry on the fisheries, and give them in payment half the fish caught. Some of the seines, however, are owned by the fishermen. With these seines there were caught, especially in former times when there was no regulation as to the size of the meshes, a large number of small salmon, weighing between 2 and 3 pounds, sometimes even several boat loads. Since a regulation has been made that the meshes of the salmon seines must not be less than 2 inches, the small salmon are somewhat more protected. The length of these seines varies from 60 to 72 fathoms, and their depth is from 2 to 3 fathoms. They are drawn by two, three, or four men. Of late years the number of these seines has increased considerably, and this circumstance has doubtless contributed its share towards the decrease in the number of salmon which is complained of. In 1881 the salmon fisheries on the coast of Skane yielded an income of 18,478 crowns [$4,952.10]. The number of fishermen engaged in these fisheries in 1881 was 486, boats 125, seines 124, floating-nets 1,588, and lines 3,038.

OTHER SMALL FISHERIES.—Besides the fisheries mentioned above, there are fisheries on a limited scale for some other food-fish and marine

animals. Among these there are some kinds of fish which come from the Cattegat at certain seasons of the year and pass through the Sound into the Baltic. In some years these fish will come in considerable numbers, while in others their number is small or they stay away altogether. Among these we may mention the mackerel, the *Gadus æglifinus* L., and the hornfish (*Belone vulgaris*). Other fish are found near the coast of Skane all the time, but not in such quantities as to give rise to extensive fisheries. Among these there are several varieties of the flounder, the *Cyclopterus lumpus*, the *Ammodytes tobianus*, and the *Ammodytes lancea*.

The mackerel fisheries.—The mackerel make their appearance in schools about the end of May. On the coast of Skane mackerel fisheries are carried on along a limited stretch of coast in the northern part of the Sound, principally by fishermen from Hittarp and Raa. In the Sound proper these fisheries will pay only in exceptional cases, as when there has been a northerly current for several days. The mackerel nets are 60 fathoms long and 100 meshes deep; they are bound in two parts and are arranged something like the *nürdingar* (see above), but have only 15 meshes to the yard. They are used both as stationary and as floating nets. In the mackerel fisheries each boat has a crew of three men and four nets. In 1881 the Skane mackerel-fisheries yielded an income of 1,010 crowns [$270.68]. During the last few years the number of mackerel has decreased very considerably.

The hornfish fisheries (*Belone vulgaris*).—These fish, like the mackerel, make their appearance in May and June, and are caught in bottom-nets in the Sound, and on the south coast of Skane in salmon seines. When the hornfish have been seen to go near the coast during the day the school is surrounded with a seine and the fish are driven towards it by throwing stones into the water. During the night hornfish are caught in seines in the same manner as salmon. There are no reliable data as to the income derived from these fisheries.

This may be the proper place to say a few words with regard to the bottom-nets, an apparatus which in Sweden is used only in a few places on the coast of Skane. The bottom-net consists of two parts—the so-called "land-arm," and the "head," or the place into which the fish are led and where they are caught (Fig. 19 A, B). The principle is the same as that of a common trap, but in the bottom-net there is a special bottom of net-work which is raised when the net is taken up. Bottom-nets are set even in very shallow water, and often stand in the water only up to a certain height. The deepest net of this kind, near Raa, stands about 2 fathoms in the water. Their dimensions are very considerable, their length being from 9 to 12 fathoms. The largest and most expensive are found in the Sound. It is a peculiarity of these nets that the poles which support the net are not driven into the ground, but are held in position by lines and grapnels. Bottom-nets are set as early as April and remain standing till the middle of July, when they are taken ashore to be set again in the middle of August, when they remain in

the water till the end of October. Every fourteenth day the nets are taken ashore and dried, while the poles and grapnels are left in the water.

Fisheries for Cyclopterus lumpus.—The male of these fish is by many considered a great delicacy, while the female is not esteemed so highly. These fish are caught in February, March, and April. They are said to spawn in the Sound in June and July. In the Sound this fish frequently reaches the length of 2½ feet.

Fisheries for Ammodytes.—These fish are caught both in the Sound and in the Baltic, and seem to have been more numerous in former times than now. They are caught in July and August with fine, small seines. They are eaten fried or dried, and have a good flavor. The quantity caught, however, is small, and these fisheries are of very slight importance.

Lobster fisheries.—Lobsters are found in small numbers on the coast of Skane. They are caught with fish-pots, and in the 120 to 128 fish-pots used in these fisheries 400 lobsters were caught in 1881.

Fisheries for other crustaceans.—Near the Kullen promontory a number of *Cancer pagurus* are caught every year, generally during the period from October to February. The boats used in these fisheries have a crew of three men each, and the apparatus used is generally old flounder-nets. These crustaceans sell near the Kullen promontory at from 25 to 33 ore [6 to 8 cents] apiece.

Of greater importance are the fisheries for *Palæmon squilla.* These small crustaceans are not only used as bait, but form likewise a very excellent article of food. They usually remain among the algæ, and are found principally in the southern part of the Sound, in the wide algæ bottoms near Saltholm, on the Danish coast, and near Malmö, Limhamn, and Holeviken, on the Swedish side of the Sound. The fishing season lasts from the end of April till the middle of September. These crustaceans wander along the coast; from May to August from south to north, and from August till the end of the fisheries from north to south. They are mainly taken in fish-pots, which vary in size, the rings varying from 1 to 4 feet in diameter. The apparatus consists of the fish-pot proper with two short arms, and a loose "land-arm" in the middle, 24 or 25 yards long, which is pushed by means of iron poles, four to each fish-pot. This apparatus is set in rows from the land, the opening turned towards the shore. Near Limhamn each boat has from 18 to 20 such fish-pots, costing from 20 to 25 crowns [$5.36 to $6.70] apiece, and in these fisheries each boat can earn from 500 to 600 crowns [$134 to $160.80]. It is only of late years that these fisheries have been carried on to any considerable extent. In former times only here and there a fisherman owned a few fish-pots, and kept very secret what he caught with them. Gradually, however, people began to find out that the income from these fisheries is important, and for the last 16 years they have been carried on very generally on the coast of Skane, and with such

success as to place the flounder fisheries in the background. The crustaceans caught are mostly sent to Copenhagen, where they fetch from 50 ore to 1 crown [13.4 cents to 26.8 cents] per *pot* (a *pot* = about 1 quart). Besides with fish-pots, these fisheries are also carried on with purse-nets attached to a pole (Fig. 21). The income derived from these fisheries in 1881 was 11,890 crowns [$3,186.52].

Statistics of the Skane fisheries.

Years.	Number of fishermen engaged in all the fisheries.	Income from all the fisheries.
1874	1,967	$170,052 96
1875	1,067	179,770 64
1876	1,030	189,452 41
1877	2,216	228,753 00
1878	2,322	230,702 80
1879	2,602	215,571 96
1880	3,115	248,607 55
1881	2,938	254,408 91
Total		1,723,470 23

STATISTICS OF THE SWEDISH FISHERIES AND REMARKS ON THE IMPORTANCE OF SCIENTIFIC INVESTIGATIONS CONCERNING THEM.

There is no longer any doubt in the mind of any one that it is of great interest to have reliable data relative to the average annual yield which may be expected from our salt-water and fresh-water fisheries. It is generally acknowledged that statistics are of very great importance in forming a proper judgment of any industry in itself and in its relations to other industries, and the matter has of late years received considerable attention n Sweden, as far as the fisheries are concerned. In the Instructions to the Superintendent of Fisheries, issued February 12, 1864, he was enjoined "to prepare statistics of the fisheries considered as an industry in relation to the other occupations of the population, the capital invested, the income derived therefrom," &c. Thus far we have not been able to obtain statistics of our entire fisheries; and the same applies to every other country. Unfortunately we do not yet possess statistics embracing the more important fisheries of the entire Kingdom of Sweden; and in this respect Norway is ahead of us, as tolerably complete statistics of the Norwegian cod and herring fisheries are taken every year. In most other countries fishery statistics are still in their infancy, and the subject has not by any means been given the attention which it deserves. As a general rule people are satisfied with approximate figures based on rather uncertain calculations. Among the reasons therefor we must mention as the most important the difficulty in obtaining reliable data relative to the yield of the fisheries, a difficulty, however, which is often considered much greater than it really is.

The preparing of useful fishery statistics is connected with considerable trouble and expense, which might justly be considered as too great, if the question was merely to learn how many fish were caught and the economical significance of such numbers; but fishery statistics are also, from another point of view, of the greatest importance for the fishing industry. Like any other industry, the fisheries, if they are to be managed in a rational manner, must rest on a scientific basis. The first questions which have to be answered are the following: What circumstances determine the changes in the result of the fisheries? And which among these are caused by man, and which not? For this purpose it is in the first place necessary to know the yield of the fisheries, for without a knowledge of the fisheries and their yield it is impossible to draw any certain conclusions relative to the circumstances which influence the fisheries. Any one who is earnestly determined to answer the above questions will soon find that the statements of old fishermen cannot be relied upon, as has hitherto been the case in many instances. As soon as the question becomes one of science, one can no longer content himself with statements of fishermen, such as that the fisheries grow worse from year to year, or that such and such a wind brings good fisheries, &c. Observations are necessary, observations taken systematically for a considerable length of time and taken in different localities; in short, the course of the fisheries must be made the subject of scientific investigations. I shall below give an instance to show how easy it is to draw hasty conclusions from a knowledge of fisheries limited to a few years. The importance of investigating the fisheries themselves has, in my opinion, always been too much overlooked, while we are often told of the vast importance of the investigation of various circumstances which have an influence on the fisheries, such as the flora and fauna of the water, its saltness, temperature, &c. Such investigations are doubtless important, but only by combining them with data relative to the fisheries themselves do they become of practical value, as otherwise they easily lead to erroneous hypotheses of doubtful value, instances of which are but too frequent in the history of the fisheries. A knowledge of the course of the fisheries for any considerable period of time cannot be obtained without statistical data, and this goes to show that statistics are the true basis of a thorough investigation of the fisheries.

Fishery statistics are of considerable value, even if they relate only to a certain fishery or a single locality, as showing the course of the fisheries; especially if they are accompanied by data relative to various circumstances which have exercised an influence on the fisheries. The more detailed and extensive the statistics are, the greater will be their value. But outside of the interest which fishery statistics possess, as furnishing the material for a scientific solution of the various problems connected with the fisheries, they are of great practical value to the owners of fishing waters, for judging whether the quantity of fish will be influenced by the extent to which fishing is carried on, for calculat-

ing the average yield of fisheries and their actual value, for ascertaining the indemnity to be paid for any damage done to the fishing waters, and such matters.

It is exceedingly important to be able to decide whether an increase or decrease in the yield of fisheries is to be considered as a continual increase or decrease in the quantity of fish, or is simply caused by the changes to which all fisheries seem to be subject; and, if so, if any periodicity in the course of the fisheries can be observed. In certain cases it will be easy to show unmistakable causes of a decrease in fisheries, but in most cases this will be exceedingly difficult, and even impossible, without statistical data. As an exceedingly interesting example of the changes to which fisheries are subject, I give below a table showing the quantity of salmon caught in a *laxpata* (a sort of salmon-trap) at Svartö, on the Luleå River. The *laxpata* is a contrivance consisting of piles and nets, where the salmon enters and is taken out with special nets. These traps are set in the rivers in spring as soon as the depth of the water will allow it. The Svartö fishing station is near the mouth of the Luleå River, and is therefore not influenced by fisheries further down the stream.

Table showing the fishing season, and the quantity of salmon caught at the Svartö fishing station during the period 1804 *to* 1880.

Year.	Fishing season.	Number of salmon caught.	Weight in *lispund.**	Year.	Fishing season.	Number of salmon caught.	Weight in *lispund.*
1804	June 20 to Aug. 13	904	1,125	1843			2,816
1805	June 28 to Aug. 13	721	901	1844			1,452
1806	June 28 to Aug. 11	792	990	1845			1,232
1807	July 1 to Aug. 11	1,103	1,379	1846			440
1808	June 29 to July 24	1,878	2,348	1847			1,452
1809	June 24 to Aug. 3	1,842	2,202	1848	June 16 to Aug. 10		302
1810	July 4 to Aug. 8	1,186	1,483	1849	June 21 to Aug. 7		1,408
1811	June 27 to Aug. 4	1,544	1,930	1850	June 18 to Aug. 15		572
1812	June 26 to Aug. 7	1,000	1,250	1851	June 25 to Aug. 8		1,056
1813	June 24 to Aug. 4	632	790	1852	June 17 to Aug. 10		880
1814	June 27 to Aug. 6	827	1,034	1853	June 16 to Aug. 4		616
1815	June 27 to July 31	405	506	1854	June 18 to July 24		1,760
1816	June 23 to Aug. 4	658	823	1855	June 23 to Aug. 1		352
1817	June 22 to Aug. 11	1,551	1,939	1856	June 16 to Aug. 10		2,288
1818	June 22 to July 29	922	1,153	1857	June 24 to Aug. 14		1,012
1819	June 24 to July 27	1,221	1,526	1858	June 13 to Aug. 6		1,056
1820	June 22 to July 29	993	1,241	1859	June 15 to Aug. 3		1,056
1821	June 21 to Aug. 7	1,390	1,738	1860	June 12 to Aug. 3		1,672
1822	June 18 to Aug. 8	1,738	2,273	1861			3,520
1823	June 27 to Aug. 11	1,734	2,168	1862			1,584
1824	June 17 to Aug. 4	1,610	2,013	1863			1,232
1825	June 21 to Aug. 14	1,112	1,390	1864			704
1826	June 9 to Aug. 4	5,350	6,688	1865			704
1827	June 20 to Aug. 7	3,251	3,064	1866			880
1828	June 20 to Aug. 12	1,332	1,665	1867			176
1829	June 24 to Aug. 14	971	1,214	1868			704
1830	June 28 to Aug. 13	1,478	1,848	1869			616
1831	June 17 to Aug. 8	719	899	1870			352
1832	June 12 to Aug. 3	1,280	1,590	1871			880
1833	June 17 to Aug. 13	828	1,034	1872			528
1834	June 16 to Aug. 4	1,338	1,662	1873			672
1835			2,816	1874	June 18 to Aug. 21		2,562
1836			2,288	1875	June 15 to Aug. 18		1,793
1837			528	1876	June 23 to Aug. 28		3,385
1838			880	1877			1,896
1839			176	1878	June 13 to Aug. 9		1,025
1840			396	1879			218
1841			1,100	1880			1,076
1842			1,276				

* 1 *lispund* equals about 18.6 pounds.

These fisheries are owned by several persons, and for this reason it became necessary to keep a record of the fish caught, so that they could be equally divided. These data are therefore perfectly reliable. The manner of keeping the records differed somewhat at different times, the number of salmon being given at one time, and the weight of the fish at another.

From these statistics it appears, first, that the salmon fisheries then as now were subject to considerable changes. Calculated in pounds, the quantity of salmon caught during the 76 years when these records were kept amounted to 1,845,230 pounds, or an average of 24,275 pounds per annum. Calculated by five-year periods we get the following result:

Period.	*Lispund.*	Period.	*Lispund.*	Period.	*Lispund.*
1804–8	1,349	1829–33	1,317	1854–58	1,294
1809–13	1,531	1834–38	1,035	1859–63	1,813
1814–18	1,091	1839–43	1,153	1864–68	634
1819–23	1,789	1844–48	994	1869–73	610
1824–28	2,964	1849–53	886	1874–78	2,132

During 33 years the number of fish caught has come up to or exceeded the annual average of 1,305 *lispund* [24,275 pounds], and during 43 years it has fallen below that average. The richest fisheries occurred during the period from 1820 to 1830, especially during the period from 1824 to 1828, when the average per annum rose to 2,964 *lispund*, and the richest fisheries during that period were in 1826, when 6,688 *lispund* of salmon were caught; the poorest fisheries were in 1839 and 1867, when only 176 *lispund* of salmon were caught. From about the year 1835 there were a number of poor fishing years, which were followed by a number of good years after 1840; but from 1850 to 1855 the fisheries again became poor. The same was the case to a still greater degree during the periods 1864–1868 and 1869–1873, while during the following five-year period the fisheries increased again.

It will therefore be seen how difficult it is to judge from a few years' data whether the fisheries are continually declining, and that even poor fisheries, continued for several years, are not in themselves sufficient (without showing any specific cause for the same) to prove that such is the case. The above data do not, in my opinion, prove any periodicity in these fisheries. As regards the season when the fisheries began and during which they were carried on, it appears from the above data that during the first decades the fisheries began somewhat later in June than was the case more recently. The time when the fisheries began does not, as a general rule, seem to have exercised any influence on the quantity of fish caught. It should be observed, however, that during the richest salmon year, 1826, the fisheries commenced unusually early, on June 9, while in the particularly unfavorable year, 1867, the ice in the Luleå River did not begin to break till June 1, which of course

made the beginning of the fisheries rather late. In the year 1810, when the fisheries did not begin till July 1, the number of fish nevertheless exceeded the average.

The data relative to the Svartö fisheries are certainly not extensive enough to enable us to answer the question as to the causes why the fisheries resulted as they did, but it must be acknowledged that they furnish valuable contributions toward answering, among other things, various questions relating to the number of fish in former years and now.

Common people frequently distrust statistics, not the least those relating to the fisheries, because it is known that it is impossible to obtain absolutely exact data, partly for the reason that the fishermen themselves do not know exactly how many fish have been caught. It is of course desirable to get as accurate statistics as possible, but on the other hand it is not necessary to know the yield of the fisheries down to the pound; nor do statistics from one locality lose all their value because they are not complete in every respect, or because they are incorrect in some of the minor details. Small mistakes and imperfections are eliminated where general results are obtained, and the figures will nevertheless give a tolerably correct idea of the actual condition of things. Experience has shown that the disinclination of the fishermen to furnish statistics has soon disappeared when they found that no evil consequences resulted therefrom. In order not to mislead, the statistical data should enter sufficiently into detail, and should explain themselves as far as possible.

Fishery statistics, however, cannot by themselves solve the problems which require solution, if the fisheries are to be carried on in a rational manner. There should be considered the methods employed in the fisheries, the condition of the weather, and other circumstances which are supposed to have an influence on the fisheries.

It has long been acknowledged that it is of great importance to investigate the physical condition of the sea, its temperature, saltness, &c. On the German coasts stations were established ten years ago, not only for examining the physical condition of the waters of the Baltic, but also to take a record of the yield of the fisheries at said stations. In Sweden we have now a Nautico-meteorological Bureau, whose observations, it is true, embrace only hydrography, and not, like the German stations, the fisheries and their yield. But many of the stations of this Bureau, because they are located on the fishing grounds, become of great importance to the fisheries.

But in order that such investigations may be of real value to the fisheries, it is necessary that they should go hand in hand with observations relative to the course of the fisheries. I have, therefore, with limited means at my disposal, endeavored to work in this direction, and have had a station established at Hufvudskör, on the coast of Stockholm, where observations are taken regarding the saltness and

temperature of the water, near the surface and also at a depth of ten fathoms. I have also caused the superintendents at some of the Skane fishing stations to keep a journal of the temperature of the water near the surface, and a record of the wind, current, and the daily yield of the fisheries; but I have not asked them to give the exact number of fish caught every day, because this would involve considerable trouble, and hardly seems necessary. Even for obtaining a correct idea of the course of the salmon fisheries and of the circumstances which influence them, such observations are of great interest. On some of our salmon streams the superintendents of the fisheries, or special observers, have taken observations relative to the depth of water in the stream, its temperature, and such matters.