V.—REPORT ON THE DEPARTMENT OF FISHERIES IN THE WORLD'S EXPOSITION IN PHILADELPHIA, 1876.

By Joakim Anderssen, *Juryman.**

I.

THE FISHERY EXHIBITION IN PHILADELPHIA IN 1876.

COMPRISED ACCORDING TO THE "GROUPING FOR THE JUDGES' WORK."

(Group V.)

Fish and productions of fisheries, fishing implements, &c.:

1. Aquatic mammals: seals, whales, &c.; living specimens in aquaria; specimens stuffed, salted, or preserved in other ways.
2. Fish, alive and preserved.
3. Fish in brine, and parts of fish used for food.
4. Crustacea, echinoderms, bêche de mer.
5. Mollusks, oysters, clams, &c., used for food.
6. Shells, corals, and pearls.
7. Whalebone, shagreen, fish-glue, isinglass.
8. Fishing implements: nets, baskets, hooks, and other apparatus used for fishing.
9. Pisciculture: aquaria, hatching-pools, vessels for transporting roe and young fish, and other apparatus used for hatching, raising, or preserving fish.

The judges, whose number for the whole exposition was 250 (half of that number being Americans) in the department of fisheries, were, in the beginning—

1. Professor *Spencer F. Baird*, director of one department of the government exhibit and Assistant Secretary of the Smithsonian Institution in Washington, chairman.

2. Mr. *Seth Green*, Superintendent of Fisheries of the State of New York, from Rochester, N. Y.; and

3. The editor of this report.

Later, when Mr. Seth Green, partly on account of his health and partly on account of his many other engagements, could not attend, and was therefore discharged at his own request, his place was filled by a man of similar experience, Mr. *T. B. Ferguson*, Commissioner of Fisheries for the State of Maryland. Both Professor Baird and Mr. Ferguson were so overwhelmed with work and were so much occupied in various ways that they had scarcely any time to attend to their jury work. In consequence, Mr. *B. Phillips*, secretary of the government exhibit, a

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highly intelligent gentleman and well-known correspondent of one of the great New York papers, was chosen to act for Professor Baird and Mr. Ferguson, in conjunction with the editor, as permanent member of the committee. It ought to be mentioned that, as in the beginning so few objects were exhibited in the department of fisheries, three judges were deemed sufficient for this group; but as objects continued to come in all the time, these judges had enough to do, so that this group could not finish its work until the very last moment, July 30. It must likewise be mentioned that at the Philadelphia Exposition the verdict of the judges was not final, but that it had to be submitted to the criticism of the Centennial Commission and had to be approved by them; the verdict thereby became more impartial and dignified.

EXHIBITORS AND OBJECTS EXHIBITED.

A.—Norway.

Norway, which, both with regard to its products and implements, was best represented (excepting of course the United States, whose exhibit was very full), numbered thirty-two exhibitors, who are mentioned below, together with the objects exhibited by them.

1. *Commercial Union of Aalesund.*—An almost complete collection of all the fishing implements used in Norway, as well as models of fishing-boats.

2. *Carl E. Rónneberg & Sons, of Aalesund.*—Dried codfish, dried and pressed codfish in tin cans.

3. *Laurids Madson, of Aalesund.*—Sides of codfish, prepared in the Scotch manner.

4. *H. A. Helgesen, of Aalesund.*—Preserved fish-cakes, fresh salmon in tin cans (lobsters were promised but were not sent).

5. *Patent Twine Manufactory (Kraasbye Brothers, of Aalesund).*—Fishing-lines of silk, flax, and hemp.

6. *The Bergen Museum.*—Large and instructive collection of fish in spirits of wine, stuffed fish, models of vessels and boats, lodging and ice houses.

7. *The Bergen Commercial Union.*—A complete collection of fish dried and salted, salt herring and roe, and several kinds of fish-oil.

8. *The Bergen Smoking Establishment.*—Smoked herrings, four different sizes (great herrings, merchants' herrings, middle herrings, Christiania herrings).

9. *Fagerheim's net factory (Gottlieb Thomson, Bergen).*—Salmon and herring nets, mackerel and codfish nets, made of hemp and cotton.

10. *Peter Mohn, Bergen.*—Salt fat herrings in tin cans.

11. *Peter Egidens, Bergen.*—Fine herrings and anchovies.

12. *Thomas Erichsen, Bergen.*—Different kinds of fishing-hooks.

13. *H. Dons, Christiania (Christiania Preserving Company.)*—Small smoked herrings in oil, and fish-cakes in hermetically sealed tin cans.

14. *Christiania sail factory.*—Nets and lines made of hemp.

15. *Hadeland glass manufactory.*—Glass floats and glass balls for nets and lines.

16. *Falck-Ytter, Christiania.*—Fishing-sleighs.

17. *W. Nordrock, Christiania.*—Anchovies.

18. *Mrs. Gina Smith, Christiania.*—Anchovies.

19. *Mrs. Rina Tellefsen, Christiania.*—Anchovies.

20. *Zeorg Lund, Christiania.*—Anchovies.

21. *C. C. Just, Christiania.*—Anchovies.

22. *Christian Johnsen, Christianssund.*—Dried codfish.

23. *Jens O. Dahl, Havó.*—Codfish and herring nets, codfish-lines.

24. *Borderich & Co., Lyngvær.*—Fish-flour (codfish chopped fine), white caviar (made of codfish roe), isinglass.

25. *Norwegian Preserving Company, Mandal.*—Fresh preserved flounders, mackerel, and anchovies.

26. *C. A. Thorne, Moss.*—Anchovies in oil, fresh lobster and salmon in hermetically sealed cans.

27. *Stavanger Preserving Company.*—Preserved fish-cakes in wine and other sauces, fresh lobster in hermetically sealed cans.

28. *C. Stórmer, Svolvær.*—White caviar.

29. *Svend Fohn, Tónsberg.*—Four different kinds of spermaceti.

30. *Anton Rosing's Widow.*—Cakes of fish-flour.

31. *L. B. Soyland, Flekkefiord.*—Preserved skate.

32. *F. Hjorth, Frederikstad.*—Anchovies.

(The articles which were to be sent from the *Bergen Glass Manufactory* did not arrive.)

Of these exhibitors the first thirty, whose articles were found to be in excellent condition, were recommended for awards, and the Centennial Commission also adopted this recommendation. The two last mentioned exhibitors, however, received no award, because the articles exhibited by them were spoiled, probably because the cans had not been properly sealed.

B.—SWEDEN

had the following exhibitors:

1. *The Royal Swedish Commission, H. Widegren, superintendent of fisheries, Stockholm.*—A complete collection of fresh-water fishing implements, also nets, lines, &c., used by Swedish fishermen on the banks in the North Sea and the Kattegat, models of bank-fishing vessels and boats, especially of a boat for transporting live fish, salt Gottland and Blekinge herrings, eel, and codfish, dried codfish, and anchovies (pickled spratt), and finally a collection of fish from the Swedish lakes and coasts in glass jars filled with spirits of wine.

2. *Gustav Andersson, Tjellbacka.*—Skinned and boned herrings, anchovies and sardines in hermetically sealed tin cans.

3. *H. C. Bergström, Lysekil.*—Anchovies and herrings in hermetically sealed tin cans.

4. *N. O. Erickson, Lysekil.*—Anchovies and herrings in hermetically sealed tin cans.

5. *J. J. Hallgren, Gullholmen.*—Anchovies and fine skinned and boned herrings.

6. *August Lysell, Lysekil.*—Anchovies and fine skinned and boned herrings.

7. *Edward Nilson, Grebbestad.*—Smoked mackerel in oil in hermetically sealed tin cans.

8. *N. Wikström, Stockholm.*—Preserved salmon.

All the first mentioned seven exhibitors were recommended for awards; the salmon exhibited by N. Wikström, although good, was found wanting in freshness of flavor.

(C. M. Amundson, Udevalla, and Leidesdorf's manufactory of fishing implements, Stockholm, had announced several objects for exhibition, which, however, were not sent.)

C.—France

had of course the largest, finest, and best arranged exhibit of all kinds of sardines, sardels, and anchovies hermetically put up in oil. The exhibitors were principally from Nantes, L'Orient, Paris, Bordeaux, and Belle Isle, and most of them were recommended for awards.

D and E.—Spain and Portugal

exhibited common sardels and other food-fish boiled in oil, and besides a large number of preserved cuttlefish and mollusks boiled in oil with tomatoes, truffles, &c., and finally dry-salted and hard-pressed sardines in small wooden boxes, for poor people and therefore comparatively cheap. The Spanish exhibits came from Corunna, Bermeo, Pontovidero (Galicia), Loredo, Velva-Grove, Nevera, and Barcelona; and the Portuguese exhibits from Lisbon, St. Ybes, Oporto, Faro Alga, and Cambra Balbura.

F.—Italy

had likewise exhibited several kinds of sardines in oil, anchovies, and pickled eel from Leghorn, Genoa, and Bologna.

G.—Russia.

Preserved whitefish and carp from St. Petersburg and Astrachan sturgeon-caviar, isinglass, and seal-oil.

H.—Turkey's

only exhibit consisted of a kind of caviar of whole fish-roe, in the form of sausages, called "botargo," having a most delicious flavor.

I.—Austria.

Preserved skinned, strongly salted, and pressed small herrings (a kind of sardels) in oil.

J.—THE NETHERLANDS

had a fine exhibit of excellent herring-nets, floating nets, codfish-lines, trawl-nets, a model of a large herring-seine, models of fishing-vessels, and boats, both ancient and modern, from A. G. Maas in Scheveningen; pickled herring from M. I. Suries & Co. in Rotterdam; smoked salmon from T. E. Novenhays in Amsterdam, and models of cotton nets from Arntzenius, Jamnek & Co. in Goor.

K.—GREAT BRITAIN.

Pilchards in oil, fresh preserved salmon, from C. Freyer and Crosse & Blackwell, London; fresh-water fishing implements from W. & J. Ryder, Birmingham; and fish-hooks from Joseph Buchanan, Glasgow.

L.—GERMANY.

Samples of nets made of cotton, flax, and hemp from "Mechanische Netzfabrik und Weberei-Actien Gesellschaft," Itzehoe, Holstein, and Igler, Bohemia.

M.—CHILI

had a comparatively large exhibit of different kinds of preserved fish and mollusks (12 kinds), prepared algæ and sea-grass, in oil, in the Spanish-Portuguese way.

N.—JAPAN.

Models of fishing implements, fine nets of silk and flax, fish-poles with the line running inside the pole, lobster and eel traps, different kinds of fish baskets and boxes for keeping live fish, strongly salted and smoked salmon with head and tail, sewed in coarse cloth, dried sea-weed (sea-weed-tengusa), of which an insipid but cooling dish is prepared by mixing a large quantity of sugar with it, isinglass, and prepared fish-skin (shagreen).

O.—CHINA.

Models of fishing implements, isinglass, dried crustaceans and fins.

P.—BRAZIL.

Isinglass, preserved fish, turtle-oil, and butter.

Q.—ARGENTINE REPUBLIC.

Fish-baskets of straw and fishing-lines.

R.—LIBERIA.

Nets made of the fiber of trees (ramee).

S.—CAPE OF GOOD HOPE.

Fresh crayfish preserved in tin cans.

T.—VICTORIA.

Shell-fish, crabs, and stuffed fish.

U.—TASMANIA.

Stuffed fish (salmon and trout), and different kinds of shell-fish.

V.—BERMUDA.

Corals, shell-fish, beautiful live salt-water fish in aquaria.

X.—CANADA

had exhibited a large quantity of preserved fish and other marine animals, chiefly lobster, mackerel, and salmon (Canadian Meat and Produce Company, Richibucto), besides salt salmon, trout, and herring (also smoked), dried codfish, pollock (Halifax, Nova Scotia), fishing implements, especially for fresh-water fishing, and winches for hauling in long lines.

Y.—THE UNITED STATES

had, as was to be expected, the largest and most complete collection of all kinds of fish and fishing implements, boats, models of boats and vessels, &c., and everything pertaining to the fisheries and fish trade, all under one and the same roof, in the United States Government's building, in which there were catalogued specimens of all the products of the United States—grain, fruit, minerals, coal, land and marine animals, industrial products, both ancient and modern, war materials, &c. It would lead us too far to enumerate everything pertaining to fish and fisheries, and in fact does not come within the scope of this pamphlet, while we shall make brief mention of those exhibits which the individual States had made in their respective "State buildings" or in the main buildings.

1.—*Massachusetts.*

The Commission of Fisheries of this State had exhibited a complete and beautiful collection of boats and vessels, especially mackerel-schooners, fishing-boats, &c. The city of Gloucester, at present the largest and most important fishing station in America, had exhibited a complete and very instructive collection of everything belonging to bank-fishing, as well as models of ancient and modern boats and vessels floating on a pond specially arranged for this purpose, on which seine-fishing was illustrated by models, and on whose banks there were models of different establishments for receiving and preparing fish. Among the apparatus peculiar to America we must mention the so-called "bait-mills," by which suitable pieces of bait are cut very rapidly from the raw material, salt herring, swordfish, cuttlefish, &c., and likewise the "ice-crushers" and other implements for breaking the ice, used for keeping fresh fish, in small pieces. W. K. Lewes & Brothers and W. Under-

wood & Co., Boston, had a separate exhibit of salmon, lobster, codfish, mackerel, and shell-fish, preserved fresh; and the Gloucester Isinglass Company and Norwood & Son, Ipswich, had an exhibit of isinglass.

2.—*Maine.*

Extract of fish (juices) resembling Liebig's extract of meat, suitable for nourishing soups, put up hermetically in tin cans, a new invention by J. G. Goodale, Saco; mackerel and lobster put up fresh by J. Winslow Jones, Portland; oysters put up fresh by the Annapolis Packing Company; preserved lobsters and large mackerel by the Portland Packing Company; preserved oysters and clams by Bunham & Morrell, Portland; fishing-poles by Charles E. Wheeler, Farmington.

3.—*Pennsylvania.*

A large selection of fishing-poles of split bamboo, and other fresh-water fishing implements, from Fox, Shipley, and John Krider, Philadelphia.

4.—*New York.*

Preserved salmon, mackerel, oysters, clams, and isinglass, from Kemp, Day & Co., New York; whalebone, salt eel and salmon, auchovies, sardines, and caviar, from Max Ams, New York; live salt-water and fresh-water fish and green turtles, in aquaria, from Eugene Blackford, New York.

5.—*Maryland.*

Models of oyster vessels and boats; oyster scrapers and tongs, with the winches belonging to them, used in the Chesapeake Bay; samples of oysters from different depths; model of the hatching-house and apparatus in Druid Hill Park, Baltimore; model of a floating fishing-battery near Baltimore; fish in spirits of wine; large quantities of preserved oysters (Murray & Co., Baltimore.)

6.—*Ohio.*

Stuffed fresh-water fish (Cuvier Club, Lake Erie).

7.—*Chicago.*

Isinglass made of sturgeon.

8.—*California.*

Fresh salmon, put up in cans, from Columbia River.

9.—*Oregon.*

Fresh salmon put up in tin cans, and salt salmon in one-half and one-quarter barrels, from the Oregon Packing Company.

Being on the jury, I had, of course, an opportunity to see and examine

all the above-mentioned exhibits, and all my observations led me to the decided conclusion that America stands very high as regards its salt-water and fresh-water fisheries; as high as in many other branches of industry. This will become clearer from the following description of—

II.

THE FISHERIES OF NORTH AMERICA.

Besides the observations made by me at the exhibition, I had another opportunity of gaining further knowledge of this subject by a journey to New York, Long Island, Boston, and Gloucester, which I made in company with Mr. F. Wallem.

I shall first speak of the *fish markets*. Of these, the Fulton Market, in New York, is the largest and best arranged. It consists of a series of large connected buildings, situated partly along the East River and partly along some of the streets of New York, and contains convenient places for wholesale and retail fish-dealers, for offices, and packing; also a library and reading-room, as well as kitchen and restaurants. At the exhibition, and later in his establishment in Fulton Market, I made the acquaintance of one of the great fish-princes, Mr. Eugene Blackford, whose magnificent and well-arranged establishment contains numberless live fish, and fresh fish on ice of every kind, and, as a specialty, soft crabs, which in New York are considered a delicacy during the period when they change their shell, and are therefore eaten in enormous quantities, shell and all, both boiled and broiled, lobsters and green turtles, which are brought weekly from the West Indies, and are from New York sent to other cities, and frogs. I suppose that Mr. Blackford is the only one of these fish-dealers who himself supplies his market with live and fresh fish. For this purpose he keeps a little steamer, furnished with a purse-seine, which twice a week makes trips between the mainland and Long Island, and generally returns with a considerable quantity of fish. Nearly all the fish-dealers have their own fishing-schooners, or have at least an interest in one. Whenever there is no sale for fresh fish, or the prices are very low, the fish are placed in large and well-arranged ice-cellars, where they freeze, and are kept till they can be sold to greater advantage. Although the sales were quite good at the time I visited New York, I nevertheless found in Mr. Blackford's ice-cellar a large quantity of frozen fish, especially large salmon, which had fallen a few cents in price. Whilst in the street the temperature was 108° Fahrenheit, it was 40° in the cellar, which made it necessary to put on warm woolen clothing before descending into it.

This large fish-market supplies Philadelphia and many other cities with fresh fish or fish on ice nearly all the year round. The kinds of fish which are most common are: Codfish, flounders, mackerel, salmon, brook-trout (*Salmo fontinalis*), bass (*Perca atraria, Labrax lineatus*), blue-fish (*Scomber saltator*), shad (*Alosa* or *Clupea sapidissima*), turbot, pompano

(*Trachynotus*). The prices of fresh fish in a market as large as this one, of course, vary considerably. The following are the average prices: Codfish, 5 to 6 cents; flounders, 8 cents; common mackerel (*Scomber scombrus*), 8 to 10 cents; Spanish mackerel (*Cybium maculatum* and *regale*, *Scomber maculatus* and *regalis*), which is esteemed as highly as salmon, 25 to 30 cents per pound. The value of all the fish annually sold in Fulton Market is about $2,000,000. Of these, Mr. Blackford sells about one-tenth, or $200,000 worth.

In Boston the fish-trade is carried on in a little different manner from New York. Besides a large common market, where all kinds of fresh, salt, and smoked fish are sold, there are special markets for fresh fish, where the fish are received from the fishing-schooners and placed on ice, and where the vessels that are going out are furnished with bait and ice. It must be mentioned here that all the fishing-schooners which are sent out from Boston and supply the Boston markets with fish are always furnished with a considerable quantity of ice for keeping the fish fresh. These vessels usually make one trip every two weeks, and generally return to Boston with a full cargo of fish. Their fishing implements consist of lines, with which they chiefly catch codfish and flounders, but also small swordfish, which are quite common on the coast between Cape Cod and Cape Ann, where the Boston fishermen have their station. The prices of fish in Boston are generally a little lower than in New York.

In Gloucester, the most important fishing-station in America, which possesses more than 500 well-furnished and beautiful fishing-schooners, there is no fish market like in New York and Boston, but a large number of very considerable fish-establishments, which supply a great portion of the United States and Canada with fresh fish, and more especially with salt herring, mackerel, dried codfish, and smoked halibut. As the fish-trade of Gloucester is very extensive, a more detailed description will not be out of place.

Gloucester, situated on Cape Ann, in the State of Massachusetts, a few miles from Boston, was founded by Englishmen about two hundred years ago, and, after many ups and downs, it has, from an inconsiderable fishing-village, by energy and pluck, risen to be an important city, with a population of about 17,000, who live almost exclusively by the fisheries, which, as I mentioned before, employ about 500 schooners with an aggregate tonnage of 30,000, besides a large number of boats engaged in coast-fishing. The result of these fisheries for a single year (1875) are, according to a volume published in 1876 entitled "The Fisheries of Gloucester," as follows:

		Value.
Bank (Newfoundland) cod....	177,473 quintals.....	$998,628
George's cod.....	185,758 quintals.....	1,021,669
George's halibut	2,462,364 pounds	172,365
Bank halibut	7,248,423 pounds	507,389

"Hake" (lyr)*	4,257 quintals	12,774
Cusk (*Brosmius vulgaris*)	2,349 quintals	7,047
Pollock	9,417 quintals	32,964
Herrings	38,292 barrels	153,168
Coast fisheries by "the dory fishermen":		
Fresh fish		89,738
Prepared fish		185,697
Fish-oil		8,945
Mackerel	18,172 barrels No. 1	327,112
Mackerel	7,065 barrels No. 2	184,780
Mackerel	21,763 barrels No. 3	174,104
Mackerel	4,039 barrels No. 4	24,205
Total		$3,900,586

Furthermore:

Pickled fish:		
31,750 herrings, valued at	$13,494	
163 barrels cod, 40¼ barrels swordfish	1,097	
410⅝ barrels trout, and 76¾ barrels fins	4,042	
21⅞ barrels salmon, 250 barrels tongues, &c	2,282	
Clams, &c	10,000	
All other fish	8,000	
Oil, not mentioned above	100,000	
		138,915
Grand total		$4,039,500

These figures will show the prices of the commonest American fishing products. It will be noticed that roe is not mentioned, as but few roe-fish are caught, and as nearly all the roe is used for bait.

Next in importance to the Gloucester fisheries are those of New York and Boston, then those of Portland, Me., Baltimore, California, and Oregon. The coast fisheries carried on along the whole coast of the United States, especially of menhaden, shad, porgy, bluefish, lobsters, oysters, and clams, yield considerable sums of money every year. The value of the salt-water fisheries of the United States has never been accurately calculated, but I think that it amounts to about $20,000,000. With regard to the value of the fresh-water fisheries of the United States, the uncertainty is still greater; but it is certain that even now it is very considerable, and hopes are entertained that in future it will be still greater, owing to the energetic measures which are being taken to further and to encourage these fisheries. These hopes are well founded, to judge at least from the happy results which so far have been obtained by pisciculture. Whilst lobsters of unusual size are caught in great numbers on the coasts of Maine, Massachusetts, and New York, the largest

* "Lyr" is the Danish for pollack (*Gadus pollachius*); but the "hake" of our East coast are species of *Phycis*.—T. H. B.

number of oysters is caught in Maryland (Chesapeake Bay) and Delaware (Cape May and the Delaware Bay). The salt-water fisheries are most highly developed in Massachusetts, whilst the most important fresh-water fisheries are in New York and Maryland, where the most excellent measures have been adopted for increasing and developing the fisheries. In the following I shall give a brief description of these fisheries, chiefly from the official reports of the State superintendent of fisheries for the State of New York, Mr. Seth Green, and the commissioner of fisheries for the State of Maryland, Mr. Ferguson, but partly also from my own personal observations.

Every State which takes an interest in the fresh-water fisheries has its own fish-commission and a superintendent of fisheries responsible to this commission. The State makes an appropriation so as to enable him to carry on his work, which consists in increasing the number of fish by every possible artificial and natural means, and in encouraging and furthering pisciculture. At the head of the fisheries stands a United States Commissioner of Fisheries, at present Prof. Spencer F. Baird, of the Smithsonian Institution at Washington, a naturalist of great fame.

The magnificent and costly hatching-houses and fish-ways which have been established in the States of Maryland and New York show the ingenuity, the practical manner, and the extent to which pisciculture is carried on in these States. The results obtained by these establishments are truly astonishing, as millions of fish of every kind are called into existence, filling the large rivers and lakes. It is especially those kinds of fish which are considered the best food-fish, *e. g.*, salmon, trout, and shad, that form the principal objects of pisciculture, but other fish, if they are of any value at all, are not neglected. The populous cities of America are therefore as a general rule well supplied with fresh fish, which form an important article of food. American pisciculture, which includes a system of protection with carefully framed regulations for protecting the young fish, has attracted great attention especially in Germany, where of late years hatching-houses on the American plan have been established under the superintendence of a gentleman from New York. The result of these experiments is not known to me. I cannot say with absolute certainty how many millions of fish are annually hatched and placed in the many lakes and rivers of America, but their number must be very considerable.

Of the hatching-houses those invented by Mr. Seth Green, of Rochester, N. Y., and by Mr. T. B. Ferguson, of Maryland, deserve the greatest attention, constituting the New York State hatching-house in Caledonia, N. Y., the Druid Hill hatching-house in Maryland, and the fish-ways near the Great Falls of the Potomac. Recently so-called "ponds" for keeping live fish and for protecting young fish have been established in the Detroit River. These "ponds" are sheets of water hedged in with poles joined by boards in such a manner that the water can circulate

freely, and that the young fish can easily slip through the openings. At one end of these ponds there is a movable gate fastened at the bottom to a mud-sill and protruding obliquely about one foot over the surface of the water. Whenever a haul is made near the "pond," the net with the fish is pulled through the gate by pushing the gate down with a pole; and the fish are emptied into the pond without being touched by human hands, and without leaving the water, so that the fish with the young reach the pond in an entirely fresh condition. Another arrangement, partly for making net-fishing easier and partly for keeping the young fish, is found near Havre de Grace (not far from Baltimore), and consists of floats or "batteries" with movable aprons on three sides, on which the net is hauled in such a manner that the fish and their young go direct from the net into a fish-pond in the float, from which the young fish can through small openings pass easily into the open water. These "fish-batteries" are only used in shallow water and in places where net-fishing could not well be carried on without some similar arrangements, and are moved from one place to the other wherever it is thought that there will be good fishing. The idea of the three movable aprons, which touch the bottom when the float lies still and can be raised up by means of chains whenever the float is to be moved, is this, that the influence of the current may be avoided by hauling the net in on that side where the current will not interfere with it. On the float are long poles, which are stuck into the bottom when the float is to lie still, and are raised when it is to move again. The aprons are then raised so high above the water that their corners can rest on frames and thus be held up until the next anchoring place is reached. There are also on these floats winches worked by horses for hauling in the nets, and dwelling-houses and sheds for keeping and preparing the fish. These floats are generally manned by 60 to 70 fishermen. The fourth side, which has no apron, is used for taking the fish on shore. Such an arrangement modified according to local demands would prove very useful in our country wherever nets cannot be hauled on shore in the usual manner.

It is impossible for me to give in this place a detailed description of the hatching-houses and fish-ways; all the more so as it would require drawings to make it perfectly clear. I therefore refer the reader to the above-mentioned Reports for 1875 and 1876, published by Mr. Seth Green and Mr. Ferguson, which contain plates. These Reports may be obtained by addressing Prof. Spencer F. Baird, Smithsonian Institution, Washington.

Great exertions have been made of late years to stock the American rivers and lakes with foreign and domestic fish by transporting live fish and impregnated fish-eggs by railroad from California, and from Europe by steamers, in boxes specially constructed for the purpose. These endeavors have partly succeeded beyond all expectation, so that at present eastern waters contain not only the highly-prized California salmon

(*Salmo quinnat*), but also trout and carp from Germany, and these fish seem to be in as flourishing a condition as in their proper home. A number of practical laws, partly local and partly applying to the whole country, have been made for the better protection and encouragement of the fisheries.

No less than to the development of the river and other fresh-water fisheries, have the Americans given their attention to the improvement of vessels, boats, and implements used in coast and ocean fishing, and a closer examination of this subject shows the high rank to which the American salt-water fisheries have attained.

The well-known American fishing-schooners, especially the Gloucester mackerel-schooners, are as beautifully constructed and as comfortably arranged and fitted up as a pleasure-yacht, and cost from $6,000 to $10,000 and $12,000, fully equipped, including fishing implements and boats. These schooners, which sail very well, have a tonnage of 60 to 130, and a crew of 9 to 14, according to the size of the vessel and the character of the fishing in which it is to be used. The schooners used for bank-fishing either near Newfoundland (Grand Bank) or George's Bank, are only furnished with long lines like the Swedish and Norwegian bank-fishing vessels, but instead of the large and heavy boats used by the latter, they have small flat-bottomed boats, so-called "dories", which are considered unusually good and safe, and are handled a great deal easier. Every bank-schooner has about 6 to 8 of these, arranged according to their size, three to four on each side of the deck. Whilst fishing is going on there are generally only two men in every dory, and single lines with a few hundred hooks are used, not as in Sweden and Norway a long row of lines tied together, with as many as 2,000 hooks, which latter arrangement, of course, involves a much greater risk in stormy weather. Nor do the Americans use the glass floats so common with the Swedish and Norwegian fishermen, probably because the lines can be handled a great deal easier without such floats, and are also more independent of the various currents. The nature of the bottom near the American coast is probably also more favorable for keeping the bait in place. The Norwegian half-moon-shaped weight for sinking the lines is not known in America, where a weight shaped like a plummet or a cylinder with a thick brass wire stuck through it is used. The large hooks or prongs used in Norway, by which the fish is frequently torn to pieces without being caught, are known from olden times, but have long since been abolished as unpractical and barbarous. The mackerel and herring schooners which are engaged in fishing either along the coast or in the Bay of Fundy during summer, or on the coasts of Newfoundland and Labrador chiefly during autumn, and in the Gulf of St. Lawrence during winter, are now all furnished, not with lines, but with the so-called "purse-seine", a new invention which of late years has become the favorite American fishing implement in all waters except on the banks, where wind and current forbid its use.

The idea of catching fish with seines in the open sea has been entertained long since, but as far as I know it has only been carried out in America by the introduction of the purse-seine, with which large numbers of mackerel, herring, shad, menhaden, and other coast fish are caught. Whenever a school of fish makes its appearance it is quickly surrounded by the seine, by one boat rowing in a circle whilst a dory lies still with the one purse-string and the one pulling-string (?), until the whole net is out in the water, whereupon all four strings are brought together on the boat, on whose railing there is a stationary arrangement for drawing the net together, which, when closed, forms a complete sack or purse, from which it derives its name, and which holds the fish, often amounting to several hundred barrels for a single haul. By means of large hooks the fish are then hauled up into the vessel, which lies ready to receive them. The length of these seines is from 150 to 220 fathoms, their depth in the middle from 15 to 30 fathoms, but at the ends only from 6 to 10 fathoms. The size of the meshes varies. The central portion forming the purse contains the smallest meshes (about 2½ inches between the knots), made of the strongest cord; then follows on each side of the centre a portion with larger meshes and thinner cord, and still larger meshes and thinner cord at both ends, all calculated to make the handling of the seine as easy as possible. Such a seine (about 200 fathoms long and 25 to 30 fathoms deep), fully equipped with good cork floats (about 700) and nut-shaped weights weighing about seven-eighths of a pound each fastened at short intervals along the bottom rope, with the exception of the centre piece, which generally is without weights, so it can quickly be pulled together, and with either galvanized lead or brass rings (weighing 2 to 3 pounds) through which the two pulling-ropes pass from end to end, costs from $800 to $900. Only the best cotton thread or the finest hemp cord is used for these seines. The boats, which are well built and constructed in the most practical manner, cost about $300 apiece. Instead of bark or catechu, tar is used for fixing up seines which have been in use for some time. After having been put in boiling tar, they pass between rollers to make them pliable and to squeeze out the superfluous tar.

Many difficulties had to be overcome before the idea of the purse-seine was carried out practically; but all these difficulties were conquered by American energy and perseverance. These difficulties consisted chiefly in making the seine as light as possible and having the purse of a suitable size and shape in proportion to the seine itself, and in the method of drawing the net together. At first the following method was followed: Before the seine was set a large and heavy leaden weight, with two blocks of iron, was, by means of ropes, lowered to the bottom in the place where the seine was to be set; then the seine was gradually rowed out into the water, pulled together at the bottom, and finally hauled up into the boat. All this process consumed considerable time and labor, and during the pulling together at the bottom many fish were lost, whilst

now the process is quick and safe. The greatest drawback was this, that the seine must reach the bottom, and wherever the water was too deep for doing this it could not be used. The sack-nets, used with us for catching pollock, or the net invented by Mr. Kildal, in Nordland, for catching codfish, are only incomplete realizations of the above-mentioned idea, and cannot compete in practical usefulness with the purse-seine, whose use is not confined to certain localities, as the sack-net, nor to certain portions of the bottom, like Kildal's net, but which can be used everywhere unless hindered by strong waves or currents. Purse-seines would prove extremely useful in our country, where schools of herring often keep in the middle of the fiords, where they cannot be reached by common nets, or in any other way except occasionally by a floating net.

Convinced of the incalculable profit which would accrue to our country from a more general use of the purse-seine, I have everywhere recommended its introduction; and my efforts in this direction seem to be rewarded, as Fagerheim's mechanical net factory near Bergen has given serious attention to the matter, and has already received several orders for purse-seines. But besides carefully manufactured seines on the American plan, and light boats, some practice will be necessary before the introduction of the purse-seines will yield full results. After having in Boston procured models of purse-seines and boats, which are to serve as guides to our manufacturers, I still desire that some American purse-seine fishermen could be engaged to instruct our fishermen in the use of these seines, so that our experiments might not prove failures, but lead to a speedy adoption of these seines. I may say here that negotiations have been opened with an American fisherman, which, so far, however, have not led to any definite results.

I have been somewhat lengthy in my description of the purse-seine, but the great importance of having it introduced with us will serve as an excuse. It seems strange that this seine, which has been in use in America for almost twenty years, and which in fact has become the principal American fishing implement, has not yet been introduced in the Scandinavian countries, from which so many good sailors have emigrated to America, and have there become experienced fishermen; but, as far as I can ascertain, it is a fact that this seine has not been introduced in a single European country, and is only known by name.

In bays and along the coasts the Americans very frequently use another somewhat expensive fishing implement, which is unknown with us, the so-called "pound-net," a sort of self-acting trap, something like our self-acting salmon-traps, only considerably larger, with which all kinds of fish are caught. As this net seems peculiarly adapted to the American coasts, with their great wealth of fish, and on account of its high price (about $400) does not seem suited to our circumstances, I will not give any further description of this very ingenious contrivance.

The well-known trawl-net and floating net of the Dutch, French, and English is, as far as I could ascertain, not used in America, where the

purse-seine fully supplies its place. For the smaller fisheries in bays and mouths of rivers our common nets are likewise used, only with this difference, that the floats are not fastened to the net itself, but swim on the surface of the water, fastened at short intervals to the strings connected with the net. Common casting-nets are also used, and purse-seines are sometimes used in this way simply by taking the pulling-ropes off.

An implement peculiar to the American bank-fisheries are the so-called "nippers," rings made of cotton yarn, used instead of gloves when handling the ropes. A furrow or groove runs all along the outside of these rings, and the ropes, whilst being hauled in, rest in this groove.

A bank-schooner generally makes three to four trips every summer, and, if the market is good, often realizes from $10,000 to $12,000 a season. The codfish and halibut, which are prepared and salted on board, are divided in about the same manner as in the Swedish and Norwegian bank-fisheries: the owner of the schooner, who furnishes the lines and other implements, receiving one-half and the crew the other half of the net yield. The result of the mackerel and herring fisheries varies more than that of the bank-fisheries. The average sum realized by mackerel-schooners is $8,000, and by herring-schooners $5,000 to $6,000, which is divided in the same manner as the result of the bank-fisheries. The small schooners which carry on line-fishing along the coast, and sell their fish fresh on ice, realize, on an average, $4,000 to $5,000 annually, which sum is distributed in different ways, but generally, as with our small cod-fisheries, in such a manner that the owner receives one-fourth and the crew the remaining three-fourths of the net income (the owner's risk being, of course, considerably smaller).

As the continent of North America, comprising the United States (now including California and Oregon), extending from the Atlantic to the Pacific, and the Dominion of Canada, consumes nearly all the fish which are caught by American fishermen, the fish are only prepared with a view to rapid consumption. They are therefore nearly all shipped fresh on ice, or sprinkled with salt and then dried or smoked a little. Codfish does not, therefore, undergo the long drying process as with us, and in Iceland, Nova Scotia, and Newfoundland, which supply distant markets, *e. g.*, Spain, Portugal, Italy, the West Indies, and Brazil, where only well-dried fish can be sent. When the fish have been taken out of the brine, either just as they are taken from the schooners or from large barrels where they have been kept in brine, they are dried on poles stretched a few feet from the ground, for three days, without being turned and pressed, are packed in large boxes and shipped inland by railroad, selling at from 5 to 6 cents per pound. Fish prepared in this manner will of course not shrink much, and weigh heavy. Some kinds of fish, as for instance the cod and pollock, after having been dried in the above-mentioned manner, are skinned, boned, and cut in narrow strips, put up in small boxes weighing from 35 to 50 pounds each, and sent farther in-

land by railroad, selling at from 6 to 8 cents per pound. Mackerel and also to some extent herrings are not treated in quite so summary a manner. They are prepared very much in the same way as with us, by being split and salted down in barrels which are made by machinery and do not look very solid. In order to keep better, the largest and fattest, mackerel and herring which from August to November are caught on the coast of Labrador are cut open and their entrails are taken out. The common herrings, resembling our spring herrings, which during the spring and summer months are caught on the coasts of America and Newfoundland, undergo a peculiar process by being salted in the holds of the schooners, from which at the end of the trip they are taken to the warehouses, where they are transferred to barrels and shipped inland at a price of $3 per barrel. Such herrings are of course of an inferior quality, and they cannot be used as with us, but must be soaked in fresh water (or milk) and then either boiled or smoked. During the year 1876 several cargoes of salt herring of different size and quality were shipped from America to Sweden. The herring-fisheries on the coasts of Labrador and Newfoundland might be developed much more than they are at present. But so far the herring has not been much esteemed in America, and the herring-fisheries have consequently been somewhat neglected.

That the shipping of herring from Norway to Montreal and Chicago has paid, must be in part ascribed to the desire of the Scandinavian emigrants to have this genuine Norwegian article of food, and in part to the difference of quality between the Norwegian and American herring, the former having a more delicate flavor than the larger Labrador herring.

The Americans also make use of their fisheries in many ways unknown to us. The finer portions of the halibut, of which large numbers are caught on the banks and near the coast of Greenland, are prepared and smoked like salmon and sold at a comparatively cheap price (8 to 12 cents per pound), whilst a number of other fish, *e. g.*, the menhaden (*Brevoortia*), and a sardel-like fish are used for making oil and guano. (The Pacific Guano Company uses enormous quantities of fish for these purposes.) Oil for medicinal purposes is, as far as I could ascertain, not made in America.

As I have mentioned before, great quantities of lobsters, oysters, and clams are caught on the eastern coast of North America, are sold at a cheap price, and therefore form a very common article of food, partly raw (oysters and clams) and partly cooked, oyster and clam soup being a very common, cheap, and delicious dish. Of late years many oysters are put up in hermetically-sealed cans, and find a ready market, partly for ships going out on long voyages and partly in Europe. The American oyster has a somewhat different shape from ours, as well as from the French and English oyster, being somewhat longer and more fleshy than ours. In America oysters are not raised artificially, as in France

and England, as their natural rate of increase seems sufficient to supply the demand; but wherever the oyster trade forms a large source of income, as in Maryland, certain regulations are enforced for protecting the oysters. At Cape May and in the Delaware Bay oysters are caught and eaten all the year round. The same also applies to clams and lobsters. Fish-meal and fish-balls put up in hermetically-sealed cans are not known in America, and the well-flavored articles of this kind in the Norwegian exhibit, therefore, attracted much favorable attention.

The common mackerel are, in America, sorted according to four sizes and qualities—Nos. 1, 2, 3, 4—all differing in price. The so-called Spanish mackerel is a fish resembling the trout in its beautiful appearance, with red spots, and almost as large as a small salmon, and sometimes fetches as high a price as salmon. Whilst ling is very scarce near the American coasts, nearly all our common fish are found in large numbers; *e. g.*, codfish, hake, pollock, haddock, cusk, flounders, halibut. The haddock reaches a much larger size than with us. It is highly esteemed, and is sold at a tolerably high price, either fresh or slightly smoked. It is well suited for being shipped on ice on account of its thick skin and its firm flesh. A fish not known with us, but very common in America, is the so-called "sheepshead" (*Sparus* or *Sargus ovis*), which gets its name from the peculiar resemblance of its head to that of a sheep.

To enumerate the many different kinds of fish found near the coasts of North America would be of but little interest to the general public. To those who take a special interest in the matter I would recommend the following works: "Report of the Commissioners of Fisheries of Maryland, 1876," and "Classification of the Collection to illustrate the Animal Resources of the United States," also published in 1876 by Prof. G. Brown Goode, M. A., in which all the North American food-fishes are enumerated and classified.

The American method of freezing whole cargoes of herring and mackerel, so that they keep fresh in the hold for two or three months, has yet to be spoken of. Unfortunately, I had no opportunity during my stay in America to witness the working of this method, but I was told that it was very practical. An American gentleman had promised me some written information on the subject, but so far I have waited for it in vain.

III.

BRIEF ACCOUNT OF THE FISHERIES OF NOVA SCOTIA AND NEWFOUNDLAND.

In Nova Scotia, whose capital (Halifax) I visited on my return from America, and in Newfoundland, whose capital (St. John's) I likewise visited in order to make myself acquainted with the fisheries, I found that they resemble ours rather than the American fisheries. There is more of a regular custom trade, or, in other words, the fishermen are more dependent on the merchants than in the United States, where they are

generally their own masters with regard to the way in which they wish to dispose of their fish. The fishermen of Nova Scotia are, to some extent, and those of Newfoundland nearly altogether, equipped by the merchants, to whom they thus become debtors, gradually paying off their debt by fish. It therefore often happens, as with us, that in poor fishing seasons the merchants run a risk of not having the money laid out by them refunded, or that they sometimes are cheated out of the whole or a portion of the fish on which they had calculated, by fishermen (in order to raise cash) selling their fish at a higher price than they would receive from their merchants to foreign merchants or to the French fishermen's colony at St. Pierre, southwest of Newfoundland.

The Nova Scotia cod-fisheries hold about the same relation to those of Newfoundland as the Söndmöre and Nordmöre cod-fisheries to those of Loffoden and Finmarken. These fisheries are carried on very much in the same way as with us. The coast-fishery is chiefly carried on by large, well-manned boats, with nets and lines, and the bank-fishery by swift schooners fitted up like the Gloucester ones and furnished with dories and boats, only not quite so handsome in their appearance. The French fishing-vessels belonging to the above-mentioned French colony of St. Pierre have a different shape and different rigging (generally cutters or large sloops like the English lobster-vessels); they are also manned and equipped differently from the Newfoundland bank-fishing vessels. The French fisheries near Newfoundland differ altogether from those of other nations, especially with regard to the preparing of the fish and roe, and the distribution of the fish. The state stands at the head of the fisheries, and has a governor at St. Pierre who superintends the whole. The present governor, M. Boubert, with whom I had the pleasure to travel from Halifax to Liverpool, told me that the French Government had sent him a number of Norwegian fishing implements, especially codfish nets and lines with floats; but as he had not yet had any opportunity to try them, he could not say anything regarding their practical use in these waters.

A Norwegian who has lived for a number of years in New York as partner in a large business establishment which failed during the civil war, and who now lives in Halifax, as Belgian consul, Mr. C. E. Rónne (son of the late Danish Doctor Rónne of Christianssand), who was educated at the Norwegian Naval Academy, but had to leave the naval service on account of his weak eyes, a man of position in Halifax, with an unusual knowledge of languages and great experience, was likewise the companion of my voyage from Halifax to Liverpool. From this interesting gentleman I obtained a great deal of information regarding New England and Newfoundland in general, and their fisheries in particular, for which I herewith express my heartfelt gratitude. I made copious notes regarding the leading features of the Nova Scotia and Newfoundland fisheries, but to complete these there are still wanting, the manner in which the fish are prepared, statistical data, &c., and I shall give

these more from oral than from written accounts, or from my own personal observation, as my stay in both places was only very short.

In Nova Scotia as well as in Newfoundland the fish are prepared in a more conservative manner than in the United States, viz, with the view of obtaining an article that will keep well and may be sent to tropical climates, especially the West Indies, Brazil, Spain, Portugal, and Italy. The codfish, which forms almost exclusively an article of export to foreign ports, is first treated in the usual manner, viz, as soon as possible after having been caught it is opened and all the entrails are taken out; it is then salted in the hold of the vessel, generally with white Cadiz or Liverpool salt. When the vessel returns from her trip the fish are taken to the "drying-places", where they are washed and cleaned of all superfluous salt and all impurities. They are then laid in small heaps, and afterwards, when the weather is favorable, side by side on scaffoldings, which, in Newfoundland, are very high, so as to let the air pass through freely and let them dry thoroughly, in just the same manner as we dry our codfish. The washing process, however, is somewhat different, for the fish are not left so long in the water as to get soft and lose some of their flavor. The thin black skin is also left on the Newfoundland codfish, as people do not think it worth while to take it off. As the climate of Newfoundland often prevents the rapid drying of the fish, there are on every drying-place, close to the scaffolding, small huts where the fish are placed in rainy or damp weather. A number of fish are nevertheless damaged during the drying process, and turn sour and dark; such fish are then sprinkled with thin lime, which makes them look white enough. The fish which are bought fresh from the boats are of course prepared and salted in sheds, and then after some time treated in the above-mentioned manner. The fresh liver is melted by steam to oil for medicinal purposes exactly as we do it in Norway; and the old livers which cannot be used in this way are made into brown train-oil. The roe of the codfish is treated in the same manner as with us, and is either shipped to France or sold to the French colony at St. Pierre. But the Newfoundland cod-liver oil and roe are by no means esteemed as highly as our Norwegian oil and roe, which is probably caused by the different mode of preparing it, and by the different food on which the codfish live in these parts.

Besides cod-fisheries, which are the most important, Nova Scotia and Newfoundland carry on extensive herring and seal fisheries in the sea extending between Nova Scotia, Newfoundland, and Labrador. Whilst the herrings from Nova Scotia are chiefly shipped to Canada and the United States, the Newfoundland herrings nearly all go to England, chiefly to Liverpool. These herrings are prepared in the usual manner. The quality of the Newfoundland herrings, however, is by no means very good.

The average quantity of dried fish shipped from Nova Scotia is 36,000,000 pounds, and from Newfoundland 108,000,000 pounds. I am

not able to state the quantity of oil, roe, herrings, and seal-skins which are shipped from these two countries.

The prices do not vary much from those of other countries, and are subject to the same fluctuations which are caused by the varying results of the fisheries and by the state of the markets. The dried codfish are shipped from Nova Scotia and Newfoundland to the West Indies and Brazil, partly in boxes and partly in baskets or a sort of tubs holding about 108 pounds each, and to Europe by merely placing them loose in the hold of the vessel. The shipping of new dried codfish generally commences towards the end of August or in September.

It may be known what an influence the cuttle-fish (calamare) has on the Newfoundland fisheries, as it is a most excellent bait, which can scarcely be replaced by any other. Just like the capelin in Finmarken, the cuttle-fish at certain times visits the coast of Newfoundland in large schools, and large numbers are then caught to be used as bait in the cod-fisheries, which commence in May and last till the end of September or October. The cuttle-fish are either kept fresh or salted, and their price varies considerably. With regard to the bait-herring, everything is exactly as with us.

IV.

POSTSCRIPT.

After having made myself acquainted with the character of the American fisheries, it was my object to apply to our fisheries all the practical American improvements as far as this might be possible. I therefore undertook my journey to New York, Long Island, Boston, and Gloucester, accompanied by Mr. F. M. Wallem, a newspaper correspondent of great and varied knowledge; the special object of this journey being to become still better acquainted, from personal observation, with the American fisheries, and particularly with the working of that most excellent fishing implement, the purse-seine, whose introduction into Norway we both considered of great importance, especially for our mackerel and herring fisheries. We were everywhere received with the greatest politeness and readiness to be shown all that was to be seen. I must here make special mention of Mr. A. A. French, in New York, head of a branch office of the American Net and Twine Company, of Boston, who showed us about on Long Island, where we saw the most important fishing implements and the way in which they are used, and of Mr. Eugene Blackford, of New York, who took us to Fulton Market and showed us everything of interest in that vast establishment. In Boston we were very kindly received by the representatives of the firm of A. A. French & Co. (the American Net and Twine Company), and in Gloucester we were fortunate enough to meet with the same kind reception from the head of the firm of Procter, Trask & Co., which last year shipped herrings from Gloucester to Sweden, and also from one of the partners of the firm of

Cunningham & Thompson, Mr. Thompson by birth a Swede, who for a number of years carried on bank-fishing and halibut-fishing with a vessel of his own, and is now solidly established in his present business; and finally from another Swede, Mr. Joseph Simpson, who, after having been at sea for many years as a bank and mackerel fisherman, has, with an American, Mr. Maker, established a repair shop at Gloucester under the firm of Maker & Simpson, employing 10 to 12 men exclusively in the repairing of purse-seines. This gentleman explained to us the arrangement and use of the purse-net, and undertook to get us models of the same. Other valuable and interesting information we received from Capt. H. Allan, of the fishing-schooner Bonanza, a new and elegant vessel of 137 tons, equipped for catching herring with a purse-seine near the coast of Labrador, which had just returned from there with a full cargo (about 1,800 barrels), and from his son, Mr. John Allan, who was commissioner of the Gloucester fishery exhibit in Philadelphia. To all these gentlemen we herewith express our gratitude.

We also visited the well-known boat-builders, Messrs. Higgins & Gifford, in Gloucester, whose workshops annually produce several hundred dories and a large number of purse-seine boats, and ordered a model of the last mentioned boat.

In making a few concluding observations in connection with the improvements in our fisheries, which in my opinion might advantageously be introduced in our country from America, I do this not only with the wish and hope of benefiting our fisheries, but also with a consciousness of the vast importance of the subject and of my inability to do full justice to it. However, I will boldly write the following, hoping that it will at any rate induce people to give the matter some thought and awaken some discussion which may further the interests of the great and important subject of the fisheries.

In the first place, especially with the view of developing our great herring-fisheries, the purse-seine should be introduced, and for our coast and bank fisheries light and quick-sailing fishing-vessels in connection with the above-mentioned dories. The usefulness of such vessels cannot be doubted, as a great deal in the fisheries depends on being swift in reaching the fishing-place, in catching the fish, and in bringing them home in a fresh condition.

Purse-seines, of different sizes and prices, are now made to order by Fagerheim's mechanical net factory near Bergen (A. G. Thomsen). On account of their being easily handled I would recommend purse-seines of first-class cotton thread, not longer than 150 fathoms, and 25 fathoms deep. The price of such a purse-seine will probably range from 2,400 to 2,800 crowns ($643 to $750).

I would not advise changing common herring-nets of thick hemp thread to purse-seines, as they would be too heavy and the change would involve a great deal of labor. Models of purse-seine boats, dories, and swift-sailing fishing-vessels may be obtained from Messrs. Higgins & Gifford, in Gloucester, Mass., U. S. A.

After what has been said above it might seem practical to use steamers instead of sailing-vessels for the fisheries, but in the present condition of the fisheries there would be much in the way of carrying out this idea. I have some experience in this matter, for a few years ago I, in company with Mr. Frederik Hanssen and Mr. Jens Sahl, built and equipped a fishing-steamer of about 20 horse-power and a tonnage of about 500. This steamer Erknö, which otherwise was a perfect success in every respect, and which was intended for the spring-herring fisheries and the bank-fisheries, was, after a few failures, chiefly occasioned by the stoppage of the spring-herring fisheries, sold to the Söndmöre-Romsdal Steamship Company. The expenses of a tolerably strong and not too small steamer like the Erknö are too great in proportion to the advantage accruing from its use. If enterprises of this kind are to pay, they ought to be carried on on a large and well-devised plan, requiring considerable capital.

The attempts which have been made to use fishing-steamers both in the Loffoden and in Finmarken have proved the correctness of this view. Even in America the use of steamers in the fisheries (excepting of course the seal and whale fisheries) is very limited.

The use of floating nets deserves attention next to the use of the purse-seine, as has been fully proved by the experiences of the Stavanger fishermen during the last year. Practical and well-equipped fishing-boats, as well as good and strong fishing implements will always pay in the long run, although the first outlay may be considerable.

The necessity of having suitable laws for protecting the fish and their young, and of having systematic arrangements for restocking our rivers and lakes with fish, partly by artificial hatching and partly by transferring fish and their young from one water to the other, deserves our fullest attention, and we may learn a great deal from America in this respect.

The method of preparing fish for the trade is likewise a question of great importance to our country. Every one acquainted with these matters knows what a loss is involved by drying salt codfish too little, to soak it, as is the custom with us, and to dry it lying in an oblique position. By this wrong way of treating the fish, not to mention the great carelessness in killing and cleaning it, and in letting too much time elapse before salting it, it of course loses much of its nourishing quality and its juiciness, becomes softer, lighter in weight, and will not keep as well. The drying process with us is generally carried on too slowly and in too careless a manner, as the fish remain unnecessarily long piled up in heaps without being turned; they consequently begin to ferment and turn dark and sour. The consequence of drying codfish on rocks which are heated by the sun, is that the fish are often burned and get shrivelled. The drying of codfish on scaffoldings or on small stones has this advantage, that it does not burn so easily and that it dries better, the warmth and the air acting evenly on both sides of the fish. To salt the

dry codfish in close boxes or barrels, lets the salt penetrate it much better and makes it heavier and juicier than when it is merely salted on the scaffolding. I think it would therefore be an advantage if those vessels which sail to the Loffoden and Finmarken to buy raw fish, had close boxes or bins in which the fish could be salted, with an arrangement to let the brine flow out from time to time. The so-called Scotch method which recently has been adopted by several large fishing-houses is therefore to be highly recommended. I convinced myself of this at the Philadelphia Exposition by examining the codfish exhibited by the firm Lauretz Madson, in Aalesund (prepared in the Scotch manner), which not only looked very fine, but had kept well and were very heavy.

The old law prohibiting the salting of codfish in boxes or barrels was doubtless well meant, but it has now become clear how senseless this law was.

I can also recommend the new American method of treating gently dried codfish, viz, by taking off the skin, cutting out the backbone and breastbones, then cutting it lengthwise in narrow strips and packing it hermetically in small wooden boxes; this method will prove of special advantage where the saving of freight is an object, when fish have to be sent to distant countries, and in keeping the fish in a good state of preservation. The advantage will be evident if a good price can be obtained, as the freight on that part of the fish which is valueless as food, is saved, as the fish itself will keep better even during the longest journey, and as the skin and bones may be used as fertilizers and will readily sell to guano manufacturers.

I think it would be worth while for our fish-merchants, besides shipping whole codfish in boxes to the West Indies and Brazil, to ship such skinned and boned codfish not only to these countries but also to Buenos Ayres, Montevideo, Peru, Australia, and possibly to Japan, China, and the interior of Germany, especially at times when whole codfish do not find a ready market.

The making of isinglass from fish-maws forms a considerable branch of American industry, as a good deal of isinglass is used for making beer and wine clear. I must strongly recommend the putting up in hermetically-sealed tin cans of stuffed crabs (*Cancer pagurus*), which has so successfully been begun by Mr. C. Wiese, of Osmundsvaag, as well as of fish-balls in brown sauce, convinced that these articles will always find a ready market, especially on board the large transatlantic steamers. I think that halibut smoked in the same manner as salmon would also sell very well with us, but would not be so well suited for the foreign trade, as fish which is not thoroughly smoked does not keep as well as strongly-smoked fish. Gently-smoked anchovies or small herrings, hermetically sealed and put up in oil, like those which Mr. Henry Dons, of the Christiania Preserving Company, had exhibited in Philadelphia, are sure to sell well.

If we consider what large quantities of shellfish, especially clams and

muscles (*Mytilus edulis*), are eaten, both raw, with vinegar and pepper, and boiled in milk, in America, France, and also in Spain and Portugal, and what a cheap and healthy food they are, it seems that we, who have so many muscles, ought certainly to follow the example of these countries. I sincerely hope that the freezing of herrings and mackerel in the holds of vessels will also soon be introduced in our country as the most suitable way of preserving large quantities of fish for a long time, and, likewise, that the shipping of fresh fish on ice will become more common with us than it is now. I think that so far the lack of proper means of communication has prevented our adopting these improved methods of shipping fish. It must not be forgotten, however, that in order to ship fresh fish on ice with any reasonable hope of success, the fish must really be fresh when it is put on ice; as fish which is several days or even hours old does not answer the purpose. If, therefore, those fish which are caught in the open sea are to be shipped on ice, it is absolutely necessary that the fishing-vessels either have ice-boxes or regular fish-boxes, where the fish can be kept alive. It is very important that both live and killed fish should be brought to market as soon after they are caught as possible, as it is well known that a fish loses much of its wholesome, nourishing quality when it dies a natural death and the blood cannot flow off. Small fish-ponds for keeping those fish alive which have been caught in nets will, therefore, in connection with fish-boxes on board the vessels, prove extremely useful, and deserve to be introduced wherever it is possible.

I must, in conclusion, mention quite a new rowing-apparatus, invented by Mr. William Lyman, of Middlefield, Conn., which was patented during the Philadelphia Exhibition. This so-called "bow-facing rowing gear" consists in having the oar divided in two parts, which are connected by double galvanized-iron hinges, which move in the form of a parallelogram, and are fastened to the boat by small balls in bronze caps, which fit exactly in two pieces of board screwed firmly to the boat, from which, therefore, the motion proceeds towards both sides. The rower sits with his face towards the prow of the boat and uses the handle of the oar in the usual manner, whilst the oars themselves move in the same direction and drive the boat forward when the rower draws the oars towards himself, and backward when he pushes them away; therefore exactly the reverse of the usual mode of rowing. To a person unaccustomed to it, this way of rowing looks very strange, as the boat seems to move the wrong way. The advantage is this, that the rower can always sit and look in the direction in which he is going; but I think that this invention will never be of much practical use, except in harbors, or for hunting and fishing. As far as I know, two samples of this rowing gear were bought during the exhibition, besides the one which I bought, and brought to Norway by Mr. A. Brun and a ship-builder, Mr. Brönlund, who therefore are able to give further information regarding this curiosity.

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