

## V.—ACCOUNT OF THE FISHERIES AND SEAL-HUNTING IN THE WHITE SEA, THE ARCTIC OCEAN, AND THE CASPIAN SEA.

BY ALEXANDER SCHULTZ.

The similarity in many respects between the fish and fisheries of the great lakes and the northeastern coast of the United States and those of certain portions of Russia has induced me to print the very interesting and important memoir of Mr. Schultz,\* prepared to accompany the Russian display of fishery-products, implements, &c., at the Vienna Exposition. In regard to the conversion of the sturgeon, so abundant in the United States, and until lately considered a refuse fish, into a valuable article of trade, the memoir will be found replete with valuable information. It also details novel modes of capturing and utilizing the cod, the herring, the salmon, the seals, and the smaller cetaceans, (porpoises, &c.,) many of them perfectly available in the United States, and worthy of introduction.—[S. F. BAIRD.]

In the district of Archangel, large fishing-villages are found on the coasts of the White Sea, especially near the mouths of rivers and streams, such as the Dwina, the Onega, the Souma, the Kem, the Kovda, the Niva, the Oumba, and the Varzoukha. A still larger portion of the population of the cities of Archangel, Onega, and Kem, as well as of the town of Souma, devote themselves exclusively to fishing and trading in fish. The coast of the Arctic Ocean which extends east of the White Sea has a very sparse population. Only here and there, at a great distance from each other, are seen the wretched huts of fishermen, inhabited only in the summer, and the felt tents of Samoyed families, who also live by fishing. The inhabitants of the town of Mezene, and those of the village of Poustozersk, at the mouth of the Petshora, are engaged either in fishing or hunting the seal or the walrus.

Not more than 3,000 fishermen live in the vast region of the Lower Petshora, extending three hundred versts (about one hundred and ninety-eight miles) along the shores of the sea, and four hundred versts (about two hundred and sixty-eight miles) up the river. The Lapland coast, with the exception of the Kola Peninsula, is entirely uninhabited as far as the Norwegian frontier. Only nomadic Laplanders show themselves

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here and there. This country, called the Mourman coast, possesses a great number of large and small inlets, which form excellent anchoring-places. Five thousand fishermen assemble there for the season, from April till the middle of August. The majority of these come from the coast-villages of the White Sea, located in the districts of Onega and Kem, and they are known by the name of "Pomortsie"—inhabitants of the sea-coast.

The average annual value of the fisheries in the White Sea, the Arctic Ocean, and the rivers flowing into them is a million<sup>4</sup> "roubles," (about \$700,000 gold.) Of this sum, the cod-fisheries on the Mourman coast yield at least 400,000 "roubles," (about \$280,000 gold,) and the herring-fisheries in the White Sea 250,000 "roubles," (about \$175,000 gold.) The phocæ-hunt yields annually about 80,000 "pouds" (2,880,000 pounds) of oil, valued at 120,000 "roubles," (about \$84,000 gold.)

The manner of fishing and of preparing the fish when caught is much less perfect on the coasts of the White Sea and the Arctic Ocean than that of the Astrachan fishermen. The fish are, in general, salted in an imperfect and sloveuly manner. The monks of the convent of Solovetsk alone distinguish themselves by their manner of salting herring; and an exception must also be made with regard to the salting of the salmon of the Dwina and the Onega. The reason of this is, not that the fishermen do not know the approved method of preparing fish, but that they shun the trouble and expense, and content themselves with the old saying, "We go on doing as our fathers and grandfathers have done before us."

#### A—THE FISHERIES IN THE WHITE SEA AND THE PET-SHORA.

In the White Sea and the rivers falling into it, such as the Petshora, the following kinds of fish are found, of which I will first give the Russian names: "Okoune," (*Perca fluviatilis*), perch; "yorsche," (*Acerina vulgaris*); "revtsa," (*Cottus quadricornis*); "kertcha," (*Cottus scorpio*); "zoubatka," (*Anarhichas lupus*), wolf-fish; "karass," (*Cyprinus carassius*), carp; "vyoune," (*Tinca vulgaris*), tench; "pestousch," (*Gobio fluviatilis*); "yélets," (*Leuciscus grislagine*); in the Tsilma and Peza Rivers: "yaz," (*Leuciscus idus*), nerfling; "soroga," (*Leuciscus rutilus*); "lestche," (*Abramis brama*); "oukleïka," (*Aspius alburnus*); "stebouka," (*Esox lucius*), pike; "siomga," (*Salmo salar*), salmon; "coumja," (*Salmo trutta*), sea-trout; "koriouchka," (*Osmerus eperlanus*), smelt; "kbaryouss," (*Thymallus exzillifer*, Agassiz), grayling; "sig," (*Coregonus oxyrhynchus*, Lin.), long-snouted white-fish; "nelma," (*Coregonus leucichthys*, Pall.); "seld," (*Clupea harengus*), herring; "treska," (*Gadus morrhua*), cod; "pertoua," (*Gadus callarias*); "navaga," (*Gadus navaga*); "saïda," (*Gadus saïda*); "nalim," (*Lota vulgaris*), burbot; "kambala," (*Pleuronectes platessa*), flounder; "kambala," (*Pleuronectes flesus*); "sterliad," (*Acipenser ruthenus*), sterlet; "minoga," (*Petromyzon fluviatilis*), lamprey; "pétchorskoï sig," (*Coregonus polkur*, Pall.),

"peliad," (*Coregonus peled*, Pall.), "tehir," (*Coregonus nasutus*, Pall.), "omoul," (*Coregonus omul*), and "sàoureï," (*Coregonus vimba*), species of white-fish.

Of all these kinds of fish, those forming the largest article of commerce are the herring, the salmon, and the cod; then follow the "navaga," the "sterliad," and the "minoga." The fish are exported to the districts of Vologda, Viatka, Yaroslav, Moscow, Olonets, St. Petersburg, and to the several districts of the province of Archangel.

#### I.—THE HERRING.

The species *Clupea harengus* is found in the White Sea only, and is divided into a large and a small kind. The former is caught especially on the southwest shore in the bay of Kandalakcha, near the convent of Solovetsk, and near the village of Pongamà, and more rarely near the city of Kem and on the northwest shore of the bay of Kandalakcha. The small herring usually attains the length of from 6 to 7½ inches; and a thousand weigh about two "pouds" and a half, (90 pounds.) These herring come up in large numbers from the depth of the sea in the beginning of November, and make for the bays, especially the bay of Soroka, where the inhabitants of the coast villages always catch them in great abundance.

Herrings leave the deep sea only during the spawning season, in order to reach the more shallow bays, and the fishermen call them by different names, according to the time when they make their appearance. The herring of St. George (appearing about the time of that saint's day) has perfectly matured roe, and spawns in April. Two hundred and fifty of these fish weigh only one "poud," (36 pounds.) It requires, on the other hand, only from 80 to 120 herring of St. John to make the same weight, and these have most of the time roe and milt. The autumn herring are the fattest, but have neither roe nor milt.

*Organization of the herring-fisheries.*—It is a rule very generally observed that the interests of a whole community shall not be injured by the preponderating influence of private individuals, and that the personal rights of every fisherman shall be protected. To insure this, various measures are taken, varying according to local conditions. For instance, in the villages of Kandalakcha, Kovda, and Kniajuoi, the herring-fishery is organized in the following manner: the places near these villages where the fisheries are most productive being known, the entire community goes there, and the result of the common labor is divided among the fishermen in proportion to the number of male inhabitants of each village.

This proportion is calculated in the following manner: At first, the number of fishermen is determined, and then the number of inhabitants obliged to furnish one fisherman. In counting one fisherman to three inhabitants, a family composed of three members must furnish one; a family of six members, two; and so on. Families having only two members

associate themselves with others numbering four members, and thus furnish two fishermen in common. Every one of these must furnish the salt and the necessary fishing-implements. When the fisheries have come to an end, all the fish which have been caught are sold in a lump, and the proceeds are divided among all the persons who have taken a part in the fishing. Families which, though taking a part in the common fisheries, wish to fish in other places, are authorized to do so with their own means; but, if the places where they desire to fish are particularly rich, the community has the right to take possession of them as common property.

On the northern coast of the White Sea, there is a large fishing-village called Kauzomene, where, in the autumn, herring-fisheries are carried on on a large scale near the mouth of the river. It is the custom in this village that the inhabitant of the village who first arrives at the mouth of the river has the right to cast his nets first; but after having drawn them in, he must yield his place to the one who comes second, and so on. The herring caught there spawn in May and disappear entirely during the latter half of July.

Toward the end of the autumn and the beginning of the winter, great herring-fisheries are going on in the bay of Soroka, where the inhabitants of the coast are joined by considerable numbers of Kareles, who come from their villages, far away from the bay. Here every person fishes for himself, every family enjoying its own gains. The fishing here is always very productive, and it is not a rare case to find 100,000 herring in the net and 70,000 in the sweep-net.

*Implements for the herring-fisheries.*—The two wings of the net, when spread out, have a total length of from 16 to 35 “sagènes,” (112 to 245 feet;) their depth is from  $2\frac{1}{2}$  to 4 “sagènes,” ( $17\frac{1}{2}$  to 28 feet;) the meshes of the wings are from 1 to  $1\frac{3}{4}$  of an inch square, and those of the purse or bag  $\frac{3}{4}$  of an inch. The bag is 4 “sagènes” (28 feet) long, and can contain 300 “pouds” (10,800 pounds) of fish. These nets are used on the south coast of the White Sea, particularly in the bay of Soroka, where usually 750 of them are employed at a time. The fisheries commence in the middle of November and last till the end of February. Holes are made in the ice in order to get the nets into the water, and they are kept there by means of small sticks tied to the wings of the net by long cords, and laid across the holes made in the ice.

For the autumn herring-fisheries, nets are used whose wings are generally 8 “sagènes” (56 feet) long, and every fisherman has such a net in his boat. The boats always go out two by two. A cord with a running-knot tied to the prows of the two boats prevents their separating. Every boat is manned by three fishermen, one of whom rows while the second guides the helm, and the third continually sounds the sea by means of a long pole, to ascertain the presence of a school of herring. The moment the fishing ought to commence, the cord uniting the two boats is pulled out; and the fishermen in each rowing rapidly, they

soon separate. During this time, one of the nets is cast, and the boats keep in the same place till the whole net is in the water; then the oars are again put in motion, dragging the net a certain distance, when the two boats again unite. The wings are then drawn into the boats, the bag is detached from them, tied up like a purse, and left in the water till the second net has likewise been cast and drawn. After having brought this double operation to an end, the herring are taken out of the bag by means of haul-nets and crayfish-nets and put in the boats or laid on the shore.

The largest nets, the so-called "cissauges," which are always hauled on shore, are from 50 to 100 "sagènes" (350 to 700 feet) long, and have a bag measuring 7 "sagènes," (49 feet.)

The total length of this implement is 8 "sagènes," (56 feet,) and a cylindrical net is attached to its bag serving as a leap, 3 "arsheens" (7 feet) in length, and stretched over three small wooden rings. The meshes of the cylindrical net and those of the bag measure only half an inch, while those of the wings measure  $1\frac{1}{4}$  inches. With nets of this kind, small herring scarcely two inches long are caught under the ice; of these small herring, 2,500 weigh one "poud," (36 pounds.) This kind of fishing is chiefly carried on near the mouths of the Dwina, and cart-loads of these fish are taken to Archangel, the price of one cart-load being generally 5 "roubles," (\$3.50 gold.)

The sweep-nets have mostly ten hoops; the first or foremost one, being the largest, about  $2\frac{1}{2}$  "arsheens" (5 feet 10 inches) in diameter, while the last or hindmost, being the smallest, measures only  $\frac{1}{2}$  "arsheen," (1 foot 2 inches.) The hoops are placed at a distance of  $1\frac{1}{2}$  "arsheens" (3 feet 6 inches) from each other. The meshes are one inch square. Two little necks, shaped like funnels, called "gorges" by the fishermen, are attached to the inside of the nets; and, through these openings, the fish enter the net, where they become imprisoned. Each wing of the net measures 10 "sagènes" (70 feet) in length. These sweep-nets are placed at a depth varying from 1 to 3 "sagènes," (7 to 21 feet,) chiefly during the months of January and February.

*Preparing the herring.*—The herring caught in the spring, summer, and autumn, in the bay of Kandalakcha, at Pogama, at Solovetsk, and other places, are always salted. The monks of Solovetsk know how to do this admirably. They do not take out the entrails, but after having washed the herring properly, they barrel them in layers with the greatest precision, and put a thick covering of salt on every layer, after which the barrels are placed in the ice-vaults.

In most of the villages, on the contrary, the herring are thrown promiscuously into pine barrels, which are so badly made that they scarcely retain the brine; then a quantity of salt is added, and the whole is well shaken. Sometimes the large herring of St. John are dressed, and then placed in layers in the barrels, slightly salted. The barrels are then left to stand a week and a half till the fish are completely im-

pregnated with the salt, and then finally closed. The barrels generally used are 16 inches high and  $9\frac{1}{2}$  inches in diameter. Every barrel contains usually from 70 to 100 herring of St. John, or from 200 to 250 of St. George, and its weight varies between 34 and 42 pounds. To every barrel the fishermen take 4 pounds of salt in the spring, and 6 pounds in the autumn. The largest barrels, containing from 150 to 400 herring, are one "arsheen". (2 feet 4 inches) high, and half an "arsheen" (1 foot 2 inches) in diameter. At Archangel, the price of such a barrel varies from 30 to 50 "kopecks," (21 to 35 cents.) For salting, Spanish or Archangel salt is used.

The herring are smoked in some villages of the district of Kem, at Saroka, at Jisma, and at Saukhoï Navoloki, where there are 80 smoke-houses. The village of Ouna, in the district of Onega, has 4 smoke-houses. They are simple sheds covered by a slanting roof, with small apertures to let the smoke pass out. Parallel to the walls, fifteen or more poles are placed at a distance of  $1\frac{1}{2}$  "arsheens" (3 feet 6 inches) from each other, supporting other poles, which are placed across the former. On these poles small laths are placed, pointed at the end, and on which the herring are spitted, after having been washed and salted. After eight or nine days, the herring are thoroughly smoked. The whole process usually takes twelve days. The smoked herring cost 90 "kopecks" (63 cents) a thousand, and sometimes even 1 "rouble" 25 "kopecks," (about 87 cents.) Not less than ten millions of herring are smoked every year.

## 2.—THE SALMON.

They distinguish three kinds of salmon according to the time when they show themselves in the rivers. The first makes its appearance immediately after the breaking of the ice, toward the end of May or the beginning of June. Its roe is almost matured. The salmon of this kind is of medium size, and weighs about seven pounds. The second kind appears toward the end of June and during July; it is small, and weighs only three pounds. At this time, male fish are found with the milt almost matured. The third kind begins to ascend the rivers in August, and stays there till the water is covered with a slight coating of ice. Among them are found males as well as females; but milt and roe are so little developed that this salmon cannot spawn that same autumn. This kind is the largest and fattest; some caught in the Dwina and Onega weighing twenty pounds. The first two kinds named enter the rivers to spawn during the autumn of the same year. After having spawned, they spend the winter in the rivers, returning to the sea in the spring. In the Petshora, the Mezenc, the Dwina, the Onega, and the Varzoukha, the salmon is caught in enormous quantities.

*Implements for salmon-fishing.*—The bars, which extend over the entire breadth of the river or over a portion of the stream, consist of stakes firmly driven in the ground, to which poles are attached support-

ing a sort of trellis made of boughs. These parks are arranged in zig-zag shape, the outer angles having openings, where leaps or wooden boxes are placed. These bars are not used in the Petshora, the Mezene, the Kouloï, and the Dwina, but in all the other rivers falling into the White Sea.

As soon as the rising of the river has subsided, people begin to build these bars, always leaving an opening of 3 "sagènes" (21 feet) to let the fish and the boats pass. The bar of the river Ponoï consists of two parallel rows of stakes on which transverse beams rest, surmounted by long thick poles weighted down by stones. The stakes are driven in at a distance of 2 "sagènes" (14 feet) from each other. In the intervening spaces, horizontal and vertical poles are fixed, furnished with a trellis of thin branches, and here the apparatus for catching the fish is placed, consisting of a large box whose opening is turned toward the mouth of the river. This apparatus is called "taïnik" in Russian. A funnel, 10 inches broad and  $1\frac{1}{2}$  "sagènes" ( $10\frac{1}{2}$  feet) long, leads to this box, open at the top and crossed by planks, on which the fisherman stands ready to take out the captured salmon with a small net.

In the Onega, near the village of Podporojyú, the bar has only one row of wooden stakes, on which thick poles are placed, weighted down by heavy stones. In the intervening spaces, poles driven in at a distance of 2 "arsheens" (4 feet 8 inches) from each other, support the trellis. As rafts of timber and planks float down the river, bars have been built 2 "sagènes" (14 feet) in front of the chief bar, in order to preserve them against accidents. These last-mentioned bars are a sort of ramparts formed by beams floating on the water and attached to trestles placed there for the purpose. In the Onega, no boxes, but sweep-nets, are placed on the bars. While the fishermen take up and examine the sweep-nets, they are replaced by a net stretched on a wooden frame, so as to prevent the fish from passing.

Near the town of Onega, they use, besides the sweep-nets, a bog-net called "kourma." This is placed opposite the opening of the sweep-net, and is intended to catch those salmon which may attempt to escape the moment the leap is taken up.

At the bar of the river Kitcha, another sweep-net is used, which has the shape of a truncated pyramid, and consists of a certain number of poles fastened in a wooden frame. The foremost part of this pyramid is open and is turned toward the opening in the bar. A funnel-shaped net, called "gorge," is attached to the frame, having the shape of a quadrangular, truncated pyramid. This apparatus is placed on a support by means of a winch, and one of the fishermen slips inside to take the salmon. The sweep-nets of the bar of the river Souma are called "merschi," and consist of several wooden frames resembling the apparatus which has just been described.

Skillful divers are kept at all the bars, who immediately repair any damage done under the water. These bars are constructed and put in posi-

tion by special manufacturers, who inspect them during the fishing-season, and take them to pieces at the end of the autumn.

In June and July, they fish for the salmon with seines 6 "sagènes" long, (42 feet,) whose bag is 4 "sagènes" (28 feet) long and 3 "sagènes" (21 feet) wide. The meshes of the bag are an inch square, and those of the wings of the seine from  $1\frac{1}{2}$  to  $2\frac{1}{4}$  inches. These seines are also used as stationary nets. The following is the method of fishing: One of the fishermen remains on shore and holds the cord attached to the shortest wing. The others gradually lower the net into the sea, standing at a distance of several "sagènes" from each other. One-half of the net is in a straight line from the shore, while the other half forms a large semicircle, whose extremity approaches the portion under water in the shape of a hook, in such a manner that there is a passage of 4 "sagènes" (28 feet) between the halves, which leads into the hook above mentioned. As soon as one of the fishermen, who is on the outlook in one of the boats, notices that a certain number of salmon have entered the net, he detaches from the pole the cord keeping back that end of the wing of the net which forms the hook, and takes off the nippers holding the bolt-ropes to the poles, so that the longer wing of the net becomes free and can be hauled on shore by means of a winch. The salmon which have been caught in the hook are in this manner forced to enter the bag, which the fishermen afterward draw on shore.

In the Petshora River, seines are used measuring from 250 to 400 "sagènes" (1,750 to 2,800 feet) in length.

They first place a net on the shore in a perpendicular position and fastened to poles, and then a second net is cast so as to form with the first the letter T. At the ends, there are curtains of crescent or polygonal shape, whose concave portion is turned toward what is called the "wall," viz, the perpendicular net on the shore. The entrance is between two nets which join the stationary nets in a slanting direction. The bottom of the apparatus where the fish are caught is likewise formed by a net.

When the salmon approach the shore, they meet the "wall" and follow it till they enter into the apparatus itself, from which they cannot escape.

Other stationery nets, simple parts of nets, have only a single "wall," and are placed on the shore in a perpendicular position. At the mouth of the Petshora, one of these "walls" extends as far as five and even seven "verst" from the shore, (two and two-thirds miles to four miles.)

Every net is from 40 to 50 "sagènes" (280 to 350 feet) long, with meshes  $3\frac{1}{2}$  inches square, sixteen of which make the height of the net. A certain number of these nets are tied together, the head bolt-ropes being fastened to poles driven in at a distance of 15 "sagènes" (105 feet) from each other. The nets are examined at the time the tide is out, and the salmon caught in the meshes are taken out. These nets are set during the month of July, and taken up in September. They also use the



drag-net, which consist of two or three parallel nets, the inner part of which has small meshes, while the two outer have large ones, or a single large-meshed net.

The floating seines used in the Dwina are from 150 to 200 "sagènes" (1,050 to 1,400 feet) long, seldom as long as 300 "sagènes," (2,100 feet.) Those of the Petshora are usually 200 "sagènes" (1,400 feet) long, and those of the other rivers from 80 to 100 "sagènes," (560 to 700 feet.) The depth of the seine is from 28 to 32 meshes, each measuring from 2 to 2½ square inches. Two boats, at some distance from each other, go down the stream dragging the net; they finally approach each other, and the net is gradually drawn into one of the boats. This fishing is carried on from the middle of July till the rivers are frozen.

Fishing is also carried on in these streams with floating nets in the shape of a bag, measuring 2½ "sagènes" in length, (17½ feet.)

In the dark autumn nights, the salmon, the pike, and the "lavaretus" are caught with fish-gigs by torch-light. The fish-gig has the shape of a fork with three or four prongs, each terminating in a barbed pike. A fire is made on a chafing-dish on the prow of the boat, so that the fish at the bottom of the river can easily be seen and speared. They also use fish-gigs composed of a whole bunch of prongs.

*Preparing the salmon.*—Salmon is mostly placed in the market salted, rarely smoked. The salting is done in the following manner: The head of the fish is cut off, the belly is opened, and the entrails are taken out; then it is washed clean and filled with salt; salt is also put under the gills, and the scales are usually rubbed with it. They calculate, generally, 17½ pounds of salt to 100 pounds of fish. The quantity of salt to be used depends also on the season of the year and on the quality of the fish. The best salmon comes from the Onega and the Dwina. That of the Petshora is larger and fatter, but it is salted so little that it becomes worthless.

### 3.—THE "NAVAGA" (*GADUS NAVAGA*) AND OTHER SALT-WATER FISH.

The "navaga" appears in large numbers at the mouths of rivers and near the sea-shore toward the end of the autumn. This fish, which is very voracious, spawns in the autumn. It has an excellent flavor, and is sent frozen, in enormous quantities, into the interior of Russia as far as Astrachan, where fish is so plentiful.

In the villages located on the rivers falling into the White Sea, flounders (*Pleuronectes flesus*) and plaice (*Pleuronectes platessa*) are, when caught, stuck on small poles, and are thus smoked; while at Mezene, they are salted. In the bay of Kandalakcha, a small kind of cod-fish is caught, which the fishermen salt exclusively for their own use.

*Implements for catching these fish.*—A line of twisted horse-hair is attached to a stick or to a piece of lath, from which hangs a piece of lead pierced by a strong wire. To the two ends of this wire, and sometimes also in the middle, thin little horse-hair strings are tied, furnished

with small fish-hooks. The fisherman makes a hole in the ice, and places the apparatus in the water, using small fish as baits. He draws it out soon to plunge it in again, for this fishing is very productive, a practiced fisherman often taking not less than 2,000 "navagas" in one short winter's day.

To fishing-tackle measuring 40 "sagènes" (280 feet) in length, copper or wire hooks are attached by means of horse-hair strings 10 inches in length. The hooks are placed at a distance of three-fourths of an "arsheen" (1 foot 9 inches) from each other, and are baited with small pieces of herring, or *lavaretus*, (*Coregonus polkur*.) This apparatus is placed in the spring near the shore.

#### 4.—RIVER AND LAKE FISH.

Among the river-fish, the sterlet (*Acipenser ruthenus*) holds the first rank. During the second decade of the present century, the sterlet first commenced to show themselves in the Dwina; then, in 1848 and 1849, in the Soukhona in large numbers. These precious fish seem to have come to the Dwina from the Kama through the canals. This fishery is, however, so far, not very considerable. As regards fresh-water fish, great quantities of "nalim," (*Lota vulgaris*;) of "koriouchka," (*Osmerus eperlanus*;) of *Coregonus* and of "minoga," (*Petromyzon fluviatilis*), are caught, these last mentioned chiefly in the Onega, while the "omoul" (*Coregonus omul*) and the "nelma," (*Coregonus leucichthys*), the Siberian salmon, are caught more frequently in the Petshora. Every year, about 100 "pouds" (3,600 pounds) of "minoga" (*Petromyzon fluviatilis*) are exported from the town of Onega. Next to the salmon, the "omoul" (*Coregonus omul*) finds the best market. They are salted in casks containing 12 "pouds" (832 pounds) each, reckoning about a pound and a half of salt to each "poud;" (36 pounds.)

The above-mentioned fish are either caught with lines, or with stationary nets having meshes from  $1\frac{1}{2}$  to 2 inches square. In the lakes, seines from 60 to 100 "sagènes" (420 to 700 feet) in length are used for catching scaly fish. Unfortunately, the spawn is also taken, especially in the lake of Koubino. For this purpose, hoop-nets are used with a bag measuring 4 "sagènes" (28 feet) in length. The meshes of the bag are so narrow that a fly could not pass through. Nine of these meshes measure only  $2\frac{1}{4}$  inches, while seven meshes of the wing of the seine measure  $2\frac{1}{2}$  inches. The roe of the "okoune," (*Perca fluviatilis*), and of the "yerschi," (*Acerina vulgaris*), is dried in ovens specially constructed for this purpose, and is used as a seasoning during Lent.

### B—FISHERIES IN THE ARCTIC OCEAN.

#### 1.—FISHERIES ON THE MOURMAN COAST.

The Mourman coast, in Russian Lapland, begins at the Cape of Saints, the point of demarkation between the White Sea and the Arctic Ocean,

and extends as far as the Norwegian river Worghema. On this coastline of eight hundred "versts," (about four hundred and sixty-one miles,) there are fine bays offering the fisherman good and safe anchorage. There are forty-one of these inlets into which rivers fall. At these points, the fishermen have built huts and sheds and scaffolding of various kinds, so that the shores of those bays which are frequented most look somewhat like large villages, busy with the excitement of fishing-life. The fishermen meet there in the spring and remain till the middle of August. Other anchoring-places, where the coast is almost barren, are frequented only in June and July by those fishermen who come from the populous anchoring-places, or by others who come from Archangel on large boats, manned by their masters, in order to catch a large number of fish in a short time.

*Species of fish found on the Mourman coast.*—The fisheries of the Mourman coast comprise especially the different varieties of "treska," (*Gadus morrhua*;) the "kambala," (*Pleuronectes fesus*;) and the "kambala," (*Pleuronectes platessa*;) a good many salmon also are caught near the mouths of the rivers.

Of the cod, the *Gadus morrhua* is caught most frequently. It spawns in February and in March, and is caught with baited hooks. For bait, the fishermen mostly use *Mallotus arcticus*\*, or *Ammodytes lanca*, or, in case of necessity, *Arenicola piscatorum*, a sort of thick worm dug out from the sand of the beach. The *Mallotus arcticus* and the *Ammodytes lanca* resemble the *Osmerus eperlanus*, and are, like it, easily distinguished by a peculiar odor resembling that of the cucumber. Among the varieties of the cod, there are the *Gadus aglefinus*, and the *Gadus virens*, the latter called "saïda" by the Russians.

The *Hippoglossus maximus*, Cuv., which the Russians call "paltouss," usually weighs 2 "pouds," (72 pounds;) but near the North Cape some are caught weighing 15 "pouds," (540 pounds.) The small kinds of plaice (*Pleuronectes platessa*, L.) and the *Pleuronectes limanda* have but little value as articles of commerce, as likewise the *Brosmius vulgaris*, a sort of cod; the *Sebastes norvegicus*, Cuv., called by the Russians "morskoï okoune;" and the *Anarrhichas lupus*, L.

The two kinds of sharks (*Scymnus borealis* and *Selache maxima*) are caught only for the sake of their liver, which is used in the manufacture of cod-liver oil.

*Fishing-implements.*—The "palangre" consists of a chief line as thick as a man's finger, and from 33 to 42 "sagenes" (231 to 294 feet) long, to which small lines of the thickness of a quill are attached at the distance of 1 $\frac{3}{4}$  "arsheens" (4 feet 1 inch) from each other. These lines have baited hooks. A succession of lines tied one to the other forms what is called in Russian a "yarous," extending from 6 to 10 kilometers in the sea. This "yarous," or train, is kept by three anchors a little above the bottom of the sea. Every anchor is attached by a cord to a

\*A fish similar to the capelin of the North Atlantic coast.

buoy, the location of which is indicated to the fishermen by a bunch of sea-weeds placed vertically on a pole.

The fishermen of the Mourman coast use only English hooks, which they buy from Norwegian merchants from the towns of Wardoe, Wadsoe, Hammerfest, and Tromsoe. They cost 8 "roubles" (\$5.60 gold) a thousand. Every fishing-boat, called "schniaka," uses not less than 5,000 hooks a year. These boats are open, and have only one mast, with a large sail and six oars. They are from 28 to 40 feet long, their breadth is from 6 to 9 feet, and their draught is  $4\frac{1}{2}$  feet. Their capacity is from 150 to 250 "pounds," (5,400 to 9,000 pounds.) The price of one of these boats, completely rigged, is 60 "roubles," (\$42 gold.) The fishermen will go thirty "versts" (upward of seventeen miles) out to sea in these boats.

Before setting out for the cod-fisheries, the fishermen provide themselves with a quantity of bait for their hooks, to be used on the following day. They begin to bait the hooks some hours before going to sea, and continue doing this till they reach the fishing-place. There a train, "yarous," is laid, and every six hours the captured fish are taken out. Returning from the fishing-expedition, the nets are hung up to dry on scaffolds erected for the purpose, after which boys of from nine to thirteen years put the "palangres" again in order; *i. e.*, disengage the hooks and the entangled lines.

Strong threads each 1 "arsheen" (2 feet 4 inches) long, with steel hooks, are suspended from the two ends of a slightly-curved iron rod. The hooks are baited. A cord 2 "arsheens" (4 feet 8 inches) long, with a piece of lead at the end, is attached to a ring at the middle of the rod. Then the whole is tied to a cord 280 feet in length. This implement is chiefly used by the Laplanders and by poor fishermen, who have no means for buying nets.

A large iron hook is moved easily by means of an iron ring with a pole, to which an iron chain of 4 "arsheens" (80 inches) is attached. This chain is connected with a cable 200 to 300 "sagènes" (1,400 to 2,100 feet) long, to which a weight of 10 "pounds" (360 pounds) is attached. Roasted phoca-fat is used for bait. In order to attract the sharks, large pieces of fat are placed in the deep sea in perforated boxes. The voracious shark rushes with avidity at the choice morsel of fat which is baited on the hook, and he is caught. To bring the captured shark to the surface of the water, a winch kept on the boat for the purpose is employed. When brought up, he is killed; the belly is opened, the liver is taken out, and he is then again thrown into the water. But in order that the body may not sink to the bottom and become the prey of other sharks, it is inflated with air by means of a long tube passed into the inside of the fish. In summer, the shark is caught at a depth varying between 100 and 300 "sagènes," (700 and 2,100 feet;) sometimes at 100 "versts," (about  $57\frac{1}{2}$  miles;) while in the autumn he is caught near the coast. It often happens that during the

few hours of an autumn day four fishermen catch sharks enough to yield as much as 100 "pouds" (3,600 pounds) of liver. The inhabitants of Kola catch the shark under the ice.

The small species of cod called *Gadus virens* is chiefly caught in July and August, when it rises to the surface of the sea in enormous schools. These small fish are caught like a large "carrelet," (a sort of square net fixed on a pole,) or globe, which hangs down in the shape of a bag, surrounded by a bolt-rope of the thickness of a finger. Every side of the net is from 15 to 17 "sagenes," (105 to 119 feet) long, and the meshes are an inch square. To the four ends long cords are attached, by means of which the fishermen keep the globe up and extended.

For this operation, four boats are required, each manned by three fishermen. As soon as a school of cod approaches, the fishermen cast the net into the water, first by the side of the school, and then they manage to get it underneath. To effect this, the cords attached to the four corners must be stretched evenly by the four boats. As soon as the net is placed horizontally beneath the school, the fish are frightened by yelling, striking the water with the oars, and by throwing stones into the sea, so that the fish, desiring to sink to the bottom of the sea, become entangled in the net which is below them. When this has been done, the four boats lift up the net by a regular movement. This fishery is very productive, each boat often receiving as its share about 200 "pouds" (7,200 pounds) of cod.

The small fish mentioned above, which resemble the *Osmerus eperlanus*, and are used as a bait for cod-fishing, are caught with hoop-nets 30 "sagenes" (210 feet) long. The meshes of the bags of these nets are so narrow that 44 of them make 7 square inches. When they have caught with the hoop-net 6 "pouds" (216 pounds) of these fish, it is considered sufficient to bait about 3,000 hooks on the following day.

*Preparing the various products of the fisheries.*—Among the various kinds of cod, the *Gadus morrhua* and the *Gadus virens* are salted or dried, according to the season, while the *Gadus aeglefinus* is almost always salted. The *Hippoglossus maximus* and the *Anarrhicas lupus* are only salted without cutting off the head, as is done with the different kinds of cod.

The way to prepare the cod is as follows: The head of the fish is cut off; then it is split open along the back, so that the vertebral column adheres to one-half. Then the belly is opened, and the liver and entrails are taken out; after which it is washed, and brought to the huts to be salted or suspended on poles to dry.

In the huts, the halves of the fish are laid out in rows, the side of the skin turned back, and every row is covered with a thick layer of salt.

They generally reckon from 17 to 20 "pouds" (612 to 780 pounds) of salt to 100 "pouds" (3,000 pounds) of cod-fish; and from 7 to 9 "pouds" (252 to 324 pounds) of salt to 100 "pouds" (3,600 pounds) of "pilchoni,"

or *Gadus aeglefinus*. The same quantity of *Hippoglossus maximus* requires 25 "pounds" (900 pounds) of salt. On the Mourman coast, Spanish and English salt are used, which can be imported duty-free. Wealthy fishermen usually buy their stock of salt in Norway, and sell some of it again to the poorer fishermen.

The cod salted in the spring are taken to Archangel in large sail-boats, and are much sought after as being freshly salted. The cod salted in the summer are carried in large boats, called in Russian "ladyà," which come from Archangel for this purpose. During the time of lading, and as long as the boats are at anchor near the fishing-places, the fishermen continue to salt, on board their boats, the fish taken during this time.

The cod is dried from the beginning of the fishing till the middle of May. The Russian fishermen do not take out the vertebral column as the Norwegians do. They split the back of the fish and open the belly, so that the two halves are connected only by the tail. The cod dried in this manner is by the Russians called "rochkirka," and by the Norwegians "roskaer." In Norway, they also prepare "rondfish," which the Russians call "rountovka." For this purpose, the head of the fish is cut off, and the belly is opened, but without flattening the opened fish. They are then tied two and two by the tails and hung on poles to dry. The Russians do not prepare what the Norwegians call "klipfish," that is, codfish salted and then dried.

As soon as the drying is done, the fish are taken from the poles, and heaped up like wood, placing on the top of each heap boards weighted down by stones, in order to flatten those fish which, while drying, may have become warped.

The dried cod is shipped from Archangel to St. Petersburg and to the districts of Olonets and Vologda. About 30,000 "pouds" (1,080,000 pounds) of dried cod arrive every year at St. Petersburg, and scarcely 5,600 "pouds" (201,600 pounds) of salted cod. The chief market for salt cod is the district of Archangel, especially the rural districts.

The heads of the cod-fish are generally thrown away, but sometimes the largest are gathered and spread on rocks to dry. They are taken to Archangel, where 50 "kopecks" (35 cents) are paid for a "poud," (36 pounds.) The chief buyers of this vile food are the peasants of the district of Pinéga, who live in the most wretched manner.

The tongues of the cod-fish are salted separately, 15 pounds of salt being used to 100 pounds of tongues. These salted tongues are sold at Archangel at 4 "kopecks" (2½ cents) a kilogram. From April till the middle of August, every boat can gather, if the fishing is good, about 1,600 kilograms of cod-fish tongues.

The swimming-bladder of the cod also forms an article of trade in the shape of fish-glue, after having been carefully washed, laid out, and dried. Packed in parcels of from 6 to 10 pounds, this fish-glue usually sells at Archangel for only 18 "kopecks" (12½ cents) a kilogram.

The liver of the cod-fish is gathered in tubs, and exposed to the heat of the sun. After ten days, a coating of oil of amber-color is found swimming at the top, which is skimmed and sold in casks containing from 8 to 10 "pouds," (288 to 360 pounds.) Three "pouds" (108 pounds) of liver usually yield 1 "poud" (36 pounds) of oil. The cod-liver oil sells at 2 "roubles" (\$1.40 gold) a "poud," (36 pounds.) The residue is cooked, and produces a dark-brown oil, which costs less than the first-mentioned kind. One "poud" (36 pounds) of this oil is usually obtained from 2 "pouds" (72 pounds) of the residue. The dark and burned matter remaining at the bottom of the kettles is sold to the Norwegians, who pay  $1\frac{1}{2}$  "roubles" (\$1.05 gold) or a bottle of rum for a barrel, and use it as grease.

*Organization of the fisheries.*—The financial condition of the fishermen, as regards both their mutual relations and their relations to their masters, varies according as the fisheries on the Mourman coast are carried on by fishermen who have established themselves there permanently, or by those who only stay there during the summer-months.

Among the permanent inhabitants of the Mourman coast are the inhabitants of the little town of Kola, and the Laplanders who live in the neighborhood. Those fishermen who have their own boats and fishing-implements buy on credit from the rich merchants of Kola all that is required for their households, and pay in kind, *i. e.*, by fish. The price of the fish is fixed by the merchant himself, to whom the fishermen are bound to deliver the fish caught during the spring-fisheries, which season is generally considered as continuing till the 29th of June. If their debts have been paid before this time, the merchant pays the fishermen up to the 29th of June in cash, the price determined beforehand for each fish delivered. After that time, the fishermen are at liberty to sell their fish to whom they please, and can fix their own price. The principal buyers at this time are the fishermen who sail for Norway to exchange fish, or those who come from there. In the autumn, the men lay in fish for their own winter-provision; but as soon as the frosts commence, they again deliver the frozen fish to the merchants, who send them to St. Petersburg. In the middle of December, the fishing stops entirely, to recommence three months later.

The poor inhabitants of the town of Kola, and most of the Laplanders, work as day-laborers with the merchants, and receive a certain share of the fish delivered to the merchants. The merchants furnish them fishing-implements and provisions, but they must generally pay for the boats from their own funds. The merchants divide the proceeds of the fisheries with their laborers, and buy their share of fish from them at a price fixed beforehand.

The organization of the fisheries of the "pomortsi," who only fish for some months on the Mourman coast, is entirely different. They form fishing-associations, each member receiving a certain portion of the

whole number of fish caught, while the largest portion goes to the head of the association, who defrays all the expenses.

Formerly, the inhabitants of Archangel and Kholmogori likewise fished on the Mourman coast; but at present the fisheries are almost exclusively carried on by the fishermen of the district of Kème and Onéga. Those fishermen who have the means to build small houses, depots, and sheds on the coast, as well as large and small boats, and to provide fishing-implements and the necessary provisions, become independent master-fishermen, and form associations, of which they become the leaders, and which are usually composed of four fishermen. The laborers hire themselves out, and receive in return part of the fish which have been caught.

The head of the association engages his laborers in the autumn or the beginning of the winter; gives them money to buy provisions for themselves and their families; and defrays all their expenses. Every head of an association has an anchoring-place in some bay on the Mourman coast. Thither he sends his laborers. These set out on their long and difficult journey about the middle of March. According to an ancient custom, the master (head of association) gives them a feast on the eve of their departure, and presents each with a piece of cloth sufficient for a pair of gloves. The pilot of the boat, and those laborers who have to draw the net, receive two pairs of gloves.

They reach the village of Kandalachka with tolerable ease, for the roads lead through well-known villages, where they are well received and conveyed on sleighs. But from Kandalachka to Kola and the village of Raznavoloki, a distance of nine hundred "versts," (about five hundred and eighteen miles,) they are obliged to perform the journey on foot, dragging their clothes and provisions after them on little sleds. From Raznavoloki to the fishing-places, they travel in sleighs drawn by reindeer, at the expense of the master; and from Kola on boats, with wooden runners. They hoist the large sail, and the wind drives them rapidly to the open sea. Having arrived at the place of their destination, they immediately set to work. They have to remove the masses of snow under which the huts and sheds are almost buried, to repair the boats, to get the fishing-implements into working-order; and, after all this has been done, they go to sea.

The money-value of the fishing is divided in the following manner: The master first takes two-thirds, and the laborers divide the other third, so that every laborer receives one-twelfth. If every one of them receives 100 "roubles" (\$70 gold) as his share, the total sum realized by the fishing has been 1,200 "roubles," (\$840 gold.) The pilot, who has to lead the expedition, must keep order among the laborers, and watch over the interests of the master, for which he receives a certain *pro rata* of the eight-twelfths which come to the master, and, moreover, a certain fee, which is fixed beforehand, and which varies from 10 to 50 "roubles," (\$7 to \$35.) In this manner, the master's portion amounts to 20 forty-eighths, while the combined portions of the four laborers amount to 19 forty-eighths, of



the whole sum. At first sight, it might be thought that the masters make a considerable profit, and that the laborers are working at a disadvantage. This, however, is not the case; for the sum which the laborers receive is the actual pay for their labor, while the master must deduct from his portion a large amount for the boats, fishing-implements, salt, &c. These expenses are seldom less than 250 "roubles," (\$175 gold,) so that, as a general rule, the laborers work on favorable conditions.

*The trade with Norway.*—The bartering-trade with Norway has been going on since the second half of the last century, and is increasing from year to year. The Russian vessels, laden with rye-flour, wheat-flour, millet, and oat-meal, are obliged to put into one of the four Norwegian ports of Wardoe, Wadsoe, Hammerfest, and Tromsøe, to declare their cargoes and to pay the duty; rye-flour, oat-meal, and building-materials alone being free of duty. The Russian government, upon its part, authorizes the citizens and peasants inhabiting the coast of the White Sea to export rye-flour and oat-meal to Norway, while the merchants of the first guild have the right to trade in other articles. The Norwegian authorities are very strict in their watch over the coast. As soon as the Russian sailors have been authorized to commence their bartering-trade, they sail for the different bays of the coast, where they have least competition to fear, and there exchange their cargoes of rye-flour and oat-meal for fish.

The Norwegian government allows the inhabitants of Finnmarken, during six weeks, viz, from the 1st of July to the 15th of August, (new style,) this bartering-trade with the Russian fishermen, who are also allowed to sell their goods for cash only to merchants. But when a Russian vessel has been in Norwegian waters for six weeks, it can also sell rye-flour to the inhabitants for cash, on condition that the regular terms of the bartering-trade are not exceeded, and not less than three bags to one buyer. The Russian fishermen find it much to their advantage to barter their cargoes for fish. They usually receive, for one "poud" (36 pounds) of rye-flour, from three to five "pouds" (108 to 180 pounds) of cod-fish, or four to eight "pouds" (144 to 288 pounds) of saïda, (a small kind of cod-fish.) The Russian fishermen usually exchange a portion of their rye-flour and their oat-meal for fish, and the other portion for walrus-skins.

From 400 to 500 Russian ships, manned by more than 2,000 men, devote themselves every year to this bartering-trade. It may be safely asserted that they export annually from Norway about 700,000 "pouds" (25,200,000 pounds) of fish. In 1860, the export amounted to a million of "pouds," (36,000,000 pounds,) because the cod-fisheries, and especially that of the "saïda," had been particularly rich.

The average prices at Archangel during the years from 1852 to 1860 were as follows: Salt cod, 60 to 75 "kopecks" (42 to 52 cents) per "poud," (36 pounds); dried cod, 1 "rouble" to 1½ "roubles," (70 cents to \$1.05 gold); salted "saïda," 20 to 30 "kopecks," (14 to 21 cents gold);

dried "saïda," 1 "rouble" to 1 "rouble" 20 "kopecks," (70 cents to 84 cents gold;) cod-liver oil, 2 "roubles" to 2 "roubles" 20 "kopecks," (\$1.40 to \$1.54;) dried cod-fish heads, 10 "kopecks," (7 cents.)

## 2.—FISHERIES AT NOVAYA-ZEMLYA.

Between the years 1830 and 1840, Novaya-Zemlya was visited by considerable numbers of "pomortsi," inhabitants of Mezene, and fishermen from the Gulf of the Petshora, and every year large sailing-vessels brought thence rich cargoes of salmon or trout, of seals and walrus. After that, the product of the fisheries and of the chase diminished; the animals left their usual places of abode and removed to others less accessible. The fishermen consequently ceased going to Novaya-Zemlya, so that in 1850 and 1860 only five vessels sailed for that group of islands.

The northern island of Novaya-Zemlya is most frequented by fishermen, while those who have strong and well-equipped vessels venture as far north as Matoschkine. The arrangements are made so as to arrive toward the end of June at Novaya-Zemlya, where the fishermen commence their work by hunting the seals and the walrus, and afterward devote themselves to fishing for the common trout, the variety called *Salmo alpinus*, which the Russians call "golets." This little fish, which only weighs four pounds, enters the rivers in large numbers during the spawning-season, when it is caught by means of small bars and leaps. They are fished for in the sea with seines and stationary nets. Every boat usually contains three seines and six stationary nets. The "golets" fishery is always productive; for during its stay in these latitudes, every boat catches about 300 "pouds" (10,800 pounds) of this fish. A "poud" (36 pounds) of salted "golets" costs 3 "roubles," (\$2.10.) In 1830, and during the three following years this fishery was so extraordinarily abundant that the fishermen were obliged to throw a large number of "golets" into the sea, because they had not salt enough. In 1852, the fisheries were also productive; the stationary nets contained on an average 20 "pouds" (720 pounds) of this fish, and one fisherman caught 480 "pouds" (17,280 pounds) in a single day.

The "golets" fishery ceases in the middle of August, and the fishermen sail for the "Iron Gate," the narrow channel which separates the northern island of Novaya-Zemlya from the island of Vaïgatch, where they hunt the walrus.

The fishermen always try to be at home again in September; most of them dread the idea of spending the winter in Novaya-Zemlya, on account of its severe and unhealthy climate. Some men, however, from the Gulf of the Petshora, always spend the winter there.

*The species sought.*—Seven different kinds of animals living in the sea are hunted on the northern coast of Russia for their fat and their skin. These are the "nerpa," (*Phoca anneallta* and *Phoca vitulina*, L.); the "zayats," (*Phoca barbata*, Nils.); the "lysoune," (*Phoca grænlantica*, Müll.); the "tevyak," (*Cystophora cristata*, Nils.); the "morje," (*Trichecus*

*rosmarus*;) and the "belouga," (*Delphinapterus leucas*, Pall.;) *i. e.*, five kinds of seals, the walrus, and the white orca.

The walrus is caught on the coasts of Novaya-Zemlya and the islands of Vaigatch and Kalgouyew; the "tevyak" on the Mourman coast, very rarely in the White Sea; the orca is caught in the White Sea by means of nets; the small seals and the "zayats" are shot with guns from the coast, or are killed with boat-hooks when they assemble in flocks on the ice with the "lysounes."

*b. Seal-hunting.*—On the eastern coast of the White Sea, the "Winter Coast," as it is called, and in the bays of the Dwina and the Mezeue, and on the coast of Kanine, they chiefly hunt the species of phoca called *Phoca groenlandica*. This phoca is larger than the kind found in the Caspian Sea, and usually yields six "pouds" (216 pounds) of fat. It is killed on the ice.

These animals live in the high regions of the Polar Seas from May till September, and only a few occasionally show themselves in the White Sea; but, later, they make their appearance in the gulfs and bays of the Arctic Ocean, where the females give birth to their young, and feed them. These animals pair in the beginning of February, on the ice in the White Sea, and especially in the Gulf of the Dwina.

At this time the hunting commences on the "Winter Coast" and lasts till the end of March.

The huntsmen carefully observe from the coast the movement of the floating ice. High wooden towers are erected for this purpose all along the shore, whence the observers watch the horizon with telescopes and when they have discovered an encampment of phocæ, they decide whether it is possible to get to them, and whether it is worth while to give them chase. Small hunting-sheds are also built along the coast, each of which can accommodate as many as twenty huntsmen. As soon as the phocæ show themselves at a short distance from the shore, the huntsmen venture on the floating ice, drawing a small boat after them, and they kill the young phocæ by blow with their boat-hooks, and the old ones by gun-shots. In order to approach the phocæ as near as possible, the hunters make use of the following ruse: They make themselves, as it were, invisible by muffling up in long and large and white shirts, and by advancing slowly and noiselessly on the snow. When the chase is over, the dead animals are at once skinned and dragged on shore. They usually kill only those which they can take with them for the wind easily drives the ice far away, and the booty would be lost to the huntsmen, who themselves are often exposed to the greatest dangers.

This chase takes place on the "Winter Coast," extending over a space of four hundred "versts," (two hundred and thirty miles;) and numerous huntsmen meet there from the districts of Archangel, Pinega, and Mezeue. The principal place of meeting, and at which generally two thousand huntsmen assemble, is called Kedy, and is located twelve "versts" (about seven miles) from Cape Voronov. The huntsmen have built at

this place about one hundred huts, where there is constant excitement from February till the end of March, while during the rest of the year these huts are deserted.

About the middle of March, the young phocæ are large enough to leave the ice and swim toward the open sea, whither the old ones do not follow them. They assemble in the Gulf of Mezene, where they rest on the ice and pair. The pieces of ice in the gulf are sheltered from the wind, and are not carried about by the waves, although they melt a little, especially during the rainy periods.

Numerous societies of huntsmen assemble in the beginning of April at the mouth of the river Kouloï, in order to follow for several weeks the chase of the phocæ on the ice. They use sailing-vessels 22 feet long, with an iron-plated bottom. Every vessel is manned by seven huntsmen, is completely equipped, and furnished with provisions and fuel.

The huntsmen all leave the shore at the same time; and, having reached the floating ice, they draw their vessels on the ice, and there establish a vast encampment. The younger and more active huntsmen are sent out to reconnoiter. Provided with snow-shoes, they hasten in all directions to search for the phocæ. As soon as they observe a flock, they advise the other huntsmen of the fact, and these all run toward the spot, drawing their boats after them. Having arrived within gunshot distance, the most expert are placed in the front rank and commence the chase; for every shot must kill, and not merely wound, lest the cries of the wounded phocæ frighten the whole flock and make them speed away. The animals which are killed are then placed in the boats, and the huntsmen return to the shore—sometimes on the ice, sometimes on the open sea—to deposit there the result of the chase, and bring new provisions to the comrades who had been left there.

The huntsmen usually receive from their master, provisions and clothing for the whole season, and must give him in return half or even two-thirds of all the animals which have been killed. The more hardened and expert a huntsman is, the larger is his share. Every society of twenty huntsmen elects a "starosta," (the old one,) whose duty it is to guard the coast and prepare the food, without receiving for this a larger share than the other huntsmen.

On the western coast of the White Sea, (called the Terski coast,) the phocæ-chase is not as productive as on the eastern coast, because the pieces of ice, driven toward the north, float along the shore. Scarcely more than 15,000 "pouds" (540,000 pounds) of phocæ are caught there every year.

In these latitudes, the principal meeting-place of the huntsmen is sixteen "versts" (about nine miles) north of the river Pouoi, and is called Deviataya. Huts are built here, and about five hundred huntsmen assemble, who form themselves into societies. Every society is composed of a master and three huntsmen. While one of the members of the

society remains on shore with his sleigh and his reindeer, the other three venture on the pieces of ice to discover the phocæ, which are sleeping there. Every huntsman wears over his clothes a short cloak of reindeer-skin, called "sovik," and has on his feet large boots lined with fur. At the end of a long strap passed over his shoulder he draws a small boat, weighing 20 kilograms. A game-bag with provisions is attached to his belt. His gun on his shoulder, and having in his hand a long stick, with an iron point, he rapidly and skillfully advances, by means of his snow-shoes, over the vast fields of snow and ice. The hunter who leads directs his course by a mariner's compass, and with his iron-pointed stick constantly tries the firmness of the ice. He acts as guide, and his two comrades follow him in single file, drawing their boat after them. When they have arrived at an expanse of water where phocæ are swimming, two of the huntsmen fire, while the third pushes the boat into the water in order to take up the dead animals, which he hoists into the boat by means of a boat-hook.

The chase commences early in the morning, and the huntsmen do not return to their hut till evening; a flag hoisted on the shore indicating to them its position.

b. *The chase of the white orca.*—The white orca, (*Delphinapterus leucas*, Pall.) in Russian "belouga," (the fishers of the Caspian Sea also call the great sturgeon "belouga,") is found nearly all the time in the White Sea in large numbers, but chiefly in June and July. The young orca begin to swim in May; their color is a bluish-gray, while that of the old ones is yellowish.

The orca are caught in all the bays of the Polar Sea, especially on the Kamine coast near Mezene; in the White Sea; and at the mouths of the Petshora. The fishing-implements used are seines joined together and fish-gigs.

In the summer, when the weather is calm and beautiful, large flocks of orca can be seen approaching the shallow places near the shore, or between the numerous islands of the White Sea. Several fishermen associate for hunting orca, each one furnishing a boat, and a large seine made of cords of the thickness of a finger, the meshes being 10½ inches square. The length of the net is 125 "sagenes," (875 feet,) and its depth 6 "sagenes," (42 feet.) The upper bolt-rope is furnished with wooden floats 1 "arsheen" (2 feet 4 inches) long, and placed at the distance of 2 "arsheens" (4 feet 8 inches) from each other; the lower bolt-rope has no ballast. These nets weigh about 23 "pouds," (828 pounds,) and cost 150 "roubles," (\$105 gold.)

A society has usually eight boats, each being manned by four fishermen besides the master, to whom the boat and the seine belong. The fishing commences at the end of June. The fishermen cast anchor near a group of islands, and wait impatiently for the watchmen to give the signal that a flock of orca is approaching. As soon as the signal is given, they row rapidly toward the place designated, taking good care,

however, not to fish in deeper water than 5 "sagènes," (35 feet,) lest the net, which is only 6 "sagènes" (42 feet) deep, as has been said before, should prove useless.

At first, the boats row without order; but as soon as they approach the orcæ, they place themselves in the following manner: the two middle boats approach each other and remain in the rear, while the others advance to the right and left, keeping at a distance of 120 "sagènes" (840 feet) from each other, *i. e.*, almost the length of the seine. In order that the fishing should be successful, it is necessary that the boats should advance, remaining always two and two, at the same depth; afterward, they must halt at some distance from the orcæ, and cast all the nets at the same time, after having tied them to each other. In this manner, the orcæ are surrounded, and endeavor in vain to break through. The circle is constantly growing narrower, and the orcæ are finally harpooned with fish-gigs having short handles, which are easily detached. The iron of the fish-gig is not beyond the fisherman's control, as it is joined to the hand by a cord used for pulling up the instrument and the pierced orca.

If the orcæ enter into a small bay, their retreat is cut off by means of large stationary seines, and they are easily captured.

*Hunting the walrus and the polar bear.*—About a dozen sailing-vessels devote themselves habitually to hunting the walrus from Cape Kanine to the mouth of the Kara. Every boat can carry 500 "pouds," (18,000 pounds,) and is manned by ten huntsmen, mostly inhabitants of Mezene and the Petshora Basin; sometimes, also, by well-to-do Samoyeds. The "Zyriany" and the poor Samoyeds serve among the Russians as laborers for very small pay and food.

In order not to expose these badly-built and badly-rigged boats to the dangers of the ocean, they are transported to the open sea, a distance of at least three hundred "versts" (one hundred and seventy-three miles) on sleighs drawn by reindeer. The expenses of this transportation, which are considerable, are repaid to the master, as he, besides receiving his share for each boat, receives three more portions of the whole product of the chase, which is divided into ten portions. The walrus-chase, in general, is but slightly productive. Scarcely more than six hundred of these animals are killed during a year. There are not sufficient funds to equip boats and to pay skillful and experienced huntsmen.

The polar bears live on the ice, on the islands, or on the coast. An experienced huntsman lets the animal approach within ten paces before he fires. If the bear is only wounded, the huntsman draws his hunting-knife, avoids the attack of the furious animal by leaping aside, and the moment he finds himself behind the bear he kills him. Nothing is more curious than the guns with which these hardy huntsmen attack the polar bears; they are simply manufactured by the village-smith! If the gun is not discharged, and the bear escapes, the huntsman values

his loss at 15 "roubles," (\$10.50); but if the same accident happens with a walrus, his loss amounts to 60 "roubles," (\$42.) It is not necessary to remark that the huntsman is often in danger of losing his life.

*Preparing the oil.*—From the fat of the animals which are hunted or fished for in the sea, as well as from the blubber of the whales which sometimes approach the coast of Lapland when the tide comes in, and which remain on dry land when the tide goes out again, an oil is prepared, which forms an important article of commerce.

In nearly all the coast-villages of the White Sea, there are oil-manufactories. The oil is prepared in the following manner: The fat, which has been secured by scraping, is thrown into large tubs and well shaken; the tubs are then exposed for some days to the heat of the sun. After this time, a layer of clear, limpid oil forms upon the surface, its color being yellowish; this is the first quality. The second quality is obtained by melting the residue of the scraped fat with the pieces of cut fat in a caldron containing a small quantity of water; this oil has a dark-brown color. The caldrons used for this purpose generally hold from 30 to 60 "pouds" (1,080 to 2,160 pounds) of fat; but the Archangel merchants, who send large quantities abroad, have in some villages caldrons holding from 80 to 120 "pouds" (2,880 to 4,326 pounds) of fat. In from ten to twelve hours, the whole mass is melted, and the oil is poured into casks holding from 20 to 32 "pouds," (720 to 1,152 pounds.) A "poud" of fat of the white orca usually yields 32 pounds of oil, while a "poud" of fat yields only 30. As regards the fat itself, the walrus, on an average, yields from 10 to 28 "pouds," (360 to 1,028 pounds;) the white orca, from 15 to 25 "pouds," (540 to 930 pounds;) and of the different species of seal, the *Cystophora cristata* yields 9 "pouds," (324 pounds;) the *Phoca grænlandica*, from 4 to 6 "pouds," (144 to 216 pounds;) the *Phoca annellata*, 3 "pouds," (108 pounds;) and young seal with white fur,  $1\frac{1}{2}$  "pouds," (54 pounds.)

*Preparing and cutting the skins.*—The skins of the *Phoca grænlandica* are bought by some merchants of Archangel, who salt them down in casks and send them abroad. These casks contain from 50 to 80 skins each, and they usually reckon from  $2\frac{1}{2}$  to 4 pounds of salt to each skin. Most of the skins of seals, orca, and walruses are used in the villages themselves.

When the skins have remained in the water for some time, and have lost all their hair, they are dried and tanned, and straps are made of them.

The skin of a large orca is cut into four straps, two from the back and two from the sides; that of a small orca, into three, two from the sides and one from the back. These straps are tanned and made into soles of boots and shoes and into harness. The skin of an orca can be made into from four to six pairs of reins and twelve pairs of soles.

From the skin of the *Phoca grænlandica* 70 "sagenes" (490 feet) can be cut.

The huntsmen derive the greatest profit, however, from the skins of the walruses. The Russian fishermen, especially the "promortsi," barter rye-flour very advantageously in Norway for walrus-skins. They usually get for 10 "pouds" (360 pounds) of flour two walrus-skins, which they sell at Archangel for 10 "roubles" (\$7 gold) apiece.

The monks of the convent of Solovetsk prepare the skin of the *Phoca annellata* in an admirable manner. The skins of polar bears cost 8 "roubles" (\$5.60) apiece at Archangel. They are warm and durable, but they are seldom tanned.

## C—FISHING AND SEAL-HUNTING IN THE CASPIAN SEA.

The Caspian Sea, with an area of 147,000 square miles, furnishes, perhaps, a greater quantity of fish than any other basin in Europe having the same extent. This also applies to the rivers falling into it: the Ural, the Volga, the Terek, the Koura, and the Séfid-Roud. It can be proved that the amount of fish caught is constantly increasing. Not less than 11,000,000 "pouds" (396,000,000 pounds) of fish are annually caught in the waters of the Caspian Sea.

The cause of this great abundance of fish must be found in the character of the water, which is but little salty, in the shallowness of the sea, and in the existence of numerous excellent spawning-places, especially in the immense delta of the Volga.

In the northern basin of the Caspian Sea, where the most important fisheries are located, the sea is shallowest, the greatest depth being about 8 "sagenes," (56 feet.) The southern and middle portions of this sea are, however, very deep; but no fishing is carried on there. In the northern basin, the water is scarcely brackish, often entirely sweet, particularly when there is a north wind, which carries the waters of the Ural and the Volga far out into the sea. The rivers falling into the Caspian Sea carry into it great masses of organic matter, which furnishes abundant food for the fish.

The delta of the Volga forms a vast net-work of long, narrow, and shallow lakes, called "limans," which are joined to each other, or to various branches of the Volga, by a large number of small water-courses; and here the fish find a peaceful retreat during the spawning-season.

### 1.—FISH FOUND IN THE CASPIAN SEA.

The cartilaginous fish or sturgeons are principally found in the Caspian Sea, and its tributaries, among which the Volga, with its immense basin, is the most important. The Russian fishermen call these fish "red fish." In the Caspian Sea and its tributaries, the following species of fish are found, of which the Russian name is always given first.

1. "Bélouga," (*Acipenser huso*), with an average weight of 3 "pouds," (108 pounds,) but frequently weighing from 20 to 25 "pouds," (720 to 900 pounds,) and occasionally as much as from 40 to 60 "pouds," (1,440 to 2,160 pounds.) In the year 1769, a "belouga" was caught in a bay



not far from the mouth of the Ural, weighing 70 "pouds," (2,520 pounds,) and containing 25 "pouds" (900 pounds) of roe. In 1813, one was caught in the Volga, near Saratow, weighing 80 "pouds," (2,880 pounds,) and containing 16 "pouds" (376 pounds) of roe. In 1843, one of 60 "pouds" (2,160 pounds) was caught; and, in 1849, one of 40 "pouds," (1,440 pounds,) measuring 2 "sagènes" (14 feet) in length. In 1854, a sturgeon was caught near Kazan and Nijni-Novgorod, weighing 60 "pouds," (2,160 pounds,) whose head alone weighed 17 "pouds," (612 pounds;) and another weighing 53 "pouds," (1,908 pounds.) In 1871, a "belouga" weighing 63 "pouds" (2,268 pounds) was caught near Derbent at a depth of 130 "sagènes," (910 feet.)

2. "Osètre," (*Acipenser Guldenstüdtii*.) Its average weight is 30 pounds; but many are caught in the Volga measuring from 4 to 6 feet, and weighing from 1 to 3 "pouds," (36 to 108 pounds,) sometimes weighing even 5 "pouds," (180 pounds,) and measuring from 6 to 9 feet in length. This fish is exceedingly prolific. M. Baer, a member of the academy, has found 600,000 eggs in one large-sized fish, and 260,000 in a medium-sized one.

3. "Sévriouga," (*Acipenser stellatus*.) Average weight, 15 pounds. It is caught in enormous quantities in the Koura, most of them weighing about 1 "poud," (36 pounds.)

4. "Chyp," (*Acipenser Schyppa*.) In the Ural. Weight, 1½ "pouds," (54 pounds.)

5. "Sterliad," (*Acipenser ruthenus*), sterlet. Two feet long; weight, from 15 to 20 pounds.

6. "Som," (*Silurus glanis*), Wels; sheat-fish. Length, from 3 to 6 feet; weight, as much as 6 "pouds," (216 pounds.) It is very common in the Koura, where it sometimes attains a weight of 8 "pouds," (288 pounds,) and a length of 1½ "sagènes," (10½ feet.)\*

7. "Bélorybitsa," the "nelma" of the northern rivers, (*Coregonus leucichthys*, Güldenst.,) an excellent fish, also known as the white Siberian salmon, is found in the Volga, rarely in the Ural, and not at all in the Térék and Koura. It weighs from 12 to 17 pounds, sometimes as much as 30 pounds, and measures 3 feet in length.

8. "Lòssoss," (*Salmo salar*), salmon. Is common in the Térék and the Koura, very rare in the Volga, and never found in the Ural.

9. "Chémayà," (*Aspius clupeoides*, Pall.) Is only found in the Koura and the Térék.

10. "Sazàne," (*Cyprinus carpio*, L.), carp. In the Caspian Sea and near the mouths of the Volga. Often from 3 to 4 feet long, and weighing from 40 to 50 pounds. Average weight, from 10 to 17 pounds.

11. "Karàss," (*Carassius vulgaris*), crucian carp. Common in the Volga. The largest are one foot long, and weigh 5 pounds.

12. "Soudàk," (*Lucioperca sandra*), saudre. From 15 to 20 pounds.

\*This is the European representation of the fresh-water cutfish or bull-heads of the United States.—S. F. B.

13. "Bersche," (*Lucioperca volgensis*.) Five pounds.
14. "Linn," (*Tinca vulgaris*), tench. The largest measure 2 feet in length, and weigh 7 pounds.
15. "Ousàtche," (*Barbus obtusirostris*, Yakovlew.) Rare in the Volga; common in the Koura.
16. "Piskar," (*Gobio fluviatilis*, Cuv.) Three inches long.
17. "Lestche," (*Abramis brama*.) From 8 to 10 pounds.
18. "Yersche," (*Acerina cernua*.) Usually 7 inches, but sometimes reaching 10 inches.
19. "Okoune," (*Perca fluviatilis*), perch. From 3 to 4 pounds.
20. "Sinétse," (*Abramis ballerus*, Cuv.) Found chiefly in the Volga; 10 inches long, and weighing rarely more than half a pound.
21. "Sopà," (*Abramis sapa*, Pall.) Common in the Volga.
22. "Gousterà," (*Blicca biærna*.) Thirteen inches; 2 pounds.
23. "Tchékhonne," (*Pelecus cultratus*, Agass.) Two feet; 2½ pounds.
24. "Oukleïka," (*Alburnus lucidus*, Heck.) From 4 to 6 inches.
25. "Jérékh" and "chéresper," (*Aspius rapax*.) Length, 2½ feet; weight, 16 pounds.
26. "Taràgne," (*Scardinius erythrophthalmus*, L.) Scarcely a foot long; common in the Volga. "Taràgne" is the collective name of several species of *Leuciscus* and *Abramis*; but, in the Don and the Azov Sea, the name "Taràgne" is only given to *Leuciscus Heckelii*, Nordm.
27. "Vòbla," (*Leuciscus rutilus*, L.) Length, 1½ feet; weight from 2 to 3 pounds, and found in the Volga in vast numbers.
28. "Koutoume," "Wyrezoub," (*Leuciscus Friesii*, Nordm.) Common in the Séfid-Roud, the Koura, and the Térék; very rare in the Volga, and never found in the Ural.
29. "Stchouka," (*Esox lucius*), pike. From 30 to 40 pounds; as much as 3½ feet in length.
30. "Béschenka," (*Alosa pontica*.)
31. "Jéleznitsa," (*Alosa caspica*), Astrachan herring.

These two last-mentioned species are known by the name of "Astrachan herring;" usually from 2 to 2½ pounds, and sometimes 4. Length, 1½ feet. They are very common in the Volga, which they ascend very far. Some are caught even at Koliázino, in the district of Tver. They are not found in the Ural, the Térék, the Koura, and the Séfid-Roud. The Azov Sea, the Black Sea, and the Caspian Sea contain no species of *Clupea*, Val.

32. "Podouste," (*Chondrostoma nasus*, Val.;) 1½ pounds.
33. "Minoga," (*Petromyzon fluviatilis*), Lamprey. Found in large numbers in the Koura and the Térék; common in the Volga below Astrachan; and, since 1870, very common near the towns of Ynotayeosk and Tchornoï Yar; and, since 1855, in immense masses in the district of Saratow.

Of these fish, those which furnish the principal articles of trade are the *Acipenser*, the *Silurus*, and, of scaly fish, the *Lucioperca*, the *Abramis*,

the *Alosa*, the *Leuciscus rutilus*, and the *Cyprinus carpio*, L. The *Coregonus leucichthys* and the *Salmo salar* are less important, and still less the *Esox lucius* and other small scaly fish. Pickled lamprey (*Petromyzon fluviatilis*) might form a considerable article of commerce, but, on the Terek, it is entirely neglected, and, on the Koura, it is dried and used as candles.

The first establishment for pickling lampreys was opened in the city of Tsaritsyn, after the close of the year 1871; and up to February, 1873, 700 casks, containing about 1,200,000 lampreys, had arrived at St. Petersburg, weighing not less than 56 kilograms (about 123 pounds) to the thousand, and being exceedingly well pickled; they are sold from 12 to 14 "roubles" (\$8.42 to \$9.80 gold) a thousand.

## 2.—SPAWNING-SEASON OF THE FISH IN THE CASPIAN SEA.

At Astrachan, the Volga is usually free from ice from the beginning of April, and the different kinds of fish arrive from the Caspian Sea about that time. The first to arrive is the *Scardinius erythrophthalmus*, L.; the "vobla," (*Leuciscus rutilus*), chased there during its capricious leaps from the water by the voracious "bélouga"; this is followed by the *Esox lucius*, pike; then by the *Abramis*, and by the *Lucioperca*, sandre. From the 20th of April till the 5th of May, the *Alosa*, or so-called herrings, appear in immense schools; then the "sévrionga," (*Acipenser stellatus*), sturgeon; the *Silurus glanis*, Wels; the *Cyprinus carpio*, L., carp; and, finally, the *Acipenser Guldenstädtii*, sturgeon.

Most of the scaly fish spawn in April or in May, and for this purpose seek the shallow water, where there is but little current, and where aquatic plants are numerous, and where fishing is strictly prohibited from the 15th of April till the 15th of May, in order that the spawning-process may not be interrupted. The salmon and the "clémaya," (*Aspius clupeioides*), which are caught in large numbers in the Terek and in the Koura, usually spawn in August and September, the first-mentioned on sandy bottoms.

The spawning-season of the sturgeon commences in the Volga in June and lasts till the end of July; in the Ural, it lasts from the middle of April till the middle of June. They prefer a hard and stony bottom. Only three hundred and eighty "versts" (two hundred and nineteen miles) above Astrachan, near Sarepta, the bottom of the river is of this character. In order to let the different kinds of sturgeon enjoy the rest which they require, the fishing-regulations forbid fishing in the Volga, as well in the river as in its branches, from the 15th of May till the 15th of July. Nevertheless, fishing is permitted exceptionally, to supply the local want, from the 15th of June till the 15th of July, between the Caspian Sea and the town of Tchornoï-Yar, two hundred and twenty-five "versts" (one hundred and twenty-nine miles) above Astrachan, with floating nets 90 "sagenes" (630 feet) long and 1 "sagene" (7 feet) deep.

Careful observations have shown that during the time immediately

preceding the spawning-season, the sturgeons eat nothing, while after spawning they are exceedingly voracious. In the rivers, the young sturgeon feed on the larvæ of insects and small shell-fish, and, in the sea, on small crabs and shell-fish. The little "bélouga" is an exception, feeding on other fish. The common sturgeon, the "séviouga," and the "sterliad," (*Acipenser ruthenus*,) also feed on shell-fish. When the sturgeons are one year old, they leave the rivers and go into the sea, to return as soon as they are able to spawn.

A very peculiar phenomenon in the Ural is the winter sleep of fish, especially of the sturgeon. From the end of June, the different kinds of sturgeon as well as scaly fish come to the Ural for the second time. For some time they can be seen swimming and playing in the stream, but as soon as the water grows cold this vivacity disappears; they seek the deep places, ("yatoves,") in which the bed of the river abounds, and hide there as soon as the surface is frozen. In their state of torpor, these fish secrete a viscous matter, which forms a thin layer over their whole body. The fishermen call this the "cloak" of the fish. This torpor, or sleep, of the fish is caused by severe cold and want of air under the water, and is therefore a consequence of the excessive weakening of the respiration. The fish eat nothing during this state, for nothing is found in their stomach but the viscous matter spoken of above. The great sturgeon alone (*Acipenser huso*) seems to take food during his winter-sleep, for some have been caught having scaly fish in their stomach.

The deep places, or "yatoves," of the Ural are from 7 to 8 "sagènes" (252 to 278 feet) deep, and the fish there pile themselves upon each other in thick layers. According to the account of experienced fishermen, sturgeons there associate only with sturgeons, and scaly fish with their own kind, never intermingling: the "sinètse" (*Abramis ballerus*) is the only scaly fish which has been found among the sturgeons.

Watchmen posted near the "yatoves," every one of which has its own name, notice exactly in what quantities the fish seek refuge there, and of which kind the fishing will be most productive. These watchmen develop a most astonishing sagacity in this respect.

### 3.—WEALTH OF FISH IN THE CASPIAN SEA.

Pallas, who visited the shores of the Caspian Sea in 1773, speaks of the immense quantities of fish in this sea. He says, in addition to other things, that, in the spring in the Koura, near the bar of Salyan, 15,000 sturgeons were frequently caught in one day; and that when the fishing was interrupted for one day only, the river, whose depth is 4 "arsheens," (80 inches,) was, at every bar, filled with a vast number of fish, piling themselves one upon the other to such a degree that the topmost had their backs out of the water. At that time, there was a bar at Gouryew, at the mouth of the Ural. It is related that at this place schools of sturgeon rushed at the bar in countless numbers, and would have upset it if the Cossacks had not driven them to flight by cannon-shots.

Similar stories are, it is true, not related in later times, but it is undeniable that the result of the fisheries during the years from 1820 to 1830 was perfectly enormous, and that this is not infrequently the case in our time. Thus, in 1826, during 12 consecutive days, an average of 15,000 sturgeon a day were caught, mostly "sévriongas" and common sturgeons, (*Acipenser Güldenstädtii*), at the fishing establishment ("vataga") of Providence, ("Bojii promysl,") on the Koura, fifteen "verst" (about eight miles) from the mouth of this river. There were not hands enough to carry on the work, so that an immense quantity of fish spoiled on the spot, and 40,000 of them had to be cast into the water. This "vataga" (fishing-establishment) was visited, in 1855, by the "Imperial commission for examining the fisheries of the Russian Empire." The commission was led by M. Baer, from the Imperial Academy of Sciences at St. Petersburg, the statistical work being confided to M. Danilevsky, while I had charge of the technical part.

I observed many a time that ducks and other aquatic birds, which, in the river Koura, swam on the surface of the water, fell victims to the voracity of the *Siluri*. Whenever a bird killed by a shot from a huntsman fell into the water, it was immediately seized and devoured by these enormous fish.

Every day from 3,000 to 5,000 "sévriongas" were brought to the "vataga," (fishing-establishment,) where the following quantities were caught annually: about 15,000 "bélogas;" 30,000 common sturgeon, (*Acipenser Güldenstädtii*); 250,000 "sévriongas;" and 230,000 *Siluri*.

Large numbers of the different species of sturgeon are also caught in the Ural, the Térék, and the Volga. The wealth of the northern basin of the Caspian Sea in fish is almost inexhaustible. More than 100,000 nets and at least 15,000,000 of hooks are here employed for sturgeon-fishing alone, and thousands of fishing-boats are continually engaged in this occupation. Immense nets are in constant use in the Ural, the Volga, and in the delta of this latter river; and it is no rare occurrence that at one single haul 40,000 "lestche" (*Abramis brama*) are caught, or 150,000 "voblas," (*Leuciscus rutilus*, L.) or 200,000 "jélezuitsa," (*Alosa caspica*.)

#### 4.—ESTIMATED VALUE OF THE FISHERIES IN THE CASPIAN SEA.

The quantity and value of the fish which are caught every year in the Caspian Sea and its principal tributaries, as well as the number of seals captured in this sea, can be estimated only approximately. This estimate amounts annually to the following:

"Béloga," (*Acipenser Huso*.) 475,000 "pounds," (17,100,000 pounds;) value, 1,288,000 "roubles," (\$901,600 gold.)

"Osêtre" (*Acipenser Güldenstädtii*) and "Chyp," (*Acipenser Schypa*.) 405,000 "pounds," (14,580,000 pounds;) value, 1,620,000 "roubles," (\$1,134,000 gold.)

"Sévriouga," (*Acipenser stellatus*), 65,000 "pouds," (2,340,000 pounds;) value, 1,962,000 "roubles," (\$1,373,400 gold.)

"Sterliad," (*Acipenser ruthenus*), 50,750 "pouds," (1,827,000 pounds;) value, 275,000 "roubles," (\$192,500 gold.)

"Sazane," (*Cyprinus carpio*, L.), 200,000 "pouds," (7,200,000 pounds;) value, 120,000 "roubles," (\$84,000 gold.)

"Soudah" (*Lucioperca sandra*) and "Stchouka," (*Esox lucius*), 2,650,000 "pouds," (95,400,000 pounds;) value, 2,450,000 "roubles," (\$1,715,000 gold.)

"Lestche," (*Abramis brama*), 1,375,000 "pouds," (49,500,000 pounds;) value, 1,275,000 "roubles," (\$892,500 gold.)

"Beschenka," (*Alosa pontica*), and "jeleznitsa," (*Alosa caspica*), 3,000,000 "pouds," (108,000,000 pounds;) value, 1,050,000 "roubles," (\$735,000 gold.)

"Vabla," (*Leuciscus rutilus*), 600,000 "pouds," (21,600,000 pounds;) "okoune," (*Perca fluviatilis*), 760,000 "pouds," (27,360,000 pounds;) value, 500,000 "roubles," (\$350,000 gold.)

"Som," (*Silurus glanis*), 185,000 "pouds," (6,660,000 pounds;) value, 315,000 "roubles," (\$220,500 gold.)

"Lososs," (*Salmo salar*), 33,000 "pouds," (1,188,000 pounds;) value, 106,000 "roubles," (\$74,200 gold.)

"Belorybitsa," (*Coregonus leucichthys*), 32,000 "pouds," (1,152,000 pounds;) value, 103,000 "roubles," (\$72,100 gold.)

"Béluga" bladder, 5,500 "pouds," (198,000 pounds;) value, 600,000 "roubles," (\$420,000 gold.)

"Veziga," 4,000 "pouds," (144,000 pounds;) value, 70,000 "roubles," (\$49,000 gold.)

Sturgeon caviar, 139,000 "pouds," (5,004,000 pounds;) value, 1,390,000 "roubles," (\$973,000 gold.)

Caviar of *Abramis brama* and the two kinds of *Lucioperca*, 300,000 "pouds," (10,000,000 pounds;) value, 300,000 "roubles," (\$210,000 gold.)

Fish-oil, 50,000 "pouds," (1,800,000 pounds;) value, 150,000 "roubles," (\$105,000 gold.)

Seals, 100,000 "pouds," (3,600,000 pounds;) value, 150,000 "roubles," (\$105,000 gold.)

Seal-oil, 100,000 "pouds," (3,600,000 pounds;) value, 350,000 "roubles," (\$245,000 gold.)

The grand annual total is therefore 13,000,000 "pouds," (468,000,000 pounds,) representing a value of 15,000,000 "roubles," (\$10,500,000 gold.)

##### 5.—FISHING-BASINS OF THE CASPIAN SEA.

The Caspian Sea forms four fishing-basins: 1. The trans-Caucasian; 2. The territory of the Terek Cossacks and the inhabitants of Mangy-schlak; 3. The territory of the Ural Cossacks; 4. The basin of fisheries belonging to the state.

*The trans-Caucasian fisheries.*—This basin contains four fisheries; those of Salyan and of Kizil-Agatch being the most important. The fishery of Salyan, to which the “vataga” (fishing-establishment) of Bojii-Promysl or Providence belongs, extends from the mouth of the Koura to the town of Salyan, where the river Akoucha leaves the Koura to follow its own course to the sea. At this point the fishery of Kizil-Agatch is located. The fisheries extend fifty “versts” (about twenty-nine miles) from the sea-coast. Above Salyan, on the Koura and on the Arape, the fisheries of Mougane, Chémakha, Elizabethpol, and Arase are found. The waters of Bakou extend from the mouth of the Alatchaï to Mount Akh Syvir, comprising a fishing-ground in the sea as far as fifty “versts” (about twenty-nine miles) from the shore, as well as the seal-hunting in the islands. The fisheries of Kouba commence at the mouth of the Samouch and extend to the district of Bakau.

The government always leases out the trans-Caucasian fishing-basins for a period of eight years; the contracts being made at Tiflis. From 1846 to 1854, the amount of rent received by the government was only 180,000 “roubles,” (\$126,000 gold.) It then rose to 320,000 “roubles,” (\$224,000 gold;) then to 385,000 “roubles,” (\$269,500 gold;) and at the present time it amounts to 390,000 “roubles,” (\$273,000 gold.) The person who rents a fishery keeps Tartar and Russian laborers at a fixed monthly salary, amounting, from 1846 to 1854, to  $4\frac{1}{2}$  “roubles,” (\$3.15 gold.) He also supplies the laborers with food, fishing-implements, and boats. Besides their fixed monthly pay,  $1\frac{3}{4}$  “kopecks” (not quite one cent) is given for each sturgeon that is caught.

At the “vataga” (fishing-establishment) of Bojii-Promysl, fifteen “versts” (eight and a half miles) from the mouth of the Koura, and in the Akoucha, there are bars formed by poles and stakes driven into the bed of the river, forming a curved line from one shore to the other. In every bar, openings are left 3 “sagenes” (21 feet) broad, called “gates,” for letting boats and fish pass. But, contrary to the regulations, these openings are usually closed by means of stationary nets. Fishing is always very good in all the space between the bar and the sea. People fish here with hooks, stationary lines, “palangres,” and with large and small nets and seines. The lines, being furnished with pointed hooks, which are not baited, are either held up by floats or are ballasted and arranged in rows. The fish coming from the sea are caught on the numberless hooks, and are taken up by the fishermen, who patrol all the rows of lines regularly. Besides these implements, stationary and floating nets are also used. For catching the “som,” (*Silurus glanis*), the so-called “eissage” (very large nets) are employed. The “som” is only fished for in the spring; during the other months of the year it is entirely neglected, because a great deal of salt is required to preserve this extraordinarily fat fish, and much fuel to extract the oil, both of which articles are scarce and expensive. In the autumn, the “chémaya” (*Aspius clupeoides*) is caught by means of floating nets, the thick part of which is made of

silk. Seines are but rarely employed for catching scaly fish, and this is only done in the Upper-Koura.

The person who rents a fishery is bound by his contract to fulfill the following obligations: Fishing is prohibited from the 1st of June to the 1st of August. During this period, the gates of the bar must remain open; and it is forbidden to put any lines or nets there, in order that the fish may be enabled to come up from the sea and reach their spawning-places. A fine is imposed for breaking this law, amounting to 1,000 "roubles" (\$700 gold) the first time, 2,000 "roubles" (\$1,400 gold) the second time, and, if it occurs a third time, the contract is annulled. If the lessee erects new bars of his own accord, he is punished by having his building-material confiscated; in case of a second offense, he pays a fine of 2,000 "roubles" (\$1,400 gold) the first time, and 4,000 "roubles" (\$2,800 gold) the second time. If he receives permission to construct fishing-parks, bars of stakes, or nets, he must leave two-thirds of the breadth of the river open if he has any competitors farther up the river; and, if this is not the case, only one-sixth part. In navigable rivers, bars of any kind must not occupy more than one-fourth of the breadth of the river. Moreover, it is forbidden to obstruct rivers, branches of rivers, mouths of rivers, and lakes with apparatus of this kind. Finally, to allow the fish to ascend the rivers easily, it is not allowed to cast a second seine before the first one has been taken on shore.

The lessee procures the necessary salt for preserving fish and for preparing caviar from the government salt-depots. In the district of Bakou and in the region of the salt-lakes of Salyan, salt costs 12 "kopecks" (about 7 cents) a pound. The lessee cannot get more than 130,000 "pouds," (4,996,000 pounds;) but he has the right to buy salt at Astrachan or other cities of the empire.

According to the exact statistics of M. Danilevsky, the trans-Caucasian fisheries yielded during the period from 1848 to 1855 the following:

Years.	Number of fish caught.							
	"Belouga," ( <i>Acipenser Huso</i> .)	Sturgeon, ( <i>Acipenser Guldenstädtii</i> .)	"Sévriouga," ( <i>Acipenser stellatus</i> .)	"Chypre," ( <i>Acipenser Schlegelii</i> .)	Situri.	"Clémara," ( <i>Aspius clupeoides</i> , Pall.)	Salmons.	"Sazane," ( <i>Cyprinus carpio</i> , L.)
1848	6,734	52,126	514,923	14,693	127,663	208,563	21,779	46,653
1849	8,093	27,723	492,458	14,751	79,537	306,094	91,192	33,764
1850	12,020	29,601	538,502	16,906	82,444	98,972	23,636	69,830
1851	12,507	28,576	464,923	14,975	64,066	161,337	30,594	31,378
1852	14,523	36,363	556,563	11,170	116,131	206,755	24,754	69,498
1853	9,527	35,297	513,132	13,685	107,413	191,561	22,371	41,574
1854	6,572	23,256	436,495	14,919	59,499	70,995	9,531	46,362



Years.	Caviar.		"Bélouga" bladder.		"Véziga."		"Balyk."	
	"Pouids."	Pounds.	"Pouids."	Pounds.	"Pouids."	Pounds.	"Pouids."	Pounds.
1848	26,522	952,792	533	19,188	724	26,064	278,786	10,036,296
1849	30,095	1,053,420	567	20,412	770	27,720	312,036	11,233,296
1850	31,969	1,150,784	657	23,652	880	31,680	323,207	11,635,452
1851	28,484	1,025,424	586	21,096	767	27,612	300,593	10,821,148
1852	34,089	1,227,204	690	24,840	850	30,600	281,833	10,145,983
1853	31,784	1,144,224	617	22,212	820	29,520	264,659	9,527,724
1854	24,721	889,956	531	19,116	720	25,920	304,342	10,956,312

*Fisheries in the territory of the Terek Cossacks and of the inhabitants of Mangyschlak.*—This basin comprises two districts, that of Tchétchène and that of Bakhtémir. The former extends eleven "versts" (about six miles) along the coast; the latter fourteen "versts" (about eight miles) from the Gulf of Bakhtémir to the possessions of the Schamkal of Tarki. In the sea, the extreme limit of the two districts is seventy-six "versts" (about forty-four miles) from the coast.

The right to fish in these waters belongs both to the Cossacks of the Terek, and to those fishermen who, by paying a certain sum of money, receive a permit from the military authorities.

The fishing-basin of the inhabitants of the Peninsula of Mangyschlak in the northeastern portion of the Caspian Sea extends from Cape Tiouk-Karagane twenty-five "versts" (fourteen miles) toward the north, and the same distance toward the west. It has an area of six hundred and twenty-five square "versts," (about two hundred and seventy-three square miles.) Only the inhabitants have the right to fish here.

*Fisheries in the territory of the Ural Cossacks.*—This exceedingly rich basin comprises (a) the river Ural, to a length of six hundred "versts" (about three hundred and forty-five miles) from its mouth to one hundred "versts" (about fifty-seven and one-half miles) above the city of Uralsk; (b) part of the Caspian Sea from the mouth of the Ural extending eighty-eight "versts" (about fifty and a half miles) to the west, and seventy-eight "versts" (about forty-five miles) to the east, and having a depth of 7 "sagènes," (16 feet 4 inches); (c) all the rivers and lakes in the interior of the territory; (d) a great lake, called Tcherkalskoë Mortso in the Kirghize steppe, which is connected with the sea.

All these waters are the undisputed property of the army of Ural Cossacks. The fishing-regulations are very old, and have, till the present time, been kept up by tradition and custom. The military authorities see to it that these regulations are strictly enforced. For every kind of fishing-industry, the military authorities publish regulations, stipulating the time of opening and closing the fisheries, the different formalities, conditions, &c.

As soon as the Ural is free from ice, the spring-fisheries commence. In the river, "séviougas" (*Acipenser stellatus*) are caught with floating

nets; sturgeon are caught in the sea; and scaly fish in the Tcherkalskoï Mortso. Fishing in the river is prohibited from the middle of June till the middle of August. The sturgeon appear in great numbers in the Ural in the month of July to seek refuge in the "yatoves," (deep places,) to which they, however, do not retire till October. The autumn-fisheries commence about the middle of August, first with stationary nets, then with floating nets and seines, and last till November. As soon as the Ural is frozen, they begin to catch the sturgeon under the ice by means of hooks and fish-gigs, ("bagrènié;") and scaly fish with seines in the river, and with stationary nets in the sea. Hook-fishing lasts till the middle of January, while nets are used till the first of March.

In order to allow the fish to enter freely into the Ural, fishing in the sea just at the mouths of the river is prohibited over an area eighty "versts" (about forty-six miles) long, and forty "versts" (about twenty-three miles) broad. Outside of this area it is allowed to place "palangres" perpendicularly on the shore for catching sturgeon. The number of "palangres" is fixed beforehand, and the most favorable locations are distributed by casting the lot.

In autumn, they fish in the lower part of the Ural over an extent of two hundred and eighty "versts," (about one hundred and sixty-one miles;) and 8,000 Cossacks, with 3,000 boats, are engaged in this occupation. The whole stretch is marked off into fifteen divisions. There is always one seine, with wings, to every two boats. The boats at first go slowly down the river in regular order, then, as they approach the "yatoves," (deep places,) where the fish congregate, all the boats use the oars to their utmost capacity, in order to arrive first.

After the "yatoves" of one division have been exhausted, they pass to another division, and so on in order. While the Cossacks go down the river in their boats, the merchants follow them along the shore, accompanied by wagons, on which the fish, which have been bought by them, are placed. Salting is carried on on the spot, as well as the manufacture of fish-gelc (isinglass) and of caviar.

From the city of Uralsk to the Cossack village of Antonov, people fish in the Ural under the ice with hooks and fish-gigs. This fishery is also carried on by divisions appointed for every fishing-day. The hook, called "bagor," is a fish-gig with a pointed steel hook attached to a wooden handle. Fishing with hooks is the favorite occupation of the Cossacks. Even the poorest among them can take a part in it; for the whole outlay consists of a hook, a sleigh drawn by a horse, and the necessary food and fodder for one day. At this season of the year, the price of fish is high, so that fishing becomes a very profitable occupation. Chance, however, has a good deal to do with success in this mode of fishing.

The fishermen form associations ("artelles") of from six to fifteen members, and divide the fish among them.

The value of these fisheries (by hook and by net) may be estimated with certainty at 400,000 "roubles" (\$280,000 gold) per annum.

The annual revenue of the fisheries of the army of Cossacks of the Ural is 1,200,000 "roubles," (\$840,000 gold.)

*Fisheries of the government.*—The following localities belong to the vast basin of government-fisheries: (a) the Volga, with its tributaries from the city of Kamyehine, in the district of Saratow, to the sea, which includes an area of 15,900 square "versts," (about 7,000 square miles,) with 135 fishing-establishments, ("vatagas"); (b) those portions of the sea in which fishing is free, according to the imperial decree of May 25, 1865. This part of the sea is divided into seven fisheries: 1. The southwest fishery, from the northern frontier of the territory of the Terek Cossacks to a point on the coast five "versts" (almost three miles) from the mouth of the Talovka, with an area of 1,501 $\frac{3}{4}$  square "versts," (about 657 square miles;) 2. That of the buoys of the Terek, from the boundary of the preceding division to five "versts" (almost three miles) beyond the mouth of the Prorva, with 1,252 $\frac{1}{2}$  square "versts," (549 square miles;) 3. That of the west from the boundary of the preceding division to the Island of the Four Hills, with 4,206 $\frac{1}{2}$  square "versts," (1,844 square miles;) 4. That of the buoys of the Volga in front of the mouths of the river from the Island of the Four Hills to the eastern extremity of the great gulf of Sinoyé Mortso, with 3,655 $\frac{3}{4}$  square "versts," (1,720 square miles;) 5. That of the northeast from this gulf to the western limit of the waters of the Ural, with 11,054 square "versts," (4,047 square miles;) 6. That of the Emba, from the eastern limit of the waters of the Ural to the fishing-basin of the inhabitants of Mangyschlak, with a surface of 60,596 square "versts," (22,667 square miles;) 7. The division of the high sea and the waters that wash the eastern coast of the sea to the river Atrek, which forms the boundary-line of Persia; the extent of this division has not been exactly measured.

All these divisions, not including the seventh, have an area of 82,267 square "versts," (32,286 square miles.) If one adds 15,914 square "versts" (3,398 square miles) of river-fisheries, the fourth fishing-basin comprises an area of 98,181 square "versts," (35,684 square miles.) It includes, at least in part, the districts of Saratow, of Astrachan, of Orenburg, of Stavropol, and of Daghestan. The administrative authorities have their seat at Astrachan. They were constituted by an imperial decree of the 25th of May, 1865, and are called "Administration of the fisheries and of the seal-hunt." This administration belongs to the ministry of domains, and it has officers appointed to secure the strict observance of the fishing-regulations. It also makes out the contracts and receives the payments for fishing-permits.

Not only are the river-fisheries of private individuals subject to the regulations, but also the fisheries of the cities, convents, and villages, as also those of the Astrachan Cossacks.

The river-fisheries of the Terek are leased out by the chamber of do-

mains at Stavropol for the annual sum of 28,000 "roubles," (\$19,600 gold.) The leases of the other fisheries yield the following sums: those of Prince Dolgorouki, 7,000 "roubles," (\$4,900 gold;) of Count Kouchelew-Bezborodko, 22,626 "roubles," (\$15,838.20 gold;) of the Astrachan Cosacks, 29,574 "roubles," (\$20,701.80 gold;) of the convent of Tchourki, 7,500 "roubles," (\$5,250 gold;) of the city of Astrachan, 1,863 "roubles," (\$1,304.10 gold.)

The government possesses in the Volga and its several branches, as well as in the innumerable lagoons and small brooks, ("yiryks,") sixty-three fisheries, which are leased separately. The lease is for seven years; the price of the lease amounting to 248,839 "roubles," 32 "kopecks," (\$174,187.51 gold.)

The administration of the fisheries issues special permits for fishing in the sea. The price of these permits varies, and depends as much on the season of the year as on the locality where people desire to fish. Every boat must have its permit. In the spring, the permit costs 20 "roubles" (\$14 gold) for fishing with stationary nets; in the autumn, 30 "roubles," (\$21 gold;) and for the whole year, 50 "roubles," (\$35 gold.) For fishing with seines, a permit is required for each seine, which costs 100 "roubles" (\$70 gold) a year, and 50 "roubles" (\$35 gold) for half a year. The seal-hunters pay for an annual permit 6 "roubles," (\$4.20 gold,) and for a half-yearly permit 3 "roubles," (\$2.10 gold.) A permit for fishing in winter costs 25 "roubles," (\$17.50 gold;) but those who have already a permit for the whole year, or two permits for six months each, receive the winter-permit gratis.

There are in these waters every year about 14,000 fishermen, with 3,000 large sail-boats.

Immediately in front of the mouths of the Volga, the limit of fishing is indicated by twenty-two lines of buoys. These lines are formed by beacons, or buoys, placed from 120 to 150 "sagènes" (840 to 1,050 feet) apart, in the direction of 32 degrees southeast, and extend into the sea fifty "versts," (twenty-eight miles,) with a depth of 3 "sagènes," (21 feet.) These lines are distant from two to six "versts" (about one and one-fourth miles to three and one-third miles) from each other. The two lines of buoys established before the mouth of the Térék follow the direction of 45 degrees northeast, and go out into the sea sixty "versts," (thirty-four and one-half miles,) with a depth of 4 "sagènes," (28 feet.) "Corridors," as they are called, from five to ten "versts" wide, (about three to six and one-third miles,) form openings before the mouths of the rivers to let those fish pass which are leaving the sea to ascend the rivers. Fishing in these "corridors" is prohibited. In the space between the lines, the fishermen can follow their vocation till the sea reaches the depth of 1 "sagène," (7 feet,) which is the case at about twelve "versts" (almost seven miles) out at sea, but only with "palangres;" while farther out at sea, at a depth of 3 "sagènes," (21 feet,) they can use "palangres" and stationary nets. In the first case, the

permit costs 30 "roubles" (\$21 gold) in the spring; 20 "roubles" (\$14 gold) in the autumn; and 50 "roubles" (\$35 gold) for the whole year; in the second case, 70, 50, and 100 "roubles," (\$49, \$35, and \$70 gold.) The fishing implements must be placed parallel with the lines of buoys. The rows of "palangres" are 22½ "sagenes" (147½ feet) apart, while the space between the rows of boats must be 135 "sagenes," (945 feet.) On an average, there are 5,100 fishermen, with 1,700 boats, employed annually in the fisheries among the buoys of the Volga.

Table of income from the government fisheries during the years 1867-1872.

Years.	Income from the leases of river-fisheries.			Income from the sale of permits.				Taxes on seal-oil and seal-skins transported to Astrachan.			Total.				
				Fisheries.		Seal-hunting.									
	Roubles.	Kopecks.	American gold, dol. lars.	Roubles.	American gold, dol. lars.	Roubles.	American gold, dol. lars.	Roubles.	Kopecks.	American gold, dol. lars.	Roubles.	Kopecks.	American gold, dol. lars.		
1867	210,861	47,147,603	03	209,035	146,324	50	1,479,103	30	40,302	5	22,211	804	461,577	05,324,103	234
1868	229,139	13,160,397	39	176,350	123,445	00	1,068,747	60	43,795	46	30,656	82	450,352	50,315,246	82
1869	229,868	13,160,907	69	163,930	141,751	00	963,674	10	34,549	01	24,124	30	429,310	14,300,517	104
1870	229,868	13,160,907	69	183,635	128,544	50	1,131,791	70	33,552	62	23,426	82	448,186	75,313,730	71
1871	248,839	32,174,187	52	183,700	122,590	00	999,699	30	24,888	12	17,421	67	444,923	32,311,428	31
1872	248,839	32,174,187	52	204,454	143,117	80	663,464	10	43,371	19	30,359	84	497,327	51,342,129	25

The taxes on seal-oil are paid by persons who buy the seals from the huntsmen as soon as these have returned from the sea to the mouths of the Volga. The taxes are paid as soon as the huntsman has sold his seals, or at the time when the buyer, after having notified the fishing-administration, gets ready to ship the casks of seal-oil. The tax is 30 "kopecks" (21 cents) for each "poud" (36 pounds) of seal-fat or seal-skins; and 40 "kopecks" (28 cents) for each "poud" (36 pounds) of oil.

Table showing quantities of oil and skins registered at the offices of the administration of fisheries.

Years.	Oil.			Skins.		
	Russian weight.		American weight.	Number.	Russian weight.	American weight.
			Pounds.		"Pounds."	Pounds.
1867	93,395	"pounds" 15 pounds	3,362,235	131,723	12,667	455,012
1868	104,161	"pounds" 5 pounds	3,749,801	150,947	14,786	532,296
1869	81,979	"pounds" 30 pounds	2,951,274	128,701	11,015	428,940
1870	78,790	"pounds" 15 pounds	2,836,455	137,030	12,674	446,264
1871	59,154	"pounds" 25 pounds	1,299,569	90,468	8,454	304,344
1872	102,874	"pounds"	3,703,464	156,759	13,692	492,012

Whoever introduces dead seals as contraband articles, or clandestinely sells or buys them, pays a fine triple the amount of the tax on seal-oil.

The fishing-regulations also impose fines for illicit fishing in the sea.

Thus, for the use of floating nets there is a fine of 20 "roubles," (\$14 gold,) and the fishing-implements and the fish caught are confiscated. Any person fishing in the "corridors," where fishing is prohibited, pays double the amount of an annual permit, either 100 or 240 "roubles," (\$70 or \$168 gold.) A person who is fined for the third time has not only to pay the fine, but is deprived for ten years of the right of fishing within the limits of the buoys. Persons using forged permits are arraigned before the criminal court. When a permit has run out, it must be delivered at the offices of the fishing-administration, and, if this is neglected, a fine of 5 "kopecks" (3½ cents) must be paid for each day of delay, till the maximum of 3 "roubles" (\$2.10 gold) is reached.

The river-fisheries of the government are subdivided into a certain number of small fisheries, which are leased. This, as well as the liberty of fishing in the sea, the system of buoys, and the fixing of certain periods when fishing is prohibited, has fully proved its beneficial influence and great usefulness. Formerly, there were at Astrachan only seven houses which dealt in fish and fishing-products; at present, there are in that city about thirty large and small fishing-houses, which compete with each other, not only in the preparation of fish and the different articles prepared from them, but also in the sums they pay to their employes and laborers. Poor fishermen—and their number is very great—who have commenced with but little, have been favored by fortune, and many of them have become the independent proprietors of large fishing-boats, on which numerous laborers earn a safe and good living. The prices paid by the fishing-houses are just double that which they were formerly. The system of buoys facilitates the passage of fish into the innumerable currents which form the mouths of the Volga, so that they cannot only reach the spawning-places, but ascend as high as the fisheries located beyond Kamychine in eight districts of the Volga basin. Special officers watch zealously over the strict observance of the new fishing-regulations, and the important process of spawning can now go on without the slightest risk of being disturbed.

An improvement, which is very desirable, and which has not yet been carried out, is the total abolition, or at least a great diminution, of the tax on salt. If this were done, the fish would be better salted, and certain kinds, which now, on account of the high price of salt, are not salted at all, would become an eagerly sought-for article of commerce. The Astrachan fisheries use at present not less than 2,500,000 "pouds" (90,000,000 pounds) yearly. The duty on salt is 30 "kopecks" (21 cents) on the "poud," (36 pounds.)

#### 6.—FISHING-IMPLEMENTS.

The implements used by the fishermen of the Caspian Sea are various kinds of nets, "palengres," hooks, and fish-gigs, which generally resemble those used in the Mediterranean, and are of ancient origin.

*Stationary nets.*—The nets that are in use are stationary nets float-

ing nets, seines, and cast-nets, ("éperviers.") The fishermen and proprietors of fisheries buy the material for the nets, viz, twine, thread, small cords, cords, &c., from the Astrachan merchants, who get them from Nijni-Novgorod, Kazan, and Saratow. They use for sturgeon-fishing in the sea nets which are 12 "sagènes" (84 feet) long and 4 "arsheens" (9 feet 4 inches) deep, made of five-ply or six-ply thread, with meshes  $3\frac{1}{2}$  to 4 inches square, and furnished with floats and leads. These nets are laid as deep as 4 "sagènes," (28 feet.) Generally, from 20 to 40 are joined, and sometimes even as many as 80 or 100, so as to form a straight line extending several "verst." The whole line of nets is held up by bolt-ropes on a row of stakes, which are driven into the bottom of the sea. Fishing with stationary nets continues from April till the end of May, and from August till the beginning of October. During the second part of the autumn and in the winter, they are but rarely used.

For catching the great sturgeon, ("bélouga,") especially in the winter, large nets 12 "sagènes" (84 feet) long and 6 "arsheens" (14 feet) deep, are used, with meshes 8 inches square.

In the lagoons, and in the narrow channels ("yéryke") connecting them, as well as in the mouths of rivers, stationary nets are also set for catching sturgeon and different kinds of scaly fish. According to the regulations, these nets must be set in such a manner as to leave one-third of the river unobstructed. The nets for catching scaly fish are made of 3 and 4 ply threads; are likewise 12 "sagènes" (84 feet) long, but not more than 2 "arsheens" (4 feet 8 inches) broad. The meshes are of different sizes. For *Lucioperca sandra* and *Lucioperca volgensis* and *Abramis brama*, they measure  $2\frac{1}{2}$  inches; for other small scaly fish,  $1\frac{1}{2}$  inches; and for *Coregonus leucichthys*, 4 inches. In places that are not very deep, these nets are attached to poles, while in deep places they rest on stationary stakes.

Among the stationary nets must also be classed the sweep-nets made of from four to seven osier hoops of different diameter, covered with a net forming a sort of hood over them. The circle which forms the entrance, and to which the hood and the wings are attached, has a diameter of from  $\frac{3}{4}$  to  $1\frac{1}{2}$  "sagènes," (5 feet 3 inches to 10 feet 6 inches.) The other circles, whose diameter diminishes gradually, are 1 to  $1\frac{1}{2}$  "arsheens" (1 foot 8 inches to 2 feet 6 inches) apart. The net extends  $1\frac{1}{2}$  "arsheens" (1 foot 8 inches) beyond the smallest circle forming the last bag; or, ending in a leap between the first and third circle, there is another net inside, in the shape of a funnel or truncated cone, called "straight entrance," ("goulet" in French,) whose inner opening, 4 inches broad, allows the fish to pass into the leap or bag. This entrance is kept open by means of cords. Each wing of the sweep-net is from  $1\frac{1}{2}$  to 3 "sagènes" (10 feet 6 inches to 21 feet) long, and the meshes are from  $1\frac{1}{2}$  to 2 inches square. The nets, which are fixed to poles, are placed in such a manner that the opening, like an enormous mouth, faces the fish,

which are going up the river. Several sweep-nets are usually placed side by side in such a manner that their wings form sharp angles. It is strictly forbidden to obstruct the whole breadth of the river, or the whole extent of a fishing-ground with a row of sweep-nets.

These nets are generally used in the winter; while, in the summer, small sweep-nets with one wing are used, chiefly for catching "som," (*Silurus glanis*.)

*Floating nets.*—The use of floating nets in the sea is strictly prohibited, because during the summer-months immense schools of sturgeon leave the sea to spawn in the rivers. It has sometimes happened that sturgeon have been caught in this manner, and for want of laborers and salt have been thrown into the sea after their roe and their swimming-bladder had been taken out. Whenever the officers of the fisheries find a fisherman with floating nets in the sea, they confiscate his nets and the fish he has caught, and make him pay a fine of 25 "roubles," (\$17.50 gold.)

The floating nets are from 12 to 15 "sagènes" long, (84 to 105 feet,) with meshes 4 inches square, of which 28 or 32 go to one net. The floats consist of wooden blocks one "arsheen" (2 feet 4 inches) long, cut in the shape of a spatula, and attached to cords, which are tied to the upper bolt-rope of the net, so that they can be lengthened or shortened at will, according as the school of fish keeps at a certain depth or near the surface. These nets have no lower bolt-rope and no leads. Two nets are generally tied together longitudinally, in order to double the total depth of the leap to 56 or 64 meshes. Every boat carries from 30 to 80 nets, which, bound together end to end, and thrown into the sea, form a wall of meshes several "verst" in length; and this, attached to one of the boards of the boats, is dragged along with the boat, while the latter is driven by the wind, till it extends facing the school of the advancing fish. Frequently, two boats keep the nets extended between them, and move with full sail to meet the school of fish.

In the Volga and its various branches, as also in the Ural, floating nets are used only for catching the several kinds of sturgeon. In the Terek, the "chémayà" (*Aspius clupeoides*, *Pall.*) is caught with simple floating nets, and in the Koura with silk nets. Floating nets in the shape of a bag are used in the Koura and the Volga for catching the "som," (*Silurus glanis*.)

The floating nets in the Volga have different names. For catching the "bélonga," (*Acipenser huso*,) they use the "pogonaïe" nets that are 150 "sagènes" (1,050 feet) long and from 7 to 11 "sagènes" (49 to 77 feet) broad, having meshes 6 inches square. For catching the sturgeon and the "sévrionga," (*Acipenser stellatus*,) they use, immediately after the ice has broken up, the "samoplavy;" and from the end of May to the middle of June, the "svintchatki;" then, immediately after the rising of the sea, which occurs in July, the "réjaki." The first-mentioned nets



are 90 "sagènes" (630 feet) long and 33 meshes broad, each of which is  $4\frac{1}{2}$  inches square. They have no lower bolt-rope. The "svintchatky" are from 60 to 130 "sagènes" (420 to 910 feet) long, and have two leaps, one of which, the outer, is woven with large meshes of 6 inches, and the other, or inner, with meshes of an inch and a half. One of the ends of the net has a float of reeds or of wood attached to the net by means of a cord 2 "arsheens" (4 feet 8 inches) long, while the other end is attached to the boat. The fisherman who is in the boat allows himself to be driven by the current, and is careful to see that the net and the float always follow in a straight line, and at an equal distance. The fish, which throw themselves on the net, go through the great meshes of the outer leap, and then find themselves caught in the inner one. The "réjaki" are 90 "sagènes" (630 feet) long, 2 "arsheens" (4 feet 8 inches) broad, and have meshes  $3\frac{1}{2}$  inches square, and a lower leaded bolt-rope.

In the Volga and its several branches, fishing is prohibited from May 15 to July 15, except with "palangres," and a seine of 50 "sagènes," (350 feet,) which the fishermen drag to and fro, running about on foot in the bed of the river in places which are not very deep, thus catching small, scaly fish. The fishermen are, moreover, authorized to catch sturgeon for their own use, between the city of Tchernoi-Yar and the sea, by means of floating-nets 90 "sagènes" (630 feet) long and 1 "sagène" (7 feet) broad. This fishing is permitted from June 15 to July 15.

The floating nets used in the Koura for catching the "chémaya" (*Aspius clupeoides*) have meshes  $1\frac{1}{2}$  inches square and are 12 "sagènes" (84 feet) long. Instead of floaters, the fishermen use hollow pumpkins. The bag nets for catching the "som" (*Silurus glanis*) have meshes  $2\frac{1}{2}$  inches square. The bag itself is 12 "sagènes" (84 feet) long and 5 "arsheens" (11 feet 8 inches) broad. In the Volga, these nets are used for fishing only in the spring and fall, and in the Koura, in January and February.

*Seines with bags.*—In the Volga and its tributaries, large seines ("eissaugues") are used, measuring from 300 to 400 "sagènes," (2,100 to 2,800 feet,) whose bag is from 6 to 12 "sagènes" (42 to 84 feet) long, with meshes one inch square. The meshes of that part of the wings which is nearest to the bag have the same dimensions, while those farther removed from it are from  $1\frac{3}{4}$  to  $2\frac{1}{4}$  inches in size. The wings are not of the same length. That which is cast first, the "coast-wing," as it is called, measures only 50 "sagènes," (350 feet,) while the other, which is cast so as to form a crescent, measures from 250 to 350 "sagènes," (1,750 to 2,450 feet.) The seines are used for catching *Lucioperca sandra* and *Lucioperca volgensis* and *Abramis brama*. It is no rare occurrence to take 30,000 to 40,000 fish at a single haul. From the middle of May till the beginning of July, seines are not used, because the banks of the river are overflowed and the current is exceedingly strong.

Two boats are absolutely required for this fishing; one of them, the

“nevodnik,” does nothing else but cast and haul in the nets; while the other, the “rybnitsa,” takes the fish which have been caught to the fishing-establishment, (“vataga.”) The “nevodnik” is manned by 8 or 12 fishermen, with a pilot, who directs the fishing, and has the general superintendence of the whole. On board the “rybnitsa,” which has two masts and is 36 feet long, there are 7 men, one of them being a pilot. It can carry 1,000 “pouds” (36,000 pounds) of fish. A “rybnitsa” costs from 150 to 250 “roubles,” (\$105 to \$175,) and a “nevodnik,” from 100 to 200 “roubles,” (\$70 to \$140.)

The places in the river where seine-fishing is to be carried on must have a uniform and even bottom, so that the nets can be dragged with an even movement, and may not be exposed to the danger of tearing.

According to the regulations, there can be only two seines in one and the same place, while the number of fishermen is also limited; for there must not be more than one fisherman to every 20 “sagunes” (140 feet) of net. The fishing-places must moreover be one “verst” (3,500 feet) apart. For catching the “Astrachan herring,” (*Alosa pontica* and *Alosa caspica*,) the number of nets is not limited; but, according to the regulations, the meshes of the bag of the net must measure three-eighths of a “verschok,” (little more than half an inch,) and those of the wing  $1\frac{1}{4}$  square inches. From the 15th of April till the 15th of May, these schools of herring are so numerous that the fishermen attach a second bag to the first, then again a third one to that, and do not draw the net on shore, but take the fish out with a hand-net and throw them into the “rybnitsa.”

In the sea, at a depth of from 5 to 7 feet, and especially in the spring and autumn, seines are used measuring from 300 to 400 “sagunes, (2,100 to 2,800 feet,) and the fish caught are chiefly *Lucioperca sandra*, *Lucioperca volgensis*, and *Abramis brama*, which at this time arrive in vast schools. The wings of the seine are of equal lengths. As soon as the approach of a school of fish is announced, the “rybnitsa” casts anchor, while the “nevodnik” uses all its oars or sails going toward the school and gradually casting the nets. On board the “nevodnik,” there are a pilot, six rowers, and two laborers. When the net has been cast, the “nevodnik” joins the “rybnitsa,” to which one of the ends of the seine is attached, and, all hands assisting, they begin to draw the net into the “nevodnik.” This last-mentioned boat is placed at a distance of one “arsheen” (2 feet 4 inches) from the “rybnitsa,” to which it is joined by strong transverse sticks. The net is drawn back underneath the hull of the “rybnitsa.” This must be done in an even manner, without any sudden jerks. In order to deprive the fish of every means of escape, the net is drawn in such a manner that the lower bolt-rope of the two wings slightly grazes the outside of the boat. For this purpose an iron implement is used, shaped like a heart, to the pointed end of which a long cord is attached. People fish only by daytime, and during the night the boats are drawn on shore. It is very interesting to see the fishermen go out into the sea to search for a school of fish. The experienced pilot who leads the ex-

pedition stands at the prow of the boat, constantly sounding the water with a long pole, to ascertain the presence of a school, or to see whether one is approaching. He also gives the sign as soon as he thinks the moment has come for casting the nets. Generally, the whole school is caught.

*Cast net.*)—These nets are chiefly used on the southwestern coast of the Caspian Sea, at Lencoran, and in the bay of Enseli. They are made of silk, and small scaly fish, and even roe, are caught with them. The cast net is a round, conical net. If taken up in the middle, it assumes the shape of a funnel, the lower opening having a diameter of  $5\frac{1}{2}$  "arsbeens," (12 feet 10 inches;) while in the middle of the net, which forms the apex of the cone, there is a thin cord 8 "sagenes" (56 feet) long. A slack silk rope is attached to this, ending in a noose, through which the hand can be easily passed. The opening is edged with a strong bolt-rope of the thickness of a finger, which is ballasted by small leaden tubes 6 inches long and 3 inches apart. In the spaces between the leads, cords 10 inches long are attached, with one end to the bolt-rope and the other to one of the meshes of the net above the bolt-rope. Thereby, the lower portion of the net hangs in the shape of a bag below each one of these cords, and the leads gradually approach each other. This is the old cast-net with blouses, or pockets.

When the net is cast, it spreads at first like a disk at the bottom of the water; then, as soon as the cord is drawn, the vertical cords are brought nearer together, and close the opening like a purse. The net thus forms folds, and the fish, which are underneath, get entangled in the meshes. It requires a certain degree of skill to cast the net. It is done in the following manner: The fisherman puts his left wrist in the noose, holds a portion of the net gathered in his left hand, and with his teeth takes hold of the cord with the leads. At the same time he gathers on his right arm about one-third of the extent of the net forming its opening, in such a manner as to let the end hang below the arm, while the remainder hangs down in front of his body. In this position, he seizes with his right hand the cord with the leads, describes a semicircle toward the left to give force to his throw, then turns quickly to the right, and, slackening the cord which he holds between his teeth, casts the net into the water with all his strength. The cord, weighted down by the leads, immediately sinks to the bottom, and the net, completely extended, catches the fish which are below. In order to draw it back, the fisherman lifts the net gradually by means of the cord, whose end he has not slackened, turning alternately to the right and to the left in order to bring the leads together more easily, and winds up by drawing in the whole net as rapidly as possible.

In order to attract the fish, small glittering stones, or little clay-balls, baited with worms, are thrown into the water. Fishing with the cast-net is only carried on during the night, and an even bottom, without stones or trunks of trees, is absolutely required.

"Palangres," cable-lines, (*cablières*,) and bottom-lines.—The cords, thread, and twine required for manufacturing the "palangres" are made in the villages and in some cities of the districts of Nijni-Novgorod and Saratow, whence they are sent to Astrachan. The hooks are made of wire and are barbed. These hooks are only used for the different species of sturgeon. A thousand of these books for fishing in the sea cost, if they weigh 3 "pouds," (108 pounds,) 17 "roubles," (\$11.90 gold;) those weighing 2½ "pouds" (90 pounds) to the thousand, cost 12 "roubles," (\$8.40 gold;) while the third kind, weighing 1½ "pouds" (54 pounds) to the thousand, generally cost only 7 "roubles," (\$4.90 gold.) In the rivers, hooks are used weighing 1½ "pouds," (54 pounds,) 1 "poud" 10 pounds, (46 pounds,) or 1 "poud," (36 pounds,) to the thousand; costing, respectively, 5 "roubles" 15 "kopecks," (\$3.60½ gold;) 4 "roubles" 60 "kopecks," (\$3.22 gold;) and 4 "roubles" 40 "kopecks," (\$3.08 gold.)

A "bottom-line" is a cord of the thickness of a finger and 20 "sagènes" (140 feet) long, to which pieces of whip-cord are attached about as thick as a quill, 12 inches apart, and furnished with hooks. The floats are of wood, 5 inches long and 2 inches broad. They are attached to the line, the distance between them being equal to that from the end to the fifth or sixth piece of whip-cord, making from twelve to fifteen floats to a line of 10 "sagènes," (70 feet.) From ten to fifteen of these lines are usually tied together and placed at a depth of 3 "sagènes" (21 feet) or more. They are kept in position by means of cords attached to stationary poles. In very deep places, anchors are substituted for the poles. In the summer, they are only left in the water one week, while in the other seasons they remain there two weeks. They are examined every day, and the sturgeons that have been caught on the hooks are taken off. They are placed in the sea in a straight line, and extend several "versts." The sturgeons approach "these palangres," and, anxious to pass through the free spaces between the pieces of whip-cord, are caught by the hooks, and the more efforts they make to disengage themselves the more do they bring the water in motion, and a larger number of hooks enter their body.

The "bottom-line" used in the Volga for catching the "sterliad" (*Acipenser ruthenus*) has usually 200 hooks, attached to pieces of whip-cord 11 inches long, and 15 inches apart, on the main line, which is 60 "sagènes" (420 feet) long. The hooks are made of wire, and a thousand of them weigh only 5½ pounds.

The "bélouga" (*Acipenser huso*) is caught in the sea with "palangres" at a depth of from 70 to 100 "sagènes," (490 to 700 feet,) the line having a diameter of half an inch and a length of 70 "sagènes." The hooks are attached to pieces of whip-cord, 1½ "sagènes" (10½ feet) long, and are much larger, stronger, and thicker than those used for catching the common sturgeon. A thousand of them weigh 3 "pouds," (108 pounds.) These hooks are baited with small, living, scaly fish, known by the name of "taranes," (a local name for bait fishes of several kinds of *Alosa*, *Abramis*,

*Leuciscus*, and *Cyprinus*), which are caught in the Volga immediately after the ice breaks up. In order to keep these small fish alive, the fishing-boat, which has sails, and is called "kouzovaya lodka," contains a large perforated box, which, by means of pumps, is constantly kept supplied with fresh water. When the fishermen have exhausted their stock of bait, they return to Astrachan. While the fishing is going on, the livers and the caviar of the "bélouga" are being prepared on board the boat.

*Spinning-lines and other implements with hooks.*—The "bélouga" (*Acipenser huso*) is caught under the ice in the sea by means of large perforated hooks of forged iron, baited with seal-fat. The hook is attached to a thick cord 30 "sagenes" (210 feet) long, only half of which is placed in the water, while the other half is rolled up at the edge of a hole which has been made in the ice. The other end of the line is attached to a strong piece of wood placed across the hole, and the middle of this line is tied to it with a thin thread, which tears as soon as a sturgeon has bitten, so that the remaining portion of the line unrolls and glides under the ice.

For catching the *Silurus glanis* in June and July, hooks are likewise used, baited with living frogs. The following is the method: The fishing boat is manned by two men. One rows and the other throws the line, which is attached to a rectangular wooden lever; at the same time he beats the water with a sort of shovel formed by a small piece of plank, which is slightly concave, and which is attached to a handle. This plank produces a peculiar noise, which attracts the *Silurus*, and, seeing the frog, it seizes it, and finds itself caught.

The *Coregonus leucichthys* is caught by means of the "blesnà," which consists of perforated hooks with a long shaft bearing a little tin fish, or a flat piece of tin shaped like a fish. Scales of the *Cyprinus carpio*, whose sparkling attracts the fish, are pasted on the flat part of the hook.

The Ural Cossacks use large steel hooks, sharply pointed and barbed, for catching the sturgeon under the ice. The line is attached to the thin end of a rod, whose length is in proportion to the depth of the river. Frequently, several poles are tied together; in order that the hook may descend vertically into the water, and may not be carried away by the current, leads are attached to the rod a little below the hook. Small poles are held in the hand, but generally they are evenly balanced on a tripod of wooden blocks or poles, at a convenient distance from the hole in the ice. Near this hole, an arch of osiers is stuck in the ice, to which the automatic apparatus is attached, by which, through a wooden pin, the line is kept in the position which is required for this kind of fishing—the thin end of the pole near the arch on the ice—and the hook at the desired depth. Whenever a fish seizes the hook, the pin is pulled out, the rod again becomes straight through the weight of its heavy part, and so pulls the fish out. Camps, "sidebki," of from 100 to 1,000 of these automatic arrangements may be seen every year on the ice of the Volga.

practical implement for freeing the nets of rubbish, which they invariably bring up with them from the water. It requires some skill and practice to use this tool, but it cleans the nets much better than any other used for that purpose. Strange enough, this useful implement is scarcely known outside of Snekkersteen and Skotterup.

43. *A net for catching porpoises.*—This is but seldom used, and there is only one such in the two fishing villages. Most fishes of the flounder kind are caught in "small nets," but the halibut proves too large for these. This fish is therefore caught with special halibut-hooks, (called "bagger" in Danish,) or with lines. All along the sound, nearer the Swedish than the Danish coast, there is found a very considerable depression of the bottom of the sea. From Helsingborg, the Swedish town opposite Elsinore, the fishermen call this great deep "*Skraepperne*." This seems to be the favorite resort of the halibut. In summer one may also find there large haddocks and skates. The fishing in these waters pays very well, and most of the fish caught here are brought to the Copenhagen market.

44. *A number of halibut-hooks.*

45. *A halibut-line.*

46. *Different specimens of haddock-catchers, (Danish, "torskepilk.")*—In fishing in the "*Skraepperne*" the fishermen are often obliged to make use of this instrument for want of bait, but it is not a favorite with them.

47. *A flounder-net, ready to be cast out, or, as the Danish technical term has it, to be "stoned."* By holding the split peg with one hand, and throwing out the stones with the other, the net is laid without much trouble, and, sinking to the bottom, places itself in position.

48. *A buoy; a so-called herring-buoy.*

49. *A grapple, or anchor.*

50. *A claw.*—These are of many different sizes, and are sometimes used as anchors, but more frequently to search the bottom of the sea for nets and other objects that have been lost.

51. *A fisher-buoy.*—In the sound, where the shipping, the current, and large masses of seaweeds all prove injurious to the buoys, this kind, simple as it looks, has proved the most effectual in diminishing all these causes of injury.

52. *A net-trough.*

53. *A hundred claws, "baggers," ready for being cast out.*

54. *A hundred cleft claws, hung up for drying.* Of these the two fishing villages possess an endless number.

55. *An eel-iron.*—A sort of spear for spearing eel, which, however, is but seldom used.

56, 57, and 58. *Different kinds of caufs.*

59. *Tools for manufacturing nets.*

60. *Apparatus for weighing eels.*

61. *A catcher.*

fish are thrown on to it with boat-hooks. An inspector receives, counts, and registers all the fish which each fisherman delivers. The various kinds of sturgeon—the “red fish,” or the “fish proper,” as it is called—are measured from the middle of the eye to the caudal fin; for the fishermen receive more or less pay according to the different lengths of the fish. The scale of prices, according to the length of the fish, is nearly the same in all the “vatagas” of the Astrachan district.

Four different lengths are fixed for the “bélouga,” (*Acipenser Huso*,) 3 “arsheens,” (7 feet,) and over; 1 “arsheen” 10 “vershocks” to 3 “arsheens,” (3 feet 9½ inches to 7 feet); 1 “arsheen” 4 “vershocks” to 1 “arsheen” 10 “vershocks,” (2 feet 11 inches to 3 feet 9½ inches); and 1 “arsheen” to 1 “arsheen” 4 “vershocks,” (2 feet 4 inches to 2 feet 11 inches.)

The common sturgeon should measure 1 “arsheen” to 1 “arsheen” 6 “vershocks,” (2 feet 4 inches to 3 feet 2½ inches); the “sévriouga,” (*Acipenser stellatus*,) and the “chyp,” (*Acipenser Schyppa*,) from ¾ “arsheen” to 1 “arsheen” 1 “vershock,” (1 foot 9 inches to 2 feet 5¾ inches); the “sterliad,” (*Acipenser ruthenus*,) from 4 to 7 “vershocks,” (7 inches to 12¼ inches); the “som,” (*Silurus glanis*,) from 1 “arsheen” to 1¼ “arsheens,” (2 feet 4 inches to 2 feet 11 inches); and the “sazane,” (*Cyprinus carpio*,) from 8 to 12 “vershocks,” (1 foot 1¼ inches to 1 foot 9 inches) and over.

The “soudak,” (*Lucioperca sandra*); the “bersche,” (*Lucioperca volganis*); the “lestche,” (*Abramis brama*); the “béschenka,” (*Alosa pontica*); the “jeleznitsa,” (*Alosa caspica*), while other scaly fish are not measured, but counted.

After the fish have been delivered, they are cut, and the entrails taken out. For all this work, there are special laborers, who display an almost incredible amount of skill and rapidity, and who receive wages which are fixed beforehand by free contract.

The head and tail of the large sturgeons are cut off, and the belly is removed from the pectoral air-bladder to the tail. The belly of the smaller “bélouga” and the common sturgeon is opened, and the head is split as far as the nasal cartilage. The “sévriougas” (*Acipenser stellatus*) are split into two halves, and the entrails thrown away. The roe, the swimming-bladder, and the dorsal cord, however, are carefully taken out. These parts of the fish are handed to other laborers whose special occupation is the manufacture of caviar and isinglass, which is carried on in separate buildings. Laborers engaged in the manufacture of caviar receive the highest annual wages.

A large number of young girls and women are occupied in cutting the fish. They all wear a peculiar working-dress, consisting of breeches and a jacket; their head and half their body being covered. A sharp knife in one hand, and a little hook in the other, the working-woman begins her labor. Crouched with crossed legs on a straight bench, she picks up a fish with her hook, opens its belly, takes out the entrails, and

throws the fish into a corner, where a large heap is soon piled up. During this time, other women are splitting and cutting the fish with no less skill, and stringing them on threads made of the fiber of the bark of the linden-tree, which they pass through the eyes of the fish by means of a large needle. The skill and rapidity of these women are truly admirable. Enormous piles of fish which encumbered the floor disappear in a few hours, and pass to another building to be salted. A skillful woman can dress as many as 2,000 *Lucioperca* during a single day.

The building in which the scaly fish are salted has a long shape, usually several doors, and contains tubs and wooden boxes of different sizes. A box 3 "arsheens" (7 feet) deep 4 "arsheens" (9 feet 6 inches) broad, and 8 "arsheens" (18 feet 8 inches) long, can hold 100,000 *Alosa* or 45,000 *Abramis* or 30,000 *Lucioperca* or 2,000 "pouds" (72,000 pounds) of sturgeon of different kinds. The tubs have generally a diameter of  $4\frac{1}{2}$  "arsheens," (10 feet 6 inches,) and a depth of  $3\frac{1}{2}$  "arsheens," (8 feet 2 inches,) and can hold 45,000 *Alosa* or 20,000 *Abramis*. The number of tubs and boxes varies according to the locality. Thus, the "vataga" (fishing-establishment) of Pétropovlovsk, fifty "versts" (about twenty-seven miles) above Astrachan, on the banks of the Volga, has four large cellars, each holding from 30 to 40 large boxes, destined chiefly for salting the various kinds of *Alosa*.

The so-called "cold cellars" are particularly grand; here blocks of ice are piled up behind a wooden lattice, leaving a space of  $1\frac{1}{2}$  "sagene" (10 feet 6 inches) free along the walls of the cellar. Entering a salting-cellar through the large door, one sees first the rooms where salt is pulverized by machines; then the cellar itself, in which there is a long floored corridor, running between high and strong wooden pillars. To the right and left of this "corridor," the boxes are ranged side by side. The roof, which rests on numerous pillars, has sky-lights which give sufficient light for the whole cellar. In the roof, there is also a large opening, from which an inclined plane, made of planks, leads into the cellar. On this inclined plane, the "bélougas" and large sturgeons are easily let down into the cellar. Several ventilators keep the air constantly pure.

#### 8.—PREPARING THE FISH AND ITS SEVERAL PARTS.

*Salting.*—After having been dressed, the fish are, under the superintendence of the salter, placed in layers in the boxes above mentioned in such a manner that the heads and tails alternate. The salter then throws, with a shovel, the necessary quantity of salt on every layer of fish; the quantity of salt varying according to the kind of fish, and according to the season. In the Astrachan "vatagas," (fishing-establishments,) it is customary to take from 27 to 30 "pouds" (972 to 1,080 pounds) of salt in the spring, and from 18 to 20 "pouds" (648 to 720 pounds) in the autumn to every 1,000 *Lucioperca*; from 7 to 9 "pouds" (252 to 324 pounds) in the spring, and from 4 to 6 "pouds" (144 to 216



pounds) in the autumn, to every 1,000 *Abramis*, *Perca fluviatilis*, and *Aspius rapax*; and, on an average, 10 "pounds," (360 pounds,) to 1,000 *Alosa*. A thousand small *Cyprinus carpio*, L., require from 15 to 18 "pounds" (540 to 618 pounds) of salt.

A thousand fresh fish have the following average weight: *Cyprinus carpio*, L., 120 "pounds," (4,320 pounds;) *Lucioperca sandra* and *Esox lucius*, 100 "pounds," (3,600 pounds;) *Lucioperca volgensis*, 55 "pounds," (1,980 pounds;) *Abramis brama* and *Aspius rapax*, 50 "pounds," (1,800 pounds;) *Perca fluviatilis*, 35 "pounds," (1,290 pounds;) *Scardinius erythrophthalmus*, L., 32 "pounds," (1,152 pounds;) and the various kinds of *Alosa*, from 20 to 25 "pounds," (720 to 900 pounds.)

The different kinds of sturgeon and the *Silurus* require from 12 to 13 pounds of salt to every "pound" (36 pounds) of fish; and the large *Cyprinus carpio*, L., the *Salmo salar*, and the *Coregonus leucichthys*, Gldenst., 12½ pounds to every "pound" of fish, (36 pounds.)

In the autumn, the back, and not the belly, of the scaly fish is split open, so as to let the salt saturate more thoroughly.

The fish remain a longer or shorter time in the box according to the different species: *Lucioperca*, one month; *Cyprinus carpio*, L., 6 days; *Silurus*, till autumn; *Abramis*, 12 days; the different kinds of *Alosa* till the month of June. The brine of the *Lucioperca* is again used for salting the *Abramis* or the *Leuciscus rutilus*, while the brine of the other scaly fish is thrown away.

In the spring, the fish are taken from the boxes, washed, and dried on poles. This is done particularly with the *Lucioperca*, the *Abramis*, and the *Leuciscus rutilus*, L.; while the *Cyprinus carpio* is dried on hurdles made of reeds. The drying process being completed, the fish are taken from the poles, or from the hurdles, laid up in warehouses, and in July shipped by steamer to Nijni-Novgorod. In September, large boats arrive at the "vatagas," (fishing-establishments,) where they buy the fish on the spot, being salted before they are shipped.

The so-called herring, *Alosa caspica*, is not dressed, but is salted as it is. Up to the years 1854 and 1855, the Astrachan herring were only used for extracting the oil from them. Even poor people, frightened by its name, "beschenka," (the furious fish,) hesitated to use it for food. It is owing to the efforts of the committee appointed for examining the fisheries under the direction of Mr. Baer that several lessees of the fisheries finally consented to salt the "beschenka" and the "jleznitsa" under the name of "herring." From that time, the Astrachan herring, as a salt fish, has become more and more an article of commerce, while the extraction of oil from it has diminished in proportion. Thus, there were salted in the river-waters of Astrachan, in 1858, 43,000,000 of this fish, while the number rose to 140,000,000 in 1871, and to 160,000,000 in 1872; while during the same year, 1872, only 30,000 herring were used in the manufacture of oil.

The "blouga," (*Acipenser huso*,) and the "svriouga," (*Acipenser*

*stellatus*.) taken in the spring, remain for six months in the boxes, till the salting and hardening process is complete. Afterward they are taken out, dried superficially, and packed in casks.

Those kinds of sturgeon which are caught from spring till the middle of July are transported, during September and October, on wagons to the Saratov fair; while the fish of this kind caught between the 8th of July and the 15th of August are shipped the following spring to Nijni-Novgorod on large boats, which are towed by steamers.

The sturgeon caught in the district of Emba, the northeastern basin of the sea, are salted on board of large fishing-boats called "koujovaya."

The fish, having been dressed, are usually laid in brine for two days, and then they are placed in layers at the bottom of the boat, each layer being covered with salt.

The fishermen return from their fishing-expeditions on the sea to Astrachan at the end of June, and keep the fish they have caught in warehouses till a transport starts for Nijni-Novgorod.

The sturgeons caught from the 15th of August till the first frost are preserved in the wells (boxes in the hold of the vessel filled with fresh water and used for keeping fish) in order to be shipped at a later time.

*Manufacture of caviar.*—Two sorts of caviar are manufactured, fresh or grained caviar, and hard or pressed caviar. In both cases, the roe of the several kinds of sturgeon is spread out on a net with narrow meshes forming a sieve, and stretched over a wooden frame; then the grains are passed through the meshes by slightly pressing the whole mass till nothing remains on the sieve but the cellular tissue, the fat, and the muscle. The grains, which are black or brown, fall through the sieve into a wooden receptacle placed underneath. For manufacturing grained caviar, the roe is sprinkled with very clean and fine salt, and the whole mass is stirred with a wooden fork having eight or ten prongs. The quantity of salt required varies, according to the season, from 5 to  $1\frac{3}{4}$  pounds; in August they take from 3 to 5 pounds of salt to 1 "poud" (36 pounds) of roe, and from  $2\frac{1}{2}$  to  $1\frac{3}{4}$  in winter. The less the fresh caviar is salted the more it is esteemed. The roe mixed with the salt presents at first a doughy appearance when it is stirred; but when every grain has been impregnated with salt, the whole mass swells, and in stirring it a slight noise is perceptible like that of stirring small grains of glass. This noise is the sign that the caviar is ready. Then it is packed in casks made of lindenwood, which does not impart any bad flavor to it, while this is not the case with casks made of other wood.

For manufacturing pressed caviar, a tub half filled with brine is placed under the sieve; the brine being stronger or weaker, according to the temperature and the season. To impregnate the grains evenly with brine, the whole mass is stirred with a wooden fork, always turning it from the same side; then the grains are taken out with fine sieves, and after the whole brine has been drained, 3 "pouds" (108 pounds) of

grains are put in a sack made of the bark of the linden, which is placed under the press in order to get all the brine out of the caviar, and to transform it to a solid mass. In thus pressing the caviar, a large number of grains are crushed, and a portion of their contents flows out with the brine, so that on every "poud" (36 pounds) there is a loss of from 10 to 12 pounds. After having taken the pressed caviar from the sacks, it is packed in casks containing 30 "pouds" (1,080 pounds) each, the inside of which is covered with napkin-linen, this being the reason why the caviar is also called "napkin-caviar," (*caviar à la serviette*.)

The finest quality of pressed caviar, that which has been least pressed and salted, is placed in straight linen bags of a cylindrical shape, and is then called "sack-caviar," (*caviar à sac*.) Caviar is also shipped in tin boxes hermetically closed and soldered.

Fresh caviar is always preferred to pressed caviar, and also costs more. At Astrachan, fresh caviar costs from 30 to 35 "roubles" (\$21 to \$24.50 gold) the "poud," (36 pounds,) while the pressed caviar only costs 24 "roubles," (\$16.80 gold.) It is infinitely more advantageous to manufacture grained caviar than hard caviar, because the former pays better, requires less salt and less trouble, and there is scarcely any loss on it.

Every year about 11,000 "pouds" (396,000 pounds) of caviar are sent abroad from Astrachan, especially to Berlin, to Dresden, and to Vienna. This caviar is bought by contract from the proprietors of the fisheries, who either get it from their own fisheries or from fishermen hired by them for this purpose, and who prepare the caviar on their own boats while fishing on the sea. There are in the "vatagas" (fishing-establishments) special laborers for manufacturing caviar, who receive an annual salary of 300, 400, and even 600 "roubles," (\$210, \$280, to \$420 gold,) besides board, lodging, fuel, and light.

In trade, the caviar of the "bélouga" (*Acipenser huso*) is esteemed more highly than that of the common sturgeon, (*Acipenser Guldensüdtii*,) or of the "séviouga," (*Acipenser stellatus*,) because its grains are larger and better looking. The most savory of all caviars is the small grained caviar of the "sterliad," (*Acipenser ruthenus*,) but it does not form an article of commerce.

All the different kinds of sturgeon have not equally fat roe. This depends both on the good quality of the fish and on the season when it has been caught. The fattest caviar is that made, during the hot season, from the roe of those kinds of sturgeons which are caught in the sea between the 8th of July and the 15th of August. This roe is left only a few hours in the brine, and then taken out and packed, without being pressed, in casks holding from 5 to 10 "pouds" (180 to 360 pounds) each.

If the roe is tender to the touch in the ovaries, and is already spoiled, roe and ovaries are thrown into the brine till they are thoroughly impregnated with salt. This is then caviar of the worst quality, and is shipped in casks holding from 27 to 30 "pouds," (972 to 1,080 pounds.) This quality is worth only from 3 to 4 "roubles" (\$2.10 to \$2.80 gold)

the "poud," (36 pounds.) The kind called "summer-caviar," however, sells at from 6 to 9 "roubles," (\$4.20 to \$6.30 gold.)

The milt of the "bélouga" (*Acipenser huso*) and of the common sturgeon (*Acipenser Guldenstädtii*) is left from three to four days in the brine, and then shipped in barrels. The milt of a "bélouga" of medium size often weighs 27 pounds, and that of the common sturgeon 12 pounds.

The roe of the "lestehe," (*Abramis brama*), of the "soudak," (*Lucio perca sandra*), and of the "vobla," (*Leuciscus rutilus*, L.), is also used for making a kind of caviar which is chiefly sent to Constantinople and to Greece. Greek merchants come to Astrachan, buy the roe of these fish at the "vatagas" (fishing-establishments,) and there prepare the caviar themselves. They draw from the body of the fish the little bags which contain the roe, throw them together promiscuously, and cover each layer with a certain quantity of salt. They then press the whole between boards weighted down by heavy stones. This caviar remains thus for a month, after which the Greeks put it in casks and ship it. Caviar which has been thus prepared is cut in slices shaped like disks, and is much sought after in Greece.

*Manufacture of isinglass.*—The bladder of fish, which is known in trade by the name of "feuille d'esturgeon" in French, "Hausenblase" in German, and "isinglass" in English, is extracted from the inner side of the swimming-bladder, not only of the "bélouga," but also of other kinds of sturgeon, as likewise of the *Silurus glanis* and of the *Cyprinus carpio*. It is true that the large sturgeon yields the greatest quantity of bladder, but the best is that of the common sturgeon, (*Acipenser Guldenstädtii*), while the most inferior quality is that which comes from the *Silurus*. Good isinglass must be pure, white, shining, half-transparent, dry, and horny, without taste, but not without some perfume. Good fish-bladder dissolves in water heated to 30 or 40 degrees Réaumur (about 100 to 122 degrees Fahrenheit) without leaving any residue, and when it grows cold it becomes a transparent and almost colorless gelatine.

The fish-bladder is mostly prepared by young boys, superintended by experienced laborers. First, the swimming bladder of the fish is thrown into the water, where it is left for several days; the water being frequently changed, in order to detach all the fatty and bloody particles from the bladder. The hotter the water the quicker is this done. The bladders are then taken out, and cut lengthwise into strips, which are exposed to the sun and air. These strips, or leaves, are usually spread out, in order to dry them, with their outer side on small boards of lindenwood; the inner side is formed by leaves (*lamellæ*) of pure isinglass, which, after having been well dried, are carefully detached from the outer side. The leaves of isinglass thus obtained are laid between pieces of linen, to preserve them from the flies and from dust; then they are placed under a press, so that they may not become warped, but may form smooth cakes. It is only after all these different operations have been performed that the laborer proceeds to pick the

leaves and tie them in bundles. These bundles of isinglass, produced from the large sturgeon, are usually composed of from ten to fifteen leaves, and weigh  $1\frac{1}{4}$  pounds each; while those of the common sturgeon, or of the "sévriouga," contain twenty-five leaves, and weigh one pound each. Generally, eighty of these bundles are sewed up in a linen bag; they are also made up into small bales, covered with rush mats or with linen, and are then shipped, after being securely headed.

The "poud" (36 pounds) of "sturgeon-leaf" costs in Astrachan from 120 to 180 "roubles," (\$84 to \$126 gold.)

The swimming-bladder, deprived of its inner skin, that is, of the inner shining cuticle of which isinglass is made, as described above, still contains a certain quantity of glue, which is moistened with water, and then removed by scraping it with a knife; this is also moistened with water, and then kneaded. This mass is molded into small round tablets of the size of a dollar, which are dried. This kind of fish-glue is shipped in sacks, and costs less than the isinglass in leaves.

The leaves of the glue from the *Silurus* are arranged in book-form, and are dried on thin cords. They are shipped in bags containing 4 "pouds" (144 pounds) each. The glue gained from the *Cyprinus carpio* is also in leaves, arranged in packages of 30 each.

Some persons at Astrachan have manufactured good fish-glue from the scales of fish. Even at this day there lives in the Cossack village of Samyani, 60 "versts" (about  $34\frac{1}{2}$  miles) above Astrachan, a surgeon named Sokologorski, who, from the scales of the *Alosa*, extracts glue in thin and transparent leaves. According to his account, two pounds of this glue are as good as one "poud" (36 pounds) of sturgeon-glue. Unfortunately, he has not the necessary means to enable him to place any considerable quantity of his manufactures in the market.

Formerly, the shining cuticle of the swimming-bladder was dried, and cut into long, straight strips, which were tied alternately together, one by the side of the other and one on the top of the other. These strips thus tied were then laid in water to become soft, and afterward pressed to let the water run off. This matter was then molded into different figures, such as horseshoes, lyres, hearts, cylinders, &c. Small wooden bolts kept these figures in their original shape till they were completely dry. The Ural Cossacks, even to this day, make "glue hearts," which they put up in packages of 42. It requires 1,500 "glue lyres" to make one "poud," (36 pounds,) and from 7,000 to 10,000 "glue horseshoes" to make the same weight.

Isinglass is used for clarifying various liquids, for making fine glue-colors, for giving a gloss and finish to textile fabrics, for making plasters, for taking the impress of coins, and finally in the kitchen for making jellies.

*Manufacture of "véziga."*—"Véziga" is the name given to the dried dorsal cord of various kinds of sturgeon. After the entrails, the roe, and the swimming-bladder have been taken out of the fish, a small

incision is made in the flesh, and, the finger being inserted, the dorsal cord is drawn out. This cord has the shape of a long and straight ribbon. It is carefully washed, and pressed, so that the soft matter which it contains oozes out, after which it is dried during from three to eight days, according to the season. When the "véziga" is entirely dry, it is put up in packages, fifty of which form a bale weighing one "poud," (36 pounds.) A package of "véziga" of the "bélouga" (*Acipenser huso*) contains twelve dried dorsal cords, while there are twenty in a package of "véziga" of the *Acipenser Guldenstädtii*, the *Acipenser stellatus*, and the *Acipenser schyba*. A thousand "bélougas" of medium size generally produce 5 "pouds" (180 pounds) of "véziga;" but the same number of common sturgeon, (*Acipenser Guldenstädtii*), and of *Acipenser stellatus*, yield only 1 "poud," (36 pounds.) When the "véziga" is boiled, it rises, and in this condition it is cut into small pieces, which form an important ingredient in excellent little fish-pies. The "véziga" is not used for anything else. It costs from 15 to 20 "roubles" (\$10.50 to \$14 gold) a "poud," (36 pounds.)

*Manufacture of "balyk."*—The Tartar word "balyk" means "fish," and is used in Russian for the backs of sturgeons which have been slightly salted and then dried in the sun. For making good "balyk," a large and tolerably fat fish is selected, whose head, tail, sides, and belly are taken off. That which remains, the dorsal part, has to undergo a special salting, while the other parts are salted in the usual manner. The back of the common sturgeon (*Acipenser Guldenstädtii*) and of the "sévrjougá" (*Acipenser stellatus*) remain entire, while those of the large sturgeon (*Acipenser Huso*) are cut, either lengthwise only, or else both lengthwise and crosswise. The pieces are placed in a tub so as not to touch each other nor the sides of the tub; and they are left thus after having been covered with a thick layer of salt from nine to twelve days, and even fifteen days when the pieces are large and the weather is hot. The salt is mixed with a little saltpeter, to give to the "balyk" a reddish color, (2 pounds of saltpeter to 50 "pouds" (1,800 pounds) of "balyk.") Allspice, cloves, and bay-leaves are frequently put into the brine. When the salting is finished, the "balyk" is put into water for a day or two, in order to detach all particles of the brine from it. Thereupon it is dried, first in the sun and then in the shade, on roofed scaffoldings, which are erected for the purpose. This last-mentioned operation requires from four to six weeks, and is considered finished when the "balyk" begins to cover with a slight mold, the absence of which shows that it has been salted too much.

Good "balyk" must be as soft and tender as smoked salmon; must have a reddish or orange-brown color; and must have an odor something like that of the cucumber; it must also be transparent, show no traces of putrefaction, nor have a bitter taste; and, finally, it must not be too salty. There are very few manufacturers who can prepare "balyk" that has all these qualities. A "poud" (36 pounds) of good "balyk"

costs at the manufactory at least 18 "roubles," (\$12.60 gold,) and at retail it can seldom be bought for less than 1 "rouble" (70 cents gold) a pound. The "balyk" made in March is considered the best.

On the banks of the Koura, and in the trans-Caucasian waters, where the "sévrionga" (*Acipenser stellatus*) is caught in large numbers, "balyk" is made of at least 300,000 of these fish every year. This "balyk," commonly called "djirin," is not of the first quality. It is dry, very salty, and is much sought after by the inhabitants of Kachetia, because it produces thirst and gives them occasion to quench it with the excellent production of their vineyards.

A large sturgeon of 20 "pouds" (720 pounds) yields 5 "pouds" (180 pounds) of "balyk;" a very large "sévrionga," 15 pounds; a common-sized "sévrionga," 4 pounds; and the common sturgeon, from 8 to 12 pounds.

*Manufacture of oil.*—Oil is extracted either from the fat which incloses the entrails of the sturgeon and the *Lucioperca*, or from the whole body of the Astrachan herring, (*Alosa pontica* and *Alosa caspica*.) In the first case, the fat is taken out, washed, and cut into pieces, which are thrown into a tub, with from 10 to 15 pounds of salt for the whole mass. The whole is then well shaken in a caldron, and placed on the fire; this caldron being put inside a larger copper caldron, in which the water is boiled, thus causing the fat in the inner caldron to melt. When the oil swims on the surface, it is skimmed off and poured into oakwood barrels. This oil is pure and has a light-yellow color. It is used for cooking-purposes, and for softening caviar when it has become too dry.

Oil was made from Astrachan herring on a very large scale till the year 1854, when people commenced to salt this fish. Other scaly fish, even the "sterliad," (*Acipenser ruthenus*,) were used for making oil. The period from April 15 to May 5, fixed for this manufacture, was scarcely ever observed. This period is still considered the legal period for the "vatagas" (fishing-establishments) located below Astrachan; while for those above this city, the time for making oil is between April 20 and May 10. Any person taken in the manufacture of oil before or after this period has to pay a fine of 25 "roubles" (\$17.50 gold) for every day beyond the legal period.

The manufacture of oil is carried on in the open air. The *Alosa* are piled up in casks and tubs, and are constantly moistened with boiling water till the oil separates and swims on the surface. The oil is poured into barrels, and sold at from 2 "roubles" 75 "kopecks" (\$1.92½ gold) to 3 "roubles" 25 "kopecks" (\$2.27½ gold) a "poud," (36 pounds.) It is used in soap-factories and in tanneries; it is also burned in lamps and used in making oil varnish.

The residue must be buried in the ground, and it is strictly forbidden to throw it into the water. Any violation of this regulation is punished with a fine of 100 "roubles," (\$70 gold.)

Since the year 1870, people have commenced, although it is properly not allowed, to make oil of lampreys, (*Petromyzon fluviatilis*,) which, in December and January, appear in great numbers in the Volga above Astrachan. These fish yield no less than 8 pounds of oil per thousand fish; and this oil, which costs 3 "roubles" (\$2.10) a "poud," (36 pounds,) is pure and clear, although containing a good deal of glue. It is not probable that this industry will develop much; for several "vatagas" (fishing-establishments) have already begun to pickle the lamprey, which forms in this shape a very savory dish. Thus, in October last, a merchant of Tchernoi-Yar, Sabourow by name, sent to St. Petersburg for experienced laborers to pickle 3,000 "pouds" (108,000 pounds) of lamprey. A thousand lampreys weigh not less than 140 pounds.

9.—MARKET-PRICE OF FISH AND THEIR PRODUCTS.

Table of the market-prices since the year 1866, when fishing in the sea was declared perfectly free.

	PER "POUD," 36 POUNDS.				
	From July 1, 1866, to July 1, 1867.	From July 1, 1867, to July 1, 1868.	From July 1, 1868, to July 1, 1869.	From July 1, 1869, to July 1, 1870.	From July 1, 1870, to July 1, 1871.
<i>Acipenser huso</i> .....	\$1 33 to \$1 57½	\$1 47 to \$1 50½	\$1 61	\$1 61 to 1 92½	\$2 38
<i>Acipenser Guldenstädtii</i> of 3' 6" .....	1 57½ 2 06½	1 57½ 2 03	1 57½ to \$2 03	2 38 2 45	3 08
Of 2' 4" .....	1 01½ 1 54	1 47 1 50½	1 01½ 1 50½	2 10 2 31	2 87
<i>Acipenser stellatus</i> of 2' 4" .....	1 29½ 1 82	1 29½ 1 68	1 29½ 2 75	1 92½ 1 82	2 73
Less than 2' 4" .....	73½ 98	91 1 02½	1 02½	1 71½ 1 82	2 52
<i>Acipenser schyba</i> .....	1 33 1 57½	1 47 1 50½	1 50½	1 78½ 1 89½	2 38
<i>Siturus glanis</i> of 3' 6" .....	1 12	1 12	1 12	1 26 1 68	1 26 to \$1 54
Of 2' 4" .....	63	63	63	70 98	63 84
<i>Oreogonus leucichthys</i> .....	1 22½	1 40	70 1 75	1 75 2 80	1 75 2 45
<i>Acipenser ruthenus</i> .....	.....	87½	1 15½	1 75	1 75
<i>Cyprinus carpio</i> , dried .....	70	77	.....	94½	1 05 1 05
Salt .....	35	63	.....	5-½	59½ 49 59½
<i>Tinca vulgaris</i> and <i>Perca fluviatilis</i> .....	28	28	28	35	35
<i>Esox lucius</i> , salt .....	80½ 84	45½ 59½	32½	84	91
Heads of <i>Acipenser huso</i> , salt .....	70	77	77	1 05	1 22½
Belly of <i>Acipenser huso</i> .....	2 45 2 80	2 45 2 80	2 80	2 80 3 32½	3 15 3 85
Caviar, pressed .....	8 75 12 60	8 75 12 60	8 05 14 00	9 80 15 40	10 50 15 40
Made in summer .....	4 55	4 20	4 20	6 30	5 60
Inferior quality .....	2 80	2 35	2 35	3 15	2 75
Fresh caviar of <i>Acipenser huso</i> .....	11 40 17 50	11 20 17 50	11 40 18 20	11 20 19 60	11 90 19 60
Of <i>Acipenser Guldenstädtii</i> .....	8 92½ 12 60	8 92½ 11 20	8 40 9 80	11 20	7 70 11 20
Milt of sturgeon .....	35	70	1 05	1 05	1 05
Oil .....	1 75	1 47 1 96	1 47 1 68	1 54 2 17	1 92½ 2 27½
<i>Abramis brama</i> .....	56	56 59½	63	77	91
<i>Lucioperca volgensis</i> .....	24½	24½	24½	24½	35
Seals .....	1 33	84	91	1 40	2 33

PER THOUSAND.

<i>Alosa</i> .....	7 52½	7 52½	4 20	6 39	4 72½	6 30	4 27	7 70
<i>Abramis brama</i> , salt, large .....	16 10 18 90	16 80 18 90	16 80	19 01	19 60	25 20	22 40	25 20
Salt, small .....	8 05 9 45	8 40 9 45	8 40	9 00	9 80	12 60	11 20	12 60
<i>Aspius rapax</i> .....	4 37½	4 20	4 44½	4 20	3 50	4 90	4 90	7 00
" <i>Sordes</i> " .....	2 10	4 55	3 36	4 55	3 50	4 90	4 90	7 00
<i>Leuciscus rutilus</i> .....	70	1 75	1 26	2 27½	1 05	2 10	3 15	2 10
<i>Perca fluviatilis</i> .....	2 10	2 80	2 80	2 45	2 80	3 15	4 20	4 90



10.—PRICE OF FISH AS FIXED BY AGREEMENT BETWEEN THE FISHERMEN AND THE FISHING-HOUSES.

The fishing-houses pay to the fishermen whom they hire either an annual salary, or a fixed price, determined by agreement for every kind of fish and the articles manufactured from fish. The fishermen have no fishing-implements, and receive these from the fishing-houses. They are principally engaged for seine-fishing, serve as rowers, or work at the "vatagas," (fishing-establishments.) Russians very seldom hire themselves out by the year, while the Kalmyks do this exclusively. The annual salary is in proportion to their skill, experience, and diligence.

Those fishermen who are paid according to the number of fish caught nearly all own a little house, horses or cattle, boats, or other property, which assure them credit at the fishing-houses, and serve as a guarantee for the payment of indemnities in case they do not fulfill the conditions to which they have bound themselves by agreement. They receive the earnest-money in advance to buy fishing-implements and equip their boats. This subsidy is much more considerable for those who fish in the sea than for those who fish in the river; for the former must have a spacious, safe, and solidly-built sail-boat, and also a larger number of workmen. Moreover, they are exposed to all kinds of privations and dangers.

Contracts are made in July. The fishing-year commences July 1. If the year has been favorable, the fisherman, after paying back the earnest-money, has a considerable sum left; if, on the other hand, it has been unfavorable, the fisherman finds it difficult to meet all his expenses, and he is obliged to contract debts, which he is never able to pay.

Table showing the beneficial influence which the liberty of fishing in the sea has had on the wages of fishermen.

	The fishermen have received the following prices per "poud," (36 pounds.)					
	From July 1, 1866, to July 1, 1867.	From July 1, 1867, to July 1, 1868.	From July 1, 1868, to July 1, 1869.	From July 1, 1869, to July 1, 1870.	From July 1, 1870, to July 1, 1871.	From July 1, 1871, to July 1, 1872.
<i>Acipenser huso</i> .....	\$0 56	\$0 56	\$0 70	\$1 19	\$1 26	\$1 54
(December 1 to February 15) .....	1 61	1 26	1 26	1 75	2 10	2 10
<i>Acipenser Guldenstädtii</i> , (3' 6") .....	91	91	1 26	1 40	1 47	1 75
(December 1 to February 15) .....	1 61	1 26	1 26	1 75	2 10	2 10
(2' 4") .....	63	63	63	1 75	1 08½	1 23½
(December 1 to February 15) .....	1 61	1 26	1 26	1 75	2 10	2 10
<i>Acipenser stellatus</i> , (2' 4") .....	91	77	84	1 40	1 47	1 75
(1' 9") .....	63	63	63	1 05	1 75	1 23½
(December 1 to February 15) .....	1 61	1 26	1 26	1 75	2 10	2 10
<i>Acipenser Schyppa</i> .....	52½	52½	52½	1 19	1 26	1 54
(December 1 to February 15) .....	52½	52½	52½	1 19	2 10	2 10
Heads of <i>Acipenser huso</i> .....	21	24½	24½	38½	38½	52½

Table showing the beneficial influence, &c.—Continued.

	The fishermen have received the following prices per "poud," (36 pounds.)					
	From July 1, 1866, to July 1, 1867.	From July 1, 1867, to July 1, 1868.	From July 1, 1868, to July 1, 1869.	From July 1, 1869, to July 1, 1870.	From July 1, 1870, to July 1, 1871.	From July 1, 1871, to July 1, 1872.
<b>Caviar of <i>Acipenser huso</i>.</b>						
(July 1 to September 1) .....	\$4 27	\$4 27	\$4 90	\$7 00	\$7 35	\$8 40
(September 1 to December 1) .....	6 37	6 37	7 70	11 90	12 25	13 30
(December 1 to February 15) .....	7 91	8 12	8 40	11 90	12 60	12 60
Caviar of second quality, made in summer .....	2 10	2 10	2 10	2 10	2 10	2 10
Caviar of inferior quality .....	70	70	70	70	70	70
<b>Caviar of <i>Acipenser Guldenstädtii</i> and of <i>Acipenser stellatus</i>:</b>						
(July 1 to December 1) .....	4 27	4 27	4 90	6 30	6 65	7 70
(December 1 to February 15) .....	9 37	8 12	8 40	6 30	6 65	7 70
(February 15 to July 1) .....	4 27	4 27	4 55	6 30	6 55	7 70
<i>Silurus glanis</i> , (3' 6") .....	35	35	35	35	49	49
(2' 4") .....	17½	17½	17½	17½	24½	24½
<i>Coregonus leucichthys</i> .....	21	21	21	21	21	35
Seals in spring .....	21	21	21	35	35	70
In autumn .....	35	35	35	1 05	70	21
	PER THOUSAND.					
<i>Acipenser ruthenus</i> .....	10 50	10 50	10 50	10 50	21 00	21 00
<i>Cyprinus carpio</i> , L.:						
(1' 9" and more, in spring) .....	11 20	11 20	11 20	11 20	11 20	11 20
(1' 5¾" to 1' 9", in spring) .....	5 60	5 60	5 60	5 60	5 60	5 60
(1' 9" and more, in autumn) .....			17 50	17 50	17 50	28 00
(1' 5¾" to 1' 9", in autumn) .....			8 75	8 75	8 75	10 50
(1' 2" to 1' 5¾", salt) .....	3 50	3 50	3 50	3 50	5 50	3 50
Salting <i>Luciopeca sandra</i> at the "vataga" .....	4 90	4 90	4 90	4 90	5 60	7 70
Salting <i>Luciopeca sandra</i> on the boat .....					7 00	28 00
Salting <i>Esox lucius</i> in spring .....	3 50	3 50	3 50	3 50	4 20	4 20
In autumn .....					4 90	28 00
Salting large-sized <i>Abramis brama</i> , strongly .....	3 50	3 50	3 50	3 50	4 20	5 60
Slightly .....					4 90	8 75
Large-sized <i>Abramis brama</i> , salted and dried .....		9 10	9 10	9 10	9 80	10 50
Salting medium-sized <i>Abramis brama</i> strongly .....	1 40	1 40	1 40	1 40	2 10	2 80
Salting medium-sized <i>Abramis brama</i> slightly .....					2 10	8 75
Medium-sized <i>Abramis brama</i> salted and dried .....		5 95	5 95	5 95	6 36	6 65
Salting <i>Aspius rapax</i> .....	1 05	1 05	1 05	1 05	1 05	1 05
Salting <i>Luciopeca volgensis</i> strongly .....	1 05	1 05	1 05	1 05	1 05	1 05
Slightly .....						2 80
<i>Alosa</i> .....	52½	52½	52½	52½	52½	52½
Salting <i>Leuciscus rutilus</i> .....	07	07	07	07	07	07
Salting and drying .....	21	21	70	1 05	1 05	1 05
Salting <i>Scardinius erythrophthalmus</i> .....	70	70	70	70	70	1 05
Slightly .....						2 80
Salting and drying .....	1 40	1 40	1 75	2 45	2 45	2 80

11.—SEAL-HUNTING.

The seal, which is very common in the Caspian Sea, (*Phoca caspica*), is from 3 to 6 feet long, weighs from 2 to 4 "pounds," (72 to 144 pounds), and has a variegated fur, the back grayish-brown with yellowish stripes.

These seals gather in large herds, and, plunging continually into the water, chase scaly fish, of which they eat only the breast, leaving the remainder of the body, with the entrails, to the sea-birds, which are constantly hovering above them. Endowed with a very acute sense of smell, the seals at times escape the vigilance of their enemies, the fishermen, with the exception, however, of the young, which, inexperi-

enced as they are, follow the fishing-boats for long distances, and seem to take special pleasure in hearing the fishermen whistle or sing. It is an interesting spectacle to see the young seals lying on their back, sleeping peaceably while being rocked by the waves, and throwing up from time to time small jets of water by breathing.

The seals love the cold; and, in the summer, they seek the deep sea, leaving it in the autumn for their favorite place of abode, the north-eastern basin of the Caspian Sea, which is the portion first covered with ice, and where the ice breaks up latest. Numerous herds of seals gather on pieces of floating ice, to rest or to pair. The pairing-season lasts from the end of December till January 10. The female every year gives birth to one young one, seldom to two. The young have a shining white, silky fur; but after ten days it becomes coarse and turns gray. Then the tender solicitude of the mother ceases; for the little one has to go into the water and swim. Seals that are one year old have gray fur speckled with black spots.

The seal is hunted also on the western coast of the Caspian Sea, at the mouths of the Volga and the Ural, and in its southern part, especially on the islands of the Gulf of Apherón.

The principal meeting-places of seal-hunters are on the seven islands situated north of the Peninsula of Mangysblak, called the "Seals' Islands," on account of the large number of these animals found there. Other islands also abound in phocæ. Thus there have been years when about 40,000 seals were killed on the island of Peshnoï, before the mouths of the Ural; and, in 1846, 1,300 were killed in one night.

The seals are hunted in three different ways: they are killed with clubs on the islands where they gather; or they are shot with guns; or they are caught in nets.

The first-mentioned way is the grandest, and yields the best results.

The great meeting-place of the huntsmen is Koulali, the largest of the seal islands, having a length of thirty-five "versts," (about twenty miles,) and a breadth of three "versts," (about one and two-thirds miles.) The hunters, who winter there every year, have built wooden houses, huts, and sheds on this island. The fishing-authorities at Astrachan send every year one of their officers to Koulali to superintend the chase and the hunters, where he remains from October till the middle of May. On account of the bustle and noise, the seals have deserted this island for a number of years, and selected, for their place of gathering, the islands of Sviatoï and Podgornoï.

In the spring and autumn, the seals seek the shore to rest in the sun, one herd arriving after the other. Scarcely has the first settled, when a second comes yelling and showing their teeth to drive it away, followed soon by a third, to which it in turn has to yield its place; so that the last herd arriving always drives the first farther back on the coast. The invasion terminates by the arrival of some isolated stragglers.

Now is the time for the hunters to commence the chase. They care-

fully observe in what place, and, approximately, in what numbers, the seals have gathered; and then elect as their chief the most experienced and skillful among them. They approach the rookery in boats, either at dusk or during the night, always going against the wind, to conceal their approach.

After their arrival on shore, the hunters disembark noiselessly, form a line in order to cut off the retreat of the seals, and thus, creeping, advance quite near to the herd, which is sleeping and suspects no danger. On a signal from the chief, the hunters all rise at once and pitilessly attack their unfortunate victims, killing them by a single blow on the snout with the club. The bodies are piled up by means of gaffs, and after a few minutes form a rampart, depriving the survivors of every chance of regaining the sea. The seals howl, groan, bite, and defend themselves; but the hunters, eager for gain, go on killing them without mercy, and soon the whole herd is massacred. It is no infrequent occurrence to see 15,000 dead seals cover the battle-field of a single night.

After the killing, the dressing of the seals commences, usually about daybreak.

The head is cut off, the belly is opened, and the skin is taken off with the thick layer of fat adhering to it. These skins are piled up on the boats, which take them to large sailing-vessels, anchored some "verst" from the shore, on which they are heaped up, each layer being covered with salt. These vessels sail with their cargo to Astrachan, while the hunters return to the coast to carefully clean the battle-field. They bury the bodies and entrails, at some distance, deep in the ground, or throw them into the sea, far from the shore, and carefully obliterate every trace of blood, so that, when another herd of seals arrives, these animals do not see any marks of the slaughter which has taken place; for experience has shown that they never select for their rookery a place from which every trace of the slaughter has not been carefully removed.

Two hundred seal-hunters, employed by wealthy merchants or fishermen, usually winter on the island of Koulali. Numerous boats, besides, go there every year to participate in the chase. The masters of these boats secure permits from the fishing-authorities and give them to their workmen, who receive their wages in money. The pilot generally gets from 175 to 300 "roubles," (\$122.50 to \$210 gold,) and the workmen from 85 to 125 "roubles," (\$59.50 to \$87.50 gold.). They are fed at the expense of the master.

Another way of hunting the seals is to take them with nets. Immense nets are stretched out, into which the hunters endeavor to chase them by yelling and making a noise. This way of hunting is chiefly employed in the maritime district of the Ural Cossacks and in the Gulf of Sinéyé Mortso, from October till the sea is covered with ice.

The nets, called "okhani," are 6 "sagènes" (42 feet) deep, and have meshes of  $7\frac{1}{2}$  inches.

The following is the manner of proceeding: Forty boats join together and elect a chief and an assistant chief. Then the boats sail out to sea with a fair wind, or use their oars, going in a line, thus forming a sort of chain. In every boat, there are three nets. The chief, followed by twenty boats, is on the lookout for a herd of seals, which he endeavors to cut off, while his assistant remains with the other half of the fleet at some distance from the shore. When the chief thinks that the time for action has come, he gives the signal by throwing into the sea a bale, to which a flag is fastened. At this signal, the boats simultaneously cast their nets, which are all tied together so as to form a wall of meshes, by which the seals are soon completely surrounded. Then the hunters begin to yell and to strike the water with their oars, in order to frighten them. These seek to avoid the danger by plunging, but they rush against the barrier of nets, and are caught in the meshes, so that they can be killed without difficulty. This way of hunting is prohibited in those parts of the sea where it injures the fishing or obstructs the first-mentioned manner of hunting. The chase on the ice is fraught with many dangers, and is, therefore, at present prohibited. The hunters, sitting on little sledges drawn by strong and bardy horses, and provided with food, continue on for several weeks to shoot old seals, and kill young ones while they still have their white and silk-like fur. These hunters brave all dangers; and it has sometimes happened that the south or southwest wind, having detached large masses of ice from the shore, has driven them out into the open sea, where they have floated in all directions, with the adventurous huntsmen on them. These unfortunate hunters usually perish from cold and hunger on these masses of ice, or find their death in the waves.

#### 12.—MANUFACTURE OF SEAL-OIL.

The fat adhering to the skin of the seal is detached from it, cut into pieces, and melted in caldrons, after which the oil is poured in barrels. This is the simplest way of making seal-oil, and the hunters often employ it. But oil is also manufactured by steam in establishments built for this purpose on the left bank of the Volga, opposite Astrachan, by some rich merchants. Thirty-five "verst" (about twenty miles) below Astrachan, the Sapojnikow Brothers have built a steam oil-factory at the "vataga" (fishing-establishment) of Ikrianuaya. This factory is particularly busy in the spring, when whole cargoes of seal-fat arrive, which is either boiled immediately in order to extract the oil, or is safely stored away in cellars. These cellars are long, floored, and furnished with four ventilators and several windows. Large oak-wood tubs, plated with lead on the inside, and capable of holding 700 "pouds" (25,200 pounds) of oil each, are placed at intervals in holes dug in the ground. The oil which runs out from the seal-fat piled up in layers flows into these tubs by way of an inclined plane. The oil is

then poured into barrels. In order that the skins, from which the fat has not yet been removed, may not spoil, they are salted again, just as it had been done on board the vessels; 150 "pouds" (5,490 pounds) of salt being generally used for salting a thousand skins, and only 70 "pouds" (2,520 pounds) per thousand for the final salting, before the skins are stored in the cellars. Kalmyks are employed chiefly to detach the fat from the skins. They spread the skin, with the fur down, on an inclined plank, which they lean against their breast, in order to have the free use of both their hands. Then, armed with a two-handled knife, they scrape the fat from the skin. The oil, which is pure and clear, running down during this operation, flows into a reservoir let into the ground, holding 400 "pouds," (14,400 pounds,) and forming a cube, each side of which measures one "sagene," (7 feet.) This work is extremely fatiguing. A strong and experienced Kalmyk can, however, clean 500 or even 700 skins in a single day. The workmen form associations, sharing their labor and their gain.

The fat is then melted in large tubs, where it is exposed to the action of steam. The oil flows through a funnel-shaped apparatus, and, finally, through pipes into immense oak-wood reservoirs. There are three such reservoirs connected by pipes, and let into the ground, so that the oil from the first flows into the second, and then into the third, from whence, through cocks, it passes into casks, which can be shipped as soon as filled. Each one of these reservoirs has a diameter of 3 "sagene," (21 feet,) a depth of 1 "sagene," (7 feet,) and can hold 4,800 "pouds" (172,000 pounds) of oil.

The oil thus extracted forms the first quality. The second quality is obtained by melting the residue in caldrons, and by pressing it. The color of this oil is dark-brown. Before the residue is put into the caldrons, (capable of holding 200 "pouds" (7,200 pounds) each, it is thrown into a receptacle with an inclined bottom, and the whole mass is stirred violently by means of wooden shovels. This is done in the sunlight, so that the heat may help to melt the mass. This receptacle is joined to the caldron by a large gutter, which is walled up in the furnace. Through this gutter, the residue is led into the caldron, there to melt, which done, the mass is taken out with dippers and cast into a box, which is then pressed. By means of this last operation, all the remaining oil contained in the residue is extracted.

The oil-factory of the Sapojnikow Brothers formerly manufactured about 100,000 "pouds" (3,600,000 pounds) of seal-oil, which was sent to Moscow, where it was chiefly used in leather-factories; but during the last fifteen years, this establishment has gone down considerably, and other wealthy Astrachan merchants, among them Messrs. Vlasow, Smoline, and Orékhov, have established several factories for making the oil.

The skins of the seals are used for making knapsacks and for covering valises.