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# The Amur pike (Esox reicherti Dybowski) in Fishes of the Amur Basin

Results of the Ichthyological Expedition to the Amur Region, 1945-1949
by G. V. Nikolsky, 1956

Translated December 1970, from the Russian, by

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Esocidae--The pike family
(Chapter VII, p. 99-111)

In the Amur River this family is represented by only one fish--Amur pike--Esox reicherti Dybowski, which is widespread in the Amur Basin and is important as a commercial fish.

## I. Amur pike--Esox reicherti Dybowski

Common names: Russian--Shchuka; Chinese--Kou yu; Japanese--Kava kamas, Kamochuci.

Description: (Determined by 24 samples--15 males, 9 females--30 to 65 cm in length, taken in July 1947 in Tyr region). D VI-VII, 11-15, average 13.8 branched rays; A IV-V, 11-13, average 11.7 branched rays. Number of scales in lateral line (perforated 11) 48-64, average 57.1; number of scale rows, 135-165, average 151.1.

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Length of head, given as percentage of the length of the body to the end of the scales, 26-31%, average 28%; diameter of eyes 2.0-4.0%, average 3.2%; length of snout 11-14%, average 12.5%; distance from eye to gill cover 11-13%, average 12.2%; width of frontal bone 5.0-6.5%, average 5.6%; minimum depth of body 6.0-8.0%, average in females 6.7, in males 7.0; length of the caudal peduncle 12-16%, average in females 14.1, in males 14.3; anterior dorsal distance 73-79%, average 75.6; pectoral-ventral distance 25-30%, average in females 27.6, in males 27.1; length of the base of dorsal fin 10-14%, average in females 11.5, in males 11.9; depth of dorsal fin 10-14%, average 12.7; length of the base of anal fin 9.0-11.0% average 10.1; length of pectoral fin 11-14%, average in females 12.1, in males 13.0; length of ventral fin 10-14%, average in females 12.1, in males 12.5.

In adults the back is greenish gray, the upper tip of the caudal fin is the same color as the back; the sides are silver (in fish from rivers) or gold in color (in fish from small lakes). On the sides of the body and the head there are black or dark brown spots and the same spots appear in the fins. The pectoral, ventral, anal and the lower lobe of the caudal fin are yellowish or reddish. Only on the anal, caudal and dorsal fins are there dark spots. The iris of the eye is silver or pale-gold. In general, coloration of adult Amur pike, like other characteristics, reveals its adaptation to life in the river bed, rather than among weeds as does the common pike. Coloration of the adult Amur pike is very similar to some salmon or taimen. Young pike, age 2+ to 3+, and length of 30 to 35 cm,

live along shorelines, and in summer among vegetation on flooded areas. The young pike are more like adult common pike in color. Prominent dark spots are usually not found in the young pike, but if spots are present, they are of a pale color. On the sides of the body they often have rows of dark inclined bars which make them difficult to see among the vegetation; later, when moving to the river bed they take on the coloration of the adult fish. The males of the Amur pike are smaller than females. As we saw in the previous description they have smaller pectoral-ventral distance and longer paired fins. Coloration change in adult fish is not known.

Comparative notes

Amur pike and common pike (Esox lucius) differ in color as adults. The Amur pike also has smaller scales, the head is more covered by scales, and there are other biological characteristics. Differences from common pike, from which Amur pike doubtlessly originated, can be seen in [the Amur pike's] adaptation to life in coastal waters with weakly developed vegetation and with very strong fluctuation of water levels. Thus, Amur pike occupy relatively the same ecological niche as common pike. [Reasoning is obscure. Ed.]

Unfortunately, we do not have information about morphometrical characteristics of Amur pike from different parts of the Amur River. However, as it could be seen, in analyzing the rate of growth of pike from different parts of the Amur, as well as in statistical data obtained by Pacific Ocean Institute of Fish Economy and Oceanography (Bogaevsky,

1947), doubtless there are several groups of fish living in relatively separate regions.

Distribution of fish

The Amur pike is distributed in the basins of rivers Tugur Uda, Suifun, Tim, and Poronaia (on Sahalin), and also through the whole Amur basin from the mountains to Amur Bay. The pike is found in lakes Buir Nur, Arguna, Shilka, Onona, and Ingoda. It is absent only in the upper flows of Amur River tributaries, which have mountain stream characteristics. In basins of Ingoda and Onona, pike are found only in lakes which are separated from the Amur River. Pike exist in Lake Kenon. It is numerous in Ussura (in Hanka Lake) and Sungara.

Way of living

The Amur pike is a common fish of the Amur region and one of the basic commercial fishes. After spawning, which takes place in April-May on flooded shore vegetation, adult pike partially stay in coastal zones and partially migrate in lakes where they inhabit open waters. A number of them also go into the Amur River bed; here they commonly inhabit parts of the river close to shallows where water flow is slow. Such waters are usually rich with fry of different fish, as well as with adult Cebak (Leuciscus waleckii Dyb.) and podust-chernobrinshka (Xenocypris macrolepis) on which pike feed.[1] By fall, pike migrate from lakes and tributaries to the Amur River bed. However, part of the population, the exception noticed in fish of Chinese faunal complex, does

[1] Scientific names added by translator.

not migrate in winter from lakes to the Amur bed, but to lower flows of the larger tributaries to the lakes. In winter, in river beds, pike continue to feed actively.

In summer young and immature pike occupy shore zones almost exclusively, and in flooding season [ they occupy] flooded areas. In open parts of lakes and the Amur River bed, young pike are almost never found. In the upper flow of the Amur River, particularly in basins of Onona and Ingoda, pike live generally in lakes.

Reproduction

Amur pike reach sexual maturity in mass at the age of 3+; an insignificant part, mostly males, ripen at the age of 2+; and part, mostly females, at the age of 4+. The length at which the Amur pike usually become sexually mature is about 40 cm. The sex ratio of pike at spawning time usually is characterized by a slight preponderance of males. Manizer and Bool (no date) recorded that in a sample taken May 8, 1937 from Lake Udil, 80% were males and 20% were females. In the sample taken May 9, 1937, 63.5% were males and 36.5% were females. In the pike sample taken May 7 to 16, 1940, at the region of Novo Ilinovsky, there were 75% males and 25% females. After the spawning time, sex ratio is either close to 1:1 (for instance, in the sample taken in July 1947 from Bolon Lake, there were 45% males and 55% females), or is characterized by a slight preponderance of females (for instance, at sample taken in Tir region in July 1947, there were 62% females and 38% males).

Fecundity of Amur pike, according to data of V. K. Soldatova (1915), fluctuates from 29, 271 to 127, 260 eggs, with an average of 86, 142. The fecundity of a pike 62.7 cm long and 1, 930 g in weight determined by V. T. Bogaevsky was 25, 970 eggs. Manizer and Bool reported data on fecundity of 11 pike obtained in spring of 1937 in Udil region (Table 1 in this translation). According to D. S. Zagorodnaya (1955), average fecundity of Amur pike was 38, 419 eggs. In different regions of the lower Amur, fecundity varies from place to place. Least fecundity was observed in pike from Orel Lake, but that was associated with larger sizes of eggs. Relative fecundity of pike from Bolon Lake was 21.3 in 1951, and 27.2 in 1952; in Lake Petropavlovskoe in 1952 it was 30.8, and in Lake Orel it was 20.7. Regular fluctuations of relative fecundity with growth changes were not observed.

Spawning time of pike from different sections of the Amur ranges from April to June. In Lake Hanka, according to V. T. Bogaevsky and V. E. Rozova, spawning takes place occasionally at the end of March, commonly about mid-April. In the lower flow of the Amur River, spawning was observed in May or at the beginning of June (V. T. Bogaevsky for Novo-Ilinovka region; Cherniavska for Nizshny Tambovsky region; Manizer and Bool for Udil Lake). Krizhanovky, Smirnov and Soin (1951) stated that the beginning of the spawning of the Amur pike is associated not only with appearance of the appropriate temperature but also with flooding of land vegetation which serves as substrate for eggs. So in 1946, as observed by S. G. Soin in the Bolon region, before flooding started, pike were ripe but did not spawn. Spawning began on May 24,

when water started flooding land vegetation on which pike laid their eggs. In 1947, when water level of the Amur River was high, spawning in the Bolon region was already completed on May 15. The spawning period of Amur pike is short; in each region it does not last longer than one week.

Size, year class composition and growth

Size distribution of pike in commercial catches in the Amur Basin is subject to very strong fluctuation. Changes were found even in separated regions in different years. So, as noted by V. T. Bogaevsky (1945), dimension of pike in the Bolon region decreased strongly. Table 2 shows some data on size distribution of pike in commercial catches in different sections of the Amur Basin.

Commercial catches usually contain year classes from 1+ to 12+ or 13+. Basic mass of catches is represented by classes 3+ to 5+ (Table 3).

The maximum weight of pike observed was about 16 kg. Correlation of the growth, length and weight of pike from Lake Bolon in 1947 is given in Table 4.

Unfortunately the data available for sizes of young fish are very few and to not permit a detailed picture of pike growth in the first year of life. As can be seen in the results given below, regardless of short spawning period, size of yearlings varies a great deal. In 1946, young were of the following sizes: in Bolon on June 27, length was 6.8 cm; on July 8, 10.9 cm; on July 23, 10.1 cm; on July 30, 15.5 cm; in Lake Udil on July 22, 5.9 cm. In 1947, young fish obtained on July 13 from

Tyr were distributed as follows: 5.0-5.5 cm, 2; 5.5-6.0 cm, 6; 6.0-6.5 cm, 5; 6.5-7.0 cm, 2; 7.0-7.5 cm, 1; mean, 6.1 cm.

In Amuga, on July 15, fish of 10.3 and 10.5 cm were obtained. In Saharovka, one young fish caught on July 22 had a length of 8.1 cm. In 1948 young pike of the following sizes were obtained: In upper Amur: Shilka in Staroloncakovo on July 6, 9.8 and 10.1 cm; Lake Ural on July 9, 3.9 cm; Amur close to Sverbevo on July 23, 10.0 cm; Dzalinda, 10.3 cm; Elabuga, Lake Nikitina on July 30, 15.5 cm; Bolon on June 19, 5.5 and 7.7 cm; on June 21, 4.4 cm; on June 23, 7.0 cm; on July 3, 8.7, 12.5 and 13.7 cm; on July 5, 10.9 cm, on July 10, 6.9, 8.1 and 14.7 cm; on July 13, 11.2 and 13.7 cm; July 14, 8.6, 9.7, 10.0, 10.5, 11.1 and 13.0 cm; July 15, 13.0, 13.4 and 14.0 cm; July 16, 11.3 cm, July 17, 11.8 cm, July 21, 11.3, July 24, 11.5, 12.8 and 14.9 cm; July 28, 11.2, 12.3, 12.4, 12.5, 13.7 cm. In this way, at the end of July, young pike in the Bolon region often reach more than 14 cm.

Growth of pike was determined by means of back calculation on linear scale (calculation has been done by A. K. Sviderskaya) and can be seen in Table 5. Comparison of fish growth from different regions shows that existing difference is extremely insignificant and fits into the error limit. Males are characterized by somewhat slower growth than females. Comparison of data on pike growth with the data obtained for middle flow by A. Ya. Taranc, shows a very similar picture.

Feeding

Young pike, 5 cm or more in length, feed almost completely on fry of other fish. As shown by M. N. Lishev (1950), the diet of pike 50-80 mm long consisted mostly of fry from various cyprinids 15 to 40 mm long. Average size of prey was 15 to 25% of the size of the predator, maximum 57%. Composition of the diet of pike 17 cm or more, differed slightly in relation to size.

In spring, following spawning, pike begin to feed intensively. Basic food of pike in flows, bays and lakes is serebriani caras (Carassius auratus) [goldfish], which represents 25-88% of weight of food in different samples; other diet components play subordinate roles. In the summertime, at the Amur River bed, the most important food items in the pike diets are Amurskiy cebak (Leuciscus waleckii Dybowski) and podust-chernobriushka (Xenocypris macrolepis). In the fall, the basic component of pike diet changes very often and depends on which prey fish migrate from tributaries to the Amur in the given moment. So, at the beginning of October 1947, the predominant food item was podust-chernobriushka and vostrobriushka (Hemiculter leucisculus leucisculus, Vasilevsky), and at the end of October it was caras (Carassius auratus), Malaya coriushka (Hypomesus olidus, Pallas) and cebak. Caras, which is the most important food item in the spring, summer and fall, is not eaten in winter. Basic food items in winter are Malaya coriushka, podust-chernobriushka, kon(s) (genus Hemibarbus), vostrobriushka, and peskar(s) (in general, genus Rostrogobio).

Size of prey eaten by adult pike ranges from 5 to 35% of pike body size. Average size of prey decreases somewhat with an increase in size of the predator.

Pike feed intensively throughout the whole year with the exception of spawning time. Detailed work about pike feeding has been done by M. N. Lishev (1950).

Migration

Spawning migration from the Amur bed to the outlets and lakes begins before ice has melted. In the Bolon region, migration begins usually about mid-April. At that time pike constitute sufficiently strong concentrations. After spawning, pike spread along shores of lakes, slow moving outlets and flooded areas. Part of them, after spawning, travel back to the Amur bed where they occupy shallows and places with slow current. It is known that young pike to 40 cm of length, so-called "travianki", always inhabit flooded areas and lakes but as a rule never the Amur bed. After they have started active feeding, pike larvae also keep to the coastal areas, particularly among flooded vegetation.

In the fall, usually at the end of September, pike in the Bolon region leave the lakes and occupy outlets and bays, the places where other fish migrate through from the lake to the Amur River. Here pike stay until the end of October or the beginning of November, when they start migration to the Amur bed or other deep tributaries. Part of the pike population in the lower Amur region does not migrate from

the big lakes to the Amur River, but instead ascends to the larger lake tributaries--as examples, from Bolon Lake to Harpi River, from Udil Lake to rivers Pildu and Bichi, and from Orel Lake to Dzhapi River.

In winter, pike do not become sluggish and stay at the bottom, but live actively throughout the whole winter continuing intensive feeding.

Pike inhabiting the Amur River region do not perform long distance migrations. Marking experiments carried out in October 1937 and 1939 by V. T. Bogoaevsky (1947) showed that 89% of marked fish had been recaptured 20 km or less from the place of release; 11% had been recaptured at the distance of 160 km from the place of release. In terms of time, 38.3% of marked fish had been caught in less than 100 days after marking, 45.2% in 100-200 days (in the time of spawning migration) 10.9% in more than 200 days, and 5.6% in more than a year.

## The role of the pike in the life of Amur ichthyo fauna

Pike in the Amur River region appear to be the most numerous and widely distributed predator. It has a strong influence on the populations of caras, cebak, podust-chernobriushka, vostrobriushka, coriushka and peskar(s), reducing their number. Pike feeding in the summer on caras, and in winter on coriushka, peskar(s), and vostrobriushka, compete with other predators, particularly with the som (the Amur catfishes, Silurus soldatovi and Parasilurus asotus); they compete with kitaiski okun (Chinese sea perch, Siniperca chua-tsi, Basilewsky) and zmeegolov (Orhiocephalus argus warpachowskii Berg) for caras; and they compete with predatory members of Cultrinae for koriushka and vostrobriushka.

At the Amur River bed, pike feed in the summer on cebak, and so compete with Amur zereh (Pseudaspirus leptocephalus Pallas).

Economic importance

Pike represent one of the basic commercial fishes of the Amur Basin. It is intensively fished commercially at the upper, middle and lower flows of the Amur River.

Catches of pike in the Amur Basin in recent years are given as follows:

Middle Amur commercial fisheries which have quantitatively the best catch of pike [1]

| Year | Catch (kg) | Year | Catch (kg) | Year | Catch (kg) |
|---|---|---|---|---|---|
| 1937 | 2, 063, 800 | 1942 | 596, 700 | 1947 | 792, 800 |
| 1938 | 2, 027, 100 | 1943 | 1, 007, 200 | 1948 | 797, 700 |
| 1939 | 1, 586, 600 | 1944 | 949, 200 | 1949 | 1, 148, 500 |
| 1940 | 967, 400 | 1945 | 246, 000 | | |
| 1941 | 738, 400 | 1946 | 232, 900 | | |

[1] Data of the original tables were given in old Russian commercial weight measures. They have been translated into the metric measures considering that: 1 centner = 100 kg; 1 pood = 16. 38 kg.

Lower Amur commercial fisheries for pike

| Year | Catch (kg) | Year | Catch (kg) |
|---|---|---|---|
| 1940 | 156, 200 | 1944 | 239, 200 |
| 1941 | 181, 500 | 1945 | 160, 000 |
| 1942 | 269, 500 | 1946 | 501, 000 |
| 1943 | 205, 000 | 1947 | 122, 500 |

Habarov region commercial fisheries for pike

| Year | Catch (kg) | Year | Catch (kg) |
|---|---|---|---|
| 1941 | 56, 800 | 1946 | 48, 700 |
| 1942 | 38, 800 | 1947 | 113, 100 |
| 1943 | 114, 400 | 1948 | 177, 500 |
| 1944 | 84, 600 | 1949 | 286, 500 |
| 1945 | 32, 100 | | |

Unplanned consumers catch of pike

| Year | Catch (kg) | Year | Catch (kg) |
|---|---|---|---|
| 1940 | 235, 300 | 1944 | 239, 300 |
| 1941 | 453, 800 | 1945 | 113, 200 |
| 1942 | 451, 300 | 1946 | 178, 000 |
| 1943 | 168, 100 | 1947 | 120, 400 |

Total catch of pike for the Soviet Union part of the Amur Basin in recent years

| Year | Catch (kg) | Year | Catch (kg) |
|---|---|---|---|
| 1941 | 1, 430, 500 | 1945 | 531, 300 |
| 1942 | 1, 356, 300 | 1946 | 960, 600 |
| 1943 | 1, 495, 300 | 1947 | 1, 148, 800 |
| 1944 | 1, 512, 300 | | |

The best catch of pike in the Amur Basin was in 1937. In the lower Amur the best catches were obtained at the fisheries regions of Elabuga, Daerga and Bolon, where pike are exploited commercially mostly in lakes. As can be seen from presented catch curves of separated commercial fisheries (Fig. 1), catches for the whole lower Amur region have two outstanding maxima each year. First maximum appears in May (in April only in Bolon) and is associated with spawning migration. Second maximum of the catch comes in southern fisheries (Elabuga, Daerga, Bolon) in October, and in northern fisheries (Novo-Ilinovka, Solonci) in September-October. The second maximum is associated with fall migration from lakes to the Amur bed. It has to be noticed that the fall increase in catch is more outstanding in the northern fisheries than in the southern. Pike are caught in small quantities in the winter months.

Basic equipment for catching pike and other fish is "zakidnie nevoda" (seines). Small amounts of pike are caught with stavnaia seta (shutter net). Other fishing devices do not play a significant role in pike catches.

As a food product Amur pike do not differ considerably in quality from European and American pike. Comparative data can be seen in Table 6. Data are given by I. V. Kizevetter (1942) and represent content of fats, moisture, proteins and ash in the flesh of Amur, Astrahan and American pike. The presented data show regular differences only in quantities of fats in muscles. Amur pike have nearly two times more fat than Astrahan or American pike. The Amur pike is prepared as a salty product or it is canned. Considerable part is utilized as a fresh food.

## Dynamics of pike population and means of its reproduction

As seen in the tables presented, catch of pike in the Amur region had a peak in 1937; after that the catch started decreasing and continued to decrease until 1945-1946. According to Bogoaevsky, decrease in catch was followed with decrease of average size of fish caught. However, change of average size of fish cannot be caused only by the influence of exploitation, but is also a result of strong management and stocking.

Amur pike, as a phytophil fish, spawn on vegetation. Years with low spring water level are unfavorable for spawning. Concentrations

of pike on the small flooded areas, covered with vegetation convenient for spawning, are very vulnerable for catching; and in such fishing operations considerable part of laid eggs also are destroyed.

I think that intensive harvest at the spawning grounds (instead of harvest while pike migrate for spawning, and which is more rational) was the main cause of decrease in numbers of pike and thus affected total harvest. Another important point is that pike release all their eggs at one time, which results in complete loss of eggs when spawning conditions are unfavorable.

Pike can stand oxygen deficiencies better than most other fish; also, in the winter pike often migrate from the lakes to the mouths of lake tributaries, rather than to the faster flowing Amur beds. Hence, setting traps in such places had strong influence on pike abundance. Pike were affected more by such harvests than were other fish species. Regulations which prohibited fishing on spawning grounds and setting traps at river mouths doubtlessly resulted in increased numbers of pike in recent years. Presently, catches certainly are on the increase, although average size of fish caught is still small. The small size is caused by high participation of strong year class 1947-1948.

The question is what should be done for pike in the Amur Basin? Do we have to maintain restoration of the pike population, or inasmuch as pike appear as predators which affect some other commercially important species, should it be destroyed or its population reduced?

As shown by M. N. Lishev (1950), the diet of pike consists more of coarse fish than of commercial fish. Reduction of the pike population will result in a sharp increase in coarse fish, and since most of them (particularly pescars) feed on the same food as commercial fish, the latter would be adversely affected. However, the number of commercial fish eaten by pike increases sharply as pike grow. We conclude that high concentration of large pike in such waters is undesirable.

I think that our fisheries must have the following attitudes toward pike. Size distribution in the catches has to be such that every size of fish does not surpass 50 cm. There is no need for limiting the catch of small pike. It is very important, especially in the years of low water level, to allow undisturbed spawning. Considering the pike in the Amur River region, I once more emphasize that we need to organize fisheries so as not to reduce the population but to establish such management which will protect other commercial fish from predation by pike.

Considering all which is said above, it seems to me that with good management conditions, a steady population of pike can be established, and middle Amur fisheries can expect a harvest of about 1,500,000 kg per year. At present, the harvest is based on the spring spawning run and on the fall migration. However, contrary to past practice, fish will have to be caught while migrating, and not while on the spawning grounds.

Table 1.--Fecundity of pike in the region of Udil Lake

| Length (cm) | Weight (grams) | Weight of gonads (grams) | Coefficient of ripeness | Fecundity | |
|---|---|---|---|---|---|
| | | | | Absolute | Relative |
| 57.5 | 1,670 | 265 | 15.9 | 30.000 | 18.0 |
| 58.5 | 1,780 | 223 | 12.5 | 34,578 | 19.6 |
| 29.5 | 2,030 | 225 | 11.2 | 37.035 | 18.2 |
| 60.0 | 2,110 | 345 | 16.3 | 42.435 | 20.0 |
| 60.5 | 1,960 | 270 | 13.8 | 36.450 | 18.6 |
| 61.0 | 2,115 | 390 | 18.4 | 52.600 | 24.7 |
| 61.2 | 1,975 | 300 | 15.2 | 38.500 | 19.6 |
| 62.0 | 2,320 | 390 | 16.8 | 51.350 | 22.2 |
| 67.0 | 2,820 | 603 | 21.5 | 70.551 | 25.0 |
| 79.0 | 4,500 | 369 | 8.2 | 46.350 | 10.2* |
| 89.5 | 7,400 | 1,220 | 16.5 | 150.997 | 21.5 |

* Observed traces of injury.

Table 2. --Size distribution of pike in commercial catches in different parts of Amur Basin

(The original table is herewith condensed; vertical columns covering 5 cm have been combined to columns covering 15 cm)

| Place and date | Length in centimeters | | | | | | Average | Av. wt. (gr) | Coefficient of condition |
|---|---|---|---|---|---|---|---|---|---|
| | 20-35 | 35-50 | 50-65 | 65-80 | 80-95 | 95-105 | | | |
| Tyr VII/12-13/47 | | | | | | | | | |
| Females | 1 | 4 | 4 | - | - | - | 47.0 | - | - |
| Males | - | 9 | 6 | - | - | - | 45.9 | - | - |
| Solonci 1937 | 1 | 56 | 98 | 28 | 9 | 3 | 58.7 | 2430 | 1.23 |
| VII/24/47 | 1 | 53 | 18 | - | - | - | 46.1 | - | - |
| Novo Ilinovka V/7-16/40 | | | | | | | | | |
| Males | - | 83 | 109 | - | - | - | 51.0 | - | - |
| Females | - | 12 | 50 | 1 | - | - | 53.7 | - | - |
| VII/29/46 | 3 | 8 | 4 | - | - | 1 | 47.5 | - | - |
| Vasnesenovka | | | | | | | | | |
| VIII/4/46 | - | 6 | 4 | 1 | - | - | 49.9 | - | - |
| Bolon | | | | | | | | | |
| X/18/43 | - | 14 | 74 | 29 | 1 | - | 58.5 | 2050 | 1.01 |
| X/23/43 | 27 | 72 | 119 | 34 | 1 | - | 52.4 | 1200 | 0.83 |
| X/25-29/43 | 70 | 417 | 832 | 217 | 8 | - | 54.5 | 1675 | 1.03 |
| IV/14-17/44 | 96 | 541 | 64 | - | - | - | 43.4 | 810 | 0.99 |
| IV/29-30/44 | 41 | 640 | 322 | 46 | 2 | - | 48.9 | 1200 | 1.03 |
| V/5-6/44 | 34 | 177 | 65 | 2 | - | - | 45.2 | 945 | 1.02 |
| VI/2/44 | 1 | 41 | 8 | - | - | - | 44.6 | 812 | 0.92 |
| X/16-19/44 | 4 | 991 | 466 | 25 | - | 1 | 46.5 | 975 | 0.98 |
| IV/19-22/45 | 4 | 452 | 212 | 37 | 3 | - | 48.8 | 950 | 0.82 |
| V/4-6/45 | 4 | 280 | 67 | 9 | 2 | 1 | 46.2 | 943 | 0.94 |
| VII /2/45 | - | 19 | 4 | - | - | - | 45.6 | 1000 | 1.05 |
| V/8/46 | 17 | 26 | 45 | 1 | - | 1 | 47.7 | - | - |
| V/31/46 | 1 | - | 33 | 4 | - | - | 57.6 | - | - |
| V-VI/47 | 2 | 17 | 39 | 5 | 1 | 1 | 54.9 | - | - |
| X-XII/47 | 3 | 29 | 63 | 11 | 2 | - | 55.2 | - | - |
| VII/48 | 6 | 9 | 10 | 3 | 2 | - | 52.0 | 1431 | 1.03 |
| Elabuga | | | | | | | | | |
| Summer/47 | 2 | 7 | 8 | 1 | - | - | 49.3 | - | - |

Table 3. --Age composition (percentage) of pike in commercial catches (after A. K. Sviderskaya, 1956)

| Place | Age | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1+ | 2+ | 3+ | 4+ | 5+ | 6+ | 7+ | 8+ |
| Tyr | 16.5 | 28.0 | 34.0 | 18.5 | 1.0 | - | 2.0 | - |
| Solonci | - | 26.9 | 53.8 | 15.5 | 3.8 | - | - | - |
| Novo Ilinovka | 18.7 | 18.7 | 37.5 | 12.5 | 6.3 | - | - | 6.3 |
| Bolon 1947 | 10.0 | 7.0 | 31.0 | 33.0 | 12.0 | 4.0 | 2.0 | 1.0 |
| 1948 | 20.0 | 23.3 | 10.0 | 16.7 | 13.3 | 6.7 | 6.7 | 3.3 |
| Elabuga | - | 22.2 | 44.5 | 22.2 | - | 11.1 | - | - |

Table 4.--Correlation of age, length and weight of Bolon pike in 1947

| Length and weight | Age | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1+ | 2+ | 3+ | 4+ | 5+ | 6+ | 7+ | 8+ |
| Males | | | | | | | | |
| Length (cm) | - | - | 49.1 | 55.4 | 60.8 | 66.4 | 81.8 | - |
| Weight (grams) | - | - | 1010 | 1524 | 1915 | 2522 | 4310 | - |
| Coefficient of condition | - | - | 0.84 | 0.92 | 1.12 | 0.89 | 0.79 | - |
| Females | | | | | | | | |
| Length (cm) | - | - | 50.9 | 57.7 | 63.7 | 68.8 | 78.0 | 90.0 |
| Weight (grams) | - | - | 1212 | 1732 | 2166 | 2720 | 5100 | 7000 |
| Coefficient of condition | - | - | 0.94 | 0.94 | 0.84 | 0.82 | 1.03 | 0.99 |
| Young | | | | | | | | |
| Length (cm) | 32.1 | 42.3 | - | - | - | - | - | - |
| Weight (grams) | 307 | 800 | - | - | - | - | - | - |
| Coefficient of condition | 0.92 | 1.08 | - | - | - | - | - | - |

Table 5.--Growth (cm) of pike from different regions of Amur River Basin

| Place and year | Age | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Saharovka 1947 | 21.5 | 33.8 | 42.0 | 47.5 | 56.0 | 62.5 | - | - |
| Amgun 1947 | 22.6 | 33.0 | 41.0 | 48.8 | - | - | - | - |
| Tyr 1947 | | | | | | | | |
| Females | 21.4 | 32.9 | 43.3 | 51.3 | - | - | - | - |
| Males | 21.3 | 32.7 | 42.3 | 49.9 | - | - | - | - |
| Solonci 1947 | 21.6 | 32.6 | 41.9 | 48.9 | 55.3 | - | - | - |
| Suhanovka 1947 | 23.7 | 35.7 | 45.0 | 51.6 | 56.5 | - | - | - |
| Novo-Ilinovka | | | | | | | | |
| 1946 | 21.7 | 32.4 | 42.6 | 51.8 | 59.0 | - | - | - |
| Verline Tamborskoe | | | | | | | | |
| 1946 | 22.6 | 34.0 | 43.3 | 50.9 | 56.6 | - | - | - |
| Vornesenovskaia | | | | | | | | |
| 1946 | 21.2 | 32.0 | 40.5 | 48.0 | 52.3 | 58.5 | - | - |
| Bolon 1947 | | | | | | | | |
| Females | 21.5 | 32.1 | 44.0 | 51.7 | 58.8 | 68.1 | 75.0 | 84.0 |
| Males | 20.7 | 32.3 | 42.0 | 50.3 | 57.3 | 63.9 | - | - |
| 1948 | 22.2 | 32.9 | 43.5 | 51.6 | 59.3 | 67.0 | 74.5 | 78.5 |

Table 6.--Chemical composition of the flesh (percentage) of different pike (after I. V. Kizevetter, 1942)

| Pike from | Moisture | Fats | Proteins | Ash |
|---|---|---|---|---|
| Amur region | | | | |
| Lake Hanka | 78.25 | 1.05 | 20.06 | 1.20 |
| Lake Bolon | 77.70 | 1.98 | 18.39 | 1.14 |
| Astrahan | 80.54 | 0.68 | 18.53 | 1.00 |
| | 78.89 | 0.72 | 18.80 | 1.40 |
| American | 79.80 | 0.50 | 18.70 | 1.20 |

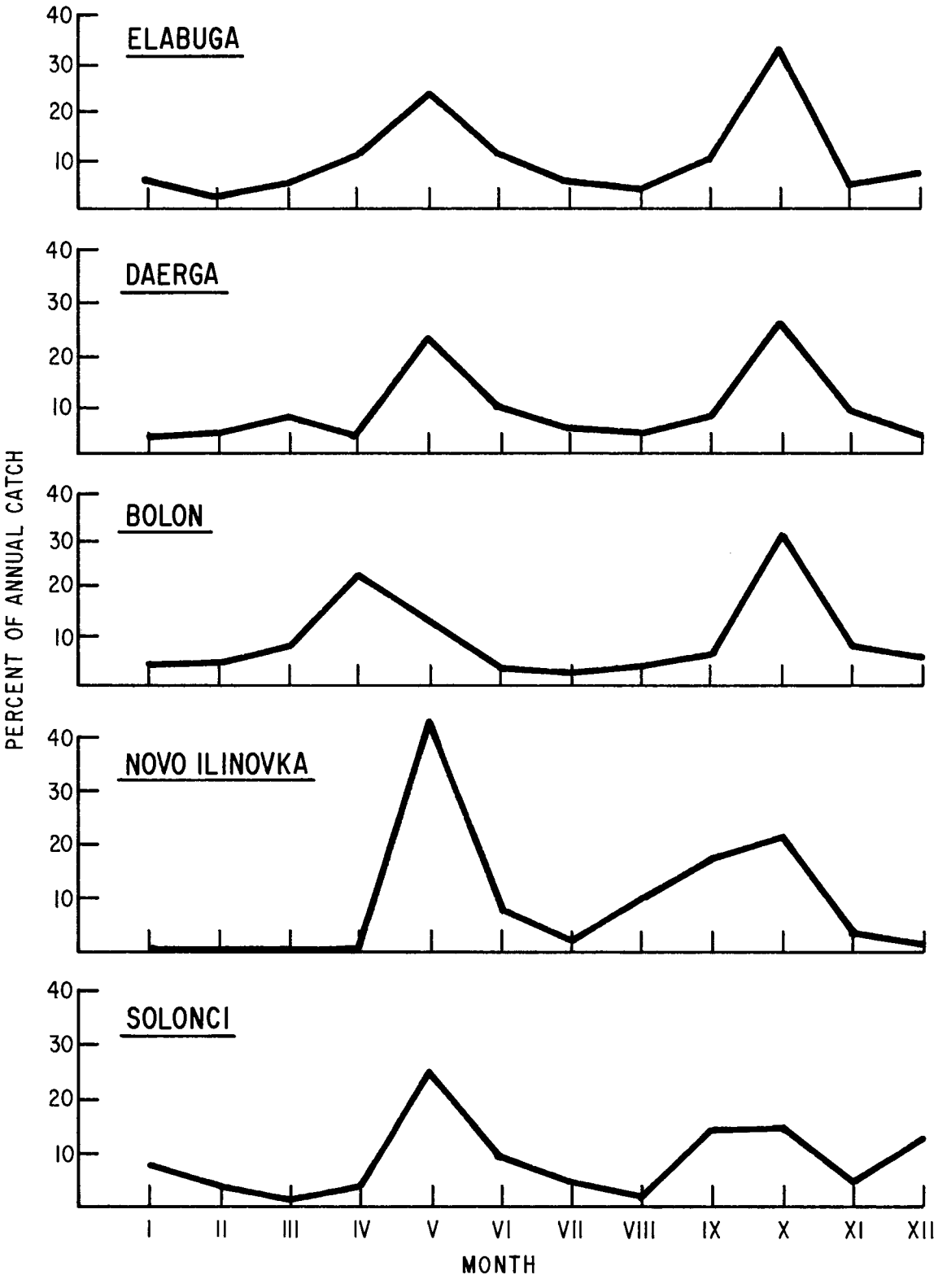


Figure 1. --Seasonal distribution of catch of Amur pike, given in percent of the year's catch.