

SYNOPSIS OF BIOLOGICAL DATA ON

***Huco huchō* (Linnaeus, 1758)**

Prepared by
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**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME, 1968**

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Hucho hucho (L.)

Prepared by

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PREPARATION OF THIS SYNOPSIS

The original version (provisional) of the synopsis was prepared for the Second Session of the European Inland Fisheries Advisory Commission (EIFAC), Paris, 7-12 May 1962, under No. FB/62/S22.

The present text is a supplement to this synopsis.

Readers are requested to suggest corrections and additions to this provisional version to make it comprehensive. Comments and requests for information should be addressed to the co-ordinator of this series:

Marine Biology and Environment Branch
Fishery Resources and Exploitation Division
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1. IDENTITY

1.1 Nomenclature

1.11 Valid name

Current name: Hucho hucho (Linnaeus, 1758)

Original combination: Salmo hucho (Linnaeus, 1758), Syst.Nat., 10: 309.

1.12 Objective synonymy

Hucho hucho (Linnaeus) Günther, 1866, Cat.Fish. Brit.Mus., 6: 125.

Hucho germanorum Günther, 1966, Cat.Fish.Brit. Mus., 6: 140.

Günther (1866:125) suggested that Salmo hucho and other related (unspecified) fishes "may be united under the name of Hucho". However, as the dentition of these fishes is very imperfectly known, this division can be merely indicated at present". Günther never actually used the name Hucho hucho, but in view of his suggestion it must be credited to him. He probably considered the tautonymous combination invalid, and intended his specific name germanorum to replace hucho when his new genus Hucho was adopted. Under the present Rules of Zoological Nomenclature, however, there is no objection to tautonymous names, and H. germanorum Günther must be rejected as a junior synonym of H. hucho (Linnaeus).

1.2 Taxonomy

1.21 Affinities

Suprageneric

Phylum Vertebrata

Subphylum Craniata

Superclass Gnathostomata

Series Pisces

Class Teleostomi

Subclass Actinopterygii

Group Teleostei

Order Clupeiformes

Suborder Salmonoidei

Family Salmonidae

Subfamily Salmoninae

(Classification after Berg, 1947).

Generic

Hucho Günther, 1866, Cat.Fish.Brit.Mus., 6: 125.
Type species (fixed by monotypy): Salmo hucho Linnaeus, 1758.

The description of the genus Hucho Günther is as follows:

Salmoninae in which the teeth of the vomer form a compact band. No teeth on the copulae. Body cylindrical, covered with small scales. Skin covered with black spots in the form of an X (Berg, 1948).

Hucho is usually regarded as being most closely related to Salvelinus Richardson, but Norden (1961) was of the opinion that it should be placed between the genera Brachymystax Günther and Salmo Linnaeus.

The following four species are included by Berg (1948) within the genus Hucho:

1 - Hucho hucho (L.) On the first gill-arch 16 gillrakers; freshwater fish from the Danube river basin, no migratory species. D III-IV 9-10, A IV-V 7-9, 18-20 squ 180 20-24 200

The number of the pyloric caeca is 200.

2 - Hucho taimen (Pallas)

On the first gill-arch 11-12 gillrakers; freshwater fish from the Siberian river basins, no migratory species. D IV-V 9-11, A III-IV 8-9, squ 198 26-30 220

The number of the pyloric caeca is 150-210.

3 - Hucho ishikawai Mori

Freshwater fish from the Korean river Yalu, no migratory species.

4 - Hucho perryi (Brevoort)

On the first gill-arch 12-14 gillrakers; freshwater fish from the Sakhalin rivers. This species migrates for spawning from the Sea of Japan to the rivers of Sakhalin and Hokkaido. D III 9-10, A III 8-10, squ 109 17 16 121

Hucho perryi has larger scales than H. hucho and H. taimen.

This information is given by Berg (1962) and by Ivaska (1951).

H. perryi was regarded by Vladkov (1963) and Shaposhnikov (1967) as forming the distinct subgenus Parahucho Vladkov.

Specific

No type specimen was designated by Linnaeus and we have no information on the subsequent selection of a neotype.

No type locality was given by Linnaeus (1758).

Characters by which *H. hucho* may be distinguished from other members of the genus are given in the previous section. The adult fish is illustrated in Figure 1.

1.22 Taxonomic status

The taxonomic status of the four species is not established by breeding data. The differences are based on the biometric indices of the skull.

1.23 Subspecies

None described.

1.24 Standard common names, vernacular names.

The common names used in various countries are set out in Table 1; these are based on a number of sources, chiefly the following: Berg (1947), Benecke (1886), Gasowska (1962), Ivaska (1951), Neresheimer (1937), Nowicki (1889) and Smolian (1920).

Table 1.

Names in common use in various countries and river basins of distribution of the species.

<u>Country</u>	<u>Common names</u>	<u>River</u>
German Federal Republic	Hauch, Rotfish, Rothuchen, Donausalm, Donaulachs.	Iller, Wertach, Lech, Altmühl, Vils, Naab, Regen, Isar, Inn, Danube.
Austria	Donauleachs, Huchen.	Inn, Salzach, Enns, Steyr, Lech, Ybbs, Mur, Kamp, Danube, Leitha, Drava.
Czechoslovakia	Hlavatka, Hlavakta vazska, Gadovica, Hlavatka obycajna, Losos jezerny.	Orava, White orava, Black orava, Wag, Poprad, Turica, Nitra, Hron, Kusuka.
Poland	Glowacica.	Dunajec, Poprad.

<u>Country</u>	<u>Common names</u>	<u>River</u>
Hungary	Huco, Galoca, Dunai galoca, Huho-szemling, Retke, Huko-huhko.	Danube
Romanian People's Republic	Lostrita, Lostosa, Lestoca, Lostoza.	Bystrica river in Moldavia, Danube, Oltul, Maros, Lotrul, Argesul.
Bulgaria	Dunavska pstra	Danube.
Yugoslavia	Mladica, Ljepolica, Mladica glavatica, Mlacak, Sulec.	Drava, Sava, Dobra, Kupa, Morava, Una, Lim, Vrbas, Sana, Bosna.
U.S.S.R.	Dunajskij losos, Holovatilzia, tributary of Holovatch.	Czeremosh, Prut, Szybeny, tributary of Czeremosh.
England	River salmon, Danube salmon.	- -
France	Saumon du Danube, Huchon.	- -
		1.3 Morphology
		1.31 External Morphology
		(For descriptions of spawn, larvae and adolescents, see 3.17, 3.22, 3.23).
		The morphology and morphometry of the species <i>Hucho hucho</i> is little explored because it is very difficult to obtain the necessary data. The study by Shaposhnikov (1967) on the differences between the genera <i>Hucho</i> Günther and <i>Brachymystax</i> Günther gives information on the biometric indices of the skull and on the structure. It seems advisable to study the morphology and morphometry of the species <i>Hucho hucho</i> (L) from different European rivers (for example in Yugoslavia and Austria). In this way it may be possible to discover geographical variations.

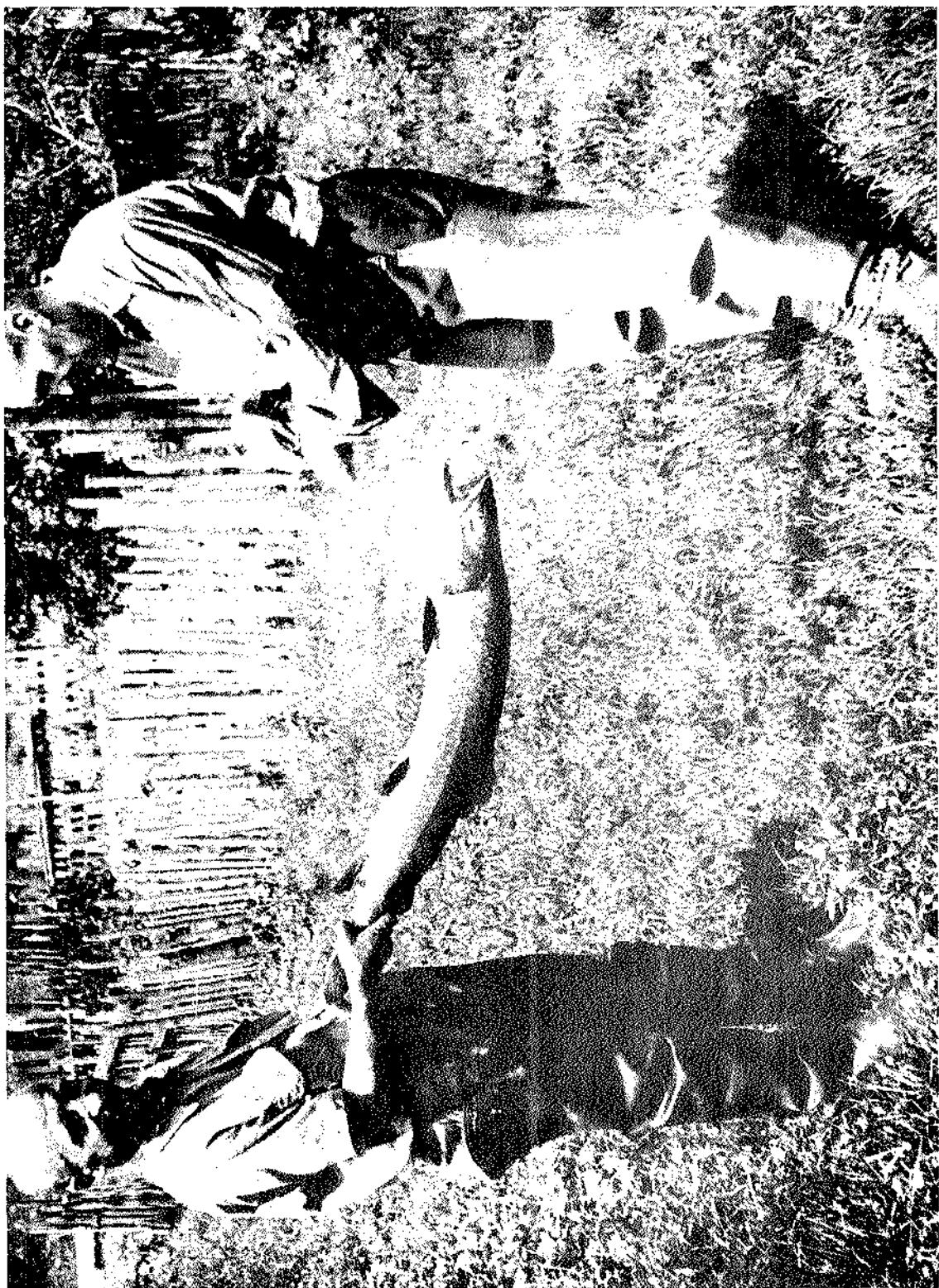


Figure 1: Hucho hucho from Dunajec River, Poland

2. DISTRIBUTION

2.1 Total area

The species *H. hucho* occurs in the Danube river basin, in the countries listed in Table I (see also Figures 2, 3 and 4).

H. hucho prefers the upper reaches of the tributaries of this large river (given in Table I). The species dwells in cold water with plenty of oxygen and with a stony bottom.

2.2 Differential distribution

2.21 Spawning, larvae and juveniles

H. hucho is a spring spawner; it spawns in March and April (often between April 8 and 20, according to Ivaska 1951), at a water temperature of +5° to +6°C, in the upper courses of highland rivers. The spawning grounds are chosen in 30-60 cm of water, where the bottom is covered with gravel or coarse sand.

The larvae keep close to the ground, near the spawning place. The latter is very similar to the spawning hole of *Chondrostoma nasus* (L.). When *C. nasus* is hatched it is used as food by the larvae of *H. hucho*. During the spawning period, the males are generally very fierce, driving away intruders with great pugnacity and vigour, or engaging in formal combats with other males.

2.22 Adults

After spawning, the parent fish go downstream and keep close to deep places and rocks, where *Chondrostoma nasus*, their principal food, is found. The adults live mainly in the upper region of distribution of the barbel (*Barbus fluviatilis*).

2.3 Determinants of distribution changes

The ecological determinants of the distribution of *H. hucho* are (1) oxygenated water, (2) temperature of water (max. +15°C), (3) gravel or coarse sand bottom, (4) rapid and strong current with deep places, and (5) plenty of food.

During the spawning period, *H. hucho* is found near the spawning places of *Chondrostoma nasus*, and at other periods in the upper region of *Barbus fluviatilis*, where there is also plenty of *Chondrostoma*. The alevis live near the spawning places. The maximum temperature for the alevis is +12°C. The trout region does not suit the adults, as there is too little water for the large fish, and too little food.

From an early age, *H. hucho* is confined to ecological region of *C. nasus*.

2.4 Hybridization

No hybrids are described.

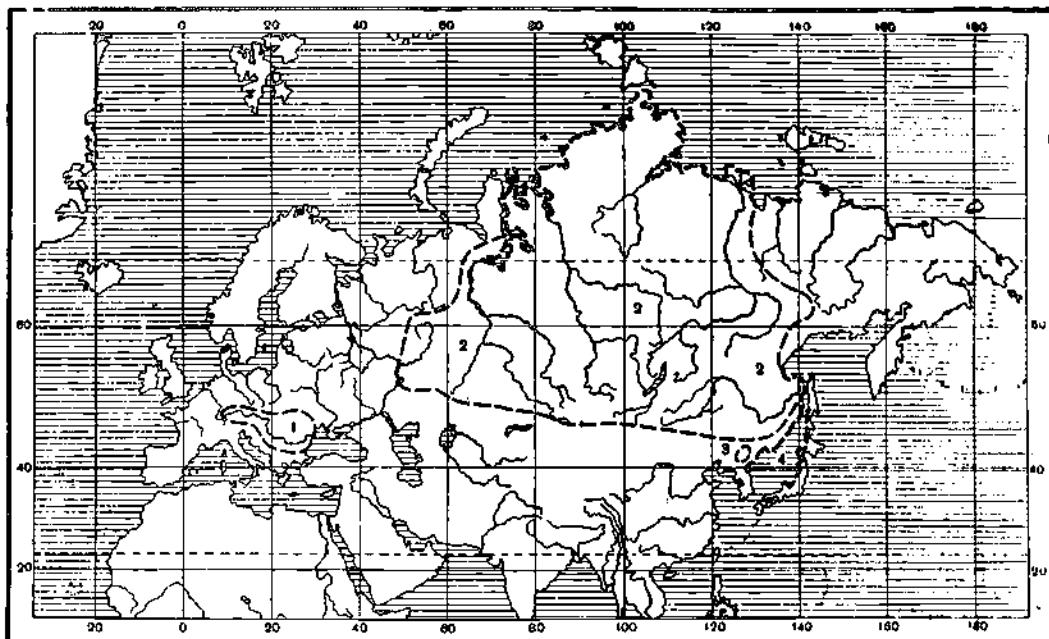


Figure 2: Distribution of Genus Hucho

1 - Hucho hucho (L.), Danube River Basin; 2 - H. taimen (Pallas), Kama River and Siberian Rivers; 3 - H. ishikawai, upper region of Yalu River in East Siberia;
4 - H. parryi, the Sea of Japan, migratory form (after Berg, 1962)

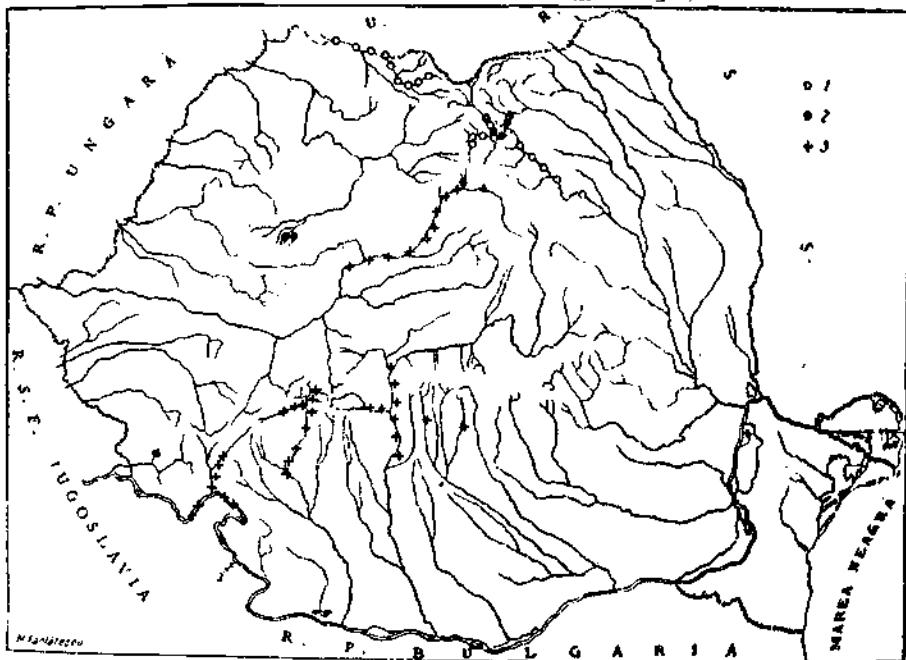


Figure 3: Distribution of Hucho hucho and Salvelinus fontinalis in Romania
 1 - Hucho hucho, 2 - Salvelinus fontinalis, 3 - Hucho hucho formerly present
 (after Bánárescu, 1964)



Figure 4: Distribution and catch places of Hucho hucho in
 Poland (Dunajec River Basin)

3. BIONOMICS AND LIFE HISTORY

3.1 Reproduction

3.11 Sexuality

H. hucho is heterosexual. With the approach of the spawning time, the males undergo marked colour changes, turning red or copper-red.

3.12 Maturity

According to Ivaska (1951) the females reach sexual maturity at the age of 5 years; other authors give 3 or 4 years. Ivaska's data are based on his personal observations made in Czechoslovakia. It is possible that in other climatic regions the maturity is earlier. At the age of 5 years, the females are 65-70 cm long and weigh about 3.5 kg.

3.13 Mating

Gravelly shallows, where the stream runs fairly rapidly, are selected as spawning grounds, and on arrival the *Hucho* segregate into pairs, and the female sets to work to scoop out a shallow, saucer-like depression, 25-60 cm deep, by means of vigorous, flapping movements of her body and tail.

This may take several days. When the work is finished, the female assumes a characteristic, crouching positions and spawning takes place. The spawning beds are 60 cm wide and 10-30 cm deep.

3.14 Fertilization

Fertilization is external; the ova and sperm are merely shed into the water, where fertilization takes place.

3.15 Gonads

The female has two gonads, which contain clusters of eggs. In the fish, these eggs drop into the body cavity and are extruded naturally or artificially. The size and number of eggs are variable, depending on the age, length and weight of the female. The only available data come from a very small number of authors. Precise quantities are given by Ivaska (1951) from Czechoslovakian rivers: females from the Turča river, weighing about 3-5 kg, give 2400 eggs, 4-5 kg females give 3-4000 eggs, 6-8 kg females give 5-6000 eggs, 10-12 kg females give 8-12000 eggs, and 18 kg females give 18600 eggs. Kulmatycki (1931b) describing *H. hucho* from the Czremosh river, noted that a 6-year female, of weight 3595 g and 784 mm long, gave 1600 eggs. In 1967, at the Lopuszna hatchery in Poland, 4 females gave 22100 eggs.

3.16 Spawning

The spawning season is in spring, when the temperature of water is between +5° and +10°C. Spawning takes place once a year. Water temperature must be stable. The spawning time depends on the stability of water temperature and on favorable climatic conditions. For example, Kulmatycki (1931b) observed spawning in the Czeremosz river at +5° and +6°C; Ivaska (1951) saw it in the Turča river (Czechoslovakia) at +6°, +8° and +10°C. In Poland the spawning time is between April 20 and 26, in Yugoslavia in the Drava river (Ivaska, 1951), between March 18 and 22.

According to some authors, the female makes the spawning hole by vigorous, flapping movements of her body and caudal fin. The eggs are dug into the sand or gravel. The female covers the eggs with fine gravel. During the spawning period, *H. hucho* takes on a red colour, and for this reason it is called in Austria and Germany "Rotfish" or "Rothuchen". At spawning time, the parent fish lose their natural timidity.

3.17 Spawn

The eggs of *H. hucho* are 4.5 to 6 mm in diameter (Ivaska, 1951) and resemble closely those of the trout (*Salmo fario*), but are of a more yellow colour. The texture, type of membrane and degree of buoyancy have not been examined.

3.2 Pre-adult phase

3.21 Embryonic phase

The period from fertilization to hatching depends on the temperature of the water. The following observations were made at the Lopuszna hatchery, Poland, following fertilization on April 25, at a water temperature of 7°C. After 228.4 degree-days (the phase "degree-days" means the product of the mean water temperature and duration of the incubation period in days), two pigmented eyes appeared in the embryo. From that moment, it took 65.7 degree-days for the embryos to hatch.

The period from hatching to the loss of the yolk sac is 164.1 degree-days. The fry live on small plankton organisms, which are their first food. According to Ivaska (1951), there is no parental care during the hatching or embryonic phase.

A common parasite of the eggs is a fungus (*Saprolegnia*), which damages the egg membranes. The eggs also have very numerous predators among fishes. The most common are: grayling (*Thymallus thymallus*), barbel (*Barbus fluviatilis*), and *Chondrostoma nasus*; they eat the eggs during the spawning season.

3.22 Larvae phase

The fry is transparent, with a large head and a large yolk sac (see Figures 5 and 6), and is rather inactive until the yolk sac is absorbed.

After final disappearance of the yolk sac, the fry become predators and attack the fry of common fish in the region, particularly the fry of Chodostroma nasus (see 2.2).

The very large head with a large, toothed mouth, is well adapted for predation. In the post-larval phase the movements are very speedy and lively.

The alevin, when in the post-larval phase, are sensitive to changes of water temperature. It has been found under aquarium conditions that they are unable to orientate above +16°C..

Fry, hatched on April 25, 1967 at +6°C, needed from 60 to 70 days to complete their metamorphosis into the essentially adult form. The following data have been obtained at the Lopuszna hatchery:

Date of spawning	Appearance of eyed embryo	Number of degree-days from spawning to eyed embryo	Number of degree-days from eyed to hatching
25.4.67.	24.5.67.	228.4	65.7
Number of degree-days from hatching to final disappearance of yolk sac	Total sum of degree days		
164.1	458.2		

3.23 Adolescent phase

The alevin live one year in the spawning region and are fierce predators. According to various authors and to the observations of the present writers, the principal food of H. hucho is Chondrostoma nasus. The growing fish must go downstream in search of deeper waters.

3.3 Adult phase (Mature fish)

3.31 Longevity

H. hucho grows very quickly as it has no competitors for food. Mature fish can reach the imposing length, according to Herman (quoted after Ivaska, 1951) of up to 2 m. The maximum age of caught H. hucho is 20 years. The age was determined by examining the

otoliths and scales.

Females are larger than males.

3.32 Hardiness

H. hucho is very delicate fish, and is especially sensitive to damage during handling. According to Ivaska (1951) some authors are of the opinion that cutting the adipose fin for marking retards the growth of the fish. Mature Hucho can stand high water temperatures (up to +20°C) when there is a good supply of oxygen (8 to 9 mg/l). On the other hand, it is highly sensitive to chemical pollution of the water.

3.33 Competitors

Thanks to its agility, strength and greediness, H. hucho has no competitors.

3.34 Predators

Mature H. hucho have no predators. Young and small individuals, when they arrive in waters which run relatively slowly, can become the prey of the pike (Esox lucius L.).

3.35 Parasites, diseases, injuries and abnormalities - Parasites and diseases

The most frequent disease is the invasion of injured parts of the body by a fungus (Saprolegnia). This disease attacks the fish when they are bruised during spawning. According to Ivaska (1951), there are cases when Basanistes huchonis Schrank (Copepoda) attach themselves to the internal side of the opercula of the gills. Apart from that, H. hucho is liable to the same diseases as other fish of the region: Ichthyobdelidae, Acanthocephalus, Triaenophorus, Bacterium salmonicida.

- Injuries and abnormalities

None described.

3.4 Nutrition and growth

3.41 Feeding

H. hucho feeds during the whole of its life. Its greediness grows as it becomes older, larger and stronger. Under artificial conditions it must be fed with live fish as it does not take dead ones. Fishermen have noticed that H. hucho always catches its prey from the front.

3.42 Food

As it has been said already (see 2.21 and 3.23), the main food of H. hucho is live fish. In its habitat, H. hucho feeds on all available species. In Spring it feeds on the Cyprinidae

which gather in the spawning places. In summer it preys for the most part on *Chondrostoma nasus*, which live in shoals, and in autumn and winter seeks deeper places, where other fish spend the cold season in large numbers.

According to the authors quoted in the references, the feeding relation is 10 kg of food per 1 kg of fish. It can be expected that the amount of food required grows with the age and weight.

The meat of *H. hucho* is very delicate and tastes like that of trout or salmon, but is paler in colour.

3.43 Growth rate

Figures 8-10 demonstrate the relation between the age, length and weight of the fish, according to Ivaska (1951) and other authors. The age and growth rates of this species have been calculated by the scales (Figure 7).

On the strength of the available data and graphs it can be concluded that, in spite of the different ecological environments (Czechoslovakia, Ukraine, Yugoslavia, Austria and Poland), the weight and linear growth rates are similar. The yearly increase in length gradually decreases after the 8th year of life, but the weight increases steadily.

3.44 Metabolism - Metabolic rates

According to the data found in the literature, and to personal observations of the present writers, *H. hucho* feeds all the year.

The endocrine system and hormones have not been investigated.

3.5 Behaviour

For the feeding behaviour see 3.41, and for the reproduction behaviour see 2.21, 3.13 and 3.21.

3.51 Migration and local movements

H. hucho does not undertake large migrations. Unless disturbed, it makes only local migrations in search of spawning places. Sometimes it enters smaller tributaries.

3.52 Schooling

Larger specimens usually occur singly and no schools of this species have been described.

3.53 Responses to stimuli - Environmental stimuli

H. hucho, especially when young, is very sensitive to chemical pollution of the water and to changes of temperature. The eyed eggs are very sensitive to lack of oxygen and to high temperatures (maximum +15°C). Old individuals can stand +20°C.

H. hucho is also very sensitive to the action of electric current, which is important for electric fishing.

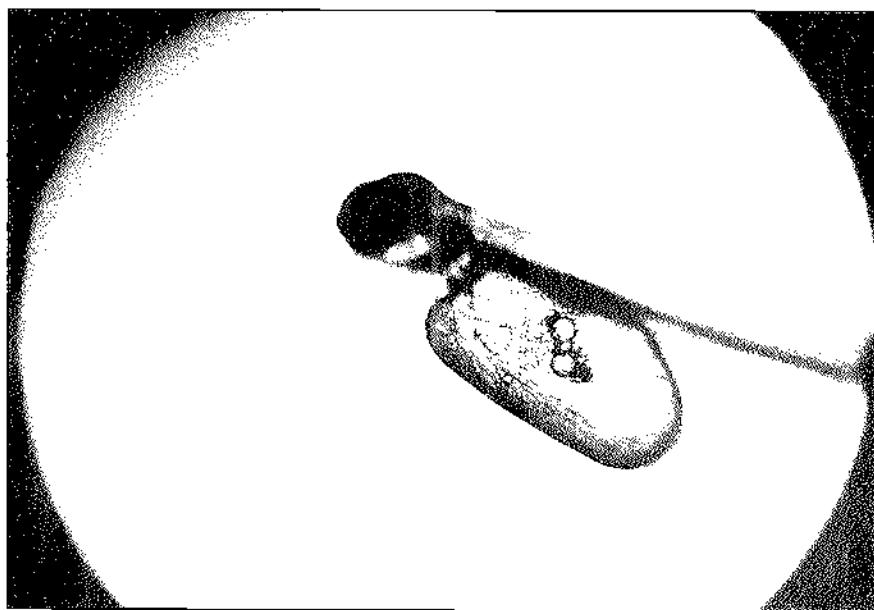
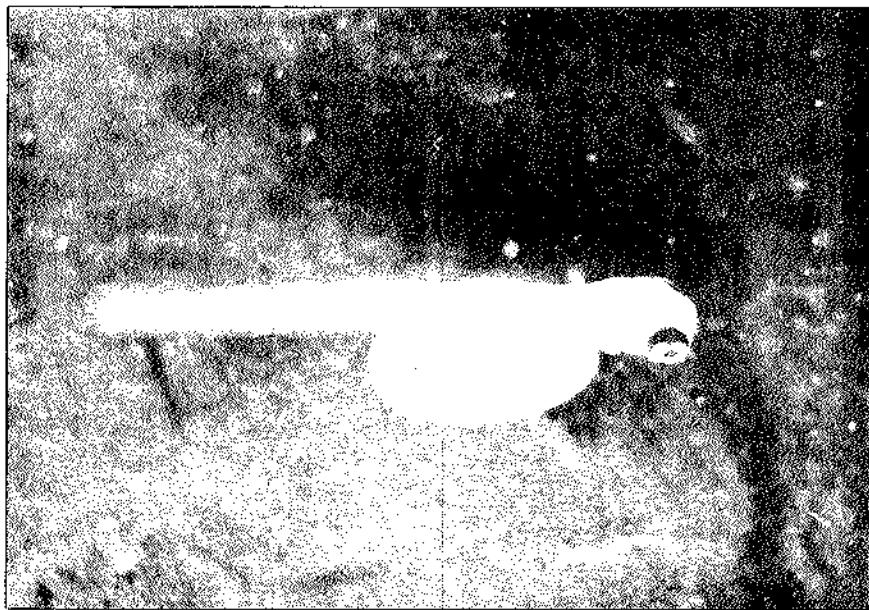


Figure 5: The Fry, one day old

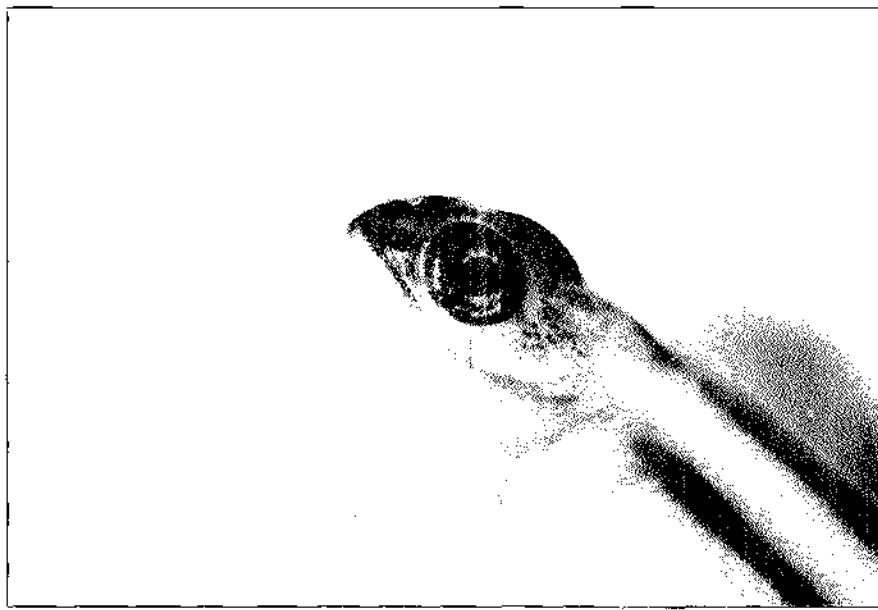
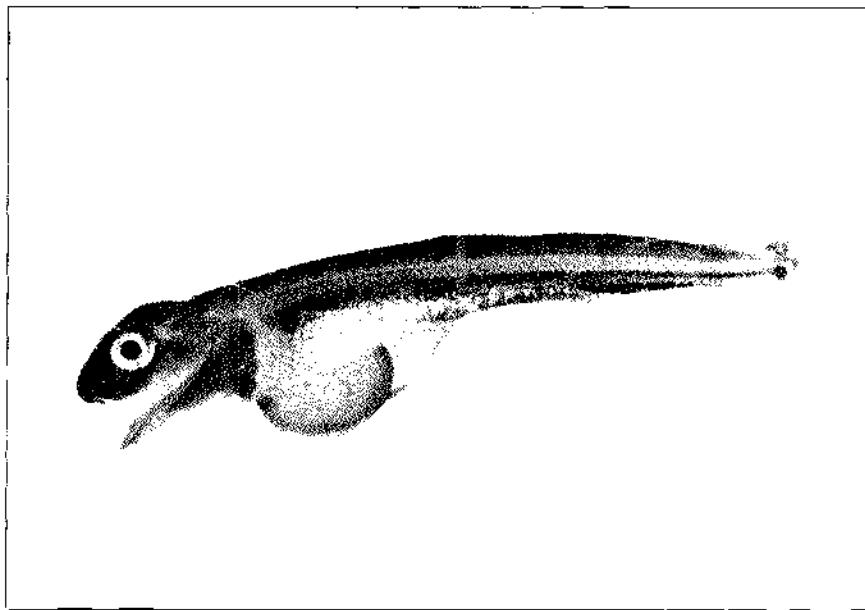


Figure 6: Hucho hucho, five days old

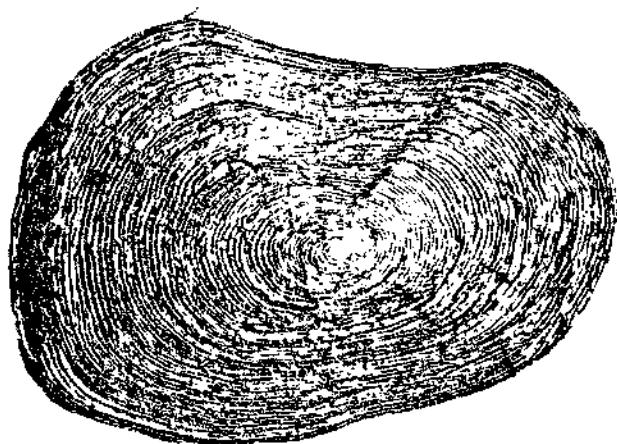


Figure 7: Scale of Hucho hucho - L. 70 cm, Lc. 63 cm, weight 3.2 kg,
age 4+, caught in Dunajec River near Czorsztyn, Poland,
11.8.1967

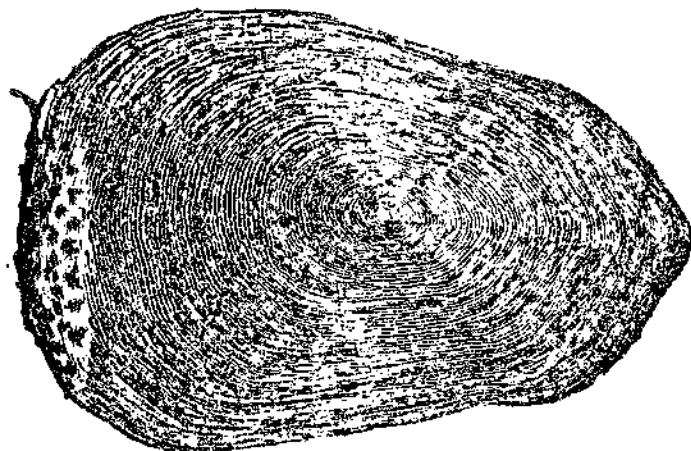
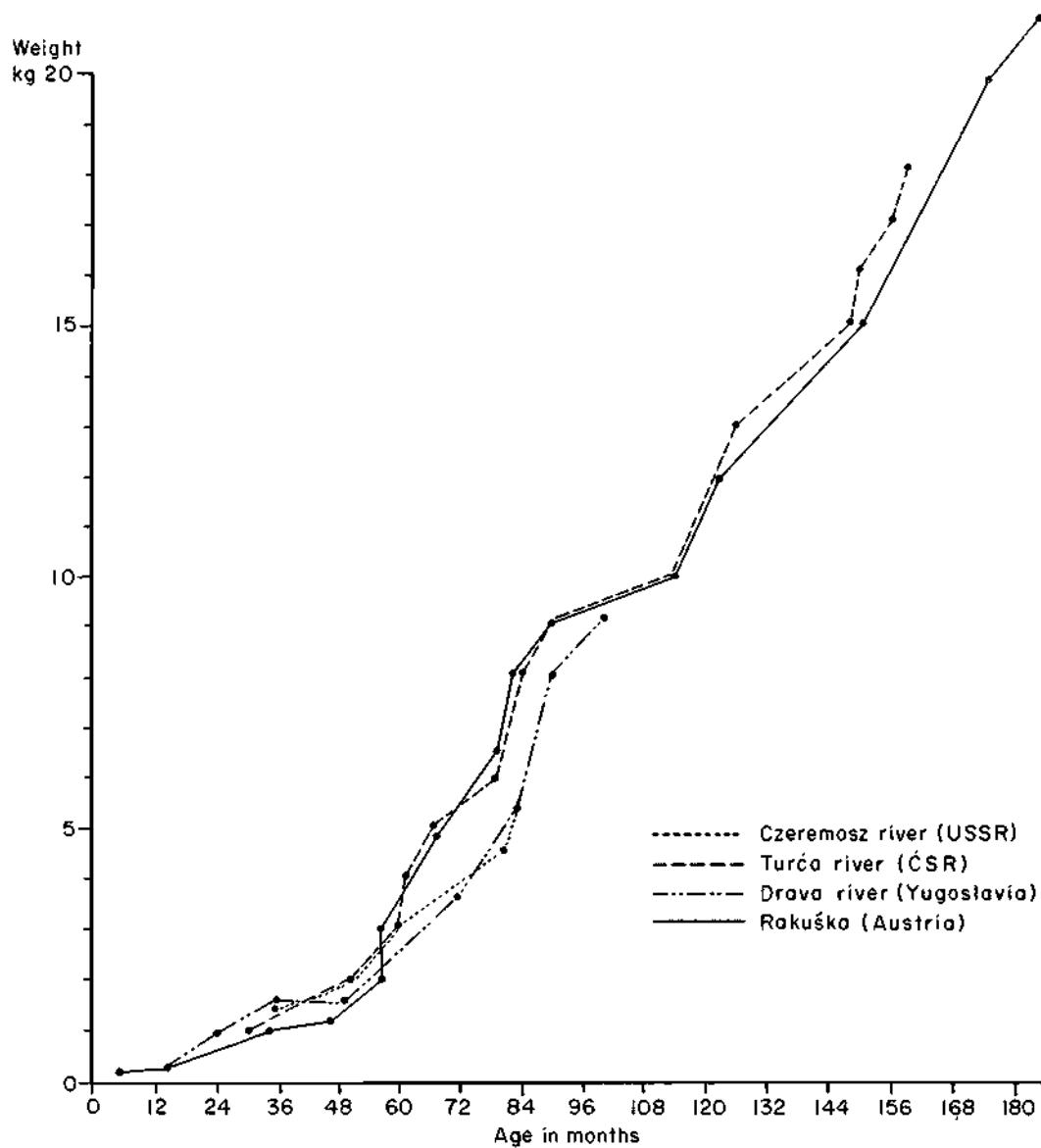


Figure 7: Scale of Hucho hucho - L. 91 cm, Lc. 81 cm, weight 7.9 kg,
age 6+, caught in Dunajec River near Niedzica, 29.11.1964

Figure 8: Age-weight relationship in H. hucho

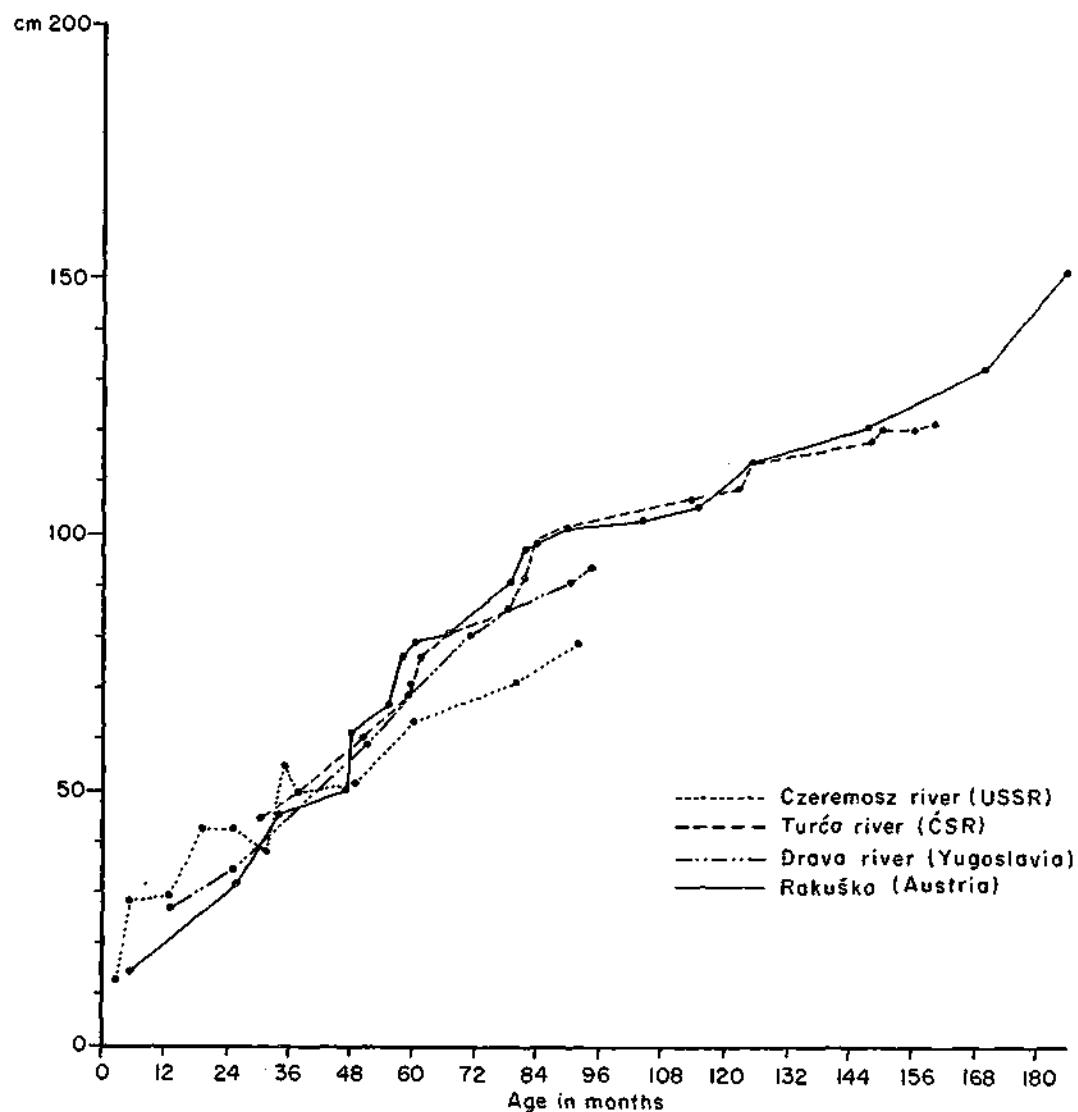
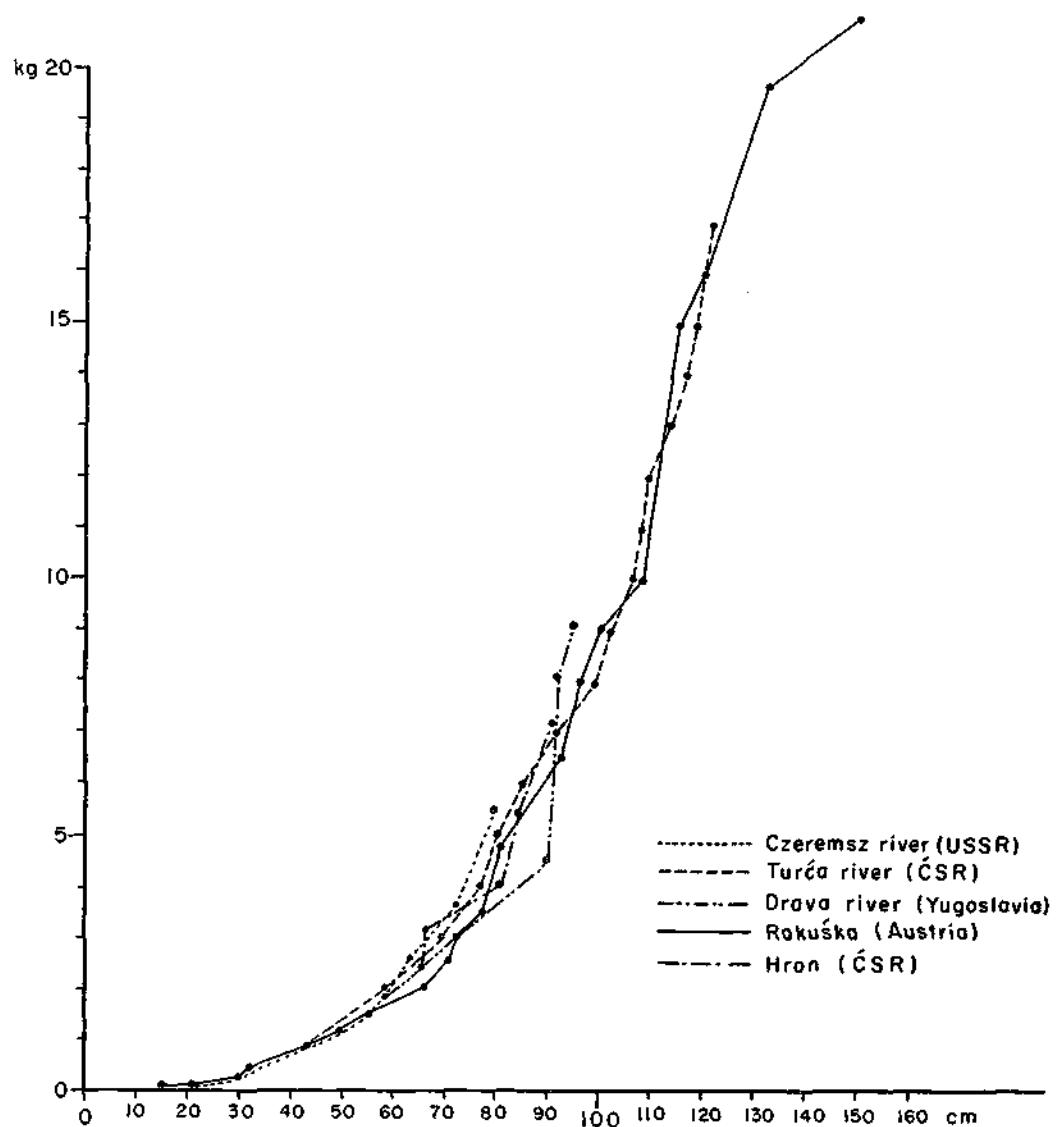


Figure 9: Age-length relationship in H. hucho

Figure 10: Relationship between length and weight in H. hucho

5. EXPLOITATION

5.1 Fishing equipment

5.11 Gears

5.12 Boats

H. hucho occurs singly and is regarded chiefly as a sport fish. It is also caught by the Danube fishermen in nets, and in mountain streams, by poachers with spears and forks by torchlight. For sport fishing a strong rod, 2.5 to 3 m long, and a line up to 100 m should be used. In Slovakia, a string made of an especially impregnated silk, cotton or hemp thread was formerly used (see Ivaska, 1951). At present nylon fibre is used. The reel should be of good quality. The hooks are anchor-shaped, No. 1-3/10 in size. The plug, a type of lure which dives and darts through the water rather than rotates like the conventional spinning bait, is often effective. The plugs are of various forms.

The fish can also be caught with landing nets.

5.2 Fishing areas

See Table 1.

5.3 Fishing seasons

5.31 General pattern of seasons

The depth of the places where H. hucho is caught varies with the season of the year : in autumn it occurs deeper than in summer, at a depth of 0.7 to 3 m.

Sport fishing gives best results in late autumn, when the fish are most hungry. In summer, frogs can be used as bait. H. hucho is caught particularly in the morning, before sunset and before thunderstorms, but there are no special rules. The angler is recommended to watch the water and to observe the behaviour of the fish.

In early spring fishing should be discontinued because of the approaching spawning season.

5.4 Fishing operations and results

5.41 Effort and intensity

5.42 Selectivity

5.43 Catches

It is very difficult to determine the fishing effort because it depends on the skill and disposition of the angler and on the choice of the fishing equipment. For this reason no precise data are given in this item. We have included data given by Prof. Iwanciv on catches of H. hucho in the Dunajec river from 1956 to 1967 (Table II).

Table II - Hucho hucho (L.) captured in Dunajec River, Poland
 Data given by Prof.dr. E. Iwanciw, Cracow, Poland (unpublished)

No.	Date	Place	Total (cm)	Length (cm)	Body (cm)	Weight (g)	Sex	Age from scales (yrs)	Remarks
1	20.07.56	Maniowy	66.5	60.0	2800	♀	4+		
2	7.11.60	Katy	47.0	42.5	950	-	no scales collected		
3	23.05.64	Maniowy	54.0	-	1600	-	"		
4	23.05.64	"	53.0	-	1450	-	"		
5	31.05.64	"	54.0	-	1400	-	"		
6	6.06.64	Czorsztyn	98.0	89.0	9000	♀	6+	with spinning	
7	17.06.64	Maniowy	106.0	94.0	11200	♀	no scales collected	"	
8	29.11.64	Niedzica	91.0	81.0	7900	-	6+		
9	27.07.65	Maniowy	105.0	96.0	9300	-	no scales collected		
10	6.08.65	"	82.0	73.0	5200	♀	"		
11	23.10.65	Katy	75.0	66.0	3500	♂	5+	with spinning	
12	24.10.65	"	60.0	52.5	2200	-	3+		
13	24.10.65	Czorsztyn	97.5	86.0	8400	♂	5+		
14	19.02.66	Maniowy	78.0	-	4900	-	no scales collected		
15	19.02.66	Czorsztyn	75.0	-	4200	-	"		
16	20.02.66	Katy	74.0	-	4000	-	"		
17	30.07.66	Maniowy	63.0	-	2800	-	"		
18	5.08.66	Czorsztyn	62.0	-	2400	-	"		
19	8.08.66	"	79.0	-	5400	-	"		
20	19.09.66	"	80.0	-	5000	♀	"		
21	25.09.66	"	66.0	-	2800	♀	"		
22	25.09.66	"	83.0	-	5600	♂	"		
23	25.06.67	Maniowy	65.0	-	2900	-	3+		
24	11.08.67	Czorsztyn	70.0	63.0	3200	♂	4+		
25	2.10.67	"	60.2	-	1900	♂	3+		
26	8.10.67	"	71.0	65.5	3600	♂	4+		

6. PROTECTION AND MANAGEMENT

6.1 Regulatory legislative measures

6.11 Limitation or reduction of total catch

There are no quantitative limitations in fishing H. hucho. In Poland, a special fee must be added to fishing licenses for trout waters and fishing for H. hucho is prohibited from 1 December to 15 May.

6.12 Protection of portions of population

Small H. hucho are protected in all countries in which the fish occurs. The minimum legal length at which fish may be taken varies between 50 and 80 cm; in Poland it is 60 cm (total length).

Since H. hucho converts fish material of little value into highly valuable meat, its protection requires special consideration. The unfavourable opinion of some fishermen, who assert that H. hucho destroys the population of trout and grayling, has not been confirmed. Ivaska (1951) and Kulmatycki (1931a,b) have demonstrated that, although

single specimens of the trout or grayling may be found in the alimentary canal of H. hucho, its main food is the more readily available Chondrostoma nasus.

6.5 Artificial stocking

6.51 Maintenance stocking

In Poland, artificial stocking of the rivers Dunajec and Poprad is carried out every year. In 1967, these rivers were stocked with 20,800 fry.

6.52 Transplantation; introduction

According to Ivaska (1951), H. hucho was transplanted to Switzerland (15,000 eggs in 1949). Svetina (1962) reported that rivers in Morocco, France and Belgium had been stocked and the stocking of the Moroccan rivers gave positive results. The Anglers' Encyclopaedia (Colin Willock, London, 1960) gave a note that H. hucho was stocked in the Thames but failed to establish itself.

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SYNOPSIS OF FISHERIES BIOLOGICAL DATA

This is one of a series of documents issued by FAO, CSIRO and USFWS concerning species and stocks of aquatic organisms of present or potential economic interest. The primary purpose of the series is to make existing information readily available to fishery scientists according to a standard pattern, and by so doing also to draw attention to gaps in knowledge. It is hoped that synopses in the series will be useful to other scientists initiating investigations of the species concerned or of related ones, as a means of exchange of knowledge among those already working on the species, and as the basis for comparative study of fisheries resources. They will be brought up to date from time to time as further information becomes available either as revisions of the entire document or their specific chapters.

The relevant series of documents are:

FAO	Fisheries Synopsis No. (replacing, as from 1.1.63 FAO Fisheries Biology Synopsis) and	FR/S FB/S
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Synopses in these series are compiled according to a standard outline described in Fib/S1 Rev. 1 (1965).

FAO, CSIRO and USFWS are working to secure the co-operation of other organizations and of individual scientists in drafting synopses on species about which they have knowledge, and welcome offers of help in this task. Additions and corrections to synopses already issued will also be most welcome. Comments including suggestions for the expansion of the outline and requests for information should be addressed to the co-ordinator of this work:

Fishery Resources and Exploitation Division
Marine Biology and Environment Branch
Food and Agriculture Organization
of the United Nations
Via delle Terme di Caracalla
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SSR/F526 (FR/S86)	Synopsis on the biology of the jack mackerel (<i>Trachurus trachurus</i>). (Published as U.S. Fish and Wildlife Service Special Scientific Report - Fisheries No. 526)	April 1966
FRi/S30	Synopsis of biological data on the pike <i>Esox lucius</i> (Linnaeus) 1758. Provisional version	April 1966
FR/S31.1	Synopsis of biological data on common carp <i>Cyprinus carpio</i> (Linnaeus) 1758 (Asia and the Far East). Provisional version	May 1966
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FRm/S33 Rev. 1	Synopsis of biological data on the Norway pout <i>Trisopterus esmarkii</i> (Nilsson) 1855	January 1968
FRi/S36	Synopsis of biological data on the bream <i>Abramis brama</i> (L.)	February 1968
FR/S32	Synopsis of biological data on catla <i>Catla catla</i> (Hamilton) 1822. Revision 1.	November 1968

