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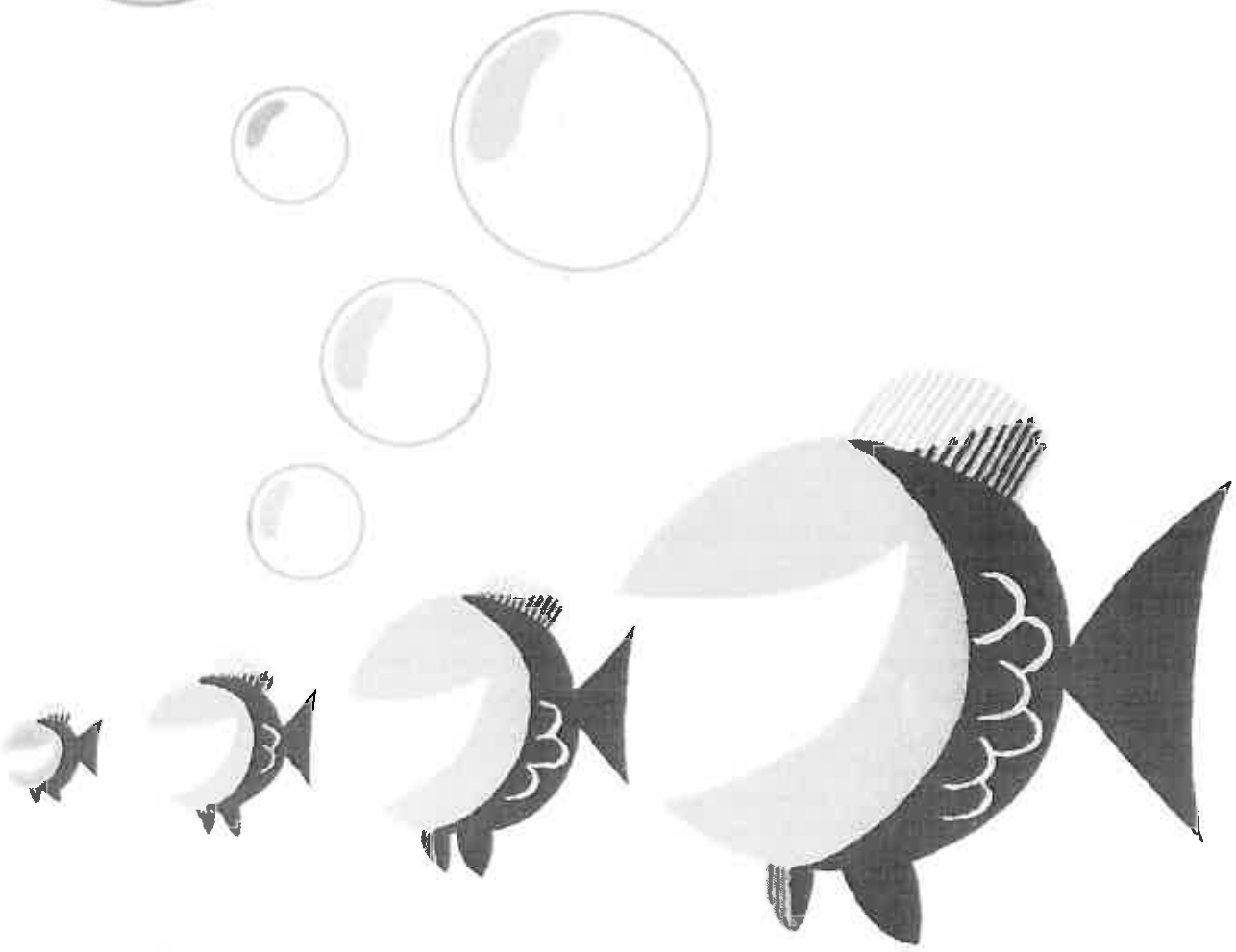

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Country report of Finland for the intersessional period of the European Inland Fisheries Advisory Commission (EIFAC) 1988 – 1989

Outi Heikinheimo–Schmid, Riitta Rahkonen, Kai Westman and Pekka Tuunainen

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COUNTRY REPORT OF FINLAND FOR THE INTERSESSIONAL PERIOD OF THE EUROPEAN INLAND FISHERIES ADVISORY COMMISSION (EIFAC) 1988 - 1989

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Introduction

Finland's inland waters cover 33 520 km², which is about 10 % of the country's total area. There are over 60 000 lakes, 17 of which have a surface area of more than 200 km². The lakes are shallow, the average depth being 7 m. Together, they have a total shore length of 130 000 km. Nearly one hectare of lake area and about 30 m of shoreline are available per capita of the population (4.9 million). The total length of the rivers exceeds 20 000 km.

Government responsibility for both inland and marine fisheries and their management in Finland is vested in the Ministry of Agriculture and Forestry. The fisheries administration comprises eleven districts, each headed by a fisheries biologist. Each district is divided into uniform fishery areas in order to facilitate planning of the fisheries and their management. Regional plans for fisheries are under preparation in the fishery areas.

In 1988 the Finnish Game and Fisheries Research Institute was partly re-organized. A new division, the Aquaculture Division, which takes care of the State fish culture, was separated from the Fisheries Division.

In 1988 some 1 314 900 people were engaged in fishing in inland waters. About 2 200 of them were professional or semiprofessional fishermen and the rest fished for recreation and their own use (Appendix 1).

The total catch from inland waters was estimated at about 36 300 tons in 1988. This was about 25 % of the total catch for the country. The commercial catch from inland waters was about 4700 tons in 1988. The main species in the catch were vendace (Coregonus albula), whitefish (Coregonus spp.), pike (Esox lucius) and roach (Rutilus rutilus) (Appendix 1). The catch of vendace was 260 tons lower than in 1987.

Damming of rivers and water level regulation of lakes and reservoirs, mainly for hydro-electric power generation, have created serious problems in fisheries management. Due to extensive water protection measures, pollution of waters has strongly diminished. About 80 % of the lake area in Finland is classified as good or excellent. In 18 % of the lake area the water quality is satisfactory, but 2/3 of this area contains brown, humic waters, which are not considered polluted. In about 2 % of the lake area the water quality is passable or heavily polluted by industry or sewage.

Acidification creates problems mainly in small and medium-sized lakes. Attension has been paid to the occurrence of radioactive compounds in fish, due to the Tshernobyl accident.

The main part of the management of the economically important fish stocks consists of extensive fish stocking programs. The total number of fish released in 1988 was 56 million (output of newly hatched larvae excluded). Almost 48 % of these were whitefish (Coregonus spp.) (Appendix 2).

Production of fish for human consumption increased rapidly in the 1980s and has reached more than 16 million kg (99 % rainbow trout Salmo gairdneri) in 1988, which was ca. 30 % more than in 1987. Almost 80 % of the fish is reared in brackish water in net cages (Appendix 2).

The EIFAC National Committee, chaired by the EIFAC correspondent for Finland, is responsible for liaison between EIFAC and Finland and works on subjects of current interest to EIFAC.

I FISHERIES BIOLOGY AND MANAGEMENT

1. Economic aspects of commercial and recreational fisheries

Commercial fishing in inland waters is mainly a part-time occupation. In 1988, only 16 % of the 2 215 professional fishermen obtained more than half of their income from fishing. The annual profitability of commercial fisheries in inland waters is studied by means of daily records kept by households or enterprises.

Vendace is the most important fish species in the catch of the commercial fishery in inland waters. In recent years the vendace stocks have been poor in several lakes, and the vendace catch decreased by 1 800 tons from 1986, being 4 600 tons in 1988. In Lake Inari a strong vendace stock has developed as a result of introduction. The vendace catch, most of which is taken with trawls, has risen from 18 tons in 1986 to 226 tons in 1988 and is estimated to exceed 300 tons in 1989.

The total catch of the commercial fishery from inland waters in 1988 was nearly 900 tons less than in 1986 (Appendix 1).

The annual human consumption of fish in 1988 was about 19 kg gutted fish per capita, and 60-70 % of this was covered by the domestic supply.

Subsistence and recreational fishing is of great economic and social significance in Finland. Perch (Perca fluviatilis) and pike are the most important species in the catch. Half of the catch is taken with gill nets.

The numbers in brackets ( ) refer to the numbers in the bibliography.

In 1988 the total catch was 42 tons. Half of this total catch was taken by only 10 % of the households, and the median annual catch per household was 20 kg.

A personal fishing licence and the permission of the water owner are generally required for every kind of fishing, but district licences allow angling with natural bait and ice fishing with rods without the permission of the water owner.

In 1988 the annual catch of the native crayfish (Astacus astacus), estimated from a nationwide questionnaire on subsistence and recreational fishing, was about 3.5 million individuals. The value of the catch was 42.5 million FIM (10.1 million USD).

There are no statistics on the lamprey (Lampetra fluviatilis) catch in 1984-1989. In 1983 it was 2.3-2.4 million individuals, which is about 100 tons. The value of the catch was estimated at 4.3 million FIM (800 000 USD).

2. Survey and appraisal of inland waters

Studies on the population dynamics and causes of year-class fluctuations in the vendace have been intensified. The research on vendace is coordinated by a national working group. According to the information collected by this group, the vendace stocks were better than average in northern Finland in 1988 but weaker in other parts of the country. More effort should be directed to monitoring the food animal stocks of vendace and to research on the effects of predation on vendace. The intensive trawl fishing of vendace has created anxiety among the fishermen in recent years. The effects of trawling on the vendace stocks are one of the most urgent topics of research.

A co-operative research program on Lake Saimaa was started in 1989. Three subprojects have begun so far, attention being mainly

directed to the biology of vendace, assessment of the pelagic fish stocks and the success of stocking with brown trout. In the near future attention will be paid to the interactions between vendace, whitefish and smelt (Osmerus eperlanus). The program will be carried out jointly by units subordinate to three different ministries, the Ministry of Education, the Ministry of Agriculture and Forestry and the Ministry of the Environment. A research vessel was taken into use on Lake Saimaa in 1989. It is 27 m long and it is fitted with trawling gear, sampling equipment for studying the water chemistry and plankton, meteorological devices, micro-computers and analysing equipment. The vessel is owned by the National Board of Waters and the Environment, and is used for hydrological and fish studies in co-operation with the Finnish Game and Fisheries Research Institute and the University of Joensuu.

The hydroacoustic method has been used to estimate the density of vendace stocks in several important fishery areas (29, 30).

A biomanipulative approach has been adopted in the management of the eutrophicated Lake Vesijärvi, southern Finland. The management is based on the hypothesis that the high phytoplankton production is maintained by internal phosphorus loading and catalysed by the structure of the food web, where the roach plays a decisive role. Enclosure studies confirmed the eutrophicating effect of the roach. Effective stocking with pike-perch (Stizostedion lucioperca) and selective harvesting of coarse fish have been applied to improve the water quality and the structure of the fish community. The project is financed by the City of Lahti (26, 43).

A plan for the management of the fisheries in the municipality of Inari, North Finland, based on a five-year research project, was presented in 1989. The municipality has abundant waters with rich fish stocks, mainly whitefish. In many lakes the growth of fish is retarded because of ineffective fishing, due, for example, to long distances from human settlement. In most of the

lakes the fishing effort should be increased. Predator fish species, mainly brown trout (Salmo trutta m. lacustris) and char (Salvelinus alpinus), should be released and these should be of the right size to use the dwarf whitefish stocks. Stocking with vendace could increase the fishing potential in some lakes, but the effects should first be carefully studied (92).

3. Management of inland waters

3.1. Restoration of waters

Restoration measures have been carried out in rivers in order to improve the reproduction areas of salmonids, increase crayfish production and provide opportunities for recreational fishing. Follow-up research has also been performed.

3.2. Stocking

In 1988 the number of salmonids (Salmo and Salvelinus sp.) released to the wild at the age of one summer or more was about 9.3 million. The corresponding number for whitefish species was 27 million, for other fish 20.4 million (grayling (Thymallus thymallus), pike, pike-perch and cyprinidae) and for crayfish 90 000 (including 10 000 signal crayfish, Pacifastacus leniusculus). The value of the input was about 85 million FIM (20 million USD) (Appendix 2).

In addition, transfer stocking was performed with some fish species and with crayfish and lambrey. In 1989, 10 000 eels (Anquilla anquilla) were imported from Sweden and stocked in small research lakes in southern Finland.

3.3. Marking and tagging

To evaluate the results of stocking the inland waters, and for research purposes, 69 000 salmonids (mainly brown trout), 3 000

whitefish and 2 000 other fish were tagged with Carlin tags in 1988-1989. In addition, 420 000 brown trout and 120 000 whitefish were marked with microtags ("nose tags").

The Finnish Game and Fisheries Research Institute handles all the tag returns. Data-processing, correspondence and payment orders are directed automatically.

3.4. Introductions

During 1989 the veterinary authorities allowed the import of a small number of eels (10 000) from Swedish quarantine for experimental stocking of some small lakes in southern Finland. Eggs of char and rainbow trout were imported from Sweden during 1988 and 1989 for breeding purposes. Signal crayfish were also imported from Sweden to be reared in closed ponds.

4. Research programs shared with other countries

Cooperation has been continued between Finland and the neighbouring countries. In the Tenojoki (Tana) River on the Finnish-Norwegian border, the yearly studies on the Atlantic salmon (Salmo salar) stock include preparation of catch statistics, catch sampling, and assessments of parr densities and smolt production (68). Joint studies on salmon are also carried out in the Näätämönjoki (Neiden) River.

The Finnish-Soviet Border Water Commission has continued its work in Lake Pyhäjärvi (Karelia) (2, 3) and in the Paatsjoki river system (Lake Inari). In the Tuloma River research on the brown trout stock started in 1988. The possibility of recolonizing the upper reaches of the watercourse with salmon is also being studied. Finnish-Soviet cooperation was continued in investigations on salmonid smolt production in the rivers of Finnish and Soviet Karelia and the Kola Peninsula. Soviet specialists from the Institute of Biology of Inland waters, Borok

(Academy of Sciences of the USSR), in cooperation with the Finnish Game and Fisheries Research Institute, carried out biotelemetrical studies in the Vantaanjoki River, to examine movements of sea trout (Salmo trutta m. trutta) and salmon captured and released in the fish ladder in the river mouth. Joint Soviet-Finnish research was continued on the migrations, genetics and physiology of different salmon and sea trout stocks in the Gulf of Finland.

Research on the fish stocks and fisheries in the Tornionjoki River was continued in cooperation with the Finnish-Swedish Border River Commission and the Swedish fisheries authorities (31, 36).

Liaison has been continued with inland fisheries researchers in Poland, Hungary, Czechoslovakia and Federal Republic of Germany, attention being concentrated on fish culture, and research on whitefish, vendace and sea trout.

5. Other subjects

The proceedings of the International Symposium on Biology and Management of Coregonids, held in Finland, Joensuu, in 1987 were published in "Finnish Fisheries Research" No. 9 in 1988 (see selected literature).

II FISH CULTURE AND DISEASES

1. Fish culture

1.1. Fish farms and the production

In 1988 the total number of fish farms in Finland was nearly 600 and in addition natural rearing ponds were used with a total area of c. 10 200 hectares. The rainbow trout is practically the only fish species farmed for food in Finland, although a few attempts have been made to develop the farming of Baltic salmon, whitefish and arctic char in net cages in brackish and fresh water. There is also growing interest in crayfish farming. In 1988, 339 farms (about one half in inland water) produced almost 16 400 tons of fish for human consumption (99 % rainbow trout), of which only 3 500 tons was reared in fresh water. The value of the food fish production in 1988, calculated as the producer price, was 361 million FIM (86 million USD) (Appendix 2, see also section 3.2.).

Fish for stocking are produced either intensively in land-based fish farms (mostly salmonids) or extensively in large ponds with a natural food supply (mostly whitefish, grayling, pike and pike-perch and some cyprinid species). Many farms producing rainbow trout also rear other salmonids for stocking. In 1988, the number of salmonids produced for stocking purposes, excluding newly hatched larvae, was 9.3 million. The natural freshwater rearing ponds produced about 47 million mostly one-summer old juveniles (Appendix 2, see also section 3.2.). In 1988, the value of juvenile production for stocking was about 85 million FIM (20 million USD).

1.2. State fish culture

The Finnish Game and Fisheries Institute and its Aguaculture Division takes care of the State fish culture. The State has 12 fish culture stations already in operation or under construction

and plans also exist for three further stations. The fish culture stations produce high-quality eggs and fry to conserve and increase the stocks of valuable fish species. The station also produce fish for research and for stocking carried out by the State. An important task is the conservation of threatened fish species and stocks.

Some 20 fish species, 60 different fish stocks and two crayfish species are cultivated in the State fish farms. The stations annually produce ca. 100 million eggs and fry of whitefish, ca. 25 million eggs and fry of salmon, trout and char and ca. 25 million eggs of pike-perch, grayling and other fish for stocking. Since it has become more and more difficult to obtain eggs from natural waters, due to weakening of the fish stocks, the State fish culture has attempted to ensure the supply of eggs and fry by cultivating brood fish at the stations. The use of the eggs can then be controlled in such a way that only the most suitable fish species and stocks are released in each river or lake.

1.3. Research on fish physiology

Research has been continued on improving techniques for rearing high-quality smolts. In examining the fish in the stocking groups, not only the general smolt characteristics have been studied - minimum size, body silvering and condition factor - but also several physiological properties, including the oxygen carrying and osmoregulatory capacities, and energy stores. Attention has also been paid to the hormonal control of smoltification. By connecting the physiological studies with tagging experiments a clear correlation between the physiological smolt status and the tag return of adults was shown (14, 95, 96, 97, 99, 100, 122, 123) .

The research on brood stocks and roe quality has been continued. It includes experimental work on the effects of the annual light rhythm on the hormonal control of reproduction (67).

1.4. Research on fish nutrition

The farmed fish mainly receive dried fish feeds. Low-value fish (mainly smelt) and Baltic herring are used to some extent mainly as a raw material for semimoist feeds. The use of herring in inland farms has decreased because of the risk of transmitting serious fish diseases from the sea.

Fish feed development is constantly researched in cooperation with the manufacturers and fish farmers. The main goals are to achieve better feed utilization, to reduce wastage of nutrients from the feeds, and to develop feeds that will improve the quality of fish for consumption and stocking, and for brood stocks (9, 10, 40, 89). New types of feeds are also needed for intensive cultivation of non-salmonid fish species and freshwater crayfish farming.

1.5. Development of aquaculture technology

Most modern fish farms have adopted microprocessor-controlled systems to optimize automatic feeding, and to control water flow, illumination and temperature.

A new aquaculture technology development unit came into use at one State fish culture station in central Finland in 1989. In this unit it is possible to test various basins and feeds in both natural and extreme temperatures and other cultivation conditions.

In intensive aquaculture systems new species need new technical developments. For example, production of live feeds for crayfish and pike-perch is receiving attention.

The development of aquaculture technology includes examination of the physiology of fish for stocking reared under different conditions. A considerable and increasing part of the stocking material in Finland is produced using heated effluents to

stimulate growth, which requires a whole series of new technological steps (99, 125).

A new outflow water treatment technology came into operation on a productive scale at one State fish culture station in northern Finland in 1989. Testing of the procedure is still incomplete, but it appears that the phosphorus loading from fish farms can be reduced to the lowest level generally attainable in flow-through systems.

2. Fish and crayfish diseases

2.1. Fish

By the end of 1989, 150 Finnish fish farms belonged to the official Fish Health Control System run by the National Veterinary Institute. The health control system is due to be renewed according to the proposals of the Fish Health Control working group, which delivered its memorandum to the Ministry of Agriculture and Forestry at the end of October in 1989.

Since 1986, furunculosis (caused by Aeromonas salmonicida subsp. salmonicida) has been the most serious fish disease caused by bacteria. The affected farms are mainly food fish farms located in the coastal area of the Gulf of Bothnia. The number of affected farms has increased most rapidly in the archipelago, where 60 % of the rainbow trout is produced: 4 farms in 1988, 21 farms in 1989. Since 1986, furunculosis has also been diagnosed in four freshwater hatcheries.

Some clinical outbreaks caused by A. salmonicida subsp. achromogenes (ASA disease) and atypical strains of A. salmonicida have occured all over Finland during summers 1988 and 1989.

The bacterium Yersinia ruckeri has been isolated sporadically from the intestine and wounds of both farmed and wild fish since

1986. Symptoms of the disease caused by Y. ruckeri have not been noted for certain.

The first case of the bacterial kidney disease (BKD) caused by Renibacterium salmoninarum was identified at the beginning of summer 1989 at one food fish farm on the island of Ahvenanmaa.

IPN virus of type Ab has been isolated on the island of Ahvenanmaa since 1987. In 1989, the number of affected farms was five. In 1989 IPN virus of type Ab also was found at one farm in the county of Turku and Pori and IPN virus of type He was isolated at one farm in the county of Vaasa.

Research on fish diseases increased considerably in Finland in the late 1980s. Besides the official Health Control System, for example, the distribution of viral and bacterial diseases and the monogenean Gyrodactylus salaris has been studied in some research projects (42). The occurrence of bacterial and parasitic diseases has been monitored and studied intensively at four fish farms in NE Finland since 1984 (84). Research projects on the influence of water quality on fish diseases are in progress in the coastal area adjoining the Gulfs of Finland and Bothnia and in four lakes differing in water quality (including parasites) in Central Finland (41, 111, 113). Attempts have been made to improve fish disease diagnostics (23) and to find new drugs against bacterial diseases (4, 5, 6). The immunological response has been investigated in both farmed and wild fish. A study has been started with the aim of improving disinfection methods for the roe of the main fish species cultivated in Finland. New disinfectant chemicals for fish farms have been tested against the most common bacteria.

2.2. Crayfish

Some new cases of crayfish plague appeared in 1988-1989. Research has continued on the role played by plague-resistant signal crayfish as plague spreaders. If stressed under culture

conditions, juvenile signal crayfish have shown rather high plague mortality. Haemolymph studies on Aphanomyces -infected crayfish and signal crayfish have continued.

The number of finds of the parasite Psorospermium haeckeli has risen to 25 in southern Finland. The haemolymph values of infected crayfish are under study. In certain conditions P. haeckeli can cause mortality in both natural crayfish populations and aquaculture stocks.

III FISH AND POLLUTED WATER

1. Fish and fish farm effluents

The main factor limiting the growth of the fish farming industry in Finland is the problem of fish farm effluents. In fresh waters, the main nuisance is eutrophication caused by phosphorus; organic loading and direct oxygen uptake are of less importance. Net cage farming on the Baltic coast can cause changes in the primary production because of nitrogen loading.

Fish farming is mainly increasing in the sea. In fresh waters the production actually decreased in the late 1980s if measured by mass. The new low phosphorus feeds, effective feeding techniques and new methods of removing suspended solids from the outlet waters decreased the total phosphorus load in inland fish farming by 37 % in the last decade, though the total production in fresh waters increased by about 56 % in the same period (66).

2. Biological monitoring

Standard toxicological and physiological methods for evaluating the effects of effluents on fish at different stages of development are available for administrative use. Strategies based on these methods will be elaborated in order to complement

national biological monitoring. It has been suggested that these be used as supplementary methods in monitoring waste discharge areas and, for example, in compensatory stocking programs. A five-year research program, "Fish diseases as water quality indicators", started in 1987, has revealed a great variety of diseases and parasites in fish from coastal waters receiving waste loads. A similar research project was started in inland waters in 1989.

Water quality criteria have been prepared for fishing waters and will be evaluated over a period of some years.

International cooperation with the Helsinki Commission, ICES and OECD continues in this field.

3. Bioaccumulation of toxic and radioactive substances in fish

A national program for monitoring the concentrations of chlorinated hydrocarbons and heavy metals in fish has been in progress since 1978. The results have revealed that the mercury, DDT and PCB concentrations in fish in water areas receiving waste loads are decreasing. In 1988 the program was revised, the number of sampling stations being decreased and sampling now being carried out every third year. This enables the extension of analyses to chlorinated phenols, chlordane and polychlorinated dibenzodioxins and furans. Freshwater mussels are included in the program.

Monitoring has been continued of the occurrence in fish of radioisotopes released during the nuclear power plant accident in Tshernobyl in 1986. The deposition was heaviest in central Finland. The highest Cs-137 concentrations have been found in small oligotrophic lakes. Since 1987 the radioactivity of fish in the deposition areas has been decreasing. In the areas of highest deposition, the use as food of perch and other predator fishes should still be restricted to two or three times a week

in the areas of highest deposition, but other fish species can safely be consumed throughout the country (57, 59).

4. Acidification of inland waters

The first phase of the five-year research project on acidification due to air pollution, initiated in 1985, has been completed (49, 58, 78, 80, 81, 82, 107, 108, 116). The project will be continued and extended to North Finland. The fisheries part of this project is conducted by the Finnish Game and Fisheries Research Institute in cooperation with the University of Helsinki.

During 1988 and 1989, 20 of a total of 80 study lakes were test-fished to confirm the earlier observations on the effects of acidification on fish and to examine whether further changes in the structure of fish populations had occurred. The catches showed population structures similar to those recorded three years earlier, but roach were absent from four acid lakes that had previously had sparse roach populations. These observations suggest that the disappearance of acid-sensitive fish populations is still continuing in poorly buffered lakes in southern Finland. The mechanisms of action of acidification, including the effects of aluminium, on the reproductive stages of different fish species have been examined in both the laboratory and the field.

Differences in the sensitivity of several fish species to acidification have been evaluated. The ovulation and spawning of coregonids and perch was delayed by acidity and aluminium. The fertilization rate of the eggs was decreased somewhat and there were disturbances in the embryogenesis. In sublethal acidity and aluminium concentrations, development of newly hatched fry was retarded.

In acidified lakes the reproduction of the crayfish was shown to fail when the pH of the water had fallen to 5.5. The growth rate

of adult crayfish was not affected.

In addition to the water quality monitoring in the test-fishing lakes, the degree of acidification has been examined in some trout and salmon rivers on the south coast and in northern Finland.

The fish species composition in 8 lakes that were limed 2 years ago was mostly similar to that before neutralization. However, in the lakes that still had some remains of roach populations during the liming, new cohorts of roach had appeared.

5. Physical habitat modification

A model describing the ecosystem of regulated lakes was developed by the National Board of Waters and the Environment in cooperation with the Finnish Game and Fisheries Research Institute and the Technical Research Centre of Finland. The goal of the project was to evaluate the effects of lake regulation on fish stocks more accurately than before. The model was tested with data from Lake Oulujärvi and is still being adjusted. More information is needed on the effects of regulation on the early stages of fish, and the interactions between the fish stocks (15).

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Kalansaalis vuonna 1988, 1000 kg.
Fiskfångsten år 1988, 1000 kg.
Fish catches in 1988, 1000 kg.
Tiedot perustuvat Riista- ja kalatalouden tutkimuslaitoksen tekemiin tiedusteluihin vuodelta 1988.
Uppgifterna baserar sig på Vilt- och fiskeriforskningsinstitutets förfrågningar för år 1988.
The data are based on inquiries concerning 1988 made by the Finnish Game and Fisheries Research Institute.

	Merikalastus - Havsfiske Marine fisheries				Sisävesikalastus - Insjöfiske Freshwater fisheries			
	Ammatti-kalastajat Yrkes-fiskare Profes-sional fishermen	Osa-aika kalastajat Deltids-fiskare Part time fishermen	Virkistys ja kotitarve-kalastajat Fritids- ja husbehovs-fiskare Recreational and sub-sistence fishermen	Yhteensä Totalt Total	Ammatti-kalastajat Yrkes-fiskare Profes-sional fishermen	Virkistys ja kotitarve-kalastajat Fritids- ja husbehovs-fiskare Recreational and sub-sistence fishermen	Yhteensä Totalt Total	YHTEENSÄ TOTALT TOTAL
Silakka - Strömming Baltic herring	84690	8134	1220	94044	-	-	-	94044
Kilohaili - Vassbuk Sprat	461	34	..	495	-	-	-	495
Turska - Torsk Cod	2490	413	276	3179	-	-	-	3179
Kampela - Flundra Flounder	45	24	374	443	-	-	-	443
Hauki - Gädda Pike	113	93	1497	1703	324	7894	8218	9921
Muikku - Siklöja Vendace	39	31	22	92	2676	1876	4552	4644
Siika - Sik Whitefish	757	483	980	2220	503	1952	2455	4675
Lohi - Lax Salmon	553	100	145	798	8	145	153	951
Taimen - Öring Trout	140	53	389	582	25	429	454	1036
Kirjolohi - Regnbågslax Rainbow trout	..	..	112	112	..	279	279	391
Harjus - Harr Grayling	-	-	4	4	2	174	176	180
Kuore - Nors Smelt	71	42	137	250	189	57	246	496
Lahna - Braxen Bream	88	89	478	655	47	1760	1807	2462
Säyne - Id Ide	7	12	150	169	5	247	252	421
Särki - Mört Roach	51	44	844	939	287	4107	4394	5333
Made - Lake Burbot	102	59	225	386	200	1391	1591	1977
Ahven - Abborre Perch	121	103	2697	2921	189	9654	9843	12764
Kuha - Gös Pike-perch	168	44	325	537	55	484	539	1076
Muut - Övriga Others	235	110	91	436	154	1185	1339	1775
Yhteensä - Totalt Total	90131	9868	9966	109965	4664	31634	36298	146263

Ammattikalastajien saamat keskihinnat vuonna 1988, mk/kg.

Medelpris som yrkesfiskarna erhållit år 1988, mk/kg.

Average prices obtained by professional fishermen in 1988, FIM/kg.

	Koko maa - Hela landet - Whole country
Silakka - Strömming Baltic herring	
ihmisravinnoksi 1) - till människoföda 1) for human consumption 1)	2.58
rehuksi - till foder for animal fodder	0.59
Kilohaili - Vassbuk Sprat	2.58
Turska - Torsk Cod	4.49
Kampela - Flundra Flounder	6.91
Hauki - Gädda Pike	9.29
Muikku - Siklöja Vendace	7.46
Siika - Sik Whitefish	11.73
Lohi - Lax Salmon	33.91
Taimen - Öring Trout	24.61
Kuore - Nors Smelt	2.96
Lahna - Braxen Bream	3.59
Säyne - Id Ide	2.39
Särki - Mört Roach	2.68
Made - Lake Burbot	11.69
Ahven - Abborre Perch	5.37
Kuha - Gös Pike-perch	21.44
Muut - Övriga Others	2.64

1) noin 23 % kokonaissilakkasaaliista
ca. 23 % av totalströmmingfångst
about 23 % of total catch of Baltic herring

Ammattikalastajat sekä virkistys- ja kotitarvekalastajat vuonna 1988.
Yrkesfiskare och fritids- och husbehovsfiskare år 1988.
Professional fishermen and recreational and subsistence fishermen in 1988.

	Merikalastus Havsfisket Marine fisheries	Sisävesikalastus 1) Insjöfiske 1) Freshwater fisheries 1)	YHTEENSÄ - TOTALT TOTAL
AMMATTIKALASTAJAT - YRKESFISKARE - PROFESSIONAL FISHERMEN			
Ammattikalastajat Yrkesfiskare Professional fishermen	1299	351	1650
vähintään 50 % tuloista kalastuksesta minst 50 % av uppehåll från fiske at least 60 % of livelihood from fishing			
Osa-aikakalastajat Deltidsfiskare Part time fishermen	1092	1864	4171
10 - 50 % tuloista kalastuksesta 10 - 50 % av uppehåll från fiske 10 - 50 % of livelihood from fishing			
Osa-aikakalastajat Deltidsfiskare Part time fishermen	1215		
alle 10 % tuloista kalastuksesta under 10 % av uppehåll från fiske less than 10 % of livelihood from fishing			
Yhteensä - Totalt - Total	3606	2215	5821
VIRKISTYS- JA KOTITARVEKALASTAJAT - FRITIDS- OCH HUSBEHOVSFISKARE - RECREATIONAL AND SUBSISTENCE FISHERMEN			
Yhteensä - Totalt - Total	397811	1312664	1710475

Ammattikalastajamääriin sisältyvät myös ainoastaan toisen henkilön palveluksessa kalastavat.
Innehåller även de yrkesfiskare som endast är i annans tjänst.
Employed fishermen who fish only for the patron are included in the numbers of fishermen.

Riista- ja kalatalouden tutkimuslaitos
Vilt- och fiskeriforskningsinstitutet

Kalanviljely Suomessa 1988 Fiskodling i Finland 1988 Fish Culture in Finland 1988

Ruokakalatuotanto
Matfiskproduktion
Food fish production

	Meri Havet Brackish water	Sisävesi Sött vatten Fresh water	Kaikkiaan Inalles Total	Arvo Värde Value
Tuotanto - Produktion Production	1000 kg	1000 kg	1000 kg	Mmk
Kirjolohi - Regnbågslax - Rainbow trout[1]	12 749	3 487	16 236	357
Lohi - Lax - Salmon	117	—	117	4
Muut lajit - Andra arter - Other species[2]	9	5	14	0
Yhteensä - Tillsammans - Total	12 875	3 493	16 367	361
Laitoksia - Anstalter - Farms				
kpl - st - pc	172	167	339	

1) Tuotantomäärät perkaamatonta painoa - Som orensad fisk - In ungutted fish

2) Taimen ja siika - Öring och sik - Brown trout and whitefish

Tuotantotilat
Produktionsutrymme
Production capacity

	Meri Havet Brackish water	Sisävesi Sött vatten Fresh water	Kaikkiaan Inalles Total
Verkkoaltaat 1000 m³ Nätkassar - Net cages	890	327	1 217
Kiinteältaat 1000 m² Dammar och trög - Ponds and tanks	24	1 443	1 467
Luonnonravintolammikot ha Naturnäringsdammar - Natural food rearing ponds	30	10 220	10 250

Poikastoimitukset ja määrät [3]
Yngelleveranser och mängder
Output of juveniles

Laji/ryhmä ja kokoluokka Art/grupp och storleksklass Species/group and size class		Toimitettu istutuksiin tai jatkoviljelyyn Leveranser till utsättning och fortsatt odling Output for stocking and on-growing 1000 kpl-st-ind	Laitosten kalamäärät vuoden lopussa Mängder i odlingar i slutet av året Amounts in the hatcheries at the end of the year 1000 kpl-st-ind
Kirjolohi -	alle-under 20 g	12 674	1 039
Regnbågslax -	20—200 g	6 294	10 275
Rainbow trout	yli-över-over 200 g	2 410	7 734
Meri- ja järvilohi -	alle-under 20 g	1 764	2 918
Lax och insjölax -	20—200 g	4 000	2 265
Atlantic salmon	yli-över-over 200 g	25	108
Meritaimen -	alle-under 50 g	2 196	1 240
Havsöring -	yli-över-over 50 g	1 233	1 229
Sea trout			
Järvi- ja purotaimen -	alle-under 50 g	3 781	5 406
Insjö- och bäcköring -	yli-över-over 50 g	2 476	2 192
Browa trout			
Nieriät -	alle-under 50 g	61	689
Rödingarter -	yli-över-over 50 g	148	320
Char and Brook trout			
Siiat - Sik -	alle-under 20 g	26 774	511
Coregonids	yli-över-over 20 g	382	84
Harjus[4] -	kaikki koot	2 607	288
Harr -	alla storlekar		
Grayling	all sizes		
Kuha[4] -	kaikki koot	5 808	249
Gös -	alla storlekar		
Pike-perch	all sizes		
Hauki[4] -	kaikki koot	10 258	28
Gädda -	alla storlekar		
Pike	all sizes		
Särkikalat[4] -	kaikki koot	1 772	15
Mörtfiskar -	alla storlekar		
Cyprinids	all sizes		
Ravut[4] -	kaikki koot	89	19
Kräftor -	alla storlekar		
Crayfish species	all sizes		

Poikastuotannon arvo - Yngelproduktionens värde
Value of juvenile production

Kirjolohi - Regnbågslax - Rainbow trout 59 Mmk
Muut lajit - Andra arter - Other species 110 Mmk
josta istutukseen toimitettu osuus n. 70—80 %
varav ca 70—80 % levererade för utsättning.

3) Ei sisällä vastakuoriutuneiden toimituksia
Leveranser av nykläckta inte med
Output of newly hatched larvae excluded

4) Yleensä yksikesäisiä, alle 10 g painoisia poikasia
Vanligen ensomriga yngel, medelvikt under 10 g
Usually one summer old fingerlings under 10 g in size.

Suomen Kalankasvattaja 4/89

RIISTA-JA KALATALOUDEN TUTKIMUSLAITOS
KALATUTKIMUKSIA-
FISKUNDERSÖKNINGAR

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