SPAWNING MIGRATION OF PERCH, (*PERCA FLUVIATILIS* L.), IN DIFFERENT COASTAL WATERS IN THE BALTIC SEA

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ABSTRACT

The population of adult perch in the Baltic Sea consists of a number of spawning populations. Spawning migration is different in different tagging places. Perch were marked with Carlin tags during the spawning period and released after tagging in the Helsinki Sea area where they had been caught. In Helsinki Sea same sizes fish like to stay together, but recoveries of different sizes perch near the releasing places every spring indicate that perch shows homing to the spawning areas. Beside this, Fish tagged in the spring and recaptured in the spring one or more years later showed a strong affinity to the point of release, while fish from the same group recaptured in the autumn and winter had migrated far too deep and sheltered waters. Homing to the spawning areas in Taivassalo is not as clear as Helsinki. A majority was recaptured during the spring in the following years close to the releasing place. But several recaptures were made randomly and far from releasing place during spring.

Keywords: Perch, migration, tags, recapture, homing.

INTRODUCTION

Perch (*Perca fluviatilis* L.) has a wide geographical distribution and lives both in fresh and brackish waters. In the coastal waters of the northern Baltic Sea perch is one of the most dominant species (Neuman, 1982). It is an important commercial and recreational fish in Finland.

The migration of fish is strongly co-related with the surrounding environment. The Baltic Sea is a large brackish water basin. There are considerable environmental gradients including both abiotic (e.g. salinity and temperature) and biotic (e.g. prey and predator abundance) parameters in the Baltic Sea for pelagic, benthic, littoral and coastal fish fauna. Perch is abundant in the littoral and coastal areas in the Baltic Sea. The timing of spawning is influenced by the local environmental factors. Perch is a spring spawning and high fecundity species (Karås, 1987). In spring the temperature is probably the most important factor of governing spawning. The high or low salinity regulates fish species distribution area via osmoregulatory mechanisms (Oikari, 1978; Aro, 1989). . According to Klinkhardt &Winkler (1989), salinity influences egg development of perch and developing eggs tolerate salinities up to 7-7.5 ppt

These studies have shown a distinct pattern of spawning migration by tagging perch during the periods 1977-1991 in different places of the coastal waters of Finland.

STUDY AREAS, MATERIALS AND METHODS

The study area in Taivassalo in the northern Archipelago Sea is located by a shallow inlet Mynämäenlahti. The area is characterized by a dense archipelago with narrow sounds and rich vegetation. The depth of the inner archipelago is mainly less than 10 meters, but the deeper waters (30-50 m) are reached in outer parts (Vesihallitus, 1977). In the inner parts, in shallow inlets and bays, water temperature of 20-25° C is reached almost annually during the summertime. In outer parts, the water temperature is normally less than 20° C. The salinity of the water is 7 ppt.

Off the coast of Helsinki the archipelago forms only a belt along the coast line. The inlets are shallow, usually under 4-5 meters. In the outer archipelago the deepest areas are over 30 m. During summer the water temperature in the inshore is 20-25° C. During winter the ice cover lasts on average 120 days. The salinity of the surface water is 4-5 ppt.

Tagging of perch were carried out in the Helsinki sea area in four sites and in the northern part of the Archipelago sea, at Taivassalo in one sites in the years 1977- in the years 1977-1978 and 1990-1991 (Fig. 1). A total of 4396 perch were tagged mainly during spawning in May with Carlin tags. By September 1999, recaptures had been reported for 328 fish (Table 1). The fish were not anaesthetized and the tagged perch had been released in the places in which they were originally caught for tagging. They were held in net cages for 0-24 hours before release. Fish were recaptured in Taivassalo by both professional and recreational fishers and in Helsinki by recreational fishers. Fisherman sent the found tags to the research institute with the information asked for on the tag. This information included the place and date of recapture and the size of the fish at recapture.

Table 1. Tagging places and dates, numbers of fish tagged.

Tagging place	Tagging date	Type of tag	No. tagged	Recoveries no.	%
Ihattula, Taivassalo	May 1977	Carlin	1000	41	4,1
Ihattula, Taivassalo	May 1978	Carlin	1000	80	8
Helsinki, Vanhankaupunginlahti	May-June 1990	Carlin	200	19	9,5
Helsinki, Vanhankaupunginlahti	May-June 1990	Carlin	500	19	3,8
Helsinki, Vanhankaupunginlahti	May-June 1990	Carlin	98	20	20,4
Helsinki, Vanhankaupunginlahti	May 1991	Carlin	299	10	3,4
Helsinki, Vanhankaupunginlahti	May 1991	Carlin	100	8	8
Helsinki, Vanhankaupunginlahti	May-June 1991	Carlin	200	46	23
Helsinki, Reposalmi	May 1978	Carlin	478	40	8,4
Helsinki, Vartiokylanlahti	May 1978	Carlin	166	14	8,4
Helsinki, Mustalahti	May 1978	Carlin	355	31	8,7
Total			4396	328	7,5

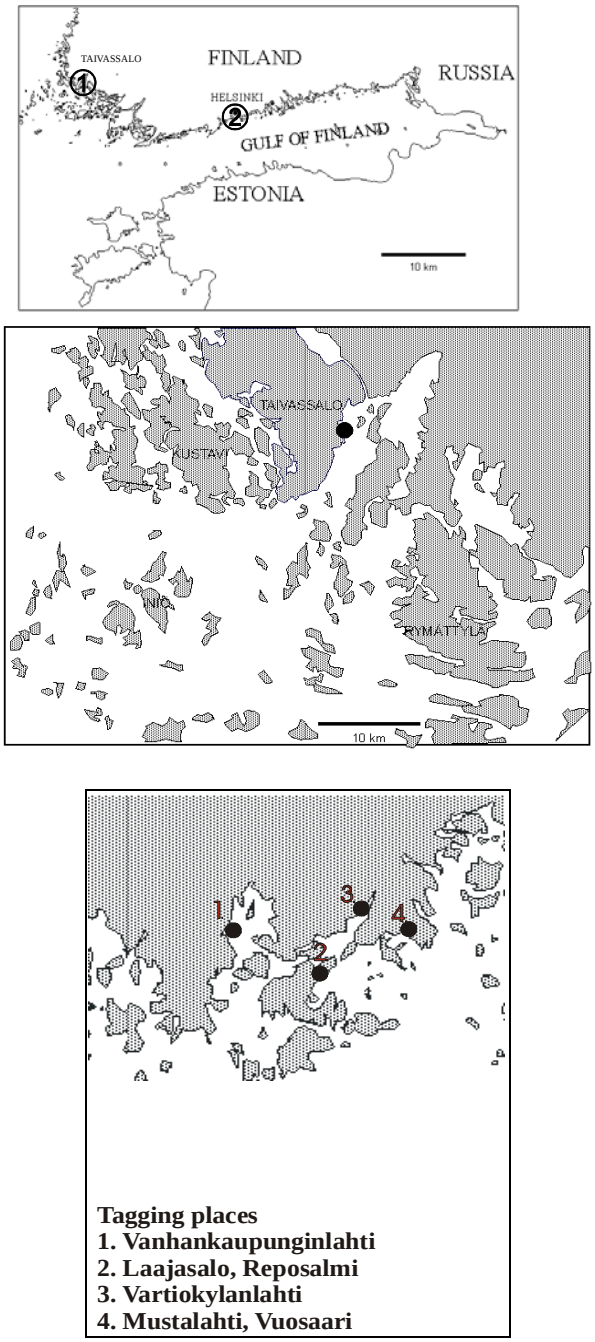

Fig. 1. Study areas and tagging places in 1977-91.

RESULTS

Both in Taivassalo and Helsinki recapture rate is higher during the spawning period. In Taivassalo 92% of the recaptures were made in May-June and 90% of them within 10 km from the releasing place (Fig. 2 & 3.). Recoveries in autumn and in winter were a very few (Table 2). There was a relationship between total fish length and distance moved in Taivassalo though a high proportion of different sizes adult perch was recaptured near the tagging place (Table 3) and smaller fish dispersed less than larger fish.

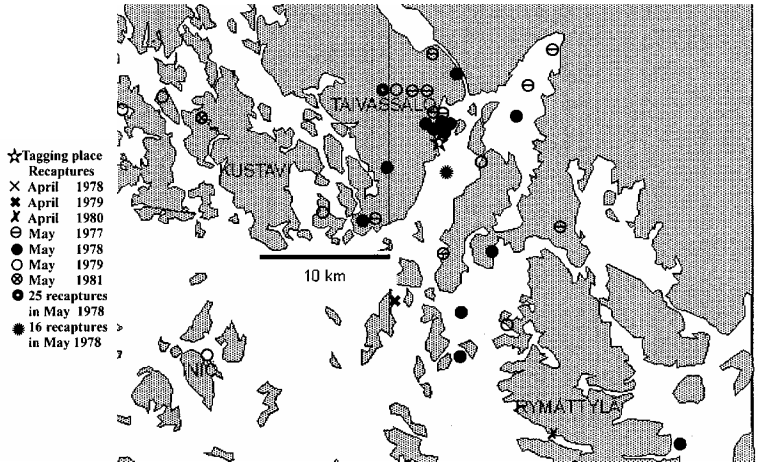

Fig. 2. Recoveries of tagging carried out in April and May in Taivassalo in May 1977-1978. 2 fish recovered outside the map. One from the south and the other from the south-east of the point of release.

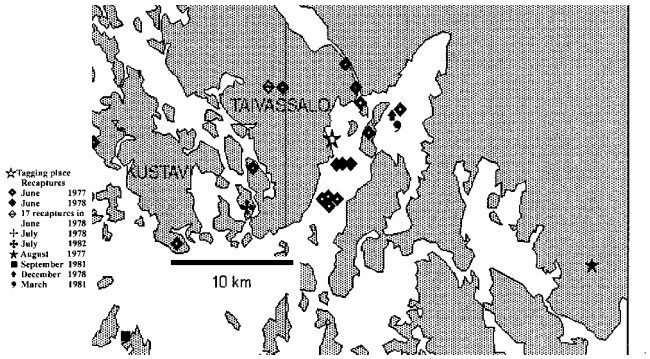

Fig. 3. Recoveries of taggings carried out in June - March in Taivassalo in May 1977-1978.

In Helsinki in general over 60% of the recaptures were made in May-June and over 90% within 10 km (Table 2 & Figs. 4-13). In May and June some recaptures were made in deeper waters several kilometers far from the tagging place.

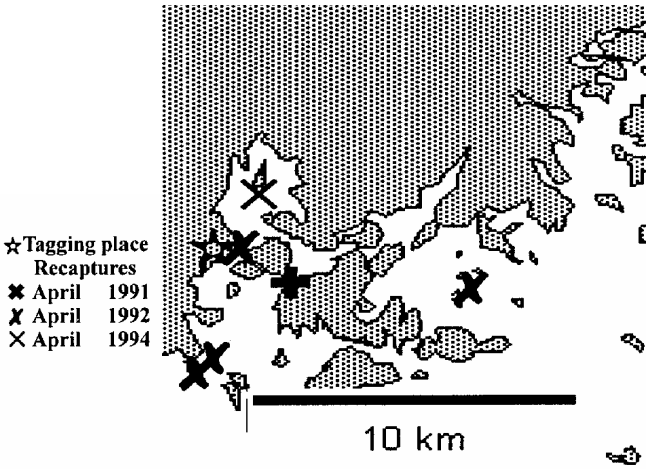

Fig. 4. Recoveries of taggings in April carried out in Vanhankaupunginlahti Bay in May 1990-1991.

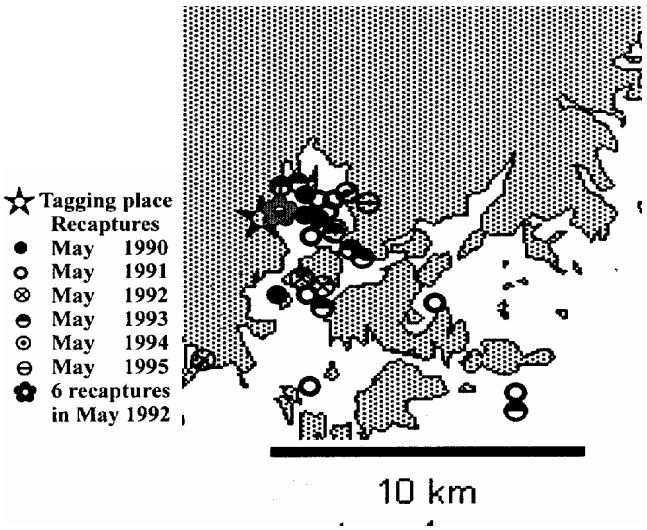

Fig. 5. Recoveries of taggings in May carried out in Vanhankaupunginlahti Bay in May 1990-1991.

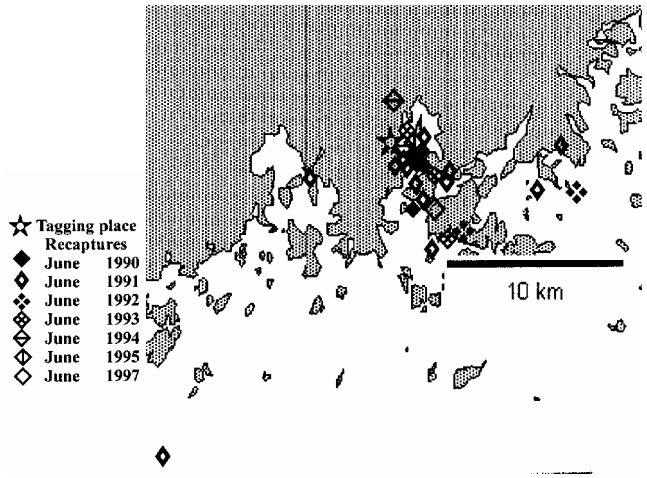

Fig. 6. Recoveries of taggings in June carried out in Vanhankaupunginlahti Bay in May 1990-1991.

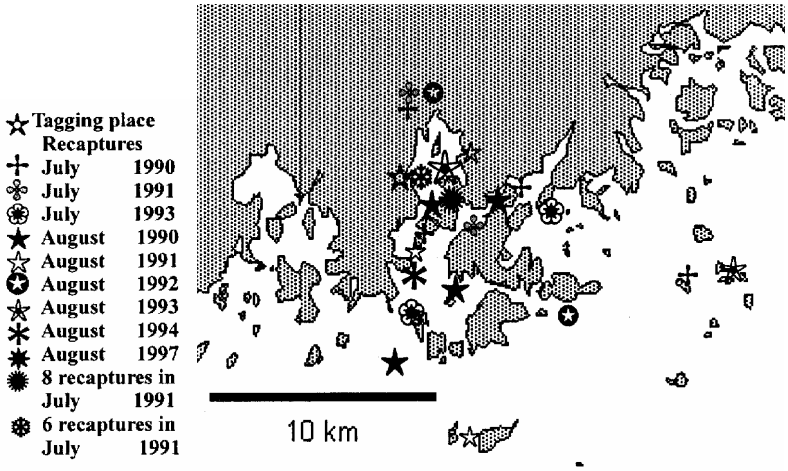

Fig. 7. Recoveries of tagging in July - August carried out in Vanhankaupunginlahti Bay in May 1990-1991.

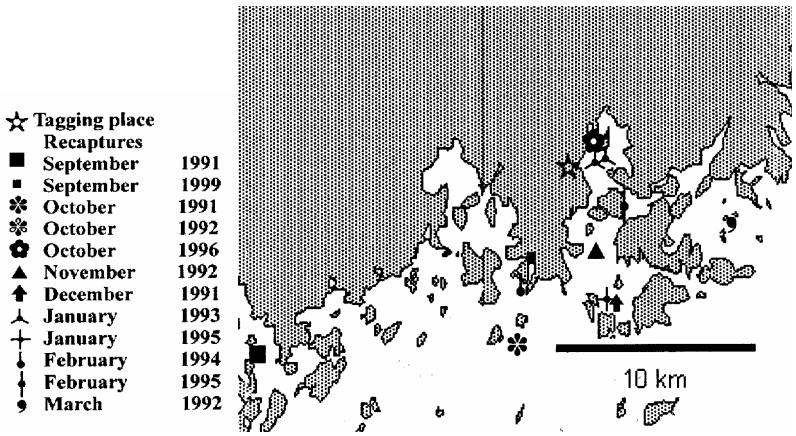

Fig. 8. Recoveries of tagging in Sep - March carried out in Vanhankaupunginlahti Bay in May 1990-1991.

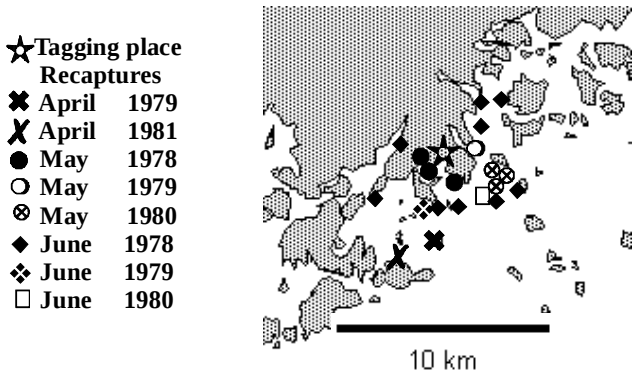

Fig. 9. Recoveries of tagging in April – June carried out in Mustalahti Bay in Helsinki in May 1978.

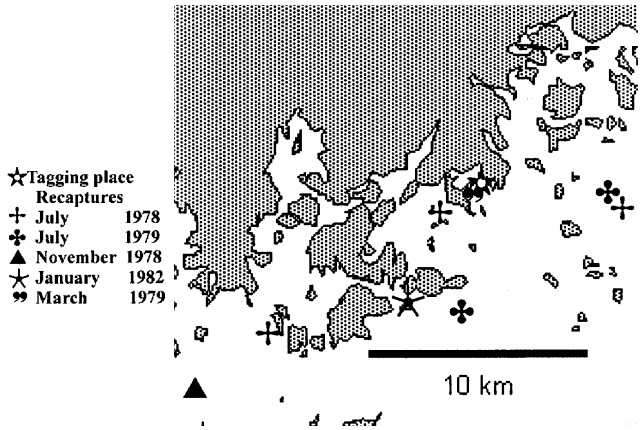

Fig. 10. Recoveries of tagging in July – March carried out in Mustalahti Bay in Helsinki in May 1978.

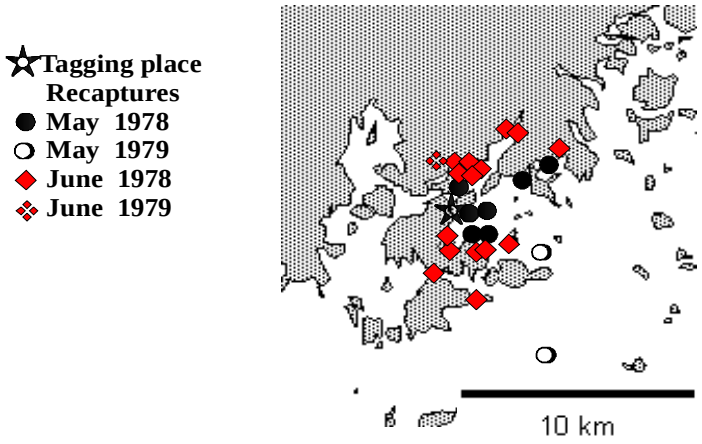

Fig. 11. Recoveries of tagging in May and June carried out in Reposalmi, Laajasalo in Helsinki in May 1978.

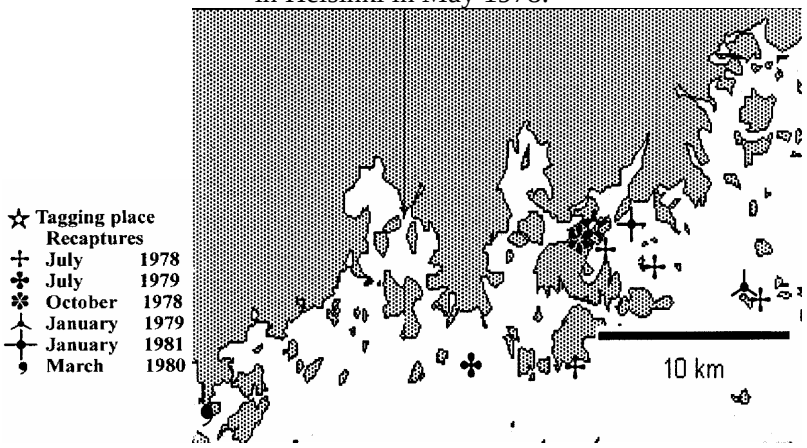

Fig. 12. Recoveries of tagging in July - March carried out in Reposalmi, Laajasalo in Helsinki in May 1978.

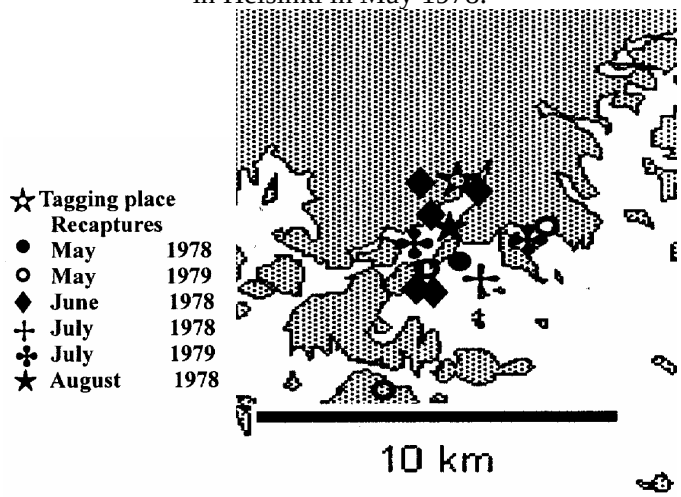

Fig. 13. Recoveries of tagging in May - August carried out in Vartiokylänlahti Bay in Helsinki in May 1978.

Table 2. The distance between tagging and recapture site according to months.

Tagging place	Month	Distance from place of release (km)											no in-
		0-5		5-10		10-15		15-20		over 20		total	forma-
		number	%	number	%	number	%	number	%	number	%	number	tion*
Ihattula, Taivassalo	April	-	-	-	-	1	33	-	-	2	66	3	
	May	54	74	8	11	4	5	2	3	5	7	73	
	June	10	31	21e	63	1	3	1	3	-	-	33	
	July -Aug.	-	-	1	33	-	-	-	-	2	66	3	6
	Sept -Oct.	-	-	-		-	-	-	-	1	100	1	
	Nov -Dec.	-	-	1	100	-	-	-	-	-	-	1	
	Jan. -March	-	-	1	100	-	-	-	-	-	-	1	
Total		64	55	32	28	6	5	3	3	10	9	115	
Helsinki, Vanhankaupunginlahti	April	3	50	3	50	-	-	-	-	-	-	6	
	May	25	73	5	15	3	9	1	3	-	-	34	
	June	20	71	6	21	1	4	1	4	-	-	28	
	July -Aug.	24	73	7	21	1	3	1	3	-	-	33	7
	Sept -Oct.	2	33	1	17	2	33	1	17	-	-	6	
	Nov -Dec.	1	50	1	50	-	-	-	-	-	-	2	
	Jan. -March	3	50	3	50	-	-	-	-	-	-	6	
Total		78	68	26	23	7	6	4	3			115	
Helsinki, Reposalmi	April	-	-	-	-	-	-	-	-	-	-	-	
	May	10	83	2	17	-	-	-	-	-	-	12	
	June	16	89	2	11	-	-	-	-	-	-	18	
	July -Aug.	2	40	3	60	-	-	-	-	-	-	5	1
	Sept -Oct.	1	100	-	-	-	-	-	-	-	-	1	
	Nov -Dec.	-	-	-	-	-	-	-	-	-	-	-	
	Jan. -March	1	33	1	33	-	-	-	-	1	33	3	
Total		30	77	8	20					1	3	39	
Helsinki, Vartiokylanlahti	April	-	-	-	-	-	-	-	-	-	-	-	
	May	3	75	1	25	-	-	-	-	-	-	4	
	June	5	100	-	-	-	-	-	-	-	-	5	0
	July -Aug.	5	100	-	-	-	-	-	-	-	-	5	
	Sept -Oct.	-	-	-	-	-	-	-	-	-	-	-	
	Nov -Dec.	-	-	-	-	-	-	-	-	-	-	-	
	Jan. -March	-	-	-	-	-	-	-	-	-	-	-	
Total		13	93	1	7							14	
Helsinki, Mustalahti	April	2	100	-	-	-	-	-	-	-	-	2	
	May	7	78	-	-	2	22	-	-	-	-	9	
	June	11	100	-	-	-	-	-	-	-	-	11	
	July -Aug.	1	20	3	60	1	20	-	-	-	-	5	1
	Sept -Oct.	-	-	-	-	-	-	-	-	-	-	-	
	Nov -Dec.	-	-	-	-	1	100	-	-	-	-	1	
	Jan. -March	1	50	1	50	-	-	-	-	-	-	2	
Total		22	73	4	13	4	13					30	

* The month of recapture is unknown.

In Helsinki there was no relationship between total fish length and distance moved. Same sized groups were recaptured from the same areas (Table 3).

Table 3. The distance of migrations according to size groups.

Tagging place	Size at tagging	Distance from place of release (km)											no information*
		0 - 4.9		5 -9.9		10 - 14.9		15 – 19.9		over 20		total	
		number	%	number	%	number	%	number	%	number	%	number	
Ihattula, Taivassalo	<19.9	2	25	4	50	2	25	-	-	-	-	8	
	20 -24.9	21	28	43	59	2	3	2	3	5	7	73	
	25 -29.9	20	65	4	13	2	6	1	3	4	13	31	33
	30 -40	-	-	1	50	-	-	-	-	1	50	2	
	Total	43	38	52	45	6	5	3	3	10	9	114	
Helsinki, Vanhankaupunginlahti	<19.9	18	72	4	16	1	4	1	4	1	4	25	
	20 -24.9	25	63	13	33	1	2	1	2	-	-	40	
	25 -29.9	14	45	14	45	-	-	3	10			31	39
	30 -40	3	75	1	25	-	-	-	-	-	-	4	
	Total	60	60	32	32	2	2	5	5	1	1	100	
Helsinki, Reposalmi	<19.9	20	80	4	16	-	-	-	-	1	4	25	
	20 - 25	6	55	5	45	-	-	-	-	-	-	11	9
	Total	26	72	9	25					1	3	36	
Helsinki, Vartiokylänlahti	<19.9	7	88	1	12	-	-	-	-	-	-	8	
	20 - 25	5	100	-	-	-	-	-	-	-	-	5	
	Total	12	92	1	8							13	
Helsinki, Mustalahti	<19.9	17	63	7	26	2	7	1	4	-	-	27	0
	20 - 25	3	75	1	25	-	-	-	-	-	-	4	
	Total	20	65	8	26	2	6	1	3			31	

* No information about the size of recapture.

DISCUSSION

In Taivassalo 92 % and in Helsinki over 60 % of the recaptures were made in May – June, which are the most important months for the perch fishery (Böhling et al., 1983; Sepponen & Hilden, 1984; Böhling & Lehtonen, 1985). The variation in recapture percentages may be dependent on the activity of perch, fishing intensity, the time of fishing, fishing effort and mortality after tagging. Activity maxima are during spring and early autumn and minima during summer and winter (Neuman, 1979). In Helsinki recaptures were made by recreational fishers and in Taivassalo by both professional and recreational fishers though in Taivassalo the majority of the catches were taken by professional fishers. Recreational perch fishing is concentrated in the summer months (Lehtonen & Salojärvi, 1978) and professional fishing in spring (Lehtonen, 1978) where large amounts are easy to capture with trap nets. This may be the one reason that about 50% of the recaptures were made in spring in Taivassalo. Usually perch spawn in May and during the spawning period perch gather in the shallow water spawning places. So perch is more vulnerable during the spawning period and in these areas recapture rate was higher during that time.

Perch seem to gather in areas where the conditions in certain season are favorable for spawning and feeding (Böhling & Lehtonen, 1985). In the Helsinki Sea area perch was observed to migrate between shallow water spawning areas, feeding areas and deep water wintering areas. Similar migrations were also observed by Henking (1923), Allen (1935), Forney (1971), Thorpe (1974), Collette et al. (1977), Craig (1977), Böhling & Lehtonen (1985) and Järv (2000). Perch form more or less separate local stocks along

the Baltic Sea coasts; these populations are not discrete units, however, because perch spawn all along the coast and the mixing with neighboring stocks is likely (Böhling & Lehtonen, 1985; Aro, 1989). During spawning homing was observed in Helsinki. In Helsinki same sized fish preferred same areas but during the spawning period recoveries of different sized perch near the releasing places indicate that perch shows homing to the spawning area. Beside this, the recoveries of perch in the tagging places during spawning time in the following years indicate homing to the spawning areas. Homing was also observed by Worthington (1949), Willemsen (1977), Johnson (1978), and Böhling & Lehtonen (1985) and Järv (2000).

In Taivassalo a majority of perch were recaptured during the spawning period in the following years close to the tagging place. However, several recaptures were also made far from the tagging place during the spawning period which indicates that Homing to the spawning areas in Taivassalo is not as clear as in Helsinki. A possible reason may be that they spawn close to the tagging place and dispersed far just after spawn. The other possible reason may be that they really spawn far from the tagging place.

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