Proc. Estonian Acad. Sci. Biol. Ecol., 2000, **49**, 3, 270–276
https://doi.org/10.3176/biol.ecol.2000.3.03

MIGRATIONS OF THE PERCH (*Perca fluviatilis* L.) IN THE COASTAL WATERS OF WESTERN ESTONIA

Leili JÄRV

Estonian Marine Institute, Viljandi mnt. 18B, 11216 Tallinn, Estonia; leili@ness.sea.ee

Received 21 July 1999, in revised form 9 May 2000

Abstract. Migration of perch was studied by tagging 2146 fish in Matsalu Bay in 1994–95. The tagging was made mainly during the spawning time. Until May 1999, 286 recoveries had been reported. Annual migrations take place between shallower spawning and feeding areas and deeper wintering areas. Differences in migration distances depending on migration direction were revealed. The homing of perch was also observed.

Key words: freshwater fish, perch, migration, homing, Moonsund Archipelago.

INTRODUCTION

The European perch (*Perca fluviatilis* L.) is one of the most abundant fish species in Estonian waters, inhabiting both fresh and saline waters. It is important for commercial as well as recreational fisheries. The main coastal fishing areas are Matsalu Bay, the Väinameri (Moonsund) Archipelago, and Pärnu Bay, the Gulf of Riga, see Fig. 1. The Estonian total annual perch catch (from the sea) was from 300 to 600 tonnes in 1994–97 and it had a decreasing trend. The fast increase in fishing intensity in the Väinameri Archipelago area was mainly due to the opening of foreign markets for perch and pikeperch (Ojaveer et al., 1998). In the conditions of overexploitation of the perch stock, right management procedures cannot be applied, if the factual distribution of the perch stock is not known. The migration of the perch of Matsalu Bay was studied for the first time in Estonian coastal waters in 1994–99.

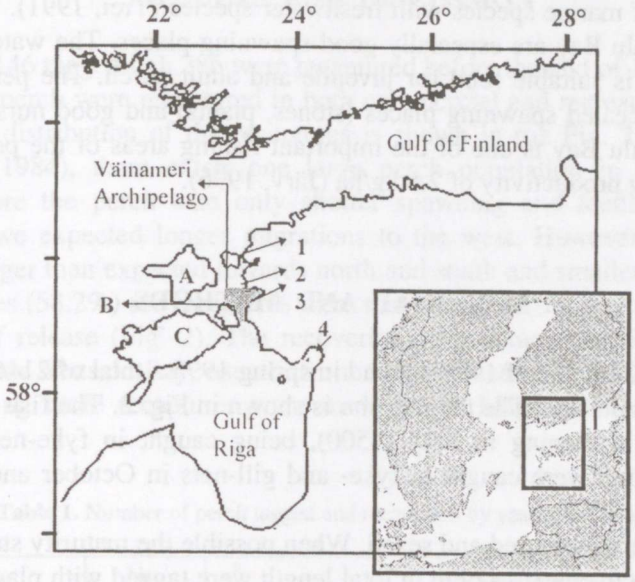

Fig. 1. Study area: 1, Paslepa Bay; 2, Topu Bay; 3, Matsalu Bay; 4, Pärnu Bay; A, Hiiumaa; B, Muhu; C, Saaremaa.

STUDY AREA

For the present study, perch were tagged in Matsalu Bay. It is a 75 km^2 shallow brackish water body in the western part of Estonia (Fig. 1). Owing to the long and narrow shape of Matsalu Bay, the influence of the gradual eastward decrease in salinity is more obvious in this bay than in other areas of the Väinameri Archipelago. Salinity and temperature depend upon the seasons and directions of the winds (Mardiste & Kaasik, 1985) and the inflow of fresh water from the Kasari River (the average yearly inflow is 40–50 m^3). The variations between years and seasons are large. The water temperature is over 15 °C up to 95 days of the year and the average temperature of summer is 20 °C (Porgasaar & Simm, 1985). Three different parts can be distinguided in Matsalu Bay. The western part is the deepest (2.5–3.9 m) and has a marine character. Its salinity fluctuates between 5 and 6.5‰. The water is oligotrophic up to slightly eutrophic. The middle part is relatively shallow (2–3 m), its salinity is mostly 2.5–5.5‰. The water is moderately eutrophic. The eastern part is shallow (1–1.5 m), the easternmost part being even less than 1 m deep. Its salinity is often below 1‰. The water is moderately up to strongly eutrophic (Porgasaar, 1980, 1981, 1985). The bay has rich phyto- and zooplankton and bottom fauna (Järvekülg, 1985; Piirsoo & Porgasaar, 1985). Mats of plants of various size cover the whole water surface of the bay. The phytobentos (37 species) is characterized by a gradual

replacement of marine species with freshwater species (Trei, 1991). The shallow areas of Matsalu Bay are especially good spawning places. The water warms up fast and there is suitable food for juvenile and adult perch. The perch can find numerous concealed spawning places (stones, plants) and good nursery areas in the bay. Matsalu Bay is one of the important fishing areas of the perch with an average fishing productivity of 2.5 kg/ha (Järv, 1996).

MATERIAL AND METHODS

During the autumns of 1994–95 and in spring 1995 a total of 2146 perch were tagged in Matsalu Bay. The tagging site is shown in Fig. 2. The fish were tagged mainly during spawning in May (1500), being caught in fyke-nets. The fish tagged in autumn were caught in fyke- and gill-nets in October and November (646).

The fish were measured and sexed. When possible the maturity stage was also estimated. Specimens 16–42 cm in total length were tagged with plastic Lea-type tags (Stott, 1971) of red (spring) and yellow (autumn) colour, attached with stainless steel wire to the fish body in front of the dorsal fin. After tagging the fish were immediately released on the spot. The fish were not anaesthetized.

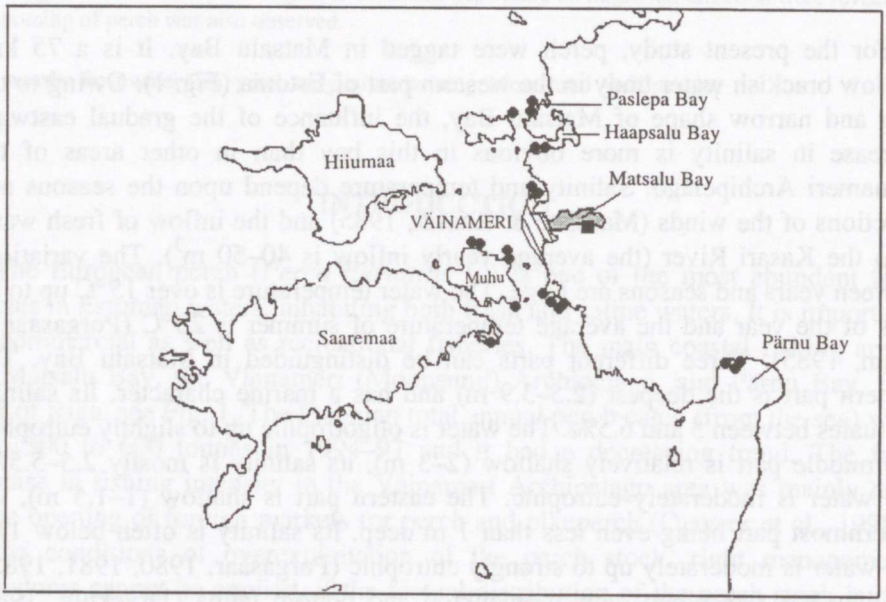

Fig. 2. Distribution of perch recaptures: ■ tagging place, ● location of recoveries. Striped area 22% of recoveries, grey area 58% of recoveries.

RESULTS AND DISCUSSION

Of the 2146 tagged fish 286 were recaptured before the end of 1999 (Table 1). The tagged perch were recaptured in both commercial and recreational fisheries. The spatial distribution of the recaptures is shown in the Fig. 2. According to Mikelsaar (1984), there exists one large perch population in the Väinameri region, where the perch take only shorter spawning and feeding migrations. Therefore, we expected longer migrations to the west. However, the dispersal area was larger than expected towards north and south and smaller towards west. In most cases (58.2%) the recaptures were made within a distance of 10 km from the place of release (Fig. 2). The recoveries form autumn tagging were made mostly outside Matsalu Bay, usually from deeper places of the Väinameri. From spring tagging more recaptures were made inside Matsalu Bay in its shallow areas.

Table 1. Number of perch tagged and recaptured by years after tagging

Tagging date	No. tagged	Recaptures						
		Tagging year	1st year	2nd year	3rd year	4th year	Total	%
Oct. 1994	394	20	7	2	1	0	30	7.6
May 1995	1500	170	38	14	8	2	232	15.5
Oct.–Nov. 1995	252	17	3	2	1	1	24	9.5
Total	2146	207	48	18	10	3	286	13.3

About 89% of the recaptures were reported from April to May, which are the most important months for the perch fishery in Matsalu Bay (Järv, 1989). The concentration of recaptures in spring is partly caused by differences in the activity of the perch between seasons. Its activity maxima are in spring and early autumn (Neuman, 1979). Very many specimens tagged in spring were recaptured soon after release, when fyke-nets are abundantly used in the Väinameri area. The fishing intensity may also influence the recoveries (Table 2).

In mid-summer (June–August) tagged perch were caught mainly in recreational fishery. In spring, autumn, and winter recaptures were mainly in professional fishery, similarly to reports from Finland (Böhling & Lehtonen, 1984).

Table 2. Temporal distribution of recoveries and mean fishing intensity in 1994–98

	Apr	May	June	July	Aug	Sep	Oct
Recoveries, %	15.2	73.3	6.1	0.4	0.7	2.9	1.4
Intensity of fyke-nets fishery, %	5.8	23.1	24	7.9	3	19.2	17

The longest migration was observed in autumn 1994 when three specimens were recaptured in Pärnu Bay, Gulf of Riga, over 160 km from the tagging site. Next summer, one specimen was recaptured in Paslepa Bay, Gulf of Finland, over 80 km from the tagging place. The longest migrations reported earlier in the Baltic Sea are 180 km from the tagging place in the western part of the Gulf of Finland to the Estonian coast and 165 km in the Archipelago Sea (Koli et al., 1978).

The average migration speed of the longest observed migration was approximately 11 km/day. The highest average speed of migration was recorded in the Väinameri area between Matsalu Bay and Topu Bay (along the coast approximately 30 km, see Fig. 1): 3 km/h (0.8 m/s). The highest speed of the perch, 1.3 m/s, was calculated and recorded in laboratory tests by Chestnoi (1977). According to the results of a hydroacoustic tagging experiment made at the beginning of the 1980s, during the first 2–3 hours after tagging and releasing the fish move at a very high speed and as straight as possible (A. Järvik, pers. comm.). So, if we calculated the average speed of perch for straight move, the speed would be 0.6 m/s.

The active migration area of perch seems to be relatively restricted. So, 98.3% of recaptures were made less than 20 km from the tagging place. It is interesting to note that the migrations were longer in the south–north direction than in the east–west direction. Tagged perch were recaptured east from the tagging place only within 0.5–1 km and to the west the longest distance from the tagging place was about 25 km. No recoveries were observed in the Väinameri area between Saaremaa, Muhu and Hiiumaa islands (Fig. 2).

In autumn, tagged adult perch had in most cases longer migrations and these were directed out from the bay to the deeper wintering areas. The immature specimens were recaptured all the year in the vicinity of the releasing site (Table 3).

Table 3. Temporal distribution of recoveries by the location (%)

Month	Inside Matsalu Bay		Outside Matsalu Bay	
	Mature perch	Immature perch	Mature perch	Immature perch
Jan.	0	0.1	1.0	0
Feb.	0.2	0	0.8	0
March	0	0.1	2.0	0
Apr.	5.1	2.7	0.2	0
May	69.5	10.4	0	0
June	3.0	0.2	0.1	0
July	0	0	0.4	0
Aug.	0.1	1.2	0.6	0
Sep.	0.2	0.1	0.7	0
Oct.	0.1	0.2	0.9	0
Nov.	0	0.1	0	0
Dec.	0	0	0	0
Total	78.2	15.1	6.7	0

Of the prespawning female perch 58% were caught in the same fyke-net within two weeks in spring, providing a good example of homing (Table 4). They were caught from the shallow (up to 3 m) water.

Table 4. Number of mature female perch recaptures from the releasing place in the years after tagging

Recapture time	No. tagged	Recaptures					
		Tagging year	1st year	2nd year	3rd year	4th year	Total
April	0	0	3	1	1	0	5
May	1213	10	12	8	5	1	36
June	0	61	14	4	2	1	82
Total	1213	71	29	13	8	2	123
%		57.7	23.6	10.6	6.5	1.6	100

ACKNOWLEDGEMENTS

Financial support was obtained from the Sida-Öst project BAL 0481. The author is grateful to Dr. G. Thoresson (Project leader) and Dr. P. Karås from the Institute of Coastal Research (Swedish National Board of Fisheries) and colleagues from the Estonian Marine Institute for help.

REFERENCES

Böhling, P. & Lehtonen, H. 1984. Effect of environmental factors on the migration of perch (*Perca fluviatilis* L.) tagged in the coastal waters of Finland. *Finn. Fish. Res.*, **5**, 31–40.

Chestnoi, V. N. 1977. *Variability of catchebility of the bottom trawls.* Pishchevaya promyshlennost´, Moskva (in Russian).

Järv, L. 1989. Ahvenapüügi prognoosimise võimalustest. *Abiks Kalurile*, **4**, 30–36.

Järv, L. 1996. Perch (*Perca fluviatilis* L.) in Estonian coastal waters. In *Proceeding of Polish–Swedish Symposium on Baltic Coastal Fisheries. Resources and Management*, pp. 81–87. Gdynia.

Järvekülg, A. 1985. Matsalu lahe põhjaloomastik. In *Matsalu – rahvusvahelise tähtsusega märgala*, pp. 53–77. Valgus, Tallinn.

Koli, L., Aro, E. & Rask, M. 1978. Tvärminnen ahvenen populaatiotutkimus. *Loppuraportti luonnontietulliselle toimikunnalle.*

Mardiste, H. & Kaasik, T. 1985. Matsalu lahe ja Kasari jõe hüdroloogiline reziim. In *Matsalu – rahvusvahelise tähtsusega märgala*, pp. 15–26. Valgus, Tallinn.

Mikelsaar, N. 1984. *Eesti NSV kalad.* Valgus, Tallinn.

Neuman, E. 1979. Activity of perch, *Perca fluviatilis* (L.), in a Baltic bay, with special reference to temperature. *Inst. Freshw. Res.* Drottningholm, Rep. **58**, 103–125.

Ojaveer, H., Järv, L. & Erm, V. 1998. Some tendencies in Estonian coastal fisheries in the mid-1990s. In *Proceeding of Symposium on Freshwater Fish and Herring Populations in the Coastal Lagoons. Environment and Fisheries*, pp. 174–184. Gdynia.

Piirsoo, K. & Porgasaar, V. 1985. Fütoplankton ja klorofüllisisaldus Matsalu lahes. In *Matsalu – rahvusvahelise tähtsusega märgala*, pp. 36–44. Valgus, Tallinn.

Porgasaar, V. 1980. Merevee soolsus Matsalu lahes 1975 ja 1977–1978. In *Loodusvaatlusi 1978*, **I**, pp. 151–160. Tallinn.

Porgasaar, V. 1981. Merevee soolsus Matsalu lahes 1979. In *Loodusvaatlusi 1979*, **I**, pp. 26–31. Tallinn.

Porgasaar, V. 1985. Matsalu lahe vee füüsikalised omadused ning nende seos klorofüll-*a* sisaldusega. *Eesti NSV TA Toim. Biol.*, **34**, 119–130.

Porgasaar, V. & Simm, H. 1985. Matsalu lahe hüdrokeemiline režiim. In *Matsalu – rahvusvahelise tähtsusega märgala*, pp. 26–35. Valgus, Tallinn.

Stott, B. 1971. Marking and tagging. In *Methods for Assessment of Fish Production in Fresh Waters* (Ricker, W. E., ed.). *IBP Handbook*, Vol. 3, pp. 82–97. Blackwell Sci. Publ., Oxford and Edinburgh.

Trei, T. 1991. *Matsalu lahe fütobentos*. Matsalu Riiklik Looduskaitseala, Tallinn.

AHVENA (*Perca fluviatilis* L.) RÄNNETEST EESTI LÄÄNEPOOLSETES RANNIKUMERE VETES

Leili JÄRV

Aastatel 1994–1995 märgistati Eesti rannikumeres kolmel korral kokku 2146 ahvenat. Märgistamiseks valiti Väinamere olulisim kude- ja turgutusala – Matsalu laht. Ajavahemikus oktoober 1994 kuni detsember 1999 taaspüüti märgistatud kaladest 13,3%. Valdav osa (78%) taaspüükidest toimus ahvena kudeajal aprillis–mais tööndusliikest mõrrapüükidest. 1995. aasta kevadel märgistatud emaste ahvenate taaspüükidest saadi 58% kahe nädala jooksul pärast märgistust samadest püünistest, millest oli võetud märgistusmaterjal. Seda võib pidada ahvena kudepaigakindluse heaks näiteks. Sügistalvised taaspüügid olid valdavalt väljaspool Matsalu lahte asuvatelt talvitusaladelt. Kindlasti mõjutas taaspüükide ajalist ja ruumilist jaotumist lisaks ahvena loomuliku sesoonse aktiivsuse muutumisele ka püügiintensiivsuse sesoonne muutumine.

Põhilised ahvena rännded olid suhteliselt lühikesed: 98,3% taaspüükidest mahtus 20 km raadiusse. Esines ka üksikuid pikki rändeid, mis olid vastupidiselt oodatule ulatuslikumad põhja–lõuna suunas. Pikimad neist ulatusid 1994. aasta sügisel Pärnu lahte. Keskmine kiirus sellel rändel oli 11 km/päevas. Ahvena maksimaalne rändekiirus, 3 km/h (0,8 m/s), registreeriti 1994. aasta sügisel Matsalu lahest Topu lahte liikumisel. Väinamere avaosast (Saaremaa, Hiiumaa ja Muhu saare vaheline mereala) ahvena taaspüüke ei olnud.

Suguküpse ahvena rännded olid ulatuslikumad ning sõltusid rohkem temperatuuri gradiendist: sügisene ränne oli suunatud Matsalu lahest välja, kevadine lahte sisse. Mittesuguküps ahven püsis aasta ringi Matsalu lahes.