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A Review of the "Scots Bay" Herring Fishery in the Upper
Bay of Fundy (4X)

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ABSTRACT

A purse seine fishery for herring in the upper Bay of Fundy (4X) was reopened in 1987 after a closure of approximately 5 years. This paper reviews the history, documents landings in recent years and summarizes biological information of relevance to the so-called "Scots Bay" fishery.

RÉSUMÉ

En 1987, la pêche au hareng à la seine coulissante a été réintroduite dans le cours supérieur de la baie de Fundy (4X), après une fermeture d'environ cinq ans. Le présent document examine l'historique de cette pêche, fait état des débarquements réalisés au cours des dernières années et résume les données biologiques pertinentes relativement à cette pêche que l'on appelle communément la pêche de la "baie Scotts."

INTRODUCTION

A herring fishery in the upper Bay of Fundy portion of NAFO Div. 4X (herring management area 21) was reopened to purse seining in 1987 after a closure of approximately 5 years. The new fishery targetted early summer spawners of the "Scots Bay" stock and was the first purse seine fishery on the east coast to open according to roe quality reports from designated commercial test vessels. There is pressure within the industry (particularly from purse seine segments) to increase this fishery, but disagreement by weir and gillnet sectors who fear disproportional effort on a single spawning component. The Scotia-Fundy Herring Advisory Committee (SFHAC) has requested consideration of the available biological information for advice on the relative size of the Scots Bay spawning group.

In this paper, we:

- i) document the history of the "Scots Bay fishery"
- ii) summarize biological characteristics of the catch
- iii) review the evidence for autonomy of this stock, and
- iv) address the issue of relative size of the stock.

i) History of the Scots Bay fishery

Commercial landings statistics have not traditionally been partitioned into upper and lower subunits of the Bay of Fundy. However, we have attempted to compile an estimate of the historical purse seine landings from the upper Bay of Fundy (area 21 on Fig. 1) using log records as follows:

$$\text{Upper B of F landings} = \text{logged upper Bay landings} \times \frac{\text{total 4WX landings}}{\text{logged 4WX landings}}$$

This series (Table 1) shows the inconsistent nature of the fishery which started about 1975, grew to 8800 t in 1979 (when a foreign factory ship was present), was closed in 1981/82 and reopened in 1987.

Historically, it was a summer fishery (concentrated in July) along the Nova Scotia shore, particularly off Margaretsville and Ile Haute (Fig.1). There was a seasonal progression of landings into the area from the Long Island shore (west of Digby) in June, off Digby and Parkers Cove in late June and early July and to Margaretsville and the upper Bay in July/August. Very little of the fishery actually took place in Scots Bay (Minas Channel) but the fishery has commonly assumed that name.

The closure was in response to concerns, primarily from the weir sector, that the upper Bay fishery was contributing to decreasing landings of juvenile fish, particularly the loss of the spring fishery in New Brunswick weirs.

A fishery was reinstated within the upper Bay of Fundy (herring area 21) (but southwest of Ile Haute) in 1987. It was meant to allow large herring to be taken in the mid-bay for fillets but developed into a roe fishery. A total of 3451 t was recorded in logbooks (Table 1). On the recommendation of the Scotia-Fundy Herring Advisory Committee, an experi-

mental roe fishery (quota = 3000 t) was undertaken in 1988, using two commercial seiners as test vessels to determine roe yield which determined the opening of the fishery (Morrisey 1988). The fishery opened July 24 and was concentrated off Margaretsville and Ile Haute (Fig. 2). Logged catch totalled 3949 t, and exceeded the quota. The fishery resulted in a roe yield of approximately 8% (3% better than average for the 4WX fishery) and prompted the request for additional allocation. The 1989 management plan provided for another controlled roe fishery in the upper Bay in July, with a quota of 5400 t.

ii) Biological characteristics of the catch

The fishery from 1975-81 took primarily large adult herring to be used in the domestic fillet market. The recent fishery has taken predominantly ripe herring for the roe market. Table 2 summarizes the age, size and maturity profile of the catch.

iii) Stock structure

It is recognized that the 4WX assessment unit subsumes spawning groups in the upper Bay of Fundy, but these have been considered small in relation to the southwest Nova Scotia spawning groups (Trinity Ledge, etc.).

A small group of spring spawners has been documented in the Minas Channel (McNairn 1932; Bradford 1987). According to Bradford (1987), spawning takes place in May and early June along the north shore of Minas Basin near or in the Minas Channel (Fig. 1). Larvae are thought to remain within the Minas Basin and to metamorphose later the same summer.

The status of a summer spawning group is less clear. Although there were historical accounts of large aggregations of herring in the Digby area (Moore 1898; Perley 1852; Huntsman 1953), these accounts were not of spawning fish. Crawford's (1979) survey of Nova Scotia fishermen mentioned July spawning at the Ile Haute and Advocate, but nothing southwest of that. Recent fishery data, however, indicate summer spawning (July) off Margaretsville and around the Ile Haute (Fig. 1). Sinclair and Tremblay (1984) reported peak spawning during July 20-Aug. 3 for "Scots Bay" based on 6 years of this fishery and a tagging study undertaken in the area in July 1980 recorded spawning fish. We (Marine Fish Division) have collected spawning fish near Ile Haute in mid-July of 1985 and 1986 and have documentation from logbooks of "ripe and running" fish near Ile Haute and off Margaretsville in mid-July in 1987 and 1988.

One tagging series was conducted on the "summer-spawning population" in Scots Bay in July 1980 (Anon. 1983). According to the summary table (Anon. 1983; Table 1), a total of 6708 spawning fish were released from six tagging sessions in the area between Advocate and Margaretsville, although the detailed list of release sites (Attachment 1 of Anon. 1983) indicates there were in the order of 13,200 released from four sites. Most long-term returns were from the release area in the upper Bay of Fundy, although there were substantial returns from the southwest Nova Scotia fishery, few from the coast of New Brunswick and eastern Maine and a few from eastern Nova Scotia (Fig. 3). On the basis of these returns, the 1983 NAFO Ad Hoc Working Group on herring tagging (Anon. 1983; p. 84) stated:

"These fish appear to disperse throughout the Bay of Fundy and its approaches during August-October with dominant distribution near the Nova Scotia side of the Bay. They appear to leave the Bay of Fundy by November with some tendency toward an eastward movement and no indication of movement to the western Gulf of Maine."

Examination of larval distribution from the spring (March) and fall (October/November) Bay of Fundy surveys indicates an area of larval aggregation off the Digby-Margaretsville shore. Although this aggregation is often distinct from the SW Nova Scotia larval patch and is usually present in both fall and spring surveys, the length of these larvae indicate that most are too small to have originated from July spawning.

iv) Relative size of the spawning unit

There is little information on which to quantify the size of the upper Bay of Fundy summer herring stock. Sinclair (1988, p. 51) states that, "The Scots Bay spawning population is much smaller than the population off southwest Nova Scotia (probably orders of magnitude smaller)", but this is without reference. There are no recent research survey series of relevance. Even the catch record is incomplete in that it has been reconstructed from logs. Purse seine catch rates in the recent fishery (Table 3) were high in spite of the fact that this was "exploratory" fishing (few vessels and without recent experience), but this is typical of fisheries on spawning aggregations.

Determination of relative spawning unit size would require a time series of surveys such as acoustic surveys covering the spawning period (July and August) and larval surveys near the end of spawning (August/September).

Scots Bay landings have been a small fraction of the 4WX total. Logged landings (prior to 1987) peaked in 1979 and 1980 at 4% and 3% of the total 4WX landings (Table 3).

MANAGEMENT CONSIDERATIONS

- 1) There is evidence of persistent summer spawning in the upper Bay of Fundy (Margaretsville to Ile Haute), but the relationship with spawning in the lower Bay (i.e. Trinity Ledge) is not certain. Tagging evidence and fishery information indicate that the upper Bay spawners are fished along the southwest NS shore prior to spawning (June and early July).
- 2) There is little evidence on which to base an estimate of relative spawning unit size. Documented historical landings made up a small portion of the 4WX total (less than 5%). The 1989 management plan will allow a fishery approaching the historical maximum, particularly if landings exceed the quota as they did in 1988.
- 3) A small but distinct spring spawning group exists in the Minas Channel and should be considered in management of the extreme upper Bay.

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Table 1. Estimated landings from the upper Bay of Fundy (calculated from log records as described in text).

Year	Logged upper Bay landings	Logged 4WX landings	Total 4WX landings	Upper Bay of Fundy landings (estimated)
1973	0	18,103	122,687	?
1974	0	17,700	149,670	?
1975	0	7,618	143,897	?
1976	0	19,779	115,178	?
1977	1661	32,676	117,171	5956
1978	1139	39,452	95,882	2768
1979	2167	14,524	59,021	8806
1980	2211	40,788	79,584	4314
1981	677	44,441	87,706	1336
1982	0	11,624	84,733	0
1983	59	48,920	84,385	102
1984	0	31,106	78,083	0
1985	0	90,057	112,385	0
1986	91	67,098	73,733	100
1987	3451	79,722	101,157	4379
1988	3949	85,741	98,371	4530

Table 2: Biological attributes of herring taken in the Scots Bay fishery 1975 to present.

Year	% at age							% maturity			Mean length	% stage 5+6	
	1	2	3	4	5	6	7+	<4	5+6	7+		July	Aug.
1973													
1974	8	77	15								14.7		
1975	1	66	2	1	27	2	1	77	10	13	20.9		
1976	1	12	23	29	5	28	2	40	43	17	26.9	49.4	
1977		11	3	27	27	19	13	33	62	5	28.4	68.1	76.3
1978		11	2	2	26	22	37	24	74	2	29.9	75.8	
1979		12	26	36	3	8	15	43	54	3	26.8	45.5	91.0
1980		.2	13	67	6	1	12	55	42	3	27.9	47.3	34.5
1981				?				53	46	1		46.8	
1982		88	5	2	3	3	.2	100	0	0	18.5		
1983	5	46	14	21	2	6	6				20.9		
1984		4	39	29	24	1	3				26.3		
1985		44	22	24	6	2	2				23.0		
1986		27	42	23	5	1	3				24.1		
1987		5	12	48	30	4	1	37	60	3	26.9	48.5	100.0
1988	0	0	.1	10	57	29	4	2	98	0	29.8	100.0	0

Table 3. Purse seine catch rates for the upper Bay of Fundy herring fishery

Year	Upper Bay		Total 4Xa Catch/night	Upper Bay		Total 4Xa Catch/set
	No. nights	Catch/night		No. sets	Catch/set	
1973	1	0.0	43.7			32.0
1977	31	53.6	28.3			26.7
1978	23	49.5	31.0			22.9
1979	102	21.3	39.4			20.3
1980	91	24.3	35.3			23.5
1981	19	35.6	29.4			26.6
1982	-	-	29.5			21.1
1983	4	14.8	34.9			26.6
1984	-	-	50.1	-	-	36.4
1985	-	-	46.2	-	-	36.3
1986	2	45.0	36.3	2	45.0	27.9
1987	97	37.3	38.0	109	33.2	30.8
1988	62	63.7	53.5	99	41.0	24.8

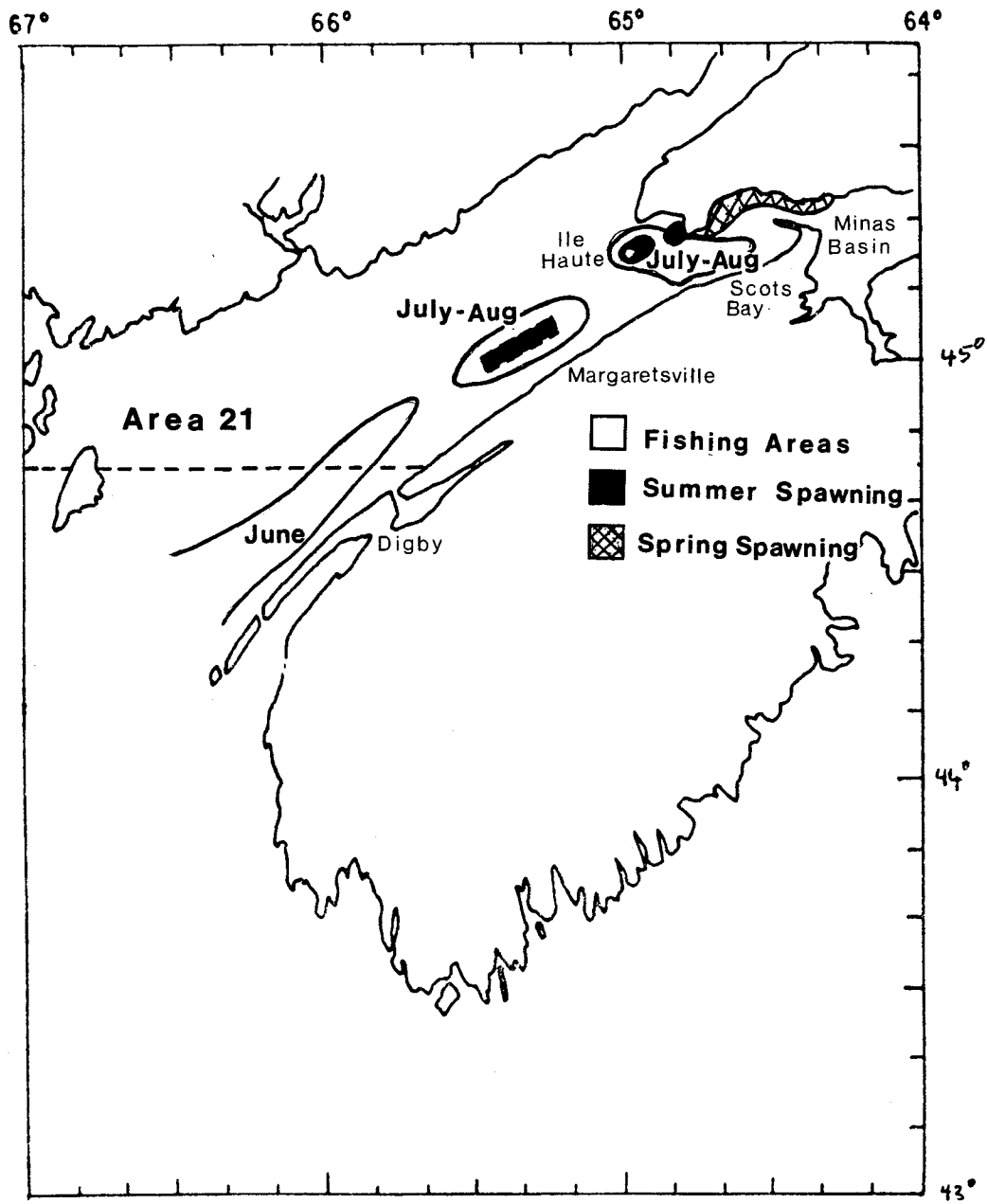


Fig. 1. The upper Bay of Fundy showing documented spawning areas.

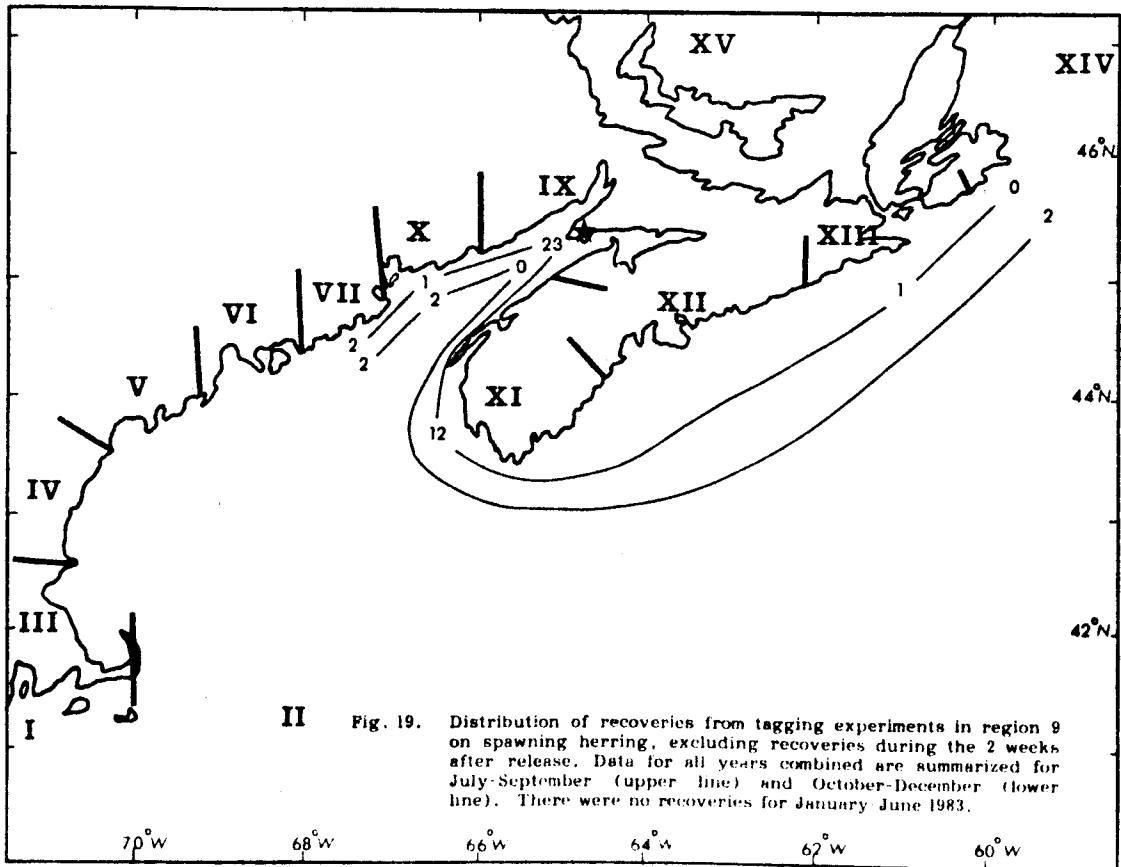


Fig. 2. Recoveries from tagging experiments in the upper Bay Fundy - released July 1980 (from Anon. 1983; Fig. 19).

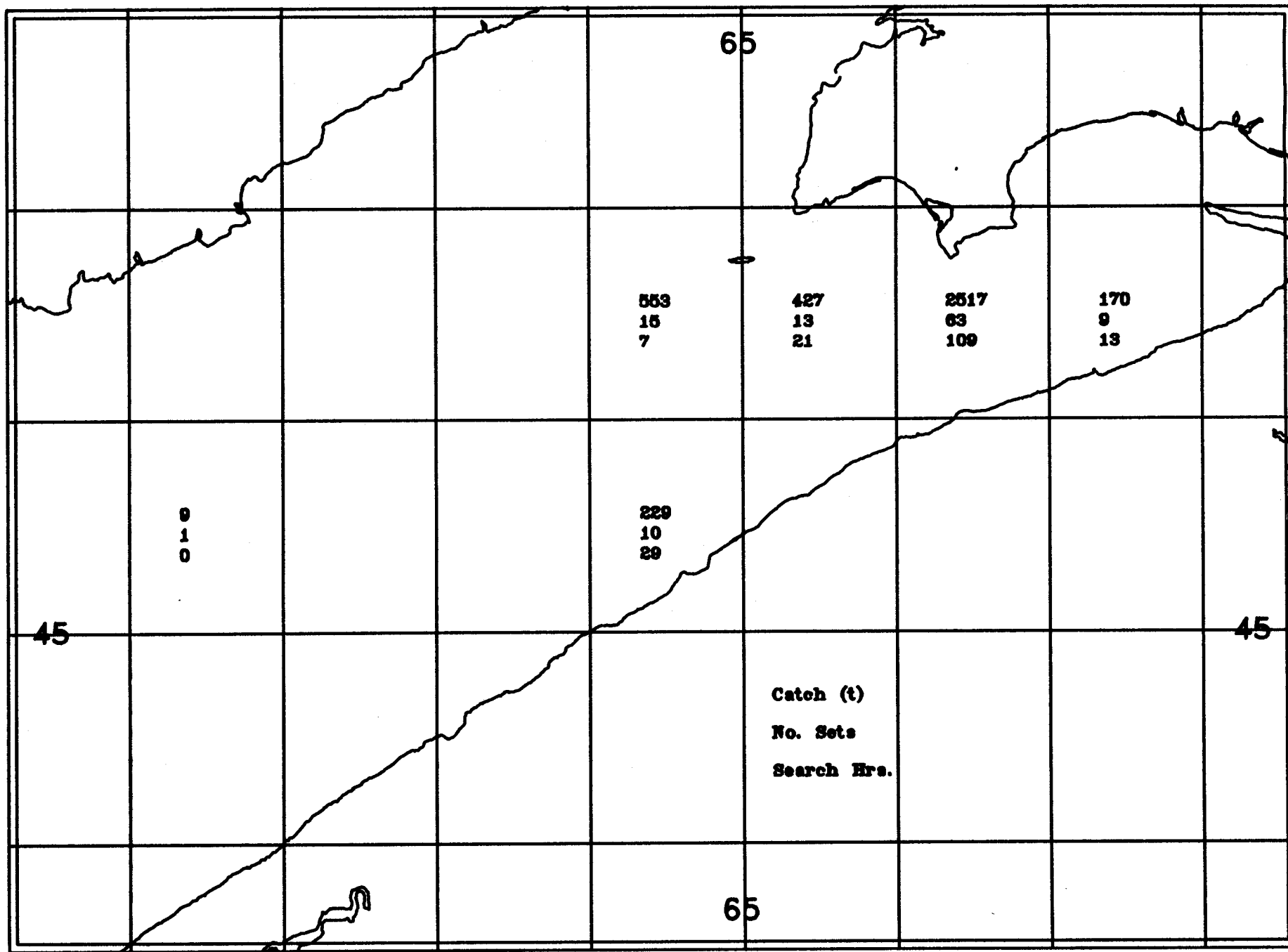


Fig. 3. Purse seine catch (t), sets (no.) and effort (sonar hours) by 10' square in the July 1988 Scots Bay fishery.