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INTERIM REPORT OF HERRING TAGGING IN THE GULF OF ST. LAWRENCE, 1970

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Two major herring fisheries are prosecuted in the Gulf of St. Lawrence (Div. 4T) at different seasons, one off the Magdalen Islands and along the New Brunswick coast in the spring (April-May) and the other in the Bay of Chaleur and along the coast of the Gaspé peninsula during the summer (July-September). During the winter (December-March) a major fishery develops near the entrance to the Gulf, along the SW coast of Newfoundland (Div. 3P).

The relationships between the herring stocks that form the basis of these fisheries have been considered by several authors (Day, 1957; Hodder, 1969; Hodder and Parsons, 1970; Iles and Tibbo, 1970; Messieh and Tibbo, 1971; and Tibbo, 1957). The fisheries occur at widely differing localities at different seasons, and the mobile fleet, largely purse-seiners and a few midwater trawlers, is able to operate in each area in turn. Some fishing is done between major areas and seasons. The herring caught in all three areas are a mixture of both spring- and autumn-spawning types with no meristic distinction between the same type in the different areas, although there are differences between the two types (Hodder and Parsons, 1970; Messieh and Tibbo, 1971). These similarities in form, and the sequential timing of occurrence, suggest that the herring stocks may be the same (Hodder and Parsons, 1970), or contribute to (Iles and Tibbo, 1970), the different fisheries.

Tagging experiments were carried out during 1970 to investigate the exchange between the three areas. Winters (1970) gives the preliminary results of tagging in the Newfoundland fishery, while this communication does the same for programs in the Magdalen Islands, and Bay of Chaleur and Gaspé (to be referred to as Gaspé, for brevity) fisheries.

Equipment and methods

Internal metal tags were used, inserted into the abdominal cavity, for recovery by magnets installed in the processing lines of reduction (fishmeal) plants. No external tags were employed since the vast majority of the fish are handled in bulk and such tags would not be recognisable, nor recoverable, in the flow of fish. The tags used measured approximately 20 x 5 x 1 mm, and were obtained from Bergen Nautik, or from the Floy Tag Co. Ltd. Insertion was made in a posterior direction through a hole punctured in the abdominal wall with a narrow-bladed scalpel, between the skeletal elements of the pelvic fins.

Fish were obtained from commercial trap-nets or purse-seines and, initially, were held in keep nets; later, free-flooding barges were used. Herring were scooped from the seine or trap as soon as the nets had been raised sufficiently to bring the fish near the surface, and deposited in the holding net or barge. The holding devices were then towed clear of the capture gear, either back to the barge or to a convenient mooring (nets). Experience proved that the fastest tagging was achieved by two-man teams. One man caught the

herring, either in a small dipnet or by hand, and held it belly up with the eyes covered by one hand for the second man to make the incision and insert the tag. Early attempts to retain tagged fish in a holding net and to release them in small groups rather than as individuals were abandoned as the combined rate of tagging (5 teams) was high (30/minute), and the fish frequently gathered near the tagging boats.

Results

Tagging was carried out in two areas, with 35,642 herring marked and released from traps along the coast of the Magdalen Islands (May 5-11) and a further 20,467 released after capture by purse-seiners along the Gaspé coast (August 14-17).

Magdalen Islands. In the Magdalen Islands most of the fish were released in the southern portion of Pleasant Bay, although 5,587 were tagged near Grindstone and a further 4,824 on the west coast at Gull Rock. The Pleasant Bay releases were made near Amherst, 1,491 herring actually being released within the harbour from large holding barges. The herring were predominantly fecund and frequently spawned in the barge; some unknown trigger, perhaps stress, resulting in a burst of spawning activity at irregular intervals. The distended gonads slowed the tagging rate since the pressure in the abdominal cavity tended to extrude the tags. It was also very difficult to make the incision in the abdominal wall without rupturing the gonads.

A total of 89 tags (0.25%) were recovered (Table 1), 45 in the capture area, 21 off the Gaspé coast (August-October), 1 off Prince Edward Island (October), and 22 in the Newfoundland fishery. The landings from the release area were all processed for food or by the only reduction plant in the area. This plant did not have magnets in the production lines until near the end of the fishery, suggesting that many of the tags may have been missed.

Table 1. Recoveries of herring tags by area of release and recapture.

No. of herring tagged	Release area	No. of recaptures by area			Total	Recovery rate (%)
		Newfoundland	Magdalens	Gaspé		
25,000	Newfoundland	391*	64*	70*	525	2.10
35,642	Magdalens	22	45	22	89	0.25
20,467	Gaspé	246	No fishing	333	579	2.83

*From Winters (1970); data to September 20, 1970.

Gaspé. A total of 20,467 herring were tagged during the period August 14-17, 2,036 off Paspèbiac, in the Bay of Chaleur, and the remainder along the northeast coast of the Gaspé peninsula, between Fox River and Grande-Vallée. Up to 4,000 herring were obtained at a time from purse-seiners and dipnetted into a specially designed, self-propelled barge.

By mid-March a total of 579 (2.8%) of the tags had been recovered, with 308 of them returned from the release area, 25 from off Prince Edward Island in October, and 246 from the Newfoundland fishery.

Discussion

The incidence of herring tagged in one fishery and recaptured in both the others (Table 1) clearly indicates that the stocks

are at least partially the same. The mixture of spring- and autumn-spawning types is seen in all fisheries, but the inshore sections of the Gulf of St. Lawrence fisheries are predominantly based on spawning concentrations, with the non-spawning fish apparently farther offshore and largely exploited by the purse-seine fleet. Thus recoveries of Magdalen Islands releases were few in the Gaspé fishery, and those that were reported were apparently made on the offshore fringes of the main fishery, particularly on American Bank. Recoveries of these releases were low in all fisheries (total 0.25%), although the few returns from the release area are probably due to late installation of magnets in the only reduction plant. Subsequent low returns suggest that these herring were either not significantly exploited further, or that considerable mortality and/or tag loss occurred. The damage done to the swollen gonads on tagging, the observed explusion of tags, and the tendency for fecund fish to lose their scales more readily, all suggest that mortality and tag loss were both high. It is also possible that the Magdalens spawning stock, particularly in the very limited area in which the majority of the tagging was carried out, may comprise only a very small portion of the total population(s) involved.

In contrast to the Magdalen releases, substantial numbers of the Gaspé releases were recaptured in the release area (1.63%) and subsequently off Newfoundland (1.20%). In addition, 25 tags were recovered off Prince Edward Island during October as the centre of fishing effort moved south out of the Bay of Chaleur.

The migration path of the herring in the Gulf of St. Lawrence cannot be fully delineated, but may be similar to that tentatively indicated in Figure 1. There is an autumn fishery off the Magdalens, but no tags are known to have been recovered there, and the relationship of these herring to the tagged stocks awaits clarification.

No tags have been recovered from the winter in Chedabucto Bay (just outside entrance to Gulf as is Newfoundland, but on south side of Laurentian Channel), although there have been recoveries from plants processing a mixture of Chedabucto and Newfoundland landings. In this case it appeared that the tags probably were all of Newfoundland origin. However, the possibility of a connection between the stocks cannot be ruled out on the present evidence.

This program and that reported by Winters (1970) of tagging carried out in the Newfoundland fishery complement each other and a combined report is anticipated.

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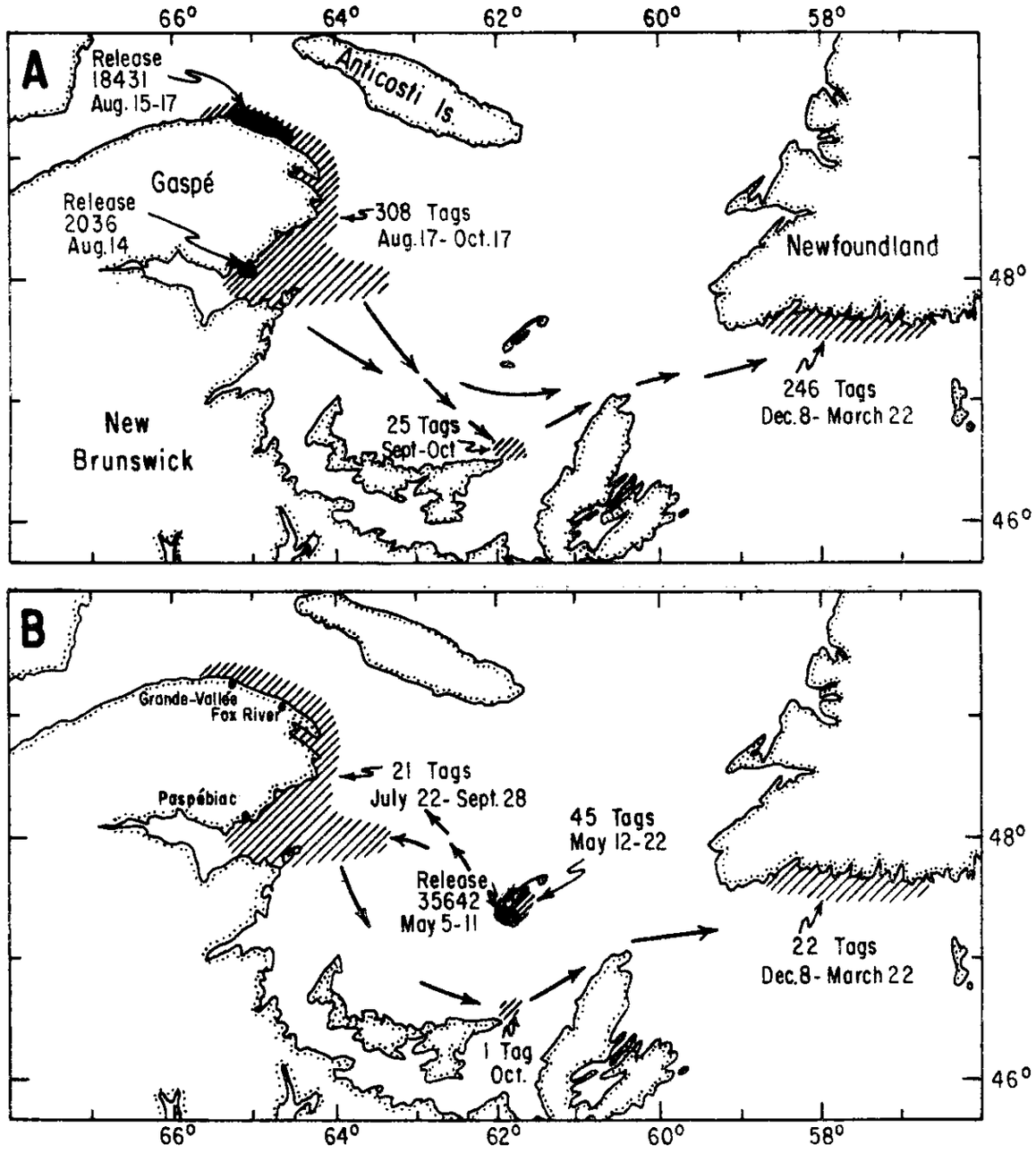

Figure 1. Release and recovery areas. A. Herring tagged along the Gaspé coast, August 14-17, 1970. B. Herring tagged around the Magdalen Islands, May 5-11, 1970.