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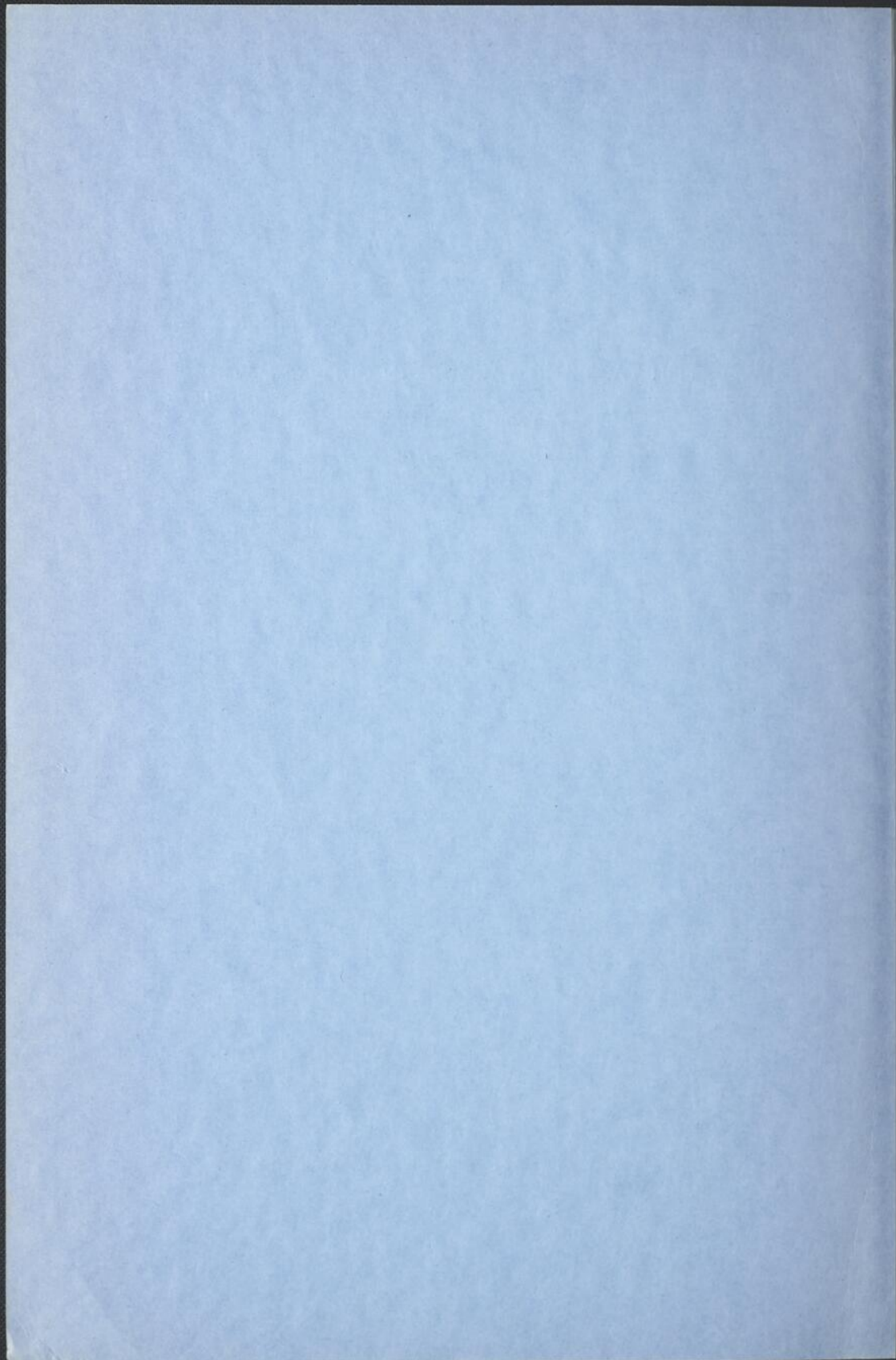
FISH TAGS AND TAGGING IN QUEBEC WATERS

VADIM D. VLADYKOV

*Department of Fisheries
Quebec, Canada*

Contribution No 55
Département des Pêcheries, Québec

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*Department of Fisheries
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ABSTRACT

During the 12-year period, from 1945 to 1956, 19,310 fish of 13 species were tagged in Quebec. Three types of tags were used. From 1938 to 1940, monel metal strap tags, adapted from the "cattle ear tag" were tried, but were discarded as unsatisfactory. Since 1940 two different types designed by the author have been used. Ring-shaped strap tags of monel or nickel have been found satisfactory for tagging some species such as sturgeon, channel catfish, and eel. For other fishes, such as shad, smelt, striped bass, tomcod, split ring and plate tags are more advantageous. In the case of two species of sturgeon, several fish with strap tags were recovered 10 and 11 years after liberation. The maximum distances between tagging and recovery points for Quebec tagged fishes were 892 miles for Atlantic sturgeon and 1,650 miles for shad.

INTRODUCTION

Since 1938, under the supervision of the author more than 25,000 fish of 13 species have been tagged and released in Quebec waters. The present paper deals with tag returns obtained during the 12-year period from 1945 to 1956 but not with recaptures made after August 1, 1956. Of 13 species tagged, principally in the St. Lawrence River, only eight commercial fishes will be discussed here.

TYPES OF TAGS USED

Three types of fish tags have been used, the two latest models of which were designed by the author.

CATTLE EAR TAG

From 1938 to 1940 two sizes of monel strap tags, adapted from the cattle ear tag were employed exclusively. Both sizes were very similar to those described and illustrated by Rounsefell and Kask (1945, Figs. 43 and 45.) These tags were unsatisfactory, because they did not allow growth of the bones to which they were attached. When they were placed on the lower jaw of a speckled trout, the pressure of the metal caused reabsorption of the boney tissue, and this permitted the tags to fall off in a few months.

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RING-SHAPED STRAP TAG

In 1940 monel and nickel strap tags, bent into the shape of a ring and resembling the "Heincke ring" (see Rounsefell and Kask, 1945), were first used. Two sizes of these tags, one $\frac{5}{8}$ " and the other 1 inch in diameter were employed. In the following discussion these tags are referred to as "strap tags."

Strap tags were placed on the lower jaw of fish of several species such as channel catfish, eel, shad, smelt, striped bass, tomcod, and trout. With the two species of sturgeon the tags were fastened through the skin and cartilage at the front edge of the dorsal fin. Strap tags are inserted through a hole made with a sharp ice pick or the sharpened end of the tag. The two ends of the tag are then clinched with ordinary but preferably long-nosed pliers as described by Vladykov (1950). This type of tag is easily and quickly attached, and is retained by the fish for several years. Its main disadvantage is that the thinness ($\frac{1}{64}$ inch) of the metal may cause the edge to cut the neighboring tissues.

SPLIT RING AND PLATE TAG

We designed in 1950 a new type of tag, which may be called "split ring and plate tag." This model consists of a metal split ring and a plate of laminated vinylite. A brief description of this tag was given in the *Journal du Conseil Guide to Fish Marks* (1953, p. 250). Three sizes of split rings, made of stainless steel piano wire, were manufactured: $\frac{3}{8}$, $\frac{5}{8}$, and $\frac{7}{8}$ inch in diameter. They can be opened sideways by means of specially designed pliers, one for each ring size. The tags or plates, attached to the split rings, carry on one surface the inscription "Département des Pêcheries, Québec," and a number and a letter on the other. This plate is made of laminated vinylite of different colors and in two sizes, $\frac{3}{5} \times \frac{1}{4}$ of an inch, and $1 \times \frac{1}{3}$ inch. The split rings and tags are placed on the lower jaw of the fish.

The advantage of the split ring and plate tag over the others is that the split ring is made of round wire and hence has a non-cutting edge. The original laminated vinylite tags were only 0.02 inch in thickness and therefore quite breakable. We are planning to use new laminated plates which will be three times thicker. To prevent the split rings from opening, as for instance, when the tagged fish becomes entangled in nets, we are experimenting with a portable spot-welder to weld the ends of the ring after being placed on the fish. So far the results are encouraging.

It is our opinion that split ring tags are very suitable for the tagging of shad and damage the fish much less than the "cheek tag" designed by Miss Cable (1950). Results from application of split rings to smelt are very encouraging, and, this type of tag may well be more durable than the celluloid opercular tags used by McKenzie (1950) for the same fish in the Miramichi estuary.

COMPARATIVE RETURNS FROM TWO TYPES OF TAGS

It is very difficult to estimate accurately the merits of the different types of tags, which were used on several species of fishes of different sizes, life spans and behaviours, but some general comments can be made.

For large and tough skinned fishes, such as sturgeon, ring-shaped strap tags are very satisfactory, and there is no need for lighter types. Of 1,005 lake sturgeon tagged during the period 6.7 percent have been returned and of 1,948 tags applied to Atlantic Sturgeon 25.9 percent have been returned. On the other hand, smaller fishes such as smelt, tomcod and trout carry the split ring tags much better. For young specimens of any fish, light and easily seen split ring tags are especially suitable. In the case of eels, strap tags attached to the lower jaw give better results, up to 11 percent return, than the split rings which had a return of 6 percent. However, some eels were recaptured after three years and still carried undamaged split ring and plate tags. Returns from strap tags were much higher (11 percent) than for split rings (3 percent) in the case of channel catfish. As shown in Table 1 the tag returns from shad and striped bass were higher for split ring tags than for strap tags.

It should be kept in mind, that the returns of tags vary greatly and are not strictly comparable between species, not only because of the different types of tags used, but mainly due to the differences in the intensity and type of fishing as well as the size of fish tagged and the season of tagging. For instance, tomcod that were caught on hook and line in the winter through the ice, during the spawning season, apparently survived tagging manipulations very poorly, for the tag returns were less than one percent. Perhaps handling of the fish when full of spawn or at too great a difference between the water temperature (32°F.) and the warmth (about 70°F.) of the fishing cabin were responsible for this. On the other hand, tomcod, caught with line during summer or autumn, survived tagging very well, and their returns varied from 10 to 20 percent.

MAXIMUM TIME BETWEEN TAGGING AND RECOVERY

Recently certain authors (Callhoun, Fry, and Hughes, 1951) claimed that because of corrosion, tags made of monel and nickel are not satisfactory. However, in our experience strap tags made of either monel or nickel resist corrosion by salt water very well. Shad, eel, striped bass, and channel catfish carried these tags from four to eight years without any traces of corrosion. Some of our sturgeons have been recaptured after 10 to 11 years. Tags on these fish showed some corrosion, but they were mainly worn by the rubbing of the tags against the sea-bottom. Stainless steel split rings, even after four years in salt water, showed no traces of corrosion.

TABLE 1.—Returns from tags applied to Quebec commercial fishes, principally in the St. Lawrence River, during the period 1945-1956 with data on maximum time retained, and maximum distances recorded between tagging and recovery stations.

[Asterisks are used as follows: (*) strap tag; (**) split ring and plate tag and (***) cattle ear tag reshaped into ring.]

Species	Number of fish tagged ¹		Number returned		Percentage return		Maximum time between tagging and recovery	Maximum mileage between tagging and recovery stations
	Strap	Split ring	Strap	Split ring	Strap	Split ring		
Lake Sturgeon (<i>A. fulvescens</i>)	1,005 (1945-54)	—	68	—	6.7	—	*10 years	*130
Atlantic sturgeon (<i>A. oxyrhynchus</i>)	1,948 (1945-49)	—	505	—	25.9	—	*11 yrs. 34 days	*892
Atlantic shad (<i>A. sapidissima</i>)	1,783 (1945-50)	152	63	14	3.5	9.2	*4 yrs. 12 days	*1,650
Eel (<i>A. rostrata</i>)	1,664 (1945-55)	170	186	10	11.2	5.9	*5 yrs. 11 mon.	*200
Channel catfish (<i>I. lacustris</i>)	1,224 (1947-55)	538	136	14	10.9	2.6	*8 yrs. 4 days	*95
Tomcod (<i>M. tomcod</i>)	— (1953-56)	7,139	—	297	—	4.2	**2 yrs. 81 days	**135
Smelt (<i>O. mordax</i>)	— (1956)	208	—	7	—	3.4	***81 days	***90
Striped bass (<i>R. saxatilis</i>)	1,411 (1945-56)	500	107	47	7.6	9.4	***6 yrs. 10½ mon.	*180

¹Numbers in parentheses refer to years of tagging.

Information on the longest periods between tagging and recaptures, for the eight species of fishes, is presented in Table 1.

LONGEST DISTANCES TRAVELLED BY TAGGED QUEBEC FISHES

Tagging is the only reliable source of information on the migratory habits of our fishes. It will be seen from Table 1 that smelt and tomcod can travel up to 90 and 135 miles respectively and that movements of channel catfish in the St. Lawrence River region are rather limited and did not exceed 95 miles. Maximum travel of striped bass in the St. Lawrence River did not exceed 180 miles.

The migratory habits of two species of sturgeon are very different. Movements of lake sturgeon apparently did not exceed 130 miles. The Atlantic sturgeon can travel much greater distances. A fish, tagged on July 31, 1947 at Isle-aux-Coudres, was recaptured on June 3, 1948 at Fox Point, at the entrance to St. Margaret's Bay, Nova Scotia, thus having travelled at least 892 miles. During that period of somewhat less than a year between tagging and recovery it grew from 28 to 36 inches in fork length and increased in weight from four to 11 pounds.

Some tagged Quebec shad were recaptured along the Atlantic sea-coast. The most distant recovery was that of a female shad tagged on June 5, 1948 at Isle Verte and recaptured on April 13, 1949 at Old Point Comfort, Virginia, at the entrance to Chesapeake Bay. Further details on distant recaptures of shad are given in another paper (Vladykov, 1956).

The greatest distance at which tagged Quebec eels (adult females) were recaptured was 200 miles. This is far from their spawning grounds in the Sargasso Sea but commercial fishery for eels in Quebec is not practised farther east than Riviere-du-Loup.

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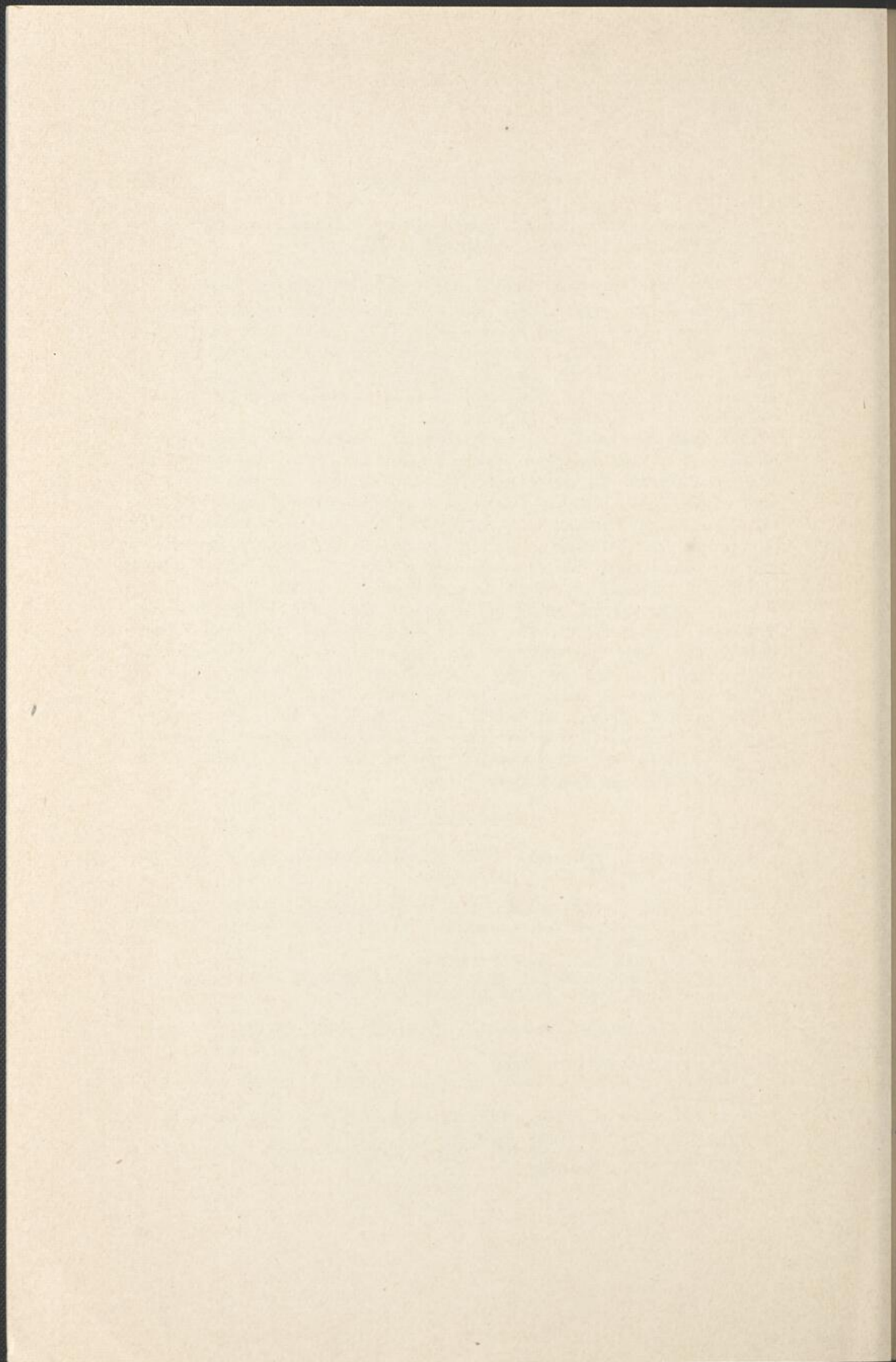
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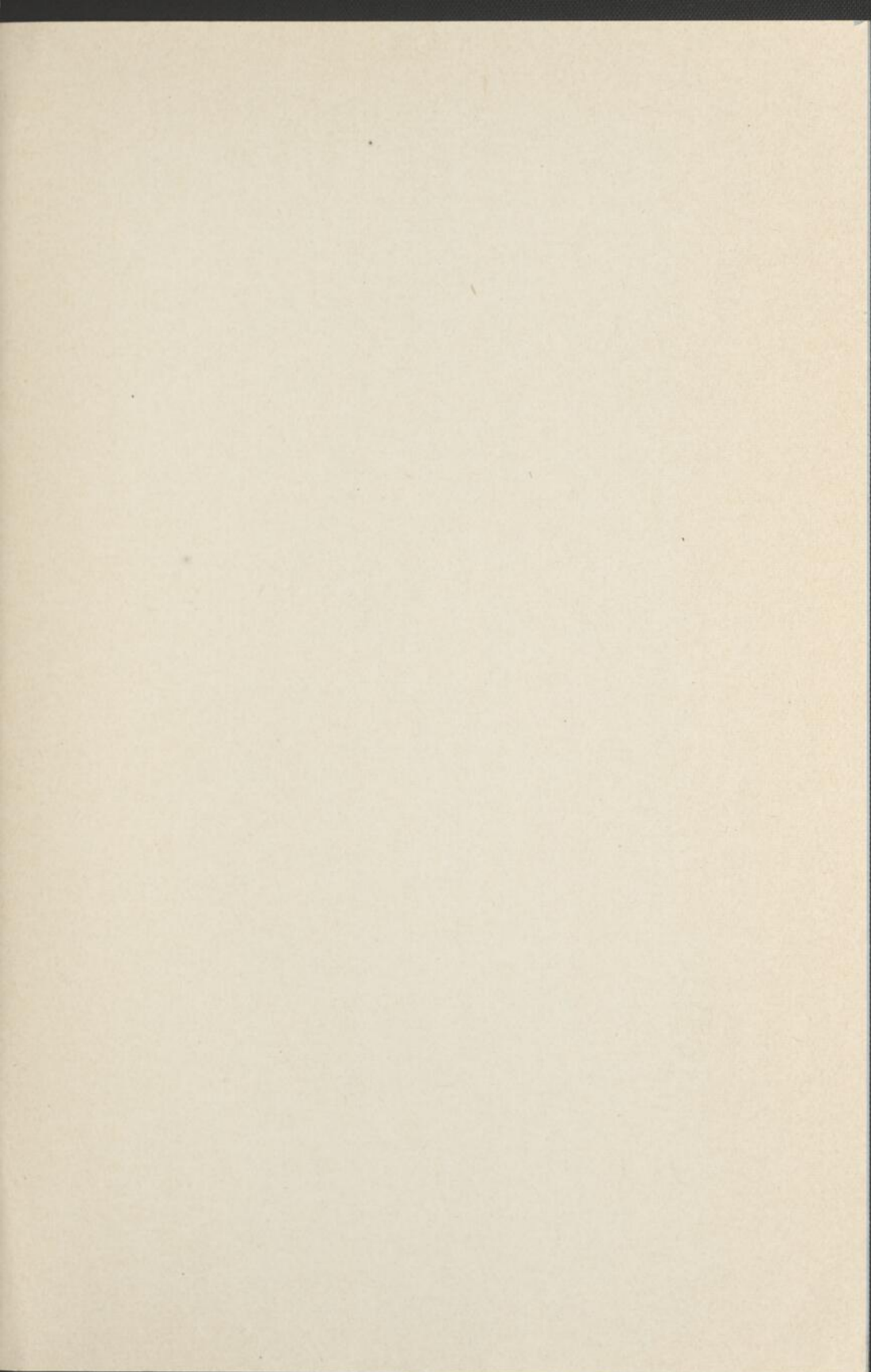
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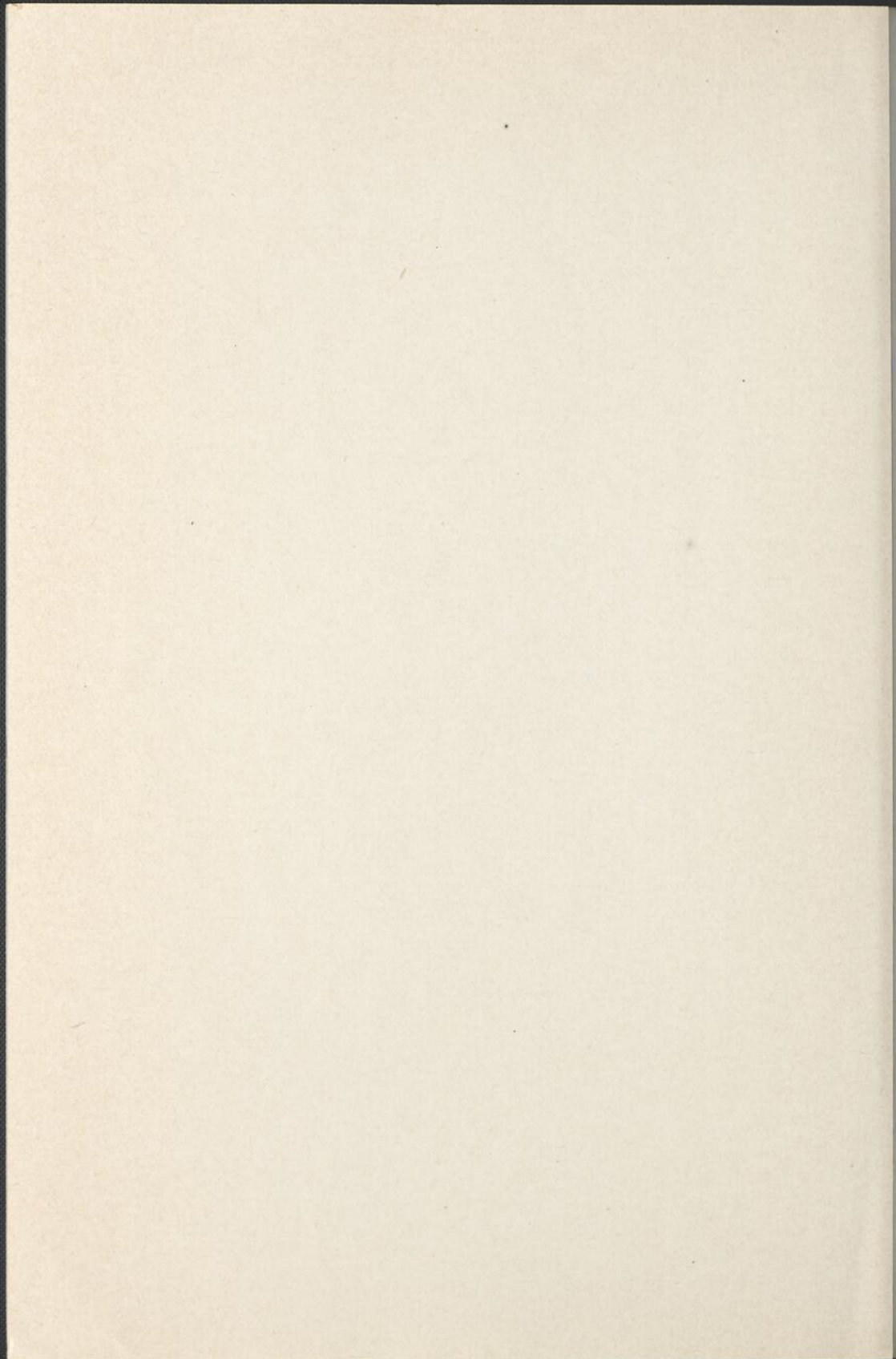
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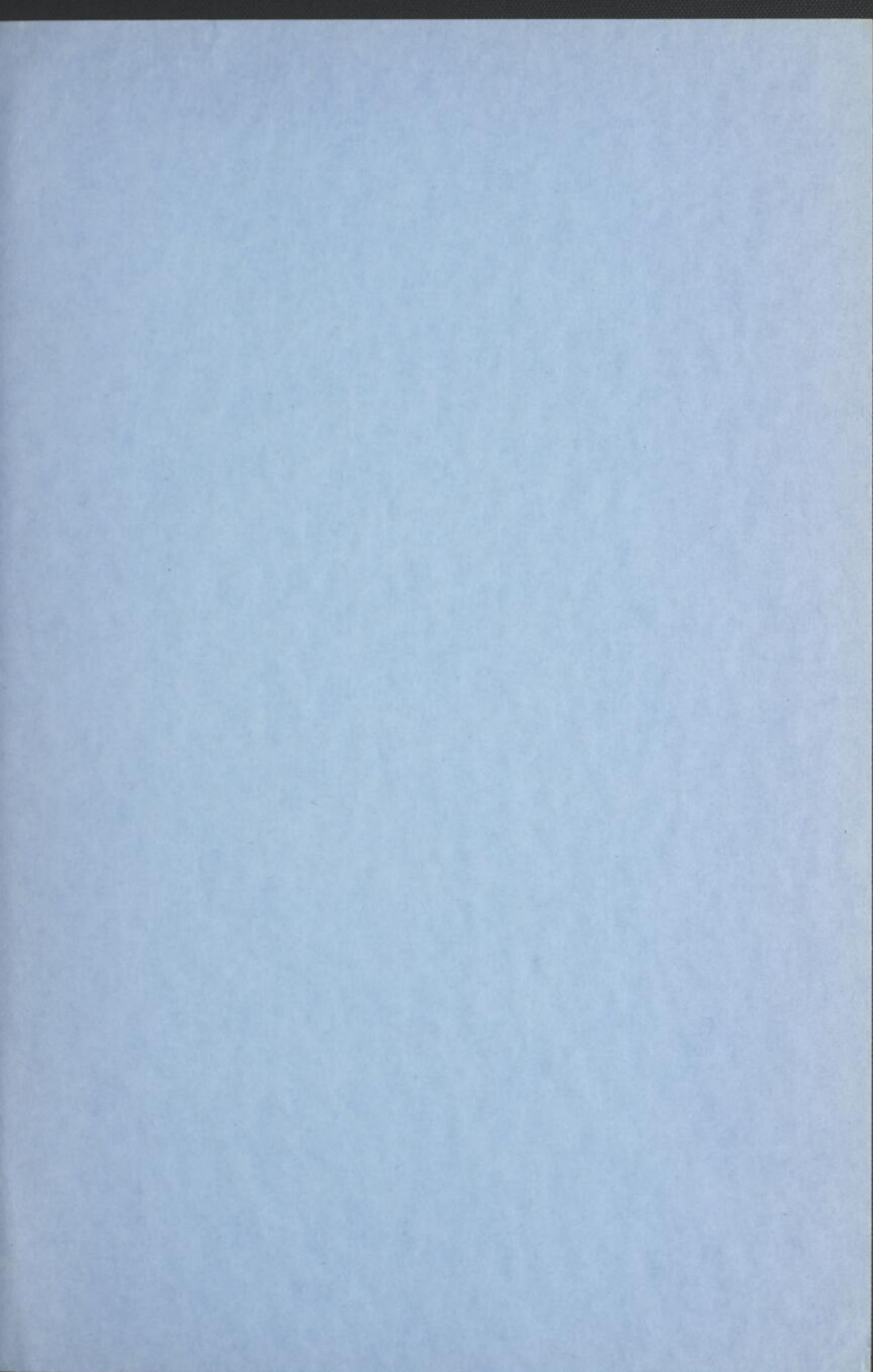
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