Fishes of the Upper and Middle Saint John River

Report No. 7c

The Saint John River Basin Board

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15.b Summer Headpond Ecology in the Saint John River Basin
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15.e Macrobenthos of the Saint John River Headponds
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S 1 Economic Trends in the Saint John River Basin
S 2 The Water Resources of the Saint John River Basin
S 3 Floods in the Saint John River Basin
S 4 Water Quality in the Saint John River Basin
S 5 Water Use for Agriculture in the Saint John River Basin
S 6 Water Use in the Forest Industries in the Saint John River Basin
S 7 Water Uses for Fisheries in the Saint John River Basin
S 8 Water Use for Wildlife in the Saint John River Basin
S 9 Water Use for Mineral Development in the Saint John River Basin
S10 Water Use for Outdoor Recreation in the Saint John River Basin
S11 Water Use for the Potato Starch Industry in the Saint John River Basin
S12 Water Use for Manufacturing in the Saint John River Basin
S13 Water Use by Municipalities in the Saint John River Basin
S14 Water Use for Power Production in the Saint John River Basin
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FOREWORD

This study is one of a series commissioned by the Saint John River Basin Board as part of its program for preparing a water management plan for the Basin. A draft has been reviewed by members of the Board, its Advisory and Liaison Committee and Planning Office. The reviewers are satisfied that the work was conducted conscientiously by highly qualified people and that they have fulfilled their terms of reference. Although the report has been checked carefully for errors, inconsistencies and omissions, a few almost certainly remain. The Planning Office would appreciate hearing of them.

This is a report made to the Board, and the recommendations put forward in it are the author's own. Each recommendation will be carefully considered during the process of developing the comprehensive plan for the river basin. However, some recommendations made with the aim of improving conditions for one water use may not be compatible with needs of other uses. As the objective of the plan is to seek an optimum balance among all uses of the water resource, it is quite possible that the Board will not include in its final plan all the recommendations contained in this report. They are presented here, nevertheless, for public information and debate.

The Saint John River Basin Board,
Fredericton, New Brunswick,
November, 1973.

FISHES OF THE UPPER AND MIDDLE SAINT JOHN RIVER

A report prepared
for the
Saint John River Basin Board

by

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February 1973

TABLE OF CONTENTS

INTRODUCTION*

This report is the third in a series describing the fisheries resource of the Saint John River Basin, and comprises a catalogue of species which occur in the basin above the estuary (the estuary is here defined as that portion of the basin subject to the ebb and flow of tide, and extends to a point approximately 1 mile downstream from the Mactaquac dam). The drainage area of this portion is about 73% of the total basin area; that is, about 15,500 square miles (39,680 sq km). Of this, only 31% lies in New Brunswick, while 20% is in Quebec and 49% in Maine. The emphasis of this investigation is on the New Brunswick portion of the basin, although information from the Quebec and Maine portions has been included in a cursory way where it was available.

The climate of the area is humid continental, with long, cold winters, cool summers, and no dry season. The mean annual temperature varies from 36°F (2.2°C) north and west of Edmundston to 41.4°F (5.2°C) at the head of tide, and the mean precipitation over the entire area is 38 inches (96.5 cm).

The river has its headwaters in the extreme northwestern portion of the basin, in the Notre Dame Mountain Region. Elevation varies from 500 to 2000 ft (152 to 610 m) with the source lake (Little Saint John Lake) having an altitude of

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*Much of the description of the basin is adapted from "DRAFT REPORT: HYDROLOGY OF THE SAINT JOHN RIVER BASIN", Engineering Division, Water Planning & Operations Br., Can. Dept. Environment, Ottawa, 1972.

1580 ft (482 m). The river slope in this region is 8 ft/mile (1.53 m/km). This portion of the basin contains many lakes, and is mostly forested, although some agriculture is practiced in the river valleys.

By the time the river enters Maine and New Brunswick it has passed into the Chaleur Uplands, a peneplain of 800 - 1,000 ft (244-305 m) altitude characterized by swampy plain and numerous lakes, and interrupted by valleys, ridges and peaks. The slope of the river has diminished to 3 ft/mile (.57 m/km) at Grand Falls. Again most of the land is forested, but about 7% has been cleared and is used primarily to grow potatoes.

At Woodstock, the character of the area changes again, to a rugged topography known as the New Brunswick Highland region, which extends to the Mactaquac dam. The eastern portion of the Tobique River system also drains this region. The slope of the river is 2 ft/mile (.38 m/km) when it enters the estuary.

The most significant industrial waste discharges in this entire portion of the basin are of high organic content typical of the pulp and paper and food processing industries.

For purposes of fisheries analysis, the area under consideration has been divided into 2 sections at Grand Falls,

this cataract being a natural barrier beyond which diadromous fish cannot normally ascend. The character of the fisheries resource above this barrier is of a quite different nature from that below. That portion of the basin between Mactaquac dam and Grand Falls is referred to as the middle basin, the portion above Grand Falls as the upper basin. Artificial barriers have been created along the mainstem at Grand Falls, Beechwood and Mactaquac with fish passage facilities incorporated into the latter two to allow migrating fish to surmount them. A dam at the Tobique Narrows has similar facilities. The man-made headponds created as a result of these barriers are the dominant features of the mainstem, in terms of the fisheries resource, in that they drastically alter the character of the water and hence its productive capacity and species composition.

Information for this catalogue was gathered from a number of sources: principle among these was a survey designed to examine the state of the fishery resource within the headponds, and to compare it with a natural lake within the system.

To this end, gill nets and seine nets were fished in each of Mactaquac, Beechwood and Tobique headponds, and Glazier Lake, an oligotrophic lake chosen as a standard of comparison. Originally, it had been intended to sample Grand Falls headpond as well, but the extremely high concentrations of wood fibres, potato eyes, and bacteria and fungi which collected on the gear precluded any sampling after the initial effort. Details of the sampling method were identical to those described in

"Ecology of the Saint John River Basin II. Catalogue of Estuary Fish Species". Where previous data indicated that a body of water became stratified throughout the course of the summer, gill nets were fished both above and below the region of the thermocline.

An intensive study of the Mactaquac headpond fish population, as a part of a productivity study of that headpond, employed trap nets and seine nets in several locations - results from that study were also incorporated into this catalogue, as were the findings of a fisheries survey carried out as part of the Green River Hydro-power Development Environmental Impact Study (a study also carried out under the auspices of the Saint John River Basin Board).

Various other sources were consulted to supplement the data: principal among these were (i) the New Brunswick lake inventory conducted by the Fish and Wildlife Branch of the New Brunswick Department of Natural Resources, and (ii) the accumulated data of the salmon investigations carried out by the Resource Development Branch of the Fisheries Service, Canada Department of the Environment. The former supplied information with respect to lakes throughout the basin, and the latter with respect to tributary streams in the middle basin. Other sources throughout the literature were also consulted.

The classification and nomenclature used in this catalogue are the same as appeared in the estuary catalogue.

As no different families appeared, there are no family descriptions. Where different species are present, descriptions are included: where species have already been described from the estuary, only distribution and abundance statements are given.

As an appendix, a series of distribution maps are provided, detailing the ranges of all species which are present within the basin in significant numbers. This does not include species whose presence is based on an isolated literature report, but only species which were actually observed during the course of the two field seasons. The maps are based on data collected in the estuary, middle and upper basins, on the sources referred to above, and on personal correspondence with reliable sources. Such sources include:

P.M. Bourque (Biologist, Maine Dep Inland Fisheries & Game)

W. Hooper (Biologist, N.B. Dept Nat. Res.)

J.R. MacDonald (Biologist, Can. Dept Environment)

W.B. Scott (Curator, Royal Ontario Museum)

J.R. Semple (Biologist, Can. Dept Environment)

F. Williamson (Biologist, Acadia University)

With respect to the distribution of species in Maine, no precise details could be given. A distribution "arrow" near the mouth of a sub-basin indicates only that the species has been recorded somewhere within that system, and possibly throughout the system, but not necessarily at that particular point.

FAMILY PETROMYZONTIDAE - the Lampreys

Petromyzon marinus - sea lamprey

The sea lamprey has been recorded in various sites throughout the middle basin, but has not been taken above Grand Falls. Scott (pers. comm.) reports a landlocked population in Trousers Lake of the Tobique River system. The species has not been taken in the present survey, probably because of the gear used.

FAMILY CLUPEIDAE - the true Herrings

Alosa aestivalis - blueback herring

Uncertainty regarding the frequency of occurrence of this species in the estuary (Meth, 1971) prompted further investigations in the spring of 1972. Samples analyzed at the Mactaquac Fishway trucking operation indicated that the spawning run of *Alosa sp.* was composed of mainly *Alosa pseudoharengus* in its earliest stages, (May 21 - June 31) with the proportion of *Alosa aestivalis* increasing in the later stages (July 1 - July 28) until eventually it consisted of almost exclusively that species. It is estimated that, of the total of 1,200,300 fish listed as "gaspereau" which were transported over the Mactaquac Dam in 1972, about 65% were actually "blueback herring".

Seine hauls taken at 3 locations in Mactaquac Headpond (Mactaquac Arm, Nackawic, and Woodstock) throughout the summer verify the presence of both species. Samples of juveniles fall into 2 distinct size classes, with the larger class generally exhibiting the pale peritoneum characteristic of *A. pseudoharengus*, the smaller class the sooty peritonium characteristic of *A. aestivalis*. This size differential between the 2 species is consistent with the temporal composition of the spawning run: i.e.- the blueback, in the main, spawns somewhat later than does the gaspereau.

Alosa pseudoharengus - alewife

The alewife ranges throughout the estuary and into the middle basin in the spring to spawn. The majority of alewives passed over the Mactaquac Dam spawn within the headpond area, although a proportion do pass upstream via the Beechwood Dam fishlift. This proportion is not at all constant, varying from 2% in 1972 to 48% in 1970. A few of these fish move as far upstream as the Tobique River system, negotiating the fishladder at the Tobique Dam in the process.

The juveniles, for the most part, appear to move downstream and out of the estuary throughout the late summer and fall. However, there is some evidence that a portion remains in the headpond environment over winter and does not leave until early in the following summer (Jessop, pers. comm.).

A record number of alewives were passed through the fishway facility at Mactaquac Dam this spring, indicating a continuation of the trend of increasing population established over the past few years.

Alosa sapidissima - American shad

The American shad has been known to occur as far upriver as Aroostook Falls during its spring spawning run (Warner, 1956), before the completion of the Beechwood Dam. Varying but small numbers (43-1490) of shad were passed through

the fishlift at that dam from 1958 to 1966. Since the building of the Mactaquac Dam, the numbers of shad reaching Beechwood have been negligible or non-existent. The Mactaquac installation seems to have thoroughly disrupted the reproductive success of the shad upstream from the dam site. Although a fairly constant number were transported to the headpond during the first 3 years of its existence (38,838 in 1968; 37,449 in 1969; 36,437 in 1970), the number of adults returning in the past two springs has decreased drastically (15,834 in 1971; 1,396 in 1972). Of a sample of 228 adults taken in 1971, 56.6% were virgins; the rest were repeat spawners. Of the virgins, nearly all males were 4 years at maturity, while females were evenly divided amongst 4 and 5 years. The repeat spawners were all 5 years or older, of course. There were no fish less than 4 years of age (Carscadden, 1972). Thus, a portion of the 1971 spawning run was of the 1967 year class, while the remainder were from previous year classes. All previous runs (1968-1970) consisted of pre-1967 year classes.

While it is obvious that the shad population above the Mactaquac Dam has "crashed", the causes of this crash are less obvious. There is no reason to assume that the 1971 population parameters are representative of the spawning run in general, since a significant proportion of that run came from the 1967 year class, a class which presumably was

affected by the construction of the dam. However, the proportion of repeat spawners (43.4%) lies within the range (40-50%) predicted by Leggett (1969) for this latitude. With the above-mentioned reservation in mind, though, the 1971 data must be used in lieu of earlier statistics.

Repeat spawners in the Saint John contribute less than 4.5% to the total annual fecundity (Leggett, 1969). Thus, the success of a particular year class is predominantly dependent upon the virgin spawners in the run. The 1971 run can thus be directly related to the year classes of 1966 and 1967, and the run of 1972 to the year classes of 1967 and 1968.

Two possible explanations exist to account for the observed "crash". First is the possibility that the decline is a normal fluctuation. Local fishermen refer to cyclical occurrences of good and bad years, and this is borne out by commercial catch statistics from the estuary (Meth, 1971). Also, shad passed over the Beechwood Dam since its completion in 1957 seem to fluctuate in abundance in a cyclical fashion. It should be noted here that *no* shad reached Beechwood in 1967 or 1968, and only very few have been seen there in the years since then.

The second, and more likely, possibility is that the construction of the dam and the subsequent creation of the headpond has interfered with spawning and effectively decimated

the shad population above the dam site. During the summer of 1967, while the dam was being constructed (it was closed on Nov. 6 and the headpond was filled by Nov. 26) the only thoroughfare between what is now the headpond and the river below the dam site was via the sluice gates of the dam. The current which developed through these gates was of such magnitude as to prohibit the upstream passage of migrating fish. Baffles were introduced into the passage in an attempt to reduce this current, but these provided little success. A trap and transport operation was instituted to move Atlantic salmon past the obstacle, but no other fish species were moved in this manner. While the possibility exists that some shad negotiated the passage, the probability of such an occurrence is considered to be negligible. Thus there was essentially no shad population available for spawning above Mactaquac, hence no 1967 year class from that area, and consequently a reduced run in 1971.

With the fish collection and transport facilities at the dam operational in 1968, 38,838 shad were released into the headpond. Thus it might have been expected, had these fish produced a viable year class, that the 1972 return would have shown some recovery. However, this was not the case: the shad return at the dam continued to plummet. This is interpreted as an indication that the headpond environment is not compatible with the propagation of shad.

The fact that there were 4 and 5 year old shad encountered at the fish collection facility in 1971 and 1972, respectively (Carscadden, pers. comm.), implies one of two things. First, there was some successful spawning above the dam in 1967 – this is highly unlikely, as discussed above. Secondly, shad may not be specific in their choice of spawning area within a given river basin – that is, the 1967 year class observed in 1971 and 1972 originated from below Mactaquac dam.

It would appear that the shad population above Mactaquac dam has been exterminated.

FAMILY SALMONIDAE - the Whitefishes, Salmon Trouts and Chars

WHITEFISHES

Coregonus clupeaformis - lake whitefish

The lake whitefish has been reported from the Madawaska River and the St. Francis lakes (presumably including Glazier Lake) by Perley (1852), from the Third Green Lake by Scott and Crossman (1959) and from the Tobique Lakes by Adams (1873). The New Brunswick Fish and Wildlife Branch lake inventory found this species in Baker Lake (Hooper, pers. comm.), as did a recent Resource Development Branch study (Hyatt, 1970). Fish-lift facilities at Mactaquac Dam and at Beechwood Dam in the mainstem Saint John have also recorded lake whitefish, but numbers have declined in recent years. In the State of Maine, the species has been reported in the Aroostook, Fish and Allagash systems (Warner, 1965, 1967; U.S. Dept. Interior, 1959).

The present survey has taken lake whitefish only in Glazier Lake of the St. Francis River system. A supplementary survey in the Green River system found this species in First and Third Green Lakes as well.

Prosopium cylindraceum - round whitefish

This whitefish, differing from the lake whitefish in its slender rounded shape, reaches sizes of about 2 pounds in its Saint John distribution. It inhabits the shallower waters of lakes, feeding in shallows and inshore, and runs into streams and rivers in November and December to spawn, when it is captured locally. It is not easily angled, but it has a white, flaky flesh of excellent flavour, particularly when smoked.

Scott and Crossman (1959) quote Cox's (1896) distribution statement of "Madawaska and upper Saint John", and record their collection from Baker Brook. Semple (pers. comm.) reported a single specimen from the mouth of the Wapskehegan River in the Tobique system, and the New Brunswick lake inventory has found the species to be plentiful in First Green Lake in the Green River system (Hooper, pers. comm.). Reports from Maine include the Fish and Allagash systems (Warner, 1965, 1967) and Glazier Lake (Bourque, pers. comm.). Round whitefish were taken in abundance from Glazier Lake in the course of the present survey.

TROUTS AND ATLANTIC SALMON

Salmo gairdneri - rainbow trout

This highly-prized sporting fish is native to the

Pacific coast of North America, where it may be either anadromous or "landlocked". It has been introduced to the Maritimes (Catt & Needler, 1946) but it is not plentiful in the Saint John. The rainbow may be lake-dwelling, or reside in streams and rivers near the outlets of lakes and below waterfalls and rapids. Adults migrate upstream in early spring to spawn, building "redds" in the manner of the Atlantic salmon. Rainbows are piscivorous and feed on a variety of other fish, and often reach sizes of 5 pounds in this area.

Small numbers of rainbows have been recorded at both the Mactaquac and Beechwood fish passage facilities in recent years and it has been reported from the Aroostook system in Maine by Warner (1956), but none were taken in the present survey.

Salmo salar - Atlantic salmon

The anadromous Atlantic salmon has been the premier fish in the Saint John, from both the sport and commercial point of view, since the time of original settlement in the basin. The numbers and range of this magnificent species have been progressively reduced with time (Dominy, 1971). The cataract at Grand Falls has always been a natural barrier to the migration of the salmon and thus the anadromous population has always been restricted to the middle and lower portion of the basin. To ensure that the spawning runs would

continue to reach the spawning grounds, fish passage facilities were implemented at each of the three hydro-electric dams constructed in the middle basin. That these methods have been at least partially successful has been shown by recent Resource Development surveys of parr density in tributary streams, particularly those of the Tobique system, the major spawning and nursery tributary of the basin (Hyatt, 1969; Semple, 1971). Nearly all tributaries above Mactaquac have some young salmon in them, although there is considerable variation in the density.

Tributaries from Maine entering the middle basin of the Saint John which contained salmon at one time include the Meduxnekeag, the Presquile and the Aroostook rivers (Atkins, 1874). However, these runs have been reduced or eliminated by the construction of various dams without fish passage facilities, and by ever-increasing pollution loads in the rivers. Although the Tinker Dam at Aroostook Falls was provided with a fishway in 1936, it has proved inadequate to the re-establishment of a significant run (Warner, 1956), although small numbers of salmon did negotiate it. In 1964, concurrent with other alterations, this fishway was rendered inoperable, and the underwater portion of a fish collection facility was installed for possible future use. In the first few years following the construction of Mactaquac Dam, most salmon were transported overland directly to the Tobique River

and thus bypassed the mouth of the Aroostook altogether. This year, however, more than 50% of the salmon transported upriver were released below the mouth of the Aroostook.

No fishway was built at the Grand Falls hydropower installation, as the spawning runs could not surpass the falls under natural conditions. However, various headwater lakes in the upper basin contain "landlocked" populations of salmon, known as "ouananiche" or "sebago". These are salmon of the same species which, while smaller, display no morphological differences from the anadromous form, but have lost the marine phase of the life cycle. The reason for this seems to be a combination of physiological and physical causes.

"Landlocked" salmon are not native to the Saint John River Basin, but have been introduced into many lakes in the Aroostook, Fish, Allagash, and Upper Saint John drainages in the State of Maine. In some cases these stockings have resulted in self-sustaining populations, while in others continual replenishment by artificial means is necessary (Havey & Warner, 1970). The Province of Quebec has attempted to establish a population of "landlocked" salmon in various lakes of the Madawaska River system during the past decade. This attempt has met with some success, although some of the introductions have found their way into the main Saint John system as well (Semple, pers. comm.).

The sebago was taken during the present survey in Glazier Lake (a self-sustaining population as a result of Maine introductions) and two specimens were recorded in the Mactaquac headpond at Nackawic. Occasional specimens have been recorded at the fish passage facilities at both Mactaquac and Beechwood dams since their inception.

Salmo trutta - brown trout

The brown trout is another exotic species, being native to western Europe. The history of its introduction to New Brunswick is summarized by Catt (1950a).

This trout inhabits slowly moving streams and quiet pools, generally where summer temperatures and turbidity are too high for speckled trout. It feeds on insects and other fish, and can attain weights of several pounds. It is considered an excellent sport fish in areas where it is plentiful, but it is uncommon in the Saint John. One specimen angled from the Meduxnekeag River near its mouth has been seen, and it is reported from the Maine portion of this river as well (Warner, 1957).

CHARS

Salvelinus alpinus - Arctic char

The Arctic char is continuously distributed across arctic North America in a relatively narrow coastal zone exhibiting both anadromous and lacustrine populations. In

Eastern North America it is replaced south of its range by *S. fontinalis* and *S. namaycush*, although several disjunct relict populations occur in recently glaciated lakes. Three such isolated populations have been recently reported from New Brunswick (Catt, 1950b; Scott & Crossman, 1959; Can. Dept. Fish.& For., 1969), and the distribution of *S. oquassa* and *S. aureolus* in Maine represent similar examples (Behnke, 1972; Saunders & MacKenzie, 1971). A single juvenile specimen was seined from Glazier Lake during this survey.

Salvelinus fontinalis - brook or speckled char (trout)

The speckled trout, as it is commonly known, inhabits cool clear streams and lakes throughout the Maritimes, where it is native. It is widely distributed throughout the middle and upper Saint John River Basin, where it is heavily fished by anglers. Natural stocks are supplemented by artificial plantings. It has been recorded from almost every tributary of the basin which has been investigated in any way. The present survey took adult specimens in Glazier Lake and Tobique River, and a single parr was seined from Grand Falls headpond.

Salvelinus namaycush - lake char (trout)

The lake trout, or toque, occurs only in deep, cool, well-oxygenated lakes where it resides during the summer,

coming into shallower water as it cools in the fall, and spawning, as do all the chars, in October and November. One of the largest of all freshwater fish in North America, this char provides excellent angling and equally excellent eating. It is usually carnivorous, feeding on members of the white-fish group which also inhabit its deep waters. Hyatt (1970) found the vast majority (89%) of fish eaten by lake trout in Baker Lake, however, to be yellow perch. When fish are not available, the lake trout becomes planktivorous, although its growth rate is less under such conditions.

The lake trout is well known in the headwaters of the Saint John: Perley (1852) listed Glazier Lake in the St. Francis system; Adams (1873), the Temiscouata and Toledi lakes in the Quebec portion of the Madawaska system; and Cox (1893), the lakes of the Saint John and Tobique river systems. More recent records include Baker Lake (Hyatt, 1970; Hooper, pers. comm.) and Glazier Lake (present survey), as well as Third Green Lake (supplementary survey) and Serpentine and Long Lakes in the Tobique River system. (Hooper, pers. comm.). The species is present in deeper lakes of the Aroostook, Fish and Allagash drainages in the state of Maine (Warner, 1956; 1965; 1967), and its presence in Glazier Lake has been confirmed (Bourque, pers. comm.).

FAMILY OSMERIDAE - the Smelts

Osmerus mordax - rainbow smelt

Records of smelt in the middle and upper Saint John are rare, at least on the Canadian side. Although it ascends the river in the early spring to spawn, it does not appear to transcend the estuary in great numbers. A few smelt were recorded at the Beechwood fish lift before the construction of Mactaquac dam, but none have appeared there since.

In Maine, the smelt has been introduced into lakes of both the Fish and the Allagash river systems, and has spread through both systems to provide an abundant forage fish for landlocked salmon, lake and speckled trout (Warner, 1965, 1967). In the Fish system it is angled in both summer and winter and is taken by dip nets from streams during the spring spawning runs. The smelt is known to occur in the Aroostook and Meduxnekeag drainages also (Warner, 1956, 1957).

The present survey found the smelt in Glazier Lake of the Saint Francis system. This is a new distributional record for the species, and has undoubtedly resulted from a spread of the Maine introductions. Several specimens were taken in Mactaquac headpond in July, which may represent a downstream movement from headwater lakes in Maine, a

remnant of the spring spawning run which was transported over Mactaquac Dam[1], or a population which has become established behind the dam.

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[1]While no records of this species exist at Mactaquac fishway, it is very possible that some smelt are passed over in the spring gaspereau run.

FAMILY ESOCIDAE - the Pikes

Esox masquinongy - muskellunge

The muskellunge, or "musky", is the largest of the North American pikes, commonly reaching weights of 20 lbs. or more. It lives in lakes of medium size, and requires low-lying marshy flats for its spring spawning, from which it moves to slightly deeper water, frequenting the edges of weed beds and rocky shoals during summer. It moves into shallow water again in the fall. The "musky" is a voracious predator of other fishes, particularly yellow perch and white suckers, and may be cannibalistic. It is one of the most popular of all game fishes, and provides an excellent meal to boot.

The muskellunge is not native to the Saint John River watershed. However, a small stock of muskellunge was introduced into Lac Frontière on the North-West Branch of the upper Saint John River by the Quebec Department of Tourism, Fish and Game in 1970 (Bourque, pers. comm.). This introduction was based on the assumption that the muskellunge was very sedentary and territorial, would breed in the lake, and would not migrate, and thus no other portion of the drainage would be invaded. The validity of these assumptions will be established in time. It is of note, however, that the

chain pickerel, *Esox niger*, a closely related species with similar habits, was also introduced into a few New Brunswick lakes about a century ago and is now well-established throughout the Saint John estuary and much of the middle basin.

Esox niger - chain pickerel

This species, an introduced one, has become well established in the lower Saint John, and extends up as far as the Beechwood fish lift at least, where annual records have shown increases lately. It is known from the Meduxnekeag River in Maine, where it is angled, and from the Aroostook River below Aroostook Falls. The present survey has recorded specimens throughout the length of the Mactaquac headpond.

FAMILY CATOSTOMIDAE - the Suckers

Catostomus catostomus - longnose sucker

The longnose sucker is a bottom feeder which inhabits slightly cooler and deeper waters than does the common white sucker, although the two species do cohabit in many waters.

This sucker is widely distributed throughout the middle and upper basin, although it is not as abundant as its relative. It is surprising that it has not been present in any of the lakes surveyed by the New Brunswick Fish and Wildlife Branch lake inventory. The present survey found the species in the Mactaquac, Beechwood and Grand Falls headponds, in the Tobique River, and in Glazier Lake, with the Beechwood population being particularly dense.

Catostomus commersoni - common white sucker

This sucker is by far the more common and more widely distributed of the two species found in the Saint John River Basin. It has been found in nearly every system which has been sampled and reported upon, both in New Brunswick and in Maine. The present survey took the species from Mactaquac headpond to Glazier Lake, inclusive. The populations in the Beechwood and upper Mactaquac headponds are extremely dense.

FAMILY CYPRINIDAE - the Minnows

Couesius plumbeus - lake chub

This important forage fish is widespread through the rivers, streams and lakes of the middle and upper basin, and has been recorded from the Mactaquac headpond to the headwaters of the Saint John in Maine. It was found in Mactaquac, Beechwood and Grand Falls headponds during the current survey, as well as in the Tobique River and in Glazier Lake.

Notemigonus crysoleucas - golden shiner

Another forage species, the golden shiner is spottily distributed through the middle basin in New Brunswick. It has been recorded at Long's Creek and at Woodstock in the Mactaquac Headpond (Hyatt, 1969), at Lake George in the Pokiok system (Hooper, pers. comm.), at the Beechwood fish lift and in the Beechwood headpond (Zitko et al, 1971) and in the Tobique River (Semple, pers. comm.). It is known in Maine from the Meduxnekeag, Aroostook, Fish and Allagash systems (Warner, 1956, 1957, 1965 and 1967).

The present survey found this species in the arm of Mactaquac headpond, and in the Beechwood and Tobique headponds.

Notropis cornutus - common shiner

This minnow is widely distributed throughout

the middle and upper basins, in lakes, rivers and streams. It was found at all sites but Glazier Lake in the present survey, although it has been reported from that lake as well (Bourque, pers. comm.).

Notropis heterolepis - blacknose shiner

While records of this species are not common, it appears to be rather widely distributed. Scott and Crossman (1959) found it in what is now the lower Mactaquac headpond (near Long's Creek) and in the Meduxnekeag River. It occurs in the Maine portion of that drainage (Warner, 1957) as well as in the Aroostook, Fish and Allagash systems in that state (Warner, 1956, 1965, 1967). The present survey found the blacknose shiner in both the Beechwood and the Tobique headponds.

Phoxinus eos - northern redbelly dace

The northern redbelly dace seems to be widely distributed throughout the middle portion of the basin, as indicated by the records of Scott and Crossman (1959) and Semple (pers. comm.). It is known from the Meduxnekeag, Presquile and Aroostook systems in Maine (Warner, 1956, 1957, 1964). There are fewer records from the upper basin, the single previous one being from Caron Lake (near Baker Lake - Hooper, pers. comm.). Warner (1965, 1967) records it from the Fish and Allagash systems. The present survey recorded the species in the Grand Falls headpond.

Phoxinus neogaeus - finescale dace

Very few records of the finescale dace exist in the Saint John River Basin. Scott and Crossman (1959) reported it from the Shogomoc River, and from the mainstem Saint John below Edmundston. It has been found in Quisibis Lake of the Quisibis River system by the New Brunswick lake inventory (Hooper, pers. comm.). It is known from the Meduxnekeag, Fish and Allagash rivers in Maine (Warner, 1957, 1965, 1967).

The finescale dace was not recorded during the present survey.

Pimephales promelas - fathead minnow

This minnow, a small one averaging 2 inches in length, commonly resides in muddy-bottomed ponds and streams. It is not usually abundant in game fish waters, and thus is not an important forage fish.

It is rare in the Saint John, with only a few records in existence. Scott and Crossman (1959) first recorded it in the upper basin, in the Saint John south of Edmundston. Since then it has been found in Lake George of the Pokiok system in the middle basin by the New Brunswick lake inventory (Hooper, pers. comm.). In Maine, it has been recorded only from the Presquile River system (Warner, 1964).

Rhinichthys atratulus - blacknose dace

This very common inhabitant of cool, clear trout streams is widely distributed throughout both the middle and upper basin where it is a prime forage fish for speckled trout and Atlantic salmon. It has been amply recorded on both sides of the border. Due to the nature of the waters sampled in the present survey, however, it was found only in one site, that being along the shore of Grand Falls headpond. This should not be interpreted as indicating that Grand Falls headpond has cool, clear waters. It was a single occurrence in the early summer, in well-aerated shallow water overhung by trees.

Semotilus atromaculatus - creek chub

The creek chub is widely distributed throughout the middle and upper basin, on both sides of the international border. The present survey found it in the Mactaquac, Tobique and Grand Falls headponds, and in the Tobique River.

Semotilus corporalis - fallfish

The fallfish is also fairly widely distributed throughout the middle and upper basin in both Maine and New Brunswick. It was found in the Mactaquac and Tobique headponds and in the Tobique River during the current survey.

Semotilus margarita - pearl dace

A minnow which resembles the creek chub, the pearl dace lives in the brown-tinted waters of bogs, streams and lakes, where it may be a forage fish for members of the Salmonidae. Its distribution in the Saint John is not well documented. Scott and Crossman list it in the Meduxnekeag River, the mainstem Saint John below Grand Falls and again below Edmundston, and in the Baker Brook system. In Maine it has been found in the Presquile, Fish and Allagash systems (Warner, 1964, 1965, 1967) and in Glazier Lake (Bourque, pers. comm.). The present survey found the pearl dace in the Grand Falls headpond.

FAMILY ICTALURIDAE - The Catfishes

Ictalurus nebulosus - brown bullhead

Scott and Crossman (1959) could find no literature references for the distribution of the brown bullhead within the Saint John river drainage in New Brunswick, and their own collection contributed no further information. However, since then the New Brunswick lake inventory has recorded this species in George and Davidson Lakes of the Pokiok system, and Williamston Lake on the Little Presquile Stream (Hooper, pers. comm.). Occasionally brown bullheads are observed at the Beechwood fish lift, and a few specimens were observed in the Tobique headpond, the Tobique River, and the Wapskehegan River of the Tobique system in 1971 (Semple, pers. comm.). Thus the species seems to be distributed throughout the middle basin. The present survey found the brown bullhead throughout the length of the Mactaquac headpond, and in the Beechwood headpond.

FAMILY ANGUILLIDAE - The Freshwater Eels

Anguilla rostrata - American eel

The American eel is plentiful and widely distributed throughout the middle basin, occurring in all tributaries above Mactaquac Dam on both sides of the international border. Although the cataract at Grand Falls presents a formidable barrier to eel passage into the upper basin, a few must negotiate it, as occasional specimens have been taken in the Fish River drainage in northern Maine (Warner, 1965).

During the present survey, eels were observed throughout the length of the Mactaquac headpond.

FAMILY CYPRINODONTIDAE - The Killifishes

Fundulus diaphanus - banded killifish

The banded killifish seems to be distributed throughout suitable habitats in the middle basin, with records occurring in what is now the Mactaquac headpond at Long's Creek and the Meduxnekeag River (Scott and Crossman, 1959), the lakes of the Pokiok system (Hooper, pers. comm.) and the Meduxnekeag, Presquile and Aroostook rivers (Warner, 1956; 1957; 1964). The species is also known from the Fish River drainage in the upper basin (Warner, 1965). Specimens were taken from the Beechwood and Tobique headponds in the current survey, thus extending the known range of this species northward (Scott and Crossman, 1959).

FAMILY GASTEROSTEIDAE - The Sticklebacks

Apeltes quadracus - fourspine stickleback

This stickleback is normally a marine or brackish water species found only in coastal areas and estuaries. However, two specimens were taken by Scott and Crossman (1959) at the mouth of Garden Brook on the Saint John, a location some sixty (60) miles from the salt water influence. This may be considered a rare occurrence, as no specimens have been found since, despite much effort in the area.

Gasterosteus aculeatus - threespine stickleback

The threespine stickleback is confined to the northern portion of the middle basin and is widely distributed throughout the upper basin, in both New Brunswick and Maine. Scott and Crossman (1959) found it in the main Saint John River below the mouth of the Tobique River, and there are records from throughout the Tobique watershed by White (1957), Hyatt (1969) and Semple (1971). The species has been recorded in the Aroostook drainage in Maine as well (Warner, 1956). In the upper basin Cox (1896) first listed it for the Madawaska and upper Saint John Rivers. Specimens have been taken from many tributaries

in New Brunswick and in Maine. Warner (1965, 1967) reports the threespine from the Fish and Allagash watersheds, and Bourque (pers. comm.) from the upper Saint John.

Pungitius pungitius - ninespine stickleback

This species is found throughout the middle and upper basin of the Saint John. It was found in the Long's Creek area by Scott and Crossman (1959) and by Hyatt (1969) and occurs in the mainstem and in various tributaries upstream to near Rivière St. François in both New Brunswick and Maine. During the current survey the species was taken in the Beechwood and Grand Falls headponds.

FAMILY GADIDAE - The Cods

Lota lota - burbot

The freshwater cod, or burbot, has long been known from waters of the Saint John (Perley, 1852; Adams, 1873). Scott and Crossman (1959) noted occurrences in First Green Lake, Baker Lake and Glazier Lake. The species has been observed very rarely at the Beechwood fish lift, and specimens have been taken in the Nackawic, Becaguimec and Tobique River systems (Hyatt, 1969, Semple, 1971), of the middle basin in New Brunswick as well as in the Aroostook system (Warner, 1956) in Maine. In the upper basin, records occur from First Green Lake, Baker Lake and Glazier Lake (Scott & Crossman, 1959), Baker Lake (Hyatt, 1970), the Fish, Allagash and upper Saint John River systems, and Glazier Lake (Warner, 1965, 1967; Bourque, pers. comm.).

The present survey found the burbot in Mactaquac headpond and Glazier Lake. A supplementary survey in the Green River system established its occurrence in Third Green Lake as well.

FAMILY PERCICHTHYIDAE - The Temperate Basses

Morone americana - white perch

The white perch does not have a wide distribution in this portion of the Saint John, being limited to the southern portion of the middle basin. Considerable numbers are passed over the Mactaquac and Beechwood dams annually, and the species has been recorded at Long's Creek in the Mactaquac headpond (Hyatt, 1969) and in the Meduxnekeag River in Maine (Warner, 1957). It has also been taken in the Beechwood headpond (Zitko et al, 1971) and has been recorded in the Aroostook River up to the Aroostook Falls (Warner, 1956). This portion of the river, of course, is still on the New Brunswick side of the border. This survey found the species throughout the Mactaquac headpond.

Morone saxatilis - striped bass

The striped bass has been known to ascend the river to the head of tide and well beyond, for records from the fish passage facilities at Beechwood and, more recently, Mactaquac show their presence. However, these records have decreased drastically in recent years, as has the related sport fishery (Meth, 1972).

At one time, also, a limited spawning run of "stripers" occurred in the Aroostook River below the Aroostook Falls (Warner, 1956) but it is likely that this run has also been eliminated since the construction of Mactaquac Dam. It is highly probable that the middle basin has seen its last striped bass.

FAMILY CENTRARCHIDAE - The Sunfishes

Lepomis auritus - redbreast sunfish

This sunfish has a spotty distribution in southwestern New Brunswick, and the only record of its presence in the middle basin has been made recently in Lake George of the Pokiok system, by the New Brunswick lake inventory (Hooper, pers. comm.). It occurs in the Meduxnekeag and Aroostook drainages in Maine as well (Warner, 1956; 1957). No specimens were taken during the present survey.

Lepomis gibbosus - pumpkinseed

The pumpkinseed is also well-known in southwestern New Brunswick (Scott and Crossman, 1959) but recent investigations have extended its range northward. The New Brunswick lake inventory has recorded it from George and Davidson Lakes of the Pokiok River system, and Williamston Lake of the Little Presquile Stream (Hooper, pers. comm.). It has been observed at the Beechwood Dam fish lift and has been taken in the Tobique headpond and Tobique River (Semple, pers. comm.). The species also occurs in the Meduxnekeag and Aroostook Rivers in Maine (Warner, 1956; 1957). The present survey has recorded the pumpkinseed from

the Mactaquac and Beechwood headponds.

Micropterus dolomieui - smallmouth black bass

The smallmouth black bass, an introduced species (Smith, 1942; Catt, 1949), has gradually spread through the estuary of the Saint John and is now well established in the southern portion of the middle basin. While it is not a migratory species, significant numbers have been observed at the fish passage facilities at Mactaquac Dam, and the present survey indicates that smallmouth are plentiful throughout the length of the Mactaquac headpond.

FAMILY PERCIDAE - The Perches

Perca flavescens - yellow perch

The yellow perch is widespread throughout the middle and upper basin. Scott and Crossman (1959) decried the fact that few positive records existed, but this situation has been rectified in recent years. While their spread is prevented by waterfalls and other obstructions in some situations, and while the perch does not inhabit fast-flowing trout and salmon streams, it has invaded most suitable environments throughout this portion of the basin, in both New Brunswick and Maine. During the present survey the yellow perch was found at every regular sampling station. A supplementary survey showed that it was present in all lakes in the New Brunswick portion of the Green River system.

FAMILY COTTIDAE - The Sculpins

Cottus cognatus - slimy sculpin

The slimy sculpin is found in habitats suitable for trout and salmon, and is found in such streams throughout the middle and upper basin, in both New Brunswick and Maine. Recent records are too numerous to list, but it is well-documented and is a very common species in the basin. No specimens were taken in the present survey due to the gear used and the types of areas sampled.

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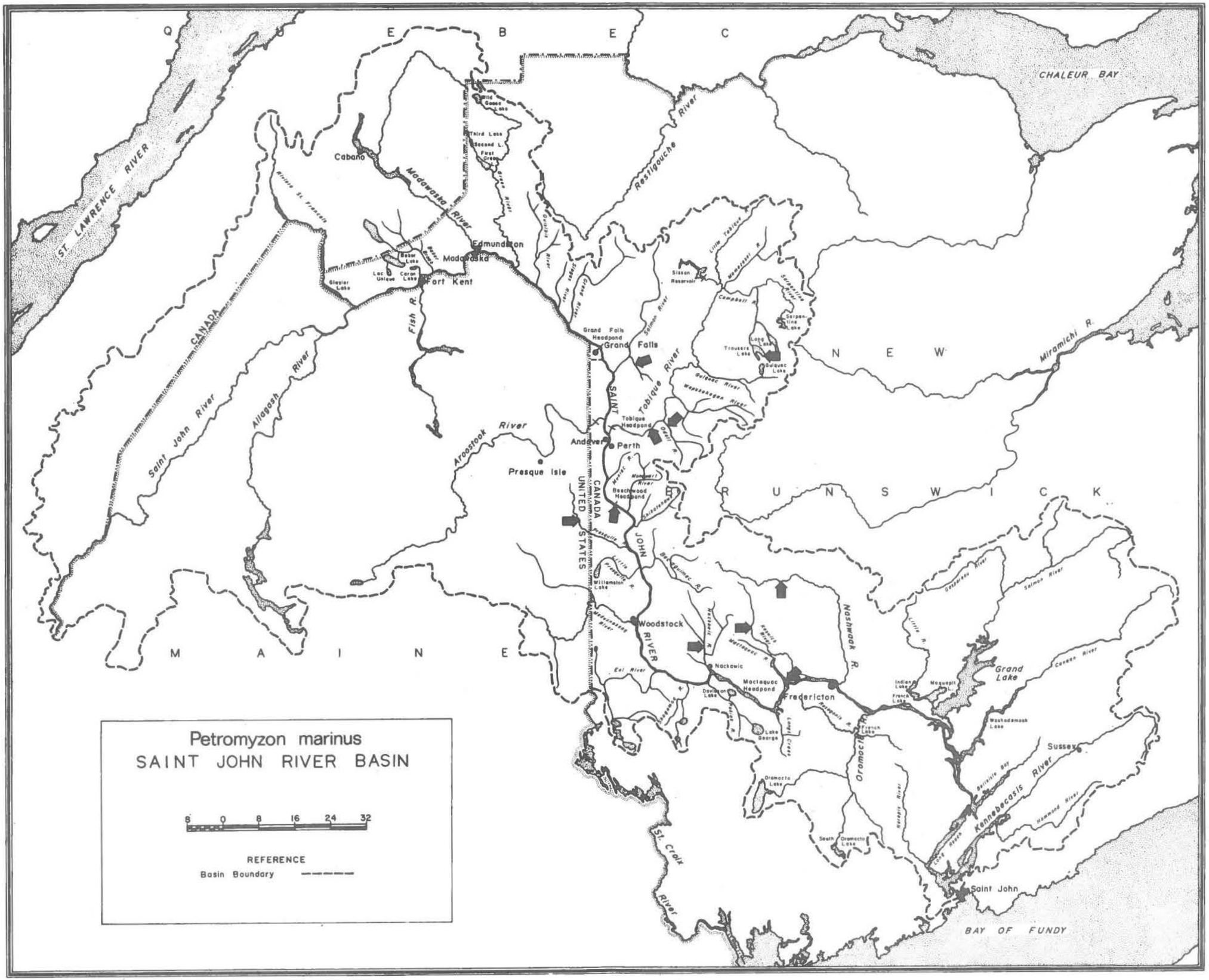
A P P E N D I X

DISTRIBUTION MAPS OF FISH SPECIES FOUND IN THE SAINT JOHN RIVER BASIN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Saint John River
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Miramichi R.
Allagash River
Aroostook River
Fish R.
Madawaska River
Cabano
Edmundston
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Andover
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Grand Falls
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Woodstock
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Lake George
Oromocto Lake
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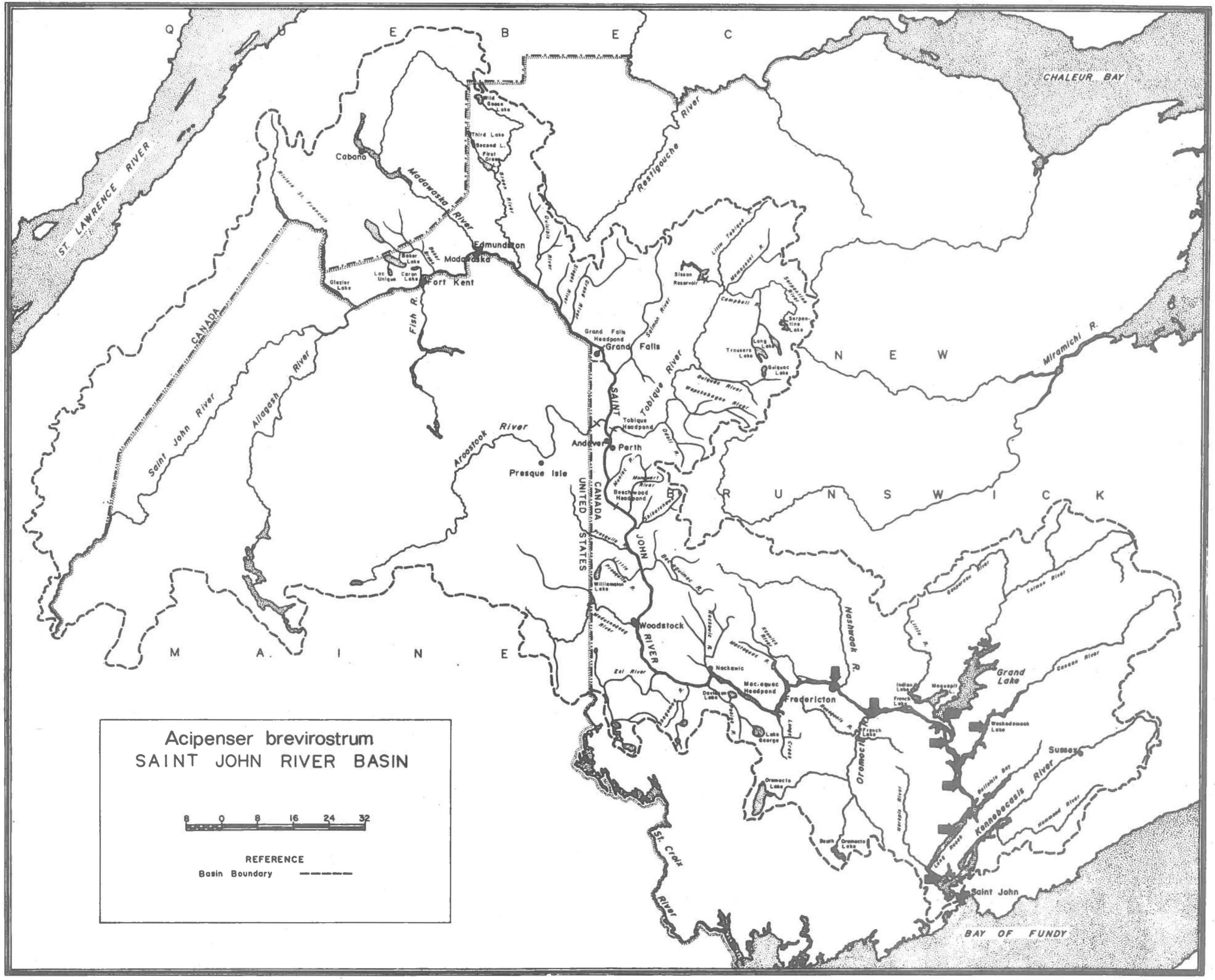
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Fort Kent
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CHALEUR BAY
Grand Falls Headpond
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Salmon River
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Grand Lake
Sussex
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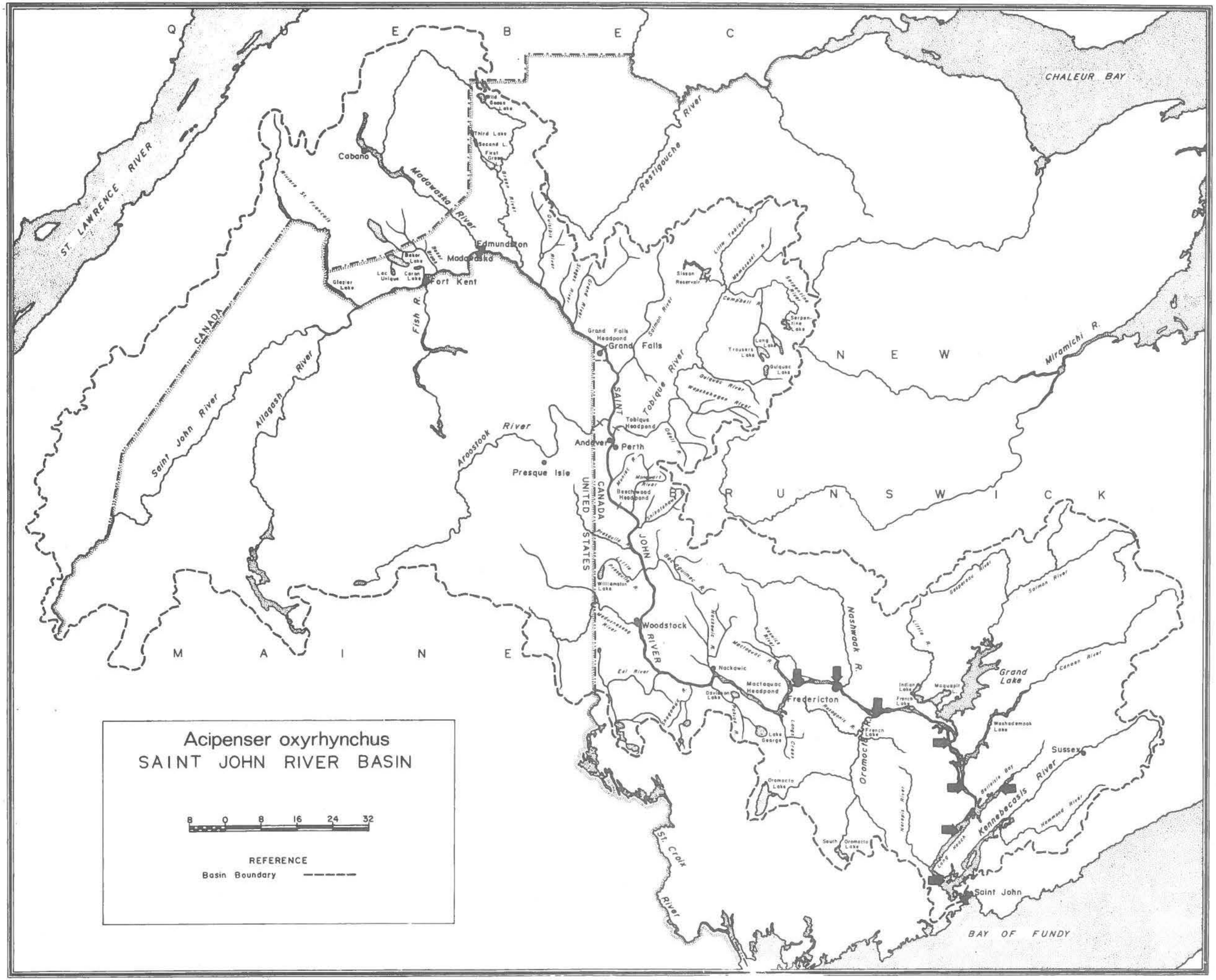
Basin Boundary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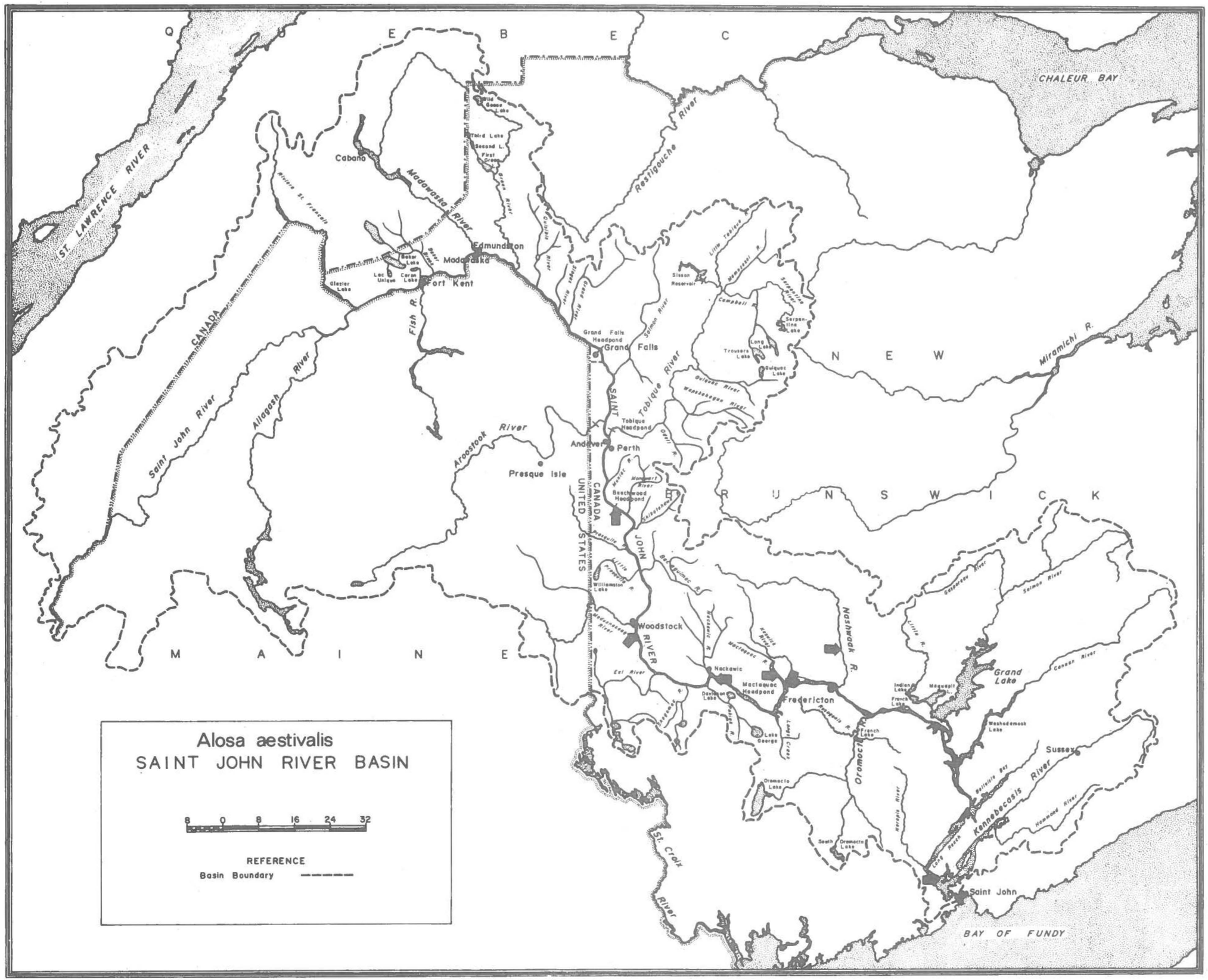
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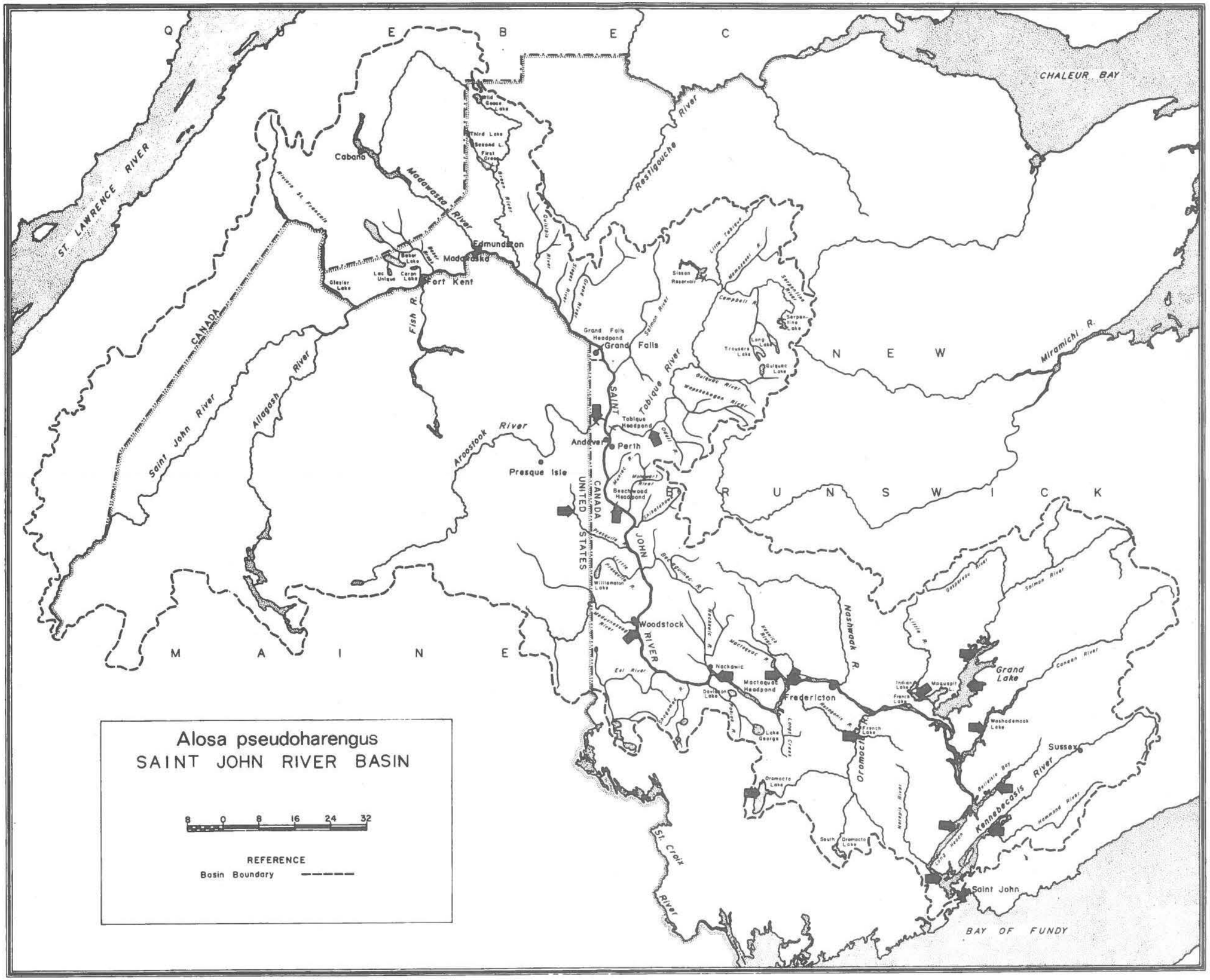
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Fish R.
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Restigouche River
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St. Croix River
Cabano
Edmundston
Madawaska
Fort Kent
Grand Falls
Perth
Andover
Presque Isle
Woodstock
Fredericton
Sussex
Saint John
Grand Lake

Alosa sapidissima

SAINT JOHN RIVER BASIN

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REFERENCE

Basin Boundary ------

ST. LAWRENCE RIVER

CHALEUR BAY

QUEBEC

NEW BRUNSWICK

MAINE

CANADA

UNITED STATES

Cabano

Madawaska River

Edmundston

Madawaska

Fort Kent

Glazier Lake

Lac Unique

Long Lake

Fish R.

Allagash River

Saint John River

Restigouche River

Grand Falls Headpond

Grand Falls

Tobique River

Tobique Headpond

Arcostook River

Andover

Perth

Presque Isle

Beechwood Headpond

SAINT JOHN RIVER

Woodstock

Nackawic

Mactaquac Headpond

Fredericton

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Oromocto R.

Grand Lake

Sussex

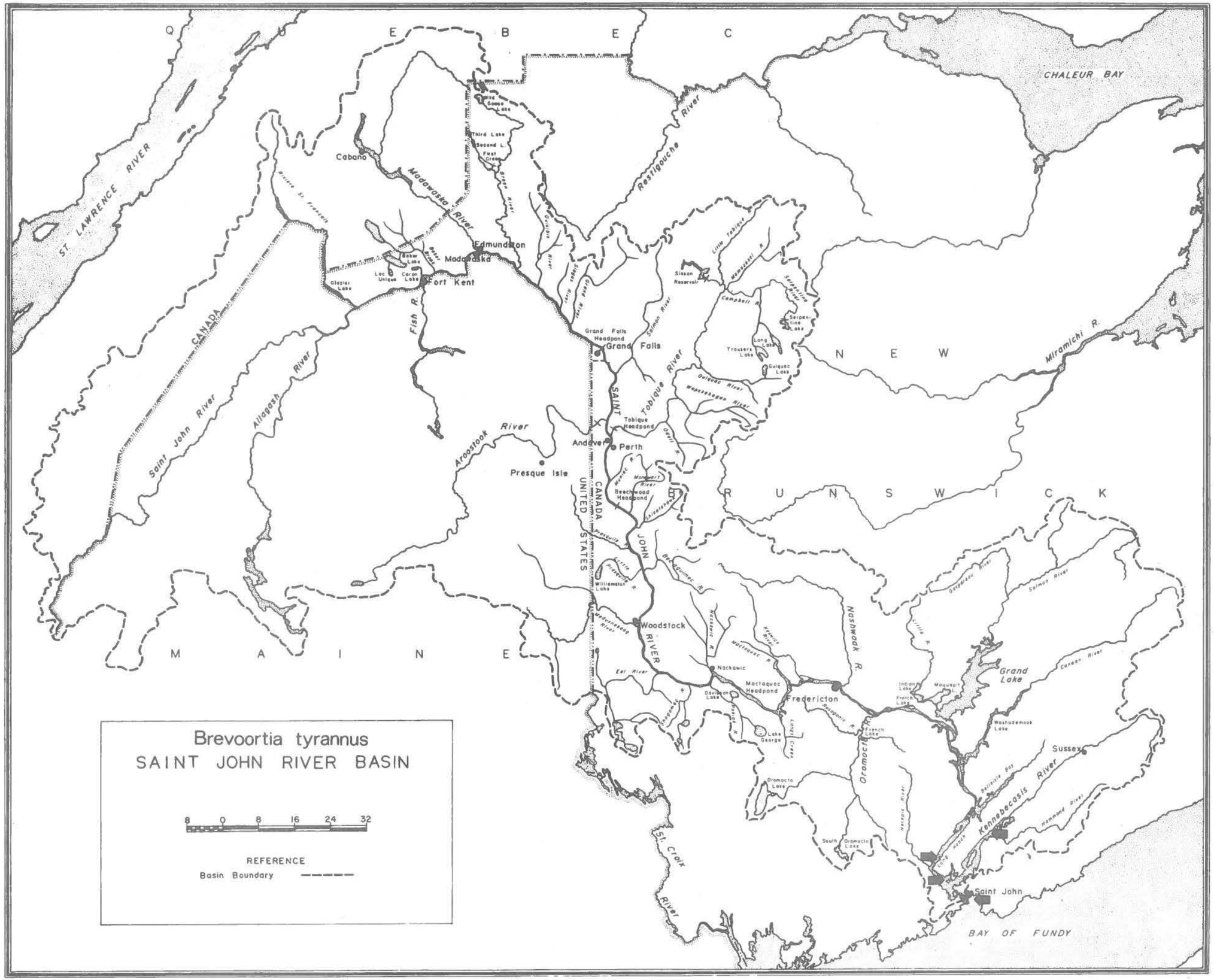
Kennebecasis River

Saint John

St. Croix River

BAY OF FUNDY

Miramichi R.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Fish R.
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Fredericton
Nashwaak R.
Oromocto R.
Oromocto Lake
South Oromocto Lake
Grand Lake
Sussex
Kennebecasis River
Saint John
St. Croix River
BAY OF FUNDY
M A I N E

Clupea harengus harengus

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

Q U E B E C

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CANADA

UNITED STATES

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

Saint John River

Allagash River

Aroostook River

Presque Isle

Cabano

Madawaska River

Edmundston

Madawaska

Fort Kent

Fish R.

Restigouche River

Grand Falls

Tobique River

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Mactaquac Headpond

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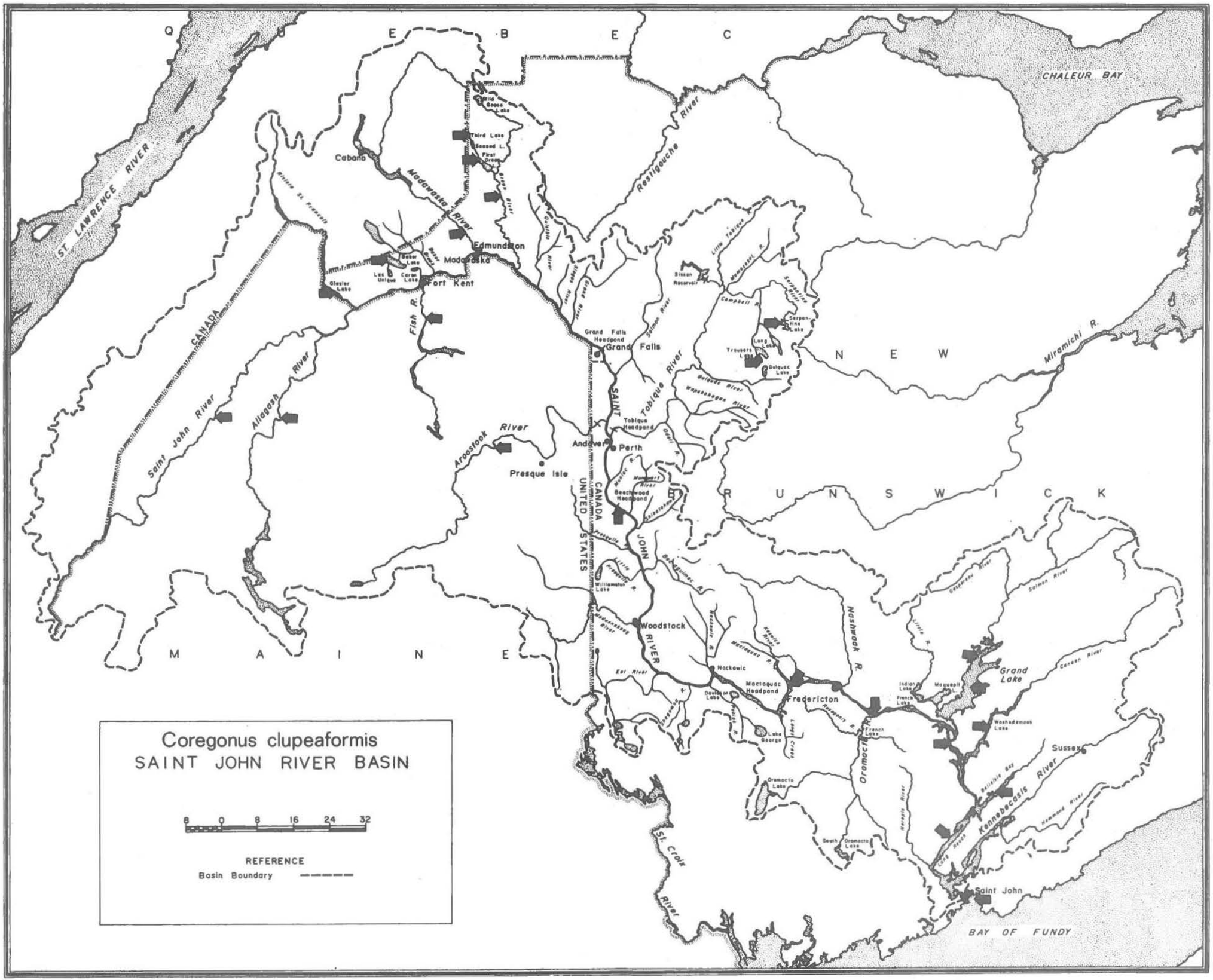

Coregonus clupeaformis
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Restigouche River
Miramichi R.
Tobique River
Nashwaak R.
Oromocto R.
Kennebecasis River
Grand Lake
Cabano
Edmundston
Madawaska
Fort Kent
Presque Isle
Andover
Perth
Grand Falls
Tobique Headpond
Beechwood Headpond
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Sussex
Saint John
Oromocto Lake
Lake George
Glazier Lake
Cargo Lake
Lac Unique
Beaver Lake
Third Lake
Second L.
First Lake
Williamston Lake
Sisson Reservoir
Serpentine Lake
Trousers Lake
Long Lake
Quiquac Lake
Indian Lake
Maquapit L.
French Lake
Washademoak Lake
Hammond River
St. Croix River

Prosopium cylindraceum

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

Q E B E C

CHALEUR BAY

ST. LAWRENCE RIVER

CANADA

UNITED STATES

M A I N E

N E W B R U N S W I C K

Cabano

Madawaska River

Edmundston

Madawaska

Fort Kent

Fish R.

Allagash River

Saint John River

Aroostook River

Presque Isle

Restigouche River

Grand Falls Headpond

Grand Falls

Tobique River

Tobique Headpond

Andover

Perth

Beechwood Headpond

SAINT JOHN RIVER

Woodstock

Nackawic

Mactaquac Headpond

Fredericton

Nashwaak R.

Oromocto R.

Oromocto Lake

St. Croix River

Miramichi R.

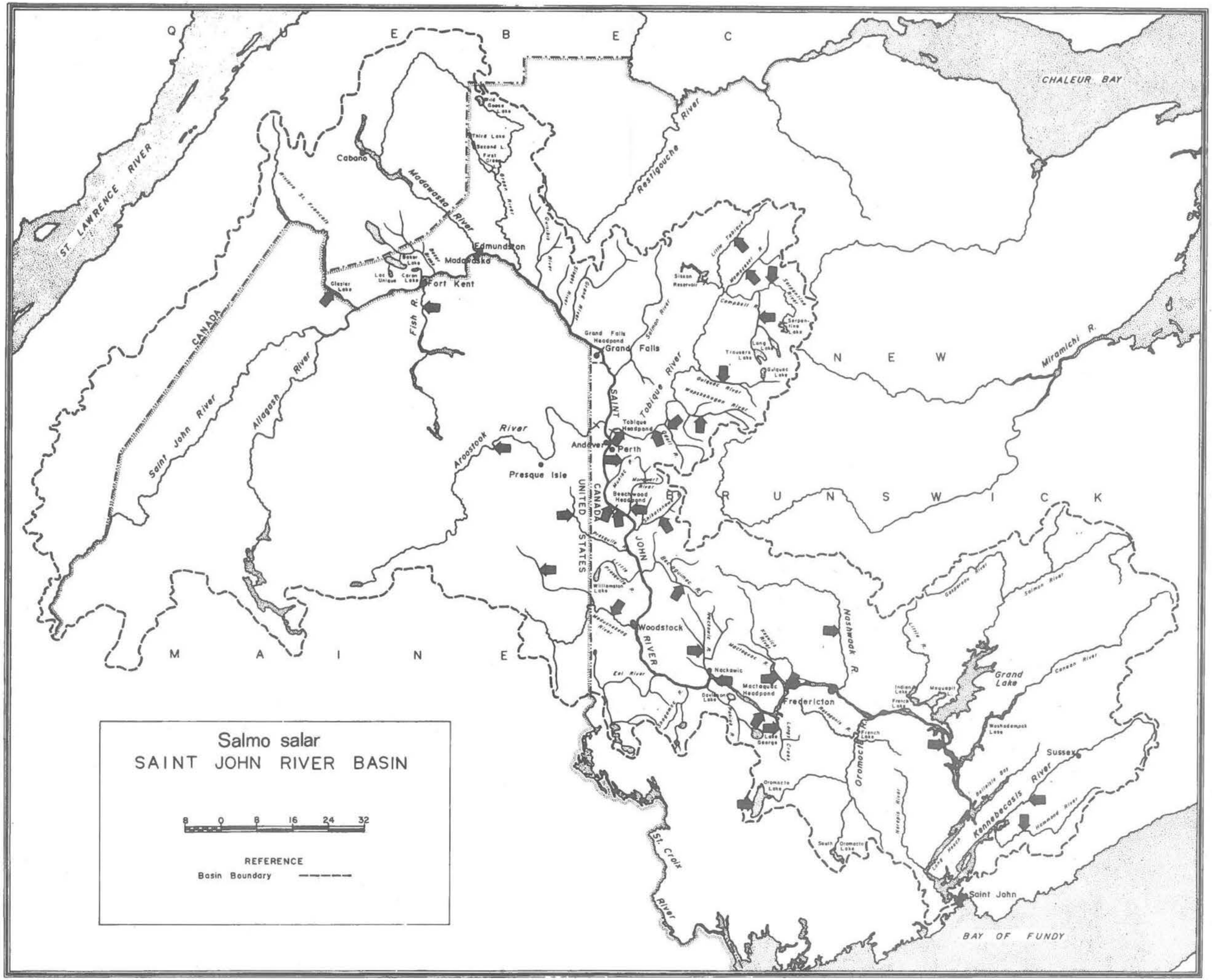
Grand Lake

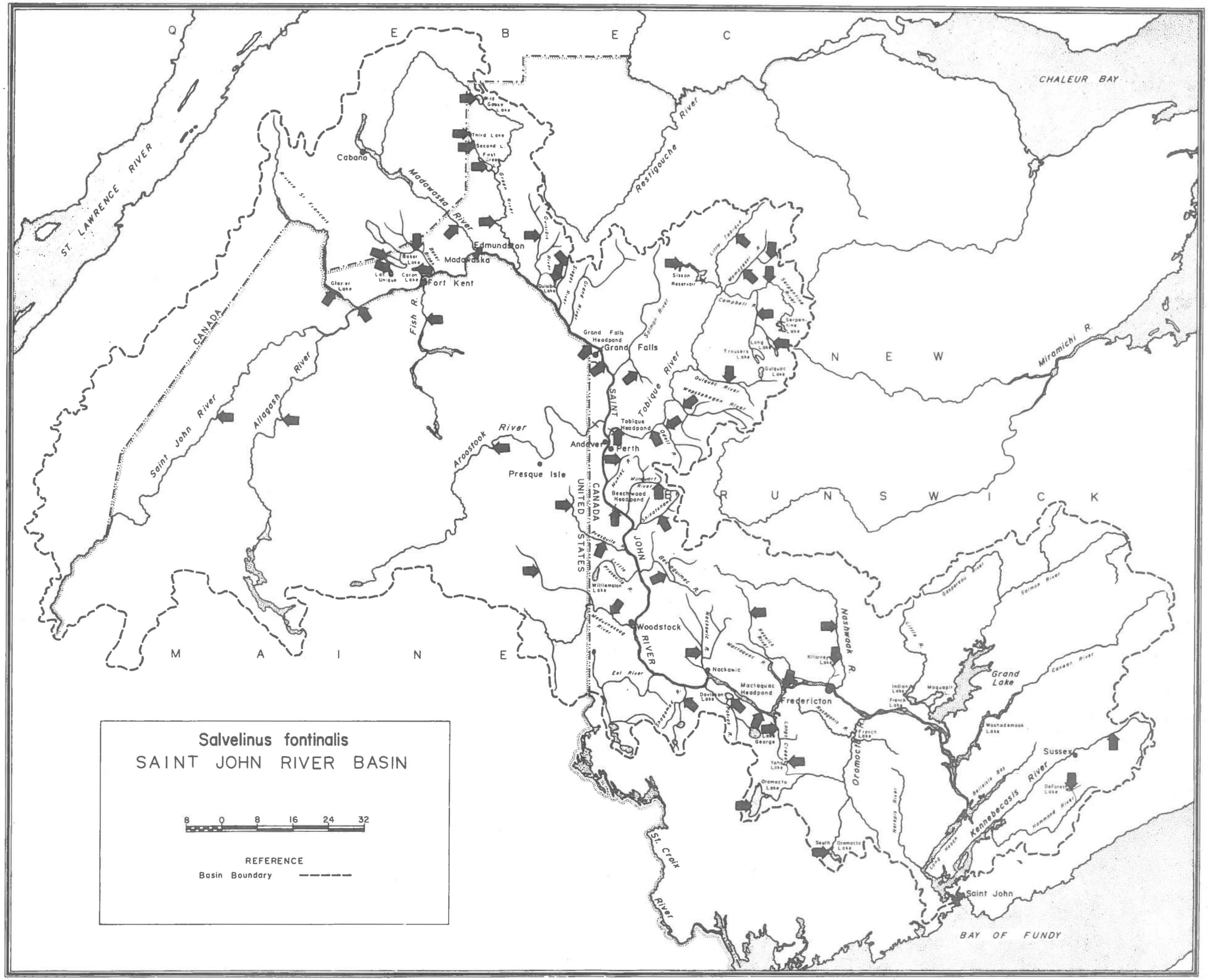
Sussex

Kennebecasis River

Saint John

BAY OF FUNDY


Salmo salar
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CANADA
Saint John River
Allagash River
Aroostook River
Presque Isle
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Fish R.
Restigouche River
CHALEUR BAY
Grand Falls
Grand Falls Headpond
Salmon River
Tobique River
Tobique Headpond
Andover
Perth
Miramichi R.
N E W B R U N S W I C K
CANADA
UNITED STATES
JOHN
Beechwood Headpond
Woodstock
RIVER
Nackawic
Mactaquac Headpond
Fredericton
Lake George
Nashwaak R.
Oromocto R.
Oromocto Lake
South Oromocto Lake
St. Croix River
Grand Lake
Sussex
Kennebecasis River
Saint John
BAY OF FUNDY
M A I N E


Salvelinus fontinalis
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CANADA
UNITED STATES
MAINE
NEW BRUNSWICK
QUEBEC
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Fish R.
Madawaska River
Restigouche River
Miramichi R.
Aroostook River
Tobique River
Nashwaak R.
Oromocto R.
Kennebecasis River
St. Croix River
Cabano
Edmundston
Madawaska
Fort Kent
Grand Falls
Andover
Perth
Presque Isle
Woodstock
Nackawic
Fredericton
Sussex
Saint John
Grand Lake

Salvelinus namaycush

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

QUEBEC

MAINE

NEW BRUNSWICK

CANADA

UNITED STATES

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

Cabano

Madawaska River

Edmundston

Madawaska

Fort Kent

Glazier Lake

Lac Unique

Caron Lake

Baker Lake

Fish R.

Allagash River

Saint John River

Aroostook River

Presque Isle

Andover

Perth

Tobique Headpond

Grand Falls Headpond

Grand Falls

SAINT JOHN RIVER

Tobique River

Restigouche River

Miramichi R.

Beechwood Headpond

Woodstock

Nackawic

Mactaquac Headpond

Fredericton

Oromocto Lake

Lake George

St. Croix River

Nashwaak R.

Oromocto R.

Grand Lake

Washademoak Lake

Sussex

Kennebecasis River

Saint John

Siegas Reservoir

Serpentine Lake

Trousers Lake

Long Lake

Gulquac Lake

Tobique Narrows

Williamston Lake

Eel River

Indian Lake

Maquapit Lake

French Lake

Canaan River

Salmon River

Hammond River

Salvelinus alpinus ····➡
Salmo gairdnerii ·····➡
Salmo trutta ·····➡

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ——————

QUEBEC

MAINE

NEW BRUNSWICK

CANADA

UNITED STATES

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

Cabano

Madawaska River

Edmundston

Madawaska

Fort Kent

Fish R.

Allagash River

Saint John River

Aroostook River

Presque Isle

Restigouche River

Grand Falls Headpond

Grand Falls

Tobique River

Tobique Headpond

Andover

Perth

Miramichi R.

Beechwood Headpond

Woodstock

SAINT JOHN RIVER

Nackawic

Mactaquac Headpond

Fredericton

Nashwaak R.

Oromocto R.

Oromocto Lake

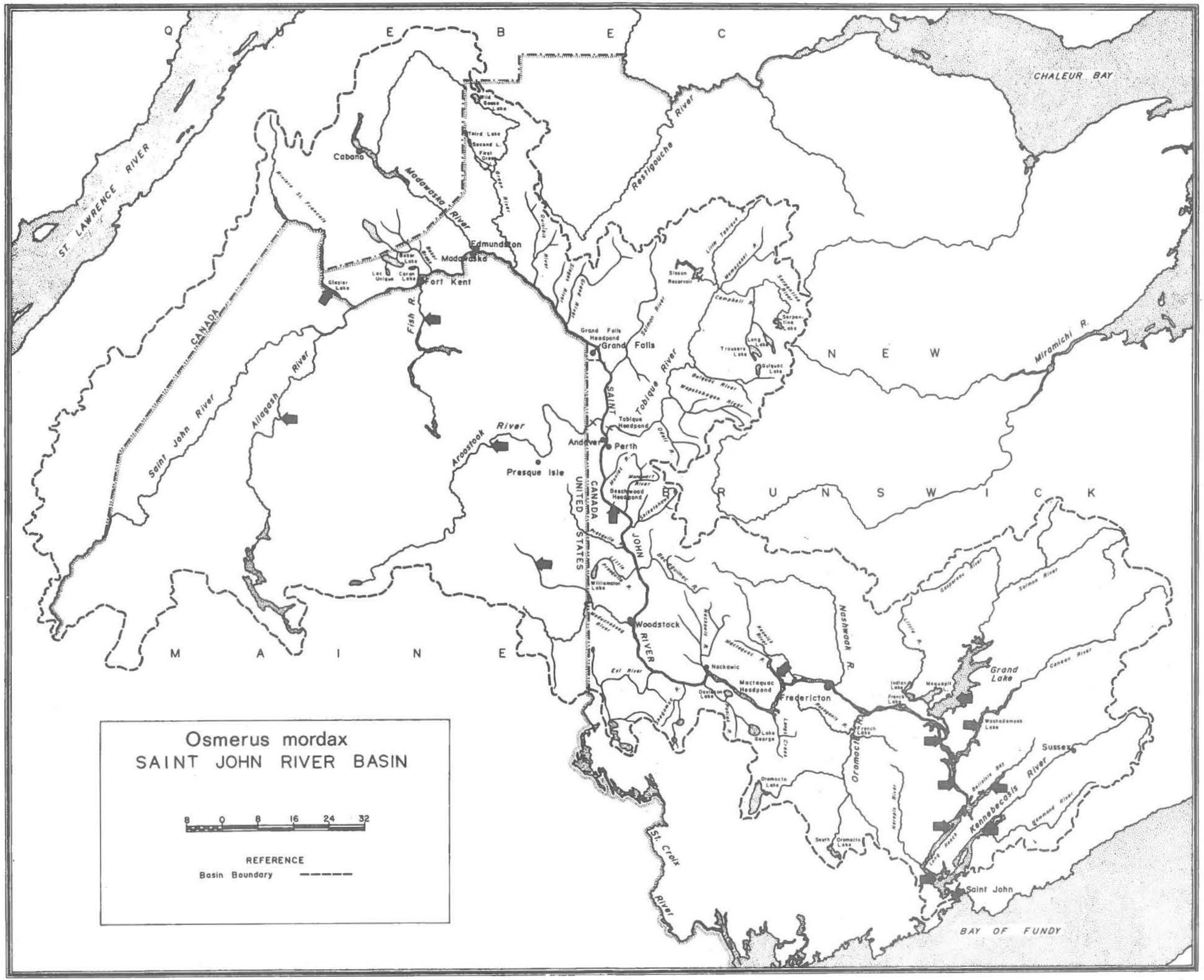
St. Croix River

Grand Lake

Sussex

Kennebecasis River

Saint John


Osmerus mordax
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Restigouche River
Madawaska River
Allagash River
Aroostook River
Fish R.
Tobique River
Miramichi R.
Nashwaak R.
Oromocto R.
Kennebecasis River
St. Croix River
Cabano
Edmundston
Madawaska
Fort Kent
Grand Falls
Andover
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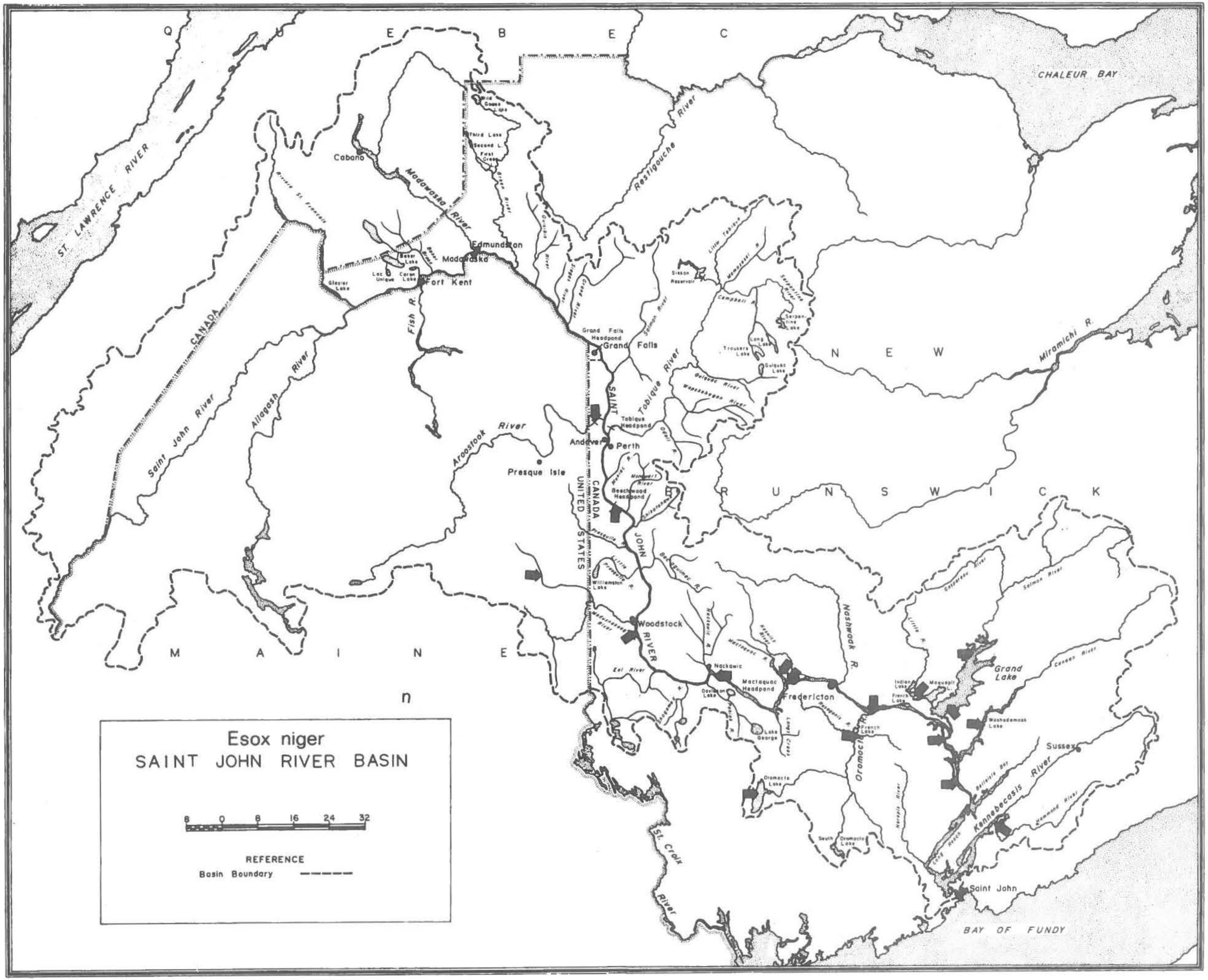
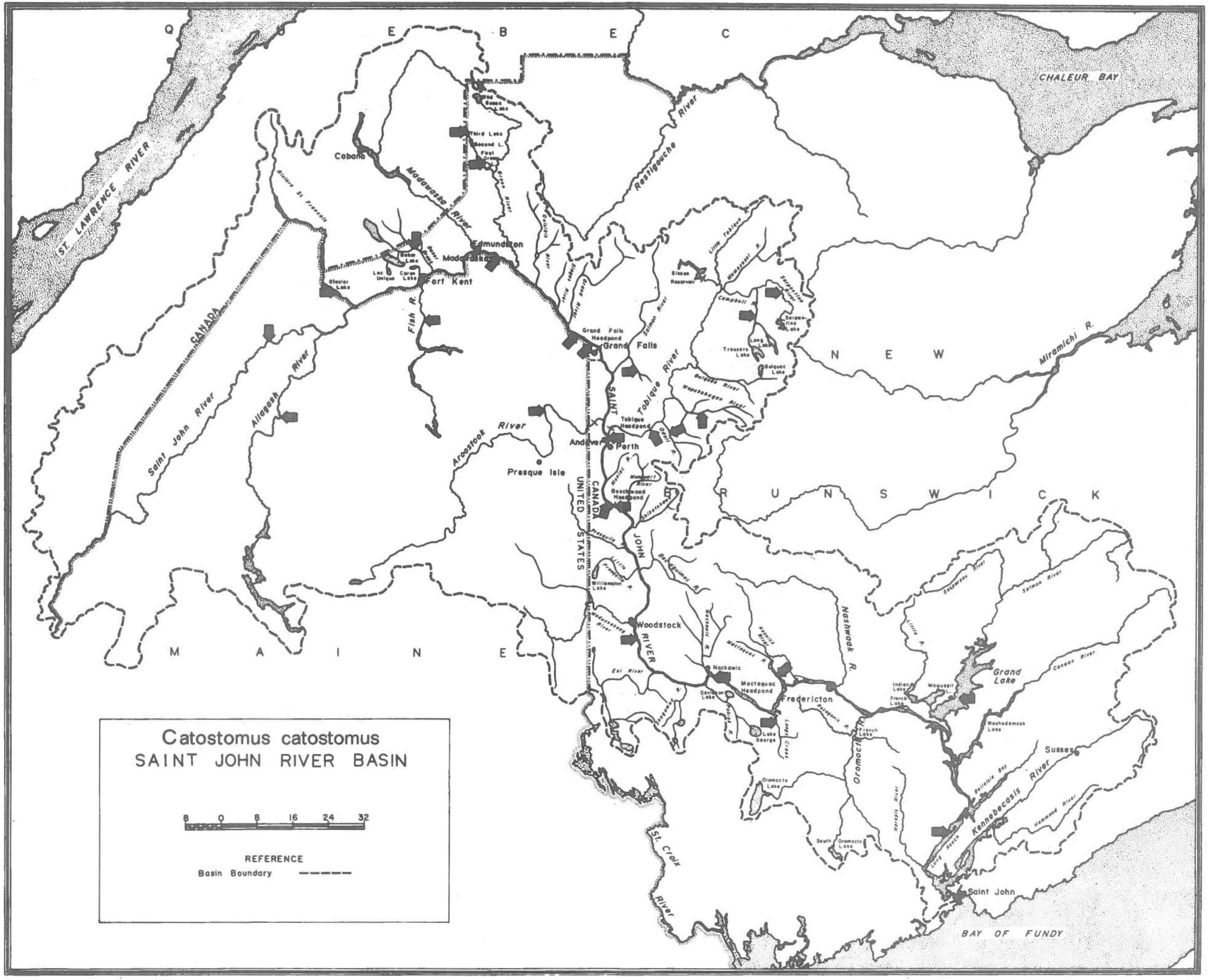
Presque Isle
Woodstock
Fredericton
Sussex
Saint John
Grand Lake


Esox niger
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CANADA
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Cabano
Edmundston
Madawaska
Fort Kent
Baker Lake
Lac Unique
Caron Lake
Glazier Lake
Presque Isle
CANADA
UNITED STATES
MAINE
Restigouche River
CHALEUR BAY
Grand Falls Headpond
Grand Falls
Tobique River
SAINT JOHN
Tobique Headpond
Andover
Perth
Beechwood Headpond
Siphon Reservoir
Little Tobique R.
Mamozekel R.
Trousers Lake
Long Lake
Quisibis Lake
Wapskanegan River
Miramichi R.
NEW BRUNSWICK
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Oromocto Lake
Lake George
Nashwaak R.
Grand Lake
Indian Lake
Maquapit Lake
Washademoak Lake
Sussex
Kennebecasis River
Saint John
BAY OF FUNDY
St. Croix River


Catostomus catostomus
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Restigouche River
Miramichi R.
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Tobique River
Nashwaak R.
Oromocto R.
St. Croix River
Kennebecasis River
Cabano
Edmundston
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Fort Kent
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Andover
Perth
Presque Isle
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Nackawic
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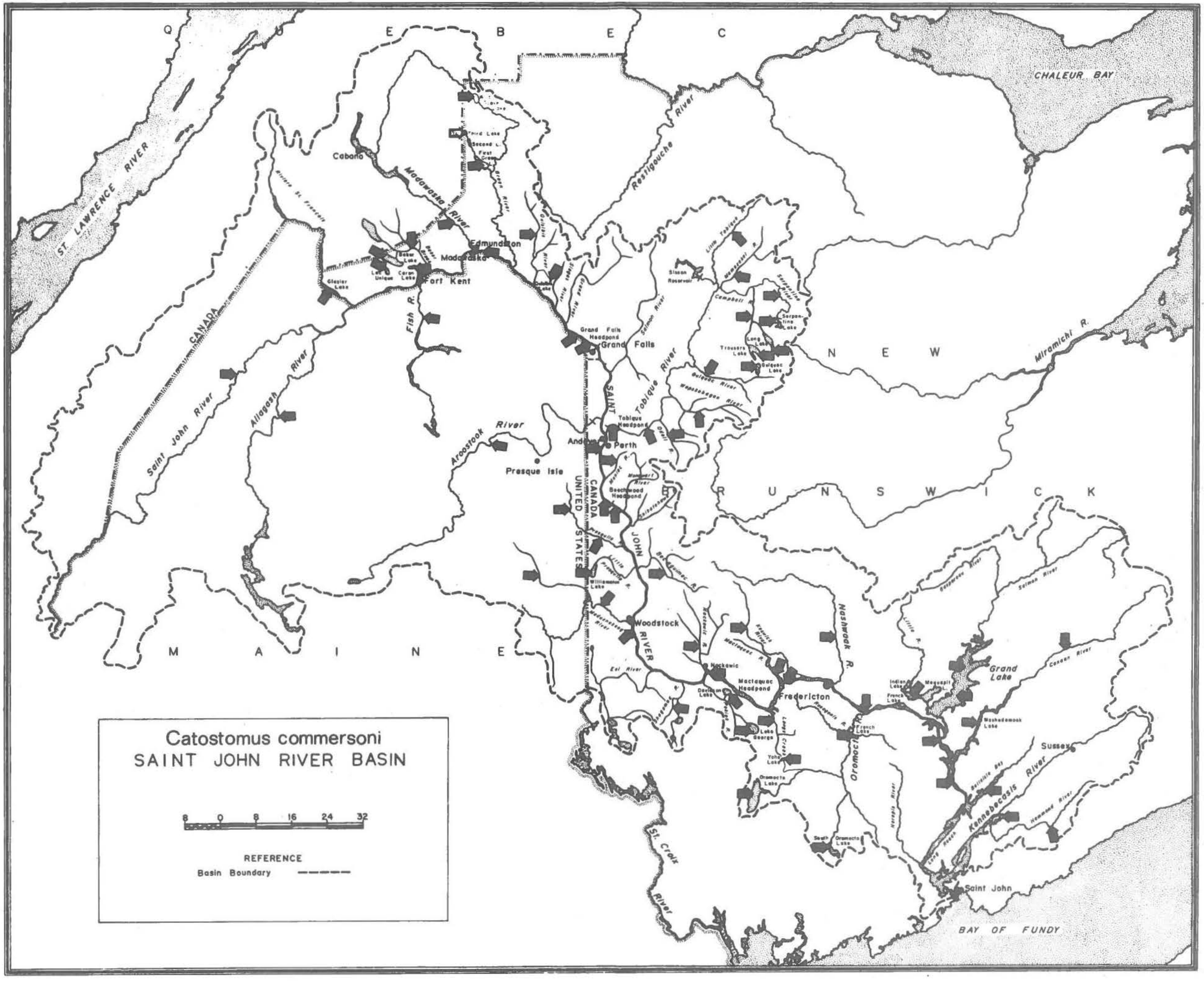
Sussex
Saint John
Grand Lake


Catostomus commersoni
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CHALEUR BAY
CANADA
UNITED STATES
M A I N E
N E W B R U N S W I C K
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Fish R.
Restigouche River
Grand Falls
Tobique River
Aroostook River
Presque Isle
Andover
Perth
Tobique Headpond
Beechwood Headpond
Miramichi R.
Woodstock
Hackawic
Mactaquac Headpond
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Nashwaak R.
Oromocto Lake
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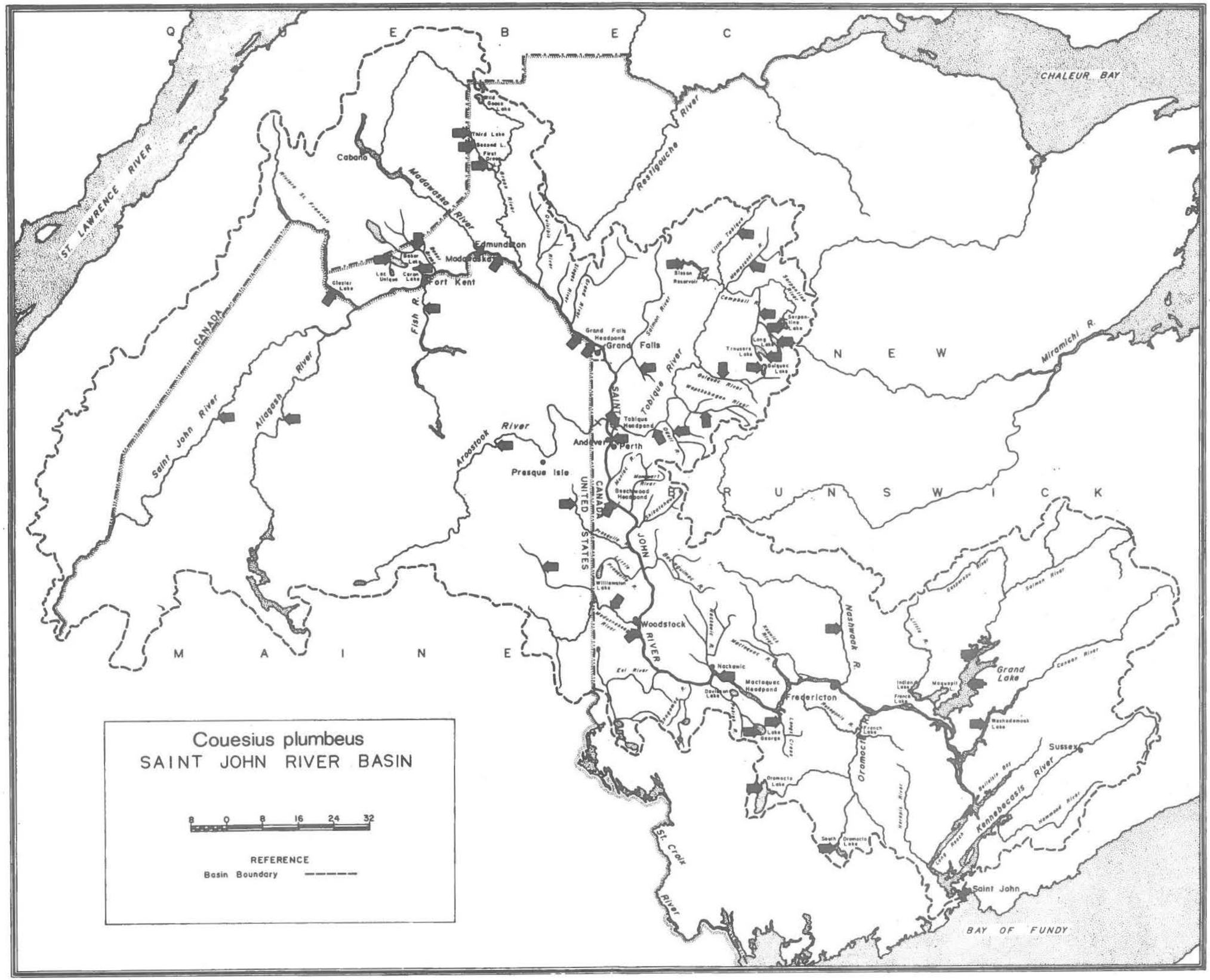
Kennebecasis River
Saint John
St. Croix River
BAY OF FUNDY


Couesius plumbeus
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Aroostook River
Presque Isle
Cabano
Madawaska River
Edmundston
Fort Kent
Fish R.
Restigouche River
Grand Falls
Tobique River
Andover
Perth
Woodstock
Nackawic
Meductic
Fredericton
Nashwaak R.
Oromocto R.
Oromocto Lake
St. Croix River
Miramichi R.
Grand Lake
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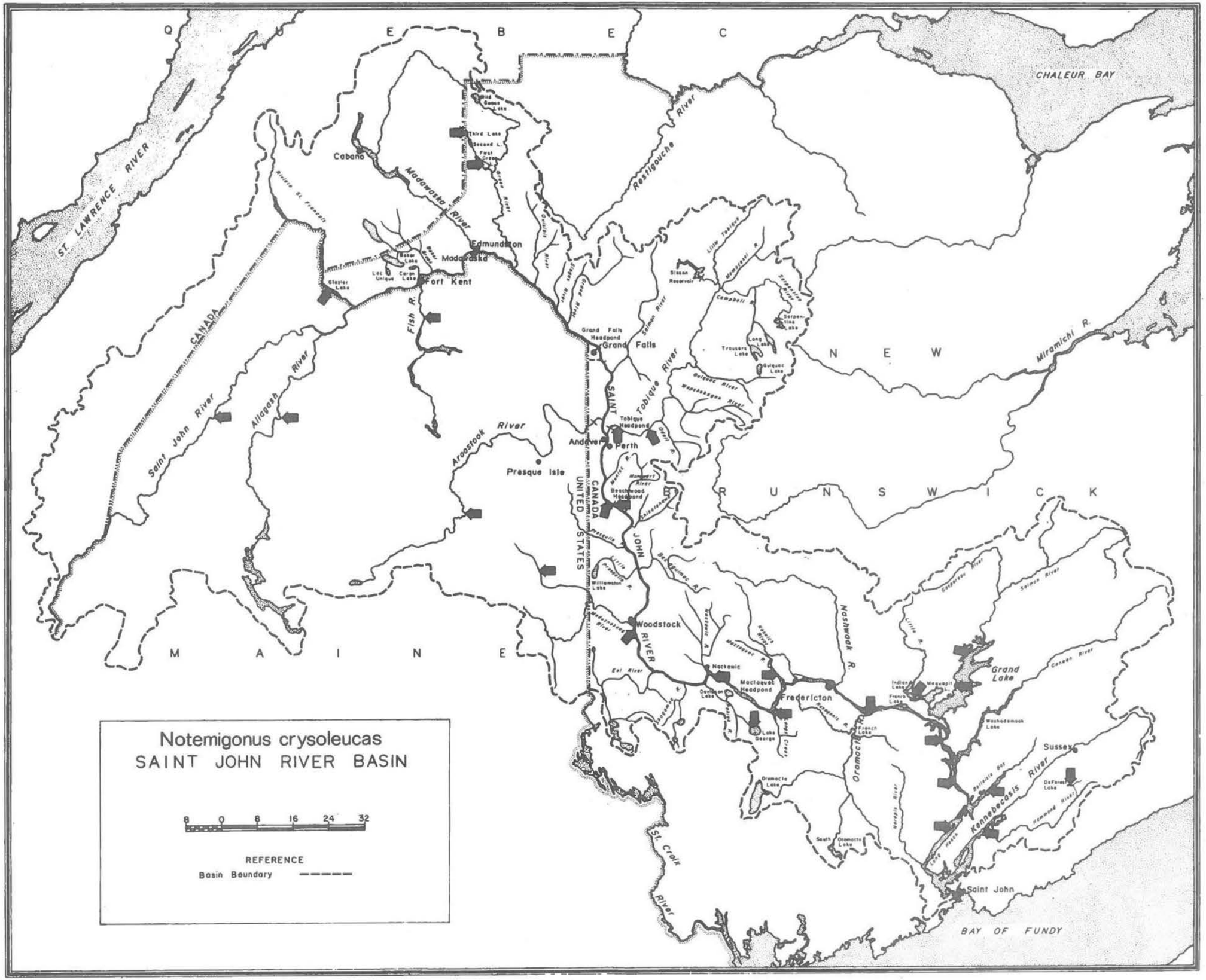
Kennebecasis River
Saint John


Notemigonus crysoleucas
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Restigouche River
Miramichi R.
Madawaska River
Allagash River
Aroostook River
Fish R.
Tobique River
Nashwaak R.
Oromocto R.
St. Croix River
Kennebecasis River
Cabano
Edmundston
Madawaska
Fort Kent
Presque Isle
Andover
Perth
Grand Falls
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Woodstock
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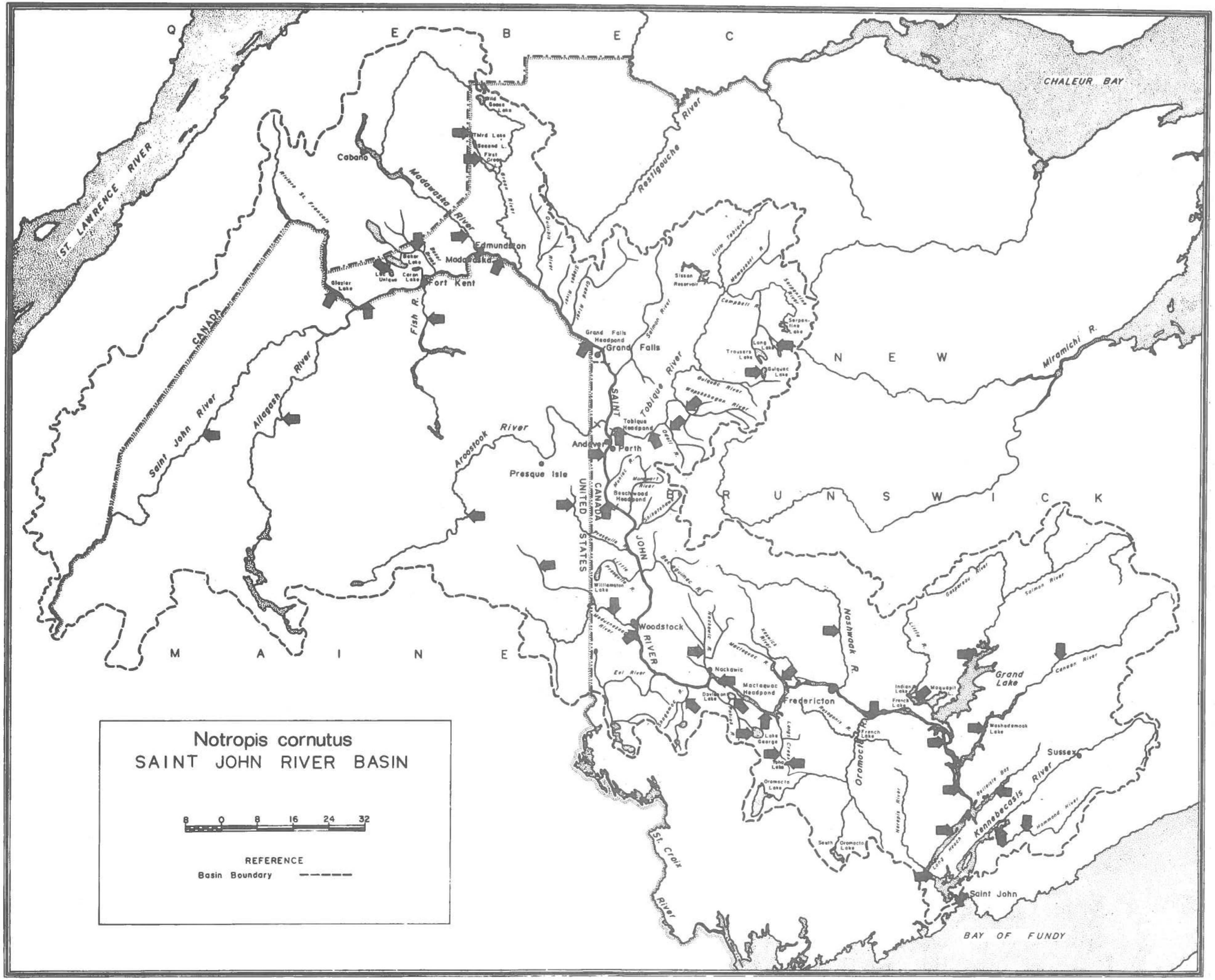
Fredericton
Grand Lake
Sussex
Saint John


Notropis cornutus
SAINT JOHN RIVER BASIN
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REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Fish R.
Madawaska River
Restigouche River
Miramichi R.
Aroostook River
Tobique River
Nashwaak R.
Oromocto R.
Kennebecasis River
St. Croix River
Cabano
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Fort Kent
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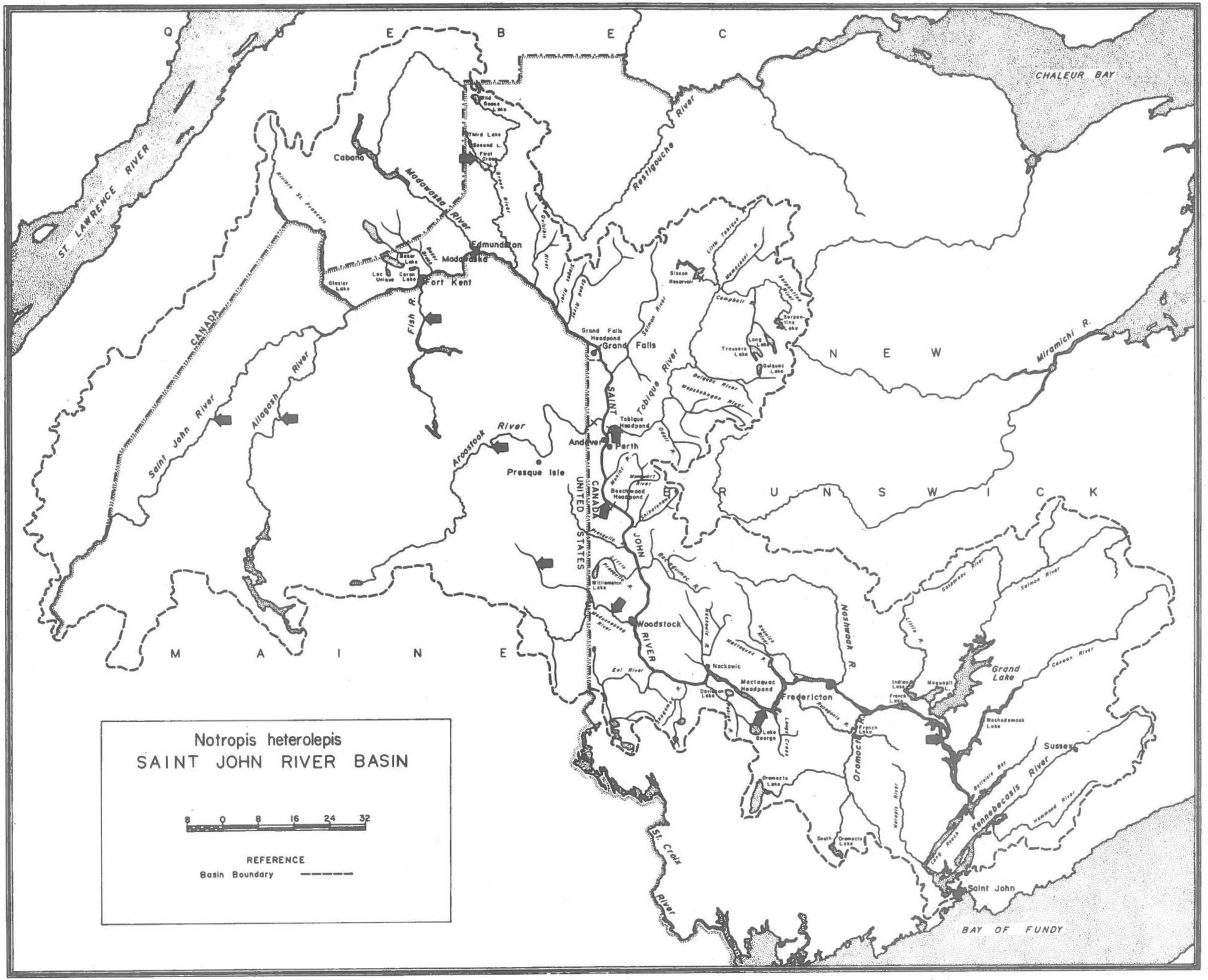
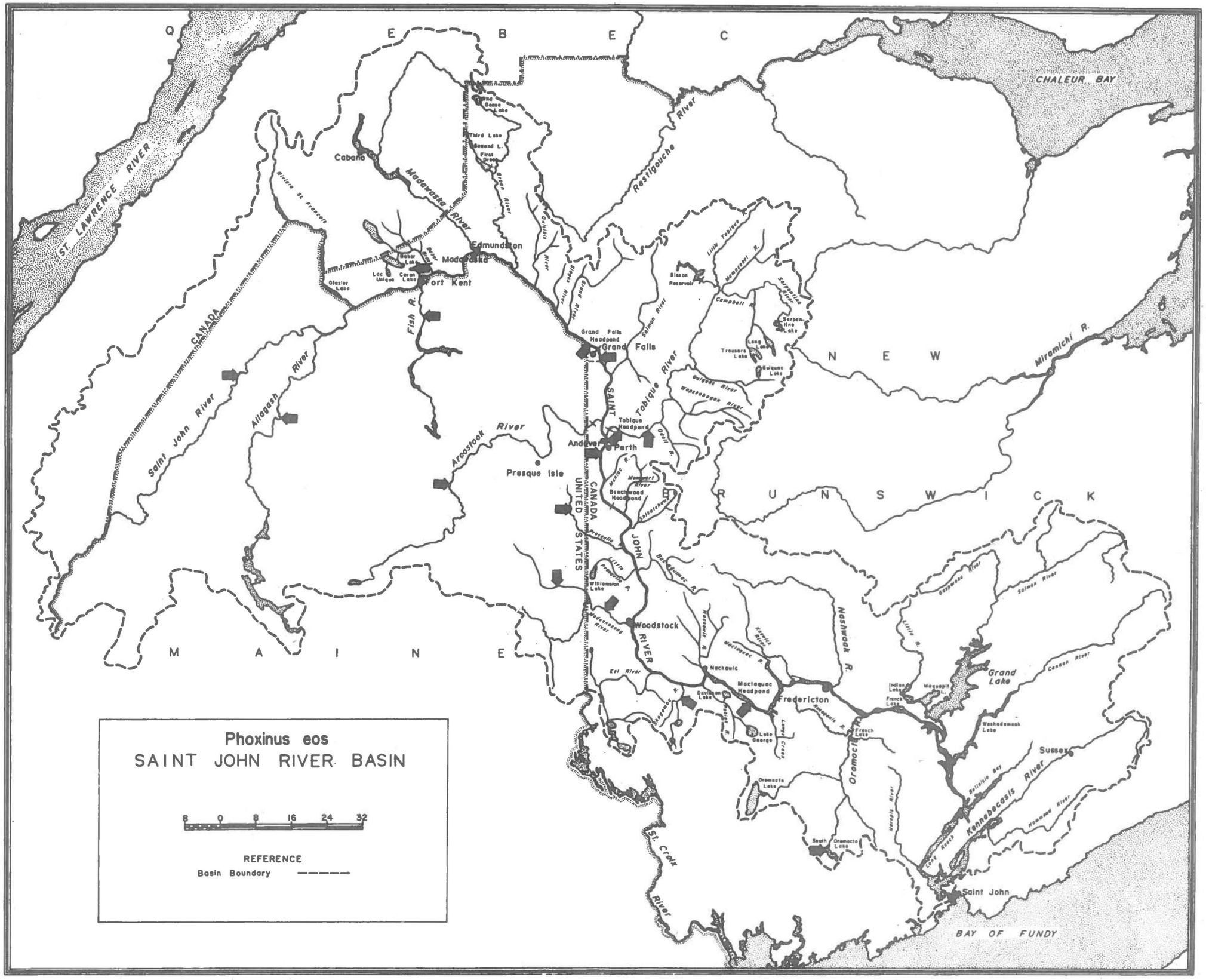
Andover
Perth
Presque Isle
Woodstock
Nackawic
Fredericton
Grand Lake
Sussex
Saint John


Notropis heterolepis
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CHALEUR BAY
CANADA
UNITED STATES
MAINE
NEW BRUNSWICK
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Fish R.
Allagash River
Saint John River
Aroostook River
Presque Isle
Restigouche River
Grand Falls Headpond
Grand Falls
Tobique River
Tobique Headpond
Andover
Perth
Beechwood Headpond
Woodstock
SAINT JOHN RIVER
Nackawic
Mactaquac Headpond
Fredericton
Lake George
Oromocto Lake
Nashwaak R.
Oromocto R.
St. Croix River
Miramichi R.
Grand Lake
Sussex
Kennebecasis River
Saint John
BAY OF FUNDY


Phoxinus eos
SAINT JOHN RIVER BASIN
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REFERENCE
Basin Boundary
QUEBEC
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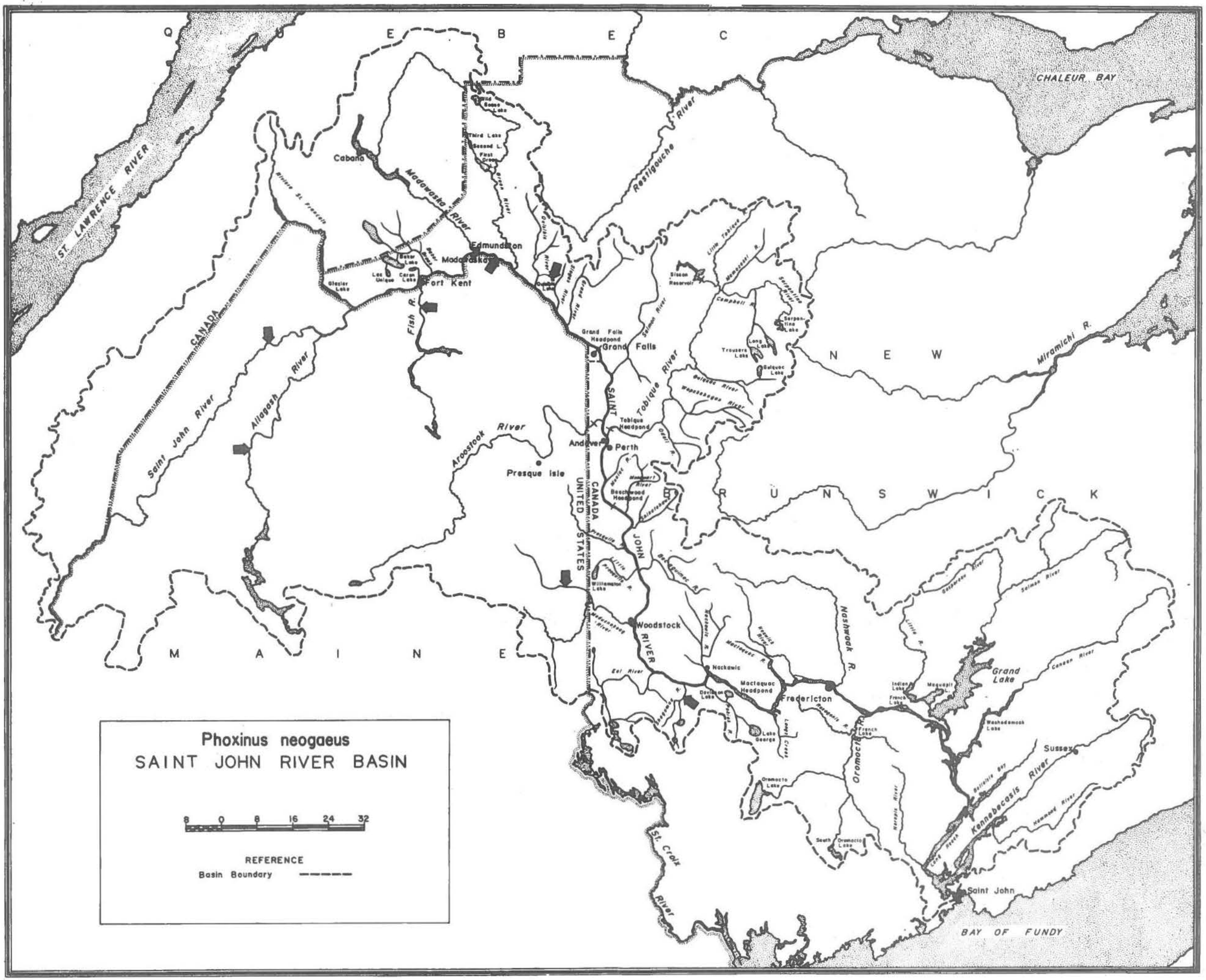
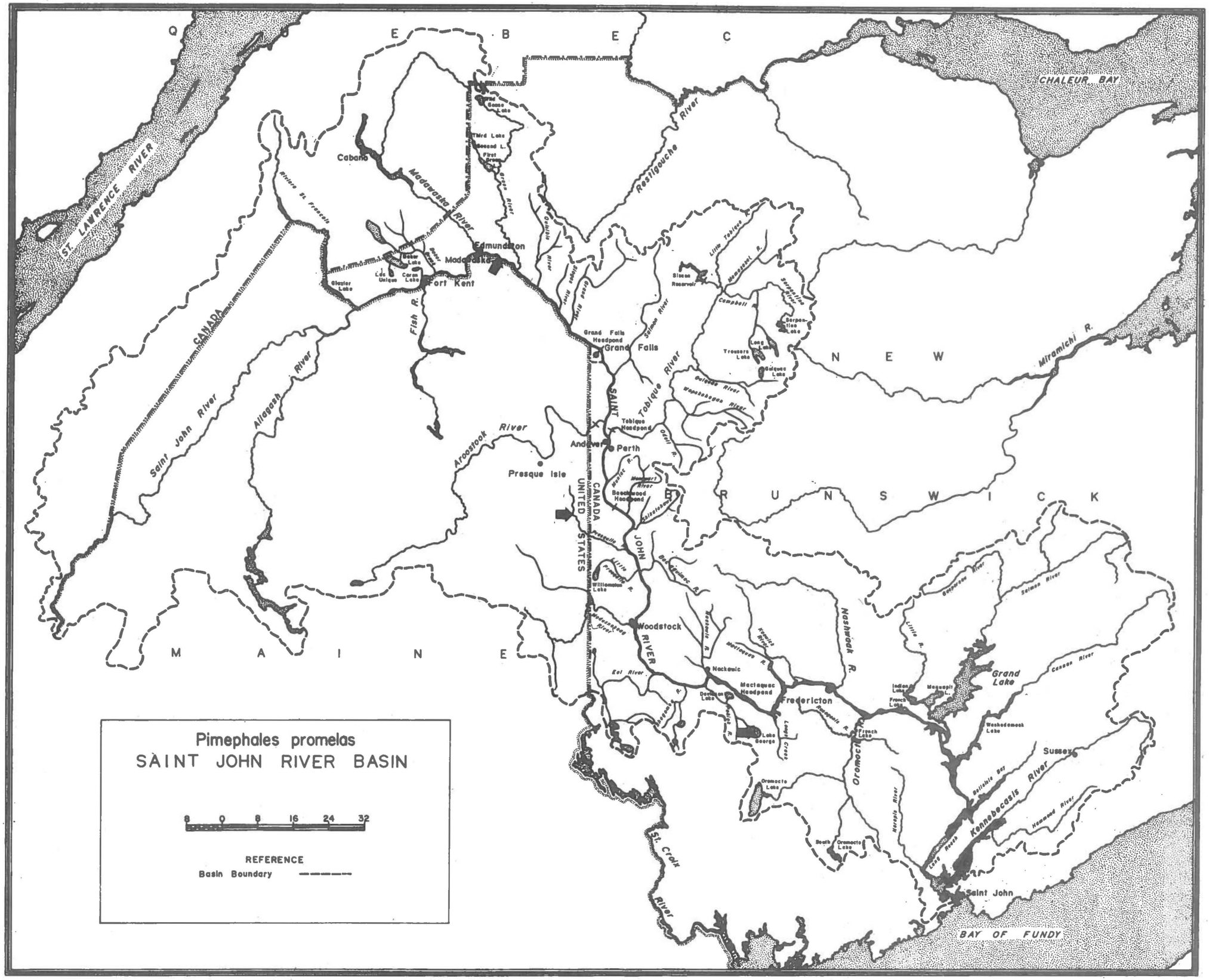
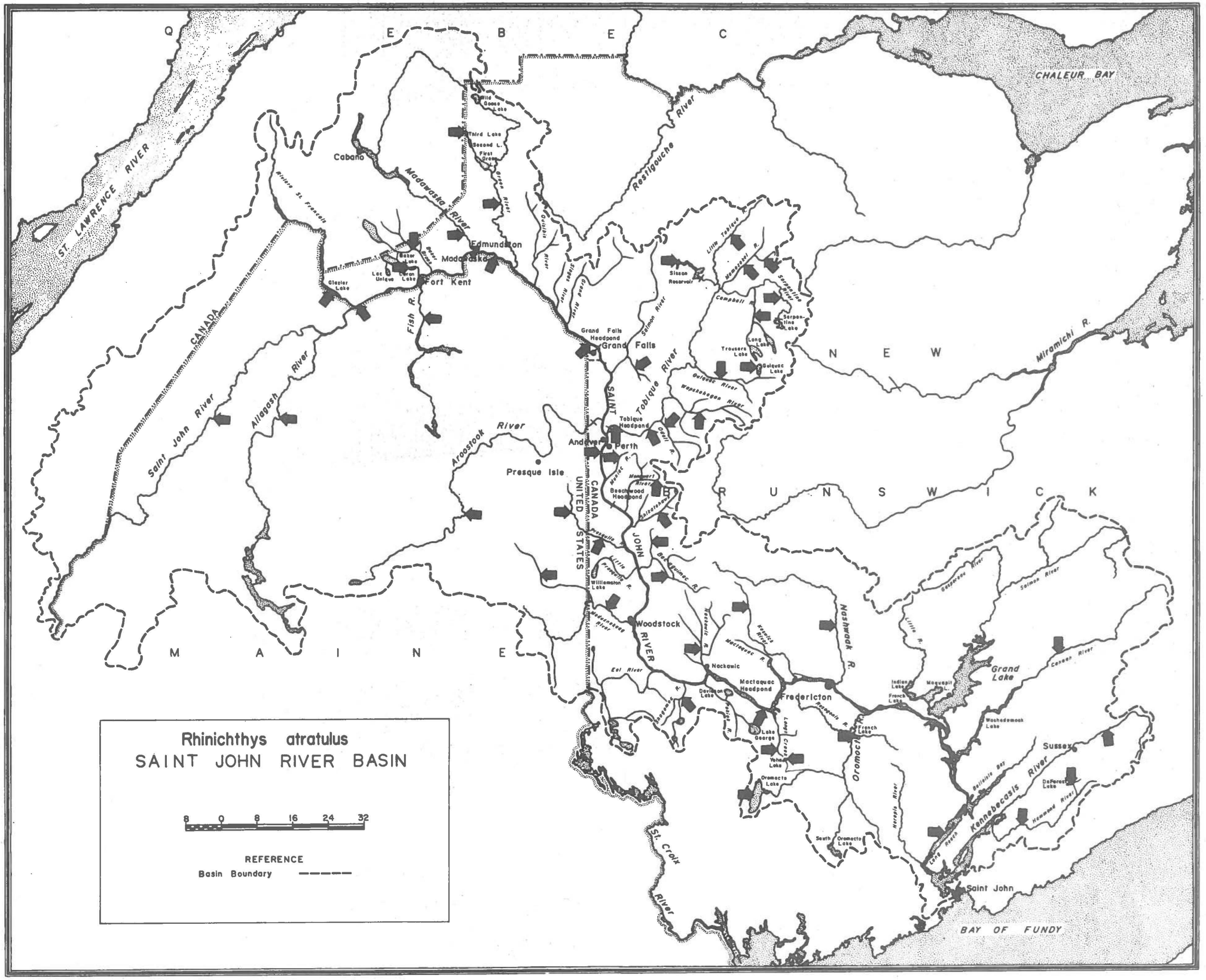
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Restigouche River
Miramichi R.
Tobique River
Nashwaak R.
Oromocto
Kennebecasis River
Cabano
Edmundston
Madawaska
Fort Kent
Presque Isle
Andover
Perth
Grand Falls
Woodstock
Nackawic
Fredericton
Oromocto
Sussex
Saint John
Grand Lake
Glazier Lake
Baker Lake
Lac Unique
Caron Lake
Third Lake
Second L.
First Grand Lake
Grand Falls Headpond
Tobique Headpond
Beechwood Headpond
Williamson Lake
Mactaquac Headpond
Lake George
Oromocto Lake
South Oromocto Lake
Indian Lake
French Lake
Mooseleuk Lake
Washademoak Lake
Trousers Lake
Long Lake
Gulquac Lake
Serpentine Lake
Sisson Reservoir
Little Tobique R.
Campbell
Salmon River
Wapskanegan River
Gulquac River
Quisibis River
Presque Isle
Meduxnekeag River
Becaguimec R.
Eel River
Keswick River
Macquac R.
Nashwaak R.
Gaspereau River
Canaan River
Hammond River
Belleisle Bay
Long Reach
Jemseg River
St. Croix River


Phoxinus neogaeus
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CHALEUR BAY
CANADA
Saint John River
Allagash River
Madawaska River
Cabano
Edmundston
Madawaska
Fort Kent
Fish R.
Restigouche River
Grand Falls
Grand Falls Headpond
Tobique River
Tobique Headpond
Andover
Perth
Presque Isle
Arcostook River
CANADA
UNITED STATES
MAINE
NEW BRUNSWICK
Miramichi R.
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Nashwaak R.
Oromocto R.
Oromocto Lake
St. Croix River
Grand Lake
Sussex
Kennebecasis River
Saint John
BAY OF FUNDY


Pimephales promelas
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CANADA
UNITED STATES
MAINE
NEW BRUNSWICK
CHALEUR BAY
BAY OF FUNDY
Cabano
Madawaska River
Edmundston
Fort Kent
Fish R.
Allagash River
Saint John River
Aroostook River
Presque Isle
Andover
Perth
Grand Falls
Grand Falls Headpond
SAINT JOHN RIVER
Tobique River
Tobique Headpond
Restigouche River
Miramichi R.
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Nashwaak R.
Oromocto Lake
St. Croix River
Grand Lake
Washademoak Lake
Sussex
Kennebecasis River
Saint John


Rhinichthys atratulus
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Restigouche River
Miramichi R.
SAINT JOHN RIVER
Tobique River
Nashwaak R.
Oromocto R.
St. Croix River
Kennebecasis River
Grand Lake
Cabano
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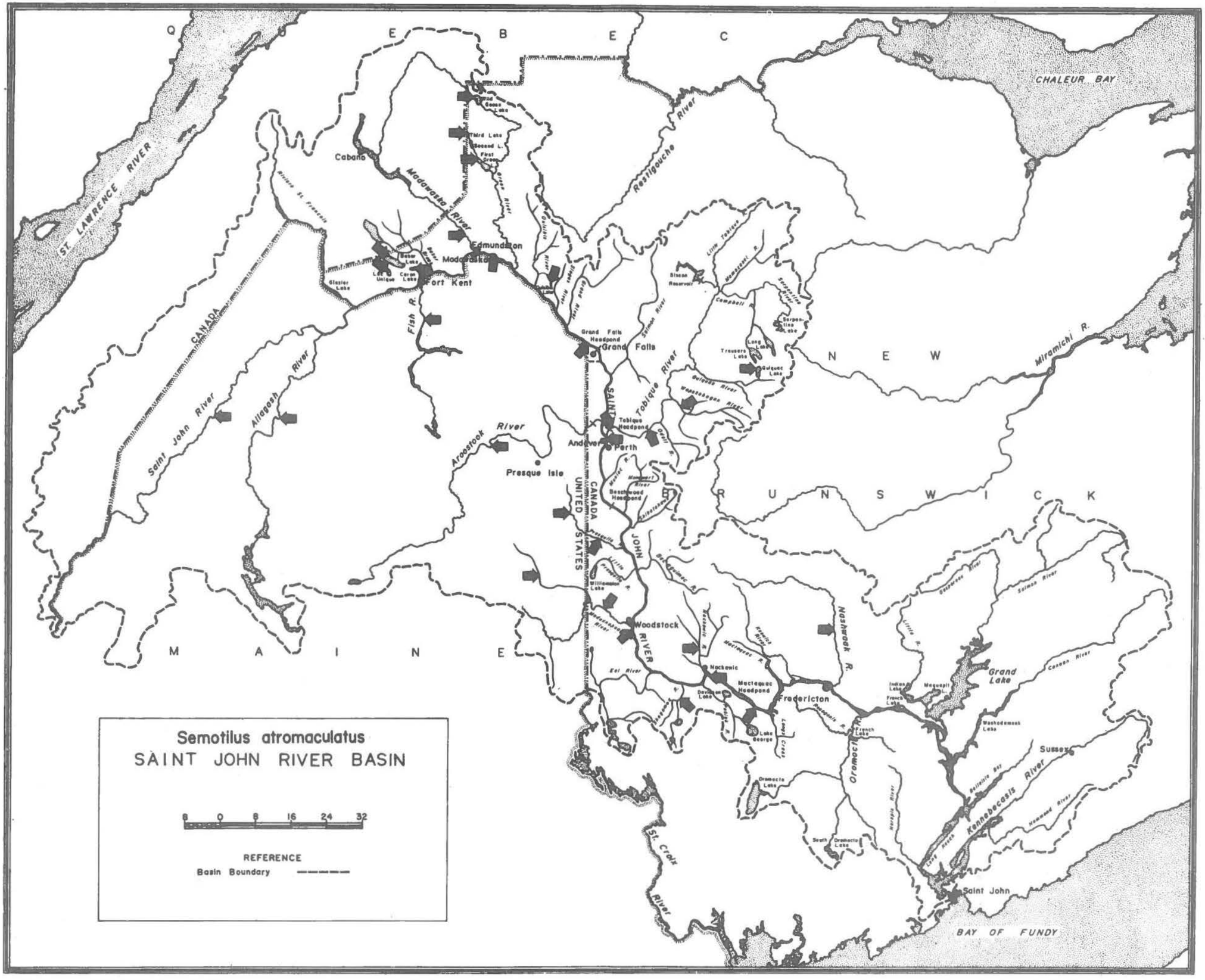
Saint John
Sussex


Semotilus atromaculatus
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Restigouche River
Miramichi R.
Tobique River
Nashwaak R.
Oromocto R.
Kennebecasis River
St. Croix River
Cabano
Edmundston
Madawaska
Fort Kent
Presque Isle
Andover
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Mactaquac Headpond
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Grand Lake
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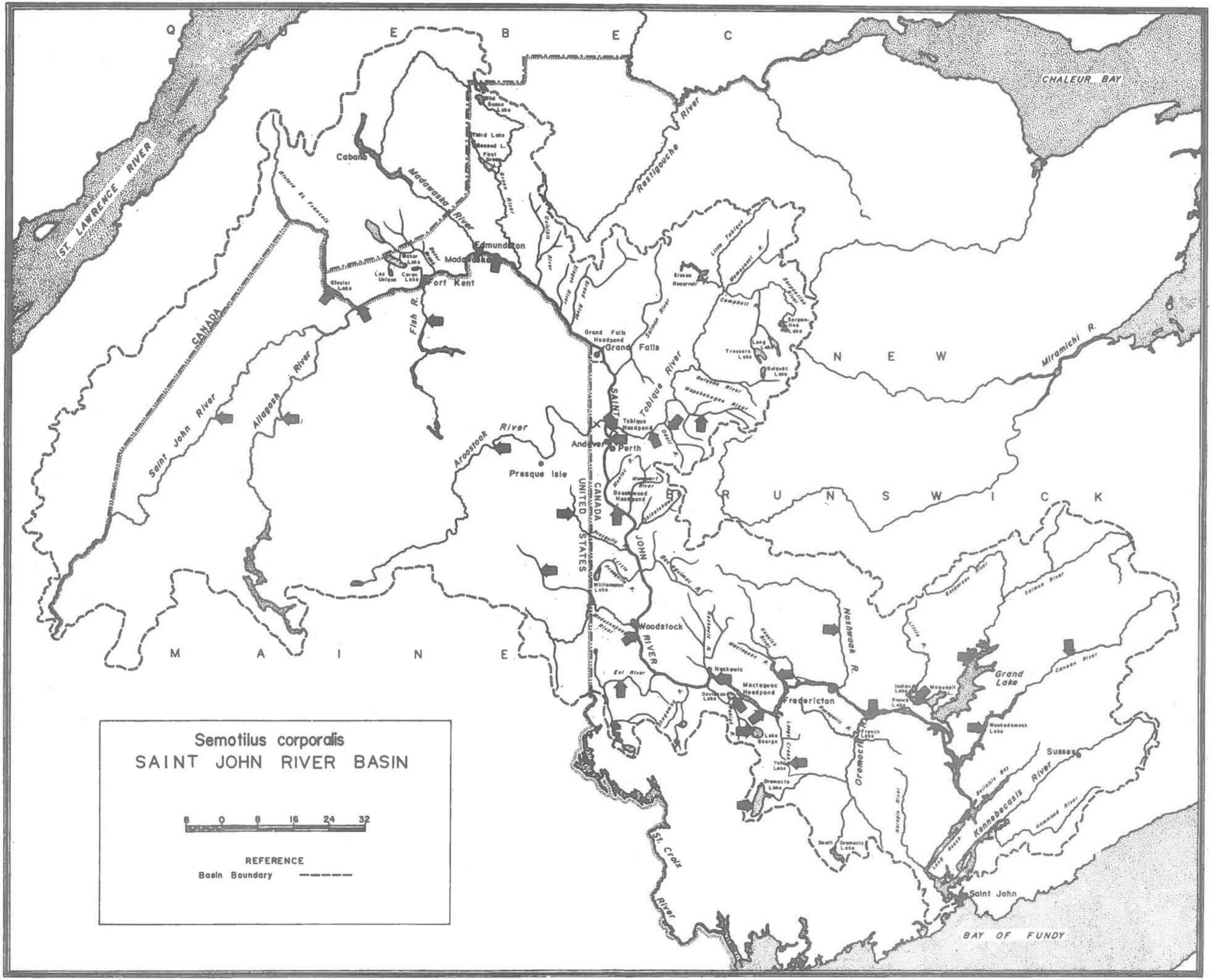
Saint John


Semotilus corporalis
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CHALEUR BAY
CANADA
UNITED STATES
M A I N E
N E W B R U N S W I C K
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Glazier Lake
Lac Unique
Caron Lake
Baker Lake
Rivière St. François
Fish R.
Allagash River
Saint John River
Restigouche River
Grand Falls
Grand Falls Headpond
Tobique River
Tobique Headpond
Andover
Perth
Presque Isle
Aroostook River
Beaverwood Headpond
Woodstock
SAINT JOHN RIVER
Nackawic
Mactaquac Headpond
Fredericton
Oromocto
Nashwaak R.
Grand Lake
Sussex
Kennebecasis River
Saint John
BAY OF FUNDY
St. Croix River

Semotilus margarita

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

QUEBEC

NEW BRUNSWICK

MAINE

CANADA

UNITED STATES

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

Restigouche River

Matapedia River

Cabano

Edmundston

Madawaska

Fort Kent

Baker Lake

Lac Unique

Caron Lake

Glacier Lake

Fish R.

Allagash River

Saint John River

Aroostook River

Presque Isle

Grand Falls Headpond

Grand Falls

SAINT JOHN RIVER

Tobique River

Tobique Headpond

Andover

Perth

Beechwood Headpond

Williamson Lake

Woodstock

Nackawic

Mactaquac Headpond

Fredericton

Lake George

Oromocto Lake

South Oromocto Lake

St. Croix River

Nashwaak R.

Killarney Lake

Grand Lake

Oromocto R.

Kennebecasis River

Sussex

Saint John

Miramichi R.

Trousers Lake

Quiquac Lake

Serpentine Lake

Campbell

Salmon River

Canaan River

Washademoak Lake

Indian Lake

Maquapit L.

French Lake

Williamson Lake

Woodstock

Nackawic

Mactaquac Headpond

Fredericton

Killarney Lake

Grand Lake

Sussex

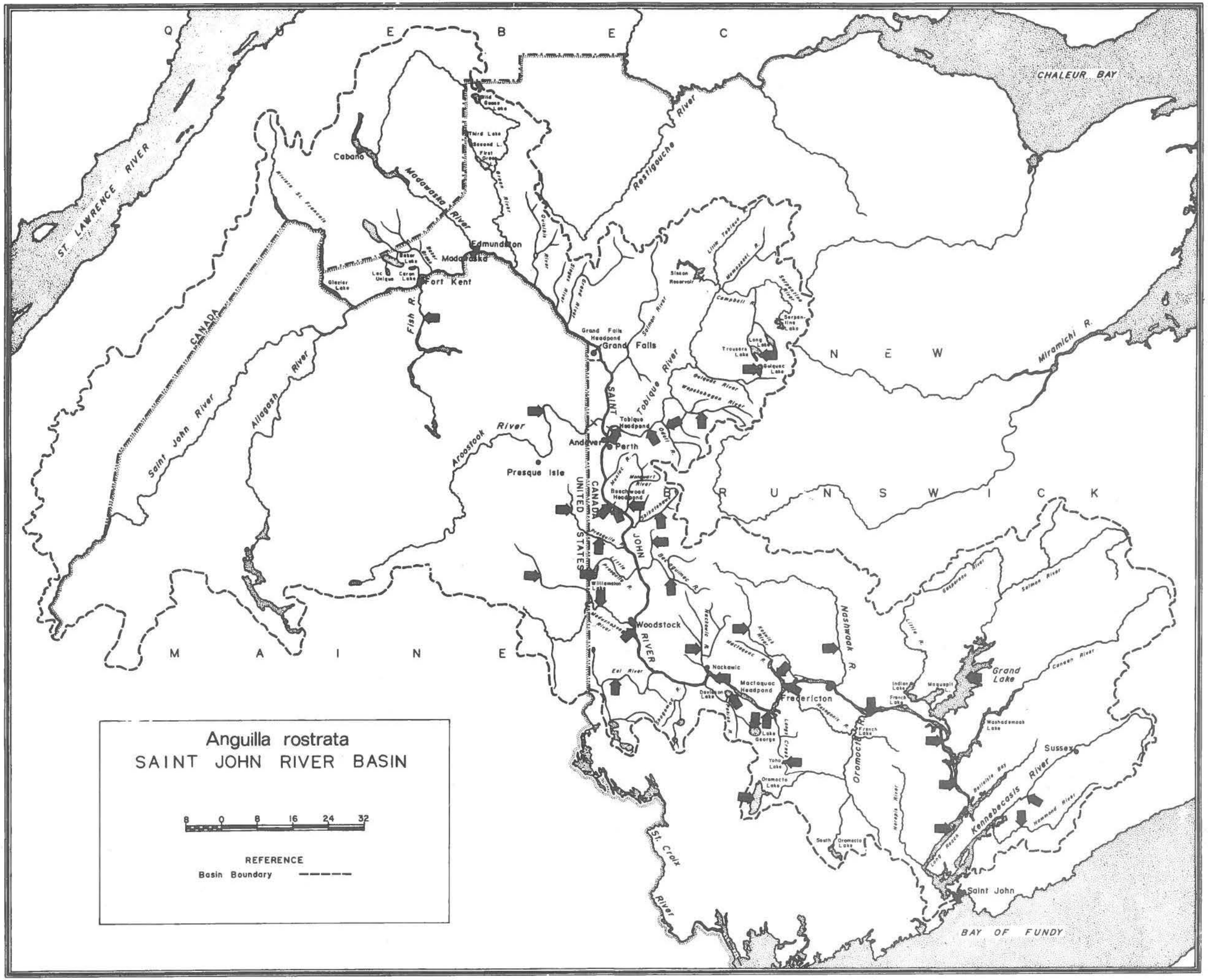
Saint John

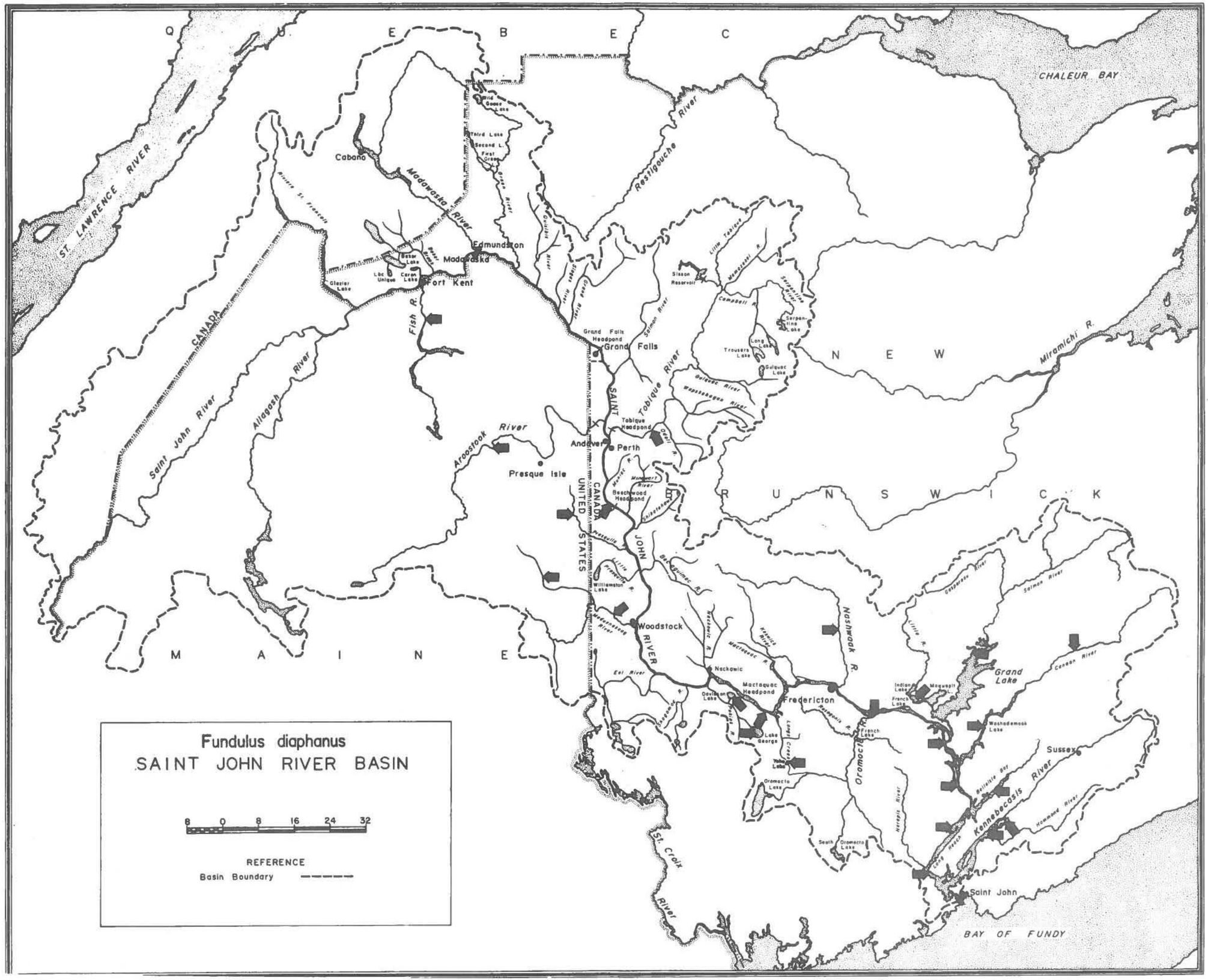
Ictalurus nebulosus
SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE
Basin Boundary ------

ST. LAWRENCE RIVER
CHALEUR BAY
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Fish R.
Allagash River
Saint John River
Aroostook River
Presque Isle
Restigouche River
Grand Falls
Tobique River
Andover
Perth
Miramichi R.
Woodstock
Nackawic
Fredericton
Grand Lake
Nashwaak R.
Oromocto L.
Sussex
Kennebecasis River
Saint John
St. Croix River
BAY OF FUNDY


Anguilla rostrata
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Aroostook River
Fish R.
Restigouche River
Matapedia River
Cascapedia River
Nepisiguit R.
Tobique River
Miramichi R.
Cabano
Edmundston
Madawaska
Fort Kent
Grand Falls
Andover
Perth
Presque Isle
Baskahegan River
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Oromocto Lake
Grand Lake
Sussex
Kennebecasis River
Saint John
St. Croix River
Nashwaak R.
Oromocto R.


Fundulus diaphanus
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Restigouche River
Miramichi R.
Tobique River
Nashwaak R.
Oromocto R.
Kennebecasis River
St. Croix River
Cabano
Edmundston
Madawaska
Fort Kent
Presque Isle
Andover
Perth
Grand Falls
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Grand Lake
Sussex
Saint John

Apeltes quadracus

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

QUEBEC

NEW BRUNSWICK

MAINE

CANADA

UNITED STATES

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

Restigouche River

Matapedia River

Cascapedia River

Little Tobique

Nepisiguit R.

Sisson Reservoir

Campbell R.

Serpentine Lake

Miramichi R.

Trousers Lake

Long Lake

Gulquac Lake

Gulquac River

Wapabagees River

Tobique River

Tobique Headpond

Quisibis R.

Grand Falls Headpond

Grand Falls

Stillman River

Grand River

Madawaska River

Cabano

Edmundston

Madawaska

Baker Lake

Baker Brook

Loc B Unique

Caron Lake

Glazier Lake

Fort Kent

Fish R.

Rivière St. François

Allagash River

Saint John River

Aroostook River

Presque Isle

Andover

Perth

Madawaska R.

Beechwood Headpond

Beechwood Dam

Tobique R.

Little Presque Isle

Williamston Lake

Woodstock

Meduxnekeag River

Eel River

Becaguimec R.

Nackawic

Mactaquac Headpond

Mactaquac Dam

Fredericton

Devidson Lake

Lake George

Keswick R.

Mactaquac R.

Nashwaak R.

Oromocto R.

Oromocto Lake

South Oromocto Lake

Hayseys River

Lake Utopia

Little R.

Gaspereau River

Salmon River

Grand Lake

Canoes River

Indian Lake

Maquapit L.

French Lake

Washademoak Lake

Sussex

Belleisle Bay

Kennebecasis River

Hammond River

Saint John

St. Croix River

Gasterosteus aculeatus

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

Q E B E C

N E W B R U N S W I C K

M A I N E

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

CANADA

UNITED STATES

Saint John River

Allagash River

Aroostook River

Fish R.

Madawaska River

Restigouche River

Miramichi R.

Tobique River

Nashwaak R.

Oromocto R.

Kennebecasis River

St. Croix River

Cabano

Edmundston

Madawaska

Fort Kent

Grand Falls

Andover

Perth

Tobique Headpond

Presque Isle

Woodstock

Nackawic

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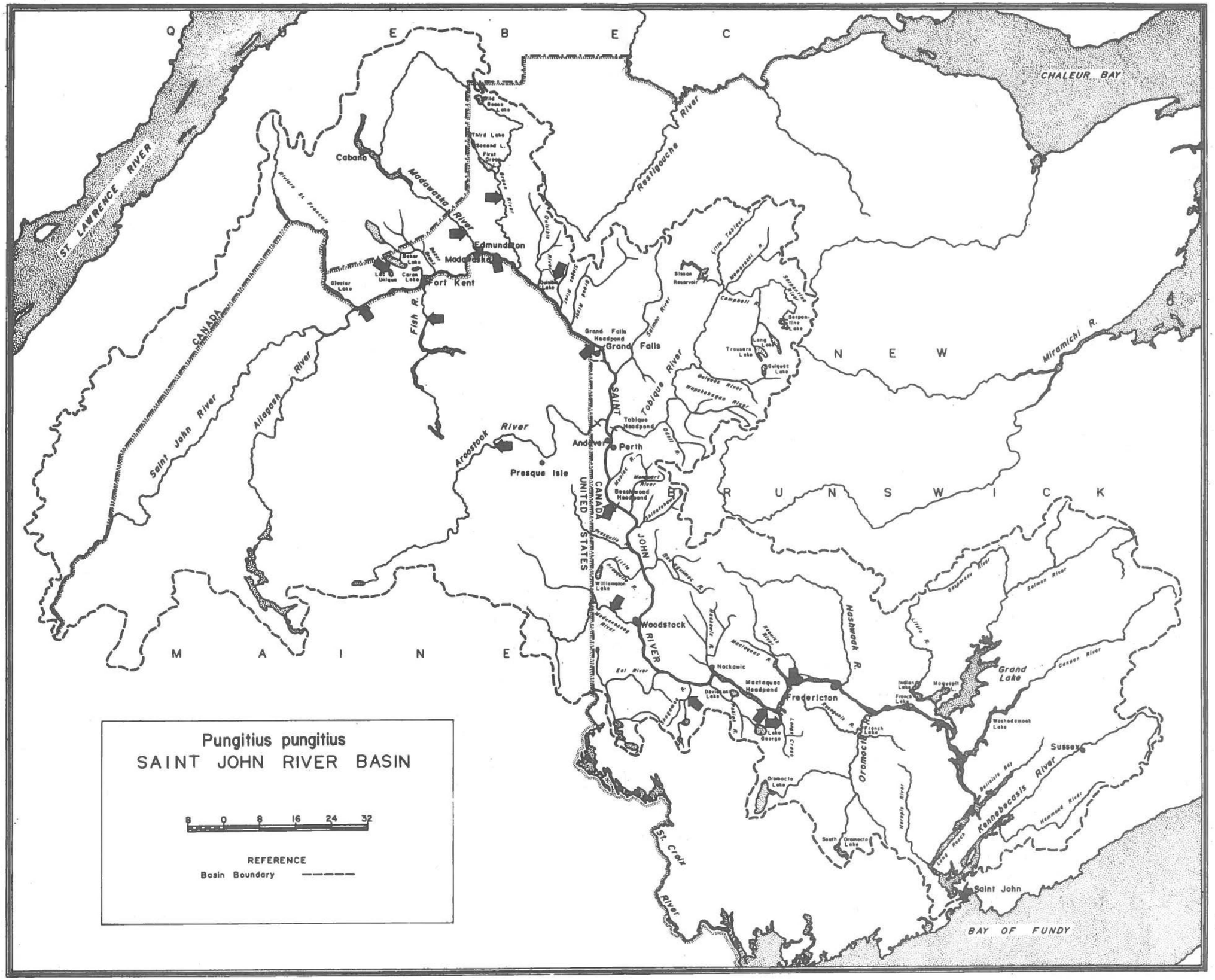
Fredericton

Grand Lake

Sussex

Saint John


Pungitius pungitius
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
ST. LAWRENCE RIVER
CHALEUR BAY
CANADA
UNITED STATES
Saint John River
Allagash River
Aroostook River
Presque Isle
Cabano
Madawaska River
Edmundston
Fort Kent
Fish R.
Restigouche River
Grand Falls
Grand Falls Headpond
Tobique River
Tobique Headpond
Andover
Perth
Beechwood Headpond
Miramichi R.
Trousers Lake
Long Lake
Quiquac Lake
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Lake George
Oromocto Lake
South Oromocto Lake
St. Croix River
Nashwaak R.
Oromocto R.
Grand Lake
Sussex
Kennebecasis River
Saint John
BAY OF FUNDY

Lota lota
SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

Microgadus tomcod

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

CANADA

UNITED STATES

M A I N E

N E W B R U N S W I C K

Cabano

Madawaska River

Edmundston

Madawaska

Fort Kent

Fish R.

Allagash River

Saint John River

Aroostook River

Presque Isle

Restigouche River

Grand Falls

Tobique River

Andover

Perth

Woodstock

Nackawic

Fredericton

Oromocto R.

Nashwaak R.

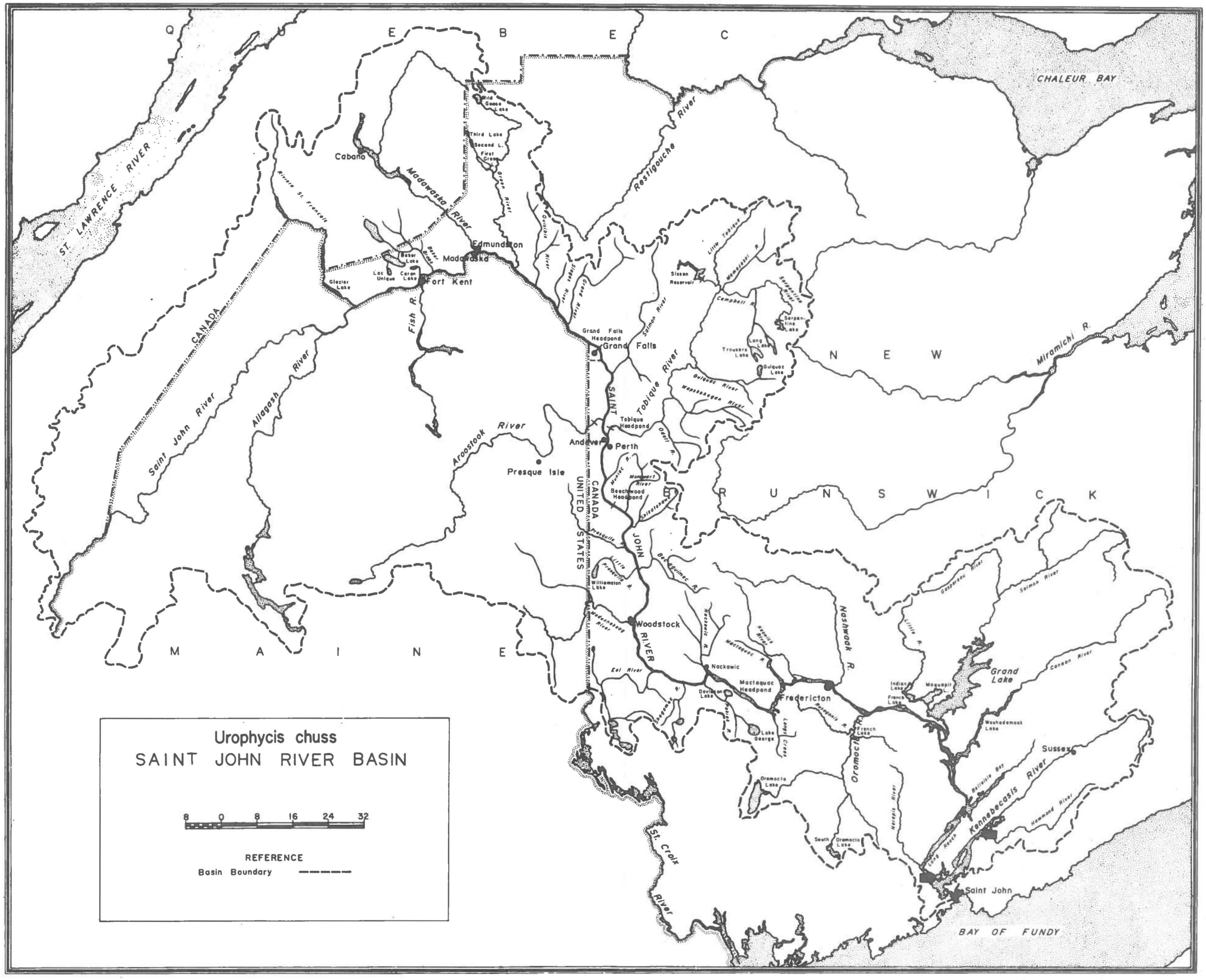
Miramichi R.

Sussex

Kennebecasis River

Saint John

St. Croix River


Urophycis chuss
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST. LAWRENCE RIVER
CHALEUR BAY
BAY OF FUNDY
Restigouche River
Miramichi R.
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Tobique River
Nashwaak R.
Oromocto R.
Kennebecasis River
St. Croix River
Cabano
Edmundston
Madawaska
Fort Kent
Grand Falls
Andover
Perth
Presque Isle
Woodstock
Nackawic
Fredericton
Sussex
Saint John
Grand Lake

Morone americana

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

QUEBEC

NEW BRUNSWICK

MAINE

CANADA

UNITED STATES

ST. LAWRENCE RIVER

Saint John River

Allagash River

Aroostook River

Fish R.

Madawaska River

Restigouche River

CHALEUR BAY

Miramichi R.

Tobique River

Nashwaak R.

Oromocto R.

Kennebecasis River

St. Croix River

Cabano

Edmundston

Madawaska

Fort Kent

Grand Falls Headpond

Grand Falls

Andover

Perth

Presque Isle

Beechwood Headpond

Tobique Headpond

Woodstock

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Mactaquac Headpond

Fredericton

Lake George

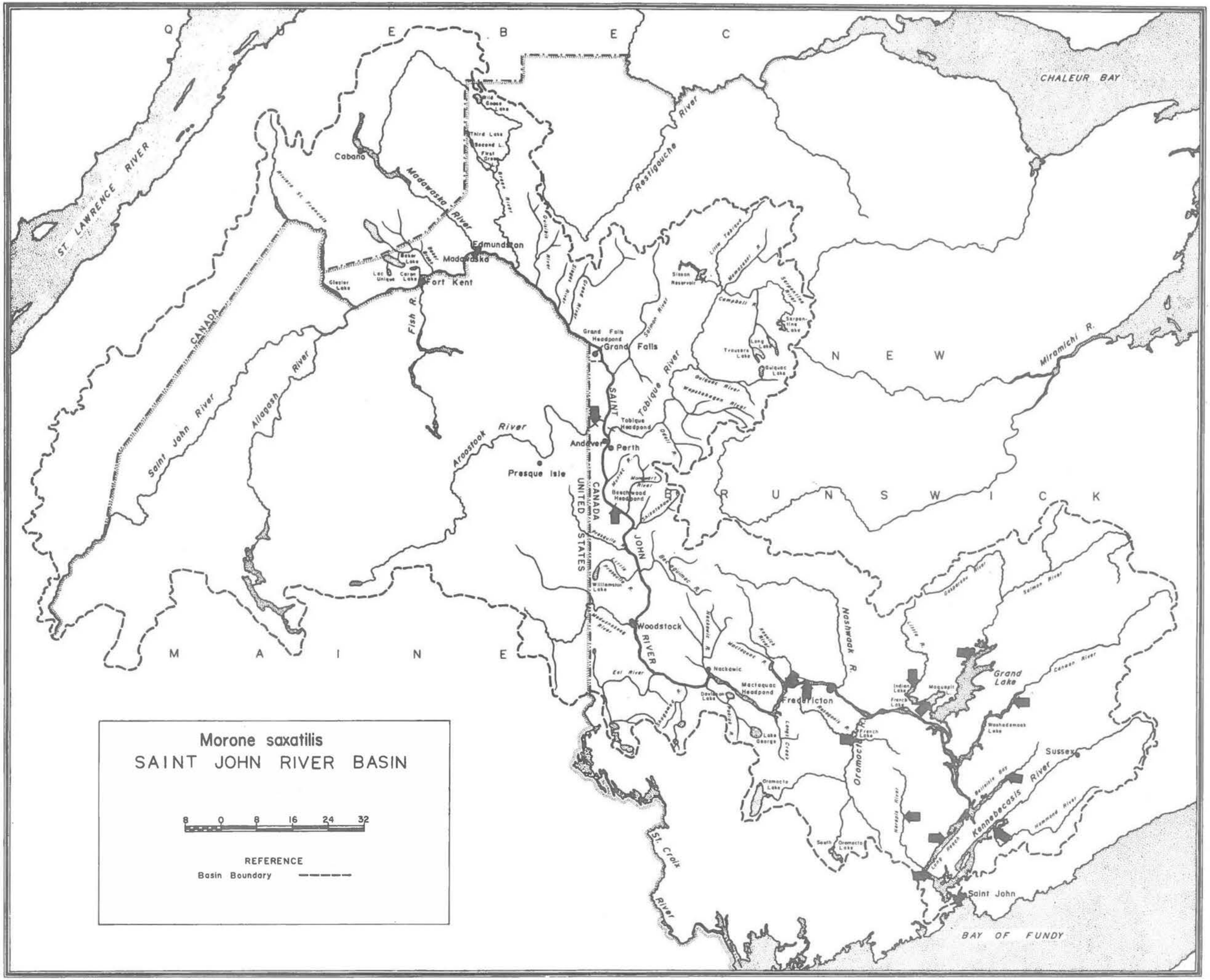
Oromocto Lake

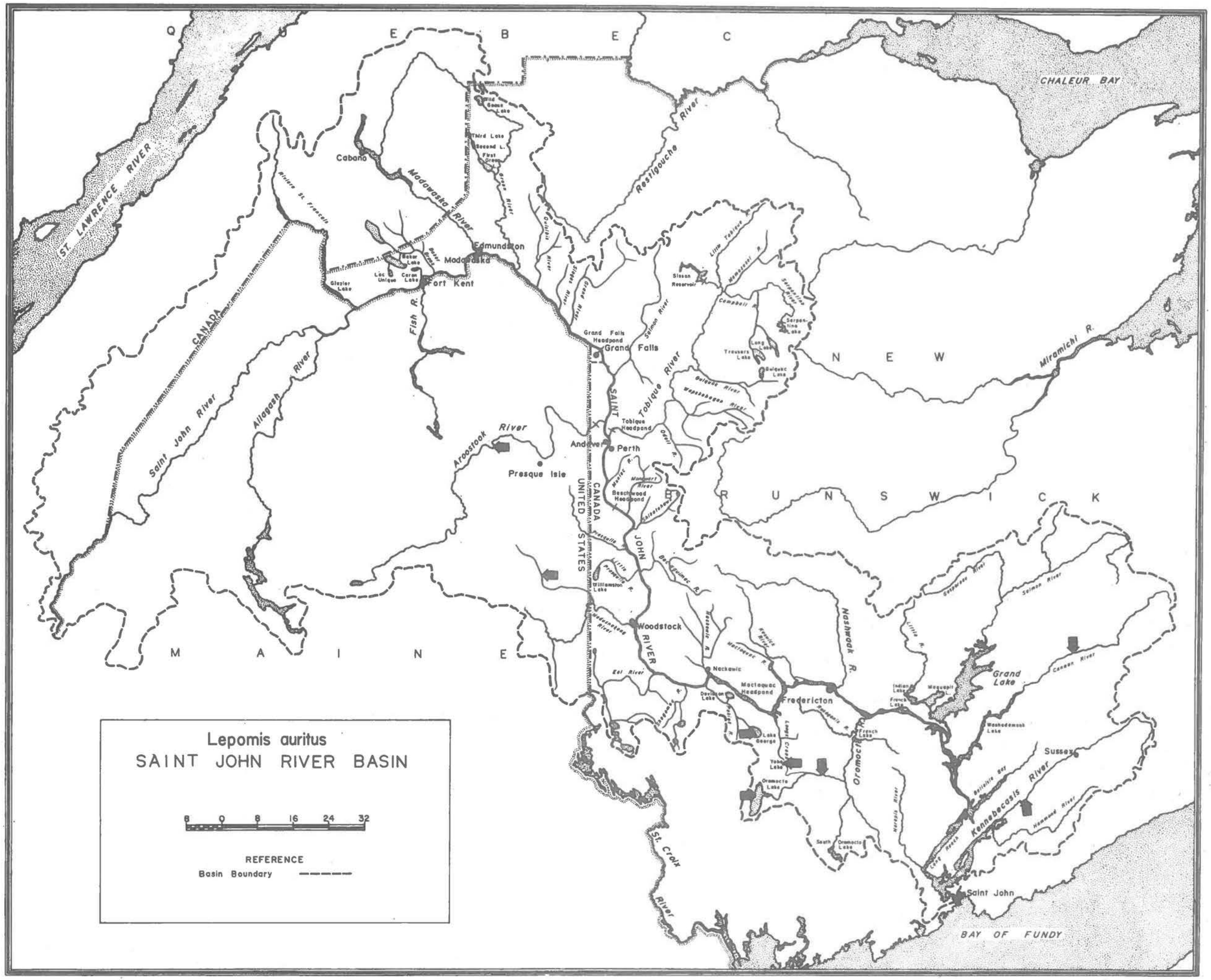
Sussex

Grand Lake

Saint John

BAY OF FUNDY


Morone saxatilis
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
NEW BRUNSWICK
MAINE
CANADA
UNITED STATES
ST LAWRENCE RIVER
CHALEUR BAY
Restigouche River
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Fish R.
Allagash River
Saint John River
Aroostook River
Presque Isle
Grand Falls
Tobique River
Andover
Perth
Miramichi R.
SAINT JOHN RIVER
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Oromocto R.
Nashwaak R.
Grand Lake
Sussex
Kennebecasis River
Saint John
St. Croix River
BAY OF FUNDY


Lepomis auritus
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
QUEBEC
MAINE
NEW BRUNSWICK
ST. LAWRENCE RIVER
CHALEUR BAY
CANADA
UNITED STATES
Saint John River
Allagash River
Aroostook River
Fish R.
Restigouche River
Matapedia River
Miramichi R.
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Glazier Lake
Lac Unique
Caron Lake
Baker Lake
Baker Brook
Rivière St. François
Green River
Grand Falls Headpond
Grand Falls
Salmon River
Tobique River
Tobique Headpond
Perth
Andover
Presque Isle
Beechwood Headpond
Mattawamkeag River
Meduxnekeag River
Prestville
Little Presque Isle R.
Williamston Lake
Woodstock
Eel River
Nackawic
Mactaquac Headpond
Fredericton
Davidson Lake
Lake George
Yoho Lake
Oromocto Lake
South Oromocto Lake
Oromocto River
Nashwaak R.
Nashoba River
St. Croix River
Grand Lake
Indian Lake
French Lake
Washademoak Lake
Sussex
Kennebecasis River
Hammond River
Canaan River
Salmon River
Gaspereau River
Little R.
Saint John
BAY OF FUNDY
Sisson Reservoir
Little Tobique R.
Campbell
Serpentine Lake
Trousers Lake
Long Lake
Bulgaac Lake
Bulgaac River
Wapskanegan River
Quisibis R.
Mactaquac R.
Nashwaak R.
Becaguimec R.
Meduxnekeag R.
Little Presque Isle R.
Presque Isle R.
Mattawamkeag R.
Shiretown R.
Prestville
Second L.
First Grand Lake
Third Lake
Second Grand Lake
Green River
Grand River
Quisibis River
Little Tobique R.
Campbell
Serpentine River
Bellisle Bay
Lake Kenah

Lepomis gibbosus

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

Q U E B E C

N E W B R U N S W I C K

M A I N E

CANADA

UNITED STATES

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

Restigouche River

Matapedia R.

Cascapedia River

Upsalquitch River

Little Tobique

Sisson Reservoir

Campbell

Serpentine

Serpentine Lake

Long Lake

Trousers Lake

Gulquac Lake

Gulquac River

Wapskanegan River

Miramichi R.

Tobique River

Grand Falls Headpond

Grand Falls

Salmon River

Tobique Headpond

Andover

Perth

Aroostook River

Presque Isle

Meduxnekeag R.

Beechwood Headpond

Chiputneticook

Prestile

Little Presque

Williamston Lake

Meduxnekeag River

Woodstock

SAINT JOHN RIVER

Eel River

Becaguimec R.

Nackawic

Meritimeguac R.

Keswick R.

Keswick River

Mactaquac Headpond

Davidson Lake

Lake George

Yoho Lake

Oromocto Lake

Fredericton

Nashwaak R.

Killarney Lake

Indian Lake

Magaguadavic Lake

French Lake

Grand Lake

Canaan River

Washademoak Lake

Sussex

Kennebecasis River

DeForest Lake

Hammond River

Belleisle Bay

Oromocto River

Oromocto Lake

South Oromocto Lake

St. Croix River

Saint John

Saint John River

Allagash River

Fish R.

Madawaska River

Cabano

Third Lake

Second L.

First Grand Lake

Edmundston

Madawaska

Baker Lake

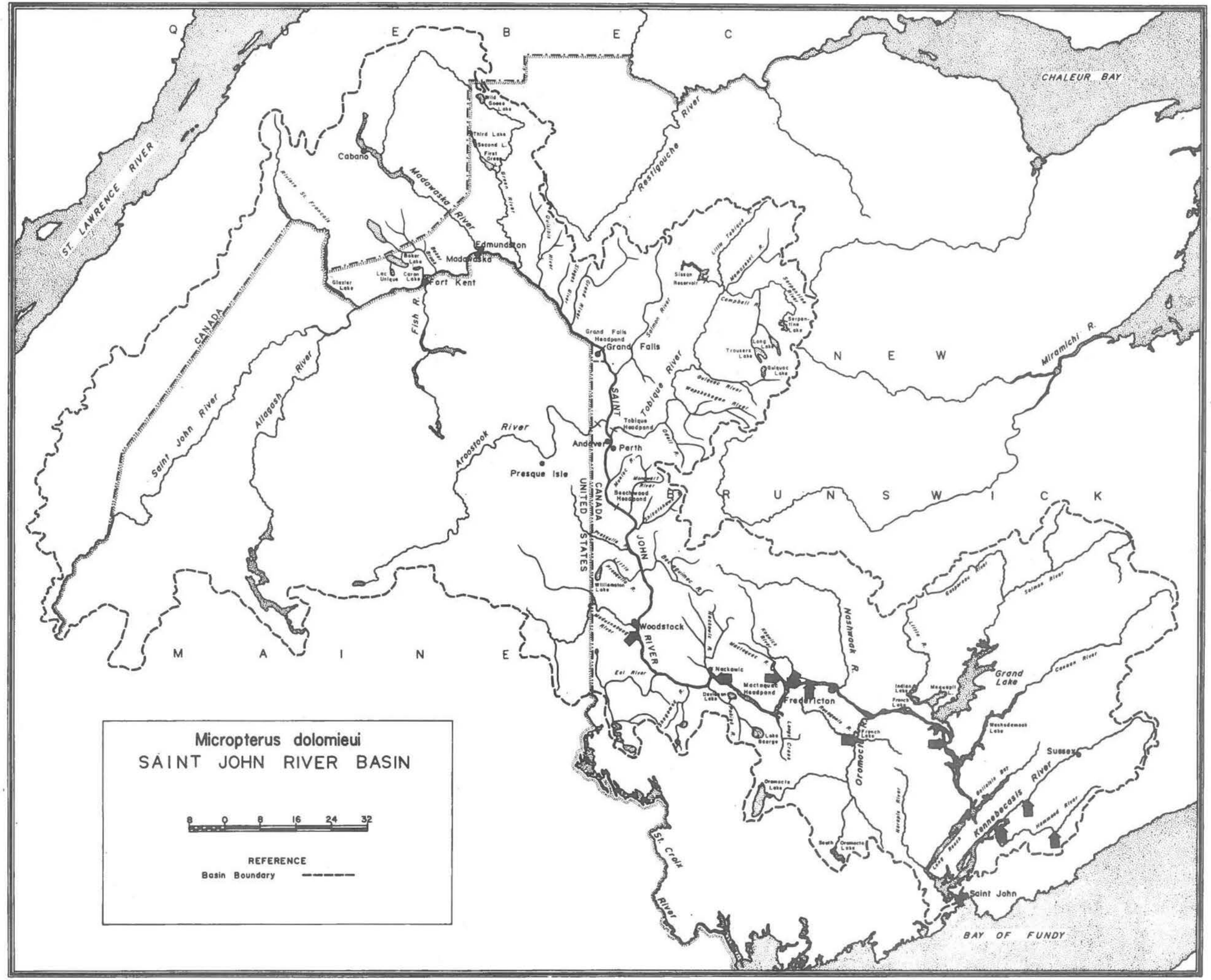
Lac Unique

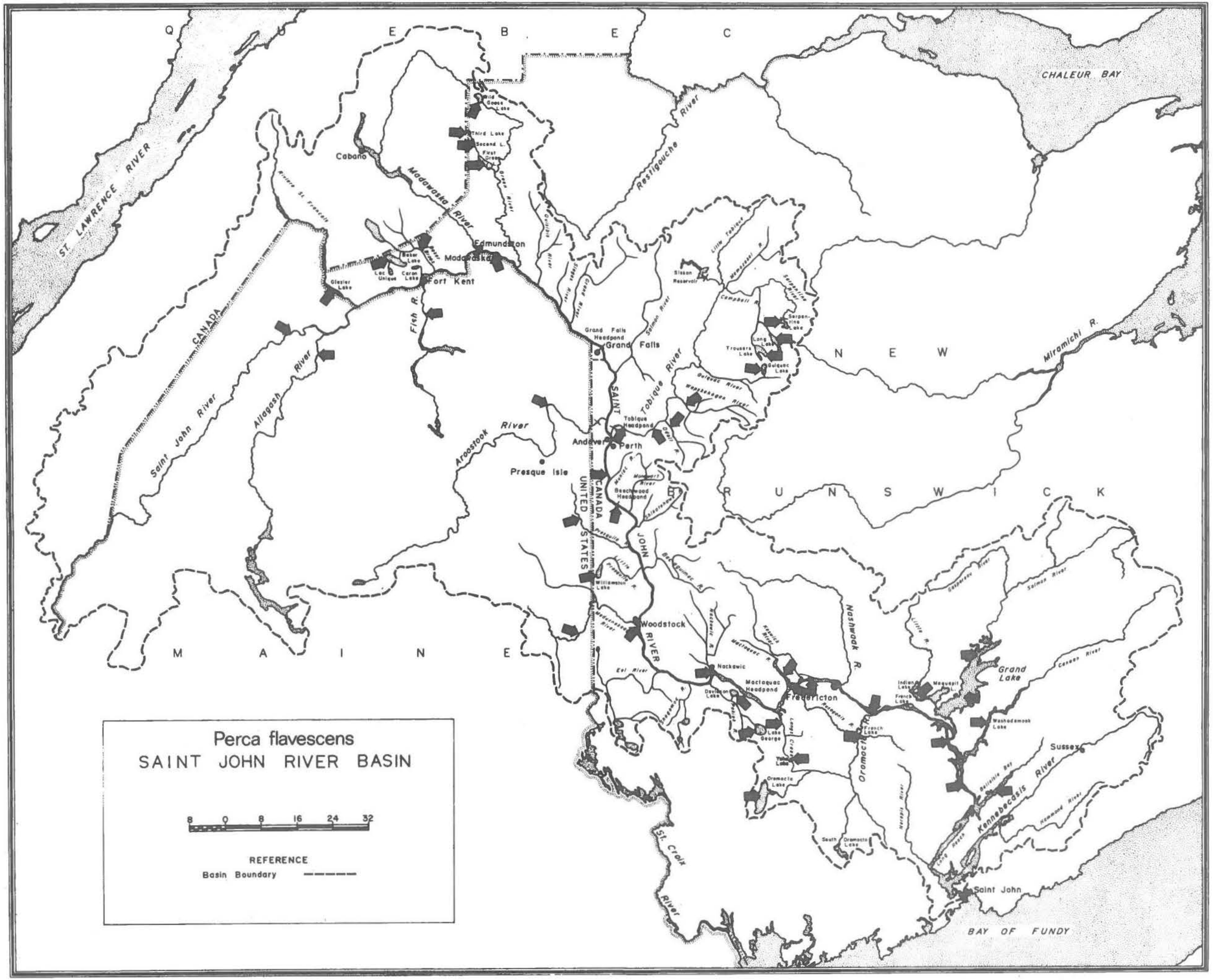
Caron Lake

Fort Kent

Glazier Lake

Rivière St. François


Micropterus dolomieui
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CANADA
UNITED STATES
MAINE
NEW BRUNSWICK
CHALEUR BAY
BAY OF FUNDY
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Fish R.
Allagash River
Saint John River
Aroostook River
Presque Isle
Restigouche River
Grand Falls
Tobique River
Andover
Perth
Woodstock
SAINT JOHN RIVER
Nackawic
Fredericton
Oromocto
Grand Lake
Sussex
Kennebecasis River
Saint John
St. Croix River
Miramichi R.
Nashwaak R.


Perca flavescens
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CANADA
UNITED STATES
MAINE
NEW BRUNSWICK
CHALEUR BAY
BAY OF FUNDY
Saint John River
Allagash River
Aroostook River
Fish R.
Madawaska River
Restigouche River
Tobique River
Miramichi R.
St. Croix River
Nashwaak R.
Oromocto Lake
Grand Lake
Kennebecasis River
Cabano
Edmundston
Madawaska
Fort Kent
Presque Isle
Andover
Perth
Grand Falls
Tobique Headpond
Beechwood Headpond
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Sussex
Saint John

Menidia menidia
SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

QUEBEC

NEW BRUNSWICK

MAINE

CANADA

UNITED STATES

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

Saint John River

Allagash River

Aroostook River

Fish R.

Madawaska River

Restigouche River

Grand Falls

Tobique River

Miramichi R.

Nashwaak R.

Oromocto Lake

St. Croix River

Kennebecasis River

Cabano

Edmundston

Madawaska

Fort Kent

Presque Isle

Andover

Perth

Woodstock

Nackawic

Fredericton

Grand Lake

Sussex

Saint John

Cottus cognatus

SAINT JOHN RIVER BASIN

8 0 8 16 24 32

REFERENCE

Basin Boundary ------

Q E B E C

N E W B R U N S W I C K

M A I N E

CANADA

UNITED STATES

ST. LAWRENCE RIVER

CHALEUR BAY

BAY OF FUNDY

Restigouche River

Matapedia R.

Miramichi R.

Cabano

Madawaska River

Edmundston

Madawaska

Fort Kent

Fish R.

Allagash River

Saint John River

Aroostook River

Presque Isle

Grand Falls Headpond

Grand Falls

Tobique River

SAINT JOHN

Tobique Headpond

Andover

Perth

Woodstock

RIVER

Nashwaak R.

Nackawic

Mactaquac Headpond

Fredericton

Oromocto

Oromocto Lake

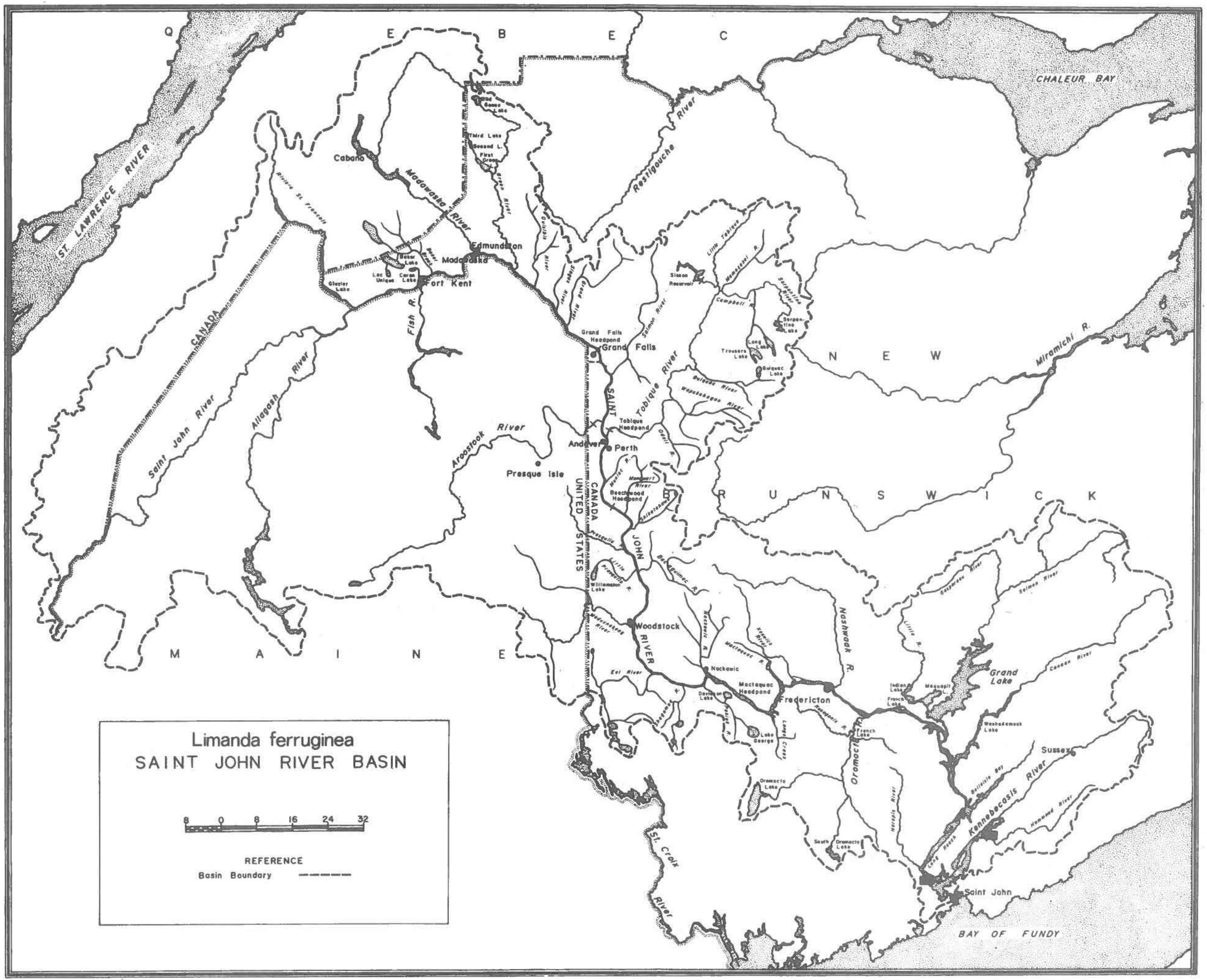
Grand Lake

Sussex

Kennebecasis River

Saint John

St. Croix River


Limanda ferruginea
SAINT JOHN RIVER BASIN
8 0 8 16 24 32
REFERENCE
Basin Boundary
ST. LAWRENCE RIVER
CHALEUR BAY
CANADA
UNITED STATES
MAINE
NEW BRUNSWICK
Cabano
Madawaska River
Edmundston
Madawaska
Fort Kent
Fish R.
Restigouche River
Grand Falls
Grand Falls Headpond
Tobique River
Tobique Headpond
Andover
Perth
Presque Isle
Aroostook River
Allagash River
Saint John River
SAINT JOHN RIVER
Woodstock
Nackawic
Mactaquac Headpond
Fredericton
Oromocto Lake
Lake George
Nashwaak R.
Grand Lake
Sussex
Kennebecasis River
Saint John
St. Croix River
BAY OF FUNDY
Miramichi R.