NATIVE LAKE TROUT *(Salvelinus namaycush)* STOCKS IN THE CANADIAN WATERS OF LAKE SUPERIOR PRIOR TO 1955

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ABSTRACT

The decline of Lake Superior lake trout stocks after the sea lamprey *(Petromyzon marinus)* population explosion of the 1950s was both dramatic and decisive. Few native stocks remain to permit scientific data collection. However, interviews with old-time fishermen suggest that there had existed many discrete and semi-discrete stocks within the lake. Historical records in the form of government correspondence and records, explorers' accounts, and Hudson Bay Company records yield further accounts.

As background to the study, a brief history of the commercial fishery is outlined. Remote stations were scattered along the length of the Canadian border, and supported the fishing enterprises of the main towns: Sault Ste. Marie, Heron Bay, Port Coldwell, Jackfish, Rossport, Nipigon, Hurkett, and Thunder Bay.

The first commercial fisheries in Canadian waters were those operated by the Hudson Bay Company. Records are available from 1800 to the 1950s and contain many valuable entries concerning species composition, seasonal movements, spawning grounds, and spawning times. The relevance of these records to fisheries investigations prompted the inclusion of not only lake trout, but all fish species, in this review.

Fishermen tended to distinguish varieties of lake trout on the basis of the following criteria:

1. Spawning location and time -

Trends in spawning periods may be latitudinal, runs appearing later on the grounds as one moves southward. Local variations can also relate to spawning site, i.e. whether on river, shore, or shoal beds, in windward or leeward zones, or in deep or shallow

waters. In addition, different breeding groups (runs) might sequentially utilize single grounds (up to four runs being reported at certain sites).

2. Body weight and form -

Later runs tended to contain larger and heavier fish. Pulses of different size classes arrived on certain grounds, while inter-shoal variations in average size occurred.

3. Flesh colouration -

Flesh colouration may, in some cases, suggest mechanisms ecologically separating lake trout groups during some portion of their lives (such as different feeding niches). Colouration differences, remaining constant through time, existed between certain spawning runs or grounds.

4. Skin colouration -

Body colour may represent spawning period responses of certain lake trout groups.

5. Non-spawning movements -

While discrete groups of fish were less obvious during the non-spawning seasons, there occurred vertical and/or horizontal segregation of smaller and larger lake trout. Large fish became pelagic in June or July, and some moved inshore; at a few locations a second, smaller "summer run" occurred in mid-August.

In the text each of the above criteria is assessed for its validity in stock indentification.

Fishermen distinguished four general variants of leans, fats or siscowets, halfbreeds, and humpers or paperbellies *S. namaycush.* In addition, different "breeds" or forms of lean trout were commonly recognized. Often a form was known by a name referring to its most

distinctive feature: blacks, redfins, yellowfins, grays, salmon-trout, red trout, moss trout, sand trout, racers, and deepwater leans. A form might have been quite site specific, spawning only on certain selected grounds or might, on the other hand, have composed a general spawning run of fish, appearing at many places along the shore or shoals. Each is discussed in turn, and local spawning habits, grounds, and movements are summarized by lake region. At least 250 former spawning grounds are identified, including 18 rivers which were once characterized by September runs of lake trout. Spawning locations for the deepwater, non-lean trout variants (paperbellies, half- breeds, and siscowet) are less easily discovered. Approximately 35 fishing grounds are noted, with spawning reported at at least four of these. Consideration is given to the possible existence of phenotypically distinct stocks of siscowet. Due to the nature of the sources used in an historical approach such as this, an abundance of clues for mapping former fish stocks are generated; unfortunately, many must also remain inconclusive.

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One fish,

Two fish,

Red fish,

Blue fish.

DR. SEUSS

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1. INTRODUCTION

Each person, as he or she goes about the daily process of living, constantly modifies the boundaries of individual existence: extending horizons of experience, discovering new possibilities, denying or embracing opportunities which constantly arise. A major driving force for the choices one makes is a seemingly inherent human need for order. Chaos is disturbing, and one grows uncomfortable with things that defy analysis. Meaning arises out of order, and when we can discern meaning in existence we then, as human beings, are able "to choose, to behave, and to become" (Nijhoff 1959).

In Western society the quest for order has embraced the tools of technology. Providing the means for radically changing the contours of the environment, these tools are often applied with the premise that the landscape may be moulded to coincide with the psyche of man. Yet when the human-created world is imposed upon, rather than integrated with the natural world, the resultant disharmony generates disturbances felt by both. One must not ignore the fact that changing any landscape can also exact changes in the nature of those persons living within it.

The escalating rate of change and growing complexification of Western culture is having two most disturbing consequences. First, the integrity and order present within natural systems is being degraded: species are being forced to extinction, established patterns of community organization are being broken, genetic diversity is being lost. Second, man's sense of alienation from his surrounding world is increasing. It has been stressed by existentialist philosophers that alienation derives from a diminished sense of meaning. The meaning which was sought through technology has eluded us.

The watchword of the natural sciences is becoming "connectivity". Biological investigations are unfolding a dynamic order within the natural world. They reveal that even small perturbations may disturb this order and exert drastic effects felt far afield -- and ultimately by man himself. The biologist dealing with any natural system must be aware of his three- fold mandate to avoid such consequences:

1) determine component parts and their interactions,

2) monitor changes in these parts, and

3) devise management schemes which work to maintain the integrity of these parts.

The loss of genetic diversity must also be a major concern for wild-life managers. Such loss decreases the chances that a species will adapt to change. It is clear that, in many situations, management simply at the species or population level has led to severe reductions in the gene pool and resultant instability (Odum 1971). Numerous examples are to be found in both local and widespread depletion of fish species within the Great Lakes system (Beeton et al. 1978). It is the opinion of many biologists, especially those involved in fisheries research, that wildlife management must consider species at the level of their individual stocks

Marr (1957) proposed that a stock be defined as:

> "... a population or a portion of a population, all members of which are characterized by similarities which are not heritable, but are induced by the environment."

Scientific expertise in separating genetically determined characteristics from phenotypic expressions of environmental conditions is developing but still primitive. While advances have been made in techniques for genetic identification (such as those of electrophoresis), many studies are crippled by lack of samples or the time required for analysis.

The present study attempts to identify possible stocks of native lake trout (*Salvelinus namaycush*) within the Canadian waters of Lake Superior prior to the advent of the sea lamprey (*Petromyzon marinus*) in the early 1950s. Recognition of such stocks is based upon oral and written descriptions of phenotypic features, including those anatomical and behavioural. A general, widely-inclusive definition of a stock is therefore adopted. The term stock is used in the sense of Marr's (1957) "group":

> "A group is a fraction of a population with distinctive characteristics, the nature of which (phenotypic or genotypic) has not yet been determined."

Ricker (1959) considers the question of stock discreteness:

> "... stock is here used to describe the fish spawning in a particular stream or lake at a particular season, which to a substantial degree do not interbreed with any other stock. What constitutes a "substantial degree" is open to discussion and investigation, but I do not mean to exclude all intermingling of stocks."

The key point throughout the present paper is that observable differences between groupings of lake trout within Lake Superior persisted through time. If these differences are considered valid stock indicators (see Section 4.1.2 for discussion), then it appears that such stocks were both numerous and self-sustaining.

During the spawning seasons, distinct groups of lake trout, containing one or more stocks each, might come on the spawning grounds at different times. These were known to fishermen as "runs". Various studies have revealed that lake trout, like salmon, will home to specific spawning reefs (Eshmeyer 1955; Martin 1957; Loftus 1958; Desjardine et al. 1980).

1.1 BACKGROUND TO LAKE SUPERIOR

Lake Superior, situated at the head of the St. Lawrence drainage system, rests almost entirely within the Precambrian rocks of the Canadian

Shield. With a mean depth of 148 m. (487 ft.) and the largest surface area of any of the world's freshwater lakes, it is cold and oligotrophic. Much of the Canadian north shore is quite precipitous and shore areas drop off rapidly to depths greater than 90 m. (300 ft.; see Lawrie and Rahrer 1973; Matheson and Munawar 1978).

Lawrie (1978) lists 73 fish species which have been present in Lake Superior, 10 of these exotics. Lake trout and whitefish remained the dominant species of the commercial fishery until their collapse in the 195Os. The history of the fishery is one of progressive exploitation of grounds situated at increasing distances from home ports as local supplies were depleted. It is the opinion of Lawrie and Rahrer (1973) that:

> "... the long maintenance of high yields of lake trout presumably owes much to the species' widespread distribution in a multitude of quasi-discrete stocks which lent themselves to a sequential fishing-up process during the development of the fishery."

Despite the effects of early exploitation, however, many lake trout stocks remained viable years after significant stock losses had been witnessed in the other Great Lakes. This was due to two major factors: a commercial fishery which was, on the whole, less intensive, and the later occurrence of severe lamprey predation. In consequence, many fishermen survive who remember the habits and habitats of healthy native Lake Superior lake trout stocks. The region therefore offers a unique opportunity for the fisheries investigator.

As background to this study a brief history of the lake's commercial fisheries, following the Hudson Bay Company's adventures in the industry, is presented in the following section. This company's enterprises are reviewed in Section 2, and the recorded biological data relevant to fisheries investigations is examined.

1.2 HISTORY OF THE COMMERCIAL FISHERIES

The 1860s represented a time of upsurge for commercial fishing interests on Canadian Lake Superior. At a time when discouraging duties were being imposed on salt fish by the United States, new markets for fresh fish were opening up. Schooners and sailboats had proven inefficient for transporting this commodity. With the opening of the American Sault Ste. Marie canal in 1856, new steam-driven vessels were able to move goods rapidly to distant ports in the lower Great Lakes.

The introduction of new innovations progressively increased the level of exploitation of the lake's fish species. Steam fishing tugs were first seen on Lake Superior in 1871. In the 1890s, steam power was employed to lift nets over drums, while about 1900 new automatic net-pullers brought great savings of time and effort. The first motor boat was utilized at Marquette in 1899, and soon the internal combustion engine was an integral part of the industry. Later, in the 1930s, less efficient linen gill nets gave way to cotton, while these in turn were replaced by nylon in the 195Os (Van Oosten 1940; Lawrie and Rahrer 1973).

In the following regional summaries, reference is made to Fig. 1 and Figs. SM1 to SM75 (Appendix VI) in defining locations.

1.2.1 EASTERN LAKE SUPERIOR

By the late 1860s, fresh fish from eastern waters was regularly shipped by the steamer "Chicora" to markets in Cleveland, Detroit, and Toronto. In addition to the traditional native fisheries of Batchawana Bay, Goulais Bay, and Gros Cap, a "large business" was being conducted from a station on Parisienne Island (Fig. SM2; Canada. Dept. of Marine and Fisheries 1869). In 1871 permanent buildings were erected both on the Lizard Islands (Fig. SM10)

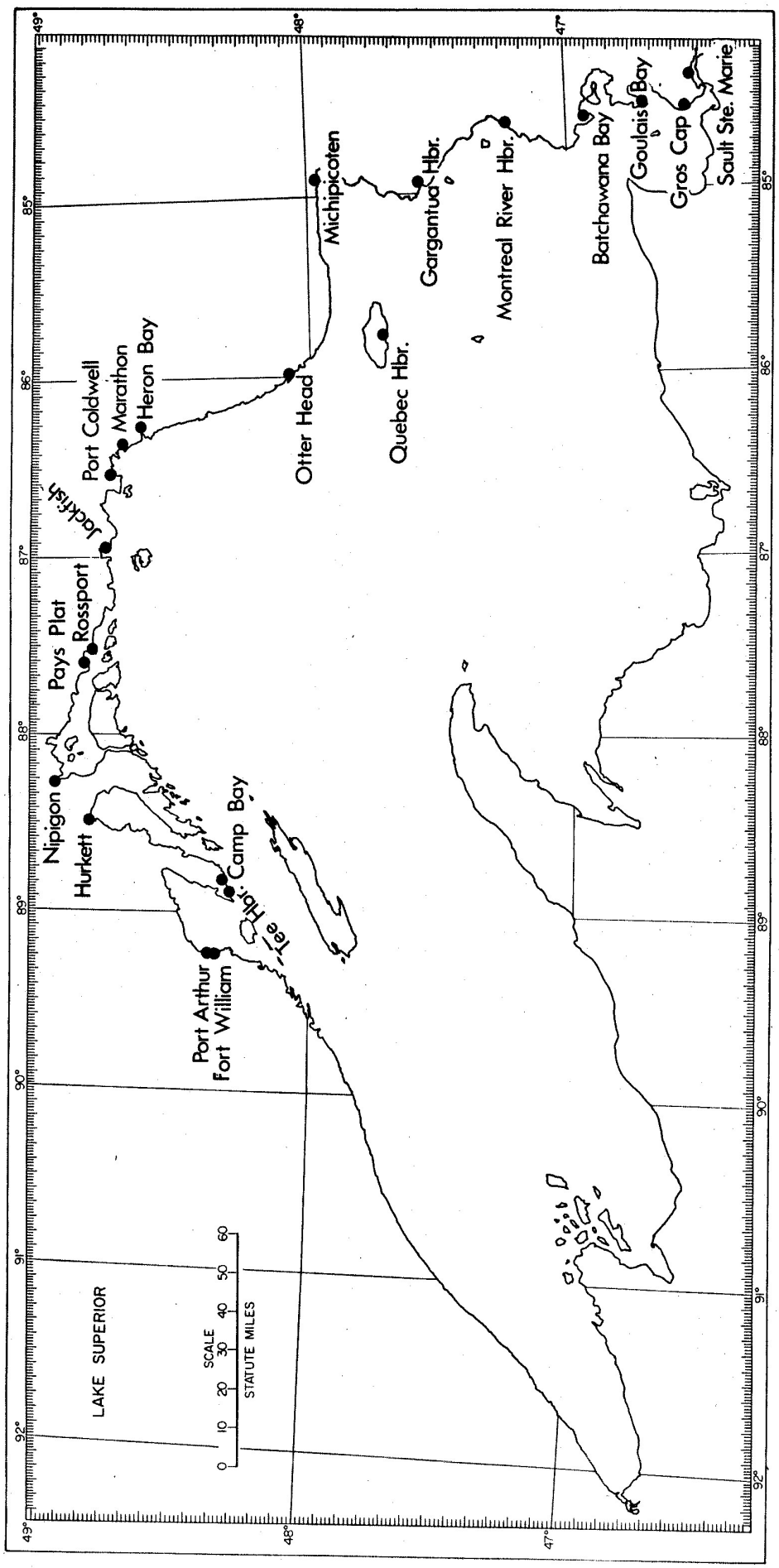


FIG. 1

THE MAJOR FISHING PORTS OF CANADIAN LAKE SUPERIOR PRIOR TO 1955

and Michipicoten Island (Fig. SM25; Canada. Dept. of Marine and Fisheries 1871). Both of these locations may have been operated by the Chicago-based firm known as the A. Booth Packing Co. (and later the Booth Fisheries Co.). Established in 1848 by Alfred Booth, it had acquired a lease to property on Quebec Harbour (Michipicoten Island) in 1860 (Mr. I. Purvis, personal comm. 1979). Active fishing on both Lake Winnipeg and the Great Lakes was begun about 1871 (Anon. 1955).

Through a series of business acquisitions and market manipulations, the Booth Fisheries Co. grew to be the dominating force in a "fish trust" comprising about ten companies spread from Detroit to Manitoba. The trust claimed a capital of 5.5 million dollars and annual sale of 100 million lb. of fish (Anon. March 16, 1905)

In the 1890s Booth assumed control of the Wiarton-based Dominion Fish Co. and extended this company's operations to the Lake Superior trade. Soon most Canadian fishermen in the east were selling to either the parent company or its subsidiary, and few licenses were independently owned. The situation proved cause for concern for one early fisheries inspector:

> "Mr. Duncan deplores the fact that most of the fisheries of his large district are controlled by a powerful syndicate of United States citizens, who keep the earning rates of our Canadians at a minimum... By employing foreign crews it enables the syndicate to land Canadian catch in their own ports without reporting it." (Canada. Dept. of Marine and Fisheries 1902).

Such opportunistic pursuit of the industry extended fishing stations beyond Michipicoten and north along the coast line of present-day Pukaskwa Park. In addition to the major encampments at Quebec Harbour (Fig. SM25) and Gargantua Harbour (Fig. SM12), stations were situated at Caribou Island (Fig. SM30), Dog River (Fig. SM15), Richardson Harbour (Fig. SM18), and Simons Harbour (Fig. SM19) at the turn of the century (Coleman 1899; Duncan July 17, 1899). Booth Company tugs would regularly tour the various

stations and freight fish to Sault Ste. Marie.

In the 1920s, the success of the Booth Fisheries Company began to wane, reportedly as a result of bad management rather than any scarcity of fish. Finally in 1937 its eastern Lake Superior interests were sold to James Purvis and Son, Ltd. of Gore Bay (Manitoulin Island). The new company began fishing with two Booth tugs. Gradually a successful enterprise was built through the exploitation of new grounds, such as Superior Shoal (Fig. SM42), and the opening of new markets, such as those for smoked trout or fat siscowet (see Section 4.2) in the "Jewish trade" of Philadelphia, Brooklyn, and Chicago (Mr. I. Purvis, personal comm. 1979). At its peak the company held four tug licenses for a total of 220,000 m. (240,000 yd.) of gill net.

In the 1930s and 1940s there existed a number of fishing businesses, including those of the Mitchell Bros., Gino Nori, Carmen Talerico, the McKays, and the Lapointes. Brief historical reviews are given by Collins (n.d.a), Macdonald (1974), and Marsh (1976). In 1959 the Purvis Fisheries was sold to Ferroclad Fisheries, which still operates from Mamainse Harbour (Fig. SM5).

1.2.2 PORT COLDWELL

Like so many small northern Ontario towns Port Coldwell sprang up as a station along the newly completed C.P.R. line. It was soon evident that the snug harbour of this supply depot would also prove ideal for sheltering fishing boats.

In 1889 Van Every erected a large ice house and freezer and employed six boats and crews to fill it with fish (Anon. June 15, 1889). Van Every's enterprise appears to have been short-lived, but Case (1892) lists seven

fishermen as residents of Port Coldwell. By 1895 two tugs were based here, while in 1896 seven pound nets were fished east of the village (Canada. Dept. of Marine and Fisheries 1894-98).

Port Coldwell fishermen probably sold their fish initially to the Booth Fisheries Company and later the Nipigon Bay Fish Co. of Rossport (see Section 1.2.4). In 1915, however, the Nicoll Brothers Fish Company was established in Port Coldwell and remained the life-giving force for the town until the 1950s when, like so many other businesses, it declined along with the lake trout populations.

The Nicolls proved to be shrewd businessmen. By offering fair prices and opening up new markets other local fishermen were persuaded to sell to them. In the early 1920s the brothers directly held licenses for 47,000 m. (51,000 yd.) of gill net, increasing the number to 77,000 m. (84,000 yd.) by 1929 (Ontario Dept. of Lands and Forests 1920-1929).

In the 1920s Port Coldwell fishermen were licensed strictly for grounds in the Heron Bay to Port Coldwell vicinity, but in the 1930s a "pioneering" spirit developed and tugs roamed southward along the present day Pukaskwa Park shore as far as the Otter Head (Fig. SM18; Mrs. H. Cress, personal comm. 1978). Lake trout dominated the town's fisheries and trade in fat trout grew quite lucrative (see Section 4.2). The first tugs to run to Superior Shoal after it was surveyed in 1929 were the Nicoll Bros. "Strathbelle" and Harry English's "Iris" (see Section 5.6). By the 1940s, the 88 km. (55 mi.) trips had been discontinued, however.

During the peak years, the Nicoll tugs harvested an average of perhaps 63,500 kg. (140,000 lb.) of lake trout annually (Mr. F. Legault personal comm. 1979). Mrs. H. Cress (personal comm. 1978) reported that catches were still excellent until 1952, but a decline was noticeable in 1953. Today six houses are left standing in the town, but only one family resides there on a permanent

basis.

For additional information, Mountain (1976) chronicles the development and operation of the town's fisheries (with some inaccuracies)

1.2.3 JACKFISH

Fishermen were already established at Jackfish when Ben Almos and his two brothers arrived to fish in the early 1880s (Mr. A. Almos, personal comm. 1979). Their numbers were augmented by Peter Dahl, Sr. and Jacob Hendrickson in the early 1890s. However, it is noted by the Dominion Fisheries Commissioner, E.E. Prince (April 25, 1896):

> " ... fishing has never been very extensively carried on upon this part of Superior, partly because the coast is very rocky and stormy and partly because in former years very destructive wasteful fishing was pursued by U.S. poachers and the supply seriously depleted."

Fishing at Jackfish was conducted mostly from rowboats and later gas boats. A single rowboat fisherman licensed for 7300 m. (8,000 yd.) of net averaged approximately 5900 kg. (13,000 lb.) of lake trout annually (Mr. A. Almos, personal comm. 1979).

The Slate Islands (Fig. SM38) proved most excellent lake trout grounds. Originally privately leased to Lieutenant Governor Patterson, the earliest fishing license for the Slates was probably issued in 1884 (Kerr Feb. 13, 1886). Production levels were high for a time:

> "The fishing on these islands was formerly leased to Messrs. Noble who grossly abused it, and for many years it was practically worthless. The Department has applications from C.W. Gauthier and others but as there is ground for believing that these applicants would simply destroy the fisheries in the same way that the Nobles did it was decided not to grant any license in the future." (Prince Dec. 2, 1897)

The Nobles were managers of the Dominion Fish Company. In the 1930s three fishermen were permanent residents of Jackfish, all sons of original inhabitants. According to Mr. A. Almos (personal comm. 1979) the most successful fishing period was from 1940 to 1948. Today only building

foundations mark the townsite. Additional historical details are to be found in Mercier et al. (1973) and Poole (1976).

1.2.4 ROSSPORT

In the early years of the north shore fisheries, inhabitants maintained only tenuous contact with the outside world and must have often endured a profound sense of isolation. Although the fishery at Pays Plat Bay (Fig. SM44) was still under control of the Hudson Bay Company in the 1870s (Kerr Nov. 21, 1871), other men from the south arrived to establish scattered and meagre camps on the islands south of Nipigon Bay. William Boon began fishing on Bowman Island (Fig. SM55) in the 1870s and was followed by George Gerow in 1881. Osler (1868) encountered fishermen on St. Ignace Is. (Fig. SM54), where he also found the wife of the 1iqht-house keeper suffering in the latter stages of consumption. Years before settlers arrived at McKay's Harbour (later called Rossport) fish were cured in sugar and salt at Chummy Point (Chubby Harbour; Fig. SM45) to await the infrequent arrival of the lake steamers. Most camps were abandoned in the fall.

By 1894 plans were being laid by the Booth Fisheries Company to force inroads in the Rossport industry. A letter to their Port Arthur representative expressed the desire to raise the price of fish in Rossport at the expense of the recently established Rossport Fish Company, adding that this was "liable to stir up a great deal of strife" (Turner Sept. 17, 1894).

At the turn of the century, post office directories (Henderson 1900) listed 18 resident fishermen at Rossport and 9 at Nipigon. About this time J.A. Nicol took the post of Rossport station master. Struck by the possibility of shipping fresh fish on the C.P.R. line, he built a small ice

house and entered the industry as a buyer. From this modest start, his Nipigon Bay Fish Co. grew to be one of the major enterprises along the north shore, and acted as a competitor to the Booth Company. In 1940 a boxcar load of fish was being shipped each day, and fish was being brought from as far away as Black Bay (Mr. C. Macmillan personal comm. 1978). The company survived until 1953.

In addition to the Nipigon Bay Fish Company, a couple of smaller independent firms flourished in Rossport. The Bowman Fish Company was started prior to 1910 and in 1918 entered the fish trade on Lake Nipigon. John Paulmart established the Independent Coop around 1915 and his company endured into the 1940s.

1.2.5 THE BLACK BAY PENINSULA AND THUNDER BAY AREAS

Despite the decline of Fort William as a fur trading post, in 1866 Fountain (1904) found it to be,

> "... a great fish-curing depot, and this trade seems now to give it all its importance."

By 1870 two .steamers, as part of their regular cargo, were carrying fish to Collingwood, and in 1875 stations were situated as far afield as Victoria Island (Fig. SM74) to the south and Point Porphory (Fig. SM63), Shaganash Island (Fig. SM61) and Roche Debout Point (Fig. SM59) on the Black Bay Peninsula (Anon. 1873; Canada. Dept. of Marine and Fisheries 1875).

Near the end of the 1870s only local natives were actively fishing at Fort William, and in 1881 the Hudson Bay Company post closed completely. This decline was paralleled by the growth of the fishing industry in Prince Arthur's Landing (which became Port Arthur in 1884). In 1879 the first private company, the Lake Superior Fish Co. was established. It is not certain if it was American controlled, but much of its catch was shipped

through Minneapolis. A wharf was built, a tug ran daily to the various stations, and the business developed rapidly. By 1883 the company employed 30 men and maintained two steam tugs and 6 large fishing smacks (Anon. July, 1883). The growth of the industry during this decade, and its success in obtaining fish from waters that must have seemed to possess unlimited supplies, attracted many fishermen from other areas.

The fate of the Lake Superior Fish Co. is uncertain, but it is probable that it became enfolded into the growing conglomerate of the Booth Fisheries Co. In 1884 a Booth steamer was making regular runs between Duluth and Port Arthur. It was supplied by the newly established Port Arthur Fish Co., which soon was in virtually complete control of the fisheries from Thunder Bay to Heron Bay (Anon. 1889). ln 1891 seven tugs and many sailing vessels were docked at the Lakehead (Port Arthur Board of Trade 1891):

> "At little Port Arthur alone the figures of the fishing industry for the market are astonishing. In 1888 the fisher- men there caught 500,000 pounds of whitefish, 360,000 pounds of lake trout, 48,000 pounds of sturgeon, 90,000 pounds of pickerel, and 30,000 pounds of other fish, or more than a million pounds in all." (Ralph 1892)

In the 1890s, a number of new businesses were established, including the Union Fish Company and Gagne Bros. Fishery (Henderson 1900; Anon. Jan. 23, 1892). More fishing communities and stations were also established along the Sibley and Black Bay Peninsulas. By 1883 a fishery existed at Black's Dock on Sheesheeb Point (Fig. SM59; Selwyn 1883). Fishing out of Hurkett began around the turn of the century and in 1919 A.W. Nuttall employed 16 men for the winter fisheries of Black Bay (Mrs. N. Thrower, personal comm. 1978). In addition, south of Thunder Bay fishermen were established in the Cloud Bay area in the 1920s (Mr. V. Bergman, personal comm. 1980). These fishermen sold their fish not only to the Booth Co. but also to the Fort William Fish Co., which had been established by Thomas

Craigie in 1916.

In the west end, as in the east, Booth sold its Lake Superior assets about 1934, initially to the Nipigon Bay Fish Co. of Rossport. In the early 1930s, the Royal Fish Co. opened but was soon acquired by Kemp Fisheries of Duluth. This company has today become the dominant force in the western Lake Superior industry.

In the 1930s fishing camps were established at Tee Harbour (Fig. SM66) on Black Bay, and in 1939 the first herring fishery was based at Squaw Bay (Fig. SM64; Mrs. E. McKay, personal comm. 1979). In the early 1940s the Tee Harbour camp was moved to Camp Bay (Fig. SM65) where today two active fishermen still remain to carry on the tradition.

2. THE FISHERIES OF THE HUDSON BAY COMPANY TRADING POSTS ON LAKE SUPERIOR

2.1 INTRODUCTION

Upon examining the written collections of the 18th and 19th century fur trading enterprises, one discovers a wealth of observations concerned with the animal resources of northern Ontario. To sift through such voluminous records requires both time and patience, but one is frequently rewarded with an intimate and detailed view of the interactions of humans and the early Canadian environment. The purposes of the trading corporations were mainly exploitive; to extract the material wealth of the land and so pursue rising profits. Yet the people they employed to man their New World outposts were likewise moulded by this land, as they sought to familiarize themselves with (and adapt themselves to) an environment which frequently grew hostile.

For the purposes of this chapter, research was generally limited to the journals, correspondence, and annual reports of the Hudson's Bay Company. The original documents are now housed in the Provincial Archives of Manitoba, with microfilm copies of the written records retained in the Public Archives of Canada in Ottawa and the Public Record Office in London, England. Appendix I references the material I have examined. The authors of this material were not scientists, but many were well educated and acute observers of nature. They took a keen interest in the habits of the animals of their land, knowing that both the economic welfare of their company and the physical survival of the post inhabitants depended upon this knowledge. It was in their own interests that the directors of the Company frequently stressed the importance of maintaining detailed post journals. Directives were dispatched from London outlining the matters and affairs appropriate for journal entry; these have been reviewed by Moodie (1977).

Since the journals and reports were written in the terms of the scientific layman, a certain amount of speculation and inference is required in their interpretation. Moodie and Catchpole (1975) discuss analytical problems and have successfully applied techniques of content analysis in reconstructing, from the Company journals of the Hudson Bay district,

patterns of estuary freeze-up and break-up. Although the methods of content analysis were found to be inapplicable to the present study, still it was possible to make qualitative assessments of the habits and abundances of pre-stressed fish populations in Lake Superior.

2.2. A SEASONAL SUMMARY

A number of fur trading enterprises preceded the Hudson Bay Company to Lake Superior country. Posts had been maintained by the French since the early 18th century. Finally in 1804, the rival XY and North West companies merged to form the North West Company and vigourously competed with Hudson Bay Company interests in the Far West. The British firm countered by erecting inland posts between Lake Superior and Lake Athabasca in close proximity to those already established by the North West Company (Public Archives of Canada 1974). On Lake Superior the small establishment of Pointe de Meuron (later Fort William) challenged the monopoly of the French post near the mouth of the Kaministikwia River. From 1797 to 1803 and 1816 to 1821, Hudson Bay Company employees resided a short distance from the French fort at Michipicoten. The amalgamation of the two companies in 1821 brought the N.W.Co. forts under Hudson Bay Company jurisdiction. In addition to the major posts of Michipicoten House, Pic Post, Fort William, and Sault Ste. Marie, seasonal outposts were maintained at the mouth of the Agawa River[1], on Batchawana Bay[2], and at Red Rock (situated at the head of Nipigon Harbour). These subsidiary posts engaged in limited fisheries but were mainly supported by their parent establishments.

Several authors have summarized the fishing activities of the Lake Superior fur trading establishments. Nute (1926, 1944) reviews in detail the history of the American Fur Company's involvement in the industry. Sections on the fisheries of the major Hudson Bay Company posts are presented by Marsh (1976), Weiler (1973), and Campbell (1976). The annotated bibliography of White (1977) lists sources relevant to fisheries on both sides of the lake. In

addition, faunal analyses have been completed at the former post sites (Burns 1972, 1973; Cloutier 1976; Hamalainen 1976). Unfortunately, in the acidic soils of the Precambrian shield, bones are subject to rapid decay and fish remains are seldom identifiable to species.

The Company fisheries were conducted at all possible times of the year in order that fresh supplies of fish might be obtained. In winter holes cut through the ice permitted fishing with hooks and lines, and (in the case of the Indians) fish spears. After ice break-up, lines with 30 or more salmon hooks (for lake trout) or cod hooks (for sturgeon and large pike) were set from the shore.

The net fisheries employed seines and gill nets in the nearshore zones of the lake. Seines were plied from the shore or from small, flat-bottomed batteaux and would vary in length:

> "... Kirkup in the evening finished the Trout seine 32 fathoms long. 61 mesh deep of a four inch mesh." (M.P.J. April 4, 1821).
>
> "... four men [went] to haul the seine (upwards of seventy fathoms in length.)" (M.P.R. 1817-18).

Gill nets were strung with cedar floats and stones and dipped in boiled larch bark to strengthen and darken them. A major task during the winter involved knitting new nets from imported twine, for nets and lines were frequently carried away in the stormy waters of autumn.

To secure supplies of fish sufficient for winter consumption, it was often necessary to establish distant fishing stations close to spawning grounds of whitefish and lake trout. Early in September supplies of salt and barrels (capable of holding 91 kg., 200 lb., of fish each) were ferried to the various stations in readiness for the arrival of the fishermen. A station was usually managed by two or three Company employees with Indian helpers. Shortages of available men occasionally made it impossible for a post to send more than one crew to its stations. Remaining at one station until the fish retreated to deep water, the men would then pack their gear and move to another where the run continued to a later date. In those years when the spawning runs came

late, or when high winds drove the fish from the shores, it might prove necessary for the crews to remain away into November, waiting out the end of the run or hoping for the return of the fish. In years of greater abundance, the fisheries would end sooner, frequently forced to a halt by lack of salt or barrels. Despite such variations in the annual fishing dates, close examination of the journals permits inferences to be drawn regarding the length of the spawning periods at the different fishing locations.

Although the majority of the fish, were put into "pickle", many might be frozen in the colder weather of late autumn. The usual practice was to suspend these fish on a scaffold by stakes run through their tails (P.P.R. 1833). By hauling ice from the lake in late winter, each post could preserve fish in cold storage until the hot summer.

In 1839 the Hudson Bay Company entered the fisheries on a commercial basis. This was partly a response to the success being enjoyed by the rival American Fur Company (Weiler 1973). The intensity of the fall fishing was rapidly escalated. In 1839 Fort William sent 593 barrels (54,000 kg. -- 119,000 lb.) of fish to market and cured 110 barrels (10,000 kg.-- 22,000 lb.) for their own use (F.W.J. Nov. 30, 1839). In 1840 800 barrels were shipped from Michipicoten House to the American market (Keith May 1, 1841). The fisheries of Pic Post were smaller in scale, and 127 barrels were procured during the spawning season of 1840. Fish were shipped on the Hudson Bay Company schooner "White Fish", which began to make regular tours of the various fishing stations. The number of stations was actively extended until the late 1850s when the fish trade began to fall into decline. Fig. 2 locates the fishing stations utilized by the Lake Superior posts between 1800 and 1860.

Although the focus of this thesis is upon the native lake trout stocks of Lake Superior, I decided that attention should also be paid to the other fish species described in the Hudson Bay Company records. The relevance of this additional information to fisheries biology, plus the fact that this important source of information has been generally overlooked by fisheries investigators, determined this decision. In addition, it is, of course,

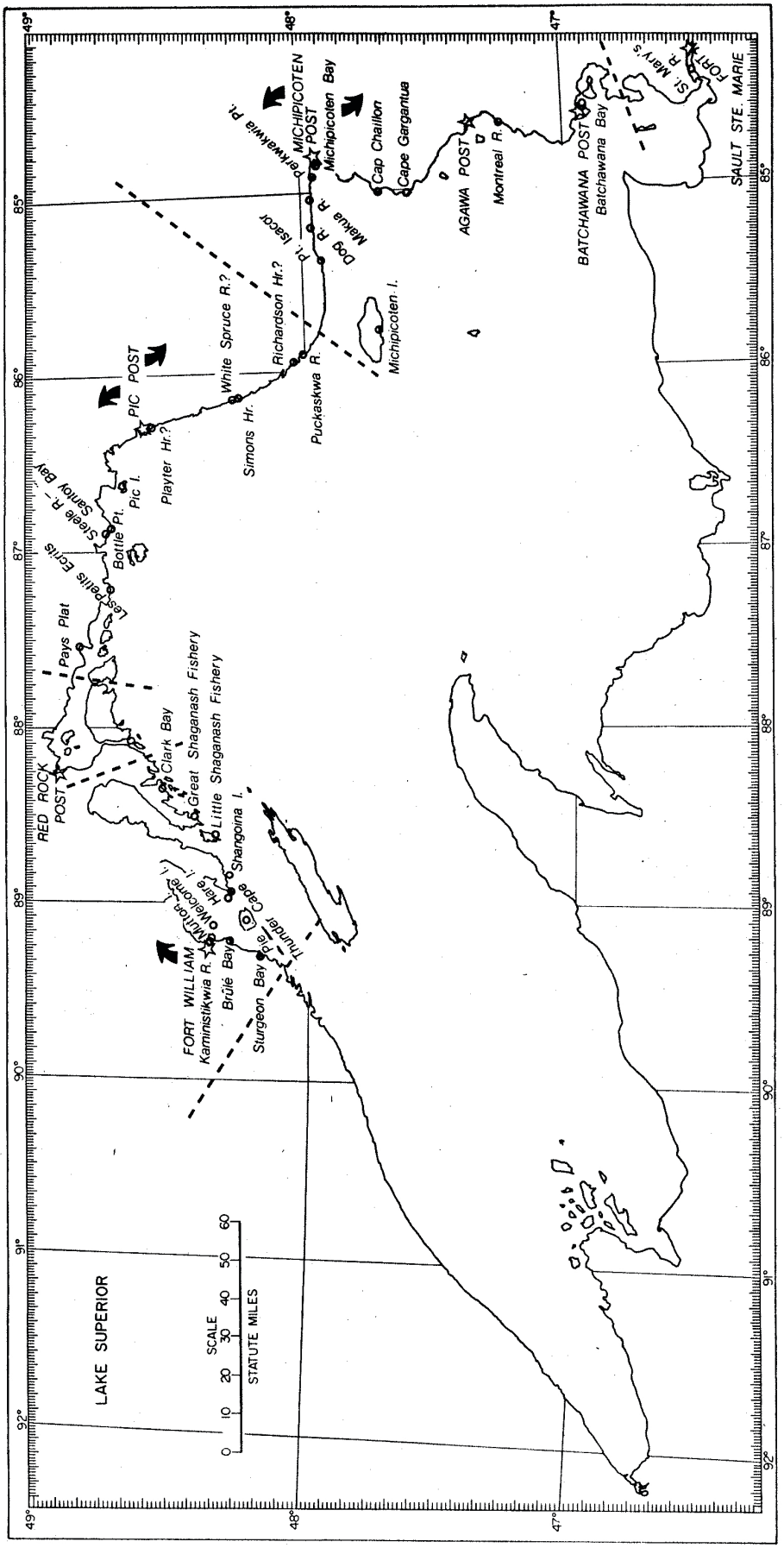


FIG. 2 **LOCATION OF THE FALL LAKE TROUT FISHING STATIONS ASSOCIATED WITH THE HUDSON BAY CO. TRADING POSTS OF LAKE SUPERIOR — — 1800 to 1860**

obvious that lake trout do not exist in isolation within a lake; they react to the movements and habits of other species to which they are often bound in predator-prey relationships. A more thorough description of any ecological community will always contribute to better understanding of its individual component parts.

As the major means of subsistence, fish were frequently mentioned in the journals. Daily catches at the posts were generally noted, and the productivity of the fall stations carefully recorded. When studying the journals, one is immediately struck by two things:

- Fish were very abundant locally in the lake, particularly during the spawning period;
- the availability of the various fish species was far from constant, presumably due to the combined effects of primitive exploitation techniques, vagaries of weather, and natural fluctuation in the abundances of the fish populations on the various grounds.

A summary of the biological information encountered in the company records follows. The three major posts are first discussed, in order of increasing importance of their fisheries. Little information is available on the relatively minor fisheries of Red Rock Post and Fort Sault Ste. Marie.

2.2.1 PIC POST FISHERIES

2.2.1.1 DECEMBER TO AUGUST

Lake trout were an important part of the spring catch for Pic Post. It is interesting to discover that siscowet, a deep-water form (see Section 4.2) would move into shallow water in the vicinity of the Post, putting in an appearance usually no earlier than the second week of May. Chief Factor Thomas McMurray knew them as:

> "... a species of Trout, but remarkably Fat at this season." (P.P.J. Aug. 18, 1831).

Early catches were made with nets, but during the peak abundances of

June some could be hooked on set trout lines. Occasionally individuals would move close enough inshore to fall victim, to the seines (P.P.J. May 1, 1830). It is quite probable that the siscowet (and lean trout) followed "herring" into shallow waters, for these species ran concurrently during May and June. (Herring, in the journals, refers to *Coregonus artedii* and may also include other Coregonine species). The disappearance of the siscowet from inshore waters occurred somewhat before the general retreat of the herring to deeper water (below the thermocline, as suggested by Fry 1937) and usually no later than the first week or beginning of the second week, of July. Considering the very great depths in which siscowet lake trout spend most of the year, one would expect them to possess a greater sensitivity to the warming surface waters.

In springs of scarcity, seining might also be conducted about the mouth of the Little Pic River (Fig. SH33) where lake trout were in certain years abundant. One day in 1833, 900 kg. (2000 lb.) of lean trout and siscowet were salted here (P.P.J. June 20, 1837). Fish salted in the spring would be consumed during the months of July, August, and September when few fish were found in the nets.

Herring were caught in special nets of small mesh size. At the height of the spring runs, many were swept into seines plied at the mouth of the Pic River or in Heron Bay (known at the time as Herring Bay; Fig. SM23). In this bay, notes Logan (1846), 3000 might be taken in one haul. Toward the end of the first week or into the second week of May, herring made their first appearance (although a journal entry for June 13, 1934 complains of the late arrival of the herring, cold weather being blamed as the reason). It was noted on July 2, 1837 that:

> "... the Herring is diminishing this Season for that kind of Fish is drawing near when few or none are caught."

Most years, however, it was still possible before the fishery failed completely, to catch some throughout July and occasionally into the first week of August.

At the Pic Post herring was used as bait for the trout hooks or salted when sufficient quantities became available. This fish was consumed during the summer, but, not surprisingly, trout and whitefish were thought more palatable. In years of plenty it was not uncommon to feed herrings to the dogs kept at the post or to give them out as supplies to the Indians. Occasionally some would be smoked (P.P.J. June 1, 1831).

A small and rather inconstant supply of whitefish (i.e. lake whitefish, *Coregonus clupeaformis,* and perhaps some round whitefish, *Prosopium cylindraceum)* was obtained from nets set in spring. Mention is also made of taking them by spear (P.P.J. Aug. 8, 1830) and seine (P.P.J. July 10, 1830). The general paucity of whitefish in the vicinity of the fort was offset by movement of this fish in June to the shores about the Little Pic River (Fig. SM33):

> "Sent off John Mathieson, Joseph Montpeau, and 6 Indians with a Boat and the seine to Little Pic River about 20 Miles from this to try and salt a few Barrels of White Fish, as to this season the Indians say they are plenty." (P.P.J. June 17, 1840).

The Lake Superior journals seldom refer to the average weights of the fish species, but exceptional specimens are noted. Factor McMurray marvels at such a whitefish:

> "... 9 Trout, a Sturgeon, 14 Herring and 2 White Fish, one of which measures 27 ins. in length and its weight as it came out of the nets 21 lbs., the largest of the kind I ever saw." (P.P.J. May 18, 1835).

This is still only half the weight of the largest known whitefish which was taken off Isle Royale, Lake Superior in 1818 (Van Oosten 1946).

Spring and summer seining in the vicinity of the post gave occasional catches of suckers and "dorees". Agassiz (1850) reports that most of his specimens of longnose sucker (*Catostomus aurora,* now properly known as *Catostomus catostomus*) were taken at the Pic River. It is possible that the journals may instead be referring to the white sucker (*Catostomus*

commersoni) also distributed throughout Lake Superior. It was noted on April 19, 1832, however, that "14 Red Suckers" were caught with the seine. These undoubtedly were the longnose or northern sucker which assumes a distinctive red mid-lateral colouration at spawning time.

A single reference is made to a catch of "Red Carp" from a gill net (P.P.J. April 10, 1830). This may involve a confusion of the names "sucker" and "carp" but more likely refers to the redhorse (probably *Moxostoma macrolepidotum):* the laterally compressed body of the latter lends to it the general form of the carp. Gourley (1822) remarks that, in addition to suckers, two species of carp were identified in Lake Superior waters. The true carp (*Cyprinus carpio)* is an exotic to North America, and was not recognized in Lake Superior until 1915 (MacCrimmon 1968).

The fish referred to as "dorees" were probably walleyes *(Stizostedion vitreum).* Occasional reference is made to the "pickerel", but the names are likely synonymous here. Agassiz also identified in Lake Superior the sauger *(Lucioperca americana,* now known as *Stizostedion canadense),*a fish similar enough in appearance to the walleye to be easily confused by the fur traders.

Narrator J.E. Cabot recounts Agassiz's experiences at the Pic Post on July 13, 1848:

> "The Professor got a number of fishes, among them a brilliant green pickerel, a new species. A sturgeon was caught in the river opposite our tent, in a net belonging to one of the Indians, who dispatched him after some contest, with a fish spear. Prof. Agassiz requested me to make a sketch of this fish, which was some four or five feet long." (Agassiz 1850).

What Agassiz called "pickerels" were actually Esocidae, and in Lake Superior he identified *Esox boreus,* or the northern pike (known now as *Esox lucius).* The Pic journals mention only once the netting of a pike (P.P.J. May 1, 1828) and also once a jackfish (P.P.J. May 2, 1828). Both probably refer to *E. lucius.*[3] From the dearth of catch we must conclude that this

species was rare in the vicinity of the Pic River (Fig. SM23).

Some sturgeon *(Acipenser fulvescens)* were taken in nets, at an average of only 6 or 7 a year. Sturgeon nets were made of a special coarse material known as "No. 4 Twine":

> "Seined Morning and Evening but caught nothing. tried the Drag Seine as Sturgeon are leaping in the River but caught none, no one here, except myself know how to use it, never having fished in that way. they are ackward." (P.P.J. April 27, 1832).

A few references are made to "perche" *(Perea flavescens)* taken during seining operations at the mouth of the Pic River and at Heron Bay. A single reference is made to a "Macqua" caught in a net July 13, 1827. This "breed" of siscowet was identified by Barnston (1874) and called *Salmo ursinus* (See Section 4.2).

2.2.1.2 SEPTEMBER TO NOVEMBER

Fall fishing was devoted almost exclusively to the salting of lake trout. It was necessary that some stations be established at great distance from the Post for spawning runs were absent at the Pic River itself. Silt may have been to blame:

> "The River Peck takes its name from an Indian word, signifying mud, as it pours out an ash-coloured, and when swollen, a reddish- yellow water, tinging the lake for a mile or two round its mouth, and derived from beds of yellow and white clay some d stance up the river." (Bigsby 1850).

Even though the post was a small one, sufficient supplies of fish for winter consumption were far from guaranteed. Therefore, at least two, and sometimes three, stations were established. The most important were at Pays Plat, in the area of Santoy Bay and Bottle Point (called in one journal "la peche a la gros truite a l'ance aux Bouteille". P.P.J. Oct. 8, 1829), and at a site known only as "Old Sansregrette's Fishery" but probably referring to Simons Harbour.[4]

The distant trout fishery at Pays Plat lasted for many weeks, being

established late in August or early September and lasting into November. This suggests an extended spawning period and possibly the existence of more than one run of lake trout (see Section 5.7). Most likely, however, the majority of lake trout spawned by mid-October. An entry in the 1845 journal refers to a fishing station situated probably at Pays Plat:

> "In the evening the Fishermen arrived in the boat with 40 barrels salt Trout. The Trout are spawning much latter this fall than usual, which is the cause of their being so long filling the casks. On the 1st instant [October] last fall, they had secured, and brought home 70 barrels." (P.P.J. Oct. 29, 1845).

The fact that a fishing station would be established a full 96 km. (60 mi.) distant from the post suggests the importance of the Pays Plat as both a breeding ground for fish and a safe harbour for fishermen, unrivalled by points farther east.

Fishing at "l'Ance a la Bouteille" was conducted at Bottle Point, along the shores of Santoy Bay, and in the Steele River. In 1830 for the first time, a "weir"[5] was erected in the river and tended from about September 15th to October 21st, and by October 5th had procured only half of its final yield (23 barrels). If this represents th typical peak for the Steele River spawning run, it is later than usual for rivers in the northeastern regions of Lake Superior (see Loftus 1958 and Section 5.4). However, as will be discussed below, dates for river runs could vary significantly from year to year. In certain years, in fact, lake trout would fail to enter the rivers entirely:

> "Cadrant and Party arrived. they only Pickled 30 Casks, 26 Less than last Autumn. the constant stormy weather was against them and at Bottle Bay River, the Trout failed, few or none entered that River to Spawn. Cadrant in a gale of wind lost a Net and 3 Cod Lines, which were carried away." (P.P.J. Nov. 2, 1833).

Several journals refer to "Old Sansregrette's Fishery", where a majority of the catch was obtained prior to the start of the third week of October. An unnamed station, probably Old Sansregrette's, is mentioned in the 1828 journal:

> "... Cadrant has 10 Barils of Troute Salted and ... the Troute now begins to approach the Shores of the Lake." (P.P.J. Sept. 26, 1828).

Little else may be inferred, however, about the spawning period of the trout caught here.

There were other more distant and less popular spawning grounds where stations were also occasionally established. In 1833 a seine fishery was maintained at the Pukaskwa River from September 4th to October 5th. Loftus (1958) notes that lake trout typically spawned in the river from September 5th to 15th (see also Section 5.4). Thompson (1822) arrived at Pic Post September 8th, only to find all hands "absent to salt trout in the Bay of Islands near the Otter Head." (This location may refer to Richardson Harbour). It is noted in 1827 that at "a bay this side of the White River", the fishermen abandoned their stat1on on October 16th as:

> "... they had no success at this Fishing as the Trout had done Spawning, consequently left the Shallows for the deep." (P.P.J. Oct. 16, 1827).

(Between the Pic and White Rivers are a series of sheltered bays. The largest is Playter Harbour). Also in 1827, a lake trout fishery was established, for the first time, at Les Petits Ecrits. Obviously there were not as many late-spawners here as at "Old Sansregrette's Fishery", for all fishing efforts were usually shifted to this latter place after the first week in October (McIntosh Feb. 3, 1828; Swanston Sept. 27, 1828). Reference is also made to the presence of a lake trout fishery a little north of Sansregrette's, possibly at the White Spruce River (P.P.J. Sept. 22, 1827). Finally, two other "secondary" stations are mentioned: Pic Island (P.P.J. 1833) and a place about 19 km. (12 mi.) west of the post and known as "Isle Rouge" (P.P.J. 1840). Its exact location could not be determined.

Whitefish formed a small and occasional part of the fall catch. It was found that whitefish spawned in Oiseau Bay (called Louison's Bay in

the journals; (Fig. SM21) in November (P.P.J. Nov. 6, 1832). The frequent failure of the stations in the Pic River region to yield whitefish in November may have been the consequence of rather late spawning periods:

> "La perdrix Blanc and an Indian who had remained at Ance a la Bouteille to catch White Fish arrived. he did not catch a single one. he tried several Places but no Fish Spawns or else they had done and retired to Deep Water, however on enquiry from the Indians I was told White Fish spawns late in the Season about the commencement of December." (P.P.J. Nov. 3, 1883).

Such late spawning was not necessarily typical of whitefish caught at other points in the lake. At Pays Plat, for example, 300 were obtained prior to November 9th, 1835, and it is likely that these fish were approaching the shores to spawn. It will also be seen that stations operated by Fort William and Michipicoten House could depend upon whitefish catches earlier in the autumn.

In the fall months, a limited amount of netting was continued at or near the Pic River. With the seines were captured "dorees" and suckers. From the nets and lines some sturgeon, whitefish, and trout were taken. Often the local fishing was discontinued entirely in order that all nets might be pressed into the service of the distant stations.

2.2.2 FORT WILLIAM FISHERIES

2.2.2.1 DECEMBER TO AUGUST

Winter fishing began as soon as ice had firmly set in Thunder Bay. Venturing across the ice, fishermen would set up to 20 trout lines along the west end of Pie Island or would range them northward toward the Welcome Islands. It was the practice of some Indian families to quit the fort and encamp "toward the Bottom of the Bay", possibly near Caribou Is. (Fig. SM68) where they knew the fishing usually surpassed that found nearer the establishment. Indians remaining about the post speared trout but

seldom managed to take more than a few at a time by this method. The general scarcity of lake trout in these waters suggests that their wintering grounds may have been located in the deeper waters of the western portion of the bay or to the south, outside of Thunder Bay entirely. Other native winter camps existed at Black Bay and McNab Point (Point Brule; Fig. SM71), but probably none could depend upon a steady supply of fish.

To augment the winter stores, men from the post would regularly cross to the Welcome Islands and set 3 or 4 nets for suckers. Some years these fish were quite abundant. Nets might be left in the water for over a week and, with luck, yield over 100 suckers. Their proximity to the fort, and their relative importance as a source of fish in the hungry winter months, made these islands attractive to fishermen: "Visinau went to Welcome Islands in order to mark out the usual

> places where the company sets nets under the ice, before the freeman & Indians takes possession of the best stands." (F.W.J Dec. 26, 1831).

Lines and nets were moved closer to shore as the ice grew thin in April, until finally it was too weak to walk upon. At this time fishing was suspended at the lake. As soon as the ice cleared, lines and nets were set opposite the mouth of the Current River (Fig. SM70). Here fishing for "trout" continued from the first week of May into June. These trout may have been brook trout (*Salvelinus fontinalis*) which would more likely be found in shallow water at this time than lake trout. Fishing within the river itself proved to be of but mediocre success, "the rocky bed of the stream not being favourable to seining operation" (quoted by Russell 1915).

A nearshore gill net fishery for lake trout was established the last week in May and continued throughout June. By the first week of July, fish were becoming scarce in nets set at Pie Island, Shangoina Island (Shagoinah

Island), and the Welcome Islands, and the fisheries tended to fail by the end of the first week of July, presumably when the lake trout returned to the deeper waters of the bay. At the Shangoina Islands, an especially large summer run would appear. After the Company entered the fishery on a commercial basis, many barrels were transported from here: for example, in June of 1837 (a good season) 63 barrels of trout were salted. Swanston (June 30, 1835) remarks that the station was maintained on the west side of the island.

Twice in summer whitefish would approach certain shores of Thunder Bay, where they fell victim to the post's seines and gill nets. The first run occurred in the last week of June or first week of July, while the second arrived in mid-August:

> "... it is an extraordinary thing that we can not catch any whitefish this late season when in former years there used to be an abundance about the middle of the month..." (F.W.J. Aug. 25, 1826).

In great numbers these fish would congregate at the entrance of the Kaministikwia River. The Reverend Mountain (1844) informs us that, "Five thousand of these fish were taken in one morning before breakfast during the past summer". This pattern of two summer runs or "false spawns" of whitefish is confirmed by Purvis (1977). However, he sets a later peak for the first run; in mid-July and lasting approximately one week. Also, a longer duration for the first run is suggested by the journals. A meteorological record, included at the end of the 1839 journal supplies the following details:

June 21: The small white fish come to the entrance of this river in shoals

June 26: Heavy rain during the night. The whitefish have departed from the entrance of the river.

June 29: Perfectly calm at sunset. The whitefish have returned. took 2506 this morning in 2 hauls with the seine...

July 3: The whitefish have again disappeared from the entrance of the river.

The failure of trout-line fishing in summer was at times due to a scarcity of herring for bait. Unlike the posts at the Michipicoten and Pic Rivers whose fisheries procured herring inshore during June and part of July, herring never formed a significant part of the Fort William fisheries. No summer inshore movements are noted, and few seining attempts were ever made at this time. The failure of these species as a exploitable resource is also discussed in Section 2.2.2.2.

In the first half of May, sturgeon began to appear in nets set near the mouth of the Kaministikwia River. Therefore, they were to be found running in this river at a later date than in the Pic River (see Section 2.2.1.1). In June the "Big Forks" (Mission R.; Fig. SM71) was a favourite place for seining. Flooding in the months of May and June often made seining difficult and at times impossible. During the second or third week of July sturgeon moved into the rapids to spawn. Great numbers up to large sizes were occasionally reported (F.W.J July 12, 1824): entries for 1823 record a 34-kg. (76-lb.) sturgeon (June 11), a 31-kg.(68-lb.) specimen (June 16), and finally, on July 11th, a 136-kg. (300 lb.) giant. This last enormous creature approximates the upper reported range for the species; Carlander (1969) cites a 125-kg. (275 lb.) female from Lake Winnipeg, Manitoba as the largest documented. In the early 1900s, however, a sturgeon weighing 141 kg. (310 ib.) was pulled from the waters of Batchawana Bay (Drew and Littlejohn 1975).

Suckers appear to have been common in and about the Kaministikwia River from early May until mid-July:

> "Seine gave 300 suckers". (F.W.J. July 4, 1826).
>
> "All the Indians and Freemen about the place have been setting nets and are partly successful in catching suckers and pikes." (F.W.J. May 13, 1827).
>
> "Michel arrived from the Rapids. brought 95 suckers." (F.W.J. May 17, 1827).

Suckers found in the stream after mid-May were more likely to have been

Catastomus commersoni than the longnose sucker, which spawns at an earlier date and for a shorter period.

It is written that:

> "The principal and indeed the only river of note is Kamanaistiquia or Ft. William.... It may also be remarked that it abounds with all kinds of fish, peculiar to the country, such as sturgeon, whitefish, perch, pike, pickerel, suckers and a few catfish." (F.W.R. 1828).

Catfish may refer to the brown bullhead (*Ictalurus nebulosus*) or the channel catfish *(Ictalurus punctatus),* although Scott and Crossman (1973) record the presence of these species south of Sault Ste. Marie only. Perhaps the burbot *(Lota lota)* is a more likely candidate.

2.2.2.2 SEPTEMBER TO NOVEMBER

Early in the fall, occasional catches of suckers and pickerel were made with nets and seines employed in the vicinity of the fort. The main efforts of the fishermen, however, were devoted to the capture of lake trout and whitefish. While encampments were established at the more distant stations, nets set at Mutton Island (also called Sheep Island) were checked every two or three days (weather permitting) to supply those people remaining at the fort with fresh fish. In Thunder Bay two runs of trout were observed. Those at Mutton Island were a smaller, early-running variety and usually left the grounds in the last week of September. At this time fishing was discontinued here, and the men and nets dispatched to aid fishermen already engaged at Pie Island. Large trout were then coming into shallow water along the shores of the island. This variety did not spawn in any significant numbers at Mutton Island; nor, apparently, were they common at the Welcome Islands, which were the site of a minor station established for the exploitation of the earlier, September-running lake trout.

After 1830 two or three stations were maintained each year at Pie

Island and were probably located somewhere along its north shore (F.W.J. Sept. 12, 1835). It was possible to still net trout in the second week of November when fishing efforts were usually suspended. Stations were also established at both Thunder Cape (Point Tonnère) and Hare Island (Rabbit Island). It was usual to commence setting nets at the Cape first and, as these trout began to fail, shift to the island grounds where spawning tended to continue later (about the first week of November).

In 1839, the first year of the commercial fisheries, Fort William supported 17 stations. The most productive were those established on Shangoina and its neighbouring islands. While crews might arrive here early in September, the lion's share of their barrels were not filled until the large trout commenced spawning toward the end of the first week of October:

> "...it is astonishing what a number of Trout there are of this season amongst these Islands, many of them weigh from 15 to 20 lbs and very few less than 10 lbs... (F.W.J. Oct. 15, 1836)

One may infer, therefore, that this run of large trout ended earlier than those of trout casting spawn on the shores of Pie Island or Hare Island. The Shangoina spawning terminated after October 20th when the fishermen would turn their attention to the whitefish fishery. In the 1840s there were three manned stations situated among these small islands. The yield here in 1839 was 21,500 kg. (47,400 lb. or 237 barrels) of whitefish and trout, while almost 7,700 kg. (17,000 lb.) were obtained at the Pie Island stations.

Prior to 1836, a station was occasionally established at a place known as Pointe au Pere. Although less important as a trout fishery than those discussed above, late season gill netting was possible in November. In both 1826 and 1829, the Welcome Islands (also called Les Isle Travers) proved a successful station. The presence of an native fishery at Sturgeon Bay is also noted (F.W.J. Sept. 17, 1839). Closer to home, trout

would also approach the Kaministikwia River:

> "Patahkinangue came from the Little Forks. he informs me that he has filled 4 Barrels of Troute there. (F.W.J. November 8, 1839)

It is not possible, unfortunately, to determine if trout would actually enter the Little Forks (McKellar River; Fig. SM71).

Sometime after 1845 the company extended its operations eastward along the Black Bay Peninsula. The available journals make no mention of these stations, but an Admiralty chart marks their locations as the "Little Shaganash Fishery" (centred at Monk Island off the northeast end of Porphyry Island), the "Great Shaganash Fishery" (between Shaganash and Cargill Islands, and the main shore), and Clark Bay (Great Britain. The Admiralty 1863). Stevenson (1865) also mentions the Little Shaganash Fishery:

> "there were a lot of old empty fish barrels there, and the remains of wigwams, lodges, canoes and sweating houses." [August 7, 1875].

Closely following the general retreat of the lake trout at Shangoina· Island was a run of large whitefish. These reportedly averaged 3.6 kg. (8 lbs.) each, with some weighing 7.3 kg. (16 lbs.) to 8.2 kg. (18 lbs.) (F.W.J. 1840, Thermometrical Chart). Spawning began between October 22nd and 25th and some years continued until the last week of November (later than at any other station):

> November 16, 1837. "Michel Collin & Boucher with the Big Boat & 5 other men to the Shagoinas Island to fish White fish... November 21, 1837...returned from Shagoinas with 580 whitefish. It appears that owing to the High water in the Lake the White Fish did not spawn on the usual shallows therefore they were not so abundant as in former seasons (F.W.J.)

Large spawning runs also came to the northern shores of Pie Island. These whitefish would, on the average, quit the shallow waters about the second week of November (earlier than those at Shangoina Island). Actual dates could vary widely from year to year. However:

> "[at Pattie]...the whitefish had finished spawning and left the Shallows for the deep." (F.W.J. Nov. 8, 1837)
> "The Indians arrived from the Pattie with 1130 Whitefish. they report that the fishermen there only began to catch fish in any quantity this morning. (F.W.J. Nov. 5, 1836)

A distinct run of whitefish would begin to approach the shores about the Kaministikwia River as early as the end of August (F.W.J. August 29, 1839) and almost always during the first half of September. At this time seines were plied and nets set at the river's mouth. Once in the 1850s, 30 barrels of whitefish were taken in one seine haul near Fort William (Anon. 1923). These composed a river-running stock. The earliest recorded date on which whitefish actually began moving into the river was September 3rd:

> "...the Nets have produced twenty White Fish & six other king which by some (who appear acquainted with it) is deemed a sign that the fishing will commence at the Rapids earlier than common. (F.W.J. Sept. 9, 1818).

The rapids referred to are a distance of 18 km. (11 mi.) upstream from the fort site. Most years large numbers of whitefish began appearing at the foot of the rapids between September 30th and October 7th. Spawning approached a peak about a week later, but certain years the run could continue into the last week of October:

> "...this is generally about the time the fish fails here (at the Fort). the Whitefish are gone up the River to spawn in the shallows & rapids, hence very few will be got this season at the entrance of the River with the Sean." (F.W.J. Oct. 3, 1830).

At times fishing even became difficult at the rapids, as the fish were in the habit of moving up into the rapids where the water was too fast to effectively ply the seine. Even so, extremely large hauls were possible (such as in 1831, when 11,000 fresh fish and 5 salted barrels were obtained in only nine days.; F.W.J. Oct. 21, 1831).[6] Clearly the whitefish of the Kam River initiated their spawning movements far earlier than was typical for stocks spawning in the main lake. In addition, they tended to be of a smaller size. The District Report for 1825 notes their average individual

weight as being 0.5 kg. (1 lb.), and elsewhere it is recorded that about 500 filled 2 barrels (i.e. an average weight of 0.36 kg. (0.8 lb.) each; F.W.J. Oct. 14, 1836). This may have been a "dwarf" form.

The existence of sympatric populations of "dwarf" and "normal" whitefish has been discovered in a number of North American lakes (see Lindsey, Clayton and Franzin 1970; Kennedy 1943). In Munising Bay of Lake Superior, for example, Edsall (1960) found the whitefish stock to differ markedly from those outside the bay in its slow rate of growth and late maturity; average weight at age XI was 0.36 kg. (0.8 lb.) and no female matured younger than age V. All fish of both sexes were mature at age XII and older.

No mention of spawning herring is made in the Fort William journals, and no fisheries were established for their exploitation. The annual reports of the Department of Marine and Fisheries of Canada, however, show that after 1900 the commercial herring fishery of Thunder Bay grew rapidly in importance. Koelz (1929) describes seasonal movements:

> "In Thunder Bay, out of Port Arthur and Fort William, Ontario, the schools begin moving in from the west between Pie Island and the mainland about the middle of November and spread northward and eastward. They remain until early December and depart then rather suddenly over the same course. While in the bay they are taken at depths of 6 to 25 fathoms on mud and clay bottom...almost incredible quantities were taken by the virgin fisheries."

Therefore, if herring were spawning on deep grounds away from the shore areas of Thunder Bay, it is quite possible the fishermen of the Hudson Bay Company were unaware of their location. On the other hand, although fishermen would abandon their Pie Island stations prior to the end of the second week of November, it is strange that such large movements of fish so close to the islands would go unnoticed. Local native people also fished the area until later in the season. Such a resource could have greatly augmented winter supplies in years when trout and whitefish were scarce. Perhaps then, the patterns of movement described by Koelz (1929) did not exist at the time of the Hudson Bay Company's operation (or if they did

were possibly at a later seasonal date).

2.2.3 MICHIPICOTEN POST FISJIERIES

2.2.3.1 DECEMBER TO AUGUST

At Michipicoten Post, as at Pic Post, herring were extremely plentiful, especially throughout the month of June and into July. The earliest recorded date for the first appearance of spring herring was May 17 (1829), but most years these fish would not approach the shores until after May 20th. It seems that the inshore movements about the Michipicoten River occurred at a somewhat later date than those at the Pic. Comparing four years for which dates of first netting are certain for both locations, one finds a difference of approximately one week to 10 days. Appearing first in the nets sunk at Perkwakwia Point (known as Gros Cap or Doghead Point) or near the Michipicoten River mouth, (Fig. SM14) herring would then typically invade the river itself, an unusual habit for this species:

> "We continue to obtain by means of the seine abundance of Herring at the entrance of the River, into which contrary to their usual course they have not ascended this year, the consequence probably as before hinted of the augmented waters from the interior which renders the river water fouler and colder than usual -- qualities which I am apt to think are offensive to this kind of fish." (M.P.J. July 10,1831).

The entry for July 20, 1830, which reports that herring were spawning in the river, is likely an error as herring are usually fall spawners[7]. It is not known to what distance herring would ascend the river, but great quantities could potentially be taken at various sites:

> "... A great haul of Herring, but we intend to salt no more -- we have salted 55 Bbls. altogether." (M.P.J. July 20, 1838).

The men of the establishment also exploited inshore movements of whitefish and lake trout which occurred in July of each year. Whitefish arrived at Perkwakwia Point somewhat prior to the lake trout, and here both species were in the greatest abundances to be found in the Bay. Nets were

initially set at depth, and progressively moved into shallower waters:

> "Set four large meshed Nets (for the first time this Season) in about 20 fathoms of water in the hopes of catching Trout and Whitefish." (M.P.J. July 23, 1818).

By late July it became possible to draw whitefish into seines plyed at both Perkwakwia Point and in the vicinity of (but not in) the Michipicoten River. It is also noted:

> "[If] additional men were sent here by the 15th July they would be in time for the principal fishery at a small River about 18 Miles from here [probably the Dog River]. another of the Fishing places is a little short of 25 Miles from hence [probably the Eagle River; Fig. SM15] there are several other fishings that is pretty nigh us ... to all these places the N.W.C^{0} always send from here." (M.P.R. 1817/18).

In Michipicoten Bay, the general shoreward movement of trout and whitefish occurred about the same time as the retreat of the lake herring:

> "The Herring fish have now retired from spawning in this River, a few however are caught by nets in the lake -- sufficient to bait our lines for Trout which begin to approach our Shores -- we expect soon to get Tittamingue [whitefish]. A few nets for this fish were put in water today at Gros Cap." (M.P.J. July 20, 1830).

> "The Herring have now retired from our Shores but we begin to catch Whitefish in nets placed about the Gros Cap." (M.P.J. July 20, 1828).

It is possible that predatory trout moved in to feed upon herring as they vacated the river and shores. Interestingly, summer runs of lake trout and herring did not occur concurrently as they did in the vicinity of Pic River -- a difference in habit for which there is no obvious reason. Nevertheless, the prolongation of the fishing season permitted the Michipicoten post a more certain supply of fresh fish in summer than was enjoyed by the other posts. Whitefish tended to outnumber lake trout in the nets, but both species were generally available in the bay area throughout August. Various entries provide an indication of catch size:

> "... the Nets (6) caught 35 Whitefish and Trout -- A result which is considered very fair for the season." (M.P.J. July 18, 1827).

> " 60 Tittamingue -- best from six nets seen at this place." (M.P.J. Aug. 12, 1831).

> " Seine 110 White Fish.... The number of Whitefish is considered

> extraordinary at this season. If I had men probably we might be enabled to salt several Barrels of Whitefish." (M.P.J. July 28, 1838).

In April and early May, "suckers" and "carps" dominated the catch (see Section 2.2.1.1). The procurement of "red suckers" *(Catostomus catostomus)* is occasionally noted (M.P.J. May 1, 1839). Early spring could loom as a time of hunger:

> "... employed fishing, opening up part of a Sturgeon net for twine to sling floats & stones for nets, as well as to bark the remainder of the Sturgeon nets, again upon other Lines. necessity now forces us to try every means to procure subsistence. only two fish today." (M.P.J. May 18, 1801).

> "Altho we have six Nets in the Water there are only two of them that are the proper size for catching Carp, the only kind of fish caught here in the spring." (M.P.J. April 24, 1818).

Infrequent catches of Sturgeon were made throughout June, but serious efforts to obtain this species were generally frustrated until the later part of that month:

> "Set the large marsh net below the fall opposite the House for Sturgeon." (M.P.J. June 29, 1797).

> "Set a sturgeon net at the river mouth across the N. Channel." (M.P.J. June 20, 1799).

It is noted April 28, 1828 that:

> "... our fishermen caught only one Jack or pike fish." see Section 2.2.1.1).

In addition, a single reference is made to the capture of a "sheepshead"; also known as the freshwater drum *(Aplodinotus grunniens):*

> "... got a sort of Fish in the river which I believe called a Sheepshead and is generally caught in Saltwater at home. it weighed about 5pds had a very round back, and sharp prickly fins from the shoulders to the Tail. It tastes something between a Trout & a Sturgeon. They are very rare here about but are often caught as I am informed about Michilimackinac." (M.P.J. June 22, 1798).

There are no other known references to the occurrence of sheepshead in Lake Superior (Scott and Crossman 1973). On the basis of the above description, there is also some possibility that the Post employees had misidentified a

smallmouth bass *(Micropterus dolomieui),* a species which would also have been uncommon in this region.

2.2.3.2 SEPTEMBER TO NOVEMBER

Of great importance as a fall fishery was the Dog River, where, prior to 1821, Hudson Bay Company fishermen would ply their nets in close proximity to those of the rival North West Company. Until the 1820s the Dog was known to all simply as "Trout River". In early years river-spawning lake trout were exploited solely with seines (of varying dimensions). Then, in 1829, there was introduced to Lake Superior the fishing weir, an innovation modelled upon those employed by both natives and white men west of the Rocky Mountains (M.P.J. Sept. 5, 1829). Proving a great success, it yielded at the Dog River 36 barrels of lake trout that year:

> "not only with respect to the productiveness (equivalent to the usual result of at least three fisheries (27 Nets) and the labour of 6 men during a period of 40 days) of the experiment (which occupied a period of 22 days and the labour of one man with his family) but also productive of immense saving of labour and considerable expense of fishing Tackle." (M.P.J. Sept. 26, 1829).

The advance guard of the fall runs began to gather about the river mouths, preparatory to moving upstream (where they were followed by the seiners). Journal entries indicate that the spawning period at the Dog River could vary greatly from year to year. Fig. 3 depicts catch data recorded for the year 1840 (M.P.J. Sept. 21, 1840). We see that the actual period of spawning lasted less than 2 weeks, and that few trout remained after September 20th. Similarly, in the years 1829, 1830, and 1839, the conclusion of spawning, and the general retreat of the stock, occurred by September 23rd (earlier than dates recorded by recent authorities see Section 5.3). On the other hand, certain years were characterized by a delayed spawning period:

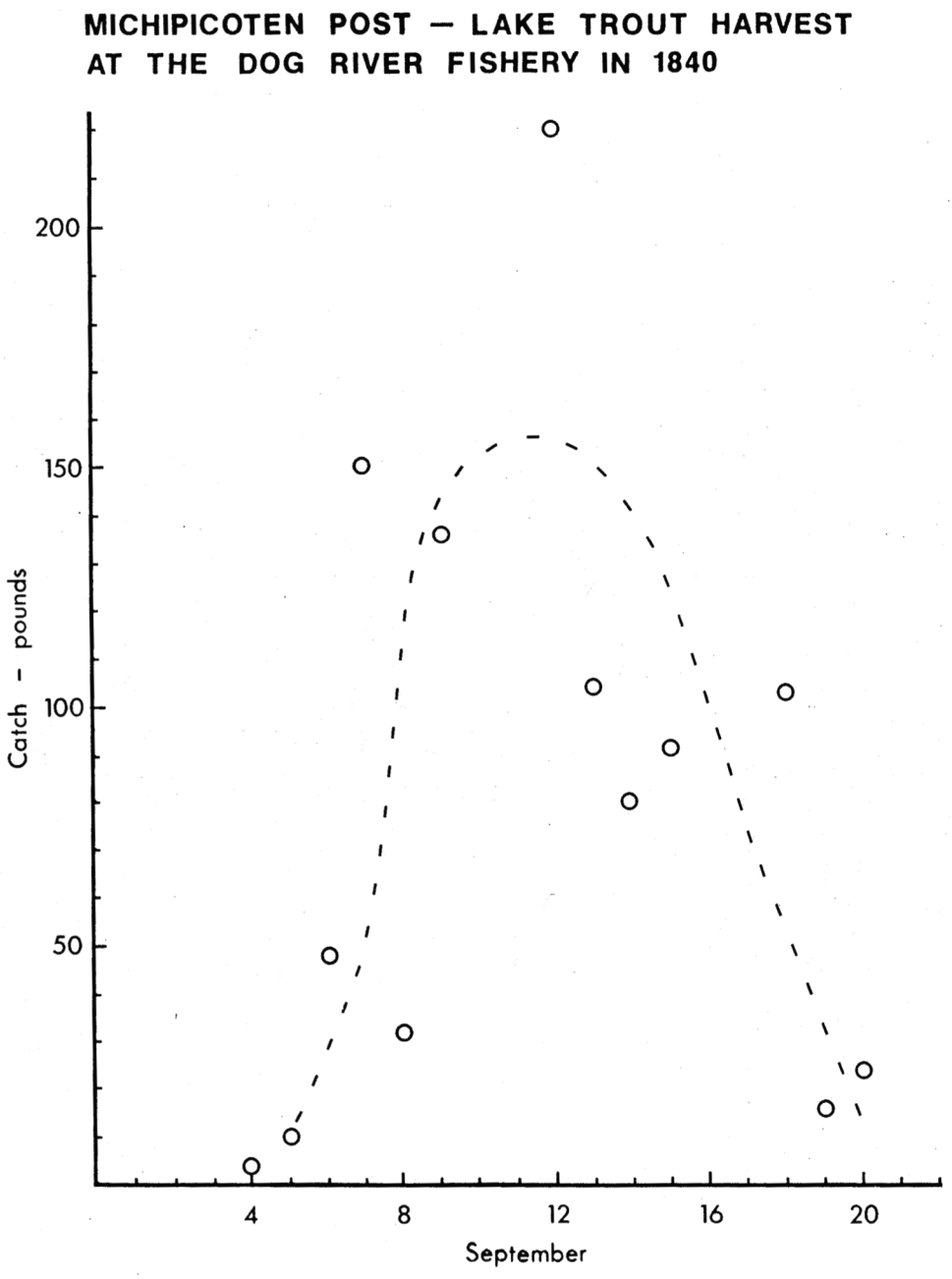

MICHIPICOTEN POST — LAKE TROUT HARVEST
AT THE DOG RIVER FISHERY IN 1840
Catch - pounds
200
150
100
50
4
8
12
16
20
September

FIG. 3

> "... the Trout are not begun to gather in the River..." (M.P.J. Sept. 13, 1799).
>
> "the fish were not plentiful till the last four days." (M.·P.J. Sept. 25, 1799).
>
> "It was near a fortnight [after September 9th] ere the fish were plentiful enough to admit of [the men] curing any during which time they could not get sufficient for their own subsistence. tis but these few days past that they became numerous." (M.P.J. Oct. 3, 1801).

In 1840 the average individual weight of Dog River lake trout was 1.2 kg. (2.7 lb. -- i.e. 19 barrels were found to hold a total of 1412 fish; M.P.J. Sept. 21, 1840).

Weir fisheries were also established at the Makua River[8], and the lake trout run here proved almost as productive as that of the Dog River. We also learn of an unsuccessful attempt in 1828:

> "... to make a fall fishery at Montreal River (which got a great name last year for being abundantly stocked with excellent Trout) which entirely failed and where too much time was lost..." (M.P.J. Oct. 22, 1828).

No further reference is made to establishing a fishing station at Montreal River, although it was frequented by native fishermen. Stream-running stocks of lake trout may have been a common phenomenon in this region, frequenting not only the larger streams:

> "Sent Mr. Robertson to order McKay to establish a Barriere at a small rivulet (a little beyond his station [at the Dog River]) where I hear Trout cast their spawn." (M.P.J. Sept. 10, 1830).

Two fishing stations were located about Cape Gargantua; one at a place known as the "Stoney Islands" (which may allude to the area about Devil's Warehouse; Fig SM12; M.P.J. Sept. 19, 1827). Spawning grounds also existed about Cap Chaillon, where a station was periodically established at a place known as "Mousseau's ascent to his Sugar Bush" (M.P.J. Oct. 6, 1828). Occasional mention is made of a native fishery at the "Ecores", possibly referring to Point Isacor (M.P.J. Sept. 2, 1839). In addition, it is noted September 9th, 1858 (M.P.J.), that a fishing party was dispatched to Michipicoten Island for lake trout, equipped with "a lake boat with jib

& main sail & spars".

The inhabitants of Michipicoten House, like those of Fort William (see Section 2.2.2.2), identified two varieties of lake trout, distinguishing them according to size and spawning sequence. The first run of small trout included both river and early shore-spawners, while large trout would often run through October and past the first week of November. At Cap Chaillon, for example:

> "they have collected a very superior lot of rich Trout and Whitefish.... [Boucher] reports that some kind of Trout have not concluded casting their spawn but his salt and Barrels were spent." (M.P.J. Oct. 16, 1839).

Trout and whitefish could run concurrently, and were not necessarily isolated by their spawning periods as was the case at some other locations in the lake (as at Pic River or Shangoina Island, both previously discussed). It is also interesting to note that lake trout and whitefish south of Michipicoten Bay would spawn to a later date. The following information is extracted from the Thermometrical Journal for 1839:

Sept. 4-6	Small trout collecting at Small Rivers to Cast their spawn
Sept. 13	Small trout begun spawning
Sept. 23-24	Small trout in this vicinity done spawning
Oct. 18-19	Spawning of small trout about ended
Nov. 18-20	Large trout & Tittamingue cease spawning in this vicinity altho not elsewhere

In 1832 lake trout disappeared from the area about Perkwakwia Point around October 8th (M.P.J.). Sometimes November whitefish fisheries were established at the Point, but these were quite minor in scale.

The earliest fall whitefish were those approaching the shores of Michipicoten Bay prior to spawning in the river. These tended to be smaller than whitefish taken elsewhere, but at an average weight of 0.7 kg. (1.5 lb.) each, they were heavier than the fish of the Kaministikwia River stock (Section 2.2.2.2).[9]

The earliest recorded date on which whitefish began entering the river was September 10th in 1859. Typically, however, upstream movements

commenced between September 23rd and October 3rd. Seining operations were occasionally extended a distance of 16 km. (10 mi.) upstream to Scot's Falls (but it is likely that only a small percentage of the stock would migrate this far):

> "The men took the seine up the River almost to the Portage and descending thru it out at 10 different places without catching a fish -- In the evening at the mouth of the River 26 W. Fish were caught." (M.P.J. Oct. 11, 1827).

> "The seine was worked today in different places of the River down from the Grand Peche [exact location not known] and only procured one Tittamingue and two pickerel fishes. Hence we presume the fish have got up amongst the Rapids and dispersed here and there." (M.P.J. Oct. 9, 1829).

Other favourite locations for plying the seines included the mouth of the Magpie River, the "first point above the House", and Point Parisienne (location not known -- M.P.J. Oct. 8, 1829). As in the Kaministikwia River, rapid waters were preferential spawning sites. In certain years the river would attract whitefish for over 3 weeks, and in 1830 supported a seine and weir fishery from September 23rd to November 10th. Sensitive to turbid waters, however, whitefish would avoid the river in times of storm and resulting siltation. Natural modification of the river bottom (including, no doubt spawning beds) was a common phenomenon in the Michipicoten River and other rivers of the North Shore:

> "... [the Tinsmith] is besides very expert at working the Seine, by which some years ago a great number of white fish used to be caught during the spawning season in this River -- an alteration since in the bed of the River occasioned by a flood or flush of water seems to have given occasion to the fish to resort elsewhere." (M.P.J. Sept. 25, 1828).

Storm damage could be quite dramatic:

> "In the evening the gale increased to a perfect Hurricane, rolling the Water of the Lake into the River at a most rapid and alarming rate flooding and scouping off its banks everywhere - so much so that a strong quay at the end of our Mess House was demolished and the Hause itself partly undermined. Indeed the violence of the gale and consequent influx of water in the River surpassed anything of the kind remembered." (M.P.J. Oct. 25, 1829).

The Dog River was likewise susceptible to the effects of wind and sea, with their power to interrupt normal spawning patterns of the lake trout and whitefish stocks (the latter arriving to cast spawn a short time after the trout had departed -- M.P.J. Sept. 27, 1831):

> "J. Clousten and assistants arrived from the fishery at Dog River - which owing to the frequent furious gales and heavy rains, is quite over - The bed and channel of the river being quite cut up and deranged." (M.P.J. Oct. 29, 1831).

In October incidental catches of lake herring were periodically made in whitefish seines plied in the Michipicoten River. No spawning run is described, however, and the fish were at no time remotely as abundant as in July. C. F. George Keith noted the presence of a variety of fish he identified as a "Ciskeche":

> " a small species about the same size and bearing considerable resemblance to the Herring." (M.P.J. Oct. 17, 1831).

Keith also refers once to the capture of four small "Toulibee" in the river (M.P.J. Sept. 23, 1840). Certainly the names cisco, herring and tullibee have all been used to describe *Coregonus artedii.* Koelz (1929) saw fit to recognize two subspecies in Lake Superior, *C. artedii artedii* and *C. artedi albus,* the former distinguished by its body of slenderer proportions. Jordan and Evermann (1908) added another, *C. artedii arcturus* to the list. While it is unlikely that any of these forms should be granted subspecific status, it is possible that they represent different stocks of ciscoes. These were perhaps familiar to the fishermen of Michipicoten Post.

2.2.4 RED ROCK POST FISHERIES

The Hudson Bay Company post on the northwest shore of Lake Nipigon maintained an outpost at the mouth of the Nipigon River. It was a small, relatively minor establishment, and Stevenson (1865) describes the site in its later years:

> "The station consisting primarily of two large log buildings, viz a

> one-roomed dwelling house and a store - also a potato patch, has an unimportant neglected look. There are besides two small log shanties ... Outside the enclosure there are a few wigwams, but as we had already heard - all the Indians had gone up the river to hunt and collect birch bark "

Whitefish tended to dominate the fall catch. In 1837 the total harvest was 5,500 whitefish and 2 kegs of Trout (either lake trout or brook trout).

It may be noted, in passing, that the fishing stations situated on Lake Nipigon are identified as English Bay, Sandy River, Peche au Large, Grande Peche, Roche qui Frappe, and Isle aux Brochel. (The locations of some of these are not clear.)

2.2.5 FORT SAULT STE. MARIE FISHERIES

Scores of historical accounts survive describing the native whitefish fisheries at the St. Mary's River rapids (Macdonald 1979). Men of the Hudson Bay Company Post also exploited the rapids in order to obtain fish both for personal consumption and the foreign market. The major part of the fishing was in October:

> "There are but few fish yet in the Rapid according to report and the few that are caught some petty traders from the American, side immediately trade being encamped on the Island for that purpose." (S.S.M.J. Sept. 21, 1824).

> "The whitefish have not been plentiful these few nights back in the Rapid. Oct. 24, 1824). I got upwards of 100 today." (S.S.M.J.

> "La Verdue came here from the Rapid. He had with him but one fish. The fishing is at an end for this season." (S.S.M.J. Nov. 27, 1824).

3. METHOOOLOGY FOR STOCK IDENTIFICATION

3.1 PERSONAL COMMUNICATION

Many of the pioneer families which played a vital role in developing the Lake Superior country have not yet been lost from this land. Second and third generation descendants remain to continue the family name and recall earlier days of settlement and industry. Their towns have modernized, but civilization still hugs the broad sweep of shoreline from Sault Ste. Marie to Thunder Bay. This close proximity to the lake insured that inhabitants knew intimately its ways and resources.

During the summers of 1978 to 1980, I interviewed individuals personally involved with the pre-1960 Lake Superior fisheries. Some of these people had been contacted by letter during the spring of 1978. The most obvious sources, of course, were the commercial fishermen. Certain of these people had entered the profession prior to 1920, learning their trade under the tutelage of their fathers and pursuing the lake trout fishery until its collapse in the 1950s. The oldest interviewee was 93 years of age.

Many commercial fishermen had retained grounds licensed by their fathers, fishing small blocks of water near shore and close to their home towns. Occasionally a ground might be fished out for a time; then it became necessary to move to more distant sites. Some fishermen employed tugs rather than rowboats or gas boats and could range far afield. The western end of the lake has traditionally been more accessible to the small-scale operator with its greater number of sheltered bay and island areas, nearshore grounds, and less intense prevailing winds during the fishing season. Harsher conditions in eastern waters demanded larger and more capital intensive enterprises.

I considered it also desirable to seek out participants in the recreational fisheries and charter boat operators. The sports people employed different equipment, different techniques, and frequently fished at different times of the year (see Loftus 1979). Their experiences and impressions of the fish therefore offered many insights not available from commercial fishermen.

In total 80 people directly involved with the former lake trout fisheries were interviewed; a number of those most informative were interviewed more than once. In addition, helpful suggestions and valuable information was kindly supplied by employees of a number of government agencies (See Appendix II).

A few interviews were recorded on tape. However, it was generally found that simple note-taking was more conducive to relaxed conversation and detailed explanations. Questionnaires were prepared as an interview guide but seldom rigidly adhered to -- an informal atmosphere was encouraged. Given sufficient time, the most valuable route to obtaining oral historical information is not necessarily the most direct. During the interviews emphasis was placed upon:

- background history of the lake trout fishery;
- lake trout appearances, habitats, and habits, including spawning ground locations and characteristics, movements;
- fishing techniques, including equipment, depths fished, frequency of fishing; and
- stock transformations.

Interviewees were requested to mark on Canadian Hydrographic Service (or National Oceanic and Atmospheric Administration) Great Lakes navigational charts the native lake trout spawning grounds with which they were personally familiar.

3.2 THE SPAWNING GROUND MAPS

This report is but one in a continuing series of efforts at delineating the natural habitats of Great Lakes' fish species. A pioneer attempt was made by Reighard (1910), who produced whole lake maps, large in scale but lacking in detail. Careful attention to detail, on the other hand, is shown by Smith (1968) in his study of former lake trout spawning grounds in the Canadian waters of Lake Huron and Georgian Bay. More ambitious still is the unpublished work of Organ et al. (1978) which maps spawning grounds of all species in the coastal waters of Michigan state. Horrall (1976), Peck (1978), and Coberly (personal comm. 1979) are also pursuing relevant studies. It is hoped that the volume currently being prepared by Goodyear et al. (1981) will draw together these many threads to form a definitive summary of spawning grounds in the Great Lakes.

For the present study, the reference publication of Lawrie (1967), "An Atlas of Canadian Lake Superior Fishing Grounds", has proved invaluable. (It does not, however, deal with spawning grounds specifically). When the name of a particular ground was in doubt this work was considered to be the final authority. Usually names shown on the hydrographic charts were retained, although there are many instances where these derive from the inventive imaginations of the original surveying parties and ignore the historical precedents. The complaints of local residents that these names are neither the first nor the best are being investigated by the Geographical Names Board (Queen's Park, Toronto) -- hopefully changes will be seen in future map publications.

Page size sections of the lake charts were photocopied to produce the maps of Fig. SMl to Fig. SM75. Their collective lake locations are outlined in Figures 5, 6, and 7 of Appendix VI. In mapping the spawning grounds for lean lake trout, an attempt was made to assess these as major

or minor. Smith (1968) classified a particular ground as minor if it was fished only when conditions prevented a fisherman from visiting a preferred (or major) ground. Qualitative interpretation was, of course, often required:

> "... It should be recognized that an area close to home might be considered a major spawning area by a small-boat fisherman, but this same area might be considered minor to a fisherman with a seventy-foot tug."

Interviewees for the present study usually recalled certain lean trout grounds as having been either very important or relatively minor; these are so indica- ted on the maps of Appendix VI. Many grounds would not stand out in memory, however, and are simply classified as of "average" importance (or "not known"). A spawning site might also be described as the favourite resort of one or more varieties of lake trout. The names indicated on the maps are those employed by the local fishermen to describe these types. Each type is discussed in detail in Section 4.1.3 and its relevance to stock identification considered. Only spawning grounds mentioned by interviewees are shown on the maps; historical references to grounds are noted in the text only. Spawning dates and possible stocks are summarized in Appendix V (see also Section 5).

The non-lean forms of lake trout are reviewed in Section 4.2. Only a minority of the interviewees had actively sought these varieties, and even these people were generally unaware of spawning locations and times. As will be seen, certain habits of these fish discourage such knowledge. In consequence, it was usually only possible to outline general fishing areas. Any reported spawning activity of non-leans within these areas is specifically noted on the maps of Appendix VI by the word "spawning". When drawing the maps, an effort was made to remain true to the correct fishing depths for non-leans and spawning depths for leans. It is at times,

however, difficult to pinpoint exact fishing locations on the shoals. Nets were moved up a shoal into shallower water as the spawning season progressed. Then, as the trout would again slip away to deeper waters, the process was reversed, and nets were shifted back down the shoal. Tug fishermen, of course, could not fish as close to shore as those men with small boats. The lake trout they would catch tended to be moving on or off the grounds, rather than actually spawning. Those fishermen with small rigs would often know with more precision the exact points of spawning, and would understand fish habits more intimately. On the other hand, they have experienced more localized areas of water, and fewer stocks than the tugmen. Such basic differences of perspective often demand careful interpretation and evaluation of interview statements.

Unfortunately, few of the lean lake trout variants described below survive today. Many of the original spawning grounds are now deserted in the fall. In consequence, (while also desirable) it is unavoidably necessary that ,this report remain rooted in the phenomenological insights of the individuals interviewed. Few opportunities remain to test scientifically the conclusions drawn by original observers. Often one can but simply describe the statements of these men foregoing detailed assessment, letting them stand as the experiences of knowledgeable people. Each fisherman, in the course of years of observation, came to discern patterns of fish behaviour. At the basis of recognizing specific groups of lake trout within these patterns lie certain parameters, the foremost being those of spatial-temporal distribution -- for the question, "Where are the fish", is, of course, the most important one for a fisherman. Confirming the existence of these groups are criteria of physical appearance (discussed in Section 4.1.2). It has been discovered in studies of various

fish species that such criteria often do, in fact, correlate with known breeding stocks.

The researcher must recognize certain problems of inertia. Having developed patterns of fishing based on their observations, fishermen will usually be loathe to change them. Experimentation costs both money and time. Limited experience can lead to misconceptions. A fisherman may believe a type of trout to frequent only certain grounds or depths because he has never moved to others. He may underestimate its average weight because he had never fished larger mesh sizes.

A concerted effort was made to corroborate all opinions. Yet with such a vast distance of shore and a small and declining population of old-timers, this was frequently impossible. In the case of contradictory statements, preference was often given to those of the most experienced fishermen. However, such discrepancies could reflect not the errors of people, but rather, the nature of the lake trout themselves; i.e. their phenotypic plasticity, behavioural diversity, and variations in stock abundance.

Certain regrettable gaps exist in the spawning ground maps: notably places between the Pukaskswa and Pic Rivers (Fig. SM18 to Fig. SM23), along the Black Bay Peninsula (Fig. SM59 to Fig. SM61), and south of Mink Point (Fig. SM74). These are frequently inhospitable areas of shore, distant from any fishing ports. Only a few individuals are living who were familiar with these waters, and some of them were unavailable for interview. It should also be remembered that in a lake whose bottom is as rugged as that of Lake Superior, there may have been many areas with abundant fish where fishermen would not set their nets. These are unexploitable zones of the lake which remained "refuges" for the resident fish. Such are the "stickholes", for example, the deep depressions where logs and debris would collect and tear

out any nets buffetted about by the currents (also see Purvis 1977).

3.3 WRITTEN MATERIAL

In line with the increasing interdisciplinarity of modern science, the fisheries biologist is taking steps into the domain of the historian. In the field of Great Lakes rehabilitation, the necessity of perceiving the present in the context of the past in hopes of changing the future becomes increasingly evident. The need to work towards a wise resource use perspective demands that management decisions be assessed within an historical context. To understand the past is to remain rooted in the world, avoid repeating mistakes, and perceive directions of forward trends. This applies equally to individuals, societies, or management strategies. Such are the criteria for any successful ideology. Those that have realized these dictums have endured; those that have not have been passed by.

To ground his knowledge of current Great Lakes ecosystems in the processes of their early transformations, the ecologist must turn to musty archives, forgotten texts, and fading maps. In recent years much progress has been made in identifying sources of information (Beeton and Strand 1975; Smith 1976; Regier and Whillans 1978; Francis et al. 1979). Whillans (1977) critically assesses sources and considers the epistemology of the fisheries historian.

Resource institutions consulted during the present study are listed in Appendix II. Of major importance were the holdings of the Federal Department of Fisheries and Oceans, which include

- overseers' reports,
- hatchery records,
- licensee records,
- departmental correspondence, and
- investigative commission reports.

Provincial agencies concerned with fisheries matters have been, on the

whole, remiss in retaining early archival materials.

Many published and unpublished accounts of explorers, settlers, sportsmen, and naturalists were consulted. Surveyors' notebooks and local newspaper articles were found to be valuable. Useful background information was found in American governmental reports.

Fishermen's logs were especially desirable. Unfortunately, very few small-scale operators would bother keeping such, and most pre-1950 records of the fishing companies have been lost, burned, or drowned years ago. Catch records of James Purvis and Son, Ltd. (1934-1955) have been helpful (supplied by Mr. M. Purvis, personal comm. 1978). A visit was paid the head office of the Booth Fisheries Company in Chicago -- alas, all has been discarded from the days when this enterprise reigned over the Lake Superior fisheries.

4. NATIVE LAKE TROUT -- A GENERAL DISCUSSION

Examination of historical records reveals a great confusion of lake trout appellations and descriptions. Martin (1977) has compiled a list of 36 common names and reviews the rather astounding number of nomenclatural changes which followed Walbaum's original description of 1792. Early investigators tended to propose the existence of new species or subspecies on the basis of local variations in external features. Richardson (1836), for example, listed thirteen species of lake trout. Through the years numbers were discarded until today it is usual to regard the lake trout as one species *(Salvelinus namaycush),* with the fat siscowet relegated to subspecific status *(Salvelinus namaycush siscowet).* Hubbs and Lagler (1964) have also included the Rush Lake trout as an isolated subspecies *(Salvelinus namaycush huronicus),* although without widespread support. There still exists some controversy over whether the lake trout should rightfully be distinguished from the other charrs by awarding it the special generic name *Cristivomer* in place of *Salvelinus.* Martin (1977) reviews briefly the literature supporting both sides of this argument.

Quite apart from any taxonomic debate, fishermen recognized four general varieties of lake trout within Lake Superior waters -- leans, fats (or siscowets), halfbreeds, and paperbellies (sometimes called humpers). These are functional categories based upon observed differences in behaviour, habitat, and features. Each tended to dictate different techniques of fishing and brought different prices at market. For the purposes of marketing, a variety might be further classified, usually according to size. Leans, for example, were often packed for shipping as headless, medium, and No. 1 trout. In addition to such arbitrary divisions, however, fishermen recall specific forms of trout within the four categories, differentiating these on the basis of one or more of the following criteria:

1. spawning location,
2. spawning time,
3. gross physical features such as flesh colour, skin colour, body size, body form, and weight,
4. spatial-seasonal distribution, and
5. feeding habits.

Each form was usually known by a name referring to its most obvious unique feature, such as redfin, black, sand trout, moss trout, and so on. It was during the spawning season that fishermen became most aware of the existence of these types. A particular type might be quite site-specific, spawning only on certain selected grounds. On the other hand, a type could refer to a general spawning run of fish, appearing at many places along the shore or shoals. The problem of detailing intraspecific variants as perceived by fishermen is occasionally complicated by the fact that the same name may be employed by people from different localities to describe groups of fish which bore little resemblance to each other. In addition, that which fishermen presumed to be a unique form constant through time might only have represented the responses of individual fish to local environmental conditions, responses as transient as the conditions themselves. In many instances, however, the criteria listed above can imply some degree of isolation between groups of lake trout, and it is possible to infer from these the former existence of discrete or semi-discrete stocks and subpopulations within Lake Superior. Historical documents reveal that people have recognized stocks for many years, and although not now supported in their judgements of taxonomic status, their observations do have biological significance.

Section 4 reviews the evidence for the existence of lake trout stocks (or subpopulations) and discusses the general characteristics

of the intraspecific groups known to fishermen of the Great Lakes in general, and Lake Superior in particular. Section 5 continues with a detailed regional account of the Canadian waters of Lake Superior. In the absence of quantitative data (from tagging experiments, meristic or morphological studies or electrophoretic analyses), conclusions concerning the presence of former stocks must remain, unfortunately, quite speculative in many instances. Despite the loss of most of these native stocks prior to 1960, the survival of local remnants holds promise for further fruitful study.

4.1 LEANS

4.1.1 INTRODUCTION

Early explorers to the Upper Great Lakes marvelled at the great sizes of lake trout they encountered there. Three forms were identified by the Jesuits at Michilimackinac, Lake Huron:

> "... one, the common kind; the second, larger than three feet in length and one in width; and third, monstrous, for no other expresses it -- being moreover so fat that the Savages, who delight in grease, have difficulty in eating it." (Jesuit Relations 1670 - 71).[10]

Wintering here in 1680, the Recollet Father Hennepin (1698) describes techniques of fishing through holes cut in the ice with nets set in 46 m. (150 ft.) of water. He coins the term "salmon-trout" for the fish he found here. Trout fishing at Michilimackinac also employed hooks and lines, sunk in some places to depths as great as 90 m. (300 ft. -- Henry 1809).

The explorer Charlevoix comments upon the piscatorial situation of Lake Huron in 1721:

> "There are three sorts of [trout] taken, among which is one of monstrous size and in so great quantities that the Indian with his spear will strike to the number of fifty in the space of three hours." (Charlevoix 1744).

As Alexander Mackenzie (1801) paddled westward through Lake Superior in

1789, he also found three different forms of charr but offers no description. Gourley (1822), however, supplies some details. One form was the brook trout; the other two lake trout, the largest reaching:

> "... 80 and 90 pounds weight.. [and] at Michilimackinac also are said to weigh 50 and some over 70 pounds.[11] They resemble the salmon of the sea, and may be of the same family, with the difference occasioned by their different water and food. The meat is similar in colour but not so highly flavoured. I think the proper name of this fish is the "lake salmon". The next species is more frequent, but of whiter meat, and smaller in size, weighing from 10 to 20 pounds and taken in greatest abundance in the fall. This fish is like the trout of the brooks, except being larger and without shining red spots on the sides. For the sake of distinction he may with' propriety be named the "salmon-trout".

The habit of larger lake trout of moving into shallow water for a short period in spring or early summer is discussed in detail in Section 4.1.2.5. It is natural that this was the time of year when they were most evident to early travellers, for these trout generally spawned late in the fall season -- at a time when few people forced to move about in fragile canoes would be fishing).

The large trout which Gourley calls "lake salmon" were also known as Mackinaw trout(or Mackinaw salmon), after the Mackinac Straits where they were first noted. Mitchill (1818) described them as *Salmo amethystus,* selecting this name because of a purplish tint, resembling that of amethystus quartz, which he found at the base of the teeth. (No fisherman interviewed by myself remembered seeing such dental colouration on Lake Superior lake trout).

DeKay (1842), in his Natural History of New York, distinguished the Mackinaw salmon from the "Lake Trout", which he identified as *Salmo confinis.* He described the colour of the former as dark or dusky gray dorsally, with many light gray spots on the back or sides, and somewhat yellowish ventral, anal and pectoral fins. The flesh was reddish in colour. The latter fish he found to be a smaller "species" of more robust

shape, with a much blacker back, fins tinged slightly with red, and paler "coarser" flesh. The British naturalist Adams (1873) notes that the Mackinaw salmon (or Namaycush) differed from the Lake Trout (also referred to as the Tague) and siscowet in having a more deeply forked caudal fin, ventral fins placed farther back on the body, and a characteristically extended labial crest. Mackinaw trout were believed to be limited to the Upper Lakes for the most part, although DeKay (1842) notes their presence along the southern shores of Lake Erie. On the average, however, the Lower Great Lakes and inland waters of Ontario have always held smaller lake trout than those native to the Upper Great Lakes:

> " examples (of Lake Ontario trout) weighing 24 lbs. are sometimes taken, but the average weight is much less than that. The fish caught in seines, on lines, etc. do not average more than 2 pounds, but in the large meshed gill nets, set especially for trout, the average is probably 8 pounds." (United States Com- mission of Fish and Fisheries 1890).

A number of sportsman's accounts published in the 19th century (e.g. Roosevelt 1865; King 1866) identified both the above "species" in Lake Superior. One cannot, of course, be certain of the investigative care with which these writers would study their fish specimens. Insufficient details are supplied concerning habitat and habit to propose that these men were in fact observing discrete subpopulations. Nevertheless, Lake Superior fishermen, past and present, have found visibly distinct forms of lake trout to exist not only in different parts of the lake but also to appear concurrently or consecutively upon the same fishing grounds. As examples, historical references to this great array of lake trout variants are reproduced in Appendix III: one pertaining to the Upper Great Lakes in general (Goode 1884), and one specifically to the St. Ignace Island area of Canadian Lake Superior (Thomson 1883, and elaborated by Kerr Jan. 3, 1885). The bewilderment of early taxonomists is quite understandable.

4.1.2 CRITERIA FOR STOCK IDENTIFICATION

4.1.2.1 SPAWNING LOCATION AND TIME

Throughout the early years of Canadian fisheries management, much heated debate centred on whether closed season regulations were representative of the true spawning periods of the fish species they were designed to protect. It was obvious that the gravidity of a particular species could vary widely under the influence of genetic makeup, age, and local conditions such as food supply, current, and temperature. Many decried the blanket application of province-wide close seasons, advocating instead zoned fishing regulations. Fielding (1915), for instance, wrote:

> "Let me give as examples only two instances of these varying periods in the province of Ontario. On the west shore of the Saugeen or Bruce Peninsula the lake trout *(Cristivomer)* come on the "redds" a fortnight earlier than it does on the southeast shores of Georgian Bay. Again, in lake Nipigon, the speckled trout becomes gravid nearly a month later than it does in the river flowing out of it."

In bodies of water as vast as the Great Lakes, it was clear that one could not even consider the whole lake as a single spawning unit. Along such great stretches of shoreline, fishermen have long recognized serial trends in the annual lake trout spawning periods. For example, information collected by Smith (1968) during interviews with local Canadian fishermen, indicates that spawning in Lake Huron commenced latest in the vicinity of the Straits of Mackinac (Nov. 1 - 15) and became progressively earlier as one moved along the shore of Manitoulin Island, southward toward Kettle Point (Oct. 20 - Nov. 10). In Georgian Bay, with the exception of the Collingwood area, a general counter-clockwise trend, from latest to earliest, was apparent. It will be seen below that comparable large-scale trends were also known within Lake Superior waters (see Sections 5.3 and 5.9). These may, in part, be related to differential cooling of near surface waters in the lake. Falling water temperatures can trigger

spawning activity.

Evidence collected by Van Oosten (1927) along the American shores of Lake Huron fails to reveal obvious north-south trends in the spawning periods. Local conditions, affecting only local stocks, may obscure such general trends. Different spawning groups of lake trout may be observed in Lake Superior, and these well show temporal, as well as habitat segregation according to whether they spawn in:

1. river, shore, or bank areas,
2. windward or leeward zones,
3. bay or inshore areas, and
4. deep or shallow waters.

River-running subpopulations, for example, often spawn somewhat earlier than those along the lakeshore. Stocks frequenting the warmer waters of a shallow bay may ripen more slowly, reproductively isolating them from those spending most of the year in the waters of the main lake. In addition, historical documents dealing with the Upper Great Lake fisheries often noted two major runs of lake trout -- one spawning inshore, and another spawning predominantly on the offshore reefs and shoals. In Lake Huron, for example, a "shallow-water trout" or "shoal trout" came ashore near Alpena, Port Austin, and Southhampton between September 15th and 25th and remained there for approximately 2 weeks (On certain grounds these might be taken in 1 m. (3 ft.) of water). A later, heavier run of "deep-water trout" (apparently also a variety of lean) did not approach the shore and was most common upon the reefs between October 10th and the latter part of November -- the season being later in the northern part of the lake than at Alpena and Southampton (United States House of Representatives 1897). In the same document, however, it is stated than Georgian Bay fishermen knew their offshore trout to spawn earlier than the larger inshore trout. In Lake Superior the first run at Marquette, Michigan, on

the other hand, was the "shoal trout", a smaller fish (Cook 1929). On the basis of the interviews conducted along the Canadian shore, it is evident that large native trout could be taken at spawning time on either the offshore banks or shore shoals depending upon location in the lake. A majority of fishermen reported inshore spawning to commence prior to offshore spawning, but this too could vary with location.

The spawning scenario in Lake Superior was considerably complicated by the fact that more than one seemingly distinct spawning group (or run) could appear on the same grounds. This phenomenon seems to have been more common in Lake Superior than in any other of the Great Lakes. In contrast, a different situation prevailed along the Wisconsin shore of Lake Michigan, where fishermen found no more than one run of lake trout utilizing a single ground (Ms. C. Coberly, personal comm. 1979).

This multiple usage of Lake Superior breeding grounds resulted in a rather extended spawning season in certain parts of the lake. The duration of the spawning period for each group could vary. Successive runs showed definite peak concentrations of individuals, and these might be separated in time by as much as 2 weeks or more. If spawning is a response to declining lake temperatures, intraspecific variation is evident in the temperatures preferred by each spawning group. Despite intermingling of individuals at the end of one run and the beginning of the next these differential preferences seem to have remained fairly consistent through many years. In addition, the presence of breeding grounds in close proximity (i.e within the normal range of lake trout movements; see Section 4.1.3.6), characterized by different spawning dates, suggests the sympatric association of different groups of fish varying in their responses to spawning stimuli. According to Fabricius (1950), "the spawning activities in fish are released by an inherited neural releasing mechanism, in which various internal and external stimuli cooperate by

heterogeneous summation".

The individuals of a particular spawning run might vary not only in their spawning periods but also in their spawning depths, as well as in certain gross physical features (discussed in detail below).

4.1.2.2 BODY WEIGHT AND FORM

As a general rule, seasonally later runs were composed of larger and heavier fish. Certain grounds were famous for the large sizes of their spawning trout. Although the weight ranges characteristic of successive runs could show much overlap as these arrived on the same grounds, consistencies were found in the modal weights reported by fishermen for each run. On the basis of the interviews, it seems that there was not merely an inter- gradation of sizes arriving on the grounds, but actual pulses of differentsize classes. Several factors, inherent to the trout populations, might account for these inter-run variations:

1. Differences in age composition; i.e. different age classes may show temporal separation at spawning time, with younger fish spawning at earlier dates.
2. Differences in growth rates; i.e. earlier runs may include slower-growing individuals.
3. Differences in "age at maturity"; i.e. precocious maturity may characterize earlier runs which have a greater percentage of younger individuals.
4. Sex difference, which might give the appearance of different breeding runs. Such confusion was not evident in the interviews. In addition, most evidence indicates no sexual divergence in the growth rate of lake trout (Martin and 0lver 1980).

It is obvious that these factors are, to a large extent, interrelated. Alm

(1959) presents an experimental basis for stating:

> "In a population with good growth rate maturity appears at a lower age and usually also at a smaller size than in a population with poor growth rate, where maturity is reached only at a higher age and in most cases at a bigger size. In populations with very poor growth rate and high age for maturity the average length at maturity can again be lower, and approach that of the earliest mature and fast-growing populations."

Furthermore, his experiments with various species at Kälarne Fishery Research Station in Sweden revealed that "age at maturity":

> "... can be genetically determined in different species and also in different forms of the same species. It is then usually higher in large-sized and often fast-growing forms than in small-sized and often slow-growing ones. This is exemplified by big and small forms of trout, and perhaps also by similar forms of char and. whitefish."

Genetic bases for differential growth and maturation rates are always difficult to infer, and many authors stress the importance of environmental influences such as water temperature, diet, and fishing pressures. The densest stock, for example, will tend to have the smallest fish as a result of competition for food (see review in Ricker 1959) -- extreme examples of this phenomenon are dwarf forms developed by certain species (see Nilsson 1955). In some cases, a fishing-up phenomenon might occur, whereby large individuals are removed from the more heavily exploited stocks. Nevertheless, the fact that specific size classes appeared annually on certain Lake Superior grounds, and at relatively the same time each year suggests a strong stability in composition at these spawning locations. It is possible that this stability is linked to local racial differences.

It is useful to cite related studies. Partly on the basis of variations in growth rates, Tomkins (1951) postulates the existence of two distinct lake trout populations within Georgian Bay. Employing length criteria, Cope (1953, 1957) outlines various races of cutthroat trout *(Salmo clarki)* within Yellowstone Lake. Analysis of scale features can also prove useful in relating size to age composition. Scale studies have been

utilized in the identification of salmon stocks, for example (Major et al. 1970; Henry 1961), but unfortunately no efforts have been made at applying these techniques to lake trout at the level of their individual spawning runs.

Differences in body form between the lake trout of different grounds or different runs on the same grounds have also been reported by Lake Superior fishermen. Variations in body form between segments of a population may suggest different rates of growth. Martin (1949) has demonstrated that fish pass through a number of relative growth stanzas during their lifetimes. Logarithmic plots of body part length versus total body length show that the transition from one stanza to the next is marked by a sharp inflection of the slope. Body size at inflection is the most important factor in creating intraspecific variation in the relative sizes of body parts (not changes in the slopes of the growth lines).

According to Martin (1949), stanza changes occur during the eyed egg stage, hatching, ossification, and the onset of sexual maturity -- early stages are the most significant in determining body form. To the extent that growth rate and body form are under the influence of environmental factors, intraspecific variations may reflect different habitat conditions at the critical stages of development. Inter-lake comparisons of fish populations reveal effects of temperature: northern, colder water races have been found to often possess smaller heads, eyes, maxillaries, and fins than faster-growing, southern races (Martin 1939). It is possible that physical differences such as these may find expression within a single lake between stocks frequenting different depth zones (see also Section 4.2).

4.1.2.3 FLESH COLOURATIOH

Questions concerning the factors controlling Salmoninae flesh shades

have, through the years, stimulated much debate but little serious scientific study. Wide colour variations for salmon, lake trout, and brook trout have been recorded. Among the salmon, fishermen have long identified flesh shades with particular breeding groups. Prince (1916] cites the Skeena River (British Columbia) sockeye *(Oncorhyncus nerka)* as an example:

> "This particular local variety I have never encountered anywhere else, in all my extensive tours along the Pacific Coast during the last twenty years. It had not the usual vermilion or orange red colour, but a deep beef-red tint of rather a dull disagreeable shade. The local canners know well this peculiar variety and never used it for canning purposes unless there is a shortage."

Early scientific opinion was torn between the camps of environmental and genetic determinacy. Davy (1828) cites what seems to involve an instance of gradual introgression subsequent to the introduction of brown trout of a deep red flesh to a Scottish lake whose natives were strictly white-fleshed. The introduced trout were "easily known" by their darker backs and brighter sides -- some offspring showed intermediate colouration and the red-fleshed variety was lost only after 20 years. Prince (1916) reviews the environment-based theories of his day, which, like our own, centred on factors of diet, sexual ripeness, and age. Prince, himself concluded a genetic basis.

It has been known for years that astacene and xanthophyll (carotenoids) dissolved in fatty oils can colour trout flesh (Steven 1948; Goodwin 1954). A number of experiments have revealed these colours to be dietary in origin, and field observations have demonstrated the effect that feeding habits have on flesh shades. In some lakes it has been found that planktivorous lake trout tend to have flesh of darker colour than those of piscivorous inclination (Mr. N. V. Martin, personal comm. 1979). In 1961 a bloom of opossum shrimp *(Mysis relicta)* in Green Lake, Wisconsin, was accompanied by the sudden and unprecedented appearance of coloured-fleshed

lake trout:

> "Because salmon-fleshed trout are of a size range where the major proportion of the food supply consists of Mysis a direct correlation must be considered. Similarly, the size range of trout which feeds on fishes (non-carotene bearers) are white-fleshed. Trout under 10.9 inches appear to be incapable of converting the carotene factor to pink or salmon-colored flesh, despite the fact that they feed exclusively on the crustacean." (Hacker 1962).

Similarly, Nilsson and Andersson (1967), while investigating brown trout *(Salmo trutta* L.) in a northern Swedish lake, found almost all individuals under 0.1 kg. (0.22 lb.) to have white flesh, and almost all over 0.2 kg. (0.44 lb.) to have red flesh. (They found little evidence to suggest any influence of a crustacean diet, however). As mentioned in Section 4.1.1, early investigators found that the smaller lake trout of the Great Lakes (i.e. *Salmo confinis* - DeKay 1842) tended to be of paler flesh. If the proclivity for coloured flesh is related to age, these small forms of lake trout may have been, in fact, younger age classes. From the interviews, I found that runs of smaller lake trout (such as the blacks) were predominantly white-fleshed in certain areas of Lake Superior (see Sections 5.6 and 5.7), although this rule was not inviolable. Neither the largest nor the smallest specimens displayed strictly one shade.

Miller and Kennedy (1948) drew a relationship between the flesh colour of Great Bear Lake lake trout and their spawning condition (but not their size or sex). Ripe individuals were typically white- or yellow-fleshed, while those with immature gonads tended to be orange- or red-fleshed. The authors suggest, "probably the developing eggs or sperm use the reserve of fat which gives the flesh its colour." On the other hand, Kennedy (personal comm. 1979) was unable to discern an obvious pattern among the lake trout of Great Slave Lake. Rawson (1961) examined female lake trout from Lac La Ronge, Saskatchewan, and found a much lower percentage of trout with brightly-coloured flesh than did Miller and Kennedy (1948). Spawning females were almost all pale, but a sample of 18

immature fish revealed a mixture of shades. On the basis of my Lake Superior interviews, it was not possible to relate flesh colouration to either sex or sexual condition.

It is clear that any genotypic expression of flesh colour will tend to be .masked by the interaction of a variety of environmental and physiological factors. As a result, flesh colouration may be regarded as a rather unreliable racial indicator. It is true in Lake Superior, however, that visible flesh differences, which remained consistent from year to year, existed between certain spawning runs and between certain spawning shoals. The persistence of different flesh forms may suggest the operation of mechanisms ecologically separating groups of lake trout during at least part of their life spans. For example, to the extent that flesh colour is diet-related, one might posit the existence of different feeding niches. In addition, it is probable that the efficiency of carotenoid absorption is genetically linked. Peterson et al. (1966), for example, found the potential for colour production to vary in both wild and hatchery brook trout when fed on xanthophyll-rich diets.

It is worth noting an observation made by Prince (1916) that flesh colour is manifested in the shading of lake trout eggs: red-fleshed individuals will produce red-coloured eggs. Hacker (March 7, 1975) made similar observations at Green Lake. Cook (1929) was involved in fish culture work in the American waters of Lake Superior:

> "I do not think that any field connected with the collection of Lake Trout eggs provides a larger variety of eggs considering colour and size. Eggs of greenish cast, light cream, salmon pink and amber shades, besides several variations of these colours are taken. Often eggs of these various colors are taken from fish caught on the same shoals."

Although egg colour is not considered in delineating the stocks discussed below, a number of fishermen interviewed noted unique colour variations For

example, Mr. F. McCoy (personal comm. 1979), former captain of the Purvis tug "Dobson", found redfins to have predominantly red eggs, grayish-coloured trout to have both flesh and eggs of mixed shades, and fat trout to have eggs off-white or slightly pink-white in colour (see Section 4.1.3). In addition, Caribou Island trout showed eggs of brownish colours (Section 5.5).

It is also interesting to note the abundance of early reports praising the flavour of fish from northern lakes, especially Lake Superior, compared to the flavour of fish from the south. Goode (1884) reports the complaint of Erie, Pennsylvania fish dealers that the trout they received were quite inferior to those of Lake Superior, generally having only poorer white meat. As transportation facilities grew more efficient, the northern lake trout and whitefish usually fetched higher prices in the southern markets. Some modern Lake Superior fishermen support the opinion that brightly-fleshed trout taste better than those of pale colours. (Organoleptic studies of brook trout yielded only slight evidence in favour of this common view; Peterson et al. 1966). More frequently interviewees would claim strong preference for the taste of native lake trout over that of planted lake trout. Similar findings were made by Baeder et al. (1945) in organoleptic studies of brook trout:

> "The flesh of the hatchery-reared fish had a peculiar quality which was described by some of the judges as "tacky". That is, there was a tendency for the flesh to cause the judges' teeth to stick together somewhat as they do when eating a caramel."

4.1.2.4 SKIN COLOURATION

The intraspecific variability in skin colouration of the salmonids, as well as their ability to alter colour pattern over a range of seasonal and habitat conditions, has been frequently noted. Local surroundings can stimulate pigmentation transformations. When moved from a white sandy

bottom to one of darker rocks, brook trout will rapidly darken according to Simon (1946). On the other hand, when Peterson et al. (1966) moved brightly-coloured brook trout from a dark- to a light-coloured background they found a shift of pigmentation from the skin to the flesh (also witnessed by Chinarina 1959). In Lake Superior, Agassiz (1850) noted local colour variants dependent upon habitat bottom:

> "... 1. The trout of the open lake *(truite du large),* of a gray silvery colour, with inconspicuous spots and a white belly; 2. Those of the rocky ground *(truite des battures),* more yellowish, with large distinct spots; 3. Those of the sandy bottom, which are simply mottled... The general colour [of lake trout] varies with the ground on which it is caught. Those found on muddy bottoms are generally grayish, while those from a gravelly bottom are of a reddish colour, with brighter fins."

Herbert's (1851) "Fish and Fishing" (a compendious, if occasionally fictitious work) describes in greater detail these varieties. The sandy bottom trout *(Truite de Grève)* were generally "muddy greenish brown", darker green on the back, and browner on the sides than the *Truite des Battures,* with belly yellowish gray in colour rather than bluish-silver. The spots were much smaller and less well defined. (The Ontario Game and Fish Commission (1892) reiterates these fishermen-recognized classes). It will also be seen below that more recent Lake Superior fishermen knew an assortment of colour types comparable to those of Agassiz. The frequent presence of more than one type at a single location at spawning time suggests the influence of other factors on colouration in addition to local substrate. Colour may reflect habitat prior to the arrival of the trout on the spawning grounds. Odiorne (1957), for example, remarks upon the retardation of melanophore development in young fish reared on white backgrounds.

In considering the factors determining colour modification, the physical and chemical nature of the water itself may also be taken into

account in certain lakes. Simon (1946) found that cutthroat trout of turbid and alkaline waters tended to be lighter than stream-dwelling individuals. King (1866) discusses the "bog trout" (brown trout) of Scotland, which assumed a deeper brown shade in moss-tainted waters. According to Royce (1943) lake trout of the clear New York Finger Lakes were silvery in colour with lightly-coloured fins, while those of the brown Adirondack lakes were quite dark with stronger fin colouration. It is possible that these water properties do not act directly upon the fish but rather upon components of their diet (which can also influence colouration). In Lake Superior, Schertzer et al. (1978) noted reduced water transparencies in the red clay areas (Nipigon-Black Bay, Marathon, and Whitefish Bay). According to Weiler (1978), however, Lake Superior water chemistry shows little spatial or seasonal variation and has maintained constant concentrations of the major ions since 1900. It seems unlikely, therefore, that chemical properties of the lake would exert important effects on fish colouration.

Certain colour variations in lake trout might be attributed to sexual dimorphism. Royce (1943) and Merriman (1935) observed spawning males to assume bright, black side bands, accompanied by dorsal lightening. This distinctive pattern was not typical of Lake Superior lake trout, nor were sexual differences in body colouration reported by fishermen. Limited dimorphic variation in fin colouration was noted by some interviewees(see Section 4 1.3.2).

The xanthophylls that colour flesh also will colour skin, and visible effects of varying their concentrations in diet have been demonstrated (Steven 1948). Among the experimental brook trout used by Peterson et al. (1966), coloured fins and skin were associated with coloured flesh. Under natural conditions, the stocking of Lake Opeongo (Algonquin Park) with ciscoe *(Coregonus artedii)* in 1948 preceded the appearance of silver-coloured lake trout in a population which had previously been composed of dark-skinned individuals

(Mr. N. V. Martin, personal comm. 1979).

Bean (1902) notes that Alaskan lake trout specimens are usually very dark. Sage et al. (1904) state that black skin colouration was common among the confined trout of fish hatcheries. In Lake Nipigon, Dymond (1926) found a very dark-skinned variety, known locally as "black trout", to exist there. These were of medium size, seldom exceeding 1.8 kg. (4 lb.) or 2.3 kg. (5 lb.), and ascended rivers to spawn. As none were to be found in summer, Dymond suggests that the colouration may have been stimulated by the darkness of the river waters. As noted by Peterson et al. (1966): "It is well known that the bright colours of trout disappear rather rapidly after exposure to light."

During interviews many Lake Superior fishermen remarked that dark skin colours would lighten after the fish had been for some time out of the water. It was; on the other hand, the experience of a couple of interviewees that black trout left in a fish box would only fade at spots where their bodies had been touching, while several fishermen maintained that blacks out of water usually did not lose their colour. In general, however, dark colouration probably represented a natural spawning period response of certain groups of Lake Superior lake trout and was used to identify them at this time. At certain locations black trout would appear in deep-set nets several weeks before the actual spawning period, but their presence was generally considered rare in spring and summer (although a few fishermen noted that they often captured very dark specimens indeed when trolling in certain areas: the Port Coldwell area (Fig. SM33) and near Montreal Island (Fig. SM9) were specifically mentioned).

Precedents exist for the use of skin colouration as a criterion for salmonid stock identification. Bulkley (1963) found significant differences in spotting counts and body colouration between six spawning runs of cutthroat

trout in Yellowstone Lake. Nilsson and Filipsson (1971) noted significant differences in both skin and flesh colouration between two discrete forms of Arctic char *(Salvelinus alpinus)* in a lake of the Swedish Lapland, despite similar preferences for crustacean species and identical points of capture. Genetic determinants are proposed by Ricker (1959) to explain differences in colour between three stocks of Kootenay Lake (British Columbia) kokanee *(Onchorhynchus nerka),* as well as between introduced kokanee and residual progeny of anadromous sockeye salmon in Cultus Lake.

4.1.2.5 NON-SPAWNING MOVEMENTS

The regional studies of Section 5 concentrate upon the behavior and appearance of lean lake trout at their spawning times. It was at these times that fishermen were most aware of their movements and habits. Visually distinct group of lake trout were less obvious at other seasons.

In this report some attention is also paid to the non-spawning movements of Lake Superior lake trout. Both vertical and horizontal separation of larger (and older) trout from smaller trout was frequently noted. Trout caught in bottom-set nets in early spring were usually of smaller size. As the weeks progressed many trout moved into shallower zones along the off-shore shoals or shore banks. Shoals in the same general area might be characterized by fish of different size classes differences sometimes not attributable simply to the effects of diff- erential fishing pressure. Still later, in June or July, large lake trout tended to become pelagic, at which time many fishermen knew them to feed on insects at the surface (see also Lawrie and Rahrer 1973). Some movements have also been associated with the pursuit of lake herring stocks.

At certain sites nearshore, movements of large lake trout were known and might be referred to as a summer "run". Some years these fish would be available for several weeks. In the shallow waters, gill nets were fished "corks out", set right at the surface. In more open waters, far greater numbers of large trout were taken on troll lines while swimming above the

bottom-set nets. In the 1950s some fishermen began the practice of "canning" (or floating) their nets at the surface during the early summer. The technique, although successful in catching more fish, was not widely employed on the Canadian side of Lake Superior. Preparation of the nets was time-consuming and there was a greater chance of net damage.

At scattered locations along the Canadian shore, large lake trout again moved into shallower waters in the second part of August. Usually the fish of this movement were not as abundant as the first. These fish were not yet preparing to spawn and would shortly depart again for greater depths. It was not unusual for this run to fail entirely, perhaps due to atypical winds or temperatures.

4.1.3 NATIVE LEAN LAKE TROUT VARIETIES DESCRIBED BY FISHERMEN

4.1.3.1 BLACKS

The smallest mature lake trout tended to spawn inshore during the earliest part of the fall season in September or early October. On certain grounds, these were typically gray or silver-gray in colour with lighter gray spots and light ventral surface and were described by various fishermen as "ordinary trout" or "little grays". However, at many locations both in the eastern and the western waters of the lake, the earliest run trout were very dark. Their sides were slightly lighter than their backs, which were noted as having been brown-green, dark brown, or black in colour. The ventral region was darker than that of other lake trout, and the variety was generally known as "black trout". Average weights cited for trout in this run ranged from 1 kg. (2.2 lb.) to 2.7 kg. (6 lb.). At this size, the body was found to be somewhat robust and stocky -- the form may relate to that which was identified as *Salmo confinis* in the 19th century (and perhaps also the *Truite de Greve* of Agassiz 1850). Many fishermen found the flesh colour of the blacks to

have been reddish, but certain areas were visited by those with pale flesh tones (see Sections 5.6 and 5.7).

In addition to this distinctive inshore run, other trout of larger size might also be quite dark in colour. The Caribou Island trout for example, were undoubtedly a discrete subpopulation almost exclusively black and somewhat heavier than those described above (see Section 5.5; Fig. SM30).

In the island environs south of Nipigon Bay and the Black Bay Peninsula, fishermen sought not only an early run of small blacks but also the spawning "big blacks", which appeared later in the season. These were not, however, regarded as a distinct spawning run. (Thomson (1883) refers to these as Rock trout, a name also employed by some Lake Huron fishermen when referring to the native blacks of that lake; see Appendix III).River-spawners composed the most obvious stocks of dark coloured trout. No physical variations from lake-spawning blacks were reported by fishermen. Native spawning stocks utilized many of the Canadian rivers of Lake Superior. These stocks were most prevalent south of the Pic River on the eastern shore, while none were known to have existed west of Nipigon Bay or along the American shore. Although certain streams entertained a wide range of fish sizes, there is no evidence to suggest that any one stream played host to more than one stock. Certain streams might contain a number of separate spawning sites -- extensive movements of lake trout could occur within the Michipicoten River, for example (Section 5.3). It is not known, however, if groups of fish would selectively home to specific grounds within a single stream.

Authors in the past have pointed out that, with the exception of

Lake Superior, stream-spawning habits were rare to lake trout (although Martin and Olver (1980) suggest a greater prevalence among Arctic populations). Appendix IV, however, cites reported instances of lake trout entering rivers other than those of Lake Superior. It is clear that this phenomena while atypical of the species, should not be regarded as having been rare. It is undoubtedly characteristic of the populations of certain inland lakes and was probably, at one time, more common in the Great Lakes than in recent decades. Stream populations, of course, are more susceptible than those of the lake to natural hazards such as water fluctuations or inhospitable weather conditions, as well as to the effects of exploitive fisheries. Many former populations have been lost.

During the Lake Superior spawning season, lake trout tended to enter the rivers after dusk and retreat to the lake before dawn. The peak of the daily run was usually between 11 PM and 1 AM. Some trout would not leave the river however (especially when the spawning sites were a long distance upstream), and would rest by day in spots of quieter flow (see also Loftus 1958).

4.1.3.2 REDFINS AND YELLOWFINS

In general, any lake trout possessing brightly coloured fins was liable to be called "redfin". It was possible for dark trout to display red-coloured fins, a condition especially obvious at the Slate Islands (Fig. SM38; Section 5.6) and among certain river-spawning stocks. The name, however was also employed by many Lake Superior fishermen to describe a specific run of lake trout which they understood to follow closely upon that of the earliest spawners (i.e. the small black trout or "regular" grayish trout) but to represent a different "breed". It is

possible that fin colouration could be triggered in certain fish by falling water temperatures, thus creating the illusion of a new run. Blacks and redfins might spawn on the same grounds. At certain locations, the black trout would retreat from these grounds before redfins had even appeared. Although this was not always the case, generally the two forms were not found spawning at the same time. Redfins were the heavier variety, averaging 3.2 kg. (7 lb.) to 3.6 kg. (8 lb.), and were frequently over 6.8 kg. (15 lb.). Some fishermen described these fish as lighter in colour and more elongated (proportionately less deep of body) than the blacks. Flesh colour was pink, orange, or red, whereas black trout might show pale shades.

Redfin grounds were situated at many locations on the Canadian side of the lake. In addition, one finds this classification employed by fishermen of Isle Royale (Rakestraw 1968), the Keweenaw Peninsula (Organ et al. 1978), and the Green Bay area of Lake Michigan (C. Coberly, personal comm. 1979). Fishermen of Georgian Bay also identified redfins as a second run of lake trout (Kerr Nov. 19, 1886; Loftus 1980).

Former fishermen of Jackfish and Port Coldwell areas tended to refer to the fish of their second run as yellowfins rather than redfins. (a couple of local residents pointed out that, in many instances, yellow- fins should more properly be called "orangefins" (their fins being an oranqe-red colour). Fishermen of the Black Bay Peninsula - Thunder Bay area also tended not to distinguish redfins and yellowfins as different spawning classes. Certain grounds, however, particularly those along windward island shores, were frequented predominantly by lake trout with yellow fins (Section 5.9). In addition, certain fishermen of the Rossport area believed yellowfins to represent a unique run at a few locations

(discussed 1n Section 5.7). It has been suggested that lake trout which were larger and spawned at later dates were more likely to exhibit yellow colouration.

In Lake Superior it was rare to capture trout with coloured fins anytime except during the late summer or fall (with the exception of those at Superior Shoal; Fig. SM42; see Section 5.8), suggesting that fin colouration was a phenomenon initiated by the approach of the spawning season. (This response was also observed by Royce 1943.) Exceptions were encountered, however, and a couple of fishermen believed fins to be coloured all year but darker when spawning time drew nigh. This may also be typical of certain populations of small inland lakes. A stock of lake trout native to Killala Lake (at the headwaters of the Little Pic River; Fig. SM33), for example, is extremely dark in colour, of average weight 1.1 kg. (2.5 lb., and is known to retain its red-coloured fins throughout the year (Mr. R. Ryder, personal comm. 1978).

It is probable that large fish such as yellowfins, or those of the late runs discussed below, corresponded to the Mackinaw trout *(Salmo amethystus)* described in the 19th century (see Section 4.1.1).

4.1.3.3 THE LATE RUNS

Passing along the northern shores of the lake toward Thunder Bay, fishermen identified very late runs of large trout at certain locations. Residents of Port Coldwell and Jackfish referred to the fish of the third spawning runs, in general, as "salmon-trout". These fish began spawning in late October and continued through November:

> "... The salmon-trout were streamlined and had a small head like a West Coast salmon. The tail was not too big, and all possessed red flesh. They did not have coloured fins, and they had a silvery body, not as dark as the blacks and yellowfins. Salmon-trout were taken in a little deeper water at 5 or 6 fathoms." (See Section

5.6.; Mr. A. Almos, personal comm. 1979).

Fishermen whose grounds were situated along the Black Bay Peninsula knew large red fleshed trout as "red trout" (see Section 5.9). However, those men who plied the waters among the islands south of Nipigon Bay applied the name red trout to a separate spawning run. Here red trout were easily distinguished from the black trout which they followed and differed mainly in size from later-running trout. This form is discussed in more detail in Section 5.7. Kerr (Jan. 3, 1885) records the existence of red trout in the Upper Lakes, noting it to be "the finest of all, best for procuring eggs from."

Some fishermen may also refer to groups of late-spawners as "gray trout". Thomson (1883) notes the large gray, or "shovel-nose trout", a variety existing about St. Ignace Island (Fig. SM54) and weighing up to 32 kg. (70 lb.; Appendix III). In this general region, gray trout were understood to be the last run of the season, having uncoloured fins, a body short but deep in appearance, and flesh white or yellow-white in colour (Section 5.7). Approaching the shore banks of these islands, grays showed a predilection to spawn at relatively greater depths than most other varieties of lean trout; depths quoted varied from 9 m. (30 ft.) to 20 m. (65 ft.). Here (as well as in certain areas farther west) large grays (and less frequently yellowfins) were found spawning over shore beds of filamentous green algae, designated "moss" by local fishermen (and marked as such on the appropriate spawning ground maps in Appendix V). In the Rock, Wright's, and Washington Harbour areas of Isle Royale (Fig. 7), "channel salmon" lake trout selected similar substrates and so earned the additional nickname "moss trout". Mr. S. Sivertson (personal comm. 1979) explains that moss trout eggs were unusually small, even though these fish were a big "breed", ranging from 6.8 kg. (15 lb.) to 16 kg. (35 lb.). Organ et. al. (1978) note the presence of moss trout more often in the

Michigan waters of Lake Michigan than Lake Superior. In a biological survey of Lake George, New York, Needham et al. (1922) identified the "moss" described by local fishermen as *Dichotomosiphon tuberosus,* finding "its best development at depths of forty or fifty feet, or just below the nitella zone".

4.1.3.4 SAND TROUT

In the southeastern portion of the lake, fishermen recognized not only two major runs of fall spawners but also another type they knew as "sand trout". These fish were considered distinct, having very red meat and light silvery colouration, with darker blotches (not spots) on the back. Also called "silver trout", individuals were described as slender and small, a 1.8 kg. (4 lb.) specimen being considered a large one. In Lake Superior they were usually taken in summer. Some fishermen described sand trout as a shoal fish, mostly taken at depths of approximately 55 m. (180 ft.) over sandy bottom. Oth2r people knew this form to move to inshore flats in June and July. It is possible that the Lake Superior sand trout corresponded to the form known to Lake Huron fishermen as "summer trout", which Kennedy (1941) describes as

> "... lighter in colour than the Winter Trout (fall spawners). Fishermen say they have taken them with spawn running in the summer. These fish "disappear" in the autumn or winter.

According to one report, summer trout were immature fish (Canada. Dept. of Marine and Fisheries. 1904). The sand trout may have similarly represented young age classes. In the Apostle Island region of Lake Superior, Dryer (1966) found the greatest abundance of small lake trout between 49 m.(160 ft.) and 53 m. (174 ft.) in summer, and 55 m. (180 ft.) and 71 m. (234 ft.) in spring. On the other hand, sand trout may represent a seasonal phenotypic variation in certain groups of smaller early- spawning black or "regular" trout. Few spawning grounds for sand trout were discovered, although several fishermen knew trout of this description to spawn at a few sites along the eastern shore. It was remarked by Mr. G. Jones (personal comm. 1978) that the last time he saw sand trout was in the late 1960s in summer on the Pukaskwa Flats (see Section 5.4; Fig. SM17). Here, according to

Loftus (1952) sand trout would spawn between October 20th and November 30th, a late run for that area.

4.1.3.5 DEEPWATER LEANS

On a couple of the deep offshore shoals in the Caribou Island to Michipicoten Island area (Section 5.5), as well as at Superior Shoal (Fig. SM42), certain lake trout were identified as "deepwater leans". These appeared rounder in shape than the "ordinary leans" and possessed a thin "filament" of fat along the abdominal wall, a consequence perhaps of feeding habits (although the fat was never as thick as that found in siscowets and halfbreeds). Flesh colours were pinkish and never as red as that shown by certain shallower leans in the same areas, also suggesting partia1 differences in diet (see Section 4.1.2.3). Caught at a depth of about 55 m. (180 ft.), deepwater leans may have spawned here in the fall. Feeding may have occurred at even greater depths. Lake Nipigon fishermen likewise identified a form of deepwater lake trout, unknown above depths of 37 m.(120 ft.),'and spawning at depths of 37 m. (120 ft.) to 55 m. (180 ft.; Dymond 1926). These were fatter, with small heads and white flesh and were seldom, if ever, found in the same nets with the other lake trout variants (Mr. K. McLeod, pers. comm. 1979). It is uncertain to what degree the deepwater leans of a particular shoal in Lake Superior were isolated from other leans above and the fat trout below, but reproductive isolation from the shallow-spawning stocks seems indicated

4.1.3.6 RACER TROUT

Tagging returns have shown that occasionally individual lake trout may travel great distances. In a study of Apostle Island trout, for example, Eschmeyer et. al. (1953) found that most remained within 80 km. (50 mi.) of

the point of release, but 9 percent of those recaptured had moved over 159 km. (100 mi.), and a few had journeyed over 410 km. (255 mi.). The larger trout would move the greater distances(see review in Lawrie and Rahrer 1973).

Occasionally trout in an obviously emaciated condition were taken in Lake Superior. Milner (1874) writes:

> "Solitary individuals, known among the fishermen as "racers", are found in the summer-time swimming sluggishly at the surface. They are easily taken with the gaff-hook, and bite readily at any bait thrown to them. They are always very thin in flesh. Dissection of the few I have taken failed to find any adequate cause for their condition."

It is thought by some that such fish had travelled large expanses of open water, and endured shortages of food. Racers may also be called "lunkers" (although lunker may be used to simply refer to a large, solitary fish) or "razorbacks", because of their poor condition and seemingly rough and protruding backbones. The lake trout planted in Mishibishu Lake, Ontario assumed this condition prior to the introduction of a forage base of lake herring (Harrison 1968). The form is also known among certain other fish species existing in habitats of scarce resources, including whitefish and pike.

Certain localized areas in the lake produced great abundances of the racer form. Best known was Superior Shoal (Fig. SM42). Sweeny (1890) mentions another site and proposes a different explanation for the piscine oddities:

> "One locality is pointed out, and is called by the fishermen "The Hospital": because of the great numbers of crippled and misshapen fish raised from the bottom; with its sharp, jagged rocks, among which a fierce, strong current seems ever surging, I conjecture to be the cause of the great number of maimed and unsymmetrical fish taken at this particular spot."

The location of "The Hospital" is not recorded but may have been in the vicinity of Isle Royale. In Section 5.8 the racer is discussed in more detai1.

4.2 FATS, HALFBREEDS, AND PAPERBELLIES

People who fished Lake Superior have always been familiar with lake trout possessing a high content of body fat. The Indians referred to these trout as "siscowet", an Ojibway word meaning "cooks itself" (Goode 1884). This appellation endures today. Many early travellers complained of the manner in which its flesh would fry away to grease. Anna Jameson (1838) refers to the "skevat" as being very abundant in the upper part of the lake and "so exceedingly rich and lucious, and oily when fresh as to be quite uneatable". At the time however, the siscowet was becoming popular as a "fashionable luxury" with the discovery that it made "a most luxurious pickle":

> "It is very excellent, but so rich even in this state, that like tunny marinee it is necessary either to taste abstemiously, or die heroically of indigestion." (Jameson 1838).

Many early settlers to the region thought the siscowet to be a hybrid between the whitefish and lean lake trout (Strang 1855). Overseer J.W. Kerr (Sept. 7, 1868) believed the siscowet to be a cross between "salmon lake trout" and speckled trout. Such beliefs were dispelled as the animal came under scientific investigation, but to this day there exists little knowledge regarding its spawning habits and grounds. The first description was made by Agassiz (1850) who pronounced the siscowet a separate species (*Salmo siscowet* Agassiz), and so began a long history of controversy over the taxonomic status to be awarded to this fish (see Crawford 1966; Martin 1977).

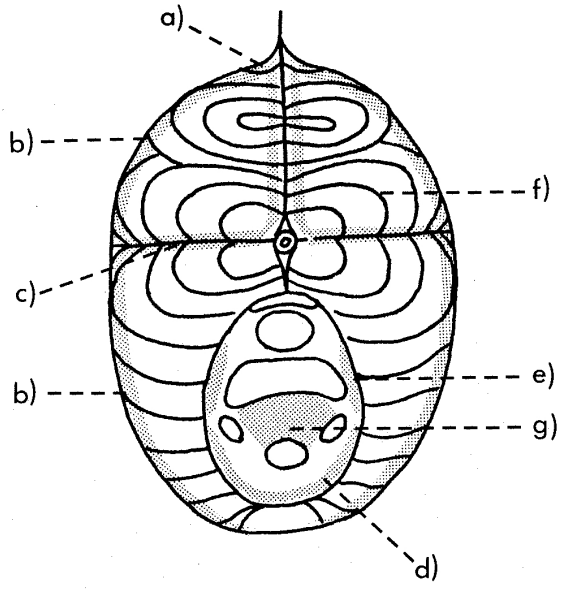
Of course, the most obvious difference between siscowet and lean lake trout is in fat content. Thurston (1962) found large variations in the oil of siscowet fillets, the content increasing greatly with increasing size of fish. Lean trout also contained significantly more moisture than fats. Similarly Eschmeyer and Phillips (1965) found fat content to range from 32.5 to 88.8 percent in siscowets and 6.6 to 52.3 percent in lake

trout. (The large individual variation in fat content for the siscowet was probably due to the inclusion of halfbreeds in the sample).

Data obtained from hatchery-reared stocks suggested a genetic basis for fat content differences between leans and siscowets. Purvis (1979) has summarized the body locations of visible fat, and this is reproduced with permission in Fig. 4. Siscowet might possess up to a 2.5 cm. layer of fat lining the abdominal region, while halfbreeds had 0.6 to 1.2 cm. (Mr. L. Jago, personal comm. 1979).

Agassiz (1850) notes further points of difference distinguishing siscowet from *S. namaycush namaycush:* the lower branch of the pre-operculum is more extended than the upper, the dorsal fin is larger, the caudal fin is much less furcated, the ventral fins are set less far back, and the pectoral fins are longer and farther from the gill opening. It has also been noted that siscowets had thicker skin, smaller scales, weaker teeth, smaller heads, less pointed snouts, and rounder and shorter bodies than lean trout (Nachtrieb 1897; Hallock 1877). More recently, Khan and Qadri (1970) proposed a subspecific status for leans and fats on the basis of depth separation and meristic and morphological differences. Employing techniques of principal component and discriminatory analysis, Lee (1971) demonstrated significant differences in head length and body girth (measured at the dorsal insertion). Stauffer (1977) also used principal component analysis to reveal five additional morphological characteristics (including dorsal, pectoral, and anal fin height, and anal and pectoral fin rays) which in combination could prove useful in distinguishing juveniles of hatchery-reared leans, wild leans, and fats. In studies of buoyancy regulation, Crawford (1966) found that as fat trout grew older and heavier swim bladder volume decreased (to O percent in large siscowets from Grand Marais, Michigan). He notes:

FIG. 4 BODY LOCATIONS OF VISIBLE FAT IN SISCOWET LAKE TROUT



From Purvis (1979), with permission of the author.

a) Along the dorsal line lengthways on either side of the dorsal fin ray supports and separating the fillets on either side of the fish.
b) Under the skin separating the skin from body flesh.
c) At the lateral line running laterally from skin to vertebral column and front to back.
d) Lining the abdominal tissue from front to back across the lowermost abdominal area.
e) Lining the walls along the sides of the body cavity.
f) Between the layers or "flakes" of muscle tissue which run crossways to the length of the fish.
g) Lining the viscera.

> "Average flotation pressures of 6.3 atm. for siscowets and 3.8 atm. for lean lake trout from Lake Superior (Bateau Rock) indicated that these fish could have been neutrally buoyant at various depths, with one fishing a F.P. of 13.9 atm., equal to a depth of 135 m. (75 fathoms)."

Hybrid crosses of two populations of lean lake trout differing in their ability to retain swim bladder gas were made by Ihssen and Tait (1974) and revealed at least partial genetic control of this physiological trait.

Inconclusive evidence exists to suggest that morphologically different stocks of siscowet existed within Lake Superior. It was common in the early days of the fishery to distinguish two forms based upon differences in skin and flesh colouration (Kingston 1853; Sweeny 1890). Barnston (1874) describes a fish known as "Macqua trout" or "bear trout" which spawned at a different season:

> "It is still fatter than the siskowet, and can be melted, with little residue, into oil. I have named it a distinct species, following the idea of the Indians, and observing it to possess a different shape of body and head entirely from the siskowet. It is found in small numbers throughout the lake, along the north shore, but, like the siskowet, prevails most in the neighbourhood of the Pic. Can it be hybrid between *namaycush* and the siscowet?"

Stockwell (1875) described the bear trout as:

> "... a species of white-meated trout of very indifferent quality, so closely resembling the siskowit, that it is largely sold under that name, by which means the nobler fish is undervalued except where well known."

At Isle Royale, fishermen identified black and white siscowet: "Black generally run almost three times as large as white. Spawn in up to 100 fathoms of water." (Rakestraw 1968). Fishermen interviewed for the present study usually described a single general morphological form for the siscowet, with white to pale pink flesh and body lighter in appearance than the leans. Below the lateral line the body was yellowish, fading into grayish-white on the belly; above it was faded brownish-gray or greenish- brown. Spotting varied but was usually less distinct than among the leans. Agassiz (1850) notes:

> "The colour varies according to the feeding ground on which it is caught, and is brighter during the breeding season, as is generally the case among all species of this family. The young have transverse bars which disappear with growth, like those other species of salmon."

Fishermen have long noted that the deeper they fished, the fatter the fish they seemed to find, however, and some truth lies in the statement made by Eddy and Surber (1947) that "all sorts of gradations in body form occur."

Discussing size, Sweeny (1890) notes:

> "The largest specimens I can learn of weighed 60 lbs. -- females always larger than males, whose flesh is always firmer than the spawners. The smaller species of Siskiwit rarely exceeds 30 lbs. for the female and half that weight for the male."

The majority were smaller, however. Lanman (1847) reports that few exceeded 5.4 kg. (12 lb.), while Herbert (1851) notes an average weight of 1.8 kg. (4 lb.) or 2.3 kg.(5 lb.), with maximum weight of 7.7 kg. (17 lb.). Mr. W. Sanders (personal comm. 1978), former hatchery manager at Sault Ste Marie, found a general average of 4.1 kg. (9 lb.) or 4.5 kg. (10 lb.) in eastern Lake Superior waters, with occasional specimens running to large sizes. In the 1950s, fat trout over 2.3 kg. (5 lb.) were sent to market headless (Mr. S. Talarico, personal comm. 1979).

The name siscowet has traditionally been applied only to those fat trout from Lake Superior and, while they have been reported in other Great Lakes, they are nowhere as abundant as here. At one time in northern Lake Huron there were occasionally taken trout of the fatness of the siscowet (United States House of Representatives 1897). Southampton fishermen recognized the existence of fat trout (Kennedy 1941; Mr. I. Sisson, personal comm. 1979). In Lake Michigan fat trout were also reported in limited numbers (Strang 1855) and are still to be found in the vicinity of Cheboygan-Milwaukee Reef (Mr. M. Walters, personal comm. 1979). In the 19th century Lake Superior siscowet was introduced into

other waters by the American Fish Commissioners, including Mystic Pond on Cape Cod (Massachusetts Commission on Inland Fisheries 1872, 1884).

Siscowet were rare in the southwestern part of Lake Superior, only beginning to become more plentiful in the American waters about Whitefish Point (Fig. 5). Historical references mention particularly high abundances about Isle Royale and the Keeweenaw Peninsula. However, according to Sweeny (1880), Chairman of the Minnesota Fish Commission, siscowet were nowhere as abundant as lean trout: one barrel of siscowet to 15 of "Namaycush" was considered a plentiful catch. Relative abundances in Canadian waters in this early period are not known. Siscowet would outnumber lean trout in the spring catches at the Pic Post (Section 2.2.1.1). Agassiz (1850) found siscowet to occur "everywhere along the northern shores", although this is undoubtedly exaggerated. His specimens were obtained at Michipicoten (Bay?), but he notes also the plenitude about Isle Royale. (A century later Hubbs and Lagler (1949) cite accounts of catches at Good Little Boat Harbour, Chippewa Harbour, Amygdaloid Channel, and elsewhere along the north shore of the island -- Fig.7).

Gill netting for fat trout was generally conducted at depths ranging from 73 m. (240 ft.) to over 183 m. (600 ft. -- which caused a high attrition rate of net floats prior to the days of reinforced aluminum. Even the early cedar floats were flattened to the form of a shingle). At certain locations in Lake Superior, siscowet would move into near-surface waters for a short period in June or July. Milner (1874) reports, and Eschmeyer (1955) supports, the apparent absence of any migratory instinct at spawning time. Interviews with Lake Superior fishermen suggest, however, that at least some stocks would move to shallower depths on a bank to spawn, although definite annual patterns are difficult to discern.

In light of the apparent variability of depth distribution, one imagines a situation in which fat trout are distributed unevenly along the sides of the deep offshore shoals, but relatively free to move between different depths, probably in opportunistic pursuit of food.

Siscowet have been found in spawning condition during most months of the fishing season (Eschmeyer 1955), and it is possible that they do not spawn every year. Sweeny (1890) recounts that:

> "In the neighbourhood of Isle Royale ... fish were found in various stages of development; in some the eggs are firm and hard and undeveloped, in others fully developed, soft, and ripe, ready for spawning. The males are also in the same stages of readiness; from some the milt flows freely and in great abundance; others seem spent, while others, again, seem immature and the milt undeveloped."

Occasionally Canadian fishermen lifted siscowet with spawn running in nets set over bottoms of clay. Perhaps fat trout are less selective than leans in their spawning sites. When fat trout were brought up from great depths their eggs would burst; consequently they were not preferred by spawn-takers (Mr. W. Sanders, personal comm. 1978).

It is thought that halfbreeds are immature fat trout (Khan and Qadri 1970), although Mr. L. Morden (pers. comm. 1979) found the largest trout he identified as halfbreeds to have been 3.4 kg. (7.5 lb.). Also some have been reported in spawning condition (although these may have been fat trout). Most halfbreeds were 1.4 kg. (3 lb.) and under (Mr. I. Purvis, personal comm. 1979). Halfbreeds were found at shallower depths than fats, from 36 m. (120 ft.) to 128 m. (420 ft.), and there were certain popular grounds where siscowets were netted in greatest abundance. Halfbreeds were usually preferred over siscowets for smoking.

Electrophoretic analysis of the serum enzyme lactic dehydrogenase (LDH) suggested three strains of lake trout: lean, fat, and paper- belly. Patterns for fish identified as halfbreeds by fishermen showed the same

patterns as either paperbellies or, more frequently, fats according to studies conducted by Laarman and Ulrickson (1970).

Paperbellies, known to American fishermen as humpers, have been described by Eschmeyer and Phillips (1965), Rahrer (1965), and Lawrie and Rahrer (1973). This variant is unique in having a very white belly, sometimes distended, with abnormally thin skin. Paperbellies are a lighter gray colour than the deepwater fats. It has been suggested by Lawrie and Rahrer (1973), that paperbellies derive from wandering lean lake trout which colonized the offshore banks and underwent subsequent polymorphic development. Opinions differ widely on the fat content of paperbellies. Some fishermen found them oily and of inferior quality to even the fat trout. On the other hand, it was often possible to include paperbellies with lean trout in market shipments. As discovered by Eschmeyer and Phillips (1965), the rate of increase of paperbelly fat content with length was nearly as rapid as that of siscowets and more rapid than that of lean lake trout.

Occasionally fishermen will use the term "banker" to variously describe small siscowets, halfbreeds, or paperbellies. It was not always evident from the interviews which variant was intended. In these instances the text simply refers to bankers

5. A REGIONAL DISCUSSION OF NATIVE LAKE SUPERIOR LAKE TROUT STOCKS

For discussion purposes, Lake Superior has been divided into ten regions. Criteria of geography, commercial fishing patterns (see Section 1.2), and/or stock discreteness determined their selection. The summary of Appendix V arranges grounds from east to west by region.

5.1 SAULT STE. MARIE TO COPPERMINE POINT

In the southeastern waters, commercial lake trout fishing traditionally located north of the twin promontories Agassiz (1850) called the "Pillars of Hercules of Lake Superior" -- the Canadian Gros Cap and American Iroquois Point (Fig. SM1). Beyond this gateway the land opens to form Whitefish Bay, narrowing again at the larger northern gateway, flanked by Whitefish and Coppermine Points (Fig. SM4). This marks the entrance to the lake proper.

Southernmost Whitefish Bay (Fig. SM1) possessed excellent herring and whitefish grounds, but lake trout spawning grounds were scarce. There are indications, however, that trout movements into these waters (even to the St. Mary's River) were more common prior to 50 years ago.

On the Michigan state side, Organ et al. (1978) indicate a substantial spawning ground for "native" trout which was centred between Point Iroquois and Nadoway Point and extended westward to the Canadian Gros Cap Reefs (through water as deep as 17 m. (55 ft.); Fig. SM1). They describe a single spawning run commencing about November 1st. Fishermen familiar with the Canadian inshore grounds found the first run to begin earlier in the season. The bottom between Gros Cap and Kelly Creek (Fig. SM1 and Fig. SM2) is rocky and gravelly, and both "regular" and black trout would usually move close to shore to spawn during the first week of October. (It is known that the late Mr. Alec Daigle of Gros Cap witnessed each year trout cleaning debris from the rocks about North Gros Cap; 1947 was the last year this phenomenon was seen; Mr. M. Purvis, personal comm. 1978).

Roosevelt (1865) believed Goulais Bay (Fig. SM2) to have been one *of* the "favourite haunts" of the Mackinaw Salmon:

> "Late in the fall they retire to the sombre depths, and are only taken by still fishing with a long line and live bait, and at such times the deep water abreast of Gros Cap is one of their favourite localities, and they are there frequently caught by the Indians from fifty to seventy-five pounds."

(Specimens of these weights were relatively rare after 1918). In 1766 Indians informed Alexander Henry (1809) of excellent autumn fishing at "Oak-bay" (Goulais Bay), which was known to the French as "Anse a la Peche" or "Fishing Cove". It is not known if lake trout or whitefish were being caught here, but both have been praised for their abundances in this area. Fishermen still living, however, remember grounds centred about Goulais Point rather than inside the bay itself where the bottom is predominantly sand and mud and therefore discouraging to spawning activity.

The shoals about Maple Island (Fig. SM3) were considered to have been indisputably one of the finest trouting grounds in this part of the lake. The fishermen of the .Goulais Bay Indian Reserve always made this a popular spot in the fall when both black trout and redfins would congregate on the rubble bottom between the island and the shore. Between October 5th and 10th black trout began arriving on the ground, the run lasting a week to 10 days. Redfins appeared shortly before the end of this run and usually departed by the end of October. These dates correspond to those reported by American fishermen for southern Whitefish Bay (Iroquois Island, Salt Point, and Tahqueamenon Island) as recorded by Van Oosten (1927).

Much of the shoreline of Batchawana Bay, including Harmony and Havilland Bays, drops off too rapidly to serve as proper grounds, but Fig. SM3 indicates important spawning areas in the southern portion of the bay and about Batchawana Island. Provincial Land Surveyor Wilson (1865) heard Indian reports of grounds off the east and northeast shores of the island. In his notes we discover one possible reason for their excellence:

> "A strong current from the west sweeps around to the north and north-east of the island. the water is of considerable depth, and the current so strong that a considerable portion of it is open during the winter."

An area of suitable bottom is made more advantageous as a spawning ground if washed by currents. Thus will it be kept clear of debris and constantly replenished by fresh water. Lake trout seem especially attracted to exposed points or open shorelines and a moderate wind will bring many trout inshore to spawn (see Martin and Olver 1980). It has been the experience of some Lake Superior fishermen that spawning is heaviest on the windward side of islands. This is not, however, always borne out in reality, and excessively high winds can drive trout away from the shallow grounds and back to the depths.

The importance of southern Batchawana Bay as a spawning area prompted A.G. Duncan, Inspector of Fisheries, to recommend in 1911 that the waters "east of a line drawn from Rudderhead Point along the west side of the Batchewana Island to Sand Point" be set aside as a preserve (Canada. Dept. Marine and Fisheries. 1911). It is possible that his recommendation arose from an impression that the bay was being overfished.

The eastern half of Batchawana Bay reaches a maximum depth of 45 m. (149 ft.). This area of deep water is effectively separated from the main lake by Batchawana Island and its shallow southern shoals. Trout, spending most of the year in these deep inner waters, would move onto the shallows at spawning time. Along the western side of Havilland Bay and northward toward Batchawana Is., they would spawn in 1 m. (3 ft.) of water (Mr. G.A. Jones, personal comm. 1978). The bay trout were a smaller black, most weighing 0.9 kg. (2 lb.) or 1. 4 kg. (3 lb.), with 4.5 kg. (10 lb.) representing a large one. It is probable that they formed a stock discrete from those of the lake. Following completion of bay spawning, fishermen would move outside of Batchawana Island where lake trout ran to large sizes and were characterized by a somewhat later

spawning period (commencing about October 15th). Recent experimental netting by the Ontario Ministry of Natural Resources suggests that planted lake trout may be successfully recolonizing the deeper waters of Batchawana Bay (Wohlgemuth 1974).

It is interesting to note that the whitefish of Batchawana Bay may also have been, at one time, a discrete stock. In the Report of the Ontario Game and Fish Commission (1892) reference is made to an assertion of local fishermen that there existed whitefish peculiar to the bay. Barnston (1874), once factor of the Hudson Bay Company Post at Michipicoten, wrote:

> " in spring we sometimes had sent to us from a small outpost at Bachewaino Bay a fish or two, longer than our own and much thicker and heavier.... I never had an opportunity of submitting these white-fish to a close comparison with the large specimens taken at the Sault Ste. Marie, below the rapids, but I conjecture they might be of the same species."

Within Pancake Bay (Fig. SM4) there was little spawning activity, possibly due to a sandy condition of the bottom. The variety known locally as sand trout (see Section 4.1.3.4) resorted to the flats in this area (and it was trout of this same appearance and size class which moved into the bay in early summer to feed). North from Pancake Point to Coppermine Point both black and "regular" trout ran close to shore. Fishermen described the flesh of the black trout as predominantly reddish in colour. Generally, prior to 1945, one found the average weight of the trout in the first run to be 1.1 kg. (2.5 lb.) to 2.7 kg. (6 lb.), with an average weight of almost 1.8 kg. (4 lb.).

Pancake Shoal (Fig. SM4) was once a popular fishing ground and served as a source of lake trout spawn for the Sault Ste. Marie Hatchery (Parker 1931). Trout probably spawned all around the Sandy Islands (Fig. SM4), but a couple of fishermen remember hauling better catches along the shores of South Sandy Island. On Parisienne Shoal (Fig. SM4), it was possible for a single boat to take many tons during the few weeks that the

blacks and redfins were present there. It is the opinion of some that the shoal runs occurred somewhat later than the shore runs in this region. The Indian fishery of Goulais Bay, for example, was shifted to the shoals as the season progressed, Parisienne Shoal being the latest site of spawning (Mr. G. Agawa, personal comm. 1978). Blacks typically began to cast their spawn here between October 15th to 20th. After one week, redfins arrived according to their time.

The shores of Parisienne Island (Fig. SM2) were noted for whitefish breeding, and in the 1890s fears of depletion caused these grounds to be set aside as a preserve for a number of years (Canada. Dept. of Marine and Fisheries. 1893). But the sandy bottom that made these grounds so attractive to whitefish discouraged spawning of the lake trout, and only a few spots proved acceptable. Redfins were known to occasionally spawn at the southern end and on the hump just north of the island.

East of Parisienne Island the deep bottom of Whitefish Bay rises to form a ridge known as Halfway Bank (Fig. SM2). The waters are as little as 17 m. (55 ft.) to 24 m. (80 ft.) deep, and in summer nets were anchored to catch trout and whitefish as they moved near the top of the bank. Some trout may have crossed the 4 km. (2.5 mi.) to 7 km. (4.3 mi.)-wide ditch of deep water (of maximum depth 79.2 m. or 260 ft.) to spawn on the main shore in the fall. Fishermen believe, however, that it is more likely that these stocks followed the sides of Halfway Bank northward to arrive in October at Parisienne Shoal and the Sandy Islands.

North of Pancake Shoal, Cubin Bank (Fig. SM5) was a popular ground in June and July for lean trout, although none chose to spawn here. This region was not a favoured one for siscowet, halfbreed, or paperbelly fishing. Agassiz's (1850) expedition caught siscowet somewhere in the vicinity of South Sandy Island or Parisienne Shoal. Summaries of the 1948 CF-1 commercial catch records show this to be the only site where fat

trout were reported -- a total of 117 kg. (259 lb.) netted in May (Ontario Ministry of Natural Resources. 1980).

In contrast to areas farther north, this region supported only limited river-spawning ,stocks. It is likely that few or no lake trout ever moved into the Pancake (Fig. SM4), Batchawana (Fig. SM3), or Goulais (Fig. SM2) Rivers. A minor run frequented the Harmony River (Fig. SM3). An early photograph shows a catch of lake trout and whitefish from the St. Mary's River (possibly taken in summer; Young 1900). Lake trout continue to be found near the the rapids in late spring and summer (Mr. G. Primeau, personal comm. 1979).

5.2 COPPERMINE POINT TO CAPE GARGANTUA

If a line were drawn between Coppermine Point and Cape Gargantua contained therein would be a sort of great bay, whose bottom rolls and swells to form many islands and shallows. Here, in fact, is the last extensive area of near-shore shoal waters until Schreiber is reached, far to the northwest. The gill net boats found much profit here, as also did the trollers, though at times much equipment could be lost. The rugged bottom made it seem, according to the fishermen, as if one were "fishing off the sides of mountains".

Along the shore in fall the greatest concentrations of trout tended to be found near the mouths of the rivers. Spawning would commence here a short time, perhaps several days, after the river-spawners began to run. Much of the shore is rubble and gravel and, potentially at least, offers suitable spawning substrates. Important grounds were located about Coppermine Point (Fig. SMS) and in the vicinity of the Devil's Warehouse, at Gargantua (Fig. SM12). Along many other stretches though, the bottom slopes rapidly away from shore at angles greater than 40° and so

discourages spawners. Taken as a whole, the shore was less productive in the fall than the offshore shoals.

Six fishermen, all veterans of these waters, were interviewed. None spoke of an early run of black trout except in the vicinity of Coppermine Point. Instead the first spawners were referred to as "regular" or "ordinary", trout. This is apparently not a confusion of terminology, and the reasons for the paucity of the smaller dark trout remain obscure. Also of note, is the fact that redfins, while abundant on the shoals, spawned at only a couple of isolated grounds along the shore. One gathering place for redfins was a short stretch of beach just north of Mica Bay and around the small nearshore Crow's Nest Island (Fig. SM6). Another was near Robertson Cove (Fig. SMlO).

Spawning was reported all around Montreal Island (Fig. SM9) where the "regular" grayish trout could be taken in as little as 1.5 m. (5 ft.) of water. The best grounds were on the windward, southwestern shores. Eight km. (5 mi.) to the south, Montreal Shoal (Fig. SM7) rises to within 3 m. (10 ft.) of the surface. Not only were the regular trout here, but large redfins would come in great abundance. Neither at Montreal Island, nor along the adjacent main shore, were these redfins noted as having been prevalent.

In certain years at Montreal Shoal, and possibly on some of the other offshore grounds as well, spawning may have continued much later into the season than was typical in eastern Lake Superior. Occasionally when fishing for whitefish in early December, Mr. W. Renner (personal comm. 1979) would also take a few large trout with ripe spawn. Mr. G. Primeau (personal comm. 1979) reports an incident he describes as unusual. One November day in the late 1950s, he set in the shallow waters of Montreal Shoal and procured 500 kg. (1100 lb.) of large

redfins. This is also interesting as it suggests that the pressure of lamprey predation on these shoals may not have been as great as it was along the main shore at this time. It should be noted that spawning trout were seldom found on the offshore shoals earlier than October.

To the rubble strewn bottom around Gull Island (Fig. SM11) came thousands upon thousands of lakers, and from these shoals many tons were taken in fall nets. Sometimes the island was ringed with nets set in as close as possible to catch trout as they moved up into 2 m. (6 ft.) or less to spawn. Both redfins and the regular trout spawned here. Another variety reportedly came too, not as a distinct run, but as a fish unique in appearance. Instead of the dull gray of the regular trout, these had a back more silvery green in colour, and sides more whitish. On this light background were contrasted large, darker spots. (Trout of similar description spawned at Red Rock; see Section 5.3).

In the words of an early provincial game warden, the Lizard Islands (Fig. SM10) were "one of the best breeding grounds for whitefish and lake trout in the Province" (Ontario Department of Game and Fisheries 1910). Under lobbying pressure from the Fish and Game Association of Sault Ste. Marie, the federal government closed the islands to commercial fishing. in 1905. When the grounds were again opened in 1911, there had apparently occurred a resurgence of .stocks which had previously been described as dwindling. A note in the Ontario Game and Fisheries Report for 1911 gives us some idea of what the productivity of these grounds must have been in the earliest years of the industry:

> "...one of the Dominion Fish Co. tugs fished there part of August and part of September, and stated that they had good fishing; then it was opened during the month of October for sail-boat fishermen with the result that one boat caught 12 tons, another 11 tons, and another 7 tons. This was all done in two weeks' fishing and fishermen claim that they have not caught so many fish in the east end for several years; in fact they caught fish in such large quantities that they could hardly find a market for their catch..."

A group of off-shore banks, averaging 15 m. (50 ft.) deep, extend from Rousseau Bank (Fig. SMS) to Mackinnon Bank north of Cape Gargantua (Fig. SM12), forming a sort of broken frame to this region. To these banks lake trout would return each summer. Presumably they would move inshore again in the fall as few spawners were taken, except on Mackinnon Bank, late in October or in November. The most popular was Miron Bank (Fig. SMll). From here the charter boats might troll northward to Sparrow Shoal. It may be reasonable to suggest that these trout would move the short distance to the Leach Island grounds to spawn. Other banks, such as Mike Nable (Fig. SM8), were up to 11 km. (7 mi.) from the nearest spawning grounds. It is probable that some banks were frequented by trout using a number of different spawning grounds. Loftus (1958) reports recaptures of Montreal River (Fig. SM7) spawners from all shoals within 48 km. (30 mi.) of the river. Some travelled much greater distances.

Reported differences in the trout of different banks do suggest that during the non-spawning season there was at least partial segregation of trout within these waters. The banks were fished by the trollers for years in a similar manner and during the same months. Mr. Krezak (personal comm. 1979), however, found that different banks tended to give different size classes of fish. At Miron Bank (Fig. SMll) were taken the greatest range of sizes -- from 2.3 kg. (5 lb.) to 25 kg. (55 lb.) while an 18 kg. (40 lb.) fish was not uncommon. These were "perfect trout, nicely-shaped". Montreal Shoal (Fig. SM7) also had "perfect" fish, but they were not as large -- 1.4 kg. (3 lb.) or 1.8 kg. (4 lb.) was the average, and some were up to 8 kg. (18 lb.) but very seldom over 9 kg. (20 lb.). At Jokey Lump (Fig. SM6) most trout ranged from 3.6 kg. (8 lb.) to 8 kg. (18 lb.) with only the odd one up to 11 kg. (24 lb.). A similar situation prevailed at

Mike Nable Shoal (Fig. SM8).

Some morphological differences in the trout of different banks were noted. Those taken by trolling at Mackinnon Bank (Fig. SM12) were shorter and deeper than those found on Miron Bank. In weight, however, the Mackinnon Bank trout were not necessarily small, for some would range up to 14 kg. (30 lb.; Mr. M. Krezak, personal comm. 1979).

Trout taken in nets on Boissoneau's Bank, south of Agawa Bay (Fig. SM9), Mr. Renner (personal comm. 1979) describes as having been shorter and "chubbier" (deeper of body) than other leans in the area. A dark muddy colour on the dorsal half, they were light under the stomach with a belly that seemed very thin. (This description is similar to that for paperbellies, although the Boissoneau Bank trout were supposedly lean.) Instead of pink flesh the Boissoneau Bank trout had meat more yellowish in colour. Nets were set at 18 m. (60 ft.) to 28 m. (92 ft.). in September, although the spawn was not running at this time. Spawning ground locations could not be ascertained. These might be prespawning age classes, or indeed a variety of deeper-spawning lake trout distinct from those running along the shores.

Netting in the spring would bring fishermen a mixture of trout and whitefish. At the start of the fishing season lake trout were found at about 75 m. (245 ft.). Trolling did not begin until June when lines were dropped to depths of 65 m. (214 ft.) to 75 m. (245 ft.). Before the large trout came on, smaller individuals would approach the banks. According to Holly (1953), the shore along the "Red Rocks" (near Gargantua Harbour, Fig. SM12) allowed excellent trolling for these.[12] As the trout began to move up the sides of the shoals, the depth for trolling was reduced accordingly, until by the end of July perhaps only 30 m. (100 ft.)of line was let out and kept within 9 m. (30 ft.) of the surface. In the Montreal River area (Fig.

SM7), the lake trout would quit the shallow water after mid-August and retire to deeper water prior to moving onto their spawning grounds. In July for a couple of weeks, sand trout also moved onto the Agawa Flats (Fig. SM9).

It was in late July and a good part of August, that the big trout, called by some lunkers, could be captured. Smaller trout of about 2.3 kg. (5 lb.) were present but made up a decided minority of the catch. At times, one could see large trout breaking the surface, out of reach of the bottom-set nets but biting well on hooks. It was not until the 1950s that some fishermen began to float their nets on the surface and discovered that larger catches might be obtained this way.

In addition to such factors as water temperature and availability of food, other secondary factors may also exert an influence on fish movements. Bad storms in spring and summer for example, may cause muck to be stirred up from deeper bottoms, driving fish into shallower, clearer water over more solid bottom. Following times of rough weather trout would be observed to have left certain areas where debris from pulp logs was known to collect.

Halfbreeds were present between Pte. aux Mines and Siesta Shoal (Fig. SM6; Mr. A. Lawrie, personal comm. 1980). Between Montreal Shoal and Island and the adjacent main-shore is a tract of deep water which also provided popular fishing for fat trout and halfbreeds (Fig. SM7). Mr. W. Renner (personal comm. 1979) reports that the fats he was taking in 146 m. (480 ft.) to 165 m. (540 ft.) were from 2.7 kg. (6 lb.) to 5.5 kg. (12 lb.) in weight, while the halfbreeds in 91 m. (300 ft.) to 110 m. (360 ft.) were 0.7 kg. (1.5 lb.) to approximately 2.7 kg. (6 lb.).

Mr. M. Krezak (personal comm. 1978) explained that although fats might spend much of the year at depths as great as 183 m. (600 ft.) or more, they would come into shallower depths to spawn. On the sides of certain banks, from the beginning of August until the middle of that month, he would take

spawning siscowets (and halfbreeds) in 46 m. (150 ft.) of water.

Of several river-spawning runs in this regions, the Montreal River (Fig. SM7) received the greatest abundances of lake trout. Opinions vary on the exact dates for this run, and the best estimate is that trout first entered the river between September 20th and 25th, and only stragglers remained after October 10th or 15th. These dates include those reported by Loftus (1952, 1958) -- fishermen I interviewed agreed with behavioural characteristics described by him. In 1951, the first year of sampling at the river by Loftus (1958), the smallest males were approximately 61 cm. (24 in.) in total length, while few trout were taken over 81 cm. (32 in), the average size of age XII fish (see Carlander 1969). Employing the weight-length relationship for Lake Superior trout established by Eschmeyer and Philips (1965), these respective lengths correspond to weights of approximately 2.0 kg. (4.4 lb.) and 4.8 kg. (10.7 lb.). Several fishermen knowledgeable of the run prior to 1945 agreed that a majority of trout were between 3.6 kg. (8 lb,)and 4.5 kg. (10 lb.). However, it was also noted that in early years individuals of 7 kg. (15 lb.) to 9 kg. (20 lb,) were not uncommon in the river, and occasionally specimens up to 16 kg. (35 lb.) were found. The period after 1945, of course, witnessed the growth of the lamprey problem in this part of the lake. Lampreys in the early years of their increase tended to select larger trout first, and by 1951 this process may have already been well under way. It is quite probable, however, that fishing pressure may also have affected the abundance and size distribution of this stock during the period 1900 to 1950. It is clear that spawning trout were more abundant in years previous to 1949, as suggested by Loftus (1958). In the 1920s spawn takers for the Sault Ste. Marie Provincial Hatchery were able to take up to 1000 to 1500 fish in one sweep of their 76-m. seine (Mr. W. Sanders, personal comm.

1978). One fisherman recalled the stories his father recounted sailing from the Soo to Montreal River around the turn of the century, where he once took 1000 kegs of fish in a couple of nights (at 100 lb. or 45 kg. per keg). Although a law was introduced about 1900 prohibiting fishing within 1 mi. (1.6 km.) of a river mouth, the Montreal River remained a favourite spot for poachers. Nets were set about the mouth, and trout were snagged along the bottom. Early overseers lamented the illegal use of scoop nets and seines, and predicted the depletion of the stock (Elliot Aug. 15, 1896; Ontario Dept. of Game and Fisheries 1910). In addition to illegal fishing, the waters offshore from the Montreal River supported a thriving commercial fishery; it was one of the most popular areas for sports-fishing in eastern Lake Superior.

In past years many trout would spawn about the mouth of the Agawa River (Fig. SM9), but seldom ventured far beyond the mouth into the areas of mud and sand bottom. Spawning occurred at about the same time as the Montreal River. (One experienced fisherman asserted that trout arrived at the Agawa a couple of days earlier). A run also occurred at the Baldhead River (formerly the Gravel River; Fig. SM10) where the fish would proceed about 500 m. (550 yd.) upstream as far as the rapids. What must be considered a minor run approached the mouth of the Sand River (Fig. SM10), but only occasionally did any trout wander into the river itself. One fisherman reported that a run existed at Alona Creek, but this could not be further verified (Fig. SM6).

5.3 CAPE GARGANTUA TO POINT ISACOR

From Cape Gargantua northward the shore assumes an imposing aspect in which progressively higher cliffs fall hundreds of feet toward the water. South of Grindstone Point (Fig. SM12) narrow, rocky shelves still

hug a good percentage of the shore and offer some resort to spawning fish. But beyond, until the sand beaches of Michipicoten Harbour are reached, one can pull a boat tightly against the mainland rock and still drop anchor into many metres of water without touching bottom. Only Old Woman Bay and Brule Harbour (Fig. SM13) present shoals of limited extent.

The area about Indian Harbour (Fig. SM12) possessed lake trout spawning grounds of special note. Centuries before any commercial fishermen discovered their value, Ojibway natives would drift among the rocks and tiny islands to set their nets in fall. North of Ryan Point and around Cap Chaillon and the rubble strewn ledges of Grindstone Point, both redfins and the smaller regular trout would spawn. Along the Low Lands north of Grindstone Point trout could be netted shortly before their spawning time (Fig. SM13). Here was little opportunity for spawning, and it is believed that most of these fish were moving southward toward more suitable grounds. Prior to the general spawning movement onto the beach shoals, trout would also congregate upon the shelf extending outward from Grindstone Point (approximately 30 m. (100 ft.) deep).

During the first week of October trout would approach the shore bank about Red Rock River (Fig. SM12) but avoided running into the river itself. When the run was on, it is said, fishermen took some of the region's largest trout from here. The average weight of each fish was almost 7 kg. (15 lb.). According to Mr. M. Krezak (pers. comm. 1979) many of these were known locally as "half-dollar fish", a variety unique to this bank (although similar in appearance to the Gull Island trout described in Section 5.2; Fig.SMll). A deep red coloured about two-thirds of the pectoral and dorsal fins (but not the tail), and the flesh was pink in colour. Their silver- gray bodies were highlighted by large "coin-sized" spots or b.lotches of a darker shade. Fish marked in this manner could be

found neither along adjacent stretches of shore, nor at nearby MacKinnon Bank. No "half- dollar trout" were ever evident except at spawning time. These trout may have composed a stock distinguishable by the unique colouration they assumed in the fall, although, as stressed previously.in Section 4.1.2.4, a variety of factors of habit and habitat can influence skin colouration. The opinion was expressed by at least one fisherman that local water conditions affected by the sedimentary geology of the area, and perhaps associated with some properties of the Red Rock River outfall, acted to "create" the half-dollar trout.

Upon the ledge encompassed by Old Woman Bay (Fig. SM13), lake trout would gather prior to spawning in late September at the northern point and, to a lesser degree, upon the shoals about the river's mouth. Farther to the north, spawners came just inside the entrance to Brule Harbour and along the shore of Entrance Island (Fig. SM13). Some. of the larger trout would spawn at depths as great as 18 m. (60 ft.; Mr. 0. Bjornaa, personal comm. 1979), and it is reported that the onset of spawning was several days later than at Old Woman Bay. During stormy weather it was the habit of many trout to move onto the shoal just inside the mouth of the eastern bay. Lake trout also spawned in nearby False Harbour in water too shallow for gill nets.

To the north in Michipicoten Bay (Fig. SM14),spawning began at an earlier date, a fact already revealed by the Hudson Bay Company journals (see section 2.2.3.2). An entry for September 26th in the diary of William H. Keating (geologist with the 1823 American surveying expedition under Major Stephen Long) describes fish from what was probably the earliest run of lake trout sought each year by fishermen of Michipicoten House:

> "The trouts which we ate there appeared to us distinct from any other fish, and we regret that they had all been cut up before Mr. Say [biologist] was enabled to obtain specimens for study and preparation. The trout is a

> dusky colour, with light spots irregularly scattered upon its surface; it is a richer and more substantial food than the white-fish, but not so delicate; its flesh is of a reddish tinge which approaches that of European salmon. The season for catching the trout had nearly expired..." (Keating 1825).

In addition to these, redfins were once common about Michipicoten Harbour. West of Michipicoten Bay the densest spawning occurred in the close vicinity of the rivers: the Dore, the Makua (or Bear), the Eagle, and especially the Dog, now known as the University River. Holly (1953) notes that "from Dog Harbour to Ghost River, and especially off Eagle River, the whole coastal area is excellent lake trout ground any time of the year". The Dog Banks (Fig. SM15) were fished both spring and summer and it is probable that many of the shore and river-spawners remained along its sides year round. Tagging studies made by Loftus (1958) at Dog River revealed two separate movements away from the spawning grounds. A majority of recaptures by commercial fishermen occurred at the Dog Banks, although a scattering of trout westward along the shore of the lake was apparent.

The arrival of trout in shallow waters in summer tended to occur earlier in Michipicoten Bay than in the vicinity of the Montreal River (Fig. SM7). Fishermen were in general agreement with the dates noted in the Hudson Bay Company journals. Trout could be seen feeding near the surface in late June, frequently in the company of ciscoes. The largest specimens were taken by trolling in July, and were usually scarce by the end of that month. A similar pattern was manifest around Grindstone Point. Trout remained on or near the top of Mackinnon Bank (approximately 27 m. (90 ft.) deep) later into the summer season (Fig. SM12). When the Purvis tugs fished here they might drop gangs of nets from Cap Chaillon around the outside of the bank toward Cape Gargantua (Mr. L. Morden, personal comm. 1979). Holly (1953) includes a report:

> "These form an excellent trolling ground and are a favourite spot for

> "hookers" or poachers to drop their illegal hook lines. The trout are large and plentiful in late July and August and easily accessible harbours are near at hand...."

South of Point Isacor (Fig. SM15) are a number of deepwater banks which yielded a good showing of trout. In May and early June, nets would be set for lean trout on the southern portion of the shallower Isacor Bank (the minimum depth of which is 36 m. -- 120 ft.) in about 82 m.(270 ft.) of water (Fig. SM16)[12]. Later in June, and into the summer, the nets were moved closer to shore between the Eagle and Ghost Rivers. As early as the first week of August, the Purvis tugs would occasionally set for bankers (halfbreeds?) on Isacor Bank. By mid-October siscowet ranging up to large sizes dominated the catch and continued to do so until the conclusion of fishing, usually around November 20th (James Purvis and Son, Ltd. 1934-55). Similarly, in October siscowet moved from deeper waters outside of East Bank (Fig. SM15) onto the bank itself (the minimum depth of which is 73 m. -- 240 ft.). The dates for actual fat trout spawning in this region are uncertain.

Additional fat trout grounds existed closer to Michipicoten Bay, although the exact locations of some are not known. The Rev. James Evans, dispatched by the Methodist Church as minister to the Ojibway Indians, wintered at the Hudson's Bay Company Post at the mouth of what he called the "Meshebegwasdoong River" (Michipicoten River). Here in 1838 he found fat trout available within easy rowing distance:

> " the trout are not infrequently an inch thick with fine white fat resembling the leaf of a hog, and if hung in the sun will almost melt away leaving nothing save the skin and bones. They fry without anything to grease the pan and leave therein an abundance of fine pure sweet oil which is even good to shorten cake without leaving any disagreeably fish taste. Now laugh all."[14] (Landon 1973).

During the first week of July, 1974, native fat trout were taken in less than 9 m. (30 ft.) of water near Michipicoten River (Mr. H. Orr, personal comm. 1978). Fishermen confirm that in former years such an

occurrence was not unusual, although fat trout would never appear in as great numbers as at the P.Lc River and certain other localities (see Section 2.2.1.1), and there seems to have been no regular annual movement of Michipicoten fats into shallow water.

A lake trout run into the Michipicoten River is known to have existed at least as long ago as the 1920s, and is described by fishermen as having been of major importance (although not as important as that of the Dog River). Often trout would work their way upstream unusually great distances -- sometimes as far as Scot's Fall 16 km. (10 mi.) from the lake. Here they would cast their spawn in the pool below the falls. About September 17th the first fish would enter the river, and while most trout spawned within ten days some could still be found 2 to 3 weeks later. Their average weight is not known, although specimens over 13.5 kg. (30 lb.) have been reported. A great number of the trout in the river were red-finned. A spawning run as large as the one described by the old-time fishermen would most likely have been mentioned in the Hudson Bay Company journals of Michipicoten House. Since it is not, presumably none existed in the 1850s, and it would seem that the Michipicoten River spawners had more recent origins in lake-spawning stocks.

Trout began to appear in the Dog River (Fig. SM15) each year at about the same time as in the Michipicoten River. A spawning period from September 17th to 30th is noted by Loftus (1958), and according to Devereaux (1963), September 24th was the approximate peak of the spawning period, compared to October 21st for trout from shore sites in this area. This last date, however, refers to the later runs of lake trout -- in the vicinity of the, river mouths trout began to spawn only a short time after those actually in the rivers. It should be noted that these dates for the Dog River spawning run are later than those found to be typical during the

operation of the Hudson Bay Company post, a discrepancy for which there is no obvious reason. However, as mentioned in Section 2.2.3.2, the spawning period could show much yearly variation.

Loftus (1958) found Dog River trout to be "three to four inches shorter than Montreal River trout at maturity" (measuring fork length).This represents an average weight difference of 0.7 kg. (1.5 lb.; Eschmeyer and Phillips 1965). Interviewees agreed that Dog River trout tended to be smaller than Montreal River trout. Average weights reported ranged from 1.8 kg. (4 lb.) to 3.2 kg. (7lb.), and fish over 6.6 kg. (14 lb.) were considered to have been rare. One experienced old-timer found the trout to have been "at one time so thick you could almost walk across the river on their backs". The Dog River, like the Montreal; was a favourite with sportsmen and poachers, although being less accessible, fishing pressure was reduced somewhat. Nevertheless, it is apparent that by the second half of the 1940s the stock had significantly declined over earlier years.

Opinions regarding dates for the Eagle River run varied widely (Fig. SM15). It was the practice of many fishermen to commence their operations in the Pukaskwa River area (Fig. SM17) in order to catch the earliest run of trout there, and to then move consecutively to the Eagle, the Dog (and sometimes the Bear), and lastly the Montreal River. As a consequence of this practice fishermen may have arrived during a run, and so be uncertain as to the actual dates it normally began. Loftus (1958) supplies dates from September 12th to 20th for the Eagle River, and these may be the best approximations. Some years, however, trout might begin up to a week earlier, and might remain in the river three weeks. A pool inside the mouth where fish congregated made this a popular river for illegal scoop-netting.

At the Bear River (Fig. SM14) a minor run moved as far as 360 m. (1120

ft.) upstream. Similarly, trout moved into the Dore River (Fig. SM14) as far as the falls 182 m. (600 ft.) from the lake. Some trout spawned in the Old Woman River, but most spawning was on the lakeshore near the mouth (Fig. SM13).

5.4 POINT ISACOR TO PLAYTER HARBOUR

The broad sweep of shore from Point Isacor northward toward the Pic River is as exposed to the moods of Superior as any place on the lake. It receives the full brunt of the howling autumn winds, and strong currents push close to its craggy banks. Places such as La Canadienne Point, Point Isacor, and outside Otter Island proved to be, at times, especially difficult to fish. Yet for those fishermen with sufficient nets and horsepower, it usually paid them well to come, set their nets, and lay overnight in the little harbours that pockmark the shore.

From the impressions of several fishermen, it seems that lake trout spawned along much of the shore stretching from Ganley Harbour to the Otter Head (Fig. SM17 and Fig. SM18). Some of the heaviest spawning was at La Canadienne Point. A little to the south is the long stretch of shoals called the Pukaskwa Flats (Fig. SM17). Here tugs would commence setting nets in August at about 64 m. (210 ft.) and gradually move them up onto the Flats and the shore as the trout came on to spawn. Redfins arrived in great numbers, as did whitefish later in the season. The earliest run was predominantly silver gray bodied, regular trout, but mixed among them were easily distinguishable black trout. Most of these dark trout would probably move northward to the Pukaskwa River to spawn. In this region, as in the previous (Section 5.3), trout were particularly abundant about the mouths of the rivers early in the fall season. Here were the major grounds for the blacks, although these fish were reported to have also spawned at Simon's Harbour, Spruce Harbour

(Fig. SM.19), and the Otter Head (Fig. SM18). Mr. F. Legault (personal comm. 1978) remembers the 1930s when, at the height of the run in the vicinity of Spruce Harbour, 1200 m. (3940 ft.) of nets could be set in the evening and pulled at 11 P.M. containing 181 kg. (400 lb.), then again at 12 P.M., and again in the morning, each time with similar weight.

The log of the Pijitic, a pleasure vessel operated by Marathon Paper Mills for the entertainment of its employees and clients, contains many accounts of the Pukaskwa area shore (Stevens 1950-51). An entry for September 9th, 1950 notes that lake trout were being caught along the beach and the old dock foundations at Richardson Harbour (Fig. SM18). These trout were probably just beginning to spawn. The notation for September 12th made in the vicinity of the White Gravel River (Fig. SM21), sheds more light on spawning times:

> "...We then trolled the beach for lake trout near nets that had been placed on the beach by the trappers and Talricco. We picked up one 8-pound laker. The brook trout had some lake trout eggs in them showing they had been working the beach where the lake trout were spawning."

A spawning season commencing in early September was fairly typical of most of the grounds north of Ganley Harbour (Fig. SM17). In general, spawning in the vicinity of a river would begin at the same time, or slightly after, river-running began. It is less certain how late into the season spawning would continue as few boats would be fishing the grounds at this time. According to Mr. I. Johnson (personal comm. 1979), a redfin run would begin near the White Gravel River in as little as 0.6 m. (2 ft.) of water about the 1st of November (or "at the first of the dark moon"). This may not have been typical of the whole shore however. Farther to the north near Morrison Harbour (Fig. SM22), McNab {Sept. 7, 1922) suggests that the second run (which he refers to as yellowfins) would begin at an earlier date, i.e. about October 25th. Few fishermen familiar with the shore north of the White Gravel River, a part of what is now Pukaskwa National Park, are still living. Descriptions of former fish

spawning habits here must, for the most part, remain unwritten.

Examination of the Purvis records for the 193Os reveals that lean trout could still be caught in the vicinity of Isacor Point early in November, long after the Eagle River (Fig. SM15) spawning run had ceased. Many No. 1 lake trout (under 5 lbs -- 2.3 kg.) were evident throughout October and may represent, in part, individuals that had moved away from the Eagle or Dog Rivers. The majority of the total daily poundage taken was made up of trout classed as medium (from 2.3 to 3.6 kg.; 5 to 8 lb.), Similarly, in the vicinity of the Pukaskwa River (Fig. SM17) large numbers of leans were still being caught when the tugs quit the waters in November. Again the major percentage of the catch was medium trout, although, after the second week in October, many large trout classed as "headless" appeared (the typical total daily weight ratio of headless to medium trout was between 1:2 and 1:3). Along the main shore at the Otter Head (Fig. SM18), pound nets were established by the Purvis operation and would still capture lean trout after mid- October (James Purvis and Son, Ltd. 1934-1955).

Holly (1953) noted that excellent summer grounds for both trout and whitefish were to be found on the Pukaskwa Flats. Trolling about "the large rocks off Otter Island" (Fig. SM18) usually also met with success. He writes:

> "Leaving Otter Head in 1948, we delayed long enough to troll around the bare rock at the harbour entrance and at each swing around we caught one or two four to eight lb. lake trout. We ended up with about 150 lbs."

In addition to these grounds, interviewees reported that lean trout could be found in shallow water in July at Simon's Harbour (Fig. SM19) and along the shore from Point Isacor to Pilot Harbour (Fig. SM16). Evidence is not sufficient to infer possible differences between these summer movements and those of the other regions.

Grounds famous for siscowet and halfbreeds were the Spruce Banks (Fig.

SM20), and throughout the history of the commercial fishery they were frequented by many of the major eastern operations. A Purvis tug would start fishing for trout in the spring and continue to periodically visit the banks until November. When the fishing was concentrated more inshore for leans perhaps one or two gangs of nets at (11,890 yd. to 10,872 m. per gang) would be dropped in deep water (Mr. L. Morden, personal comm. 1978). Fishermen responded to movements of the fish up and down the bank in relation to either their feeding or spawning migrations. In summer the best sets for fats were made on the outside banks. By October effort was concentrated more inshore closer to the White Spruce River (Fig. SM19). It is not known when these trout actually spawned on the banks.

Off the Oiseau Banks (Fig. SM21; exact location unknown) in 64 m. (210 ft.) of water, Mr. F. Legault (personal comm. 1979) would catch siscowet that were beginning to spawn about the 15th or 20th of October. Other siscowet and halfbreed grounds included those near the Otter Head and south of the Pukaskwa Flats, although these were not as important as the Spruce Banks. Approximately 40 km. (25 mi.) west of Simons Harbour is a small shoal (of 62 m.; 204 ft.) where fats were scarce, but paperbellies were often plentiful (Fig. 6).The black trout which spawned in the pools below the first rapids of the Pukaskwa River where also known to local residents as "yellowfins", many possessing this fin colouration. Colin Macmillan (1975), a Pukaskwa area resident and guide for many years in the 1940s and 1950s, describes their habits in his notes (based upon information given him by Gideon Nicoll of Port Coldwell):

> "These Black Trout spend most of the year in very deep water, below 400', where the commercial fishermen cannot net them. Usually about the first week or so of August a few male Black Trout would be caught in nets set in 400' of water. These fish were the vanguard of the spawning run. The females usually followed the males by two weeks. During the remainder of August and into September these fish moved in ever increasing number up from the deep water into the shallows, then into the rivers to spawn. Gib Nicol said the dates when these fish entered the rivers could vary as much as a month, he thought water temperature was the controlling factor."

Usually blacks entered the Pukaskwa River between September 1st and 5th. The

run tended to peak about September 12th, but when MacMillan (1975) first witnessed them in 1949 they were still gathered in the pools in late September. During the day fish would remain in the pools. An early reference by Bell (1905) also refers to the ascent of this stream by large lake trout -- [11] the mouths of these various streams are a common resort for the Indians during the early autumn."

A large range of sizes frequented the Pukaskwa River. The log book of the Pijitic proves that in 1951 it was still possible to hook trout weighing at least 8.2 kg. (18 lb.):

> "September 20, 1951.... We landed five large fish and lost so many that we lost count of them. I suppose we fished all told ten hours out of the day and I would truthfully say that we each of us had fish on our lines eight hours of the ten. Boy were we tired out." (Stevens 1950-51).

By 1954 and 1955 experimental seine hauls would yield only 62 trout (Loftus 1958).

The smallest of the river trout were 1.4 kg. (3 lb.) or 1.8 kg. (4 lb.) and all had red flesh. It is interesting to note that lake trout in the Pukaskwa were found to be heavily predatory on their own eggs. Some sport-fishermen, in fact, would use an artificial roe lure in their capture: i.e. yellow feathers with red flecks which were made to lie on the bottom of the river in the pools (Mr. C. MacMillan 1975, and personal comm. 1978).

Fishing at the Pukaskwa began earlier in the fall than elsewhere in eastern Lake Superior and could at times become quite intensive. Most of the recreational fishermen would fish on the flats at the entrance or troll about the mouth. In the 1940s so many boats might be here at one time that traffic congestion would become a problem, necessitating that fishermen cooperate by driving in one direction in a circle (Mr.C. MacMillan, personal comm. 1978).

Poaching was common at both the Pukaskwa and White Gravel Rivers. A

falls on this latter river prevented fish from running more than 60 m. (200 ft.) upstream. Often storms would partially close the mouth with sand and gravel. It was reportedly the practice of at least one tug to cut a channel 3 m. (10 ft.) to 5 m. (15 ft.) wide through the bar, permitting trout free access to the river. Then the gap was closed and the fish trapped in the pool inside. Once in this way, 2360 kg. (5200 lb.) of lake trout were taken during one seining operation. Loftus (1952) reports spawning occurred between September 22nd and 30th, but this could not be further confirmed.

Spawning would occur about the mouths of the Pipe River (Fig. SM17) and the Ghost River (Fig. SM16). Usually trout would not move right inside, although during a storm many might take shelter in the rivers rather than quit the shores. A minor run occurred in the Swallow River (Fig. SM19), but it is not known if the fish ranged as far as the first falls 850 m. (2790 ft.) upstream. A couple of fishermen reported a former run at the White Spruce River, but again nothing is known of its characteristics (Fig. SM19).

5.5 MICHIPICOTEN ISLAND TO CARIBOU ISLAND

The vacationing Disturnell (1863) remarked:

> "Michipicoten Island (the Island of Knobs or Hills) may be called the gem of Lake Superior, presenting a most beautiful appearance as approached from the southward, where a few picturesque islands may be seen near the harbour, which can be entered during all winds.Nature seems to have adopted this island as a place of resort for the seekers of health and pleasure ..."

For one hundred years after the demise of the Hudson Bay Company fishing stations, Quebec Harbour proved a popular resort not only for sportsmen, but also for the seekers of commercial fishing wealth.

Lake trout would spawn along many of the island's shores, although the northeastern end was considered treacherous in fall and less intensively exploited (Fig. SM24 and Fig. SM25). Favourite grounds were

The Breeders, Clay Banks, Shingles, Bonner Head, and Four-mile Point. It is the opinion of some experienced fishermen that trout at the Clay Banks and Shingles remained in this vicinity throughout the year. It was possible, they claim, to follow the movements of these fish up and down the banks from spring until fall. Here great abundances of especially large red-finned trout were enjoyed. One day in 1944, for example, Mr. G. Primeau (personal comm. 1978) lifted his nets at the Clay Banks to find 51 lake trout; the 30 largest weighed 488 kg. (1076 lb.). It is probably to these large, late-spawners that Loftus (1958) refers when he notes the spawning period of the northwestern shores as being from November 8th to 18th. It is also probable that some lake trout spawned even later, but the fishing tugs usually abandoned the waters by this date. About the island, earlier runs also occurred. Duncan (Nov. 23, 1910) implies one such run when he remarks that lake trout left the banks about the 15th of October. One fishermen recalled that Clay Bank trout would first arrive "when the leaves were blowing off the island. These would sink in the water and the nets would haul up big clumps of them."

In summer it was common for anglers to troll out of Quebec Harbour, inside the Breeders, and up the western side of the island. Along the southern islands and at the Clay and Shingles Banks, one often hooked 4.5 kg. (10 lb.) to 6.8 kg. (15 lb.) lake trout in mid-July. Trout up to 14 kg. (30 lb.) were not unusual. At the Clay Banks and probably elsewhere about the island, large fish became pelagic in July swimming near to the surface at the edges of the shore banks. Two fishermen reported that many large trout with red fins could be seen at this time and were of the opinion that fin colouration was not strictly a characteristic of spawning condition. (It is possible, however, that fins would darken in the fall. Mr. I. Purvis (personal comm. 1979) further described

Michipicoten Island lake trout as gray with gray-green spots and orange flesh.

South of Michipicoten Island lies an extensive association of banks, the largest of which adjoins the 5.6 km. (3.5 mi.)-long Caribou Island (Fig. SM30). On the Canadian side, the major banks, with their shallowest depths, are:

Butch Bank (Fig. SM26)	38.0 m.	125 ft.
MacMillan Bank (Fig. SM29)	26.6 m.	87 ft.
The Hummock (Fig. SM260)	25.1 m.	82 ft.
Northwest Bank (Fig. SM29)	24.8 m.	82 ft.
West Banks (Fig. SM30)	19.9 m.	65 ft.
Chummy Bank (Fig. SM26)	14.6 m.	48 ft.
North Bank (Fig. SM.29)	9.5 m.	31 ft.

(Depths taken from Canadian Hydrographic Service 1976).

Lean trout were associated with these banks and often recognized as different from those about Michipicoten Island by virtue of their skin colouration, body shape, or flesh colour. Trout at the Northwest, Chummy, and Hummock Banks are said to have possessed a yellowish cast to their gray bodies[15]. Tugs of the Purvis Fisheries set nets at Chummy Bank and The Hummock for summer leans and halfbreeds. In September and October leans were also caught here, although it is not known if they were spawning at this time. Large individuals of the sizes common about Michipicoten Island tended to be atypical of all these banks. Butch Bank trout averaged O.7 kg. (1. 5 lb.) or O. 9 kg. (2 lb.) and were known to yield, on the whole, the smallest trout. Fish were abundant here, however, and the ground was a popular one for tug fishermen. It is possible that preferential cropping of this bank may have removed the larger fish. In 1963, however, samples from Butch, MacMillan, and Chummy Banks, and The Hummock contained many 13 and 14 year old fish. On the basis of these findings, Lawrie (1964) concluded

a healthy status for these populations. Heterogeneity of growth rates between the populations may explain the size differences. Employing analysis of variance techniques, Patriarche and Peck (1970) have also found differences in the growth rates of humper trout stocks from six banks in the American waters of the Caribou Island area.

The spawning habits of the lean trout of the banks (except those about Caribou Island itself) are not clear. If they spawned on banks such as Chummy and Butch, as fishermen believe they did, it was at a depth unusual for lean trout in Lake Superior. Late in September trout would appear upon the shallow North Bank and the shore banks about Caribou Island. Spawning would commence about October 1st and last for approximately three weeks. Throughout the fall, trout were available over most of the shoals, but actual spawning tended to occur in 9.1 m. (30 ft.) of water and less. Heaviest fish concentrations were found along the southern and western shores of the island. Here tugs would fish fewer nets and make fewer sets than at other banks, for in autumn the weather was frequently bad and the waters treacherous. In a storm, debris would be stirred from the bottom and could rip out much netting. The effects of wind in altering spawning habits were obvious to fishermen at Caribou Island; a northwest wind meant trout on the grounds for longer periods of time, while wind from the southeast drove fish from the shores and frustrated fishing.

The trout spawning at Caribou Island were of unique appearance, being almost exclusively dark in colour, although the odd gray (or silver-gray) trout might be found among them. Here the Purvis tugs would secure only 2 or 3 percent silver-grays per lift (Mr. L. Morden, personal comm. 1979). The "Caribou Island black" possessed a dark brown-green back (almost black in appearance), gray belly, and sides with a liberal sprinkling of dark spots tinted between with green. They were stocky and an average of 2.7

kg. (6 lb.) in weight; a 4.5 kg. (10 lb.) specimen was considered large for its kind. Red-finned individuals were uncommon. While the blacks were white of flesh, the silver-grays taken here were red- or pink-fleshed. Perhaps the latter were fish of a roving nature, not native to the immediate vicinity of Caribou Island but straying at spawning time from more northerly banks or Michipicoten Island. Around the Caribou Island shoals one might troll for these dark trout throughout the summer. One fished on the very edge of the drop-off ("where you could see bottom on one side of the boat, and only dark water on the other") suggesting that at least some portion of these blacks may have constituted a sedentary stock. Trout of their appearance were uncommon on the other banks.

Patriarche and Peck (1970) found the paperbelly (or humper) to be the most abundant lake trout variety on the banks which they sampled. A similar situation prevailed at certain of the Canadian banks prior to the sea lamprey invasion. (This may have continued to be the case for, as suggested by the above authors, the paperbellies' small size made them less vulnerable to lamprey predation). Butch Bank was generally praised as the best for paperbellies. Good lifts were also possible at Chummy and East Banks (Fig. SM26 and Fig. SM28), and paperbellies were reported to have been present on all of the banks in this region. It is curious to note that Mr. W. Sanders (personal comm. 1978) would in November (1940s?) find paperbellies with ripe eggs in the 200 m. (650 ft.) hole situated 4.8 km. (3 mi.) north-northwest of Chummy Bank. The eggs were found to be ruptured when the fish were examined at the surface.

Mr. L. Morden (personal comm 1979) reported the existence of deepwater leans at Southeast Bank (Fig. SM30) and the Breeders off Michipicoten Island (Fig. SM24). Halfbreeds were reported at the Southeast, Chummy,

and East Banks, The Hummock, and 16 km. (10 mi.) east of The Hummock (Fig. SM27). Mr. w. Saunders (personal comm. 1979) referred to the Chummy Bank trout as "bankers" which he distinguished from paperbellies. Fats were often taken at 128 m. (420 ft.) to 183 m. (600 ft.) between certain of the banks and in water off the shore bank of Michipicoten Island. What may be recognized roughly as a "ditch" surrounds the island, and in this fat trout would congregate.

Little is known of the spawning habits of the non-lean varieties. Purvis (1977) records the opinion of some fishermen that siscowet south of Michipicoten Island would move to the surface in August to spawn over deep waters. Most certainly, as he states, "further investigation is likely warranted in this area."

West of Michipicoten Island, the Big Flats (Fig. 6) were a source of fats, halfbreeds, and paperbellies both in summer and in fall. Here the records of James Purvis and Son, Ltd. (1934-1955) show, the best summer catches were made during the first three weeks of July (although the best were still much less than those lifted after Mid-September). Average catch per unit effort for 5 lifts in October and November of 1936 was 240 kg./1000 m. (480 lb./1000 yd.) of gill net, which far exceeds that of Superior Shoal (Section 5.8). From September to November large fats (over 4.5 kg.; 10 lb.) dominated the catch in an average ratio of 3:1 with bankers, and medium and small fats (ranging from 2.0:1 to 4.5:1, determined from 10 different lifts). Leans were only taken in small quantities as incidental catch.

5.6 PLAYTER HARBOUR TO SCHREIBER POINT

The waters west of Playter Harbour (Fig. SM23) contained grounds exploited by fishermen from the three major fishing centres of Rossport, Port Coldwell (Fig. SM33), and Jackfish (Fig. SM39). Places such as Almos Shoal (Fig. SM39),

Foster Island, McKay Rocks, Hawkins Island (Fig. SM33), and Nicoll Shoal (Fig. SM35) still bear their names and remember them as early pioneers to this part of Ontario. Most of the old-time resident commercial fishermen of Port Coldwell, Peninsula (or Marathon, Fig. SM31), and Heron Bay (Fig. SM23) are gone, although a few younger people remain who carry memories back to the 1940s. Still, lack of informants has prevented some of the spawning ground maps east of Jackfish from being as comprehensive as might be desired.

Jackfish fishermen knew three runs of trout. Along these shores, the earliest that trout would approach the spawning banks was August 15th to 20th. The 1911 Report of the Ontario Department of Game and Fisheries notes an unusually early spawning run at Jackfish that year:

> "...the run of gray and black trout was on about the 15th of August and right up to the 15th of September. These fish were then filled with ripe spawn."

Spawning of the first-run trout usually began between September 20th and 25th, continuing for 10 days to 2 weeks -- dates fairly typical of the shores from Port Coldwell to Rossport. It may have been a frequent occurrence to find trout commencing to spawn in Jackfish Bay (Fig. SM39) a few days earlier than along the main-shore. Two extracts from the Port Arthur Fish Hatchery correspondence, referring to Rossport and Port Coldwell respectively, further testify to the influences of temperature on trout behaviour:

> "...[it] is due to the high temperature. The black trout that should spawn between September 22nd and October 5th are out in deep water and wandering all over the lake." (McNab Oct. 15, 1922).

> "I find that the extreme hot weather has delaid the spawning season of the black trout and when entering the shallow water, the storm of last Wednesday drove them out in deep water and I am doubtful if they will ever return (McNab Oct. 2, 1920).

Both blacks and "regular" silver-gray trout formed the first run. From Cape Victoria to Worthington Bay (Fig. SM39 and Fig. SM41) the grounds were almost continuous, and the old Hudson Bay fishing stations at L'Ance a la Bouteille (Fig. SM37) and Les Petits Ecrits (Fig. SM41) were still showing especially heavy runs in the late 1940s. On the Jackfish grounds of the lakeshore, blacks

averaged 2.7 kg. (6 lb.) with few taken over 3.6 kg. (8 lb.) -- i.e. larger fish than the blacks spawning south of Coppermine Point (see Section 5.1). Usually their flesh was white.

In veritable droves the trout would arrive on the shores of the Slate Islands (Fig. SM38) in early fall. The spawning grounds between Mortimer and Patterson Islands were well known, especially by the rowboat fishermen of Jackfish who tended to avoid the exposed eastern and south-eastern shores, seeking instead protection inside the islands. It was possible, however, to fish with comparative safety in the protection of the southern bays of Patterson Island, and Mr. A. King (personal comm. 1978) remembers that some of the heaviest fishing he has ever seen was at the east point of Horace Cove.

Black trout were the most common variety at the islands. Spawning commenced at the same time as at Jackfish, although it was reported that they might be taken on the sheltered grounds of the islands 1.1r1.til later in the season. Smaller, on the average, than the shore blacks, most were 1.4 kg. (3 lb.) in size with few over 2.0 kg. (4.5 lb.). Red-coloured fins marked many, although these were not regarded as a discrete run or stock. As early as mid-August they were taken by fishermen trolling near the lighthouse south of Sunday Harbour. Larger trout more typically spawned at the Leadman Islands (formerly called the Little Slates). Here in the course of the fall season, blacks, yellowfins, and salmon- trout (see below) came successively to cast their spawn on the rubble shoals. Mr. C. Cress (personal comm. 1978) found areas of honeycomb rock (uncommon to most of Lake Superior) to exist around Leadman Island.

South of the Pic River (Fig. SM23) the first run came on the grounds at an earlier date than west of Neys Provincial Park (Fig. SM33). At Randle Point, Happy Harbour and Playter Harbour (Fig. SM23) spawn would be seen running from black trout just after the first week in September. The general westward trend of earlier spawning periods, noted in Section 5.3, was not apparent at the Pic River. South of the Pic River, this trend may have paralleled the annual September cooling rate

for near surface waters (Environment Canada 1970, 1973). Martin and Olver (1980) summarize observations concerning the importance of temperature in determining the initiation and duration of the spawning periods for lake trout populations.

By August 20th it was usually possible to net large trout within Jackfish Bay at a depth of 36 m. (120 ft.) Shortly before the end of the black (or "regular") trout run, the yellow-finned trout would appear on certain of the same shoals. Mr. A. Almos (personal comm. 1979), son of one of the earliest fishermen at Jackfish, noted the presence of a "yellowfin" racer form in that area:

> "Yellowfins had big heads, big teeth, and some had small bodies -- they were very ugly."

These tended to range from 4.5 kg. (12 lb.) to 11.3 kg. (25 lb.). (See Section 4.1.3.2). Mr. Almos reported that very occasionally a yellow-finned trout would be taken in summer.

In this region the "salmon-trout of the third run"(see Section 4.1.3.3) might continue spawning throughout the month of November and perhaps into December. Pic Island (Fig. SM33) was not an important spawning ground as much of the shore is surrounded by unsuitable sandy bottom. In August, however, large lake trout would congregate in the 36 m. (120 ft.) waters of Thompson Channel where they might be captured by trolling, or in nets of up to 20 cm. (8 in.) mesh. In July and early August, large trout could also be taken by trolling close to shore. Interviewees spoke of catches similar to those made by Stevenson (1865):

> "August 1 ... The sun shone out warm a little before midday, and as we neared the island, passing not far from some rocks just showing above the surface with the heavy rolling swells breaking over them, I trolled for half an hour and caught three lake trout, one about 30 lbs., another over 20, and the smallest about 10 lbs."

It would seem that throughout the summer these large trout would remain in the environs of the island. On "moss-covered" bottom in Thompson Channel, Mr. F. Legault (personal comm. 1980) located spawning gray trout

(salmon-trout?). According to this fisherman, the large trout common in the Thompson Channel-Detention Island area were absent east of Port Coldwell, while 11 km. (7 mi.) west of Port Coldwell the fish which he knew as gray trout were absent. Salmon-trout spawned along certain small stretches of shore in the area of Jackfish Bay (Fig. SM39). Above the town in the east arm of the bay, Mr. A. Almos (personal comm. 1979) and his father would take an average of 2 or 3 salmon-trout at spawning time. (The largest lake trout he ever saw were two individuals taken from here: one 14.1 kg. (31 lb.) and one 15 kg. (33 lb.)). Prior to the construction of the pulp mill in 1948, yellowfins would spawn inside Moberly Bay and on the shoal about Cody Island (although salmon-trout were absent from these particular grounds), as well as at Lawson Island, south of Santoy Bay (Fig. SM37). According to Mr. P. Dahl (personal comm. 1979), large lake trout with "a hooked jaw" were taken near Jackfish in December. Unfortunately, no detailed description is available (perhaps these correspond to the "shovel-nosed grays" mentioned by Thomson (1883); Appendix III).

In spring, lake trout would begin to move into shallow water. In May Jackfish fishermen would start to sink their nets along the main shore between 33.0 m. (108 ft.) and 43.0 m. (144 ft.) -- shallower depths than those at which fishermen in the southeastern part of the lake would commence setting the1r nets (see Section 5.2). Most trout captured were 1.1 kg. (2.5 lb.) to 1.4 kg. (3.0 lb,), for, according to the fishermen, larger fish lay in deeper realms. Until the latter part of June, trout were seldom fished at depths shallower than 33 m. (108 ft.). At the end of June, lake trout up to large sizes would approach the shallows where they could be taken on the troll -- this movement to shallow water occurred earlier than in the southeastern part of the lake. The general retreat to deeper waters came by the end of July. (Along this portion of the northern shore, the period of these movements reported by interviewees was later than that noted in the journals of the Hudson Bay

Company post at the Pic River; see Section 2.2.1.1.)

Close to the Steel River (Fig. SM37) proved an excellent site for trolling. Here boats would move in as close as 3.6 m. (12 ft.) from shore. On the bank, about the river's mouth, trout up to 13.6 kg. (30 lb.) were found, although most were from 2.3 kg. (5 lb.) to 4.5 kg. (10 lb.). Prior to the installation of the Marathon mill, lean lake trout would move close to shore in Peninsula Harbour (Fig. SM31). According to Mr. K. T. McQuaig (personal comm. 1978), it was possible to catch 90 kg. (200 lb.) to 136 kg. (300 lb.) of trout per day by trolling. The annual appearance of these summer runs was noted in the Pic Post journals (Section 2.2.1.1). In 1974 planted trout again resumed this habit by running into less than 2 m. (6 ft.) of water near the town of Marathon (where trout had not come for many years); arriving in July, they remained on into August (Mr. B. Honan, personal comm. 1978). Farther west, Mr. O. LaBarr (personal comm. 1978) of Port Coldwell engaged in recreational trolling in the vicinity of the townsite as early as the 1930s. On his hooks in summer he took black as well as gray-coloured trout.

In both summer and fall, the shoals at the Black River (now dammed to create the present Aquasoban River; Fig. SM39) were once famous as trouting grounds. Over 100 years ago, a provincial geologist praised the site:

> "The mouth of the Black River affords one of the most esteemed fisheries upon the lake, and has long been the resort of neighbouring Indians during the proper season. Our own little net, scarcely twenty yards in length, supplied us abundantly, and a little surplus. The fish here taken are the speckled and salmon trout, white fish, siscowit, pike and herring. The labour of one or two men, during the first run, would supply a large settlement with most excellent fish...." (Anon 1872).

There are indications that these stocks of lean lake trout and siscowet suffered depletion prior to the ravages of the sea lamprey.

A series of deep offshore banks extending far to the southwest of Peninsula Harbour formed one of the most extensive areas of fat trout

ground in the entire lake. It is little wonder that the Nicoll Brothers of Port Coldwell, despite lower market values, found fishing for these trout quite profitable. Large siscowet of 4.5 kg. (10 lb.) to 9.0 kg. (20 lb.), and occasionally up to 11.3 kg. (25 lb.), reportedly ranged along the length of the Pic Bank (Fig. SM34 and Fig. $M36). Fishing might commence in August around the shallow hump 16 km. (10 mi.) south of Pic Island (Fig. SM32). In search of siscowet, one might also follow along the crest of the Copper Island Bank (Fig. SM40). Spawn was seen to run from these trout on September 1st, but the peak of their spawning period was probably mid-October to early November (Mr. F. Legault, personal comm. 1980). The late Mr. F. Gerow of Rossport would fish for fats along the bank after December 10th and on toward Christmas (Mr. W. Schelling, personal comm. 1979). Individuals up to 11 kg. (25 lb.) were known; large siscowet might be taken all summer but were not as abundant as those of the fall season. (It should be noted that many siscowet were also taken off the extensive Jackfish Bank (Fig. SM36), although exact locations were not determined).

Closer to Port Coldwell, Uncle Bobs Bank (Fig. SM31) and the banks in the vicinity of Fred Shoal (Fig. SM33) were considered among the best grounds in the region. Perhaps the siscowet that the Hudson Bay Company fishermen captured in June near the Pic River moved to these banks in fall to spawn. (This inshore movement of fats had never been observed by several fishermen questioned at Heron Bay and Marathon, however).Another instance of siscowet moving into shallow water came from the Slate Islands. A siscowet was caught south of Dupuis Island (Fig. SM38) in approximately 3 m. (10 ft.) of water in July by Mr. P. Dahl (personal comm. 1978). It is said that this was occasionally the experience of other fishermen as well.

Fats were fished in deep water until August when nets were moved onto the edges of the various banks. Purvis (1977) was informed by local fishermen that fats came onto the banks east of Pic Island (Fig. SM33)

to spawn at this time. No fishermen interviewed by myself, however, remembered having actually seen spawn running from these siscowet at this time. While certainly many were present on the banks in August, most may have actually spawned much later in the season. Nicoll Brothers Fishery used not to be able to obtain spawn from fat trout for the Port Arthur Hatchery until November and December (Nicoll Sept. 27, 1920; Nicoll Oct. 22, 1917).

Purvis (1977) notes the presence of paperbellies on banks west of the Pic River (Fig. SM23). About June 1st, before any lean trout had appeared, these fish moved into shallow waters in the vicinity of Port Coldwell harbour and southward along the shore (Fig. SM33). Reportedly, the paperbellies (or bankers as the local fishermen will call them) would not bite on trolling hooks. Those captured in nets averaged 1.8kg. (4 lb.) to 2.7 kg. (6 lb.). There is no suggestion that spawning ever occurred in inshore waters.

River-spawning is a much less common phenomenon along the shore of western Lake Superior than along the eastern shores. At the Steele River (Fig. SM37) the fishing success enjoyed by the Hudson Bay Company Pic Post endured into the 20th century (see Section 2.2.1.2). Local fishermen set pound nets about the mouth, and residents of Jackfish scooped upstream for black trout to supply winter provisions. These fish might run 6 km. (3.7 mi.) upstream in September. By the 1930s, however, the run had been drastically reduced. It is possible that it fell victim, in part, to overfishing, but one might also consider the possible effects of logging drives made down the Steele River.

The Pic River (Fig. SM31), both in the days of the Hudson Bay Company and in more recent decades, received no river-run lake trout. It is said, however, that trout would run up the Prairie River (Fig. SM35) in autumns when storms had not forced obstructing debris into the mouth, but no further details were obtained. In the early 1900s spawning trout would also move the short distance into the Black (Aquasoban) River

as far as the falls (where poachers were known to fish; Mr. P. Dahl, personal comm. 1980; Fig. SM39). Water fluctuations generated by the construction of a dam in 1948 and the creation of artificial Hays Lake conceivably had negative effects upon this stock.

One fisherman knew lake trout to be present in the Little Pic River (Fig. SM33) in the 1930s, although the run must be considered to have been minor in scale. Reasons for its disappearance are not known, but it is reported that planted lake trout again moved into the Little Pic River during the spawning season of 1978.

5.8 SCHREIBER POINT TO NIPIGON STRAIT

Those fishing memories of the big haul or the big fish, the kind that the old-timers repeat for generations, have always been both common and amazing in the Pays Plat-Rossport area of Lake Superior. In the shelter of the islands, on the rubble of the many shoals, trout and whitefish spawned late into the season in numbers that were a fisherman's dream. In July of 1823, Major Delafield was impressed by the great fishing potential:

> "In this group of islands there are strong currents, forming eddies by their points, where the Indians usually fish for whitefish. The whitefish of Lake Superior are said not to be so good as those in Mackinac. The salmon trout are very fine. Sturgeon are much eaten but the fat is too rank, otherwise the sturgeon would be delicate and good. A place called Gun-Point [Rossport Point; Drew and Littlejohn 1975], which is formed by a long and flat neck of land projecting into the lake amongst islands affords a good fishery. This is the first extensive flat seen on the lake.'' (Delafield 1943).

Along the shores about the town of Rossport (Fig. SM44), those fish called "red trout" congregated at spawning time in numbers greater than anywhere else. The rather ambiguous nature of the term has been previously discussed in Section 4.1.3.3. The sportsman Thomson (1883), however, gave credit to the form's distinctiveness:

> " the Red Trout is far superior to any of its confreres, and is called by the Indians - Pugwashooaneg, that is, Pays-Platt-District fish, as it is taken only in this locality, and only in the fall of the year as a rule. The Indians come from Nepigon expressly to fish

> for it, and care for no other trout in comparison. It is much more highly esteemed than the brook trout.... I found the flesh of a bright pink, and the flavour exquisite."

A few experienced fishermen from Rossport defined red trout as a separate spawning run. Around August 10th, red trout first began appearing in the nets. They thus preceded the blacks into shallower water, but actually spawned at a later date. Throughout September they would remain on the edges of the bank in 18 m. (60 ft.) to 36 m. (120 ft.) of water, while blacks might be spawning above them nearer to shore. Finally in the first week of October, they too would move close to shore for about two weeks in order to deposit their roe. Red trout could be seen on some of the same grounds as the blacks, but their sites, as indicated by fishermen, tended to be smaller in area and less numerous. (Examples include Bread Rock, Armour Island, and Fraser Point, Fig. SM41, Fig. SM54, and Fig. SM55 respectively). Red trout were noted as having paler skin than blacks, red flesh, and weights up to 6.8 kg. (15 lb.). The early-spawning black trout were less than 4.5 kg. (10 lb.) and typically averaged between 1.4 kg. (3 lb.) and 2.3 kg. (5 lb.). Like the black trout of the Jackfish grounds (Section 5.6), flesh colour was predominantly off-white in colour. Differences in the flesh colouration of red trout and black trout could suggest a segregation in diet of the two forms (see Section 4.1.2.3); unfortunately, fishermen very seldom note the stomach contents of their catch.

Along the lakeside shores of the islands the small-class blacks would spawn almost everywhere (and at about the same time each place); separate stocks are therefore difficult to discern. Certain bay areas of clay and mud were avoided by the trout, of course, but on the whole, the blacks were pervasive, and in good years their runs were heavier than of most other places in the lakes. Although spawning grounds are not shown on the outside of Puff Island and other islands to the south (Fig. SM57), the fish probably came here as well. Fishermen were wary of certain of these wave-swept shores and would set only in the lee waters, especially

when the autumn winds blew in from the southeast.

As previously remarked in discussion of the northern shores about Jackfish, the initial dates of spawning might vary widely from one year to the next. An early season is noted by Bastedo (Sept. 12, 1901); in that "year spawn-takers from the Duluth Fish Hatchery procured at Rossport all the spawn they required by September 9th. Most years, however, black trout would approach the grounds between September 5th to 10th but would only commence spawning about September 22nd for one to two weeks (also noted by McNab Oct. 15, 1922).

Many blacks in this region displayed coloured fins at spawning time. Seldom was a distinct variety of lake trout identified as "redfins", although Mr. H. Legault and Mr. F. Legault (personal comm. 1979) distinguished redfins from yellowfins (on the basis of spawning locations, slight differences in spawning times, and paler flesh tones). Certain grounds were renowned as yellowfin haunts in later fall. Spawning depths varied and often exceeded those of earlier-running lake trout. As one moved west of Fluor Island toward Sheesheeb Bay (Section 5.9), the trout Mr. W. Schelling (personal comm. 1979) identified as yellowfins grew scarce.

In late October and November the large yellowfins and gray trout arrived to spawn on their grounds. Here fishermen set nets having meshes of up to 23 cm. (9 in.) extension measure, larger mesh sizes than any used elsewhere on the Canadian side of the lake. In the early years of this century even 25 cm. (10 in.) mesh nets were occasionally utilized (McNab Oct. 15, 1922). Yellowfins were usually over 5.4 kg. (12 lb.) in weight, and prior to 1950, trout of 9.1 kg. (20 lb.) to 23 kg. (50 lb.) might be taken throughout the islands. Some were quite dark in colour and might be called "big blacks". The largest trout taken during the annual Rossport Fish Derby (1938 to 1960) was the winner in 1938 and weighed 18.8 kg. (41.5 lb.), although the average winner was usually about 6.8 kg. (15 lb., Anon 1950). An early photograph (exact date unknown) shows a group of resident

fishermen (including J.A. Nicol) with a trout of 29.0 kg. (64.0 lb.) dressed weight. In more recent memory, a 28.7 kg. (63.2 lb.) trout was caught by an angler in 1952.

Certain grounds were renowned for the large trout which returned to them each year. Among the most productive were Spider Reef (Fig. SM43), Salter Island (Fig. SM45), and Confiance Island (Fig. SM43). As marked on the charts, the phenomena of grays spawning over "mossy" bottom was evident at certain places (see Section 4.1.3.3). Less frequently one observed yellowfins engaged in this activity. In the area of the Rossport Islands, gray trout often spawned from mid-November into December. There appears to be validity in the observation that lake trout in the Rossport Island area spawned for a longer period of time than trout in most other areas of the lake. A tendency to exaggerate this point, however, can lie in the fact that fishermen setting nets in the shelter of the islands, rather than along more exposed shores, were able to extend their operations later into the season.

Although given form by the positioning of several major islands, Nipigon Bay (Fig. SM46 to Fig. SM52) is virtually self-contained, being joined to the main lake by only a few narrow channels. From the depths of Simpson Channel (Fig. SM44 and Fig. SM45) the bottom rises steadily as one moves into the bay. Its mean depth is 27 m. (90 ft.; Ryder 1968). Fishermen are convinced that the Nipigon Bay lake trout were peculiar to these waters and tended to remain within the bay all of their lives. It is possible, however, that some trout would migrate into the bay at spawning time. If this was the case, most probably entered through the eastern channels as relatively few were taken in Moffat Strait (Fig. SM53}, and Nipigon Strait (Fig. SM56) in the fall.

Much of the bottom of Nipigon Bay is clay and mud and unsuitable for spawning. The important grounds were scattered throughout the western portion (rather far from the main lake). Here two trout forms of distinct appearance were taken in approximately equal proportions; one silver (not

gray) in colour, and the other dark, although usually not as dark as the blacks taken on the outside shores of the islands. In general, these bay trout were of a small class, usually less than 2.3 kg. (5 lb.), and fatter than the Lake Superior leans, possessing a thin layer of fat lining the abdominal area. It may have been possible to trace these physical variations to differences in diet, although no specific conclusions regarding feeding habits are possible. (Nipigon Bay was a famous resort for herring stocks, which even moved into Rossport Harbour (Fig. SM44) in great numbers: here locals would snag them off the dock and net them off the point; Mr. F. Legault, personal comm. 1980). Lake trout in the bay spawned 8 to 10 days later than those of the main lake, a consequence related, no doubt, to the relative warmth of the bay waters (which might remain a couple of degrees warmer in September; Environment Canada 1970, 1973).

The westward moving currents of Lake Superior are broken up by the numerous islands, mingle in the channels and bays, drift into Nipigon Bay and return again to the main lake. The meeting of currents formed areas of very fine fishing, especially in spring and early summer when lake trout were taken pelagically among the islands prior to their return to deeper realms. Along the western shore of Salter Island, for example, a strong current moves northward into the bay while another returns along the adjacent Simpson Island shore. Near the mouth of Simpson Channel (Fig. SM45) their waters meet, and fishermen located the zones of greatest disturbance by watching for the ruffled water at the surface. Trolling across them would yield good catches of lake trout.

It has been suggested that at certain locations (such as Michipicoten Island; Section 5.5) lake trout would not move far from their spawning shoals during the year. Movements were limited to depth changes close to the sides of these same shoals. However, regular migrations into Nipigon Strait (Fig. SM56) were known. The first was in the spring, at ice-out, when the largest hauls were made by nets set near the edge of the receding

ice. As the waters warmed the trout departed, only to return again in June when fishermen would set drift nets in the strait. This second movement may have involved a pursuit of herring stocks which were also prevalent in the strait at this time.

Pound nets were popular in the Rossport area and were set both inside and outside of the islands. Stakes were frequently driven at Winston Point (Fig. SM43), Rossport Point (Fig.SM44), off the east side of Salter Island (Fig. SM45), the north side of Simpson Island (Fig. SM46), and in Nipigon Bay. The bay on the east side of Simpson Island was known as Poundnet Bay (Fig. SM45). There were other points which might have given even higher yields but fast currents put pound nets in danger of being swept away. When it was necessary to set nets in current, the leads were often greatly reduced in length. When pound nets were intended for the capture of lake trout, they were set in the water about the first week in June, and the fish would remain in shallow water until after mid-July. Around July 1st was the peak period when large fish were very near the water's surface. At this time, pound net trout ran from 4.5 kg. (10 lb.) to 6.4 kg. (14 lb.; Mr. W. Schelling, personal comm. 1978). In this region in the spring, trout would appear in water less than 46 m. (150 ft.) one to two weeks earlier than along the exposed northern shore east of Terrace Bay (Fig. SM39). They would depart from the shore about the same time in July, however.

In Nipigon Bay trout came into shallow water between June 1st and 5th, when nets were fished "corks out" on the flats in 2 m. (6 ft.) of water. A source of problem lay in the number of pulp logs littering the bottom: in a strong wind these would be stirred up and could tear out many nets. It was characteristic of the spring trout taken in Nipigon Bay (as was also the case with the spawning trout) that they were smaller than those found outside of the bay. Many whitefish could, at one time, also be found on these bay shoals.

No fat trout, halfbreed, or paperbelly spawning grounds were reported among the islands or in Nipigon Bay. Rossport fishermen moved outside of

the islands to catch these fish. Setting nets off Copper Island (Fig. SM43) in July for siscowet usually met with success. The phenomenon observed in the Pic River area involving movements of fat or paperbelly trout into shallow water at certain times of the year was also evident in the Rossport-St. Ignace Island region. In July pound nets set at certain points on the outside shores of the islands only would capture fats. On occasion they were also taken by trolling (Mr. F. Legault, personal comm. 1978). In addition, McNab's (Oct. 13, 1923) correspondence reveals that under certain conditions fats might move inshore as late as October. Apparently this was an unusual occurrence, which hatchery manager McNab attributes to the unseasonably warm water temperatures:

> "... In fact without storms, just calm weather for two weeks, I never seen the like for twenty-five years when siskiwitt, that is the fat fish that inhabits from 70 to 100 fathoms, this fish comes to the shores in 3 feet of water. I have seen 1000 lbs. at Rossport and the fishermen are only paid 3¢ a lb. for such a class as they are."

While lake trout were known to move close to the town of Red Rock, only rumours remain that the Nipigon River once supported an important run of lake trout. No other native river spawning populations were described by interviewees, although in 1968 and again in 1977 (?) planted lake trout were seen running approximately 7 km. (4.5 mi.) up the Jackpine River (Lapenskie Oct. 11, 1965; Mr. H. Legault, personal comm. 1979).

5.8 SUPERIOR SHOAL

Superior Shoal (Fig. SM42) comprises a number of banks which rise like pinnacle mountains from the lake bottom. The shallowest point is 6.1 m. (20 ft.) below the surface, and the ditches between the banks are, in places, over 183 m. (600 ft.) deep. The nearest point of land is almost 64 km. (40 mi.) away. Lake trout would therefore tend to remain in the vicinity of Superior Shoal throughout their lives. Of 33 recoveries of 799 lake trout tagged by the Fisheries Research Board of Canada (1958 to 1961), only one was not from the Shoal (Lawrie 1964). In addition, there are

indications that stocks would even remain in the vicinity of a single bank; moving from shallow to deeper levels along the side of the "mountain", effectively separated from the next by the ditch in between. Nets set over deep water between the banks would catch very few trout. Also, some physical variations between the different shoal populations of both leans and fatter trout were noticed by fishermen, and geographic isolation of certain stocks seems to be indicated.

Several interviewed fishermen remarked that at no other place in the lake could one find so many different "kinds" of trout in such a small area. To drift 100 m. (325 ft.) over Superior Shoal might mean a depth change of 60 m. (200 ft.) or more. A tug would set its nets up and down a shoal to yield fats and leans of a range of size classes. There was also a greater overlapping of the depth ranges of fats and leans than was usually apparent in inshore areas. Sporadically throughout the fishing season, siscowets would be captured in 37 m. (120 ft.) or less of water. Mr. L. Morden (personal comm. 1979), a former tug captain who fished the shoals in the 1940s for James Purvis and Son, Ltd., found deepwater leans to be common, especially on the East and South Shoals (see Section 4.1.3.5).

The periodic lateral migrations characteristic of some inshore lake trout stocks were thus replaced on Superior Shoal by vertical movements up and down the sides of the shoals. Movements do not seem to have been pelagic here. In addition, they were not obviously related to seasonal changes. Fish could have easily made feeding forays and returned through a short distance to more suitable depths.

North Shoal is a large underwater plateau of undulating surface which lies from 55 m. (180 ft.) to 81 m. (265 ft.) beneath the surface. On top of the shoal paperbellies flooded the nets, but few lean trout were present. Descriptions of Superior Shoal paperbellies were typical for the variety, except that an unusual number of red-finned individuals were noted.

Mr. F. Legault (personal comm. 1978), who fished Superior Shoal in the 1930s on the Port Coldwell tug Iris, found West shoal No. 1 to have the

nicest lean trout for market -- few deformed fish or paperbellies were taken here. It was on the East Shoal that trout of racer appearance were most common. Upon Centre Shoal a number of different varieties were reported to have existed. Some fishermen found deformed leans in great numbers, but others took large lifts of fine trout here (Mr. R. Hamilton, personal comm.1979). Nets were set in deep water between the banks. According to Mr. I. Johnson (personal comm. 1979), a fisherman for the Nicoll Bros. of Port Coldwell, Superior Shoal siscowet were fatter than normal and less desired by markets.

In general, the lean trout of Superior Shoal tended to be dark in colour (although not black like the Caribou Island trout; Section 5.5), having a dark brown back and mottled appearance. Typically the trout were slow-growing and long-lived. Prior to 1956, when the shoal was closed to commercial fishing, they tended to be, on the average, smaller than inshore trout. Interviewees reported the average round weight to have been 0.9 kg. (2 lb.) to 1.4 kg. (3 lb.): only rarely were any over 6.8 kg. (15 lb.) or9.1 kg. (20 lb.). In 1964 Superior Shoal was again opened to fishermen. Catch samples in this year found the fish to average 0.97 kg. (2.13 lb.) dressed weight. Trout from elsewhere in the lake averaged 1.12 kg. (2.48 lb.). At this time about 75 percent of the inshore samples was composed of planted trout, of which virtually none were taken on the offshore grounds (Anon. 1964). Therefore, the disparity in weight between Superior Shoal lake trout and inshore lake trout would have been even more pronounced in earlier years when native fish (generally heavier than planted trout) dominated the inshore catch. One fisherman reported having seen fish approximately 0.35 kg. (0.75 lb.) in weight containing spawn on Superior Shoal. (According to the weight-length relationship of Eschmeyer and Phillips (1965), this represents a total length of 0.35 m. -- 1.2 ft.). Samples taken from Superior Shoal in the early 1960s included trout ranging up to 16 years of age (Lawrie 1964). A spawning run of trout in the Marquette-Munising area was found by Rahrer (1967) to be comprised of

individuals of only 7 through 12 years of age, with ten-year olds being most abundant. (The smallest mature male was 0.56 m. or 1.9 ft.).

At Superior Shoal lean trout have been found in spawning condition throughout the fishing season from June to October (see also Loftus 1958). Isolated fish populations, less exposed to inshore climatic controls such as temperature and wind and not limited by unavailability of suitable substrate, could potentially evolve a wide range of spawning times. It is also quite possible that the lake trout of the Shoal did not spawn every year. This situation is common in more northern lakes. In Keller Lake (Northwest Territories) Johnson (1973) found that each fish spawned only three times during its lifetime and tended to be in very poor condition.

Martin and Olver (1980) have summarized the literature pertaining to the factors that affect the growth rate of lake trout. They stress the importance of food supply, population density, and temperature. Nilsson and Svardson (1968), for example, have shown the effect that a good forage base can have on stimulating growth of trout in Swedish lakes. It is probable that all three of the above factors were acting in combination to determine fish growth on Superior Shoal. Here fishermen found a great scarcity of forage fish. Gut analyses of adult trout confirmed this, revealing *Mysis relicta* to have been the major food item (Budd 1955). This also helps to explain, at least to some degree, the fact that most of the lean trout had very red flesh (see Section 4.1.2.3). According to Mr. J. Macdonald (personal comm. 1978), owner of Ferroclad Fisheries of Mamainse, "even the bladders are very pink, the gut barrels would run red from the bladders."

The leans, and to a lesser extent the siscowets and paperbellies, showed a high percentage of deformities on the Shoal. Certainly not all were of poor condition, but many appeared large-headed with emaciated bodies of the racer form and were easily recognized by inspectors and fishermen as coming from Superior Shoal (Section 4.1.3.6). When discussing these fish with old- time fishermen the term "freaks" will often be heard

(or less frequently the designation "steamboat-chasers"; Mr. P. Hamilton, personal comm. 1980). Mr. L. Morden (1978) comments:

> "... some were humpbacked, some had too big a head, some had huge fins, which were sometimes orange or red. There were so many different kinds of deformities. The fish were very thick and there may have been interbreeding."

This situation still prevailed when Adolph King started to journey out to the Shoal in 1951. He referred to these fish as "reptiles", with prominent teeth and eyes sunken in their sockets. "They were vicious, ripping much net twine," he stated, adding humourously, "We were afraid they might even snap at our legs" (personal comm. 1978; also in Drew and Littlejohn (1975) but misquoted). The Nipigon Bay Fish Company of Rossport was forced to ship the "grotesque" Superior Shoal leans headless if they were to sell. They brought two or three cents less per pound. Their saleability, however, was fortunately enhanced by the redness of their flesh.

Lake trout, while perhaps of poorer market quality, have always been relatively abundant on the shoals, and this has been a successful fishing ground for those fishermen owning tugs and willing to make the long trip here. Numbers of fish were so great that the pressures of population density may have put food resources at a premium. In addition to physical deformities, the existence of cannibalism was frequently discovered (also see Lawrie and Rahrer 1973). A noteworthy example was a 5.4 kg. (12 lb.) trout found by one fisherman to have a 0.9 kg. (2 lb.) trout in its stomach. Martin and Olver (1980) have reviewed observations of cannibalism:

> "Cannibalism is apparently of minor significance in most lake charr populations. It appears to be most common in arctic lakes where there is not a diversity of forage species and the lake charr itself may be one of the few species present."

From the records of the Purvis Company it is possible to obtain some idea of C.P.E. for lake trout (fats, bankers, and leans combined) in the 1930s. The greatest catch from a single lift was obtained August 24th,

1938 from 2½ gangs of net (with 3658 m.- 12000 yd.- to a gang) which yielded 3360 kg. (7400 lb.) of trout. Catch per 914 m. (1000 yd.) of gill net was 92 kg. (203 lb.) in 1938 and 93 kg. (206 lb.) in 1939 (James Purvis and Son, Ltd. 1934-1955).

By the time he quit fishing Superior Shoal in 1956, Mr. A. King (personal comm. 1978) had perceived a decrease in the percentage of trout that showed cannibalism or deformity. During the six years that Ferroclad Fisheries fished here after the Shoal was reopened in 1964, the thin-bodied racers were a rarity in the catch (Mr. J. Macdonald, personal comm. 1978). The reason for this is not clear. It is possible that the populations were sufficiently thinned by fishing during the 1950s to remove pressure on limited resources, permitting improved growth of the surviving fish. However, the 1967/1970 average C.P.E. from the Shoal was much higher than the Purvis estimate -- 213 kg. (470 lb.) per 914 m. (1000 yd.) of comparable net (assuming an average weight of 0.97 kg., or 2.13 lb., per fish; Anon 1964, Lawrie 1978) No apparent change in the food supply had occurred. Smelt had not colonized the shoal in the 1960s. Neither had possibly more robust hatchery trout colonized the Shoal, nor was sea lamprey predation a significant problem.

A similar phenomenon involving the revitalization of trout populations of poor condition was also witnessed in Lake Nipigon. In 1916 the lake was opened to commercial operators as a source of fish during World War I, and the Fort William Fish Co. maintained the steam tug Pewabic here. Mr. A. King (personal comm. 1978), engineer, found conditions of cannibalism and deformity similar to those he later found on Superior Shoal. Despite this, Mr. King explains, a "fishing bonanza" occurred in which many outfits with tugs and gas boats arrived in Macdiarmid to take advantage of the large tonnages which were to be had. He writes:

> " Therefore these conditions for three seasons as stated reduced the population of fish in Lake Nipigon to such a point that "cannibalism" almost was a thing of the past and Lake Trout,

> especially now, were able to find enough feed to become a very much improved and healthier specimen which kept improving up to the present day. Lake Nipigon trout has been for many years since that era a very fine species... The writer ... had seen in 1917 [fish], especially trout, netted in Lake Nipigon with their head near the weight of the rest of the body." (King n.d.)

5.9 NIPIGON STRAIT TO THUNDER CAPE

The great archipelago of islands that commences near Schreiber arcs southward as far as Pigeon River and the American border. The coastline of the Black Bay Peninsula is shattered into a series of deeply indented bays and small nearshore islands. Gollat (1976) notes that the larger bays (Otter Cove, Sheesheeb Bay, and Sturgeon Bay; Fig. SM59 and Fig. SM60) were very popular with lake trout anglers. Inside the majority of the bays, however, sand and mud deposits are laid down, and they proved generally unsuitable sites for spawning stocks. About the multitude of islands, the shoals are predominantly covered by more acceptable rubble and coarse gravel.

The initiation of spawning for the different runs of trout followed a definite trend in time as one moved westward toward Thunder Bay. Along the shore, fishermen would maintain contact with one another, and when someone to the east announced that a run was on his friends farther west would prepare nets for their own fall fishing. At Black's Wharf near Sheesheeb Bay (Fig. SM59), blacks were on their spawning grounds around September 17th, while about three days would pass until the general commencement of spawning between Shaganash Island (Fig. SM61) and Black Bay (Fig. SM63). According to Mr. M. Gerow (personal comm. 1980) fishing at Point Magnet (Fig. SM61) began somewhat earlier than in the vicinity of Rossport. Spawning dates at Silver Islet (Fig. SM65) differed from those noted at Number 10 Light (Shaganash Island, Mr. G. McKay, personal comm. 1979) and, in turn, spawning about Thunder Cape (Fig. SM66) was later than at Silver Islet.

Along the Black Bay Peninsula, the early-spawning blacks were

described as usually weighing 0.9 kg. (2 lb.) to 2.3 kg. (5 lb.), with some reaching 3.2 kg. (7 lb.); i.e. similar in weight to those described in Sections 5.1 and 5.7 but somewhat lighter (on the average) than those taken on the mainshore Jackfish grounds (Section 5.6). Nets of 12.7 cm. (5 in.) or 14.0 cm. (5.5 in.) mesh were used in their capture. Here Mr. R. McKay (personal comm. 1979), whose grounds were in the Shaganash Island area, found some blacks to have coloured fins. Most of these possessed fins edged with white, although some had reddish and others slightly bluish-coloured fins. Certain years the blacks would be available on these grounds until almost the middle of October. Their flesh was usually pink in colour.

Especially abundant were the blacks spawning on the inside of Edward and Porphory Islands (Fig. SM63) and Point Magnet (Fig. SM61). From pound nets set at Point Magnet, the Port Arthur Hatchery could usually be confident of a good supply of black trout eggs (McNab Oct. 19, 1923). On the whole, black trout tended to spawn in greatest numbers on the leeward side of islands, while larger red trout (see below) were most prevalent on the windward lakeside shores.

Later runs of trout followed a spawning sequence along the Peninsula toward Thunder Bay similar to that of the black trout. The second included many red-finned individuals. Near Jean Pierre Bay (Fig. SM60) these would range from 2.3 kg. (5 lb.) to 6.8 kg. (15 lb.). The smaller individuals began spawning near the end of the first week in October and the peak of the run occurred between October 15th and 20th. Larger size classes might continue into November. Yellowfins reportedly spawned at Stanton Island (Fig. SM60) and on a couple of shoals west of Shaganash Island (although not many spawned around the island itself; Fig. SM61). At some locations one would also discover gray trout and large blacks present as late spawners. In general, however, fishermen in this region, unlike those from the Rossport area, do not remember the different runs as having been obviously discrete in time. Some lumped grays, yellowfins, and redfins

under a general class "red trout", perceiving them to have arrived more or less continuously on certain grounds. On the shoals about Shaganash Island, blacks were still on the grounds when the reds appeared, and there was a mingling of both until the larger reds became dominant in late October and November. In this region, as compared to the Rossport area, stocks of large lake trout seem to have been less significant to the fall fishery, although less effort was probably devoted to their capture. Smaller mesh sizes were usually employed and fishermen tended not to set trout nets as late into the season, either retiring them for the winter or switching their attention to the herring fishery.

It is interesting to note that spawning period trends analogous to those of the lake trout also existed for lake herring. At Camp Bay on the Sibley Peninsula (Fig. SM65) one could catch herring as much as two to three weeks before they were spawning in Thunder Bay. Certain autumns the fishing here was finished before it had even begun in Thunder Bay. The initiation of herring spawning (like lake trout spawning) is, at least in part, under the control of declining water temperatures: the shallowness of Black Bay causes its waters to cool more rapidly during the course of the fall than those of Thunder Bay. It is also the opinion of local fishermen that a number of different and discrete herring stocks frequent the waters of these two bays at spawning time.

Very little lake trout spawning occurred within Black Bay itself except near the entrance; south from George Point on the western side and south from Foster Point on the eastern (Fig. SM63 and Fig. SM64). Much of the bottom is composed of clay with scattered patches of sand, weed, and rock, and there are far better grounds here for walleye, whitefish, and herring than for lake trout (although, in former years, Mr. A. Nuttall (personal comm. 1980) would take small numbers of fall trout at Bent Island, inset Fig. SM64). During the month of September, its water can be several C° warmer than that of the main lake. When the currents of Black Bay push southward along the Sibley Peninsula (Fig. SM63) they may exert

strong influences on the fishing there, especially at those times of the year when the fish frequent the shallows. As also happens in Nipigon Strait (see Section 5.7), nets set in spring near the edge of the ice in Black Bay would yield good trout catches. When the ice lingered fishing proved quite successful, but when strong winds broke up the ice and sent it out into the main lake the lake trout would leave for deep water (Mr. 0. Kukko, personal comm. 1978). Later, in early summer, wind from the southeast brought trout close to shore along Middlebrun Channel and at Middlebrun Point (Fig. SM65). But those days when the wind changed to the northeast and pushed the warm, brownish water of Black Bay southward, the trout again retreated to open water. Similar effects could be seen in the fall when the bay waters could act to delay spawning.

Early in spring, trout were taken outside the islands along the Black Bay Peninsula where the banks slip away into very deep water and also in certain of the deeper inside channels (such as that west of Lasher and Spain Islands; Fig. SM60). In May, movements to shallower zones occurred as trout pushed into Sheesheeb Bay (Fig. SM59) and also congregated in the 27 m. (90ft.) shelf west of Gourdeau, Swede, and Macoun islands (Fig. SM60). Early in June, they would move to shallower depths, and large trout were available to trollers near Jean Pierre and Sturgeon Bays in July (Fig. SM60). Here they might be seen surface feeding on insects. According to a fisherman interviewed by Gollat (1976), an excellent trolling area for large trout in the 1940s ran from Swede to Brodeur Islands and across to Otter Island and Roche Debout Point (Fig. SM59 and Fig. SM60). In the 1930s it was not uncommon to take trout weighing from 18 kg. (40 lb.) to 29 kg. (65 lb.) on the shoals outside Black's Dock (Fig. SM59; Mrs. E. McKay, personal comm.1978).

Spring and summer movements of lake trout seem to have occurred at approximately the same time in this region and in the Rossport region. (No westward time trends are apparent, and perhaps these seasonal movements are less under the influence of water temperature and current than those

occurring at spawning time). Along Middlebrun Channel (such as at Finlay Bay; Fig. SM65) pound nets were set about the 1st of June. Trout first appeared in shallow water around June 10th. (and some would occasionally push northward almost to the bottom of Black Bay). The large "pound-net trout" were most evident in 3.7 m. (12 ft..) of water and less at the end of June and early in July (Mr. M. Gerow, personal comm. 1980). This behaviour paralleled that of trout among the Rossport Islands, where they were available at shallow depths until after mid-July (see Section 5.7). Along the Black Bay and Sibley Peninsula, the general retreat would occur about this time, although in some years large stragglers would drift in and out of the near-surface waters until August.

It should be noted that the trout found in Sheesheeb Bay in June were of a small class, averaging 0.9 kg. (2 lb.) to 1.4 kg. (3 lb.). Large trout were uncommon here. Stockier than trout taken at other nearby locations, these small trout were leant distinction by their somewhat "humped" appearance (although they were not paperbellies and are described by Mr. O. Nordlander (personal comm. 1979) as having been a "nice-eating, beautiful lean trout"). Small spots dotted the skin and flesh colour ranged from off-white to red. According to Mr. Nordlander, only two or three net lifts were possible before these fish disappeared until the following summer -- in this area they came only as a feeding group. When Sheesheeb Bay fish were sold to the Nipigon Bay Fish Company of Rossport, employees in the packing plant found them to be easily recognizable (Mr. Baker, personal comm. 1978).

The Bateau Rock area (Fig. SM62) consists of a series of jagged peaks and shoals, which rise to the water's surface at one point. The shallowest peaks are contained within a 2 km.^{2} (1.2 mi.^{2}) area lying . 24 km. (15 mi.) due south of Flour Island (Fig. SM57) and 11 km. (7 mi.) east of the Gull Island shoals, which straddle the international boundary. Like Superior Shoal, the deep lake locations of these two fishing grounds could act as a genetic isolating mechanism for the fish stocks located there.

Two fishermen, experienced with trout fishing on both Superior Shoal and the Bateau Rock shoals, stressed the similarity in appearance of the leans at the two locations: flesh colour was deep red, skin colour was dark (and quite mottled), heads appeared to be large, and body shapes were comparable. (The racer form seems to have been much less evident at Bateau Rock, however). Crawford (1966) describes the lean trout at the latter location as "dark green laterally, with light red markings on the fins." Lean trout netted at Bateau Rock were small, ranging from 1.1 kg. (2.5 lb.) to 3.2 kg. (7 lb.). Net sets made by the Fisheries Research Board of Canada revealed that the population contained unusually large numbers of older lake trout up to ten years of age. (The age distribution was younger than that of Superior Shoal leans, however; Lawrie 1964).

Also found along the sides of the Bateau Rock shoals were fats, half-breeds, and paperbellies. It has been the experience of some fishermen that many of the lake trout of the greater depths possessed abnormally large and protruding eyes, a trait which earned them the name "popeyes". (One is reminded of the deep-water form of chub, *Coregonus kiyi,* endowed with eyes comparatively large for its family). This unusual trait may have arisen as an isolated adaptation to life in deep water. It has also been noted among Arctic char, whitefish and salmon that some deep-water forms possess larger eyes than shallower zone forms (Nikol'skiy 1969). Mr. B. Humby (personal comm. 1979) also reports that Bateau Rock fats were abnormally mottled in appearance.

To the west, at the Gull Island shoals, American fishermen found humpers (or paperbellies) spawning at a depth of about 75 m. (245 ft.). These fish were known as "mooneyes", but, unfortunately, no description is available (Rakestraw 1968, and Mr. S. Sivertson, personal comm. 1979).

Elsewhere, nets could be set to capture siscowets and halfbreeds at various locations along the outside dropoff of the Black Bay Peninsula islands. South of Puff Island offered deepwater fishing during the summer months (Fig. SM57 and Fig. SM58). Another important summer location east

of Shaganash Island is indicated on Fig. SM61. It is not known if siscowet came inshore along these islands at any time. Mr. G. Ingves (personal comm. 1979) spoke of a stretch of shore bank north of Foster Point (Fig. SM63) where he had discovered fats in summer. Farther north, inside Black Bay itself, there is a 59 m. (193 ft.) hole which harboured fat trout (Fig. SM64; Mr. A. Ronquist, personal comm. 1978). There have been no known stocks of river-spawners in this region.

5.10 THUNDER CAPE TO PIGEON RIVER

Thunder Bay has a maximum depth of 90 m. (295 ft.), making it the deepest, as well as the largest, of the three great bays of northern Lake Superior. Yet the bay is still shallow enough that most of its volume lies potentially within the annual depth range of lean lake trout. In addition, fishermen could conceivably set their nets over a great percentage of the bottom within the bay. Those men that were interviewed therefore seemed more confident in their knowledge of fish movements, and more certain of the location and extent of the various spawning grounds, than fishermen from many other localities. This is not to say that interviewees were always in agreement, however.

Within Thunder Bay the majority of potential spawning grounds lie along the northern and western shores. Except in the bay areas of the eastern shore, the bottom drops rapidly away from the land. The entrance to the bay is guarded by Thunder Cape (Fig. SM66) in the east and dominated by the large Pie Island (Fig. SM72 and Fig. SM73) to the southwest. South of Greenstone Point (Pie Island), a string of islands flank the shore for two-thirds of the distance to Pigeon Bay (Fig. SM75). On the outside of these islands few trout would spawn, and depths of 180 m. (590 ft.) and more are soon encountered. The trout remained in the deep waters to the west of these islands, moving to nearby shores when it was their time to spawn.

One fisherman was available who was experienced with fishing south of

Mink Point (Fig. SM74). At. the Mount McKay Indian Reserve there are several fishermen who remember the native trout north of Mink Point prior to 1955. In the 1930s and 1940s, the fishing license of the Fort William Indian Band read:

> "From the west mouth of the McKellar River to one half mile outside of Mutton Island, thence southeast to Pie Island, thence southwest to Keefer Point, thence to Sister Island, and thence to the northeast point of Jarvis Bay, opposite east of Beaver Island."

During September, near-surface temperatures are higher in Thunder Bay than in the outside lake (Environment Canada 1970, 1973). As might be expected, the different bay runs would commence at later dates. Black trout spawned on Hare Island Reef at the same time (or somewhat after) spawning about Thunder Cape and at a later date than the blacks near Tee Harbour (Fig. SM66; see also Section 2.2.2.2). Toward the end of September, these fish would approach the reef, casting spawn at the end of that month or early in October. While the Cape was not noted for its large trout, these would crowd the gravel and rubble bottom around Hare Island in great swarms. For their capture, fishermen would string nets from as close to the island as possible, a11 the way to the bell buoy (and almost into the shipping lane). These large "breeds" were described as gray trout and yellow-finned trout. Many would still be spawning in November (also noted in the Fort William post journals), although it could not be ascertained if fishermen here perceived two runs discrete in time. Mr. O. Kukko (personal comm. 1978), who fished the area in the 1950s, found this yellowfin population usually to possess orange-coloured flesh (unlike the white-fleshed yellowfins typical of the Rossport area; Section 5.7) and to range up to 2 3 kg. (50 lb.).

Spawning along the eastern shore of Thunder Bay above the Cape was of little consequence. Lake trout came in at certain places between Sawyer Bay (Fig. SM66) and Clavet Point (Fig. SM67) in relatively low concentrations, and this stretch was far more important for its whitefish grounds. Six and a half km. (4 mi.) north of Clavet Point trout would

still be spawning in November. Off the southern shore of Caribou Island (Fig. SM68), large concentrations of black trout would commence spawning at the end of the first week in October, after spawning had already begun at Hare Island. Redfins were also here, and their time came in the third week of October. North of Caribou Island, at depths of 5.5 m. (18 ft.) to 12 m. (39 ft.), are "mossy" areas. Here in October Mr. G. Tyska (personal comm. 1978) would capture with 16.5 cm. (6.5 in.) mesh nets, large trout with spawn running. The gray trout of the Rossport area demonstrated a similar site selectivity but spawned later in the season (see Section 5.7).

Closer to the western bayshore is little Buck Island (Fig. SM68).Here large trout were even more prevalent, causing the 19.0 cm. (7.5 in.) nets to be brought out later in the fishing season. Mr. G. Miller (personal comm. 1978) reports:

> "... it was not uncommon for the trout to be fifty-two to fifty-four pounds with heads weighing four or five pounds. They might have two to two and one half pounds of whitefish in them, at two or three whitefish each."

At certain places spawning continued into Dece1nber. One fisherman, an old hand on a number of the Port Arthur tugs, reported that after the herring fishing of late October and November he would rush to the north end of Thunder Bay to catch the tail end of the trout runs (Mr. C. Wuori, personal comm. 1979). Such statements support the contention of the Hudson Bay Company employees that the fall fishing always seemed better at the bottom of the Bay (see Section 2.2.2.2).

In late September and early October, it was possible to catch black trout off the breakwall at Port Arthur and Fort William (Fig. SM70). The exact dates of spawning are not known but are perhaps a little earlier than those for Caribou Island. Moving in close, the trout would spawn on the rubble deposited at the foot of the wall.

Centrally located in Thunder Bay is Schwitzer Shoal (Fig. SM70), considered to have been one of the better sites for catching lake trout in

the fall. Its minimum depth is 6.1 m. (20 ft.).

At Grand Reef, near Brule Bay (Fig. SM71), black trout would move in somewhat earlier than those at Hare Island and spawn around September 25th for about one week. They were of a larger size, up to 3.6 kg. (8 lb.) and fished with a 13.9 cm. (5.5 in.) mesh net. Black trout in this region did not acquire red fins (Mr. S. Pervais, personal comm. 1979). Similarly, blacks would spawn along the entire shore from Squaw Bay to Wyllie Point and on the shoals of northern Flatland Island (Fig. SM73). At certain points along the main shore, however, a smaller trout, averaging 1.8 kg. (4 lb.) and coloured gray rather than black, would arrive at a somewhat earlier date and mid-September was the earliest they would spawn.

Prior to spawning, trout would assemble to lie for a short time on the 12 m. (40 ft.) flat inside and to the north of Flatland Reef (Fig. SM73). These nearshore areas were not noted as good grounds for larger trout (although, certainly there were some for the taking in October). Near the end of August, large trout would be netted in the 24 m. (78 ft.) to 37 m. (120 ft.) passage situated between Pie Island and Flatland Island and extending southwest from Deadman Island (Fig. SM73 and Fig. SM74). After a short period, these trout were lost to the nets until October 20th when redfins averaging 6.8 kg. (15 lb.) would start spawning around Pie Island in 1.8 m. (6 ft.) of water and less. Keefer Point always proved a fine spot, as did most of the north shore of the island. According to Mr. S. Pervais (personal comm. 1979), the largest redfins of 11.3 kg. (25 lb,) to 13.6 kg. (30 lb.) would spawn after October 20th on the grounds about the point indicated by "*" on Fig. SM72. His father spoke to him of former days when the native fishermen would come here to salt fish for the winter season. Some redfins and yellowfins may still have been spawning after November 15th and could be found here in very shallow water (Mr. M. Gerow, personal comm. 1980).

McNab (Sept. 30, 1917) remarks that "a shoal near Pie Island lighthouse in early days was noted for a run of black trout between Sept.

18th and 30th" (Fig. SM73). Mr. H. Charlie (personal comm. 1979) confirms that fishing for spawning black trout at Pie Island began between September 15th and 20th. This is comparable to spawning dates for black trout along the northern Black Bay Peninsula (Section 5.9). In other correspondence, McNab (Oct. 28, 1911) supplies even earlier dates for the grounds in the vicinity of Pigeon River (Fig. SM75): black trout spawned between September 15th and October 5th, redfin trout between October 1st and 31st, and "sa1mon" (gray trout?) between November 1st and December 15th. Pigeon Bay is directly exposed to the currents of cold waters of the main lake - perhaps these encourage earlier spawning.

Mr. V. Bergman (personal comm. 1980) found large, silvery-coloured lake trout in the "mossy" areas about Beaver Island (Fig. SM74). These were lighter in colour than the trout of Caldwell Shoal which commenced to run the first part of November in shallower water. In turn, the Caldwell Shoal fish showed different body shades from the huge yellow-finned individuals spawning along the nearby shoals of Victoria Island. These last were the latest spawners identified for the area south of Mink Point.

It is thought by some fishermen that when lake trout were not inshore in shallow water, they could roam widely about Thunder Bay. Fishing might be good at a certain spot one day and unsuccessful for weeks afterward. Fishermen related some trout to those of herring which were thought also to range freely through much of the Bay. Early in spring, nets were set at an average of 27 m. (90 ft.) or greater. Shortly after May 24th, large trout were found in the shallow waters of Thunder Bay and the inside of Pie Island. Here they would be present for as long as three weeks to a month, during which time fishermen would set nets at such places as Hoorigan and Clavet Bays (Fig. SM67), where trout were especially abundant and close to shore. After mid-June many fishermen would not bother to set nets again until September. Occasionally places south of Thunder Bay still showed trout at the end of the first week of July, but apparently this was rare.

It is believed by certain fishermen that lean trout of the the

northern portion of Thunder Bay showed a tendency to move eastward toward the head of the bay in early spring. Here many eventually came inshore along predominantly sand beaches from Vigars Point southward to Mackenzie Bay (Fig. SM68). After June they would quit these areas, eventually to spawn at more southern locations at Caribou Island and other offshore points in the vicinity. It is interesting to note, however, that one found bay movements of whitefish to have been opposite to those of trout (as revealed in fishermen interviews conducted by Purvis 1977). Whitefish supposedly would leave their overwintering area between Caribou Island and O'Connor Point in May and move westward along the shore "presumably following a water temperature until June, when they are either gone or so many suckers have moved into shallow water that the commercial fishermen pull out their; nets." In the fall the whitefish would again move eastward as the spawning run progressed.

Summer trolling for lake trout was a common practice, but generally lines were sunk to depths of 11 m. (36 ft.) and more after mid-June. One fisherman noted that he would troll in July between Turtle Head (on Pie Island; Fig. SM72) and Thunder Cape (Fig. SM66) along the edge where Thunder Bay began to drop off into the main lake.

Thunder Bay did not provide many choice grounds for siscowet. Some were taken in August in the 91 m. (300 ft.) trough west of Clavet Bay (Fig. SM67). From the edge of the drop-off at the entrance to Thunder Bay, fishermen would extend nets down to 146 m. (480 ft.) for fats. In addition, some would seek "bankers" (probably small fats or halfbreeds) in the central basin of Thunder Bay in November (Fig. SM67).

At no time in the memory of fishermen interviewed, have lake trout run up any of the rivers in this region -- although certain streams, potentially at least, provide suitable spawning conditions. Hamilton (1978) describes a first run of planted lake trout into the MacKenzie River in the fall of 1977 (Fig. SM68). Few were noted in 1978.

An unusual story in the Fort William Times Journal (Anon Dec. 14,

1903) reports that a local resident had a few days previously captured a 33 kg. (72.7 lb.) lake trout in shallow water some distance up McVicar's Creek (Fig. SM70); the newspaper seems to have been convinced of the story's authenticity.

6. CONCLUSION

Criteria employed by fishermen in recognizing "breeds" of lake trout can provide useful information for researchers interested in stock identification. Prior to 1955, there existed in Lake Superior visibly different spawning groups or runs of lean lake charr, apparently separable in terms of time and/or space. Such runs might occur concurrently on different spawning grounds or consecutively on the same ground.

Certain regional trends in the period of spawning were evident on a large scale and can, no doubt, be partly related to water temperature differences. Spawning occurred later, for example, as one moved southward from the Pukaskwa River (Fig. SM17) or northward from Thunder Bay along the Black Bay Peninsula (Fig. SM57 to Fig. SM66).

Local variations in spawning period can, however, suggest sympatric associations of various breeding stocks of lean lake trout. Physical differences in flesh colour, skin colour, body size and body form, remaining constant over long periods of time, also yield evidence for their former existence.

The earliest reports of intraspecific differentiation among *S. n. namaycush* date from the 17th century and the Jesuit Relations. In the 19th century, fur traders of the Hudson Bay Company derived food supplies from over 30 traditional spawning areas. At least two visibly distinct runs of lake trout would resort to certain grounds in the fall.

Fishermen interviewed for the present report have noted that occasionally three or four forms of lean trout would frequent the same grounds, or grounds in close proximity. A form tended to be known by a

name referring to its most obvious unique feature: blacks, redfins, yellowfins, grays, moss trout, sand trout, and so on. During the spawning season, fishermen became most aware of the existence of these types. A type might be quite site specific, spawning only on certain selected grounds, or might refer to a general spawning run of fish, appearing at many places along the shore or shoals. Spawning grounds, as shown by the maps of Appendix VI, might range in size from long stretches of shoreline to patches of bottom a few metres in diameter. This report has located at least 250 grounds including 18 rivers which once were frequented by September spawning stocks. River-running trout tended to spawn earlier than those of the adjacent main shore and shoals. At certain shore grounds, the spawning season would extend from early September to mid-December as pulses of lean lake trout followed each other into shallow water. This was especially true among the islands south of Nipigon Bay and along the Black Bay Peninsula.

In this report consideration was also given to the non-spawning movements of Lake Superior trout. The pelagic nature of large lean lake trout in late spring or early summer involved, in certain areas, inshore movements or "summer runs" which were exploited by fishermen at this time. It is unclear whether these represented the movements of separate stocks or of older age groups. Spring movements of siscowets or paperbellies to shallow waters, while not typical of these variants, were not unknown.

As is the case with lean trout, it is possible that morphologically different stocks of siscowet have existed within Lake Superior. In the 19th century, two forms were distinguished by variations in skin and flesh colouration and size. Fishermen are aware that the degree of fat content tended to be proportional to depth, and that it is possible that "all sorts of gradations in body form occur" (Eddy and Surber 1947). The difficulties involved in fishing open areas of water at great depths in the fall season tended to leave fishermen unaware of the exact spawning habits and locations for non-lean lake trout variants. The most extensive areas of

non-lean fishing grounds existed in eastern Lake Superior between Michipicoten Bay (Fig. SM14) and Rossport (Fig. SM44). In all approximately 35 non-lean fishing grounds have been identified, with spawning reported at at least 4 of these. Certain grounds such as the Pic and Copper Banks (Fig. SM34 and Fig. SM40) are quite extensive in area.

It is probable that the sedentary nature of certain lake trout groups, both lean and non-lean, encouraged stock formation especially on offshore shoals. Other groups, while highly migratory at spawning time, probably maintained strong homing tendencies which would encourage segregation (see review in Martin and Olver 1980). This was most apparent among the river- spawning lake trout populations of the east and northeast shores. In addition, certain groups, while mixing more or less freely on the shore or shoal grounds, apparently remained semi-discrete by the very fact that they were seen year after year at specific locations.

It is the nature of the sources used in an historical approach such as this that an abundance of clues for mapping former fish stocks is generated: unfortunately, many must also remain speculative and inconclusive. Further analyses (including electrophoretic techniques) of stock remnants would prove valuable in both verifying fishermen's impressions and determining degrees of stock discreteness. Surviving stocks of native lean lake trout have been reported at the Slate Islands (Fig. SM38), Bateau Rocks (Fig. SM62), and Pie Island (Fig. SM72). In addition, genetic strains of Lake Superior trout have been maintained for many years in a number of Ontario's inland lakes (such as Killala and Mishibishu Lakes), as well as in the breeding tanks of several Ontario fish hatcheries. In fact, during the past 100 years Lake Superior has been a popular source of transplants, which have been scattered widely about North America. The havoc wrought by the sea lamprey on the salmonid stocks of the Great Lakes has been well documented. It has been suggested by Lawrie and Rahrer (1973) that a sequential fishing-up process of lake trout stocks was occurring within Lake Superior waters prior to the advent

of *Petromyzon marinus.* The opportunistic development of the commercial industry, as described in Section 1.2., created conditions in which this would be likely to occur. Although further investigation was beyond the immediate scope of this thesis, on the basis of both the interviews and preliminary examination of government catch-effort statistics prior to 1930, the contention of the above authors seems to be valid for some regions. Evidence for the depletion of river-spawning stocks prior to 1945 is discussed above for example.

Reviewing the processes of stock transformation within the lake should be the next step for continued research. Again, the primary and most valuable sources of information are the "old-timers" themselves, fishermen who have repeatedly demonstrated an intimate awareness of lake conditions and fish habitats. Such knowledge develops only from years of observation, from the certainty that economic and physical security depends upon its accuracy, and from a respect for, and desire to conserve the environment which has lent them a livelihood.

7. FOOTNOTES

1. In the late 1800s there were 150 people connected with this post according to Bussineau (1915 - 27). No information pertaining to its fisheries is available. The post was abandoned in 1844 (Collins n.d.b).

2. The Batchawana post was established prior to 1814 (Franchere 1854). In 1824 it was abandoned as an unpaying venture but was again reopened some years later (F.W.R. 1824).

3. The Michipicoten journal for April 28, 1828 notes: our fishermen caught only one jack or pike fish."

4. It is described as having been about 24 miles east of the post (P.P.J. Sept 4 and Oct. 18, 1834).

5. Such a weir was first employed a year before by fishermen of Michipicoten Post (see Section 2.2.3.2).

6. The KamRiver whitefish run ceased prior to 1920. McNab (Sept. 18, 1920 and Oct. 4, 1921) attributes its loss to the effect of dredging and dumping of grain screenings into the river (at the rate of 5,000,000 bushels each fall).

7. Although Todd (1980) reports a population of *C. artedii* which spawns during the spring near Copper Harbour, Michigan.

8. Identified in the journals by its French name "Riviere aux Cormiers", or its English name "Mountain Ash River". This is not to be confused with the present-day Mountain Ash River, a smaller stream 4 km. (2.5 mi.) west of the Makua River (Fig. SM14).

9. This calculated weight is based upon 3 journal entries:

   a) The season's catch for 1840 was 3150 fish which filled 25 barrels (i.e. 0.48 kg. (1.6 lb.) each). Interestingly, 2130 of these fish were taken in the course of only one fortuitous day, September 25th (M.P.J. Oct. 16 & 17, 1840).

   b) 400 whitefish filled 3 barrels (i.e. an average weight of 0.68 kg. (1.5 lb.) each -- M.P.J. Sept. 29, 1838).

   c) 726 whitefish filled 5 barrels plus providing a meal for the people of the fort (i.e. approximately 0.63 kg. (1.4 lb.) each -- M.P.J. Sept. 30 & Oct. 1, 1820).

10. These were probably the brook trout, lean lake trout, and a Lake Huron population of the siscowet lake trout (see also Section 4.2}.

11. Mitchill (1818) maintains that lake trout at Michilimackinac reached 54.4 kg. (120 lb.) in weight. The largest confirmed specimen on record is a 46.3 kg. (102 lb.) behemoth from Lake Athabasca, Saskatchewan caught in a gillnet in 1961 (Scott and Crossman 1973).

12. In the early 1950s, Dr. Leland Holly of Michigan was a well-known visitor to the Gargantua area. In a series of articles for Lakeland Yachting he described his sporting adventures in eastern Lake Superior (Holly 1953).

13. Beginning early in spring, the Purvis tugs would also fish whitefish on the Isacor Banks or flats. They were large "jumbos", also known to the fishermen as "slams" (Mr. L. Morden, personal comm. 1978).

14. Not really so laughable. The George Gerow family, which came to Rossport in 1881 would make pies from siscowet oil. Gerow was engaged in commercial fishing in the Nipigon Straits area (Mr. F. Legault, personal comm. 1978).

15. In studies of brook trout, Peterson et a1. (1966) found that administration of lutein (an xanthophyll) would produce yellow colouration in skin, fins and flesh.

8. PERSONAL COMMUNICATION

AGAWA, G.	Goulais Mission, Aug. 22, 1978.
ALMOS, A.	Terrace Bay, April 26, 1979.
BAKER J.	Thunder Bay, Aug. 18, 1978.
BERGMAN, V.	Thunder Bay, June 19, 1980.
BJORNAA, O.	Sault Ste. Marie, April 23, 1979.
CHARLIE, H.	Squaw Bay (Mt. McKay I.R., Thunder Bay), May 2, 1979
COBERLY, C.	Ludington (Michigan), Feb. 8, 1979.
CRESS, C.	Heron Bay, Aug. 16, 1978.
CRESS, (Mrs.) H.	Marathon, Aug. 16, 1978.
DAHL P.	Thunder Bay, Aug. 18, 1978
DAHL, P.	Thunder Bay, June 18, 1980
GEROW, M.	Squaw Bay (Pass Lake), May 8, 1980
HAMILTON, R.	Thunder Bay (O.M.N.R.), April 30, 1979.
HAMILTON, P.	Dorion, June 25, 1980.
HONAN, B.	Marathon, July 4, 1978.
HUMBY, B.	Toronto, June 20, 1979.
INGVES, G.	Thunder Bay, May 4, 1979.
JAGO, L.	Sault Ste. Marie (O.M.N.R.), April 24, 1979.
JOHNSON, I.	Terrace Bay, April 29, 1979.
JONES, G.A.	Batchawana Bay, Aug. 14, 1978.
KENNEDY, W.A.	Nanaimo (British Columbia), corresp., March 29, 1979.
KING, A.	Terrace Bay, July 6, 1978
KREZAK, M.	Sault Ste. Marie, Aug. 11, 1978.
KUKKO, O.	Camp Bay, July 15, 1978.
LABARR, O.	Port Coldwell, Aug. 21, 1978
LAWRIE, A	Maple (O.M.N.R.), correspondence, Sept., 1980..
LEGAULT, F.	Rossport, July 9, 1978
LEGAULT, F.	Rossport, April 27, 1979.
LEGAULT, F.	Rossport, June 23, 1980
LEGAULT, H.	Rossport, April 27, 1979.

MACDONALD, J.	Mamainse Hbr., Aug. 15, 1978
MACMILLAN, C.	Marathon, July 4, 1978
McCOY, F.	Sault Ste. Marie, April 23, 1979
McKAY, E.	Squaw Bay (Pass Lake), Aug. 17, 1978.
McKAY, E.	Squaw Bay (Pass Lake), April 29, 1979.
McKAY, R.	Squaw Bay (Pass Lake), April 29, 1979.
McKAY, G.	Squaw Bay (Pass Lake), April 29, 1979.
McLEOD, K.	Thunder Bay, May 2, 1979.
MCQUAIG, K.T.	Heron Bay, July 5, 1978.
MARTIN, N.V.	Maple (O.M.N.R.), Jan. 29, 1979.
MILLER, G.	Amethyst Hbr., July 15, 1978.
MORDEN, L.	Agawa Bay, July 3, 1978.
MORDEN, L.	Agawa Bay, April 25, 1979.
NORDLANDER, 0.	Thunder Bay, May 2, 1979.
NUTTALL, A.	Hurkett, June 21, 1980.
ORR, H.	Wawa (O.M.N.R.), July 17, 1978.
PRIMEAU, G.	Sault Ste. Marie, Aug. 13, 1978.
PRIMEAU, G.	Sault Ste. Marie, April 23, 1979.
PURVIS, I.	Gore Bay, Sept. 13, 1979.
PURVIS, M.	Sault Ste. Marie (O.M.N.R.), June 29, 1978.
PERVAIS, S.	Mt. McKay I.R. (Thunder Bay), May 4, 1979.
RENNER, W.	Montreal River, April 25, 1979.
RONQUIST, A.	Squaw Bay (Pass Lake), July 10, 1978.
RYDER, R.	Thunder Bay (O.M.N.R.), July 14, 1978.
SANDERS, W.	Sault Ste. Marie, Aug. 11, 1978.
SAUNDERS, W.	South Baymouth, Sept. 14, 1979.
SCHELLING, W.	Rossport, July 8, 1978.
SCHELLING, W.	Rossport, April 27, 1979.
SISSON, I.	South Baymouth, Sept. 14, 1979.
SIVERTSON, S.	Duluth (Minnesota), May 3, 1979.

TALARICO, S.	**Sault Ste. Marie, May 6, 1979.**
THROWER, N.	**Thunder Bay, Aug. 18, 1978.**
TYSKA, G.	**Amethyst Hbr., July 15, 1978.**
WALTERS, M.	**Ludington (Michigan), Feb. 8, 1979.**
WHILLANS, T.	**Toronto, July 4, 1980.**
WUORI, C.	**Thunder Bay, May 2, 1979.**

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10. LIST OF APPENDICES

APPENDIX I

HUDSON BAY COMPANY RECORDS CONSULTED AND LOCATIONS OF HOLDINGS

POST JOURNALS	PIC POST PPJ	FORT WILLIAM FWJ	MICHIPICOTEN POST MPJ	FORT SAULT STE. MARIE SSMJ	NIPIGON HOUSE (Red Rock) NPJ
1797-98			PAC (v.1)		
1798-99			PAC (v.3)		
1799-00			PAC (v.4)		
1800-01			PAC (v.5)		
1801-02			PAC (v.6)		
1802-03			PAC (v.7)		
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1817-18			PAC (v.8)		
1818-19		PAC (v.4)	PAC (v.9)		
1819-20		PAC (v.5)	PAC (v.10)		
1820-21		PAC (v.6)	PAC (v.11)		
1821-22					
1822-23					
1823-24					
1824-25		TBHS		PAC (v.1)	
1825-26					
1826-27		PAM (v.1)		PAC (v.2)	
1827-28	PAC (v.1)	PAC (v.7)	PAC (v.12)		
1828-29	PAC (v.2)	PAC (v.8)	PAC (v.13)		
1829-30	PAC (v.3)	PAM (v.2)	PAC (v.14)		
1830-31	PAC (v.4)	PAC (v.10) PAM (v.3)	PAC (v.15)		
1831-32	PAC (v.5)	PAC (v.11) PAC (v.4)	PAC (v.16)		
1832-33	PAC (v.6)	PAC (v.12)	PAC (v.17)		
1833-34	PAC (v.7)	PAC (v.13)	PAC (v.18)		
1834-35	PAC (v.8)	PAC (v.14)			
1835-36	PAC (v.9)	PAC (v.15) TBHS		PAC (v.?)	
1836-37		TBHS			
1837-38	PAC (v.10)	PAC (v.17) PAM (v.5)			PAC (v.20)
1838-39			PAC (v.19)		PAC (v.21)
1839-40		PAC (v.19)	PAC (v.20)		

Appendix I continued

	PIC POST	FORT WILLIAM	MICHIPICOTEN POST	FORT SAULT STE. MARIE	NIPIGON HOUSE (Red Rock)
POST JOURNALS	PPJ	FWJ	MPJ	SSMJ	NPJ
1840-41	PAC (v.11)	PAM (v.7)	PAC (v.22)		
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1845-46	FF				
.					
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.					
1849-50		PAC (v.20)			
1850-51		PAC (v.20)			
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.					
1858			OA		
1858-59			OA		
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.					
.					
1870-71					PAC (v.23)
POST REPORTS	PPR	FWR	MPR	SSMR	NPR
1817-18			PAC (v.1)		
1818-19			PAC (v.2)		
1819-20			PAC (v.3)		
1820-21			PAC (v.4)		
1821-22					
1822-23					
1823-24		PAC (v.1)			
1824-25		PAC (v.2)			
1825-26		PAC (v.3)			
1826-27		PAC (v.3)			
1827-28	PAC (v.1)	PAC (v.5)	PAC (v.5)		
1828-29	PAC (v.2)	PAC (v.6)	PAC (v.6)		
1829-30			PAC (v.7)		
1830-31		PAC (v.7)	PAC (v.8)		
1831-32					
1832-33	PAC (v.3)				
1833-34	PAC (v.4)				

Appendix I continued

ABREVIATIONS AND HOLDINGS

1. PAC - Public Archives of Canada, Ottawa, Ontario

   a) PPJ - 2 reels, MG20 HBC 1Ml17 and MG20 HBC 1Ml18 PPR - Reel MG20 HBC U1781

   b) FWJ - 2 reels, MG20 HBC 1M152 and MG20 HBC 153 FWR - Reel MG20 HBC 1M783

      Correspondence books - Reel HBC 1M251

   c) MPJ - 2 reels, MG20 HBC 1M79 and MG20 HBC 1H80 MPR - 2 reels, MG20 HBC 1M779 and MG20 HBC 1M780

      Correspondence books - Reel MG20 HBC 1M181i

   d) SSMJ - Reel MG20 HBC 1Ml31

   e) NHJ - 2 reels, MG20 HBC 1M102 and MG20 HBC 1Ml03

2. PAM - Provincial Archives of Manitoba, Winnipeg, Manitoba

   - journal originals - MGl Cl

3. OA - Ontario Archives, Toronto, Ontario

4. TBHS - Thunder Bay Historical Society, Thunder Bay, Ontario

5. FF - Fort Friendship, Wawa, Ontario (journal privately owned by Mrs. A. Turcott).

APPENDIX II

RESOURCE INSTITUTIONS CONSULTED

A. GOVERNMENT AGENCIES

1. Ontario Ministry of Natural Resources Queen's Park, Toronto (incl. library) Sault Ste. Marie

   Thunder Bay Wawa Terrace Bay Nipigon

   South Baymouth (Lake Huron) Dorion Fish Hatchery, Dorion

   Tarentorus Fish Hatchery, Sault Ste. Marie

2. Ontario Ministry of Culture and Recreation Queen's Park, Toronto

   Thunder Bay

3. Environment Canada

   Canada Centre for Inland Waters, Burlington (incl. library)

   Fisheries and Marine Service, Ottawa

   Freshwater Institute, Winnipeg Hydrographic Service, Ottawa

4. Parks Canada

   Pukaskwa National Park office, Marathon

5. Great Lakes Fishery Commission Laboratory, Ann Arbor (incl. library)

APPENDIX II continued

B. PUBLIC LIBRARIES AND ARCHIVES

1. Public Archives of Canada Wellington Street, Ottawa

   Government Records, Tunney's Pasture, Ottawa

2. Ontario Archives, Toronto

3. Provincial Archives of Manitoba, Winnipeg

   Hudson Bay Company Archives

4. Thunder Bay Historical Society Archives, Thunder Bay

5. Sault Ste. Marie Historical Society Archives, Sault Ste. Marie

6. National Library of Canada, Ottawa

7. University of Toronto, Toronto

   Robarts Library

   Science and Medicine Library

   Sigmund Samuel Library

   Zoology Department Library

   Fisher Rare Book Library

   Institute for Environmental Studies Library

8. Royal Ontario Museum, Toronto ROM Library (Main) Ichthyology

   Department Library Canadiana Collection

9. Metropolitan Toronto Central Library, Toronto

10. Sault Ste. Marie Public Library, Sault Ste. Marie

11. Fort William and Port Arthur Libraries, Thunder Bay

12. Old Fort William, Archives, Thunder Bay

13. Terrace Bay Public Library, Terrace Bay

14. Nipigon Public Library, Nipigon

APPENDIX III

HISTORICAL EXAMPLES OF GREAT LAKES LAKE TROUT VARIANTS

A. Goode (1884)

(In the summer of 1880 Louis Kumlien investigated local varieties of lake trout):

1. Green Bay vicinity - Black Trout - salmon-coloured flesh
   - Lake Trout - white flesh
2. Eastern shore of Green Bay, on the eastern shore of Lake Michigan-- two species of Mackinaw Trout recognized by fishermen
3. Grand Traverse Bay, Lake Michigan
   - Reef Trout - long, slim, coarse-meated variety taken in shallow water
   - when large called Racers
   Pot-bellies - short chubby variety, taken in deep water
4. Vicinity of Two Rivers, Wisconsin
   - Reef Trout - large, lank, coarse flesh (see above)
   - other form more highly prized, taken in deep water
5. South end Lake Michigan - two forms, one darker-coloured and has red flesh being the more highly prized
6. Grand Haven - two forms of Mackinaw Trout - Shoal-water trout
   - Deep-water trout
7. Thunder Bay, L. Huron vicinity - (1) "Buckskin" - held in high esteem
   (2) Racer

B. Thomson (1883)

Varieties of trout

1.	Salmon trout, weight up to	70 pounds
2.	"Siskowitt", weight up to	12 "
3.	Half-breed Siskowitt, weight	5 "
4.	"Potgut", very inferior fish, weight up to	12 "

5.	Rock or black trout, weight up to	40	"
6.	Large gray or shovel-nose trout, weight up to	70	"
7.	"California Trout", yellow spots and flesh, weight to	10	"
8.	"Half-breed red trout", weight up to	15	"
9.	Common brook or speckled trout, weight up toq	7	"
10.	Red trout, weight up to	42	"

C. Kerr (Jan. 3, 1885)

Varieties of trout in Lakes Superior and Huron, and Georgian Bay

1. Siscoet - a very fat fish
2. A hybrid or halfbreed, about 4 lbs. weight, mixture of the rock trout and siscoet
3. Rock trout
4. Small black trout
5. Pot gut trout
6. Gray trout - a good fish
7. Red fins trout - a good fish
8. Red trout - the finest of them all, best for procuring eggs
9. Speckled trout

APPENDIX IV

REPORTED CASES OF LAKE TROUT ENTERING RIVERS (EXCLUDING LAKE SUPERIOR)

Canada. Dept. of Marine and Fisheries (1892) - spawning in Lower Rideau River, Ontario. Other streams suggested.

Dymond (1926) - spawning in Sturgeon River, Lake Nipigon, Ontario. (Also noted by McNab Nov. 23, 1913).

Harper (1948) - found in Windy River, Neultin Lake; Dubawnt River, Dubawnt Lake; and the upper Kazan River below Ennadai Lake in early summer and fall. (Keewatin).

Keil (1928) - under certain unusual water conditions found in South Fork of Snake River, Jackson's Lake, Wyoming.

McLeod (personal comm. 1979) - found in Wabonish River, Lake Nipigon, Ontario.

Paterson (1968) - spawning in the outlet of Swan Lake, Alberta.

Racey (1894) - spawning in Sixteen Mile Creek, Lake Ontario, Ontario

Sequin and Roussel (1968) - spawning in Des Cedres Brook, Des Cedres Lake, Quebec.

Stinnisser (1972) - hatchery-reared lake trout (Lake Superior origin) spawning in streams of Mishibishu chain of lakes, Ontario.

Whillans, T.H. (personal comm. 1980) - reportedly ran up Young's Creek, Lake Erie, Ontario

APPENDIX V

SUMMARY OF SPAWNING GROUNDS AND PERIODS

FOR NATIVE LEAN LAKE TROUT STOCKS

LEGEND (applying to Appendices V and VI)

Varieties of Native Lake Trout (Names are those employed by interviewed fishermen)

Leans	REG	- "Regular" or "ordinary" trout
	BL	- Black
	RF	- Redfin
	RD	- Red
	YN	- Yellowfin
	GY	- Grey
	ST	- Salmon-trout
	SAND	- Sand trout
	R	- Racer
	DWL	- Deepwater lean
	moss	- Trout spawning in "moss" (see Section 4.1.3.3)

Spawning Grounds

1. Shore or Shoal

a) Major

b) Average (or of unknown importance)

c) Minor

2. Rivers

b) Major

b) Minor (or of unknown importance)

Appendix V continued

Legend (continued)

Non-leans	FATS	- Siscowet (or fat)
	HB	- Halfbreed
	PB	- Paperbelly (or humper)

+++++++
+++++++ Fishing grounds

Spawning - spawning noted on grounds

Fishing seasons

Spring a) spring (April to June)

Summer b) summer (July to Aug.)

Fall c) fall (Sept. to Nov.)

Appendix V continued

A. SHORE AND SHOAL SPAWNING AREAS

LOCATION	APPROXIMATE SPAWNING PERIOD Start	Finish	DOMINANT VARIETY	COMMENT
SECTION 5.1 - SAULT STE. MARIE TO COPPERMINE POINT				
Gros Cap to Maple Pt.	1st wk Oct		BL, REG	
Maple Is.	Oct 5-10 Oct 15	for 7-10 days end of Oct	BL RF	-spawning heavier than along mainshore -2 distinct runs
Parisienne Shoal	Oct 15-20 Oct 22-27	for 7-10 days	BL RF	-offshore stocks, spawning later than those near shore -2 distinct runs
E. Batchawana Bay	Oct 10		BL	-small B, probably a discrete stock
Outside Batchawana Is.	Oct 10-15		BL	
S. Sandy Is.	Oct 15-20			
Pancake Bay Flats			SAND	-observed in summer and fall (see text)
SECTION 5.2 - COPPERMINE POINT TO CAPE GARGANTUA				
Mica Bay, Pte. Aux Mines	Oct 1	Oct 15 (?)	RF	-run unique to this area
Montreal Shoal	Sept 28-Oct 1 Oct 10-25	early Oct Nov or early Dec	REG RF	-possible stock of large RF
Montreal Is.	Oct 5-10	Oct 25	REG	

Appendix V continued

LOCATION	APPROXIMATE SPAWNING PERIOD Start	Finish	DOMINANT VARIETY	COMMENT
Boissineau Bank			(see comment)	-unique form to this area (deeper body, thinner ventral region, colour differences from other leans) taken in late summer - spawning location unknown
Agawa Bay	late Sept		REG, SAND	
Clay R. and Sand R. area			SAND	
Lizard Is.	Oct 5-10	Oct 25 or later	REG, RF	
Robertson Cove			RF	-possible stock
Leach Is.	Oct 5-10	Oct 25 (?)		
Sparrow Shoal	Oct 5-10	Oct 25	REG	-especially large charr
Gull Is.	Oct 10-25	1st wk Nov	REG, RF, (see comment)	-in addition to REG and RF, presence of form unique in skin colouration (silver-green colour with large darker spots)
SECTION 5.3 - CAPE GARGANTUA TO POINT ISACOR				
Mackinnon Bank	Oct 15	up to 1st wk Nov	RF	-possible offshore spawning stock

Appendix V continued

LOCATION	APPROXIMATE SPAWNING PERIOD Start	Finish	DOMINANT VARIETY	COMMENT
Red Rock	1st wk Oct		REG, (see comment)	-in addition to REG, presence of spawning form known as "half-dollar trout" (coloured fins, pink flesh, coin-sized markings on silver-gray bodies)
N. point of Old Woman Bay	late Sept		REG	
Brulé Hbr.	3 days after Old Woman Bay Nov		REG (see comment)	-large late spawners at 18 m (60 ft) - deeper than REG
Michipicoten Bay	3rd wk Sept		BL, REG, RF	
SECTION 5.4 - POINT ISACOR TO PLAYTER HARBOUR				
Pukaskwa Flats	early Sept		BL, REG, RF	
Richardson Hbr.	Sept 10			
Otter Head		after Oct 15	BL, RF	-possible stocks of BL
Simons Hbr., Spruce Hbr.			BL	-possible stocks
White Gravel R. area	Sept 7 Nov 1		BL RF	-stock of late-spawning RF?

Appendix V continued

LOCATION	APPROXIMATE SPAWNING PERIOD Start	Finish	DOMINANT VARIETY	COMMENT
SECTION 5.5 - MICHIPICOTEN ISLAND TO CARIBOU ISLAND				
Clay Banks, The Shingles, Mines Bank (Michipicoten Is.)	early Oct	3rd wk Nov	RF	-probable stocks of RF
Chummy, Northwest, The Hummock Banks				-stocks of leans -spawning habits not known
Butch Bank				-stock of leans smaller than those of the above banks
Caribour Is.	Oct 1	Oct 22	BL	-probable stock
SECTION 5.6 - PLAYTER HARBOUR TO SCHREIBER POINT				
Playter Hbr., Happy Hbr., Randle Pt.	After Sept 7		BL	
Port Coldwell, Detention Is.			YN, GY(ST?)	-probable stocks
Thompson Channel	Nov		GY	-spawning in "moss" areas (see text)
Lawson Is.			YN	
Leadman Is.			BL, YN, ST	-probable stocks -large charr more abundant than at Slate Is.

Appendix V continued

LOCATION	APPROXIMATE SPAWNING PERIOD Start	Finish	DOMINANT VARIETY	COMMENT
Slate Is.	Sept 20-25	for 2 wk (longer in sheltered areas)	BL	-stocks probably discrete from those of mainland
N. Mortimer Is. (Slate Is.)			YN	
Jackfish Bay area	Sept 20-25	for 10 days-2 wk	BL	
Moberly Bay, Cody Is. (Jackfish Bay)	Oct 1 or later		YN	-possible stock -racer form also reported
E. arm of Jackfish Bay			ST	-possible minor stock
SECTION 5.7 - SCHREIBER POINT TO NIPIGON STRAIT				
Among islands S. of Rossport and Nipigon Bay	Sept 22	Oct 10	BL	
Bread Rock, Quarry Is.	1st wk Oct	Oct 15	RD	-possible stocks? (see text)
Quarry Is., Rolette Shoal (N. Salter Is.)	Nov	Dec	YN, GY	-spawning in "moss" areas (see text)
W. Wilson Is., Salter Is., St. Ignace Hbr.	mid Nov	Dec	GY	-probable stocks of late spawners
Nipigon Bay	Sept 30		BL, silver-coloured charr	-probably discrete stocks
Armour Is., Fraser Pt.	Oct 5	Oct 15	RD	-possible stocks? (see text)

Appendix V continued

LOCATION	APPROXIMATE SPAWNING PERIOD Start	Finish	DOMINANT VARIETY	COMMENT
SECTION 5.8 - SUPERIOR SHOAL				
Superior Shoal	July ? Sept ?		(see text)	-discrete stocks, possibly associated with particular banks -numerous instances of deformity and cannibalism
SECTION 5.9 - NIPIGON STRAIT TO THUNDER CAPE				
Sheesheeb Bay area	Sept 17		BL	
Sheesheeb Bay			(see comment)	-small trout in June distinct in appearance from those of mainshore (stockier, colouration differences)
Jean Pierre Bay	Oct 7	Nov	RD, RF	
Shaganash Is.	Sept 20 late Oct	mid Oct	BL YN	-possible stock of YN
Magnet Pt.	Sept 20		BL	
Black Bay				-spawning stocks move only to S. portion
Thunder Cape	Sept 30		BL	
Bateau Rock			(see text)	-probable discrete stocks of leans

Appendix V continued

LOCATION	APPROXIMATE SPAWNING PERIOD Start	Finish	DOMINANT VARIETY	COMMENT
SECTION 5.10 - THUNDER CAPE TO PIGEON RIVER				
Hare Is. Reef	Sept 30-early Oct	Nov	BL, YN, GY	
6.5 km (4 mi) N. of Clavet Pt.		Nov		-possible stock of late-spawners
S. shore of Caribou Is.	end 1st wk Oct 3rd wk Oct		BL RF	
N. shore Caribou Is.			GY	-spawning in "moss" areas
N. end Thunder Bay		Dec		-unusually late-spawners
Buck Is.			GY(?)	-large, late-spawners
Breakwall at Port Arthur and Fort William	late Sept-early Oct		BL	
Schwitzer Shoal				-probable stock
Grand Reef (Brulé Bay)	Sept 25	Oct 2	BL	
S. of Squaw Bay	mid-Sept		BL, "little grays"	
Pie Is.	Sept 15 Oct 20 after Oct 20	late Sept mid to late Nov	BL RF large RF	
N.W. shore Victoria Is.	Nov		YN	-probable stock
Beaver Is.			GY (?)	-spawning in "moss" areas
Caldwell Shoal (Pt. Caldwell)	1st half Nov.		large spawners	-possible stock

Appendix V continued

B. SPAWNING RIVERS

LOCATION	APPROXIMATE SPAWNING PERIOD start	Finish	IMPORTANCE
SECTION 5.1 - SAULT STE MARIE TO COPPERMINE POINT			
Harmony River			Minor
SECTION 5.2 - COPPERMINE POINT TO CAPE GARGANTUA			
Alona Creek			Minor
Montreal River	Sept 20-25	Oct 10-15	Major
Agawa River	Sept 20-25	Oct 10-15	Major
Sand River			Minor
Baldhead R.			Major (Minor?)
SECTION 5.3 - CAPE GARGANTUA TO POINT ISACOR			
Old Woman River			Minor
Michipicoten River	Sept 17	Sept 27-Oct 8	Major
Doré River			Minor
Bear (Makua) River			Minor
Dog (University) River	Sept 17 (Loftus 1958)	Sept 30	Major
Eagle River	before Dog R.		Major

Appendix V continued

LOCATION	APPROXIMATE SPAWNING PERIOD start	finish	IMPORTANCE
SECTION 5.4 - POINT ISACOR TO PLAYTER HARBOUR			
Pukaskwa River	Sept 1-5	Late Sept	Major
Swallow River			Minor
White Spruce River			Major (Minor?)
SECTION 5.6 - PLAYTER HARBOUR TO SCHREIBER POINT			
Little Pic River			Minor
Prairie River			Minor
Steele River			Major
Black (Aquasoban) River	Sept		Major (Minor?)
SECTION 5.7 - SCHREIBER POINT TO ISACOR STRAIT			
Nipigon R.?			

APPENDIX VI

LAKE CHART SECTIONAL MAPS SHOWING THE LOCATIONS OF LEAN LAKE TROUT SPAWNING GROUNDS AND NON-LEAN LAKE TROUT FISHING AND SPAWNING GROUNDS PRIOR TO 1955

Includes Figures 5, 6, 7, and SM1 to SM75

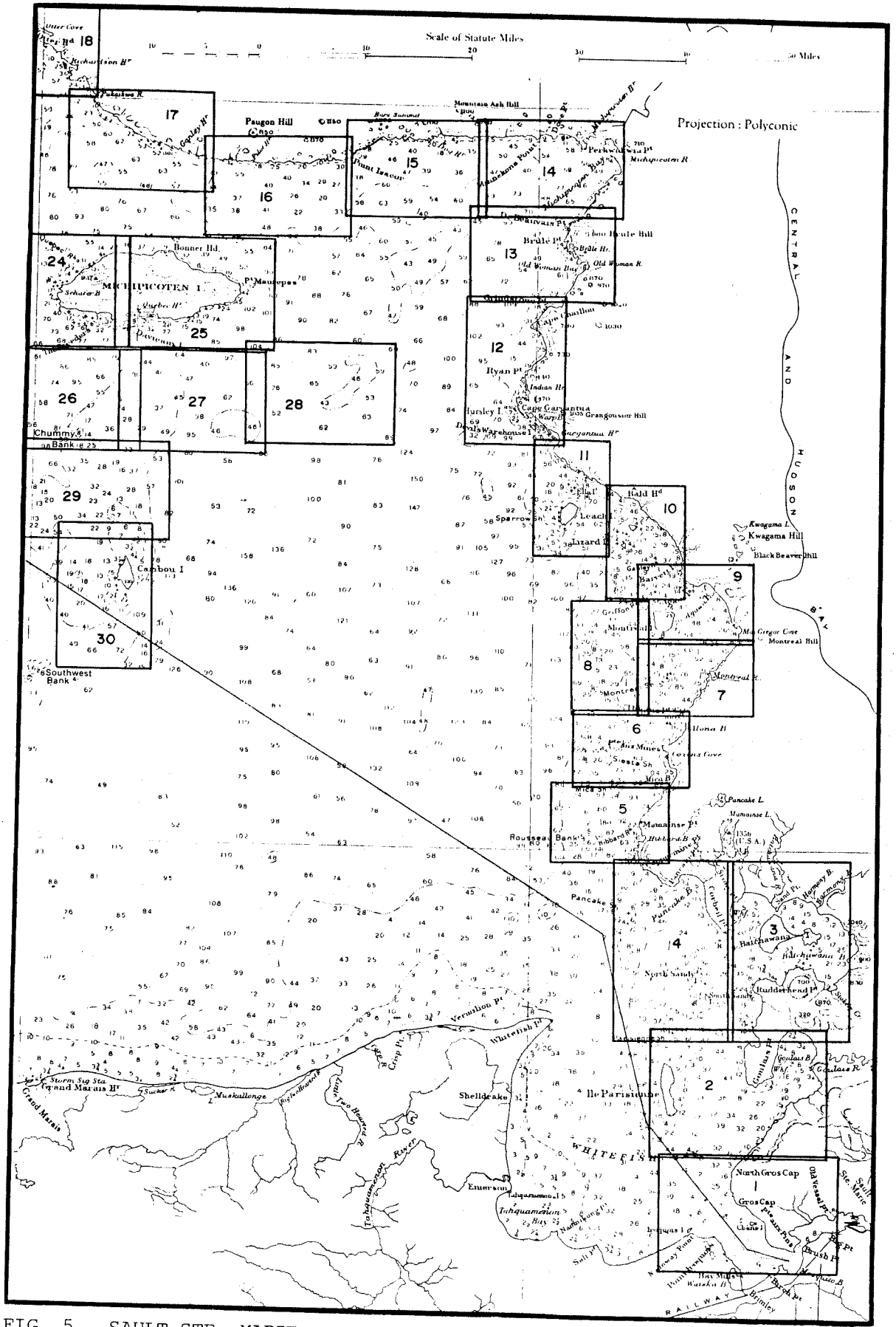


FIG. 5. SAULT STE. MARIE TO OTTER HEAD - SHOWING THE LOCATIONS OF FIGURES SM1-SM17, SM24-30

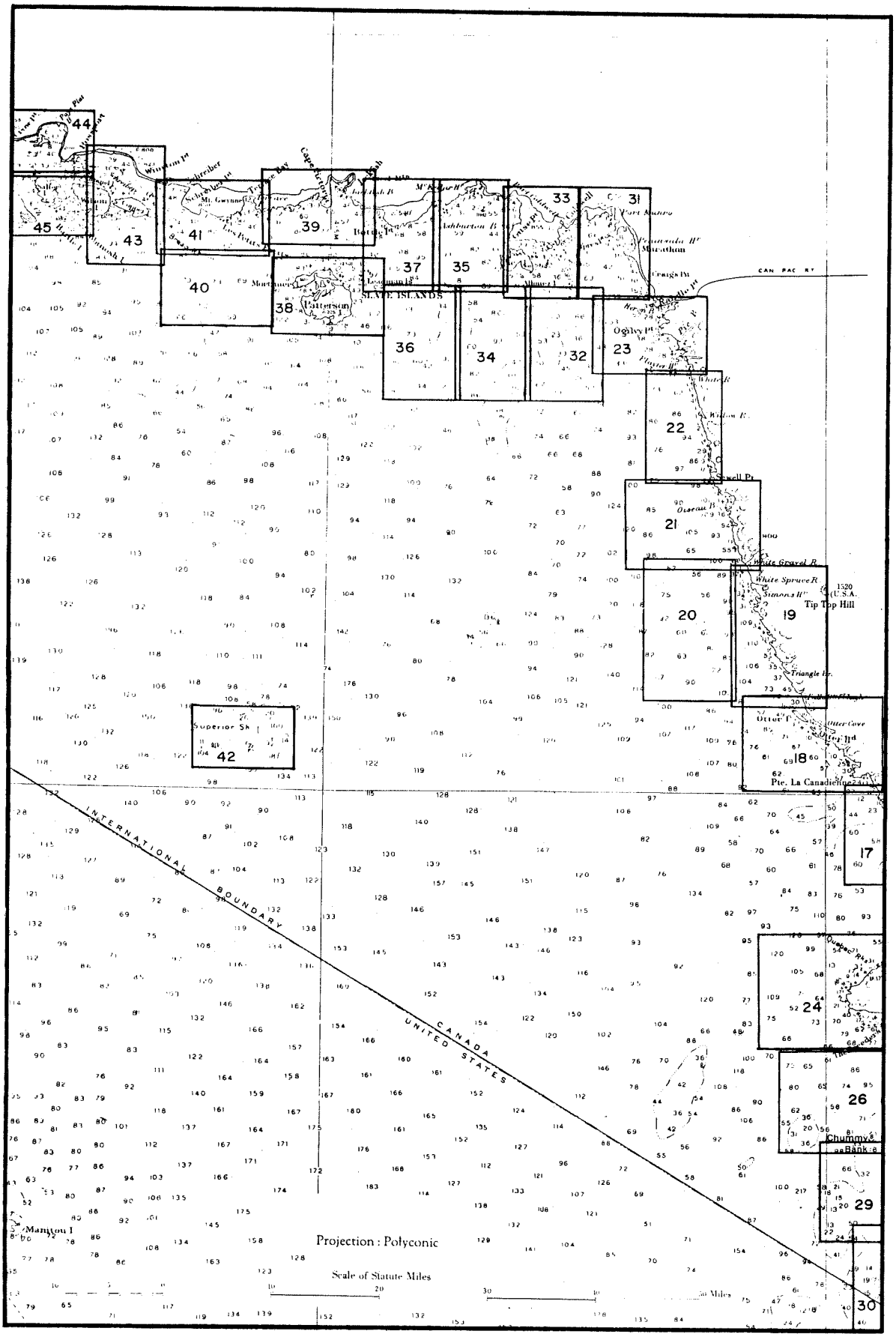


FIG. 6. OTTER HEAD TO PAYS PLAT - SHOWING THE LOCATIONS OF FIGURES SM18-SM23, SM31-SM45

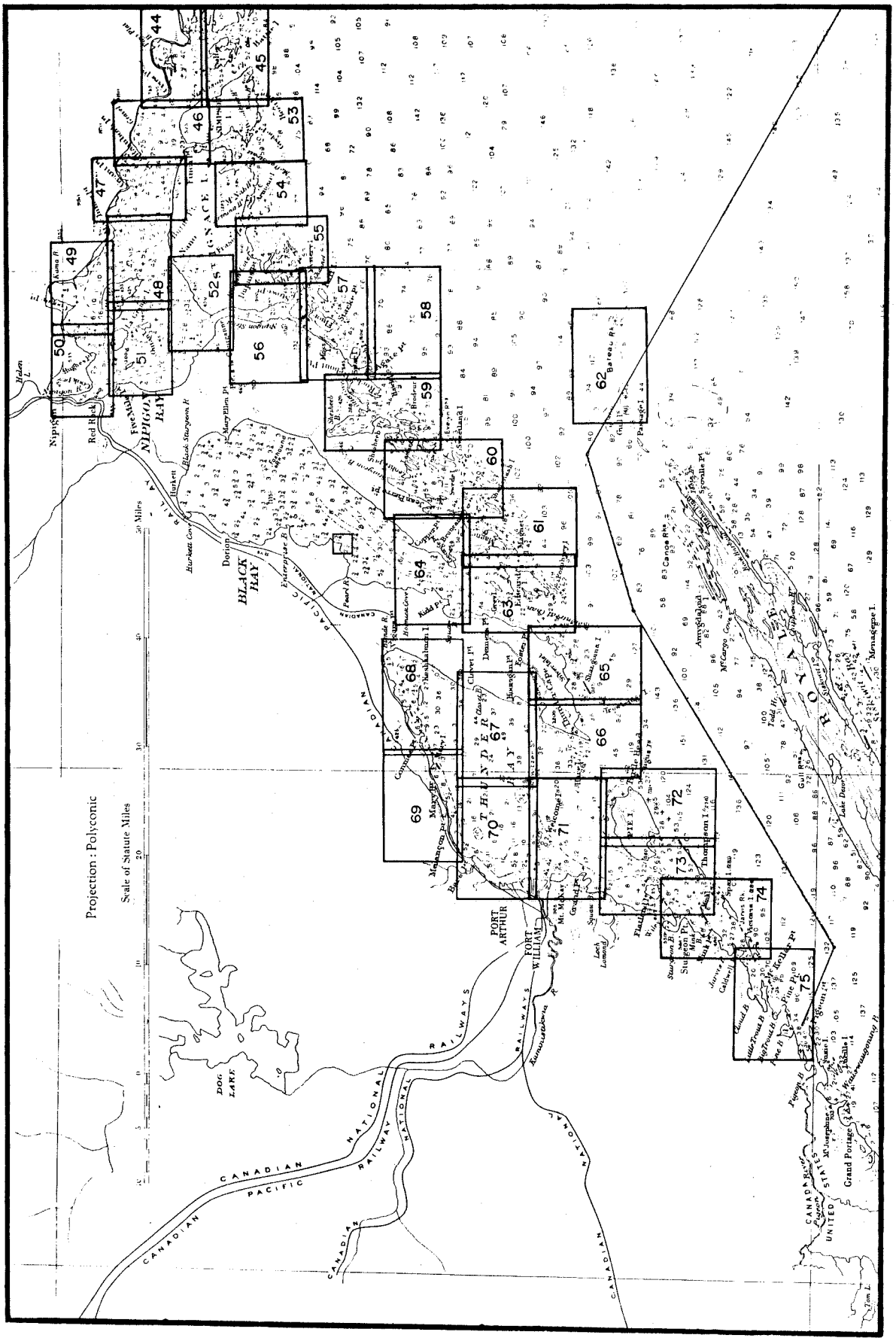


FIG. 7. PAYS PLAT TO PIGEON RIVER - SHOWING THE LOCATIONS OF FIGURES SM46-SM75

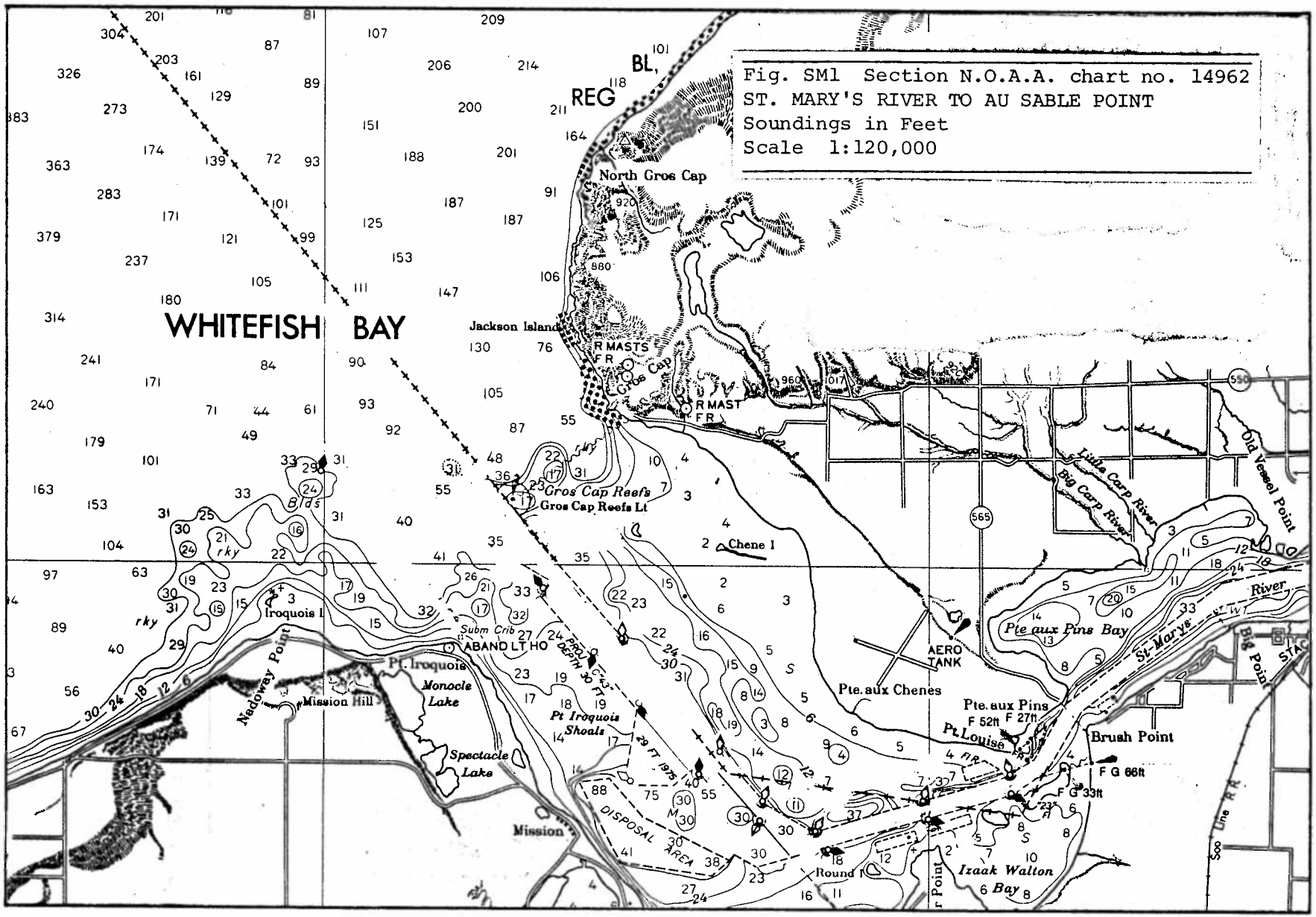


Fig. SM1 Section N.O.A.A. chart no. 14962
ST. MARY'S RIVER TO AU SABLE POINT
Soundings in Feet
Scale 1:120,000

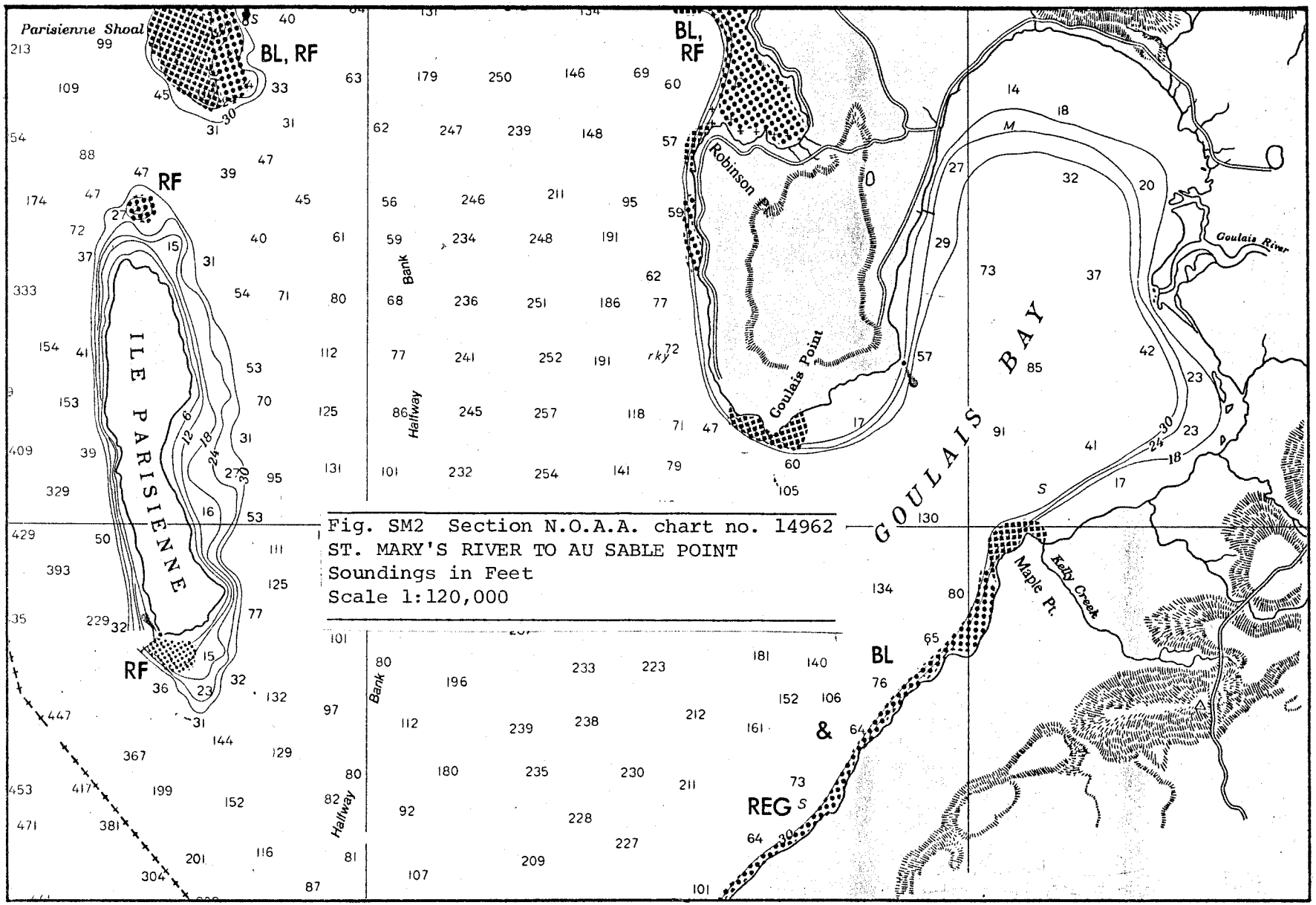


Fig. SM2 Section N.O.A.A. chart no. 14962
ST. MARY'S RIVER TO AU SABLE POINT
Soundings in Feet
Scale 1:120,000

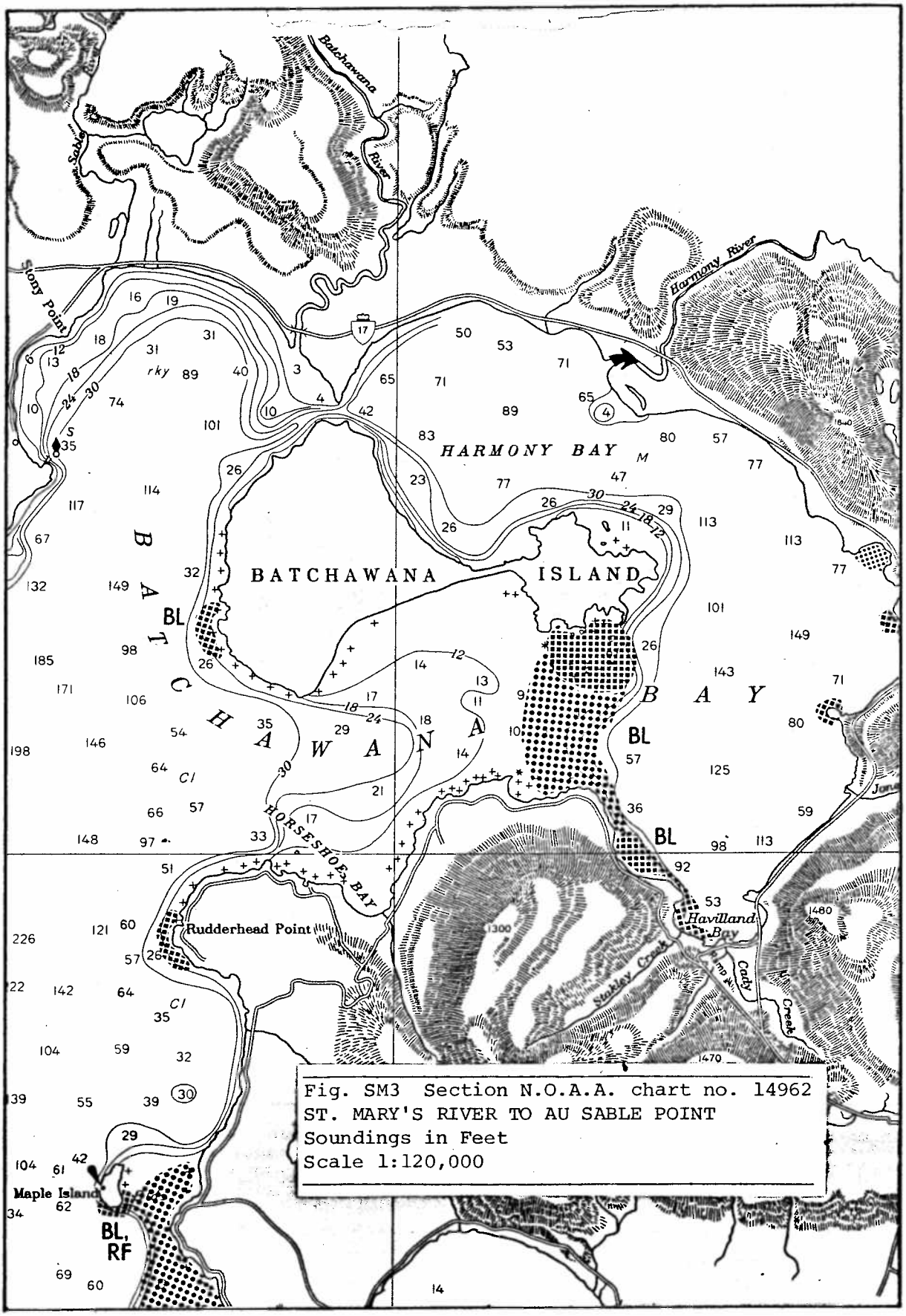


Fig. SM3 Section N.O.A.A. chart no. 14962
ST. MARY'S RIVER TO AU SABLE POINT
Soundings in Feet
Scale 1:120,000

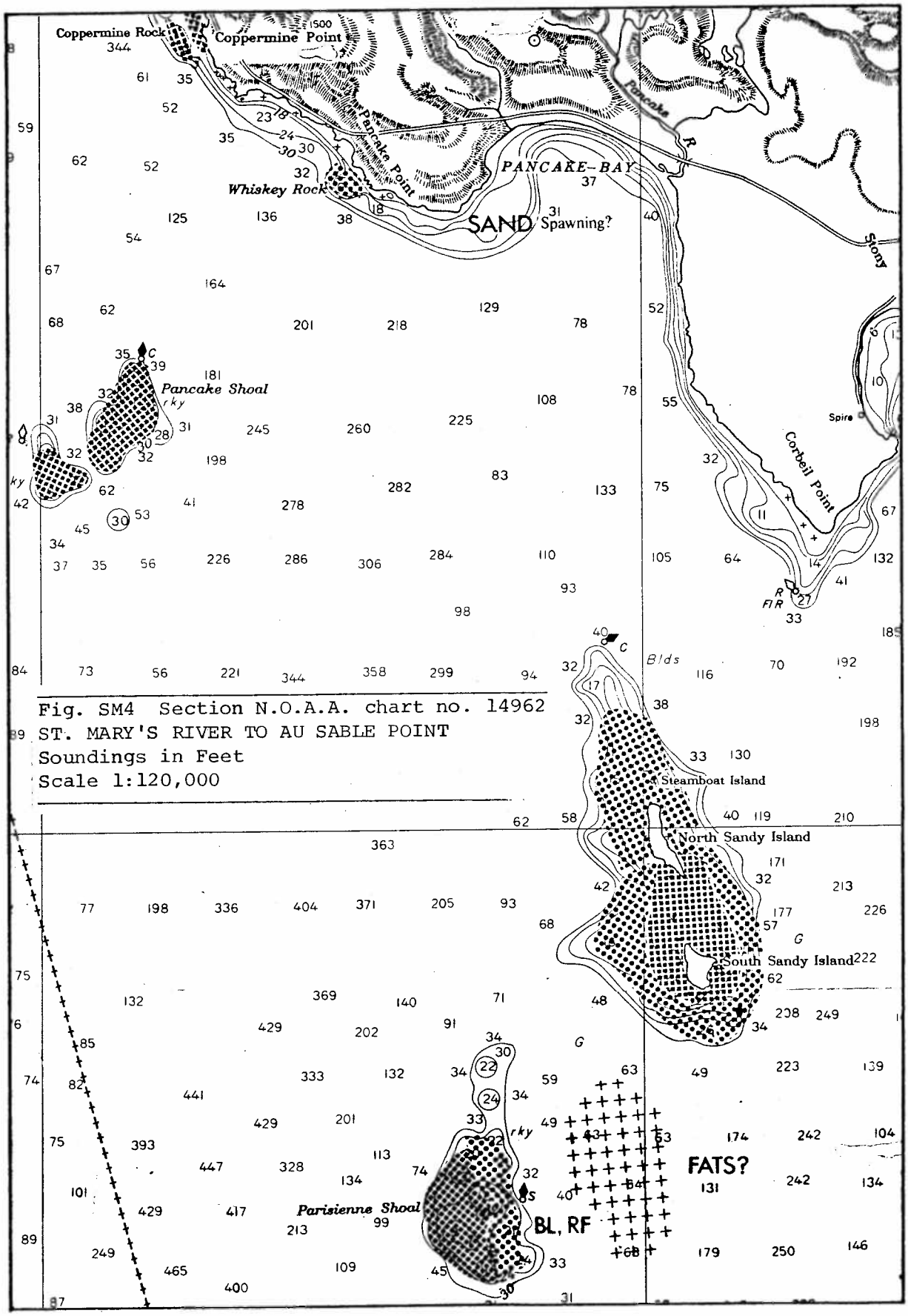


Fig. SM4 Section N.O.A.A. chart no. 14962
ST. MARY'S RIVER TO AU SABLE POINT
Soundings in Feet
Scale 1:120,000

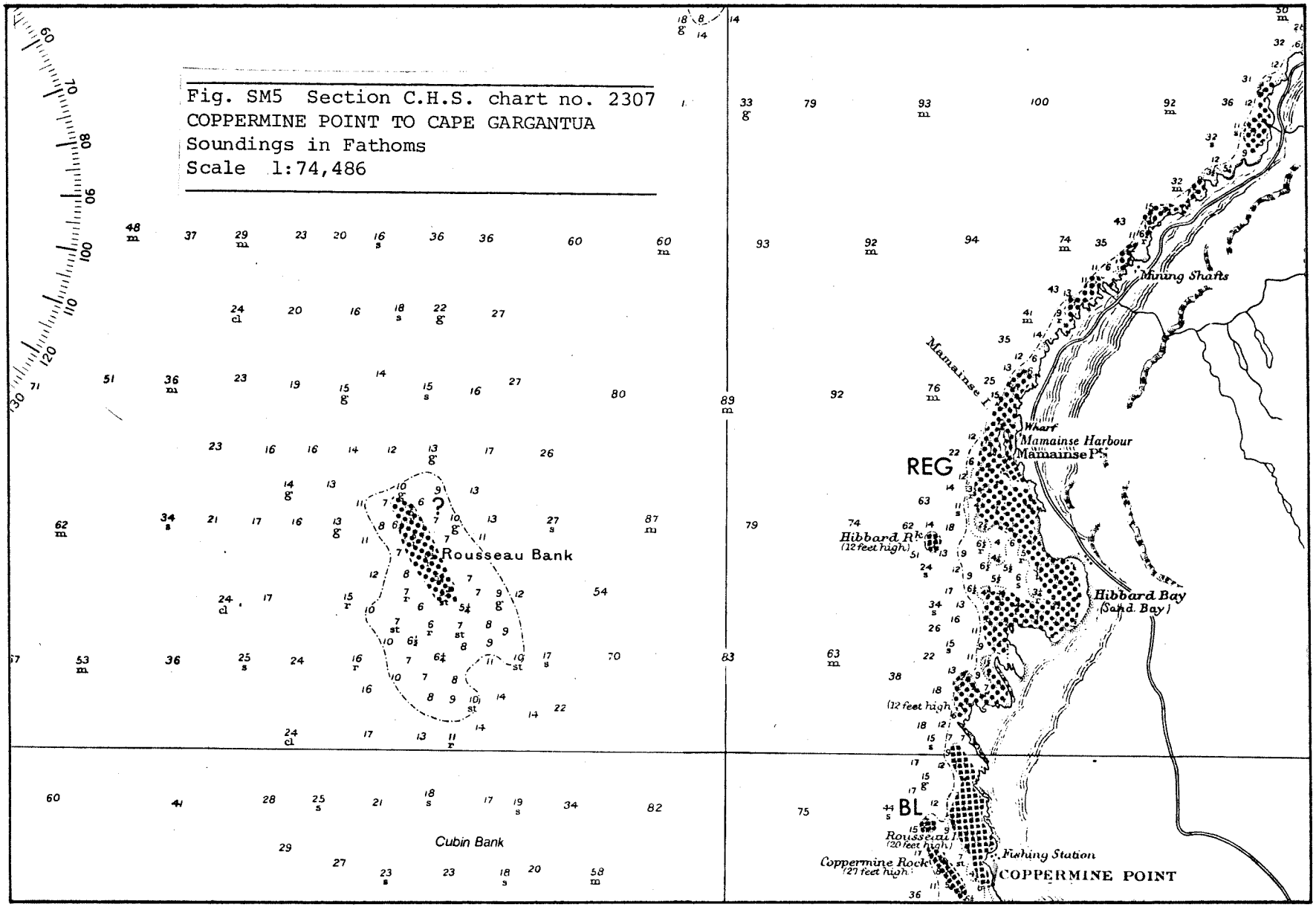


Fig. SM5 Section C.H.S. chart no. 2307
COPPERMINE POINT TO CAPE GARGANTUA
Soundings in Fathoms
Scale 1:74,486

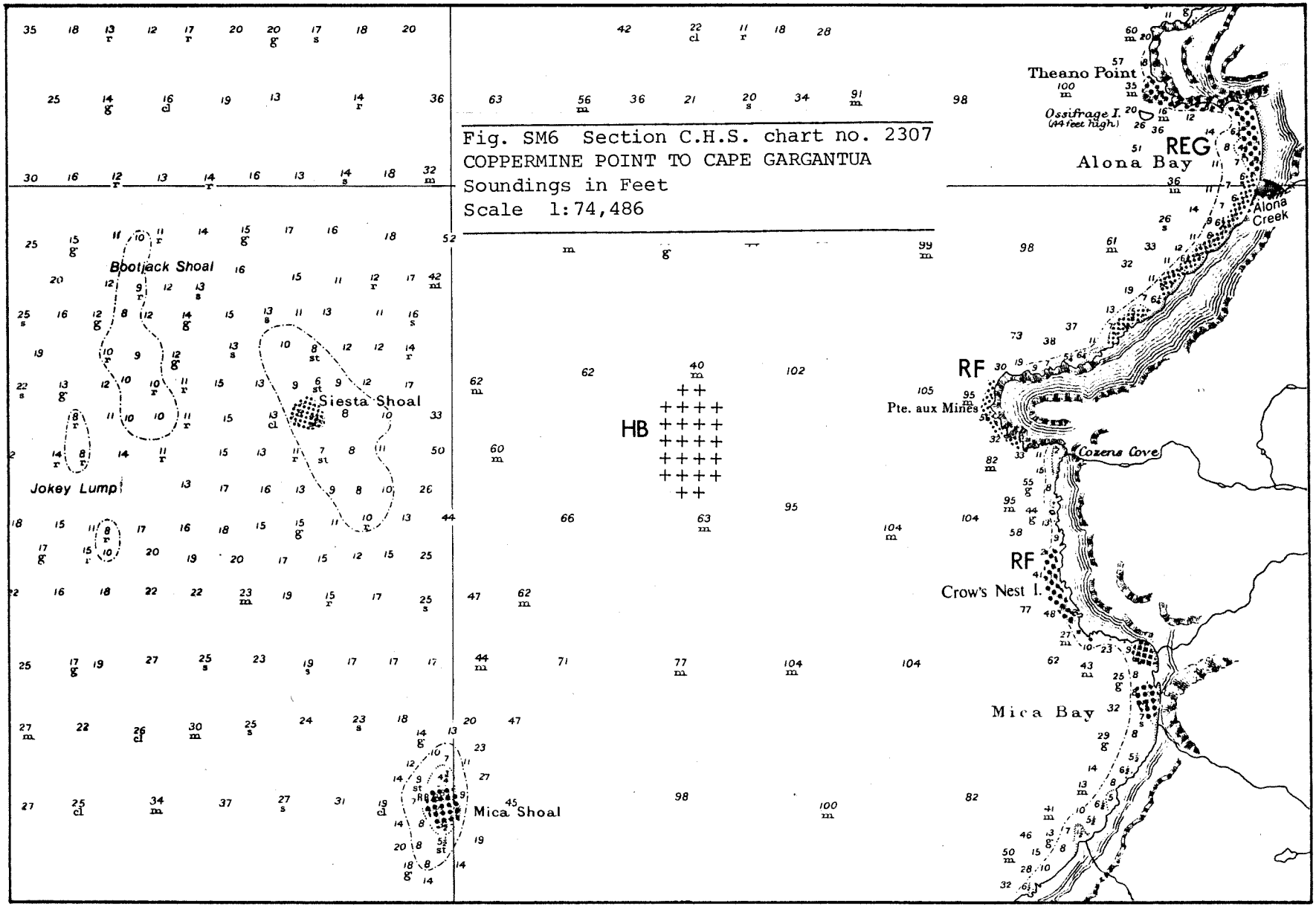


Fig. SM6 Section C.H.S. chart no. 2307
COPPERMINE POINT TO CAPE GARGANTUA
Soundings in Feet
Scale 1:74,486

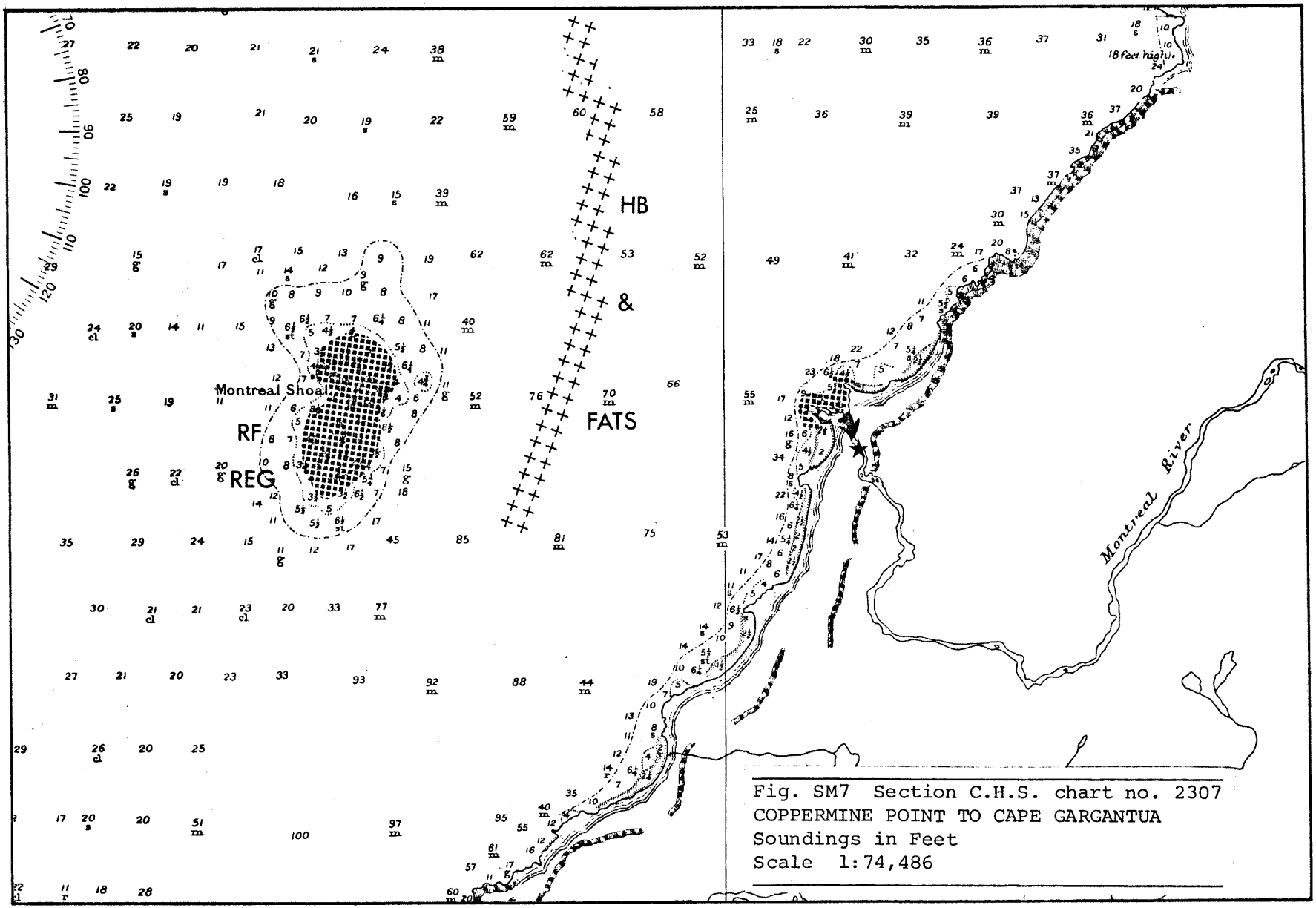


Fig. SM7 Section C.H.S. chart no. 2307
COPPERMINE POINT TO CAPE GARGANTUA
Soundings in Feet
Scale 1:74,486

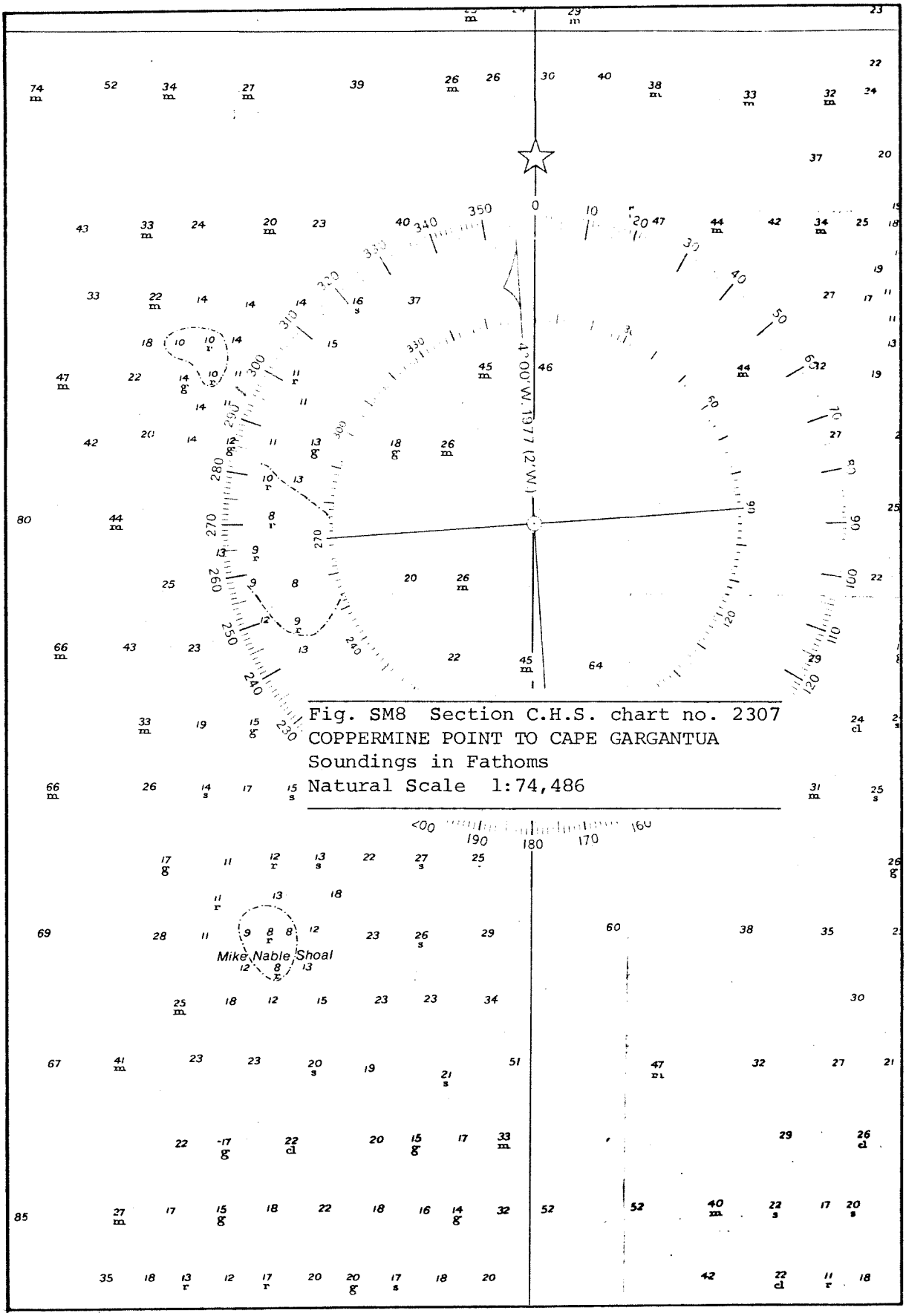


Fig. SM8 Section C.H.S. chart no. 2307
COPPERMINE POINT TO CAPE GARGANTUA
Soundings in Fathoms
Natural Scale 1:74,486

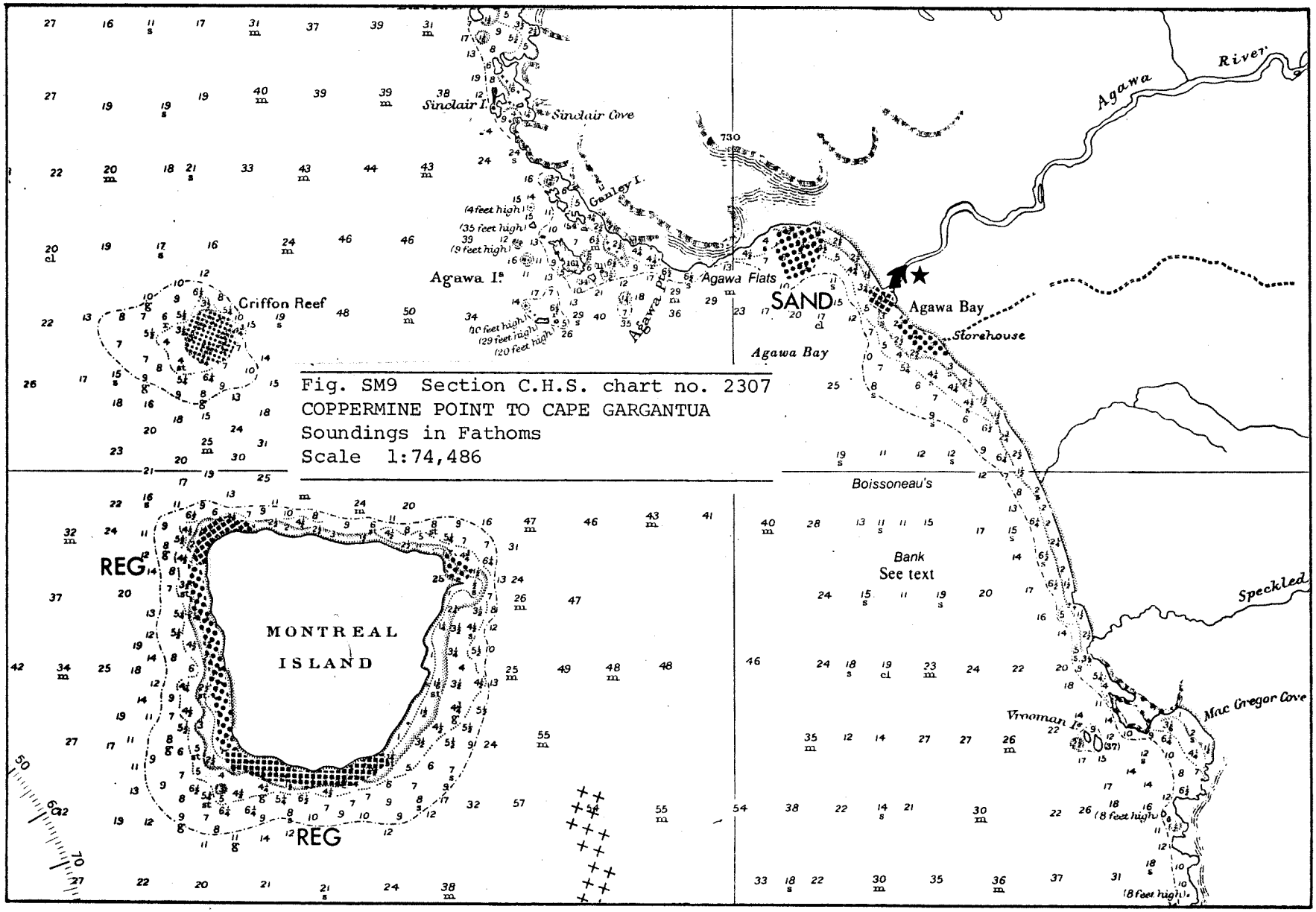


Fig. SM9 Section C.H.S. chart no. 2307
COPPERMINE POINT TO CAPE GARGANTUA
Soundings in Fathoms
Scale 1:74,486

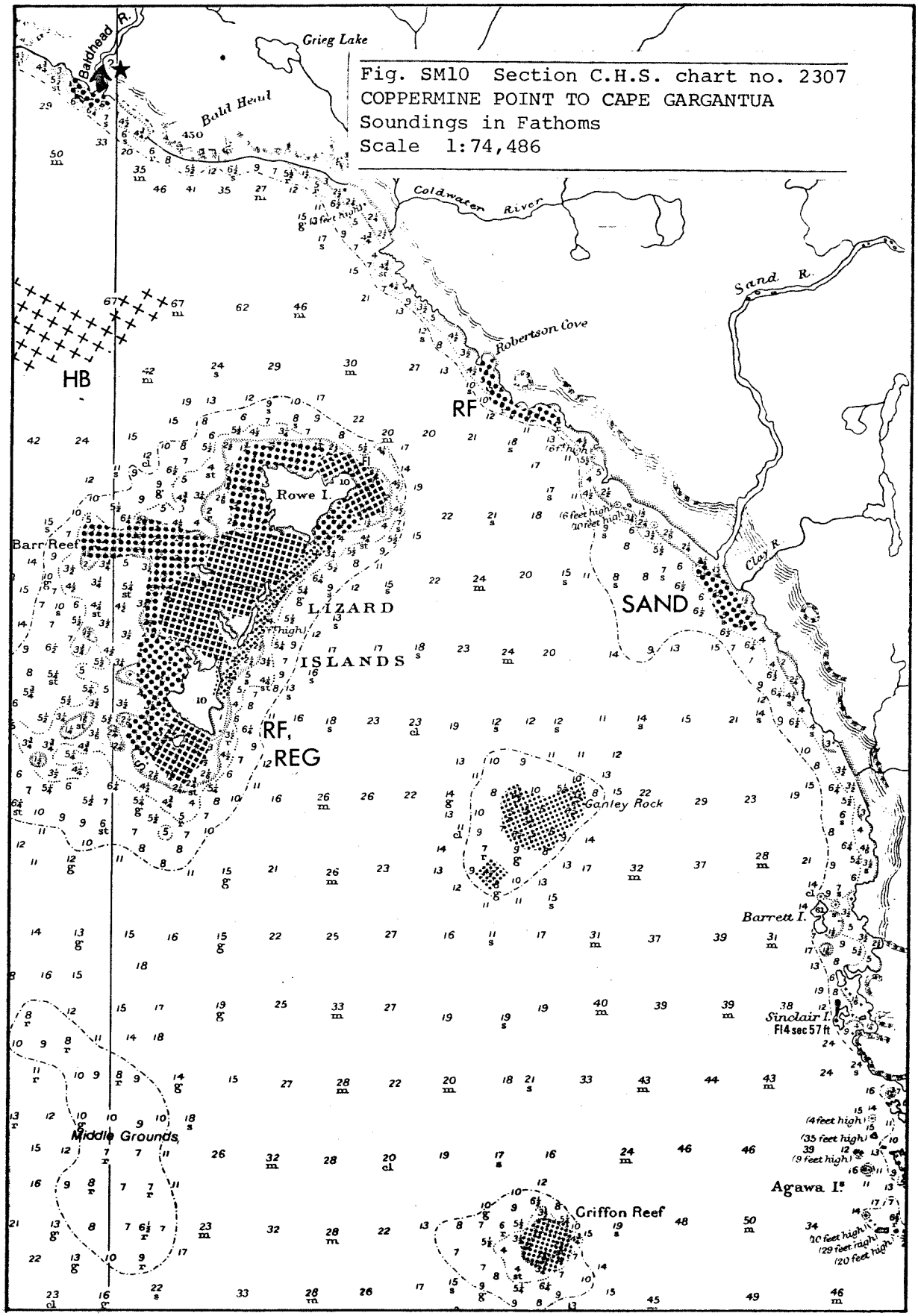


Fig. SM10 Section C.H.S. chart no. 2307
COPPERMINE POINT TO CAPE GARGANTUA
Soundings in Fathoms
Scale 1:74,486
Baldhead R.
Grieg Lake
Bald Head
Coldwater River
Sand R.
Robertson Cove
HB
RF
Rowe I.
Barr Reef
LIZARD
ISLANDS
RF,
REG
SAND
Clay R.
Ganley Rock
Barrett I.
Sinclair I.
Fl 4 sec 57 ft
Middle Grounds
Griffon Reef
Agawa Is.

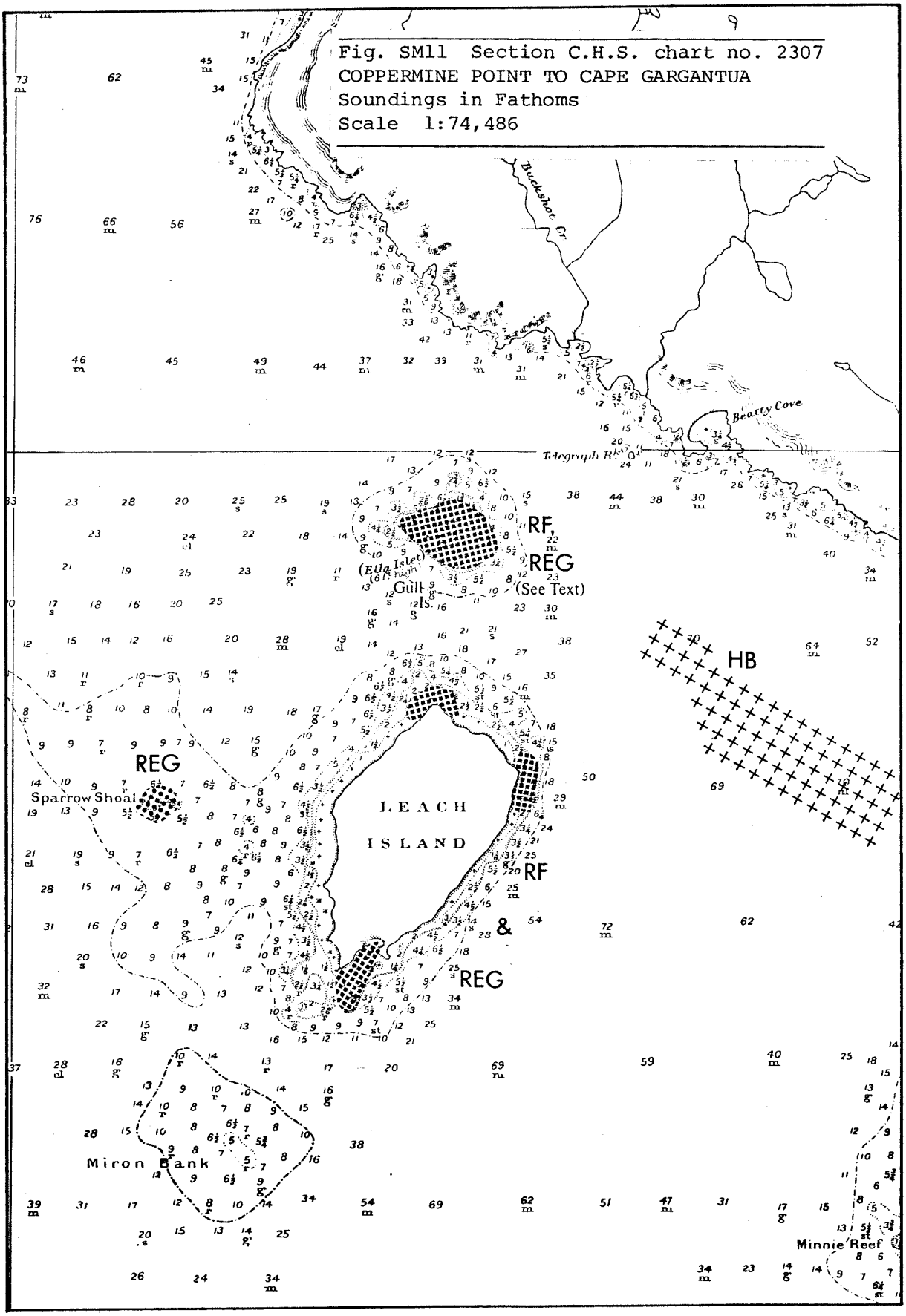


Fig. SM11 Section C.H.S. chart no. 2307
COPPERMINE POINT TO CAPE GARGANTUA
Soundings in Fathoms
Scale 1:74,486

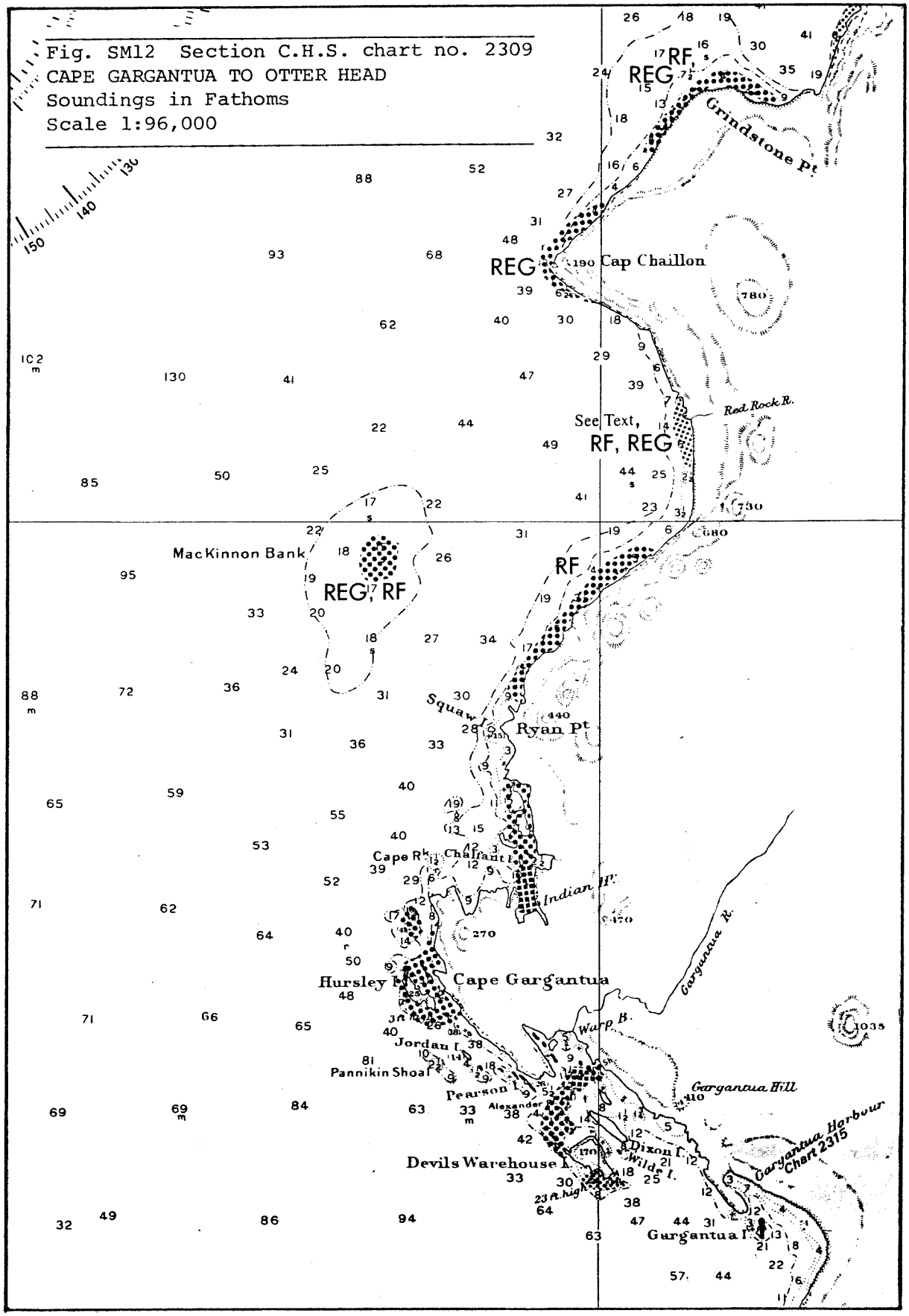


Fig. SM12 Section C.H.S. chart no. 2309
CAPE GARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000
RF, REG
Grindstone Pt
REG
Cap Chaillon
780
Red Rock R.
See Text,
RF, REG
MacKinnon Bank
REG, RF
RF
Squaw I.
Ryan Pt
440
Cape Rk
Chalfant I.
Indian H.
270
Hursley R.
Cape Gargantua
Gargantua R.
Warp B.
Jordan I.
Pannikin Shoal
Pearson I.
Alexander I.
Gargantua Hill
410
Gargantua Harbour
Chart 2315
Dixon I.
Wilds I.
Devils Warehouse I.
23 ft. high
Gargantua I.

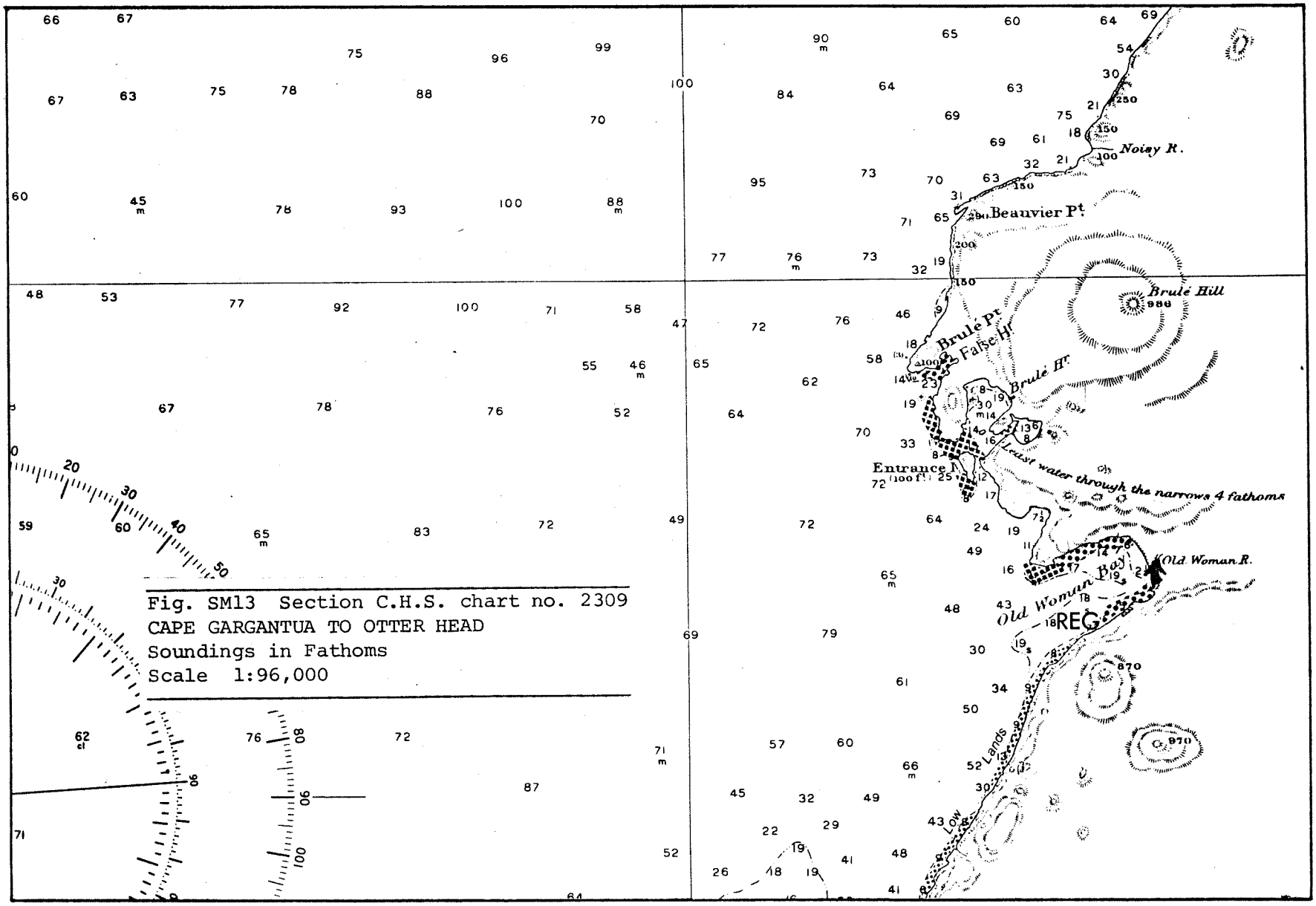


Fig. SM13 Section C.H.S. chart no. 2309
CAPE GARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000

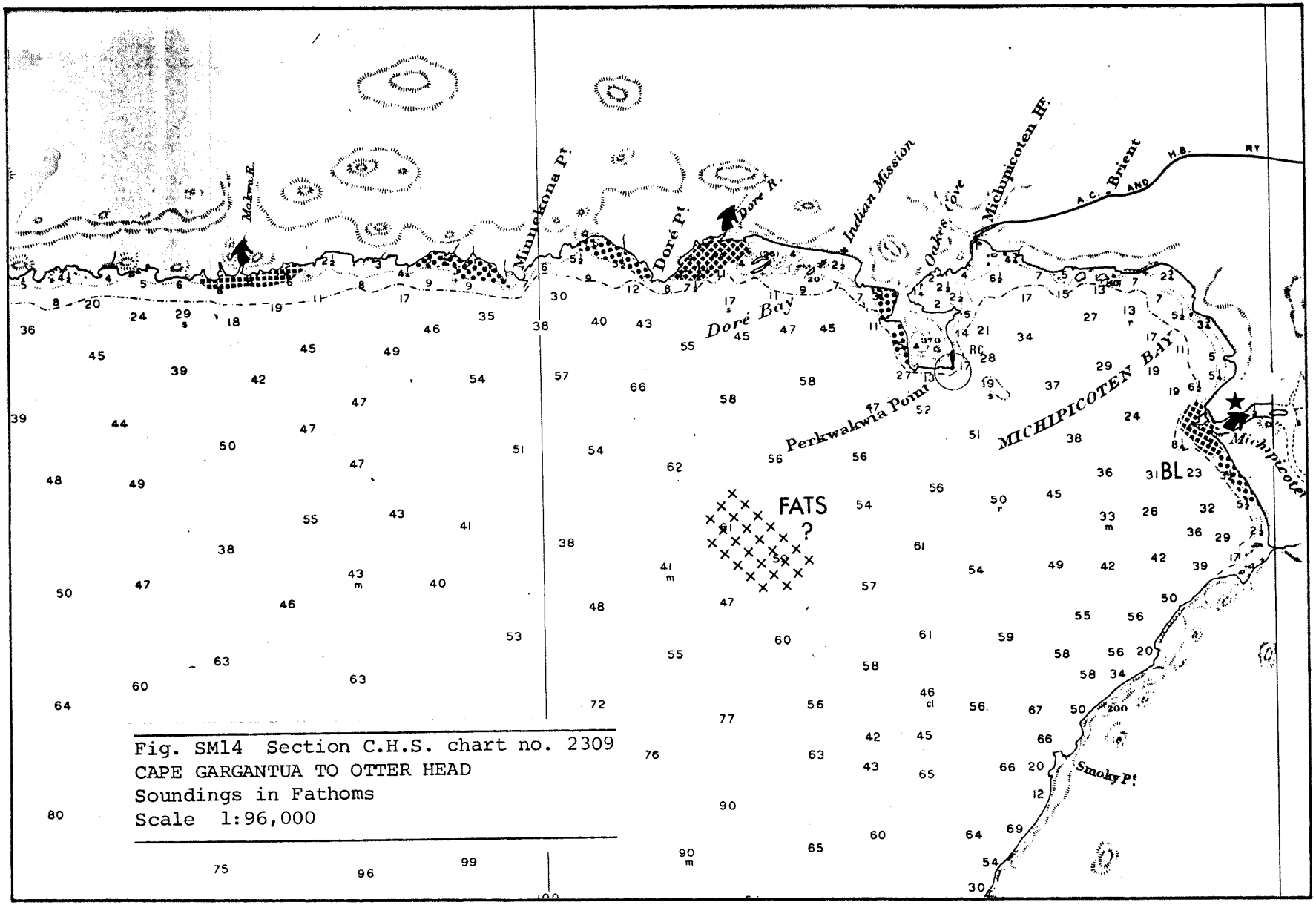


Fig. SM14 Section C.H.S. chart no. 2309
CAPE GARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000

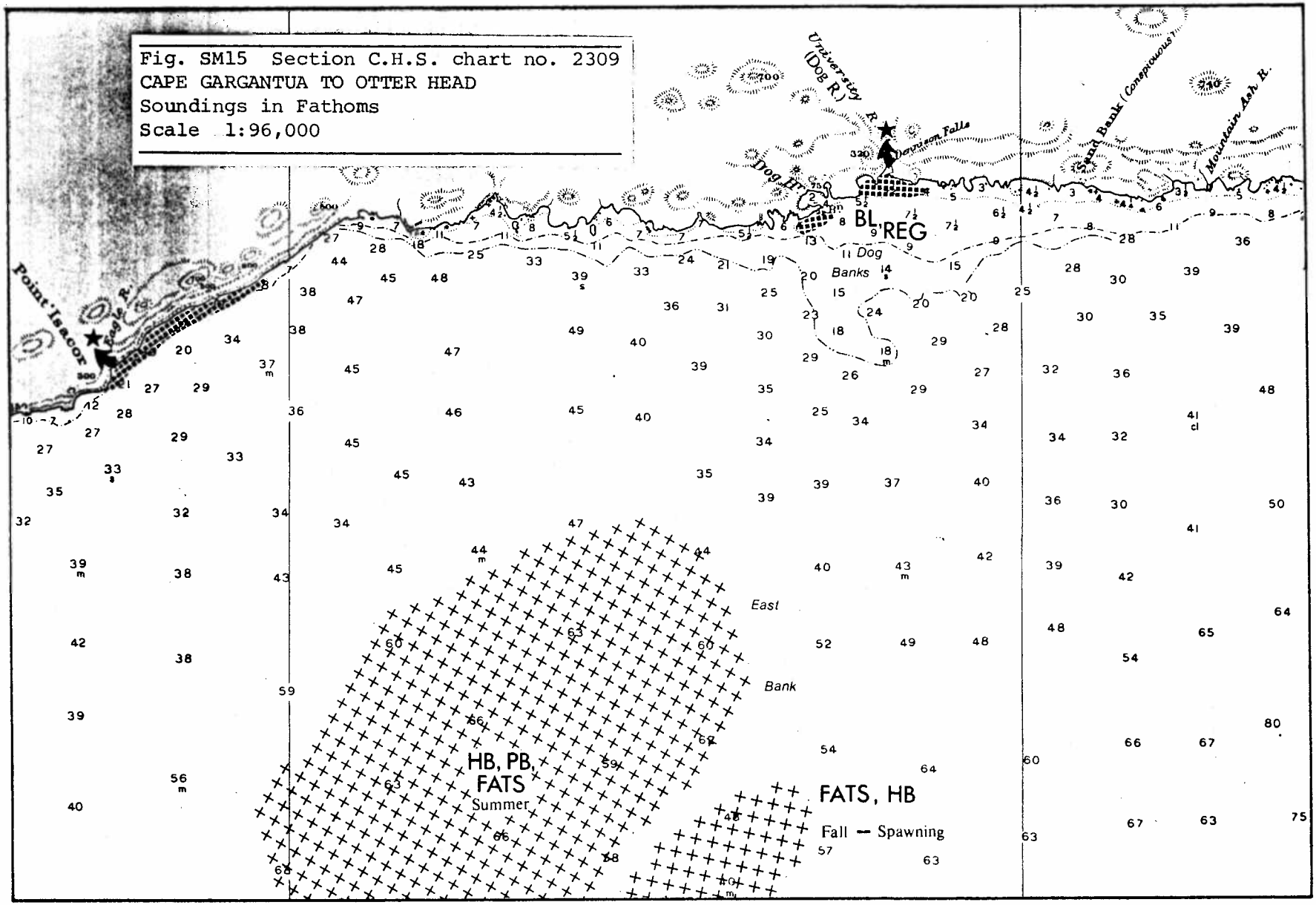


Fig. SM15 Section C.H.S. chart no. 2309
CAPE GARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000
University (Dog R.)
Harrison Falls
Dog R.
Point Isacor
Eagle R.
Sand Bank (Conspicuous)
Mountain Ash R.
BL, REG
Dog Banks
East
Bank
HB, PB, FATS
Summer
FATS, HB
Fall — Spawning

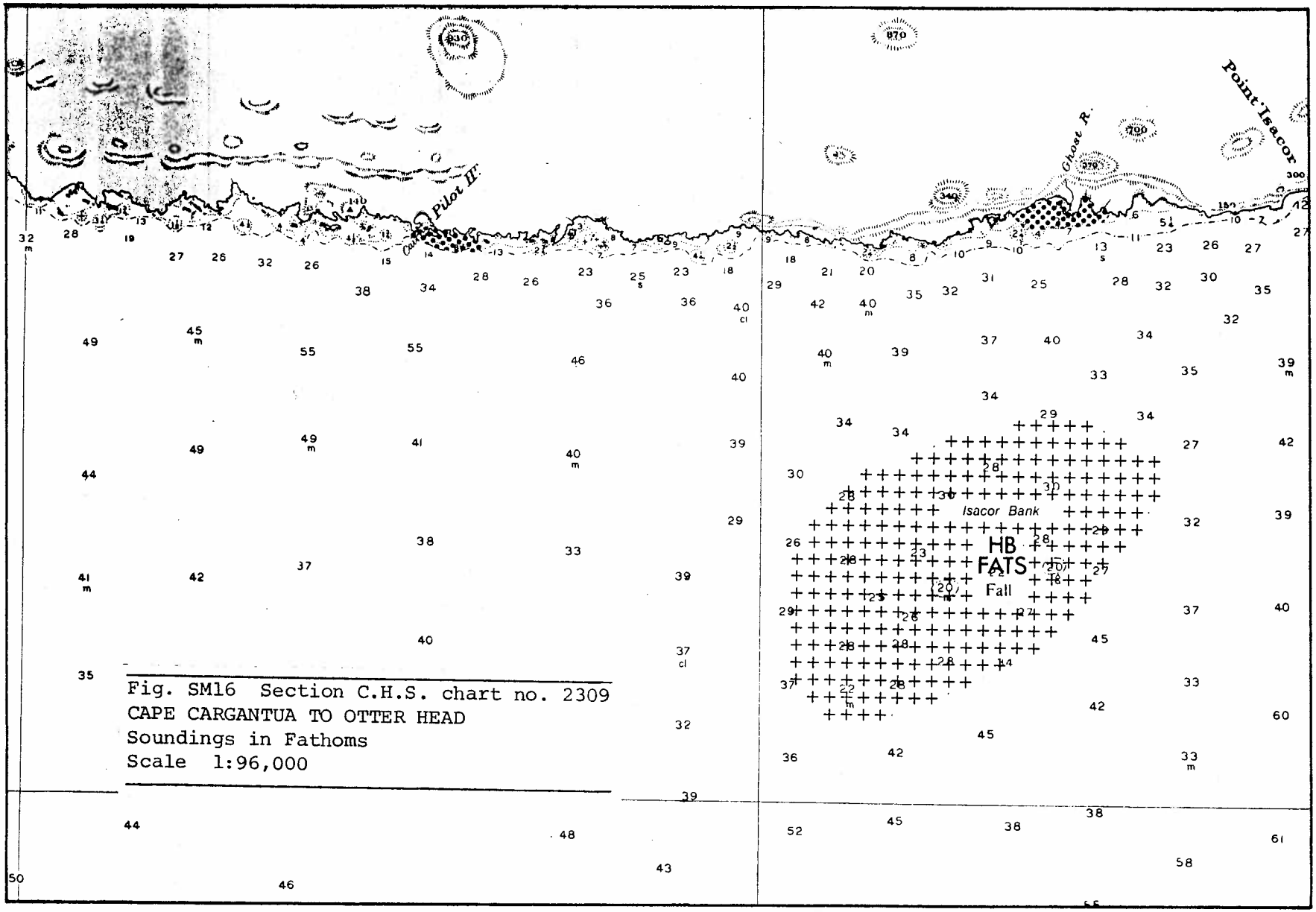


Fig. SM16 Section C.H.S. chart no. 2309
CAPE CARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000

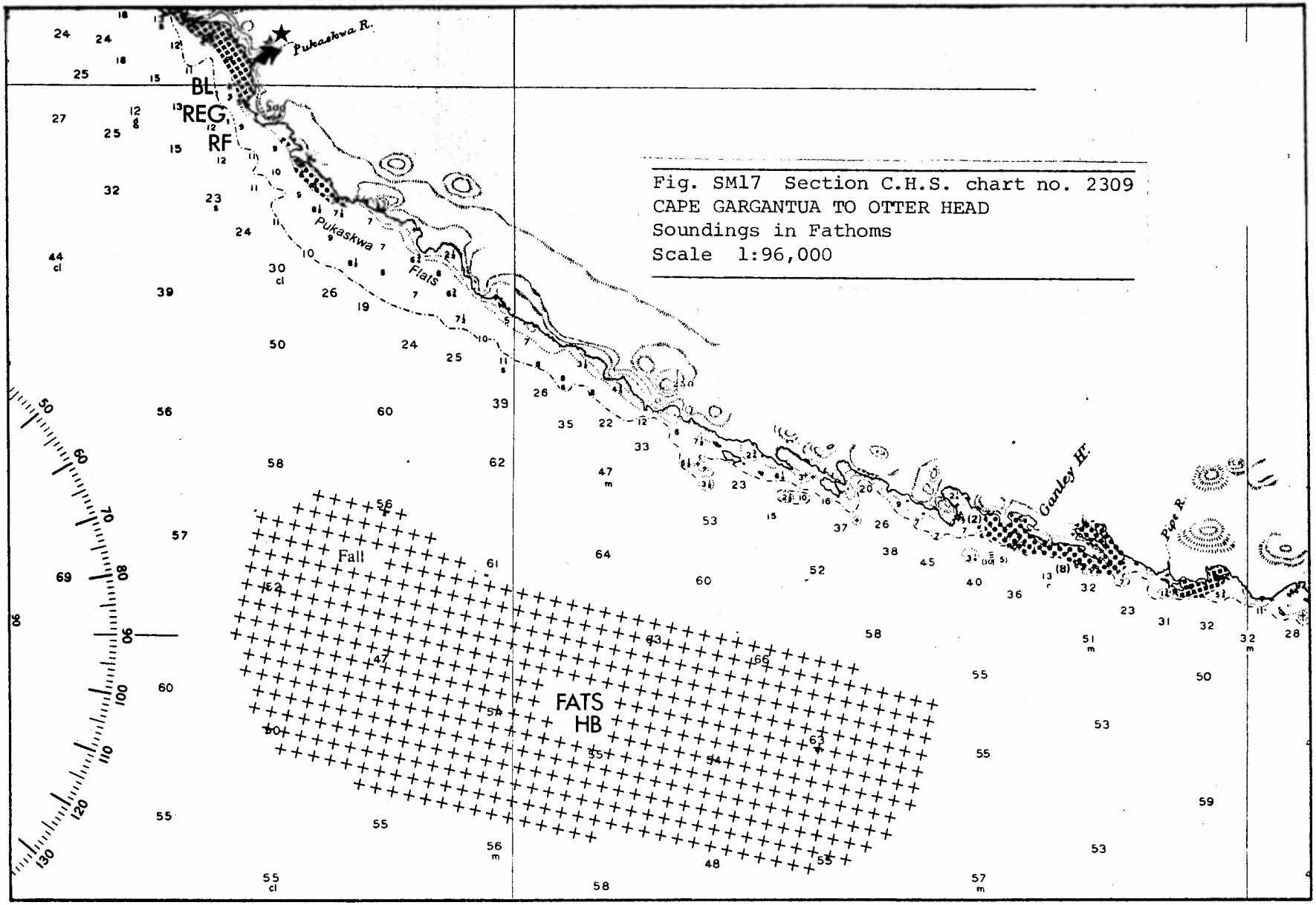


Fig. SM17 Section C.H.S. chart no. 2309
CAPE GARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000

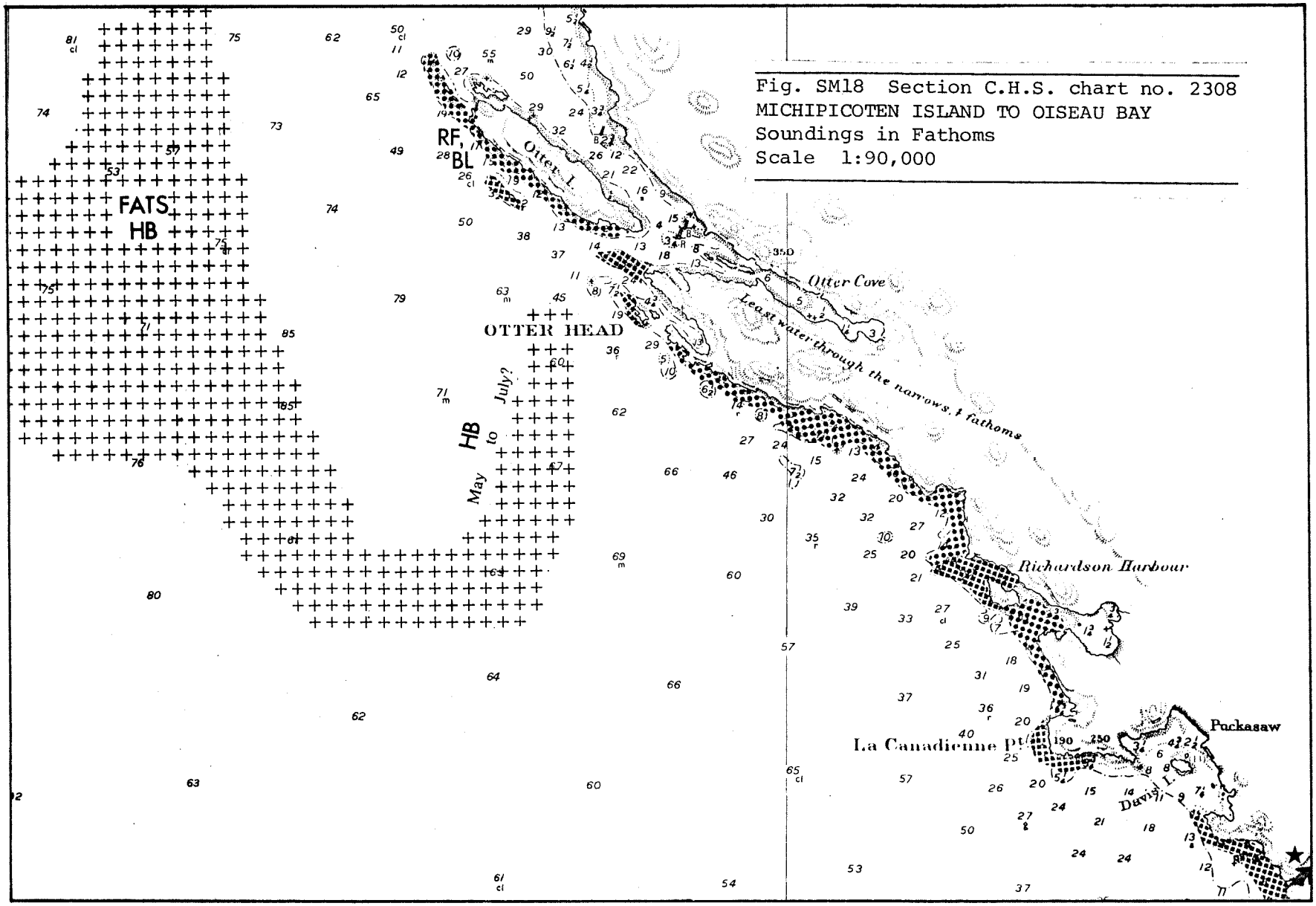


Fig. SM18 Section C.H.S. chart no. 2308
MICHIPICOTEN ISLAND TO OISEAU BAY
Soundings in Fathoms
Scale 1:90,000

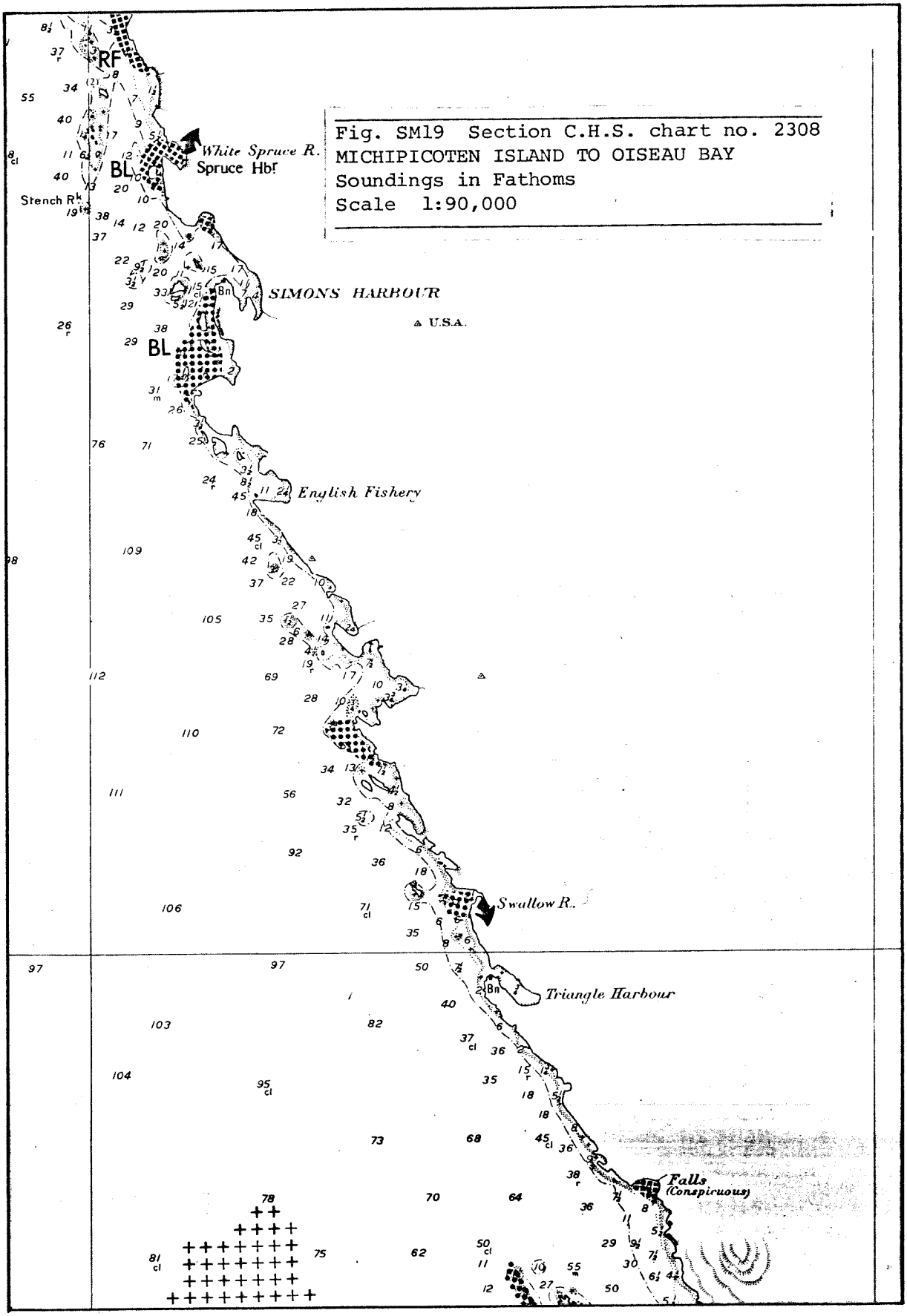


Fig. SM19 Section C.H.S. chart no. 2308
MICHIPICOTEN ISLAND TO OISEAU BAY
Soundings in Fathoms
Scale 1:90,000

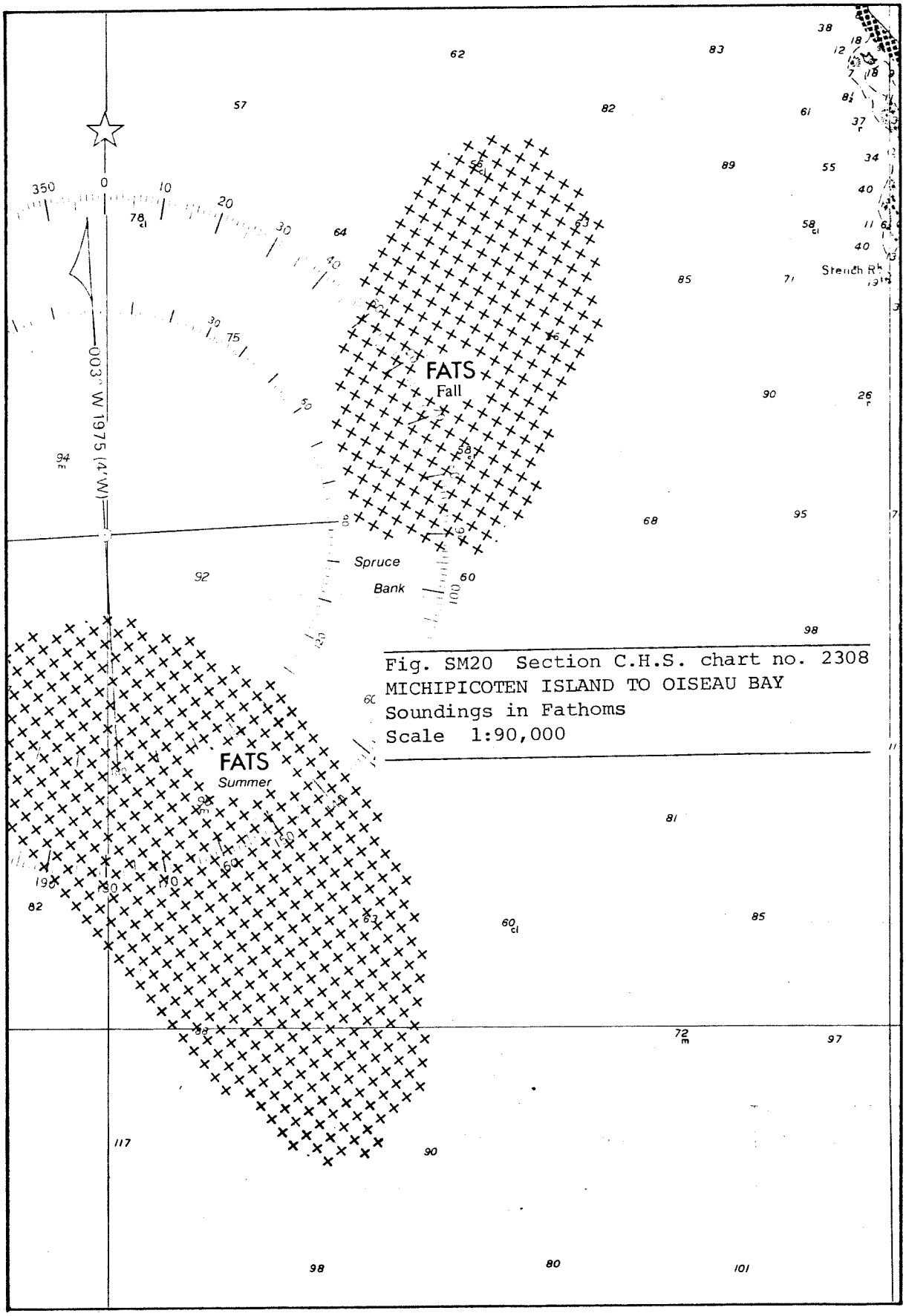


Fig. SM20 Section C.H.S. chart no. 2308
MICHIPICOTEN ISLAND TO OISEAU BAY
Soundings in Fathoms
Scale 1:90,000

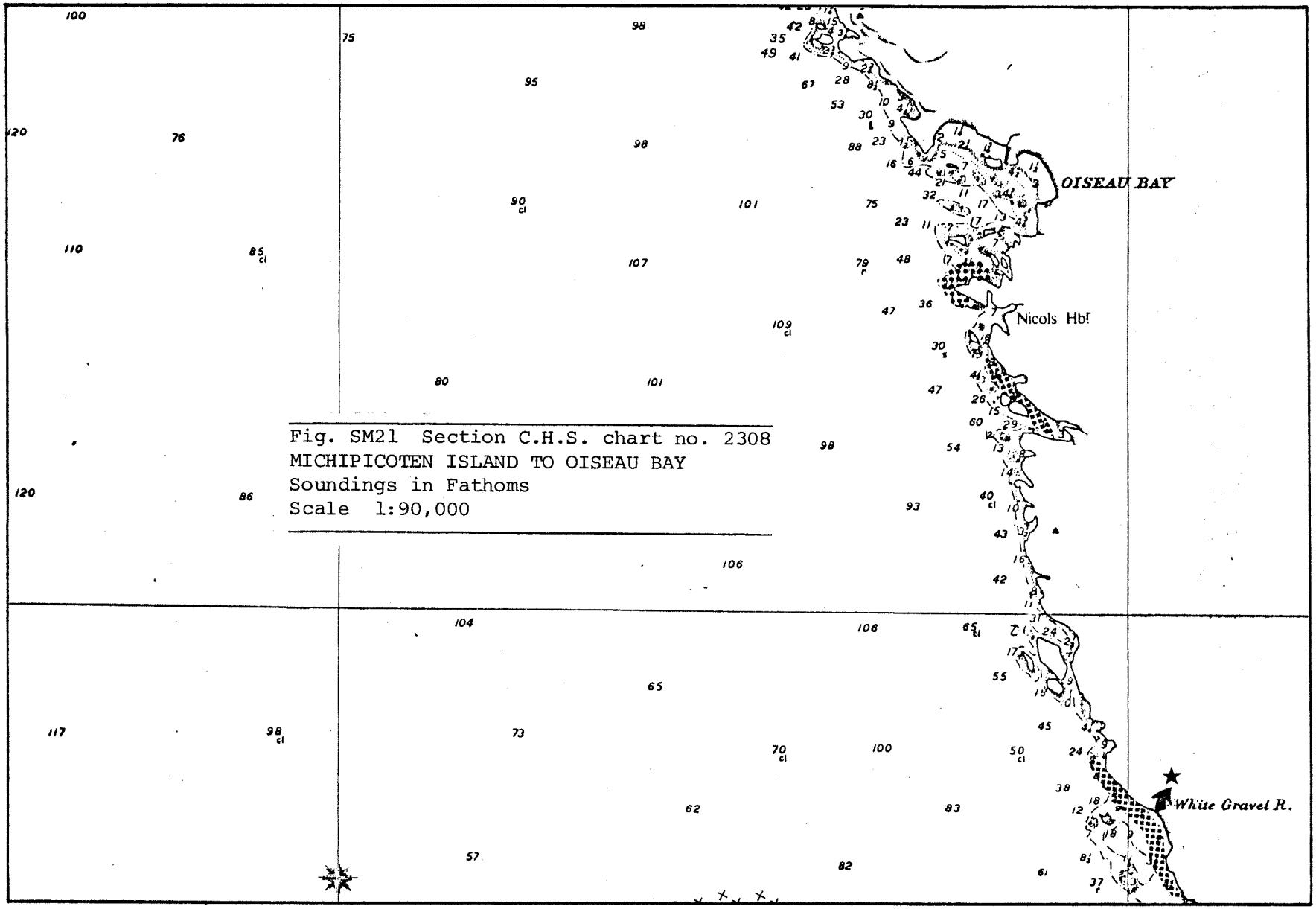


Fig. SM21 Section C.H.S. chart no. 2308
MICHIPICOTEN ISLAND TO OISEAU BAY
Soundings in Fathoms
Scale 1:90,000

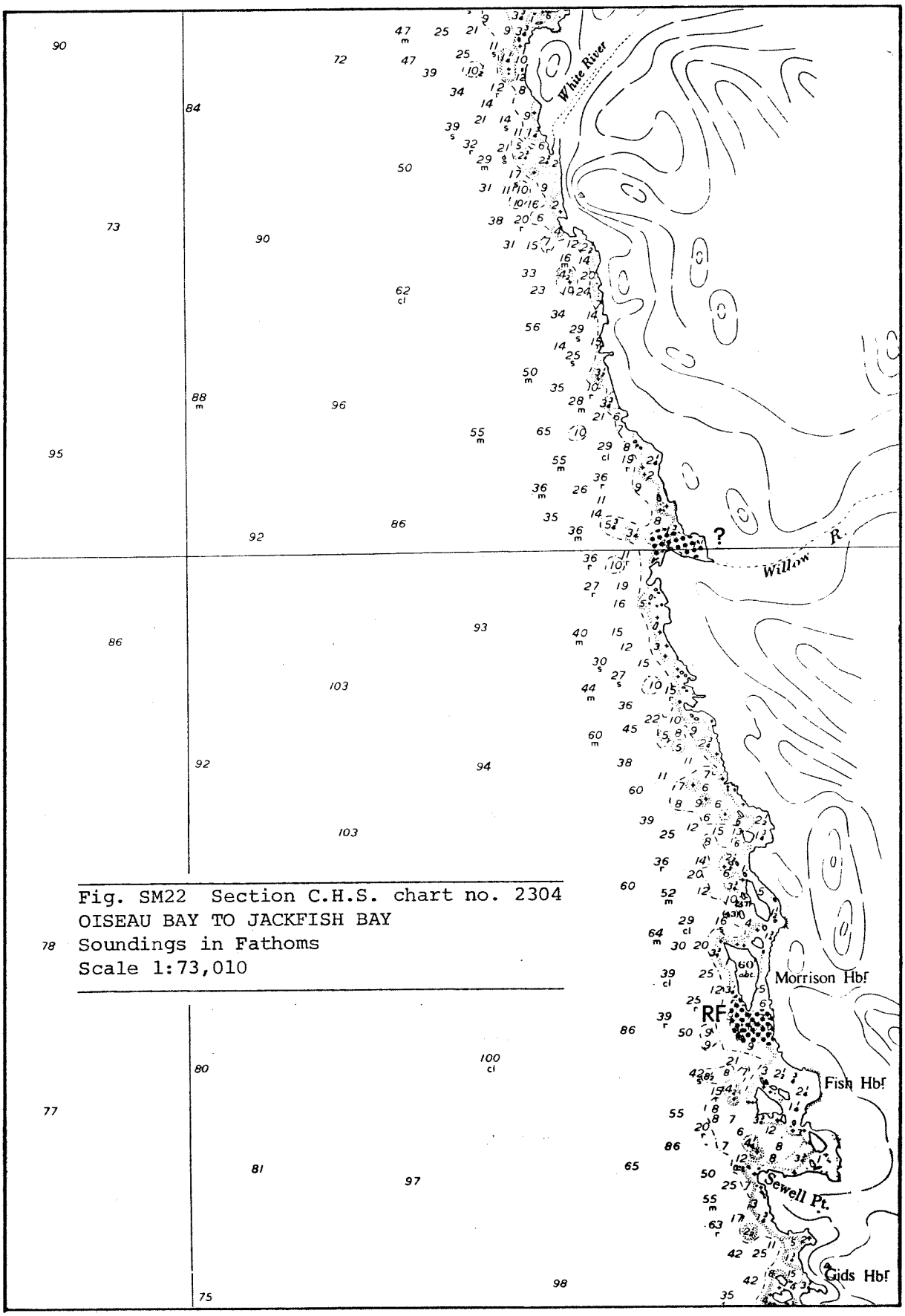


Fig. SM22 Section C.H.S. chart no. 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010

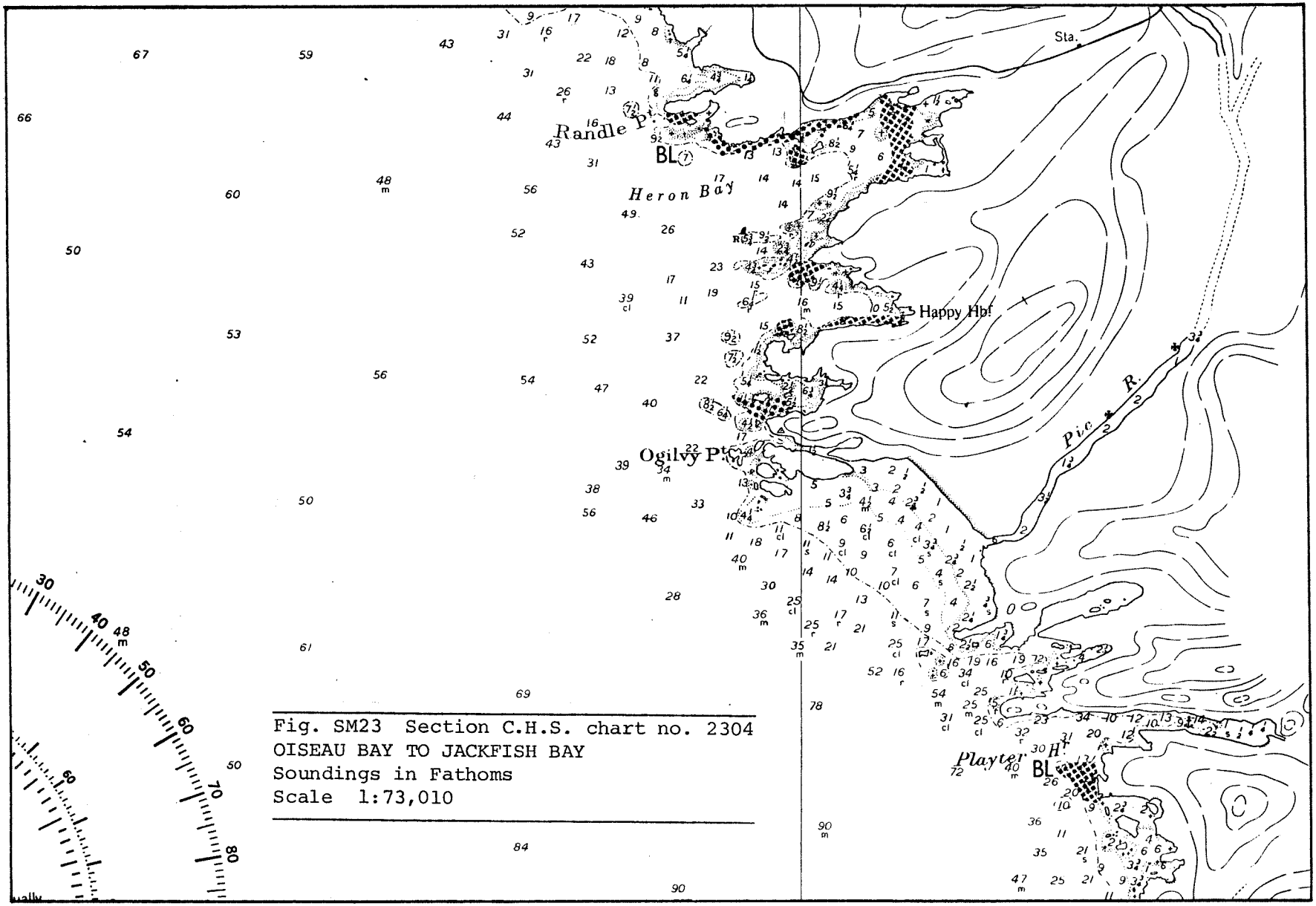


Fig. SM23 Section C.H.S. chart no. 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010

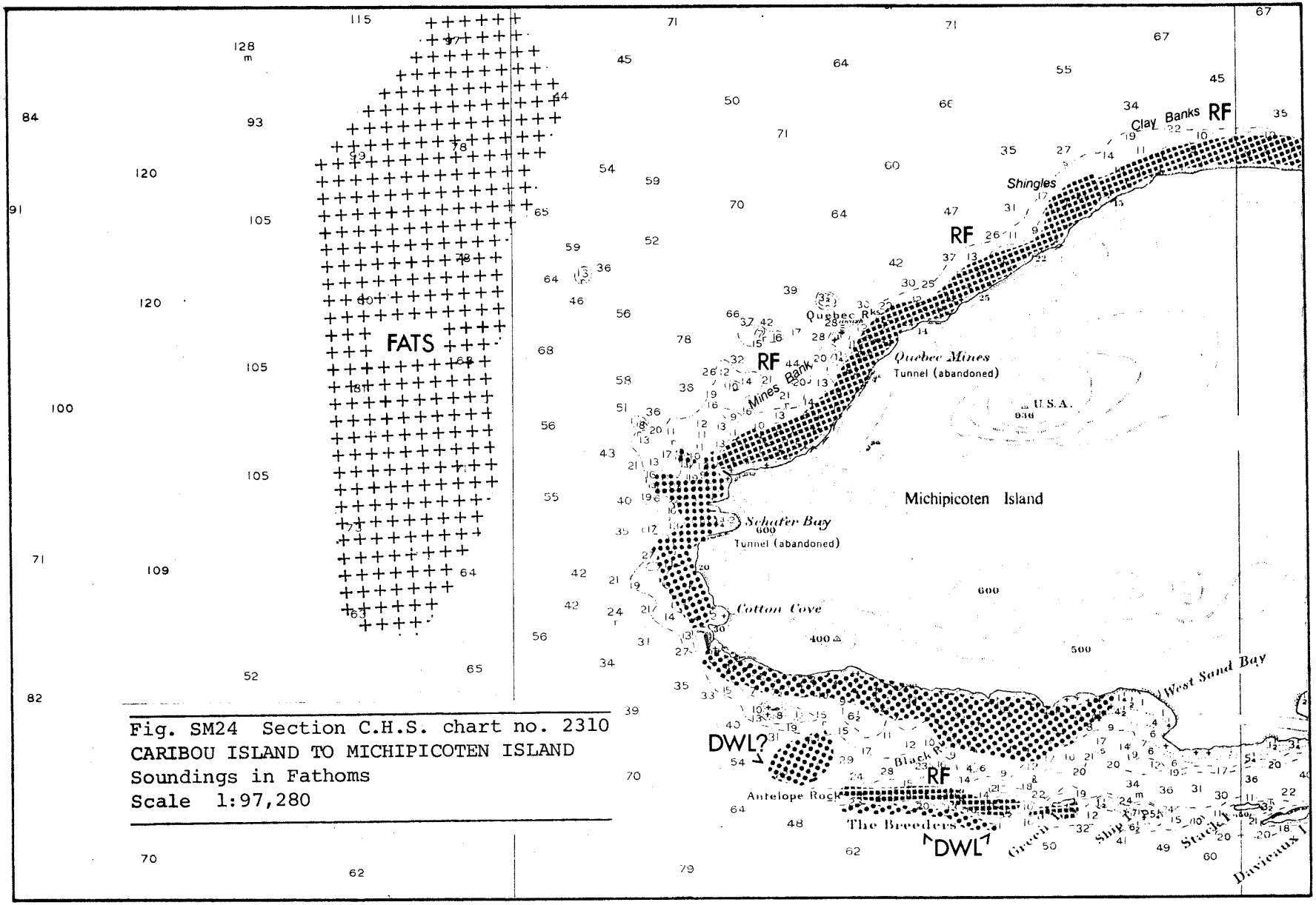


Fig. SM24 Section C.H.S. chart no. 2310
CARIBOU ISLAND TO MICHIPICOTEN ISLAND
Soundings in Fathoms
Scale 1:97,280

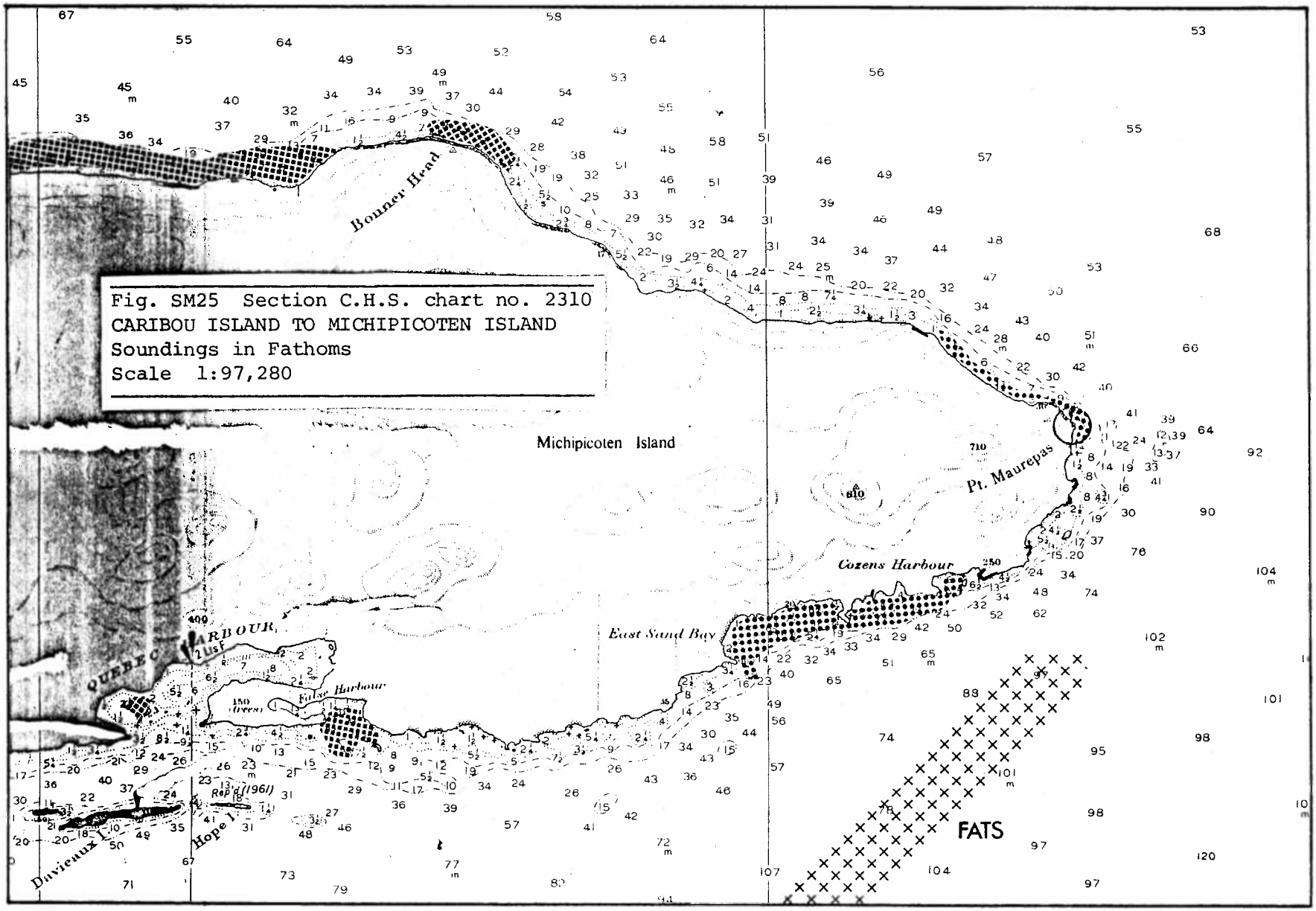


Fig. SM25 Section C.H.S. chart no. 2310
CARIBOU ISLAND TO MICHIPICOTEN ISLAND
Soundings in Fathoms
Scale 1:97,280

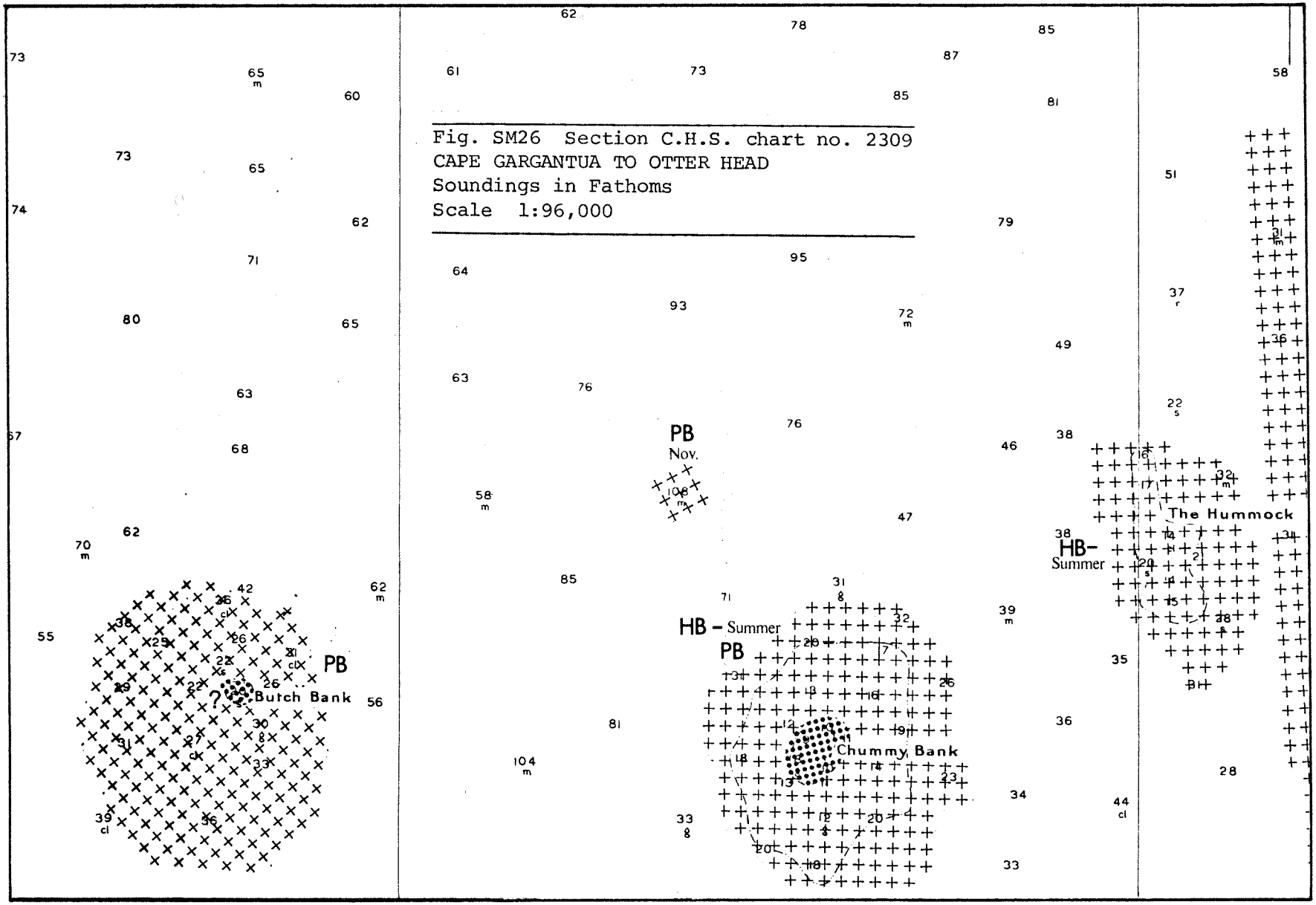


Fig. SM26 Section C.H.S. chart no. 2309
CAPE GARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000

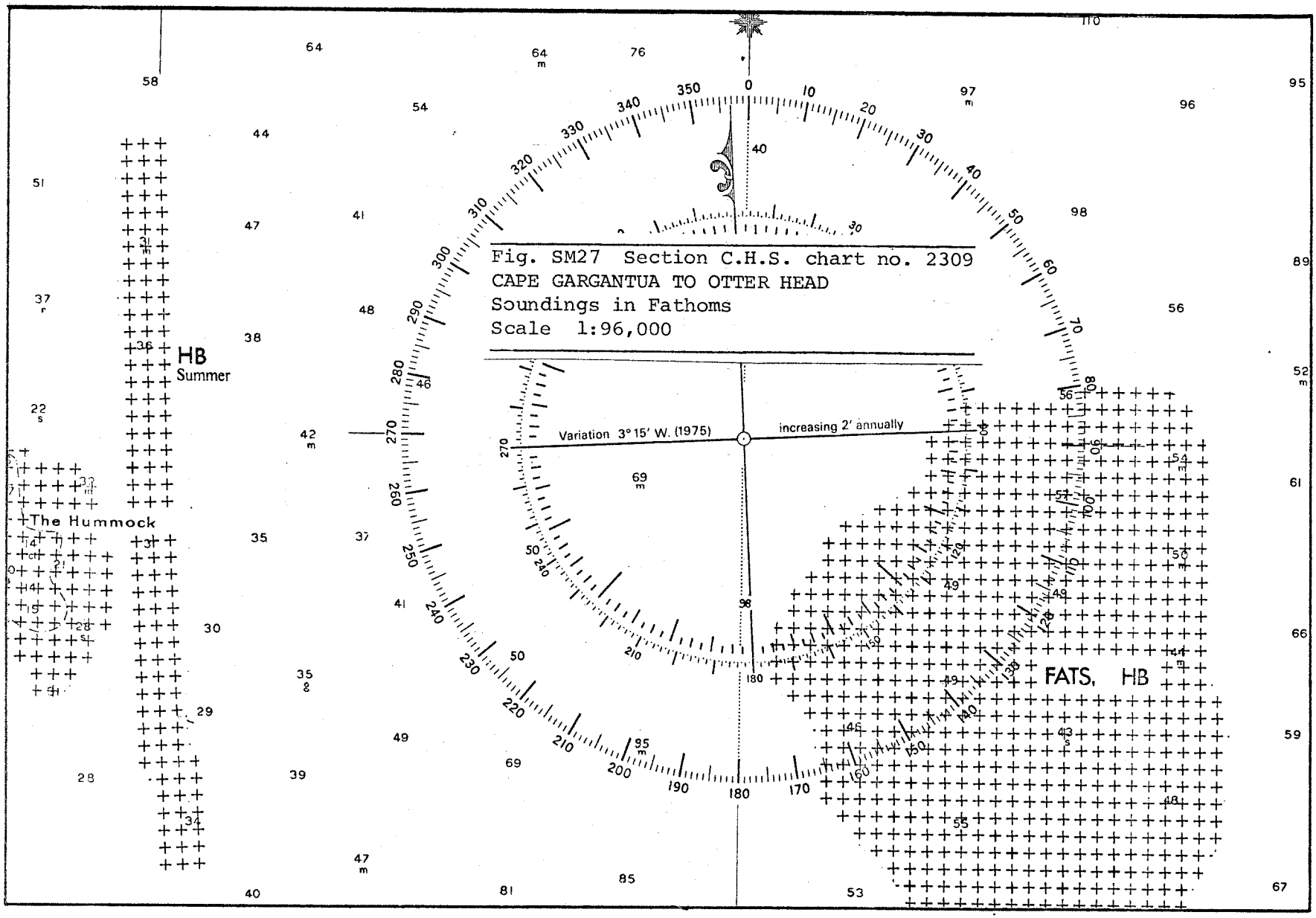


Fig. SM27 Section C.H.S. chart no. 2309
CAPE GARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000

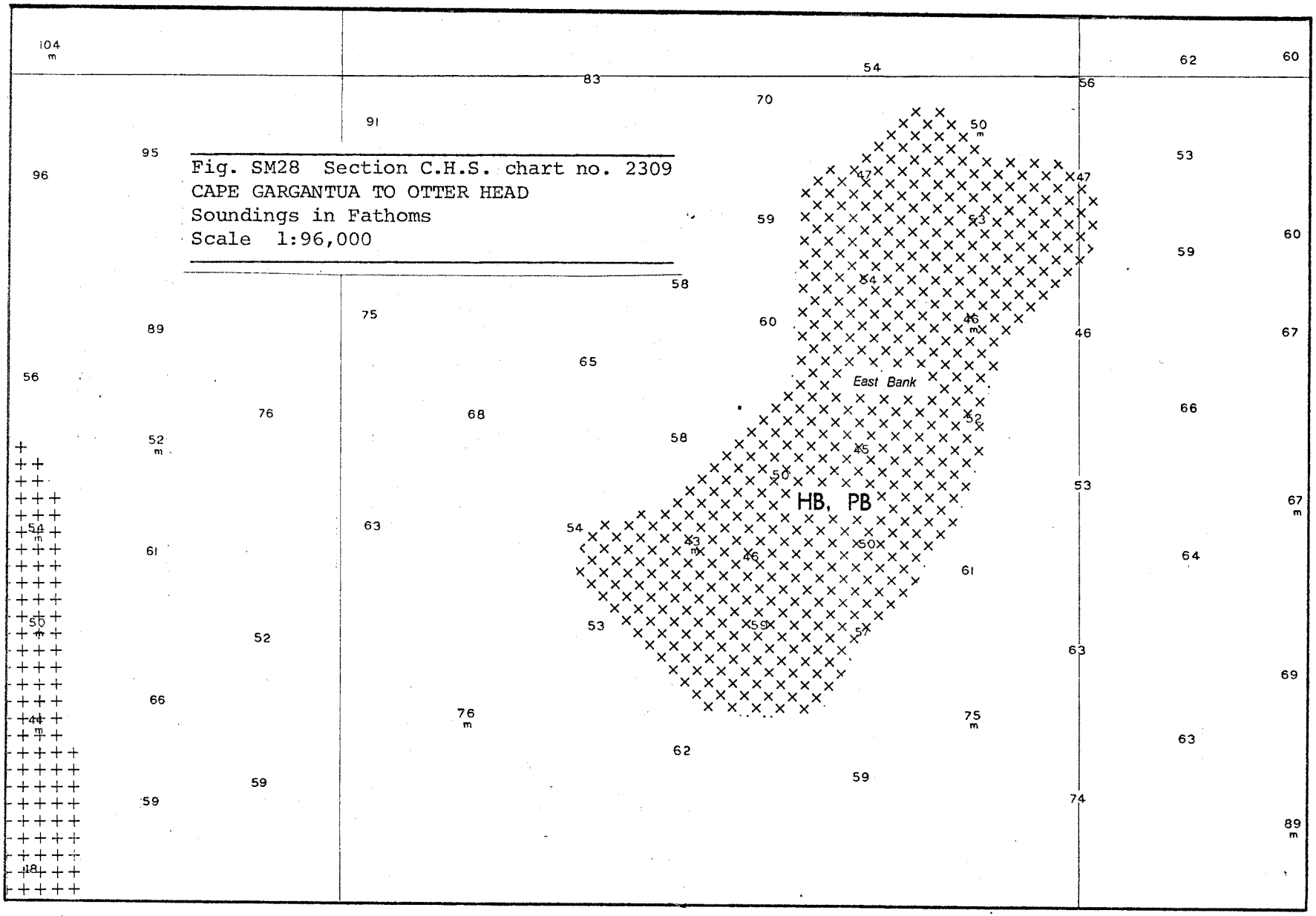


Fig. SM28 Section C.H.S. chart no. 2309
CAPE GARGANTUA TO OTTER HEAD
Soundings in Fathoms
Scale 1:96,000

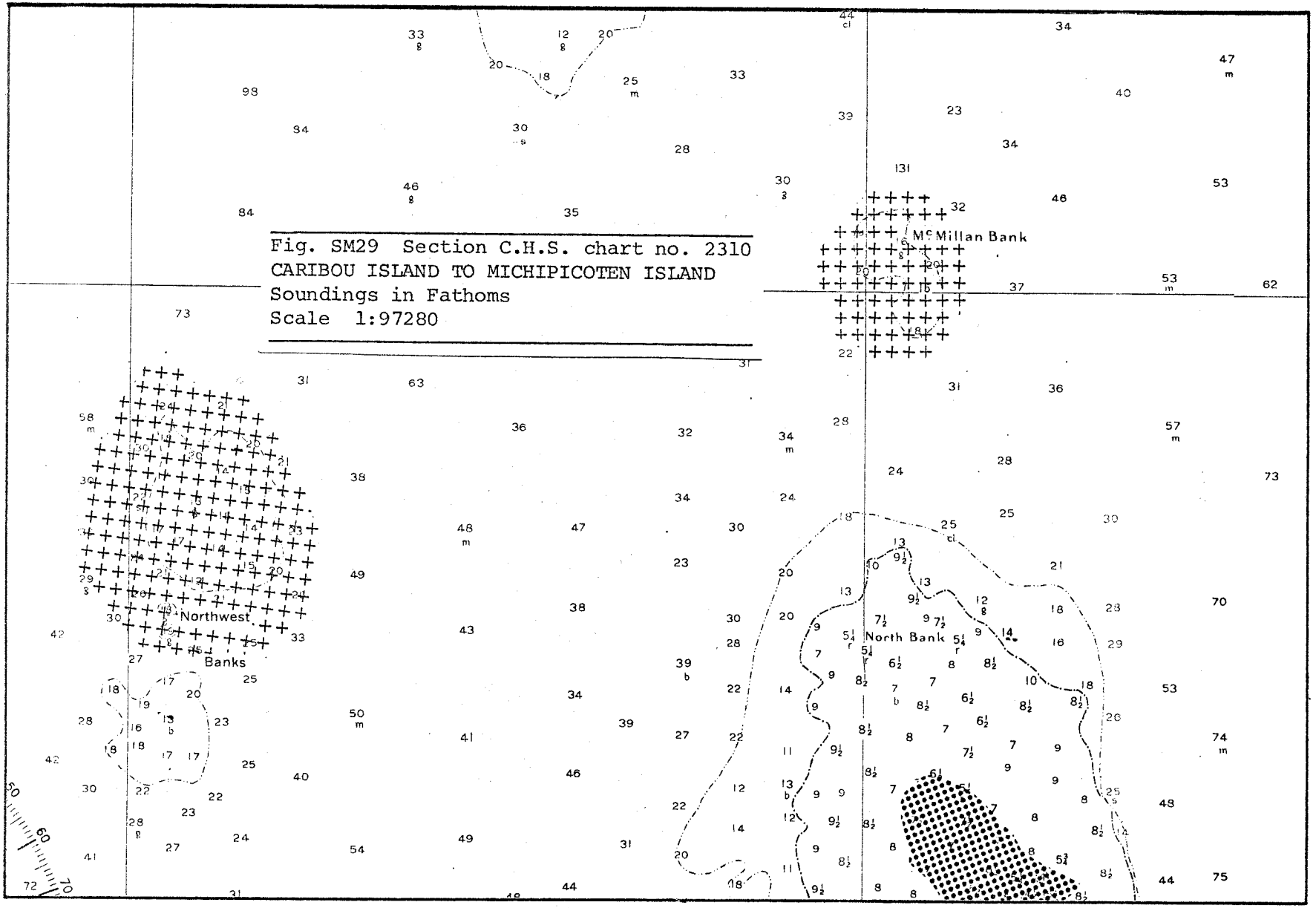


Fig. SM29 Section C.H.S. chart no. 2310
CARIBOU ISLAND TO MICHIPICOTEN ISLAND
Soundings in Fathoms
Scale 1:97280

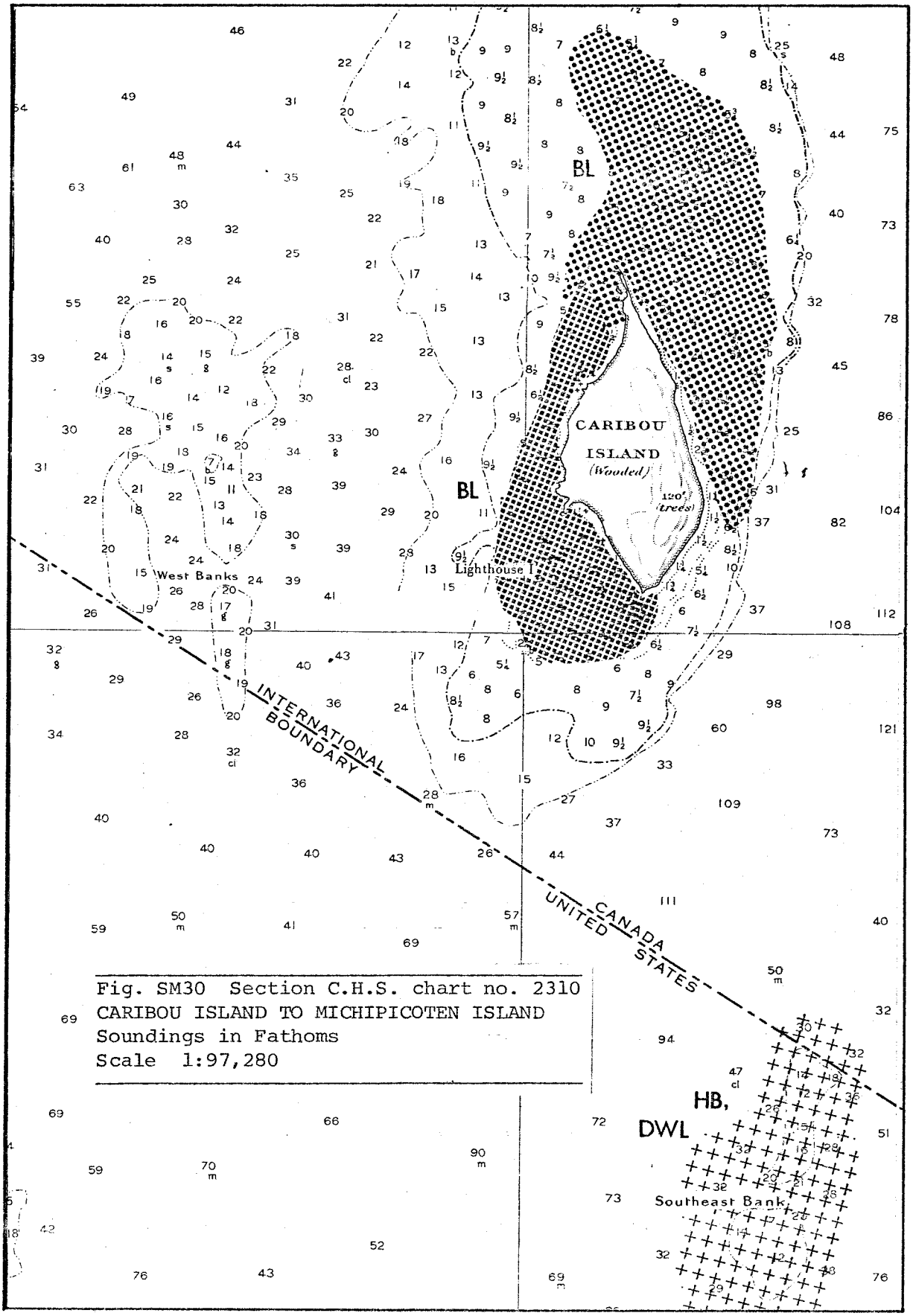
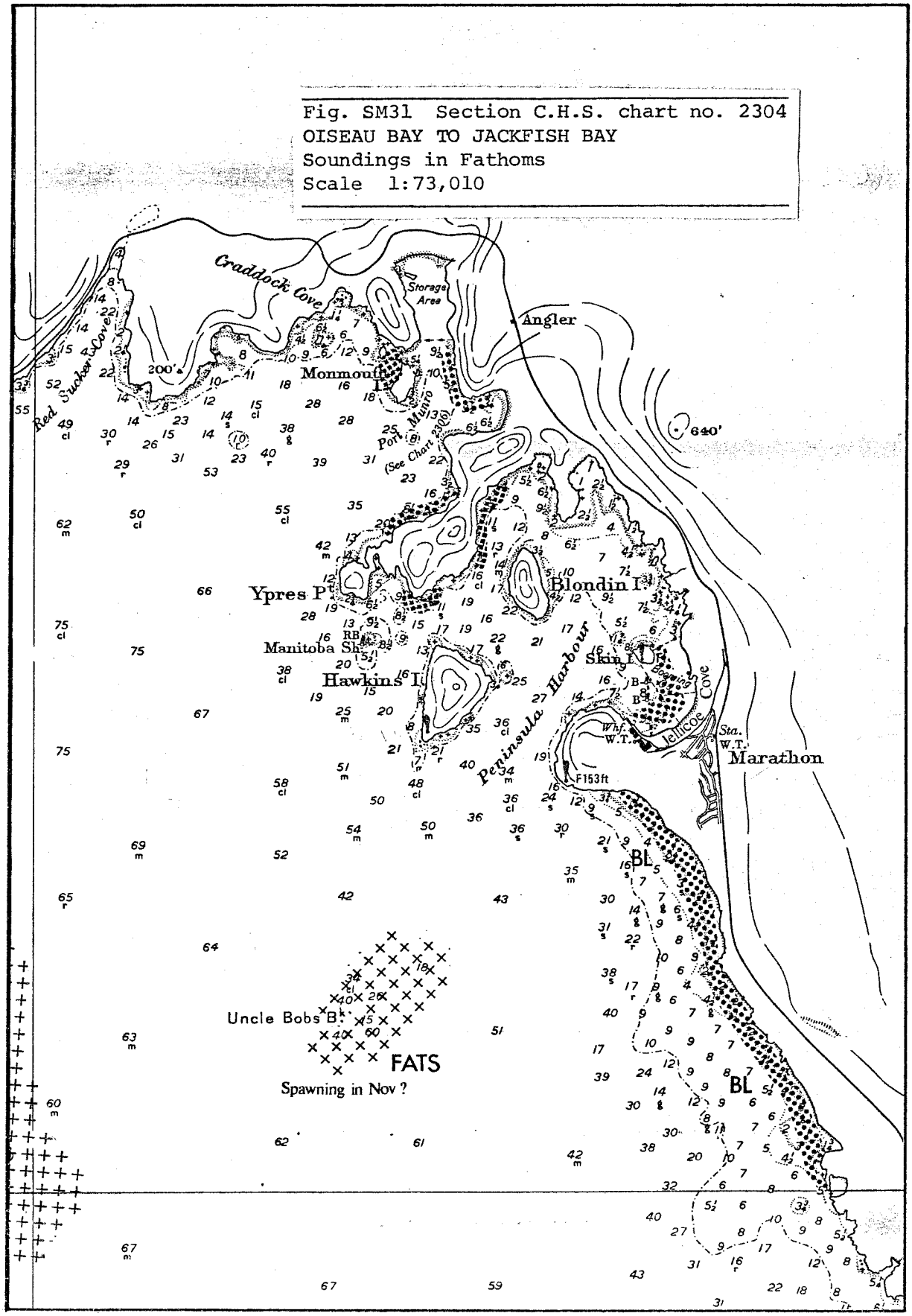


Fig. SM30 Section C.H.S. chart no. 2310
CARIBOU ISLAND TO MICHIPICOTEN ISLAND
Soundings in Fathoms
Scale 1:97,280

Fig. SM31 Section C.H.S. chart no. 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010



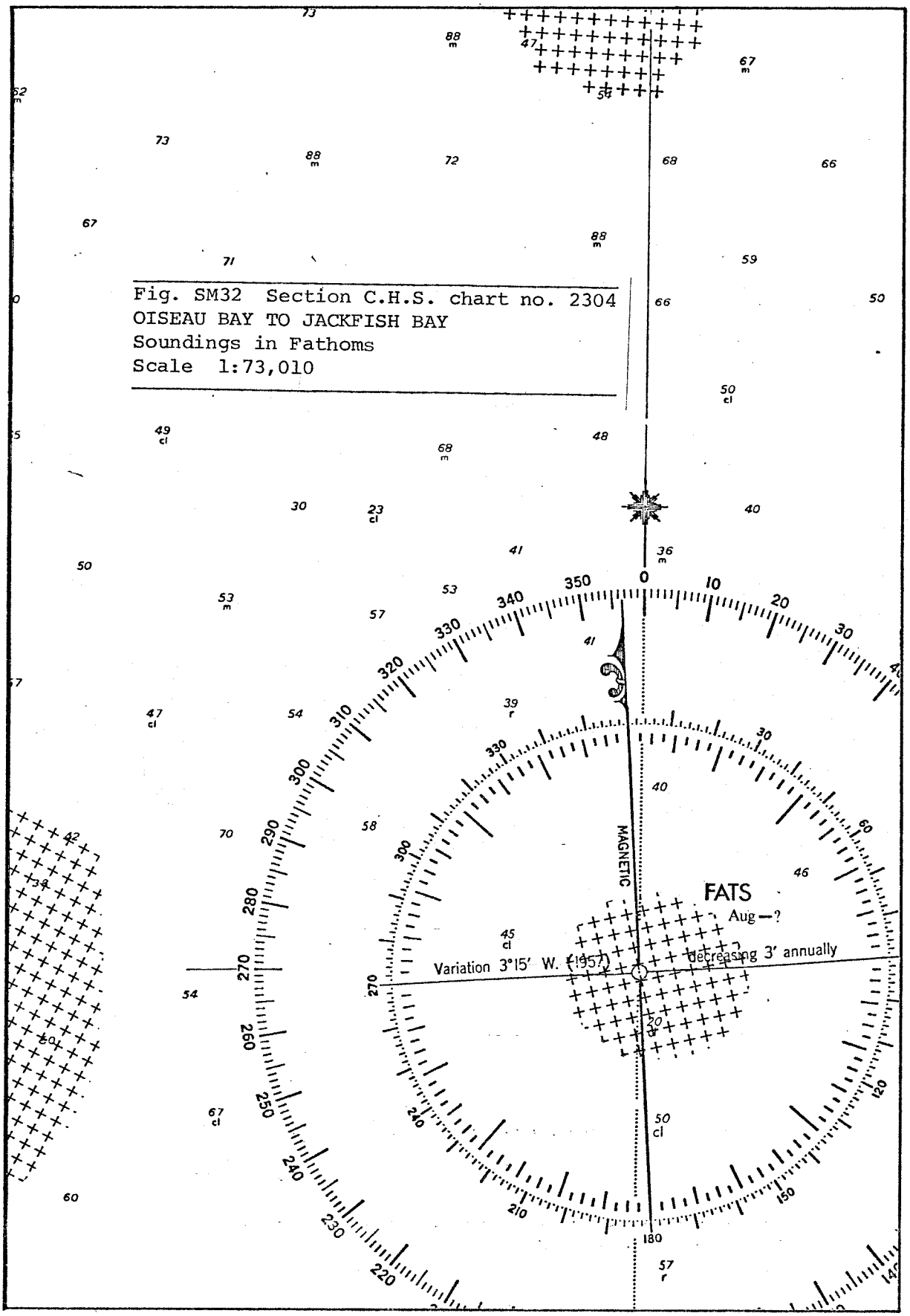


Fig. SM32 Section C.H.S. chart no. 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010

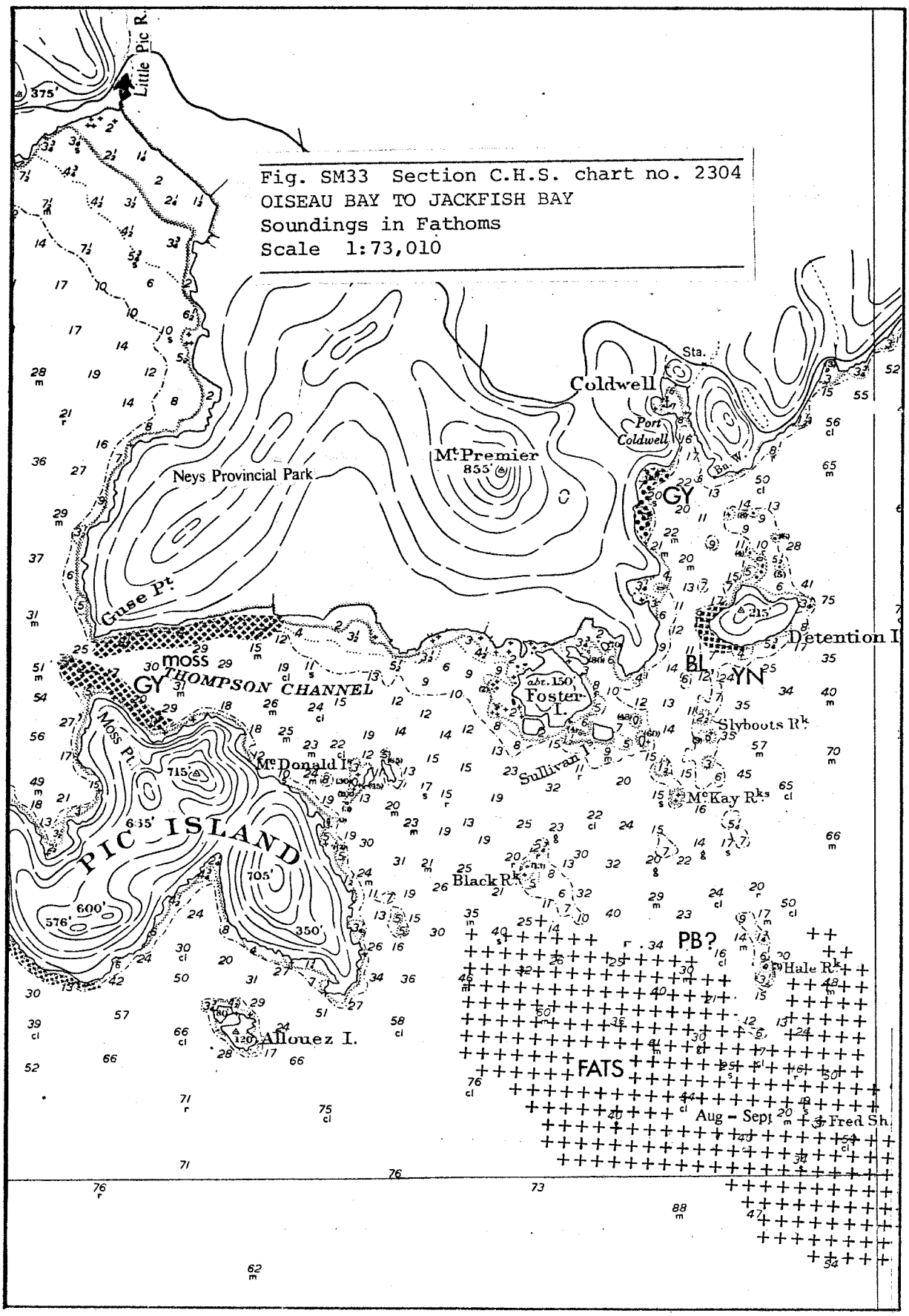


Fig. SM33 Section C.H.S. chart no. 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010

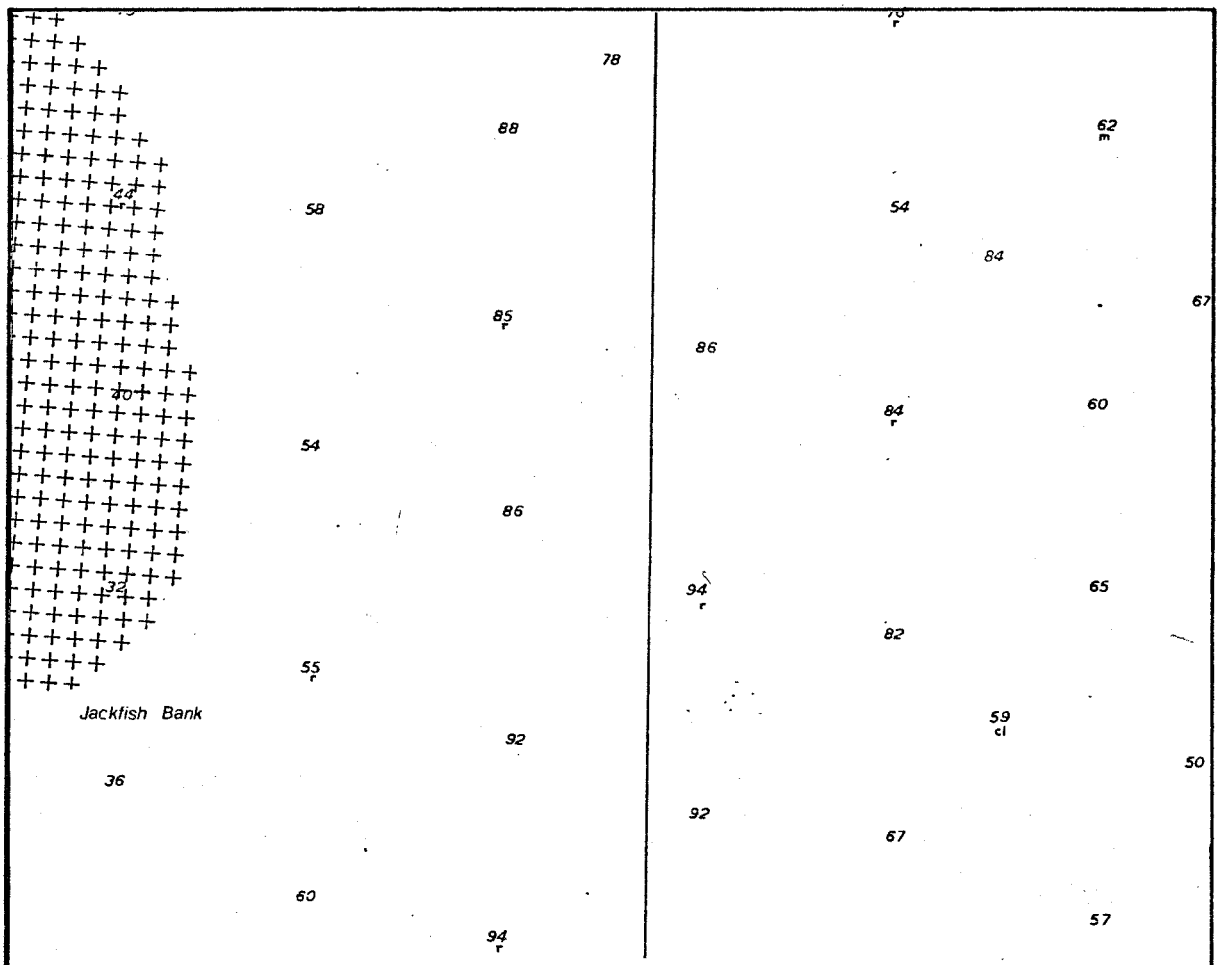
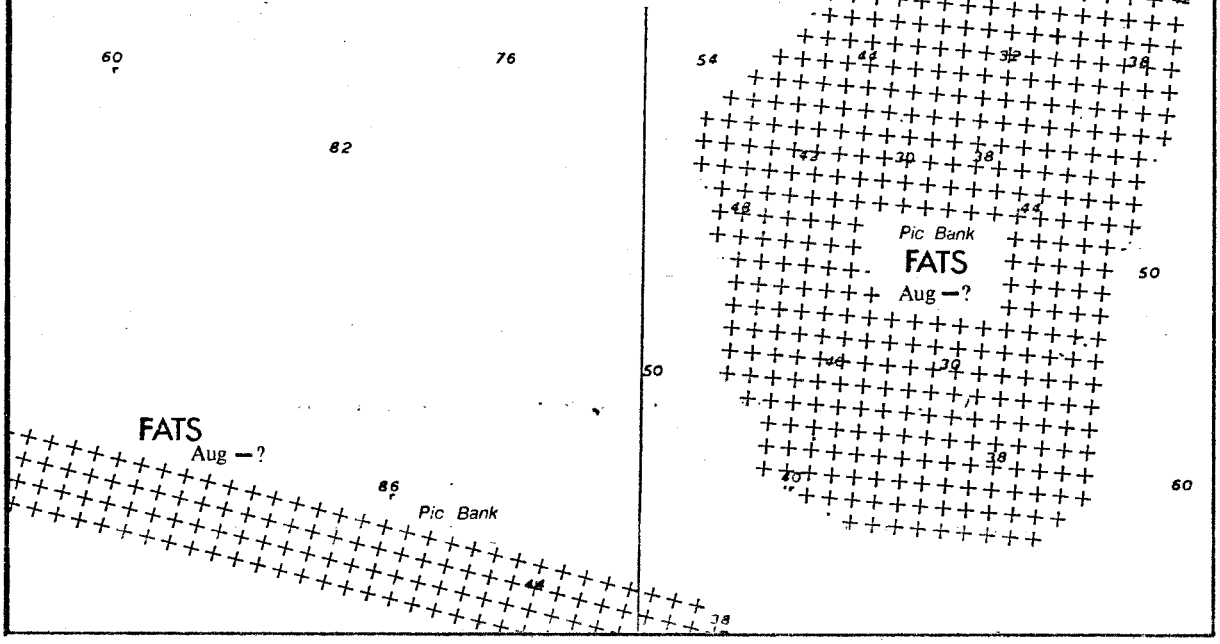


Fig. SM34 Section C.H.S. chart no. 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010



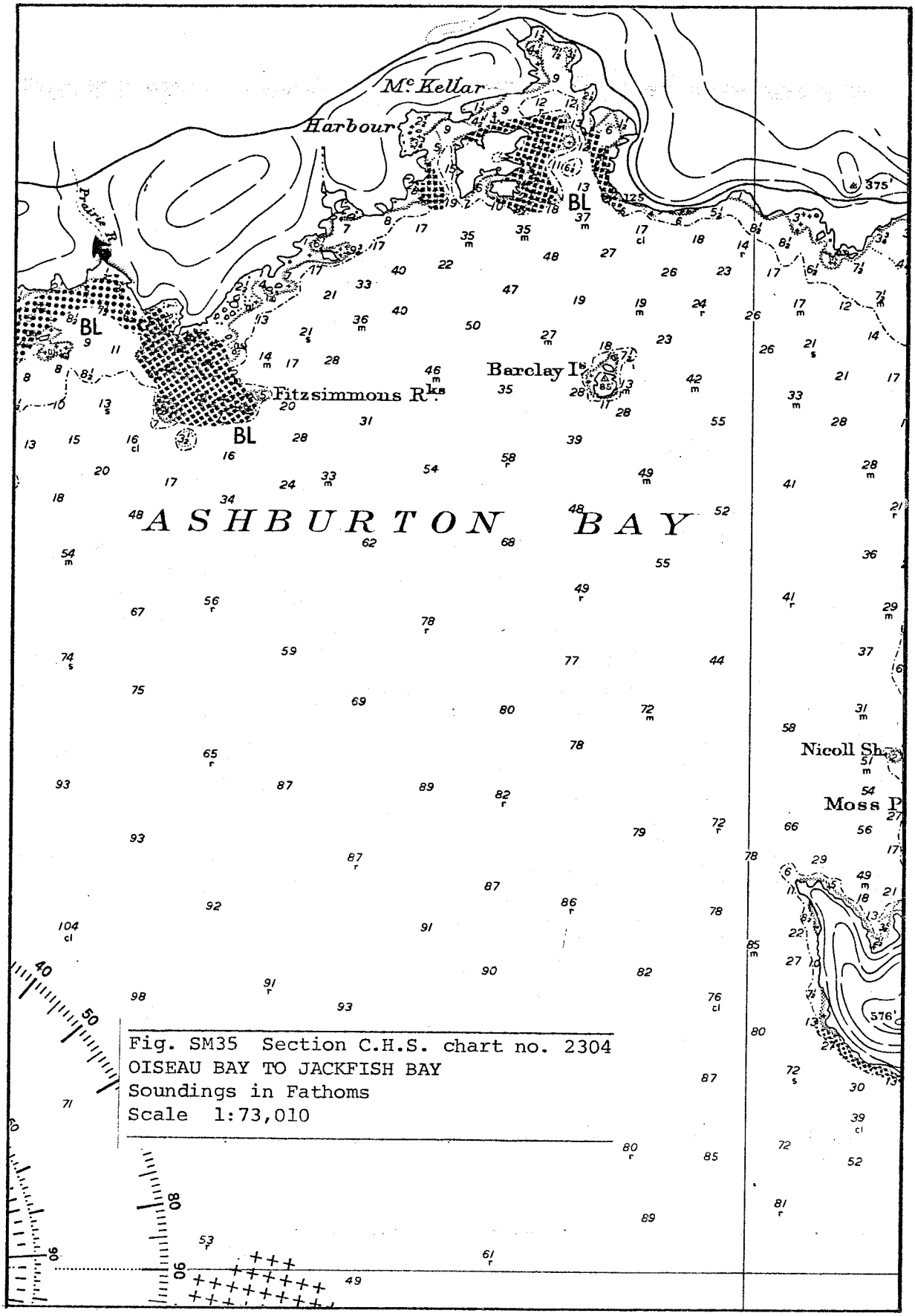


Fig. SM35 Section C.H.S. chart no. 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010

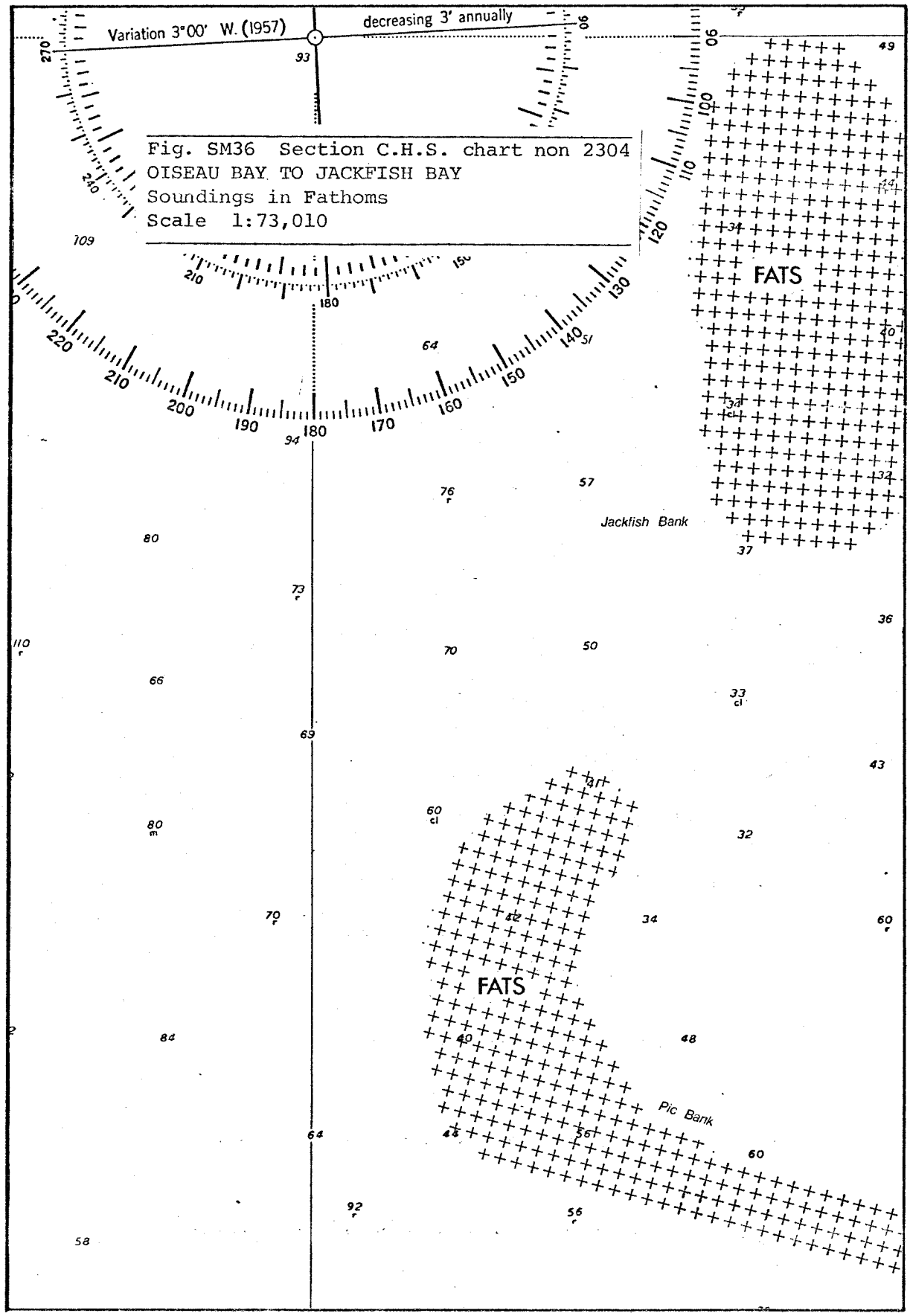


Fig. SM36 Section C.H.S. chart non 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010

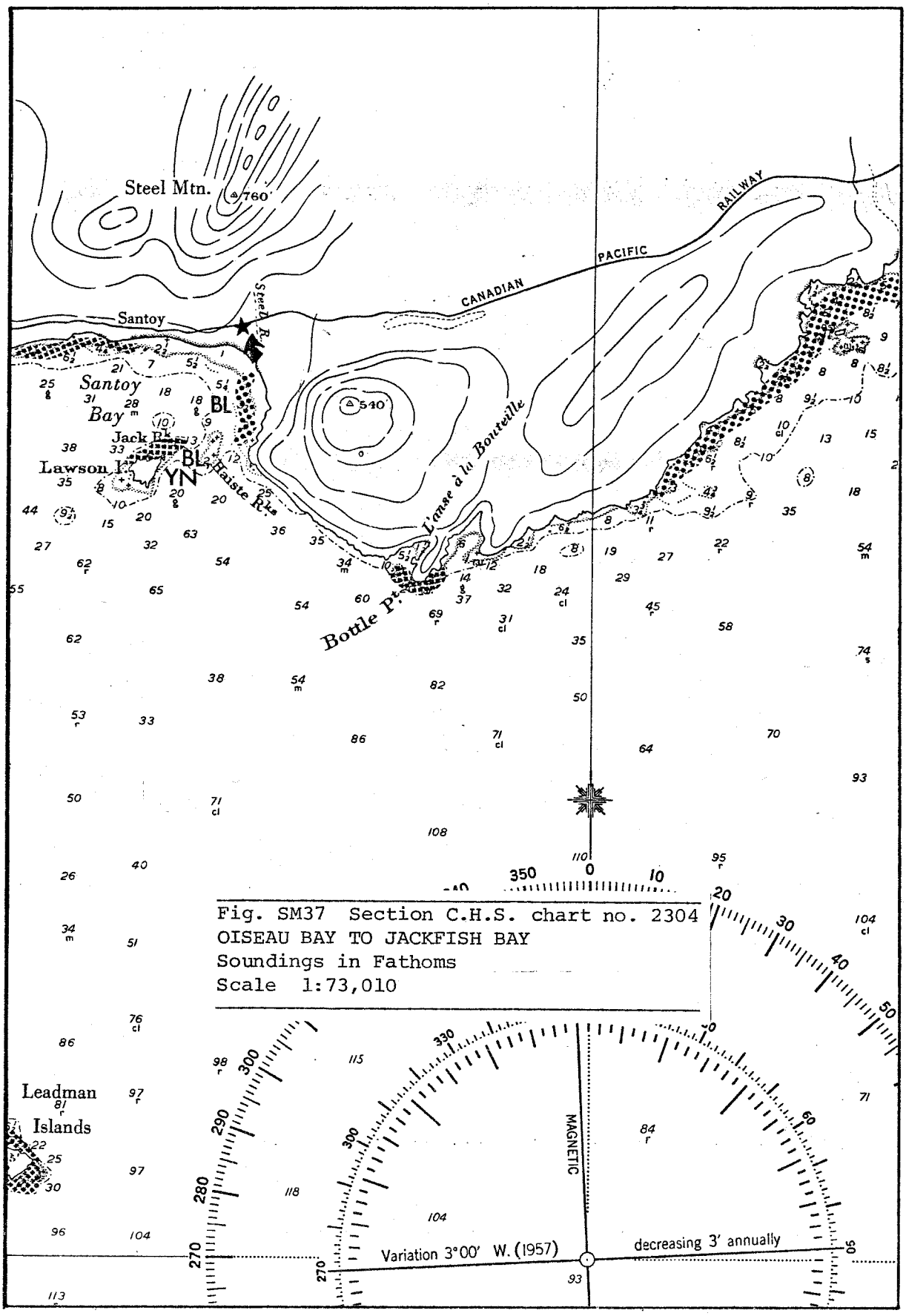


Fig. SM37 Section C.H.S. chart no. 2304
OISEAU BAY TO JACKFISH BAY
Soundings in Fathoms
Scale 1:73,010

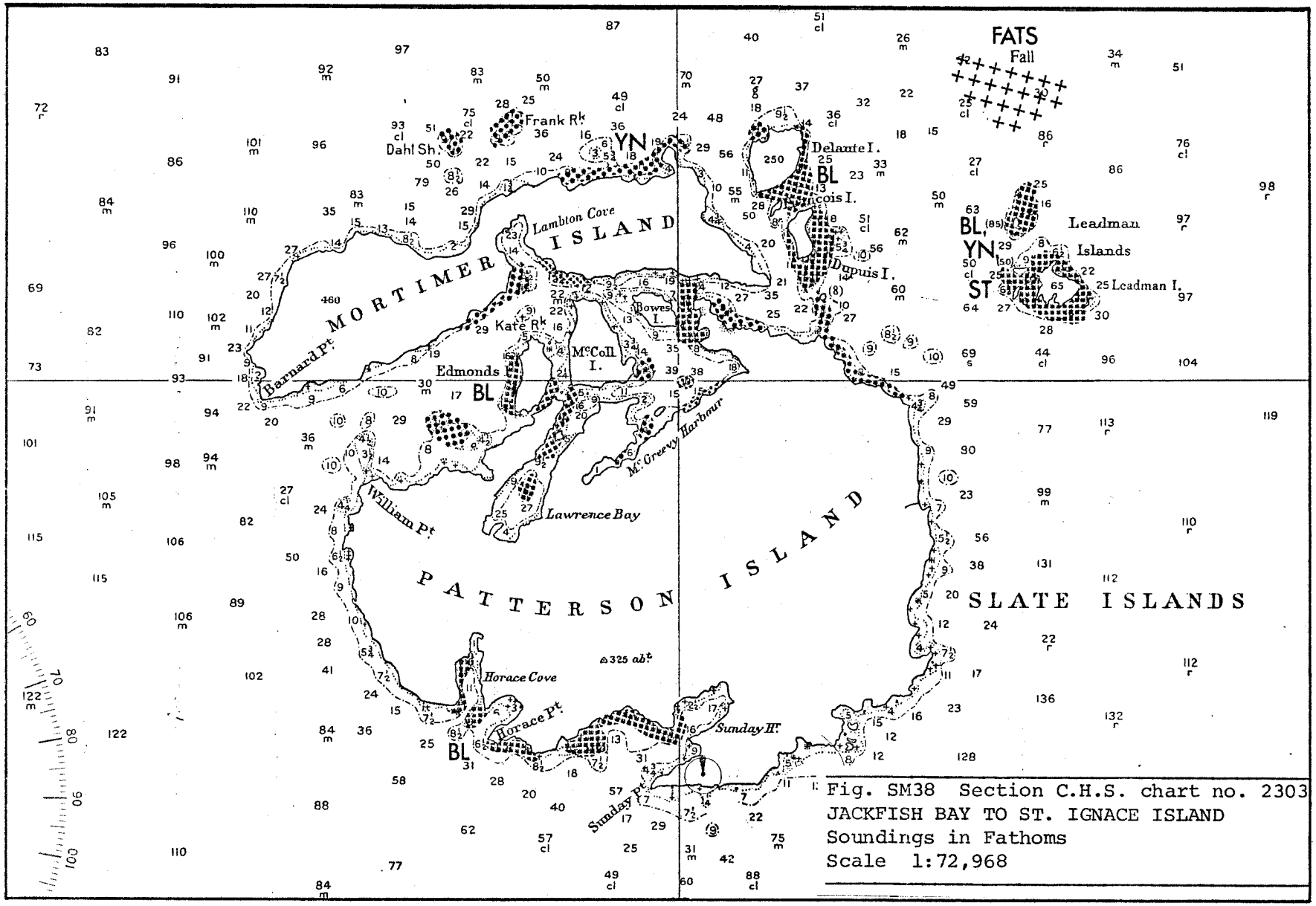


Fig. SM38 Section C.H.S. chart no. 2303
JACKFISH BAY TO ST. IGNACE ISLAND
Soundings in Fathoms
Scale 1:72,968

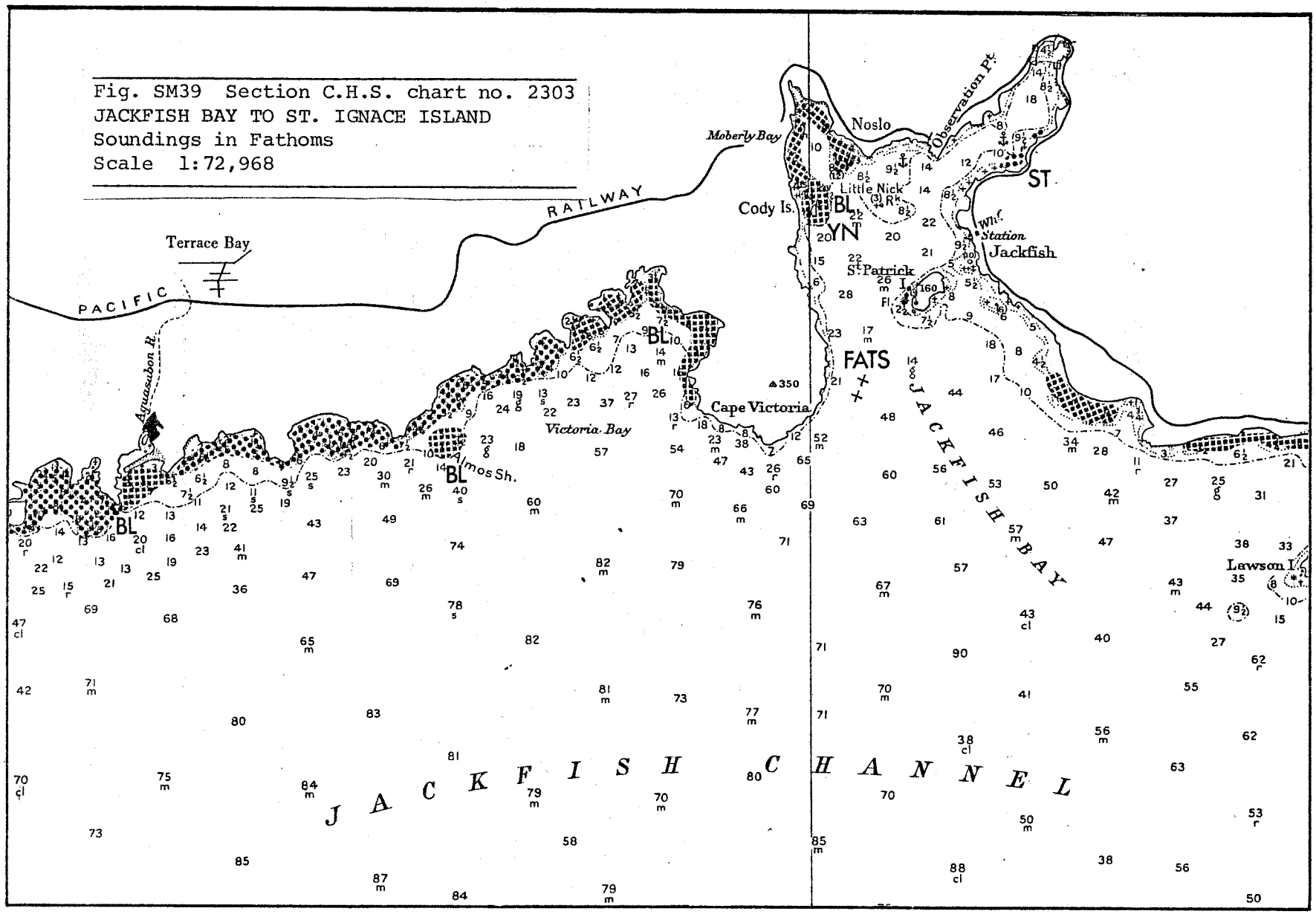


Fig. SM39 Section C.H.S. chart no. 2303
JACKFISH BAY TO ST. IGNACE ISLAND
Soundings in Fathoms
Scale 1:72,968

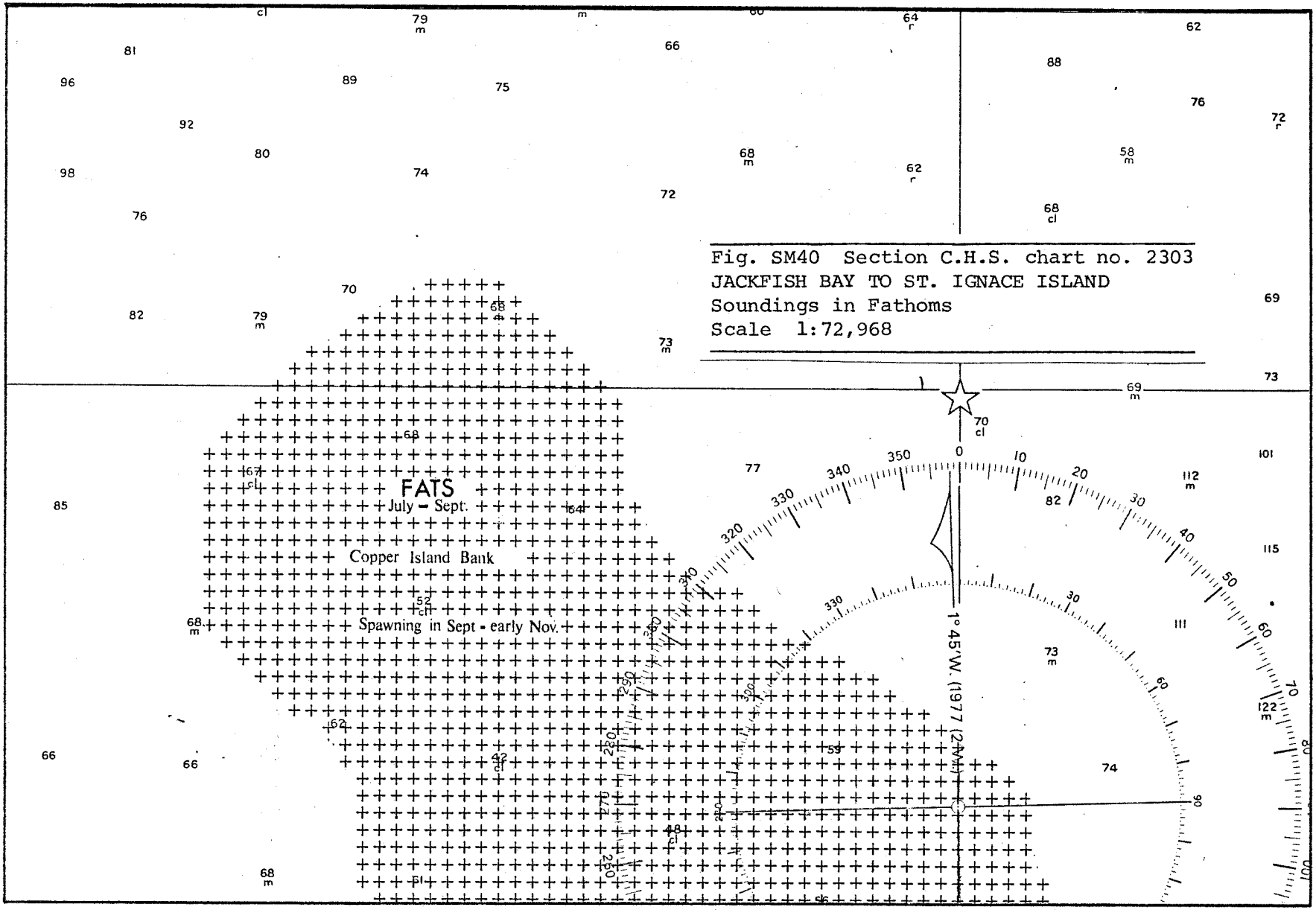


Fig. SM40 Section C.H.S. chart no. 2303
JACKFISH BAY TO ST. IGNACE ISLAND
Soundings in Fathoms
Scale 1:72,968

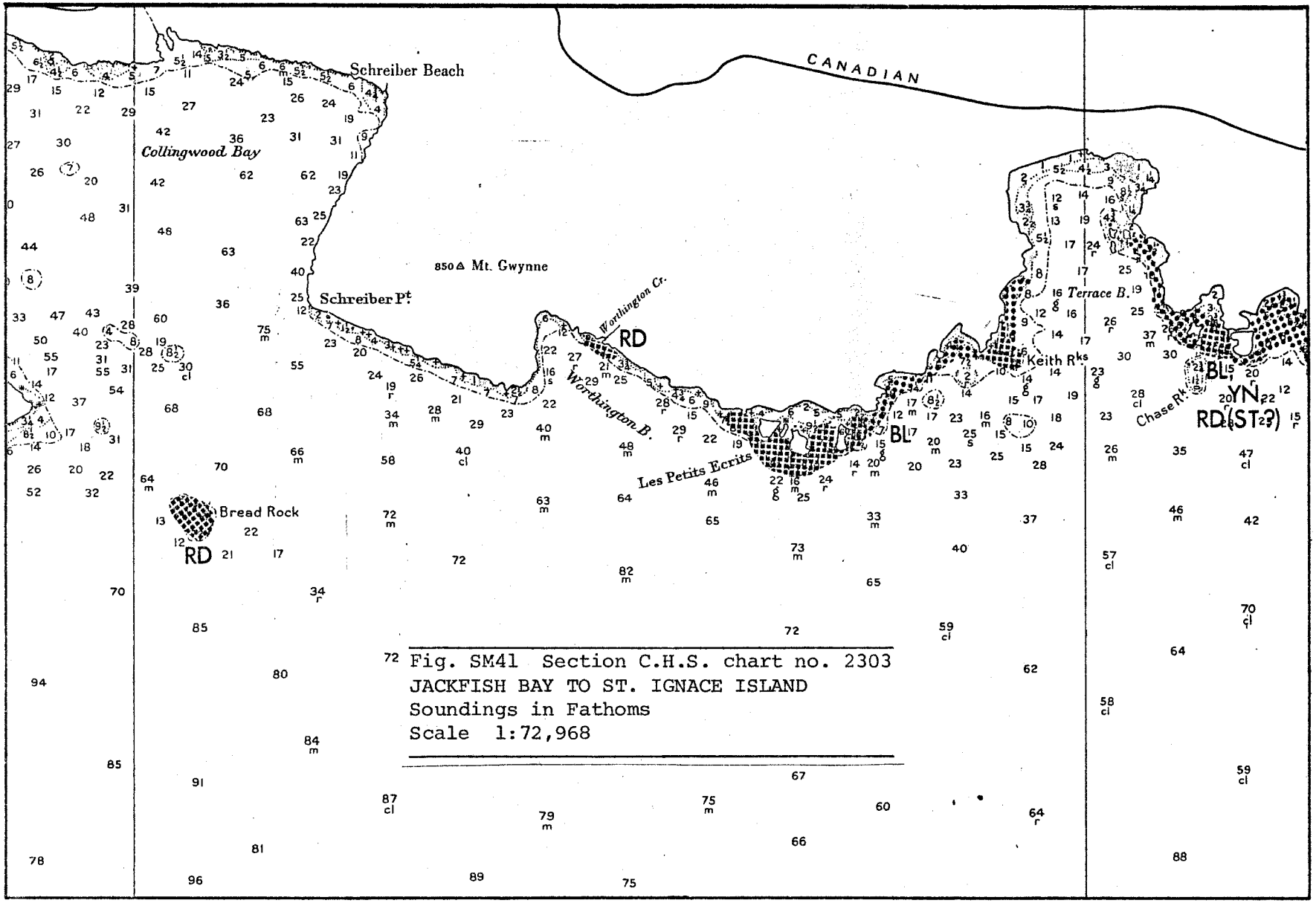


Fig. SM41 Section C.H.S. chart no. 2303
JACKFISH BAY TO ST. IGNACE ISLAND
Soundings in Fathoms
Scale 1:72,968

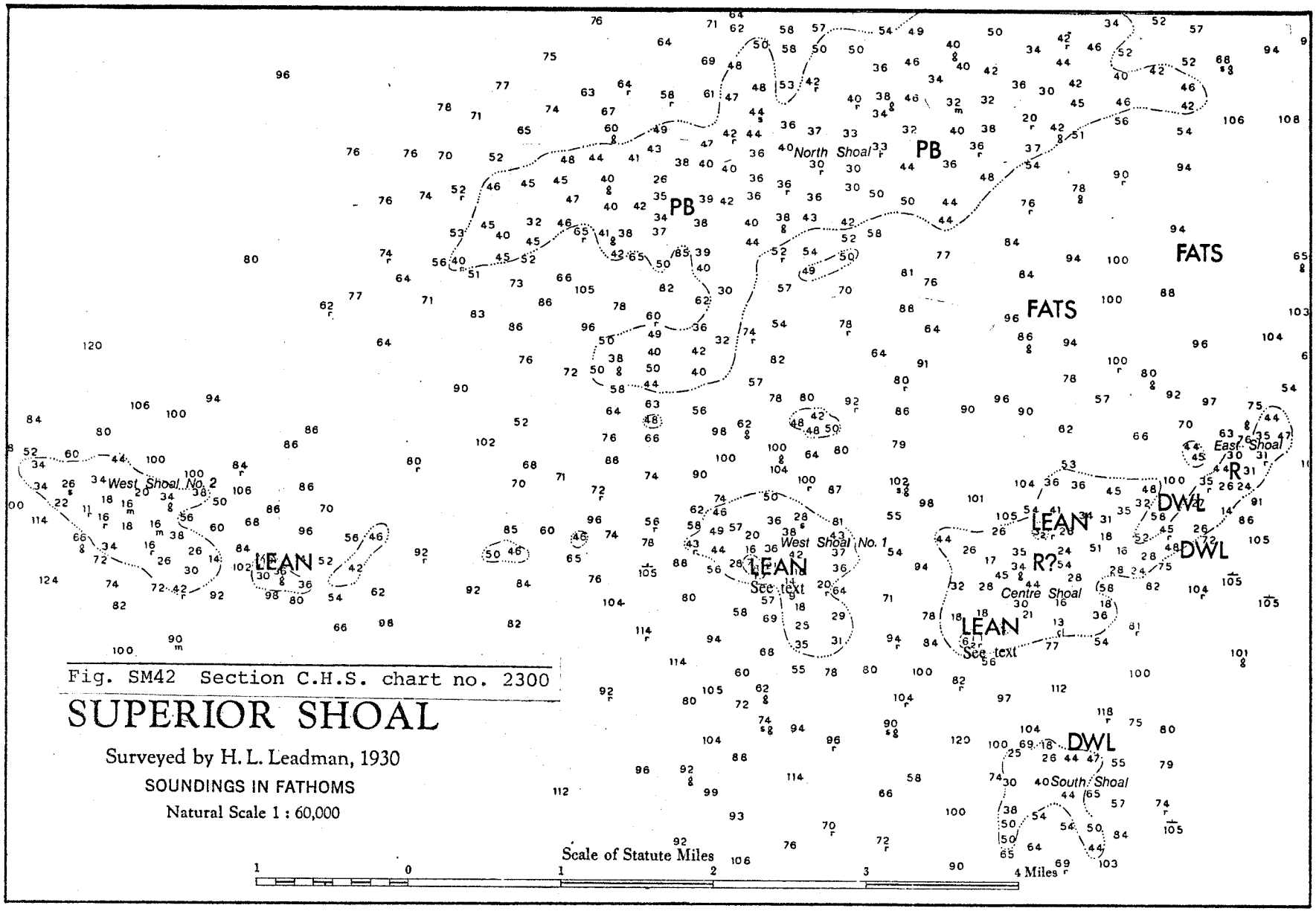


Fig. SM42 Section C.H.S. chart no. 2300

SUPERIOR SHOAL

Surveyed by H. L. Leadman, 1930

SOUNDINGS IN FATHOMS

Natural Scale 1 : 60,000

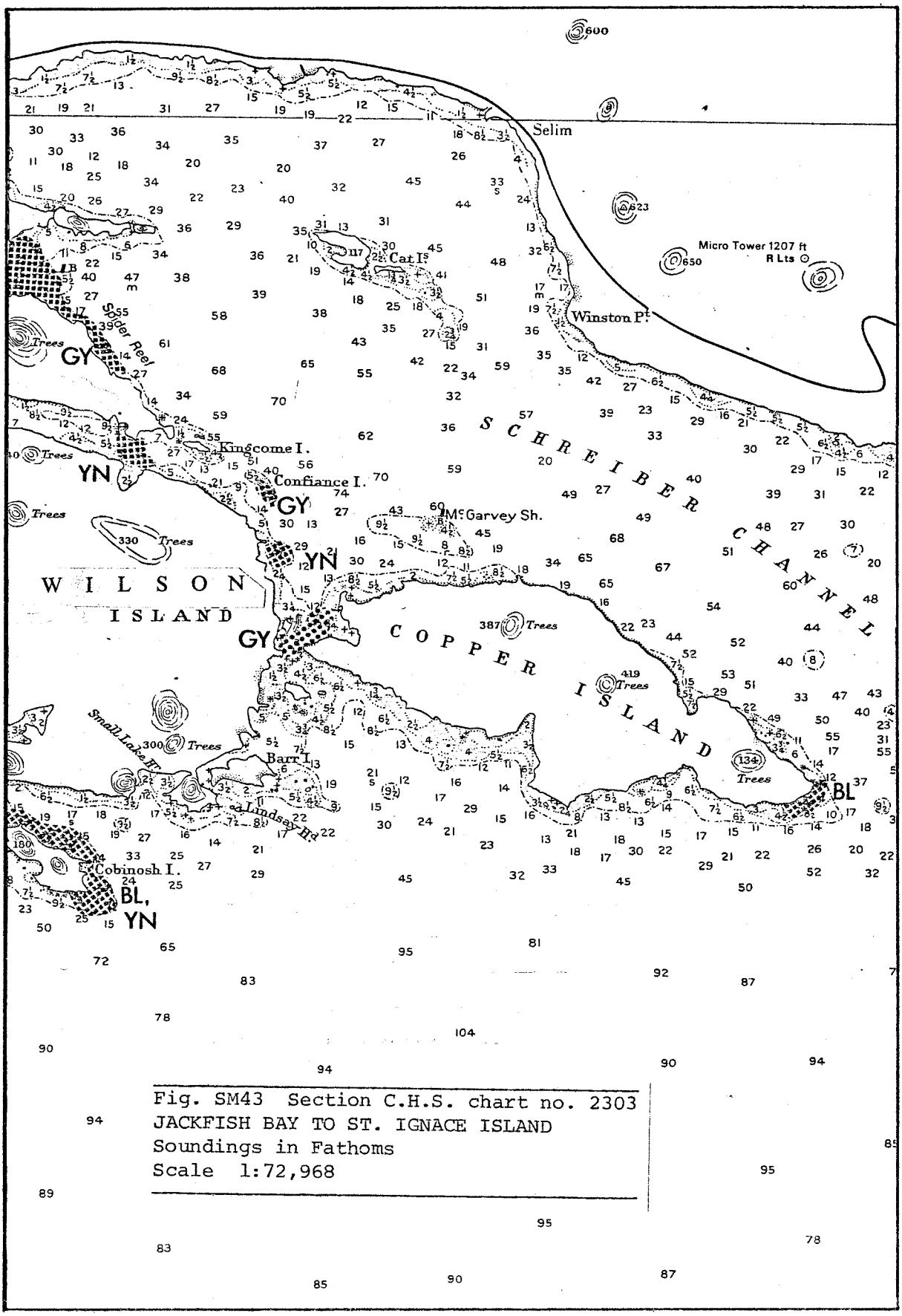


Fig. SM43 Section C.H.S. chart no. 2303
JACKFISH BAY TO ST. IGNACE ISLAND
Soundings in Fathoms
Scale 1:72,968

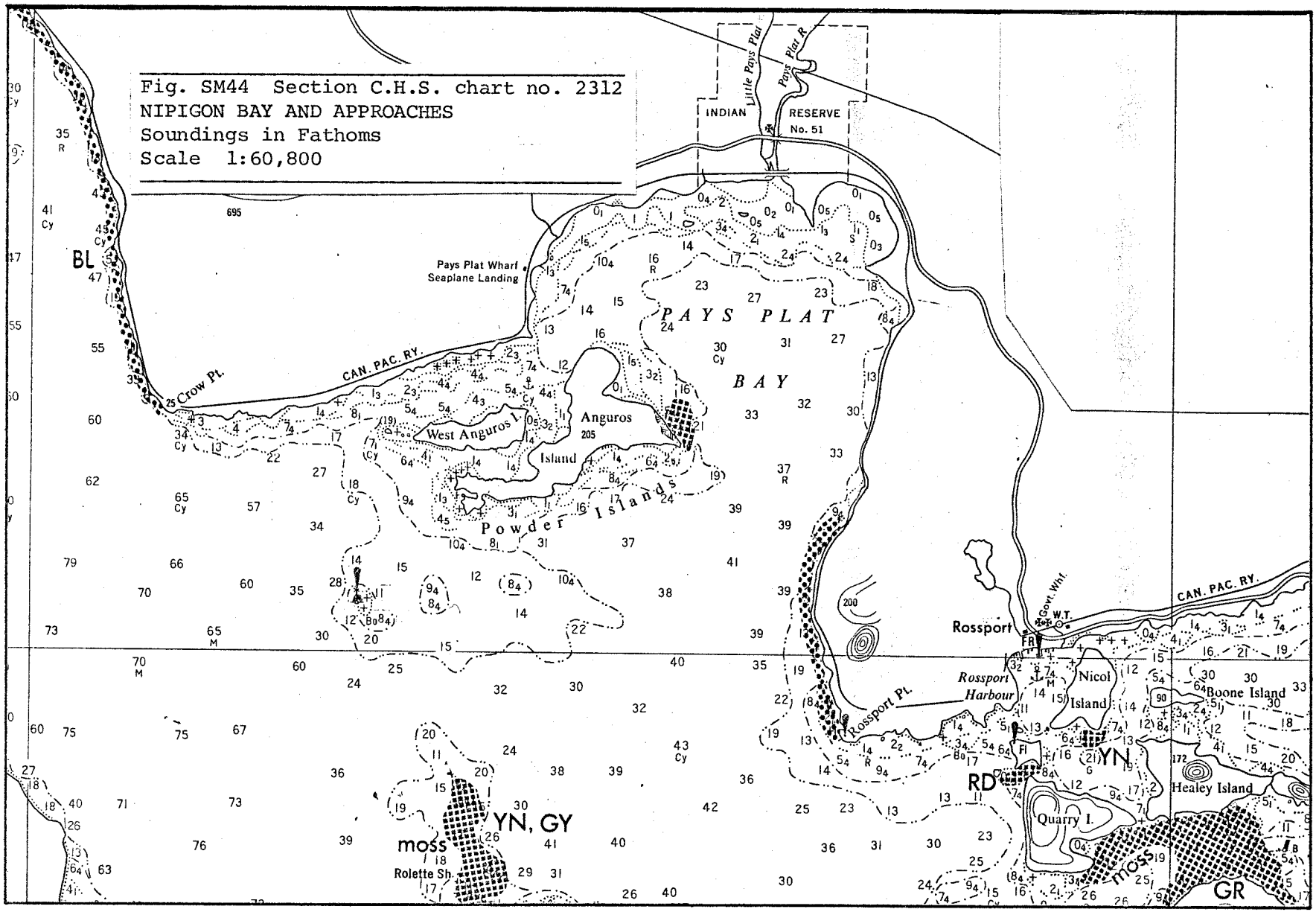


Fig. SM44 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800
INDIAN RESERVE No. 51
Little Pays Plat R.
Pays Plat R.
Pays Plat Wharf
Seaplane Landing
PAYS PLAT BAY
CAN. PAC. RY.
Crow Pt.
West Anguros I.
Anguros Island
Powder Islands
Rossport
Govt. Wh.
W.T.
Rossport Harbour
Rossport Pt.
Nicol Island
Boone Island
Healey Island
Quarry I.
YN, GY
YN
RD
GR
moss
Rolette Sh.

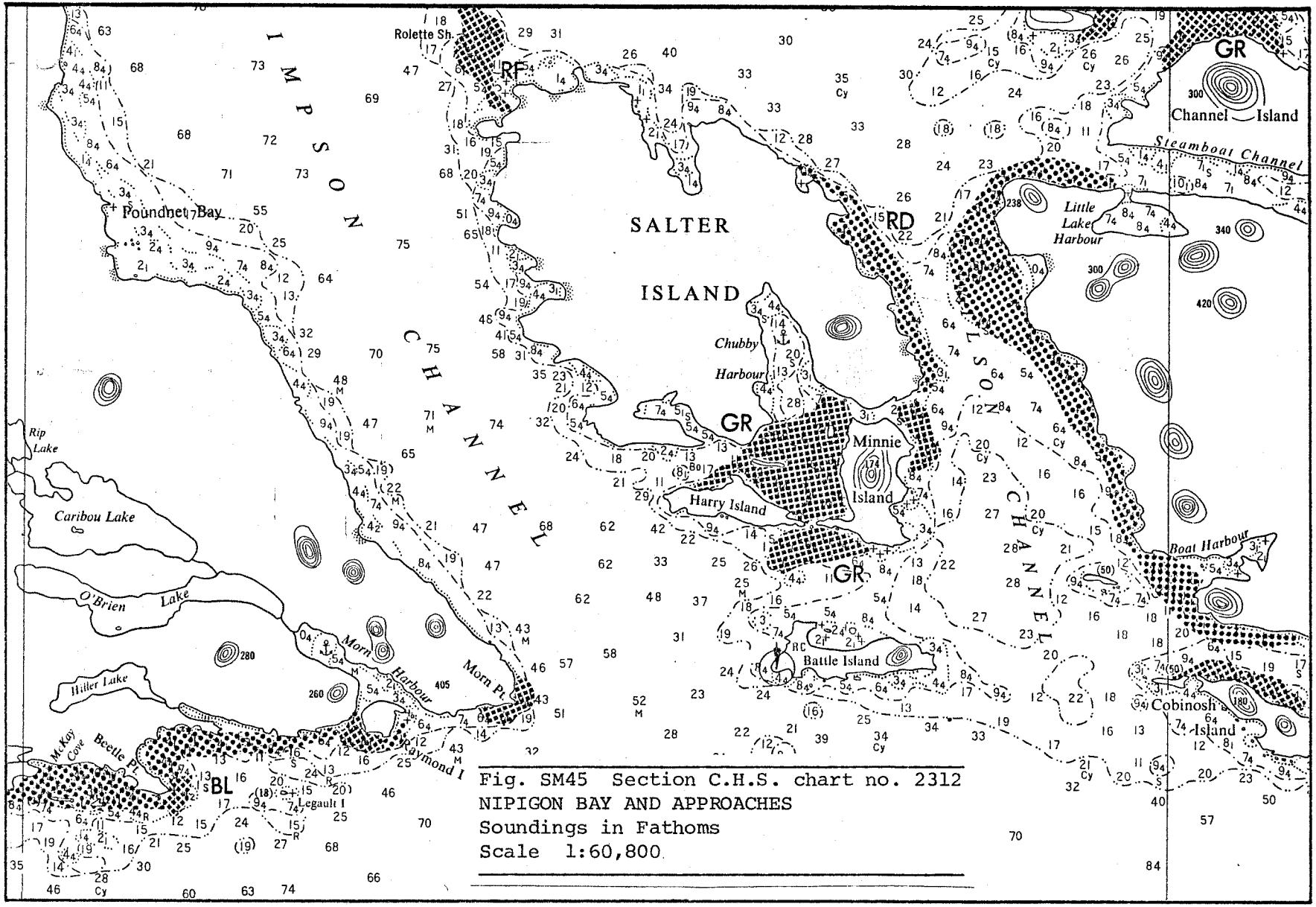


Fig. SM45 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

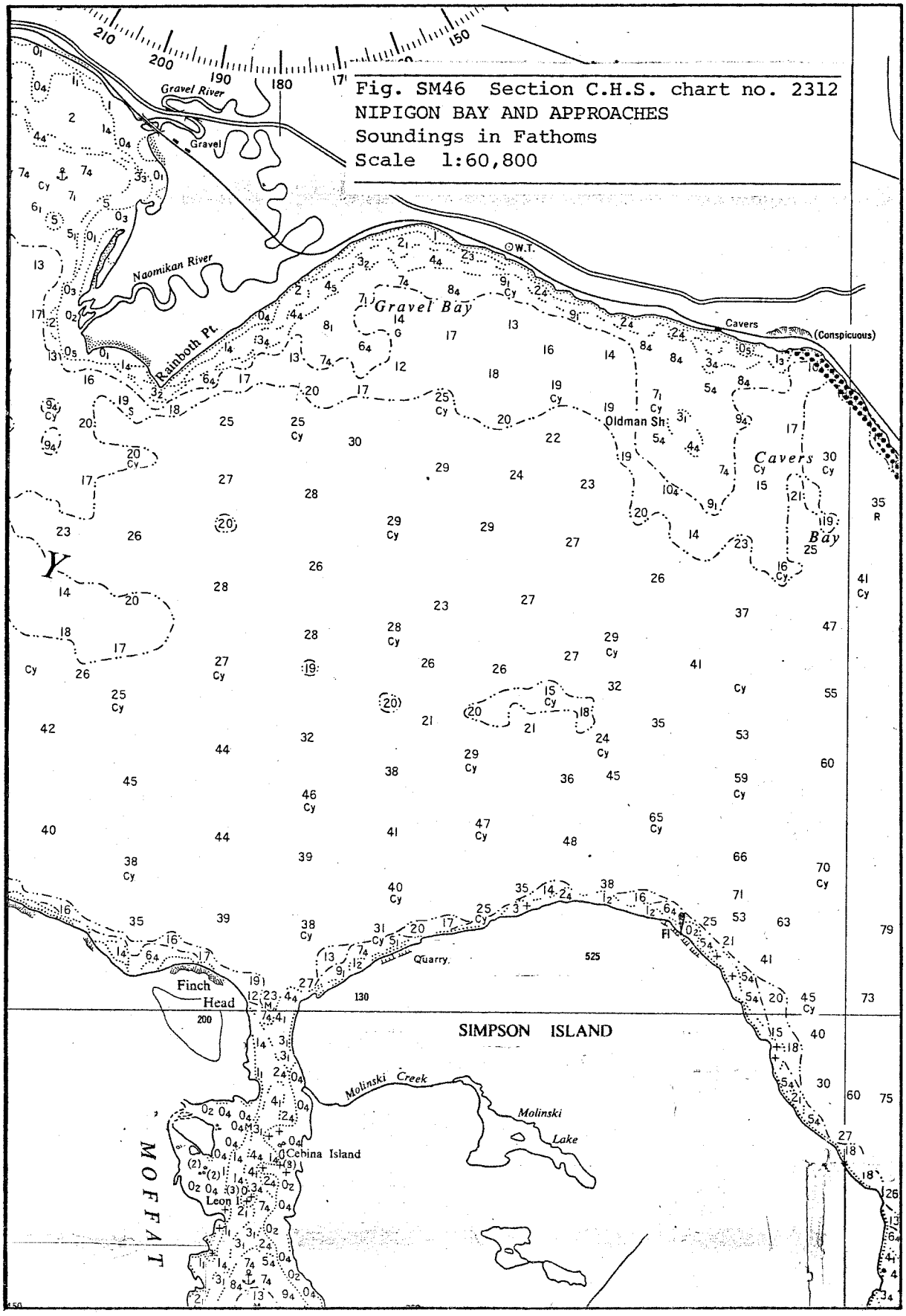


Fig. SM46 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

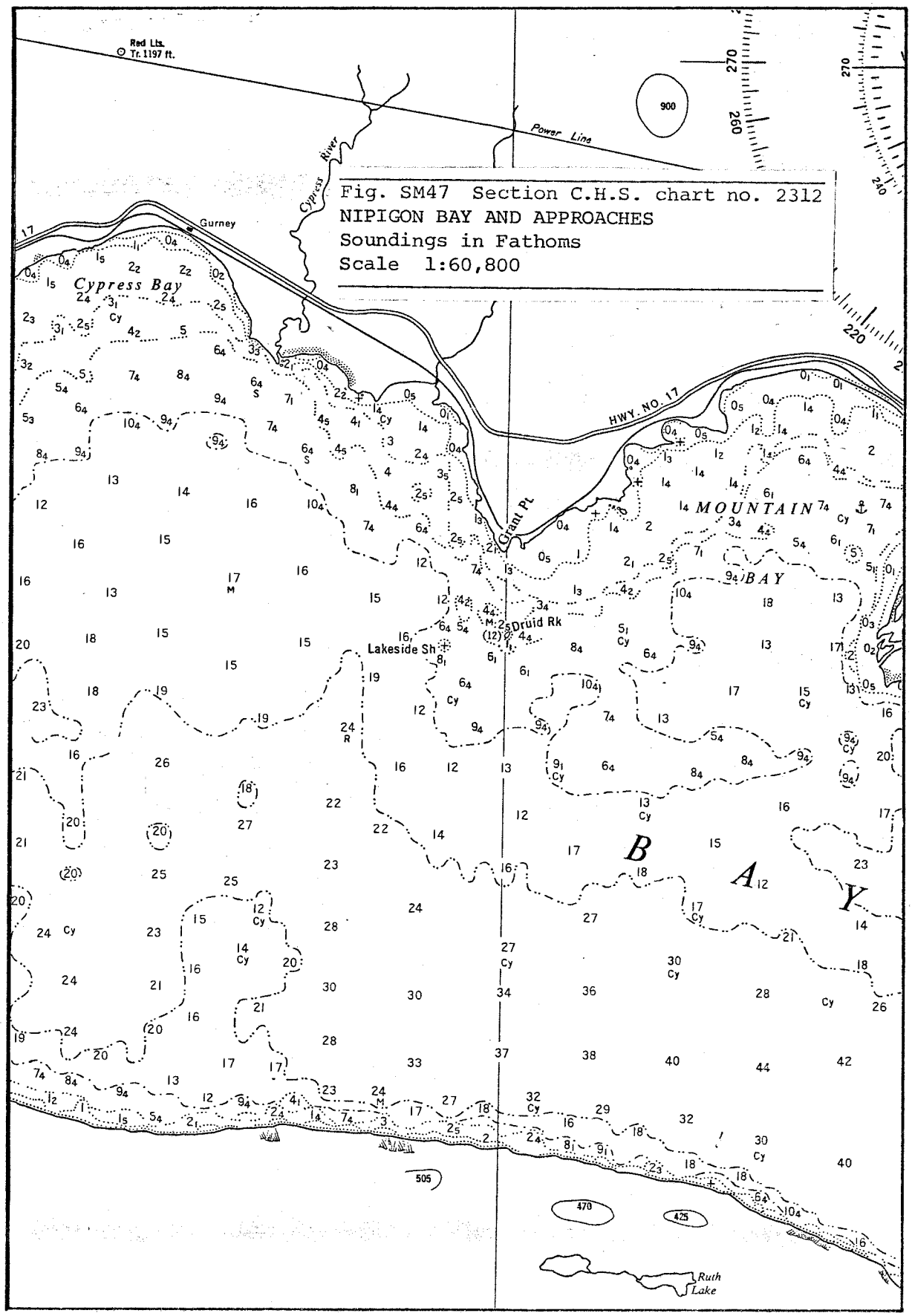


Fig. SM47 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

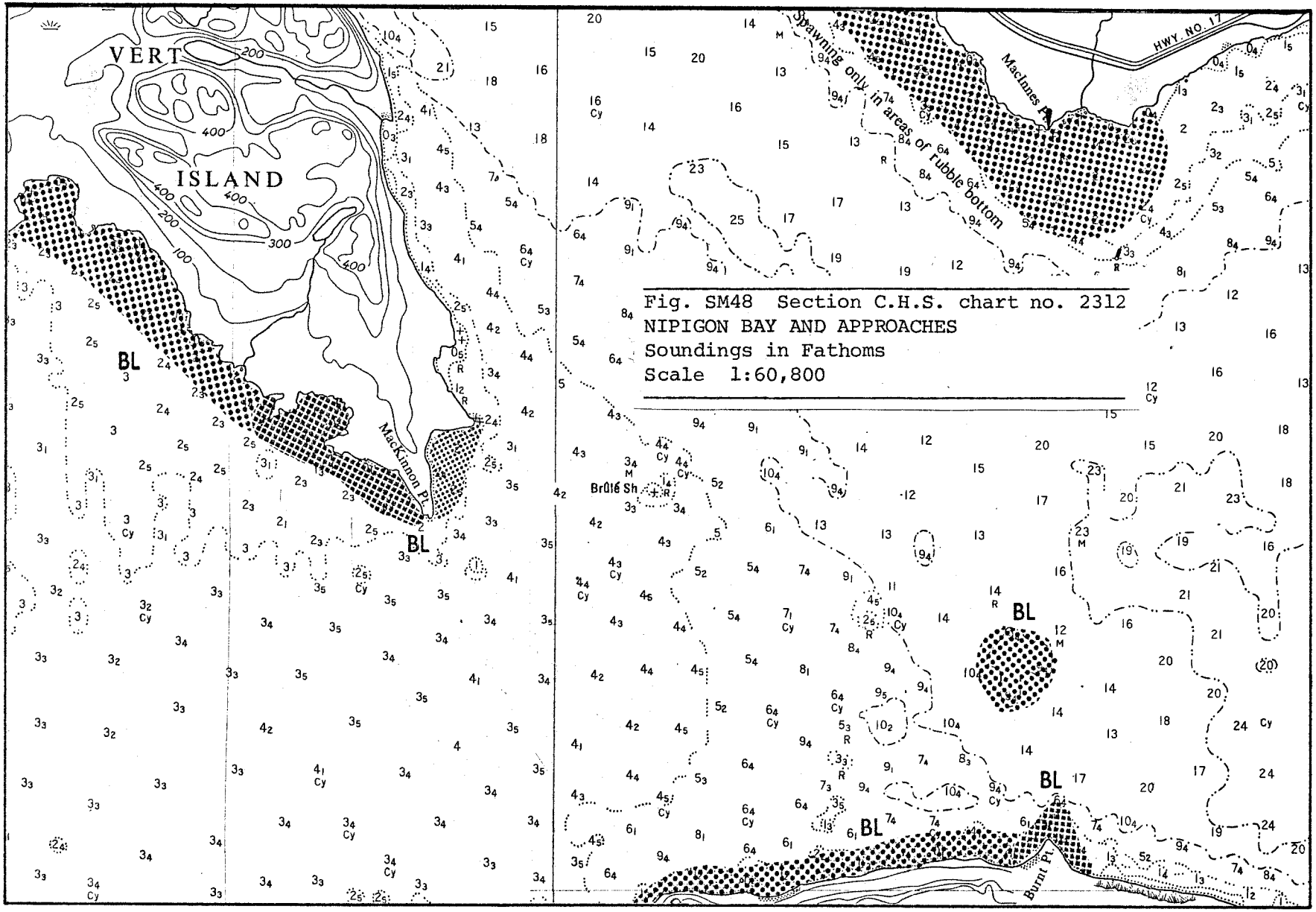


Fig. SM48 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

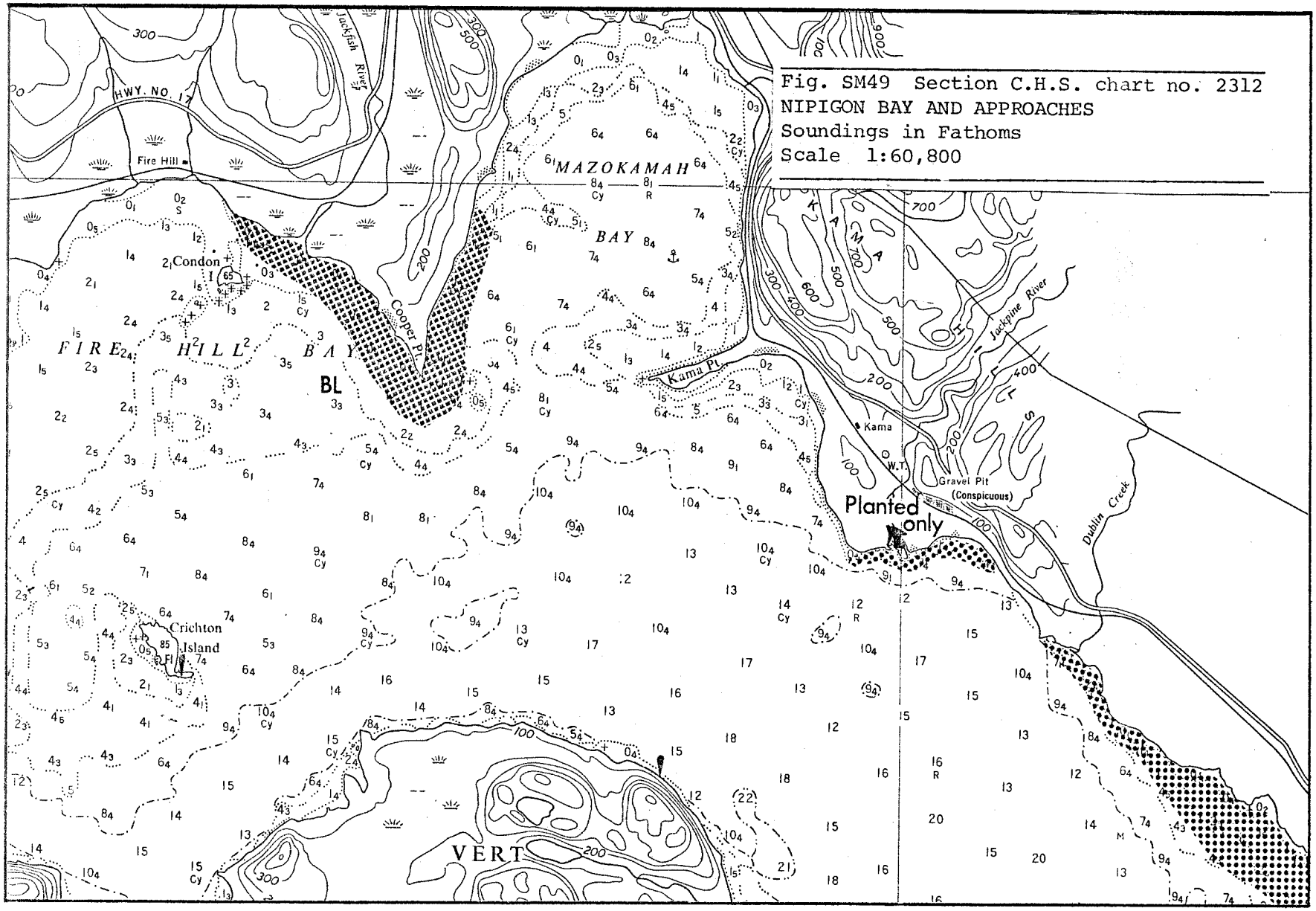


Fig. SM49 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

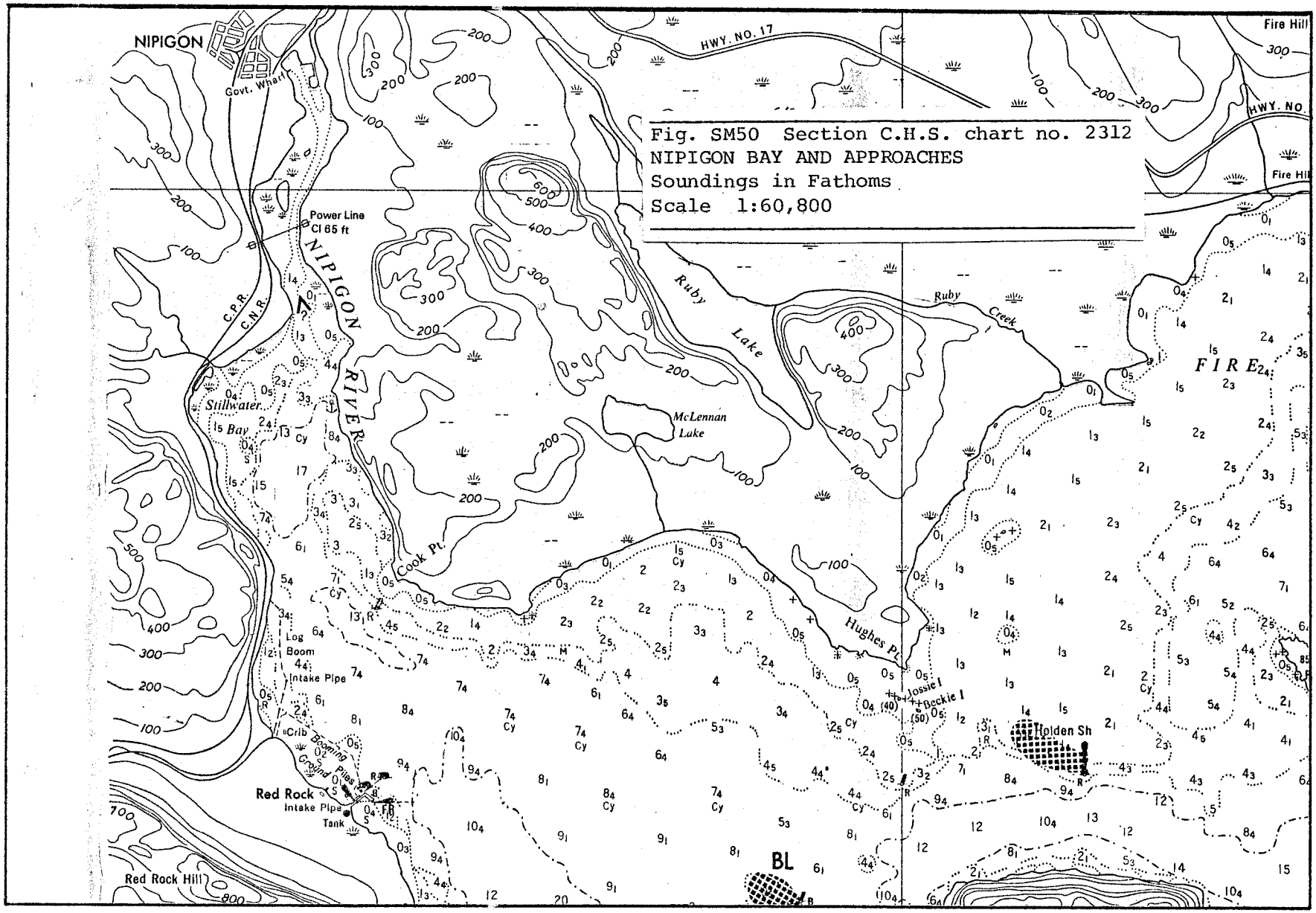


Fig. SM50 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

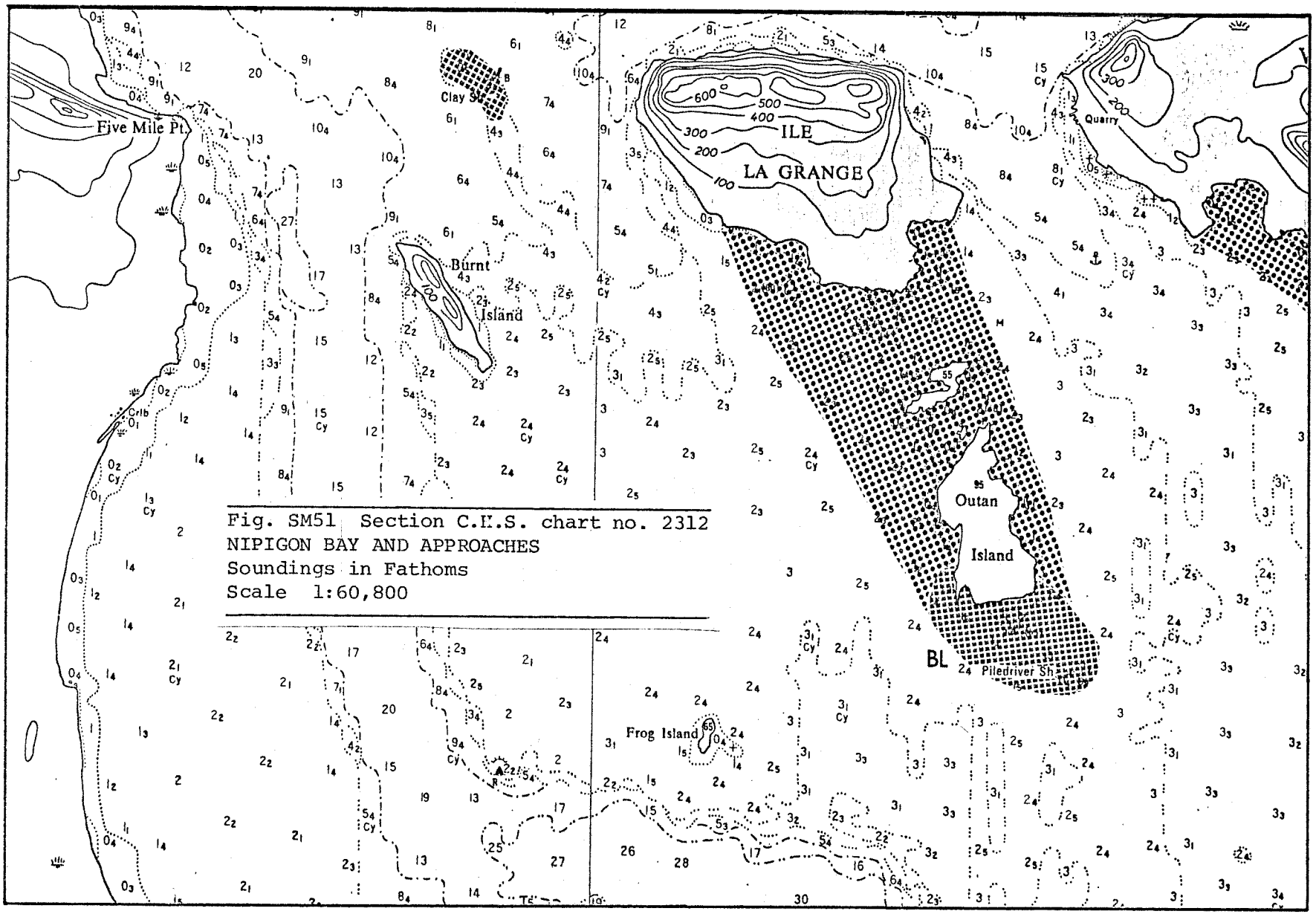


Fig. SM51 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

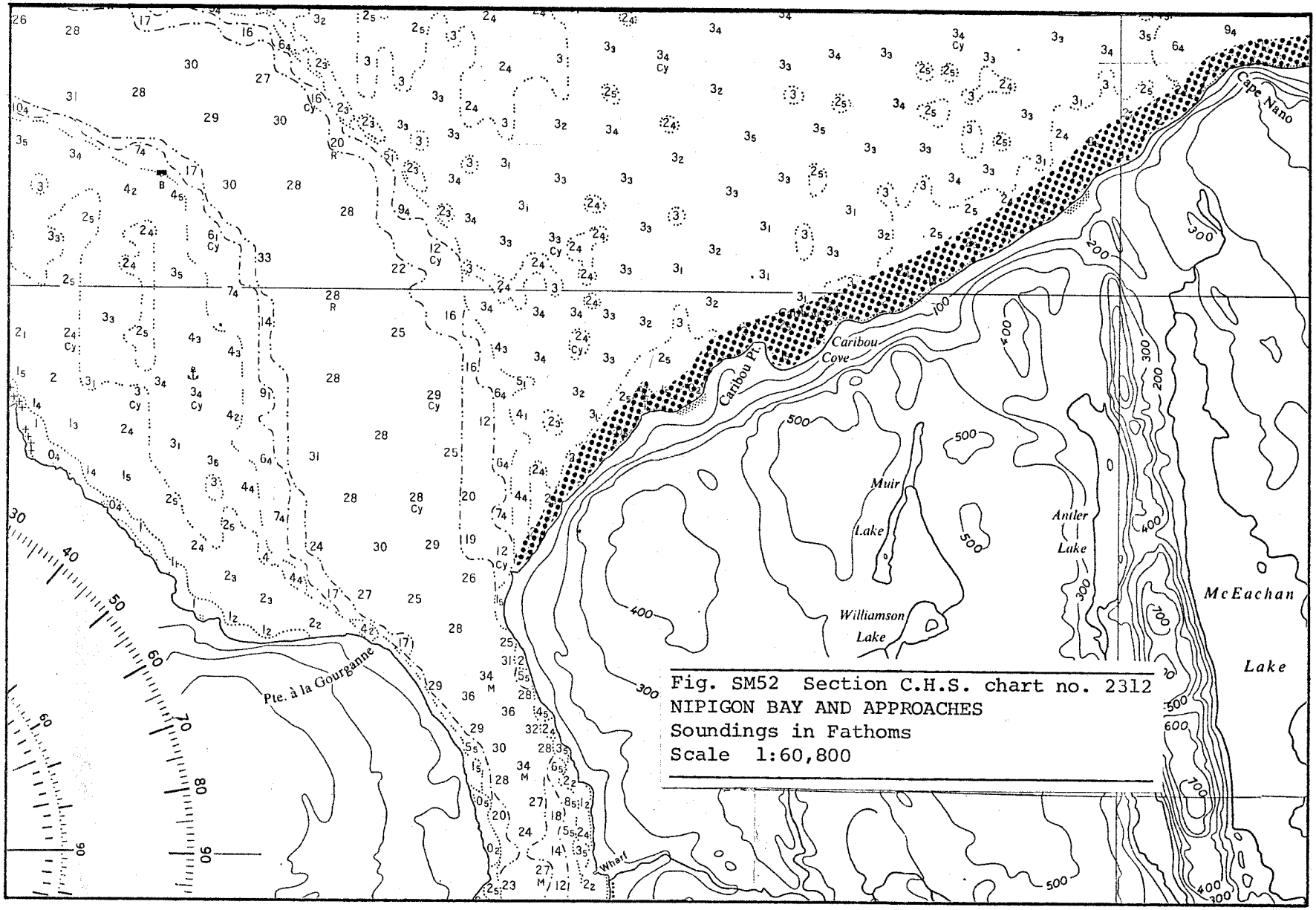


Fig. SM52 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

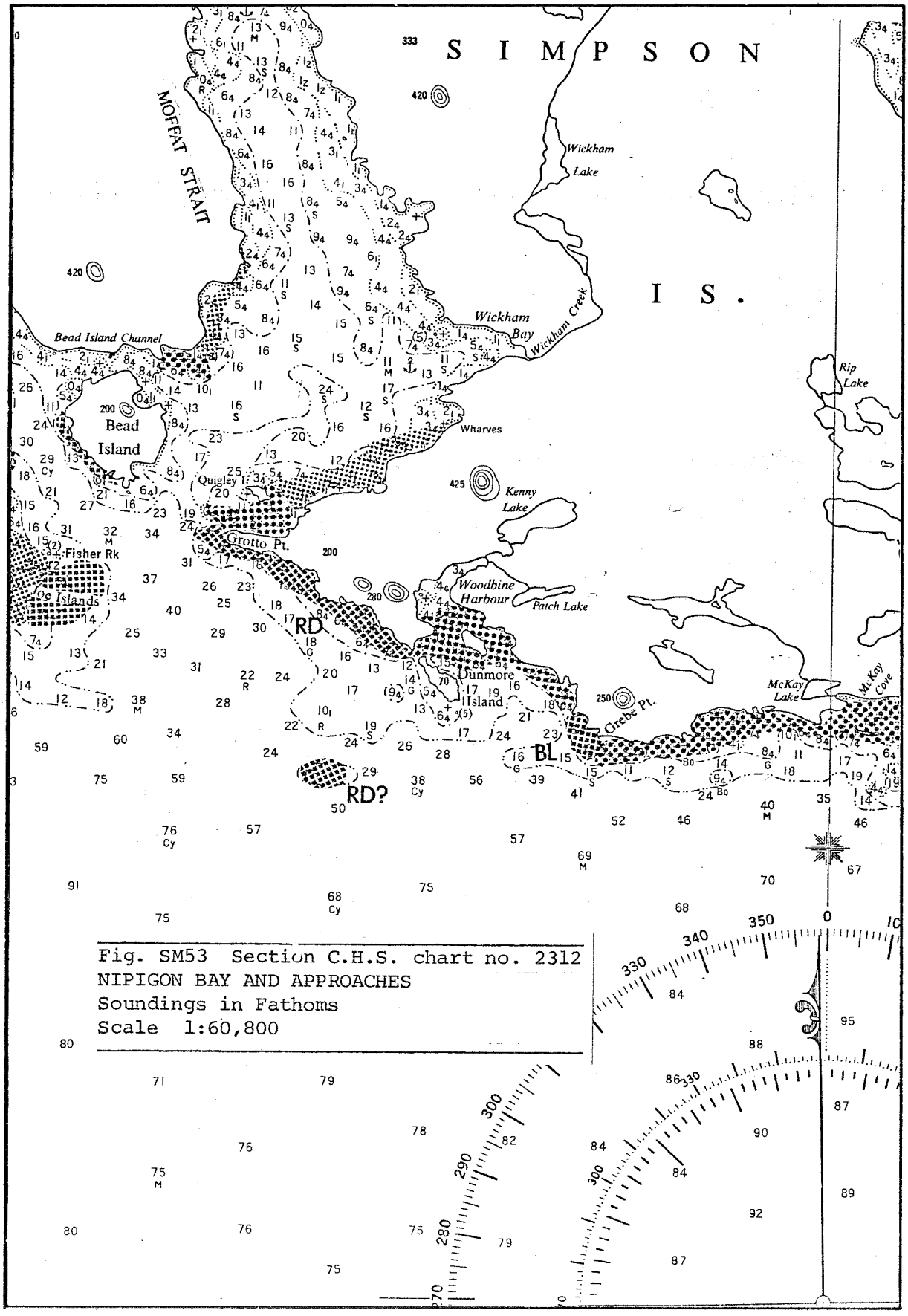


Fig. SM53 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

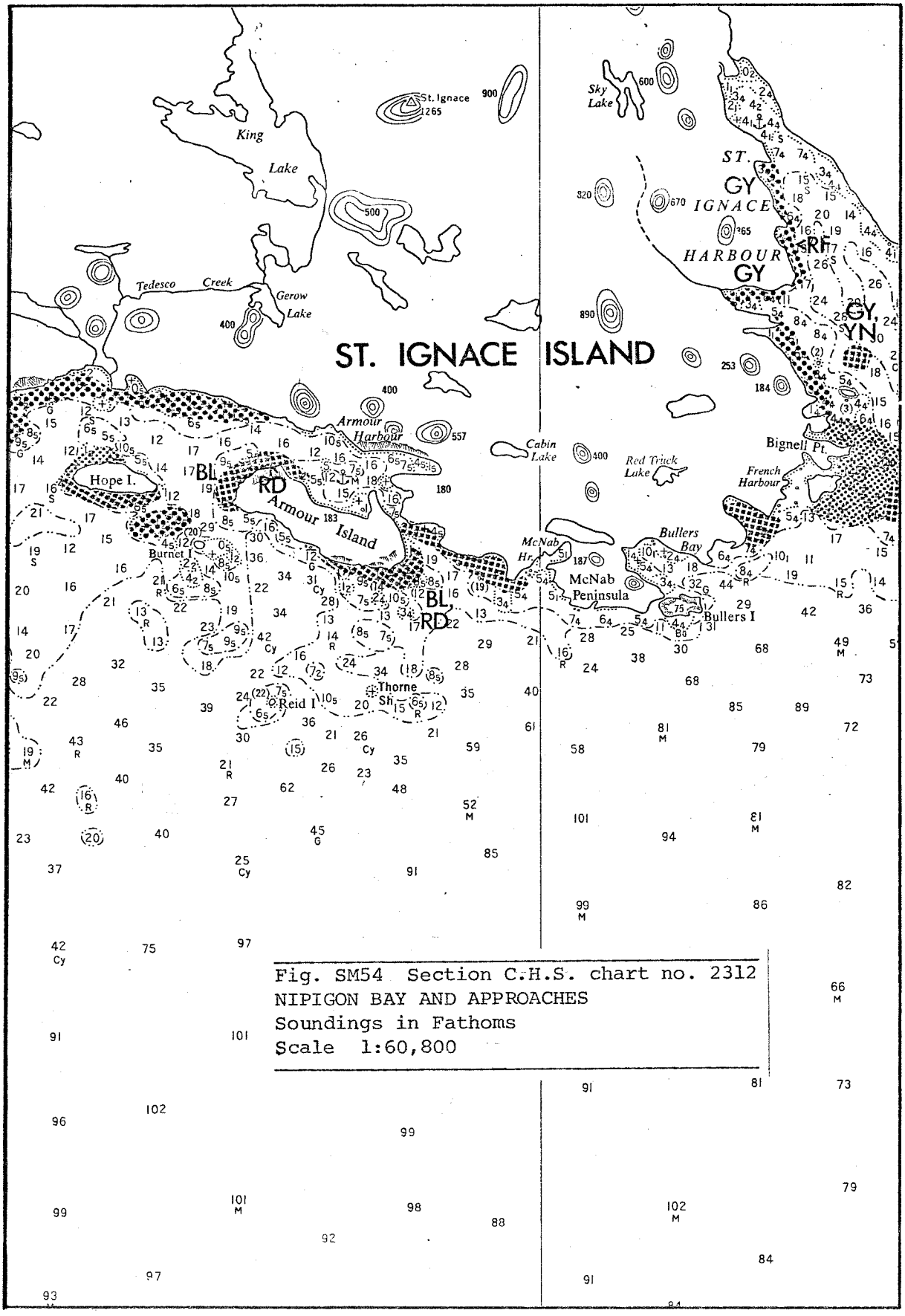


Fig. SM54 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

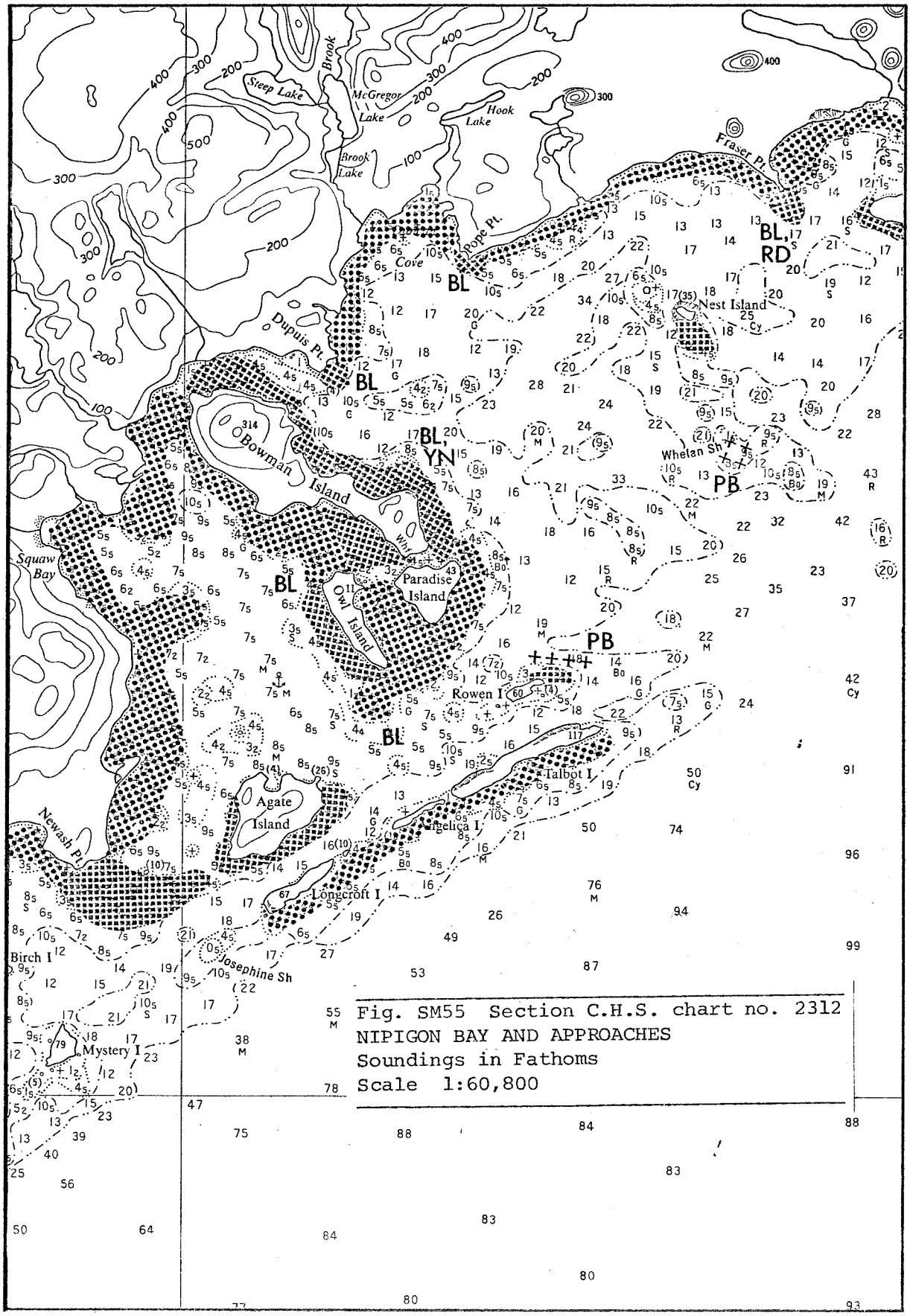


Fig. SM55 Section C.H.S. chart no. 2312
NIPIGON BAY AND APPROACHES
Soundings in Fathoms
Scale 1:60,800

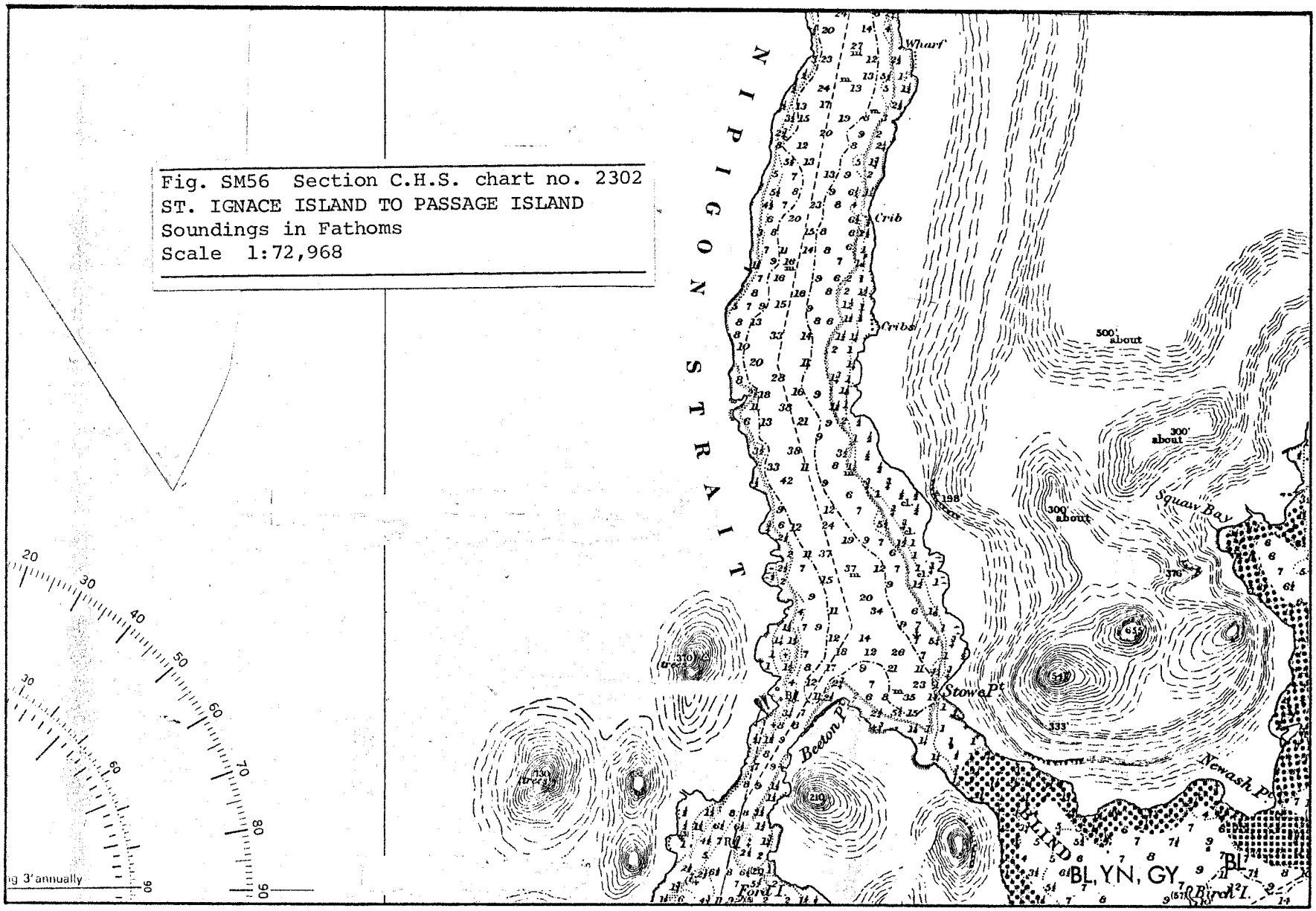


Fig. SM56 Section C.H.S. chart no. 2302
ST. IGNACE ISLAND TO PASSAGE ISLAND
Soundings in Fathoms
Scale 1:72,968
NIPIGON STRAIT
Wharf
Crib
Crib
500' about
300' about
300' about
Squaw Bay
Stowe Pt
Beaton Pt
Newash Pt
BL, YN, GY
BL
g 3' annually

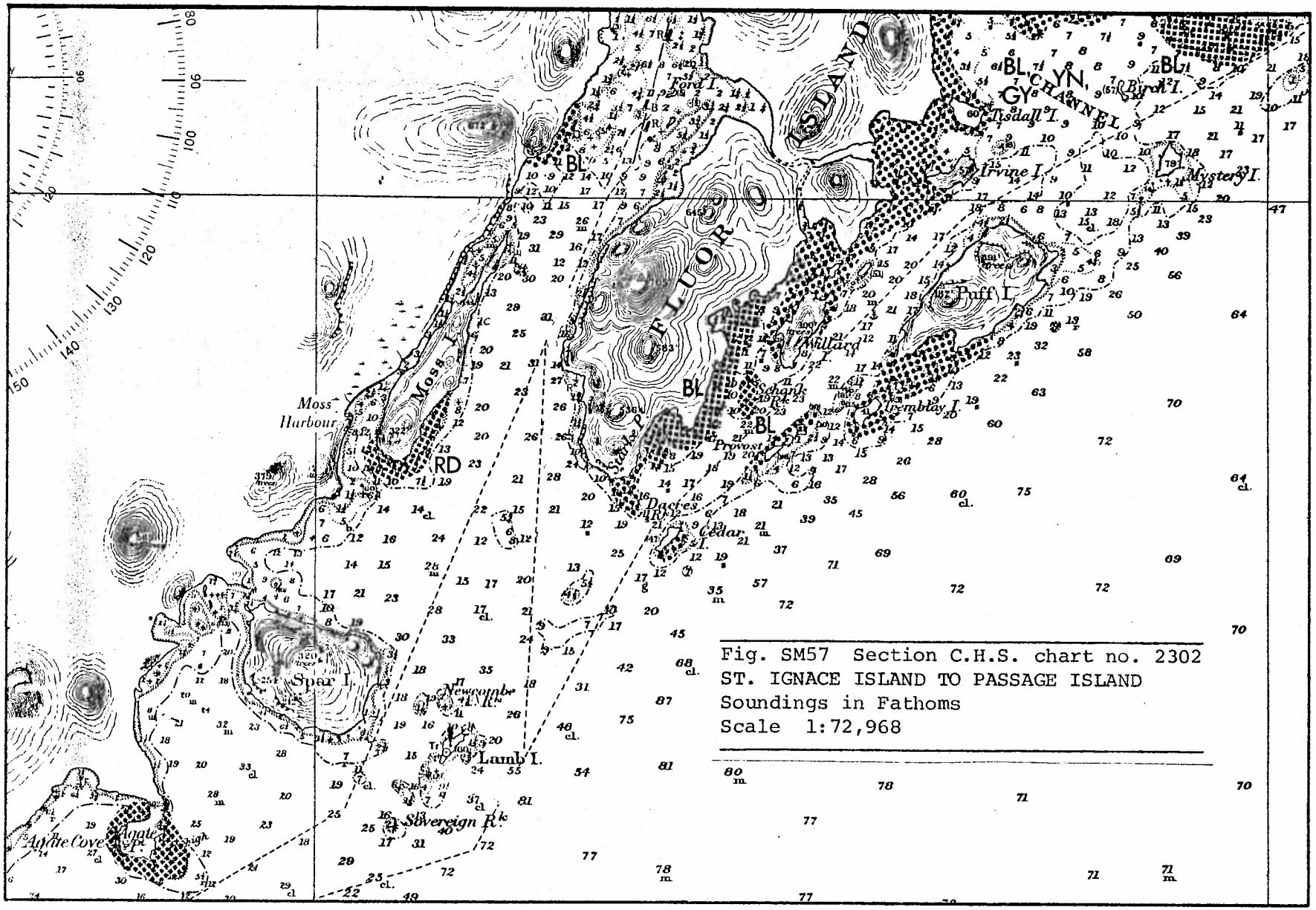


Fig. SM57 Section C.H.S. chart no. 2302
ST. IGNACE ISLAND TO PASSAGE ISLAND
Soundings in Fathoms
Scale 1:72,968

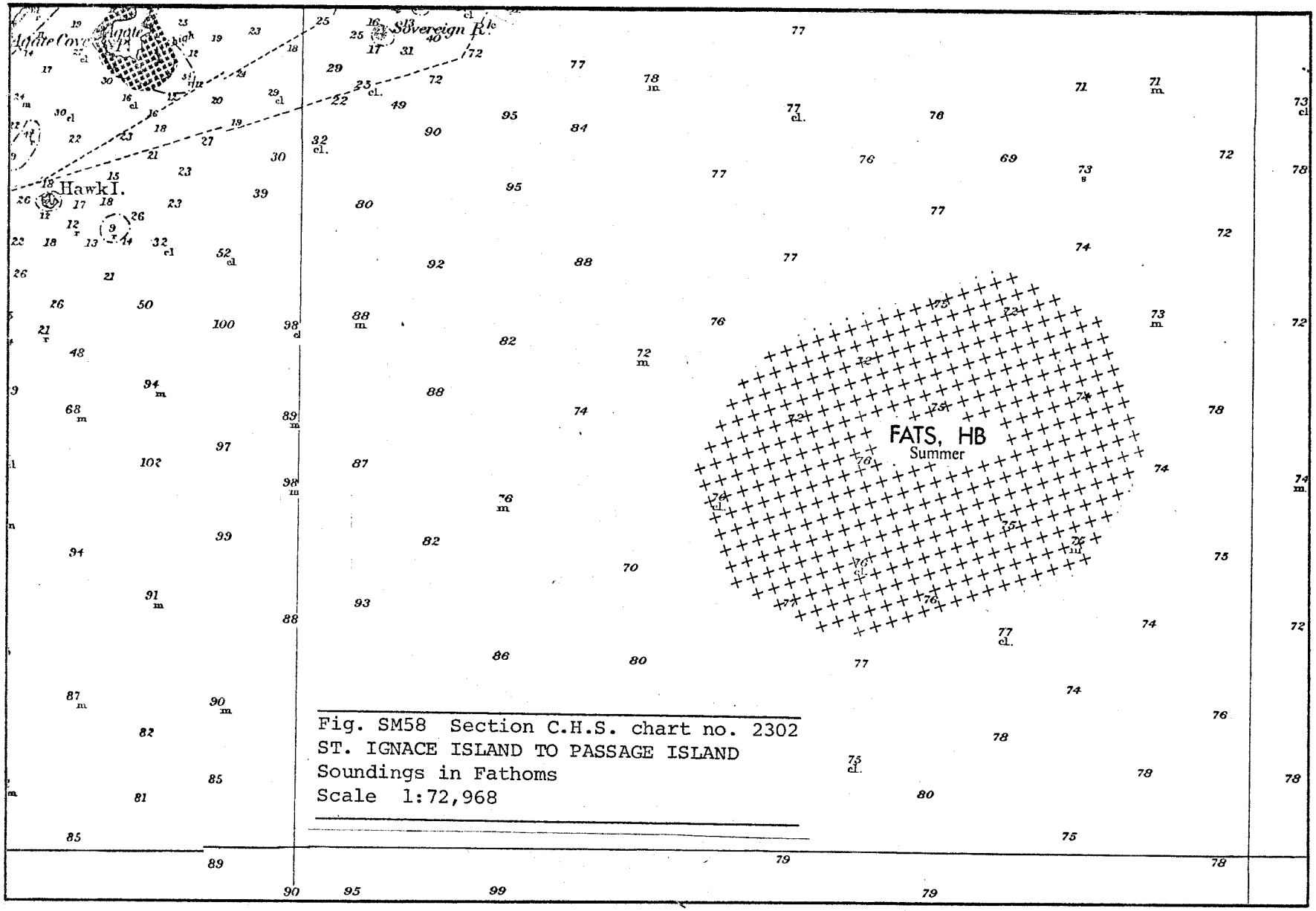


Fig. SM58 Section C.H.S. chart no. 2302
ST. IGNACE ISLAND TO PASSAGE ISLAND
Soundings in Fathoms
Scale 1:72,968

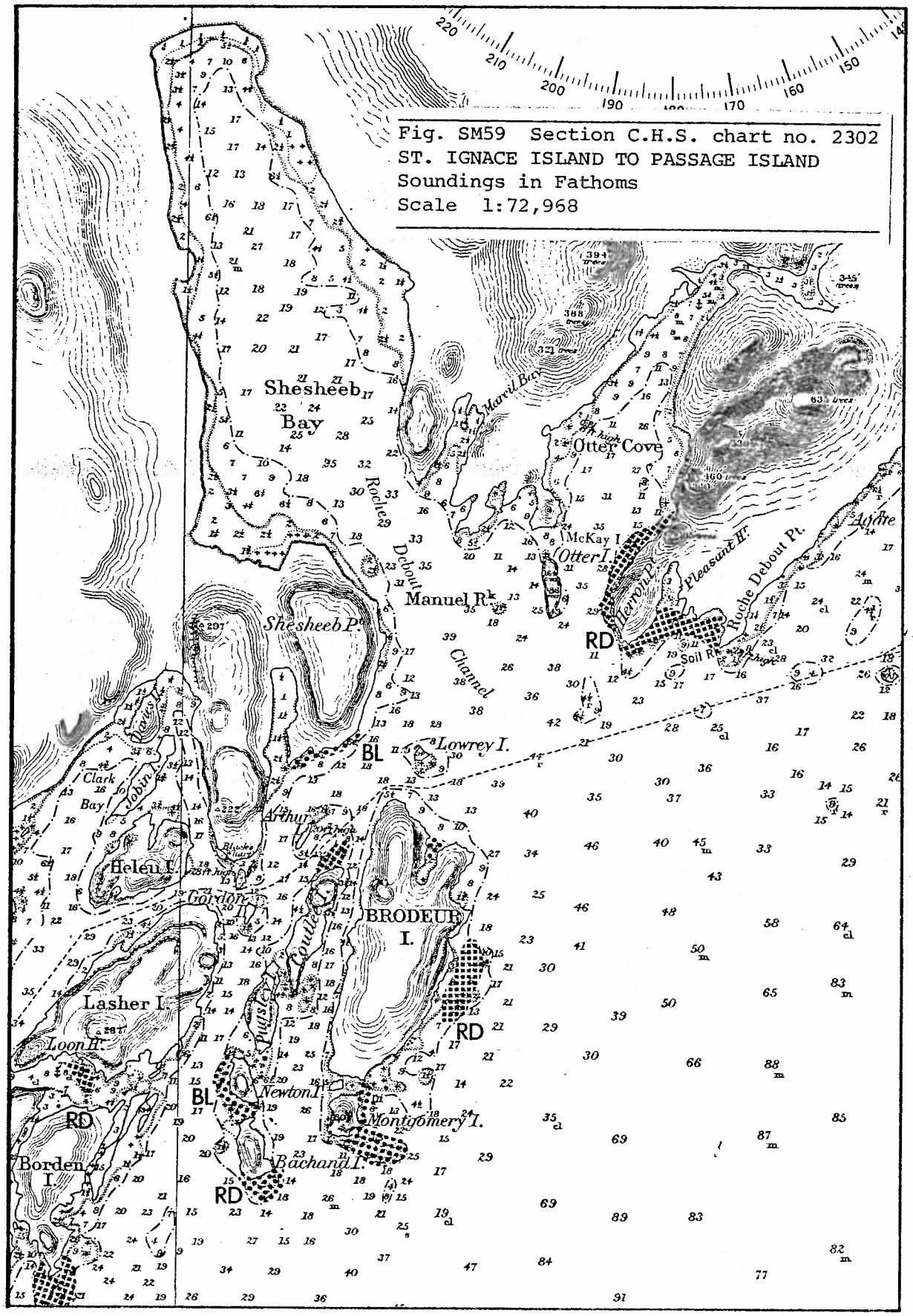


Fig. SM59 Section C.H.S. chart no. 2302
ST. IGNACE ISLAND TO PASSAGE ISLAND
Soundings in Fathoms
Scale 1:72,968

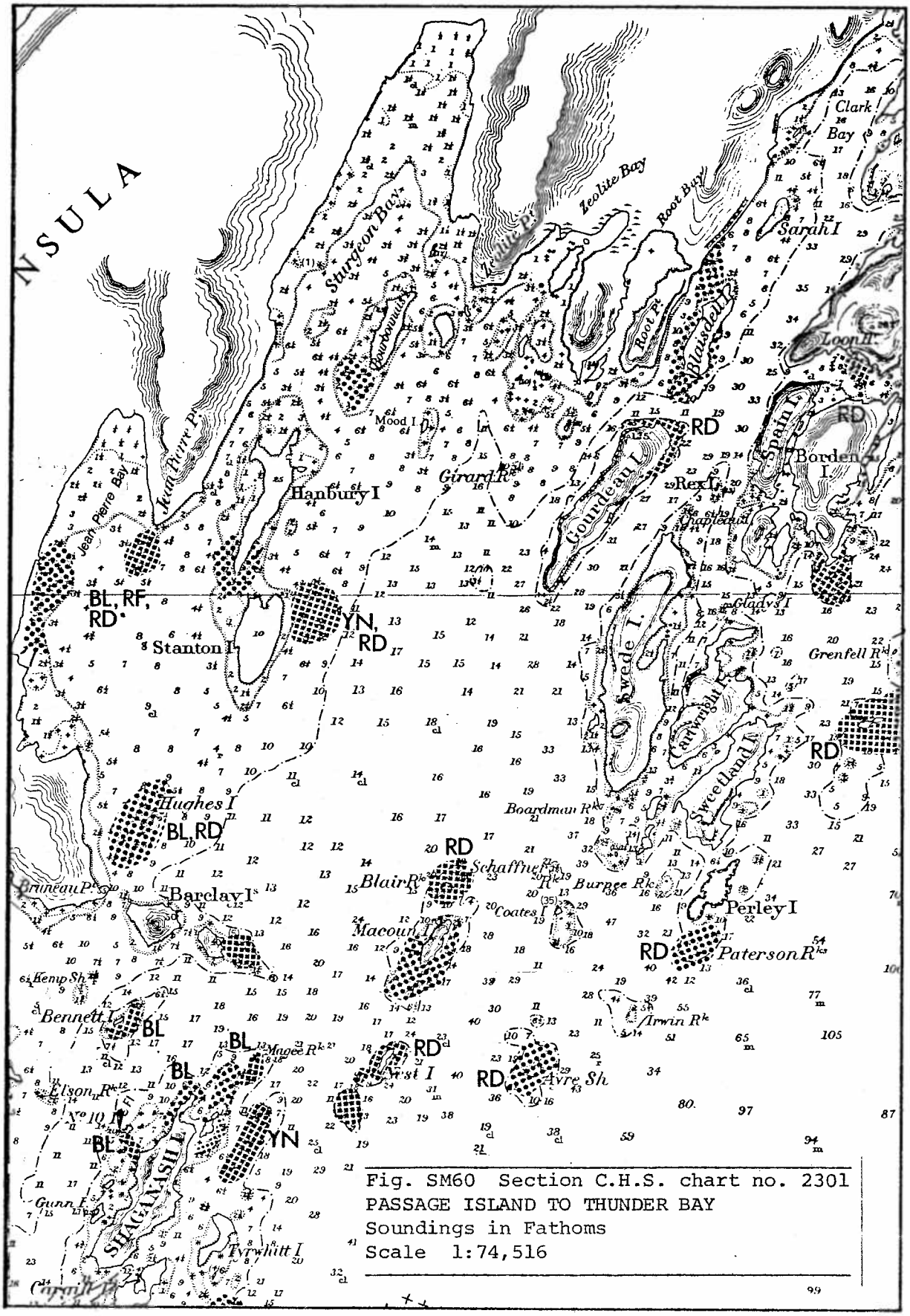


Fig. SM60 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

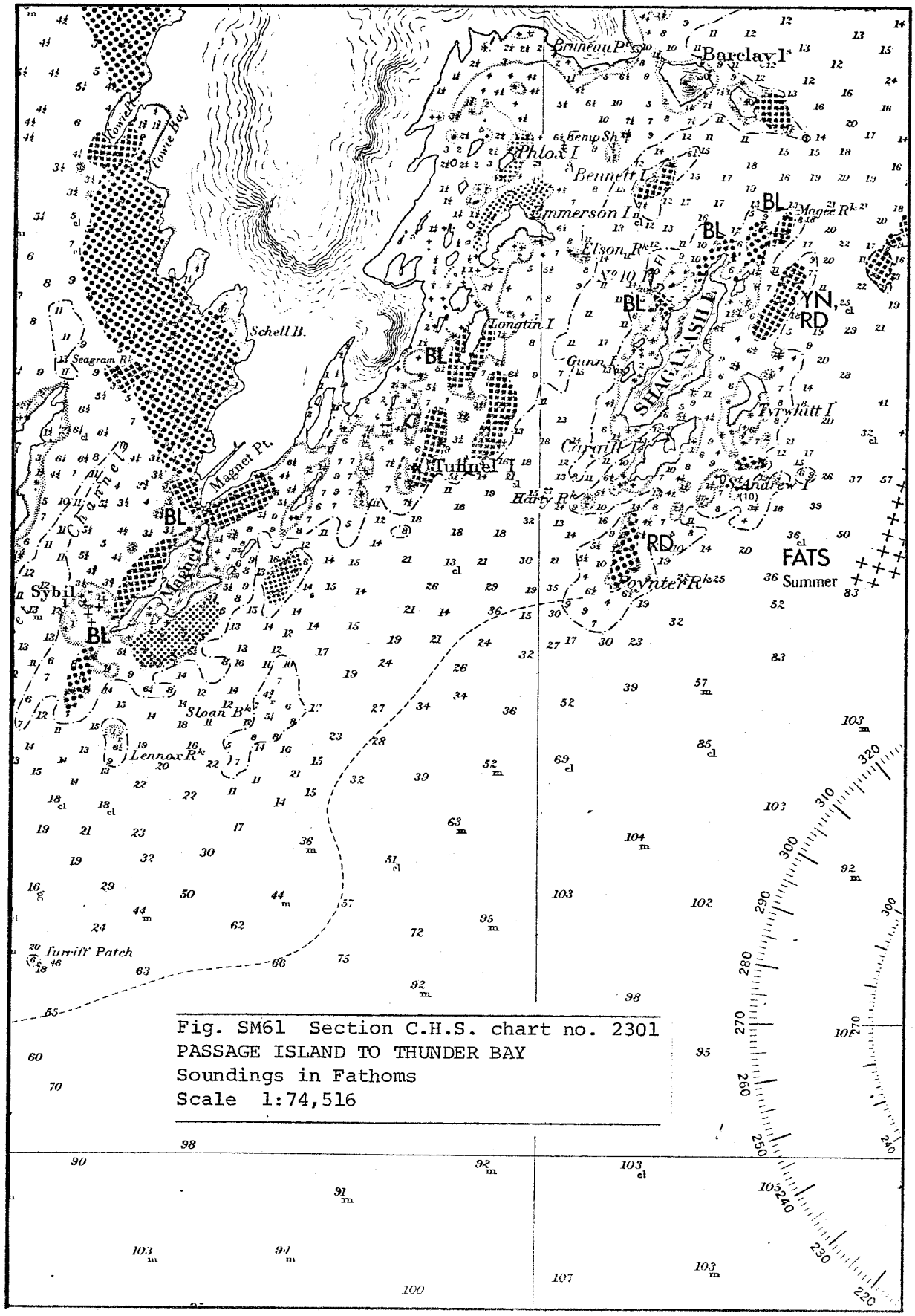


Fig. SM61 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

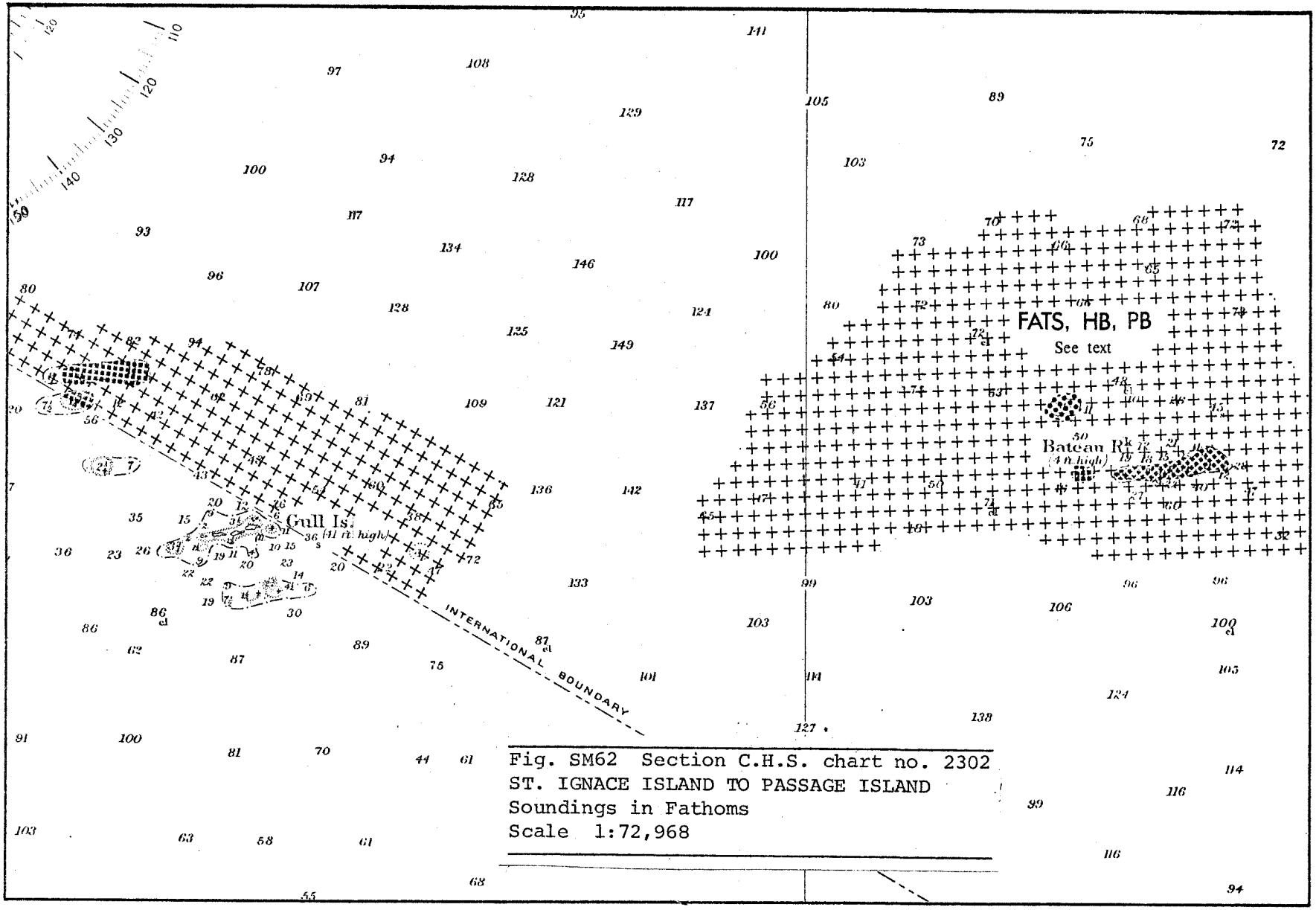


Fig. SM62 Section C.H.S. chart no. 2302
ST. IGNACE ISLAND TO PASSAGE ISLAND
Soundings in Fathoms
Scale 1:72,968

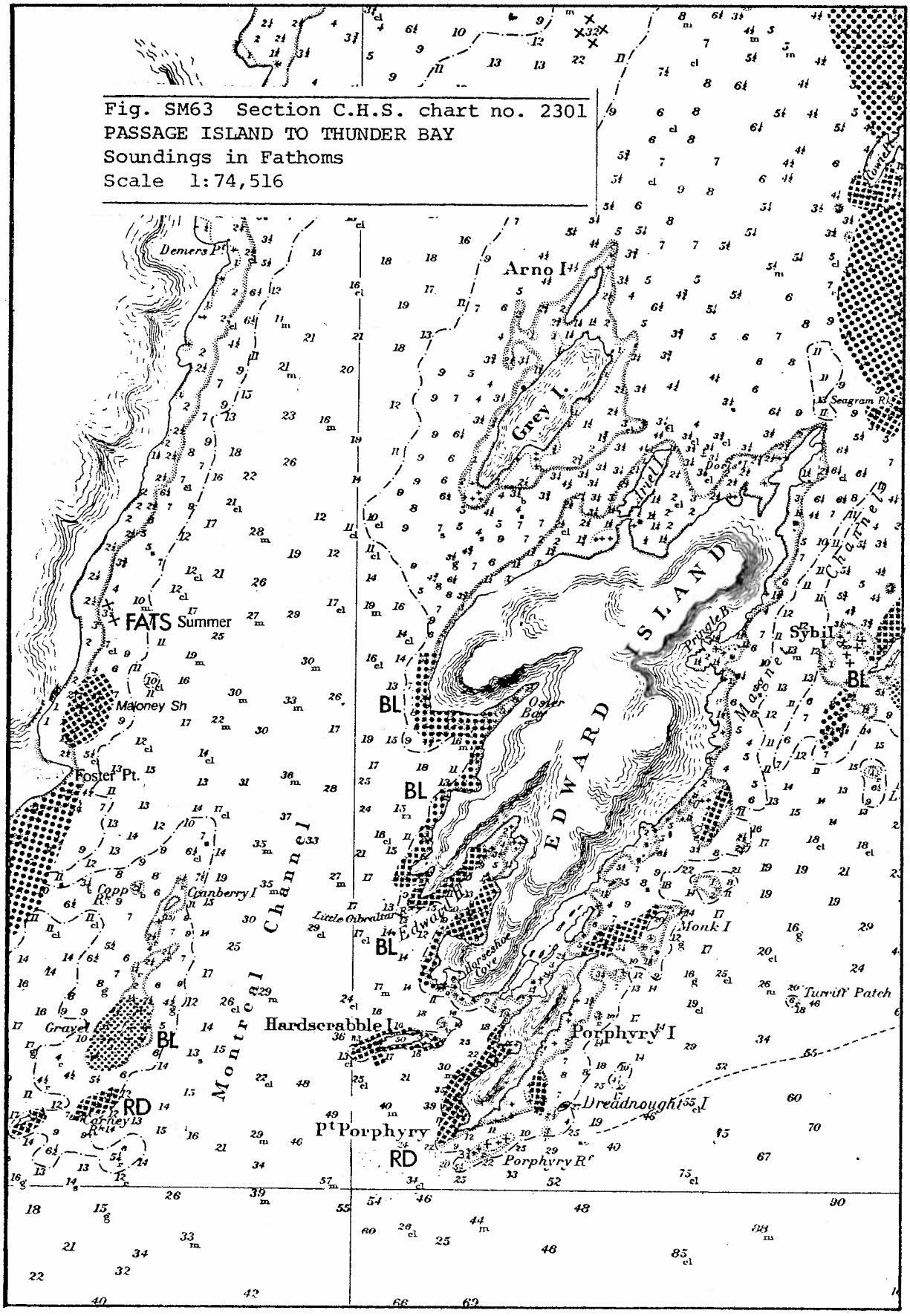


Fig. SM63 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

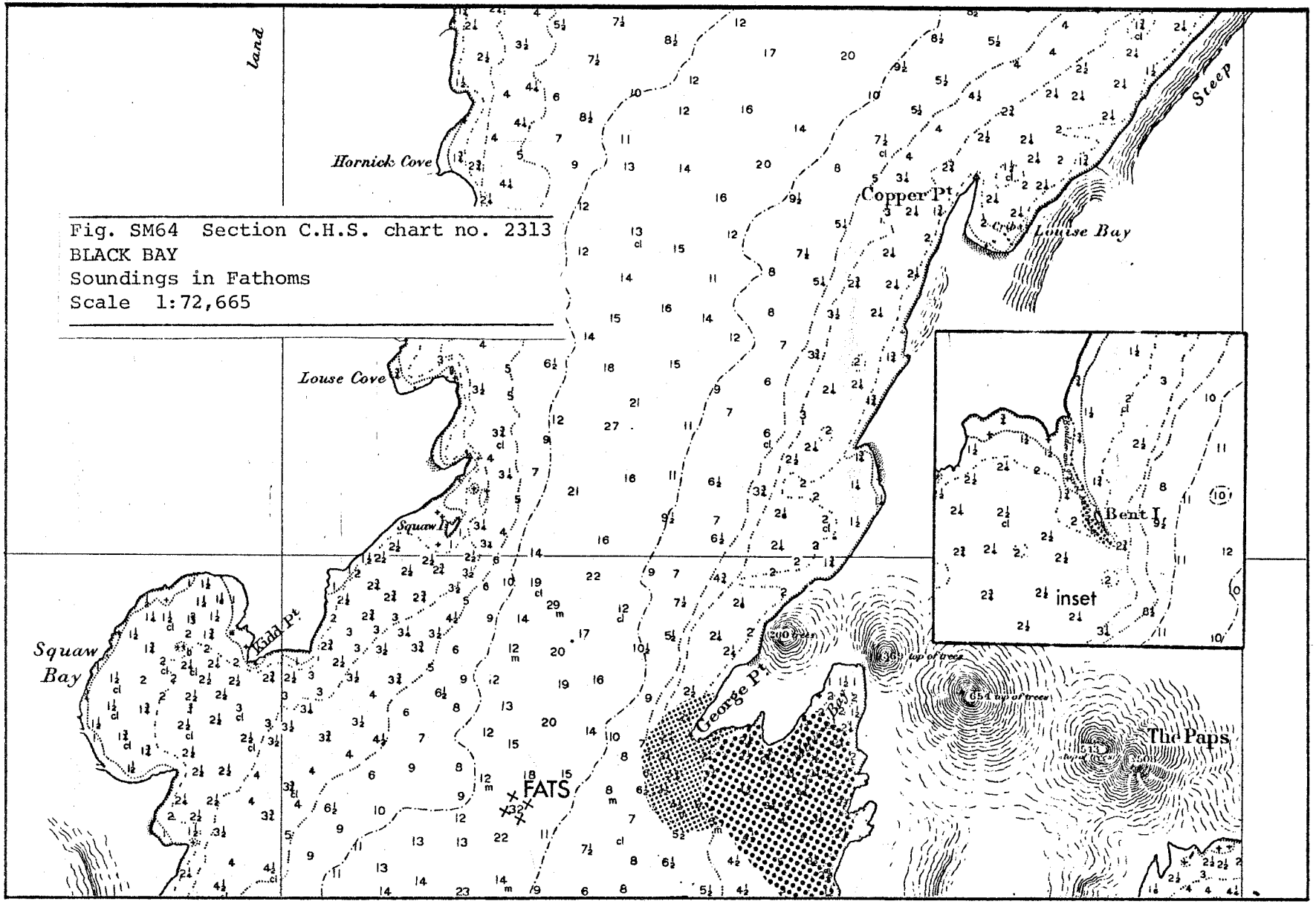


Fig. SM64 Section C.H.S. chart no. 2313
BLACK BAY
Soundings in Fathoms
Scale 1:72,665

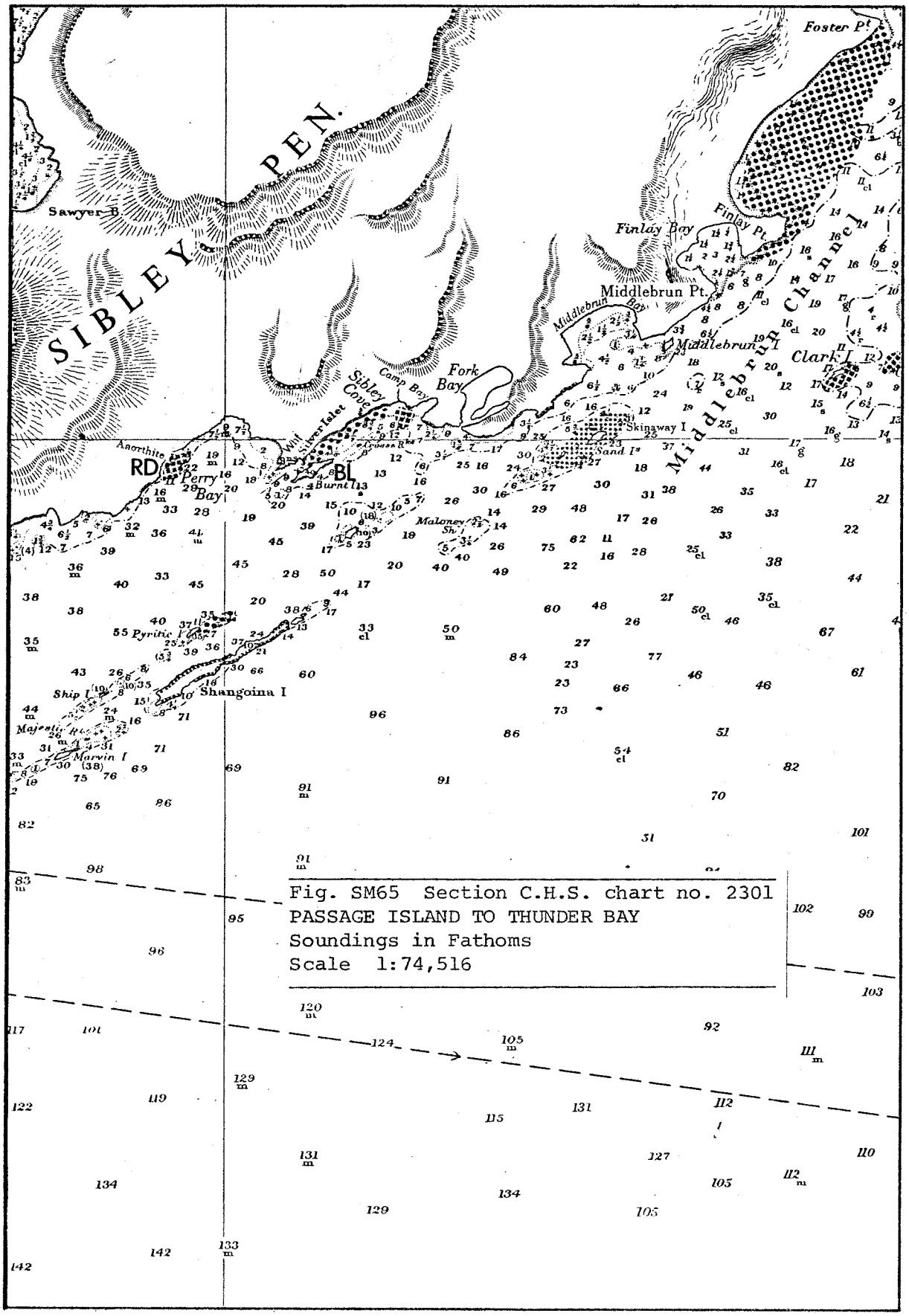


Fig. SM65 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

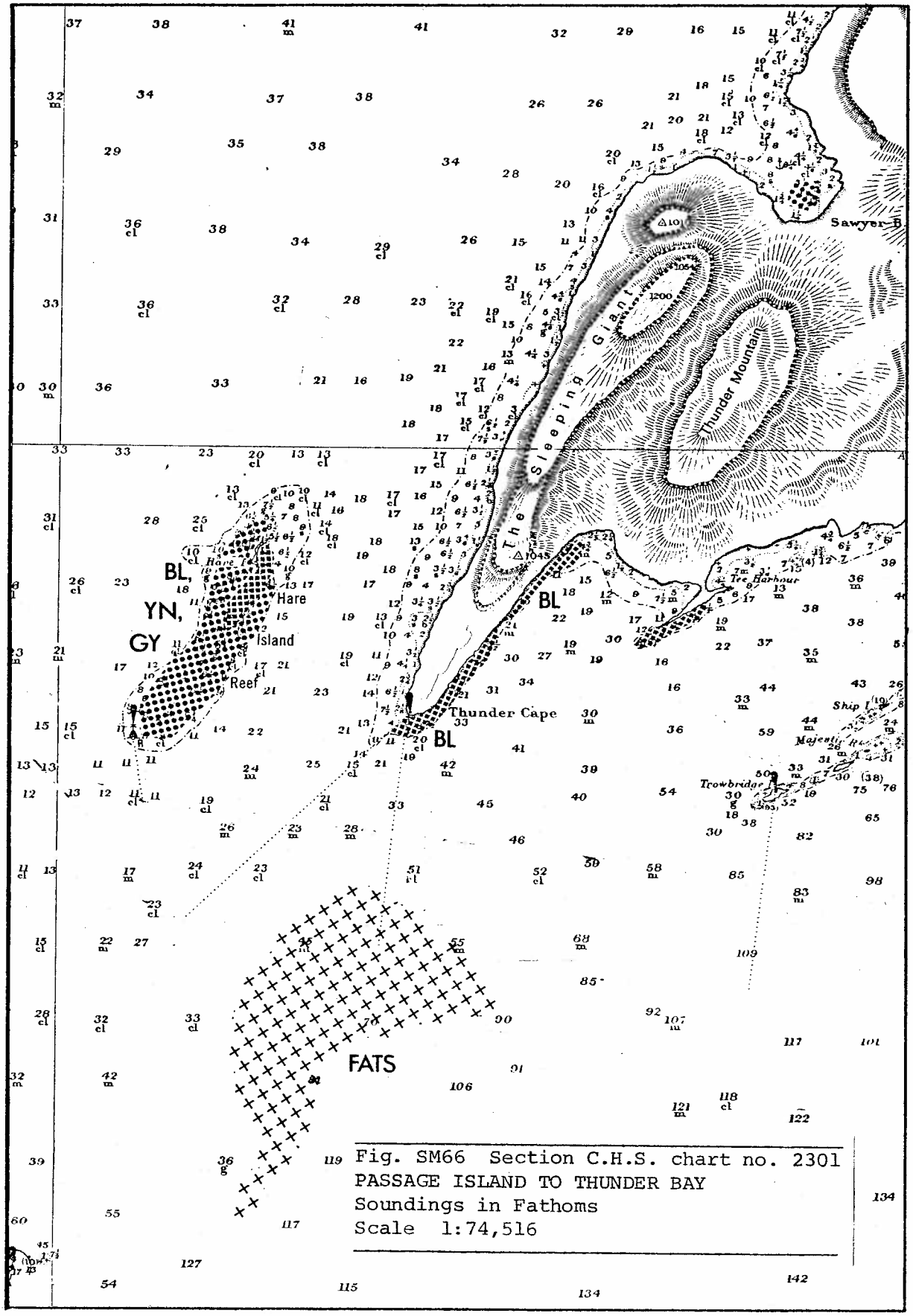


Fig. SM66 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

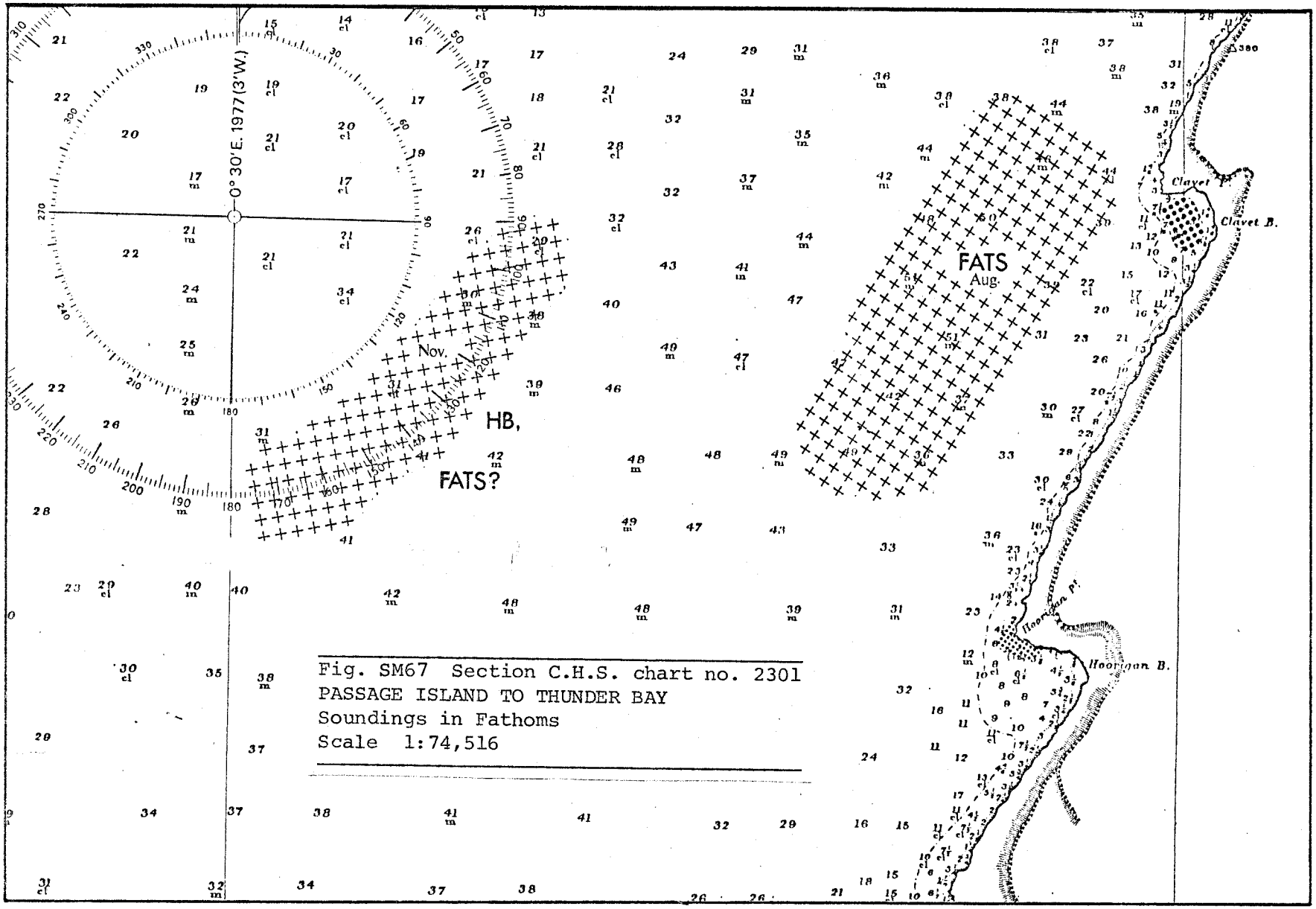


Fig. SM67 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

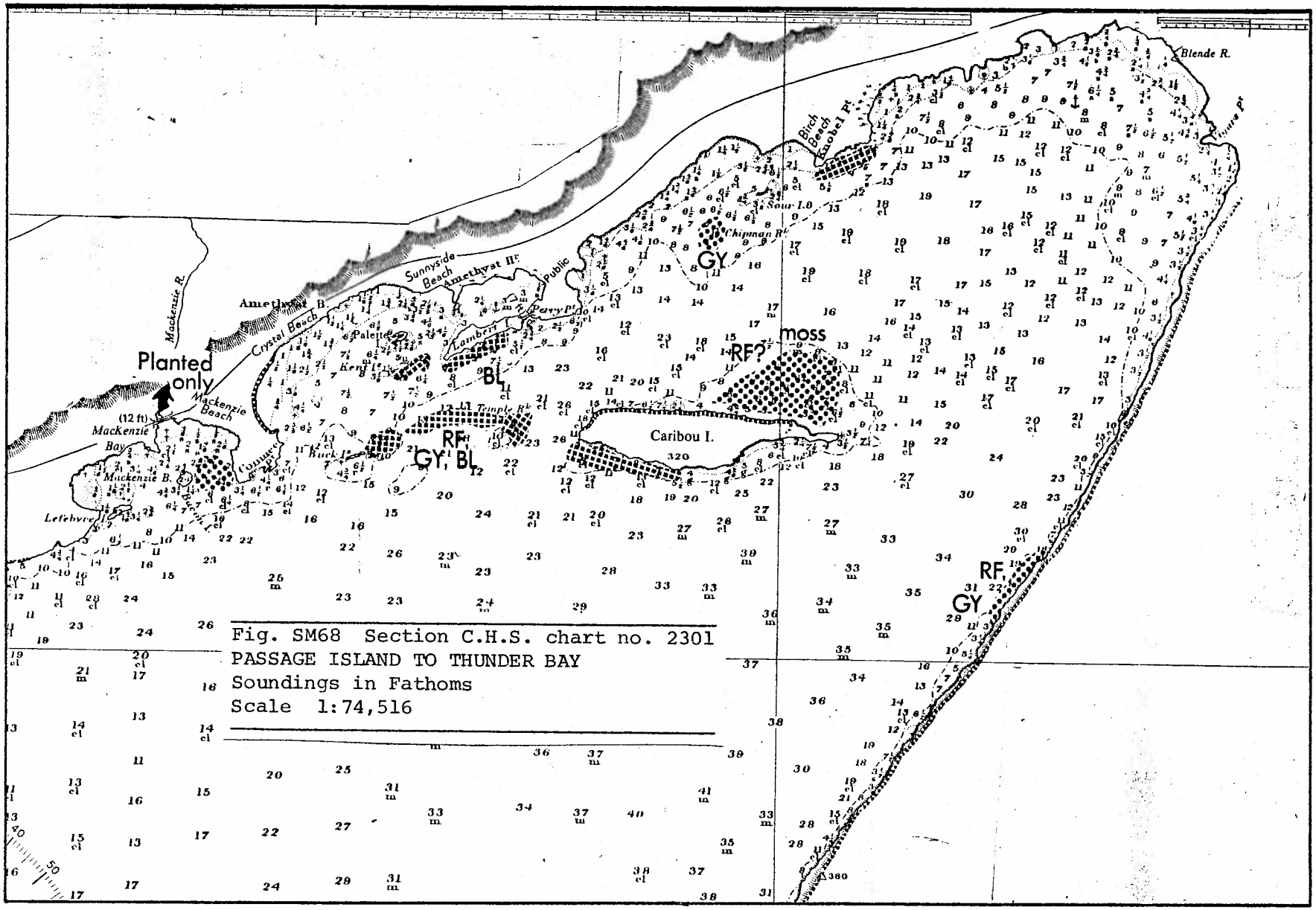


Fig. SM68 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

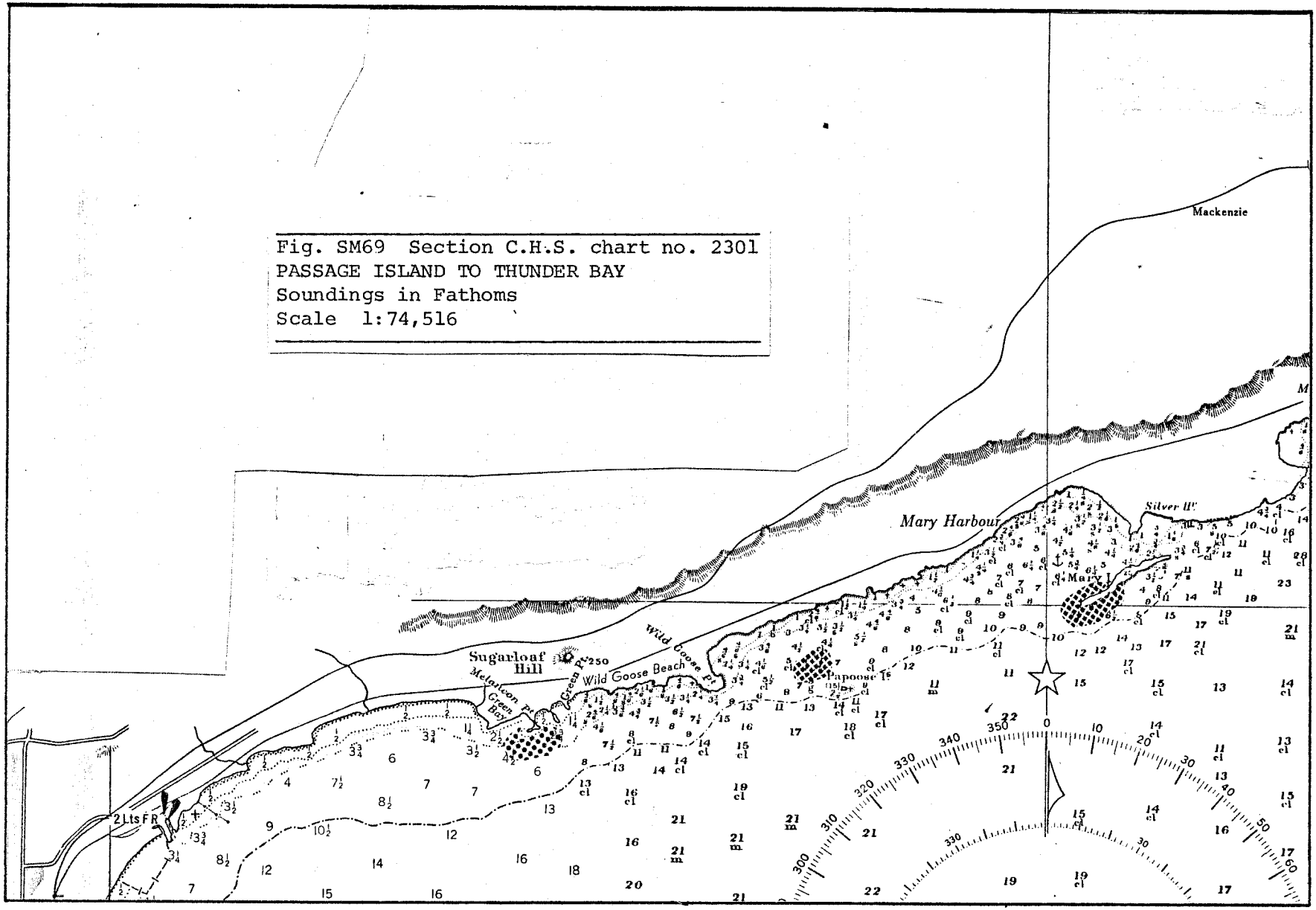


Fig. SM69 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

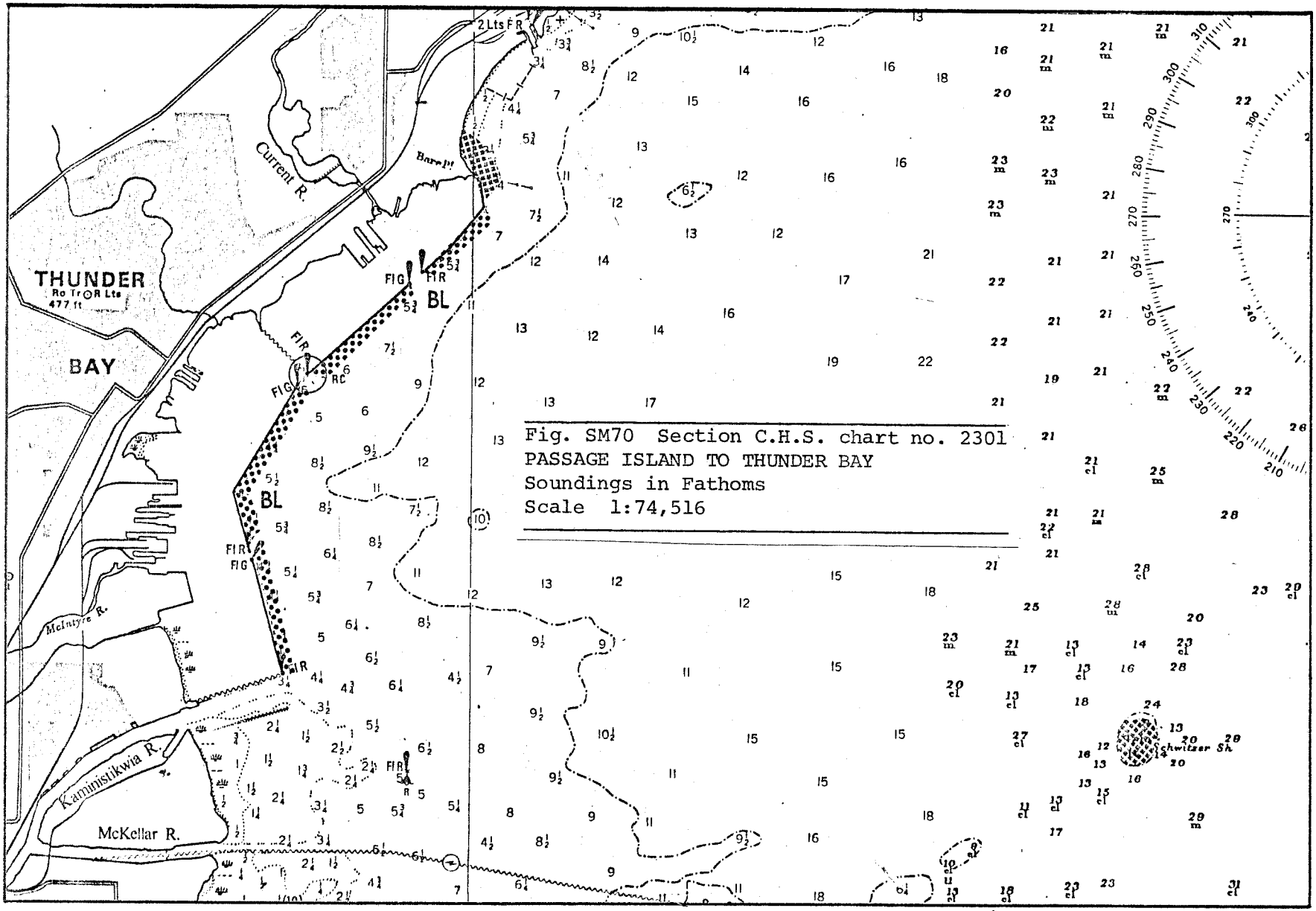


Fig. SM70 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

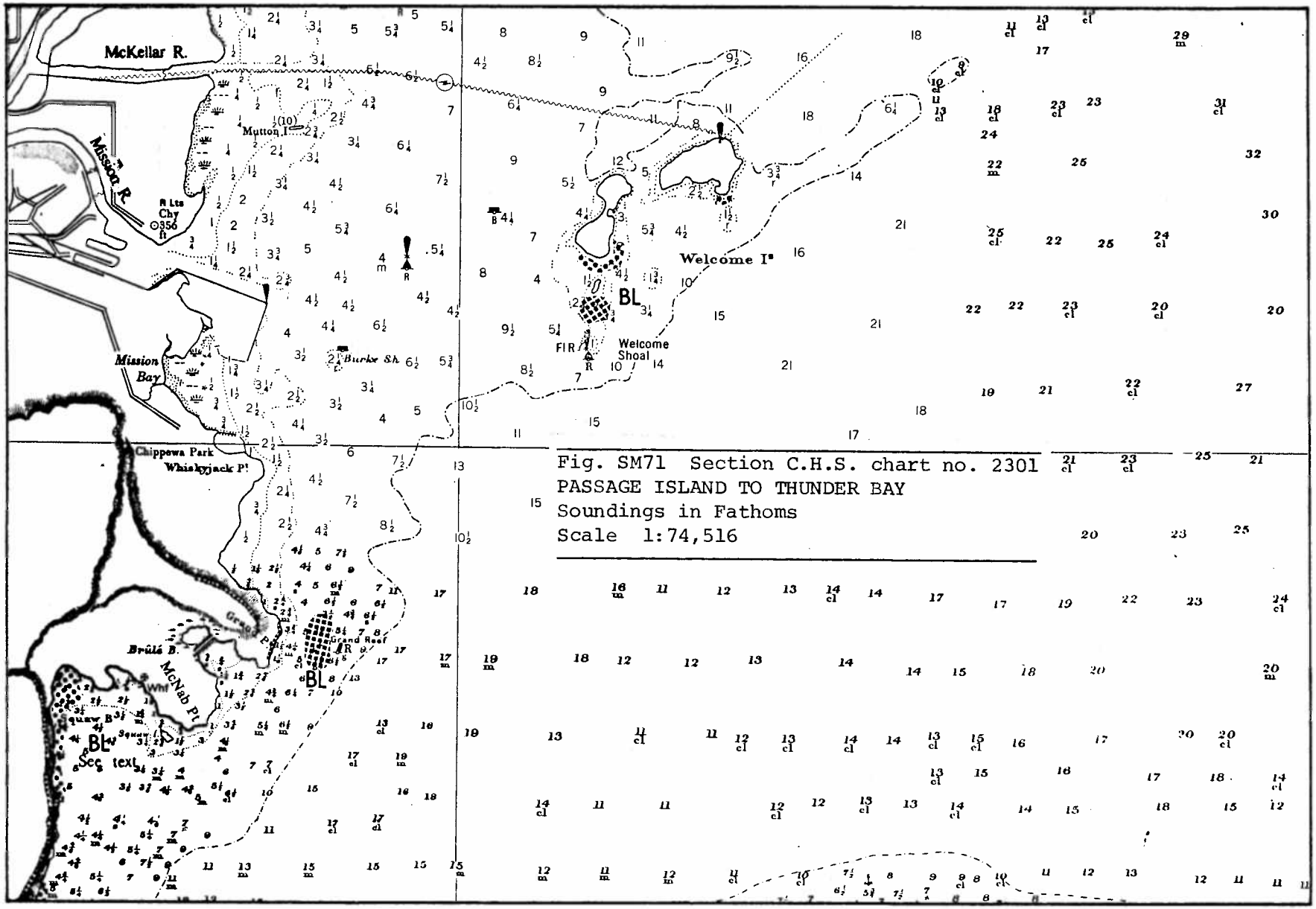


Fig. SM71 Section C.H.S. chart no. 2301
PASSAGE ISLAND TO THUNDER BAY
Soundings in Fathoms
Scale 1:74,516

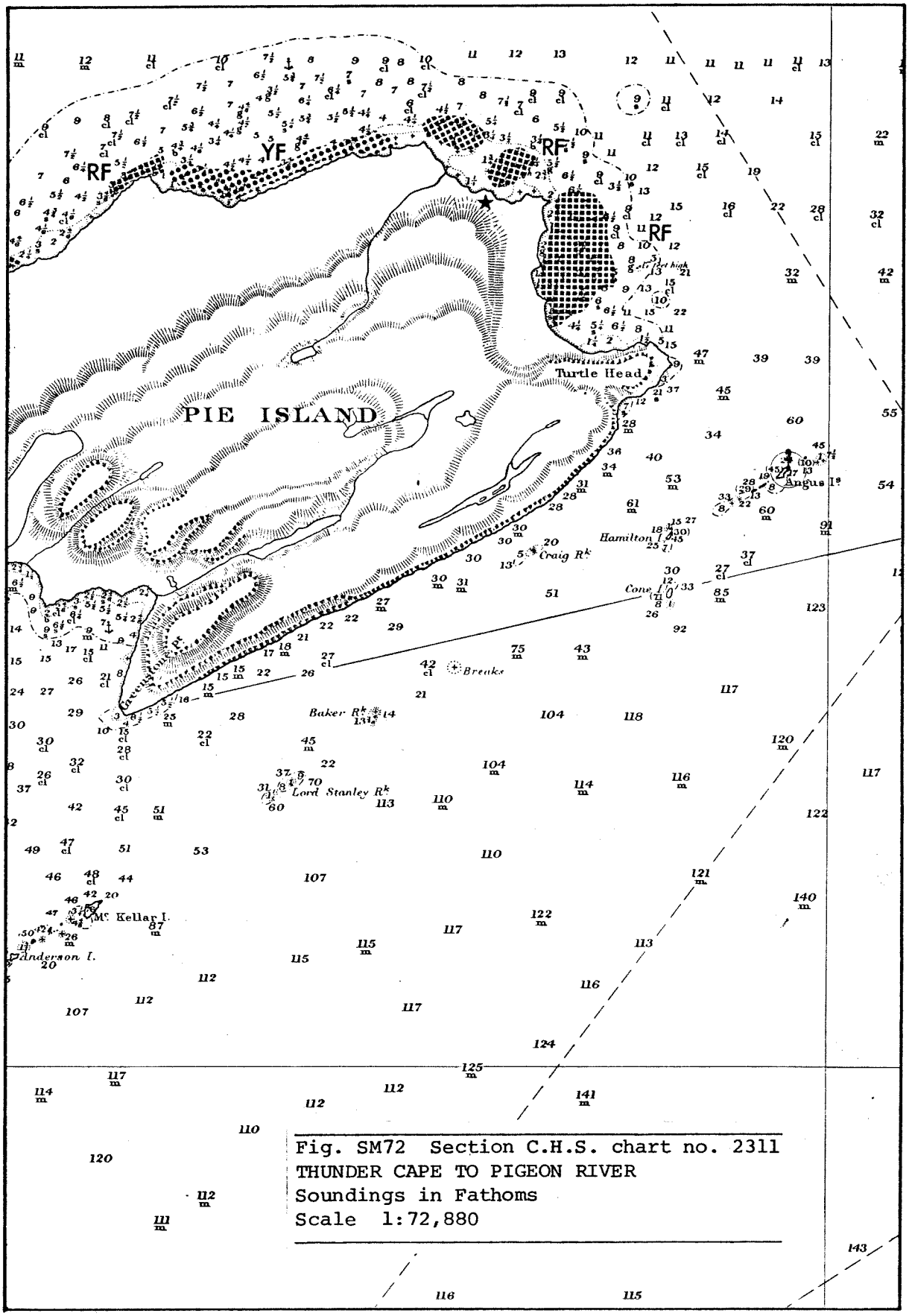


Fig. SM72 Section C.H.S. chart no. 2311
THUNDER CAPE TO PIGEON RIVER
Soundings in Fathoms
Scale 1:72,880

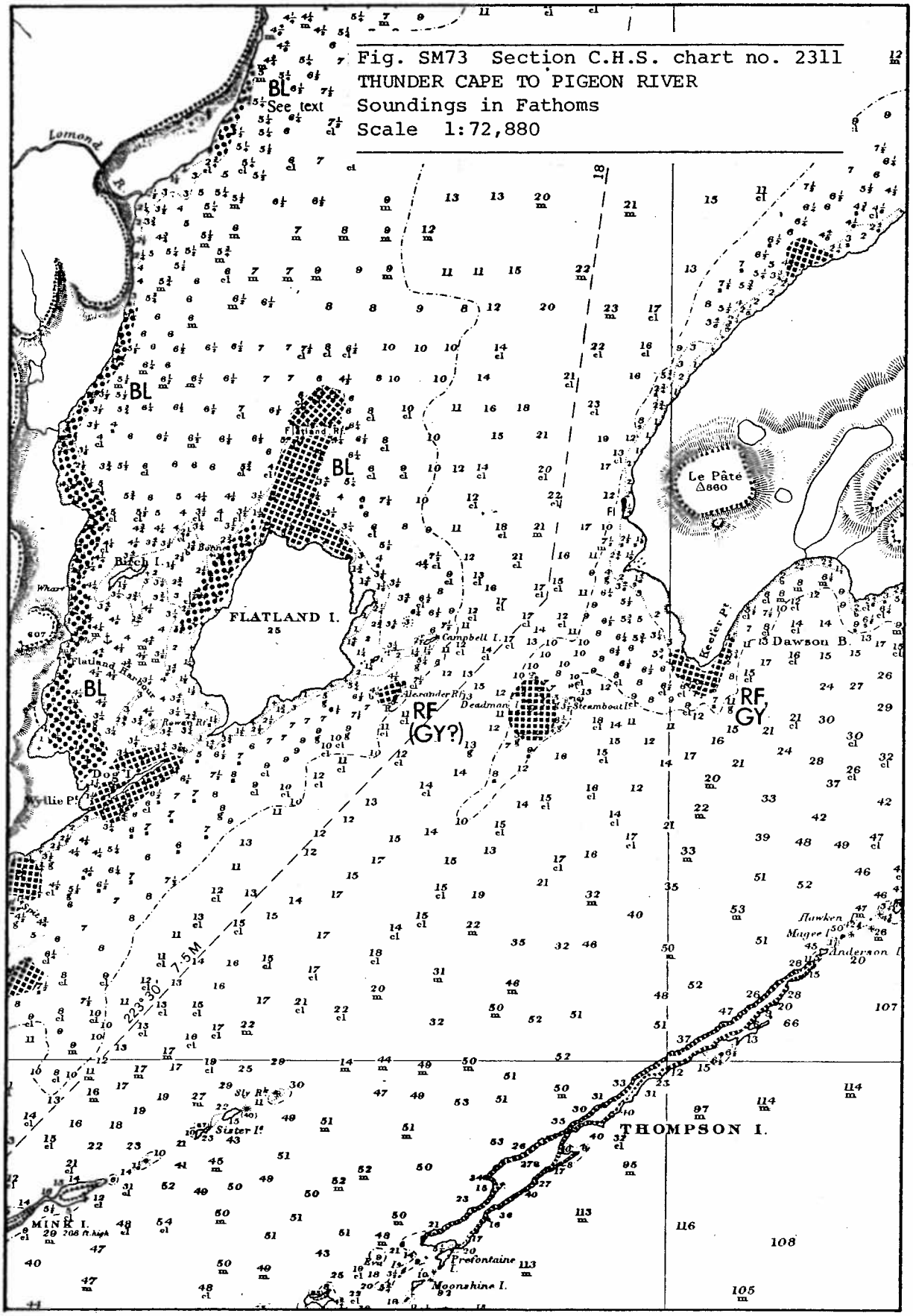


Fig. SM73 Section C.H.S. chart no. 2311
THUNDER CAPE TO PIGEON RIVER
Soundings in Fathoms
Scale 1:72,880

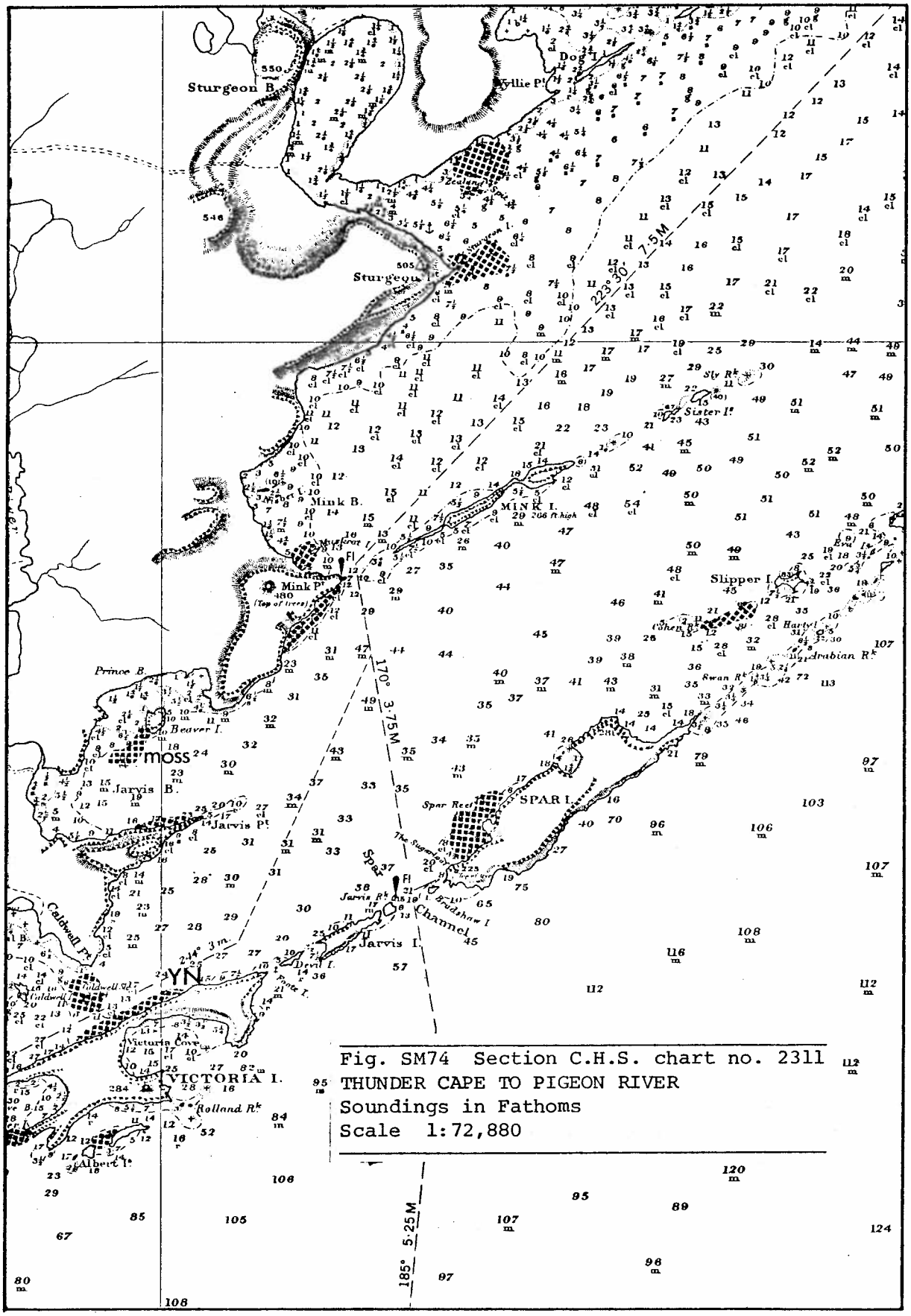


Fig. SM74 Section C.H.S. chart no. 2311
THUNDER CAPE TO PIGEON RIVER
Soundings in Fathoms
Scale 1:72,880

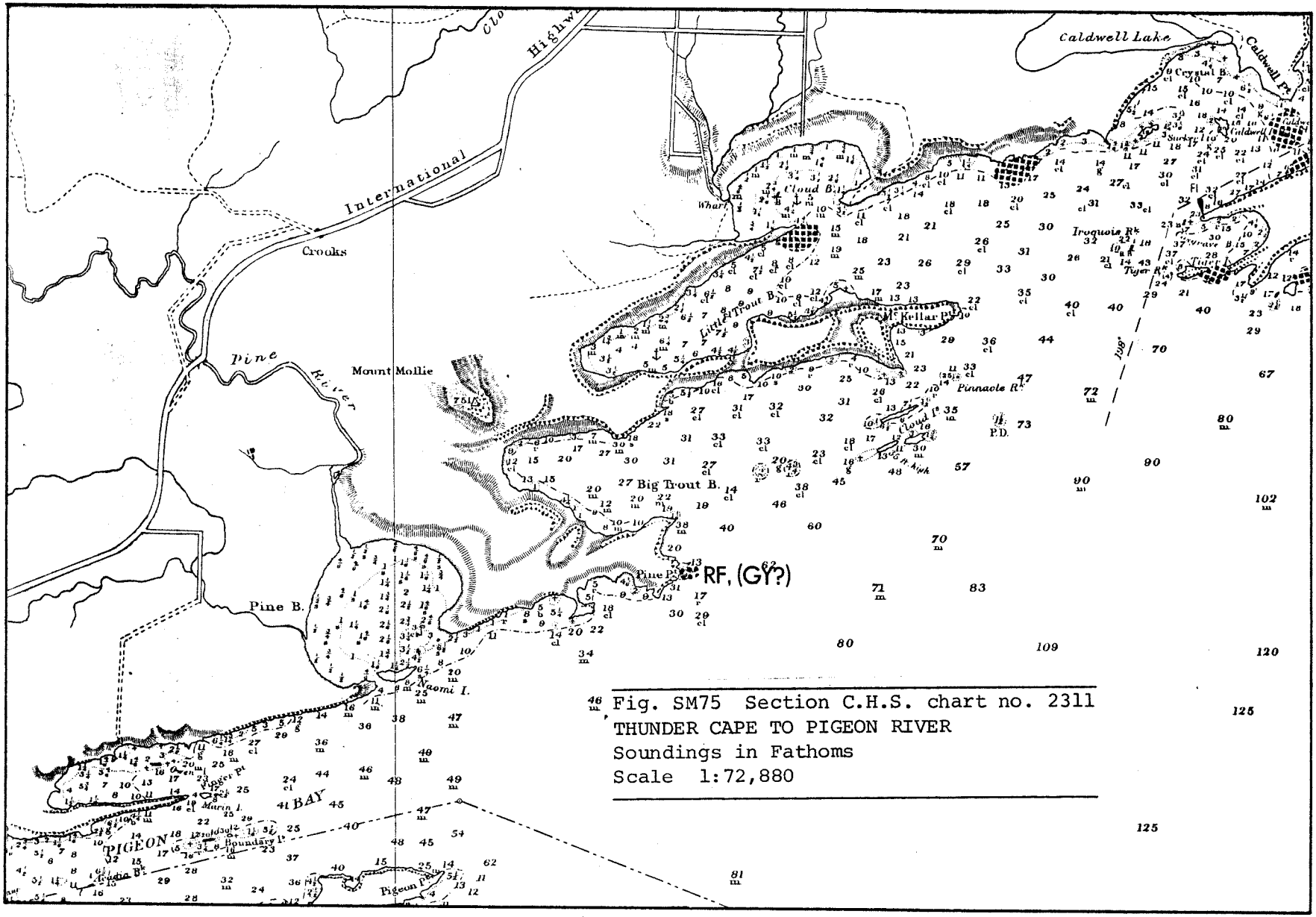


Fig. SM75 Section C.H.S. chart no. 2311
THUNDER CAPE TO PIGEON RIVER
Soundings in Fathoms
Scale 1:72,880