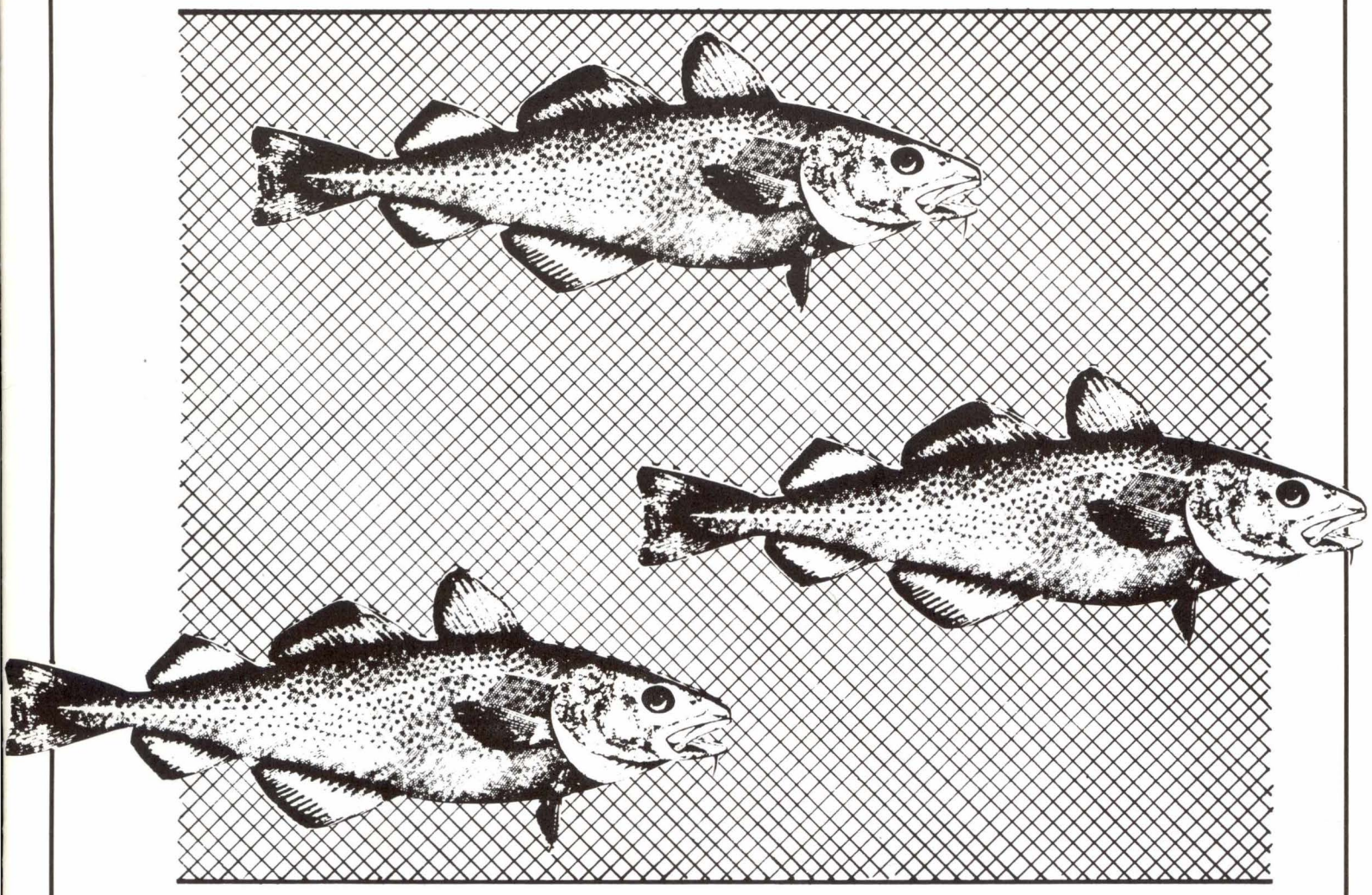
Fisheries and Oceans | Pêches et Océans

TRAP COD

SOME FACTS ABOUT UNPREDICTABLE CATCHES AND SMALL FISH



Canada

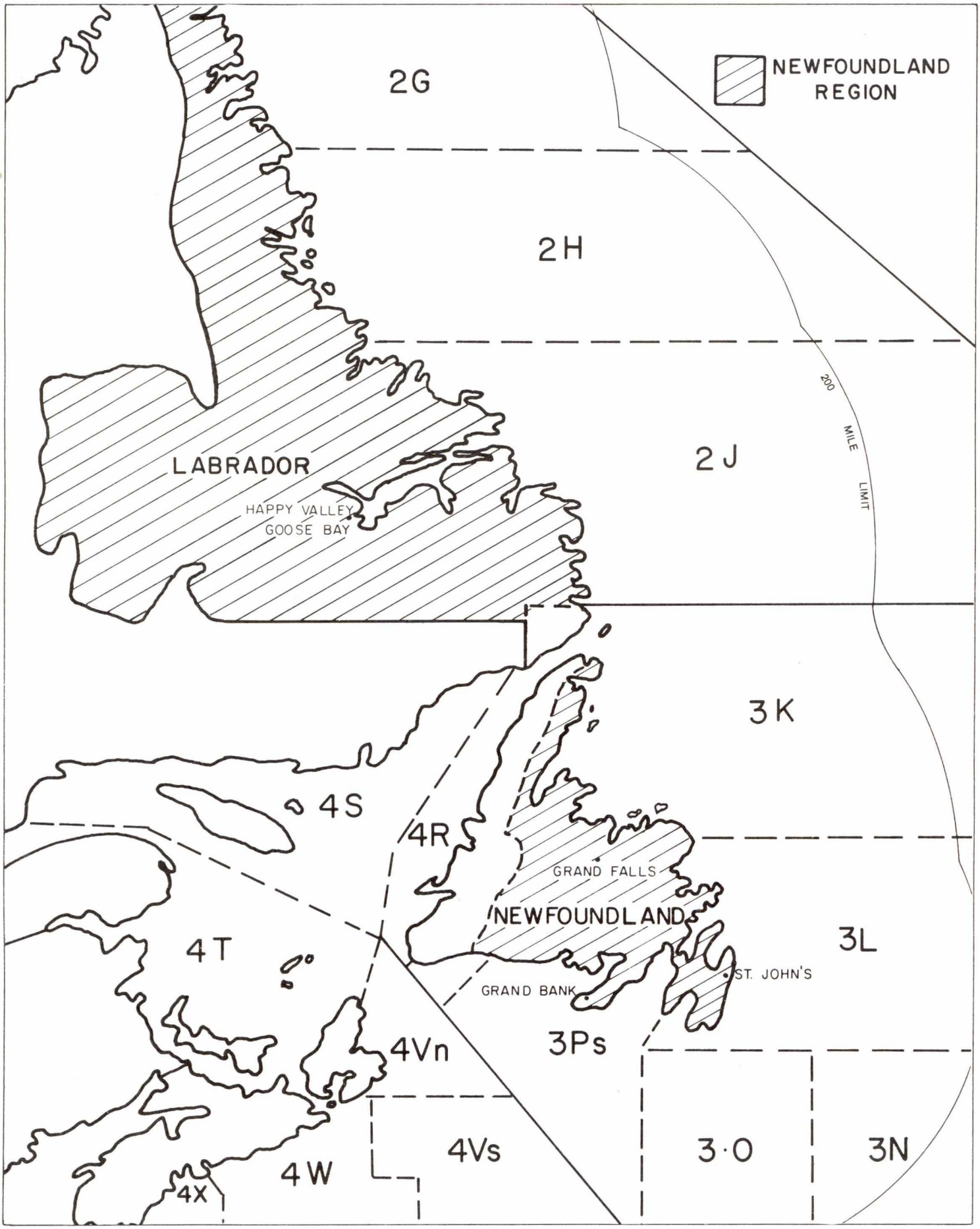
Questions and Answers

Department of Fisheries and Oceans personnel in the Newfoundland Region are constantly meeting requests from various sources — the general public, schools, the news media and many others — for information on a wide range of fisheries-related matters. Many of these informational needs are anticipated in advance and are met through the provision of materials, such as the "Underwater World" series on fish species, which has already been prepared for distribution on demand. In other cases a simple telephone call or letter to some Department staff member is all that is required to get the answer to a specific question.

Sometimes, however, there is a widespread demand for information on some matter of such importance, complexity or controversy that it can only be adequately met by the preparation of a new package of information designed especially to deal with that issue. A recent example of this is a 12-page brochure, published in March, entitled "Acid Rain: A Newfoundland and Labrador Perspective".

Another example is this publication on the trap fishery. Virtually every year various aspects of the trap fishery become matters of serious concern and discussion in many areas of the province. In January, 1983, the Department of Fisheries and Oceans sponsored at Gander an inshore fisheries workshop with fishermen to discuss various problems in that sector of the industry. Among the multitude of questions addressed were many pertaining to the trap fishery.

This brochure is a direct response to the needs of trap fishermen, as expressed during the Gander meeting and elsewhere, for information on those matters.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HAPPY VALLEY
GOOSE BAY
NEWFOUNDLAND
GRAND FALLS
ST. JOHN'S
GRAND BANK
200 MILE LIMIT

The cod trap

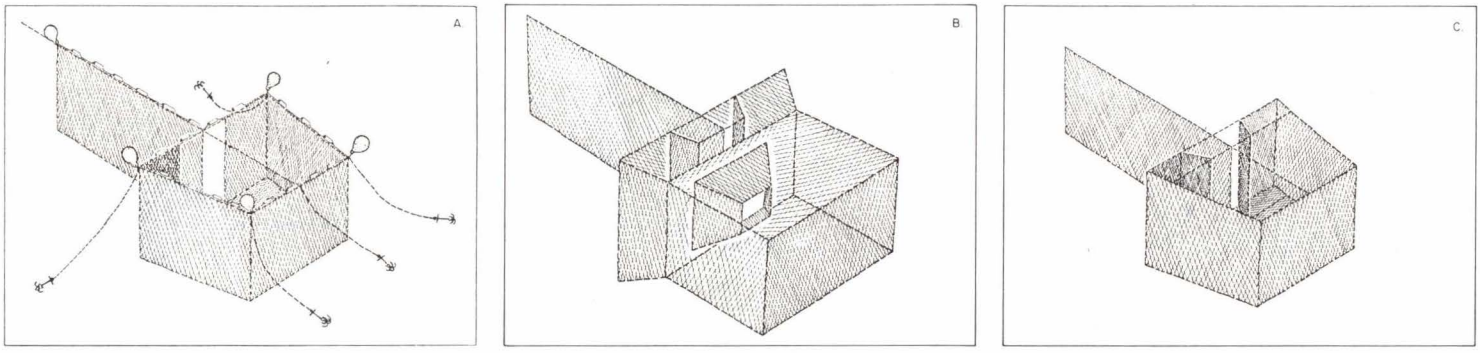
Tradition has it that the Newfoundland cod trap was invented in the 1860's by Captain William H. Whitely, a Newfoundland fishing skipper operating at the time out of Bonne Esperance on the Quebec shore of the Gulf of St. Lawrence.

The basic design of the trap has not changed since then, although some modifications have been made to mesh sizes, rigging, etc., to meet local conditions. Also, both Newfoundland and Japanese fishermen have made changes in recent years to the shape of the front or entrance ('door') side of the trap to improve its catching and holding efficiency. (Fig. 1)

The cod trap is one of the most labour- and cost-efficient fishing gears ever devised and can be spectacularly successful when used under the appropriate conditions. In spite of this, however, the trap fishery in Newfoundland has traditionally been plagued by two serious problems: catches can vary tremendously — from enormous to almost nothing — from season to season, and the trap catches mostly small fish.

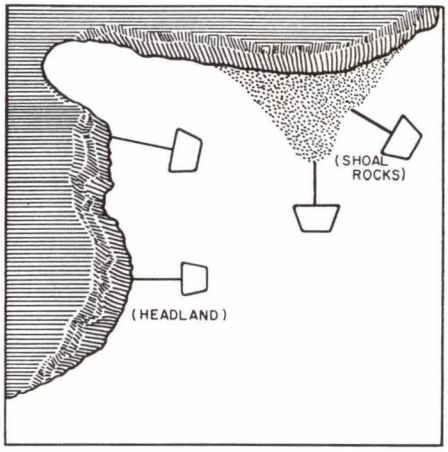
This brochure provides some facts and figures about both these problems.

Figure 1. Cod traps in use in Newfoundland and Labrador: A. the traditional Newfoundland trap; B. the Japanese trap; C. the modified Newfoundland trap.



Unpredictable Catches

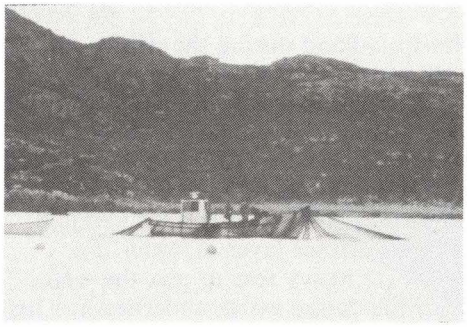
Figure 2. Typical trap berth locations.



The history of cod trap catches is one of ups and downs. Catches in one year may be excellent, with fishermen getting more fish than they can handle; in other years they may have great difficulty even scraping a 'saving voyage'. Catches in different areas may also show great differences. For example, the fishery in Fogo can be excellent while that in La Scie is extremely poor, all the in the same year. The next year the pattern of catches might be reversed.

The nature of the cod trap itself is one of the reasons for these fluctuations in catch. It is a stationary gear set in a specific location and must wait for the fish to come to it. (Fig. 2) About all a fisherman can do to improve the situation is move the trap to a new berth or shift it to deeper or shoaler water in an existing location. There are a number of factors about which a fisherman can do little or nothing that affect the behaviour and movements of cod and directly affect their chances of getting caught in a trap.

Thus, there are several possible reasons why the cod trap fishery experiences frequent failures, even though there may be plenty of fishermen, boats and traps employed to ensure a successful season.



Hydrographic conditions

Codfish prefer to inhabit water with a temperature of about 0° C to 4° C, although very small cod will tolerate somewhat warmer or colder water. It can also be said that although you may catch a cod of any size in water of any depth, generally speaking the larger the codfish the deeper the water it prefers to live in. Figure 3 illustrates typical inshore/nearshore water temperature conditions in Newfoundland waters and indicates what size cod are most likely to be taken (and the gear most likely to be used) at various water depths.

Of the many factors which can directly affect cod trap catches, probably the most important are hydrographic conditions. The most important of these are generally water temperature, currents or tides and sea conditions. Sometimes, for example, the current or tide may be so strong as to pull trap floats complete under water, making it impossible to haul the gear for several hours or even days, until the tide slackens.

However, the hydrographic factors which most commonly affect the trap fishery — and the effect can be good or bad, depending on the situation — are water temperature and sea conditions. These are influenced to a very significant degree by atmospheric conditions: air temperature and prevailing wind direction and speed. The following drawings (Figs. 4 & 5) show how hydrographic conditions (influenced by atmospheric conditions) can affect the trap fishery.

Figure 3. Typical inshore summer water temperature profile off Newfoundland east coast; inshore gears normally used at various depths; average length of cod in inches/centimetres taken along east coast inshore during 1961-65 using different gears: trap 20.8 in./58.1 cm; handline 22.9/58.1; linetrawl 23.7/60.1; longline 26.1/66.3; gillnet 30/76.2.

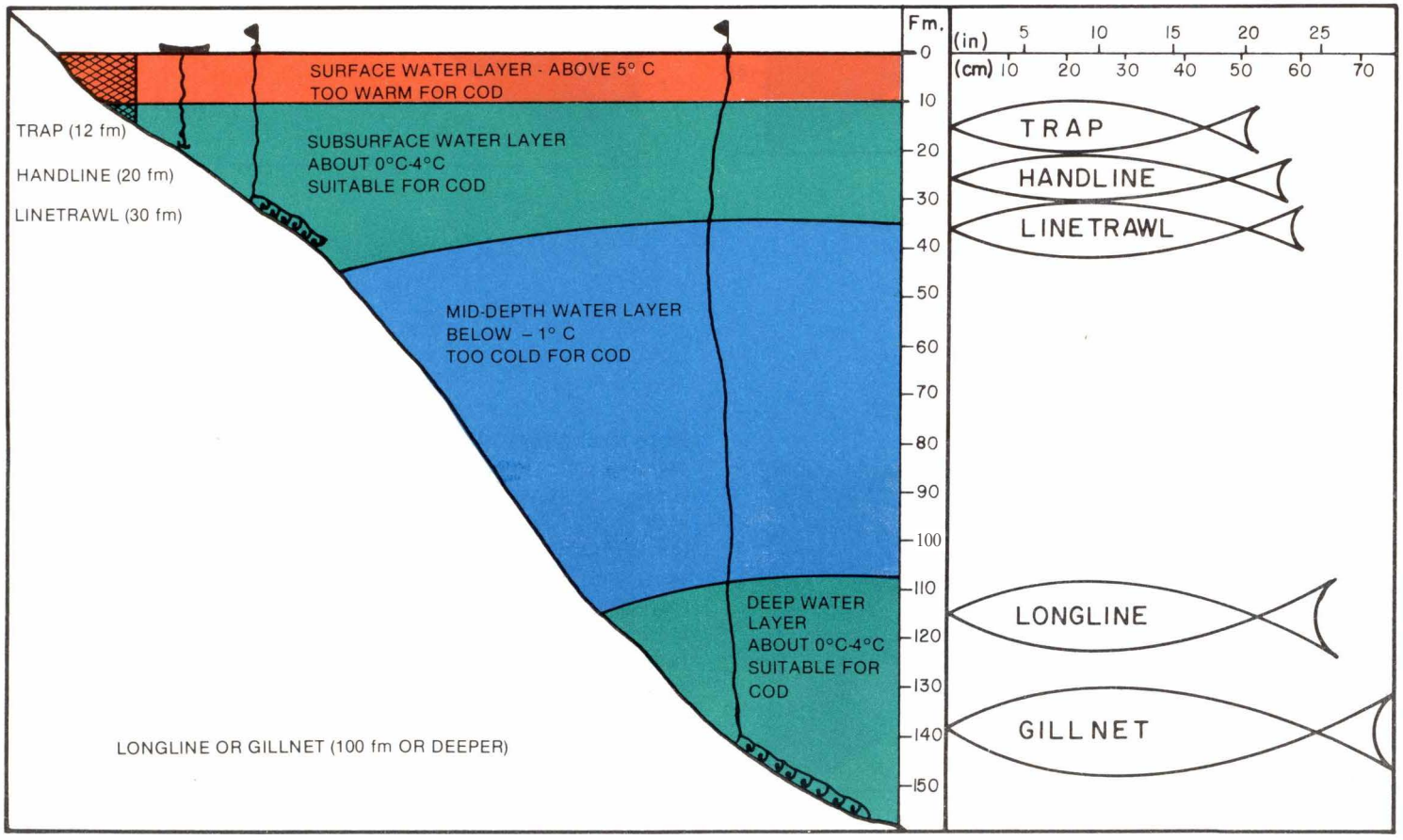
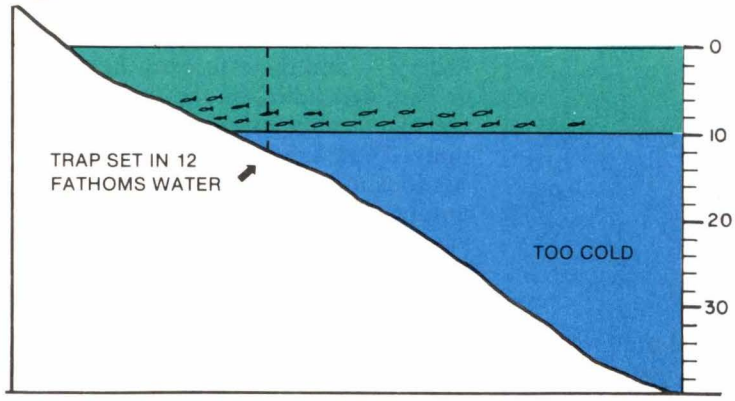
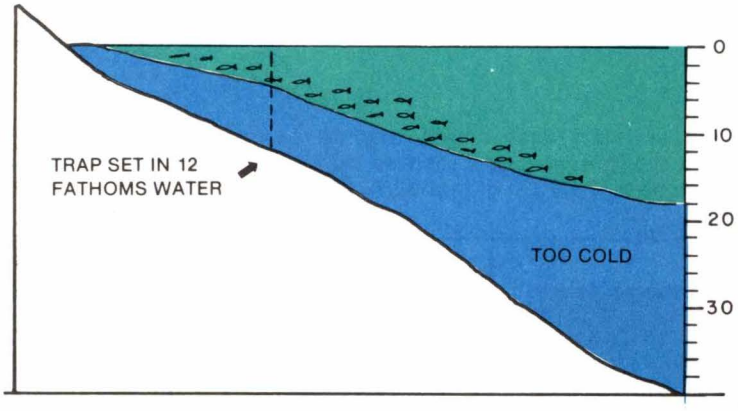


Figure 4A



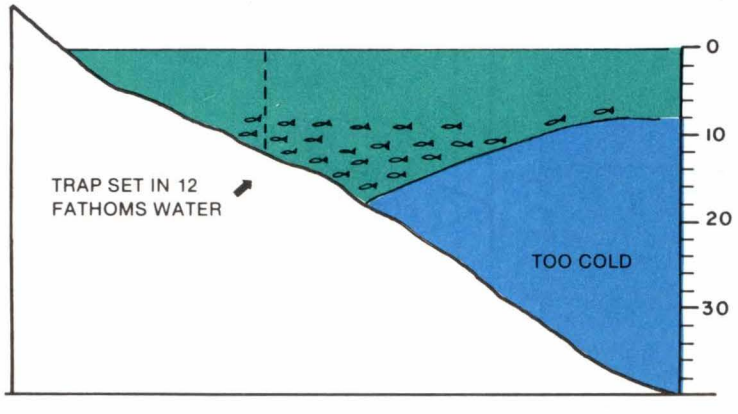
Off the east coast of Newfoundland during the winter, the temperature of all inshore waters is likely to be about -1° C to -1.5° C. As the spring and summer advance, ice melts or moves off, the air gets increasingly warmer and surface water temperature starts to rise. Figure 4A shows a typical situation we might find in June month when there has been a relatively late, cold spring and there are only light variable winds prevailing. There is no surface layer of water too warm for cod and there are no heavy seas to mix the water layer suitable for cod with the cooler water underneath. The suitable water layer is only about 10 fathoms deep and the cod, following the caplin, will come very near to shore since there is only a small bottom area near shore with suitable water temperatures. A trap set about 12 fathoms deep in this situation should do well if there is a good run of fish.

Figure 4B



Here the stable June situation has been upset by strong prevailing offshore winds. The water layer suitable for cod has been pushed offshore and replaced close to shore by upwelling colder water from underneath. In this situation, the trap would be standing mostly in the too cold water. Some fish might come further inshore than the trap, encounter the leader and enter the trap, but it is more likely that most fish will stay outside the trap area. Poor June fishing can be expected under these conditions.

Figure 4C



Here strong prevailing onshore winds have pushed the suitable water layer shoreward, causing it to deepen near shore. This pushes down the cold water underneath and a greater bottom area covered with water of a suitable temperature is opened up to the feeding cod. In this situation, the fish can be expected to congregate near shore in trap-depth waters in large numbers. In addition, the fisherman has a greater depth range, down to about 18 or 20 fathoms, in which to set his trap and still stay within the suitable water layer. There should be good fishing in this kind of early season situation.

Figure 4D

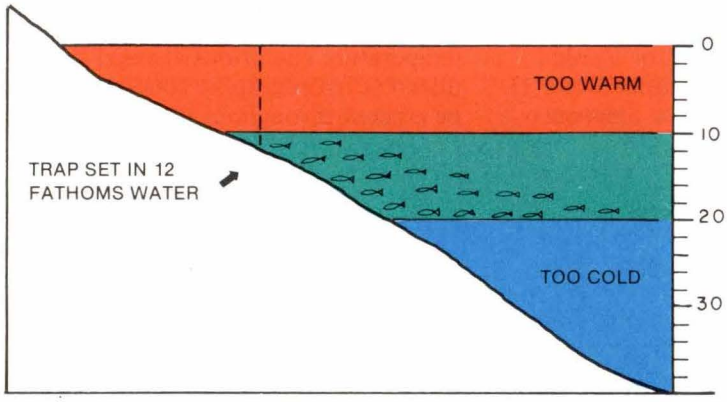
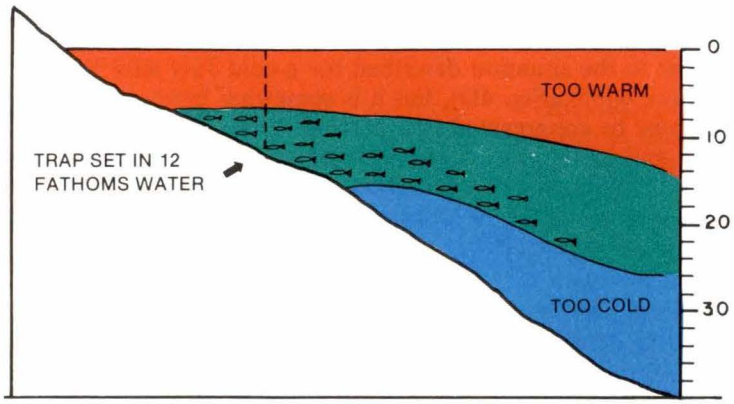


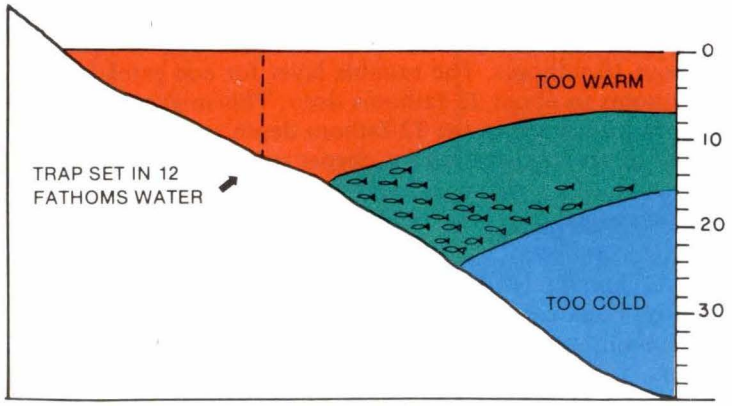
Figure 4D shows the kind of situation we might find in July under light variable wind conditions. The warmer summer weather has created a surface layer of water nine to 10 fathoms deep that is too warm for cod. A suitable water layer now extends from about the 10-fathom depth down to about 20 fathoms; unsuitably cod water lies underneath. Here a trap set at 12 fathoms might not be in a good position since most of the fish will likely be congregated near the bottom of the suitable water layer at the 15-20 fathom level. A trap set in this depth range might do well; but over all, the fishery probably will not be good.

Figure 4E



The above situation, where light variable July wind conditions have allowed the surface water level to become too warm, can be improved by a steady offshore wind in late July or early August. The wind pushes the warm surface water offshore and the water level suitable for cod rises up somewhat, bringing the fish into average trap depths. The cold bottom water will also rise in this situation, so that the cod will most likely be found in a fairly thin layer between about seven or eight fathoms down and 16 or 17 fathoms down. This should provide excellent fishing conditions for all but the shoalest and deepest of traps.

Figure 4F



However, if the stable July situation shown in Figure 4D is followed by strong onshore winds, the situation could be radically different. Here the warm surface layer of water is being pushed shoreward by the wind. As it presses against the shore, it is forced downward, perhaps as deep as 15 or 16 fathoms. The layer suitable for cod is forced down beneath it, and the cold bottom layer beneath that is also pushed down. Most of the cod are now lying 20 fathoms deep or more, and there will be poor fishing for all but the deepest traps.

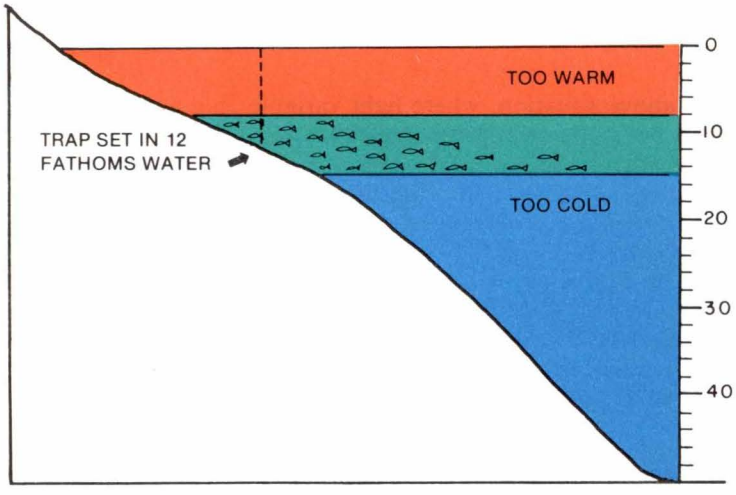
ERRATUM

On page 8, the sections of text for Figure 5A and Figure 5B have been incorrectly placed. For Figure 5A, read the text opposite Figure 5B; for Figure 5B, read the text opposite Figure 5A.

The reader must bear in mind that these are six rather simple, 'average' situations for a year that started with a late, cold spring, making for a cold trap season. The six situations were: 1) cold June, light variable or light onshore winds; 2) late June, strong offshore winds; 3) late June, strong onshore winds; 4) cold July, light variable or light onshore winds; 5) late July, strong offshore winds; 6) late July, strong onshore winds.

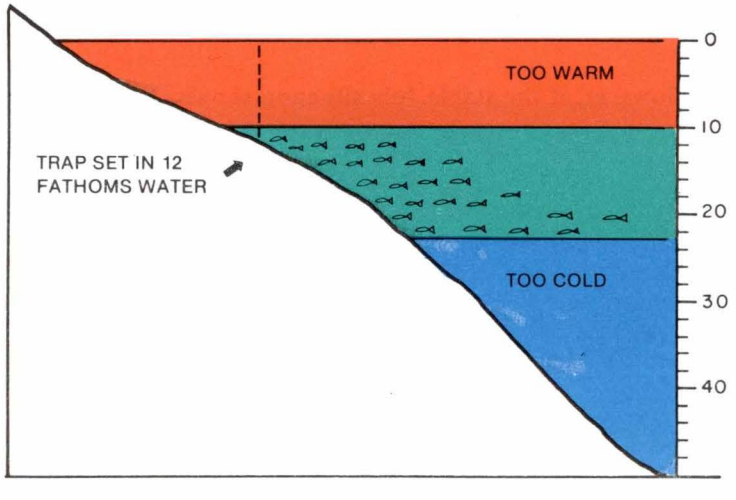
There is hardly ever anything this simple, however, in the trap fishery or any other fishery. There are many other kinds of situations that arise. For instance, we might get an early, warm spring, making for a warm trap season over all. Moderate prevailing winds, whether offshore or onshore, will produce different situations from light or strong winds. As these wind and air temperature conditions change, many different hydrographic conditions can be created throughout the trap season. Figure 5 illustrates several other possible situations.

Figure 5A



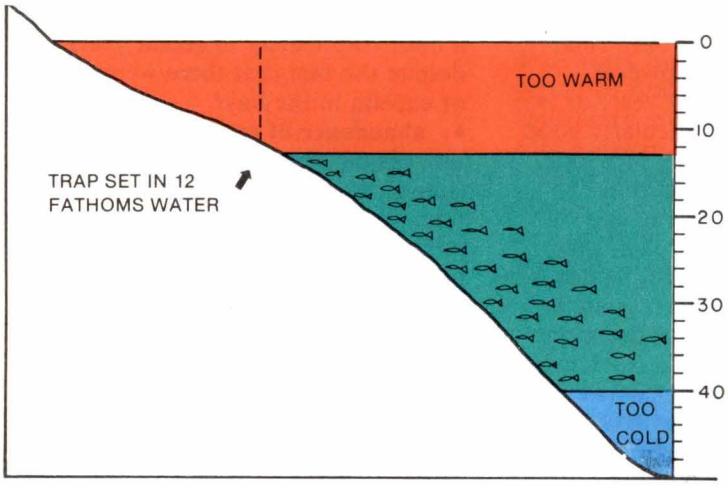
This is a typical situation in June month on a warm year with moderate onshore winds prevailing. There is a warm layer of water, unsuitable for cod, about eight fathoms deep. Beneath that is a suitable layer going down to about 15 fathoms, with colder water lying beneath that. This is similar to the situation described for a cold July with light onshore winds (Fig. 4D), but it is somewhat better. The cod will now be congregated in a narrower layer between roughly eight and 15 fathoms down, in good average trap depth. These conditions can mean good fishing for most traps as long as they prevail — and they could prevail right up into August or even later.

Figure 5B



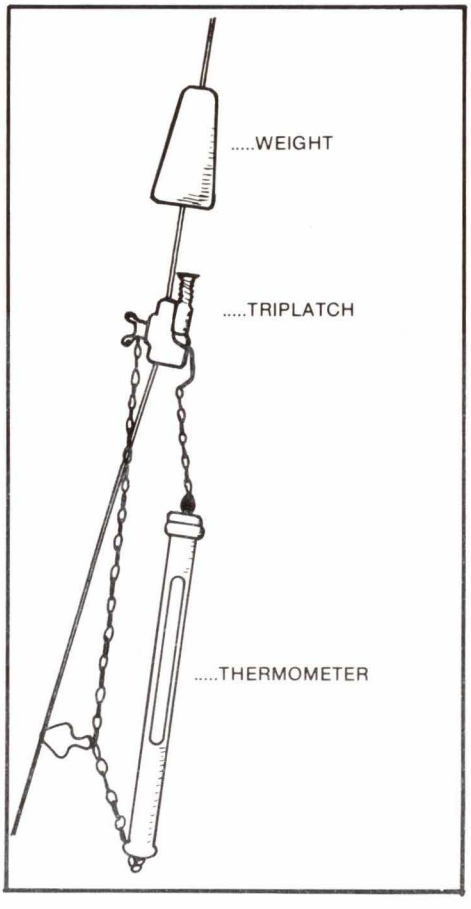
This is the kind of situation we might find in August on a cold year with light to moderate onshore winds prevailing. It is similar to the situation described for a cold July with heavy onshore winds (Fig. 4F). The warm surface layer of water is not pushed quite as deep, however; it is down to only about 10 fathoms. The suitable layer for cod extends from 10 fathoms to about 23 fathoms deep. This might cut the cod off from traps in the 12-fathom depth range, but it should mean good fishing for deeper traps, as on the Avalon Peninsula, say, where they are usually set in the 18 to 20 fathom range.

Figure 5C



This is a typical kind of late-season situation. It might be found in August on a warm year with heavy onshore winds prevailing; or in September on a cold year with heavy onshore winds; or in September on a warm year with light to moderate onshore winds. In any case, either the summer temperatures or the onshore winds, or a combination of both, has by August or September created a deep surface layer of warm water extending down to about 13 fathoms or more. By this time, the water layer suitable for cod has likewise been pushed downward to about 40 fathoms. This is the end of the season for most trap fishermen, as the cod are now too deep for all but the deepest traps. The capelin have gone and the cod tend to be widely dispersed over a large bottom area, feeding off crab, shrimp and other bottom living creatures. These conditions generally make for successful linetrawl and near-shore gillnet fisheries. (The reader should bear in mind that the deep water layer suitable for cod found at about the 100 fathom depth is a very stable one, and the longline and gillnet fisheries conducted in this water is seldom, if ever, affected by the sort of hydrographic conditions described for Figures 4 and 5.)

Figure 6. Deep-sea reversing thermometer.



Obviously, there is an almost endless number of situations that can arise. And things can be further complicated by local shoreline and bottom conditions, as they affect wind direction, currents, wave action and so on.

Observant fishermen, however, will soon recognize general patterns in the conditions in their particular areas. Those with a good basic understanding of the effects of winds and temperatures on the waters in their area may be able to take advantage of changing conditions to shift trap locations, or change to other gears from time to time, and so improve their chances of increasing their season's landings.

One piece of equipment needed to take advantage of changes in hydrographic conditions is a reversing water thermometer (Fig. 6). By using the thermometer, a fisherman can determine the temperature of the water at different depths and set his trap at whatever depth has a suitable temperature range for cod (or change to another type of gear such as the linetrawl).

The reversing thermometer is simple to operate. It is lowered into the water on a line to the required depth. It records the temperature there, and then a weight is sent down the line to operate a trip-latch and allow the thermometer to turn upside-down. This traps the mercury at whatever reading has been recorded and the thermometer can then be hauled to the surface without the reading being changed as the thermometer passes through water of different temperatures.

The reversing thermometer is a relatively expensive piece of equipment, costing about $300 or more, but it is built to last, and it can be very useful.

Other factors influencing catch predictability

Hydrographic conditions are the most important factors affecting trap landings year in and year out. There are many other factors, however, which can make for a bad year, or two or three in a row (or particularly good years too, for that matter), in a local area or along an entire coastline.

For instance, if the overall size of the stock being fished is down, then chances are trap catches will be down (along with catches by other gears as well). Or the overall size of the stock may be quite large, but the stock might contain low numbers of the small size of cod that are normally caught in traps. The amount of capelin that come inshore to spawn can affect trap landings; so can the amount of capelin that stay offshore because they are too young to spawn. The amount of sunlight, the presence of 'dirty water' and the spawning time of the cod are other factors which can help make or break a trap fisherman's season.

- **size of the cod stock.** A successful inshore fishery requires a good supply of cod offshore in the range of sizes normally caught in the traps. The size of the northern cod stock is currently estimated to be about 1,500,000 t (metric tonnes), which should provide good catches inshore. During the 1970's, the inshore catch was very low because the cod stock was reduced to a very low level (around 400,000 t) because of overfishing. (See Fig. 8)
- **low abundance of one or more year-classes.** Sometimes the spawning in a particular year is not successful because of adverse ocean conditions and few cod are born of that year- class. (A year-class is the cod born in a particular year; cod born in 1980, for example, would form the 1980 year-class.) Year-class success or failure is vital to the trap fishery. When two year-classes in succession are failures, there is a shortage several years later of cod in the traps and inshore generally, since it is cod of four to six years old that form the major portion of trap catches.
- **lack of capelin.** The inshore cod trap fishery takes place during the inshore spawning migration of capelin, which at this time are the major source of food for inshore cod. A lack of capelin in a local area could discourage cod from staying there. They could move to other areas or into deeper water to search for food. However, the presence of large quantities of capelin in an area does not automatically ensure a good trap fishery. Conception and Trinity Bay fishermen experienced a poor trap fishery in recent years despite the fact that there were plenty of capelin in the bays.
- **abundance of capelin and other food offshore.** In some years, the spawning success of capelin is higher than average and there are unusually large schools of young one- and two-year-old capelin in the offshore area. Since capelin do not spawn at these ages, they do not migrate inshore, but stay offshore where they are available to cod. Also, in some years small arctic cod 10 to 20 cm (four to eight inches) long are found in large schools offshore. If the cod normally available to the trap fishery discover these food sources offshore, they may not need to move inshore with the capelin spawning migration.
- **too much sunlight.** During prolonged periods of bright sunlight, larger cod tend to move close inshore only duing the night. During the day, they will move off to deeper water, out of cod trap depth, to escape the light. The much smaller cod can endure brighter light, however, and during periods of bright sunlight, only these very small fish, tom-cod size, will stay in the area of the cod traps. The effect of sunlight is most pronounced when the water is very clear and calm and the light goes deeper than usual, making it possible to see bottom where normally it cannot be seen.
- **'dirty' water.** In some years, there are large numbers of tiny marine organisms in the water which produce a sticky, clinging substance, commonly called "slub", that becomes attached to nets. Slub sometimes fouls nets so badly that it destroys their effectiveness for fishing and results in poor catches. Another small organism, locally called "blackberry", can also ruin a trap season. Blackberry occurs in some years in great abundance along the Labrador and eastern Newfoundland coasts. These organisms produce a very unpleasant odour, something like rotten eggs. Cod feed on them, sometimes to such an extent that the odour taints the flesh of the fish and makes it undesirable as a fresh food product. This does not make cod any harder to catch, but it may decrease fresh fish sales and thus make it unworthwhile to continue fishing while the blackberry organisms are in a fishing area. It

should be noted, however, that the blackberry problem generally does not have the same adverse affect on saltfish production since the odour disappears from salted fish in a short period of time. Both slub and blackberry are indicators of unusually cold water in an area.

- **delayed spawning of cod.** Occasionlly, cod spawning may be delayed by cold water on the overwintering grounds. If spawning is delayed significantly, the cod may move off the spawning area too late to make contact with the capelin as they start their inshore migration. In such a situation, there could be a poor inshore run of cod.

Small Fish

One of the two major problems which have always faced the cod trap fishery is the fact that traps catch mostly small fish. This section of the brochure discusses several important aspects of this problem.

The major questions addressed are: the reasons why mostly small fish are caught; the effects of changing trap mesh sizes, and; the economic implications of catching mostly small fish.

Factors influencing size of fish caught

There are four main factors influencing the size of fish caught in a cod trap: mesh size, relative numbers of large and small fish which come in contact with the trap, relative numbers of large and small fish in the population or stock of cod being fished and geographical location of fishing effort.

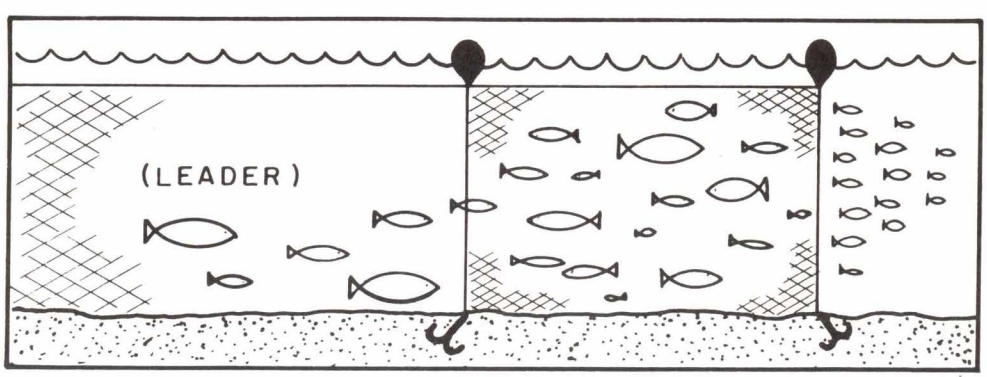
- **mesh size.** Fish which become enclosed by a net such as a cod trap usually make some effort to escape. They can usually accomplish this only by swimming or forcing their way through the net meshes. Mesh size is, therefore, important in determining the size of the fish which will be able to escape and the size of those that will remain in the trap. We refer to this process as the mesh selection or selectivity of the trap.

For a particular mesh size, it would seem reasonable to assume that all fish below a certain size would escape though the netting, while all those above this size would either stay in the trap or become meshed in the netting.

In practice, the situation is not as simple. For various reasons, not all the fish which are smaller around than the mesh size escape from a cod trap. The majority of these very small fish will escape, but some will stay in the trap. The bigger the fish, the more likely it is to remain in the trap. All the fish larger around than the mesh size will be held in the trap (Fig. 7), providing they don't swim out over the top or through the doors. Usually, it is as the trap is being hauled and the cod "dried up" that the fish try to escape through the netting. Because the fish are dried up toward the back of the trap, it is mainly through the back panel, and the side panels joined to the back, that they try to get away. Generally speaking, therefore, it is possible to influence the size of cod held in a trap by varying the mesh size used at the back of the trap.

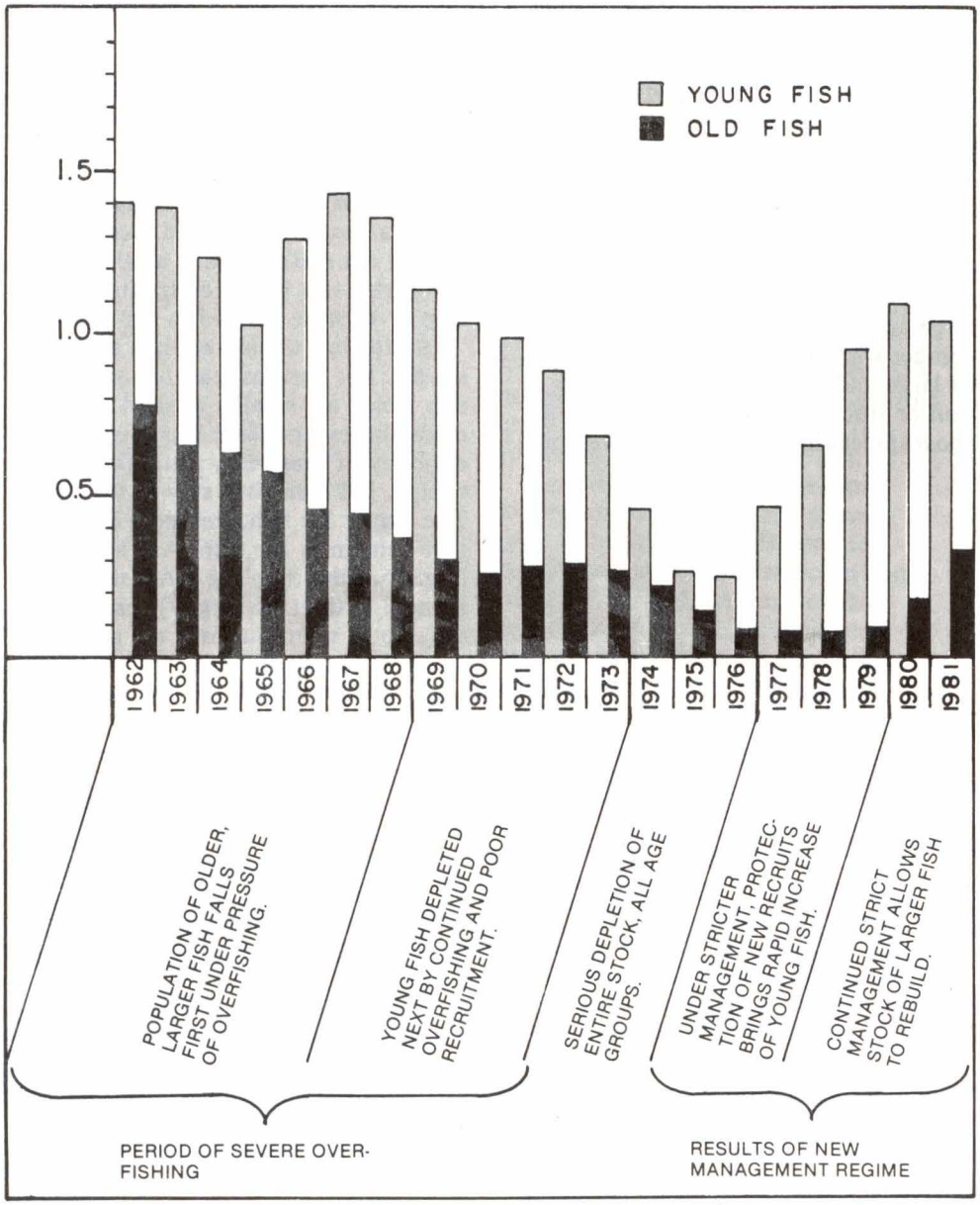
- **numbers of large and small fish which come in contact with the cod trap.** Compared to other gears used in the inshore fishery, the cod trap tends to catch the smallest fish, mainly because smaller fish tend to be closer to shore where most cod traps are set.

Figure 7. Fish of many sizes will enter the trap and usually remain there, circling within the walls. The very small fish will escape mainly through the back mesh as the trap is being dried up.



However, there are variations from year to year in the relative amounts of small and larger fish caught. Water temperatures or distribution and abundance of food may bring more large cod within range of the traps in some years. In certain areas, such as around headlands, deep water may run close to shore, and in such places larger cod may come within range of traps; traps set in deep water tend to catch a larger run of fish. Traps set in the bottom of bays, where little trapping was done until recently, tend to catch smaller fish.

Figure 8. Estimated yearly population (by weight) of young fish (4-7 years) and old fish (8 years and over) in the northern cod stock, 1962-81.



• **numbers of large and small cod in the stock being fished.** If a cod stock is in a healthy or stable condition, all age groups, older ages in particular, will probably be abundant. As a stock is fished, it is usually the older, larger fish that get caught first. Overfishing plus poor survival of young fish reduces the population of both old and young fish. As the stock rebuilds, smaller fish in the younger age groups are more numerous.

As indicated in Figure 8, this process has occurred with the 'northern' cod stock. In the early 1960's, before heavy fishing pressure, this stock was made up of large numbers of old and young fish. Fishing pressure then reduced the number of old fish, while the younger fish remained in relatively high numbers, indicating a good survival rate from eggs to their first appearance in the fishery (recruitment). However, with a further increase in fishing pressure, and poorer recruitment, the numbers of both old and young fish were reduced in the early to mid-1970's, dropping to their lowest level in 1976.

Strong conservation measures and improved recruitment enabled the rebuilding of the stock. The first sign of this was a dramatic increase in the numbers of young fish.

The significance of all this to the trap fishery is that the catch will to some degree reflect the size make-up of the total stock. Thus, it can be shown that the average size of cod taken in traps declined after the 1960's, reflecting the heavy fishing pressure on the northern cod stock. In recent years, however, there has been a general increase in the average length of trap cod. (Although this was not evident in the 1982 trap fishery because of the appearance of the relatively abundant 1978 year-class, which brought a lot of young, small fish into the traps.) Once the stock is fully rebuilt, the average size of trap cod will still, of course, be smaller than cod taken by other gears.

• **geographical location.** The average length of cod taken in traps has been shown to differ between NAFO divisions — the average length increases as one goes from south to north. There are three main reasons for this: variations in migratory patterns within a stock; differences in growth rate from south to north; differences in growth rate between year-classes.

Figure 9A shows the average length of trap cod caught during 1978 in four NAFO divisions with 3-1/2 in. (8.9 cm) back mesh. It also shows the percentage of the total weight of the catches that was made up of fish under 17 inches (43 cm) long. Notice how the average length of the fish decreases toward the southern areas and how the catch of very small fish increases dramatically.

Effect of mesh size changes in cod traps

The most important part of a cod trap in regulating the size of fish which it catches is the back or 'drying' twine. Regulations require that no mesh in a trap be smaller than 3-1/2 inch extension measure. In most cod traps, only the back, the bottom and the first two or three fathoms of the sides attached to the back have 3-1/2 inch mesh.

If we replaced the 3-1/2 inch mesh with a smaller mesh, the result should be a catch having a smaller average size, since more very small fish would be held in the trap. If we replaced the 3-1/2 inch mesh with a larger size, however, the average size of fish held in the trap should be larger. From experiments which have been conducted, we know that both these statements are true.

In Figure 9A we saw the average sizes of fish that were caught in four NAFO divisions by trap fishermen using 3-1/2 inch back mesh. Using the knowledge gained from the experiments just referred to, we can tell what would have happened to those catches if the traps used had had four-inch back mesh instead of 3-1/2 inch. Figure 9B gives estimates of the average sizes of fish and estimates of the amounts of very small fish (under 17 inches) that would have been caught if four-inch back mesh had been used. The average size of fish caught within each division would have increased by about an inch or more. The most dramatic result, however, would have been a tremendous decrease in the amount of very small fish caught, especially in the southern area (3L and 3Ps). (There would also be a reduction in the numbers of 18 and 19 inch fish caught using four inch back mesh, but the numbers would be so small as to be unimportant in terms of the total catch. There would be no loss of fish 20 inches and over.)

Figure 9A. Average lengths of trap cod caught in 1978 in NAFO divisions 2J, 3K, 3L and 3Ps using 3-1/2 inch back mesh. Percentages of catches (by weight) made up of fish under 17 inches (43.2 cm).

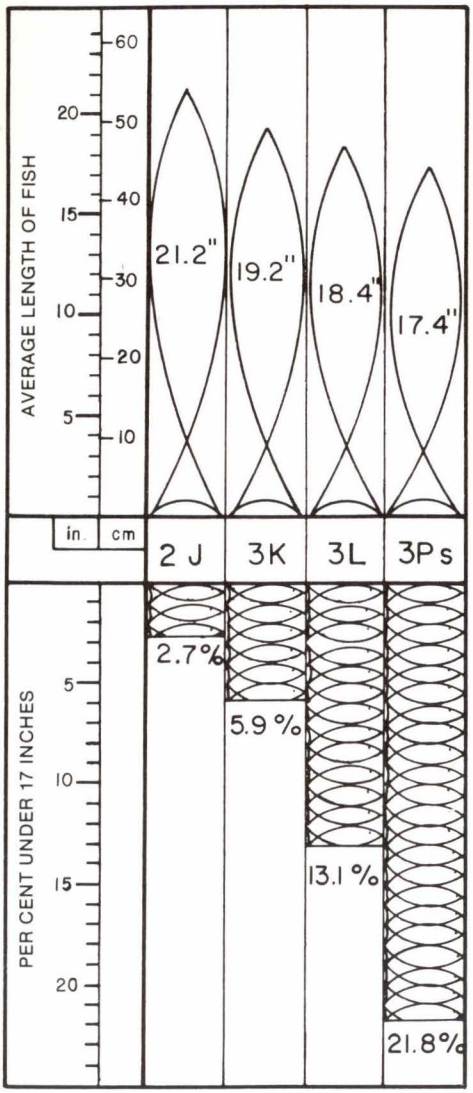
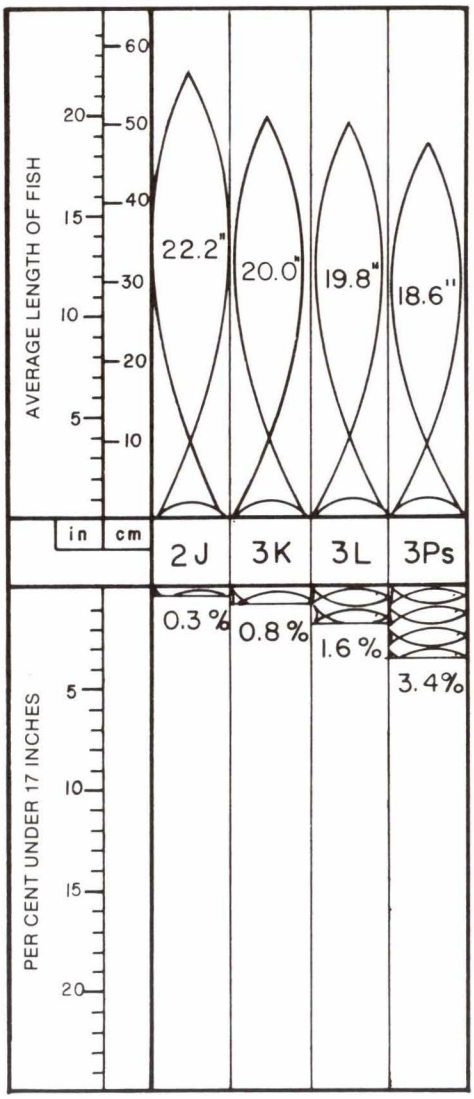
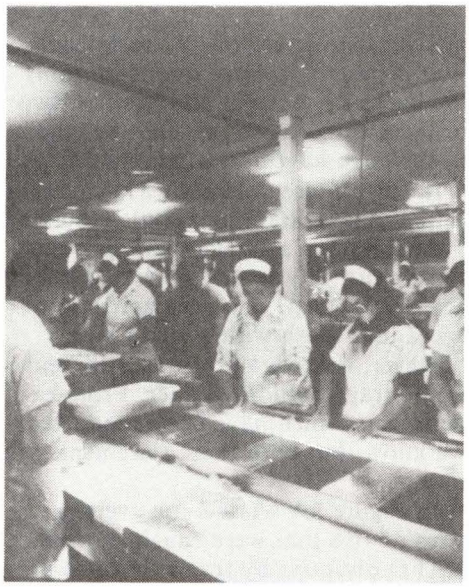


Figure 9B. Estimated average lengths of fish that could have been caught if four inch back mesh had been used. Percentages of catches that would have been under 17 inches using four inch back mesh.





Economics of small fish

The catching, handling, processing and marketing of small fish are all more difficult than for large fish. The economic impact of small fish is felt in various ways:

- The fisherman gets a lower price for his catch.
- The processor pays less for his raw material but gets a lower price for his marketed product.
- The processor has higher production costs because of lower overall plant productivity.
- Plant workers will in the long run earn less income because of lower plant productivity.
- Fishermen have to spend more time culling, bleeding and gutting the fish when much of the catch is small.

Small fish are usually processed into frozen block product. The main reason for this is that the fillet market requires individual fillets of a particular size. Fillets from small fish do not meet the requirements.

In addition, small fish are most prevalent during the trap season, when most plants are glutted. Fish texture already softened by the warmer temperatures of shoal water and summer weather may be further softened by extended holding times at the plant. Processors, in an effort to handle as much of the catch as possible, may be forced to process all of the trap catch into block product.

A number of studies have indicated that the size of fish has a significant bearing on processing costs. Table I indicates that plant productivity could be increased by about 34 percent with an increase in fish size from an average weight of 1.8 lb. (0.8 kg) to 2.5 lb. (1.1 kg).

In this example, a thousand kilograms of round small fish produced 13 kilograms (29 lb.) more fillets than the same weight of round large fish. However, the large fish were processed in less than three-quarters the time, so that plant output per hour was 34 percent higher with the larger fish. This meant a much lower cutting cost for the processor. The lower cutting cost was more than enough to offset the slightly lower weight yield from the larger fish, as well as the higher price he would have paid the fishermen for these fish. On the other hand, the processor probably got a better market price for the fillets from the large fish. In addition to this again, the processor would have made further savings on the larger fillets at other processing stages (skinning, trimming, packing, etc.) where again less handling would have been necessary.

The handling — culling, bleeding and gutting — of small fish is also a problem for fishermen. In one hour, a fisherman can bleed and gut about 255 small fish with a round weight of about 1.4 kg. (3.2 lb.) each. He is handling about 367 kg. (816 lb.) of fish per hour. However, if he were handling 1.8 kilogram (4 pound) fish, he would still bleed and gut about 245 in an hour, and this would give him an hourly work output of about 441 kg. (980 lb.). this represents about a 20 percent increase in productivity or, to put it another way, a 20 percent reduction in the amount of time required to bleed and gut a particular volume of fish.

TABLE I — How the use of small and large cod affects plant productivity (processing output).

Item	Small Fish	Large Fish	% of Change
Weight (Rnd.)	1,000 kg. (2,200 lb.)	1,000 kg. (2,200 lb.)	—
No. of fish	1,195	870	−28.2%
Fillet output	304 kg. (669 lb.)	291 kg. (640 lb.)	−4.3%
Yield	30.4%	29.1%	−4.3%
Processing (cutting) manhours required	4.3 hrs.	3.1 hrs.	−27.9%
Processing (cutting) output/hour	70.3 kg. (155 lb.)	94.5 kg. (208 lb.)	+34.4%

The Future of the Trap Fishery

The trap fishery, like any fishery, has certain problems more or less all its own.

Some of them, such as the stationary nature of the gear, the unpredictability of catches and the problem of small fish, have been discused in this brochure.

Some of these problems can probably never be completely solved, although some improvements can be made. If catches are poor in a particular berth, the trap can be moved. The use of a thermometer to check water temperatures in different berths can take some of the guesswork out of the moving and help ensure better catches on a more regular basis. The use of larger trap mesh and the continued build-up of the stocks should bring about some improvement in the problem of small fish.

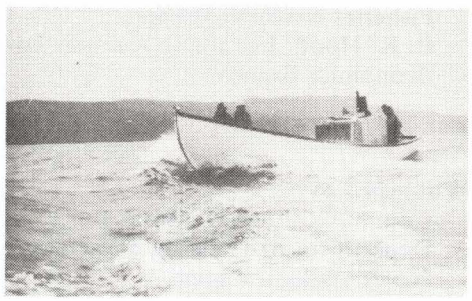
The cod trap also has certain advantages as a fishing method. The trap requires no bait. To operate this gear, the trap fisherman needs to use far less fuel than fishermen using some other gears. The trap is still relatively inexpensive to acquire, and it is still an extremely effective catching method when the fish are there to catch.

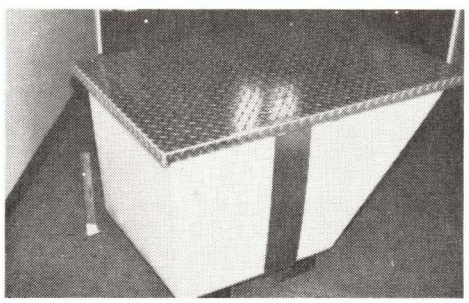
For nearly a hundred years, the cod trap was one of the cornerstones of the Newfoundland fishing industry. Then the introduction of new technology — new fishing methods, new gears, new fisheries for other species — combined with the reduction of stocks through overfishing, brought about a period of rapid decline in the importance of the trap in the overall fisheries picture of Newfoundland and Labrador.

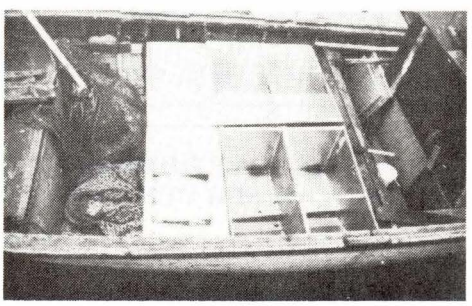
But now the situation appears to have stabilized to a considerable degree. The period of the most rapid introduction of new technologies is over; strict management by the Department of Fisheries and Oceans is enabling stocks to rebuild. Since the severe stock depression of the mid-1970's, the cod fishery as a whole has been on an upward trend and the trap fishery, despite continuing periodic problems, has shared in the generally improving situation.

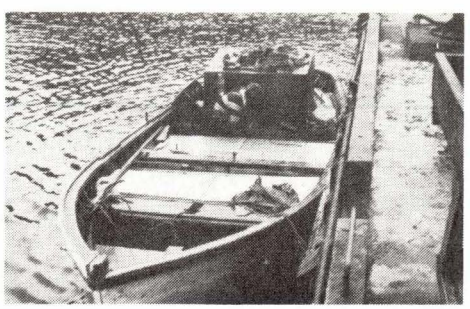
From 1976 to 1980, trap landings have averaged more than 38.2 million kilograms (85 million pounds) a year. With further work on existing problems and continued rebuilding of the northern cod stock, there is no apparent reason why there should not continue to be a stable, viable and important trap fishery, especially where trap crews can combine it with other methods such as handlining and longlining.

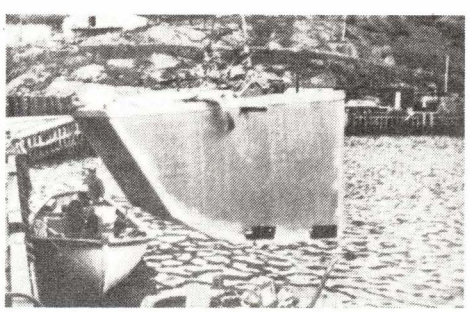
Just one example of how the Department of Fisheries and Oceans is helping to overcome some of the special problems of trap fishermen, and others, is this system of covered, insulated fish holding containers designed by the Fisheries Development Branch for use in open trap boats.











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