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National reports on description of fisheries and sampling schemes

by

Assistant Executive Secretary
ICNAF

At the January 1974 Special Commission Meeting, STACRES approved several recommendations of the Working Group on ICNAF Data Base Improvement. These were outlined in Circular Letter 74/12 (dated 21 February 1974). This report covers item 1(d) of that Circular Letter "that all Member Countries supply the Secretariat with a document describing in detail their various fisheries and sampling schemes in the ICNAF Area".

As of 25 May 1974, reports have been received from six Member Countries as follows:

The commercial fishery biological sampling programme - Canada (Maritimes and Quebec)

by

R. G. Halliday, D. N. Fitzgerald
and D. S. Miller

Fisheries and Marine Service,
Biological Station,
St. Andrews, N. B.
Canada

INTRODUCTION

In response to the request of the ICNAF Working Group on Statistics and Sampling for documents describing in detail the various fisheries and sampling schemes of each country (Circular letter 74/12), the following description of the sampling programme for Canada (Maritimes and Quebec) is presented.

The interrelationships and diversity of Canadian fisheries make it impractical to prepare "Sampling Reports" in the format proposed by the Working Group (Annex C to Circular letter 74/12). However, pelagic (herring and mackerel) fisheries and groundfish fisheries are sufficiently discrete, and sampling problems sufficiently different, to merit separate descriptions.

The problems of bias in sampling and of variation in estimates of size and age composition of removals are not considered in this document (see documents by Doubleday and Sreedharan presented to this meeting).

THE FISHERIES

There are about 800 vessels over 25 gross tons and many smaller vessels fishing from Maritimes and Quebec ports in ICNAF Subareas 3-5, but Subarea 4, being the adjacent sea area, is the most important. A wide variety of groundfish species are fished, the most important being cod, haddock, pollock, white hake, redfish, Atlantic halibut, and the flounder species. Most are caught by otter trawls but midwater trawls, longlines and handlines, gillnets, and Scottish and Danish seines, are also widely used. Most herring are caught by purse seine but some are taken in midwater trawls, and weirs, gillnets, and traps are important in some localities. The mackerel fishery is currently prosecuted entirely in inshore waters and small purse seines, traps, and jiggers vary in importance with locality. Although the most important scallop fishery is that on Georges Bank, substantial fisheries are also conducted in the Bay of Fundy and the southern Gulf of St. Lawrence. A specialised dredge is used with variations in design among fisheries. There is an extremely important coastal lobster trap fishery conducted throughout the region, and a small, developing, offshore trap fishery in Div. 4X and Subarea 5. Spider crab (snow crab) are fished extensively in the southern Gulf of St. Lawrence. Specialised crab traps are the primary gear, but otter trawls have also been used. Localised shrimp fisheries occur in the southern Gulf of St. Lawrence and off southwestern Nova Scotia using small mesh shrimp trawls in which some groundfish are caught incidentally. A small tuna purse seine fleet based in southern New Brunswick operates in the eastern Pacific and eastern and western Atlantic Oceans.

This great diversity of species and stocks fished, and variety of vessel and gear sizes and types, creates major difficulties for obtaining comprehensive biological sampling of catches. This is compounded by the fact that, although the larger vessels tend to land at major ports with large processing

plants, the numerous small vessels engaged in these fisheries land their catch in a large number of small ports scattered throughout the region.

The sampling programme is designed to cover groundfish, herring, mackerel, and tuna. Invertebrate fisheries are not sampled with the exception that meat sizes of Georges Bank scallops are monitored.

SAMPLING - ORGANISATION AND MANPOWER

Responsibility for sampling in the Maritimes (New Brunswick, Prince Edward Island, and Nova Scotia) rests with the St. Andrews Biological Station of the Federal Fisheries and Marine Service. In Quebec this is the responsibility of provincial authorities, but currently they are conducting no biological sampling of commercial catches. The important cod and herring landings in the Gaspé region of Quebec are sampled by St. Andrews Station staff.

The St. Andrews Station maintains six technicians located in areas of high volume landings - Cape Breton, Halifax, Lunenburg, Lockeport area, Yarmouth area, and northern New Brunswick. Their primary responsibilities are to sample landings and maintain the vessel log book system in their area, but they are also called upon for sea duty on both commercial and research vessels. A further seven technicians based in St. Andrews process herring and mackerel samples collected in the field (as these require detailed laboratory examination), conduct sampling field trips to areas of seasonal importance which cannot be covered by permanent field staff, assist permanent field staff during periods of high volume landings, and sample tuna landings, the processing plant for which is located locally (two technicians part time).

Cooperation from other Branches of the Fisheries and Marine Service plays a significant role in herring and mackerel sampling, accounting for approximately 40% of the samples collected for these species in 1973. A number of other staff at St. Andrews are involved in age reading, sample auditing, and updating computer data files.

As almost all the personnel involved in the sampling programme also have other duties, it is not possible at this time to break down the actual man-years involved in this activity alone, nor the costs involved.

CONSTRAINTS ON, AND DRAWBACKS OF, CURRENT SAMPLING PROGRAMME

In 1973, sampling coverage was as follows:

	Length samples	Age samples	Landings (m.t.)
Groundfish	206	139	288,002
Herring	715	427	170,255
Mackerel	157	105	18,700

Each length sample contains approximately 200 fish and age samples contain stratified sub-samples of 30-40 fish. When reviewed in detail, it is apparent that most of the species stocks fished by Canada (M & Q) are inadequately sampled. The inadequacies in 1971 sampling coverage (judged against minimum ICNAF standards) are described by Hodder (ICNAF Summ. Doc. 73/2. Serial No. 2931). Although there have been significant improvements in herring and mackerel sampling since then, this is not the case for groundfish.

Insufficient allocation of manpower is the basic constraint on all aspects of the sampling programme. Maximum trip length for Canadian vessels is two weeks (with the exception of tuna boats) and the catch is landed wet. Thus, virtually all catches are in suitable condition for measurement at the time of landing. While this allows more comprehensive sampling coverage than if sampling were conducted aboard commercial vessels at sea, it does not allow sampling of fish discarded at sea. Another drawback is that vessels fishing

on more than one stock of a species (e.g. haddock in Div. 4X and Div. 5Z) in a single trip can seldom be sampled, as in most cases the fish from each stock cannot be distinguished at the time of landing.

Sea sampling opportunities are restricted not only by available manpower but also by space restrictions on most of the smaller vessels and, in winter months, by excessive exposure to adverse weather conditions on all but the larger stern trawlers.

HERRING AND MACKEREL SAMPLING

Vessels fishing herring and mackerel, or servicing weirs and traps, usually land their fish daily. However, purse seiners fishing for herring in the Gulf of St. Lawrence and offshore areas, e.g. Georges Bank sometimes remain at sea for three or four days. Samples are obtained by (1) dip-netting out of the vessel hold before or during unloading (2) taking a grab sample from the unloading mechanism, (3) taking a grab sample from large storage bins in fish plants during filling or after they have been filled. Method (3) is the most common. Approximately 200 fish are measured from this sample. A sub-sample of these 200 fish of two or three fish from each 1/2 cm length group are retained for detailed examination including fish weight, sex, maturity, and removal of otoliths for ageing. Occasionally these detailed observations are made when the fish are in fresh condition but usually after frozen storage.

Efforts are made to distribute sampling activity seasonally and among components of the fishery in proportion to the volume of landings. However, this alone is a substantial problem due to the complexity of the fisheries concerned. Closely adjacent fisheries are conducted on distinct stock components, as for example in Div. 4Vn - 4Wa where geographically adjacent groups of small, young herring and large, old herring, (possibly even belonging to different stocks) are fished by the same vessels in the same time period. Similarly, in the Bay of Fundy there are herring gillnet fisheries (with inshore and offshore components), at least three distinct purse seine fishery components, and distinctly different weir fisheries on the New Brunswick and Nova Scotia sides of the Bay.

A substantial proportion of herring caught by Canadian vessels (and weirs) in the Bay of Fundy, on Jeffrey's Ledge (Div. 5Y) and on Georges Bank are landed directly in the U.S.A. To date, it has not been possible to obtain samples of these landings.

Weir catches and some purse seine catches are transported to port by specialised carrier vessels, and frequently the catches of more than one weir or purse seiner will be mixed in a single carrier load. Furthermore, in some areas land-based processing capacity is inadequate to handle the volume of herring landed in that locality during the height of the local fishing season, thus trucking fish substantial distances for processing is common. These factors increase the difficulty of associating exact catch locations and catch weights with samples taken and decrease the chance that the sample will be representative of the catch.

The procedure of salting fish at time of capture (which induces time-related changes in length and weight of fish) in some areas e.g. in the Bay of Fundy, but not in others e.g. Sydney Bight-Chedabucto Bay, can bias analyses of sampling data and should be taken into account.

GROUNDFISH SAMPLING

Groundfish landings may originate, at one end of the scale, from small vessels fishing on a daily basis and landing in an isolated location from which landings are trucked to a processing plant, or at the other end, from large stern trawlers (>500 gross tons) landing after a 10 day trip at the major plant where the fish will be processed. Thus, sampling procedures must be varied to fit the prevailing conditions. Major plants located in the larger ports present the best opportunities for sampling due to the high volume of landings

and usually modern spacious facilities. Thus, most sampling is done from the landings of the large otter trawlers and mid-water trawlers which discharge at these ports, and unloading procedures are fairly standard. These vessels return to port with the catch stored in ice in the vessel hold, separated by species into pens. The fish are hoisted from the hold in wire baskets or wooden tubs and sluiced to a culling table where they are culled by market category if cod (large, medium, small) or haddock (large, and small). Other species are seldom culled. The fish are then boxed and weighed and removed to the cutting room, or iced and stored in a holding room. The weight of fish a box will hold is standard within a plant commonly being 250 lbs., but capacities ranging from 200 lb. to 600 lb. are used depending on plant facilities. At the courtesy of plant personnel, a sampler is provided with a number of boxes of the species to be sampled. For species which are culled, all market categories are sampled, at least one box of each category being measured and generally two or more boxes of the larger fish. Whenever possible, all of the fish in a box are measured to prevent bias caused by smaller fish working to the bottom of the box. Flounder and redfish are sexed when measured. Otoliths for ageing are removed from a stratified sub-sample of those measured, normally one fish from each centimetre length interval being sampled. For species which are sexed, one fish per cm. per sex is sampled.

Increasing difficulties are being encountered in sampling at those major plants. Modernisation of unloading techniques such as the use of suction unloaders associated with bulk storage, and the speeding up of production, results in fewer opportunities for sampling. Samples are obtained at the courtesy of the plant management and all fish are returned to the production line. Thus, sampling must be completed prior to the completion of processing of that species from the landing being sampled.

Catches from small vessels are commonly landed at small fishing villages. The volume of landings at any one is comparatively low and unsteady. Distances of 50 to 100 miles or more separate these locations from the bases of the field technicians.

Sampling at these locations is time consuming and expensive. However, some of these ports are visited when time permits and landings warrant the time and expense involved.

At some of these small ports, the landings are crated and shipped to market or boxed and transported to a processing plant immediately on unloading, giving little opportunity for sampling.

Description of fisheries and sampling schemes for Canada (Nfld.)

by

A. T. Pinhorn
Department of the Environment
Fisheries and Marine Service
Biological Station
St. John's, Newfoundland

(a) Groundfish fishery - Offshore

Fishery - Side and stern trawlers make trips of about 8-10 days duration to ICNAF Subareas 3 and 4. Catches of various groundfish species are landed at 12 fishing ports on the east and south coasts of Newfoundland, 2 of which operate on a seasonal basis only.

Opportunities for sampling - Dockside sampling only is possible. Sampling of discards at sea is completely lacking but sampling at dockside occurs before any discarding onshore takes place.

Current sampling

Population sampled - Landings from catches made from separate stocks of groundfish; generally catches made in only one Division for a given species are sampled but in some cases where stocks overlap boundaries of Divisions, fish caught in two adjacent Divisions are sampled if from a single stock.

Length samples

Place sample taken - Sampling takes place at dockside on a regular basis as follows:
Port of St. John's - almost all trips are sampled if possible.
Ports of Marystown, Burin, Fortune, Grand Bank (Burin Peninsula) - sampling takes place during a two-weekly period for most months.
Other ports - sampling takes place on an irregular basis.

Method of collection - Landings are sampled by area or stock from which catch was taken and by market category if landings are so sorted. Males and females are measured separately for redfish, American plaice, witch and yellowtail. A primary sampling unit consists of one 500 lb box of fish.

Size of sample and frequency of collection

Length frequency samples usually consist of 400-800 fish per landing sampled per species. Frequency of sampling varies with port at which sampling takes place. At St. John's, samples are collected from each trip if conditions of sampling are met. This averages about 12-15 trips per month. For ports on the Burin Peninsula, sampling takes place during a two-week period for most months and about 8-10 trips per month are sampled. This, of course, is divided among various species and fisheries, with the majority of samples in a month being from the stock for which the fleet is concentrating in that month.

Staffing and/or cost - No port samplers are involved. Two men are involved for 2 weeks during most months in Burin Peninsula sampling and two men for the entire month in St. John's sampling, although in the latter case the two men would be involved in sampling full time for about 2 weeks only throughout the month; during the remainding time between sampling they are engaged in other related or unrelated duties.

Reason for choice of current sampling methods - With the logistic constraints listed below, the current scheme provides the best estimates of per cent at length and consequently the best estimate of numbers landed at each length from a given fishery on a given stock. Sampling is designed to provide these estimates on a monthly basis if a sustained fishery takes place on a given stock; otherwise a quarterly, half-yearly or yearly breakdown of landings by length groups may be the smallest possible unit.

Drawbacks - The number of fish measured per sample is probably adequate although the number of samples for certain species and stocks is inadequate.

Constraints - On board sampling is not possible at present because of lack of staff. Some ports along the western part of the south coast of Newfoundland are difficult to sample except on an irregular basis because of difficulties encountered in travelling to the ports.

Age samples

Place sample taken - Age samples are taken at same time length samples are taken.

Method of collection - Landings sampled for lengths (above) are subsampled for ageing. Stratified samples are collected on a quarterly basis if possible for cod, haddock, American plaice, witch and yellowtail although in cases where the fishery is not concentrated on a given stock for a sufficient period, half-yearly stratified samples have to be collected. In the case of redfish random samples are at present being collected from each length sample.

Size of sample and frequency of collection - A predetermined number of otoliths is collected on a quarterly basis if possible for cod, haddock, American plaice, witch and yellowtail (see Table 1). These are collected throughout the quarter with a number being collected from each sample taken for length measurements. If it is not possible to complete a sample in a quarter then a half-yearly stratified sample is attempted. For redfish, random samples are collected from each sample taken for lengths. In the case of redfish, American plaice, witch and yellowtail sex is recorded for the otolith sample and males are females are analyzed separately.

Staffing and/or cost - Collection of otoliths - same staff as involved in collection of length samples.

Age-reading - about 9 individuals are currently involved in offshore groundfish age determination. It is difficult to estimate the actual man-years involved because these individuals are also involved in all aspects of the groundfish work in addition to age determination but an estimate of 3 man-years would seem to be reasonable.

Reason for choice of current sampling method - To get an unbiased estimate of the per cent of age at length and consequently the numbers of fish at each age landed from various fisheries.

Drawbacks - The stratified samples when completed probably provide reasonable estimates of per cent at each age but considerable difficulty is encountered in collecting adequate otoliths from fisheries which only last for a relatively short period.

Constraints - The size of the staff and the difficulty in transportation to and from some ports limits the number of different vessels that can be sampled. The size of staff further limits the ageing that can be handled under a specified time limit.

General note - The above outlined sampling report for offshore groundfish sampling is the proposed program for 1974. In recent years because of lack of staff in the groundfish sampling program, the numbers of fish in each sample was not as large and the incidence of sampling was not as frequent as it will be in 1974.

(b) Groundfish fishery - Inshore

Fishery - Small boats (< 25 tons) and medium-size boats (26-50 tons) fishing a mixture of codtraps, handlines, gillnets and longlines. Trips are usually of one day duration except for the larger longline type boats which sometimes make trips of several days duration.

Opportunities for sampling - Dockside sampling only is possible. Sampling at sea is impracticable because of small size of boats generally. Scarcely any discarding takes place at sea and measurements at dockside occur before any discarding takes place.

Current sampling

Population sampled - Landings at selected ports from catches in areas immediately adjacent to ports. Species sampled is generally cod but samples of American plaice, witch and Greenland halibut caught in the inshore fishery are also sometimes sampled.

Length samples

Place sample taken - Sampling takes place at dockside at selected ports where fish are being landed from the areas immediately adjacent to the selected port.

Method of collection - Landings are sampled by area from which catch was taken and by gear, separate length samples being taken from each gear fished. Males and females are measured separately for American plaice, witch and Greenland halibut. A primary sampling unit usually consists of the catch or part of the catch of one or more fishermen fishing a given gear on a given day and the weight of this unit will vary from sample to sample.

Size of sample and frequency of collection - Size of sample varies considerably depending on availability of fish on a given day. Usually 300-400 fish are sampled per unit but this can vary between 100 and 1000 fish in some instances.

Frequency of sampling varies from one sampling period per year in some selected ports to three sampling periods per year in other sampling ports, the duration of the sampling period being generally 2-4 weeks, except in Labrador where one sampling trip of 4-6 weeks duration is normal. Sampling occurs on each day that inshore catches are being landed and numbers of samples normally range from 25-50 samples for the year from all gears combined.

Staffing and/or cost - No port samplers are involved. About 40 man-weeks are involved in inshore sampling programs.

Reason for choice of current sampling method - With the constraints listed below, the current scheme provides a reasonable estimate of per cent at length and consequently of numbers landed at each length by each gear in each area.

Drawbacks - The number of samples and the number of fish measured per sample seem to be adequate to produce an estimate of per cent at length during the sampling period although in some cases it is probably not entirely representative of the fishery for the year.

Constraints - The frequency of sampling and the numbers of samples are difficult to control because of the variations in availability of fish from the inshore fishery on a day to day basis. Because of the many and widely separated fishing localities along the Newfoundland coast, only a selected number can be sampled for a selected period or periods.

Age samples

Place sample taken - Age samples are generally taken at the same time length samples are taken, although in isolated cases lengths or otoliths only are taken.

Method of collection - Landings sampled for length (above) are subsampled for ageing. Stratified samples are taken for each sampling period separately. In some cases a stratified sample is taken separately for each gear and in other cases a single stratified sample is taken from all gears combined in a given port.

Size of sample and frequency of collection - A predetermined number of otoliths is collected (see Table 1) for each sampling period. These are collected throughout the sampling period with a number being collected from each sample taken for length measurements. Frequency of collection is the same as for length samples.

Staffing and/or cost - Collection of otoliths - Same staff as is involved in collection of length samples.

Age reading - About 7 individuals are currently involved in inshore groundfish age determination. It is difficult to estimate the actual man-years involved because the individuals are involved in all aspects of the groundfish work in addition to age-determination but 2 man-years would seem to be a reasonable estimate.

Reason for choice of current sampling method - To get an unbiased estimate of the per cent of age at length and consequently the numbers of fish landed at each age by the various inshore gears.

Drawbacks - Same as for length samples.

Constraints - The size of the staff and the difficulty in transportation to and from many of the widely separated fishing ports limits the number of different localities that can be sampled. The size of staff further limits the ageing that can be handled under a specified time limit.

Table 1. Stratified sampling scheme for groundfish species.

Species	Length range	No. of pairs of otoliths (in each 3 cm group)	
		Scheme 1	Scheme 2
COD OFFSHORE AND INSHORE	< 32 cm	5	25
	33-62 cm	15	25
	63-101 cm	30	25
	102-116 cm	15	25
	> 116 cm	5	25
		(in each 2 cm group)	
HADDOCK	< 15 cm	10	
	16-29 cm	10	
	30-49 cm	15	
	> 49 cm	20	
AMERICAN PLAICE, WITCH, YELLOWTAIL		(in each 2 cm group)	
Male	< 31 cm	20	
	32-47 cm	30	
	> 47 cm	20	
Female	< 31 cm	20	
	32-65 cm	30	
	66-71 cm	20	
	> 71 cm	10	

Description of Fisheries and Sampling Schemes carried out by the Federal Republic of Germany

by

J. Messtorff
Federal Research Board of Fisheries
Bremerhaven
Federal Republic of Germany

Trawl Fishery mainly for Cod in Subareas 1, 2 and 3:

Only carried out by factory-sterntrawlers making trips of about 90 days duration (except in Division 1 F, where on a very smallscale also wet-fish trawlers may fish occasionally). Depending on the fishing conditions they may shift operations between Subareas or even to or from fishing grounds outside the convention area during one trip. All catches are processed and deepfrozen at sea.

Opportunities for Sampling:

On-board sampling only (very rare exception: dockside-sampling of wet-fish landings from Division 1 F).

Current Sampling

Populations sampled: Cod and Redfish in Subareas 1 and 2 and Division 3 K

Length Samples

Place Sample Taken: Fish hold on board into which the codend, i.E. the unsorted catch of one haul, is emptied.

Method of Collection:

a) When sampler on board, all cod and redfish respectively inside one sorting compartment of the fish hold (above) or, if the quantity is too large, all fish of the species to be sampled, which are contained in a transversally separated part of such a compartment before sorting and processing starts.

b) Supplementary on-board sampling on request by instructed crew members; a random sample of whole fish from the unsorted catch is being deep-frozen, stored in separate containers and worked up at the laboratory after landing.

Size of Samples and Frequency of Collection:

a) Several hundred fish per sample, samples are being collected according to the fishing operations and conditions at different daytimes and from different depth zones as completely as possible during the time period at disposal. If circumstances allow, sampler may also be transferred to another vessel for continued sampling.

b) At least 200 fish per sample and fishing ground.

Staffing and/or Cost:

2 seagoing samplers, but separately on duty on different vessels and at different times and areas according to the fishing seasons. In view of the long absence of the fishing vessels frome homeports air travel expenses have to be considered as additional cost factors.

Reason for Choice of Current Sampling Methods:

No alternatives, but on the other hand the most reasonable and direct scheme which additionally presents opportunity of sampling discards as well as of evaluation of conversion factors for nominal catch calculations.

Drawbacks and Constraints:

Although the number of samples as well as the number of fish measured per sample may be adequate, sampling can only be carried out on a very restricted number of vessels and within a limited time period of the fishing season. Samples mentioned under b) may be biased towards more larger fish.

Age Samples

Place Sample Taken: Same as for length samples.

Method and Frequency of Collection and Size of Samples:

Some but not necessarily all cod catches sampled for length are subsampled for ageing, such that at least one fish is taken from each cm interval group by sex and maturity stage. Additional otoliths (only one per fish and not by sex) are taken, such that except for extreme variants otoliths of at least 10 fish per cm-group become available from the same area and time period. They may be obtained and accumulated from different hauls. Samples of whole fish collected and frozen by crew members at sea also present additional ageing material by sex. Redfish age samples (scales) are collected correspondingly but always individually by sex.

Staffing and/or Cost: Besides the samplers (above) 3 - 4 age readers.

Reason for Choice of Current Sampling Method:

Only but optimum way to get samples of adequate size and composition and hence valid estimates of the distribution of age at length.

Drawbacks: Apparently none to any extend.

Contraints:.

The size of staff limits specifically ageing that can be handled under specified time limits.

Japanese Sampling Report Proposed by ICNAF Working Group on Statistics and Sampling

by

Ikuo Ikeda

Far Seas Fisheries Research Laboratory
Shimizu, 424, Japan

Fishery Stern trawlers make trips of about 70 days duration to the edge of continental shelf in Statistical Area 6 and Subarea 5, Georges Bank and other Subareas. All catches are refrigerated aboard just after they caught and transported to various Japanese and foreign ports by carrying vessels.

Opportunities for Sampling on-deck sampling only. Sampling of discards is sometimes inadequate.

Current Sampling

Population Sampled - catches at some fishing ground for each haul.

Length Sampling

Place Sample Taken - on-deck of trawlers

Method of Collection - random sampling from catch of the species by arbitrary haul. Breakdown into sex has not been introduced.

Size of Sample and Frequency of Collection - about one time per ten-day is notified. Each sample includes about 200 individuals.

Staffing - a deck officer per vessle

Reason for Choice of Current Sampling Methods - From the view point of the fishing performance, another methods is hardly introduced.

Drawbacks - Frequencies of sampling depend largely on time available and enthusiasm of crews.

Constraints - On-board sampling by the professional staff is partly carried out, but increase of the effort is not possible at the present stage.

Age Samples

Place Sample Taken - on-deck of trawlers

Method of Collection - purposive selection in terms of the length of fish, such that length of fish sampled ranges from maximum to minimum with same number of fish for each length

Size of Sample and Frequency of Collection - In case of sampling by deck officer 20 individuals of paticular species per ten-day is notified. In case of sampling by professional staff the size and the frequency increase by about twice comparing to the above.

Staffing - 3 vessels have been nominated with a deck officer for each

Reason for Choice of Current Sampling Method - to get good estimation of the growth and age of the fish. The age-length key moreover obtained can be used for estimating age composition of the catch.

Drawbacks - Staff for age reading is very limited and the frequency of sampling largely depends on the convenience of crews.

Constraints - limited staff for age determination and limited availability of crew for sampling

Remark For special studies, the length composition can be calculated from the catch record by market size categories collected by fishing company, if necessary. And length composition by size categories have been measured by the professional staffs. It is observed that size classification does not change by season, location and vessels. An unbiased estimate of length composition of catch in a certain region and period, therefore, can be possibly made from the two series of records, namely the catch by size and the length composition of a given size.

Portuguese Sampling Report

by

M. Lima-Dias
Instituto de Biologia Maritima, Lisbon

FISHERY - Trawlers making trips of about 6 months duration to Subareas 1 to 4. Catches are landed at various Portuguese ports.

OPPORTUNITIES FOR SAMPLING - Onboard only, before discarding.

CURRENT SAMPLING:

Population sampled - Cod, where possible

Length Samples:

Place Sample taken - Onboard

Method of collection - Catches are sampled at random.

Size of Sample and Frequency of Collection - Between 4 and 10 samples per division and per month are taken; between 100 and 500 fishes are taken for each sample.

Staff and/or Cost - Two sample collectors on board.

Reason for Choice of Current Sampling Methods - The scheme seems the most reasonable due to the fact that cod is the main species and is processed onboard.

Drawbacks - The number of samples taken seems to be inadequate, although the number of fish measured per sample is adequate. Discards are included in the sample.

Constraints - Sampling on landings is not possible due to the fact that cod is processed onboard. Increasing of sampling is somewhat difficult due to restrictions imposed by vessel captains (lack of space on board, shortage of time, etc.).

Age Samples:

Place Sample Taken - Onboard.

Method of collection - From the samples taken for lengths some are taken also for age.

Size of Sample and Frequency of Collection - Normally samples of 100 fishes are taken sometimes per month, depending on the sailing of the boat from one to another fishing ground.

Staffing and/or Cost - 1 age reader; 2 sample collectors on board.

Reason for choice of Current Sampling Method - Because this is the method that can be followed without disturbing very much the fishing operations and the processing of the fish on board.

Drawbacks - Unknown.

Constraints - Firstly the conditions on board and secondly the size of staff limits the workload that can be handled for age readings.

COUNTRY - Portugal

FISHERY - Gill netters making trips of about 6 months duration to Subarea 1, 3 and 4. Catches are landed at various Portuguese ports.

OPPORTUNITIES FOR SAMPLING - Onboard only, before discarding.

CURRENT SAMPLING:

Population sampled - Cod, where possible.

Length Samples:

Place Sample Taken - Onboard.

Method of collection - Catches are sampled at random.

Size of Sample and Frequency of Collection - Between 4 and 10 samples per division and per month are taken; between 100 and 500 fishes are taken for each sample.

Staff and/or Cost - Two sample collectors on board.

Reason for Choice of Current Sampling Methods - The scheme seems the most reasonable due to the fact that cod is the main species and is processed onboard.

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Staffing and/or Cost - 1 age reader; 2sample collectors on board.

Reason for choice of Current Sampling Method - Because this is the method that can be followed without disturbing very much the fishing operations and the processing of the fish on board.

Drawbacks - Unknown.

Constraints - Firstly the conditions on board and secondly the size of staff limits the workload that can be handled for age readings.

United Kingdom Sampling Report

by

J.G. Pope
Fisheries Laboratory
Lowestoft, Suffolk, England

Fishery

Side trawlers making trips of 21 days + to West Greenland; catches landed at Hull and Grimsby.

Opportunities for Sampling

Dockside sampling only. Sampling of discards is inadequate.

Current Sampling

Landings from sub-area 1 when available. (Cod)

Length Samples

Place sample taken

Dockside market where fish are laid out for auction.

Method of collection

Landings are sampled by vessel and area in which the catch was taken. A primary sampling unit consists of one 140 lb box of fish, fish are sorted into size and, or, quality categories. Boxes of each category are measured and raised to the total catch of the vessel. The total length of the fish is measured, recorded to the centimetre below, eg 47.8 cm = 47 cm.

Size of sample and frequency of collection

Samples are taken wherever possible, very few landings are made from this area at UK ports, each sample consists of approx 200 fish

Choice of current sampling methods

This is dependent on the number of landings from the area.

Drawbacks

There are insufficient commercial landings from the area to provide enough fish for a regular programme to be maintained - the number of fish measured per sample is adequate.

Constraints

On board sampling is not possible due to the length of voyage and the wastage of manpower if observers were sent to sea on commercial vessels.

Fishery

Stern freezer trawlers making trips of duration to Newfoundland, Labrador and Greenland areas.

Opportunities for Sampling

At processing plants immediately after the fish has been thawed. Sampling of discards is inadequate.

Current Sampling

Population sampled

Cod from ICNAF regions 1, 2 and 3 throughout the year whenever landings are available.

Method of collection

Landings are sampled by vessel and area in which the catch was taken - fish are landed unsorted in frozen blocks (approx 100 lb weight), after thawing approx 400-450 fish are measured and weighed. The measured sample is raised to the weight of the total catch.

Size of sample and frequency of collection

Samples are taken whenever fish from these areas are available.

Reason for choice of sampling method

The only point at which there is reasonable access to sufficient quantities of a freezer trawler's catch in a thawed condition is in one of the large processing plants.

Drawbacks

There are insufficient commercial landings from the areas to provide enough fish for a regular programme to be maintained - the number of fish measured per sample is adequate.

Constraints

The length of trip of a freezer trawler makes the employment of scientific staff to undertake the sampling uneconomic. Attempts to employ the crew of factory vessels to undertake the work presented a number of difficulties but it may be possible to overcome these should other methods of sampling the catch become unworkable.

Age Samples

No routine age samples of the ICNAF area stocks are undertaken.

United States Sampling Report

by

Ronnee L. Schultz

Otter Trawl Fishery: Side and stern trawlers making trips of about 1 to 14 days duration to Georges Bank, Browns Bank, the Gulf of Maine, Southern New England grounds (5Zw), the Eastern Nova Scotian Shelf, the Gulf of St. Lawrence and Statistical Area 6 (middle Atlantic grounds).

Opportunities for Sampling: Dockside and discard sampling at sea. Discard sampling appears to be inadequate for hakes and mixed species.

Current Sampling:

Populations Sampled	Primary Species	
A. Georges Bank (5Ze)	Cod Haddock Pollock Silver hake Redfish American dab	Winter flounder Witch flounder Yellowtail Lobsters Sea herring
B. Browns Bank	Cod Haddock Pollock	Redfish American dab Witch flounder
C. Gulf of Maine	Cod Haddock Pollock Silver hake Redfish American dab Witch flounder	Shrimp Sea herring Mackerel Yellowtail Winter flounder Squid
D. Eastern Nova Scotian Shelf	Cod Haddock Redfish	
E. Gulf of St. Lawrence	Redfish	
F. Southern New England Grounds	Cod Haddock Pollock American dab Yellowtail Sea herring Mackerel Silver hake Red hake Skates Sculpins Ocean pout	Winter flounder Four spot flounder Lobster Butterfish Crabs Squid Sea robins Alewife (river herring) Sea bass Bluefish Fluke

G. Middle Atlantic Grounds	Yellowtail	Lobster
	Sea herring	Butterfish
	Mackerel	Crabs
	Silver hake	Squid
	Red hake	Alewife (river herring)
	Skates	Sea bass
	Sculpins	Bluefish
	Ocean pout	Striped bass
	Winter flounder	Fluke
	Four spot flounder	

Length Samples

Place taken: Dockside in major ports where personnel are routinely assigned and at sea while sampling for discard.

Method of collection: Food fish landings are sampled by size group (market category) and area of capture. Redfish, yellowtail, lobsters, silver hake, shrimp and crabs are separated by sex.

Industrial fish landings are sampled dockside as they are being unloaded from the hold.

1. Size of sample and frequency of collection:

   Foodfish samples consist of 100 specimens for each size group landed. Five samples per month per sampling area for each market size. A sample of squid consists of 50 individuals, taken weekly at each major port of landing. Sea herring and mackerel samples are taken weekly throughout the season at each major port of landing. Industrial fish samples are made up of two one-bushel (about 60 pounds) sub-samples. Industrial samples are to be made on each vessel landing industrial fish at least once each month. Yellowtail discard samples taken at sea consist of one bushel of discard and one bushel of market fish taken at least once each day during the trip.

2. Staffing and/or Cost:

   Twelve statistical and sampling specialists working 25 to 50 percent of the time sampling at a salary cost of approximately $72,000 a maintenance of cost at about $40,000. Sea sampling is presently budgeted at $10,000 with no additional staffing.

3. Reason for Choice of Current Sampling Methods:

   In terms of randomness, costs and resulting data, this appears to be about the most efficient method.

4. Drawbacks:

   The chief drawback in obtaining adequate sampling coverage of this fishery is the inability to cover small ports where no permanent staff is located, and the limited amount of time that can be given to sampling because of other duties combined with the mixed species nature of the fisheries with many small catches of individual species. As a result these goals are not met for most species and the sample number is less than desired.

Sea sampling while probably the most desirable from the standpoint of sampling and obtaining effort data, is by far the most expensive and time consuming program, therefore sea sampling plays only a minor role in the sampling program and is concentrated within the yellowtail fishery.

Age Samples

1. Place taken:

   Same as length samples, however, sea herring and mackerel are frozen for later processing at the Northeast Fisheries Center in Woods Hole for ages.

2. Method of Collection:

   Age samples are obtained by taking a stratified subsample of the length frequency sample. This is done by selecting at least one fish representing one centimeter interval from within the total range of sizes in the length sample.

3. Size and Frequency of Collection:

   The frequency of age sampling is dependent on the frequency at which length samples are taken. Each time a length sample is obtained an age sample is taken for the species listed in Table 1.

4. Staffing Costs:

   None in addition to that shown in the costs of length sampling staff costs.

5. Reasons for Choice of Current Sampling Methods:

   To obtain as unbiased an estimate of age composition of the landings as related to length within limited personnel and budget allocations.

6. Drawbacks:

   Currently the number of samples taken and the number of fish appear to be adequate to estimate age at length for most of the species listed.

Table 1. Species and Market Categories Age by Number of Fish Taken for Otoliths or Scales

Species or Market Category	Number Aged	
	Otoliths	Scales
Cod		
Whale	20	
Large	20	
Market	20	
Scrod		
Haddock		
Large		20
Scrod		15
Pollock		20

Silver hake	10 each sex		
Redfish	10 " "		
American dab	20		
Winter flounder	20		
Witch flounder	20		
Yellowtail	25 each sex		
Adult sea herring	30		
Juvenile sea herring	30		
Mackerel	30		
Butterfish	20		
Scup	20	or	20
Sea bass	20	or	20
Shad	20	or	20
Striped bass	20	or	20
White hake	20		

Line Trawl Fishery: Line trawl (longline) vessels making trips of one to several days duration to the Gulf of Maine, Georges Bank, Southern New England Grounds, and the Middle Atlantic area.

Opportunity for Sampling: The opportunity for sampling, when it occurs, is at dockside. Sampling this fishery is inadequate because most line trawl landings occur in areas not covered by present staff. Also if a choice is to be made for sampling a trawler or longliner the trawler gets first preference because of its larger catch.

Current Sampling:

A. Population Sampled

Georges Bank and Gulf of Maine - cod.

B. Length Samples

1. Place taken dockside at ports where staff are located.

2. Method of Collection: Same as for side and stern trawl fishery.

3. Size and Frequency of Collection: . Same as stern trawl fishery except side and stern trawl fishery is sampled first if a choice is to be made.

4. Staffing Costs: Staffing costs included in otter trawl fishery estimates.

5. Reason for Choice of Current Sampling Methods: Same as side and stern trawl fishery.

6. Drawbacks: Samples are inadequate to assess the effect of line trawl fishery.

7. Constraints: Staffing and funding to attend to more isolated landing areas.

C. Age Samples

1. Place taken: same side and stern trawl fishery.

2. Method of Collection: same as above.

3. Size and Frequency of Collections: Requirements are same as stern and side trawl fishery.

4. Staffing costs: These costs are included in side and stern trawl fishery costs.

5. Drawbacks: Same as length sampling line trawl fishery.

6. Constraints: Staffing and funding.

Gill Net Fishery: Undertonnage vessels (less than 5 tons) making trips of about 1 day's duration to the Gulf of Maine. No coverage.

Pound Net Fishery: Carrier vessels making daily trips to pound nets located inshore from Maine to Virginia.

Opportunities for Sampling: Dockside only.

Current Sampling:

A. Population Sampled

Area	Species
Gulf of Maine	Mackerel
	Herring
Southern New England	Mackerel
	Herring
	Fluke
	Sea bass
	Striped bass
	Scup
	Butterfish
	Squid
	Bluefish
Chesapeake Area	River herring
	Shad
	White perch
	Striped bass

B. Length Samples

1. Place taken: Dockside at ports where landed.

2. Method of Collection: Same as mentioned under Otter Trawl fishery.

3. Size of Sample and Frequency of Collection: Sampling of this fishery is seasonal, running from February to July in the Chesapeake area and April to September in the southern New England and Gulf of Maine areas. Samples are collected whenever time allows in the New England area. Sampling in the Chesapeake area is based on sites available for sampling. Each site to be sampled at least once each day during the sampling period between April and June. All vessels landed are sampled. Sample size in the Chesapeake area depends on the size of the catch. A one bushel sub-sample is to be obtained from the first 5000 pounds unloaded, one from the next 10,000 pounds and one bushel from any vessel landing more than 15,000 pounds.

4. Staffing Costs: Staffing for the river herring sampling program in the Chesapeake is approximately $5,000. Costs for sampling in the New England area are included in the figures for the Otter Trawl fishery.

5. Reasons for Choice of Current Sampling Methods: In the Chesapeake area the needs for species composition estimates are the greatest so few length frequency samples are taken. Sampling methods used in the New England area are the same as those employed in the Otter Trawl fishery.

6. Drawbacks: Inadequate coverage.

7. Constraints: Staffing and funding such that Chesapeake sampling program has not operated every year.

Stop Seine and Purse Seine Fishery: Vessels making trips of one to several days duration to inshore and offshore areas.

Opportunity for Sampling: Dockside sampling only. Stop seine fleet sampling appears to be adequate for juvenile sea herring. Purse seine fleet sampling adequacy has varied between years and between components depending on fishing patterns. Adequacy is improving.

Current Sampling

A. Populations Sampled

Area	Species
Gulf of Maine	Adult sea herring Juvenile sea herring Menhaden Mackerel
Georges Bank	Sea herring
Southern New England	Sea herring

B. Length Samples

1. Place Sample Taken: Dockside at ports and plants where species are landed and availability of staff permits and at Woods Hole.

2. Method of Collection: Landings are sampled as they are being unloaded. Generally this is done by sampling a box or scooping fish from the conveyor as they are being pumped from the hold. In some cases state inspectors save a box of juvenile sea herring for later processing at Woods Hole

3. Size of Sample and Frequency of Collection: A length sample consists of 100 individuals. These samples are taken on a weekly basis throughout the season.

4. Staffing and Costs: In addition to the people and funds mentioned in the section on the otter trawler fishery two people at an annual cost of $30,000 are employed in association with the juvenile herring fishery.

5. Reason for Choice of Current Sampling Methods: These methods appear to be the most reasonable with regard to attaining desired sample size derived from sample data.

6. Drawbacks: The number and size of samples has not always been adequate for the adult herring fishery but the situation is improving. Mackerel sampling is inadequate mainly for lack of adequate staffing.

7. Constraints: Inadequate staff and funding.

C. Age Samples

1. Place taken: Age samples are taken as subsamples from the length frequency sample that is taken dockside and from samples provided to the Northeast Fisheries Center in Woods Hole.

2. Method of Collection: From the length samples, fish are selected in a stratified manner, at least one fish from each centimeter interval represented in the length sample is selected.

3. Size Sample and Frequency of Collection: An age sample of at least 30 fish is collected each time a length sample is taken.

4. Staffing and/or Cost. No additional costs.

5. Reason for Choice of Current Sampling Methods: To obtain an unbiased estimate of percentage at age and length.

6. Drawbacks: Requires increased attention to sampling all fleet components.

7. Constraints: The limited size of the age readings staff dictates that not all ages can be read, therefore subsampling of age samples is practiced.

Dredge Fishery: Scallop and surf clam dredge fishery making trips of 1 to 10 days duration to Gulf of Maine, Georges Bank, Southern New England Grounds, and Middle Atlantic Grounds and landing their catches in various New England and Middle Atlantic ports.

Opportunities for Sampling: Dockside only.

Current Sampling

A. Population Sampled: Scallops from Georges Bank and middle Atlantic Grounds and surf clams from Middle Atlantic Grounds (SA6).

B. Length Samples:

1. Place taken: Dockside as they are landed.

2. Method of Collection: Boxes are placed aboard cooperating sea scallop vessels: The captains are asked to place in the box, shells (top value only) from the last tow of the trip and save for sampling personnel ashore. A sample of surf clams is obtained from each surf clam trip interviewed.

3. Size of Sample and Frequency of Collection: A sample of sea scallops contains at least 200 shells. These samples are collected as often as vessels land that have saved samples for samplers.

A sample of surf clams consists of 10 clams. Samples are collected each time a vessel is interviewed.

4. Staffing and Costs: In addition to costs included in other sections. Two people at a cost of $30,000 are employed in the Surf Clam program.

5. Reason for Choice of Current Sampling Methods: Budget and staffing limitations limit scallop sampling to shells brought in by fishermen, as scallops are normally shucked at sea.

6. Drawbacks: Ability of fishermen to take a random sample of sea scallops may be open to question. Surf clam samples have not been investigated adequately.

7. Constraints: Limited personnel and budget restrictions is the major obstacle for increased sampling.

C. Age Samples: No routine ageing of samples is done for sea scallops or surf clams due to budget and personnel limitations and size of shells preclude long term storage of samples.

Offshore Pot Fishery: Offshore lobster pot vessels make trips of 3 to 5 days to Georges Bank, Southern New England and Middle Atlantic Grounds.

Opportunities for Sampling: Dockside only. Sampling of discard lobsters or crabs is inadequate.

Current Sampling

A. Populations Sampled

Georges Bank	American lobster
	Red crabs
Southern New England	American lobster
	Red crabs

B. Length Samples

1. Place taken: Dockside at ports of landing.

2. Method of Collection: As the lobsters are being unloaded several boxes of lobsters or crabs are measured. The lobsters are measured by sex.

3. Size of Sample and Frequency of Collection: The standard sample size is 100 lobsters or crabs per market size landed. Sampling requirements ask for at least one sample per canyon area fished, per month.

4. Staffing and Costs: Included in Otter Trawl Fishery.

5. Reason for Choice of Current Sampling Methods: These methods are the best that can be obtained within the present budget and personnel restraints which eliminate sea sampling.

6. Drawbacks: No sampling of discard can be obtained.

7. Constraints: Budget and personnel limitations prohibits increased sampling.

C. Age Samples: Because there is no known method for aging lobsters no age samples are taken.

International Commission for the Northwest Atlantic Fisheries

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Addendum 1

ANNUAL MEETING - JUNE 1974

National reports on description of fisheries and sampling schemes

Report on the method of sampling fish caught by Polish fisheries in the ICNAF Area

by

J. Sosinski
Sea Fisheries Institute
Gdynia, Poland

I. Fisheries

Polish Fisheries in the ICNAF and Statistical area are mainly basing on stern factory trawlers. They perform 3 to 6 months' trips. Fish is unloaded at home harbours or on mother ships. The fish is processed into fillets or head off and gutted fish and are seldom unloaded in full shape. This kind of fishing and its processing has forced us to arrange the collection of data directly on board ships.

II. Circumstance of sample collection

Samples are collected at sea on commercial ships aboard which there is a research team, on research ships and on reconnaissance ships.

The practice exists also to bring home mackerel and herring samples in a frozen state. In 1973 there were some attempts to introduce the practice of measuring fish on commercial ships to be performed by the ship's crew.

III. Population sampling

a/ Cod, flatfish and redfish from Labrador and Newfoundland are mainly analized in the winter period

of best catches by the research team on the commercial ship.

b/ herring and mackerel are sampled in the period of best catches by the research team which occurs to be then on the commercial vessels. Length sampling is performed also on commercial vessels by the crew. Research teams take, during their sojourn at sea, the maximum number of samples, with an aim to get samples from each exploited fishing ground.
In the Labrador and Newfoundland area as well as in the Subareas 5 and 6 samples of caught fish are taken by teams from the research and reconnaissance ships on the fishing grounds and in the time limits resulting from their working programme. On these ships fish is caught in the same way as on the fishing ships; that is why samples collected characterize the exploited bank.

c/ Squids samples are also collected in the same way as mentioned above in Subarea 5 and 6.

IV. Length sampling

1/ Place of sample collection

On the ship immediately after the catch the fish is taken from successful banks which represent the caught fish stock.
So far as herring and mackerel are concerned, sample collection is also carried out on commercial ships, samples are later on analyzed on land where they are supplied in a frozen state.

2/ Way of collecting

Fish are measured on board as soon as the catch is completed or in the processing plant of the ship before they are sorted. The sample is at venture and characterises the length composition of the examined

stock. Samples destined to freezing and home where they are to be analyzed are also collected at venture before sorting.

3/ Size of the sample and frequency of collection

Attempts are made to collect the maximum quantity of samples, during the principal season of fishing the given species of fish. During their stay on board the research team samples as many hauls as possible and all the occurring there species of fish. During the fishing seasons, each species of caught fish is sampled 3 - 4 times a month on each exploited fishing ground. Sampling of cod and flatfish comprises about 1000 specimens. Mackerel and herring sampling includes about 500 to 600 specimens.

4/ S t a f f

The research team on board the commercial or reconnaissance ship consists of 2 persons. On research ships there are 5 to 7 persons.

5/ Why the method of sampling now used has been chosen

The presently used method characterizes the length composition of the caught fish, during the main fishing seasons on various fishing grounds. It gives length characteristics of the fish caught by the fishing fleet. The obtained length composition is not subject to mistakes owing to the sampling directly performed at sea before sorting and to the examinations of big samples. It represents the catch composition and not the unloaded composition.

6/ Deficiencies

It seems that this method is good. It embraces all the fish / non only the fish brought home as it is done sometimes in other countries/. The sample

size is sufficient. The number of sampling is at time unsufficient as the research team cannot be present in all the fishing grounds simultaneously, and in all the periods.

7/ Limitations

The need of a sufficient number of workers and sometimes the lack of space on some types of ship does not permit to collect samples from all the fishing grounds all the year round. Sometimes also the ship's shifting to another fishing area disorganizes the research programme prepared by the research team on that ship.

V. Age sampling

1/ Place of sample collection: the same as in the length sampling.

2/ Way of collecting

Length sampling is first submitted to a pre-sampling to define the age of the fished stock. The fish to be age-sampled is taken at venture, tending however to analyze each length class. The age composition of the fished stocks is estimated by the key system "age - length".

3/ The sample size and collection frequency

From the sample to define length, 100 specimens are taken to define age.

Herring and mackerel samples brought home in a frozen state are entirely submitted to age sampling. These samples comprise about 300 specimens.

4/ S t a f f

The same as in the length sampling.
The age reading by otoliths is generally done by a research worker examining a given species.

5/ Why the method of sampling, now used, has been chosen

The age sampling connected with the length sampling gives a unbiased picture of the right age composition of the examined species caught by the fishing fleet.

6/ Deficiencies

The same as in length sampling.

7/ Limitations

The same as in length sampling.

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ADDENDUM 2

ANNUAL MEETING - JUNE 1974

National reports on description of fisheries and sampling schemes

USSR Sampling Scheme

Part I - A.S. Noskov
Part II - V.A. Chekhova and
A.I. Postolaky

Part I

Methods of collection age-size samples used by AtlantNIRO spceialists in the ICNAF Area

by

A.S. Noskov
AtlantNIRO
Kaliningrad, USSR

In January 1974, ICNAF adopted the recommendation at the mid-term meeting to submit scientific reports on methods of collection age - size samples by all the member - countries to the ICNAF Annual Meeting. This report deals with the methods description elaborated by AtlantNIRO Laboratory of West Atlantic and used for samples collection in Subareas 4 and 5 and in Statistical Area 6.

Presently, age - size data are collectod by the laboratory mainly for seven fish species, namely, for silver hake, red hake, herring, argentine, butterfish and spiny dogfish. The samples are taken from trawl or purse seine catches while fishing the species mentioned above. They are collected from board the vessels SRTM type (side trawling) and BMRT type (stern trawling). Besides that, size samples were choosen from the land catches.

The collection of samples is made by stock units for the main fish species. The areas of samples collection for determination age and size composition is shown in Table I. Every

month, the scientists collect not less than 30 samples for mass measurements from each area, each sample including 200 specimens. The same areas are used for determining both age and size composition of catches. Every quarter one sample is taken according to size groups established by ICNAF for corresponding ish species, the volume to be taken for each fish species is selected by the laboratory. Table 2 serves as an example characterizing the volume of silver hake samples taken every quarter. The experiments showed that such a volume of data collected is representative enough (Table I).

The otoliths are taken for all the fish species mentioned above for exception of the spiny dogfish, in case with that fish species a spur located in front of the dorsal fin is taken for the analysis. Silver hake otoliths are fixated into the 96% alcohol or in 60% glycerine, the otoliths of other fish species are kept dry.

The laboratory has a staff of observers, two persons on the average are always working at sea.

The analogous method is used for collecting age sample both in time of completing trawl survey and on board the scouting vessels. But, the collection of samples in the last case is not a regular action that can be explained by the specificity of scouting vessels work.

The fact that this method is not well - grounded mathematically is one of the defects proper to it. A restricted staff of observers makes difficult to take the needed number of samples. As the experience shows, not less than four persons are always be at sea, that will allow to collect a truth material for all the populations. Besides that, it is necessary to note that the observers have some difficulties being on board the fishing vessels because of limitated possibilities to come to the desirable area of samples collection.

Table I Volume of data necessary to be collected according to the method adopted.

Fish. Species	Inhabitance areas	Volume of material to be collected (by quarter)				Total
		I	2	3	4	
Silver hake	4 W	I8000/265	I8000/265	I8000/265	I8000/265	72000/I060
	4 X	-	I8000/265	I8000/265	-	36000/530
	5 Ze	I8000/265	I8000/265	I8000/265	I8000/265	72000/I060
	5 Zw + 6	I8000/265	I8000/265	I8000/265	I8000/265	72000/I060
Red hake	5 Ze	-	I8000/250	I8000/250	I8000/250	54000/250
	5 Zw + 6	I8000/250	I8000/250	I8000/250	I8000/250	72000/I000
Herring	4 V	I8000/250	I8000/250	-	-	36000/500
	4 XW	I8000/250	I8000/250	-	-	36000/500
	5 Z	I8000/250	I8000/250	I8000/250	I8000/250	72000/I000
	6	I8000/250	-	-	I8000/250	36000/500
Argentine	4 V	-	I8000/250	-	-	I8000/250
	4 W	-	I8000/250	-	-	I8000/250
	4 X + 5 Z	-	36000/500	-	-	36000/500
Mackerel	4 XWV	-	-	I8000/250	I8000/250	36000/500
	5 Z	I8000/250	I8000/250	-	-	36000/500
	6	I8000/250	I8000/250	-	-	36000/500
Butterfish	5 Zw + 6	-	I8000/250	I8000/250	I8000/250	54000/750
Spiny dogfish	5 Z + 6	36000/500	-	-	36000/I000	72000/I500

Note: The number of specimens for mass measurements is given in the numerator, that for age determination - in the denominator.

Table 2. Quarter age sample volume collected from each stock unit of silver hake.

Size range	I12/I13	I14/I15	I16/I17	I18/I19	I20/I21	I22/I23	I24/I25	I26/I27	I28/I29	I30/I31	I32/I33	I34/I35	I36/I37	I38/I39	I40/I41	I42/I43	I44/I45	I46/I47	I48/I49	I50/I51	I52/I53	I54/I55	I56/I57	Total
Number of fish to be collected	5	5	5	5	I0	I0	I5	20	20	20	20	20	20	I5	I5	I0	I0	I0	I0	5	5	5	5	265

Part II

On methods of size-age sampling

by

V.A. Chekhova and A.I. Postolaky
Polar Research Institute of Marine
Fisheries and Oceanography (PINRO)
Murmansk, USSR

The main requirement, claimed to size-age sampling is to the effect that the size-age composition of fish in the sample has to be in agreement with that in the catch and, in the end, with that in the population exploited. Therefore, the sampling is to be conducted in the areas of commercial concentrations, when a set of trawlings taken one after another brings the stable catches by their sizes and assortment.

Size sampling

All the samples are taken at sea, aboard the vessel. On boards the research vessels, where there are the opportunities to carry out the observations all day around, only accident trawlings and those in which the "single" catches are registered or those which are similar to the previous ones by their size and weight composition already measured, have been missed. On boards the scouting vessels, where only two or three observers operate, a sample is only taken from the catches which are of interest to fishing fleet.

It is not always possible to measure the whole catch, therefore it is used in practice to measure the part of it. Usually 800–1,000 specimens of fish are measured from each catch. In each Subarea 2,000–4,000 specimens are measured monthly.

The size samples are taken by two pesrons in the cruises of the research and scouting vessels. One of them measures the fish and, if it's necessary, opens it for sex determination, another registeres the results.

At the existing method of measuring we have a sufficiently complete set of observations and proper assessment on size composition.

There is a deficiency in the method of samples selection, especially in cases of great catches (5 tons and more). The whole catch is brought into the box on the deck. Then a part of the catch is separated by the board. This part might be not identical with the rest part of the catch by the size.

There are no any factors prevented the sampling.

The samples are not taken ashore (during landing) and on boards the fishery vessels.

Age sampling

The following moments are to be taken into account at age sampling: locality of the stock (population), the character of the seasonal distribution of fish in the limits of the stock area, the representation of the catch.

The age samples are taken from the catch not less than 1 ton weighted. The number of fish in one sample is 300 specimens. The selection of fish for a sample is conducted without interruption from the certain part of the catch aimed at the size composition of fish in the sample to be corresponded with the catch, on the whole.

In separate cases the "selected sampling" method is applied, i.e. the method of fish selection by certain size groups.

In each Division the samples are taken 1 or 2 times per month.

For characteristics of the age composition of the Labrador stock cod the samples are selected in April and May in the area off South Labrador. Age samples of cod in Divisions

3L,3N,3O are taken in the areas of commercial concentrations in winter-spring period.

Age samples of "beaked" redfish are also taken from the commercial catches (not less than 1 ton). The size of a sample is 300 specimens. As far as the differentiation in the size-age composition of redfish by depths is observed, the additional samples are taken over the depth range up to 300 m, from 301 to 500 m and over 501 m.

The age samples are taken by three persons aboard the ~~fishery~~ research vessels and by two - aboard the scouting ones. The analysis of the samples is carried out by specialists ashore.

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ADDENDUM 3

ANNUAL MEETING - JUNE 1974

National reports on description of fisheries and sampling schemes

Fisheries and sampling schemes for Denmark

by

Sv.Aa. Horsted
Grønlands Fiskeriundersøgelser
Charlottenlund, Denmark

Danish fisheries in the ICNAF Area are conducted by Greenland, the Faores and Denmark (mainland). Denmark (M) only fish for salmon and shrimp in Subarea 1, Denmark (F) has fisheries in Subarea 1-4 and Denmark (G) in Subarea 1-3. At present only Denmark (G) fisheries are sampled. The following information does, therefore, refer only to the Denmark (G) fisheries.

Fisheries: Inshore fisheries by small boats (less than 100 GRT) on a variety of species: shrimp by trawl, cod by pound net, longlines, handlines and gillnets, salmon by set gillnets and drift nets. Other species mainly as by-catch in the cod and shrimp fisheries. Longline fisheries for Greenland halibut in northern Greenland is in winter time conducted from the ice ("vessel" - dog sledge).

Offshore fisheries apart from salmon drift netting by small boats is conducted by stern trawlers in the 151-500 and 501-900 GRT classes. Trips of about 10 days duration. Fish gutted and iced on board and landed at Greenland fishing industries for further production. Target species normally cod or Greenland halibut.

Opportunity for Sampling: Good opportunities to sample on the industry plants when fish is landed. Observations on discards by interviews. Opportunity to sample at sea exists. Inshore fisheries sampled either by fishermen themselves or directly by research vessels visiting the fisheries.

Current Sampling:

Population sampled - all major species in Subarea 1 and to some extent also trawler catches of cod and Greenland halibut in other areas. Samples are supplemented by sampling research vessel catches totally.

Length samples - Landings are sampled by random selection of a number of fish boxes (each box containing about 60 kg). All fish in these are measured, normally in quantities about 1000 fish.

Frequency of sampling - as far as possible monthly.

Staffing and/or cost - 2-3 ½prt samplers.

Drawbacks - Difficult to insure that all divisions are properly covered. Sometimes the one trip sampled has spread over two or three divisions and these cannot be separated in the sample. Samples supplied and sampled by fishermen often lack necessary backgrouns information, e.g. on gear used.

Constraints - Difficult for the sampling team to get round and sample in more than the one port, where the field laboratory is situated (Godthaab, Div. 1D).

Age samples - The randomly sampled length samples are subsampled for ageing on a stratified scheme. Normally up to ten fish in each cm group is sampled for ageing (apply to cod only).

Staffing - as for length samples plys 1 age reader.

Drawbacks - same as for length sampling.

Constraints - same as for length sampling. Number of trained age readers at present too low to extend the scheme significantly, but it may be possible to train one more man.

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National reports on description of fisheries and sampling schemes

German Democratic Republic Sampling Report

by

W. Ranke
Institute für Hochseefischerei
Rostock-Marienehe
German Democratic Republic

1. COD / ROUNDNOSE GRENADIER

Fishery

Factory trawler (1801-3000 BRT):
Trips for three months, ICNAF-Subareas 1,2,3 and Baffinland. Processing aboard.
Stern trawler (901-1800 BRT):
Trips for three months into the same areas. Delivery of the catch to factory vessels.
Side trawler (501-900 BRT):
Sporadic trips for three months into the same areas. Delivery of the catch to factory trawler and factory vessels. Processing aboard.

Opportunities for Sampling

Sampling on commercial vessels by biologists; in exceptional cases sampling by the crew aboard on order and landing of frozen samples. Analysis of the samples by biologists aboard respectively ashore (frozen samples).

Current Sampling

Population Sampled -

Cod: W - Greenland, Labrador, Newfoundland (ICNAF-Subareas 1,2 and 3), 1 st and occasionally 4th quarter.
Roundnose grenadier: Baffinland, Labrador/Newfoundland (ICNAF- Subareas 2 and 3),3rd and 4 th quarter.

Length Samples

Place Sample Taken - aboard

Method of Collection - l_t - measurement. Random sampling.

Size of Sample and Frequency of Collection -

Cod: 10 samples/ month, 300 - 500 specimen/sample.
Roundnose grenadier: 10 samples/month,
200 - 400 specimen/sample

Staffing and/or Cost - Occasionally 1-2 persons for sampling.

Reason for Choice of Current Sampling Method -

Precise estimates of percent at length in the catch can be made.

Drawbacks - Realization of the number of samples not always possible because of constraints listed below.

Constraints - Sampling dependent of the employment of a biologist aboard, continuously not possible.

Age Samples

Place Sample Taken - aboard

Method of Collection - Additional to length sample, random sampling.

Size of Sample and Frequency of Collection -

Cod, Roundnose grenadier } 3 samples/month, 100-300 specimen/ sample

Staffing and/or Cost- 1-2 persons for sampling aboard and 1 assistant/year ashore for ageing.

Reason for Choice of Current Sampling Method -

Precise estimates of percent of age at length (group) possible during the period of research.

Drawbacks - Realization of the number of samples not always possible because of constraints listed below.

Constraints - Size of staff limits the workload (sampling and ageing). Number of frozen samples brought along restricted by production loss.

2. REDFISH/TELEOSTEAN FLATFISHES

Fishery

Factory trawler (1801-3000 BRT):
Trips for three months into the ICNAF -Subareas 2,3 and to Baffinland. Processing aboard.
Stern trawler (901-1800 BRT):
Trips for three months into the same areas. Delivery of the

catch to factory vessels (TVS).
Side trawler (501-900 BRT):
Sporadic trips for three months into the same areas. Delivery to factory trawler or factory vessels. Processing aboard. Redfish, Greenland halibut and other flatfishes only as by-catch. Special fishery for these species only short-termed and for limited fishing grounds.

Opportunities for Sampling

Sampling on commercial vessels by biologists; in exceptional cases sampling by the crew aboard on order and landing of frozen samples. Analysis of the samples by biologists aboard respectively ashore (frozen samples).

Current Sampling

Population Sampled

Redfish: Labrador/Newfoundland (ICNAF-Subareas 2,3), Baffinland

Greenland halibut: Baffinland, Labrador/Newfoundland (ICNAF - Subareas 2,3)

Length Samples

Place Sample Taken - aboard

Method of Collection - l_t- measurement, random sampling.

Size of Sample and Frequency of Collection -

Redfish, Greenland halibut } 5 samples/month, 100-300 specimen/sample
other flatfishes - sporadic sampling

Staffing and/or Cost - Occasionally 1-2 persons for sampling.

Reason for Choice of Current Sampling Method-

Precise estimates of percent at length in the catch can be made.

Drawbacks-Realization of the number of samples not always possible because of constraints listed below.

Constraints - Sampling dependent of the employment of a biologist aboard, continuously not possible. It is not possible to separate the single flatfish species (except Greenland halibut) in the catch statistics.

Age Samples

Place Sample Taken - aboard

Method of Collection-Additional to length sample, random sampling.

Size of Sample and Frequency of Collection -

Redfish } 3 samples/month,
Greenland halibut } 100-200 specimen/sample

Staffing and/or Cost - 1-2 persons for sampling aboard and 1 assistant/year ashore for ageing.

Reason for Choice of Current Sampling Method -

Precise estimates of percent of age at length (group)during the period of research possible.

Drawbacks - Realization of the number of samples not always possible because of constraints listed below.

Constraints - Size of staff limits the workload(sampling and ageing). Number of frozen samples brought along restricted by production loss.
The methods for ageing Greenland halibut not yet full developed.

3. HERRING/MACKEREL

Fishery

Factory trawler (1801-3000 BRT) and stern trawler (901-1800 BRT):
Trips for three months into the ICNAF-Subarea 5 and into the Statistical Area 6. Processing aboard.

Opportunities for Sampling

Sampling on commercial vessels by biologists; in exceptional cases sampling by the crew aboard on order and landing of frozen samples. Analysis of the samples by biologists aboard respectively ashore (frozen samples).

Current Sampling

Population Sampled

Herring: New-England (ICNAF-Areas 5 Z and 5 Y), 3rd and 4th quarter.

Mackerel: New-England and USA-Shelf (ICNAF-Subarea 5 and Statistical Area 6), 4 th and 1st quarter

Length Samples

Place Sample Taken - aboard

Method of Collection - Random sampling.

l_t - measurements (for mackerel in the season 1973/74 also fork length, in future only fork length)

Size of Sample and Frequency of Collection - During the main season on the average 12-15 length samples/month, 300-400 specimen/sample.

Staffing and/or Cost - 1-2 persons/season for sampling

Reason for Choice of Current Sampling Method -

Precise estimates of percent at length can be made.

Drawbacks - Discards not examined.
Number of samples not sufficient for all months because of constraints listed below.

Constraints - Dependent of the employment of a biologist aboard. Outside the main season continuous sampling not always possible. Restriction of the frozen samples brought along by commercial vessels: Ordering of 3 samples/month possible.

Age Samples

Place Sample Taken - Simultaneous sampling for age and length.

Method of Collection - Random sampling.

Size of Sample and Frequency of Collection -

In the main season 5 samples/month, 100 specimen/sample (mackerel rarely 50 specimen).

Staffing and/or Cost - 1-2 persons aboard for sampling and 3-4 assistants ashore for analysing the samples.

Reason for Choice of Current Sampling Method -

Number of age samples adequate for precise estimates of percent of most important age groups at length (group).

Drawbacks - } listed above
Constraints - }

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ANNUAL MEETING - JUNE 1974

National reports on description of fisheries and sampling schemes

Spanish Sampling Report

by

E.C. Lopez Veiga
Instituto de Investigaciones Pesqueras
Vigo, Spain

Fishery - Cod directed fishery is carried out mainly by pair trawlers, although there are some otter trawlers are involved in it. Trips of both types of fishing units take place in Subareas 1 to 5, lasting about six months. Squid directed fishery is mainly operated by stern and otter trawlers in Subarea 5 and Statistical Area 6. Duration of those trips is from 2 to 4 months.

Opportunities for Sampling - On-deck sampling only on commercial catches. No sampling on discards is made.

Current Sampling:

Populations sampled - cod

Length Samples:

Place sample taken - on board

Method of Collection - catches are sampled at random

Size of Sample and Frequency of Collection - when possible five samples per dividion and per month are taken. About 200 and 300 fishes are taken for each sample.

Staff and/or cost - Two samples collectors, each one on board of a fishing unit, carrying a tape recorder which avoids difficulties of writing on paper and measuring at the same time.

Reason for choice of current sampling methods - This scheme seems the only one possible due to the fact that the fish is processed on board which makes sampling on landings impossible. Sampling is only carried out on cod, which is the main species.

Drawbacks - The number of samples taken seems to be adequate when the minimum level is reached. Sampling in the whole area is inadequate due to the fact that the fishing units which carry the observers do not cover the whole area. Discards are not included in the samples.

Constraints - Sampling on landings is not possible due to the fact that the fish is processed on board and the long duration of the trips. Increase of sampling is difficult due to space restrictions on board and the lack of staff who wish to remain in this work mainly because of the length of the trips. Instruction of new staff is constantly needed and it has to be done on board by a member of the scientific staff.

Age Samples:

Place sample taken - on board

Method of Collection - from samples taken for lengths, some are taken for age sampling

Size of Sample and Frequency of Collection - when possible, five individuals per each 1-cm length-class interval appeared on length samples are taken for age determination. That means one sample per month and division.

Staff and/or cost - 4 to 5 age readers and two sample collectors on board.

Reason for choice of current sampling method - same as for length samples.

Drawbacks - For sampling on board the same as for length sampling. For ageing, apparently none.

Constraints - Ageing has to be carried out by members of the scientific staff, due to the lack of auxiliary staff. Each otolith has to be read three times. When two of the readers, at least, agree, the reading is given as valid. All this means that the work has to be handled under certain time limits.

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ANNUAL MEETING - JUNE 1974

National reports on description of fisheries and sampling schemes

Fisheries and Sampling Scheme for France

by

J.P. Minet
ISTPM
St. Pierre and Miquelon

I. The Fisheries

French fisheries in the ICNAF area are conducted by France by boats coming from the mainland and by boats based in St. Pierre, the first fishing in Subareas 1 to 5, the second in Subareas 3 and 4.

1. Mainland. About 20 boats, mainly stern trawlers, ranging from 60 to 90 m total length, are fishing for cod mostly, in recent years, in winter and sometimes in autumn in Subarea 5 for herring and squid. The duration of such trips ranges from 2 to 4 months.

   Due to bad conditions only a few fishing trips have been made in Subareas 1 and 2 in recent years, resulting in a great decrease in fishing effort in some statistical areas.

2. St. Pierre and Miquelon. The offshore fishery is conducted by 3 side-trawlers 35 m in length and 1 stern-trawler 45 m in length. Species caught are mainly cod, American plaice, yellowtail and redfish. Fish are eviscerated and iced during the fishing trips (8 days), mainly in 3P, 4V-3NO.

   The inshore fishery is conducted from May to November by 60 "dories" (4 to 16 h.p.) fishing around the islands (3Ps) for cod and sometimes for mackerel used as bait for handlines. American plaice and skates are taken as by-catch.

II. Sampling

Sampling on commercial landings is made only in St. Pierre at the freezing plant by measuring one box in every 15 boxes landed (mostly on cod, redfish and sometimes flatfishes). But a large part of the sampling is made on board the R.V. Cryos on fishing grounds visited by the French fishing vessels as indicated in the French Research Report (Summ.Doc. 74/22) and Res.Doc. 73/35 and 73/36 - the procedure is as follows.

Cod - at each haul up to 20 baskets are measured (800 kg) after sex determination. Otoliths are taken on a random basis on a subsample of 4 baskets (2 of males and 2 of females).

Herring - at each haul 300 fishes are measured (½ cm) and 200 are frozen for study at the laboratory (otoliths and length in mm).

American plaice - total catch is measured at each haul after sex determination. Otoliths are collected from 100 fish.

Yellowtail - total catch is measured at each haul after sex determination; 200 fish are frozen for study in the laboratory and examination of otoliths on a subsample.

Redfish - 5 baskets (200 kg) are measured at each haul (no otoliths collected since 1972).

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ANNUAL MEETING - JUNE 1974

National Reports on Description of Fisheries and Sampling Schemes

Federal Republic of Germany Herring Fishery in Subarea 5 plus Statistical Area 6

by

A. Schumacher
Institut für Seefischerei
Hamburg, Fed.Rep. Germany

Fishery - Stern trawlers making trips of about 60 days duration to Georges Bank (Sa 5 + 6). Catches are processed on board and landed as frozen blocks of filets.

Opportunities for Sampling - Sampling is possible only on board of the factory trawlers. The sampling team consists of 1 scientist and 1 technician.

Current Sampling:

Populations sampled - Herring on Georges Bank during the main part of the season (August-October, 8-12 weeks).

Length samples - From almost each tow of the ship samples, a random sample of 1 basket (±105 kg, approximately 600 herring) is measured to 0.5 cm below.

Age samples - Random subsamples of 100 herring for biological characters (including age) are taken from the length samples and transported in deep frozen condition to the laboratory.

Additional sampling - If necessary, the scientist requests herring samples from other ships. These samples of ±300 fish are collected by instructed crew members, deep frozen and transpotted to the laboratory. During the part of the seasons not covered by a sampling team, instructed crew members also take samples in the same way.

Staffing and cost - One scientist, one technician permanently employed in the institute. Additional costs: travelling expenses and overtime for the sampling team, about 9000-10000 DM per season.

Reason for choice of current sampling method - No alternative.

Drawbacks - Apparently none to any extent.

Constraints - Budget and personnel limitations prohibit extension of current sampling system.