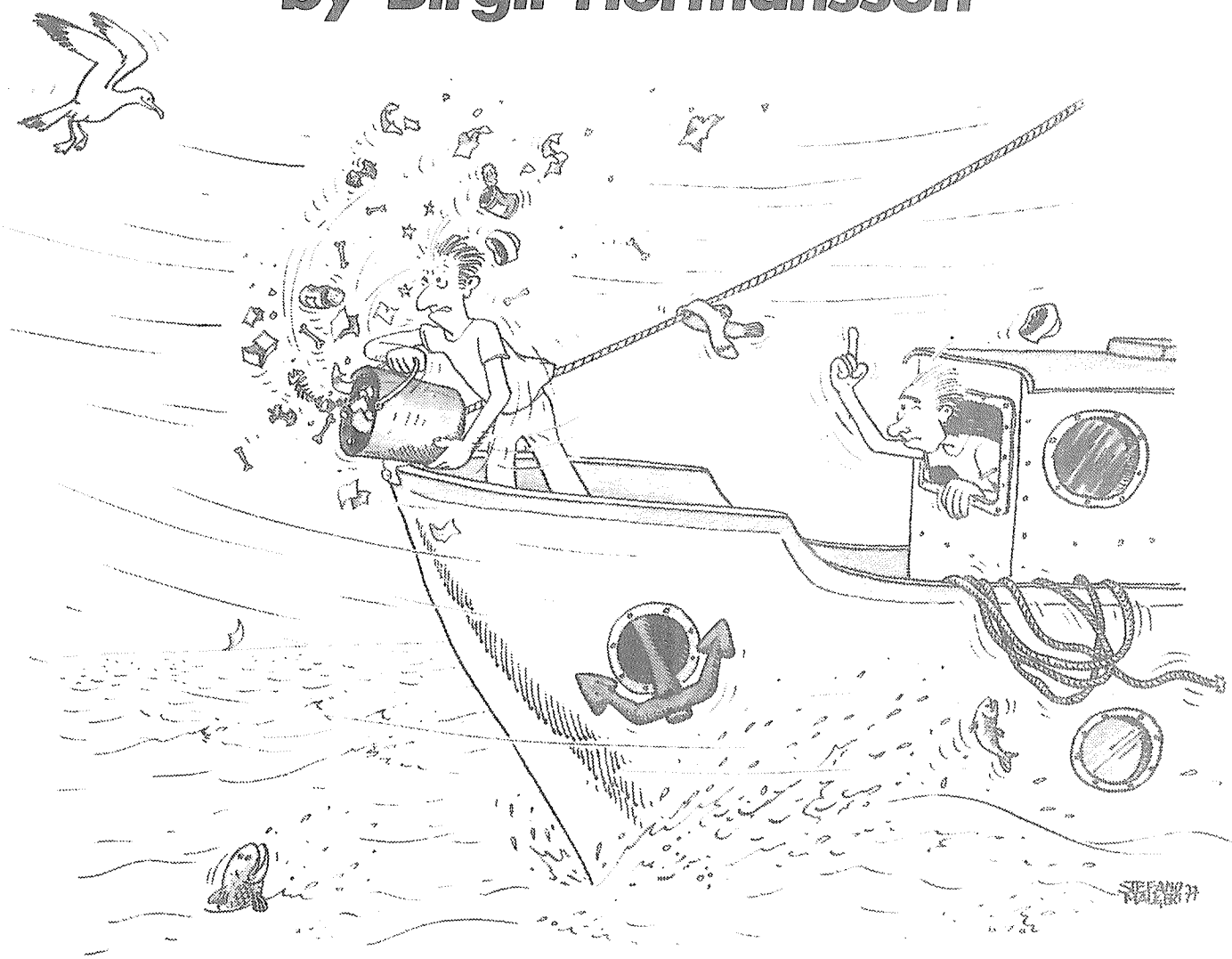
Training Fishermen at Sea

by Birgir Hermansson



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TRAINING FISHERMEN AT SEA

FAO Fishing Manuals

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by Birgir Hermansson

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Contents

Foreword

This manual is based on the experience of an expatriate FAO expert serving as masterfisherman/instructor on a fishery training project. It is, however, assumed that most of the information provided in the manual is relevant to any fishery training activity where a fishing training vessel is used. It is aimed at the masterfisherman/instructor, his crew, as well as the persons responsible for designing the vessel, and its operation as a training aid.

Introduction

The purpose of this manual is to provide a guide for training fishermen on board training vessels of 100 to 200 GT (excepting engine-room personnel). The course envisaged is for one year, including instruction at sea and on shore, for a group of 10 to 20 trainees. For efficiency and convenience of handling, the trainees should be divided into three rotating groups, so that when one is training at sea two are on shore—one learning the theory of navigation and the other being trained in gear and methods.

As a few weeks will have to be allowed for orientation at the beginning of the course and as there must be a review period at the end, as well as time off for local holidays and vacations for trainees during the course, it is estimated that the maximum time spent at sea by each trainee will be about three months.

It is generally agreed that a fisherman should spend three or four years at sea before attempting to become a skipper or mate. A one-year course, such as prescribed in this manual, cannot bring trainees, most of whom probably have no previous sea experience, up to the standard required to become skippers or mates, but it can provide the necessary training and theoretical knowledge to enable those who complete the course to work on board their local commercially operated fishing vessels and gain the required experience at sea. They can then take an examination to obtain a skipper's or a mate's certificate.

Trainees who complete the course described in this manual should be issued with a Certificate of Competence. This evidence of their successful study and serious intent will promote their prospects of becoming mates and skippers, especially in most developing countries where the lack of formal training to attain such competence presents a constant hindrance to fishermen.

In the case of exceptional trainees who have had previous experience in fishing (say, three years or more), the course should enable them to obtain a limited licence (or ticket) as skipper of a fishing vessel of about 100 GT for operating 50 to 80 miles at sea.

The question of what to include and what to leave out of a manual of this kind is largely a matter of personal choice and no doubt every

masterfisherman using it will have his own opinion on the subject. Those who feel strongly on this matter should use their common sense and prepare their lecture notes to meet their own requirements. As stated at the start, this manual is to be used as a guide, not as a rigid textbook. It does not pretend to spell out what each instructor should or should not teach, but deals with the subjects and problems most frequently faced by skippers and other instructors on training vessels.

1 The Training Vessel

The main objective of training at sea is to enable the trainees to gain sound experience of all the work done by the crew on board a commercial fishing vessel. This experience should include:

—routine work;

—non-mechanized fishing operations;

—mechanized operations, including double rig, stern, bottom and midwater trawling, purse seining, longlining, pole-and-line fishing and gillnetting;

—seamanship and the use of navigational and electronic aids;

—safety measures; and

—handling the catch.

To achieve success in such training, the following aspects need to be considered:

—The training vessel should be similar in size to the average commercial fishing boat operating in the area, or to those soon to be introduced, and large enough to work in all weathers in the nearby grounds where commercial vessels operate. However, as operating costs rise rapidly with length, the vessel should be kept as small as is practicable for training.

—The vessel should, of course, be suitable for using the industrialized fishing methods and techniques employed in the areas concerned or likely to be introduced in the near future. The vessel should operate one method of fishing at a time, as do commercial fishing boats, but be rigged to permit realistic demonstrations of all other important fishing methods. Unconventional multi-purpose fishing arrangements should be avoided.

—While the vessel need not have classroom facilities, there should be sufficient space in the wheelhouse and engine room for a small group of trainees. The wheelhouse should have an all-round view and a door opening directly to the working deck.

—As the vessel is not expected to catch commercial quantities of fish, half the fishhold capacity of a commercial boat is sufficient. The

spare space saved can be utilized for accommodation.

—Equipment should be in line with that used in commercial vessels.

—The hull should be of the standard construction of a typical commercial vessel, preferably subdivided by transverse bulkheads with watertight doors of one-compartment standard, if possible.

—Power for propulsion and deck machinery should be less than that in commercial vessels. It should be operated through a central master control, with arrangements for reduced power use in the early training period. This is important because trainees are likely to make mistakes in operations and it may be of critical urgency to cut power immediately to prevent an accident.

—Twin electrical systems (AC and DC) should be provided, *eg,* DC from the main engine and AC from an auxiliary. Basic navigational and radio equipment should be linked up to each system in case of a

Keep them busy, but within reason

single system failure. A separate battery system should also be installed for emergency use.

—Particular attention should be given to safety equipment and procedures. Life-saving equipment, including inflatable rafts, must be sufficient for all on board. Adequate fire-fighting equipment must also be installed.

2 Crew Requirements

2.1 Crew: Number, Composition, Wages, etc.

A training vessel needs a permanent skeleton crew, but how many depends on the size of the vessel, the length of fishing trips, and trainees, maturity and previous sea experience. For example, a 200 gross ton training vessel could be made to carry a maximum of 20 trainees, consisting of two-thirds deck trainees (skipper category) and one-third engineer trainees. The minimum crew for such a vessel (not including counterparts) would be a masterfisherman (the skipper), three experienced able seamen as deck hands, the engineer and a cook—total 6.

There will be counterparts for the masterfisherman and the engineer. Wherever possible, an outstanding trainee from a former group should be assigned from the start as a trainee counterpart skipper or chief officer. This not only strengthens the structure of command but provides a useful link through the counterpart with the crew and the trainees. It also provides a safeguard in the event of the masterfisherman resigning or falling ill, because then there is a substitute immediately at hand and—especially advantageous—a man whom (presumably) the masterfisherman has himself trained. Such a trainee counterpart, and a similar counterpart for the engineer, would bring the total of skeleton staff to 8. The crewing arrangement mentioned above fits a situation where a relatively large fishery training vessel is employed; outside assistance is given in the form of expatriate masterfishermen training counterpart national skippers, mates and engineers, to eventually take over full command of the vessel; a large number (up to 20) inexperienced trainees are taken aboard for training; and the vessel is taken on a week's cruise (or longer). Naturally, if the situation is different the number and composition of the permanent crew should be adjusted accordingly, bearing in mind the need for a margin of safety and reserve for sickness, leave and emergencies.

Further it should be stressed that all the permanent crew of the training vessel, including cook and able seamen, should be *instructors.*

Their main function is to *teach*, not just to fish, navigate and maintain the vessel. The crew's conduct on shore and on board should always bear this stamp.

It is highly desirable that the permanent crew are not only paid fixed salaries but a percentage of the earnings from the catch. Furthermore, a substantial allowance should be paid, based on the number of days spent at sea. Such an allowance provides an incentive to fishing and other sea-going efforts and sustains the morale of the crew in working long hours at sea and helps to make a 'happy ship'.

2.2 Duties of the Crew and Structure of Command

2.2.1 *The counterpart*

As already indicated, a key man to be recruited at the start is the counterpart to the masterfisherman. This must be a man who is to be trained to be a skipper. This masterfisherman-trainee relationship should be made clear, firmly but diplomatically, from the day the two start working together: the overall responsibility for the vessel and its crew is the masterfisherman's and his alone. This point is stressed because previous experience has shown the need to be explicit regarding this relationship between the two. Even small misunderstandings, if not resolved at the start, may lead to bigger problems which could bedevil the vessel and create intolerable stresses between all on board. As the old saying goes: 'There has not yet been built so big a ship that it could hold two captains on board, and there will never be.' So this matter of the masterfisherman's captaincy of the vessel must be understood and fully accepted from the beginning.

Indeed, the terms of reference for the skipper's counterpart should make the situation clear and beyond dispute. Those terms should state:

2.2.1.1 The counterpart must work as the deputy or understudy of the masterfisherman, 'who has overall command of the ship, the crew and the trainees', and assist in all work on board the vessel as required by the masterfisherman.

2.2.1.2 In particular, the counterpart must be responsible to the masterfisherman for the routine administration of the vessel, cleanliness and hygiene on board, crew discipline, maintenance and upkeep of the vessel and maintenance of the fishing gear and the vessel's equipment in general.

2.2.1.3 In addition, the counterpart must be responsible to the masterfisherman for the allocation of duties and

responsibilities of the trainees and crew while at sea, and should participate in practical sea training at the instruction of the masterfisherman.

2.2.1.4 The counterpart must also serve as mate and his duties should include arrangements for bunkering, *ie,* taking on board fuel, ice, water and other stores and provisions.

2.2.1.5 The counterpart must also be in charge, under the masterfisherman's direction, of storage of the fish in the hold, and supervise the unloading and weighing of the catch on return to port.

2.2.1.6 When the vessel is in port, the counterpart must arrange the watches and carry out such duties as are assigned to him by the masterfisherman.

2.2 Sea Duties of the Crew

The three deckhands should each be put in charge of a watch at sea and ensure that the trainees keep an alert look-out at all times and keep on the given compass course. When fishing, the deckhands should take up the position required according to the gear in use. In harbour, they should be made responsible for the maintenance of the vessel above the waterline. In tropical waters, in particular, they must ensure continuous chipping and painting. Their duties must also include maintenance of cleanliness and hygiene in the vessel and, in general, keeping it 'ship-shape'.

The regular crew should also be required, within their field of competence, to assist in the instruction of the trainees. This will in the main consist of instruction in the repair of fishing gear and in splicing wires and ropes, *etc.* Further, as many trainees have no sea experience, the crew must take special precautions for their safety and keep a watchful eye on them during fishing operations. The crew should receive specific instruction and general guidance in these duties to ensure that they can discharge these responsibilities effectively.

The cook should instruct the trainees on how to cook and serve meals and on general work in the galley and messroom, with special emphasis on the need to keep both places clean and tidy. At least one trainee should be assigned each day for galley duties. All this is important because every fisherman should be able to cook and take care of the galley work so that there is no need to employ a man particularly for the job.

3 The Training Programme

3.1 Grouping the Trainees

During their orientation period at the institute, the trainees will be sorted into two groups (deck and engine-room) in accordance with their background, education and attitude towards the type of work they want to do.

All trainees are supposed to have had some experience at sea and have a fisherman's background, but this is not always the case. Indeed, as already indicated, many of them will never have been to sea and may be found to be chronic suffers from sea-sickness and in other respects unable to stand up to the demands of training as fishermen. The early stages of the sea-training programme usually reveals those who will not complete the course and those who will become professional fishermen. In view of this situation, the weeding out process should be done as soon as possible, to make places available for more suitable trainees.

The masterfisherman should maintain close liaison with the shore instructors to ensure the co-ordination of shore training and activities with the sea training programme.

3.2 General Instruction on Board

As an introduction to their new surroundings, the trainees should be shown the construction and layout of the vessel and taught the names of the various parts. During this introductory period they should be taught the nautical terms used on board fishing vessels.

Their first lesson in seamanship should be on how to steer the vessel and how to react to helm orders.

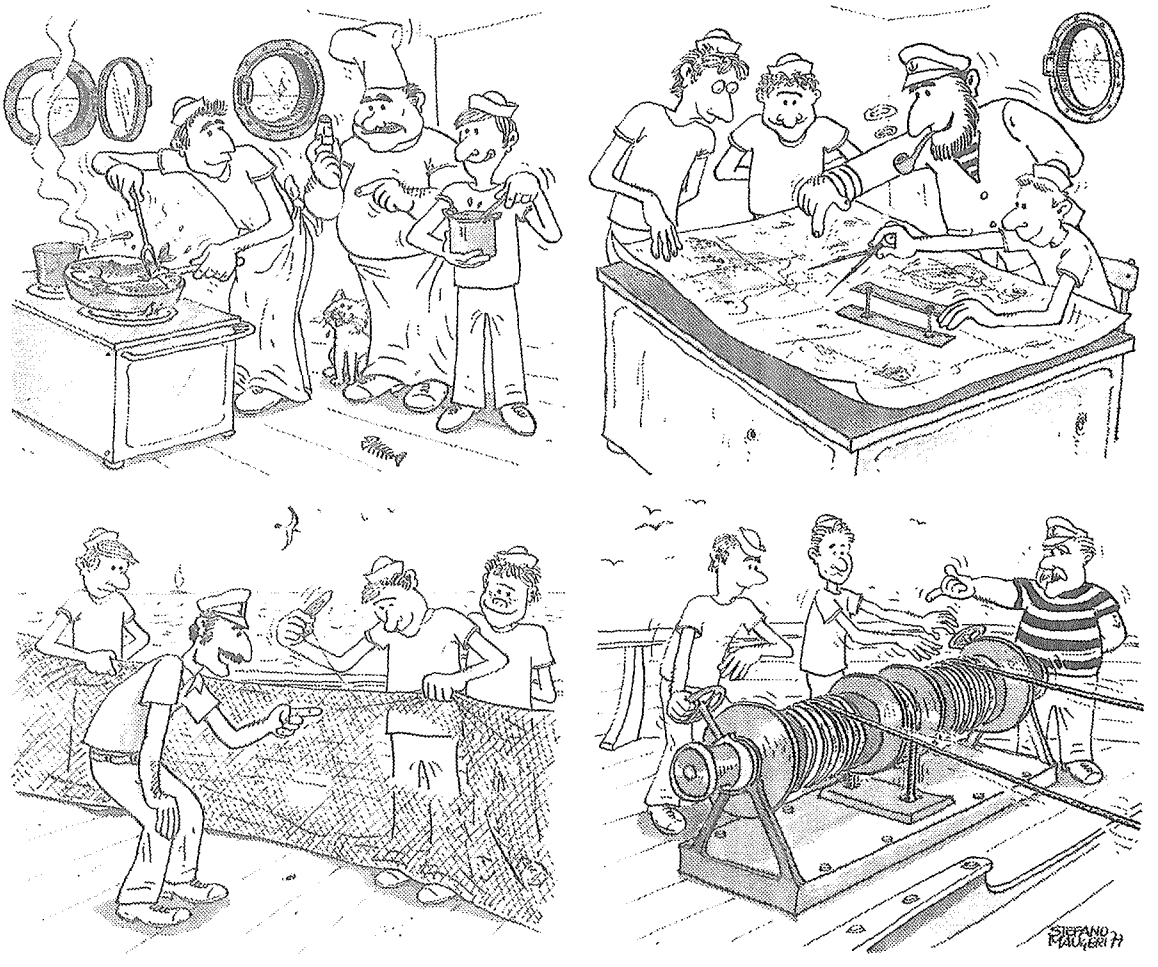
When organizing instruction specific times should be allotted to theoretical and practical teaching, depending on the type of fishing gear in use.

3.3 Watches

There should be three watches for wheelhouse and other duties, each of three hours, rotating round the clock, each watch being, as previously stated, under the leadership of an able seaman. This is preferable to the four-hour system in which the watches always fall in the same time of day; such a situation could create 'favourable watches', as, for example, the 8-12 watch, and make the trainees in other watches dissatisfied. The three-hour arrangement ensures a changing pattern of watch keeping so that over a period everyone shares the same hours of duty.

3.4 Handling the Vessel

While fishing and practical training can be effectively conducted as a



Teach, instruct, explain and let the trainees do the work

combined operation for several days at a stretch, it is essential to take time off from fishing for some training exercises. An example is that of instruction in navigation by fixing the position of the vessel by taking bearings on one or more objects. Another example is handling exercises.

These latter exercises should start after the trainees have learned how to steer the vessel and react to helm orders.

In preparation for the exercises the masterfisherman should give a short lecture to the trainees on the ship's controls, the propeller, the difference between the fixed and convertible pitch propeller, the effects of the propeller on the steering, and on the rudder, and how the propeller and the rudder work in relation to each other. A short question and answer session is desirable to find out the extent to which the trainees have absorbed the information given in the lecture before starting on the practical handling exercise. A good way to conduct this exercise is to have two trainees at a time to work together—one at the vessel's controls, giving the helm orders and acting as the vessel's 'skipper' and the other steering the vessel.

A useful arrangement for manoeuvre practice is to launch a large polyester float, with a weight tied to it to prevent it drifting too fast, and let the trainees manoeuvre the vessel in relation to the float. A good exercise is to have them run the vessel full speed ahead for a few hundred yards, then turn back and bring the vessel to a complete stop at a point where the float is four yards from the starboard side and can be seen in a straight line from the side of the wheelhouse.

3.5 Fishing Operations

When the trainees have mastered this manoeuvre they can move on to handling the vessel in fishing and other operations, closely supervised, of course, by the masterfisherman or his counterpart. If possible, they should also be trained to take the vessel out to sea and to bring it in and tie up alongside a jetty.

All trainees should be on duty in fishing operations, their stations, of course, being determined by the type of fishing gear being used.

Take for an example a bottom trawl operation. For this, one watch will be in the wheelhouse, another on the winch and the third handling the doors and the gear at the stern. One of the trainees in the wheelhouse watch will be the 'skipper' who, under the watchful eye of the masterfisherman, will manoeuvre the vessel while shooting and hauling the trawl. At the end of each haul the trainees should change

position. Thus, the watch in the wheelhouse moves to the winch, that on the winch goes to handle the gear and the doors, while the third watch goes to the wheelhouse.

When the fishing gear becomes damaged or when there is a wire or rope to be spliced or a knot to tie, the trainees should do the work under the supervision of the deckhands. The masterfisherman should ensure that the crew's instruction in such work and in general seamanship is effective. He may find it necessary to guide and assist the deckhands in their methods of instruction to enable them to convey more effectively their knowledge and skill to the trainees.

When difficulties arise during operations, as, for example, when gear becomes stuck or fouled or entangled with that of another fishing vessel, the masterfisherman should assemble all the trainees to observe how the vessel is manoeuvred to get it cleared.

4 Basic Meteorology

The introductory lecture which the masterfisherman should give to all new trainees should concentrate on the following four main points:

4.1 A General Explanation of Meteorology

Describing the meaning of such terms as depressions, isobars, warm and cold fronts, *etc.*

Depressions or lows, ie, regions where the atmospheric pressure is lower than that in surrounding areas. This situation is a main cause of winds, arising from the contact and interaction of streams of cold dense air and warm light air. Depressions usually measure a few hundred miles in diameter. Their absolute depth and gradient vary greatly. The strength of winds is in relation to the depth and size of depressions. Barometric observations are recorded in millibars. This unit, adopted by meteorologists, is one thousandth of the average pressure of the atmosphere at sea level, which is about 14½ lb per square inch or 1000 millibars, (75 cm or 29.5 inches of mercury).

Isobars are the lines on a weather chart which link points of equal barometric pressure.

A *warm front* is the forward boundary of the warm sector of a depression.

A *cold front* is the beginning of the cold sector of the depression (at the rear of the warm sector) and, generally, is associated with very strong winds, showers and thunderstorms.

4.2 Radio Broadcasts

These are issued by the meteorological services of many countries. It is necessary to know how to interpret them and take action accordingly. Fishermen, of course, are guided in this matter by their extensive experience of weather conditions. The broadcasts are given in two ways:

(1) Weather information gathered by a widespread system of observation stations. These report weather conditions such as wind velocity, sky and sea conditions, temperatures, *etc,* to their meteorology bureau, which compiles and analyses the information and sends reports to the radio stations for broadcast every few hours.

(2) General forecasts are also given every few hours on the weather conditions the meteorologists expect. These forecasts of course are based on the reports from the observation stations and other factors, such as the position and direction of movement of depressions, *etc.* The occurrence and movements of depressions are not yet fully predictable, so weather forecasts are not always accurate. The fisherman, therefore, must make his own weather observations and, in the light of the broadcast forecasts and his experience, make his own evaluation of the likely situation. A wrong conclusion about the weather can be very expensive to a fisherman. The trainees, however, must be warned that it takes much experience before they can make their own weather forecasts and forecast evaluations.

4.3 Instrument Readings and their Interpretation

The only weather instruments the fisherman generally has at his disposal are the barometer and the thermometer. By experienced use of these and skilful interpretation of other available information, he should be able to assess the coming weather conditions.

The two types of barometer should be explained to the trainees: the *mercury barometer,* which is more accurate but not so easy to read or transport, and the *aneroid barometer,* which is commonly used on board fishing vessels. The mercury barometer has a column of air balanced by a column of mercury. The aneroid barometer is made of a thin metal chamber, partly exhausted of air. It is susceptible to the changes in atmospheric pressure, which are indicated by a pointer at the top of the chamber. A falling barometer, *ie,* when the pointer drops below the 1000 millibar mark, indicates that weather conditions will deteriorate. A rising barometer indicates fair weather conditions.

The *thermometer* consists of a glass tube of very small bore, partially filled with mercury. There is a bulb at one end, the other being sealed. The mercury expands with heat and contracts with cold, thus indicating the temperature, recorded in degrees on the tube.

The Celsius and Fahrenheit thermometers are the two most common in use. The temperature ranges are expressed as follows:

Centigrade: Water freezes at 0°, boils at 100°

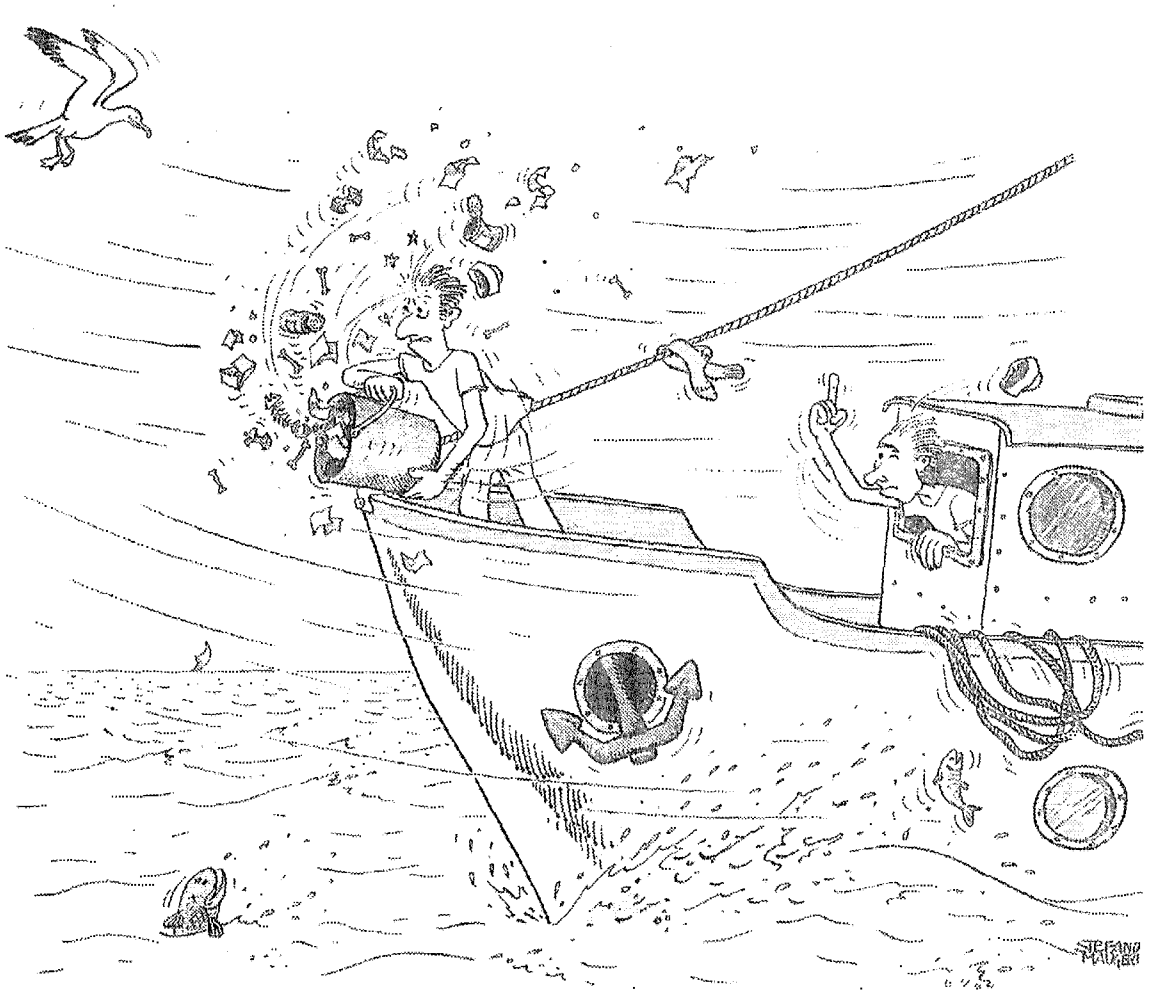
Fahrenheit: Water freezes at 32°, boils at 212°

4.4 Wind Force and Weather Observations

Wind speed is commonly expressed in knots (1 nautical mile/hour, or 1 knot = ½ metre/second, approximately.

Wind direction is expressed in compass points (another good reason why the trainees should be taught how to 'box the compass') but related to true north.

For his lecture on wind force and state of weather observations, the masterfisherman should have at his side the ship's barometer and a thermometer in order to point out their parts, and explain how the instruments work and how to read them correctly. He should also have a weather bureau map which gives the meteorological terms and their symbols, and a copy each of Tables I, II and III on wind force, state of sea and visibility, which appear in this chapter.



Several ways of gauging wind velocity and direction—not all advisable

If the vessel is operating in a zone where violent tropical storms occur, such as hurricanes, typhoons or cyclones, the masterfisherman should describe the characteristics of such storms and when and how to take avoiding action when they are developing.

The lecture notes should be published as a leaflet and a copy given to each trainee with a copy of the map and of Tables I, II and III. The trainees will find these a useful reference for terms they need to use every day.

As the accuracy of weather observations depends to a large extent on experience, the masterfisherman should try to pass on to the trainees as much as possible of his accumulated knowledge. One practical way to achieve this is to take every opportunity to exercise trainees in estimating wind force and in making other weather observations and assessments. These can be compared with the evaluation by the masterfisherman and reasons for different conclusions analysed and discussed.

Table I

Weather and Wind Force

Beaufort Scale Force	*Description of Wind*	*Speed in Knots*	*Appearance of Sea*	*Appearance of Land*
0	Calm	Less than 1	Sea like a mirror	Smoke goes straight up
1	Light air	1-3	Ripples with the appearance of scales but without foam crests	Direction of the wind can be seen by the smoke. Flags do not move
2	Light	4-6	Small wavelets, still short but more pronounced. Crests have a glossy appearance and do not break	Wind can be heard in the leaves of the trees. Small flags move slightly
3	Gentle breeze	7-10	Large wavelets. Crests begin to break. Foam of glossy appearance	Leaves and small tree branches vibrate. Small flags unfold

Beaufort Scale Force	*Description of Wind*	*Speed in Knots*	*Appearance of Sea*	*Appearance of Land*
4	Moderate breeze	11-16	Small waves becoming longer, fairly frequent white horses	Dust and paper floating around. Small tree branches move
5	Fresh breeze	17-21	Moderate waves, taking a more pronounced long form, many white horses formed	Small trees bend a little
6	Strong breeze	22-27	Large waves begin to form, with white foam crests more extensive every-where	Large tree branches bend. Difficult to use umbrellas
7	Near gale	28-33	Sea builds up and white foam is blown by the wind	Large trees begin to bend. Tiring to walk against the wind
8	Gale	34-40	Moderately high waves of greater length, edges of crest begin to break into spindrift. Foam is blown in well-marked streaks by the wind	Tree branches break. Difficult to walk against the wind
9	Strong gale	41-47	High waves. Dense streaks of foam along direction of wind. Crests of waves begin to tumble and roll over. Spray may affect visibility	Some damage to houses. Difficult to stand against the wind in open areas

Beaufort Scale Force	*Description of Wind*	*Speed in Knots*	*Appearance of Sea*	*Appearance of Land*
10	Storm	48-55	Very high waves with long overhanging crests. Foam blown in dense, white streaks by the wind. Surface of sea takes white appearance	Trees start falling. Considerable damage to houses
11	Violent storm	56-63	Exceptionally high waves. Small- and medium-size ships may be occasionally lost to view behind waves. Sea completely covered with long white patches of foam. Edges of wave crests blown everywhere into froth. Visibility affected.	Extensive damage to houses
12	Hurricane	64-71	Air filled with foam and spray. Sea completely white with driving spray, visibility seriously reduced	

Table II

State of Sea

Appearance	*Approximate Wave Height Metres*	
	in feet	*in metres*
Calm	0	
Smooth	1—2	0.3—0.6 m
Slight	2—4	0.6—1.2 m
Moderate	4—8	1.2—2.5 m
Rough	8—13	2.5—4.0 m
Very rough	13—20	4.0—6.0 m
High	20—30	6.0—9.0 m
Very high	30—45	9.0—14 m
Phenomenal	45 and over	14 m and over

Table III

Sky and Weather Notation

b	Blue sky (up to one-quarter covered).
bc	Partly clouded (quarter to three-quarters covered).
c	Mainly cloudy (not less than three-quarters covered).
d	Drizzle.
e	Wet air without rain.
f	Fog.
g	Gale, force 8 or 9 maintained for not less than 10 minutes.
h	Hail.
l	Lightning.
m	Mist.
o	Overcast (completely covered).
p	Passing showers.
q	Squalls.
Q	Heavy squalls.
r	Rain.
r^s	Sleet.
s	Snow.
t	Thunder.
tl	Thunderstorm.
u	Ugly sky.
v	Abnormal visibility: objects at a distance unusually clearly seen.
z	Haze.

from Trawlermen's Handbook
Fishing News Books Ltd.

Table IV

Visibility Scale

The following scale may be found convenient for recording visibility in the deck log-book:

Dense fog	*	Less than 55 yd (about 50 m)
Thick fog	*	Approx 55—220 yd (50—200 m)
Fog	*	Approx 220—550 yd (200—590 m)
Moderate fog	*	Approx 550 yd—$^5/_8$ nautical mile (590 m—1.2 km)
Mist or haze		Approx $^5/_8$—1 nautical mile (1.2—1.8 km)
Poor visibility		1—2 nautical miles (1.8—3.6 km)
Moderate visibility		2—6 nautical miles (3.6—10.8 km)
Good visibility	†	6—12 nautical miles (10.8—21.6 km)
Very good visibility	†	12—30 nautical miles (21.6—55.0 km)
Excellent visibility	†	30 nautical miles or more (55.0 km or more)

* Grouped together as "**fog**" in B.B.C. Weather Bulletins for shipping.
† Grouped together as "**good visibility**" in B.B.C. Weather Bulletins for shipping.

from 'Trawlermen's Handbook'—
Fishing News Books Ltd.

5 Seamanship

5.1 Lead Line

The masterfisherman should introduce the *lead and line* as one of the most important instruments used on a vessel for measuring the depth of the sea. The lower end of the lead should have a cavity, filled with margarine or similar fat, so that a sample of the bottom can be obtained and examined. The trainees need to be shown how to mark the line in metres or fathoms, depending on which are marked on the vessel's sea-charts.

The difference between the *hand lead* and the *deep-sea lead* should be explained—how, for example, the hand lead is used where there is shallow water, with the line marked every metre (or fathom) for the first 15 to 20 metres and after that every 5 metres, whereas the deep-sea lead is marked in longer measures.

While explaining these facts, the masterfisherman should have the lines at his side and teach the trainees how to drop them in order to obtain the correct depth and find out the nature of the bottom.

5.2 Preparation of the Vessel for Getting Underway and the duties of a Skipper Prior to Proceeding to Sea

These are functions of great importance and the masterfisherman should take particular care to see that the trainees are given detailed instructions about these. As a start, he should take all the trainees around the vessel at least an hour before casting off and point out to them the various items and details that have to be checked before going to sea. First there are the vessel's watertanks. They must be checked to ensure they have been refilled. Next, there is the galley where, in co-operation with the cook, a check must be made on the store of provisions for the cruise. Then should follow a check on the crew's quarters to make certain that all are on board so that they can then be sent to their stations. At the same time, the engine-room crew must be

notified of the hour of departure. From there, the masterfisherman should take the trainees to the main deck and supervise them in securing fishing gear and loose items to ensure that no equipment or gear will break loose once the vessel begins to roll. The trainees should lower the derricks and bolt them down and make sure that the hatches are secured. When everything is shipshape on deck, they should be taken to the bridge to check that all is in order there. The masterfisherman should make the trainees select the charts needed for the voyage and to arrange them so that they are ready to use in the chartroom. The trainees should switch on all navigation and other lights, such as the working light, to check that they are all working properly. After that they should switch on all the electronic equipment, *eg*, radar, direction finder and echo-sounders, to ensure that these are in good working order. In case anything is found not to be in good working order, an immediate attempt should be made to check the reason for malfunction and, if possible, repair it on the spot. In case this is not achieved, the masterfisherman should decide whether to delay the departure, or when he is certain that the matter can be fixed while on route to the fishing grounds, to proceed according to schedule. In case a serious matter is discovered which would not enable the boat to proceed, and calls for extensive repair, he should decide to cancel the trip until further notice. They should test the ship's whistle to ensure that the engine crew have remembered to turn on the air (if it is pneumatic). Then the masterfisherman should bring out all the ship's legal papers and check with the trainees that these are up to date and in order. The trainees should then put the helm over both ways and check if the electric, hydraulic and manual aparatus are all working properly and that the rudder indicator is in order.

After the masterfisherman has taken the trainees through such a routine as this several times, he should allow them to do it under the leadership of his counterpart or the regular crew. When he is satisfied that they know the drill completely, the trainees should be instructed to carry out the checks on their own, subject to his later inspection.

When the pre-sailing checking routine has been done the masterfisherman should assign a group of trainees to handle the mooring ropes, under the supervision of the regular crew. They should make sure the ropes are clear and ready to be pulled in. Another small group should be assigned to handle the fenders, and a third group to the wheelhouse to observe how the masterfisherman handles the vessel in leaving the jetty. Later in their training, when the masterfisherman is satisfied with their progress and competence, he should require them to handle the vessel, under his supervision, in leaving the jetty and going to sea.

5.3 The Duties of a Skipper when the Vessel is at Sea

These should come next in the training schedule. As the skipper has overall responsibility for the vessel and its crew, the importance of his duties cannot be over-emphasized. The need for conscientious attention to his duties is essential for the safety of the vessel. For example, he must ensure that an alert look-out is always kept and that at no time is the bridge left unattended. The masterfisherman should allow the trainees to observe, as often as he reasonably can, how he does his work. While he cannot be expected to maintain a running commentary on his actions and what they imply and involve, he should explain them briefly as they occur. For example, he should explain that he must know the position of the vessel at any given time, and keep a good lookout himself when there is special need for careful navigation. Or, again, he must frequently check that the compass course ordered is being steered and that the log book is entered up, and perform many other routine actions, all of which should be understood by the trainees as a contribution to the overall objective of ensuring the safety of the ship.

5.4 When the Vessel is Approaching a Jetty

The masterfisherman should use the occasion, as in the departure procedure, for instruction and show the trainees how to berth alongside and moor up to the jetty. He should explain how this is done if there is a current or if there are tidal streams or winds. As every skipper knows, going alongside a jetty with a strong following current is difficult and only those who have their vessel under complete control are capable of doing it. The degree to which wind and current can be of assistance in handling the vessel in harbour or anchorage should be explained and demonstrated.

Again, as in departure, the watches should be posted to their stations. The wheelhouse watch should observe how the masterfisherman brings the vessel in. A trainee should be at the wheel to obey helm orders. Later in training, when the masterfisherman is assured of their competence, trainees may take turns to act as the 'skipper'. During any such manoeuvres by trainees near a jetty, the masterfisherman should always have an anchor at hand ready for use.

In coming alongside, the masterfisherman should demonstrate how the vessel is brought in, usually at an angle of 20° or less, and explain that the approach is made at the slowest speed that is safe or in such a way that the vessel remains easily manoeuvrable. The trainees should

see how the wheel is put hard over in the opposite direction to the jetty with the engine running slow ahead and how the forespring swings the vessel slowly alongside the jetty.

Supervised by the crew, the trainees should handle the mooring ropes, passing ashore the head rope and the stern rope and then the back spring and the breast ropes and making them secure.

5.5 The Effects of the Propellers on the Steering of a Vessel

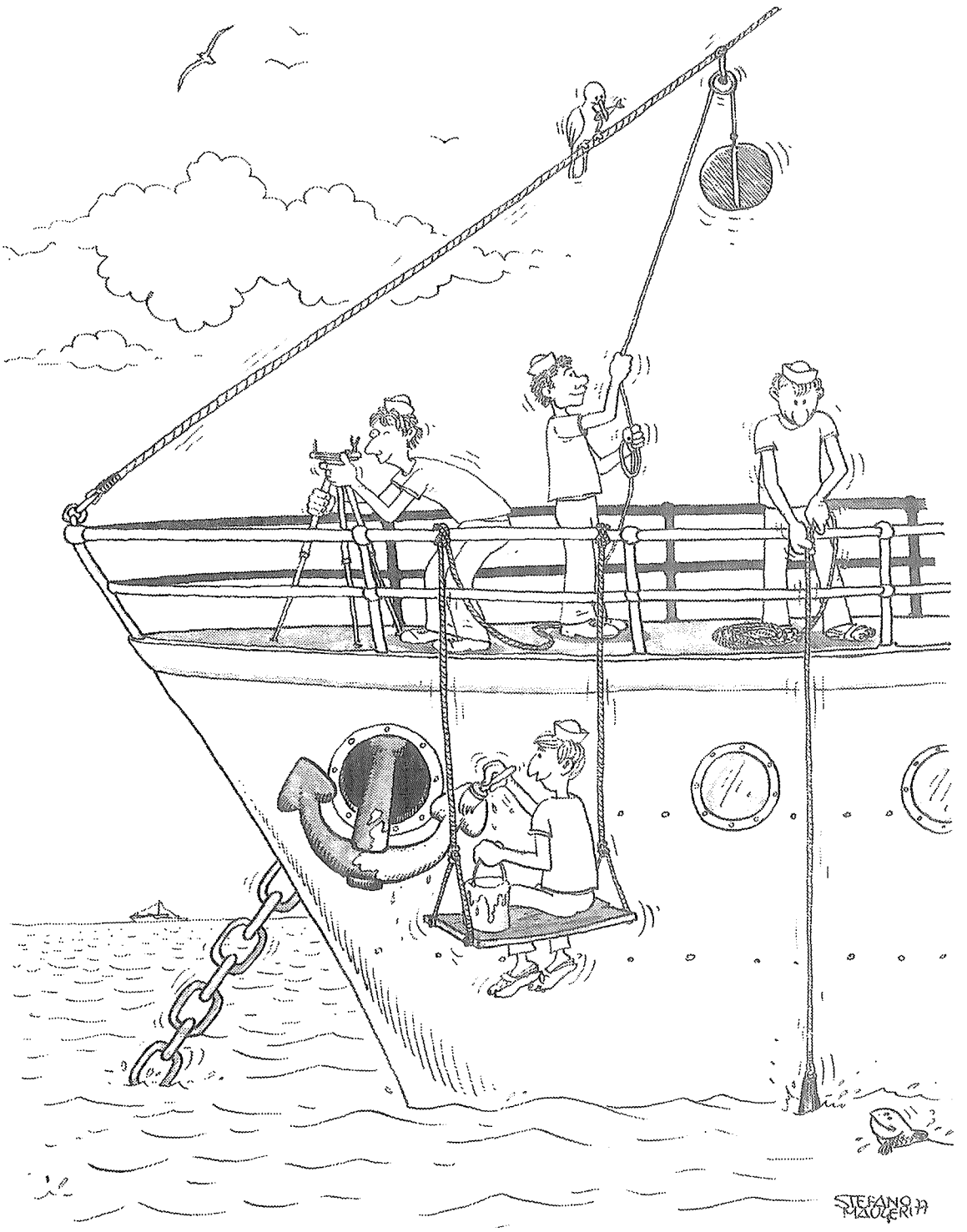
How a vessel will react to various manoeuvres, depending on the circumstances and the type of propellers used, needs to be carefully and clearly explained. As skippers know, one of the first questions to ask when taking over a ship is: 'what type of propeller has she, left or right handed?' The difference between a controllable pitch and fixed propeller needs to be detailed. The fact that a vessel with a right handed fixed propeller will go to port when going astern but to starboard with a right handed controllable pitch propeller should not only be explained to trainees but demonstrated. (You cannot demonstrate both on one vessel.) It must be stressed to them that all ships, however propelled, will bear up into the wind when going astern.

The masterfisherman needs to instruct trainees fully on the inter-relationship and co-ordination of the propeller and rudder in manoeuvring the vessel, pointing out that as the rudder is located immediately aft of the propeller there is a thrust of water past it when the propeller starts to turn, resulting in steering effects. This is why a vessel with way upon her but without the propellers turning, hardly answers to the helm. The water is not flowing fast enough past the rudder. When trainees start handling exercises, they always forget this fact and are surprised when the vessel does not answer to the helm and they miss the target. However, the masterfisherman can make use of this mistake for a demonstration lesson which the trainees are not likely to forget.

The next lesson should be on how to manoeuvre the vessel in the so-called *short turn, ie,* in alternating movements ahead and astern. These are short movements which call for incisive commands and highly competent handling of the ship. A good deal of demonstration and practice in this exercise will be necessary to bring the trainees up to the required standard of operation.

5.6 Anchoring

The masterfisherman should first teach the trainees how to bring the vessel to *anchorage* under normal circumstances before dealing with more difficult conditions. They need to be instructed on how to select a place on the chart with a suitable depth and to ascertain the nature of



There is more to anchoring than dropping an anchor

the bottom there. Next, they should be told to find out, or try to estimate, the direction and strength of the tide and current, the rise and fall of the tide and, if there is any wind, its direction and strength. All these factors, of course, must be related to the size and displacement of the vessel. Again, in explaining that the usual length of chain or cable used for anchoring is 4 to 5 fathoms to one of depth, they need to be warned of circumstances when a longer chain or cable has to be paid out. This may be required, for example, if there is a very strong tide or current, or the nature of the bottom is unfavourable for anchoring, or if the vessel is to remain at anchor for a long time.

The duties of the skipper and the crew while the vessel is at anchor should be fully explained so that they realize that observance of them is essential for the safety of the vessel. Examples of those duties should be given, such as checking to ensure that the correct signal is flown or shown when required and that the regulation light is burning brightly at night, that a good look-out is maintained, especially for any signs of the vessel dragging or turning on her anchor. Relative to the latter, the trainees should be shown how to take a bearing of two objects or two lights in line and how to measure the depth regularly, because a change in them indicates that the vessel is dragging its anchor. The seriousness of dragging the anchor can be underlined by stressing that if the skipper is not on the bridge when this starts, he should be called immediately to take corrective action. In most cases the skipper will order more cable to be paid out, but if that does not work he can drop a second anchor. The masterfisherman should stress that the wisest course is often to move the vessel to another place where the bottom is more favourable for anchoring.

In order to impress on the trainees the potential danger to any vessel arising from dragging the anchor, the masterfisherman should stress that in case of an error of judgement or failure of the helm or the engine, another anchor should be dropped immediately. As this implies, not only should a vessel always carry a spare anchor, but it should be put on hand for instant use when an emergency of this kind arises.

Anchors generally used are the stock kind and the patent stockless type. The parts of the anchors should be shown to the trainees and learned by them along with all useful knowledge about anchors such as, for example, the metal they are made of and that an anchor's weight and size should be related to that of the ship, and that when purchased, it should be accompanied by a certificate stating its weight (kg), dimension (mm) and proven (tons) load applied. Trainees must be shown how the anchors are secured in the hawse pipes, how the claws and windlass brakes are applied, and how the pipes are bagged, and

told that an anchor cable is usually made up of 15 fathoms or 27.5 m lengths, each length shackled to another, A length is called a 'shackle' and, when anchoring, the skipper always states how many 'shackles' should be paid out. As previously indicated, the masterfisherman should arrange for the trainees to drop anchor under various conditions so that they acquire practical experience.

5.7 Sea Anchor

He should also have the trainees make a *drift* or *sea anchor* and explain how and when such an anchor should be used. This will call for demonstrations to show such situations as the drift of a vessel to leeward when the steering gear or the engine is out of action and the use of such an anchor to lessen drift by boats which are fishing with handlines. As there is a lot of gear and other materials on board a fishing vessel from which to construct a drift anchor—and virtually anything will do in an emergency—trainees can easily be instructed in making such an anchor from various materials. They should also be made aware of the fact that the biggest and most efficient drift anchor on board is the trawl itself.

5.8 The Patent Log

This must be the subject of a lesson, with the trainees learning the names of its main parts, how it works, how to read the dial, and how to pay out and haul in the log line. The instruction should include maintenance of the log to ensure reliability. This calls for lubricating the moving parts, washing the rotator and hanging out the line to dry.

5.9 Emergency Steering

A skipper must always be prepared to cope with emergencies and as a means of impressing this on the trainees the masterfisherman should, for example, conduct practical exercises on how to handle the vessel with *emergency steering gear*. The means for connecting the tiller to the rudder exist on board most vessels and the trainees should be shown how to secure a wire to each side of the tiller and to lead and secure it to the winch, in opposite directions. They should then practise steering the vessel by reversing the winch. They could conduct this exercise in a trawler by steering the vessel through the use of the trawl doors,

lowering and hauling them to keep the vessel on course. If the vessel does not have trawl doors, other constructions should be improvised for use in the same way.

5.10 Knots and Splices, Boat and Gear Maintenance

The deckhands should, of course, be employed as instructors in all their fields of competence, led by the bosun. In particular, they should teach the trainees how *to splice wires and ropes, tie all commonly used knots and repair fishing gear.* They should also teach the trainees how to keep the deck shipshape and in good working order by looking after the blocks, wires and other equipment, particularly in seeing that replacements are made as soon as necessary. The importance of such vigilance in maintenance work should be stressed, as the failure of blocks or breakages of wires, *etc,* during fishing operations could prove both expensive and dangerous. Experience has shown that the constant need for maintenance on machinery of all kinds is little understood by most trainees; which emphasizes the need to reiterate time and again the essential nature of maintenance.

6 Navigation

A syllabus for practical training in navigation could be drawn up along the following lines:

6.1 The Compass

Variation and *deviation*—correction of magnetic and compass courses. As these are basic subjects for navigation in practice, training should be devoted to them at the start. The trainees, of course, should have a fairly good understanding of variation and deviation as they will have been given classroom instruction ashore on the subject. The masterfisherman, therefore, should only have to show them the application of the theory at sea. The simplest way to teach the trainees how to correct magnetic and compass courses is as follows:

East is + (plus) west is — (minus) in compass to chart;
East is — (minus) west is + (plus) in chart to compass.

The masterfisherman should explain where and how to get the information about variation and deviation on board. The trainees should be shown that information about variation is taken from the sea-chart for the area concerned and is usually printed inside the compass rose on the chart.

Finding the deviation of the vessel is a more complicated matter. The deviation table, which every vessel has on board, should be shown and explained to trainees. They should be told that, because the ship's magnetic field and the deviation are changing continuously, the deviation tables should be brought up to date as often as possible.

Next, the masterfisherman should show the trainees how the deviation is found by turning the vessel around, close to a buoy or other seamark on the chart. Another and more distant object on the chart, perhaps on shore, should be pointed out and the way to take a magnetic bearing, relative to the chart, should be demonstrated. The masterfisherman should then turn the vessel around, stopping every 10 to 20 degrees, and explain to the trainees that every time a bearing is taken the steered course is read from the compass and recorded. At the

same time the compass bearing of the two objects should also be recorded. He should then explain that the deviation on each course can be found by comparing the magnetic and compass bearings. A full day should be allocated to this exercise, with each trainee taking his turn in finding the ship's deviation. This exercise will greatly improve the trainees' understanding of the compass and its use.

While a trainee is engaged on this exercise, his companions should be otherwise employed as, for example, in overhauling and preparing the fishing gear to be used on the next voyage. Such a training exercise as described could be conducted in one day between fishing trips.

While the masterfisherman is showing the trainees how to find the deviation, he should also instruct them thoroughly about the *compass*—that as the compass is the most important of all navigational aids special care has to be taken of it. Nothing containing iron, for example, should be allowed near it, otherwise its needle will be pulled away from the magnetic north. He should explain how the compass is constructed, part by part, and teach the trainees how to 'box the compass'—at least, as a start, to name eight of its 16 points, with the proviso that they quickly learn the lot.

6.2 Taking Bearings

Coastal fishermen generally use shore bearings (mountains, trees, big buildings, chimneys, *etc*) for their navigation. All coastal fishermen, everywhere in the world, use this method to obtain a good fix so that, for example, they can leave their bottom nets, longline or fish pots, *etc,* overnight and return to the exact position. The masterfisherman should explain how this is done and conduct practical exercises in this method.

6.3 Chart Work

There is unlikely to be enough space on board to teach chart work to all the trainees at the same time or to give all of them together a practical exercise in such work. Probably the masterfisherman will find it best to deal with one watch at a time. Thus, when the vessel is in coastal waters, he could put the azimuth circle on the standard compass and let the trainees of the wheelhouse watch take a bearing of objects which are clearly marked on the chart. Each trainee should have to observe different objects so that he cannot copy the bearing

results taken by others. The bearing could consist of two objects or more in line or cross bearings. When they have taken the bearings they should return to the wheelhouse and correct their findings from the compass to true bearings and then plot the vessel's position on the chart, measuring the longitude and latitude. They can then compare their results. If they have made mistakes in their chart work the masterfisherman should show them the correct calculation. At the same time, he can dwell on the essential nature of the information with which a *sea-chart* provides the skipper, such as the depth of the sea, the nature of the bottom, the objects for taking visual bearings, *etc,* and tell them under what conditions small- or large-scale charts are most suitable.

When *the course* of the vessel is laid out or altered, a trainee on wheelhouse duty should be told to work it out, supervised of course, by the masterfisherman or his counterpart. The easiest way to do this is to let the trainee draw a line on the chart from the position of the vessel to the point where it is supposed to reach. He then places a parallel rule on the line and moves the ruler on to the next compass rose. This shows him the true course and, sometimes, the magnetic course.

6.3.1 *Drift and Current*

Such an exercise provides a convenient time to explain to the trainees that it is necessary to correct the course for *drift and current* as well as to allow for deviation and variation. In explaining how to estimate these, the trainees should be told that drift is caused by the push of the wind and waves on either side of the vessel and that current is the movement of water over the sea bottom. To make this a little clearer, the masterfisherman should detail the three main types of current:

That which always goes more or less in the same direction—usually big ocean currents.

That made by the tide which, as a rule, flows in two main directions. Such currents, along with the big ocean currents, can usually be calculated in advance.

And the irregular currents caused by the wind blowing in one direction for a considerable period.

The trainees should be told how to estimate the speed of these currents, which, with some experience, can be done quite accurately. A practical exercise can be conducted by the masterfisherman when the vessel is passing a buoy or a seamark. He should identify the current and estimate how many knots it is running. He should explain how he

does this. Again, when the vessel is at anchorage trainees should be taught to estimate current speeds, *etc,* from observation of nearby buoys and other objects.

The importance of gaining full knowledge of *tidal streams* in the waters in which the vessel is sailing or fishing should be stressed, because ignorance of such streams is potentially very dangerous and may lead to damage to, or even wreckage of, the vessel. As an example, it can be pointed out to trainees that the sea can become very rough when the wind blows against a tidal stream and that many accidents and damage have occurred to vessels in such conditions because the right stream had not been selected for sailing through the area.

6.3.2 *Tide Tables*

While the masterfisherman is on this subject, he should have the *tide tables* at his side and test the trainees to see if they know how to use them. Those who do not should be given special instruction in this subject to ensure that they fully understand the use of the tables.

6.3.3 *Vessel's Speed*

Every practical opportunity should be taken to teach the trainees how to find and calculate the *speed of the vessel.* For example, such opportunities occur when the vessel is running from one buoy or seamark to another. These are clearly marked on the chart and the distances can easily be measured, a situation which makes the exercise easier for the trainees.

6.4 The Sextant

All trainees must be taught how to use and handle the *sextant.* Fortunately, conditions are excellent for its use in tropic waters in which most developing countries are to be found. Cheap sextants, such as a plastic type, can be purchased for this purpose. The masterfisherman should first make sure the trainees know the names of the parts of a sextant and then should explain how to handle the instrument so as not to damage it, stressing that good care should always be taken in handling and in storing it. The trainees should be taught to keep it clean by removing all dirt, wiping mist off the mirrors with a soft cloth, and occasionally lubricating the instrument with

special oil. The sextant should never be lifted up by any other part but the framework or the handle and, when not in use, it should always be kept in its box. The proper handling of the instrument at all times by the instructor provides a good example for the trainees to follow.

The next step is to show how to find the error most frequently met with in practice, *ie,* the *index error*—holding the sextant vertically with the index bar pointer on 0° and aiming it at the horizon. The masterfisherman should demonstrate how to move the micrometer until the reflected picture is on a straight line with the horizon, which is seen through the clear half of the horizon glass, explaining to the trainees that if the reading on the micrometer is to the right of the zero point, the index error is + (plus), if to the left - (minus). All trainees should practise making the required correction until the masterfisherman is satisfied that they know how to find the index error.

The next lesson should be on measuring the *altitude of the sun.* First, the trainees need to be shown how to adjust the telescopes of their sextants and select shades according to the brightness of the sun. Then they should hold the sextant vertically in their right hand while they move the index bar and adjust the micrometer with their left hand. They should look at the horizon straight under the sun and move the index bar until the reflected picture of the sun is approximately on the horizon, then fasten the index bar by the arc clamp. Next, they adjust the micrometer until the lower limits of the sun touch the horizon. To make sure the altitude of the sun is straight down to the horizon, the trainees should be shown how to roll the sextant slightly to both sides so the reflected picture of the sun moves in an arc, just touching the horizon.

The masterfisherman should also show the trainees how to measure the *horizontal angle* between two objects ashore to obtain a position line. He could also teach the trainees to measure two horizontal angles from three objects ashore and then use a *station-pointer* to fix the ship's position. He should demonstrate how to look through the horizon glass on the object to the left and move the index bar until the reflected picture from the object to the right just touches the one to the left. The trainees should then be shown how a danger angle is used to keep a safe distance at sea when the vessel is sailing close to land and has to pass, for example, dangerous shoals.

The next exercise should be to find the vessel's latitude by the *meridian altitude of the sun.* All that is needed other than the sextant is a reasonably accurate wrist watch and the 'Nautical Almanac'. This is the easiest way to obtain a position line for deep sea navigation, especially as the calculations are very easy to make. Indeed, when the

trainees go back home to their poorly equipped but far-offshore fishing boats, they will most likely use this method regularly.

6.5 Rules of the Road at Sea

Knowledge of the *rules of the road* and how to apply them is essential for all skippers and mates; therefore the masterfisherman should ensure that the trainees are fully conversant with them. This can be achieved in a practical way by frequently questioning them on how they would react to various situations while they are at sea, thus testing their understanding of the rules of the road. Particular emphasis should be put on questions about navigation lights and shapes, sound signals, and steering and sailing rules. A useful means of instruction is to have on board some cards painted with the colours of the navigational lights, or, if there is a blackboard available, to use coloured chalks to indicate the various lights. These can provide a means for testing the trainees about how they would react according to the navigational rules.

Usually a number of buoys have to be passed when a vessel is leaving or entering a harbour. This is a good time to point out the meaning of the different buoys, whether they are starboard, port or mid-channel buoys and so on, and to stress that the *buoys' system is international.*

7 Electronic Equipment

Short informative lectures on the electronic instruments and equipment on board are required to describe their construction and explain the work they do. The masterfisherman can obtain the information he needs for his talks from the manuals dealing with the instruments and equipment.

As the wheelhouse is the centre where these electronics are installed, the trainees should be assembled there so that, following the lectures, demonstrations can be given. Having been shown how to tune in to obtain maximum performance, the trainees should take turns in starting up and using the equipment. Several such sessions of practice may be required to enable them to handle the instruments and equipment efficiently. When the masterfisherman is satisfied about their competence in this respect, he should arrange for them to take turns in operating the equipment when on wheelhouse duties. This should be done, of course, under his supervision or that of his counterpart.

The trainees should be given a copy of the masterfisherman's lectures and the manufacturer's leaflets on the electronic equipment, if these are available, to consolidate the knowledge gained from the instruction and demonstrations.

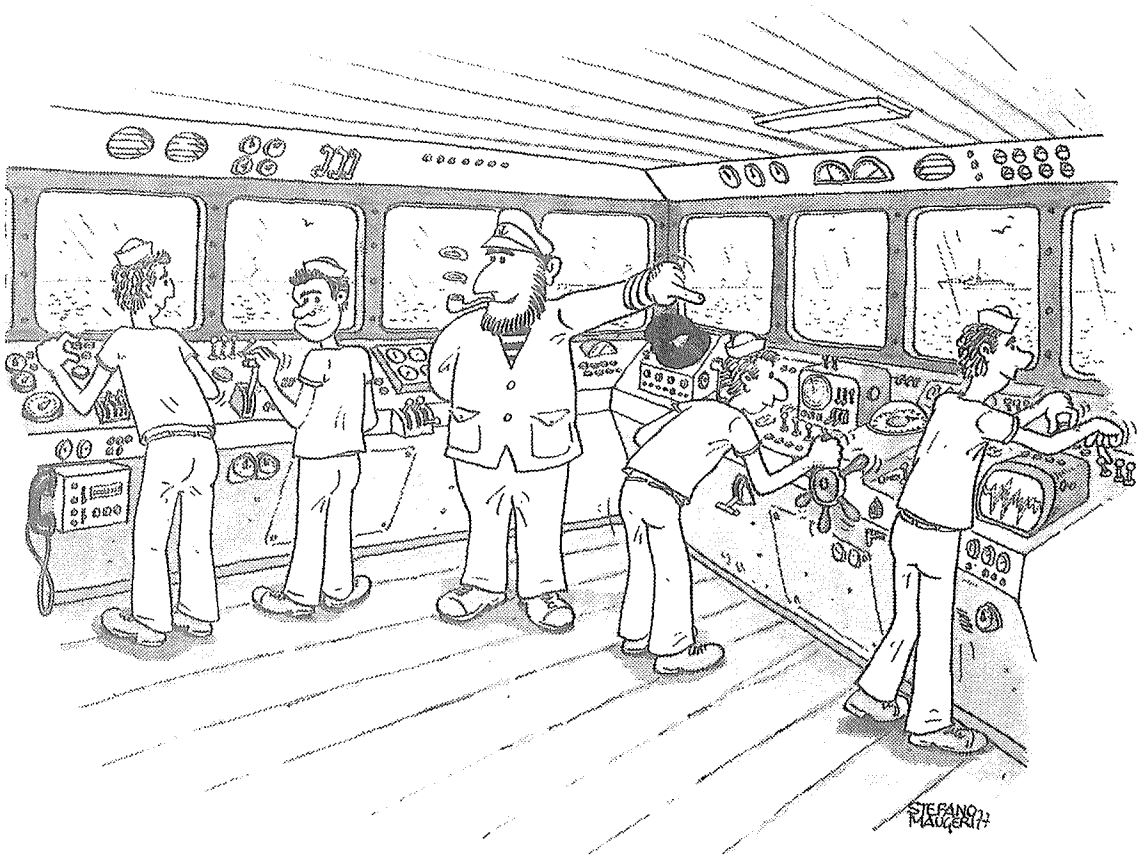
7.1 The Echo-Sounder

While the *echo-sounder* was originally designed to measure depth and should be used for this purpose, particularly if the vessel is sailing close to the coast or shoals in bad visibility, the use of the handline for sounding should not be forgotten. As previously stressed, in such circumstances frequent soundings should be made to ensure the safety of the vessel. The handline is most effective for this purpose in shallow waters and may well be the main instrument available to many of the trainees when they return home. They should also be reminded that a position line can be obtained by knowing the depth and, if another position line has been acquired, a fairly accurate fix can be worked out.

Regarding the use of the echo-sounder for fish finding, the interpretation of the echo-tracers has to be repeatedly taught and exercised. For example, there is a big difference between traces received from a hard bottom (rocks, coral) and a soft bottom (sand, mud). Different types of fish give varying echo-traces. Like all other electronic equipment, the echo-sounder has to be correctly tuned to maintain continuous sensitivity. Demonstrations while fishing of how the echo-sounder records fish traces, interferences and noise of all sorts, and of the use of the white line, provide the most practical way of showing how the instrument works.

7.2 The Sonar

Trainees should understand that the *sonar* is a variation of the echo-sounder. They should appreciate that while the echo-sounder indicates the bottom of the sea and fish under the vessel, the sonar can search a whole area, horizontally, in all directions. Further, it can be adjusted to any angle by tilting the transducer, or used vertically, for which



Make full use of training possibilities

purpose the transducer is moved into the same position as that of an echo-sounder. The trainees need to be told that the sonar has mostly been used for pelagic fishing (purse seining and mid-water trawling).

The best way to instruct the trainees in operation of the sonar is to use a sound reflector as a target. Plastic foam, which gives good echoes, and has high reflectivity, is a good material for this purpose. A weight should be tied to the reflector to sink it to a selected depth, a big float being tied to the top end. The vessel should be taken 600 to 700 m from the target, turned around and the sonar put on the searching scale with a trainee operating it and another trainee at the helm. The sonar trainee should give the helm orders when the instrument picks up the target and the helmsman should try to manoeuvre the vessel slowly toward the target. When the target is within the approximate distance, the trainee should switch over to the 250 m scale, which is normally used when shooting the purse seine, and the vessel should keep on towards the target until it is about 50 m away. The trainee should then try to go around the target, keeping at 50 m distance all the time. Through this exercise the trainees get to know the inter-relation between the vessel's course and movement and the distance and direction of the target read from the sonar scale. It also provides a better insight into the operational procedures, especially if purse seining is one of the methods used. Although the trainees may not have the opportunity to use the sonar after they return home, the exercise is good for their morale. They will become very enthusiastic about working with the sonar and more involved in the activities on board, leading to more practice in the manoeuvring and handling of the vessel.

7.3 The Radio Telephone

The *radio telephone* is of great practical value on board any vessel and its importance and operation should be thoroughly explained. Trainees should be taught how to make a call from one boat to another or from boat to shore-stations. They should be given practice in the standard phonetic spelling alphabet which is used when receiving conditions are poor, or for spelling out difficult words. They should also be taught how to speak concisely, to make emergency calls and the correct use of the words 'Mayday', 'Pan', 'Saicooriteh.'

Usually the vessel's training institute has a radio telephone and regular contact is made with the vessel, which reports its position and activities. This arrangement provides a good opportunity for the trainees to practise the use of the telephone. After the masterfisherman

has made his reports, he should arrange for the trainees on board to make telephone calls to trainees in the institute, supervised by an instructor ashore.

7.4 Radar

The *radar* is a very important navigational aid, especially when sailing in coastal waters and always when visibility is limited. After the trainees have been taught about radar and instructed how to operate it, they must spend enough time to become proficient in comparing the shore line shown on the screen with that on the chart. Once they know how to do this, it will be relatively easy for them to learn how to take bearings and distances with the radar and fix the vessel's position on the chart. Most trainees show more interest in working with radar than with other methods. As the basics, fortunately, are much the same as for fixing the vessel's position by other means, they should be encouraged to operate the radar and practise with it, under the supervision, of course, of the masterfisherman or his counterpart. A good exercise at night for them is to find and approach a target using only the radar screen as a guide. This can be arranged by tying a radar reflector to a big bamboo pole-buoy. The masterfisherman should run the vessel away for a few hundred metres and then have the trainee detect the target by radar and manoeuvre the vessel toward it, stopping at a given point.

Interpreting the various echoes, shown as reflected figures on the screen, can only be learnt by practising on the radar at sea. Such practice is, for example, essential in deciding whether the shore is where the radar shows it to be, and not closer, especially when the coast is low and flat. Again, some objects give better echoes than others. For example, as iron gives a much better echo than wood, steel or iron ships can be detected by radar at greater distances than wooden ships of the same size. The trainees must become familiar with such differences, and be warned that even a good radar may overlook a small boat, canoe or rubber dinghy. They must also appreciate that distance from an object, as well as its size and the material from which it is made, affect echoes, as, for example, buoys. These, because of their shape and size, give poor echoes, but because they are very important as navigation guides, material which give good echoes, is fixed on top of them.

7.5 Radio Direction Finder

The most common type of *direction finder* used on fishing vessels nowadays is the CRT. It is easier and simpler to operate and a position line can be acquired from it quicker than from the older types. As with the radar, the trainees will show considerable interest in the direction finder. The Bellini-Tosi antenna, which will need to be explained in detail to the trainees, is used with the light direction finder and is usually fitted on top of the wheelhouse or on top of the aft mast. It consists of two permanent antenna arms or rings forming an angle of 90°, one across the length and the other the breadth of the vessel. The trainees will have to be shown how to tune the direction finder to a radio station, indicated by an arrow on the screen against a fixed ring divided into 360°. The angle the light arrow makes with the course of the vessel can then be read. The trainees must be made to understand that the man taking the bearing has to be in continuous contact with the man steering the vessel. Furthermore, the vessel's compass course should be taken at the same moment as the bearing. There is also a loose ring shown on the direction finder which is usually moved until its degree corresponds with the compass course. The trainees should be instructed that the radio stations concerned send out signals at certain hours, or continuously, for vessels and others to take bearings. These stations are marked on all sea charts and information can be found in all piloting books regarding their positions, transmitting hours, frequencies and types of signals.

As the signals from these stations are usually very strong, so that a good bearing and position line can be obtained, trainees should learn their value. Another common use of the direction finder is to take a bearing on another vessel. This is often done if a skipper believes that another vessel is making good catches. He calls it by radio telephone and on receiving an answer he tunes his direction finder to the other vessel's frequency and immediately takes a bearing.

8 Fishing Gear and Methods

The seven most common fishing methods will be dealt with in this chapter, with a broad description of how they should be taught to the trainees.

It is not suggested that all seven methods have to be taught. Indeed, masterfishermen are advised that no more than three, at the most, preferably only two, should be introduced in a sea-going training period.

Furthermore, the success of such training depends not only on the masterfisherman concerned but also on the full participation of his regular crew in the training process. They must be instructors during fishing operations and in handling the gear, and use every opportunity to pass on their skill to the trainees. They should be encouraged to feel a responsibility for the trainees, be concerned for their welfare and safety, especially in avoiding accidents which can easily happen when shooting and hauling the gear.

A good way to test the effectiveness of the training is to hold a question and answer session after each voyage. This should reveal the extent to which the trainees have absorbed the instruction and how thoroughly they understand the gear used and the fishing methods employed.

8.1 The Trawl

The difference between the bottom trawl and the mid-water trawl, how they work and how the trawl (otter) boards keep the trawl spread out and, at the same time, sweep the fish towards the mouth of the trawl should first be explained. A practical approach before operations start is for the masterfisherman to take the trainees to the main deck where the trawl is stored and show them its various parts, the boards, the warps and the winch, and explain their function. He can point out how the two warps are connected to the trawl boards by means of intermediate pieces, and to explain the construction and the functions of the trawl boards, the brackets, the backstrops, *etc.* The

influence of the backstrops on the performance of the trawl boards should be mentioned and, if it is a bottom trawl, how the nature of the wear on the shoe plate of the board provides the main criterion as to whether the boards work in good contact with the sea bottom. He should tell them how the spread of the trawl is achieved when the advancing trawl boards meet the water at a certain angle, and indicate the size of the vertical and horizontal openings of the trawl concerned. How the warps are connected to the sweeplines or the bridles by means of the independent wire and, if sweeplines are used, how a danleno usually connects the sweeplines and the trawl's wing end, but if bridles are used, how these will be connected straight to the wing ends, needs to be explained. He can further expand on these aspects when the trawl is shot for the first time. For instance, when the sweeplines are paid out, *ie,* the stopper is in the Kelly's eye, the attention of the trainees should be drawn to the way the backstrops carry the load of the trawl net and the independent wire connects the sweeplines and the warps, and how the trawl boards are connected to the warps with the G-Links. As far as the trawl itself is concerned, the trainees should have a general knowledge of it, learned from shore classes, so only the main points need to be mentioned. However, the masterfisherman should give details about the rigging of the trawl, the length of the headline and the foot rope he is using, how the fishing line is fitted along the foot rope and how the lazy line leads to the splitting strop on the cod end and, as is most likely the case, to a splitting strop higher up on the trawl's belly.

The trainees should be taken to the trawl winch and be given a demonstration of how it is operated, and told about its most important components and their uses. At the same time, they can be shown the trawl wires or warps and told how the diameter of the warps is chosen in relation to the towing power and the gear resistance of the trawler and how the warps are maintained in good working order. The marking of the warps and the importance of having the same length between markers, and how the distance between them should be measured, need to be explained in detail. The trainees should be told that the warps stretch in action and if they do not remain of equal length the trawl will not operate efficiently and the catch rate will drop drastically. The lengths of the warps, therefore, need to be checked from time to time along with the distance between the warp markers, especially after fasteners.

About one third of the trainees should be in the wheelhouse during shooting and hauling of the trawl, with the other two thirds on deck operating the winch and handling the trawl. Deck operations should be briefly explained to new trainees before the trawl is shot for the first time, with strong emphasis on avoiding accidents.

The trainees should watch how the masterfisherman works in the wheelhouse, with him commenting to the extent possible on his actions, as, for instance, when shooting and hauling the trawl. After some experience in fishing, and when the masterfisherman feels they are competent to do so under his close supervision, the trainees should take turns in handling the vessel. Every trainee, of course, should have to do each wheelhouse job—act as skipper, operate the engine controls and give all the orders needed, *ie*, when to start paying out the trawl, sweeplines, trawl boards, and the length the warps should be paid out in relation to the depth of water fished in. Meanwhile, the deckhands should ensure that the trainees under their supervision react correctly to orders.

When a shooting operation has been completed, the masterfisherman should take all the trainees to the stern, where the warps lead into the sea, and show them how, by feeling the warps, they can tell whether the boards operate properly on the bottom. They should also measure the distance between the gallows (if it is a stern trawler) and between the warps one metre further aft then calculate what the apparent spread should be between the trawl boards. As the length of the sweeplines, and of the trawl to the end of the cod end, are known, the trainees can also culculate what the horizontal opening of the trawl's mouth should be. They should be told that if the opening, depending on the trawl's design, is between 35% and 60% of the length of the headline, the vertical spread of the trawl's mouth will be as required.

During trawling, the wheelhouse trainees, unless on other duties, should watch the echo-sounder for fish, being shown how to determine fish traces by use of the so-called white line. They should also keep a check on the depth of the water which, if changing, might require the warp to be paid out more or hauled in, and watch for big obstacles, such as rocks or wrecks. While underwater obstacles can sometimes be avoided by changing the towing course, they should be made aware of the risk involved so that if the obstacle looks bad the vessel should be stopped and the trawl retrieved. A trawl that becomes fast provides an opportunity for a practical lesson on how to release it, and to explain that there are two ways in which the net becomes fast—by trawl boards digging into a muddy ground or the trawl net or boards becoming caught on an underwater obstacle.

When hauling starts, full advantage should be taken of the training opportunities as indicated for previous operations. For example, as the trawl boards approach the gallows, trainees should secure them in the dog chains and unshackle them from the warps. The hauling in of the sweeplines provides an opportunity to demonstrate how the fish are

gathered in the cod end by running the vessel ahead before it is brought to a stop.

Again when the cod end has been heaved on board, by means of the hauling leg attached to the splitting strop, the trainees can be shown how the catch is discharged. When the trawl has been shot again the trainees, except those on wheelhouse duty, should clean, dress and ice the catch—a good practical lesson.

A point to be stressed is that the masterfisherman should take every opportunity to make all trainees do each job in all operations—not once or twice, but many times—so that they learn from experience, limited and supervised as it may be.

8.2 Purse Seining

The masterfisherman should make a drawing of the purse seine used, preferably with the trainees watching him, and explain in detail its construction and elements and how it works in shooting and hauling. Trainees should then be shown the net, with each part being handled and named and an explanation given as to how it is prepared and rigged before shooting, such as indicating how the bridles connect the net to the rings on the bar. The trainees should be shown how to lead the purse line from the winch to the rings and fasten it to the big buoy or to the skiff.

All procedures should be explained in detail—attaching the bunt and the end of the purse line to the buoy or skiff, arranging the bunt end to be easily and immediately pulled out by the buoy or the skiff, and, where applicable, setting out and fastening the ring bar at an angle of about 20° to the bulwark.

As in other operations, the trainees should be divided into groups: one each at the wheelhouse, the stern, the winch and the bow or the whaleback. Each time the purse seine is set, these trainee groups should change places so that all of them share and benefit from the same practical exercise.

Safety must always have high priority on board and trainees must be warned to keep clear of the net and all its parts and attachments throughout the operation, and particularly during shooting.

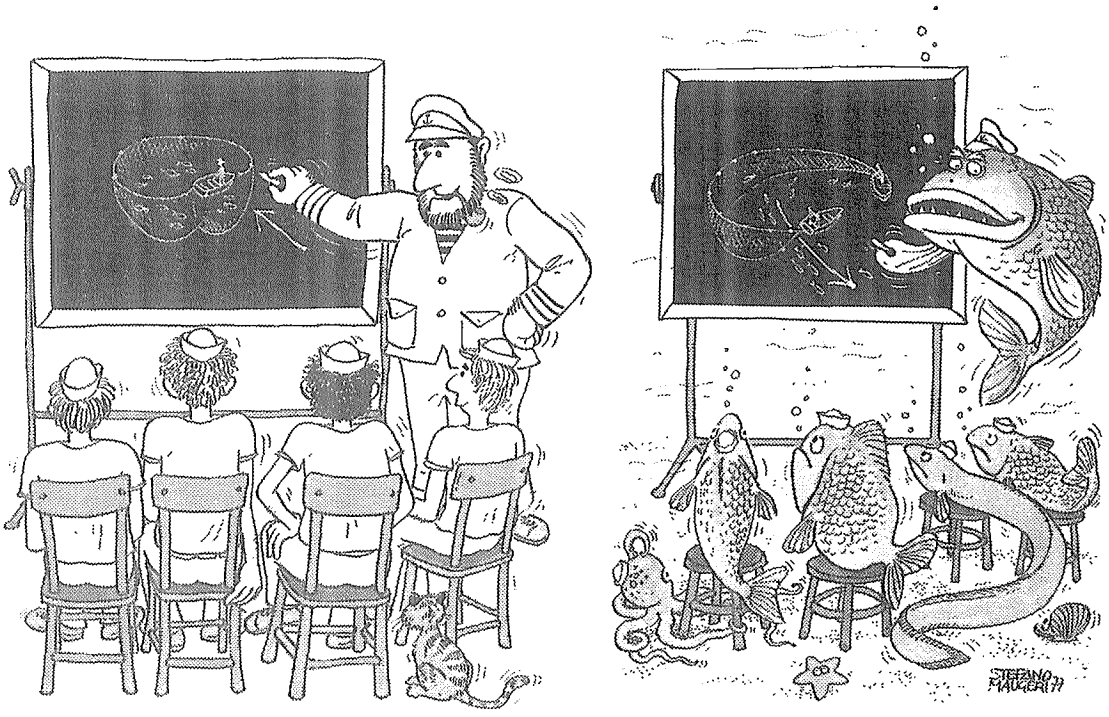
In explaining his activities and his manoeuvring of the vessel for setting the net, the masterfisherman should point out that the vessel should head into the wind, if there is any, or have it on her working side. The trainees should be warned that shooting the net with a following wind, or one blowing on the wrong side, could end up in fouled gear or worse, especially if the vessel drifts over the net.

While hauling the purse seine, the vessel, turned by the pull of the powerblock, *etc,* is likely to end up broadside to the wind. This needs explaining, also the fact that the wind can help keep the vessel clear of the purse seine.

The winchman, while shooting, can explain to trainees that the drum must not be allowed to turn faster than the purse line runs out, to avoid fouling the line.

The trainees at the stern, after releasing the net, should handle the wing-end line *ie,* the extra length of rope attached to the choke or the wing-end of the purse seine. At the pursing of the seine, they should haul in the rope and bring the choke into the powerblock. When the vessel has completed the circle, the group at the bow or the whaleback should pick up the buoy or take the end of the purse line from the skiff, shackle it to an end leading to the winch and secure the rope attached to the corkline of the bunt. When pursing starts, the winch group should come into operation.

When pursing is completed and all is in order, the regular crew should instruct the trainees in the hauling procedure. Except for those wanted elsewhere, the trainees should stack the net as it comes from the powerblock.



Who will 'outsmart' whom?

As another exercise in safety, everybody on board should wear a safety helmet. In particular, those on deck should be warned by the masterfisherman against standing below the powerblock or the transfer block.

When the fish are caught, the masterfisherman should supervise the trainees in tying up the buntline and the sinkerline of the bunt to the bunt boom and the railing of the vessel.

When brailing begins, the trainees should be posted along the rail to pull at the net in the bunt to get the fish concentrated or 'dried up' to promote fast brailing. When brailing is completed and bunt released from the bunt boom and the railing, the trainees should rig up the purse seine for the next shooting.

During the search for fish, trainees should look for birds and other signs of fish being about, as well as use the sonar. While the search is going on the masterfisherman should have the time to give further guidance to the trainees on how to interpret traces and sounds from the sonar and to explain in detail how the vessel is manoeuvred into a shooting position when fish are detected.

8.3 Bottom Gillnetting

When trainees are to be taught bottom gillnetting, the first thing the masterfisherman should do is to have a gillnet repaired—such as renewing a length—so as to be able to show how gillnets are rigged and stacked ready for use. This approach makes it easy to show how new gillnets are weighted with stones, or by other means, at measured intervals on the sinkerline, and the float line fitted with floats, often made of small plastic foam rings, which are easy to clear from the nets and how the nets are joined together to make up a fleet of 10 to 15 units which are flaked so that they will easily run overboard when set. The fitting of a heavy weight to each end of the net lengths should be demonstrated, such as stock anchors, which are frequently used where currents are strong, and how the buoy line with a buoy made say, from a big plastic float, is attached to the weight.

When the demonstration and all preparations for setting the gillnets are completed, the masterfisherman should describe the nature of the operations to come and then assign the trainees to their duty stations as in other fishing operations—in the wheelhouse and on the deck.

Those in the wheelhouse should observe how the masterfisherman manoeuvres the vessel while the nets are being set and listen to his comments. They should learn, for example, that the setting speed must

not exceed about 2 to 3 knots; a speed with which the man who throws the sinkers can cope, and that the wind, if possible, should be on the side from which the nets are set to minimize the danger of fouling the propeller.

They should learn that the vessel is slowly run upwind or against the current to pick up the slack on the nets during hauling operations. With this instruction, the trainees should soon be able to manoeuvre the vessel on their own, under the supervision, of course, of the masterfisherman. The wheelhouse trainees should also watch the echo-sounder for fish traces.

Those on deck setting the gillnets should be supervised by the regular crew, while a few of them (supervised by the bosun) should take turns in throwing the sinkers overboard. The bosun should demonstrate how the sinkers are vigorously thrown as far as possible from the side of the vessel to avoid fouling or damaging the nets. The duties of the deck trainees should include responsibility for the stock anchors and weights, and the buoy line and the buoy. Two trainees, with a regular crew member, should watch over the float line to prevent the floats becoming entangled, ready with a sharp knife to cut off any float that threatens to entangle the nets.

When setting of the nets is completed, the masterfisherman should assemble all trainees at the rail roller for the gillnets and give a detailed account of how the vessel is rigged to ensure the smooth and efficient hauling of the gillnets. In doing this he can point out the positions to be taken up by the trainees for hauling and tell them exactly what they are to do.

The training vessel should be fitted with a net hauler. For hauling, the bosun should be in control of the net hauler and supervise the deck work. He should have a trainee at the net hauler to haul the float and sinker lines off the sheave. Another trainee should be posted at the rail or rail roller, if any, equipped with a gaff to help big fish inboard and reduce damage to the nets. Four trainees should be employed at the net handling table, with one or two of the regular crew supervising them. There should be two trainees on each side of the table, the two nearest the net hauler to remove fish from the nets and the other two to disentangle the floats and float line and stones and the sinkerline from the net itself. The other trainees should stack the nets, flaking them down ready to be shot again.

As in all fishing operations, trainees should change positions for the next shooting of the net, so that by rotation all of them eventually gain experience at all the jobs involved in such fishing operations.

8.4 Driftnets

There are several ways of rigging up driftnets, but even if the rigging is different to that described in the following pages the work position of the trainees will be the same.

As an introduction, the masterfisherman should describe the method of fishing and construction and rigging of the nets. Then the trainees should be taken to the stern of the vessel where the nets are stacked and shown how to make up a long fleet of them attached to each other by lead and cork lines. The trainees should be told that the weights on the lead line must be heavy enough to sink the small floats on the corkline but keep the nets vertical in the sea. Next, the trainees need to see the driftnet warp, usually stored forward in a compartment close to the winch. Then they should be shown how the warp is marked according to the length of each net and that when the nets are set, each joint between them is tied by corkline ends to the markers. When the fleet is set, additional length of warp, the 'tissot', is paid out to allow the nets to sink to the desired depth before the warp is made fast. Next, the trainees should examine the big buoys, usually 60 in. polyester floats, and be shown how buoy lines are attached to them, after being marked every two or three metres. It should be explained that during the setting of the driftnets the buoylines are tied to the warp at the markers and that the length of the buoylines used depends on how deep the skipper wants the driftnets to sink. This depth is decided by the echo-sounder records of fish traces.

In explaining the setting of the nets, the masterfisherman should stress the importance of determining the main direction of the current on the fishing ground, and of setting the nets across the current, if the wind direction allows, because fish usually swim against the current. Driftnets should never be set against the wind. However, if there is a strong wind, the nets may sometimes be paid out from the vessel as it drifts away. The vessel is run slowly ahead in calm weather while the driftnets are paid out.

The trainees must be assigned to their work before the operation starts and instructed in the duties they are to perform during the setting. The regular crew should supervise them. The wheelhouse duty watch should steer the vessel as the driftnets are run out and watch the echo-sounder closely for fish traces. They must keep reporting all the time the changing depth of fish traces.

While setting, one group of trainees should pull the warp to the stern where it is joined to the nets. At the same time, another group should tie the buoylines to the buoys at the markers on the warp. As already

stated, the length of the buoylines is determined by the required depth of fishing. The fourth group at the stern should see that the cork and leadlines do not become tangled and that the nets go overboard wide open.

When all the driftnets have been set, the warp should be paid out, under the supervision of the bosun, to the extent required before being made fast to a bollard on the bow of the vessel. The vessel will then drift with her bow to the wind or the current until early next morning.

Before hauling begins, all the trainees should be employed on deck work, as nobody is needed in the wheelhouse for this operation. As the warp is hauled by the winch the vessel automatically moves along the fleet of driftnets, therefore it needs no manoeuvring.

Two trainees should handle the warp, one hauling it from the capstan and the other coiling it in its compartment. A third, posted at the vessel's bow, should untie the lines attached to the floats and release the driftnets from the cable, while a fourth trainee should take the floatline and haul in the floats which are then stored in their compartment.

One trainee should work at the net-hauler with the bosun. The net-hauler may be at amidships or slightly more forward at the bulwark. Nowadays it may be of a powerblock type. The trainee should pull the nets out of the net-hauler, the bosun being at its controls.

Two trainees, with a crew member, should work at the stern, stacking the driftnets so that they will run out without tangling when set again. All the other trainees, with some of the crew, posted between the net-hauler and the stern, should remove the fish from the nets. When cleared, the nets should be stacked at the stern.

8.5 Pots

In the usual way, the masterfisherman should meet the trainees when they arrive on board for a fishing operation and prepare them for what is to come. In this case he should start by explaining how the pots are constructed and what material is used for this purpose, and how they are balanced with weights attached to them. The trainees will need to be told that there are two main categories of pots for deep-sea fishing, *eg,* one for trapping fish and the other for catching lobsters or crabs. While the fish pots are usually set independently, with a float and a floatline attached to each, lobster and crab pots are often set in a string, the pots being about 10 metres apart. When fishing where the current is constant in direction, the fish pots must be set so that the entrance faces

down current, but where the current changes direction, as in tidal streams, the pots should have two entrances.

After explaining the setting procedures, the masterfisherman should assign the trainees to their jobs—one group to bait the pots and prepare the floats and the floatlines, another to place the pots ready for setting, and the third group to work with the masterfisherman in the wheelhouse and see how he manoeuvres the vessel during the setting operation. The trainees should quickly become competent in such manoeuvring of the vessel. The work of each group must, of course, be explained and supervised. Thus, the group preparing the pots and floats must understand that it is essential to ensure that there will be no entanglements when the pots are thrown overboard, and the pot-throwing group must know that the entrance to a pot should face downstream.

If the vessel is fishing with lobster pots set in strings, all the trainees should work on deck because the easiest method of setting the strings is to let the vessel drift down wind or current and there is nothing much to do in the wheelhouse. If there is no drift, the strings must be set from the stern as the vessel runs slowly ahead. In their deck work, about a third of the trainees should be taught to make sure that floatlines, floats and the heavy weights on the string, are ready, then hook the pots on the string as it is paid out. The remainder should, meanwhile, have been baiting the pots.

The bait used for the fish pots depends, of course, on the species of fish to be caught. Mackerel, herring or squid, for example, are good bait for fish pots, but for lobsters or crabs the bait may be cowhide and fish.

Obviously, since the catch in pots can stay alive longer than in, for example, gillnets, there is not the same urgency for recovery in this type of fishing. This is one reason why pots are sometimes left fishing for as long as the bait is expected to last.

When hauling in, the trainees in the wheelhouse can see how the masterfisherman manoeuvres the vessel, keeping it in such a position that the floatlines or fish pots remain vertical, while for lobster pots the vessel is manoeuvred along the string so that the slack can be taken on board. In hauling, the bosun operates the pot hauler while one trainee hauls the floatline or string and another trainee coils it. Other trainees should lift the pots on board, empty the catch and stack the pots. The rest of the deck trainees should sort the catch and clean and store it in the fishhold.

As in all other fishing operations, the groups of trainees should be rotated so that all gain experience of the various jobs to be done and each one takes a turn to be skipper, manoeuvring the vessel and

directing operations under the guidance of the masterfisherman.

8.6 Longline

The six elements of the longline are the hook, the snood and the main line, the buoy, the anchor and the buoy-line. As it is such a simple fishing gear, the masterfisherman will not take long to introduce it.

However, he and the crew will be fully occupied in teaching the trainees how to bait the hooks correctly and coil the line in the basket so that it will run smoothly overboard when being set. Until trainees master the art of baiting the hooks and coiling the rope correctly, a tangled mess may occur in setting. They must be given as much practice as possible in this work and all the trainees should be assigned to baiting procedures at the same time. Each one should, as a start, have to bait one basket of line (about 400 hooks). As they acquire more proficiency, the number of baskets can be increased.

When the longline is ready to be set, the masterfisherman should assign the trainees to different jobs. One of the trainees on wheelhouse duty should be made skipper and be in charge of the vessel, under the close supervision of the masterfisherman. One should be helmsman, another should watch the echo-sounder for fish traces, whilst others should keep lookout. Shooting the longline provides a good introduction to the responsibility of being skipper because for the masterfisherman, as little manoeuvring of the vessel is required, there is ample opportunity to enlarge on the duties of a skipper.

One group of deck trainees should be employed in bringing the longline baskets to the chute and handling the flag buoys, the buoy lines and sinkers. Another group, supervised by the bosun, should be at the stern, linking the longline baskets, and tying the buoy lines and the sinkers to the main line for throwing overboard with the flag buoys. They should take empty baskets from the chute, replacing them with full ones.

The vessel should be run at slow speed ahead during the first setting. A regular crew member must be posted at the longline chute, ready to cut the snoods attached to the hooks to prevent entanglement. Later, when the trainees become more efficient in baiting, and the length of the line has been increased, along with the speed of the vessel, the man at the chute will not be needed because he may cut the mainline instead of the snood in trying to avoid entanglement when setting is done at higher speed. Each trainee should always bait the same part of the longline so that if the line from his basket becomes entangled he will have to disentangle it, which should teach him to be more careful in

baiting next time. The masterfisherman and his crew should instruct trainees on care and safety at all times in handling the longline and in all aspects of the operation.

The masterfisherman should point out that, in hauling, the vessel should be manoeuvred in such a way that the longline goes straight down or a little aft from the rail-roller or a rail-mounted line hauler, at an angle of about 10°, and that the line is hauled in as slack as possible to reduce loss of fish from the hooks and to avoid breaking the mainline.

During hauling, one group of the deck trainees should haul in the mainline from the line hauler and coil it in a basket, gaff the fish at the rail-roller (if there is one), store the longline baskets and haul in the buoy lines and take in the flag buoys.

The other group should handle the catch, *ie*, gutting if necessary, and cleaning and storing it in the hold. Thus, when hauling is completed, no work should be left over and the trainees can immediately start baiting again.

8.7 **Handline with Reel**

In teaching how to fish handlines and reels, the masterfisherman should first demonstrate how the mainline is rigged on the reel and how the hooks and the sinker are attached.

For this purpose he should have a handline, generally made of monofilament nylon and show how hooks are threaded through an artificial rubber worm bait and have a swivel attached to the hook rings. A loop, of the same size as the hook, is made on the mainline and threaded through the swivel. The hook is then taken through the loop and secured on the mainline. Six hooks are usually attached in this way at intervals of about 1 metre, starting from about ½ metre above the sinker. A big swivel should be fixed on the mainline between every two hooks.

The hooks used are, of course, selected for the species and size of fish to be caught, and bait has to be used because, as often happens, especially in tropical waters, the fish do not bite on jigs or lures.

Artificial bait is generally used on bigger hooks (up to some 10 cm in length), while those baited are usually smaller (such as, *eg*, Mustad No. 4-7). The masterfisherman should show how hooks are tied on a snood of about 35 cm in length which, in turn, is attached to the mainline. He should then demonstrate how to bait the hooks, commenting on the different types of bait used in handline fishing.

A short lecture on the reel is required. Most reels, of course, are still worked by hand but an increasing number are power operated.

As in other methods of fishing, the first requirement is to find the fish concentrations. To do this the vessel tacks in the selected area, using the echo-sounder. Promising fish traces should be tested by fishing, and if results are satisfactory the position should be marked by buoys, which are also useful in estimating the movement and strength of currents. Sometimes the vessel has to be manoeuvred in wind and current to maintain its position, but fish are often so sensitive that a good catch can only be obtained by stopping the engines. Even the reels may have to be hand-operated or driven only by a small battery-powered motor.

In describing these conditions and methods of handling, the masterfisherman should tell the trainees that it is not always possible to anchor over a good fishing ground. A vessel frequently has to drift. In such cases it is sometimes of great advantage to use a sea-anchor to lessen the drift. This makes it possible to keep the handlines closer to the vessel's side, which reduces fouling and makes it easier to feel the fish biting. Where the current is strong or a trade wind is blowing, causing the vessel to drift very fast, the monofilament nylon line could be replaced by a stainless steel line. This will enable the fishermen to keep their handlines closer to the vessel.

Trainees, of course, should participate in the fishing, under supervision, and should be given responsibility for maintenance and upkeep of the equipment.

9 Fish Handling on Board

Handling of the catch ought to begin as soon as it comes on board, and the masterfisherman should prepare trainees in advance for taking their part in the handling operation. He can do this by assembling the trainees on deck to show them the handling equipment, *eg,* hooks, baskets, knives, *etc,* explain how to sort, gut and wash the catch, and demonstrate the use of the equipment. He should then open the hatch of the fishhold and show how to store the catch. These instructions should be practical and brief, because in their earlier training they will have been lectured on the handling operation and should have a general understanding of the equipment and procedures.

When the catch comes on deck the regular crew must act as instructors and guides and try to pass on their skill to the trainees. They should also try to keep the trainees out of trouble in using knives and other equipment and watch out for poisonous fish in the catch.

From the start, the trainees should work with the crew in cleaning the deck, baskets, fishhold, *etc,* a job which will be a practical reminder of having been told that all these must be kept clean to avoid contamination of the fish.

When the first haul is on deck and the second trawl has been shot, the crew and the trainees should undertake sorting, gutting and washing the catch. In his talk, the masterfisherman will have informed the trainees that the sorting, when necessary, must be done quickly to avoid damage by abrasion, particularly if the catch includes spiny and rough skinned species, and that the fish must not be stood or stepped on, or piled high on deck. If the catch has to be left on deck for a while, then it should be iced and protected by an awning against the sun. (Incidentally, trainees should be taught how to stun each fish hauled on deck when line fishing.)

A cardinal rule about gutting is that bad gutting is worse than no gutting, an axiom that should be impressed on trainees by the masterfisherman in his lecture and re-emphasized by crew members in the gutting operation. Demonstration and strict supervision by the crew are required to ensure that the trainees gut the fish correctly. They

should also be involved in the examination of stomach contents to find out what the fish had eaten.

The importance of washing the gutted fish in cold clean sea water before they are placed in the fishhold should again be stressed while the trainees are engaged in this operation.

In some parts of the world the catch may consist of small fish or, if such is the consumers' preference, fish are not gutted but boxed whole and appropriately iced. In tropical seas, whole, well-iced fish can be kept in a refrigerated hold for many days (over two weeks) and still reach the market in a satisfactory condition. The crucial factor is to get the fish down the hatch as fast as possible (*ie,* after sorting, washing, boxing and icing).

In storing the fish in the hold, the crew should demonstrate to the trainees to impress on them what they had previously been told—that a good layer of ice should be placed at the bottom of the hold to cool it—before lowering the baskets and boxes containing the catch. There should be strong emphasis on the plentiful use of ice, *ie,* as already mentioned, a good layer below the fish, more ice amongst the fish and another layer on top. The trainees should know from the masterfisherman's lecture that fish must be stowed in equal shallow layers and those, which quickly form ammonia, and those which discolour other fish, being stowed separately. Only one hatch at a time should be opened to stow the fish and no hatch should be left open longer than necessary.

When storing is completed—and if there is time between hauls—the masterfisherman should discuss with the trainees the fish caught and any special aspect of the catch.

On the voyage back to port the masterfisherman should demonstrate how to pump out stale water from the fishholds and put in fresh ice and explain why this should be done twice a day—in the morning and in the evening. The trainees should join the crew in doing this work.

10 Safety Measures

General

As the fisherman's calling is, by its nature, hazardous, and as the safety of men and vessels at sea is of such critical importance, the masterfisherman should, from the start, impress on all trainees the need to be vigilant at all times in their observance of safety measures. In his introductory lecture on the subject, the masterfisherman should detail the most frequent dangers and accidents to fishermen and their vessels and describe how these may be avoided.

A pre-requisite to safety on board is the practice of sound seamanship by all, including the trainees. This discipline must be enforced by the masterfisherman at all times.

A first requirement is to ensure that the trainees understand how to use the life-saving equipment and fire appliances and know where they are located. Life-jackets should be given to all trainees and crew members and must be kept in their bunks. There should also be two boxes, one forward and one aft, containing extra life-jackets—at least sufficient for half the men on board.

Among any group of people there are some who are more accident-prone than others or are more clumsy in handling gear and equipment. The masterfisherman and his crew will quickly spot such persons among a new group of trainees and should be guided accordingly, as, for example, keeping them away from handling the winch and other dangerous running gear until they are sufficiently trained and competent to use it without danger to themselves and others.

A training vessel should be provided with more emergency equipment and safeguards than an average fishing vessel, because of the untrained people on board. There should be a switch in the wheelhouse, for example, to stop the main engine in an emergency, and another switch to de-clutch the winches. These switches should be within easy reach of the masterfisherman when he is manoeuvring the vessel. Another such switch for the winch should be within easy reach of the mate or bosun on the main deck where he observes and directs the winch and handling gear operations.

The crew and trainees should be made to wear goggles when chipping rust or paint or doing any job which could harm their eyes.

10.1 First Aid

The use of the contents of the first-aid kit on board should be fully explained to the trainees and first-aid training exercises should be undertaken, including artificial respiration (*ie,* mouth to mouth) and other rescue work. All the trainees should be able to swim. Any who cannot should be taught to do so before joining the vessel.

10.2 Distress Signals

Trainees should learn Rule 31 thoroughly—*distress signals*—and the international signals, *eg*:

Vertical motion of hands or lights. In general: Affirmative.

Horizontal motion of hands or lights. In general: Negative.

Insist on safety precautions, but don't scare your trainees

They should practise making these signals and be instructed that they must perform the drill exactly as laid down.

A muster list should be prepared but, instead of detailing special duties for each person, each watch as a group should be assigned to a particular station under the leadership of an able seaman. He should be made responsible for assigning duties to each member of his watch. This system is less confusing for trainees, more reassuring from a morale point of view, and more successful in practice.

10.3 Station Drill

Station drill, which includes abandon ship, man over board, fire, *etc*, must be carried out on every voyage.

Everybody on board should know drill signals—ringing the vessel's bell continuously in case of fire or other emergencies, or giving a number of blasts (previously decided upon) on the ship's whistle for abandon ship. On hearing any such signal each should get his life-jacket, tie it on, and rush to his duty station.

As an example, let us first take practising the drill for *abandon ship*. When the crew and trainees have to run to their life-rafts, as previously assigned, the masterfisherman, or his Chief Officer, should describe how to launch a raft and to safely board it, and how to survive when adrift. Use of the container pack and other equipment on the life-raft should be demonstrated. Placards illustrating the launching and boarding of a life-raft should be displayed in the crew's and trainees' quarters. Trainees should be present when the life-rafts are taken to the maintenance workshop to be tested and overhauled, as this will enable them to see for themselves how the rafts are kept in good working condition. If possible, practical exercises with a raft, preferably at sea or in harbour, or in a swimming pool should be held.

The carrying capacity of the life-rafts in a training vessel should be double that of the number of crew and trainees. If they have this capacity, there is no need to carry lifeboats. However, if possible, there should be a dinghy on board.

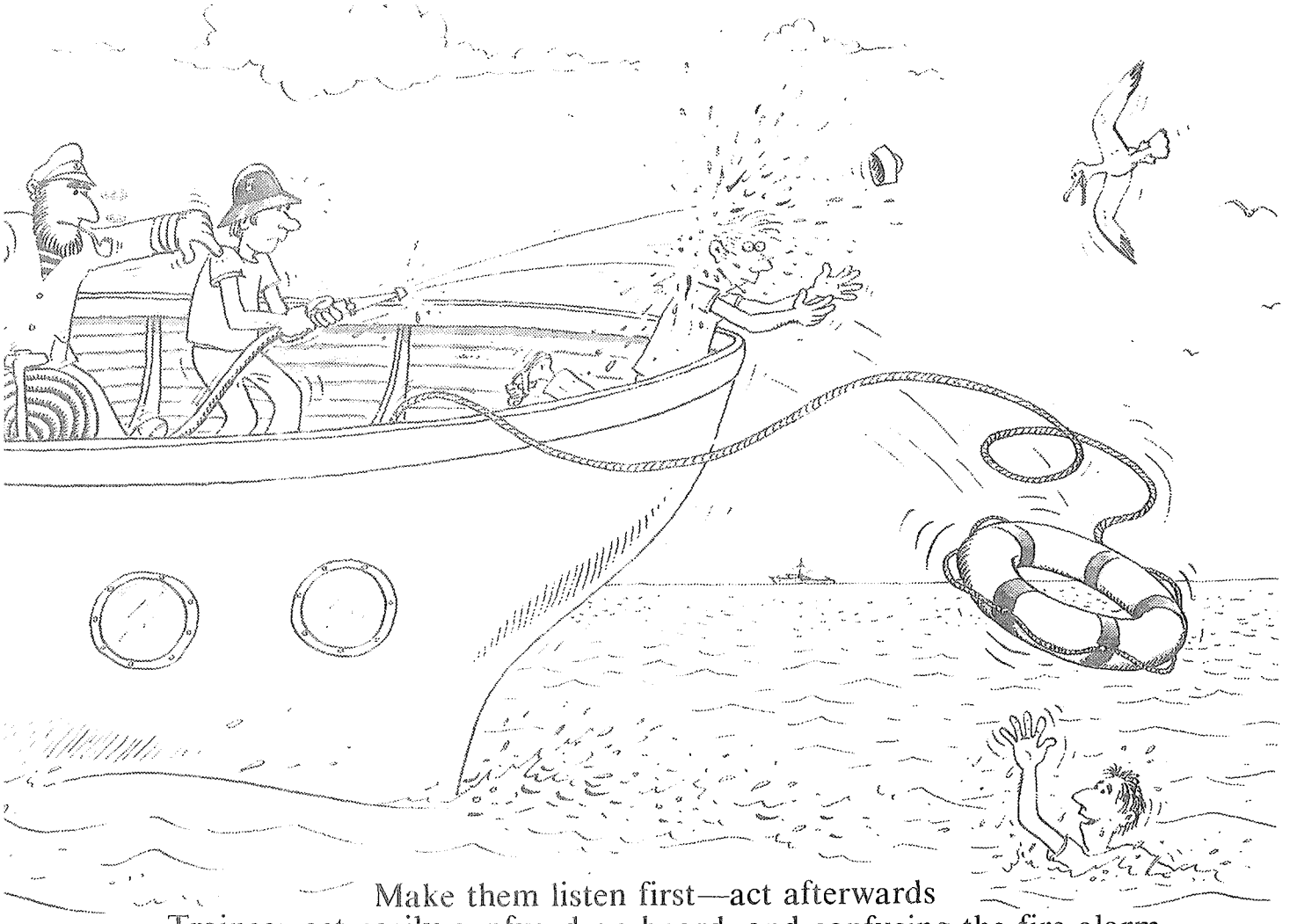
10.4 Fire-fighting Drill

The first requirement in teaching *fire-fighting drill* is to ensure that all on board know the location of all fire-fighting equipment and are instructed on how it works and how to use it. The way in which

different types of fires have to be fought should be explained so that, for example, they know that water is useless against fat fires. They should also know that the use of large quantities of water in fire-fighting can affect the vessel's stability, which may become an added danger.

All should be assigned a duty station and know that the moment the fire drill signal sounds they must rush to their assembly point to pick up their equipment and run to the location of the fire. Engineering staff, of course, always remain on duty in the engine room. If possible, the trainees should be taken to a fire station ashore where fire-fighting, in general, could be explained to them and where they could fight a simulated fire.

All fire-fighting equipment should be checked regularly to ensure it is in working order and extinguishers should be sent for maintenance once a year and to be refilled if necessary.



Make them listen first—act afterwards
Trainees get easily confused on board, and confusing the fire alarm with man-overboard drill may produce unfortunate results

10.5 Man Overboard

When *man overboard* is called the engine should be stopped immediately and the wheel put over toward the side from which the man fell. A life-buoy with a marker should be thrown as close to the man as possible and the crew member who saw him fall should keep his eyes fixed on the man, while those who threw the life-buoy should fix their eyes on it. If the masterfisherman is not on the bridge, he must be called immediately. The vessel should then put about at full speed until it is on the return course. The dinghy should be swung out, ready for launching, or an inflatable life-raft used. With the vessel on the windward, the raft can be launched towards the man.

For practising this drill, a float can be used as the man, with a weight tied to it so as to prevent it drifting too fast. The float should be suddenly thrown overboard when the vessel is steaming full speed ahead. The 'man overboard' call should be shouted and the signal sounded. The crew should rush to their duty stations. One group should go aloft to watch the float and report its position to the skipper, a second group should stand by to launch the dinghy or raft, while a third group should be on the main deck, ready with life-buoys fitted with life-lines. When the vessel has been manoeuvred toward the float (the man), the life-buoys should be thrown at it. Recovery of the float should conclude the exercise.

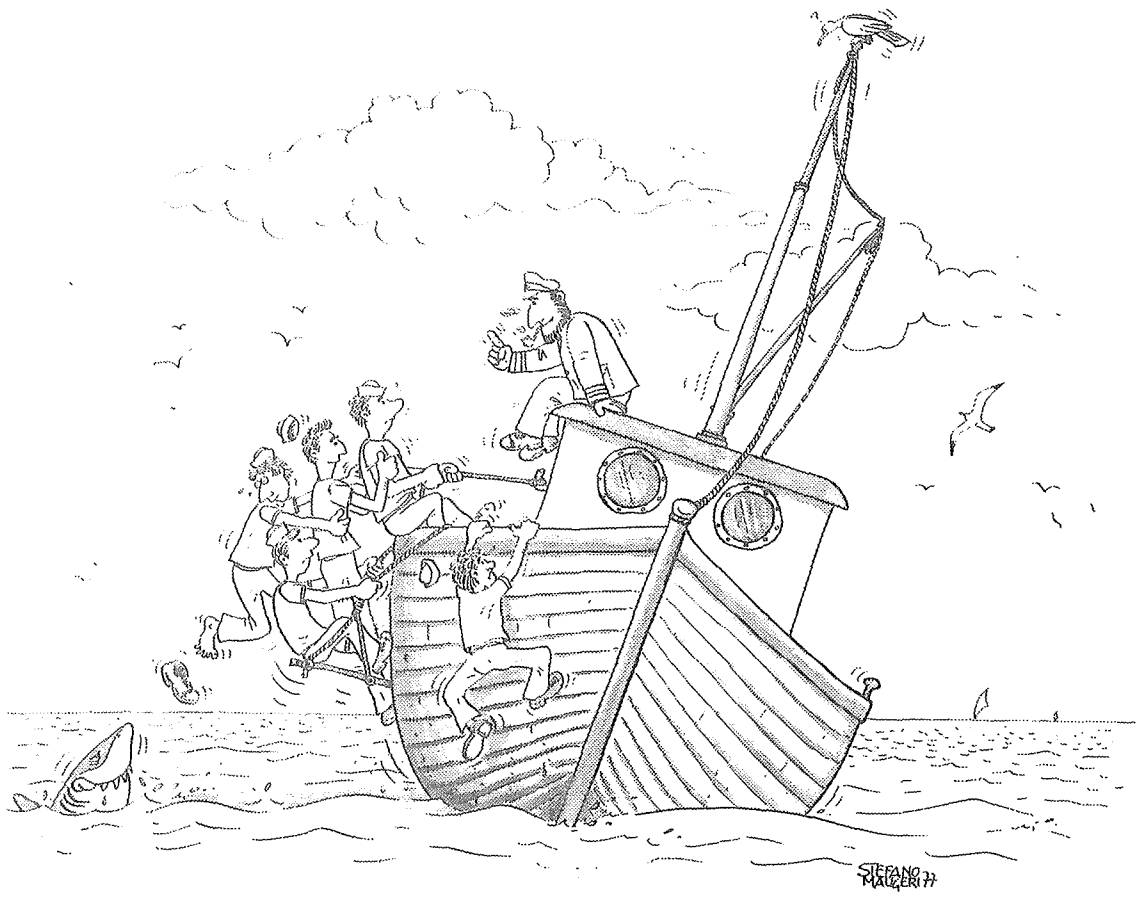
10.6 Vessel's Stability

The trainees should be taught the basic principles of stability and the importance of loading a vessel correctly. That the metacentre becomes too high when too much fish is loaded on deck. The vessel then rolls slowly but heavily and will be in danger of capsizing if its stability is too adversely affected by the deck-load. (If the metacentre is too low the ship will roll with short rapid motions, which makes her a 'stiff vessel'. Such condition makes working on board, difficult, strenuous, and unpleasant.)

Extra caution in deck loading should be taken if the vessel's gear is fast and also when a heavy load of fish is hauled on board by a derrick, especially in the case of smaller boats.

In purse seining, there is a danger of excessive weight in the bunt while brailing a big catch and many cases of capsizing of even large vessels are known. A necessary precaution is to ensure that the breastline of the bunt can be easily and quickly released should the catch lie too heavily in the net.

Free water should be kept out of the vessel. All doorways, therefore, should be suitably secured and hatches properly bolted if the weather is rough. The water freeing ports should be kept clear and well maintained to ensure quick release of sea water trapped on deck.



A reminder to use both fuel tanks—this is not the only way to demonstrate stability problems

11 Fishing Log Books

These logs should provide a continuing exercise for trainees in the subjects of this Manual, *ie,* those taught and put into practice on board the training vessel.

11.1 Trainees' Log

The trainees' log book should be kept in the vessel's chartroom or wheelhouse. It should be entered up every half hour by a trainee on wheelhouse duty. This should be done at the start under the instructor's supervision. Later, as trainees become familiar with logging, the able seaman in charge of the watch can supervise the entries. Assuming that there are three trainees on each watch of three hours, each trainee involved would have to make entries twice. This means that every trainee on board would take a turn in recording the log in every 24-hour period. By the time the training course is finished, all participants should have reached an acceptable standard of proficiency in log-keeping.

Entries to be made

11.1.1 *Compass course:* The course as recorded by the compass.

11.1.2 *Variation:* As given in every Admiralty Chart.

11.1.3 *Deviation:* Details of any deviation must be kept up to date on the vessel's deviation tables (cards). These are usually fastened to the wall in the chartroom or wheelhouse, so that corrections can be easily and quickly made.

11.1.4 *True course:* The course drawn on the chart between two positions:

11.1.5 *Drift:* The angle between the compass course and the actual course. Drift is caused by the wind and sea pushing at the vessel's sides.

11.1.6 *Current:* This is the movement of the sea's surface layer over the bottom and is known by the direction towards which it is flowing.

11.1.7 *Course made good:* The actual course made over the chart or the bottom of the sea.

11.1.8 *Log distance:* The distance from the port of departure as read on log clock or measured from the chart.

11.1.9 *Depth:* Recorded by the sounder, or taken by leadline if a sounder is not available.

11.1.10 *Position or area:* Dead reckoning position or, when fishing, the name or other description of the fishing ground.

11.1.11 *Nature of the bottom:* Determined from the chart or by echo traces and from samples obtained. International abbreviations as used in Admiralty Charts should be employed.

11.1.12 *Echo traces:* (Fish traces): These record the fish encountered (*ie*, schools, single or scattered) and need to be interpreted to determine the kind of fish found.

11.1.13 *Wind direction by compass points:* The wind is known from the direction from which it is blowing.

11.1.14 *Wind force:* This is determined on a scale devised by the British Admiral, Sir Francis Beaufort, which makes the logging of weather conditions easier and more uniform (see Table I, page 14).

11.1.15 *State of sea:* Described according to the appearance of the sea (see Table II, page 17).

11.1.16 *Air temperature:* As recorded by the thermometer.

11.1.17 *Water or sea temperature:* As recorded by the vessel's sea thermometer.

11.1.18 *Barometer reading:* As recorded by the vessel's barometer.

11.1.19 *Sky and weather record:* The description of the sky's appearance and the weather conditions at any given time (see Table III, page 17).

11.1.20 *Visibility scale:* A scale used for easy recording of the state of visibility (see Table IV, page 18).

11.1.21 *Trainees' stations during fishing operations:* This column is designed to record the position of the watches during fishing operations. The position of all watches should be recorded in each entry.

11.1.22 *Fishing gear used:* A record of the gear used. The entry should be specific. For example, if a bottom trawl is in use, the entry should specify the type.

11.1.23 *Warp's scope (or anchor cable scope during anchorage):* The warp entry must be made when the vessel is trawling, the cable entry when it is at anchorage.

11.1.24 *Estimated weight of catch:* An estimate of the weight of the catch each time the gear is hauled in must be recorded.

11.1.25 *Main species of fish caught:* Names of the main groups of fish should be given.

11.1.26 *Moon phase:* The moon has a great influence on fish behaviour, so it is very important to keep a record of observations of its phases.

11.1.27 *Remarks:* Anything worth recording. (No special column for such remarks has been put in the log book).

11.1.28 *Trainee's name and signature:* This is to ensure that *every* trainee has to make his entries in the log book, not just the most proficient writer in each watch.

11.2 Fishing Log

Every trainee should be given a personal copy of fishing log and instructed that he should make a record of every time fishing gear is shot and hauled and a catch made. At the end of every cruise each trainee should have a full record of the fishing done and results obtained, all set down in his log. This will provide an excellent reference in the meeting which should be held at the end of each trip, under the leadership of the masterfisherman, when the voyage and fishing operations can be discussed, leading to an analysis of the

economic outcome of the cruise, *eg,* cost of fuel, gear, ice, *etc,* in relation to the price obtained for the catch at the sale in the market.

Most of the columns in the fishing log are in the trainees' book, but that log is a single copy kept in the wheelhouse whereas a copy of the fishing log is kept by each trainee and remains his own record of events.

Entries to be made, other than those in the trainees' log book:

11.2.1 *Hour of shooting gear:* The exact time and details should be given, as, for example, when the bottom trawl is actually in fishing position.

11.2.2 *Hour of hauling gear:* The time when the gear is lifted from the bottom.

11.2.3 *Secchi-disc reading:* A record of the maximum depth at which the Secchi disc can be seen. (The measurement should be made at the lee side, especially before or after a fishing operation.)

11.2.4 *Analysis of the catch:* By analysing the catch, useful information may be obtained for the next fishing operation. For example, gutting the fish and seeing on what they are feeding may be revealing. If the stomach is empty, the likelihood is that the shoal is searching for food. Or the colour of fish can sometimes indicate that they have come from shallow waters, while the number of live fish may indicate when they were caught, such as at the beginning or the end of the tow, *etc.*

11.2.5 *Obstruction to fishing gear:* Any obstruction or damage to the gear should be recorded, giving the position as accurately as possible. The nature of the obstruction should, if possible, be stated, *ie,* wreck, rock, *etc.*

11.2.6 *Price the fish is expected to fetch:* Trainees should estimate how much they think the catch will fetch in the market. They should then calculate whether the voyage has been profitable or not, taking into consideration all the costs of operating the vessel. This should help in determining whether the vessel should continue fishing in the same area or move to other grounds.

12 Economics of Fishing Operations

As the aim of commercial fishing is to make a profit, every skipper wants to make sure that the income from the sale of his catch will exceed the sum of running, shore, and overhead (insurance, interest, *etc*) costs. He will try to economize, as far as technically feasible, on running costs—for example, by buying cruise supplies from the most reasonable sources and by avoiding the mistake of overstocking. On the income side, his best opportunity to boost his earnings, very often, is to concentrate on the more promising fishing grounds, *ie* fishing grounds where he can catch more fish without a substantial increase in fishing costs.

The decision to shift to a new fishing ground is affected by a variety of factors, including change in fishing time, weather conditions during the fishing operation, composition and size of catch, distance from port when the fishing is completed, condition of catch on landing, *etc.* The skipper's mind has to function like a computer, by estimating the economic consequences of changes in these factors and, for each fishing ground, calculating the combined effect on his net returns. A good fisherman should be a good business man. He will become a good businessman if he gets into the habit of visualizing the implications on costs of every decision he makes.

A good way of preparing the fishing student for responsibilities in the business of fishing is to teach him how to estimate, in advance of each cruise, running costs as well as gross returns (*ie* income from the sale of the catch—which requires making assumptions with respect to both quantity and prices of fish). From the estimated data on returns and running costs he will be able to make himself an approximate idea of what his gross cruise profit (from which he will have to subtract other than running costs to obtain a complete picture of the results of his operations) is likely to be. This process of preparing forecasts, with which the results obtained during the actual fishing operation are eventually compared, is called 'cruise budgeting'. The budgeting exercise has the purpose of improving the student's capacity to plan in advance. This in turn makes for better control of inventories of fishing supplies, improved marketing operations, *etc,* and these

improvements, in turn, are reflected in higher profits.

To illustrate this budgeting exercise, a chart 'Cruise Budgeting' (see pages 78/9) is appended. At the top of the chart, basic reference data are given for vessel name, cruise number, fishing method employed, fishing ground fished, number of days at sea, and inclusive dates of the cruise. In the first column of the body of the chart, the individual expenditure items, fuel, lubricating oil, ice, *etc,* making up the cruise running costs, are listed. In addition, there are entries for total cruise expenses, returns from sale of cruise catches, gross cruise profits, and gross cruise profits per day at sea.

Every student is given a copy of the chart before he takes part in a cruise and is instructed to estimate expenditures (for each item listed) and returns from the sale of catches, and to enter the figures in the 'forecast' column. At the end of the cruise, the student should enter, in the column 'actual', the amounts of actual expenditures and, in the column 'difference', the excess (shortfall) of actual over forecast expenditures. In the lower part of the chart, he will then fill in the data for 'total cruise expenses', 'returns from sale of cruise catches', and 'gross cruise profits', and by dividing the latter by the number of days at sea, determine 'gross cruise profits per day at sea'. The picture of the economic results of the cruise that emerges in this manner will give the student a basis for comparing results with other cruises concentrating on the same fishing grounds as well as cruises concentrating on other fishing grounds. Such comparisons aim at discovering the economic optimum of fishing operations and also help with making a rational choice between fishing grounds, where access, in principle, is available to several grounds located at different distances, and with different stocks of fish. Building up experience data for the latter type of comparisons is, in the long run, as important a product of this exercise as the improvement in budgeting skills that comes about with repeated comparisons between actual performance and forecast.

How to acquire practice in making a systematic choice between different fishing grounds that may be exploited with the fishing equipment on hand can be demonstrated by reference to another simple chart (see 'Deciding Where to Fish', pages 80/1). In this chart, the expenditure and returns data from a selected number, say four, fishing grounds are shown side-by-side. The student is asked to prepare estimates for running costs and for returns from the sale of catches for a typical cruise to each of these fishing grounds and to enter the data in the column relating to the appropriate fishing ground. The estimated number of days at sea during such a typical cruise is shown immediately below the designation of the relevant fishing ground in the column heading, to make it possible to calculate, in the lower part of

the chart, gross cruise profits per day at sea. The latter figure is used for comparisons between the fishing grounds.

Wherever comparative data per day at sea are available from previous cruises, such data may be entered in the bottom part of this chart, under the heading 'Actual Cruise Data for Comparison'. The more data of this kind are obtained, the easier it becomes for the student to prepare an evaluation of the profitability of operating on the four fishing grounds. Once the students have become experienced skippers, they will have become used to making the necessary calculations in their heads, without reference to charts.

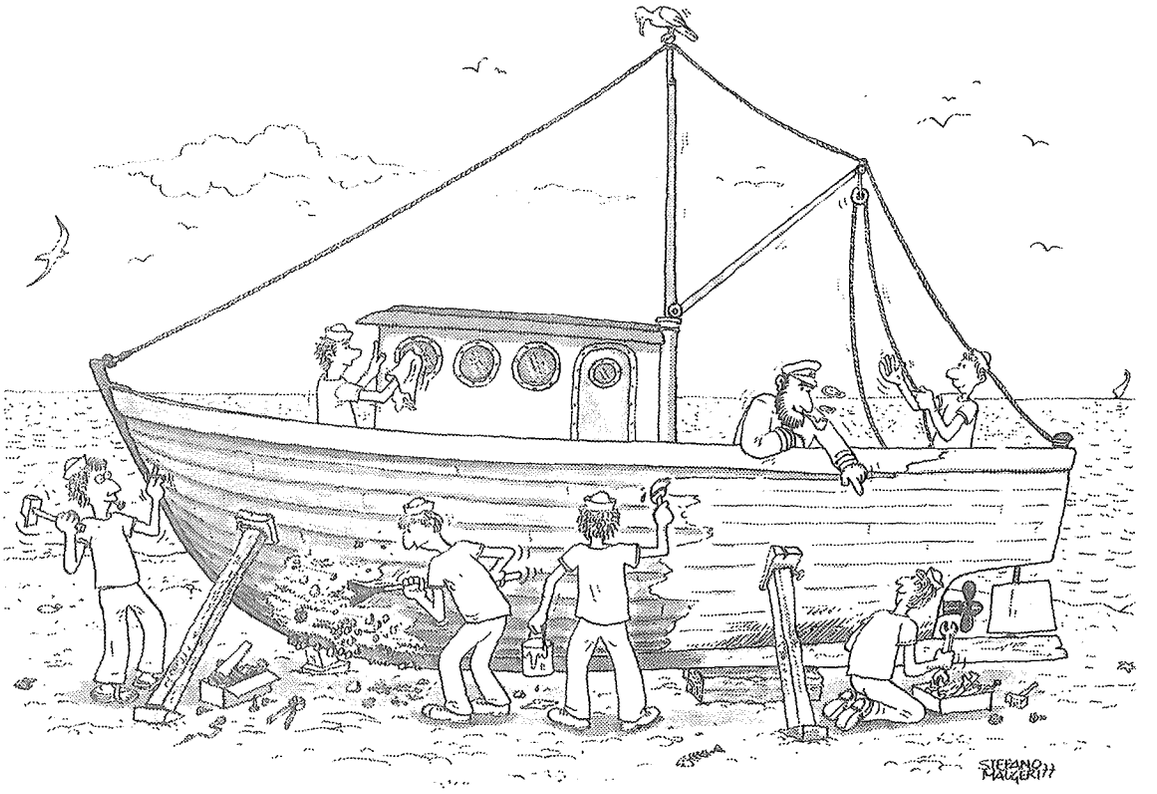
Again it is necessary to stress that the basic objective of the above two, relatively simple, cost accounting exercises is to get the student into the habit of systematically projecting expenditure and income data. Before he becomes a skilled 'manager', he will have to complete a large number of these charts and learn a number of other decision-making techniques in addition.

The third chart used in this manual in order to provide the student with an introductionto fishing economics is an 'Income Statement' (see pages 82/3). The chart illustrates the preparation of annual and quarterly costs and earnings summaries. In addition to the running cost data included in the other two charts, the Income Statement takes account of shore expenses (port dues, dry-docking expenses, *etc*) as well as overheads (insurance, interest, *etc*). As far as the actual listing of expenses is concerned, the items included will differ according to the accounting systems used in fisheries in different countries. To be of practical value for teaching purposes, comparisons should be carried out, wherever possible, with statements for similar kinds of operations. In this manner, the student is taught to identify areas where economies might be realized through improved management.

13 Vessel Maintenance

As an essential part of the routine of maintenance and repair, a vessel must be put in dry dock at times. When this is necessary for the training vessel, the masterfisherman should take full advantage of the opportunity to involve trainees in the work to be done, thus providing them with practical experience of what they had earlier been taught in the lecture room.

In order to take full advantage of this opportunity, as many as ten fishermen trainees should be involved in this work, along with a similar number of engineer trainees. For obvious reasons and as a matter of courtesy, the masterfisherman must obtain the willing consent of the dry dock management to this participation by trainees in the work to be done.



Do it yourself—the best way to learn boat maintenance

As an introduction to the dry dock operation, they should see how the work list of what is to be done is prepared, each job being specified.

13.1 Cleaning the Vessel

Some of the work to be done lends itself to participation by the trainees, as it does not call for special technical skill. Such a job is cleaning the hull. This involves scraping off barnacles and other sea growths from the underwater section, a job that needs to be done as soon as the vessel is put in dry dock because such growths are easier to remove when wet.

This scraping operation provides the masterfisherman with an opportunity to discuss the question of fouling with the trainees. The nature and extent of fouling should be noted and compared with the report from the previous dry docking of the vessel. If, relative to the time the vessel has been in the water, the fouling is excessive, then corrective action is required, such as the use of a more effective anti-fouling paint on the underwater section of the hull.

13.2 Vessel in Dry Dock

When a vessel is put in dry dock a first requirement is to carry out a detailed inspection of the hull, and this is what the masterfisherman should arrange for the trainees to do, under his guidance and supervision.

The inspection should start with the upper part of the hull, *eg,* from the waterline to the top of the bulwark. Each trainee should be given a sheet of paper on which the hull is drawn in outline so that any repairs or other work to be done can be marked, such as a dented plate or a rusted area or, if it is a wooden vessel, planks to be changed or caulking to be done. In the case of fibreglass or concrete boats, cracked or broken spots to be repaired should be indicated.

The lower part of the hull, *eg,* from the waterline down to the keel, must next be examined in the same careful manner.

After that, the trainees should be given another sheet of paper on which the port and starboard sides of the vessel are outlined, with every anode of the vessel marked thereon and numbered. While explaining the important function of the anodes in protecting the hull below the waterline, the masterfisherman should take the trainees around the vessel to check each anode to see which of them need to be replaced.

Even if an anode looks to be in good condition, it must be checked to ensure that its contacts are functioning.

Next for inspection should be the transducers of the echo-sounders, located on the bottom of the vessel. After a short lecture on the transducers and how they work, the masterfisherman should supervise the trainees in cleaning them. This must be done thoroughly, all fouling being carefully removed.

Propeller and rudder are next on the check list. The masterfisherman should show how chalked lines are used to indicate the condition of the blades. He should point out those parts of the propeller which have become pitted and rough and have to be polished. The tail shaft must be inspected, with particular attention to where it enters the tube. If no leakage of lubrication oil is to be seen and clearance is normal, nothing needs to be done but he should tell the trainees, the tail shaft must be taken out and inspected according to international regulations every fourth year. During the inspection of the rudder, the masterfisherman should show how to measure the clearance where the rudder head enters the bearing and have the trainees use a jack to push on the rudder head before reading the deflection on the gate clearance. The same reading is required in the inspection of where the rudder rests in the keel brace.

The sea chest grids should next be inspected. The grids have to be removed and the chests cleaned. The seawater intakes have to be checked to see whether they are corroded. Then the trainees should be shown how to lower the main anchor, letting out all the anchor chain. They should chip and clean the anchor and chain if necessary, and measure the diameter of the links as required. They should also paint the anchor.

13.3 Painting

As the type of construction of a vessel—wood, steel, concrete, *etc*—determines the kind of paint to be used on it and the method of applying the paint, the masterfisherman should take this opportunity to enlarge on the subject of painting vessels, why certain types of paint are used for particular jobs, the order in which various coats are applied, and why it is done in this way. He should, for example, point out the economic aspects of painting, such as the use of high quality anti-fouling paint to prevent or, at least, to reduce fouling of the underwater hull and enable the vessel to maintain good cruising speed, thereby allowing more time for fishing and reducing the time to reach and return from fishing grounds. This not only reduces operating costs

but enables the catch to be landed in better condition and fetch a higher market price.

13.4 Topside Work

The topside work to be done includes inspection of the chain locker to check on corrosion and to clean it and the water tanks, *etc.* The fuel tanks may also have to be cleaned out. While the engine room staff are mainly concerned to ensure that the bilges are inspected for corrosion and drained and cleaned, all the trainees should be involved in this important operation, which will impress on the mind of those who eventually become skippers the need to check carefully every aspect of vessel maintenance. Other routine checks require dismantling the derricks and inspecting the blocks used in the masts. Derricks should also be load-tested from time to time.

Another job the trainees can do is to chip and repaint the winches, if inspection shows this to be necessary. All winches must be lubricated while the vessel is in dry dock. All water escape ports and the scuppers must be inspected to ensure they are free and cleaned and put in good working order if required—another job in which trainees should be involved.

13.5 Procedures before Undocking

Before the vessel is undocked the masterfisherman should take the trainees again on an inspection tour so that, under his supervision, they can check every work-list item to ensure that all work has been done and in accordance with specifications. He should prepare for this inspection by specifying a routine to be followed. First on the list could be checking the condition of the anodes and then the following items:

the underwater paint, to see that it has been applied thoroughly;
the sea chests, to ensure they have been cleaned and painted;
the waterline, to see that the area has been properly dealt with;
the vessel's draft numbers, checking that they have been clearly and neatly repainted;
the anchor, to check that it has been properly cleaned and serviced.

Each masterfisherman should make up his own list of priority items to be checked, and should take the opportunity to impress on trainees the need to be completely satisfied that every job has been properly done. The rest of the work list should then be checked. Emphasis should be placed on safety inspection, such as checking to see that sea

grids are in place, that all sea valves have been closed, and that the propeller and rudder are in perfect working order. Trainees should be told that a skipper should ensure that the classification surveyor has also satisfied himself that all work specified in the dry docking survey has been carried out.

The trainees should stay on board during the refloating of the vessel and help with mooring it.

The dry docking operation, particularly the cleaning of the hull below the waterline, provides the masterfisherman with an opportunity to impress on trainees that a vessel should, if possible, be anchored in fresh water from time to time. Barnacles and other fouling sea growth cannot survive in fresh water and fall off the hull, thereby helping to keep the ship's bottom clean.

14 Performance Record of Trainees

The trainees should be made fully aware that their performance and conduct are being recorded by the masterfisherman and that they are being graded. Experience has shown such a record to be an incentive for them to master the skills taught and practised and to be a help in maintaining the high level of discipline necessary on board a training vessel. In particular, the record book is a great aid to the masterfisherman in keeping a close check on the progress of each trainee as it shows up in clear detail those who are doing well in their studies and work and those who are in need of special attention and help (see pages 84/5).

The form used in the performance record book is self-explanatory and the columns should be filled in with those alphabetical letters commonly used in schools to indicate students' performance and progress, *eg*, A = excellent; B = good; C = average; D = below average; F = fail.

A finer degree of grading can be used by the addition of plus or minus (+ or -) to the letters. For example C+ would indicate that the trainee is above average in C group.

The separate page allocated to each trainee should be completed as fully and accurately as possible so as to give a detailed account of his attainment in class and progress in work from entry to completion of the course.

The general remarks column should be used to give a broader understanding of the trainee's character and potential. The following notes on what should be revealed or indicated in recording general remarks about trainees may be helpful as a guide to the masterfisherman.

14.1 Adjustment to Sea Life

Adjustment includes both physical and mental aspects and the character of the person. Adjustment to sea-sickness and to life of board. Has he the stamina to endure the hardship and long working

hours of a fisherman's life? And—this is an important aspect—does he get on with the other trainees and the crew? Compatability is a highly desirable characteristic of anyone who seeks to live and work in close association with others. Is he developing an aptitude for life at sea? Does he enjoy going to sea, or does he shun it?

14.2 Character

Under this heading the various traits of the trainee's character should be described, such as, friendly disposition, honesty, truthfulness, openness or self-seeking and self-centred.

14.3 Attendance and Punctuality

Regular attendance shows more than the interest of the trainee in the course and subjects taught. It also reveals a steadiness of purpose and conscientiousness in performance of duty.

14.4 Technical Ability

A trainee's ability to apply his training and knowledge to practical work is essential if he is to become a skilled and reliable skipper. His potential in this respect is indicated by the skill displayed in handling the various instruments on board and in his effective performance of every kind of work.

14.5 General Intelligence

This is often manifested by his quick grasp of and insight into a complex situation, by sound judgement, and understanding the reasons behind the instructions, rules and regulations.

14.6 Tidiness and Cleanliness

Cleanliness and tidiness are required of all members of the crew of a fishing vessel. Such cleanliness and tidiness by a trainee, including personal hygiene, should be noted.

14.7 Reliability

Reliability is an important characteristic, but it is absolutely necessary at sea. For example, a lookout has to be trusted to perform his duty as does the helmsman—both responsible for functions on which the safety of the vessel and all on board may depend.

14.8 Application

Application is an essential part of a fisherman's character—willingness to work and the ability to stick to a job and see it through to a successful conclusion no matter how arduous it may be or how long it takes. The lazy man will display little or no application, except to dodge work and responsibilities.

14.9 Readiness to assume Responsibility

This trait is an essential element in the make-up of a skipper. A trainee who consistently shirks responsibility is not capable of becoming a skipper.

14.10 Discipline

Trainee's readiness to accept discipline, and be amenable to it is a must at sea and another essential in the make-up of a skipper. Trainees should fully understand the need to obey orders and be of good conduct. Only men amenable to discipline can successfully instil discipline in their subordinates.

14.11 A trainee, who shows aptitude for sea life, who is smart, interested, willing and compatible, who works hard and with sustained application, who is friendly and honest, who accepts discipline and responsibility, who is reliable and helpful, can be expected to make a good leader, who commands respect, and conducts a happy and disciplined vessel. These remarks, coupled with an evaluation of his technical knowledge and general competence, would clearly indicate his potential for becoming a skipper, mate, engineer or otherwise.

Year Month Date Day Cruise no.

Time	Compass course	Variation	Deviation	True course	Drift	Current	Course made good	Log distance	Depth	Position or area	Nature of bottom	Echo traces by sounders	Wind direction by compass points	Wind force beaufort scale	State of sea	Air temperature	Water temperature
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0030																	
0100																	
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1130																	
1200																	

Noon position Latitude Longitude Sup

1230																	
1300																	
1330																	
1400																	
1430																	
1500																	
1530																	
1600																	
etc to 2400	*use consistent depth units ie feet, metres or fathoms																

Barometer reading	Sky and weather notation	Visibility scale	Trainee's station for fishing operations: Wheel house controls	Trainee's station for fishing operations: Main winch	Trainee's station for fishing operations: Handling gear	Fishing gear used	Warps scope	* Estimated weight caught	Names of main species of fish caught	Moon phase	Remarks vessel on way from.... to.... exact time gears shot and hauled incidents worth reporting exact time should always be given	Signature of trainee

lies left

Fuel Water Food (days)

Lubr. oil Ice

Year	Month	Date	Day	Haul number	Cruise number
Position or area					
Fishing method					
Gear used					
Warps paid out when trawling		Hour of shooting gear		Hour of hauling gear	
Moon phase	State of sea	Depth		Secchi disc reading	Observation of fish caught (eg type of food in stomach)
Current		Weather conditions		Nature of bottom	Surface water temperature	Obstructions to fishing gear (to be filled in according
Rate	Direction	Force	Wind direction			

								to local conditions)			
Names of fish											
Grand total brought forward from last haul *											
Big size fish weight or pr. unit (kg)											
Meduim size											
Small size											
Total from last haul											
Grand total brought forward											
Expected price per unit **											
Remarks										Total	
Instructor's signature								* Use consistent units ie kilograms, boxes, baskets etc ** In local currency			

Vessel name: Number of days at sea: Day left port:

Cruise number: Fishing ground identification: Day returned to port:

Fishing method employed:

Item	Forecast (*amount in local currency)	Actual (*amount in local currency	Difference (amount in local currency) (+ or -)	Comments
Fuel				
Lubricating oil				
Ice				
Crews' remuneration				

Exercise Chart

Food on board						
Fresh water						
Bait						
Repair or replacement of fishing gear						
Miscellaneous						
Total cruise expenses						
Returns from sale of cruise catches						
Gross cruise profit or loss						
Gross profit or loss per day at sea						

*enter amounts that apply to this cruise only.

Vessel name:

Fishing method(s) employed*:

Item	Forecast of amount of expenditure and income**			
	Fishing ground 1 number of days at sea:	Fishing ground 2 number of days at sea:	Fishing ground 3 number of days at sea:	Fishing ground 4 number of days at sea:
Fuel				
Lubricating oil				
Ice				
Crew remuneration				
Food on board				
Fresh water				
Bait				
Repair of fishing gear				
Miscellaneous				

Total cruise expense				
Returns from sale of cruise catches				
Gross cruise profit or loss				
Gross cruise profit or loss per day at sea				

Actual cruise data for comparison***

Cruise 1				
Cruise 2				
Cruise 3				
Cruise 4				
Cruise 5				
Cruise 6				

* indicate, for each fishing ground, which method employed
** enter estimated amounts in local currency and for one cruise only
***enter in relevant Fishing Ground column
Remarks

Items	First quarter totals*	Second quarter totals*	Third quarter totals*	Fourth quarter totals*	Annual total
1 Fuel					
2 Lubricating oil					
3 Ice					
4 Crew remuneration					
5 Food on board					
6 Fresh water					
7 Bait					
8 Repair of fishing gear					
9 Depreciation of boat					
10 Interest on and repayment of loan					
11 Insurance					
12 Port dues					

13 Taxes					
14 Social security paid for crew					
15 Renewing gear					
16 Maintenance of boat					
17 Dry-docking					
18 Engine repair and maintenance					
19 Miscellaneous					
Total expenditures					
Returns from sale of fish					
Income from other sources					
Total income					
Profit or loss					
Remarks					

*amounts in local currency

Trainees Perfor

Name of trainee	Group no						
Cruise No. Date started Date ended							
	Galley and mess work	Maintenance work	Handling fish	Splicing wires	Mending nets	Operating winch	Handling gears
1 Adjustment to life at sea							
2 Character traits							
3 Attendance and punctuality							
4 Technical ability							
5 General intelligence							
6 Tidiness and cleanliness							
7 Reliability							
8 Application							
9 Readiness to assume responsibility							
10 Discipline							
11 Future prospects							

mance Record

Date arriving on board

Date leaving vessel

Handling the vessel	Steering, giving helm orders	Seamanship	Operating direction finder	Operating radio telephone	Operating radar	Keeping fishing log	Keeping log book	Knowledge of rules of road	Echo-traces interpretation	Sonar-aided manoeuvring	Meteorology	Sextant work	Celestial navigation	Chartwork	

General remarks

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The primary purpose of this manual is to provide a guide for training fishermen on board fishery training vessels of 100 to 200 GT (except engine-room personnel). It is based on the experience of an FAO expert serving as a masterfisherman instructor on a fishery training project. It is assumed that most of the information provided in the manual is relevant to any fishery training on board a training vessel. Much of the information may also be of assistance in arranging individual training on board commercial fishing vessels.