5 PROGRAMME OUTPUTS

Scientific and compliance data and the base of essential fisheries management information they provide are all outputs of observer programmes. This chapter discusses each sort of output in closer detail.

5.1 Scientific outputs

The scientific output of an observer programme is usually an array of data sets: compiled data for many data variables collected by observers to fulfil a sampling strategy (Chapter 4). Each fishery may have a different strategy with different data types and variables sampled in different ways.

In addition, observers may collect biological samples (whole fish, otoliths, stomach contents or parasites) to be brought ashore along with any relevant fishing information recorded in the observer report, usually for analysis by fisheries scientists.

This section aims to set out the main scientific data types and variables that an observer programme can routinely collect. Some details on why they are needed and hints on collecting them are included. A suite of generic data forms that can be used to record the data variables are introduced, followed by some discussion on the verification and management of these data.

5.1.1 Different types of scientific data

Scientific data variables (catch weight, species number and length, water temperature, etc) are collected to provide information useful for science, compliance and management, e.g. total catch, CPUE, species age, oceanographic conditions, etc. Table 10 summarizes the different data types and variables that can be collected by observer programmes.

Table 10 Examples of types of data that can be collected by observers

Data types	Data variable	Collection method
Total catch	Weight, number, volume or number baskets	Systematic
Discards	Weight, number, volume or number baskets	Random or systematic
Species composition	Sampled fish species, number of baskets per species	Random or systematic
Target species	Species sampled	Random
Average size	Sampled fish species, length, weight	Random
Fishing effort	Time steaming, searching, fishing, types of gear and equipment	Systematic
Age	Otoliths, scales, statoliths	Systematic
Sex and maturity	Fish sex and gonad state	Random
Species interactions	Stomach contents	Random or non-random
Stock state	Condition rating, disease, parasite level	Random
Oceanographic	Water temperature, sea state, sea colour	Systematic
Meteorological	Wind speed and direction	Systematic

5.1.2 Which data variables should be collected?

The data variables to be collected are determined by what is required to achieve the objectives of the fishery management plan. Management plans may seem far removed from the length of fish, but the links from data variable to data type to fishery performance indicators right through to the objectives of a management plan are very direct.

In the situation when no management plan is in place to guide a new observer programme, for example when the programme is collecting baseline data prior to any management priorities being set, then the following questions may help determine which variables to gather:

- How valuable is the catch?
- How important is it to have the data in terms of stock sustainability or recovery?
- How costly are the data to collect?
- How important are the data to any assessment methods being used or planned?

5.1.3 Catch and effort data

Catch represents the removal of fish from the ecosystem by fishing; it is equivalent to fishing mortality in fishery assessment models. Effort is the amount of time and energy that it takes to catch those fish. Their combination as catch per unit of effort (CPUE) is one of the most useful and commonly employed indicators for monitoring the state of a fishery. Sustainably harvested stocks usually exhibit a stable CPUE.

Separately, the two variables have many other uses in biological stock assessment and for management in general. Because of the importance of these variables almost all observers will be required to measure them. However, they are also among the hardest variables to measure properly.

Catch composition

It is not easy to estimate catch composition on a commercial vessel. The crew are usually keen to sort and process the fish as soon as it arrives on the deck, or on larger vessels it may be stored in a holding tank where it may be difficult to gain access. There are several different methods to estimate catch composition that are suitable for different vessels and different mixes of catches. There is no one correct method, and there is no one solution to any situation. It is best for observers to have an understanding of the different methods available and then to select the most suitable for a given situation.

Ideally, estimates include total weight of the catch and the weights of all species present in the catch, including any by-catch and discards. Observers will need to identify all species, including the by-catch. Sometimes it is difficult to identify and separate some species, and observers must be aware of all methods used for species identification in their fishery (see example identification sheets in Appendix 8).

It is not so vital to produce catch composition exactly as it is to produce figures that are in the right range. Appendix 9 gives an outline of some methods used by observers to estimate catch composition.

Many fishery management programmes rely on landings to estimate total catch, but these figures often fail to represent the real catch of a vessel or fleet due to by-catch, discards and high grading (discarding fish, either larger or smaller, to produce a more marketable composition) Observers must be given a clear understanding that their task is to assure that catch estimates include all fish taken from the sea in the fishing operations, not just the target species or processed catch.

Hake identification by examining gill tubercles (C.H. Lesch).

Fishing effort

Fishing effort is an important variable that can indicate a change in the stock status or the economic value of the catch. There are many different ways to measure fishing effort and these should be considered in detail with the fishery scientists and managers before collection procedures are fixed. Table 11 provides examples of the most common effort measures used by observers.

Observers will need to fully understand the measures of effort, and they should be described clearly in observer manuals, as mistakes can be very difficult to detect later.

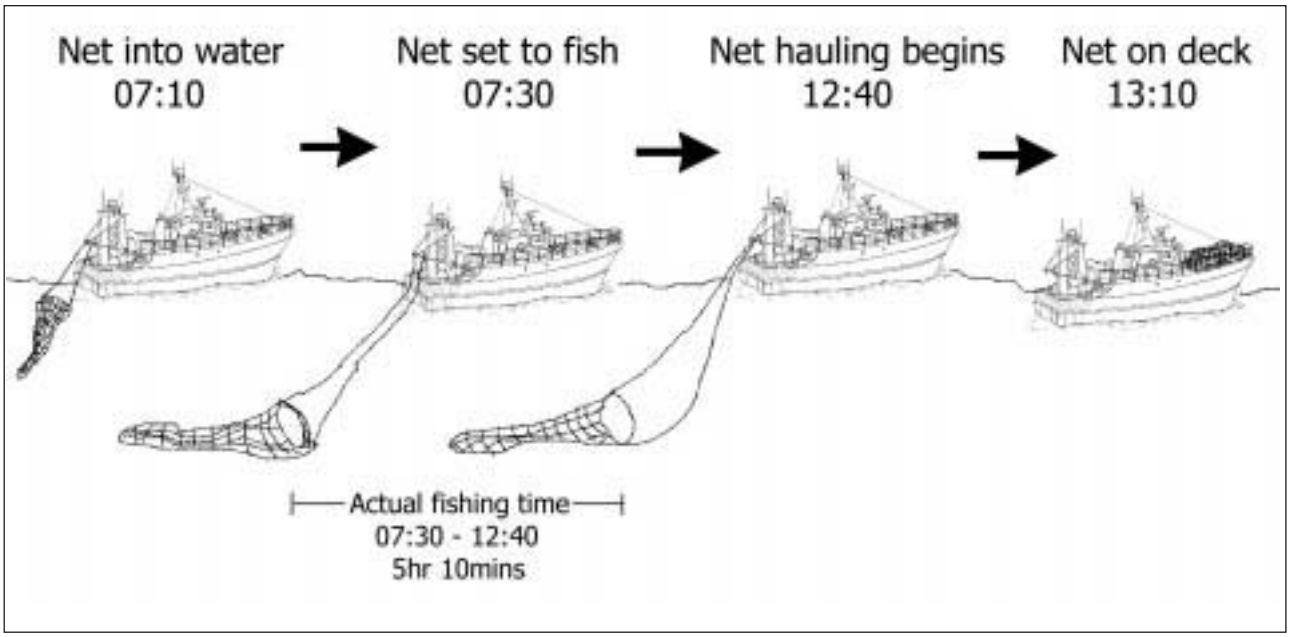
Figure 7 is an example of how to make clear the different definitions for observers, in this case related to trawling.

Table 11 Examples of measures of fishing effort related to gear

Effort measure	Examples of fishing gear	Examples of definition
The hours fished	▪ Boat seines ▪ Trawls ▪ Boat dredges ▪ Lift nets	The number of hours that the gear was actually fishing
The number of sets	▪ Surrounding nets ▪ Trawls ▪ Long-lines	The number of times the gear was set in a time period
The number of effort units	▪ Gill nets (set or drifting) ▪ Traps ▪ Fyke nets	E.g. the number of 100m of net or number of traps
The searching time	▪ Surrounding nets	Time spent actively looking for fish
The number of line hours	▪ Jiggers ▪ Pole and line	The number of lines times the time spent fishing

Many fishery management programmes rely on landings to estimate total catch, but these figures often fail to represent the real catch of a vessel or fleet due to by-catch, discards and high grading.

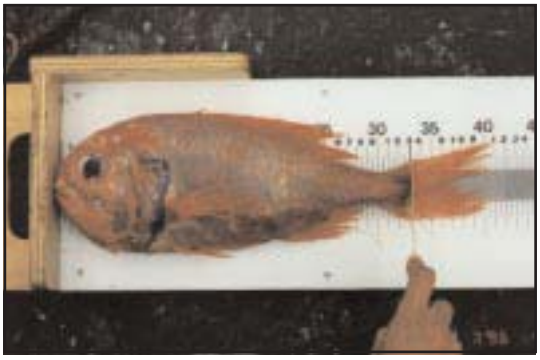
Figure 7 The set, haul and time actually fishing for a trawler



5.1.4 Biological variables

Most biological variables are required for stock assessment either as direct variables for use in models or as information used to enhance and tune the models. The amount of data required for the different variables will vary. For example, far more length frequency data are usually required than maturity stage data, although both data variables link when estimating such parameters as size at first maturity.

When choosing which variables to collect and how many samples of each, it will be important to marry together the skills of observers and the requirements of stock assessment models, and ultimately of the management plans. Again, therefore, data collection strategies must always be developed in coordination with, and against the requirements of, fisheries scientists and managers.



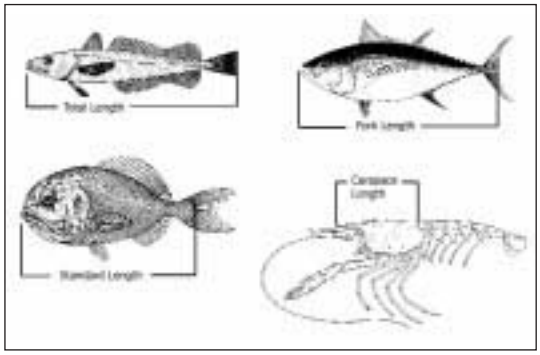
Measuring boards are a very convenient way to measure fish (S.L. Davies).

Length

The most commonly required variable is the size of the fish, which is also required in the largest sample quantities. Usually this is length measurement, but sometimes width or other size measurement is required. Length is a simple variable to measure, most commonly using a measuring board, a tape measure or callipers.

Observers must be given clear instruction of how to measure the fish and which type of measurement to use, according to the accepted standard for the respective species. Figure 8 is an example of some of the different ways to measure species. Identification sheets can be made for observers to assist them in remembering which type of measurement to use (Appendix 8).

Figure 8 Some examples of size measurement standards for sampling



Weight

Sample weight is required as a raising factor to calculate the total catch estimate, while individual fish weights are required to estimate length-weight relationships and other parameters.

Samples of fish weight are straightforward variables to collect. On a moving vessel, however, they are not always so easy to measure accurately. Baskets and large fish are usually weighed on a hanging Salter-type balance, which is best to hang in the midpoint of the vessel. Individual small fish are more difficult to weigh unless a movement compensated scale is available. One option is to use a normal 'kitchen' type scale or a small spring balance and to only take weight measurements on very calm days. Observers will need to take very good care of this equipment, washing it frequently with fresh water.

Sex determination and maturity level

The two sexes of certain species grow at different rates, and behaviour in response to fishing activities can also vary. Fisheries biologists are therefore especially interested in having length frequencies separated by sex. The way to determine the sex varies from species to species. For example, squid and finfish generally need to be cut open to visibly examine the gonads (see Box 14). Sexes in crabs have different shape abdomens that can be examined by eye. Lobsters can be examined on the underside for different positioning of the genital aperture.

While sex determination is quite straightforward in most species and can be achieved with a minimum of training, assessing the maturity levels of different species is something of an art. Even experts can argue for many hours about the maturity stage of a given individual.

Box 14

The sexing of most finfish species should be done in the following manner:

- Slit the belly of the fish; a cut of about 20-cm long parallel to the spine, somewhat ahead of the anal opening.
- Next, reach inside and move the stomach and intestine aside. The gonads should then be visible against the peritoneum (the membrane that lines the abdominal cavity).

The female gonads, the ovary, are tubular (sausage like) and normally pink, yellow, or orange. A clear bag usually surrounds ovaries. In immature fish, the ovaries maintain a similar colour but are opaque or somewhat granular in appearance.

The male gonad, the testis, is somewhat less obvious than the ovary. Testes are flattened, often crinkly at the margins, and usually white during spawning season and brownish at other times. In immature fish the testes are string-like.

Careful training and plenty of practice is required for this skill to be acquired. One training technique is to encourage observers to discuss together the maturity stages of fish, if possible while still at sea over the radio. Gonad examination by cutting the fish damages them, and this will not always be well received by the crew, especially if it is a high value catch. In this case the observer must be prepared to defend the sampling strategy and to limit the number of fish damaged to the absolute requirement, and also try to minimise the damage inflicted.

Age

Fish age data are rarely collected in any quantity; normally the length (size) measurements are converted to age data by an age-length key. The most common use of age data is for population dynamics modelling when the catch at length is converted into catch at age to model the pattern of year classes.

The age of fish is determined in different ways, using some boney parts of the body that exhibit growth rings which can be counted. This is normally done in the laboratory by specialist technicians who dye, slice and count the growth rings. In finfish, body scales are often used, or the otoliths, which are small calcified structures in the head of the fish, and can be removed with a knife and tweezers. In squid statolith rings (similar to otoliths, but smaller) are used.

Collections of ageing material are usually made on a seasonal basis due to the influence of changing environmental conditions on the growth indicator, the rings. Over a specified time period a sample is made that covers all size classes divided by sex, usually with up to 5 samples from each sex and size class. These samples are then analysed onshore and age length keys established, so that any length data can readily be converted to the age of the fish.

Extracting otoliths from monk (C.H. Lesch).

Ad hoc data

This is often at the specific request of fisheries scientists. Usually, these are for the collection of biological samples, including:

- stomachs for nutritional and ecological studies (food chain interactions);
- parasites for stock delimitation;
- whole specimens for morphological studies;
- gonads for fecundity studies or
- body tissues for DNA analysis.

Whatever is required will not be routine data collection, although observers can assist when the methods for their collection are given.

Environmental data

Environmental data such as sea surface temperate, sea state, sea colour and wind speed and direction are often collected by observers on a daily basis or with each sampled fishing event (station). This information can be used for ecosystem studies and for determining the influence of environmental parameters on fish distribution or fishing patterns. But observers should only be asked to collect environmental data when, like biological parameters, there is a direct analytical use for them.

5.1.5 Data collection forms, guidelines and identification sheets

Data forms must be simple, unambiguous and easy to complete. They should be developed in coordination with the end user (usually fishery scientists) and in relation to any databases currently in use.

Approved international data standards[10] should apply whenever possible to ensure compatibility with other regional or international datasets. However, compatibility with local datasets within the fisheries authority will also be important. Often a suite of connected forms will be required. Appendices10 and 11 respectively provide sets of generic forms for administrative and data collection purposes that can be adapted for many different situations. Appendix 12 provides full guidelines for completing the data collection forms.

Identification sheets (placed either in waterproof folders or laminated into plastic) have proved to be very successful for new observers. General species identification sheets can be produced along the lines shown in Appendix 8.1. Individual fishery sheets can also be produced that show individual information to assist the observer in completing sampling work (Appendixes 8.2 and 8.3). These sheets can be made using photographs and simple computer software.

5.1.6 Data verification and management

The scientific data sheets generated by observers will constitute the greatest volume of information in the observer programme. Data verification methods are vital to ensure that the data are both representative and unbiased, since incorrect, fake or biased data are of no use to scientists or managers. Observers can sometimes be tempted to fabricate data, especially when the weather is rough and a cosy bunk is much more appealing. It must therefore be an important principle of the programme to act appropriately when fabricated data are found in order to discourage observers from any temptation.

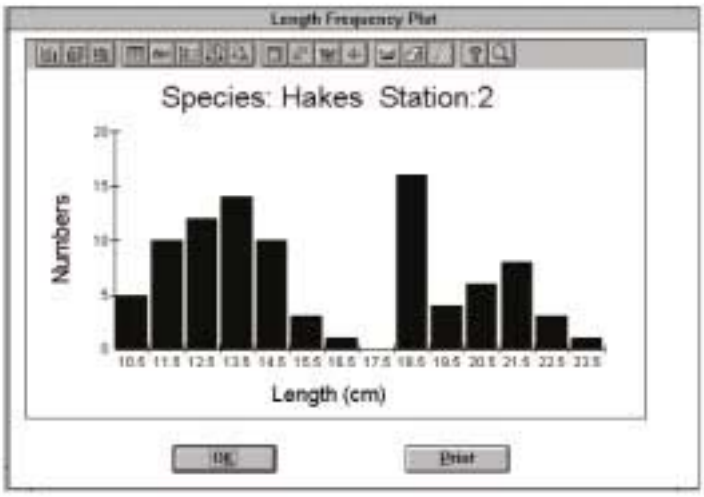
On an observer's return to shore it is important to record what data sheets have been completed. It is recommended that a summary sampling sheet is attached to the data forms when they are manually checked and that this sheet includes key details about the dataset and any mistakes or comments noted (Appendix 10.7). This summary sheet should be photocopied, completed in duplicate or recorded electronically, with one hard copy staying with the raw dataset and the other hard or soft copy being kept as a record of what data have been generated in the programme. The summary sheet, if kept electronically, could form part of a logistical database as discussed in Section 5.3. By following this simple approach collected data will have been registered within the observer programme and can be used to track its progress during further processing or transfer out of the programme to other users.

If the scientific data are entered into a database by the observer programme itself, then the following checks are worthwhile and can be programmed as routine reports for filing or as data verification summary sheets that can be attached to datasets for use by others:

- Plot the data set, e.g. fish length (see Figure 9), sex ratio and maturity level of fish, to check for outliers, which may be caused by recording or processing errors.
- Check that the data spread is sensible; be wary of too uniform a spread, as well as very erratic data points.
- If it is not what is expected, cross check with other observers in a similar area at that time or check comments in the trip report.

Table 12 gives some ideas that can be used when manually checking data sheets. When the data are checked it is also important to look for mistakes that may need discussing and rectifying with the observer. When developing data verification procedures consult with the end users (scientists and managers) to ensure that they build faith and commitment to 'their' data sets.

Figure 9 An automatically generated length frequency plot



[10] Refer to FAO Technical Papers 382, 267, 222.

Table 12 Manually verifying data sheets

Possible signs of fabricated data	Ways to avoid the problem
Data sheets too clean and neat	Ensure that observers keep their original data sheets, discourage the copying of data onto a clean sheet as this increases the possibility of errors. If data sheets are very dirty they can be photocopied.
The data points are too regular (this can be checked by simply visually scanning the data sheets)	When debriefing observers discuss their data sheets, for example ask what the average size of the fish was and if this changed at any time on the trip. Observers who have measured thousands of fish know the average size and will feel comfortable with questions about their work.
Lack of information to report at the debriefing	Observers who have been at sea for several days to months are usually keen to discuss their trip. One way of ensuring that they are performing their duties correctly is to listen to their comments about the trip and to show an interest in their observations.
Information being given to you by ships crew about observers not working properly	Keep regular contact with the industry. For example, when deploying and collecting observers, have a chat with the captain and crew about the trip so that observers know that these channels are open and transparent.
Data being very different to other observers in a similar area	Encourage observers to talk to each other over the ships radio if possible or have regular radio schedules with the observers from the home base. This encourages observers to discuss their work and any problems they are having and also reminds them they are part of a team.

5.2 Compliance outputs

Chapter 2 described how laws and regulations are designed to give formal effect to policy and management decisions. Of course, these are not sufficient to ensure that conservation and management measures are complied with.

Ensuring compliance to fisheries legislation is usually the function of a department of the fisheries authority that deals with monitoring, control and surveillance (MCS).

In a well-designed MCS system many activities are undertaken,[11] including:

- Inspection routines in ports, at sea, at landing or transhipment places, and in processing areas.
- Aerial surveillance using aeroplanes, helicopters and satellites.
- Observer activities both for direct observations and in combination with the above as a means of crosschecking and validating compliance information (Box 15).

Observer programmes can therefore be an important part of any MCS system as providers of both primary and secondary (or cross verification) data.

Box 15

The CCRF Section 8.4.3, calls on States to:

"… as far as possible, establish programmes, such as observer and inspection schemes, in order to promote compliance with applicable measures."

An observer checking the log book (S.L. Davies).

5.2.1 The main compliance activities of observers

Possibly one of the largest contributions that observers can make toward compliance control is simply being at the front line of fishing operations, thus acting as a deterrent. When an observer is on board a captain may think twice before violating fisheries legislation. In the following sections a brief description is given of the main activities that observers can perform in relation to compliance control.

[11] For a full review see Flewwelling et al. (2002).

All of the following activities rely on the appropriate legislation being in place to establish the role and function of observers and from which a strategy for observer activities can be developed.

Logbook validation

Logbook reporting is the most common way for the fisheries management authority to gather geo-referenced information on catch and effort, and other parameters. The temptation to under-report target species and by-catch will vary depending on the type of 'use right' being exercised (including in relation to quotas, fishing areas, etc.), and the associated fees (quota fees, bycatch levies, etc.) that may be required.

Observers have an important task in both 'teaching' captains to complete logbook information correctly and ensuring it is carried out, usually checking the logbook against the observer estimates and observations on a daily basis. Gross under-reporting of target or by-catch species may constitute a serious violation.

Discarding and high-grading

This is also a major part of logbook validation but it deserves to be mentioned separately as in some cases, when no logbook system is in place, there is legislation on high grading or discarding. Discards usually take place to avoid paying by-catch levies or because a species (or their size) is not commercially viable. It also includes the disposal of damaged fish. High-grading is the disposal of undersized or damaged target fish to increase the value of the processed catch, i.e. low-grade fish are discarded.

Some discarding or high-grading may be unavoidable and, indeed, it may be acceptable by the fisheries authority at a particular rate (say, 10% of the catch) but it usually consists of non-commercial species and damaged fish.

Observers must be given clear explanations of the definitions of high grading and discarding in relation to local legislation, as these definitions and the particular rules that apply can vary greatly between fisheries.

Monitoring of prohibited species and incidental catch

Clear guidelines must be given to observers on this issue. For example, a small number of crabs retained on board for the galley may not be considered a serious offence, whereas the deliberate killing of protected species of sea birds or sea mammals clearly is. Observers will also require good guides for correctly identifying species.

Undersized and spawning species

Regulations often specify the minimum size of fish that can be landed. Or there may be regulations on the spawning state of fish, such as not allowing berried females to be retained, e.g. female lobsters carrying eggs. These regulations can be quite complicated to interpret as *catching* and *retaining* are different things, but returning dead juvenile fish to the sea is not very sensible.

Often captains will be expected to move fishing area if they are catching over a certain percentage of undersize fish. In other cases where there are regulations prohibiting discards and high-grading, the vessel may be obliged to land the total catch. Observers are in the ideal position to monitor controls such as these, but clear instructions must be given on what action to take.

Fishing area and season restrictions

In order to detect area and season violations navigation skills are required. Observers should be trained in basic navigation skills, including the interpretation of charts and the use of satellite positioning equipment. If the observer suspects a violation of an area restriction he or she should first double-check the vessel's position before informing the officer on watch. If the vessel takes no action then this is usually a serious violation that requires immediate reporting. Observers, of course, must be aware of the difference between steaming through an area and actually fishing.

Fishing gear checks

Monitoring the structure, materials, set up and use of fishing gear is an important task not only for the purposes of compliance with any applicable fishing gear regulations but also in relation to the determination of fishing effort. For example, the mesh size of gillnets and cod-ends determines the size of fish caught; effective fishing effort with a 15 cm stretch mesh will be different from a 25 cm mesh.

It takes a high level of experience to really understand the gear set up of many fishing activities, but the observer is responsible for determining whether the gear or any modifications or attachments that the fishing master has made are breaking the law. If regulations exist on attachments or mesh and hook size, the observer must observe gear setting and hauling for further information or to detect a violation. If a vessel changes the gear after leaving port, before returning to port or when a patrol vessel is in the vicinity, observers should become very suspicious. Another indication that the wrong gear or wrong set up is being used may be through the size distribution of the species being caught.

Mesh size regulations are among the more common gear controls (P.E. Bergh).

Validation of processed fish

When fish are processed on board the observer should ensure that the marking of packaging is made correctly. This is important when different languages are being used, and if there are different levies for different species. The marking of a high levy species as a lower levy species, or to avoid quotas, are common violations.

Documentation checks

Observers should make routine checks of the vessel's papers and documents (such as licences and registration) to ensure that these are in order. Complications may occur in relation to the language of documents but generally infringements relating to documents are not a serious violation and can be reported once on shore.

Sightings of other vessels

If observers have a list of licensed vessels they may be able to detect unlicensed vessels fishing in the area. Any observations of this type should be reported immediately.

Transhipment at sea

If there is legislation prohibiting at-sea transhipment observers will be in a position to monitor this both for their vessel and others in the vicinity. Where possible, records should be kept of vessel details and the transhipped species and quantities.

5.2.2 Recording and reporting violations

From the above brief description of the possible activities that observers can undertake in support of compliance control it is evident that observer programmes must carefully design both the background material in support of observations (i.e. the basis on which violations might be discerned) and the methods of recording and reporting of violations.

Serious and less serious offences should be classified and observers must be aware of how to respond to violations in these two categories. Appendix sections 10.5 and 10.6 respectively give examples of a daily reporting form and a compliance form that may be used for recording the information related to an offence. Serious offences should be directly transmitted via radio, telex, fax or VMS to the observer programme, and in a coded format whenever possible. If the offence is less serious the report should be brought ashore for later follow-up.

The following points should be kept in mind when deciding on action that observers should take in reporting compliance information:

- The observer's safety must always be protected.
- Intimidation or violence against an observer **is** a serious offence.
- Observers should **not** have enforcement powers themselves, but must be seen as the 'eyes and ears' of the fisheries management authority.
- It can be very difficult to define when the 'line' has been crossed in relation to an offence For example, some discards may be acceptable, but when does it become illegal? Depending on the training and experience of observers these lines can sometimes be left flexible, while at other times they must be firmly defined.
- Cameras (still and video) may be useful in situations when observers find it difficult to secure information about violations.
- Observers can be directed to alter their sampling priorities (adaptive sampling) if a violation has been observed or is suspected, especially in order to secure evidence. However this may be difficult if there is low level of training in observers. (See Table 13 for possible learning objectives for compliance training.)

5.2.3 Court cases and evidence

Observer records and information may be required as evidence in the prosecution of a violation by a vessel, captain or company. Such evidence will be more admissible if the observer programme has developed standardised formats, methods and protocols for recording and handling compliance-related issues. Observers should be suitably trained in these protocols and also in the appropriate manner to present such information in any court proceeding.

Table 13 Examples of possible learning objectives for compliance training

Number	Learning objective
1	To be aware of main dangers inherent in working at sea, safety essentials and how to deal with typical emergency situations.
2	Understand importance of correct conduct with industry and other personnel.
3	Understand background of observer programme within political, legal and administrative context of government.
4	To understand how the duties of an observer fits in with the legal and administrative fisheries management tasks of the government and to explain the linkages and separate tasks of MCS.
5	To appreciate the way the law is structured and understand the relevant parts for an observer.
6	To understand and interpret the complex issue of high-grading and discarding, leading to more consistent actions by observers in this difficult area.
7	To be able to follow correct compliance procedures for dealing with violations commonly encountered, which will lead to more consistent compliance routines, as well as a better relationship with the industry.
8	Understand the requirements for consistency and professionalism in all observer MCS duties as a Quality Assurance feature.
9	To improve knowledge and performance of everyday observer monitoring duties, appreciation of log-sheet design and enable the observer to properly quality-check the logsheets.
10	To enable observers to make correct decisions for communicating problems or routine messages to base.
11	To develop routine communications and improve briefing material.
12	To enlarge knowledge of fishing technology, in terms of navigation aids, fish finding, gear handling, and communications.
13	To enable the observer to understand this aspect of new technology and be able to be vigilant to possible infractions.

5.3 Fisheries management information outputs

5.3.1 Output types and uses

Sometimes there is no clear distinction the scientific and compliance aspects of observer activities. For example, accurate estimates of catch, by-catch and discard will provide information sources useful for both purposes.

Moreover, while both scientific and compliance outputs of observer work serve management purposes, not all of them immediately translate into management decisions. For example, length frequency data needs to be incorporated into a stock assessment model before the latter can provide useful predictions for management planning, such as the determination of TAC or TAE. Violation reports need to be acted upon and statistics generated in order for management to understand the acceptance of rules by the industry.

Fisheries management outputs

Nevertheless, some types of information collected by observers do have direct management applications. These include the following examples.

- Data related to fish size, spawning and recruitment might directly indicate the need to open or close a fishing season or area.
- Conversion factors (the relationship between processed weight and whole weight by product type), is often collected by observers directly alongside the production line, and used by management for the calculation of catch, fees and for quota control.
- Information on fish size and species composition can be used directly for gear selectivity assessment, hence management planning when determining gear restrictions.
- Fishing plan development by the captain (possibly in collaboration with other skippers) and fleet dynamics can sometimes be monitored by observers. This information can be used to assist managers in understanding the fishery and to evaluate the best ways to manage it in harmony with the fishers.

- Marine protected areas and species can be monitored to provide information that may lead to a better understanding of their dynamics, and hence better ways to protect them.
- The condition of caught and released species is important information allowing the evaluation of the control measures in place to assess if they are adequate to achieve their intended purpose.
- Pollution - plastics, cardboard, oil waste and old fishing gear etc - may be illegally thrown over board. It is important to stop this and also to gather information that is required for assessing ocean management policies.
- Regional and international management obligations may require information from observers, even if this information is not required directly by the fisheries management authority itself.
- The expression of national sovereignty may not be seen as a very tangible output, but for some countries it is an important issue that can be addressed through the placement of observers on both domestic and foreign fleets.

Overall, there is no requirement for an observer programme to become the 'property' of any specific section of the fisheries authority. Programmes will serve a combination of objectives, and the observer's role will generally be 'multi-tasked,' within the limits defined by the strategic requirements of the fisheries authority and the resources that it provides for programme operations.

5.3.2 Information management and flows

In support of the main objective to supply high quality and timely data it is vital for an observer programme to gain respect from scientists, inspectors, managers and the industry. To achieve this, high quality and transparent information management, including performance evaluation, reporting and the maintenance of appropriate confidentiality, are essential.

There are three main groups of information flow within an observer programme: information inputs, internal information and information outputs. The groups of information flow are outlined in Table 14 with examples of information types and their main uses. It should be noted that all of these information flows can exist either on paper or in electronic format.

Incidental catch such as seabirds can be a serious management problem that can be effectively monitored by observers (S.L. Davies).

In the future observers should be seen as capable of 'multi-tasking' – contributing actively to scientific, compliance and management requirements.

Table 14 Information flows

Information flow	Information type	Main uses					
		Planning/ Deployment	Record Updating	Programme Monitoring	Information exchange	Budget control	Sampling Strategy
Information inputs to the programme from external sources	The type and amount of output data required	✓					✓
	Financial information	✓				✓	
	Vessel availability	✓					✓
	Updated vessel, license and company lists		✓				
	Updates of management measures		✓		✓		✓
	General fisheries information		✓		✓		
Internal information generated by the programme	Personnel details of observers		✓			✓	
	Logistical details of observers availability and deployment	✓	✓	✓		✓	
	Records of observer leave, training and evaluations	✓	✓	✓			
	Financial details of programme			✓		✓	
	Records of equipment allocation		✓				
	At-sea progress reports e.g. radio reports, faxes, emails	✓			✓		✓
	Completed data sheets			✓			
	Trip reports		✓	✓			
	Routine reports on activities			✓	✓	✓	✓
	Feedback to observers e.g. reports, newsletters				✓		
	Results of analytical evaluation of the sampling procedure						✓
Information outputs to the clients	Raw data from the monitoring programmes			✓			
	Summary data on activities and outputs			✓	✓		
	Summary trip report including compliance violations			✓			
	Routine reports to the FMA including financial reports			✓	✓	✓	
	Feedback to industry and other stakeholders				✓		

5.3.3 Information technology

A system for manual management of data (i.e. unaided by computers) will include handwritten registers, filing and photocopying of reports and summaries and the use of mail or fax for distribution. Such a system may be quite sufficient in a small programme when the speed of information distribution is not vital. It may also be the preferred system when power supplies are poor or staff experience with computers is limited, especially if this is combined with an isolated location with little or no technical support. Scientific data held as raw data sheets can be transferred into an electronic format at a later date by the fisheries authority or fisheries scientists.

However, if the programme is able to support one or more computers then the possibilities for more advanced information management increase enormously, including the use of:

- **word processing packages** for documents, reports and updating forms;
- **spreadsheets** to compile and process many of the information types generated by an observer programme and for financial management and control;
- **off-the-shelf database software** to generate specific databases for one or more aspects of the programme;
- **specialised but commercially available software,** such as personnel databases, financial and budget control software, publishing and programme planning tools to assist programme management and presentation; and
- **internet and e-mail** to distribute and to gather information.

Some observer programmes may start or progress to using complex information technology, including the use of local or wide area networks, centralised databases with links to other databases for imports and exports of information, and satellite links to vessels, including for transferring raw or summary observer data. Some general considerations, if these types of information technology are envisaged, are as follows.

- Although information technology can improve the timeliness and quality of observer data, it is not a substitute for the basic work observers will have to carry out.
- Specialised databases developed for observer programmes have many advantages but require suitable skills and money to develop, maintain and update.
- When the observer programme or the information system becomes complex, possibly including many stations, it may be better to decentralise the database and use interlinked modules from local databases with imports and exports to the central system. An example would be to place the scientific information (which can become quite voluminous) into a separate database that could still be linked to a central management database when needed.
- Whenever possible use a standard software development life cycle to design the system and be sure it is well documented, in case updates and changes are required later on.

The decision on the level of information technology support to be adopted by the programme will depend on a balance between the requirements on data volumes and timeliness, the level of general computer competency and technical support and, last but by no means least, the amount of money available for set-up and long-term costs.

5.3.4 Functional administration

The logistical management of an observer programme is similar to most routine administrations, i.e. looking after the things that need to be done simply to stop the programme from grinding to a halt. The functional administration for management of an observer programme needs to address:

- Observers
- Vessels and use rights
- Deployment logistics
- Finance
- Compliance
- Scientific data
- Communication and publicity

Table 15 provides an overview of these key functional areas. The framework it outlines could be used as a generic design for computer system development, but the information types, flow and outputs would be very similar in a manual system. In the latter case, however, fewer outputs (especially summary reports) would probably be produced.

An observer programme must be able to guarantee the security of the data collected to maintain the respect of the industry.

Security procedures for confidential and sensitive data must be agreed and implemented through defined data access rules.

Table 15 Functional administration of observer programme management

Functional Area	Description	Examples of inputs	Examples of outputs
Observers	Manages personnel information on observer including training and evaluation details.	▪ Observer personal details (see form in Appendix 4) ▪ Leave information (see form in Appendix 4) ▪ Observer evaluation results ▪ Summary reports on observers from 'deployment logistics' ▪ Results from training courses (see form in Appendix 4)	▪ Summary reports of observers ▪ Summary report on each observer with training, evaluation and work record ▪ Emergency details summary ▪ Statistics on training and evaluation success/score rates
Vessels and use rights	Manages all information associated to vessels and companies use rights allocations and conditions to fish	▪ Updates of vessel details ▪ Updates of use rights details ▪ Company details	▪ Reports on the vessels and their use rights details ▪ Summary of company details
Deployment logistics	Manages the placement of observers on vessels, tracking of their activities and debriefing	▪ Request for an observer (see form in Appendix 10.1) ▪ Cancellation or delay in request (see form in Appendix 10.2) ▪ Deployment details (see form in Appendix 10.3) ▪ Trip reports (see form in Appendix 10.4) ▪ Daily reports (see form in Appendix 10.5)	▪ Observer deployment details (see form in Appendix 10.3) ▪ Summary of current deployments ▪ Summary of deployments by vessel, fishery, month etc. ▪ Report on the sea-time for observers by vessel, month etc.
Finance	Manages the financial aspects that may include payments, procurements and running costs	▪ Observer sea-time (trip report) ▪ Invoices ▪ Payment details	▪ Payment advice form ▪ Financial status report ▪ Financial historical reports on payments
Compliance	Manages all information collected by observers on compliance violations	▪ Daily reports (see form in Appendix 10.5) ▪ Compliance assessment details (see form in Appendix 10.6)	▪ Summary of violations, by time, fishery, vessel or observer ▪ Trip report of violations for a given trip ▪ Summary details for a particular type of violation
Scientific data	Manages all scientific information collected by observers	▪ Daily reports (see form in Appendix 10.5) ▪ Summary sampling sheet (see form in Appendix 10.7) ▪ Sampling data forms (see forms in Appendix 11)	▪ Summary of sampling conducted on a trip ▪ Summary of sampling by type over a fishery, a time period, a particular observer etc. ▪ Raw data sets compiled as required
Communication and publicity	Manages general communication into and out of the programme including the transfer of information to a wide audience	▪ Summary reports from the other functional areas ▪ Ad-hoc inputs and miscellaneous information	▪ Newsletters ▪ Internet homepage or contribution to a homepage ▪ Bulletin boards updated

Note: Examples of all the generic forms mentioned in Table 15 are given in Appendices 4, 10 and 11, with explanations of how they can be completed. These examples demonstrate the type of information required in the different functional areas and give ideas on easy ways to collect this information.