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October 2004

منظمة الأغذية والزراعة للأمم المتحدة

联合国粮食及农业组织

Food and Agriculture Organization of the United Nations

Organisation des Nations Unies pour l'alimentation et l'agriculture

Organización de las Naciones Unidas para la Agricultura y la Alimentación

EXPERT CONSULTATION ON DATA FORMATS AND PROCEDURES FOR MONITORING, CONTROL AND SURVEILLANCE

BERGEN, NORWAY
25 to 27 OCTOBER 2004

ELECTRONIC LOGBOOK DATA REQUIREMENTS

1. The data requirements of an electronic logbook are characterized by a relatively small number of data sets that can be repeated as many times as required. Consequently, data entry will be an iterative process that is easily simplified and programmed.

Data Sets

2. The data sets required for an electronic logbook are variable in number, depending upon the fishery and the user of the data, but are likely to be limited to three or four principal sets, one of these reinforced by three subsets. Should all of these sets and subsets be used, the resulting electronic logbook reports will be sufficiently complete to satisfy the requirements of fisheries managers, fisheries compliance and enforcement activities and fishing industry interests.

3. Electronic logbook data may be either (a) stored on board the vessel for subsequent submission to a fishing authority, or (b) transmitted from the vessel to a shoreside authority. Logbook information may be transmitted through an existing VMS, or a different communication device. Because transmitting the information is more difficult to manage, this paper addresses that concept. It should be understood, however, that many of the challenges are shared by both strategies.

4. In addition to the actual data, it is essential to consider the most economical and the most universally recognizable form of the data. This is to ensure that the communications costs to remain reasonable, as well as to allow for the sharing of data among the broadest possible audience, where necessary. The recommended approach to formulating the data sets is outlined below.

5. ***Species***. The FAO three-letter codes will be the most economical and universally recognizable format for this set. Where no FAO code is available for a species there are two options to choose from: either to use the biological name (genus and species) or, in a case where it is not necessary to share the data beyond a local level, either a locally devised code or name.

6. ***Quantity, number or volume***. To be entered in local measure of weight (kilograms, pounds or stone) and converted where necessary to metric weight. Because of the difficulty of obtaining accurate weight measurements aboard a vessel, entering the

volume, e.g., boxes of a pre-determined size, could well be more practical. This figure could then be converted to an estimated weight.

7. ***Size or caliber***. This is an important parameter for both fisheries management and commercial purposes. Many fisheries already use standard calibrations for the size of key species, or a composite of size and weight. These are often designated (e.g. "sole 1, sole 2…sole 5"). Where vessels sort their catch at sea, accurate information on the size of species aboard will be available. Where the catch is not sorted, an indication of the most frequent size of caliber provides useful data. The size can easily be appended to the species code by the addition of a single digit.

8. ***Product***. Particularly useful for commercial purposes, this is generally expressed as whole, headed, gutted, filleted, etc. The standard FAO code is the most efficient means of recording.

9. ***Fishing gear***. Designation of the gear used to catch a given species. Once again, the standard FAO gear code would be used.

10. ***Refrigerated temperature store***. A data set of almost exclusively commercial significance, this provides one of the parameters that gives an indication of the likely quality of the catch when landed. Two digits will be sufficient to express this data set.

11. ***Time/date and place of landing***. Because the majority of fishing vessels land their catch at the same port, for those vessels an entry of the place of landing can normally be dispensed with. Where it is required, it would make sense to use the UN or ISO three-letter code for those locations. Failing this, a local or dedicated code could be substituted. Time and date would be expressed in the international formats of hh/mm, dd/mo. The expression of the year could be dispensed with, and added later.

12. ***Other information***. Each management plan or regulatory regime may well require data in additional to the above. All such information should be coded for ease of storage and/or transmission.

Data Set Entry Scheme

13. Fishing vessel crew may struggle with standard codes for species, gear, etc. For this reason, an optimal electronic logbook data entry system will have two levels of identification for all data sets based upon codes. The vessel crew would see, with regard to the species data set, the common or local name, or similar identifier, for each species.

14. Within the data entry software, however, that species name would be linked to the relevant FAO code, biological name or local code, and it is this latter identifier that would be transmitted. The advantage is twofold: having the dataset linked to a universal identifier means that it can be distributed and retransmitted to any number of authorized parties and that all of them will be able to decode the data in recognizable form. Furthermore, when a code is available, it will almost always be a shorter form than the actual substantive, whether it be species, condition or gear, facilitating data storage and/or transmission.

Data Transmission Economies

15. A key issue in the success of electronic logbooks will be the associated cost of transmitting the data from ship to shore, if the data are, indeed, transmitted and not stored aboard the vessel for subsequent submission. If a vessel's VMS is used for the logbook transmission, this fact is particularly important in view of the fact that many VMS

programs are based on satellite communications, a relatively expensive transmission medium.

16. While the direct translation of a paper log to electronic form would create a file size that would be prohibitively expensive to transmit, there are means of coding and compressing this data that can make the transmission costs reasonable.

17. The systems currently in use can be divided into two categories: those based upon a free text format, and those that rely upon the transmission of small, highly defined packets of data.

18. The Inmarsat-C system provides both of these possibilities. Its messaging service is capable of transmitting large text files up to 32 kilobytes. Terrestrial systems, such as cellular telephony and VHF radio would provide similar text capabilities.

19. The Inmarsat-C data reporting service also provides a transmission capability based upon one to three packets of data, with a maximum capacity of 32 bytes.

20. The Argos system offers similar capabilities and Iridium telephony or the short message service of cellular telephony could be used to similar effect.

21. Other systems, such as Orbcomm, Inmarsat-D+, etc. used in VMS have data transmission costs and benefits.

22. Free Form Data

23. Transmission of a fishing log as an open text file (i.e. ASCII file) would require an internal format to identify the data. A logical way of approaching this would be to have an uninterrupted string of text consisting of dataset identifiers, each followed by the dataset itself. One could imagine that the string, say, *"spec/cod;quan/550;calib/3;cond/g"* could mean that there are 550 kg of number 3 size gutted cod on board. At the reception end, the Fishery Management Centre would be programmed to recognize this string, strip the identifiers from it, and enter the data sets into the database.

24. While this would appear to be an economical use of the transmission capacity, an entire catch report, including a header to identify the vessel, other species with their related subsets, time and position, and a checksum to assure data integrity, could easily arrive at 1 kilobit (approximately 125 characters), costing as much as $1 per catch report.

25. This cost might be modest in some fisheries, but unworkably expensive in others. In any case, it is desireable to keep transmission costs to a minimum. In the above case, the use of file compression can facilitate this. The economy of this technique is unknown but, depending upon the specific kind of compression that is used, one would expect a savings of over 50%.

26. Highly Formatted/Packet-Based Message Data

27. The use of a highly formatted message, such as the Inmarsat-C data report or the ARGOS ship-to-shore report, presents a different environment for the electronic logbook. In both of these cases, the total available capacity is some 32 Bytes (32 characters of free text), presenting problems of capacity were the message transmitted in free text.

28. A solution to this could be to bit map these small messages. Bit mapping means that the function of each bit (i.e. 1 or 0) in a message is determined in advance, based on their place in the message. In this way, significant capacity is gained because one transmits values only. So if, for example, it is decided that the first 24 bits of the message will be a

fish species designated under the FAO three letter code, it is only necessary to transmit the three letters. The FMC will know that this is a species three-letter code because of its position in the message.

29. Likewise, the quantity of each species will have its own place and, knowing that this is a number, it will be possible to designate each digit with only four bits instead of the traditional 8-bit byte. The same goes for any numerically designated data, such as the fish temperature store.

30. In order to optimize the bit-mapped data report, some compromises on the quantities would be advantageous. Quantities can be designated as absolutes or ranges. Absolutes are units, e.g. 834 kg. Ranges are, on the other hand, in tens, hundreds or thousands of kilograms. Rounding to tens (e.g. between 1130 and 1140 kg) gives only a very small saving in data capacity but is quite close to the absolute. The use of thousands (e.g. between 1000 and 2000 kg), on the other hand, provides a significant data capacity saving but may lack sufficient accuracy.

31. A useful compromise could be reached, particularly in view of the fact that quantities determined aboard vessels are themselves estimates. The best solution may be to have several formats, depending upon the fishery. Artisanal fisheries, for example, could report in units, whilst large-scale industrial fisheries could report in thousands. Fisheries in between these two extremes could take a middle road.

32. These differences could be managed in one of two ways. Either each report would begin with a designator for the format being used. On the other hand, it could be possible to program the receiving FMC in advance so that it associates a report received from a given vessel with the format being used.

Data Input

33. For electronic logbooks to be successful, it is essential that the means of entering the data be easy to learn and rapidly executed, even for crew members with no prior knowledge of computer operations. To achieve an overview of the likely development of input devices, it is worth discussing input via a standard computer as well as through a dedicated input device developed specifically for the electronic logbook.

34. In the former case, the ease of input is dependent upon the quality of the design of the software furnished for this function. Several approaches have been used in pilot projects and in ongoing programmes in several areas around the world.

35. It is very easy to make errors in data entry, particularly with the numbers. In addition, a free form data entry system has the disadvantages of a standard computer, in that the machine is almost certainly used for other functions, and this means that sending a logbook report might require saving data in other applications before launching the logbook. There could also be problems of compatibility between the various programs. Furthermore, when developing software for a broad group of users, it would be impossible to allow for the compatibility issue as it would be impossible to know what programs each user were running.

36. A dedicated input device might solve some of these problems. A potential solution could be to use a handheld device, such as a Palm, Psion or Blackberry computing platform. This, itself, would have the advantage of permitting the crew to formulate the logbook entry where the fish was stored. Furthermore, were the handheld device connected to the ship's VMS communications system equipment by a cradle, returning the device to the cradle and pushing a button would be enough to launch the logbook report. Finally,

because the handheld would require only an interface with the communications system or its related computer, problems of compatibility would be simple to avoid.

37. As for the data entry itself, the use of an interactive scheme, rather than the passive entry described above, could facilitate entry and promote accuracy. Pushing a single button could launch a logbook entry. The handheld would show the user a list of species from which he would choose one. It would then show a list of quantities, condition, gear, etc., the user making his choice from each list. After the necessary number of cycles to finish the logbook entry, the user would select a button ending the entry and the device would display the entire entry and permits any necessary corrections. Acceptance of the entry by the user would launch transmission.

38. Developing a system for data entry on a standard computer is possible, but the active nature of the program could well provoke more compatibility problems. Furthermore, an additional improvement in the system could be achieved by using dedicated hardware with, say, specific keys for species, condition and gear.