COOPERATIVE RESEARCH IN ASIAN FISHERIES-FUTURE DIRECTIONS AND OPPORTUNITIES

by

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Abstract

The fisheries of many countries in Asia are heavily reliant upon fisheries as a major source of food protein with fish consumption levels two to three times higher than those of western countries and collectively, the region harvests approximately forty percent of the world's marine fishes. With many of the region's fish resources fully exploited or over fished, identification, quantification and reduction of biological waste in commercial fisheries has become a regional priority. However, given the complexity of multi-species fisheries and fish utilization practices as well as the technological difficulties already encountered make finding practical solutions by individual researchers or institutes extremely difficult. Within the region exist human resources, research and development facilities and equipment that if shared could significantly speed up the process of biological waste mitigation. This paper, identifies some of the current problems associated with biological waste mitigation and proposes that resolving these issues is best achieved through information, facility and human resource sharing. An initial target of setting minimum standards for fishing trials, experimental protocols and analytical techniques is proposed with a second step being the establishment of information databases of technologies to reduce biological waste. Administrative support, strategic planning and management of regional databases and the activities of scientists and technologists can only be carried out by a regional agency such as SEAFDEC or ICLARM. International cooperation between agencies, institutes and researchers is a pre-requisite for long term resolution of technological problems.

1. INTRODUCTION

In 1993 over 47.4% of the world's fish catch came from Asian fishing nations. From a total of 108,594,000 tonnes Japan, China, Indonesia, Thailand, North and South Korea, Myanmar, the Philippines and Vietnam accounted for approximately 51,310,000 tones of the world's catch illustrating the important role that SE Asia has in world fish production. The development of SE Asia's fish food culture has a long history which over the years has developed into a reliance on a diverse range of marine plants and animals at different tropic levels including sea weeds, ascidians, jelly fishes, squids, shrimps, pelagic and demersal fish. The food culture values a wide range of sizes of fish of the same species with markets being available for such delicacies as

anchovy larvae, juvenile fish as well as adults. In many cases, the price for smaller sizes can be many magnitudes higher than for the adults. It seems clear that in this region, fisheries play an important role in food culture and as a source of employment and income for coastal communities. Therefore, it would seem appropriate to have established a well defined scientific and technical infrastructure support program to identify and quantify the nature and extent of fisheries problems and where appropriate take actions for mitigation. Furthermore, the common nature of coastal marine resource harvesting operations in SE Asia also suggests that similar problems may occur in different countries in the region. Thus a regional strategy for identification, quantification and reduction of biological waste in commercial fisheries may be appropriate given the limited facilities, equipment and human resources for biological waste mitigation.

In October 1995, a workshop on Co-operative Research in Asian Fishing Technology (CRAFT I) was held during the Asian Fisheries Forum in Beijing, China. This workshop brought together fishing technologists from Asia to identify problems associated with responsible fishing technology. Much of the discussion from this workshop was associated with identifying a "realistic" strategy for improving co-operation and collaboration between fishing technologists in Asia. Eighteen months have passed since CRAFT I was held and some further elaboration of regional technical co-operation is now necessary in light of the development of a UN Code of Conduct for Responsible Fisheries and the regions own desire to promote regional co-operation. This paper, summarises the recommendations and conclusions of CRAFT I and suggests a two steps approach towards development of Responsible Fishing Technology.

2. IDENTIFICATION OF REGIONAL PROBLEMS

During the CRAFT I workshop, participants were separated into small groups after the opening address by FAO, country progress reports and keynote technical presentations to discuss the most important topics for fishing technology and international co-operation. Each group elected a group leader who presented the results of the groups discussion. The groups were as follows:

Group I	Group II	Group III	Group IV	Group V
B. van Marlen*	Y. Sreekkushana*	T. Matsuoka*	C. Leria*	I. Cartwright*
T. Yamane	Y. Matsushita	D. Monintja	J. Haluan*	C. Wardle
P. He	Fauzi. A.R.	J. Prado	R. Mounsey	C.W. Lee
Lin D. Fang	Lu Chi	J. Dickson	N. Long	E.C. Jeong
B. Chokesanguan	Y. Theparoonrat	J. Lee	N. Van Dong	T. Imai
T. Arimoto	D. Poreeyanond	Xu. L.X	B.T. Lang	C. Nasution
Y. Inoue	Rosidi. A.	Wu Yi-Hui	Y.S. Chou	
X. Zhang	B. Pasaribu			

* Group leader

Group leaders summarised their individual group discussions as follows:

Group I suggested that the priorities for research should be focused on identifying regional rather than only domestic fisheries problems in harvesting technology. A clear problem currently existed with exchange of information and a regular forum for information exchange should be established. They identified the following technical research priorities: Standardising research methodologies especially survey sampling fishing gears; Enhance fish behaviour studies; Conduct research to improve catch quality in shrimp fisheries and to investigate other ways of increasing fishers revenue without damaging stocks. How this could be achieved was difficult but a priority should be placed on establishing a network of Asian fishing technologists for information exchange as a first step.

Group II also emphasised the need information sharing and for research priorities on standardising experimental methods and survey fishing gears as well as focusing on fish behaviour studies and assessing the impacts of fishing on the environment. However, they also expressed concern over the lack of industry participation in research and the need for a fishing technology network. Research priorities should be placed on evaluating deep water fish resources.

Group III noted that historically much of the co-operative research was basic scientific studies with little or no participation from fishing technologists. They suggested that what was required was better utilisation of regional human resources and facilities; better communication within the region with countries having common fishing grounds and fisheries; improved sharing of specialised research facilities and personnel. This could be achieved by improving information exchange in the region between fishing technologists and encouraging regional organisations to asst. in this process. They concluded that the first priority was to ensure that applied R&D should be directed towards sustainable development and management and not just for technology transfer.

Group IV urged that fishers must benefit from the research and that care must be taken when transferring technology to Asian regions to ensure its appropriate. They expressed the need for global, regional and sub regional networks but that information exchange should be two way. Greater research efforts need to be made on utilising bycatch and that fishers information be used in development and management of fisheries.

Group V identified a variety of research priorities including; gear selectivity, Fish aggregating devices (FAD`s), labour reduction and environmental impact of fishing operations. It was suggested that national and regional priorities need to be established as a precursor to a regional fisheries strategy. They expressed concern that fishing technology issues had a low profile and needed to be raised. There was also a need for coordinating the various interest groups involved in fishing technology research (Universities, companies, govt. and fishers) to ensure that a multidisciplinary approach was taken.

A summary of these views are presented in table 1.

Group	Information exchange network	Involve fishermen in consultation	Standardising Expt. Methods eg. Survey gear	Fish behaviour Research	Facility sharing & person. Exch.	Envir. Assess. F/gears	Gear selectivity studies
I	•	•	•	•			
II	•	•	•	•			
III	•		•		•	•	
IV	•	•	•				
V		•				•	•

Table 1. Summary of group meetings on regional priorities in Fishing technology

Based on the group presentations the Chairs summarised the workshop discussion in the plenary session as follows:

a) Raise the profile of fishing technology R&D.

b) Set up a communication network between researchers, fishers and managers to provide a mechanism that will enable information sharing.

c) Improve access to specialised research facilities and equipment in the region.

d) Regular meetings to share information on commercial conservation technology R&D.

Such a forum must have practical commercial sea fisheries conservation harvesting technology as a fundamental objective.

e) Develop and maintain a database of fishing technology experts in the region.

f) Increase staff exchanges within the region.

An increase in the number of regional exchanges would lead to greater co-operation between Asian fishing technologists.

g) Promote "Responsible Fisheries".

h) Develop a regional strategy in fishing technology.

Efforts should be made to review fisheries that are currently either fully or over exploited and to make an assessment of the most appropriate technological conservation measures necessary for establishing these fisheries on a sustainable basis.

3. REGIONAL STRATEGY FOR RESPONSIBLE FISHING TECHNOLOGY

The points raised in CRAFT I for resolving technological problems in commercial fisheries fall into two categories. Firstly, there is a need to develop an infrastructure that will enable information and technology to flow between countries and fishing technologists in the region. Development of a regional administrative support vehicle to organize and coordinate Technology Inflow and Outflow Programs (TIP/TOP) requires the efforts of a non partisan regional agency. Because the philosophy of the Code of Conduct for Responsible Fisheries embraces fishing technology from Research, Development Training and Extension (RDT&E) perspectives, a regional coordinating agency should be capable of bringing these disciplines together rather than to treat them in isolation. This is especially the case with biological and energy waste mitigation in commercial fisheries where rapid and effective responses are required to move results of research into commercial fishing practices through technology transfer, training and extension programs.

3.1 Establish a regional support vehicle for administering Responsible fishing Technology

3.1.1 Balanced regional participation

The similarity of problems facing commercial fishing industries in the region suggest that coordinating and conducting RDT&E activities should be based on input from a broad sector of countries in the region rather than on the advice and participation of a few.

3.1.2 Encourage the adoption of standards for RDT&E programs

Significant improvements can be made in the quality of data collected during R&D programs by developing a set of regional guidelines for conducting and analyzing research data. While such standards are best developed the regions specialists, an administrative coordinating role should be carried out by a regional agency.

3.1.3 Provide a centralized registry for TIP/TOP conducted in the region

Because of the limited number of specialized research facilities, equipment and human resources for conducting R&D programs, it is important that relevant information on biological and energy waste mitigation can be catalogued and distributed to RDT&E personnel on a timely basis.

3.1.4 Manage and administer a database of biological waste reduction technology

If minimum standards are developed for the collection and analysis of biological waste reduction R&D, then it becomes possible to set up a regional information database. Unlike a central registry (section 3.3) which functions as a central library, an information database has more specific information on resources such as amounts of bycatch and discard estimates by fishery and fishing gear type. Regular input of data from the region can allow important trends to be seen in the success or failure of biological waste reduction technology. Because of the importance of data quality, managing and administering the database should be carried out at the regional level. It will also require adoption of data collection standards (see 3.2).

3.2 Establish regional targets for Responsible fishing technology research and development

With many of the fisheries in the region being characterized as either fully exploited or over-fished, identification and quantification of technological problems associated with capture technologies should be a focus of the region's fishing technologists. Some of these problems such as trying to improve the selective properties of fishing gears in warm water multi-species fisheries may require access to facilities and equipment only available in one or two countries in the region. Quantifying the nature of bycatch and discards in resources straddling several countries should be carried out on the basis of adopting common experimental methodologies and analytical procedures to ensure common agreement as to the magnitude of the problem and strategies for its mitigation. Additionally, owing to the limited number of regional specialists, regional collaborative and cooperative R&D programs are probably the most cost and time effective way to mitigate biological waste in the region. In terms of setting a priority for areas of investigation by fishing technologists, the authors have drawn on the recommendations of the Technical consultation on reduction of wastage in fisheries held in Tokyo, Japan November 1996 (FAO, 1996) and a paper the authors presented at the Second World Fisheries Congress, Brisbane, Australia August 1996 (Chopin et al. 1996).

There are several critical steps necessary to mitigate the problem of biological waste in fisheries. Firstly, all fishing induced mortalities and not just reported catches need to be measured. A greater effort is required to identify and quantify the types of unaccounted mortalities such as discards, ghost fishing, escape mortality etc. by gear type and by fishery and how they may be incorporated into Fishing mortality F (Figure 1). Secondly, reliable estimates of biological waste must be more than a single event and collecting data from fisheries on an annual basis is necessary to determine how the resource is responding to Responsible Fishing practices. Thirdly, expeditious mitigation of biological waste through improved selectivity of fishing gears requires development of methodologies and analytical techniques that stand up to rigorous investigation.

3.2.1 Estimation of bycatch and discard mortality

A global assessment of fisheries bycatch and discards has already been carried out by Alverson et al. (FAO, 1994) in which discards are estimated at 27 million tonnes. However, in this report, there is very little data from the SE Asian region. FAO report 547 has concluded that this estimate is too high and that greater efforts need to be made to collect discard information nationally. Matsuoka (this workshop) has indicated that methodologies for estimating discards in FAO TR 339 are not appropriate for multispecies fisheries and that some modifications need to be made to reduce the errors of over-estimation. On a more fundamental level, Matsuoka (this workshop) notes that very little information is available on bycatch and discards from SE Asia. Under such circumstances and with the FAO TR 547 recommendation to collect accurate information on discards, it would seem appropriate to make this a priority topic for Responsible Fishing Technology.

3.2.2 Guidelines for trawl selectivity experiments

Alverson et al. (FAO 1994) have already identified shrimp trawls as fishing gears with the highest levels of discards and it is generally accepted that greater efforts be made to improve the selective properties of trawls used in tropical industrial fisheries. While several excellent reports on selectivity have been published in this region, there is no common accepted format(s) for conducting selectivity fishing experiments and very little information is presented on nature of fishing conditions, fishing vessel and fishing gear performance. Variations in towing speed, water depth, sea conditions and net rigging can all significantly contribute to changes in trawl geometry and fishing performance and can be a significant source of noise in the data. Transferring TED or BRD technologies from one region to another or even from one vessel to another may result in different selection performance due to changes in vessel or net performance. Similarly, detailed checks of netting and BRD rigging are sometimes omitted, creating another potential source of error in selectivity performance. Within a regional context, it is therefore important when sharing data or transferring technology, that some guidelines are established to prevent or lessen the probability of gear or vessel induced changes altering selectivity performance. This can be achieved by setting up standard methodologies for monitoring vessels and fishing gear data during fishing operations. Regional agreement on data collection standards will also facilitate the process of transferring information into a regional database.

3.2.3 Guidelines for analyzing selectivity data

In much the same manner that no regional guidelines exist for collection of fishing vessels and fishing gear data, researchers in the region have no agreed method for analyzing selectivity data. Because many researchers aim to publish their findings in scientific journals, there is encouragement to be innovative (to achieve publishing success) rather than

follow the methods used by other researchers. Within this particular region, a variety of methods have been used for analyzing selectivity data including: length based selection, girth based selection, selection curves drawn by hand and by elaborate curve fitting algorithms. While this may be valuable for development as a researcher, it makes data interpretation complex for other researchers and extremely difficult for industry. In practical commercial fisheries research it is important to put the needs of industry ahead of oneself. In this context, it is necessary to agree upon some common methods for analyzing and presenting selectivity data. As in the preceding section, this will also facilitate the process of transferring information into a regional database.

4. CONCLUSIONS

The importance of fish and food security in the region requires fisheries be established on a sustainable basis. However, and a lack of data on biological waste in many SE Asian commercial fisheries is presently a limiting factor. The common nature of harvesting and utilization practices in SE Asia fisheries suggest that finding a common solution through cooperation and communication is a critical first step in this process. Presently, a lack of cooperation and communication in practical commercial sea fisheries R&D makes it difficult to develop a regional conservation strategy. Focusing on commercial fisheries, pooling regional expertise, creating opportunities for sharing information, resources and facilities can reduce duplication of research, increase utilization of facilities and encourage standardization of experimental protocols. A successful regional strategy on biological waste will be a cooperative effort by administrators, scientists, technologists and fishers from the region that work collectively on developing and improving methodologies and technologies.

While discard levels in some fisheries have been researched extensively, discard mortalities as well as all other types of fishing induced mortality have only recently been a topic for investigation (Chopin et al., 1996). These problems are compounded by a lack of time series data making it difficult to assess whether the level of biological waste is increasing or decreasing and for what specific technical, biological, economic or social reason.

Simply stated, progress towards resolving regional technological problems must be a cooperative venture between regional and national administrators, technologists, trainers and extension officers. A first step in this process should be the establishment of a regional support mechanism to foster, promote and coordinate participation by individual countries specialists in the region. A regional agency involved in practical commercial fisheries research, development training and extension is best suited to undertake this role. Secondly, priority should be given to creating a regional forum of technical specialists to identify targets for Responsible Fishing Technology Research, Development, Training and Extension. A lack of information on the impact of trawling in SE Asian coastal regions and the absence of technical guidelines for conducting and analyzing the results of fisheries experiments are two limiting factors associated with Responsible Fishing Technology. Some early consideration should be given towards

the preparation and adoption of standard methodologies for collection and analysis of selectivity, bycatch and discard data.

5. ACKNOWLEDGEMENTS

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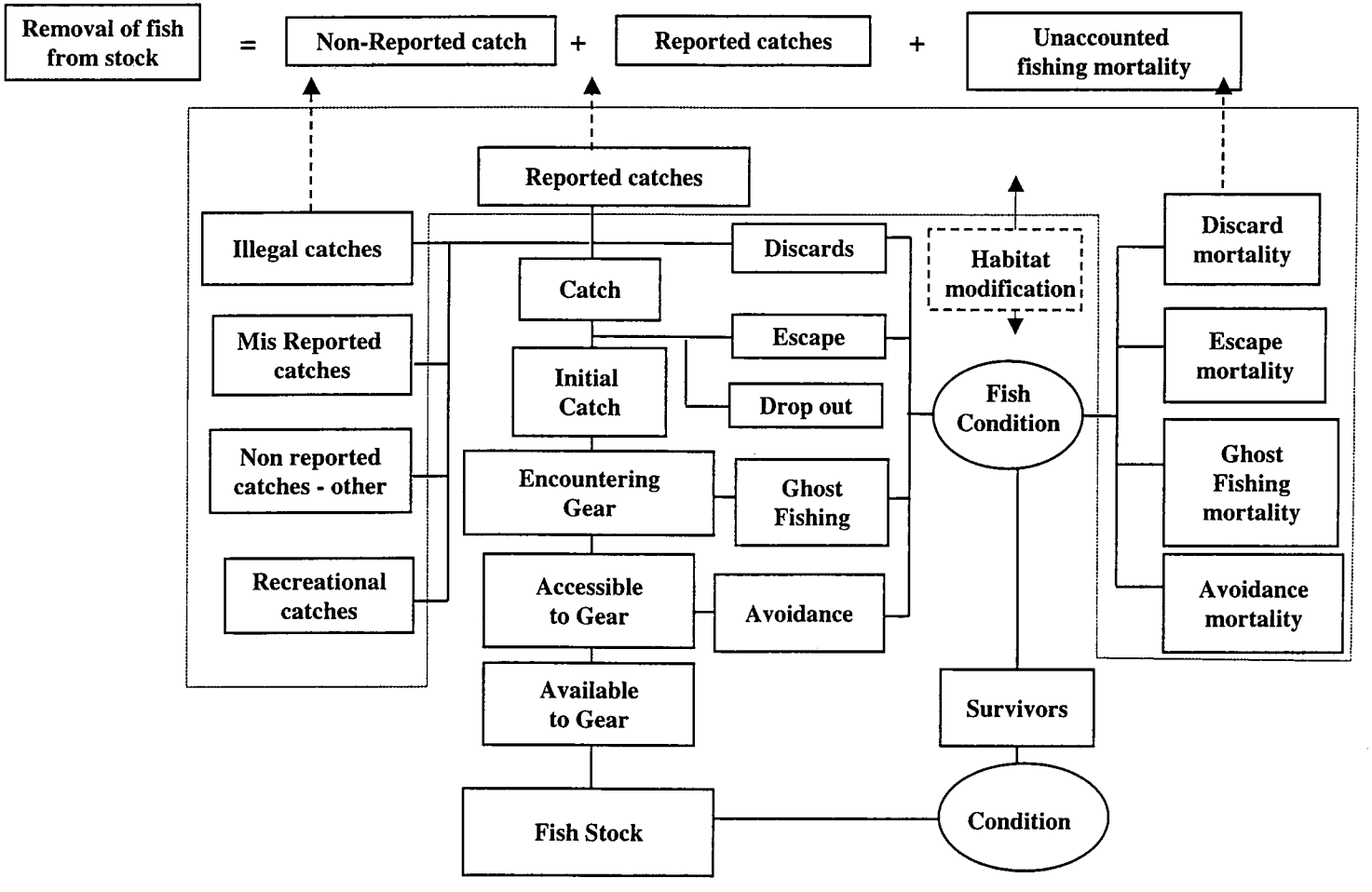

Figure 1. Sources of Fishing Induced Mortality

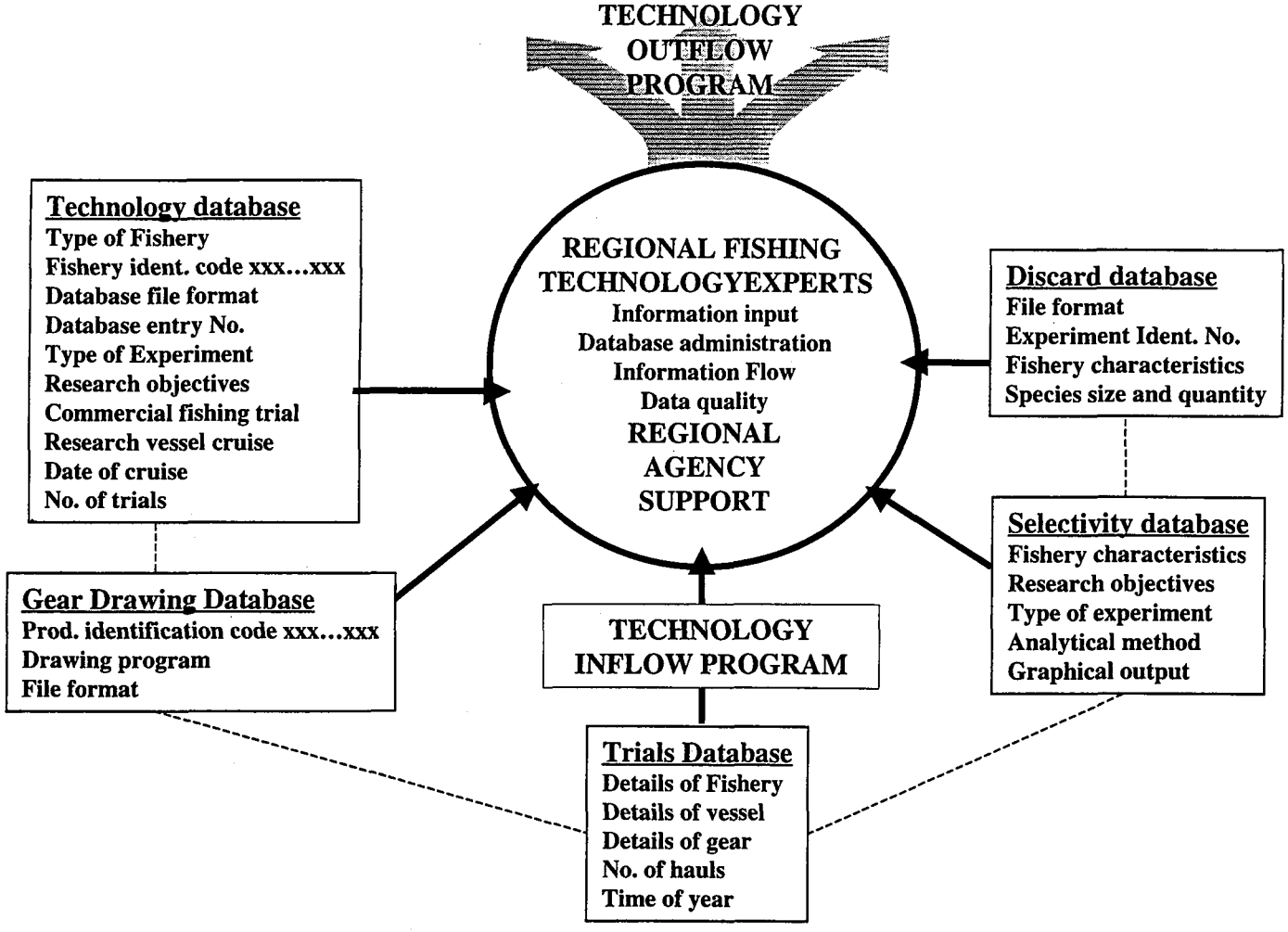

Figure 2. Responsible Fishing Technology Database