

# Report on the Workshop on Management of Small-scale Deep-sea Fisheries

University of Otago, Dunedin, New Zealand  
27 – 29 November

## **1. Background**

Small-scale deepwater fisheries usually occur along the shelf break and shelf slope wherever the continental shelf is relatively narrow and such fishing grounds are accessible to fishermen who use smaller fishing boats. These fisheries are characteristically exploited using drop lines that are retrieved using hand-powered, electric or hydraulic reels. The fish catch may be iced but otherwise little other processing is undertaken at sea.

These fisheries are particularly important to small island states that have few other demersal fish resources though they are also widely found along the continental margins of many continents in tropical and sub-tropical areas. As a consequence of the limited size of slope fish habitats, the fisheries resources occupying these areas are modest in size and of relatively low productivity. Fish that are targeted by these fisheries tend to have longevities of 30 to 50 years, and while they fish may grow to relatively large sizes (50 – 100 cm), growth rates are slow.

Many of the most valuable species are found in aggregations that occur for spawning, feeding or some other life-function purpose. This will make these resources particularly vulnerable to overexploitation and rapid depletion. Further, because of the limited habitats, stock sizes tend to be small, and different spawning populations of the same species may be separated by the smallest of distances. Despite their often relatively modest resource size these resources have the potential to provide sustainable benefits in terms of employment, food security, export revenues and the creation of economic wealth. For smaller countries they represent major renewal resources.

Many countries, both developed and developing, that possess slope fishery resources have inadequate institutional and technical capacity to effectively manage their slope-water fishery resources. Compounding this difficulty is that such boutique-like small-scale deepwater resources require the same complexity of management and many of the same management costs as that associated with large scale fisheries. Data must be collected to support assessments and the provision of resource harvesting advice. Regulations must be drafted, gazetted and enforced. Most of the management problems are generic in nature and so are common to both small-scale and large-scale deep-water fisheries.

A consequence of the high costs to effectively manage slope resources is the risk, if not the reality, that such fisheries develop without an associated improvement in institutional and technical management capacity.

Addressing the problems of managing small-scale deepwater fisheries will require that economies of scale are obtained through providing generic support on a collective basis for countries facing the same management challenges.

## **2. Issues**

### **2.1 Information and Data Collection**

#### *Disaggregation of data to show the geographical scale of fisheries*

Because slope fisheries are small-scale in nature and are locally diverse in structure, data describing fishing activities, even for single species fisheries, must record fine-scale position coordinates to enable effective management of local-area distinct reproductive populations. Collecting such information requires the cooperation of fishermen and the regulatory ability to ensure the data are provided.

#### *Confidentiality of Data*

A common concern of fishing operators when providing their detailed catch location data is concern about how confidentially the data will be treated once it is in the possession of the management authority. Of possible concern is the sale of data by government employees and the failure to ensure that data are securely archived. These problems may be as much one of perception – but they still require appropriate management attention.

#### *Provision of Generic Log Books and other Data Recording and Collection Logistics*

Many national small-scale deepwater fisheries often involve few vessels, often less than 10 and commonly on the order of two or three. Providing appropriate log books (which must be designed and printed) for a few vessels is expensive and usually beyond the capacity of small-country fishery management authorities. This argument may also apply to other data collection requirements, e.g. other related data collection sheets and the funding of port collection activities and associated logistics.

### **2.2 Resource Assessment / Estimation of Resource Abundance**

#### *Knowledge on stock structure*

Available information on stock structure indicates that such resources may be highly restricted in their movement if not almost territorial in the diel movements. Thus fisheries, even in small areas, will probably exploit more than one stock. Management that avoids overexploitation must account for the stock structure of the exploited populations, or adopt risk-averse decision policies that may forgo potential benefits. Resolving this problem will require taxonomic studies to investigate assumptions concerning species distributions and their sub-population structure.

#### *Availability of accurate population biology parameters*

Analysis of the population parameters of slope water species shows that results for the ‘same’ species from different areas may differ widely. Thus, fish considered to be the same species but found in different areas may be different species. In such cases, extrapolating in the use of population parameters will cause errors in estimates of resource productivity and what are desirable levels of resource harvesting.

#### *Use of CPUE as an abundance indicator*

The suitability of CPUE as an aid in fisheries management, in what are characteristically data poor situations, is well recognized. However, it was noted that there were many grounds for concern in the use of CPUE as a proxy for resource abundance.

- i. Where CPUE data were from targeted fisheries, it was important to recognize the danger of overestimating abundance because of failures of assumptions implicit in the  $F = qf$  relationship.<sup>1</sup>
- ii. Many examples were noted of fisheries prosecuted by only a few vessels where the arrival or departure of a single high-liner radically changed conclusions about resource abundance implied by trends in the CPUE. It was apparent that the effect of a single skipper may change average fleet catch rates by more than double.
- iii. These effects emphasized the need for, and care required in, undertaking trend analysis based on CPUE without accurate standardization of measures of effort. It was noted that it may be impossible to avoid at least some error from this cause.

#### *Gear affects on measures of CPUE*

Different gears and gear configurations will influence CPUE (and conclusions based on it) irrespective of any underlying change of resource abundance.

#### *Rapid methods for estimating stock biomass*

Direct estimation methods commonly used in the management of for shelf fish stocks are, by necessity, being used for slope resources. These involved estimating local area abundance, using, e.g. depletion estimates and visual observation, and then raising the estimate by the inverse of the sampling fraction. Concern was expressed about the potential for error as a consequence of:

- i. the multiplicative effect of errors in the estimates
- ii. uncertainty in the size of the population habitat area.

In this context, it was deemed highly desirable that

- iii. decisions based on the resource abundance estimates be appropriately risk averse.

## **2.3 Resource Management - Provision of Harvesting Advice**

#### *Reference points*

Few examples of the use of management reference points in management of slope water fisheries were available. Note was taken of the use of a *spawning potential ratio* and the use of the ration,  $B/B_{MSY}$ . The existence of other appropriate reference points was also noted.

#### *Managing species complexes – multi-species management*

Experiences presented at the workshop indicated that most slope-water fisheries unavoidably caught several species or which at least two would be present in commercially significant amounts. Thus single-species approaches to resource management would sub-optimize management of at least one of the species (if not causing serious damage) while multi-species approaches would be impractical and be subject to well known constraints. It was noted that the consequences to the sustainability of less abundant species in catches must be monitored and investigated when harvesting decisions were based on one, or a few, more abundant indicator species. Risk averse management approaches included that of basing harvesting decisions on the sustainability requirements of the more slowly growing and less productive species.

---

<sup>1</sup> F, the rate of fishing mortality is conventionally assumed to be linearly proportional to fishing effort.

## **2.4 Current Governance Desiderata**

Management of small-scale deepwater fisheries should address common current management objectives such as the “*ecological approach to management*” and the “*Precautionary approach in decision making*”. Much concern was expressed about the ability of many management authorities to satisfy such requirements, particularly when these management approaches were understood at the operational level in only a general context. Of greater concern was the view that many managers lacked the resources to undertake the basic requirements for management – collection and analysis of data, ability to provide advice on a timely basis, etc.

Current management paradigms need to be considered in terms of the priorities of governance needs. It was agreed that the danger of a multiplicity of management and conservation requirements might complicate efforts at governance and be counterproductive in terms of more certainly achieving less ambitious management objectives.

## **2.5 Conservation of Biodiversity & Bycatch Issues**

While it was recognized that managers should remain cognizant of the issues of bio-diversity and bycatch, the experience of the workshop participants was that most small-scale deepwater fisheries were ‘clean’ fisheries with low amounts of bycatch and lower amounts of discards as they primarily used hook and line fishing gear or fish traps.

## **2.6 Quality Control**

Deepwater fishes, through living at greater depths where ciguatera is not a concern, do not pose any danger of toxic products. However, these fish are often caught in countries where the threat of ciguatera is common. When ciguatera-prone species are marketed in fillet form, it is extremely difficult to distinguish these products from those derived from deepwater fishes. However, when toxic product enters the market, authorities rightly ban the sale of all fish products, safe or otherwise, from the country, or region, where the toxic product originated.

This problem is regional in nature. To avoid such costly failures in quality control, a coordinated programme is required to (a), educate those in government who are responsible for undertaking quality and health control programmes to detect ciguatera-toxic product, (b) educate those in industry how to avoid or minimize the risk of exporting ciguatera-contaminated product and (c), institute regional programmes to address this problem.

## **2.7 Protection of Spawning Populations and Sub-populations**

Commonly, many of the more valuable species comprising these fisheries depend on harvesting spawning aggregations. In such it is necessary to avoid extirpating, or severely depleting, local-area spawning subpopulations. Feeding aggregations and aggregations formed for other life history reasons, pose similar threats to resource sustainability.

## **2.8 Governance Concerns**

### *Management Costs*

The relative high cost of managing low-yield low-productivity deepwater fisheries and the challenges this raises for justifying the costs such management involves was noted. Various solutions to this problem were reviewed such as the following.

- i. collaborating in the production of, e.g., generic log books on a regional basis
- ii. regional collaboration in stock assessments
- iii. analysis of the costs and benefits of management with appropriate consideration of externalities such as conservation of bio-diversity and other 'public good' expenses that may reasonably be attributed stakeholders other than fishermen.

#### *Timely management planning*

Because of their small-scale nature considerable uncertainty usually exists as to whether trial, or new fisheries, will be profitable. Thus, the incentives to start commercial fishing in a least-cost manner were recognized. This often meant the start of fishing operations before a management framework could be established to ensure:

- i. data were collected during the extremely important start-up phase of the fishery when resources may be close to their unexploited, or virgin biomass, levels
- ii. regulatory mechanisms were in place to control the expansion of fishing effort to ensure conservation of the stocks avoid dissipation of rent and
- iii. balancing the supply of fish to market demand so as to maximize the benefits to be derived from the fishery resources.

#### *Introduction of Rights-Based Management Practices*

The potential that rights-based management approaches may offer through providing incentives for better management were discussed. There was agreement that this management approach had been successful in better achieving management objectives and ensuring sustainability of resources in a variety of other fisheries situations.

#### *Management of Marine Protected Areas / Restricted Fishing Areas*

The workshop recognized the potential and popularity of marine protected areas (MPAs) and, or, RFAs, as management and conservation tools. However it was recognized that such management methods impose significant costs for enforcement. It was noted that the use of MPAs requires genuine commitment to dialogue that goes beyond treating such consultations as part of a normative management process. As a consequence, in negotiating such zones, stakeholders may seek objectives that are inconsistent with the primary management objectives.

### **3. A Programme for Action**

#### **3.1 Governance Context**

The governance of small-scale deepwater fisheries may be seen within the context of a few critical elements.

- i. Deepwater fisheries prosecuted along continental slopes by small-scale fisheries are characteristically small, often with sustainable yields of only a few hundred tonnes.
- ii. Commercial fisheries for such fisheries rely on aggregating behaviour of the fish, often for spawning but also for feeding or some other reason.
- iii. Thus, such fisheries are particularly vulnerable to rapid depletion, at times even before it is realized that management action is necessary or possible.

- iv. Despite their small size, management of these fisheries requires most, if not all, of the activities required for management of large-scale fisheries. Therefore, in many cases, cost-benefit ratios of management interventions are high and many countries will have great difficulty in funding the research and management activities required to ensure their fisheries remain sustainable.

The workshop identified a number of necessary or desirable actions.

- i. The need to adequately document exploratory fishing and commercial fishing activities, particularly in the early stages of fisheries to facilitate subsequent management efforts.
- ii. “Old” data should be secured and entered into databases to ensure that the information is not lost, especially where operations cease and interest is diminished or lost in the fishery.
- iii. Generic Log Book and other Data Recording Aids - IGO and regional fisheries bodies should undertake or assist in the preparation of generic data recording aids – log books, data recording sheets. Thus recording aids would thus be quickly available to management regimes where such fisheries were currently being exploited or were starting to develop.
- iv. Data collection programmes require resources to enter the information in to computer data bases – this requires adequate funding. If data are not in a readily accessible form, they are of little use.
- v. Managers must convey to fishermen the expectation that data **must** be provided, using either incentives or penalties to ensure compliance.
- vi. Managers should consider the option of rotational harvesting where the small scale nature of the fishery may prevent other means of profitably exploiting the fishery
- vii. Appropriate management protocols must be established. These must recognize the importance of the spatial scale of the fisheries and the likelihood that even spatially proximal fisheries may be exploiting different stocks.
- viii. Management will inevitably be multi-species in nature and may focus on one or two indicator species. This requires appropriate resource modelling cognizant of the possibility that optimal exploitation of one or a few species in the fishery may result in depletion (or under-harvesting) of others.
- ix. Attention should be given to current fashionable approaches in fisheries management and those that are appropriate be adopted. Effective consultation with those directly affected is recommended to maximize the chances of industry support.

### 3.3 “Rapid” Management Approaches

Note was taken of the forthcoming workshop<sup>2</sup> to be hosted by the Western Pacific Fishery Management Council, Hawaii, and to be held in January 2004. The outcomes and success of the workshop should be evaluated to determine if there would be benefits in duplicating the programme in other areas or supplementing any of the workshop activities.

---

<sup>2</sup> Workshop on the Development of Bottom Fish Resource Assessment Methodologies for the U.S. Central and Western Pacific Fisheries. Western Pacific Fishery Management Council, Hawaii. 13 – 16 January 2004.