

FORMULATION OF FISHERIES MANAGEMENT PLANS

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1.0 Introduction

- 1.1 In this paper I will describe and analyse the process by which fisheries management plans are developed and implemented in Australia under the laws of the Commonwealth.
- 1.2 The paper concentrates on the decision-making processes without attempting an exhaustive assessment of all inputs into the system. The paper commences with a brief overview of the jurisdictional and institutional arrangements in Australia for decision-making in respect of fisheries management.
- 1.3 The process of development of management plans is described under the following headings;-
 - timing of introduction of management plans
 - determination of boundaries
 - establishment of Task Forces and Advisory Committees
 - determination of objective
 - collection and analysis of data
 - preparation of document setting out options for management
 - implementation and evaluation of management plans.
- 1.4 The process of formulating management plans is set out in schematic form at Attachment A.
- 1.5 When I refer to management plans for particular fisheries I am referring to arrangements which have as their basis the *allocation of access rights* for a limited number of boats or access rights in the form of individual transferable quotas (ITQ). In the latter case the basic biological and economic objectives can be achieved by the process of allocating ITQ (shares of total allowable catch) and allowing the quotas to be purchased by the most efficient operators. In the case of limitations on the number of boats, additional measures are required to protect the fish stocks and to promote the efficient use of the resources.
- 1.6 An important catalyst for the implementation of management plans for Australia's major fisheries in recent years has been the national consensus that comprehensive management plans involving the allocation of fishing rights should be introduced at an early stage in the development of fisheries. Having achieved that consensus by means of a national policy forum, it was also necessary to obtain support at the regional level to enable equitable management plans to be introduced for particular fisheries. The equitable allocation of fishing rights is a prime objective in fisheries management and can only be achieved within a reasonable time frame if the fishermen and their representatives are closely involved in developing and implementing management plans. When coupled with strong leadership from the government and industry, establishment of industry government management advisory committees on a fishery by fishery basis has provided a firm basis for implementation of new and in some cases quite innovative management plans.
- 1.7 Implementation of fisheries management plans for offshore fisheries has been complicated because Australia is a federation of states and jurisdiction over fisheries has been divided between governments on

the basis of boundaries which in most cases bear no relationship to the geographical extent of fisheries. The Commonwealth and State Governments have agreed to implement new jurisdictional arrangements in an attempt to simplify the decision making process and the administrative arrangements.

2.0 Jurisdictional and Institutional Arrangements

2.1 Commonwealth jurisdiction over commercial fisheries extends from 3 miles beyond coastal baselines to the limits of the 200 mile Australian Fishing Zone (AFZ). The State and Northern Territory Governments exercise jurisdiction over freshwater and inshore fisheries. As virtually all major fisheries overlap these jurisdictional boundaries, all Governments have agreed to rationalise jurisdiction over fisheries by implementation of the Offshore Constitutional Settlement (OCS). Commonwealth and State legislation has been passed to allow establishment of a single jurisdiction for particular fisheries. The options are for:-

- (i) A State to exercise jurisdiction over a fishery out to 200 miles
- (ii) The Commonwealth to exercise jurisdiction from low water mark out to 200 miles
- (iii) A Joint Authority of the Commonwealth and relevant State Ministers to exercise Jurisdiction from low water mark out to 200 miles.

If no agreement is reached to implement one of the three options listed, the status quo applies as far as jurisdiction is concerned.

2.2 Implementation of the OCS offers the prospect of simplifying the decision making process especially for fisheries adjacent to only one State or Territory. There is a fishing industry association in each State and accordingly the association can work with the State Government in developing management plans for local fisheries without Commonwealth involvement. Because of the vast coastline of Western Australia many fisheries off that State are not related to fisheries off another State or the Northern Territory in terms of the fish stocks and the commercial fishing operations. Accordingly, Western Australia can be expected to exercise sole jurisdiction under the OCS over many of the adjacent fisheries. Queensland is in a somewhat similar situation to Western Australia especially as far as the east coast is concerned. In other areas in most cases the fish stocks and fishing activities extend to waters adjacent to more than one State or Territory and accordingly there is a continuing need for the co-ordination of management arrangement for most offshore fisheries by the Commonwealth.

3.0 Timing of Introduction of Management Plans

- 3.1 The traditional approach to fisheries management has been that fish stocks are generally robust and can sustain a high level of fishing. Where fish stocks are seen to be susceptible to over-exploitation, controls have been introduced with the aim of prohibiting or limiting the take of juvenile or breeding fish, or introducing total catch quotas. Such action was accepted as providing protection for the fish stocks with conservation of the stocks being the primary objective.
- 3.2 There is now a growing realisation in Australia that all fish stocks are susceptible to biological over-fishing and that uncontrolled build up in fishing effort and capacity will result in a reduction in catches and profits and an unstable social environment for the fishermen and the local community. There is ample evidence of this in long established fisheries off other countries. While most of Australia's major commercial fisheries are relatively new by world standards, already there is evidence of over-exploitation of many fisheries.
- 3.3 There is widespread acceptance in Australia that management plans should be introduced at an early stage in the development of a fishery. The plans should not only aim to protect the fish stocks but they should also control the build up in catching capacity (investment in boats and equipment). The plans introduced in Australia are based on the foundation of the allocation of access rights to fishermen. These provisions and requirements are in line with the resolutions of the FAO World Conference on Fisheries Management and Development held in 1984.
- 3.4 While Australia has an international reputation for introducing management plans relatively early in the

development of fisheries (the rock lobster, prawn and abalone fisheries), there are a number of examples where management plans have been introduced only after the fishery had been over-exploited from an economic viewpoint and in some cases recruitment overfishing (biological over-exploitation) had occurred, for example in the southern bluefin tuna and southern shark fisheries. The trawl fisheries off New South Wales and Queensland and the Bass Strait scallop fishery are instances where economic over-exploitation occurred before management plans were introduced.

- 3.5 The economic and social cost to the fishermen involved (and to society generally) in an over-exploited fishery can be very high. A very good example is the Bass Strait scallop fishery where unusually high scallop abundance, high scallop prices in the early 1980's, tax incentives for primary producers and shipbuilding subsidies, resulted in a rush of new and larger boats into the fishery. Many of the fishermen have suffered serious hardship and the adverse effects have been felt throughout the local communities and spread to adjacent fisheries.
- 3.6 The lack of tight controls on increases in catching capacity may not result in major economic problems if fish prices rise at a faster rate than costs (as happened in recent years for lobster) or costs are reduced through a major technology change. However, the usual case is that in a fully exploited fishery increasing catching capacity leads to major economic problems. Once these problems set in it is very difficult to reduce effort and capacity. Major constraints will have to be imposed on fishing operations, or catch quotas introduced. Governments come under strong pressure to introduce measures which cause little or no disruption to fishing operations but such measures are ineffective. In the short term, the total catch (fishing mortality) must be reduced to allow stock size to increase if the resource is to be protected and long term economic viability improved. At least in the short run there must be a reduction in the number of fishermen and the scale of fish processing operations. If the fishermen and processors can readily move to alternative fisheries, the adjustment process may not be difficult or costly. Such alternatives are not readily available in Australia (although there are exceptions especially off northern Australia). Thus the problems of adjustment caused through over-exploiting fisheries is increasing every year.
- 3.7 Accordingly, management plans are now being introduced at an early stage in the development of fisheries. One example is the management plan for the south eastern trawl fishery. The inshore sector of the fishery is heavily exploited and the plan includes a mechanism to allow fishermen to introduce larger vessels to develop the deep water fishing grounds by purchasing fishing capacity from within the fishery. This not only relieves the problems inshore but also provides some protection from a build up of excessive fishing effort and capacity for the deep water fishery. Another example is the tuna longline fishery off the east coast. Recently many trawl fishermen and pole and line tuna fishermen have taken up tuna longlining for the high priced sashimi market. A management plan is being developed with the primary aim of ensuring that the benefits from the diversification of fishing operations are not dissipated by the entry of a large number of new fishing units.
- 3.8 There are three further examples where developmental fisheries management plans have been introduced before fully fledged commercial fishing operations had been established. These fisheries are the north west shelf and east coast deep water crustacean fisheries and the Great Australian Bight trawl fishery. At this stage a small number of boat licences are being issued to companies which agree to participate in the development program. The criteria for selecting the participating companies and allocating boat licence endorsements include previous involvement in the fishery or related fisheries, and the capacity to undertake the fishing operations and to develop markets both in Australia and overseas. Details of their fishing operations are monitored and made available to industry generally. The participants are required to undertake market development. The annual boat licences are not transferable and will not be renewed if the company does not undertake satisfactory development activities. If commercially viable fisheries are developed Governments will need to consider whether the access rights of the developers should be confirmed by the issue of transferable boat licences or whether some other arrangements should be introduced. In the meantime the companies have exclusive access to the resources while information is gathered to assist in protecting the resource from over-

exploitation and in developing long term management plans. This security appears to have assisted rather than retarded development (although the development will be kept within the limits of the resource).

- 3.9 To sum up, the timing of the introduction of management plans is crucial for the proper management of fisheries. Action should not be delayed until comprehensive data bases are established covering biological and other information to support management because of the considerable risk of over-exploitation. This applies particularly to the long-lived species (such as southern bluefin tuna and shark) as there are extensive time lags in building up the necessary data base and it takes a long time for such fisheries to recover from over-exploitation (very drastic action is required). It is now generally accepted in Australia that management plans should be introduced at an early stage in the development of commercial fisheries and in fact the stage has been reached where development plans are being introduced to assist in the development of commercial fisheries. The aim is to ensure protection of fish stocks and to provide an environment where efficient and profitable fishing activities can be undertaken. In the past some involved in fisheries management have been concerned that operators would obtain high profits under restricted entry regimes. While these concerns are still expressed, such arguments should not be permitted to stop the introduction of new management arrangements. A range of broad taxation policies are available to address these issues. If the fish resources are not utilised efficiently profits will be dissipated and the general community will be worse off.

4.0 Determination of Boundaries

- 4.1 The factors to be taken into account in setting the geographic boundaries for a fishery to be covered by a management plan include:-
- (i) the geographic distribution of the fish stocks
 - (ii) the need to allow fishermen the flexibility to adopt the most efficient fishing strategies in terms of boats, gear and areas of operation
 - (iii) the need to keep the number of Government and industry groups involved in management decisions as low as possible.
- 4.2 In Australia decisions on boundaries to fisheries are complicated because of the federal structure of Government and the artificial jurisdictional boundaries (at least from a fisheries perspective). As indicated earlier, attempts are being made to minimise the artificial boundaries by implementation of the OCS.
- 4.3 The attitude of the Commonwealth Government is that as far as possible a management plan should cover the full range of the fish stocks and fishermen should be free to employ the most efficient fishing strategies. This does not require that the management plan should cover a very large area or that the Commonwealth should always be involved. For example, if a fisherman is taking abalone or rock lobster, a small boat can be used efficiently in a relatively restricted area. For these and other reasons these fisheries are managed in Australia by the State Governments and will be designated State fisheries under the OCS.
- 4.4 Trawl fish stocks are distributed over wider areas and can be taken most efficiently by larger vessels. However, for a number of reasons, including relatively small stock size and diversity of fish species, very large trawlers have not been the most efficient (the deep water orange rough fishery in the more southerly latitudes may be an exception requiring large vessels).
- 4.5 While trawl fisheries appear to be best managed on the basis of plans covering extensive areas, the third factor in paragraph 4.1 above must be considered. In the case of some localised prawn fisheries off South Australia and Western Australia successful management arrangements have been developed covering gulfs (for example, Spencer Gulf in South Australia and Shark Bay in Western Australia). The size and number of boats and the amount of gear has been restricted and management plans developed in close consultation with the small groups of fishermen involved. However, the plans cover the full range of the particular prawn stocks and the first factor in 4.1 was probably the main factor in establishing boundaries for the fisheries.

- 4.6 Pursuit of the objective of minimising the number of Government and industry groups involved can have adverse effects on the economics of operations. In the case of the Bass Strait scallop fishery, three exclusive zones were established at the request of the States and industry to allow local interests to determine management arrangements for the scallop fisheries in adjacent waters. There are now complaints that the larger operations, who many consider are the most efficient, will not survive in the restricted areas. Moreover, once a fishery is divided this can lead to demands for even further division which can place fishermen in uneconomic operations. Again this has happened in the Bass Strait scallop fishery with further boundaries and restrictions being implemented in the State zone at the request of section groups. Thus, once the principle of non-division of a fishery is set aside, Governments find it difficult to resist calls for further division based on perceived gains (mostly short term) by sectional interests. The emphasis shifts to division of wealth rather than wealth creation through increased productivity.

5.0 Establishment of Task Forces/Advisory Committees

- 5.1 It is now accepted by Governments and industry in Australia that they must work in close cooperation if effective management plans are to be introduced within the shortest possible time. This cooperation is achieved by the establishment of task forces and management advisory committees composed of representatives from industry and Government.
- 5.2 Attachment B shows that such committees have been established for each major offshore fishery where significant Australian fishing activity occurs. These committees report directly to Ministers and thus they are the major forums for the development of policies for management of particular fisheries.
- 5.3 The advantages of industry representatives being involved directly in the decision making process include:-
- they have a detailed knowledge of the fishing techniques, areas of fishing, markets etc.
 - they provide a link between fishermen and processors and Ministers and their advisors
 - they have a good appreciation as to what is equitable between the various interest groups
 - they will press government advisors to reach decisions rather than allow decisions to be put off because of rivalry and competing interests between the parties involved
 - the management measures are likely to be more practical and involve lower costs if the industry is involved in decision making and is required to share the costs
 - the degree of cooperation from industry in implementation of the management plan is likely to be high especially where they contribute to meeting the costs of management.
- 5.4 Nevertheless, difficulties can be experienced in the involvement of industry representatives. These include:
- the pursuit of individual as well as industry objectives within the management group
 - resistance to the introduction of measures to reduce fishing mortality where scientists have identified biological problems, as such measures will reduce profits in the short term and will require adjustment to fishing and perhaps processing operations
 - the possibility that sectional interests will bias the management measures to their benefit at the expense of other participants
 - resistance to the issue of additional fishing licences and to the development of under-utilised resources by those not currently participating in the fishery
 - the problems posed by fishermen speculating against the management committee about changes in management measures as discussions in an industry/Government committee on new management measures can not be held confidential to such a committee.
- 5.5 The Government members on the committees as well as industry leaders and advisors have a duty to ensure that the issues set out in paragraph 5.4 are addressed (recognition of the biological problems in particular). For this and other reasons it would be difficult to have management programs based solely on decisions by

industry representatives. Others, such as recreational fishermen, fish canners, the tourist industry, conservationists and fishermen in adjacent or related fisheries, often have interests which need to be taken into account by governments in managing fisheries. Nevertheless, the objective of effective management of the fishery should be the main consideration and these other interest groups should not be allowed to block implementation of management measures (as has occurred in the United States).

- 5.6 Governments, in cooperation with the national industry groups, are working towards establishing a code of conduct for industry members serving on management committees. However, probably the best safeguard is to have well organised and representative industry associations with governments seeking nominations for industry representatives on managements committees from these associations.
- 5.7 When governments are considering establishing a comprehensive management plan for a fishery where there is already substantial exploitation of the resource, the first step is to establish an industry/government task force. The task force will address the threshold issues of determination of boundaries, management objectives for the particular fishery, data availability and management options. When the preferred management plan is accepted by the government, implementation and ongoing management is entrusted to a permanent management advisory committee. Representation on this committee from the various interest groups is usually similar to the composition of the task force but it is not necessary to maintain very senior representation from government and industry. It is normal for both the catching and processing sectors to be represented.
- 5.8 Finally, technical committees have been established to advise the management committees on the status of the fish stocks. The committees include scientists who are involved in research on the fish stocks or who are responsible for coordinating research in the fishery and perhaps related fisheries. The chairperson of the technical advisory committee or nominee attends management committee meetings and in some cases is a member of the management committee.

6.0 Determination of Objectives

- 6.1 The *Commonwealth Fisheries Act 1952* sets out broad objectives which the Minister must take into account in managing fisheries in the AFZ. These objectives are the need to avoid over-exploitation of fish stocks and the need to ensure optimum utilisation of the resource. These objectives are in line with those set out in the latest Law of The Sea text.
- 6.2 In order to develop detailed management plans for particular fisheries, task forces need to define the objectives with more precision. This is a difficult task where more than one fishery authority and major industry group is involved. Their respective objectives can be in conflict. The chairperson of the committee has the task of ensuring that the different viewpoints are reconciled while not compromising protection of the fish stocks and promotion of economic efficiency.
- 6.3 If there is a stock conservation problem it is necessary to determine the objectives with more precision in terms of targets. The scientists should be required to nominate a range of yield estimates on a stock by stock basis with the aim of assisting the management committee to assess the risks associated with increased fishing mortality. This is important during the early stages of development of a fishery as time is required to gather biological information. The scientists might also be asked to estimate levels of fishing mortality which could maximise yield from the fishery in the longer term. Such estimates normally require a lengthy period of exploitation and considerable biological data. At this stage it may be necessary to close the fishery for a period or introduce other measures such as catch quotas to allow the parental biomass to increase.
- 6.4 When the scientific advice is received the Management Committee should seek to define the conservation objective in clear terms. Preferably the committee should agree on the maximum level of fishing mortality to be permitted based on an assessment of the risk of recruitment overfishing. If there is insufficient scientific information on which to base precise conservation targets, then the objective should be to control the build-up of fishing mortality until improved scientific information and advice is available. This is a very difficult issue for the management committee to address as it could be held to be in conflict with the objective of

optimum utilisation and the development objectives of governments. However, the costs involved in over-exploiting the resource can be very high in terms of reduced catches and economic and social dislocation. The South Eastern Trawl Management Advisory Committee and its scientific advisory committee are addressing this issue by establishing fishing mortality targets based on the concept of “maximum prudent yield” (eg; for blue grenadier) in order to contain fishing mortality at a “prudent” level pending the gathering of information and more detailed stock assessments.

- 6.5 The second major broad objective is optimum utilisation of the resource. This covers economic, social and political objectives. From an economic viewpoint it recognises that effective fisheries management plans can result in the resource being taken efficiently with the minimum inputs of capital and labour. The term “maximum economic yield” is used in the literature on fisheries management to refer to the level of total fishing capacity at which profits for the fishery are maximised. The maximum economic yield is achieved at a lower level of fishing effort and capacity than the “maximum sustainable yield” (maximum long term catch). This issue is more complex in multi-species fisheries.
- 6.6 Established and heavily exploited fisheries can be assumed to be over-exploited from an economic viewpoint. However, no comprehensive studies have been undertaken in Australia to attempt to precisely measure the degree of economic over-exploitation. The economic studies that have been undertaken do indicate that in most fisheries the level of overall profit is not high although the most efficient can earn very high returns to capital.
- 6.7 As all established fisheries in Australia are subject to limitations on entry and in almost all cases access rights are transferable (or are subject to management plans which are based on individual transferable quotas), the value of the licences or quotas reflect expectations as to future profits.
- 6.8 In addition to the difficulty in precisely establishing the target level of catching capacity which maximises economic yield, in practice governments and industry have not accepted the desirability of such an explicit economic objective of fisheries management. If precisely stated, major reductions in catching capacity would be required to maximise the longer term benefits. This would highlight the major structural adjustment problems and it is difficult for governments and industry to accept the need for such change and to implement appropriate measures. Thus, more general economic objectives are listed such as the need to reduce excessive fishing capacity over time. In the case of the south eastern trawl fishery this was stated to be the objective for the heavily exploited inshore areas and pressure on this sector was to be relieved by controlled development of the offshore areas.
- 6.9 As well as reducing excessive fishing capacity, another economic objective is to ensure that the fish are taken at the best size for marketing. This should not be confused with the biological objective of maximising yield per recruit” because optimum market size may require catches of smaller or larger fish. Targets designed to achieve this objective could be the closure of the fishery, or areas of the fishery, for parts of the years or restrictions on the use of gear (eg small mesh in nets) which can also protect immature animals and thus serve a dual purpose as a conservation measure.
- 6.10 In addition to the conservation and economic objectives, the following additional objectives are usually included in the management plans:
 - the need to ensure an equitable sharing of access to fish resources between the various interest groups
 - the need to involve industry in decisions on management
 - administrative feasibility combined with the need to minimise the costs of administration and enforcement
 - the development of under-utilised areas and species to provide employment and other benefits
 - the minimisation of social dislocation particularly for isolated communities
 - the need to ensure that biological and economic data are gathered and analysed.

7.0 Collection and Analysis of Data

- 7.1 In order to determine boundaries, objectives and management options, it is necessary to gather all the available biological and economic information. However, this should not unduly delay formulation of management options and implementation of at least the first stages of the management plan, because the management problems will worsen the longer the delay in implementing measures. The only exception would be where the price of the fish falls substantially or fishermen face a rapid increase in their costs. Reduced fish prices or high costs would have the same effect as taxes to constrain or reduce fishing effort and capacity. This would result in lower fishing mortality and thus reduce the biological problems. However, the economic problems would remain. Moreover, in practice once a task force or management committee is established fishermen speculate on closure of the fishery or other management measures. While warnings have been issued by Ministers to the effect that speculators will not qualify for access rights, such warnings are ignored by some fishermen. Unless concrete interim measures are taken the management problems will worsen during the period that data are collected, analysed and the options assessed.
- 7.2 The amount of biological and economic data available on commercial fisheries is naturally related to how long commercial fishing operations have been undertaken and the intensity of fishing activities. As Australia's major commercial fisheries have developed over the last twentyfive to thirty years, and some only in very recent years, the biological and economic data bases are not comprehensive. In fact the economic data bases are typically poor and economic assessments of management options have rarely been undertaken in a rigorous manner before management arrangements have been introduced. This reflects the widespread view held until recent years by fishermen and fisheries managers that management measures should address only biological and social objectives. Fortunately this did not always inhibit governments in implementing management measures which have slowed the rate of increase in fishing capacity.
- 7.3 To date most of the funds allocated for fisheries research have been devoted to obtaining biological information in support of managing fisheries. Each year about A\$30 million is allocated for fisheries research by Commonwealth and State governments. It should be noted that this represents 5% of the total value of production of Australia's fisheries (A\$600 million). Research in respect of marine fisheries is costly but the benefits from well targeted management-oriented research are potentially high especially if coupled with an effective management plan. Most of the funds are derived from the general revenue of the governments but increasingly governments are levying fishermen to meet at least a portion of the costs. Thus, the research budgets of fisheries authorities will come under greater scrutiny from industry.
- 7.4 Australia's major crustacean and mollusc fisheries (prawns, lobsters and abalone) have been heavily exploited for many years and substantial data bases have been developed. These sets of information include all or part of the following:
 - environmental conditions such as water movement, temperature and salinity
 - life history characteristics such as reproduction (including fecundity and size at first reproduction), growth and mortality
 - behavioural patterns such as geographical distribution and migration and recruitment
 - catch and catch per unit of effort
 - landed catch and domestic and export market values.
- 7.5 Considerable biological research has been undertaken for some long standing fisheries such as the valuable western rock lobster fishery. For this fishery Commonwealth and State fisheries research organisations have cooperated in the research effort in support of management. They are now able to predict future recruitment to the fishery (and thus future catch levels) some years ahead which is of obvious benefit to the managers and fishermen.
- 7.6 However, for the major prawn and fish trawl fisheries on the east coast, the data sets are not as comprehensive. This partly reflects past attitudes of some fisheries authorities that prawn stocks cannot be over-exploited

and thus it is a waste of time and effort to devote extensive resources to collect and analyse biological and catch and effort data. Because of their high fecundity and short lifespan the common view was that prawn stocks were not vulnerable to recruitment overfishing. This view is now being questioned as a result of the sophisticated fishing operations which can result in a very high proportion of the stock being taken each year. A major environmental hazard such as a tropical cyclone, which can destroy juvenile habitat, can combine with heavy fishing to compound the fall in recruitment to the fishery. Major reductions in total catches have been recorded for a number of prawn fisheries over long periods. Catch rates have improved following action to reduce fishing mortality.

- 7.7 Thus, biological data need to be collected for all fisheries to enable stock assessments to be undertaken and to obtain information which will assist in assessing the optimum economic rate of exploitation. However governments will need to make judgements on how to give research priority to highly vulnerable fish stocks and especially those that are of high commercial value.
- 7.8 Biological data are collected through special research programs as well as ongoing monitoring of fishing activities. Logbooks covering catch and effort data are collected from most fishermen and form a basic component of all stock assessments in Australia. Pre-season trawl and acoustic surveys are not generally undertaken for the purpose of determining fish abundance and annual quotas. However, in most prawn fisheries pre-season trawl surveys are used to determine the best time to open the fishery to achieve high catches of large prawns.
- 7.9 The data are used to identify factors which contribute to the health of a fishery as well as providing data for stock assessment purposes. They can point to the need to protect nursery areas (such as seagrass beds and mangroves) as well as protecting immature fish through limits on the allowable size to be taken. The minimum size limits applying in the lobster fisheries are considered to be of great importance in protecting these fish stocks from over-exploitation. For some species of prawns, relatively small areas of seagrass have been identified as of major importance in providing recruits to the fishery. More attention is now being given to the protection of immature prawns following recognition of recruitment overfishing.
- 7.10 As regards stock assessment, data collected and methods employed vary widely. Direct methods of estimating the size of stocks (for example, visual and acoustic surveys) have not been widely employed partly because Australian fisheries are not heavily dependent of schooling fish. Thus, indirect methods have been used to estimate biomass and sustainable yields. In the case of the South Eastern Trawl Fishery where a comprehensive logbook was only recently introduced, the initial estimates of yields from the various stocks have been based largely on acoustic surveys of the trawlable grounds and trawl surveys to measure catches on the grounds.
- 7.11 Surplus production models based on catch surveys or catch and effort data are widely used as a measure of sustainable yields. However, these methods can result in wide errors in estimation. For the trawl surveys there are wide margins of error particularly relating to the catchability coefficient which could be unrepresentative of the true situation. Catch and effort data need to be used cautiously particularly since real fishing effort can increase as a result of many factors which are difficult to measure. The accuracy of the fishermen's records is sometimes questionable.
- 7.12 For these and other reasons fisheries authorities are turning increasingly to full analytical methods for stock assessment especially for vulnerable and highly valuable species. Virtual Population Analysis (VPA) or cohort analysis is now being undertaken for a number of fisheries. If there is one long-lived species comprising the fishery this method can provide accurate stock assessments. Data are required on fishing mortality at age and population number per age class (cohort). Catch and effort data are used in conjunction with aged samples from the population. Cohort analysis is supporting management of the southern bluefin tuna fishery under which transferable catch quotas have been allocated to participants. For multi-species trawl fisheries, the collection of such data can be time consuming and very expensive.
- 7.13 In the case of biological data, the position may be summarised as follows:

- implementation of at least interim management measures should be based on available data and should not await collection and analysis of additional data
 - data on the environment and reproduction and behaviour of the species is required to implement low cost measures of protection for the stock (protection of nursery areas and immature fish) and to ensure that fish are taken at the optimum market size
 - more information and analysis will be required if the stocks are considered to be susceptible to biological over-exploitation and/or if quotas are to be introduced (eg information to support cohort analysis or expensive acoustic or trawl surveys where one year's recruits form a significant portion of the total stock)
 - technical advisory committees should report to all the management committees - they should be required to agree on the objectives of the research with data collection and analysis related directly to the agreed objectives
 - the technical advisory committee should produce regular reports on the state of the fish stocks, initially providing estimates of maximum yields and, as additional information becomes available, more precise stock assessments
 - if the stocks are not considered to be at risk from biological over-exploitation and/or ITQs are considered impractical or undesirable for the fishery, a less complex data base and stock assessment is required.
- 7.14 Major economic benefits can be generated if fisheries are properly managed to avoid biological and economic over-exploitation. Increased quantities of fish can be taken by the same number of boats and fishermen or the number of boats or fishermen can be reduced. In both cases productivity is improved and this is a basic objective of any successful business. In a fully exploited fishery with no effective access rights a fisherman can only take increased catches at the expense of other fishermen and over time the catch of the fleet may decline. If improved management plans can be implemented the potential economic benefits can be substantial. Thus, it could be argued that governments and industry should invest heavily in research in support of management.
- 7.15 The biological data also provide an essential input for economic assessments of fisheries. Thus, fisheries economists need to acquire a basic understanding of fisheries biology and stock assessment. Economists and managers also need to gather additional economic data to support management. The primary means of gathering economic data in respect of fisheries in Australia (as well as for other rural industries) is a full survey of all operators. Information on income and expenditure including depreciation on assets, is gathered by a field survey team. Full reports are prepared on net cash operating surplus and returns to capital and labour together with an assessment of the implication for management of the fisheries. At the Commonwealth level these surveys and reports are undertaken by the Bureau of Agricultural Economics (for example, a full report by the BAE on the South Eastern Trawl Fishery was published in August 1986). The BAE is currently assessing the feasibility of carrying out economic assessments using information from a sample of fishermen and indices of revenue and cost for the fishery. If successful, more timely economic data will be available to fisheries managers.
- 7.16 Direct surveys of fishermen by management authorities are also undertaken especially before implementing major changes to management arrangements. Information is sought on the fishing boat and gear used and fishing activity over recent years. Local fishing inspectors are often asked to verify information. They are involved in assessments as to the practicality of implementing management measures.
- 7.17 In addition, fisheries authorities need to maintain records covering quantities of fish sold and prices obtained in the major markets and information on trading in licences and quotas. As most fishing licences are transferable, fluctuations in the value of licences and quota are a barometer of the economic situation and expectations of future profits.

8.0 Preparation of Options Papers

- 8.1 After a task force or management committee has been set up it is necessary to establish mechanisms for

communicating with the fishermen. While there are opportunities for direct communication especially between industry representatives and fishermen, more formal links need to be established.

- 8.2 The need for good communications with fishermen to achieve practical and political objectives is obvious. Good information and political support are essential.
- 8.3 Accordingly, before any major fisheries management proposals are submitted to governments, documents are sent to all fishermen involved setting out information, analysing options and seeking comments. Biological problems in particular require full assessment. The range of awareness of biological problems varies enormously. Some fishermen are concerned by falling catch rates while others accept this as merely evidence of increased competition.
- 8.4 If the management problems are to be addressed and overcome they must be clearly set out for the fishermen. In recent years the task forces and management committees have prepared documents for consideration by fishermen which provide biological and economic information, set out objectives as perceived by the committee and then assess the options for management. In a fishery which has not been covered by comprehensive management arrangements, including controls on total fleet fishing effort and capacity as well as the allocation of fishing rights, the options papers are broad in scope and of vital importance to all involved in the fishery.
- 8.5 The purposes of the broad options paper may be summarised as follows:-
 - (i) it is the committee's basic reference document
 - (ii) it requires the committee to address its terms of reference in an orderly manner
 - (iii) it forms part of the committee's work which is open to public scrutiny
 - (iv) it provides a means of communicating with those who will be affected by the management plan
 - (v) it focuses the attention of the committee and those who will be affected by the plan on what they want to achieve
 - (vi) it stimulates discussion on the management problems and how they might be addressed.
- 8.6 To achieve these objectives the options paper should contain:
 - (i) the terms of reference and membership of the task force or management committee
 - (ii) a description of the extent and nature of the fish processing and marketing operations
 - (iii) information on the fish stocks including scientific advice on the state of the stocks, their vulnerability to biological over-exploitation and whether fishing mortality is excessive in relation to the sustainable yields (or in relation to the assessed risk of overfishing)
 - (iv) information on the economic state of the fishery, the level of excessive fishing capacity and constraints on achieving improved economic efficiency posed by existing fishing management measures or controls on processing or marketing
 - (v) details of existing controls on fishing, processing and marketing and the reasons for introducing such controls
 - (vi) the proposed objectives for management of the fishery
 - (vii) the broad options for management of the fishery
 - (viii) discussion of the options relating them to the objectives - for example how fishing effort and capacity will be contained or reduced; how fishing under-utilised areas and/or species will be promoted; how vessel efficiency will be maintained or improved; ease of implementation and administration; effect on particular regions and employment; effect on operational flexibility and other fisheries; how the measures will ensure optimum market size of fish taken, etc
 - (ix) a summary of the options including estimates of the costs of maintaining the data bases and the cost of implementing the various options
 - (x) an assessment of whether fishing rights should be transferable.

BASIC OPTIONS FOR MANAGEMENT

8.7 The basic options for managing fisheries can be discussed under the following headings:

- A Open Access
- B Taxes on Inputs or Outputs
- C Limited Entry
- D Individual Transferable Quotas (ITQ)

A. OPEN ACCESS

- 8.8 Under this option anyone can enter the fishery provided the person has a master fishermen's licence and a general boat licence. In order to meet conservation objectives it may be necessary to discuss the introduction of limits on the minimum size of fish that can be taken, total catch which can be taken from the fishery etc. To meet social or political objectives it may be necessary to suggest controls on the size of boats, amount of gear that can be used or areas which can be fished (or times when fishing can occur).
- 8.9 It should be noted that under this option the total amount of fishing capacity and labour which will be employed will be far in excess of that required to take the resource efficiently. Controls on the type of vessels and gear to be used will add further to the inefficient use of capital and labour. Against this, regulatory costs will be low and at least initially fishermen will be relatively free from government imposed constraints on their operations. However, capital and labour will not be used efficiently and as biological problems develop, major adjustment problems can be expected to arise. Catches and catch rates will be high initially and this will attract levels of investment far in excess of what can be sustained by the fishery on a long term basis. Fishermen will leave the fishery and/or governments may provide financial assistance which will provide only temporary relief. Total quotas will be taken during progressively shorter periods of time with problems for continuity of fishing, processing and marketing operations.
- 8.10 Finally, in the absence of fishing rights fishermen will see less advantage in cooperating with fisheries authorities in managing the resource.

B. TAXES

- 8.11 This option requires the government to impose taxes on inputs or outputs in order to reduce fishing effort and capacity. The marginal operators leave the fishery and in the process the community benefits from the revenue from the taxes. Thus, the biological objective of containing fishing mortality is addressed as is the economic objective of reducing fishing capacity. Initially the government could use some or all of the tax revenue to provide adjustment assistance for the marginal operators.
- 8.12 If the tax is set at a sufficiently high level to avoid over-exploitation of the resource, other regulations which reduce efficiency of the fleet would not be necessary. In this respect the option is similar to the ITQ.
- 8.13 This option could also be seen as providing a direct return to the community from use of the resource over and above the return obtained from taxes, such as income and capital gains taxes, which apply to all individuals and companies. Thus, if the tax revenue is not used directly in managing the fishery, it could also be seen as a "resource rent tax". It would serve the dual purpose of a fishery management measure and a means of providing the community with a resource rent. In this way it is unlike the other options.
- 8.14 The options paper would need to address the practical problems in implementing this option. They would include the means of setting the level of the tax and administrative arrangements for collecting the tax.
- 8.15 Taxes have not been used in Australia as the principal means of managing any fishery. In the past, management plans have not been introduced until there were over-capacity problems and imposition of a tax in a situation of generally low profitability would pose political problems. If management plans are implemented at an early stage in the development of a fishery this may not be such a problem (also fishermen would not have had an opportunity to stake their claim). Another political problem would arise if other fisheries are managed under limited entry or ITQ arrangements and a resource rent tax is not levied for the other fisheries. In fact taxes are not required under an ITQ system to address the economic and biological objectives. The fishermen

subject to the tax would claim that the Government is discriminating against them in imposing a special tax as well as not granting them exclusive access rights. It could be argued in these circumstances that Treasury Ministers should take up the issue of a resource rent tax to apply to all fisheries.

- 8.16 Like the open access option fishermen are less likely to cooperate with fisheries authorities if they have no access rights.

C. LIMITED ENTRY

- 8.17 This is the most popular option with most fishermen as it appears to reward participants in the fishery with a windfall capital gain associated with exclusive access rights together with a limit on competition from new entrants. However, while the short term benefits to the original participants in the fishery are obvious, this basic system of fisheries management must be exposed to analysis based on the objectives for management (particularly the requirements of the Fisheries Act to avoid over-exploitation and promote optimum utilisation).
- 8.18 As regards biological objectives, limiting the number of boats will have only short term benefits at best. At worst limiting entry will compound the biological problems by encouraging fishermen to stake their claims.
- 8.19 With regard to economic objectives, again the benefits will only be short term unless additional measures are incorporated into the management plan. There are many ways for fishermen to increase fishing effort and capacity without introducing larger and more sophisticated boats, such as by introducing new technology and the gradual improvement in performance of skippers and crew.
- 8.20 Thus, the options paper must point out that limiting the number of licences will not be sufficient to meet any but the very short term objectives and unless more sophisticated programs are introduced, limited entry could exacerbate biological and economic problems by attracting investment to a fishery where access rights have been "secured".
- 8.21 The first major issue to be addressed in canvassing this option is the criterion for the allocation of licences for access rights covering boats and/or fishermen. Alternatives include previous commitment to and dependence on the fishery or the auctioning of rights. In all cases, initial access rights in respect of Australian fisheries have been based on commitment in terms of fishing activities or substantial investment in building or equipping a boat for the fishery and to a lesser extent financial dependence on the fishery. If there are major biological and/or economic problems the options paper could suggest tight criteria for entry including minimum tonnage of fish taken/or money invested. However, it will not be possible to discriminate against smaller scale operators especially if they have no economically viable alternative fishing activity. Thus, the options paper must emphasise that unless the plan is introduced very early in the development of a fishery, limiting entry will not be sufficient to address the immediate (let alone long term) biological and economic objectives.
- 8.22 Accordingly, the limited entry option must be seen as only a step in the process of implementing a comprehensive management plan. Further means of constraining fishing effort and capacity are to place an overall limit on the catch of the fleet or not to permit fishermen to replace their boats with more effective fishing units. The total catch limit, if it can be implemented and is based on sound biological data and assessment, will achieve the main biological objectives but will be completely ineffective in addressing the economic objectives. Limits on boat replacement will not achieve the biological objectives (constraining effort and catch) and may only slow down the rate of increase in catching capacity. This may be sufficient in a developing fishery but it has the additional disadvantage that fishermen will be constrained in improving efficiency by introducing more sophisticated vessels.
- 8.23 More efficient adjustment mechanisms must be established if the economic efficiency is to be improved. In Australia a number of options are being pursued and these options are now listed in management papers for Australian fisheries. The options are based on the concept of "units of capacity" which are established by allocating fishermen more definitive fishing rights. Units are allocated on the basis of the gear used (number of lobster posts or length of gillnet) or the size of boats and/or engines. Units of capacity have been established for most of Australia's major fisheries.

- 8.24 Selection of the “units of capacity” to be used will be based on an assessment of the factors which most closely reflect the catching capacity of the boat and practicality of administration and enforcement.
- 8.25 The units can be traded between fishermen which allows for an aggregation of units to improve productivity per fisherman.
- 8.26 This may be sufficient to achieve the management objectives in a lightly exploited fishery where there is substantial opportunity to increase the total catch of the fleet. The fishing effort and capacity will continue to increase as fishermen increase their effort and capacity by increasing inputs not covered by the units (eg size of boat where there are gear units), by adopting improved technology (eg electronic fish finding equipment) or increasing the time spent fishing. In a heavily exploited fishery, additional measures must be considered to contain and reduce fishing and effort capacity.
- 8.27 Thus, the options paper will need to canvass means of reducing fishing effort and capacity in a fully exploited fishery. If the economic objectives of ensuring a continuing improvement in productivity are to be achieved this will require a reduction in labour utilised and the number of boats involved (this is assuming the total catch cannot be increased in the medium to longer term). The boats to be retired could be used to develop other fisheries or they could be scrapped. The labour could also be diverted to other fisheries or to alternative employment outside the catching sector of the fishing industry. The process of adjustment requiring a reduction in the number of productive units to achieve higher productivity is one which must occur in any industry where total output is static if the industry is to remain competitive and contribute to increasing overall community welfare. However, investment capital will still be attracted by large profits earned by the “highliners” (top boats in the fishery) or because of the desire of processors to secure supplies of fish; or because prices for the fish have been rising at a faster rate than costs. Those involved in management of the fishery should not be deceived by high licence values in these situations. It is clear that any management plan for a heavily exploited fishery based on limited entry will require an adjustment program which will act to continually reduce the number of boats in the fishery. The adjustment program must form an integral part of the management plan.
- 8.28 Even if fishing mortality (total catch) can be regulated by other means under a limited entry regime (eg prohibition on the take of immature fish, total catch quotas) there is still a need to address the economic objectives. A well founded adjustment program may also provide substantial protection for the resource as well as address the economic objectives.
- 8.29 The options paper must emphasise the need to incorporate an automatic adjustment mechanism in a limited entry management plan. Under options B and D adjustment occurs autonomously. Under limited entry the adjustment mechanism must be constructed. If it is not automatic the political problems of introducing adjustment programs will need to be faced on a continuing basis. More importantly, fishermen will not be able to plan their operations over a long time frame unless the “rules” are clear and remain in force for a reasonable period.
- 8.30 It is only in recent years that consideration has been given to incorporating automatic adjustment mechanisms in limited entry management plans. The rock lobster fishery off West Australia has been widely classified as a well managed fishery but even in this fishery the lack of an automatic mechanism to contain increasing fleet fishing capacity and effort is evidenced by concerns about developments in the fishery. The Western Australian authorities recognise that fishing effort and capacity are excessive and increasing. Over the 23 years in which the management plan has been in operation, the efficiency of fishing operations has increased (through improved technology) despite strict controls on boat replacement. When combined with substantial \$A increase in the price of lobster over the years, average profits have increased. The same number of boats are taking a similar total catch but they are applying more than twice the fishing effort. Controls on the minimum size of first capture of lobster provide substantial protection for the fish stock. In addition, the length of the closed season has been increased. However, the fishery is over-exploited both biologically and economically and there is no automatic adjustment mechanism in the management plan to contain total fleet effort and capacity. Attempts to reduce the number of lobster pots per boat are being strongly resisted as

many fishermen have entered the fishery in recent years paying large premiums for the pot authorities. With hindsight a mechanism could have been incorporated in the management plan many years ago to reduce the number of pots and the number of boats over time.

- 8.31 Accordingly, it is vital that the limited entry option include an adjustment program which will act to contain total fishing effort and capacity and thus reduce the number of fishing units over time. The options for adjustment programs under limited entry plans include the following:-
- (i) surrender of units of capacity on the introduction of a new boat or engine (as in the South Eastern Trawl Fishery)
 - (ii) surrender of units of capacity on transfer of licences (see NSW and Victoria requirement in respect of abalone purchase of two licences by a new entrant)
 - (iii) surrender of units of capacity periodically (e.g. the lobster fishery in the south east of South Australia where all licence holders were required to surrender a percentage of their lobster pot holding)
 - (iv) purchase of licences under a buy-back scheme funded by Government and/or a levy on fishermen remaining in the fishery (as in the Northern Prawn Fishery).
- 8.32 It has been suggested that if there is no upper limit or a high upper limit on the number of units of capacity that an individual operator can hold, there will be a gradual reduction in the number of operators which will achieve the biological and economic objectives. While a reduction in the number of boats is likely to result in improved efficiency of the fleet it will not automatically result in reduced fishing mortality. Thus, one of the options listed in paragraph 8.31 needs to be included in any limited entry regime in respect of a heavily exploited fishery. Even if the fishery is not fully exploited, inclusion of an adjustment program in the plan will condition all concerned to the need for a reduction in the number of boats in particular fisheries in the longer term.
- 8.33 It is important that all involved in management of the fishery recognise that a limited entry management program which does not include an effective adjustment program will inevitably fail to meet the economic objectives. Experience suggests that the requirement to purchase two licences by a new entrant will be effective in reducing the number of boats. However, there are difficult administrative problems to be overcome in order to effectively impose conditions on the transfer of licences. In Australia this requires that the licence be issued to an individual and that preferably the individual licensee also operate the boat.
- 8.34 Periodic surrender of units will achieve some success but will be strongly opposed by the marginal (least profitable) operators.
- 8.35 Surrender of units on replacement of vessels and/or engines will achieve significant containment of catching capacity. However, the full effects have yet to be assessed and the surrender must involve a high percentage of the units of capacity. This could discourage the introduction of improved technology.
- 8.36 The buy-back option has been tried overseas with little success in the longer term. The tendency is to offer licences and/or units of capacity to all who have a claim for access to the fishery and then attempt to buy back a percentage of the licences or units. Unfortunately the money available is usually expended before tangible results are achieved. It is clear that the operators should contribute to meet the cost of buy back and that it should be used in conjunction with other adjustment programs as a counter-cyclical measure (purchase of licences when licence values are depressed).
- 8.37 The buy-back scheme for the Northern Prawn Fishery has been funded partly by the fishermen and in future they will meet all the costs. Recently Government and industry agreed that the levy on fishermen would be substantially increased to accelerate the reduction in fishing effort with the proviso that if effort is not reduced to the desired level within three years all licence holders will be required to surrender units to ensure the target reduction of effort is achieved.
- 8.38 One final issue is the question of transferability of licences. Practically all limited entry fishing licences in Australia are transferable and attract a value. New entrants have to pay for licences as well as the boat and

need to generate sufficient income to service the investment. Some suggest that substitution of licence values for new boats is of little or no benefit especially as limited entry seems to attract additional investment and thus exacerbate the over-capacity problem. It is suggested that this can be addressed by making licences non-transferable with Government having the sole power to "arrange" transfer of licences. This offers the prospect of containing fishing effort and capacity by ensuring that licences have no value. However, without licence/unit transfer many of the adjustment programs could not work. Moreover, a licence market would allow for entry of operators who would make the greatest contribution to increased productivity. Any Government allocation of licences is bound to be less efficient and subject to criticism.

- 8.39 To sum up, the options paper will need to canvass the basis for allocating access rights and the alternative means for incorporating an automatic adjustment program into the plan. The choice of adjustment program will depend on administrative convenience and political factors including perceived efficiency of the programs. The economic effects of the alternative adjustment measures have not been closely researched.

D. INDIVIDUAL TRANSFERABILITY QUOTAS (ITQS)

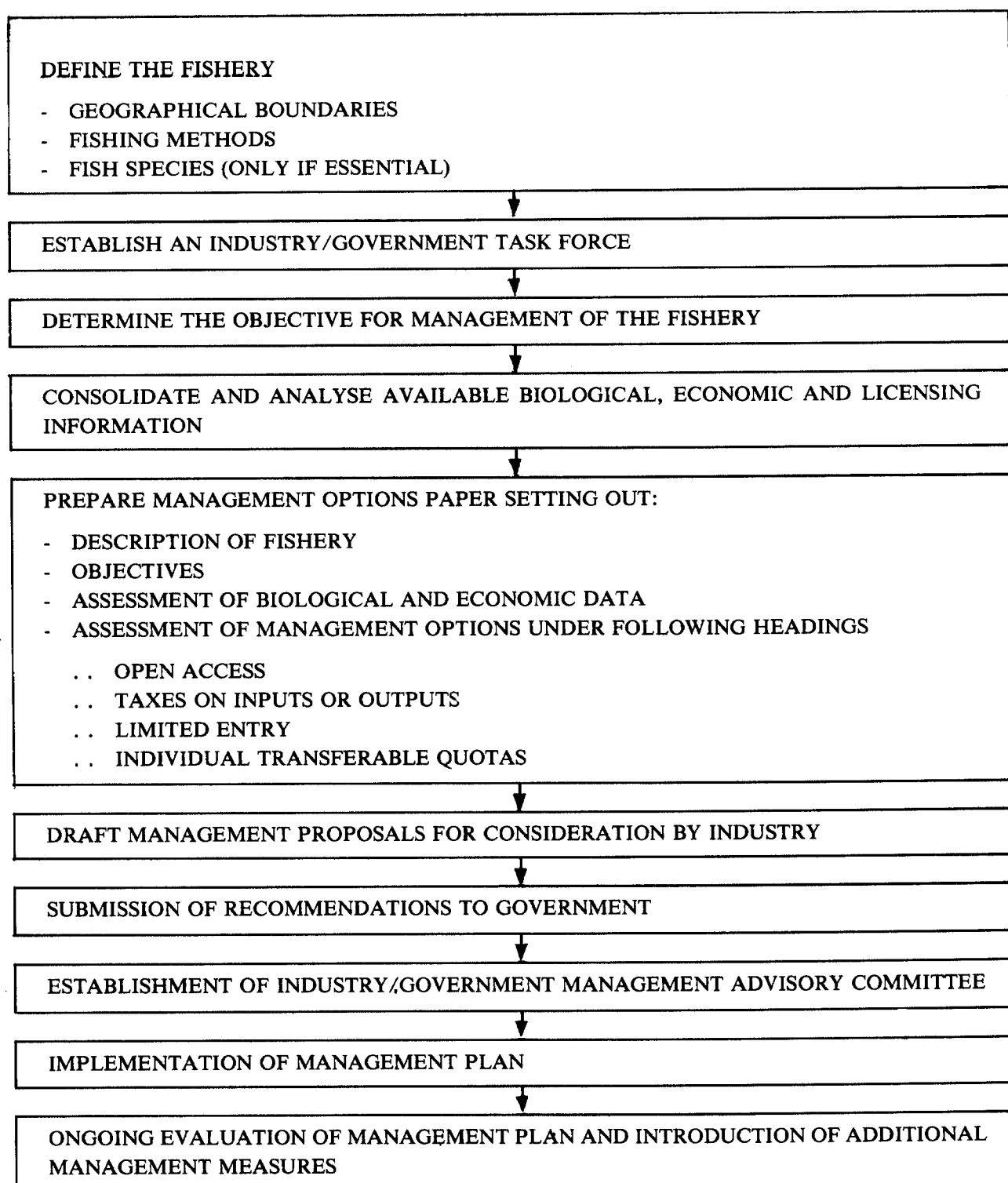
- 8.40 This option offers the prospect of direct control on the catch (biological objective) while allowing individual operators the security of exclusive access to a proportion of the catch. An operator can then determine the most effective means of taking his share of the catch and he has the option of trading catch quota on the open market.
- 8.41 This option has many advantages, the prime ones being containment of total catch (fishing mortality) and the access rights being acquired by the most efficient operators (an economic objective). However, problems in implementing ITQ systems are many and varied and they need to be canvassed in the options paper.
- 8.42 Implementation of an ITQ system requires establishment of the total catch quota, allocation of quota to individual fishermen and monitoring and enforcement of the individual quota allocations. The ITQ system would be very difficult to implement where fish are landed at many ports (or transhipped) especially for the fresh fish market, fisheries are multi-species, where there is little information on which to base total or individual quota allocations, species are short-lived and variable in abundance.
- 8.43 However, the potential benefits of an ITQ system of management are considerable for most fisheries. In New Zealand the Government has decided that the benefits are so substantial that the fisheries legislation and administration arrangements must be completely rewritten to allow for effective implementation of ITQs for all fisheries.
- 8.44 Again the issues of transferability arises with ITQ systems. However, as the transfer will not result in increased catch, the benefits in protecting the fish stocks will be retained. While high profits will be reflected in high values for catch quota the economic benefits will be retained as there is no incentive for individual operators to add catching capacity to take a larger share of the catch.

9.0 Implementation and Evaluation of Management Plans

- 9.1 Following receipt of comments on the options for management, the industry/government committee will submit proposals to Ministers. Where no management committee or comprehensive management plan are in place, the plan will need to set out:-
- (i) description of the fishery including the geographic boundaries, fishing methods etc
 - (ii) scientific and other data requirements
 - (iii) assessment of the fish stocks and the economic situation in the fishery
 - (iv) objectives for management
 - (v) the details of the management plan related to the objectives
 - (vi) provisions regarding licensing and enforcement
 - (vii) provisions regarding sharing of the costs of management between government and industry.

- 9.2 Following acceptance by governments of the management plan, a new and more complex phase in management will have commenced. To enable effective implementation and ongoing management the following steps will be taken:-
- (i) an industry government management advisory committee will be established
 - (ii) this committee will be supported by a scientific committee which will be responsible for monitoring the state of the fish stocks, recommending research projects, and advising on action to protect the fish stocks and maximising the yield from the fishery
 - (iii) the management advisory committee will also monitor the economic state of the fishery and the economic consequences of various options for management (in particular the adjustment measures)
 - (iv) the details of the management plan will be sent to every fisherman and to licensing and enforcement officials
 - (v) the legal requirements will be implemented by regulations and the details will be sent to licensing and enforcement officers
 - (vi) the licensing officers will consider applications for licences and assist in the process of review through the administrative tribunals and the courts
 - (vii) the enforcement officers will submit proposals to the management committee for surveillance of fishing activities on shore and at sea.
- 9.3 All concerned must be made aware of developments in management of the fishery and have an opportunity to comment. The management committee should submit records to fishermen and members of the committee should make themselves available for discussions with interested parties. An annual report setting out achievements and plans for the future should be prepared for the government and industry. The management committee must be open in its deliberations, with fishermen free to observe its meetings.
- 9.4 The Australian Government's current policy is to share the costs of management with the fishermen. The costs include monitoring of the fishery activities and the collection of biological and economic data. They also include the costs of licensing and enforcement. Such sharing of the cost will ensure that fishermen press all concerned to minimise cost. They will be concerned to ensure that productivity is improved through reduced costs per tonne of fish landed and processed.
- 9.5 While most fishermen can be expected to respond positively to management programs which are seen to be in their interest and the interest of all concerned, there will be some fishermen who will not understand the purpose of the measures or who pursue only short term personal interests. The legislation must incorporate penalties sufficient to deter such people including provisions for cancellation of licences.
- 9.6 The evaluation process will be a continuing one involving assessment of biological and economic data and implementation of additional measures as necessary. Regular reports will ensure that this process is undertaken rigorously. If total catches can be sustained at a high level in the longer term with an efficient fleet, substantial rents will be generated from the fishery which will benefit the fishermen and the community. This should be the aim of all fisheries management plans.

PROCESS OF FORMULATION OF FISHERIES MANAGEMENT PLANS



MANAGEMENT PLANS FOR SOME MAJOR FISHERIES – STATUS REPORT									ATTACHEMENT B MAIN COMPONENTS OF THE PLAN						
Fishery	Industry Government Management Committee	Licence Review C'tee	Management Plan			Australian Fisheries Council	Implemen- tation	Output Controls	Input Controls						
			Draft	Interim	Final				Limited entry	Gear restriction	Closed areas	Closed seasons	Capacity Unit Controls	Boat size limits	Vessel buy- back
Northern Prawn Fishery	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes
Southern Bluefin Tuna	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No	No
East Coast Trawl	Yes	Yes	Yes	Yes	Yes	Yes	Interim only	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
South Eastern Trawl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Yes	No
Southern Shark Fishery	Yes	Yes	Options to Task Force only	Yes	No	No	Interim only	No	Yes	No	No	No	Proposed	No	Under Consider- ation
Torres Strait Fisheries	Yes	No	Yes	Yes	Yes	Yes	Yes	Total Quotas	Yes	Yes	Yes	Yes	Yes	Yes	Yes (trawling only)
East Coast Tuna	Yes	No	Management Options Paper Submitted to Industry												

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Further Reading

1. Attorney-General's Department, Offshore Australia, Australian Government Publishing Service, Canberra, 1980.
2. Australian Fisheries Conference Report and Resolutions, Fisheries Management, Canberra, Jan/Feb. 1985.
3. BAIN, ROBERT, 'Problems, Priorities and Progress', The Australian Fishing Industry - Today and Tomorrow, 1984 Seminar papers, Australian Maritime College, Launceston, Tasmania, July.
4. _____, Fisheries Administration in the Australian Fishing Zone, Infofish Marketing Digest No 4/85.
5. _____, Economic Management of Fisheries: An Administrator's View, Paper presented to the 1985 29th Annual Conference of the Australian Agricultural Economics Society, February.
6. CARRINGTON, R and S. CHANDRA, A Bioeconomic Model of the Tasmanian Rock Lobster Fishery, 1986 Bureau of Agricultural Economics, Canberra, February.
7. COLLINS, D.J. and K.MENZ, Economics of the East Coast Prawn Fishery - A Perspective for Management, 1986 BAE, Canberra, February.
8. COPES, PARZIVAL, A Critical Review of Individual Quota as a Device in Fisheries Management, Discussion Paper 85-1, Simon Fraser University, BC, Canada.

9. CRUTCHFIELD, J.A., Economic and social implications of the main policy alternatives for controlling fishing effort. J Fish. Res. Board Can, 36(7): 742-52.
10. Department of Primary Industry, Future Management of the South Eastern Trawl and Danish Seine Fishery, 1981 Canberra, October.
11. _____, Southern Bluefin Tuna Management, A Discussion Paper on International Management, 1982 Canberra, April.
12. _____, Domestic Management and Options for Southern Bluefin Tuna Fishery, Canberra, 1982 December.
13. _____, Future Management of the East Coast Prawn Fishery, Canberra, July 1983
14. _____, Draft Management Plan for the Southern Bluefin Tuna Fishery, Canberra, August 1983
15. _____, Submission to Industries' Assistance Commission, Inquiry on Southern Bluefin Tuna 1984 Industry, Canberra, January.
16. _____, Draft Management Plan for the South Eastern Trawl and Danish Seine Fishery, Canberra, 1984 January.
17. _____, East Coast Prawn Trawl Fishery Management Issues, Canberra, July 1984.
18. _____, Bass Strait Scallop Fishery Management Issues, Canberra, September 1984
19. _____, East Coast Trawl Fishery, Draft Report on Future Management, Canberra, January 1985.
20. _____, Southern Shark Fishery; Management Issues, Canberra, February 1985.
21. _____, The East Coast Trawl Fishery, Report on Future Management, Canberra, June. 1985
22. _____, Management of the East Coast Tuna Fishery, Options and Consideration, Canberra, 1986 September.
23. FAO, ACMRR Working Party on the Scientific Basis of Determining Management Measures, Fisheries Report 1979 No. 236, Hong Kong, December.
24. _____, Expert Consultation on the Regulation of Fishing Effort (Fishing Mortality) , Fisheries 1983 Report No. 289, Supplement 2, Rome, January.
25. _____, An approach to the Regulation of Fishing Effort, Fisheries Technical Paper 243 Rome, 1983. Italy.
26. _____, World Conference of Fisheries Management and Development, Draft Strategy for 1984 Fisheries Management and Development and Associated Programs of Action, Rome July.
27. Gulland, J, The Management of Marine Fisheries, Scientetchnica, Bristol, 1974.
28. HAYNES, J. G. GREEN and D.J. COLLINS, The Beneficiaries of Fisheries Management, BAE, Canberra, July 1986. 1986 July.
29. Industry Assistance Commission, Harvesting and Processing of Fish Crustacea and Molluscs, Report No. 1983 328, Australian Government Publishing Service, Canberra, July.
30. KIRBY, M.J.L., Navigating troubled waters: a new policy for the Atlantic fisheries. Ottawa, Ministry of Supply 1982 and Services Canada, 739p.

31. LILBURN, B.V., Management of Fishing Resources, Paper presented to the Endangered Species Conference held
1984 at the University of Sydney, 11-12 May.
32. _____, Management of Australian Fisheries: broad Developments and Alternative Strategies,
1986 Paper presented to the Workshop on North Pacific Longline Fishery Management Options, Seattle,
USA, April.
33. MENZ, K., G. GREEN and D.J. COLLINS, Issues in the Management of the South Eastern Trawl Fishery,
1986 BAE, Canberra, August.
34. MUNRO, GORDON R, 'Fisheries Extended Jurisdiction and the Economics of Common Property resources',
1982 Canadian Journal of Economics, Vol, XV, NO. 1.
35. PEARSE, P.H., Turning the tide: a new policy for Canada's Pacific fisheries. Ottawa, Canadian Department
1982 of Fisheries and Oceans.
36. SCOTT, D.D. and P.A. NEHER, The Public Regulation of Commercial Fisheries in Canada. A study prepared
for the Economic Council of Canada.
37. Second Australian National Prawn Seminar, Proceeding edited by Pc Rothlisberg, B.J. Hill and D.J. Staples,
1972 Cleveland, Queensland, August.
38. STOKES ROBERT L. 'Limitation of Fishing Effort: An Economic Analysis of Options', Marine Policy,
1972 October, p289-301.
39. STURGESS, NH and T. MEANY (EDS.) Policy and Practice in Fisheries Management, Australian
1982 Government Publishing Service, Canberra.
40. Victorian Commercial Fisheries Licencing Review, Report prepared for the Victorian Government by the
1986 HON MJ ARNOLD, MLC, Melbourne, August.
41. WAUGH, GEOFFREY, Fisheries Management Theoretical Development and Contemporary Applications,
1984 Westview Press, Boulder, Colorado.
42. WESNEY, D., An Assessment of the Financial Feasibility of a Voluntary Licence Entitlement Buy-Back
1983 Scheme, Department of Primary Industry, Canberra, October.
43. WESNEY, D., B. SCOTT and P. FRANKLIN, Recent Development in the Management of Major Australian
1984 Fisheries: Theory and Practice, Fisheries Paper No. 85-5, Australian Fisheries Service, Canberra
August.