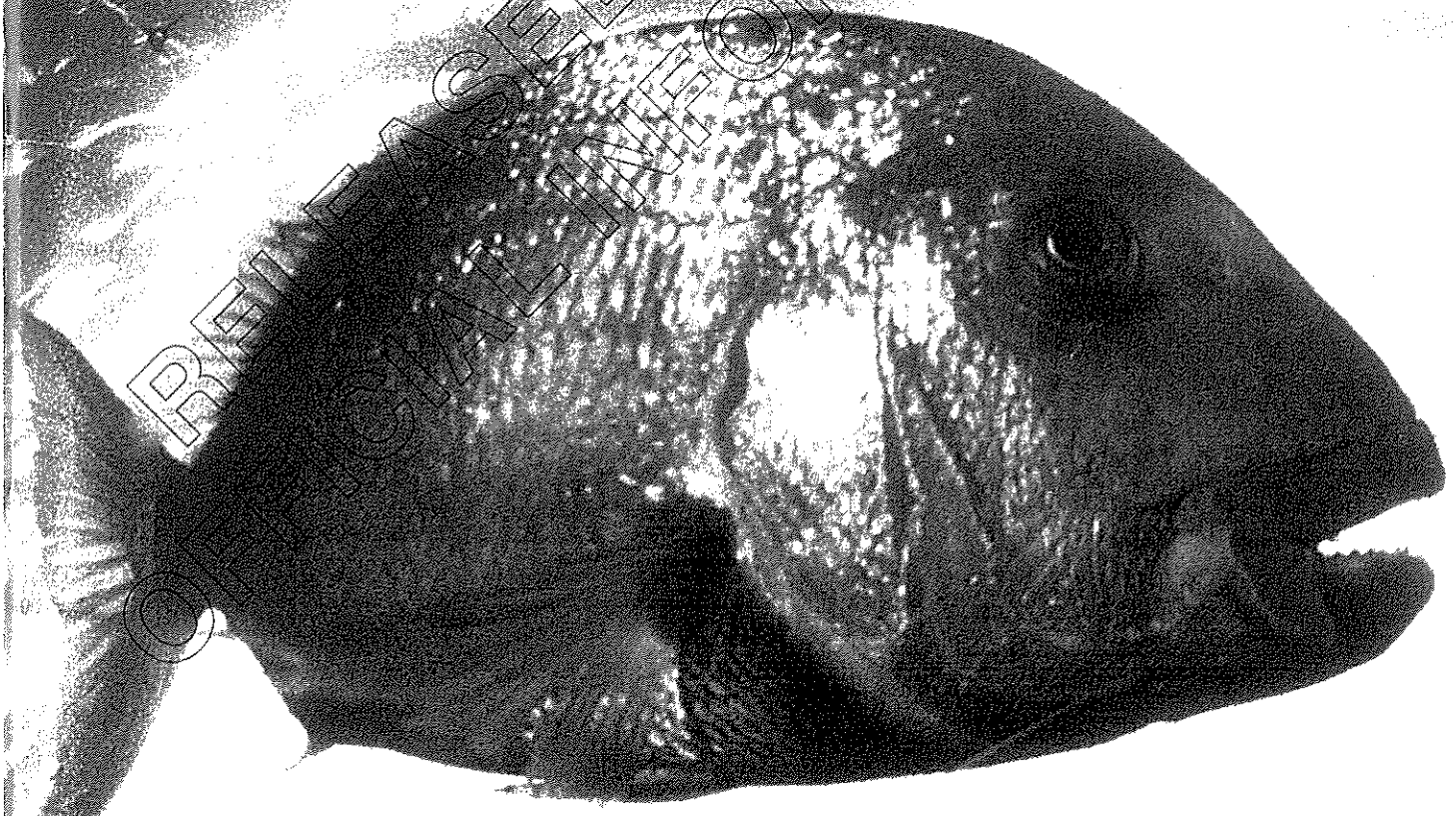
SNAPPER FISHERY STRATEGIC PLAN

Quota Management Areas SNA 1 and SNA 8

1994 to 2000



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SNAPPER STRATEGIC PLAN FOR QUOTA MANAGEMENT AREAS 1 AND 8 1994 - 2000

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PROVISO

This draft plan, as of June 1994, has been finalised by Northern Fisheries Strategic Management Group (NFSMG) industry representatives, in conjunction with MAF.

The other constituent organisations on the NFSMG have not participated in the latter stages of the preparation of this plan. This draft may require amendment to more accurately reflect the views of user groups once they have had the opportunity to consider this document and the impacts of any proposals in the document on them or their existing rights. This process is expected to be co-ordinated by MAF and completed during July 1994.

There may then be an opportunity to consider distributing the document for comment by interested agencies, groups and the general public.

This plan does not address the issue of the costs of implementing this plan.

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GLOSSARY OF TERMS

CPUE	Catch per Unit of Effort
EEZ	New Zealand's Exclusive Economic Zone extending from the shoreline to 200 nautical miles offshore
Fisheries Act/The Act	The Fisheries Act 1983 and all subsequent amendments and all Regulations under the Act
MAF	The Ministry of Agriculture and Fisheries
MAF Fisheries North	The agency of MAF, based in Auckland, and responsible for implementation of the Fisheries Act 1983 and associated functions, in the AFMA
MSY	Maximum Sustainable Yield
B_{msy}	Biomass at MSY
NFIPG	The Northern Fishing Industry Planning Group, a formal subcommittee of the New Zealand Fishing Industry Board
NFSMG	Northern Fisheries Strategic Management Group, comprising NFIPG representatives, ECO representatives, Recreational Fishing Industry representatives and Traditional fisher representatives and with MAF representation and Chairmanship
NZFIB	The New Zealand Fishing Industry Board, a producer Board established by the Fishing Industry Board Act (1963)
QAA	The Quota Appeal Authority established under the Fisheries Act
QMS	The Quota Management System established under the Fisheries Act
SNA 1	The Snapper Quota Management Area extending from Cape Runaway northwards to North Cape and to the edge of the EEZ (200 nm offshore), (Fisheries Management Area 1)
SNA 8	The Snapper Quota Management Area extending from North Cape southwards to Makara (Cook Strait) and to the edge of the EEZ (Fisheries Management Areas 8 and 9)
TAC	Total Allowable Catch
TACC	Total Allowable Commercial Catch

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SUMMARY AND RECOMMENDATIONS

Snapper is the predominant demersal fish and fishery of the Auckland Fisheries Management Area. The species is common throughout the continental shelf of Northern New Zealand. Snapper supports nationally important commercial, recreational and traditional fisheries. Appendix 1 provides detail on the fishery.

In July 1992 the Northern Fisheries Strategic Management Group (NFSMG) was established with representation from the commercial, environmental, recreational and traditional sectors, and MAF. The role of this group is to develop a strategic plan providing an agreed and comprehensive process for the sound management of northern Snapper fisheries over the 6 years 1994-2000. Conservation, allocation, compliance and research were identified as the key issues in the fishery.

The plan provides a set of integrated management strategies to achieve four specific goals which are:

GOAL 1 ***To maximise the economic, social, and cultural returns from the northern Snapper fisheries.***

GOAL 2 ***To manage the northern Snapper fisheries to support the increasing biomass.***

GOAL 3 ***To mitigate potential conflicts between users of the shared resource of the northern Snapper fisheries.***

GOAL 4 ***To ensure a research programme is developed and recommended for implementation to meet the strategic stock assessment, monitoring, environmental and management needs of the northern Snapper fisheries.***

All available indications are that the biomass is able to support, and is now increasing at, the current levels of total removals. Therefore the plan proposes a harvest strategy of constant catch for legitimate users of the resource, with comprehensive initiatives against all forms of illegal activity and wastage and to promote enhancement of the fishery. The plan's proposals for resolving potential conflict, improving the information base for the fishery and considering allocation will complement the process of increasing stock sizes and also enhance the benefits the fishery provides for all users. These proposals are highlighted in Appendix 4.

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In the actions taken by the commercial industry and MAF since July 1992, very considerable progress has already been made towards implementation of this plan. These initiatives are summarised in Appendix 5. Initiatives have been implemented to support and build on the currently occurring processes of increasing northern Snapper stock size by:

- ***assessing stock sizes, yields and other research needs in the fishery;***
- ***research and assessment of enhancement programs;***
- ***implementing a process for investigating potential conflicts;***
- ***addressing illegal extractions from the fishery including highgrading, dumping and blackmarket activity;***
- ***addressing wastage;***
- ***recognising that there is an issue of allocation in the fishery.***

The plan is proposed to be jointly implemented (or ratified if already completed) by the Minister of Fisheries and the NFSMG through the following recommendations.

The NFSMG recommends to the Minister of Fisheries that the Minister:

(i) Note: the goals of the management plan and the intention that the management strategy will allow and support an ongoing increase in population size;

(ii) Note: the current stock assessment and the recent information from the fishery which indicates that both the SNA 1 & 8 stocks are rebuilding;

(iii) Note: the actions currently taking place in 1994/95 (summarised in Appendix 5);

(iv) Note: that in 1995 that it is expected that you will receive:

- revised biomass estimate and yield information for SNA 1;
- estimates of the non-commercial take;
- information on other measures to improve and conserve the stocks, under this plan, to be implemented by NFSMG and MAF;
- further development of proposals for allocation criteria by the NFSMG, dependent on the reform of the fisheries legislation;

(v) Note: that subsequent to the receipt of the information outlined in (iv), there will then be an opportunity for you to make allowance for traditional take and commercial and recreational sector take, in accord with the existing or the revised legislation and in accord with all revised and new information on the fishery including this plan;

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(vi) Note: the opportunity for further reconsideration of the management of the fishery subsequent to the implementation of this plan;

(vii) Note: the harvest strategy proposed in Part 1, Harvest Strategy and Tactics (page10);

(viii) Note: the recommended actions for the NFSMG to complete in the implementation of the plan (summarised in Appendix 4);

(ix) Agree: to confirm your support for the Strategic Plan.

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PART 1

Introduction

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1.1 The Snapper Fishery

1.1.1 Snapper Biology

Snapper are demersal (bottom dwelling) fish found down to depths of about 200m, but are most abundant in depths of 10-60m. They are the dominant fish in northern inshore communities and occupy a wide range of habitats, including rocky reefs and areas of sand and mud bottom, being most abundant in the Hauraki Gulf. Snapper are highly fecund (productive) serial spawners. Serial spawning involves a process whereby individual fish will release many batches of eggs over an extended season during spring and summer. Adult Snapper move to inshore spawning and feeding grounds in the spring, and are thought to disperse into deeper water over the winter.

It appears that water temperature or other environmental or ecosystem factors play an important part in the success of recruitment in any year. Strong year classes in the population correspond to periods of warm water temperatures post spawning and poor recruitment often results from cooler water temperatures. This relationship is most apparent in the Snapper 1 stocks.

Snapper have a strong seasonal growth pattern, with rapid growth from November to May, and then a slowing down or cessation of growth from June to September. They may live to 60 years and have very low rates of natural mortality.

1.1.2 Commercial and Non Commercial Fisheries

Snapper is the mainstay of the Auckland Fisheries Management Area (AFMA) commercial finfish fishery. It constitutes approximately one third of the volume and an even larger proportion of the value of AFMA fisheries. Gross revenues are considerable including $57M per annum in export receipts. There are good prospects for further growth in this revenue. Several thousand jobs are either wholly or partially dependent on the Snapper fishery and on the associated fisheries established upon the Snapper fishery. "The Northland Seafood Industry" (NZFIB, June 1993) demonstrates catches from associated finfish fisheries that are at least equivalent in volume to the landings from the Snapper fishery.

In 1986, the Quota Management System (QMS) was introduced. With its introduction the northern Snapper fishery was divided into two quota management areas. These are SNA 1 (Cape Runaway to North Cape) and SNA 8 (North Cape to Makara). The "Proposed Auckland Fishery Management Plan" (MAF 1989) records that the catch histories used to allocate Individual Transferable Quota (ITQ) and to establish the 1986 Total Allowable Commercial Catch (TACC) were reduced by 45% and 53% respectively for SNA 1 & SNA 8. Decisions by the Quota Appeal Authority increased some ITQ holdings to more accurately reflect actual catch histories of individuals prior to the QMS. However, in 1992 the Minister of Fisheries further cut SNA 1 and 8 TACC's by 18.4 and 5.9% respectively.

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1.1.3 East North Island Snapper (SNA 1)

The East North Island Snapper stock (SNA 1) is the largest of the four national Snapper stocks. The current Total Allowable Commercial Catch (TACC) for this stock is 4900 tonnes. Annual export earnings are approximately $45 million. An estimate of recreational take (from 1985) is 1500 tonnes. An estimate of traditional take is not currently available.

The 1987 National Marine Recreational Fishing Survey showed that Snapper is the finfish species most sought after by non-commercial fishers. Non-commercial catches of Snapper are higher than for any other species in New Zealand. Like the commercial fishery most of the non-commercial fishery for Snapper takes place in the northern region to which this plan applies.

The current status of this stock is unclear. However there is a plausible range for the current biomass and it is apparent that rebuilding (stock size or biomass increase) is now occurring under the current management regime. A revised estimate of stock biomass is essential to resolve the uncertainties in the currently available methods for assessing this stock. Tagging surveys are underway in the stock and will form the basis of the revised biomass and yield estimates.

Appendix 1 provides detail on both the Snapper resource and the user groups in the fishery.

1.1.4 West North Island Snapper (SNA 8)

The West North Island Snapper stock (SNA 8) is the second largest of the four national Snapper stocks. The current Total Allowable Commercial Catch (TACC) for this stock is 1500 tonnes. Annual export earnings are in excess of $10 million. An estimate of recreational catch for SNA 8, derived from a 1991 tagging programme, is 250 tonnes. An estimate of traditional take is not currently available.

Recent commercial and amateur catches are at levels that will allow the stock to increase towards a size that will support the Maximum Sustainable Yield (MSY) although B_{msy} may not be well determined. The sum of the current TACC and amateur catches are sustainable in the long term. The MAF SNA 8 stock assessment model results indicate that since 1986 the stock size has more than doubled and on average catch rates have also doubled. An increase in the stock size towards the size that will support the MSY would produce two likely benefits. Firstly, a slightly higher yield would be sustainable at B_{msy}. Secondly, the model predicts that catch per unit effort (CPUE) would approximately double. There is also a possibility that as stock size increases, amateur removals will increase, thus slowing the rate of rebuilding.

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1.2 Purposes of the Strategic Plan

This strategic plan, in recognising the very major importance of northern Snapper fisheries, seeks to provide an agreed and comprehensive process for the sound management of the fisheries over the 6 years (1994-2000). Reflecting its long term focus the plan primarily outlines ongoing strategies for management, rather than presenting a detailed blueprint of immediate actions.

Since the introduction of the QMS, managing SNA 1 and 8 stocks has only been by TACC reductions without direct restraint to the recreational or traditional take. There are however, alternative complementary and possibly more effective ways of managing the fishery which form the basis of this plan.

The plan provides a set of integrated management strategies to achieve the goals which are listed below. It is provided to the Minister of Fisheries to consider at the time decisions about the TACC's for SNA 1 and 8 are to be made. The strategic plan and the initiatives it contains should be considered complementary to the TACC decisions to be taken on the SNA resource.

The plan provides a set of integrated management strategies to achieve four specific goals which are:

GOAL 1 ***To maximise the economic, social, and cultural returns from the northern Snapper fisheries.***

GOAL 2 ***To manage the northern Snapper fisheries to support the increasing biomass.***

GOAL 3 ***To mitigate potential conflicts between users of the shared resource of the northern Snapper fisheries.***

GOAL 4 ***To ensure a research programme is developed and recommended for implementation to meet the strategic stock assessment, monitoring, environmental and management needs of the northern Snapper fisheries.***

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1.3 Harvest Strategy and Tactics

1.3.1 Background to Fisheries Harvest Strategies

Harvest Strategies are a central part of fisheries planning and seek to ensure that fishery removals are controlled within acceptable limits. Possible strategies include:

- *constant harvest rate*
- *constant escapement*
- *size limits*

Tactics are the mechanisms by which fishery removals are adjusted. Options which achieve a reduction in removals without reducing legitimate catch include:

- *more enforcement*
- *reductions in wastage*
- *education*

In addition to the above tactics, viable fishery enhancement may be used to sustain and improve populations available for stock increase and/or harvest.

Harvest strategies need to be established on a user group basis due to the significantly different nature and current management regimes which apply to the user groups.

The commercial sector is now managed by the QMS which establishes limits on commercial catch. These are applied to protect the stocks, thus ensuring sustainability, and providing financial/business certainty to the commercial user(s). In the case of the Snapper fishery all indications are that the biomass is both able to and is now increasing at the present levels of total removals. There is the clear intention in this plan to continue to support the currently occurring processes of increasing stock size.

1.3.2 Harvest Strategy for Northern Snapper Fisheries

The recreational sector is now subject to a 20 Snapper per person-day bag limit, and fish size and gear restrictions. Maori involved in traditional fishing can harvest with less restriction than the recreational sector but must in general gain permission prior to commencing fishing. A prohibition on selling and trading applies to all forms of non commercial fishing.

Allocation to these sectors is a key issue within the northern Snapper fishery. It is expected that the increasing abundance and stock size of Snapper will bring about an increasing recreational catch under current regulations. Current bag limits do not appear to effectively constrain recreational take and it is expected that an increasing proportion of yield will be taken by recreational fishers/the recreational sector under the current management regime.

The plan does not propose a harvest strategy for the recreational nor traditional sectors but rather that over the coming year the NFSMG will address the issues of allocated share and of effective management of actual removals and compliance.

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A constant harvest strategy is proposed for the commercial sector at least through to 1995, when flexible management strategies may be implemented as a result of the information which forms the outcomes of this plan.

1.4 Plan Content

The 4 goals are laid out in priority order. For each goal there is an explanatory section, and there are a number of strategies by which it will be achieved.

For each strategy, there are a number of actions and indicators by which the degree of success in achieving it can be measured.

1.5 Planning Process and Implementation

The major responsibility for implementation of this plan lies with the NFSMG empowered by the Minister or MAF as appropriate. Most of this responsibility requires in essence discussion, with a view to developing resolutions, in a process facilitated by MAF. That has been the NFSMG process to date and it is expected that this will continue with costs "lying where they fall".

Funding sources for implementation of particular NFSMG initiatives will require consideration and resolution.

The Northern Fisheries Strategic Management Group is convened by MAF Fisheries North, Auckland. Membership of the group includes representation as follows:

Chairman & Secretary	- *MAF Fisheries Northern Region*
Commercial	- *Northern Fishing Industry Planning Group representatives*
Environmental	- *ECO representative and DOC observer*
MAF	- *MAF Fisheries North technical advisers and MAF Policy (Fisheries) representatives*
Maori	- *NZ Maori Council and Treaty of Waitangi Fisheries Commission representatives*
Recreational	- *NZ Recreational Fishing Council representatives*

The NFSMG has developed this strategic plan in a consultative process which commenced in July 1992. As noted in the Proviso, representation by all constituent organisations has not occurred throughout the entire term of the planning process. Once the plan is completed in draft form, efforts will be made to ensure all user groups have an opportunity to contribute their views.

The Minister has legal responsibilities under the Fisheries Act to address the issues of sustainability and allocation included in this plan.

The plan is an advisory document to facilitate this process.

Each action proposed in the plan identifies the group(s) responsible for carrying them out, and where possible is accompanied by indicators to measure progress/completion.

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PART 2

Goals, Strategies, Actions

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GOAL 1

TO MAXIMISE THE ECONOMIC, SOCIAL AND CULTURAL RETURNS FROM THE NORTHERN SNAPPER FISHERIES

2.1 Maximising Returns from the Northern Snapper Fisheries

The northern Snapper fisheries have a range of direct and indirect economic, social and cultural returns or benefits to the various user groups.

The resource is clearly a shared one and is valued by a range of differing criteria by different users. The maximisation of any one particular value is likely to detract from another value for the stock. As in so many, if not all resource use issues, wise management requires an appropriate balance between the values/needs of people and their environments. Nevertheless, the Goal as stated below intends that there be maximisation of benefits including available yield from the stock, wherever this does not significantly conflict with particular values.

In summary this goal seeks that all user groups maximise the returns and benefits derived from the use of the resource.

The strategy in the first section under this goal is to determine the optimum means of maximising the economic, social and cultural returns from the fishery. The strategy in the second section seeks to allow each user group a maximum degree of freedom in organising the management of its share of the yield. Strategies in subsequent sections generally goal seek to minimise losses due to wastage and theft and to maximise growth and recruitment of the stocks.

2.1.1 Determining Means of Maximising Returns

Strategy *To identify and establish means of maximising the economic, social and cultural returns from the fishery.*

ACTION: NFSMG to promote the assessment of benefits from the fishery by October 1996.

2.1.2 Organising Management

Strategy *To allow to each user group, commercial, recreational and traditional, maximum degree of freedom in organising the management of its share of the yield, while it does not unduly affect other users. It is presumed that user groups can best determine how to allocate and maximise returns, within each user group.*

The commercial sector allocates and manages its TACC by ITQ.

ACTION: The recreational and traditional sectors to consider benefits and means of allocating catch among fishers, (see goal 3), by October 1995.

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2.1.3 Minimising Wastage

Some wastage of Snapper, as yet unquantified, now occurs in both the commercial and non-commercial sectors. The plan aims to quantify, develop understanding of and minimise such mortality. The three ways that wastage can occur are:

- Juvenile mortality (discarding of juvenile fish that do not survive)
- Non capture mortality (fish which are not landed, but which die as a consequence of fishing operation)
- Pollution mortality (fish which die as a result of pollution and other environmental degradation)

Strategy 1 *To improve current knowledge regarding the extent of juvenile mortality.*

ACTIONS:

(i) NFSMG to ensure by October 1995 the completion of the current at-sea sampling programme to assess juvenile catch.

(ii) NFSMG to encourage the completion of research to determine the survival rate of returned juvenile fish by method.

Indicator
- A database of information on method based juvenile catch and mortality is established.

Strategy 2 *To develop appropriate controls to minimise juvenile fishing mortality.*

ACTION: NFSMG to use the data from Strategy 1 to develop and implement appropriate controls where juvenile mortality is unacceptably high.

Indicator
- Results of at-sea monitoring show a reduction in the level of sublegal mortality.

Strategy 3 *To improve current knowledge regarding the extent of non capture fishing mortality.*

ACTION: NFSMG to promote the assessment by October 1995 of international developments regarding the likely effects of non capture mortality in relation to Snapper fisheries.

Indicators
- Assessment completed.

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Strategy 4 *To minimise non capture mortality where practicable*

ACTION: NFSMG to develop by October 1995 an environmental Code of Conduct for the Snapper fishery.

Within the strategic planning framework, an environmental code of conduct would relate to specific methods of catching Snapper and the protection of the Snapper environment to ensure that all fishers operate within environmental guidelines and thus minimise effects on both the fish and their environment.

Indicators

- Process established for developing code and code development proceeding.

Strategy 5 *To establish an effective interface between coastal planning and the Snapper strategic plan to protect the Snapper resource from pollution mortality.*

ACTION: Initiate a dialogue with the coastal planning process to ensure protection of the Snapper resource from RMA activities by March 1995.

Currently there is little interaction between the jurisdiction of the Fisheries Act the coastal management zone of the RMA. Proper provision should be made within the RMA process (coastal plans, coastal permits, discharge permits) to protect the Snapper resource.

Indicators

- Consistency between coastal plans and Snapper management plan objectives.

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2.1.4 Minimising Illegal Activity

Estimates of the scale of illegal fishing vary widely. The plan aims to develop understanding of, quantify and minimise all forms of illegal activity. The four categories of illegal fishing are:

- Highgrading (the discarding of lower value legal sized fish)

  Highgrading by commercial fishers relates to the balance between capacity of the fleet and the quota available. Highgrading by recreational fishers relates to excess catching capacity in relation to bag limits, and the desire to catch particular size (larger) fish

- Retention of sublegal size fish

- Discarding of legal sized fish for any reason

- Black Marketing (fish illegally obtained for purchase or reward)

It is considered there should be provision for landing of accidentally caught Snapper but there should be no potential for fishers to benefit from taking Snapper without quota.

Strategy 1 *NFSMG to monitor recreational and commercial fishing activity to assess high grading activity and retention of sublegal sized fish.*

In broad terms, only very major differences between landed catch and a standard profile for that method could be detected. A match of these two profiles would act as an indicator that highgrading has been reduced.

ACTIONS BY OCTOBER 1995:

(i) Measure the at-sea commercial and recreational catch.

(ii) Describe the expected catch mix and size mix of fish by method/area.

(iii) Compare landed catches with the average expected at-sea catch.

Indicator

- The length distribution of the landed catch should reflect the results of at-sea sampling.

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Strategy 2 *Reduce incentives for highgrading.*

ACTIONS BY OCTOBER 1996:

(i) Develop and trial options to create disincentives against highgrading.

(ii) Educate fishers in the effects of highgrading on the long-term economic return from the fishery.

Indicators
- Trial established to examine possible methods to reduce highgrading.
- Publicity in media (newspapers, fishing magazines, etc) concerning the implications of highgrading.

Strategy 3 *Reduce the incidence of dumping.*

ACTIONS BY OCTOBER 1996:

(i) Establish the causes of dumping.

(ii) Develop a code of practice to reduce the incidence of dumping and to encourage the matching of handling capacity with catching capacity.

Indicators
- Reduction in the number of reported incidences of dumping.
- A code of practice is in place.

Strategy 4 *To require that SNA 1 and SNA 8 commercial fisheries operate principally as target fisheries only.*

ACTIONS:

(i) NFSMG to ensure the setting of appropriate annual deemed values for Snapper.

(ii) NFSMG to monitor deeming activity.

Indicator
- No significant deeming of Snapper.

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Strategy 5 *NFSMG to promote procedures to encourage fishermen to have adequate access to SNA quota to cover their foreseeable catches.*

It is acknowledged that in many inshore fisheries an inevitable by-catch of Snapper can be expected. Vessels should not commercially fish without adequate access to SNA quota to cover any expected catch or by-catch.

ACTIONS BY OCTOBER 1995:

(i) Assess reasonable SNA quota proportions of catch according to method area/season.

(ii) Promote, by code of practice, that fishermen have adequate access to SNA quota.

Indicators
- Reasonable catch proportions established.
- Code of practice established.

Strategy 6 *To determine and monitor the level of black market activity.*

ACTIONS:

(i) To promote the polling of those affected by black marketing about the level of compliance.

It is most likely that those who do most of their business in the local market will be most affected by market competition. This assumes that the majority of black market fish goes to the local market which may or may not be the case.

(ii) To promote the profiling of the commercial fishery to quantify the opportunity for illegal activity.

(iii) To promote the profiling of the non-commercial fishery to quantify the opportunity for illegal activity.

Indicator
- An estimate of the level of the black market activity based on Snapper.

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Strategy 7 *To improve the level of enforcement effort in policing the Snapper fishery.*

Snapper is the major target species in the Northern Region. Increased compliance within this fishery would therefore improve the compliance of other related fisheries.

ACTIONS BY OCTOBER 1995:

(i) NFSMG to promote increased enforcement presence at landing points.

More uniformed officers monitoring landing points for recreational and commercial fishers. Enforcement requires physical monitoring of the landing, transportation, and sale of fish. Illegal fish sales can be disguised in documentation. Consequently, some users believe that auditing procedures to investigate fisheries offences are not an efficient utilisation of compliance resources.

(ii) NFSMG to promote the targeting of persistent offenders.

The prosecution of such offenders would be seen as an example to other would be offenders.

(iii) NFSMG to promote increased publicity as to the positive benefits and importance of compliance with the fishery management system.

(iv) NFSMG to promote increased publicity of successful prosecutions.

(v) NFSMG to promote improved enforcement responsiveness to information on non-compliance.

Some users believe that MAF Fisheries needs to respond faster to information from fishers about illegal activity. Rapid action will increase the perception of the costs of illegal activity.

Indicators (3-5 years)

- Less illegal activity.
- More effective use of compliance resources in Snapper enforcement.

2.1.5 Enhancement

Strategy 1 *To develop initiatives intended to enhance the Snapper fishery.*

ACTION:

(i) NFSMG to assess feasibility of Snapper enhancement.

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GOAL 2

TO MANAGE THE NORTHERN SNAPPER FISHERIES TO SUPPORT THE INCREASING BIOMASS

2.2 Sustainable Management

Sustainable management is agreed as the cornerstone of responsible resource management.

Goal 2 places the overriding priority on the management system to determine and ensure compliance with assessed levels for sustainable harvests by all sectors which will allow the biomass to continue to be sustained and improved.

It must be noted that all indications are that the biomass is now increasing at current levels of total removals. This goal and the strategies aim to support that process.

A constant harvest strategy is proposed for the commercial sector at least through to 1995, when flexible management strategies may be implemented as a result of the information which forms the outcomes of this plan.

2.2.1 Assessment of Biomass, Yield and Non-Commercial Harvest

Strategy 1 *Reassess biomass and yield*

ACTIONS:

(i) New estimate of sustainable yield and biomass for SNA 1 (by 1/4/95).

A tagging programme will be undertaken for the SNA 1 stock in November 1993. Results from this programme will be available for the stock assessment round completed in May 1995. This programme will provide a new estimate of biomass and yield for the SNA 1 stock.

(ii) NFSMG to promote the implementation of recommended programmes from joint research planning group to monitor SNA 1 and SNA 8 stocks between assessments.

A strategic research plan is being developed for the SNA 1 and SNA 8 stocks. This will recommend agreed programmes to monitor stock performance between direct estimates of sustainable yield and stock size. These should be implemented to monitor fishery performance and the results of management strategies.

(iii) NFSMG to promote direct measurements of biomass for SNA 1 and SNA 8 as appropriate.

Currently tagging programmes are considered to provide the best estimates of sustainable yield and biomass for Snapper. This may change as a result of the development of strategic directives for Snapper research. It has been agreed however that direct estimates of biomass and yield are required.

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Strategy 2 *To ensure that harvests are within the yield of the biomass.*

All indications now are that this strategy is currently being achieved and that the biomass is now increasing.

ACTION: Direct stock assessments to be undertaken as and when necessary.

Strategy 3 *To assess recreational and traditional harvests*

ACTION: Survey traditional and recreational catch levels for SNA 1 and SNA 8 (by 1.4.95).

A survey of recreational fishing in the Auckland FMA will be undertaken during 1993/94. Results will be available for the stock assessment process completed in May 1995. Additional work is required to assess and document traditional catch.

2.2.2 Allocation

Strategy 1 *To identify commercial and non commercial (recreational and traditional) allocations to establish limits on total take to ensure the biomass is sustainably managed.*

Recreational catch is considered to be virtually unconstrained by current management rules. Current catch has been estimated at approximately 1500T per annum for SNA 1 and 250T per annum for SNA 8 but estimates are particularly uncertain. The unconstrained recreational catch would seem likely to increase over time with increasing leisure hours, technology and efficiency of gear, expenditure, and population, and at least in direct proportion to any increase in biomass. However, yield is expected to increase only slightly in proportion to any increase in biomass.

For these reasons a significant biomass increase will not be possible in the absence of real constraints on non commercial harvest for all but the most optimistic predictions for yield.

It is fundamental to sustainability to identify a non commercial catch and to manage non commercial catch within this level. There is a need to consider the traditional users allocation within the non commercial allocation.

Future reallocation between users may require compensation to be made to the sector whose share has been proportionally reduced.

ACTION: To continue discussions between user groups on the issue of allocation to develop consensus position on allocation.

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Strategy 2 *To identify, agree and implement appropriate measures to effectively limit the commercial and non commercial sectors to catch levels which are within their allocations.*

ACTIONS:

(i) Identify measures and implement as required, to constrain recreational catch to its allocation.

Once an agreed recreational allocation is established there is a need to constrain catches within this allowable figure. Measures to constrain catches should be investigated and implemented. Recreational catches may need to be modified to allow for traditional fishery take.

(ii) Identify measures and implement as required, to constrain commercial catch to its allocation.

Allocation within the commercial sector is through ITQ. Changes are expected at a national level to consolidate this system such as by introduction of ACE entitlement.

It is important to all users that the commercial sector is effectively managed including effective limitation to its total catch allocation.

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GOAL 3

TO MITIGATE POTENTIAL CONFLICTS BETWEEN USERS OF THE SHARED RESOURCE OF THE NORTHERN SNAPPER FISHERIES

2.3 Conflict Resolution

There are two general objectives which the NFSMG consider must be achieved to successfully resolve perceived conflicts in the northern Snapper fishery.

The first is to establish the rights and responsibilities of the various sectors in reasonable access to the fishery. This is expected to significantly reduce perceived conflict between sectors. The second objective is to minimise perceived conflict in the Snapper fishery which most frequently results from a perception that one party is being deprived of the Snapper resources to which it perceives it has some rights.

2.3.1 Addressing Allocation in the Northern Snapper Fisheries

Allocation of an explicit tonnage share of the TAC to each sector (Commercial, Maori, Recreational) in any fishery, has been recommended by officials for the revision of the Fisheries Act.

Allocation between user groups has not been explicitly addressed in the large, complex multiuser northern Snapper fisheries. However it is one of the most important issues in the management of the fishery and is integrally associated with consideration of any particular stock management strategies.

Establishment of an explicit and effectively enforced tonnage sector allocation within the TAC would have the mutual benefits of providing equity and certainty for sectors and thus reducing conflict between sector groups. Individual allocations within a sector would reduce allocation conflicts within sectors.

However there is considerable uncertainty as to whether and by what means, an explicit share for all sectors in the northern Snapper fishery, could practically be implemented. Concerns are also held for effectiveness of available control measures.

Regardless of the respective tonnage share of a TAC, for any particular sector, the NFSMG suggests a principle of equity in the relative status of user groups with regard to their inter-relationships, mutual status and the question of priority. In practice this will mean that burdens and benefits of improved stock management should be equitably shared by sectors. Input into future management planning decisions by the sector groups will be on an equal basis and priority will not be determined by any reference to the proportions of total allowable take which have been allocated to the sector groups.

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The NFSMG suggests that the mechanisms to determine allocation of allowable Snapper take between each sector should be transparent so that:

a) Any change in the TOTAL allowable take should be for the purpose of stock management and it must be clear that this is not a re-allocation.

b) Any change in the PROPORTIONAL SHARE between sectors should be according to agreed guidelines and it must be clear that this is a re-allocation.

Strategy 1 *To continue to allocate commercial shares of TACs in the form of the TACC within the SNA 1 & 8 areas as now defined.*

Strategy 2 *To identify, by development of a position paper, means of establishing explicit recreational and traditional shares by October 1995.*

ACTIONS FOR THE NFSMG, BY OCTOBER 1995:

(i) To establish whether systems and techniques for assessing recreational take can sufficiently accurately assess the recreational catch.

(ii) To assess how recreational catches might be constrained to an allocation.

(iii) To assess the options for compliance to enforce explicit shares including the paper trail approach (as for industry), penalty disincentives and record keeping/reporting systems.

Strategy 3 *The dividing of total allowable take into an explicit commercial and non-commercial share will be a decision for the Minister of Fisheries. It is considered appropriate that this decision wait until direct estimates of Snapper biomass and current recreational take are available and/or until the revision of the Fisheries Legislation is enacted.*

ACTIONS, FOR THE MINISTER:

1. Minister makes allowance for traditional take and commercial and recreational sector take, in accord with the existing or the revised legislation and in accord with all revised and new information on the fishery, including this plan.

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2.3.2 Minimising conflict in the Snapper fishery

Situations of (perceived or actual) conflict arise when one party perceives it is being deprived of the quality of access to Snapper resources it perceives it has some rights to. There is a need for a process to address such situations.

Although allocation of the yield from the resource among the user groups is unclear, spatial access rights for each group are now very clear. All sector groups and individual users are able to clearly determine their respective spatial rights of access to the resource, according to user group, method and season. However, both the above balance and also balanced outcomes, are difficult to maintain and to achieve wherever one "aggrieved" party can only benefit from further "spatial conflict situations" which are "resolved" by concessions from the alternate party.

It must be noted that this plan itself and the confidence it will engender that the fishery is being sustainably and comprehensively managed for the benefit of all users and that the fish stocks and its fisheries are improving, represents the major means of conflict reduction in the fishery. This will be explained in information to be made available to user groups and the public, which will improve awareness of the state of the Snapper fishery.

Strategy 1 *To develop a process to address perceived conflict situations incorporating procedures to ensure adequate user group participation, provision of information, identification of perceived conflict-related issues and development of appropriate solutions.*

ACTION: Develop an agreed process to address perceived conflict, as set out in Appendix 3.

Strategy 2 *To provide information to the public on the management of the fishery.*

The fishery is improving. This fact, together with better information on the fishery, will significantly reduce conflict situations.

ACTIONS:

(i) "Widely" publicise SNA TACC decisions accompanied by updated research information and rationale for decisions.

(ii) MAF to produce SNA newsletter whenever appropriate with news information on the fishery.

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GOAL 4

TO ENSURE A RESEARCH PROGRAMME IS DEVELOPED TO MEET THE STRATEGIC STOCK ASSESSMENT, MONITORING, ENVIRONMENTAL AND MANAGEMENT NEEDS OF THE SNA 1 AND SNA 8 FISH STOCKS

2.4 Research

The basis of careful and wise management is sound information. Collection and use of sound information is a fundamental concept within this plan.

This goal seeks to promote the development of a comprehensive long term northern Snapper strategic research plan. It also seeks to incorporate all information needs for the management plan into the strategic plan.

Strategy 1 *To develop a strategic research programme for the stock assessment and monitoring of the SNA 1 and SNA 8 fish stocks.*

A co-operative technical user group has considered short term research options for Snapper. It has been agreed that tagging is the best short term option to estimate biomass in SNA 1. A tagging programme commenced in 1993. Alternative fishery independent techniques such as egg production surveys are being investigated. These may provide a more cost effective long term technique to estimate Snapper biomass.

ACTIONS:

(i) NFSMG to promote the design of an agreed programme to provide estimates of stock biomass and yield for SNA 1 and SNA 8 at appropriate intervals.

(ii) NFSMG to promote the design of an agreed programme to annually monitor SNA 1 and SNA 8 stocks in years in between estimates of biomass.

(iii) NFSMG to agree on and promote implementation of a programme to estimate and monitor recreational and traditional catch in SNA 1 and SNA 8.

Indicators

Formal documentation of the strategic research program developed via the Snapper Working Group.

- An annually revised estimate of stock biomass.
- An estimate of yield for each year.

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- An estimate of Snapper recreational catch for each year.
- An estimate of Snapper traditional catch for each year.
- Documentation of non-commercial catches in accordance with the strategy.

Strategy 2 *To incorporate research and information requirements of the strategic management plan into the strategic research programme for the SNA 1 and SNA 8 fish stocks.*

The strategic plan identifies information needs to develop management strategies for issues such as high grading and juvenile mortality. In each case a cost benefit approach is required when considering likely gains to the stock from new management strategies. The development of strategic research directions should incorporate the collection of data for management purposes.

ACTIONS FOR NFSMG BY JUNE 1995:

(i) Summarise research proposals within the strategic plan and add costings and priorities.

(ii) Summarise information requirements within the strategic plan and address implementation, costings and priorities.

Indicators
- Research agenda, with priorities and costings, is developed.

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PART 3

Appendices

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SNAPPER WORKING GROUP REPORT 1994

(relevant sections)

Citation:
Annala, J.H. (Comp.) 1994: Report from the Fishery Assessment Plenary, May 1994: stock assessments and yield estimates. (Unpublished report held in MAF Fisheries Greta Point library, Wellington.)

1. FISHERY SUMMARY

Commercial fisheries

The Snapper fishery is one of the largest and most valuable coastal fisheries in New Zealand. The commercial fishery, which developed last century, expanded in the 1970s with increased catches by trawl and danish seine. Following the introduction of pair trawling in most areas, landings peaked in 1978 at 18 000 t. In the 1980s an increasing proportion of the catch was taken by longlining as the Japanese "iki jime" market was developed. By the mid 1980s catches had declined to 8 500 - 9 000 t, and some stocks showed signs of overfishing. The fisheries had become more dependent on the recruiting year classes as stock size decreased. With the introduction of the QMS in 1986 TACs in all stocks were set at levels intended to allow for stock rebuilding.

In 1986-87 landings from the three largest stocks were less than their respective TACs (Table 1). Catches subsequently increased in 1987-88 and catches have closely matched the actual TACs since. However, landings from SNA 7 continued to fall below the TAC, and in 1989-90 the TACC was reduced to 160 t. In 1990-91, total landings of Snapper decreased to 7 570 t. This was mainly caused by a decrease in landings from SNA 1 (660 t below the TACC); the reason for the shortfall is not known, however, landings in 1991-92 slightly exceeded the TACC. In the SNA 8 fishery, catches were slightly above the TACC in 1990-91 and in SNA 7 closely matched the current TACC. In SNA 2 the by-catch of Snapper in the tarakihi, gurnard and other fisheries, resulted in a major over-run of the Snapper TACC in the four years before 1992-93.

Changes to the TACCs took effect from 1 October 1992 resulting in a reduction for SNA 1 from 6010 to 4900 t, an increase for SNA 2 from 157 t to 250 t, and a reduction for SNA 8 from 1594 t to 1500 t. The TACC's for SNA 1 and SNA 2 were exceeded in the 1992-93 fishing year. For SNA 1 this can largely be attributed to successive carrying forward of up to 10% underruns from previous years by individual quota holders.

Table 1: Reported landings (t) of Snapper by Fishstock from 1983-84 to 1990-91 and gazetted and actual TACs (t) for 1986-87 to 1992-93.

Fishstock	SNA 1		SNA 2		SNA 3		SNA 7		SNA 8		SNA 10			
QMAs	1		2		3,4,5,6		7		8,9		10		Total	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings§	TACC
1983-84†	6539	-	145	-	2	-	375	-	1725	-	0	-	9153	-
1984-85†	6898	-	163	-	2	-	255	-	1546	-	0	-	9228	-
1985-86†	5876	-	177	-	0	-	188	-	1828	-	0	-	8653	-
1986-87‡	4016	4710	130	130	0	30	257	330	893	1330	0	10	5314	6540
1987-88‡	5061	5098	152	137	1	30	256	363	1401	1383	0	10	6900	7021
1988-89‡	5793	5614	210	157	1	30	176	372	1526	1508	0	10	7706	7691
1989-90‡	5826	5981	364	157	<1	30	294	160	1550	1594	0	10	8034	7932
1990-91‡	5315	6002	427	157	<1	31	160	160	1658	1594	0	10	7570	7944
1991-92‡	6218	6010	373	157	<1	31	143	160	1462	1594	0	10	8191	7962
1992-93‡	5423	4904	316	252	2	32	165	160	1543	1500	0	10	7448	6858

† FSU data. SNA 1 = stat areas 1-10; SNA 2 = stat areas 11-16; SNA 3 = stat areas 18-32; SNA 7 = stat areas 17, 33-36, 38; SNA 8 = stat areas 37, 39-48.

‡ QMS data.

§ Includes landings from unknown areas before 1986-87.

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Non-commercial fisheries

The 1987 National Marine Recreational Fishing Survey showed that Snapper was the most important finfish species sought by non-commercial fishers. Although the current annual catch of Snapper by the non-commercial fishery is not known, estimates for most areas are available based on the results of tagging programmes (Table 2).

Table 2: Estimates of annual non-commercial catch of Snapper (t) and non-commercial catch expressed as a percentage of commercial landings based on results of tag-recapture programmes in the stated areas and years.

			Non-commercial catch	% of commercial catch
Auckland East (SNA 1)	-	Bay of Plenty, 1984	400	30
		Hauraki Gulf, 1985	830	20
		East Northland, 1985	370	17
		TOTAL	1600	21
Challenger (SNA 7)	-	Tasman/Golden Bay, 1987	15	8
West coast North Island (SNA 8)	-	1991	250	13

2. BIOLOGY

Snapper are demersal fish found down to depths of about 200 m, but are most abundant in 10-60 m. They are the dominant fish in northern inshore communities and occupy a wide range of habitats, including rocky reefs and areas of sand and mud bottom. They are widely distributed in the warmer waters of New Zealand, being most abundant in the Hauraki Gulf.

Snapper are serial spawners, releasing many batches of eggs over an extended season during spring and summer. The larvae have a relatively short planktonic phase which results in the spawning grounds corresponding fairly closely with the nursery grounds of young Snapper. Young fish school in shallow water and sheltered areas and move out to deeper water in winter. The fish disperse more widely as they grow older. They first reach maturity from 20 to 28 cm fork length at 3-4 years of age. Large schools of Snapper congregate before spawning and move on to the spawning grounds, usually in November-December. The spawning season may extend to January-February in some areas before the fish disperse, often inshore to feeding grounds. The winter grounds are thought to be in deeper waters where the fish are more widespread.

Water temperature plays an important part in the success of recruitment in any year. Strong year classes in the population correspond to warm years, and weak year classes correspond to cold years.

Growth rate varies around New Zealand. Snapper from Tasman Bay and the west coast of the North Island grow faster and reach a larger average size than elsewhere. Snapper have a strong seasonal growth pattern, with rapid growth from November to May, and then a slowing down or cessation of growth from June to September. They may live up to 60 years or more and have very low rates of natural mortality. An estimate of M = 0.06 was made from catch curves of commercial catches from the west coast North Island pair trawl fishery in the mid-1970s.

Estimates of biological parameters relevant to stock assessment are shown in Table 3.

Table 3: Estimates of biological parameters

Fishstock	Estimate	Source
1. Natural mortality (M)		
All	0.06	Sullivan (unpubl. data)
2. Weight = a (length)^b (Weight in g, length in cm fork length)		

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All	a = 0.04467 b = 2.793			Paul (1976)
3. von Bertalanffy growth parameters				
	Both sexes combined			
	K	t_0	$L\bar{l}$	
SNA 1	0.102	-1.11	58.8	
SNA 8	0.160	-0.11	66.7	Sullivan and Gilbert (1992)
4. Age at recruitment (years)				
SNA 1	4			Sullivan and Gilbert (1992)
SNA 7	3			Ryan (unpubl. data)
SNA 8	3			Sullivan and Gilbert (1992)

3. STOCKS AND AREAS

There are no new data which would alter the stock boundaries given in previous assessment documents.

Separation of stocks has previously been on the basis of genetic studies and other biological information. The location of spawning grounds, differences in growth rates between areas and the results of tagging studies suggest that 6 or 7 stock units may exist. Although some long-distance movements have been recorded by individual fish, tagging studies show that generally movement is localised.

4. STOCK ASSESSMENT

(i) SNA 1 (Auckland East)

The estimates of yield presented in 1993 from an updated assessment based on analysis of tagging and commercial CPUE data have been revised to include recent catch and recruitment information.

(a) Water temperature - recruitment relationship

A relationship has been demonstrated between abundance estimates of one-year-olds in Hauraki Gulf trawl surveys and water temperature (Francis 1993). This relationship has now been updated with two further estimates of recruits. Recent experiments have shown that the doorspread of the net used to survey young Snapper is not constant (as previously assumed), but depends on the amount of warp deployed. Therefore abundance estimates were corrected for doorspread, which was estimated from warp length. The corrections were relatively small.

A further problem was identified from the pattern of residuals in the regression of Hauraki Gulf recruitment with water temperature. The residuals for the first five surveys were negative and those for the last four surveys were positive. Most of the variation in the residuals (78%) was explained by variations in headline height, indicating that the set-up of the trawl gear, and Snapper catchability, had changed part-way through the time series. Unfortunately, headline height was measured on only 7 of the 9 surveys, so it could not easily be included as a variable in the model. Instead, the surveys were stratified into two sets (Set 1 = surveys 1984-88; Set 2 = surveys 1989-93). A multiple regression model incorporating Temperature and Set as variables explained 95% of the variability in the Snapper abundance estimates (compared with 75% for last year's temperature-only model). The revised model had no visible pattern in the residuals. The estimated factor required to multiply the first set was 2.09 i.e., the catchability more than doubled in the second set of surveys.

A time series of predicted recruitment indices extending back to 1931 was obtained from the revised model using a relationship between Leigh water temperature and Auckland air temperature. The new index series is less variable than that used last year.

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A time series of observed recruitment indices was obtained by adjusting for the change in catchability between the first and second sets of surveys. The complete time-series (Table 4) was then rescaled so that the mean of the 9 values equalled the mean of the predicted indices for the same year classes (i.e. 1983-1989, 1991-1992). In the assessment model the observed index was used for years when it was available and the predicted index in other years.

Table 4: Estimated number of 1-year-olds in trawlable areas from Hauraki Gulf spring trawl surveys, and observed and predicted relative recruitment indices. The predicted index is scaled so that the mean for the period 1931-1993 equals one, and the observed index is scaled so that its mean equals the mean of the predicted indices for the same year classes.

Year class	Mean Feb-Jun water temp (oC)	Estimated no. of 1-yr-olds (millions)	Observed index	Predicted index
1982	18.46	-	-	0.86
1983	17.24	0.55	0.22	0.23
1984	18.30	2.49	0.99	0.72
1985	18.78	3.01	1.19	1.21
1986	19.02	3.59	1.42	1.57
1987	17.98	1.11	0.44	0.51
1988	18.54	4.22	0.80	0.93
1989	19.28	10.93	2.07	2.09
1990	19.04	-	-	1.61
1991	18.10	3.87	0.73	0.58
1992	17.32	1.22	0.23	0.25
1993	17.68	-	-	0.37
1994	-	-	-	1.15*

* This value was estimated solely from the February water temperature.

(b) Biomass estimates

Age-structured model

The age-structured model used in the 1992 assessment projects forward from an estimated biomass (53 400 t) and age structure at the start of 1985, both of which were obtained from the tagging experiments. Instead of estimating virgin biomass, mean recruitment is estimated. In 1992 this model was fitted to a set of CPUE indices which were used as indices of stock size. During the 1993 assessment it was found that confidence limits to the estimated mean recruitment, based on the uncertainty in the CPUE index, were very wide. The model does not appear to be capable of giving good estimates of mean recruitment and current stock size. However, the model does give a reasonably robust estimate of the ratio of current stock size to B_{msy} and does provide a means for investigating stock biomass trajectories under an assumed range of mean recruitments.

The Plenary has considered what could be the plausible range of mean recruitments for the SNA 1 stock. A possible lower bound for mean recruitment was agreed at 8.5 million 4 year-old recruits. This corresponds to the minimum recruitment estimated from an alternative stock reduction analysis model operating under the assumption of constant recruitment. The determination of an upper bound for mean recruitment proved to be more problematic. The Plenary agreed on a possible value of the upper bound for a mean recruitment equal to 14 million. This corresponds to a value for virgin biomass of about 450 000 t which is believed to be near to the upper end of a plausible range of virgin biomass estimates.

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The projections were calculated for the two scenarios for the period from 1985 to 1998 (Table 5). The predicted biomass trajectories under the two assumptions from 1985 to 1993 are similar with a difference of about 34% in 1993, but diverge thereafter with a difference of about 53% in 1998. The difference of 34% is probably not detectable given the available estimation techniques for this stock.

Table 5: **Model estimates for SNA 1 based on two assumptions about mean recruitment (R_0). B_0 is virgin biomass, R_0 is number of 4-year-old recruits, B_{93}, B_{95}, B_{98} and B_{msy} are mid-year stock biomasses for 1993, 1995, 1998 and maximum sustainable yield (MSY), respectively, $(C/B)_{95}$ is the assumed catch to estimated mid-year biomass ratio for 1995, $(C/B)_{MSY}$ is MSY/B_{MSY}, CSP is the mean surplus production for a stock biomass equal to B_{95} (annual surplus production depends on actual recruitment each year), CAY_{95} is current annual yield for 1995.**

Assumption	B_0 kt	B_{93} kt	B_{95} kt	B_{98} kt	B_{msy} kt	$(C/B)_{94}$ %	$(C/B)_{msy}$ %	CSP_{95} t	CAY_{95} t	MSY t
Lower bound (R_0=8.5 x 10^6)	270	37	37	32	67	16.6	9.2	5200	3400	6100
Upper bound (R_0=14 x 10^6)	450	56	65	68	110	11.2	9.2	9200	6000	10100

A yield per recruit analysis was carried out using the growth and mortality values given in Table 4 to obtain equilibrium yield estimates. Knife-edge recruitment at age 4 was assumed, and the selection pattern observed in 1985 for all methods combined (including non-commercial) was used. The value of $F_{0.1}$ as a catch to biomass ratio was 5.6%, while F_{max} occurred at a catch to biomass ratio of 9.2%. The reference fishing mortality of F_{max} (here equal to F_{msy}) was used below to estimate yields. B_{MSY} occurs at 24.8% of B_0.

Daily Egg Production Model

A Daily Egg Production Method survey (DEPM) was carried out November-December 1992 in the Hauraki Gulf to estimate biomass of spawning Snapper (Zeldis et al in prep.). Preliminary biomass estimates were made using the DEPM-determined sex ratio of 0.43, as well as an assumed value of 0.50 and equalled 20,100 t, and 23,600 t, respectively. These estimates are consistent with the biomass estimates from the age-structured model described above.

(c) Estimation of Maximum Constant Yield (MCY)

MCY was estimated from the equation MCY = 2/3 CSP (Method 3), as the stock is below B_{MSY}. For the range of CSP in 1995 in Table 5

MCY = 3470 - 6130 t

where CSP is the deterministic current surplus production as described below. This estimate is inclusive of amateur catch.

The level of risk to the stock by harvesting the population within the estimated range of MCY values is unknown.

(d) Estimation of Current Annual Yield (CAY)

CAY was calculated from the Baranov catch equation assuming that fishing is spread evenly throughout the year using the selection pattern estimated from the tagging experiments. Fref was set equal to Fmax. For the range of 1995 mid-year biomass in Table 5

CAY_{95}= 3400 - 6000 t

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This estimate is inclusive of amateur catch.

The level of risk to the stock by harvesting the population within the estimated range of CAY values is unknown.

(e) Estimation of Current Surplus Production (CSP) and Maximum Sustainable Yields (MSY)

Estimates of deterministic equilibrium yields were based on the yield per recruit analysis. Equilibrium CSP was calculated as the catch that would sustain the stock at its mid-1995 biomass assuming constant recruitment at the estimated mean value. For the range given in Table 5

Equilibrium CSP_{95}= 5200 - 9200 t

Predicted CSP for a particular year depends on the recruitment for that year and is therefore highly variable. The predicted CSP for 1995 using the observed recruitment index and non-equilibrium age structure ranged from 4325 to 8374 t. These values are slightly less than the Equilibrium CSP estimates as poor recruitment to the exploited population is predicted.

MSY was calculated as the maximum catch that could be sustained by the stock.

MSY = 6 100 - 10 100 t

This is achieved with a catch to biomass ratio of 9.2% at B_{MSY}. Again these estimates are inclusive of amateur catch.

(ii) SNA 8 (Auckland West/Central West)

Estimates of yield are presented from a revised and updated assessment based on analysis of tagging, pair trawl CPUE and catch-at-age data.

(a) Biomass estimates

A main source of uncertainty identified in last year's assessment was the use of the SNA 1 temperature-recruitment relationship to generate a time-series of relative recruitment indices for the SNA 8 stock. Discrepancies in relative year class strength were identified in comparisons between trawl catch-at-age from SNA 8 and the assumed SNA 1 recruitment index. The input data used in this assessment are the same as for the 1993 assessment with the exception the assessment approach was revised to include catch-at-age data from the trawl fishery from 1988-89 to 1993-94.

An age-structured model was constructed to permit the estimation of constant annual recruitment (number of 3 year old fish entering the fishable stock) for the period 1931 to 1985 ($\bar{R}$) (Table 6). Annual recruitments at age 3 years for each year from 1986 to 1993 (R) were estimated (Table 8). These parameters were determined by a non-linear least squares fit to the observed pair trawl cpue, trawl catch-at-age, a tagging programme estimate of absolute biomass, and total annual catches.

Table 6: Estimated annual recruitment for each year from 1986 to 1993 (Rt), constant annual recruitment for the period 1931 to 1985 ($\bar{R}$), and the arithmetic mean of annual recruitments from 1931 to 1993 (R Proj). All recruitment values are the number of 3 year olds entering the fishable stock x 10^3 in the index year.

Recruitment index	R_{1986}	R_{1987}	R_{1988}	R_{1989}	R_{1990}	R_{1991}	R_{1992}	R_{1993}	$\bar{R}$	R_{Proj}
value	718	2734	5221	4099	2534	895	3393	1813	1337	1507

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A range of scenarios was considered for varying levels of error in observed catch-at-age and absolute biomass. The model was found to be sensitive to both measurement error or bias in the tagging estimate of absolute biomass. MSY (Table 7) was calculated based on equilibrium population state with constant recruitment equal to $\bar{R}$. A most likely base case (Table 9) indicates a model biomass estimate for the beginning of 1994 equal to about 86% of B_{MSY}. However, B_{MSY}, and hence current biomass as a proportion of B_{MSY}, may not be particularly well determined. Because of the modelling procedure used, B_0 and B_{MSY} are likely to be under-estimated and the ratio B_{94}/B_{MSY} over-estimated. Biomass levels have increased substantially (more than doubled) since 1986 mainly due to the effects of large recruitments in the period 1987 to 1990. Forward projections to 2004 (B_{04} in Table 7) based on constant recruitment equal to R_{Proj} and the expected total removals of about 1790 t (current TACC plus estimated non-commercial catch) indicate that biomass will increase. However, if a relationship between water temperature and recruitment similar to that observed in SNA 1 also holds for SNA 8, then recruitment in SNA 8 may be reduced for a few years after 1994.

Table 7: Model parameter, biomass and yield estimates for SNA 8 (CVs in brackets). B_0 is virgin stock biomass B_{90}, B_{94}, B_{04} and B_{MSY} are mid-year stock biomasses for 1990, 1994, 2004 and maximum sustainable yield (MSY), respectively. B_{94}/B_{MSY} the ratio of current biomass to B_{MSY}. Equilibrium CSP is the catch that would sustain the population at its mid 1994 biomass assuming constant annual recruitment ($\bar{R}$).

B_0 kt	B_{90} kt	B_{94} kt	B_{04} kt	B_{MSY} kt	B_{94}/B_{MSY}	MSY t	Equilibrium CSP
75.9	11.7	17.3	21.5	19.9	0.86	1890	1890

The predicted current surplus production (Predicted CSP) for 1994 was calculated from the net increase in model biomass between 1994 and 1995 in the absence of commercial and non-commercial harvesting by setting recruitment equal to one of three different values: (1) the mean of recruitments from 1986 to 1993; (2) R_{proj}; and (3) $\bar{R}$ (Table 8). Predicted CSP for 1995 was calculated in the same way using the same three recruitment assumptions and assuming that in 1994 the commercial catch was equal to the current TACC of 1500 t and the non-commercial fishing mortality was equal to 0.0274 (as estimated from the results of the 1990 tagging programme). Sensitivity to the assumed recruitment levels in 1995 was examined by using values equal to half and 1.5 times the levels of the three assumptions. For all three recruitment assumptions, Predicted CSP for 1994 and 1995 was greater than the estimated combined commercial and non-commercial removals of about 1790 t, which indicates that stock size will increase in these two years.

Table 8: Predicted current surplus production (Predicted CSP) for 1994 and 1995 based on three assumed levels of recruitment. $\bar{R}_{93}$ = arithmetic mean of annual recruitment from 1986-93; R_{proj} = arithmetic mean of annual recruitment from 1931-1993; $\bar{R}$ = constant annual recruitment from 1931-85.

Recruitment		Predicted CSP 1994	1995
0.5	$\bar{R}_{1986\text{-}93}$	3100	2880
	$\bar{R}_{1986\text{-}93}$	3650	3760
1.5	$\bar{R}_{1986\text{-}93}$	4190	4640
0.5	$\bar{R}_{proj}$	2570	2210
	$\bar{R}_{proj}$	2880	2710
1.5	$\bar{R}_{proj}$	3180	3200
0.5	$\bar{R}$	2490	2120
	$\bar{R}$	2760	2560
1.5	$\bar{R}$	3040	3000

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(b) Estimation of Maximum Constant Yield (MCY)

MCY was estimated from the equation MCY = 2/3CSP (Method 3), where CSP is the equilibrium CSP for a biomass equal to B94. This method was selected because the stock is below BMSY (see Table 8).

MCY = 2/3 x 1886 t
= 1256 t (rounded to 1250 t)

The estimate is inclusive of amateur catch.

The level of risk to the stock by harvesting at the estimated MCY is unknown.

(c) Estimation of Current Annual Yield (CAY)

CAY was calculated from the Baranov catch equation under the baseline case. Fref was set equal to
F_{MSY}. At B_{MSY} the catch to mid-year biomass ratio is 9.6%. From Table 8.

CAY = 0.096 x B_{94}
= 0.096 x 17253 t
= 1656 t (rounded to 1660 t)

where B_{94} is the mid-1994 stock biomass. This estimate is inclusive of amateur catch.

The level of risk to the stock by harvesting at the estimated CAY is unknown.

5. STATUS OF THE STOCKS

SNA 1

Estimates of current and reference biomass are available for SNA 1.

The current status of this stock is uncertain. However, the Plenary agreed that the stock is currently below B_{MSY}. Under both the scenarios presented in this report, the present stock size is about half the size that would support the MSY. For the lower bound scenario, current catch levels would not be sustainable, but for the higher bound scenario the stock would move towards a size that would support MSY. An increase in the stock size towards B_{MSY} is likely to result in an increase in catch rates, and, for most of the range of mean recruitment values examined, would result in higher yields. The Plenary agreed that both extremes of the range were unlikely but could not determine a most likely estimate within the range. A revised estimate of stock biomass is essential to resolve the uncertainties in the current stock assessment.

The preliminary DEPM results, which are for the Hauraki Gulf only, are consistent with the biomass estimates from the current assessment.

SNA 8

Estimates of current and reference biomass are available for SNA 8.

Recent commercial and amateur catches and the current TACC are at levels that will allow the stock to move towards a size that will support the MSY during 1994 and 1995 for the three recruitment assumptions examined. A period of low water temperatures may produce lower recruitment for a few years beginning in 1994. The sum of the current TACC and amateur

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catches appears to be sustainable in the long term. The present stock size is less than B_{MSY}, although B_{MSY} is not well determined. The model results indicate that since 1986 the stock size has more than doubled and on average catch rates have also doubled. An increase in the stock size towards the size that will support the MSY would produce two likely benefits. Firstly, a slightly higher yield would be sustainable at B_{MSY}. Secondly, the model predicts that cpue would approximately double. There is also a possibility that as stock size increases, amateur removals will increase, thus slowing the rate of rebuilding.

6. FOR FURTHER INFORMATION

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PRIMARY OBJECTIVES

1. Improve Information Base
2. Reduce Conflict
3. Implement Stock Management Strategies

1. **To improve the information base for the northern area fishery**

Good information is the foundation for good management. At present, the information base is inadequate for most stocks.

This objective includes issues as the need for biological research to support stock assessment, current catch levels in the commercial, non-commercial and illegal fisheries, assessment of claimed juvenile mortality, economic and social impacts research, and reviewing the effectiveness of management controls, and compliance in the fishery.

2. **To reduce conflict between user groups**

The northern area fishery is a multi-user fishery with a number of significant conflicts, or perceived conflicts, between user groups. Conflict resolution must be a primary objective of management in the northern area.

This objective deals mainly with addressing the present problems associated with commercial/non-commercial conflicts. Other issues which also need to be addressed include marine reserves, taiapure, mahinga kaimoana, gear conflicts between commercial users, spatial conflicts, and public understanding to improve relations between user groups.

3. **To develop and implement agreed stock management strategies for northern area fisheries**

The development and implementation of stock management strategies for the northern area fishery is critical to achieving biological objectives for stocks and flowing from that, the benefits from the stocks which will be available to users.

This objective would deal primarily with such issues as strategies to fish stocks at particular levels which may be above or below the current level. Other related issues for which stock management strategies could be developed include maximising yield per recruit, determining juvenile mortality, protection of fishery habitats, and fishery enhancement.

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CONFLICT RESOLUTION

Definition ***A conflict "issue" exists when one party perceives that it is being deprived of the quality of access to Snapper resources it perceives it has some rights to.***

This paper records the agreed NFSMG process for addressing potential conflicts in the northern Snapper fisheries.

The paper proposes that conflicts can best be resolved by processes of information generation, consultation and discussion between the affected parties. The paper seeks to highlight the importance of separating concerns regarding "the quality of ... the Snapper resource" (that is sustainability issues) from issues of "entitlement" (that is allocation issues).

The concept that perceived "spatial conflict" situations should inevitably be resolved by compromises (concessions from the alternative party to the "aggrieved" party) can only lead to further claims and conflict. A one sided process should be avoided in favour of a process of mutual benefit which is the basis of all amicable "deals". It must be noted that this plan itself and the confidence it will engender that the fishery is being substantially and comprehensively managed for the benefit of all users and that the fish stocks and its fisheries are improving, represents the major means of conflict reduction in the fishery. This must be reflected in information available to user groups and the public, to improve awareness of the state of the Snapper fishery.

However where conflict is relatively intense, the result may be political lobbying for a range of solutions unrelated to the issues of concern, and which would achieve far less reduction of conflict than information sharing and increased sensitivity by all to the needs of other users.

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Conflict resolution process

The conflict resolution process outlined in this section is to be co-ordinated by the NFSMG. Should for whatever reason the NFSMG be unable to fulfil this function it is expected that MAF, as the agency with ultimate responsibility for the management of fisheries, will fulfil this function using a similar process.

The process for conflict resolution needs to incorporate a means for parties to bring forward issues for resolution, of ensuring stakeholder participation, and of monitoring the outcome where this involves some kind of management change. It consists of the following elements:

- NFSMG identified as initial point of contact for people with concerns about Snapper related issues. Such persons to be supplied in the first instance with appropriate information (e.g. this plan).

- NFSMG will assist where concerns/issues are significant and persistent, in identifying individual shareholders (commercial, recreational, environmental, Maori) most likely to be affected by or otherwise associated with such issues/concerns, who should be involved in efforts to find resolution.

  (i) If agreement is reached, at this point a proposition may, if appropriate, be put to the Minister for approval.

  (ii) If agreement is not able to be reached at this point, then MAF, or the then delivery agency, shall follow a consultative process which may include some or all of the following stops.

    (a) MAF to hold initial stakeholders/representatives public meeting to determine nature and extent of user/interest group concern. (Within 1 month of reference of issue from NFSMG to MAF). MAF and other groups to seek to inform this meeting of all relevant issues, rights, interests, processes.

    (b) Interest groups appoint representatives to participate in negotiations intended to more clearly define issues/objectives and possible solutions. (Time frame for this phase, 1-3 months).

    (c) Results of negotiations documented and reported back to second meeting and NFSMG, with opportunity provided for written/verbal comment on proposals or appropriate solutions where no agreement reached. (Time frame for comment, 1 month).

    (d) Where result is consensus, this may be for the continuance of the status quo or for change to management through a voluntary agreement. A statement describing elements of the voluntary agreement is to be prepared and signed by interest group/stakeholder representatives. One component of any such agreement may be that signatories will reconvene at agreed intervals to review its effectiveness. NFSMG and/or MAF to disseminate the conclusions of the review.

    (e) Where result is a regulatory proposal or where no agreement has been reached, MAF to compile draft report for Minister backgrounding issue and discussions which have occurred including options identified, and accompanied by all submissions received.

  (iii) At the completion of consultation MAF (or the delivery agent) will forward a draft report to NFSMG representatives for final comment. (Time frame for forwarding final report to Minister within 2 months of receipt of submissions).

  (iv) The Minister will then make a decision on appropriate action.

  (v) MAF will disseminate decision.

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Resources Needed

The processes of travelling to and of holding meetings, preparing submissions, researching, collating and circulating information all take time and money.

It is expected that MAF, in being responsible for coordinating much of the above process, will be responsible for the costs of it.

In short, it is proposed that costs lie where they fall in the course of conflict resolution processes.

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SUMMARY OF GOALS, STRATEGIES AND ACTIONS AND TIMETABLE FOR RECOMMENDATIONS WITHIN THE PLAN

GOAL 1 To maximise the economic social and cultural returns from the northern SNA fisheries

NFSMG	STRATEGY	NFSMG ACTION		COMPLETION DATE
2.1.1	Maximise fishery returns	i.	Assess benefits	10/96
2.1.2	Maximise sector freedom	i.	Consider within sector allocation	10/95
2.1.3.1	Improve juvenile mortality information	i.	Assess juvenile catch	10/95
		ii.	Assess survival of juvenile	
2.1.3.2	Minimise juvenile mortality	i.	Restrict unacceptable practice	
2.1.3.3	Assess non capture mortality	i.	Assess literature	10/95
2.1.3.4	Minimise non capture mortality	i.	Environmental code for good practice	10/95
2.1.3.5	Coastal plans to protect the SNA resource	i.	Ensure RC Plans are appropriate	3/95
2.1.4.1	Assess highgrading and return of sublegals by recreational and commercial	i.	Measure actual at sea catches	10/95
		ii.	Describe expected ratios	10/95
		iii.	Compare landed with at sea catches	10/95
2.1.4.2	Reduce highgrading incentives	i.	Trial options for disincentives	10/96
		ii.	Educate fishers against	10/96
2.1.4.3	Reduce dumping incidents	i.	Establish causes	10/96
		ii.	Develop a COP	10/96
2.1.4.4	Minimise "bycatch fishing" of Snapper	i.	Set appropriately high deem value	Annual
		ii.	Monitor deeming activity	Annual
2.1.4.5	Promote that fishermen ensure adequate access to quota	i.	Assess likely proportion of SNA in catches	10/95
		ii.	Establish COP to encourage appropriate access to quota	10/95

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NFSMG	STRATEGY	NFSMG ACTION	COMPLETION DATE
2.1.4.6	Assess level of illegal activity	i. Poll local market supplier affected by illegal sales	
		ii. Assess likely extent in commercial fishery	
		iii. Assess likely extent in non-commercial fishery	
2.1.4.7	Improve enforcement resources	i. Increase presence at landing points	10/95
		ii. Target persistent offenders	10/95
		iii. Publicity to encourage compliance	10/95
		iv. Publicity for successful prosecutions	10/95
		v. Improve enforcement responsiveness to new information	10/95
2.1.5.1	Encourage enhancement	i. Assess feasibility	

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GOAL 2 To Manage the Northern SNA Fisheries to Support the Increasing Biomass

NFSMG STRATEGY		NFSMG ACTION		COMPLETION DATE
2.2.1.1	Reassess biomass and yield	i.	Reassess biomass and yield	3/95
		ii.	Develop and promote program to monitor stocks between assessments	96 to 99
		iii.	Directly measure biomass as required	96 to 99
2.2.1.2	Ensure harvests are within yield	i	Assess biomass periodically to ensure continuing increase	96 to 99
2.2.1.3	Assess recreational and traditional take	i.	Survey recreational and traditional take	3/95
2.2.2.1	Assess allocations for all sectors to ensure sustainability	i.	Develop an agreed position	96 to 99
2.2.2.2	Assess measures to limit catches to allocations	i.	Identify and implement as required, recreational constraints	96 to 99
		ii.	Identify and implement as required, commercial constraints	96 to 99

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GOAL 3 **To Mitigate Potential Conflicts Between Users of the shared resource of the Northern Snapper Fisheries**

NFSMG	STRATEGY	NFSMG ACTION	COMPLETION DATE
2.3.1.1	Allocate commercial share by TACC areas	Nil	
2.3.1.2	Identify means of establishing explicit recreational and traditional shares	i. Assess research techniques ii. Assess allocative and management options iii. Assess compliance options	10/95
2.3.1.3	Minister to determine whether and what explicit shares are to be established	i. Minister to make allowance for sectors	
2.3.2.1	Develop conflict resolution process	i. Develop conflict resolution process	10/94
2.3.2.2	Provide proactive information to the public on the fishery	i. Publicise, research, management and compliance initiatives ii. Publish SNA Newsletter	94 to 99 94 to 99

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GOAL 4 **To Ensure a Research Programme is Developed and Recommended for implementation to meet the strategic stock assessment, monitoring, environmental and management needs of the Northern Snapper Fisheries**

NFSMG	STRATEGY	NFSMG ACTION		COMPLETION DATE
2.4.1.1	Develop a strategic stock assessment and monitoring program	i.	Design program to estimate stock biomass and yield at appropriate intervals	6/95
		ii.	Design program to monitor stocks between biomass estimates	6/95
		iii.	Implement program to estimate and monitor recreational and traditional catch in stocks	6/95
2.4.1.2	Incorporate information needs from the plan into the strategic research program	i.	Summarise, prioritise and cost, research proposals in the plan	6/95
		ii.	Summarise information requirements in the plan and address implementation options	6/95

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SUMMARY OF SNA PLAN INITIATIVES UNDERWAY/COMPLETED AT MAY 1994

GOAL/STRATEGY NUMBERS	DESCRIPTION OF INITIATIVE IN PROGRESS	COMPLETION DATE
2.1.2.1	Industry promoting ACE to complement and simplify ITQ	10/95
2.1.3.1	Industry funded assessment of Hauraki Gulf trawl juvenile catch	6/95
	Industry funded information on Hauraki Gulf longline juvenile catch	6/95
2.1.3.2	Fisheries Regulations implemented in 1993 to close all harbours and protect several other juvenile habitats	Done
2.1.3.3	MAF assisted Norwegian expert's visit to NZ to advise of international progress	Done
2.1.3.5	Industry dialogue with Coastal Planners to protect SNA Resource (Underway)	6/95
2.1.4.1	Industry funded assessment of Hauraki Gulf longline highgrading	6/95
2.1.4.3	Industry funded daily reporting of trawlers and seiners in Hauraki Gulf	Done
2.1.4.4	Industry supported deem value for SNA 1 revised to $20/kg at 1/10/93	Done
2.1.4.6	Industry funded assessment of the fishery to establish levels and processes for black market activity	12/94
2.1.4.7	Industry funding offer for extra compliance (not accepted)	-
	Industry has funded several projects and initiatives against non compliance	Done
	Industry funded extensive advertising over summer for MAF 0800 free phoneline -	Done
2.1.5.1	Industry funded enhancement research in progress	12/94
2.2.1.1	MAF Tagging program to reassess biomass and yield in SNA 1	Done
	MAF Egg Abundance Survey in Gulf to assess biomass and techniques	4/95

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GOAL/STRATEGY NUMBERS	DESCRIPTION OF INITIATIVE IN PROGRESS	COMPLETION DATE
2.2.1.3	MAF recreational diary (and boat ramp) surveys to assess recreational take in SNA 1	4/95
2.2.1.3	MAF now collecting information to allow assessment of traditional authorisations	6/95
2.3.1.2	Fisheries legislation review is addressing the option of explicit share by sector and how it may be implemented	10/95
2.3.2.1	NFSMG process to address conflict is completed (Appendix 3)	Done
2.3.2.2	The plan is circulated to interested parties to demonstrate the effective management of the fishery	10/94
	Information in the industry magazine and other publications to engender support	93 to 98
2.4.1.1	Stock research program drafted	95
2.4.1.2	Preliminary data collected	95

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