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May 1996

# **INTERIM MONITORING OF THE 1995 EASTERN GEMFISH SPAWNING RUN**

FINAL REPORT

**FRDC PROJECT 95/039**

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**DIVISION OF FISHERIES**

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## **1. NON-TECHNICAL SUMMARY**

Historically, monitoring of the eastern gemfish stock has been based on sampling at NSW fish markets, and carried out by NSW Fisheries Research Institute as part of its NSWs management responsibilities for the fishery. With the advent of AFMA, however, responsibility for monitoring of the fishery passed to the commonwealth, and its implementation has not been put on a firm footing. The need for continued monitoring of the fishery and the stock is particularly critical given the recent collapse of the fishery, at best qualitative indices of whether or not the condition of the stock is improving as a result of the closure, and continuing uncertainty about the future of the stock or the fishery. As a result of the uncertain plans by AFMA for monitoring the current gemfish by-catch, SETMAC recommended that a proposal be developed for submission to the FRDC to support an interim by-catch monitoring program for the 1995 spawning run, while longer term arrangements for monitoring the state of the stock could be developed.

Following a successful application, NSW FRI was contracted to continue its monitoring of the gemfish fishery and stock, as indicated by by-catch. The monitoring was completed as planned, based on on-board sampling, port sampling and market sampling. Data and samples collected include catch numbers, length frequencies and otoliths for age analysis.

The data indicate a continuing decline in the number of large, older fish in the stock. The by-catch is dominated by juveniles and small adults from the 1990 and 1991 year-classes. The 1992 year-class continues to look weak, whereas 1993 appears to have produced a much stronger year-class. Interpretation of the relative sizes of the peaks in the length frequency data is difficult, however, due to uncertain effects of sampling biases.

These data have been provided to industry at meetings of the Eastern Gemfish By-catch Working Group, the Gemfish Stock Assessment Group and the Eastern Gemfish Workshop. The data were also provided to scientists doing the gemfish stock assessment and evaluating harvest strategies for Australian fisheries at the risk of economic collapse.

## **2. BACKGROUND**

The weak condition of the eastern gemfish stock is well established, as a result of a series of science/industry/management meetings, several research initiatives, and extensive discussion with the NSW industry. What is much less apparent is the cause of the stocks decline and its prospects for recovery. No fisheries independent information on the size of the gemfish stock, either current or historical, have been collected. Rather, management has relied on indirect and fisheries-dependent indices of abundance. Historically, this

information, based on market and on-board sampling, was conducted by NSW Fisheries, as part of its responsibilities for managing the fishery. Recently, AFMA has taken over responsibility for the fishery, but it has yet to put in place a protocol and funding basis for monitoring of the size (and age) composition of the spawning stock. Nonetheless, these data are absolutely critical to determine both whether current management plans are working (i.e., the stock is, if not recovering, at least declining more slowly) and whether predictions of recruitment variation based on environmental factors are correct. As well, eastern gemfish are being considered for possible listing on the endangered species list, which makes monitoring of the size composition of the incidental commercial catch be continued even more vital.

At present (May, 1996), AFMA is in the process of developing a research program and system for routinely monitoring gemfish stocks. However, in 1994 the SETMAC Research Committee noted that it was unlikely that any system would be in place in time for the 1995 spawning run. Because of the management and scientific value of the data, the committee requested funds to carry out monitoring of the by-catch during the 1995 gemfish spawning run, in order to ensure the continuity of data for cohort analysis.

### 3. PROJECT DETAILS

#### OBJECTIVE

To ensure continuity of monitoring gemfish recruitment, in order to obtain better information on possible effects of environmental variability and over-fishing on the stock.

#### PERSONNEL

Ronald Thresher	CSIRO	Project Supervisor
Neil Andrews	NSW FRI	Sub-contract Supervisor
Kevin Rowling	NSW	FRI Scientist

### 4. TECHNICAL RESULTS, GENERAL DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

As planned, the funds sought by CSIRO Division of Fisheries on behalf of SETMAC were used to contract NSW FRI to carry out the monitoring program. Correspondence relating to the sub-contract are provided in Appendix 2.

Technical details of the NSW FRI monitoring program, its results and implications are provided in Appendices 3 and 4.

Broad results of the monitoring program were made available to the scientific community, AFMA and the fishing industry through 1) provision of the raw data to stock assessment biologists (see Appendix 5) and 2) verbal and written presentations by K. Rowling at the Eastern Gemfish By-catch Working Group meeting in Ulladulla, NSW in September, 1995, at the Eastern Gemfish Stock Assessment meeting at Cronulla, NSW, in March, 1996 and at the Eastern Gemfish Workshop, held in Canberra in April, 1996. The technical data were incorporated into the analysis in the Final Report for FRDC Project T93/238 'Evaluation of harvesting strategies for Australian fisheries at different levels of risk from economic collapse', which focussed on gemfish as a case study. The results of the analysis were also discussed at the Eastern Gemfish Workshop in Canberra, along with an up-date of the apparent relationship between environmental forcing and gemfish recruitment variability (Appendix 6).

APPENDICES

APPENDIX 1. ORIGINAL APPLICATION

## PART A - ADMINISTRATIVE SUMMARY

### A1 FRDC PROJECT NUMBER

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### A2 PROJECT TITLE

Interim Monitoring of the 1995 eastern gemfish spawning run

### A3 ORGANISATION

Name	Dr. P.C. Young, Chief		
Department	CSIRO Division of Fisheries		
Postal Address	GPO Box 1538 Hobart, Tas. 7001	Location	Castray Esplanade Hobart, Tas.
Phone	(002) 325 222	Facsimile	(002) 325 000
Name	Bureau of Resource Sciences		
Department	Department of Primary Industries and Energy		
Postal Address	PO Box E11 Queen Victoria Terrace PARKES ACT 2600	Physical Address	2nd Floor John Curtin House 22 Brisbane Avenue BARTON ACT
2600			
Phone	(06) 272 5177	Facsimile	(06) 272 4014

### A4 ADMINISTRATIVE CONTACT

Name	Mr. Greg Lyden		
Position	Grants Officer		
Postal Address	GPO Box 1538 Hobart, Tas. 7001	Location	Castray Esplanade Hobart, Tas.
Phone	(002) 325 222	Facsimile	(002) 325 000

### A5 PRINCIPAL INVESTIGATORS

1.			
Name	Dr. Ronald Thresher		
Position	Program Leader, CSIRO Temperate and Deepwater Resources Program		
Postal Address	GPO Box 1538 Hobart, Tas. 7001	Location	Castray Esplanade Hobart, Tas.

Phone	(002) 325 378	Facsimile	(002) 325 485
<b>2.</b>			
Name	Dr. Derek Staples		
Position	Head, BRS Resource Assessment Group		
Postal Address	PO Box E11	Physical Address	2nd Floor John Curtin House
	Queen Victoria Terrace		22 Brisbane Avenue
	PARKES ACT 2600		BARTON ACT
2600 Phone	(06) 272 5177	Facsimile	(06) 272 4014

## A6 PREDICTED COMMENCEMENT AND COMPLETION DATE

Commencement date 1 June 1995

Completion date 30 December 1995

## A7 PROJECT BUDGET SUMMARY

Summarise the detailed budget provided at Part C.

	1993-94	1994-95	1995-96	TOTAL
<b>FRRF Contribution</b>				
Salaries and On-costs	\$	\$	\$	\$
Travel	\$ 7,500	\$	\$	\$
Operating	\$16,000	\$	\$	\$
Capital	\$	\$	\$	\$
<b>Total FRDC</b>	<b>\$23,500</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>

<b>Research Organisation Contribution</b>				
Salaries and On-costs	\$11,350	\$	\$	\$
Travel	\$	\$	\$	\$
Operating	\$	\$	\$	\$
Capital	\$	\$	\$	\$
<b>Total Research Organisation</b>	<b>\$11,350</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>

<b>Contribution by other sources</b>				
Cash	\$	\$	\$	\$
Other (include 'in-kind')	\$	\$	\$	\$



<b>Total Contribution by other sources</b>	\$	\$	\$	\$
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<b>TOTAL BUDGET</b>	<b>\$34,850</b>	\$	\$	\$
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**CERTIFICATION**

The Principal Investigator and the person acting for and on behalf of the Research Organisation certify that all information contained in and forming part of this application to the Fisheries Research and Development Corporation is complete, accurate and provided in good faith at the date given to the Corporation and that any changes to the information will be notified to the Corporation as soon as possible.

Signed by the Principal Investigators )  
 )  
 )  
..... )  
.....

...../...../.....  
Date

SIGNED for and on behalf of the )  
Research Organisation )  
by..... )  
.....

...../...../.....  
Date

## PART B - PROJECT DESCRIPTION

*The Project Description should provide all the information necessary to enable the merit of the project to be fully evaluated.*

### B1 FRDC PROGRAM

State the primary FRDC Program and sub-program(s) that this application addresses (refer FRDC R&D Plan).

Natural Fish Resources: Sub-programs - Knowledge of Fisheries Resources, Fisheries Resource Maintenance and Improvement, and Management of Fisheries

### B2 BACKGROUND

Provide a brief background to this application.

The weak condition of the eastern gemfish stock is now well established, as a result of a series of science/industry/management meetings, several research initiatives, and extensive discussion with the NSW industry. What is much less apparent is the cause of the stocks decline and its prospects for recovery. Inevitably the size of the stock depends on both the effects of fishing and natural variability; however the relative importance of these two factors as they relate to gemfish remains unresolved. Discriminating between the effects of these two sets of factors will require focussed, detailed work on the biology of gemfish and its susceptibility to overfishing and environmental effects on recruitment, and continued monitoring of the stock as it recovers (if it does). Changes in annual wind patterns, which preliminary CSIRO studies indicate correlate with gemfish year class strength, suggest strongly that gemfish recruitment should improve over the next 1-2 years before again declining. This prediction is very testable, and if verified could have profound and wide-reaching implications for understanding how SE Australian fisheries and fished ecosystems work. Testing the prediction is critically reliant on adequate annual sampling of gemfish catches for input into cohort analysis. Past work indicates that these data can be obtained very cost-effectively by market sampling of gemfish by-catch.

### B3 NEED

Define succinctly the need for the research.

Historically, market and on-board sampling of the eastern gemfish stock was conducted by NSW Fisheries, as part of its responsibilities for managing the fishery. Recently, AFMA has taken over responsibility for the fishery, but it has yet to put in place a protocol and funding basis for monitoring of the size (and age) composition of the spawning stock. Nonetheless, these data are absolutely critical to determine both whether current management plans are working (i.e., the stock is, if not recovering, at least declining more slowly) and whether predictions of recruitment variation based on environmental factors are correct. As well, eastern gemfish are being considered for possible listing on the endangered species list, which makes monitoring of

**EDITION : 4**  
**1 August 1994**

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the size composition of the incidental commercial catch be continued even more vital.

Ultimately, it is very likely that AFMA will develop a system for routinely monitoring gemfish stocks. However, short term uncertainties about funding, in particular, indicate a very strong possibility that this system will not be in place in time for the 1995 spawning run. Because of the scientific value of the data, in terms of assessing the effects on environmental forcing and changes in parental biomass on recruitment, as well as its importance for management evaluation, we request funding to carry out monitoring of the by-catch during the 1995 gemfish spawning run, in order to ensure the continuity of data for cohort analysis.

## **B4 OBJECTIVES**

State succinctly the specific objective(s) of the research. Objectives should address 'what' is to be achieved rather than 'how' and 'why'. Objectives shall be the basis on which the relevant Fisheries Research Advisory Bodies (FRAB) advise the FRDC on the appropriateness and priority of the application.

The objective of the proposal is to ensure continuity of monitoring gemfish recruitment, in order to obtain better information on possible effects of environmental variability and over-fishing on the stock.

## **B5 INDUSTRY & MANAGEMENT CONSULTATION**

Specify the relevant consultation with industry and fisheries management undertaken before submission of this application, and the level of support for this application. Enclose any documented support for this application from the relevant FRAB, industry sector, fisheries management agency or any other beneficiary as identified at B7.

This application arose as a direct request to CSIRO and BRS by the Research Committee of SETMAC. The Research Sub-Committee of SETMAC and SETMAC itself have both accorded the monitoring of catch from the eastern gemfish stock a high priority for 1995/96.

## **B6 DIRECT BENEFITS & BENEFICIARIES**

Identify the sector(s) of the industry/or community in general that will benefit directly from the research. Quantify the difference in terms of prices (eg quality, market penetration, user satisfaction), costs (eg productivity), non market benefits and/or catch that the adoption of the research results will make to fisheries management and industry profitability.

Successful management should result in successful rebuilding. The major beneficiaries, in the short term will be the fishing industry. The ultimate beneficiary will be the Australian public as a result of the rebuilding.

## B7 FLOW OF BENEFITS

Estimate, as percentages of total benefit, the flow of benefits to fisheries, regions, States, Territory and/or other beneficiaries. Careful consideration must be given to the flow of benefits as the FRDC shall seek advice from the nominated beneficiaries (through the relevant FRAB(s)) on the appropriateness and priority of the application.

The research will apply directly to the trawl sector of the SEF. However benefits from an improved understanding of the current status of the stock will also impact management of trawling in NSW waters and the dropline fishery off NSW. To the extent that continued monitoring of gemfish increases our understanding of the role of environmental forcing and effects of fishing on stock viability, the work could have broad implications for Australian fisheries in general.

Fishery Managed by:	%	Specify fishery(ies) if appropriate or known. Name other beneficiaries	%
New South Wales	100	SE Trawl	70
Queensland		SE Non-trawl, including coastal fisheries	30
Northern Territory			
Western Australia			
South Australia			
Victoria			
Tasmania			
Australian Fisheries Management Authority			
Other Beneficiaries (eg grains producers etc.)			
TOTAL		100%	TOTAL

## B7 FORM OF RESULTS

Describe the form in which the results will be presented, eg, publication, industry or management information, process, system, or product, etc.

Results will be communicated in a report which will be made available to AFMA, the Fishery Assessment Group of SETMAC, and representative bodies of industry such as CFAC. Reports will also be made through the Demersal and Pelagic Fish Research Group (or its new equivalent) to the South Eastern Fisheries Research Committee, and summaries of the results will be prepared for popular industry journals (e.g Australian Fisheries, CFACTS, Takestock).

## B8 ADOPTION OF RESULTS

Describe the strategy for extending the results to industry with respect to transfer of technology and/or commercialisation (see R&D Plan for definitions). Include information on the organisation that will undertake the adoption, the cost of adoption, the timetable for the adoption.

NOTE: the Project Budget at Part C should include the cost of adopting the result.

Results from market sampling will be fed directly into the SET stock assessment process, and undated assessments of the state of the gemfish stock and recent recruitment produced.

## **B9 FEASIBILITY ANALYSIS**

Identify threats to the result being adopted and means of overcoming them.

There are no major threats to collecting the data or its incorporation into stock assessments or into studies of the effects of environmental variability on fish stocks. Protocols for data collection are well established, as is the infrastructure for using the data once it is collected.

## **B10 METHODS**

Describe the scientific/technical methods or protocol to be used including types of experiments, fish species involved, the data to be obtained and the means of interpreting the data. For research involving genetic manipulation refer to Clause 17, General Conditions, FRDC Project Agreement.

Protocols for market and on-board sampling of the gemfish by-catch are very well established, based on long-term work by NSW FRI and by the detailed studies carried out by industry and NSW FRI in 1994. We propose to hire a consultant (by tender) to collect these samples in 1995.

The size composition of representative samples of landed catches of gemfish from all main ports will be measured at the Sydney Fish Marker, with measurements from different ports being kept separate for later comparison. All whole fish measured will also be sexed.

Efforts will also be made to obtain representative measurements of gemfish which are discarded at sea from catches in excess of the 200 kg trip limit, especially where consistent catches are reported from a particular area (e.g. as for the 'warehou' grounds south of Eden mid way through the 1993 industry-base study). This will require considerable communication with industry representatives in the main areas, and the placement of scientific personnel aboard vessels in target areas. It is intended to discuss both the need for data on discarded catches, and the best way of obtaining the measurements, with industry representatives at the next meeting of the eastern gemfish by-catch working group (early May 1995).

As in 1994, otolith samples will probably have to be obtained at the Sydney market either by purchasing and reselling samples or by arranging with the buyers or filleters for project staff to have access to filleted frames for removal of otoliths.

All size composition data will be entered into a computer spreadsheet soon after collection, and regular reports will be compiled during the progress of the season. At the end of September a final report will be compiled, including discussion of any major developments during the season and summaries of the sexed length frequency data and the otolith samples obtained. All data will be made available to the SET Stock Assessment Group, for incorporation into analysis of gemfish stocks and to an on-going FR&DC-funded project being carried out by CSIRO on management options for gemfish.

## **B11 PERFORMANCE INDICATORS**

Identify performance measures against which the success of the overall project can be measured against the project objectives (B3). Objectives, per se are not performance measures.

The research program will have achieved its objectives if the size composition of the gemfish catch during the 1995 spawning season is determined in a manner consistent with that in previous seasons, appropriate otolith samples are collected and forwarded to the CAF, and a report presented to the SEF SAG.

## **B12 MILESTONES**

Identify (using for example a PERT or Gantt Chart) the major milestones against which progress of the project will be measured. All tangible outputs for the project should be listed as milestones together with achievement criteria for verifying that the milestones have been achieved.

March 1995: Selection of suitable consultant/agency.

## **B13 OTHER RELATED PROJECTS**

Detail other research related to this project undertaken by the applicant and other research organisations, and how such research will be integrated into or benefit this project. Indicate other projects that may be necessary before the full benefit of this project may be realised.

## **B14 FACILITIES**

Describe the facilities, eg, laboratories, aquariums, offices, vessels and gear, etc available to the project (refer Part C regarding the funding of capital items).

CSIRO has considerable experience in conducting field research and would oversee the project. The Bureau of Resource Science, in its role as chair of the South East Fishery Assessment Group, will facilitate the incorporation of results into the stock assessment process.

## **B15 STAFF**

Provide the names, positions, and skills relevant to the project of the Principal Investigator and all staff to be engaged on the project. Indicate as a percentage of time the level of contribution of each staff member to the project.

R. E. Thresher - Co-principal Investigator - 5%  
D. Staples - Co-principal investigator - 5%  
Consultant - market and field sampling - 3 months

## PART C PROJECT BUDGET

*Project Agreements shall normally cover the life of the project.*

*The budget should be a realistic reflection of costs, and include provision for a three percent annual price increase.*

*The FRDC will normally only fund (C1 to C4) the marginal costs of undertaking R&D projects. The FRDC will not fund items regarded as essential to the operation of the applicant's research facility.*

*C1 to C4 relates only to funds being requested from the FRDC.*

### C1 PROJECT STAFF

Provide estimates of, and justification for, salaries and on-costs. Direct on-costs should include normal allowances and actual costs such as payroll tax, employer's superannuation contribution and workers compensation payments. Accruing on-costs such as long service leave, sick leave, etc. should not be included. All leave should be taken within the period of the project. Consultancy fees or fees paid to another organisation should be included under 'operating'.			
	1995-96	1996-97	1997-98
Name R. Thresher			
Position Co-principal Investigator, CSOF8			
Salary			
On-costs			
Name D. Staples			
Position Co-principal Investigator, Senior Scientist			
Salary			
On-costs			
<b>Total Salaries</b>	<b>0</b>		

### C2 TRAVEL

Include details of and justification for all planned domestic and overseas travel			
	1995-96	1996-97	1997-98
Fares			
Allowances (field allowance for 50 days at \$110/d)	5,500		
Attendance at industry meetings	2,000		
<b>Total Travel</b>	<b>7,500</b>		

### C3 OPERATING COSTS

List all expendable items, ie, those items having no residual value after 1 year. Do not use categories such as general stores or miscellaneous. Provide justification for items in excess of \$1000.			
	1995-96	1996-97	1997-98
Consultant, field and market sampling	15,000		
Miscellaneous field supplies	1,000		
<b>Total Operating</b>	<b>16,000</b>		



## C4 CAPITAL

List and provide justification for all capital items. Capital items may remain the property of the FRDC until the completion of the project at which stage future ownership shall be determined (refer Project Agreement).

	1995-96	1996-97	1997-98
<b>Total Capital</b>	<b>0</b>		

## C5 CONTRIBUTION BY APPLICANT

Include normal infrastructure costs attributable to the project with respect to core staff, facilities, vessels and administrative support. Detail method of calculating 'in kind' contributions. Do not include research levies paid to the FRDC under the *Primary Industries and Energy Research and Development Act 1989*. In circumstances where the results of the research are likely to be commercialised this section shall show the method of calculation.

Total salaries and on-costs (R. Thresher and D. Staples)	11,350		
Travel			
Operating			
Capital			
<b>Total Contribution</b>	<b>11,350</b>		

## C6 CONTRIBUTION BY OTHER SOURCES

Include normal infrastructure costs attributable to the project with respect to core staff, facilities, vessels and administrative support. Detail method of calculating 'in kind' contributions. Name other government and private investors from which funds are being sought or are currently being received. Advise the consequences of such funding not being available. Do not include research levies paid to the FRDC under the *Primary Industries and Energy Research and Development Act 1989*. In circumstances where the results of the research are likely to be commercialised the applicant shall show the method of calculation.

<b>Total Contributions</b>			
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## C7 INTELLECTUAL PROPERTY

List and provide an estimated value of any related intellectual property, (including all relevant confidential or unpublished information) patents etc., owned by the applicant, the FRDC (or its predecessors) and/or other organisations. The rights to, and benefits derived from, intellectual property shall be based on the relative value of inputs made to the project by all contributors as determined and agreed at the commencement of the project, and incorporated in Project Agreement.

## C8 PROGRESS PAYMENTS

Provide a schedule of progress payments. Normally payments will be made quarterly in advance, and shall be dependent on the provision of satisfactory milestone and expenditure reports.

Because of the short-term nature of the project, we request a single payment at the onset of the project.

APPENDIX 2. CORRESPONDENCE REGARDING NSW FRI INVOLVEMENT IN PROJECT



# CSIRO Division of Fisheries

GPO Box 1538, Hobart, Tasmania 7001, Australia  
Phone: (002) 32-5222 International: (61-02) 32-5222  
Fax: (002) 32-5485 International: (61-02) 32-5485

## Fax Transmission

<b>To</b>	Name: Dr. Bob Kearney	Date: 1/6/95
	Company: NSW FRI	Fax No: 02-527-8576

<b>From</b>	Ron Thresher	RE: Gemfish sampling
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Page 1 of \_\_\_\_\_ If transmission is faulty or incomplete, please telephone the number at the top of this page.

### Message

Dear Bob,

As per our telephone conversation earlier today, I am happy to provide the following details.

As I indicated to you, CSIRO and BRS, at the request of SETMAC, jointly applied to the FR&DC for funding to continue for this year market and, if required, at-sea sampling of gemfish. The primary objective is to ensure continuity of sampling for cohort analysis, while longer term arrangements for routine monitoring of gemfish are developed. The proposal was successful, and I have now been instructed by FR&DC to organize the sampling program.

Given NSW FRI's past involvement in gemfish monitoring, it is appropriate that you be contacted with first option to undertake the sampling. The need to ensure continuity of sample protocol is paramount, for reasons you are certainly aware.

I append a copy of the proposal, which specifies the work to be carried out. The budget for sampling is as follows:

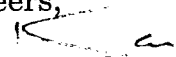
Salary	\$15,000
Field allowance	\$ 5,500
Field supplies	\$ 1,000
Local travel (attendance at SEFSAG, etc.)	\$ 1,000
<b>TOTAL</b>	<b>\$22,500</b>

I prefer to retain an additional \$1,000 for local travel, in order to cover cost of me traveling to Sydney for consultation, if required, and to attend the SEFSAG meeting when results are presented and discussed.

As the gemfish spawning run could commence as early as mid-June, I would appreciate a decision regarding FRI's involvement as soon as is possible, so that I can arrange for an alternative should it be required.

Thanks for your consideration,

Cheers,

  
Ron Thresher  
Program Leader  
Temperate and Deepwater resources



# NSW FISHERIES

Sue,  
Please contact  
Grog and arrange to  
have the funds transferred.  
Thanks.  
Ron

Dr Ron Thresher  
CSIRO Division of Fisheries  
GPO Box 1538  
HOBART TAS 7001

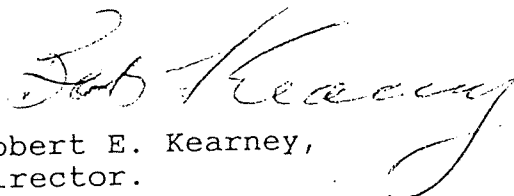
7 August, 1995

Dear Ron,

As agreed in our recent telephone conversations, I have instructed Neil Andrew and Kevin Rowling to proceed with the 1995 Gemfish sampling program. I understand from Neil that the sampling is proceeding well, although the message does not seem very optimistic. Kevin has prepared the first of the monthly data summaries and will forward it to you this week.

I would be grateful if you would arrange the transfer of funds for this work to NSW Fisheries. I understand from our previous discussions that this will amount to \$22,500, being the sum of fares, travel allowances and 'consultant' fees. The difference between this amount and the total budget (i.e. \$1,000) was to be retained by CSIRO for travel to Sydney and Canberra for consultations.

Yours sincerely,

  
Robert E. Kearney,  
Director.

APPENDIX 3. K. ROWLING'S LETTER REGARDING COMPLETION OF MONITORING PROJECT



# NSW FISHERIES

Dr Ron Thresher  
CSIRO Fisheries  
G.P.O. Box 1538 Hobart, Tasmania 7001

17th October 1995

Dear Ron,

Please find enclosed three copies of the report on monitoring of the size composition of the 1995 gemfish 'incidental' catch. This report contains the interim reports previously sent to you in the form of appendices. The findings were discussed in detail at a meeting of the EGBWG held in Ulladulla on 29th September. While the size composition data appear to be clear cut, there is still considerable debate about the size of the current spawning biomass!

I have included a disc (Note: Mac format) with two Excel files - one file has the sexed length frequency data for each sample and summaries by sex, and the other file is the final season total LF sample (I chose the period 26th June to 15th September, total N = 4443, as being most representative of the "spawning season" but as you can see from Figure 1 of the report it makes little difference which period one chooses). Note that the 2 year old (40 to 50 cm LCF) fish are under-represented in the sexed sample, as discussed at the top of page 3 in the report. Please let me know if you need a more detailed breakdown of the data, etc.

Some further catches of returning (mainly spent) fish have been taken off the far south coast of NSW in the last few weeks, and although we are continuing to collect some LF data from these catches I have not included them in the winter season data to be consistent with previous practice. There are no surprises in these recent data - results indicate the fishery has contacted the "back run" which appears some years off Eden/Bermagui about October.

Otoliths collected during the season totalled 371 (see attached summary). The otoliths themselves will be sent directly to the CAF. It should be noted that the 2 and 3 year old fish are under-represented in the otolith sample, especially the 3 year olds (50 to 60 cm LCF) - sampling hassles!

I have also included a copy of a letter I recently sent to Vince McDonall for your information - my attempt to ensure accuracy continues to be paramount in the gemfish debate!

Nic Bax had a query in a fax he sent me on 28th Sept regarding the usefulness of the 1995 length data. I believe that the length data collected this season are representative of the actual by-catch, and as such it is valid to directly compare the results for the three seasons since the TAC was set to zero (as is done in Figure 1 of the report). It was strongly suggested by industry at the September meeting that changes in fishing behaviour played a large part in shaping the 1995 size composition, but I find that difficult to support. The size composition data throughout the season and between different areas was very consistent, which tends to indicate we are again looking at the actual size composition of fish in the spawning area during the spawning period. Obviously, not all these fish (especially the 2 and 3 year olds) would be capable of spawning, though. As mentioned above, care is needed in interpreting the raw data from both the sexed and otolith samples as the younger (2 & 3 year old) fish are known to be under-represented. As mentioned in my letter to Vince McDonall, we also need to be careful in dealing with 'relative' versus 'absolute' abundance of all the recently spawned age classes (2 to 5 year olds), in the absence of any quantitative measures of actual abundance of these cohorts.

I believe the output from Andre's Bayesian model has changed substantially since our discussions at the ASFB meeting in July. I would be interested in seeing the revised output when he is happy with it.

Please let me know if I can be of any further assistance.

Regards,

Kevin Rowling  
Biologist.

FISHERIES RESEARCH INSTITUTE

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APPENDIX 4. NSW FRI REPORT



## Monitoring of the "By-Catch" of Eastern Gemfish During the 1995 Spawning Season - Summary of the Results and Comment on the Status of the Stock for CSIRO

Kevin Rowling  
Fisheries Research Institute  
P.O. Box 21, Cronulla 2230  
25th September 1995

### Introduction

Since 1993 there has been a zero Total Allowable Catch (TAC) in place for eastern gemfish *Rexea solandri* taken in the South Eastern fishery. Gemfish caught accidentally while fishing for other species have been allowed to be landed, up to a specified maximum weight per vessel per fishing trip. During the 1995 winter spawning season the vessel "trip limit" was set at 100 kg.

The size composition of the spawning season catch of eastern gemfish has been used for many years in the assessment of the status of the spawning population. The absence of a targeted commercial catch in those seasons since the introduction of a zero TAC has meant that the accidental "by-catch" has had to be used to indicate the size structure of the population in the spawning area. In 1993, comparison of the size composition of gemfish from the commercial by-catch with that of catches from survey shots of the spawning population showed the two samples to be very similar.

During the 1995 season, representative measurements were made (at the Sydney Fish Market) of the by-catch of eastern gemfish from both trawlers and dropliners. The sampling procedure was the same as that used in previous seasons, with the exception that catches from individual vessels were rarely subsampled (total catches were measured as they were often well below the trip limit of 100 kg).

This report provides a summary of the results from monitoring the landed catches of gemfish during the 1995 season, and comments on the implications of these results for the assessment of the current status of the eastern gemfish stock. Two progress reports were prepared and distributed during the course of the 1995 season, and these are attached to this report as Appendices 1 and 2.

## **Landings**

The pattern of landings of eastern gemfish during the 1995 winter season generally appeared to follow that of the previous two seasons, with large mature fish first appearing on the southern trawl grounds after a period of bad weather from 18th - 23rd June. The fish apparently moved further north prior to spawning this year, with mature fish being caught by dropliners off Laurieton in the last week of July. In 1995 there were no reports of large quantities of gemfish mixed with the warehou on the southern grounds in July, which was a feature of both the 1993 and 1994 seasons. The heaviest landings were recorded during the last week in June and the first two weeks of July, with a second period of significant landings from late August to mid September.

The regular presence of research staff at the Sydney Fish Market ensured the measurement of a high proportion of the trawled gemfish consigned for sale. From June 1st to September 15th, about 7.3 tonnes of gemfish were measured, and it is considered that this represents about half of the trawled gemfish by-catch consigned to the market during the period. Allowing for fish which were not measured, it is estimated that the total weight of marketed trawl by-catch during the 1995 winter period was of the order of 15 - 20 tonnes.

Dropline vessels also marketed significant by-catches of eastern gemfish throughout the 1995 winter season. The most consistent landings came from the Kiama and Bermagui areas. Because of the lack of a time series of comparable data, less emphasis was placed on obtaining measurements from dropline catches. For the June to mid September period about 4.1 tonnes of dropline-caught gemfish were measured, from a total estimated catch in the range 25 - 30 tonnes.

## **Size Composition of the By-Catch**

From May to mid June the trawl by-catch of eastern gemfish was comprised almost entirely of fish between 35 and 65 cm Length to Caudal Fork (LCF). Larger fish became more significant in trawl catches after the 25th June.

The size composition of the trawl by-catch for three overlapping periods in 1995 is compared with the size compositions determined for the previous seasons with zero TAC's in Figure 1. The results show the consistency of the size composition during the 1995 season, irrespective of which period is considered. Comparison of the 1995 results with those for the earlier years shows the significant changes which have occurred in the size composition of the by-catch of eastern gemfish from season to season.

The size compositions of the sexed subsamples are shown in Figure 2. There were slightly more males than females in the sexed samples. It should be noted that the 40 - 50 cm fish are under-represented in the sexed subsample as fish in this size class were often difficult to sex, so to save time only fish greater than 50 cm were sexed in some samples where time for measurement was limited.

The size composition of fish marketed from dropline catches during the period June - mid September is shown in Figure 3. Gemfish less than about 50 cm LCF are not vulnerable to the dropline gear.

To date, almost 300 pairs of otoliths have been collected for ageing at the Central Ageing Facility, and efforts are continuing to increase the number sampled.

### **Conclusions and Comments**

The quantity of eastern gemfish marketed by trawlers under the by-catch provisions during the 1995 winter season appears to be considerably less than that marketed during the two previous seasons. Accurate figures on catch rates and total catches for the 1995 season are not yet available, however the estimates from the market observations suggest there has been a decline in the abundance of eastern gemfish over the three years for which the zero TAC has been in place.

The size composition data indicate a marked change in the eastern gemfish population over the past three years. The larger fish (representing those age classes which were recruited before the period of poor recruitment) have declined significantly in relative abundance and in 1995 were very poorly represented in the catch. The relatively stronger age classes spawned in 1990 and 1991 are represented as 4 and 5 year old fish (60 to 75 cm LCF) in the 1995 catch, but they are only slightly more abundant than the 1992 age class, which has been previously identified as being poorly recruited. (The faster than normal growth of the 1992 age class evident in the 1995 data supports this interpretation.) These results suggest that the 1990 and 1991 age classes may not be sufficiently abundant to produce any significant recovery of the gemfish stock.

The most numerically abundant age class in the by-catch during the 1995 season is that spawned in 1993 (2 years old, 40 to 45 cm LCF in 1995). However the weights of catches of fish from this age class do not suggest a particularly strong recruitment, and it is probable that the dominance of this age class in the by-catch is more likely related to the declining abundance of the larger fish.

Figure 1. Size Composition of the Trawled By-Catch of Eastern Gemfish Measured During the Winter Season

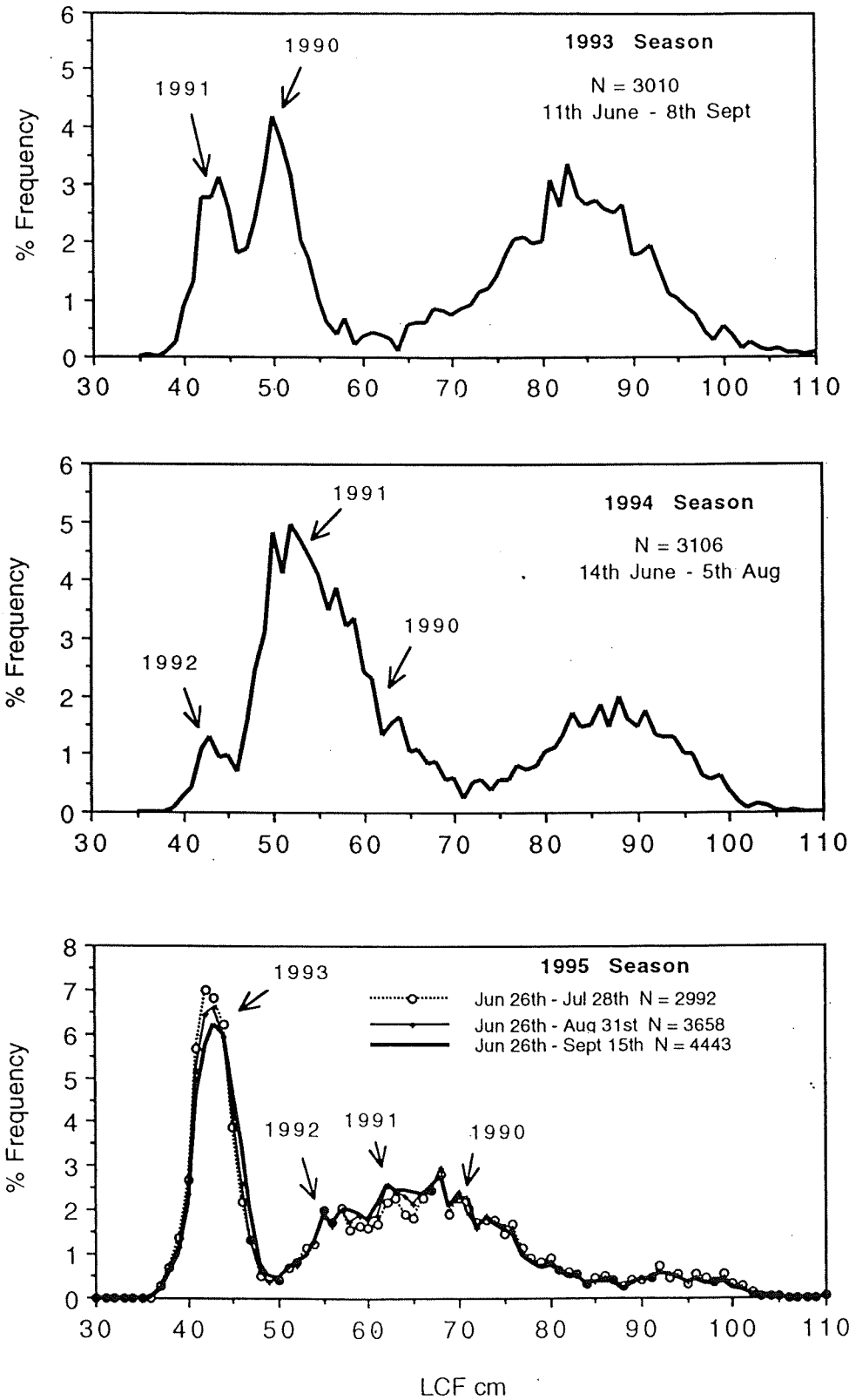


Figure 2. Eastern Gemfish - Sexed Subsample 1995

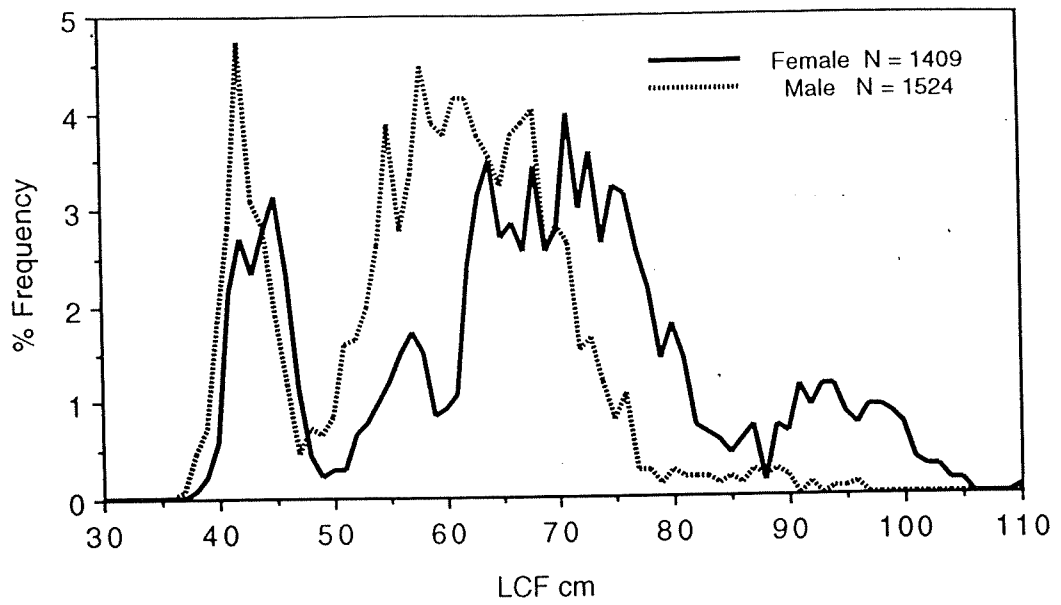
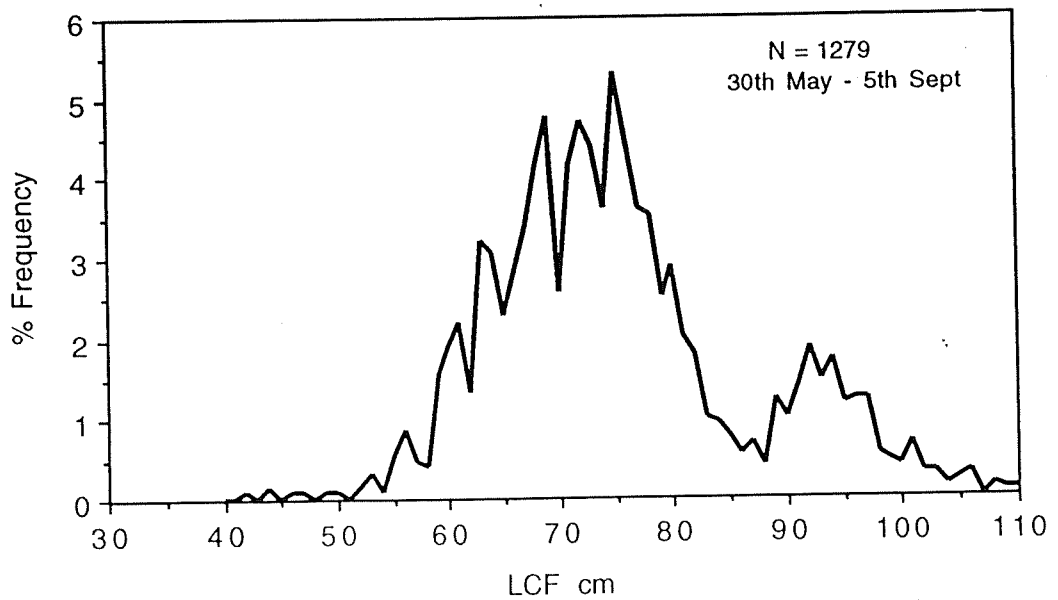


Figure 3. Eastern Gemfish - Dropline By-Catch 1995



# NSW FISHERIES

Fisheries Research Institute

## Preliminary Results From Monitoring of the "By-Catch" During the 1995 Eastern Gemfish Spawning Season

Kevin Rowling  
Fisheries Research Institute  
P.O. Box 21, Cronulla 2230  
3rd August 1995

This paper presents a brief summary of the results to the end of July from monitoring of the eastern gemfish by-catch taken during the 1995 spawning season. The size composition data were obtained from gemfish marketed under the '100 kg trip limit' provision, however on some days up to 200 kg per boat were available for sampling, due presumably to multiple days catches or to the 'State/Commonwealth waters loop-hole'.

### *Trawl 'By-Catches'*

The landed by-catch of gemfish from the trawl fishery has been very low, with the exception of the last week in June and the first 2 weeks of July when the 100 kg trip limit was regularly marketed. There were a few (unofficial) reports of dumpings during this period, but the quantities concerned were generally small (maximum reported about 25 to 30 boxes, <1 tonne).

Since mid July, marketed by-catches of gemfish have again been very low, generally less than 50 kg per vessel per day, and have been dominated by 2 year old (40-45 cm) fish, with only very small numbers of larger (>60 cm) fish. I would estimate the total catch (including an estimate for discards) of gemfish by the trawl fleet so far this season has been of the order of 30 to 50 tonnes - much lower than the two previous years with a zero TAC.

### *Size Composition*

Since late June, when large spawning-run gemfish first appeared in catches, nearly 3000 fish have been measured. The attached graph shows the length frequency of this (preliminary) 1995 sample compared with those for the 1993 and 1994 seasons. It can be seen that the larger (> 80 cm) fish have declined in relative abundance.

There is a reasonable representation of the 1990 and 1991 cohorts (4 and 5 year old fish, 60 to 75 cm), however they appear to be only slightly more abundant than the 1992 cohort (3-year olds) which has been previously identified as likely to be poorly recruited (and the cohort's faster than normal growth supports this interpretation).

Numerically dominant in the by-catch during the late June-July period are fish from the 1993 cohort - these fish are just two years of age and 40 to 45 cm in length.

### *Otolith Samples*

As anticipated, collection of otoliths during the current season has been difficult. Approximately 150 pairs had been collected to the 2nd August, and efforts to obtain a representative sample are continuing.

### *Dropline Catches*

Catches of gemfish by dropliners have been reasonably consistent with the 'normal' pattern throughout the winter season. The main landings of spawning-run fish have been made in 3 areas - Bermagui, Kiama and more recently Laurieton - although small by-catches have been taken at all significant dropline ports on the south coast. The dropline catch of gemfish during the winter season is estimated to be of the order of 25 to 30 tonnes. The graph below shows the size composition of the dropline catch measured in June and July.

### **Comment**

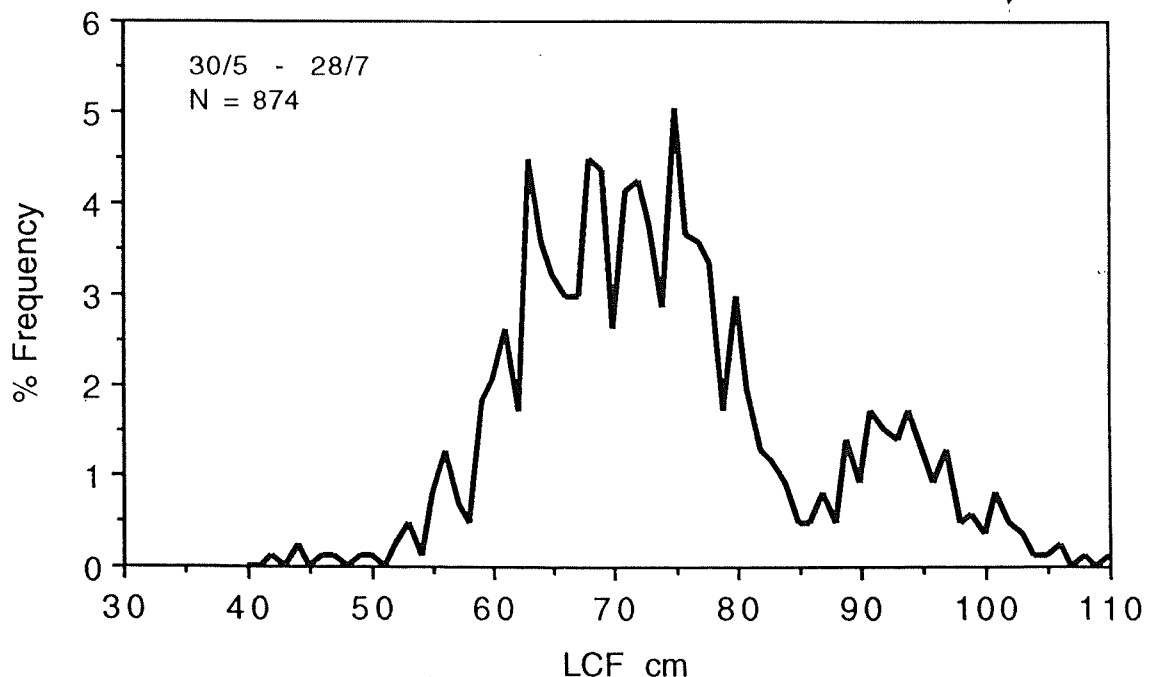
The regular presence of research staff at the Sydney Fish Market ensured the measurement of a high proportion of the gemfish consigned to the market during this season - our sample to date of 2992 fish totals about 4.35 tonnes liveweight, and it is considered that this represents over half of the trawled gemfish by-catch consigned to the market during this period.

Further measurements of gemfish marketed during the latter part of the 1995 season are not expected to significantly alter the size distribution determined from the catches to date.

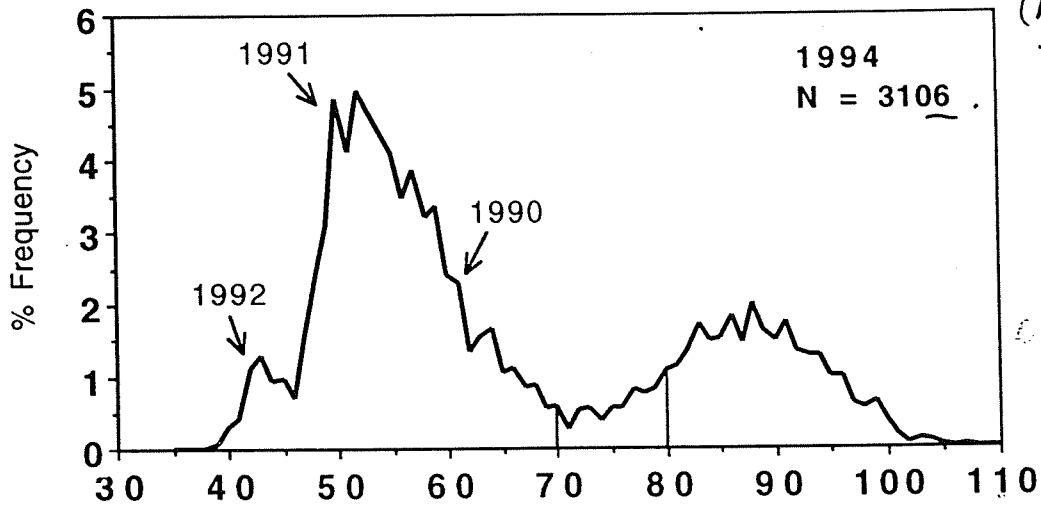
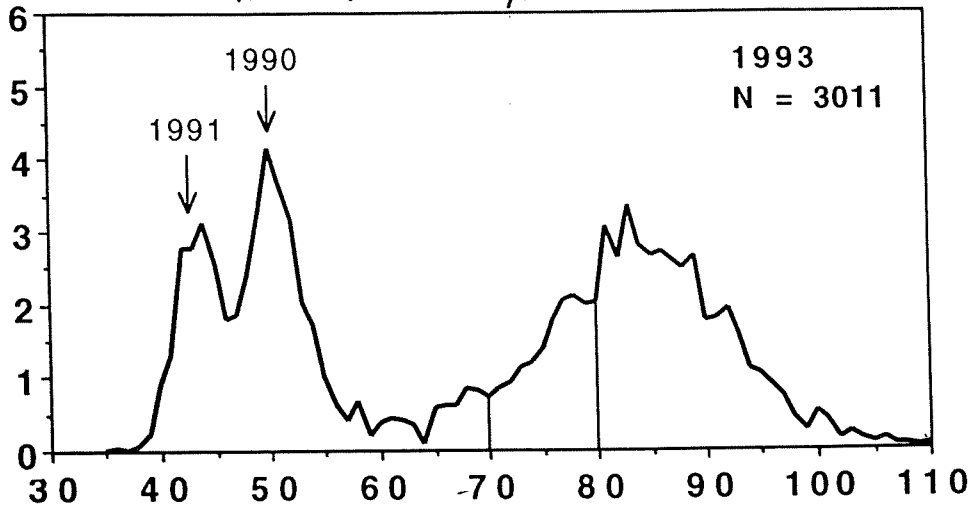
The size composition data, in combination with the very low catch rates, suggest to me that there has been a further decline in the abundance of mature gemfish during the 1995 spawning season, in spite of the improved recruitment of four and five year old fish to the stock. There is still no measure of real abundance of these cohorts relative to the 'normal' level of recruitment, and the low numbers of the four and five year old fish compared to the numbers of two and three year olds is cause for concern.

Of course there are other factors which may have influenced the 'incidental' catch rates of eastern gemfish during the 1995 season (e.g. bad weather in June; rapid northward migration of the fish in July) and the effect of these factors will need to be taken into account in any future assessments.

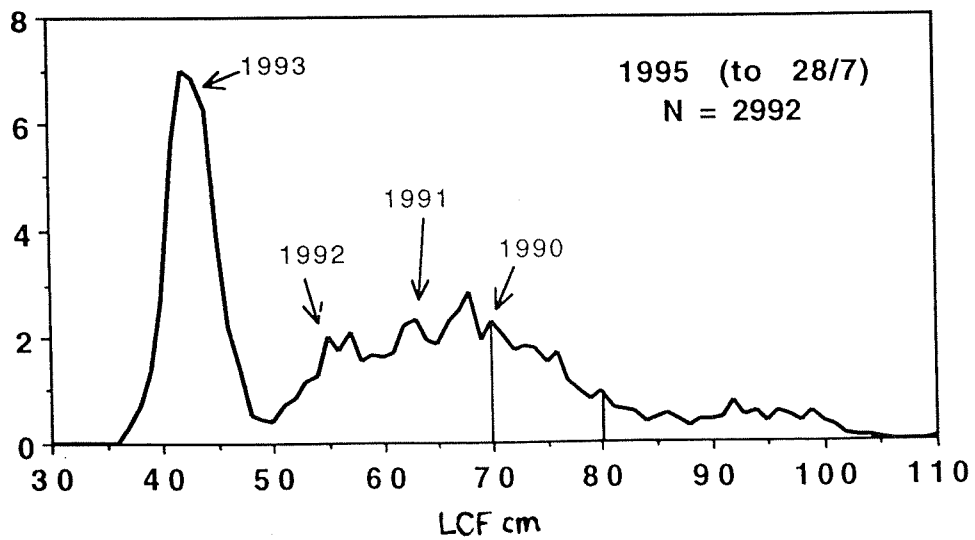
### **Dropline Gemfish By-Catch**



### Gemfish - Spawning Season Size Composition - Trawl By-catch Only.



(14/6 - 5/8).  
+ June observer  
data)





NSW FISHERIES

*Fisheries Research Institute*

**Update on monitoring of the Eastern Gemfish "By-Catch" during August 1995.**

Kevin Rowling  
Fisheries Research Institute  
P.O. Box 21, Cronulla 2230  
5th September 1995

A paper circulated in early August provided preliminary results from monitoring of the by-catch of eastern gemfish taken during June and July of the current spawning season.

Further data have been collected during August and the results of analyses of these data are presented below. Additional information on the sexed size composition of market samples, and the size composition of the otolith sample obtained to date are also presented.

*Landings of Eastern Gemfish during August 1995*

Landings of eastern gemfish from the trawl sector continued to be very low during August, with the majority of marketed catches being less than 50 kg. These small catches appeared to be fairly evenly distributed along the NSW coast from Port Stephens to Eden.

Landings increased in the last week of August, with a number of trawlers from central NSW ports again marketing 'trip limit' catches of 100 kg. No reports of excessive dumpings were received during this period. It is estimated that the weight of the trawled by-catch of eastern gemfish taken during August was less than 5 tonnes.

Dropline vessels continued to make significant landings of eastern gemfish during August in the Kiama and Bermagui areas. Many of the smaller fish in these catches appeared to be undeveloped females which were not considered to be part of the mature population. It is estimated that dropline catches of eastern gemfish during August amounted to approximately 10 tonnes.

### *Size Composition of Marketed By-Catches*

The size composition of eastern gemfish landed by trawlers during August was generally very similar to the size composition of fish landed during the late June/ July period (Figure 1). There was a slightly higher representation of 4 year old fish (1991 cohort, 60 - 65 cm LCF) in the August catch, however this is not highly significant because of the low catch rates and smaller sample size obtained during August.

The size composition of dropline catches measured during August is also consistent with that measured during the earlier part of the winter season (Figure 2), except perhaps for a suggestion of slightly fewer 4 year old fish in the August samples.

### *Sexed Size Composition*

The size compositions determined for gemfish samples which were sexed are shown in Figure 3. The observed sex ratio shows slightly more males than females, and as expected the males are more numerous in the smaller size classes while females dominate the larger size classes.

### *Otolith Sample*

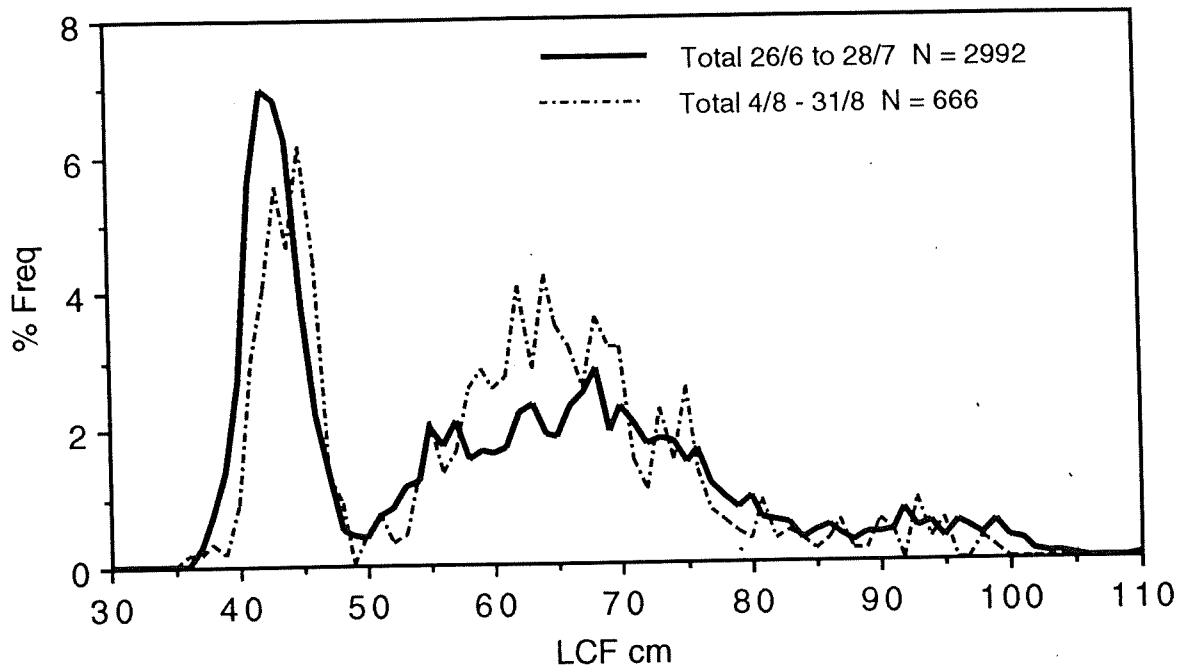
The size composition of the otolith sample obtained to date is shown in Figure 4. Efforts are continuing to increase the sample size of fish otolithed, while being careful to ensure that a representative sample is obtained.

### **Comment**

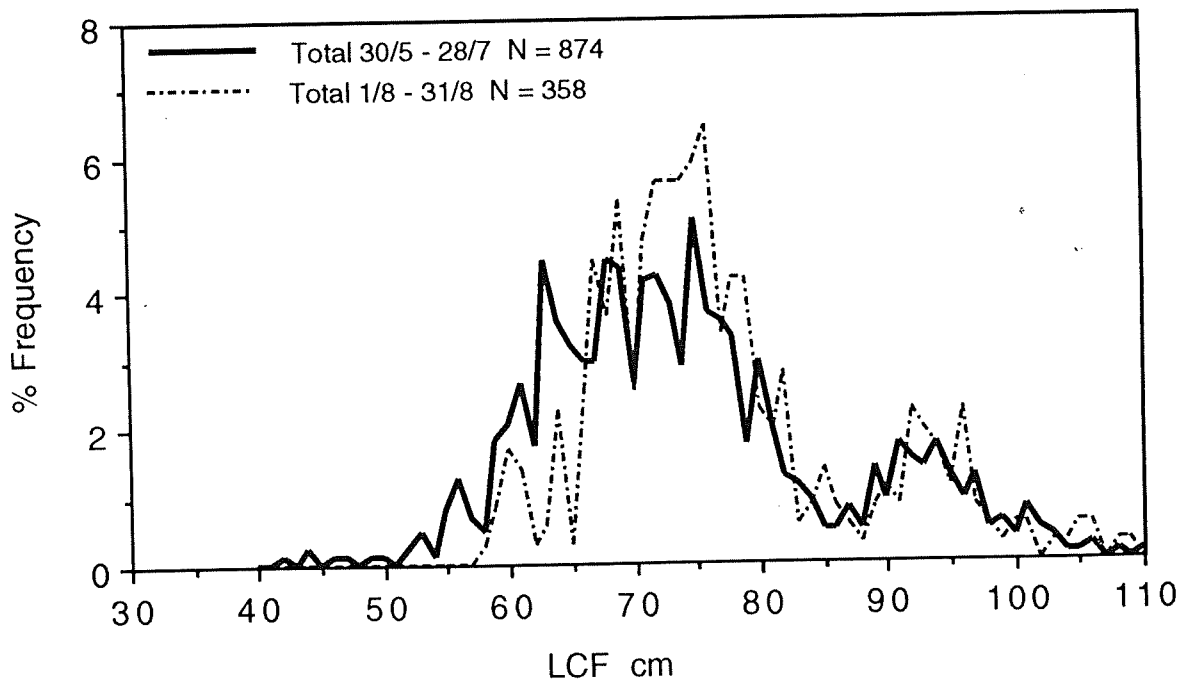
The size composition of eastern gemfish catches taken during August is consistent with that observed during the earlier part of the spawning season.

Catch rates in the trawl sector continue to be much lower than has been observed in previous years under a zero TAC.

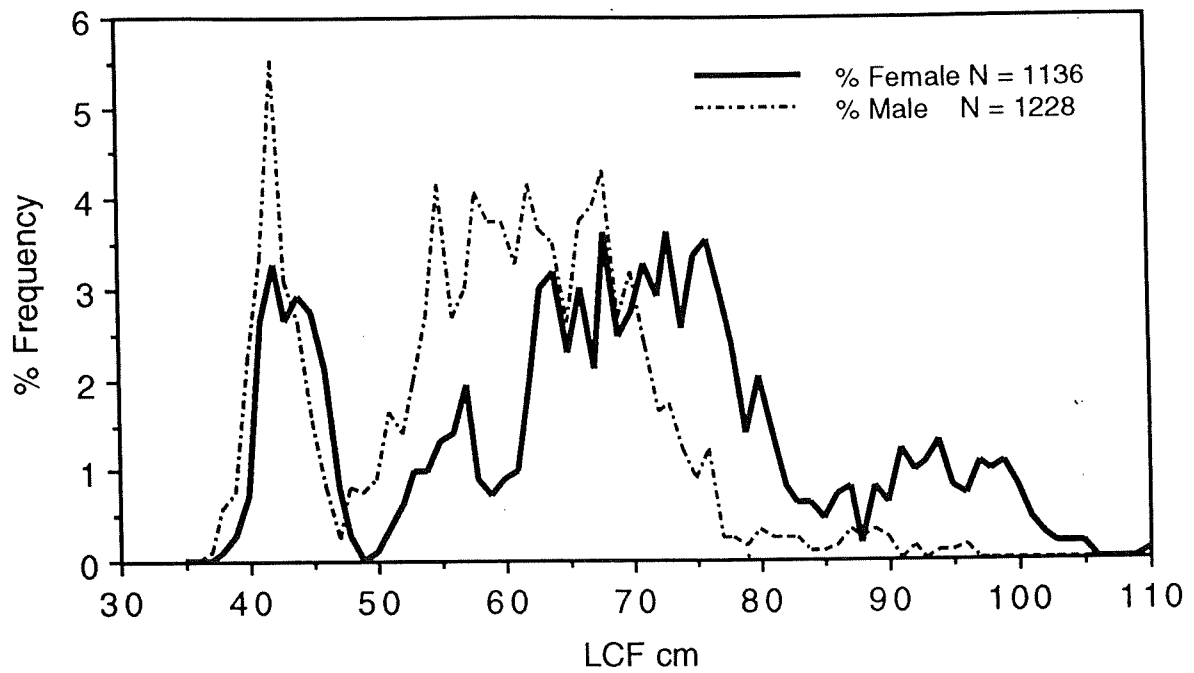
**Figure 1. Trawled Gemfish - Size Composition of Marketed Catches in June/July and August**



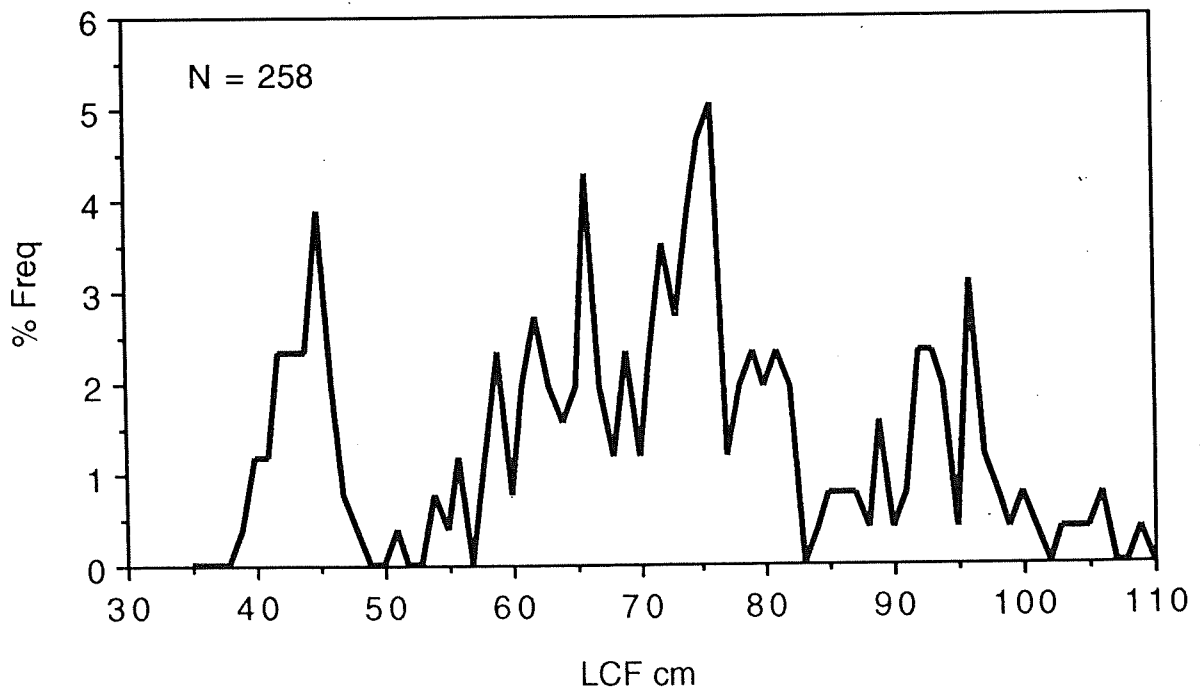
**Figure 2. Droplined Gemfish - Size Composition of Marketed Catches in June/July and August.**



**Figure 3. Size Composition of the Sexed Subsample of Eastern Gemfish (to 26/8/95)**



**Figure 4. Gemfish - 1995 Season Otolith Sample Size Composition (to 31/8/95)**



APPENDIX 5. LETTER INDICATING PROVISION OF DATA TO STOCK ASSESSMENT GROUP



# CSIRO Division of Fisheries

GPO Box 1538, Hobart, Tasmania 7001, Australia  
Phone: (002) 32-5341 International: (61-02) 32-5341  
Fax: (002) 32-5485 International: (61-02) 32-5485

## Fax Transmission

<b>To</b>	Name: Kevin Rowling	Date: 28/9/95
	Company: NSW Fisheries	Fax No: (02) 527 8576

<b>From</b>	Nic Bax	RE: Gemfish
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Page 1 of 1 If transmission is faulty or incomplete, please telephone the number at the top of this page.

### Message

Kevin

Thanks for the report on the 95 monitoring. I have passed on copies to Ron, Tony and Andre. Excel is the best format for the data -- mac or pc, it doesn't matter.

The If plots are not encouraging. They suggest either a lower biomass than estimated by the Bayesian and Synthesis models (though perhaps not K's) or a higher fishing mortality than reported. Of course they might also be an artefact of the changed selectivity of the fleet, in which case the interpretation would be difficult, especially since quite a lot of interpretation is put on the relative strength of the 1992 year class. I seem to recall hearing that this is an argument that you put forward at the meeting before the AFSB, suggesting that the 1995 length data were too unreliable to use in models. What is the reliability of lengths below 50 cm? Is it just the sexed data where these numbers are unreliable or all data? If the less than 50 cm fish were omitted from the If plots, the situation would appear more optimistic.

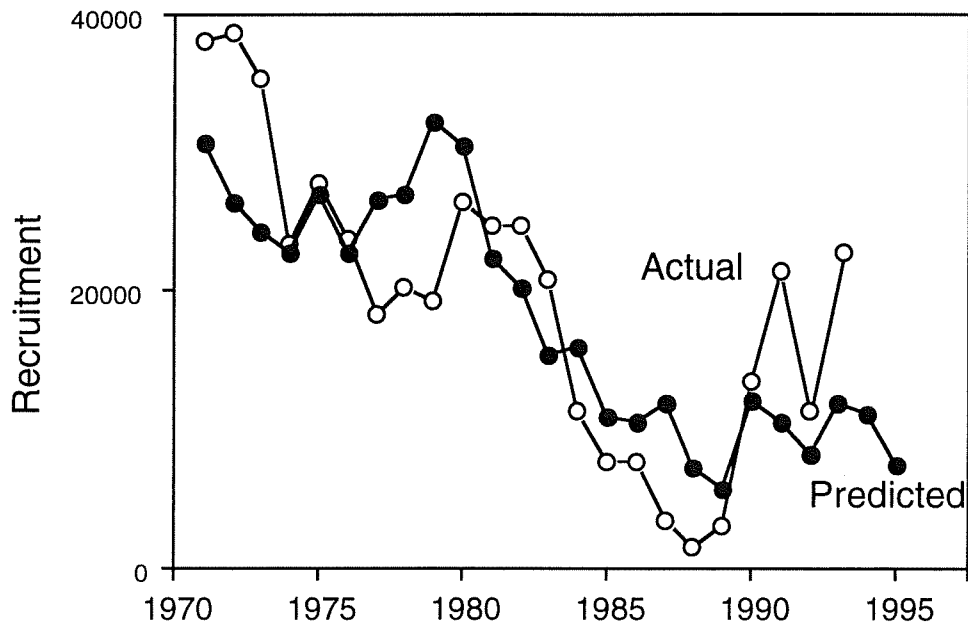
I would be interested in seeing the growth rates of the different year classes presented, perhaps in reference to the variability that you describe in an earlier paper. Andre noted that growth rate is so often confounded with the same factors that caused a changed recruitment that they are not a good indicator of yearclass strength. Still, there are documented cases, where growth rate has increased for years of poor recruitment, and perhaps the earlier analyses that you did provides evidence that this may occur in gemfish.

Cheers

APPENDIX 6. UP-DATED ANALYSIS OF THE RELATIONSHIP BETWEEN APPARENT GEMFISH RECRUITMENT, FEMALE BIOMASS (AS DERIVED FROM STOCK ASSESSMENT MODELS) AND STRENGTH OF THE ZONAL WEST WINDS

$$\text{recruitment} = -4468 + 1.47(\text{biomass}) + 124.21 (\text{wind})$$

$$R^2 = 0.57$$



Note that recruitment indices 1990-1993 are based only on by-catch data and may not be comparable in absolute magnitude to the pre-1990 indices