Professor Steve Kennelly, Cronulla Fisheries Research Centre of Excellence
SUPPLEMENTARY QUESTIONS

1. We have established that the Department has not completed a cost benefit analysis for the closure and relocation of the CFRCE. At a previous hearing we learned that Dr Sheldrake and Dr Allan were unaware of a report by Sinclair Knight Merz from 1998. Are you familiar with this report and please can you give a summary of the scope and conclusions from this report?

Yes I am familiar with this report. It was a very thorough financial Benefit-Cost Analysis of the accommodation needs of NSW Fisheries at the time and was approx. 50 pages long. It examined 7 different options and was quite comprehensive in that it included such things as refurbishment costs, rental costs, travel costs, travel time, etc. and included a host of sensitivity tests and other analyses. 3 of the 7 options allowed for the actual sale of the Cronulla property (valued at the time at $5.2 million). However, even allowing for that windfall, the evaluation and ALL sensitivity tests concluded that Option 3 provided the highest financial returns of all options (including those that involved selling Cronulla). This Option 3 was to refurbish Cronulla to go from accommodating 95 staff to 145, Wollstonecraft to go from 12 to 37 and Port Stephens to go from 50 to 75. This option was subsequently adopted by NSW Fisheries in ensuing years and over $2 million was spent to upgrade the Cronulla facilities.

2. In your opinion is there any value in the co-location of research, management and licensing staff – such as at Cronulla?

Absolutely. It is well known throughout most fisheries jurisdictions in the developed and developing world that having all facets of fisheries functions co-located is world's best practice in terms of delivering science-based fisheries management. Not only does this minimise the risk of function-based silos forming in one's agency, it also greatly reduced travel expenses and allows for proper cross-fertilisation of concepts, ideas, data, equipment, etc. and therefore a much more efficient and cost-effective organisation. It is vital that managers and licensing staff (who are at the coalface in terms of dealing with fishers one-on-one) are armed with the latest scientific information and can quickly access scientists and their expertise. Further, it is vital for scientists to know the issues that managers and licensing staff deal with on a day-to-day basis. This informs the research that they do and avoids scientists doing "blue-sky" research that may not be relevant for our managers and the government of the day. It is interesting to note that, 15 years ago or so, such silos existed but NSW Fisheries consciously attempted to break down such barriers by co-locating these functions together at Cronulla. Breaking these groups into 14 different locations throughout the state would not be

considered the best way to accommodate fisheries-related professionals by most agencies. Interestingly, Western Australia Fisheries (who many consider one of the world's best fisheries agencies) are currently adopting the "Cronulla" model by co-locating their fisheries managers and policy people with the scientists at a coastal location in the outer suburbs of Perth.

3. Please can you provide a copy of the last program of work for the CFRCE for the next 3, 5 or 10 years (whatever period of time it may have been for) that was set out prior to the closure announcement?

We do not have a specific program of research work for the Cronulla site that is separate from the rest of the research branch (other sites are located at Port Stephens, Narrandera, Coffs Harbour, Grafton and Batemans Bay). Rather, we operate according to the attached document of research priorities which outlines the work our many stakeholder groups would like to have happen, the work currently underway, and the priorities that the government itself treats as appropriate for government funding (see attached – it is also on the departmental website http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/168369/Tables-of-research-priorities.pdf). It would be accurate to assume that most of the marine-based work in the lists would be headquartered at Cronulla. I have gone through the lists and annotated each priority project with C to indicate work that is currently, or would be, based at Cronulla.

4. Please can you supply a copy of the Heritage Impact Statement that was prepared some ten years ago and that details the heritage values on the site.

See attached.

PLANNING STRATEGIC RESEARCH FOR WILD FISHERIES, AQUATIC ECOSYSTEMS AND AQUACULTURE IN NSW

– Tables of Research Priorities –

– Last updated 16 May 2011 –

NOTES:

These tables are "living documents" available online at (http://www.dpi.nsw.gov.au/research/fishing-aquaculture). As priorities change in the light of new research being completed and as new questions are formulated, stakeholders are given the opportunity to update their priorities and these updates are presented here. Stakeholders wishing to provide updates to this document should e-mail: tracey.mcvea@industry.nsw.gov.au

* indicates that research is currently underway

C indicates work that is currently, or would be, based at Cronulla

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INTRODUCTION

Decision-makers who manage fisheries, aquatic ecosystems and aquaculture receive advice from many stakeholders, interest groups and experts. Whilst such advice and opinions come from industry, recreational, Indigenous, environmental and political groups, the most influential information upon which decisions are made usually comes from rigorous, objective science. That is, decision-makers require answers to complex, difficult questions about fisheries, aquatic ecosystems and aquaculture that require the "best available scientific information". Because scientific research ultimately provides this scientific information, its direction is one of the most important factors in framing future management policies and laws.

The questions that are asked of fisheries science are usually far greater in number and scope than can be readily answered – particularly in a state like New South Wales with relatively small commercial fishing and aquaculture industries and, therefore, relatively few resources available for their scientific study. Deciding which are the most important questions to answer, and how to answer them, are key processes in shaping future fisheries research and, ultimately, future fisheries management. The latter process (how to answer high priority questions) is usually accepted as being best done by professional scientists because they are trained to be objective, impartial and to base their interpretations on rigorous analyses of available evidence. It is also well-accepted, however, that the best group(s) to lead the former process (the prioritisation of which questions should be answered) should be the end-users of the research results and potential beneficiaries, i.e., the decision-makers and stakeholders themselves. This is because these groups are in the best position to decide which areas of inquiry would contribute to decisions that would lead to the greatest improvement in the particular "stakes" in which they have a "holding".

This rationale is used in the development of the following research priorities for NSW by continually consulting with as many stakeholder groups as possible regarding the research questions they have for their particular stakeholding. These priorities are then combined and re-circulated so that these stakeholder groups have an opportunity to prioritise each others' research areas in addition to their own.

Most of NSW's various advisory councils and committees for commercial and recreational fisheries, aquaculture industries, catchment management groups, Indigenous groups, the marketing sector and other stakeholder groups are involved in this process as well as relevant Government agencies (see below table).

List of stakeholder groups consulted

AbMAC	Abalone Management Advisory Committee
AC (TOG)	Aboriginal Communities (Traditional Owner Groups)
ACoRF	Advisory Council on Recreational Fishing
AM	Australian Museum
ARAC	Aquaculture Research Advisory Committee
ARG	Aboriginal Reference Group
CMAs	Catchment Management Authorities
Coastal CMAs	Coastal Catchment Management Authorities
Co-ops	Association of NSW Fishermen's Cooperatives
DECCW	Department of Environment, Climate Change & Water
EGMAC	Estuary General Management Advisory Committee
EPTMAC	Estuary Prawn Trawl Management Advisory Committee
FSC	Fisheries Scientific Committee

AbMAC	Abalone Management Advisory Committee
LCMA	Lachlan Catchment Management Authority
LobMAC	Lobster Management Advisory Committee
Maritime	NSW Maritime
MCMA	Murray Catchment Management Authority
MDBA	Murray Darling Basin Authority
MFMA	Master Fish Merchants' Association
MPAC	Marine Park Advisory Council
NCC	Nature Conservation Council
NOW	NSW Office of Water
NRC	Natural Resources Commission of New South Wales
NRCMA	Northern Rivers Catchment Management Authority
NSWALC	NSW Aboriginal Lands Council
NSWSIC	NSW Seafood Industry Council
NSWDPI	NSW Department of Primary Industries
OHAULMAC	Ocean Haul Management Advisory Committee
OPTMAC	Ocean Prawn Trawl Management Advisory Committee
OT&LMAC	Ocean Trap & Line Management Advisory Committee
SFM	Sydney Fish Markets
SIAC	Seafood Industry Advisory Council

The net result is hundreds of different research areas being identified as requiring attention. These tables of priorities are 'living tables' that are regularly updated as priorities change as new questions are formulated, as new research is completed, as new feedback is received from stakeholders and, most importantly, as new directions and requirements come from decision-makers. To this end, regular updates of the priorities in these tables are available on the NSW DPI website (http://www.dpi.nsw.gov.au/research/fishing-aquaculture).

The tables identify the various priority areas identified during the consultative process, grouped into appropriate categories and sub-categories, and which stakeholder group(s) held particular areas as high priorities. For those research areas where work is currently underway, an asterisk (*) is appended. We also provide a brief description of most of the general areas of inquiry and the sorts of scientific work that are required to do them.

These tables should be viewed as a resource for those interested in aquatic research in NSW and those wanting to do research or seek funding for research from granting bodies. It will also prove a useful tool for such funding bodies as they decide which particular research projects should be supported and, in so doing, which particular stakeholder group(s) will be satisfied.

These tables do not prioritise the many research areas and questions because particular priorities for research depend on the point-of-view held by any particular stakeholder group. For one group (e.g., NSW DPI) to provide such a prioritisation would be simply placing its priorities above all others. Instead, we present the whole list, identifying which stakeholders hold particular priorities as important at the present time so that researchers, decision-makers and granting agencies can weigh the costs and benefits associated with answering particular questions (rather than others) in the light of knowing which stakeholders will be satisfied and which ones may not be.

Resourcing

Whilst there are several sources of funds available for research into fisheries, aquatic ecosystems and aquaculture in NSW, the majority of resources are provided by the NSW Government. The NSW Government has the overriding responsibility to manage and monitor the aquatic resources of the state on behalf of its owners (the public of NSW) and, unfortunately, at the present time, there exists little capacity outside NSW DPI for aquacultural science or for wild harvest fisheries research such as resource assessment, recreational creel surveys, etc.

However, research into fisheries, aquatic ecosystems and aquaculture in NSW does not happen in a vacuum. NSW is Australia's most populous state, is located centrally on the eastern seaboard and contains a large proportion of the country's freshwater habitats. These attributes position NSW's research issues into aquatic resources as highly significant at a national level, ensuring that NSW remains a major player in national research efforts. Such a prominent national position provides significant and on-going opportunities for the focussing of interstate and Australian Government research expertise and resources towards NSW-centric issues and a proportionate attraction of investment into their resolution.

Whilst such national foci (and their many consequent collaborations) are important to NSW, it is nevertheless true that, in an ideal world, the overall funding of research into fisheries, aquaculture and aquatic conservation in NSW would be enhanced. However, in a state with relatively few fisheries resources, a relatively small aquaculture industry and a very finite amount of funding available for a massive number of research questions, opportunities to increase funding for aquatic research remain limited.

In the foreseeable future, therefore, the majority of resources for aquatic research (which, as noted above, are provided by the NSW Government) have to be assigned to the most pressing and core issues facing our wild harvest fisheries, aquatic ecosystems and aquaculture industries. For wild harvest fisheries and aquatic conservation issues, this must involve monitoring wild stocks, aquatic biodiversity and habitats to: (i) identify if and when changes to management are warranted; and (ii) determine the success (or otherwise) of such management changes. For aquaculture, enhancing the existing and developing aquaculture industries of NSW is the priority and therefore the technological work needed to improve production for existing and new aquaculture species will continue to attract the greatest attention.

WILD FISHERIES RESOURCES

This category of priorities refers to issues concerning NSW's many commercial and recreational fisheries. These two sectors differ in the way fish are caught and what happens to them after capture (sold, released or consumed) but are similar in many of the actual species and stocks exploited.

It is well-recognised that fisheries science concerning wild harvest resources is a particularly difficult field of science because many of the questions that require answering involve dealing with things that are invisible to normal methods of observation. For its entire history, the field of fisheries science has suffered by not having at its disposal non-destructive techniques for sampling and monitoring aquatic resources. This has meant that most avenues of inquiry involve indirect measures of stocks based on catch-per-unit-effort information and increasingly sophisticated predictive models to estimate fluctuations in nature. This reliance on information about animals that are already caught, dead and removed from systems, for use in analyses that try to predict what will happen to those systems, establishes significant problems that fisheries scientists have tried to deal with for decades.

Resource Assessment

Questions about the status of stocks are fundamental to the management of all fisheries and therefore formed a consistently requested item for research across many stakeholders involved in the fishing industry or concerned about the long-term sustainability of fishing. Stock assessments of all species exploited in most of NSW's commercial fisheries are listed which, because recreational fisheries often target the same stocks, means that such assessments would also be applicable to recreational fishing interests. Another consistent feature was the identification of priorities to develop new ways to do stock assessments that are appropriate for the relatively low value fisheries that characterise NSW.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Assess the stock status of all important species in all commercial, recreational and indigenous fisheries in NSW * C	NSW DPI, AbMAC, ACoRF, DECCW, EGMAC, LobMAC, MDBA, MPAC, NCC, OFTMAC, OHAULMAC, OPTMAC, OT&LMAC, SIAC
Develop and test fishery-independent surveys to assess the biodiversity and status of wild fisheries resources in NSW * C	NSW DPI, AM, MDBA, NCC
Develop non-destructive fishery-independent technologies to monitor fish populations in the wild C	NSW DPI, AM, MDBA, NCC
Develop and test optimal strategies for assessing the status of populations of wild fisheries resources in NSW C	NSW DPI
Develop cost-effective methodologies to assess recreational fisheries in NSW C	NSW DPI, MDBA, NCC
Develop and test the effects of recovery plans for all overfished species C	NSW DPI, MDBA, NCC
Assess the levels of catches form all sectors and determine the allocation of fisheries resources between and within fishery sectors, e.g., commercial versus recreational, estuary general versus ocean hauling etc. C	NSW DPI, NCC
Develop robust time-series estimates of recreational catch and effort C	NSW DPI, MDBA, NCC
Estimate recreational catches of abalone and eastern rock lobster to enhance the TACC setting process for these species C	NSW DPI
Developing and applying methodologies to estimate the relative abundances and size-structures of pipis at appropriate spatial and temporal scales in NSW C	NSW DPI

Biology and Ecology

Information that is closely related to that required for resource assessments and many other management-related enquiries is information on the basic biology and ecology of exploited species. This information is a high priority for many commercial and recreational stakeholders and includes studies on characteristics such as a species' growth, reproductive biology, mortality, distributions, abundances, movements, interactions with other species, and how all these vary spatially and temporally.

Often the most efficient way to answer such questions involves species-specific studies (which usually make excellent post-graduate theses) but, because of the nature of the methodologies used, it is often possible to obtain data and samples on relevant characteristics of several species simultaneously using common, standardised sampling regimes.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Determine the reproductive biology, abundance and spawning biomass of sea mullet [C]	NSW DPI, OHAULMAC
Examine abundance, size-distributions, growth, movements and puerulus recruitment of lobsters * [C]	NSW DPI, LobMAC
Examine and report on the biology and recreational fishery of rock blackfish * [C]	NSW DPI, ACoRF
Examine age, growth and reproductive biology of recreationally important fish species * [C]	NSW DPI, ACoRF, MDBA
Assess the biology of freshwater yabbies and their harvest potential *	NSW DPI, Inland MAC
Determine the distribution abundance and habitats of spiny crayfish especially in relation to stocked salmonids	NSW DPI
Determine the growth, movements and biomass of bream via a tagging program * [C]	NSW DPI, ACoRF
Identify the distribution and abundance of larval stages of fish and shellfish of commercial and recreational importance *	AM, DECCW
Monitor the migration, movement and breeding behaviour of Australian Bass and Estuary Perch *	NSW DPI, DECCW
Address information gaps with respect to biological and fishery data for species with an 'overfished' exploitation status [C]	NSW DPI, NCC
Provide accurate stock identification and up-to-date taxonomy of exploited species, particularly demersal fish, sharks, rays and harvested invertebrates such as pipis, crayfish, nippers, beach worms, etc. * [C]	NSW DPI, AM, NCC
Population structure and distribution of carp	NSW DPI, MDBA
Examine the reproductive biology of school prawns * [C]	NSW DPI
Determine the impacts of climate change on the wild fisheries resources and fisheries of NSW	NSW DPI, AM, MDBA
Examine the biology, linkages and diet of Australian salmon * [C]	NSW DPI, ACoRF
Determine movements of key recreational fish species and environment and habitat relationships * [C]	NSW DPI, AM, MDBA
Determine the connectivity of key fish and invertebrate species among estuaries and coastal waters *	NSW DPI, AM
Examine the effects of rainfall and environmental flows on wild fisheries resources and fisheries * [C]	NSW DPI, MDBA
Examine the biology and movements of sharks in estuaries and coastal waters of NSW * [C]	NSW DPI, NCC
Review the trophic level of catch by the Ocean Haul Fishery and trophic	NSW DPI, DECCW, NCC,

PRIORITY PROJECTS	STAKEHOLDER GROUPS
interactions with other fisheries [C]	OHAULMAC
Determine the impacts of a possible sea urchin fishery on enhancing abalone populations and effects on other species [C]	NSW DPI, AbMAC
Examine predatory impacts of Australian salmon on other commercially important fish species * [C]	OHAULMAC
Examine biotic and abiotic factors affecting the recruitment of prawns and fish to estuaries [C]	NSW DPI, DECCW, EPTMAC, OPTMAC

Influence of Habitats and Other External Impacts

The mapping of reefs and other aquatic habitats is a key element of conservation-orientated research (see later tables) but the issues identified here for wild harvest fisheries (location of key fishing grounds, influence of physical and biological factors on production) have significant relevance for the management, production and sustainable exploitation of stocks. This sort of work can be achieved via the collection of information on the areas fished, and the distribution and abundance of organisms and physical variables that may be correlated with them. Once identified, mensurative and manipulative field experiments would be needed to show cause-and-effect relationships among such factors.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Map and describe all fishing grounds and coastal reefs to assist in management strategies involving spatial and temporal allocations of fishing effort [C]	NSW DPI, AM, DECCW, EPTMAC, NCC, OPTMAC, OT&LMAC, SIAC
Investigate the impacts of nutrient enrichments and other stressors such as sewerage treatment outfalls / discharge points and regional development on wild fisheries	NSW DPI, AbMAC, MDBA, NCC, SIAC
Determine sources of primary productivity that support NSW estuarine fisheries *	DECCW
Identify key water quality parameters necessary for sustainable fisheries to establish a mechanism to maintain and improve the environmental conditions required for sustainable fisheries production [C]	EGMAC, EPTMAC
Examine the effects on wild fisheries populations from aquaculture fish, pond run-off or artificial feeds escaping or being released	NSW DPI, DECCW, MDBA, OT&LMAC

Impacts of Management and Manipulation

There are often changes in the management of fisheries in NSW such as closures of commercial and recreational fishing in various areas and times, changes in size limits, gear restrictions, etc. It is not surprising, therefore, that significant priority has been assigned by many stakeholders to identifying the impacts of such changes on commercial and recreational fisheries and the species involved. Ideally, all changes in fisheries management should include a research program that examines them, so that the cost-effectiveness of the manipulation can be assessed in an adaptive management context. Research such as this is, however, by its nature, long-term and large-scale because it should involve adequate surveys and monitoring of the particular fishery/stocks being managed well before, during and after changes occur, in addition to mirrored examinations of “control”, unchanged fisheries and stocks. Such studies are all-too-rare throughout the world and it is unfortunate that changes to management are frequently made first and then research programs are subsequently established to monitor their effects – without prior information (nor controls) to compare against. To avoid the situation of trying to establish monitoring surveys for long periods before every individual change to management is made, large-scale, long-term, generic surveys (which are ideally fishery-independent) should be established to provide the required before and control datasets against which any subsequent management changes to a subset of fisheries and stocks can be made.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Examine the effects of recreational fishing havens on fish populations and fishing * C	NSW DPI, ACoRF, DECCW, EGMAC, FSC, MDBA, NCC, SIAC
Assess the utility of spatial and temporal closure strategies in managing a range of issues including marine pests, biodiversity, stock sustainability and sharing the resources *	NSW DPI, AM, DECCW, MDBA, NCC, OPTMAC, SIAC
Use fishery independent surveys to assess populations of fish in estuaries open and closed to different fishing regimes * C	NSW DPI, AM, DECCW, EGMAC, NCC
Determine the utility of alternative size limits and fish downs for abalone C	NSW DPI, AbMAC
Examine the utility of legal slot sizes and relationship between the release of larger fish by recreational fishers and population fecundity * C	NSW DPI, ACoRF, DECCW, MDBA, NCC
Investigate the viability of stocking fish into the marine environment (e.g., suitable species, methods, environmental impacts) *	NSW DPI
Determine the effectiveness of marine reserves on marine biodiversity, wild fisheries resources and fisheries	NSW DPI AM,
Determine the effectiveness of recreational bag limits and legal lengths on wild fisheries resources * C	NSW DPI, MDBA, NCC
Examine effectiveness of changes in management rules on wild fisheries resources * C	NSW DPI, MDBA
Determine methods to restore depleted reefs of abalone through techniques such as transplants, habitat rehabilitation and reseeding C	AbMAC
Assess the benefits of fishing restrictions at Grey Nurse Shark critical habitat sites *	NSW DPI, NCC
Investigate techniques to reduce the by-catch of threatened species in NSW's commercial and recreational fisheries *	FSC, MDBA, NCC

Reporting, Managerial and Policy Methodologies

Many research priorities were identified by stakeholders concerning ways to improve the data and information available for scientists and managers in NSW. Key priorities involve estimating wild harvests (both legal and illegal) by commercial, recreational and Indigenous fishers, using logbook systems, fishery-dependant and fishery independent surveys and creel surveys. Several important areas involve the development of ways to assess and evaluate the performance of Fishery Management Strategies and the utility of their trigger points and performance indicators.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Develop and evaluate indicators and performance measures for the impacts of commercial and recreational fishing activities on biodiversity C	NSW DPI, AM, DECCW, MDBA, NCC
Develop and evaluate robust performance indicators and trigger points in all Fishery Management Strategies * C	DECCW, EGMAC, MDBA, NCC
Estimate unreported and illegal catches of species for the commercial and recreational sectors C	NSW DPI, AbMAC, DECCW, LobMAC, MPAC, MDBA, NCC
Initiate a commercial fishery logbook program for lobsters * C	NSW DPI, LobMAC
Coordinate underwater harvesting programs to provide: (i) a comprehensive picture of competition and non club-based spearfishing activity; and (ii) estimates of recreational harvest by spear fishers	NSW DPI, ACoRF, DECCW, NCC
Assess recreational baitfish usage * C	NSW DPI, DECCW
Monitor recreational fishing effort in coastal waters using sea rescue bases C	NSW DPI

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Develop indicators of recreational fishing quality * [C]	NSW DPI
Develop a framework for the evaluation of recreational fishing survey design [C]	NSW DPI
Develop protocols for analysis of charter boat logbook information * [C]	NSW DPI
Use the recreational license data to provide the basis or frame for future survey and assessments of recreational fishing [C]	NSW DPI
Collect historical/anecdotal information from older fishers regarding the biology and fishery of yellowtail scad [C]	OHAULMAC
Determine the appropriate geographical size of fishery management units * [C]	AM, DECCW
Develop a strategic research and development plan for the abalone fishery and industry in NSW [C]	AbMAC
Develop finer scale co-management of the abalone fishery, particularly through the use of industry knowledge and experience, to provide a more cost-efficient and effective assessment of stocks * [C]	AbMAC
Develop policies and procedures for the effective monitoring and management of abalone farms	AbMAC
Estimate monetary value of species landed in the Estuary General and Estuary Prawn Trawl fisheries when sold in markets alternative to the Sydney Fish Market	EGMAC, EPTMAC
Develop ecosystem-based fisheries management and performance indicators [C]	NSW DPI, DECCW, MDBA, NCC

Concomitant Effects of Wild Harvest – Impacts of Fishing Methods and Technology

This category of priorities involves the impacts of wild harvest fisheries on other, interacting fisheries and on ecosystems and biodiversity. Many of the priorities identified in this category were identified as important by a large number of stakeholder groups, placing these issues as among the most important throughout all the tables.

These priorities include those concerned with identifying and quantifying concomitant effects of fishing (through observer programs of by-catches and issue-specific experiments to identify impacts) and those that seek solutions to those problems via technological changes to fishing practices. NSW has developed an excellent record in identifying and then finding solutions to such issues such that the methods for answering such questions are becoming routine.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Use observer programmes to monitor by-catches and retained catches for all commercial fisheries * [C]	NSW DPI, DECCW, EPTMAC, LobMAC, MPAC, NCC, OHAULMAC, OPTMAC, OT&LMAC,
Quantify and investigate the fate of discards across all gears in all fisheries and develop strategies to maximise discard survival *	NSW DPI, NCC
Determine the selectivity of current fishing gear (including effective BRDs) for key target and bycatch species *	NSW DPI, NCC
Examine the impact of trawling, hauling and other mobile fishing methods on other fisheries, biodiversity of ecosystems and habitats *	NSW DPI, AM, DECCW, OFTMAC, OHAULMAC, OPTMAC, OT&LMAC, NCC
Examine the effects of nipper pumping in estuaries [C]	NSW DPI, SIAC
Investigate changes in biomass and species composition of affected species after reducing by-catch	NSW DPI, ACoRF, DECCW
Determine hook mortality rate of released fish (species survival; best handling	ACoRF, MDBA, NCC

PRIORITY PROJECTS	STAKEHOLDER GROUPS
methods; hook patterns and sizes) and develop ways to maximise survival of released fish *	
Assess impacts of pollution from fishing activities (e.g., lost gear, bait wrappers etc.) on the environment and the development of strategies to minimise the impacts of pollution from fishing activities [C]	DECCW, MDBA, NCC
Examine potential impacts and interactions of various fishing sectors and methods with seabirds and marine mammals	DECCW, MPA
Monitor habitat loss / modification as a result of commercial fishing	AM, NCC
Develop fishing operations and gear designs to minimise the impact of fishing on incidentally caught species and undersize conspecifics of target species *	NSW DPI, DECCW, EPTMAC, NCC
Study lobster trap selectivity rates of ingress and egress and consequences for trap efficiency and ghost-fishing mortality and develop a system for the remote release of submerged lobster head-gear * [C]	NSW DPI, DECCW, LobMAC
Study the effects of lobster trapping on the benthos including physical disturbance and potential effects on the ecosystem [C]	DECCW
Assess industry-initiated gear modifications in all fisheries	NSW DPI
Determine the effectiveness of approved BRDs following the implementation of square-mesh codends in the Estuary Prawn Trawl and Ocean Trawl fisheries	NSW DPI, NCC
Determine whether FAD's and artificial reefs provide nursery areas for fish and their other effects on biodiversity *	NSW DPI, AM, ACoRF, NCC

AQUATIC ECOSYSTEMS

This category of priorities concerns the many ecological and environmental issues that arise when managing anthropogenic impacts on aquatic resources and habitats to ensure that such influences are sustainable. Many of these issues involve the importance of aquatic habitats to living aquatic resources, but issues concerning threatened species, the maintenance of biodiversity, alien species and the use of marine protected areas as management tools also provide major challenges for science because of the complex questions involved.

Biology

This table of priorities identifies basic biological studies that relate to the study, maintenance and enhancement of aquatic biodiversity in NSW. Many projects have been identified as necessary to answer questions concerning species that are listed as vulnerable, threatened or endangered in NSW. These sorts of detailed biological studies are usually best done on a species-specific level and may make interesting post-graduate projects. An unfortunate characteristic of working on threatened species, however, is the fact that they are rare and often require sophisticated, non-destructive sampling techniques.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Population genetics, distribution, abundance, movements and biology of threatened marine and freshwater species to assess species conservation status and response to recovery actions ***** *(current emphasis is on grey nurse sharks, black cod, eastern freshwater cod, Macquarie perch, southern pygmy perch and purple-spotted gudgeon)*	NSW DPI, ACoRF, AM, DECCW, FSC, MCMA, MDBA, NCC
Protecting the genetic integrity of wild stocks of Australian native freshwater fish *****	NSW DPI, ACoA, AM, DECCW, MDBA, NCC
Modelling the Grey Nurse Shark population	NSW DPI, NCC
Distribution, abundance and genetic studies of *Notopala sublineata* (snail) and *Archaeophya adamsi* (dragonfly)	AM, FSC
Active research on the distribution of remaining populations of the river snail, *Notopala sublimeata*, and techniques for a captive breeding and conservation stocking program	FSC
Monitor the distribution and abundance of threatened species *****	NSW DPI, AM, DECCW, FSC, MDBA, NCC
Determine the historical genetics and existing genetic variability of threatened species	FSC, AM, MDBA
Investigate recruitment biology, fine scale distribution patterns and rehabilitation techniques for *Posidonia* along the coast of NSW *****	NSW DPI, FSC
Monitor and assess eastern freshwater cod populations in the Clarence and Richmond River catchment *****	NSW DPI, FSC, NOW, NRCMA
Actively search for populations and determine the distribution of *Nereia lophocladia* at Coffs Harbour	FSC
Monitor the status of caprellids along NSW coastal waters	FSC
Determine the habitat requirements, environmental tolerances, population dynamics and other aspects of the life history and ecology of threatened species	FSC
Assess the status of trout cod populations	FSC
Undertake a genetic study of black cod populations on east coast and offshore islands and reefs	FSC
Undertake genetic study to verify the origin of river blackfish in the Snowy River catchment	FSC

Ecological Processes

The priorities listed in this table involve studies of ecological interactions among aquatic species. Many of the listed priorities require ongoing, large research programs requiring decades of study and millions of dollars. While such a "wish list" of grand-scale initiatives is difficult to achieve, such work is being addressed by co-ordinating large-scale, long-term surveys of habitats and biodiversity in aquatic systems under an overarching ecosystem-based fisheries management framework.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Examine estuarine ecosystem relationships and functions, including potential effects of climate variability *	NSW DPI, DECCW, NCC
Determine genetic and ecological effects of stocking in freshwater habitats *	NSW DPI, DECCW, MDBA, NCC
Compile biodiversity inventories for marine and freshwater bioregions *	NSW DPI, AM, DECCW, NCC
Contribute to sustainable rivers audit and other freshwater biodiversity surveys *	NSW DPI, AM, DECCW, MDBA, NCC, NOW
Develop survey methods for marine biodiversity * *(current focus is on rocky reef biota)*	NSW DPI, AM, DECCW, NCC
Develop genetic biodiversity procedures	NSW DPI, AM, DECCW, MDBA, NCC
Develop ecosystem models for aquatic habitats *	NSW DPI, DECCW, MDBA, NCC
Examine ecological investigations of key habitats in Marine Parks	NSW DPI, DECCW, NCC
Develop tools for the assessment of the ecological health of estuarine, freshwater and marine ecosystems as part of the NSW State priority MER (Monitoring, Evaluation & Reporting) *	AM, DECCW, NCC, NRC
Undertake ongoing monitoring of key indicators of aquatic health in estuarine, freshwater and marine ecosystems as part of the NSW State priority MER (Monitoring, Evaluation & Reporting) *	NSW DPI
Examine species connectivity at multiple scales, particularly in relation to local and regional scale oceanography	AM, DECCW, MPA
Comprehensive regional assessments of biodiversity, with a particular emphasis on the distribution of rare and threatened aquatic species	AM, FSC, MDBA

Influence of Habitats and Other External Impacts

The quality and quantity of the aquatic habitats in which each life-history stage of aquatic species live affect the number, growth and reproductive potential of those species and the overall diversity of the aquatic community. That is, healthy aquatic habitats usually lead to healthy fish, more productive fish populations and a greater diversity of assemblages of aquatic organisms. The factors that affect the health of aquatic habitats are characterised by being: (i) many in number; (ii) varied; (iii) mostly terrestrial in origin; and (iv) managed by a variety of authorities (e.g., urban and rural runoff, sewage and other sources of pollution, clearing of habitats for construction, etc.).

Studying, understanding and then communicating the role of these influences on aquatic species to relevant decisions-makers can lead to very effective, positive results for living aquatic resources. The methods for achieving such results, whilst large-scale and expensive, usually involve correlative survey work of habitats and biota, mensurative and manipulative field experimentation to establish causes-and-effects and, most importantly, the communication of results to the public and those who can influence the external impacts that affect aquatic habitats. A necessary first step in getting this information for many aquatic habitats in NSW is implementing large-scale habitat-mapping projects,

augmented with information on various physical factors and water quality measures and coupled with targeted surveys of biodiversity.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Determine and reduce the impacts of water extraction, flood mitigation, invasive species, blue green algae, flood events and land management practices on water quality, fish habitats, ecosystems and associated fisheries	NSW DPI, ACoRF, DECCW, EGMAC, MDBA, NCC, OT&LMAC
Integrated monitoring of environmental flows and their impacts on different life stages of freshwater fish *	NSW DPI, AM, DECCW, MDBA, NCC
Determine effects of thermal pollution, altered water chemistry and boundary layer processes on key freshwater species	NSW DPI, DECCW, MDBA, NCC
Identify rivers with current/potential salinity issues and fish likely to be affected	NSW DPI, DECCW, MDBA, NCC
Relate river discharge to estuarine production of fish and invertebrates	NSW DPI, DECCW, NCC
Determine flow requirements for threatened freshwater fish	NSW DPI, DECCW, MDBA, NCC
Investigate fish use of snags and develop 'resnagging' methodologies *	NSW DPI, DECCW, MDBA, NCC
Investigate recruitment and migration of fish into floodplains *	NSW DPI, DECCW, MDBA, NCC
Develop methods to assess and monitor existing and potential marine, estuarine and freshwater habitats as aquatic reserves *[C]	NSW DPI, AM, DECCW, MDBA, NCC
Improve standard techniques for bioregional assessments	NSW DPI, AM, DECCW, NCC
Determine the habitat requirements of fishes and invertebrates throughout their life cycle	AM, DECCW, MDBA
Determine the habitat requirements, environmental tolerances, population dynamics and other aspects of the life history and ecology of threatened species	AM, FSC, MDBA
Clearly identify the precise impacts of known and potential threats to threatened species	FSC, MDBA
Investigate potential impacts of sea level rise on coastal fish habitats, in particular saltmarsh, mangroves, seagrass and rocky shores *	NSW DPI, DECCW, NCC
Examine the effects on fish stocks of the management of Intermittently Closed and Open Lagoons	NSW DPI, DECCW, NCC
Assist Catchment Management Authorities to assess the status of river health and aquatic biodiversity associated with regional natural resource management reforms *	NSW DPI, CMAs, DECCW
Assess the effects of seawalls on saltmarsh and seagrass	NCC
Examine the potential impacts of stock access on saltmarsh and mangrove communities	NSW DPI
Investigate low flow fish passage in unregulated coastal rivers	NSW DPI
Investigate restoration methods for blowout holes in *Posidonia* meadows caused by boat swing moorings *	NSW DPI, FSC
Assess the effectiveness of Seagrass Friendly Moorings and anchoring restrictions in protecting seagrasses and promoting their recovery *	NSW DPI, Maritime
Examine the effects of boating activity on the spread of *Caulerpa taxifolia*	Maritime
Examine the environmental effects of boating-related pollution (i.e., sewage, grey water, etc.) in the context of other point and diffuse sources	Maritime
Investigate the effect of vessel wash on intertidal and shallow water habitats and communities	Maritime

Impacts of Management, Manipulation and Technology

There is a need to develop the databases required to assess the impacts of any management strategy on those aquatic species and/or habitats that they are designed to enhance. Whilst this is common-sense in any sort of adaptive management framework, it is all-too-common that measurement of the effectiveness of management strategies takes second place to the drive to implement the strategies in the first place. The methodologies for achieving such ends are not new but usually require the establishment of scientific monitoring protocols well before management changes occur, the inclusion of control places where no changes are expected, and they need to continue well after the implementation of any given strategy. It is also apparent that stakeholders and an ever-increasingly informed public expect such programs to be in place so that management initiatives that are shown to work through rigorous science can be encouraged, and ones that do not work, can be replaced. This group of priorities also includes the work needed to enhance fish passage in our vital freshwater rivers and streams, including the techniques to census these fish populations.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Baseline and ongoing habitat/species monitoring programs to assess performance of each marine park and the zones within them *	NSW DPI, DECCW, MPAC, NCC
Evaluate marine protected areas' contribution to sustaining fisheries ecosystems and the conservation of threatened species	NSW DPI, AM, DECCW, MPAC, NCC
Monitor improvement of fish abundances after the water reform process *	NSW DPI, DECCW, NCC
Investigate effects of barrier removal on improving fish passage *	NSW DPI, DECCW, MDBA, NCC
Assess the effectiveness of aquatic habitat and fish passage rehabilitation techniques *	NSW DPI, CMAs, DECCW, MDBA, NCC
Determine effectiveness of rehabilitation in acid sulphate soil areas and floodplains	NSW DPI, DECCW, MDBA, NCC
Use existing and new data to determine optimum size and arrangement of MPA's	NSW DPI, AM, DECCW, NCC
Determine the effects of reclamation, jetties and other structures on benthic habitats and biodiversity	NSW DPI, DECCW, NCC
Determine the effectiveness of existing aquatic habitat protection and management policies	NSW DPI, DECCW, MDBA, NCC
Develop techniques for captive breeding and conservation stocking of Macquarie perch and southern pygmy perch *	NSW DPI, FSC, HNCMA, LCMA, MDBA
Examine the environmental impacts of aquaculture on water quality and coastal environments *	ARAC, DECCW, NCC
Assess the potential benefits of aquaculture to decrease pollution and improve aquatic ecosystems (i.e., seagrasses) *	NSW DPI, ARAC, DECCW
Develop and assess new designs for fishways and the effectiveness of existing fishway designs *	NSW DPI, DECCW, MDBA, NCC
Evaluate effectiveness of by-pass channels	NCC
Assess modified lock operations and weir design in ameliorating fish passage *	NSW DPI, CMAs, MDBA, NCC
Assess the effectiveness of new fish passage remediation options such as active floodgate management and new designs for waterway crossings	NSW DPI, CMAs, MDBA, NCC
Continually improve efficiency of electrofishing and other fish sampling techniques to minimise mortality or harm	NSW DPI, FSC, MDBA, NCC
Investigate the efficacy of screens on water pump inlets in preventing fish / larvae / egg entrainment *	NSW DPI, MDBA

Alien Species

This group of priorities deals with those challenges facing managers in NSW as they try to develop ways to ameliorate the effects of harmful, invasive species like *Caulerpa taxifolia*, carp, *Gambusia*, etc. Introduced pests such as these have usually evolved elsewhere but, when introduced into NSW's unique aquatic systems, are free to live and reproduce without the natural checks and balances of their native locations. Removing these species, or at least ameliorating their impacts, is a major ongoing challenge for aquatic managers that will probably never be fully realised. Nevertheless, there are a variety of techniques available to deal with such issues (including targeted removals in well-defined areas) and it is sometimes possible to develop innovative methods. The issues involved in dealing with these problems are so large, complex and difficult that the programmes required are usually characterised by being long-term, expensive and often involve substantial laboratory work followed by long periods of field testing before solutions can be safely implemented into natural systems.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Determine the spread, impacts and control mechanisms for *Caulerpa taxifolia* *	NSW DPI, ACoRF, DECCW, EGMAC, NCC, SIAC
Develop integrated carp management tools *	NSW DPI, CMAs, DECCW, MDBA
Investigate the population structure and distribution of carp *	CMAs, DECCW, Inland MAC, MDBA
Responses of carp populations to reduction (e.g., can carp compensate for reduction in adult density by increasing recruitment)	NSW DPI, CMAs, DECCW, MDBA
Identification of habitats where carp do not occur to prevent invasion or to eradicate new invasions before they are established	NSW DPI, CMAs, DECCW, MDBA
Determine distribution patterns and impacts of introduced freshwater alien fish species on habitats and biodiversity	NSW DPI, AM, CMAs, DECCW, MDBA
Targeted biodiversity surveys in ports to detect presence of introduced marine species *	NSW DPI, AM, Coastal CMAs, DECCW
Develop control techniques for *Gambusia*	DECCW, MDBA
Develop control techniques for redfin, goldfish, weatherloach, banded grunter, tilapia and other freshwater pests * *(current focus is on redfin perch)*	NSW DPI, CMAs, DECCW, MDBA
Determine impacts and develop management and control techniques for all alien species as and when they become an issue (e.g., *Didemnum sp* in 2010)	NSW DPI, CMAs, DECCW, MDBA, NCC

AQUACULTURE

As in many places in the world, production from wild harvest fisheries in NSW will probably not be able to increase to meet expanding demand for seafood. Already some of NSW's most important aquatic resource industries are based on aquaculture (in particular, its largest – the oyster industry) and it is recognised that aquaculture has significant potential for growth as a provider of seafood. Farming fish in ponds, tanks and sea-cages is a very different discipline to the harvesting of wild stocks by commercial and recreational fishers because it requires animal husbandry to raise, in captivity, large numbers of a few species to market-size. As a consequence, the priorities for aquaculture research are mostly technologically based (see below), involving the development of methods to: (i) close the life-cycle (in laboratory aquaria) of candidate species (i.e., species that can grow quickly and easily in dense populations in captivity and that have high market appeal); and (ii) grow these species to a size and in numbers that are profitable. This involves the development of cost-effective feeds and feeding strategies and managing fish health to minimise losses.

There is a strong link between aquaculture science and more traditional fisheries biology. Aquaculture science, at least during the initial stages of domesticating a species, usually relies on information about reproduction, feeding patterns, migration and growth potential that has been established via research on animals in the wild. In turn, aquaculture research informs wild harvest fisheries science, particularly by identifying larval stages, environmental cues for spawning, growth characteristics and nutritional requirements.

Overall priorities for aquaculture research are largely driven by the need to overcome constraints to profitable culture. This involves a close interaction between scientists and existing and potential aquaculture farmers. Prioritising research topics involves identifying the key species that should be studied and those aspects of hatchery, growout technology or post-harvest issues that are most important. In a general sense, priorities need to be assessed on the basis of the estimated potential for environmentally-sustainable growth of the industry and the cost-benefit of studying a particular topic.

Several of these technical priorities identify generic attempts to enhance aquaculture opportunities and production but the majority are species-specific, focussing on problems associated with the major species currently farmed in NSW (especially oysters) and the potential for new candidate species. All these research areas require significant laboratory- and pond-based experimentation. The basic procedures for much of this work are well-established, although individual studies have to be done for individual species. Further, once the experimental work is done, farm-scale trials are required before results can be ultimately translated into industrial-scale production.

Technology – Oysters

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Determine sustainable oyster stocking densities within part or all of an estuary	ARAC, DECCW
Develop and maintain a selective breeding program for Sydney rock oysters to achieve desired traits	NSW DPI, ARAC
Develop and maintain a selective breeding program for pearl oysters to achieve desired traits	NSW DPI, ARAC
Determine optimum post-harvest storage temperatures and procedures for Sydney rock oysters	ARAC
Benchmark current oyster farm practices to determine optimum current practices and to test for benefit of new practices and lines of selectively bred oysters	ARAC
Develop technology to extend shelf life and improve the value-chain of oysters	ARAC
Improve products (e.g., add value to oyster products) and product standards	ARAC

Technology – Prawns

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Develop cost-effective prawn feeds (and reduce dependence on fishmeal) *	NSW DPI, ARAC, NCC
Domesticate prawn species for culture *	NSW DPI, ARAC
Genetically improve prawn culture species	NSW DPI, ARAC
Improve prawn broodstock performance	NSW DPI, ARAC
Enhance access to broodstock	NSW DPI, ARAC
Optimise prawn pond and sediment management practices	ARAC, DECCW
Improve survival, growth rates and food conversion ratios of prawns	NSW DPI, ARAC

Technology – Silver Perch

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Methods for advanced production of juveniles to offset slow winter growth	ARAC
Reduced energy costs	ARAC
Adopt health management strategies *	NSW DPI, ARAC
Reduce feed costs for silver perch through improved feeding practices	ARAC
Identification of appropriate sites and site selection	NSW DPI, ARAC
Improve technology for commercial, cost-effective production e.g., cage culture	NSW DPI, ARAC

Technology – Marine Fish

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Develop and improve broodstock management techniques for marine species, including Australian bass, mulloway and kingfish for improved production of high quality eggs on a year-round basis *	NSW DPI, ARAC
Improve technology for commercial cost-effective production of marine fish fingerlings	ARAC
Develop improved diets with less reliance on fishmeal for grow-out of marine fish including snapper, mulloway and kingfish *	NSW DPI, ARAC, NCC
Develop genetically superior stocks of key species	NSW DPI, ARAC
Reduce feeding costs through improved feeding practices	NSW DPI, ARAC
Identification of sites and site selection	NSW DPI, ARAC
Improve technology for commercial, cost-effective sea cage farming	NSW DPI, ARAC

Technology – Other Species

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Rock lobster aquaculture and enhancement *	NSW DPI, LobMAC
Abalone aquaculture and enhancement *	NSW DPI, ARAC
Sea Urchin aquaculture and enhancement	NSW DPI, ARAC
Investigate the integration of alternative utilisation species into normal oyster farming regimes to enhance and diversify production from a lease *	NSW DPI, ARAC
Investigate potential for aquaculture of new native species	ARAC

Technology – General

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Development and evaluation of recirculation technology for NSW species (freshwater and marine) *	NSW DPI, ARAC, DECCW, NCC
Improve and extend hatchery technology	ARAC
Reduce feeding costs through improved feeds and feeding practices	NSW DPI, ARAC
Reduce impacts from bird predation – alternative to bird netting for land-based aquaculture	ARAC

Health Management

In addition to technological problems facing aquaculture in terms of growing species economically, significant challenges face the large-scale production of seafood through the impacts that various diseases can have. For example, massive losses of Sydney Rock Oysters from estuaries in NSW due to QX disease highlight the devastating effects of diseases if they take hold in mono-specific aquaculture leases, ponds and cages.

The priorities for research on diseases identified by NSW stakeholders mostly refer to specific diseases affecting particular aquaculture or fishing industries, especially those affecting the oyster and prawn industries. Constant monitoring is required to combat such problems, as is the development of tools to fight diseases should they occur. Diagnostics, biotoxins, genetic selection and genetic engineering are all involved in addressing such problems which all require unique expertises and skills that are very different to those in traditional fisheries science and ecological work. Further, the application of these skills needs to be applied at disease- and species-specific levels.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Develop and improve affordable diagnostic tools and improve access to qualified laboratories for aquaculture species *	NSW DPI, ARAC
Investigate the potential that sewage, stormwater and agricultural runoff may lead to an accumulation of chemicals, viruses and bacteria within oysters and/or the environment that will cause human health issues	NSW DPI, ARAC, DECCW, NCC
Develop simple testing procedures for the presence of marine biotoxins to assist aquaculture, especially farming filter feeders like oysters	NSW DPI, ARAC, DECCW,
Better understand QX disease and winter mortality disease in NSW *	NSW DPI, ARAC
Understand causes of mortality of oysters in Hastings River and other north coast estuaries	NSW DPI, ARAC
Implement farm management tools to deal with diseases of silver perch (i.e.,	NSW DPI, ARAC

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Winter disease)	
Improve disease resistant oyster stock through genetic selection *	NSW DPI, ARAC
Develop an assessment process for relaying of oysters which considers the disease status of each waterway *	DECCW
The relationship between the occurrence of an oyster disease (QX, Winter Mortality, etc) and the environment of an estuary and model/predict the severity of an outbreak *	DECCW
Develop appropriate protocols for on-farm disease prevention, control and treatment for prawn diseases *	NSW DPI
Identify potential disease threats to prawn farming *	DECCW
Improve rapid diagnostic testing for VNN in barramundi, Australian bass and other native species	NSW DPI, ARAC
Improve understanding and management of exotic and endemic diseases	ARAC, DECCW, MDBA
Increase understanding and management of nodavirus and other viral diseases	ARAC, MDBA
Develop a national approach to biosecurity, particularly for translocation of aquaculture species	ARAC, MDBA
Improve understanding and management of flukes and parasites for fish culture	ARAC
Improve knowledge base to support registration of chemicals for aquaculture	ARAC, MDBA

External Impacts

Few priorities were identified which highlighted the importance of external impacts to aquaculture and, whilst this is understandably far fewer than those identified for wild harvest fisheries (which rely so heavily on natural conditions), it does recognise that water quality is one of the most important factors affecting NSW's most valuable seafood resource – oysters. Tackling such problems, however, is not simple and involves many groups and industries outside the oyster industry itself. As identified by DECCW, a whole-of-government and multi-industry approach is required to deal with such issues and involves scientific expertise that, in many cases, will reside outside traditional fisheries or aquaculture science. A major challenge, therefore, is to establish such priorities as research questions for relevant agencies and industries so that a unified approach to resolving these problems can be initiated.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Develop a unified Whole of Government waterway classification model with defined assessment criteria with relevance to oyster farming and other aquaculture	DECCW
Identify and mitigate estuaries or areas which are affected by water quality problems like acid sulphate releases, nutrient run off, chemical run off, sediment, etc. which affect the productivity of oysters and other aquaculture *	NSW DPI, ARAC, DECCW
Assess and minimise the impacts from agricultural and urban development to increase production and profitability of commercial, sustainable aquaculture	NSW DPI, ARAC
Develop strategies to understand impacts of how to best adapt to climate change	ARAC

Concomitant Effects

Certain stakeholders identified research priorities involving the impacts that aquaculture activities may have on other species and the surrounding environment. Whilst such issues as pollution, escapees from aquaculture ponds and nutrient enrichment can be difficult to quantify, methods to do so involving field experimentation are available. Further, because of the artificial nature of most aquaculture activities, replicated experimentation to determine cause-and-effect relationships can be readily implemented in industrial operations to answer such questions. It is also worth noting that it is a requirement for most aquaculture operations in NSW to undergo detailed environmental impact assessments prior to establishment, followed by ongoing monitoring of environmental impacts.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
The environmental influence of prawn farm management practices at a range of scales from molecular to regional	DECCW
Assess non-lethal methods of excluding predators from aquaculture activities	DECCW, NCC
Evaluate and/or develop alternative commercially viable products to replace timber and tar where applicable for oyster farming	ARAC, DECCW, NCC
Effects on wild populations from aquaculture fish, pond run-off or artificial feeds escaping or being released	NSW DPI, DECCW, OT&LMAC
Environmental impacts of aquaculture on water quality and coastal environments	ARAC, DECCW, NCC
Assess the benefits of aquaculture to decrease pollution and improve aquatic ecosystems (i.e., seagrasses)	ARAC, DECCW

INDIGENOUS FISHERIES

This category of research priorities involves developing an understanding of the nature, dimensions and characteristics of Indigenous fisheries and their interaction with other commercial and recreational fisheries. This is a challenging category of fisheries research in NSW (and, indeed throughout the world), having been ignored as a separate issue for much of the history of fisheries science and management. Addressing these priorities will depend on reliable and accurate information about Indigenous harvest rates, cultural and spiritual values of traditional target species and Indigenous participation in commercial and recreational fisheries and aquaculture operations.

Establishing the techniques to get the above information is challenging because there is currently a lack of expertise in this area, yet the kind of research that is needed requires culturally appropriate methodologies that have to be negotiated with individual communities. Progress in such work will probably be relatively slow initially but the first, quite significant steps are underway.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Facilitate the development of a centre for research into Aboriginal fisheries	AC (TOG), ARG, NSWALC, SIAC
Develop a research plan for Aboriginal fisheries	AC (TOG), ARG, NSWALC, SIAC
Determining catch, cultural significance of species and traditional fishing knowledge needs	AC (TOG), ARG, MDBA, SIAC
Evaluation of the socio-economic impact of non-Aboriginal fisheries on Aboriginal fisheries	NSW DPI, ARG, SIAC
Socio-economic study of the value of cultural fishing to Aboriginal communities	NSW DPI, ARG, MDBA, SIAC
Impact of management changes on the viability of Indigenous commercial fishers and the flow on effects to their communities: case study in NSW *	NSW DPI, ARG, NSWALC, SIAC

POST-HARVEST AND VALUE-ADDING

Research priorities concerning the products from fisheries and aquaculture after harvesting usually fall outside what is considered conventional "fisheries science". Despite this view, such issues form a vital component of the research needed to ensure the optimal and most beneficial use of fisheries resources. Concepts such as "whole-of-chain" approaches to achieving "triple-bottom-line" benefits for the environment, economy and society require solutions to problems associated with enhancing the economic returns that commercial fishers and aquaculturists receive for their efforts.

General priorities identified in this section included several that involve a variety of issues concerning the operation of the entire post-harvest seafood sector in NSW. The sorts of research needed in this area involve market research methodologies, economic analyses of margins and ways to enhance harvested product as it makes its way from the water to the retailer. There is a great deal of expertise and experience available in this area for other food-types in NSW and, to achieve the research priorities identified in this category, such expertise needs to be more tightly focused on the seafood industry.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Examine the dynamics of value-adding margins along the whole marketing chain for wild harvest fisheries and aquaculture products	NSW DPI
Improve oyster handling techniques post-harvest to ensure a high quality safe food product is delivered to the consumer *	ARAC
Evaluate and develop an effective oyster marketing strategy which will assist industry and provide a platform for increasing investment opportunities and consumer confidence in the industry	ARAC
Develop an oyster marketing standard and grading criteria	ARAC
Identify and implement processes for adding value to oysters and by-products	ARAC
Identify and develop available markets and identify critical factors limiting growth of export markets for Australian farmed prawns	NSW DPI, ARAC
Investigate strategies to enhance product and add value to the Estuary General Fishery	NSW DPI, EGMAC
Development of improved tagging and marketing of abalone	NSW DPI
Emerging technologies in seafood traceability systems	SFM
Identify, rank and design solutions to reduce barriers to consumption of Australian seafood	SFM
Market development of abalone, particularly through the use of product integrity and quality assurance programs to help develop unique branding	AbMAC
Evaluate mechanisms and new technologies to assist with direct marketing of fish by fishers	NSW DPI
Evaluating technology and its impact on the dynamic at the buyer-seller interface	MFMA
Investigating and developing strategies for utilisation performance in the post-harvest sector	MFMA
Identifying and implementing strategies for addressing growth limiting factors in the post harvest sector	MFMA

SOCIO-ECONOMICS, EDUCATION AND COMMUNICATION

This category of research priorities involves the very important issues surrounding the "human dimension" of fishing. These issues concern: (i) answering questions about the socio-economic nature and cultural impacts of commercial, recreational and Indigenous fishing and aquaculture and the management decisions that affect these sectors; (ii) educating stakeholders and the general public about the myriad of issues concerning fisheries and aquaculture; and (iii) communicating information amongst stakeholders so that commercial, recreational and Indigenous fishers, aquaculturists, managers, scientists, decision-makers, environmental groups and the general public can provide advice and understand issues with the benefit of the knowledge possessed by each other.

Establishing techniques to achieve these priorities are challenging, although significant expertise exists in the field of socio-economics to address most of the questions raised. Education and communication amongst stakeholders are also areas for which established techniques exist, and applying them to fisheries, aquatic ecosystems and aquaculture in NSW should be a relatively straightforward process, especially in the current environment where a myriad of advisory committees and councils exist for most stakeholder groups.

Educating and communicating the broader public of NSW (a very populous state) is, however, much more difficult as the use of the mass media (which are the most effective, albeit costly, techniques available), do not easily lend themselves to communicating the sorts of complex, multi-faceted information that characterises fisheries issues. Nevertheless, we live in an age of ever-improving communication and an ever-more discerning public, so there exists far fewer impediments to communicating fisheries information to the public than at any time in history.

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Independent assessment of the economic value of the NSW commercial fishing industry and undertake extension and promotion activities to increase the public awareness of commercial fishing (including its value) and the results of relevant research to reduce conflict	EGMAC, EPTMAC, OPTMAC, SIAC
Determine the socio-economics of the Ocean Fish and Ocean Prawn Trawl fisheries and the likely impacts of NSW fisheries management strategies and Marine Parks *	NSW DPI, OFTMAC, OPTMAC
Examine the economics of the commercial lobster fishery (costs of catching lobsters, profitability, impacts of management and community contribution on trading of quota and sales of shares)	NSW DPI, LobMAC
Survey of fishers' costs and earnings to quantify their terms of trade	NSW DPI
Examine the technical capacity and efficiency in the NSW fishing fleet *	NSW DPI
Do an economic assessment of the impact of the abalone fishery	NSW DPI
Examine fisher-attitudes towards the environment and consequent education programmes	DECCW, MDBA
Survey of economic benefits of recreational fishing to coastal communities *	NSW DPI, ACoRF
Assess the benefits of declaring a species 'recreational only' (do recreational benefits outweigh the value of the commercial catch?)	NSW DPI, ACoRF
Training and extension of recirculation systems in aquaculture	DECCW
Increase awareness and utilisation of sustainable aquaculture practices	NSW DPI, ARAC, DECCW, NCC
Increase farmer awareness and adoption of relevant R&D outcomes (extension) for all aquaculture species *	NSW DPI, ARAC
Investigate and define the socio-economic and environmental value of fisheries and fish habitats to the community	NSW DPI, MDBA
Investigate the social and economic benefits (both direct and follow-on) of commercial fishing to the community	NSW DPI

PRIORITY PROJECTS	STAKEHOLDER GROUPS
Investigate strategies to improve industry empowerment and development with respect to leadership and management initiatives	NSW DPI
Educate and communicate to the broader public of NSW the concept of sustainable seafood, and increase awareness of sustainable fishing practices in NSW	NCC

Question 4.

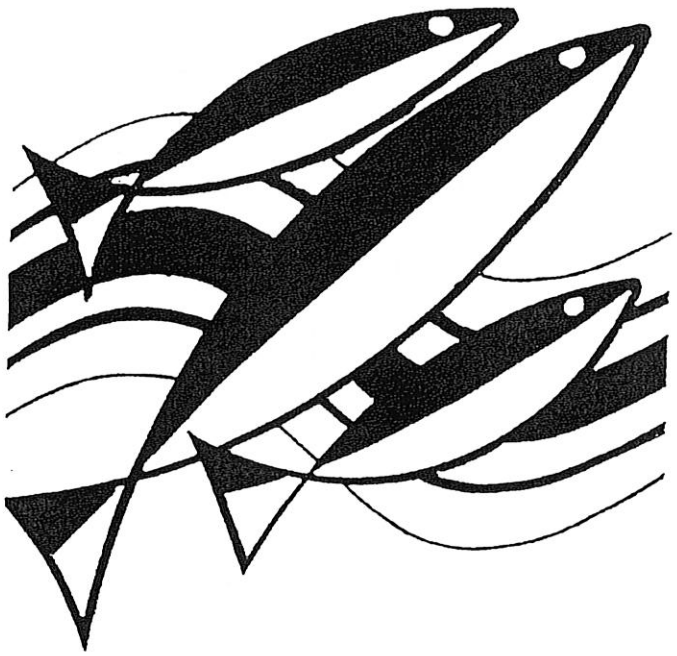
NSW FISHERIES

1997

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

1997

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER



CONTENTS

INTRODUCTION

In 1987 Section 170 was added to the NSW Heritage Act, requiring all Government instrumentalities to prepare a Heritage and Conservation Register of assets it controls or owns.

A primary reason for these registers is to help each government agency to understand the significance of any heritage assets it owns or controls and to manage them accordingly.

This register has been prepared in accordance with S170 of The Heritage Act and with the assistance of the Guidelines for the Preparation and use of Heritage and Conservation Registers supplied by the Heritage Council of New South Wales.

ACKNOWLEDGEMENTS

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THEMATIC HISTORY

NSW FISHERIES

1.0 Introduction

1.1 Background

This Historical Context Report has been prepared for NSW Fisheries by Godden Mackay Pty Ltd in compliance with the preparation of heritage and conservation registers requirements of s170 of the NSW Heritage Act. A Historical Context Report is required to not only provide such historical information as is available regarding specific items included in a register but also to place the items within an historical, administrative and environmental context.[1] This report augments a study undertaken in July 1996 by Godden Mackay Pty Ltd on several buildings at the Fisheries Research Institute Cronulla.

1.2 Site Location

The Department of Fisheries has its head office at the NSW Fish Markets in Pyrmont. The NSW Fisheries Research Institute is located at Hungry Point, Port Hacking, in the southern Sydney suburb of Cronulla. The study focuses on the group of older buildings and equipment constructed during the first decade of the century but also records subsequent development and usage. As a number of buildings at the site, built during the Stage 2, CSIR period, are now approaching the fifty year heritage assessment point, consideration should be given to collecting information regarding their construction and usage.

The other current NSW Fisheries Research Stations at Narrandera, Salamander Bay and Grafton have not been included in this study as although they are an important part of Fisheries' research network, they do not yet qualify on the basis of age (50 years). The sites should however be investigated for exceptional technological and industrial archaeological significance, during both NSW Fisheries management and during prior occupations.

The Aquatic Reserves included on the NSW Fisheries Heritage Register for their natural heritage significance have not formed part of this study. They should be the subject of a separate study, preferably carried out by NSW Fisheries staff.

1.4 Constraints

An administrative history of the agencies (State and Federal) which have managed the Gunnamatta Hatchery site has been compiled. It must however be emphasised that because of resource constraints of both time and funding, this is by no means a full and complete history of any agency; because the Gunnamatta Hatchery is the only heritage site currently listed on the NSW Fisheries Register, the study focuses on that site and the types of activities carried on there.

Accordingly it has not been possible to include the full range of activities which NS Fisheries in all its guises has carried on: the involvement with early fish marketing a liaison with municipal and industry authorities; the considerable research into inland fi and fisheries at various locations throughout the state; the network of coastal inspecto and sub-inspectors at strategic locations along the coastline; the state trawling indust experiment; the system of 'closed waters' whereby netting was prohibited in bay estuaries and rivers at certain seasons, for periods of time or permanently.

Apart from resource constraints, the inaccessibility of much of the various NSW Fisheri agencies' archival records has inhibited the breadth of research possible. No use CSIRO archival documents and photographs has been possible, apart from publishe records and Annual Reports. This has meant that it has not been possible at this time link particular activities and events with specific buildings.

1.5 Comment

This study should be read in conjunction with the Heritage Assessment prepared b Godden Mackay in July 1996. The fact that historical research for the Heritage Study ha followed rather than preceded the Heritage Assessment has meant that a considerab amount of information which would otherwise have formed part of the Assessment ha necessarily been included in the Heritage Study's text.

A comprehensive history of the Australian fishing industry is yet to be produce necessitating considerable primary research in order to establish a context for the Stud More detailed information regarding the CSIRO's fisheries activities can be found i Vivienne Mawson et al, (eds) *CSIRO at Sea 50 Years of Marine Science* (CSIR Australia, Marine Laboratories, Tasmania, 1988) ISBN 0 643 04835 9

1.6 Nomenclature

Throughout its European occupation the Hatchery site has been known variously as th Port Hacking Hatchery, the Gunnamatta Bay Hatchery, the Cronulla Hatchery, th Government Fish Hatchery, the Headquarters of the Fisheries Investigation Branch of th CSIR (later the Division of Fisheries and Oceanography of CSIRO) and the Fisherie Research Institute. The area is referred to variously as Port Hacking, Cronulla, Hungr Point and Gunnamatta Bay.

1.7 Endnotes

[1] NSW Heritage Guideline for the Preparation and Use of Heritage and Conservation Registers in Accordance with S17 of The Heritage Act for State government agencies

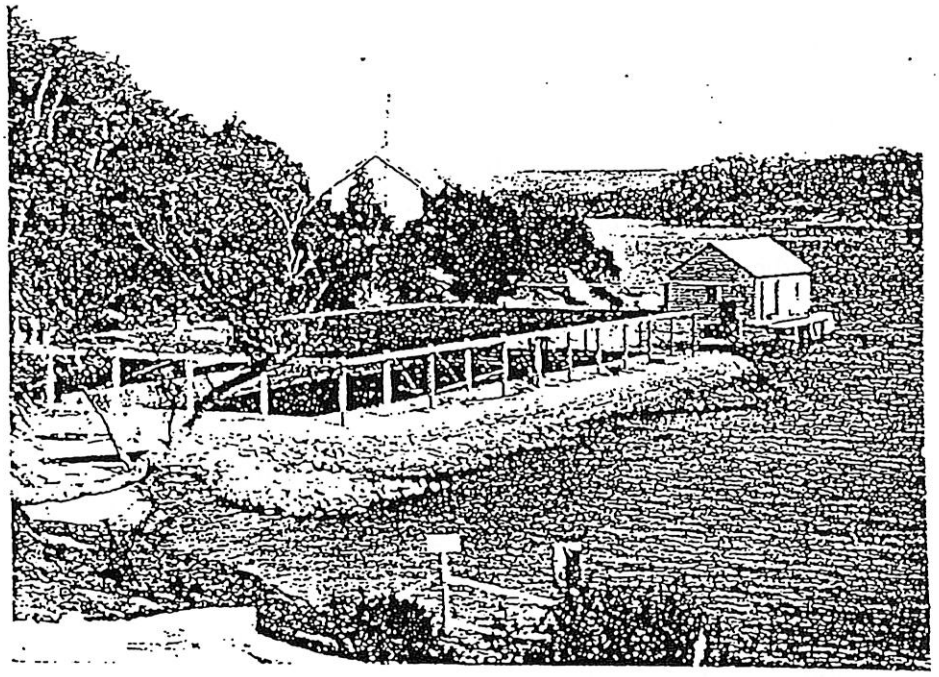


Figure 1.2 Fish Hatchery c1911.

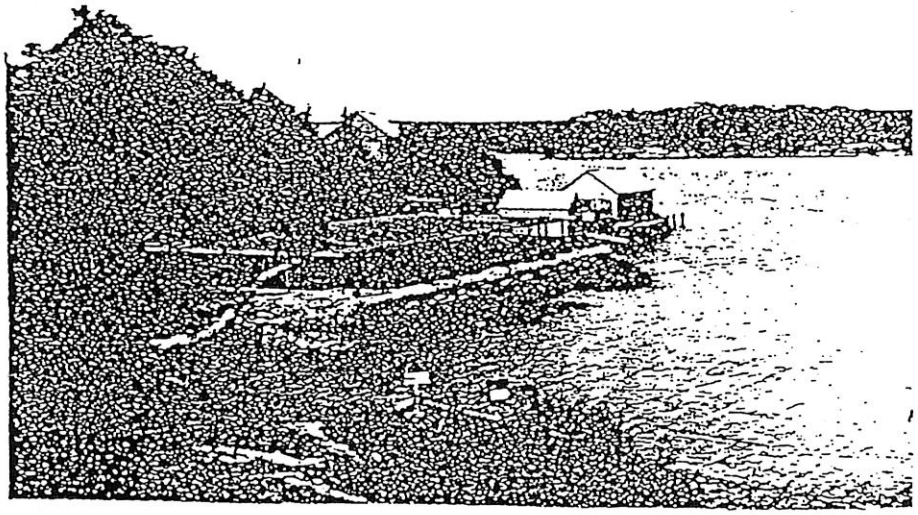


Figure 1.3 Photo showing the Hatchery c1930-1940s. Note the small building next to the Fish Pool. This was later replaced in the late 1940s by the elongated building which now occupies that site. (From CSIRO at Sea, 1988).

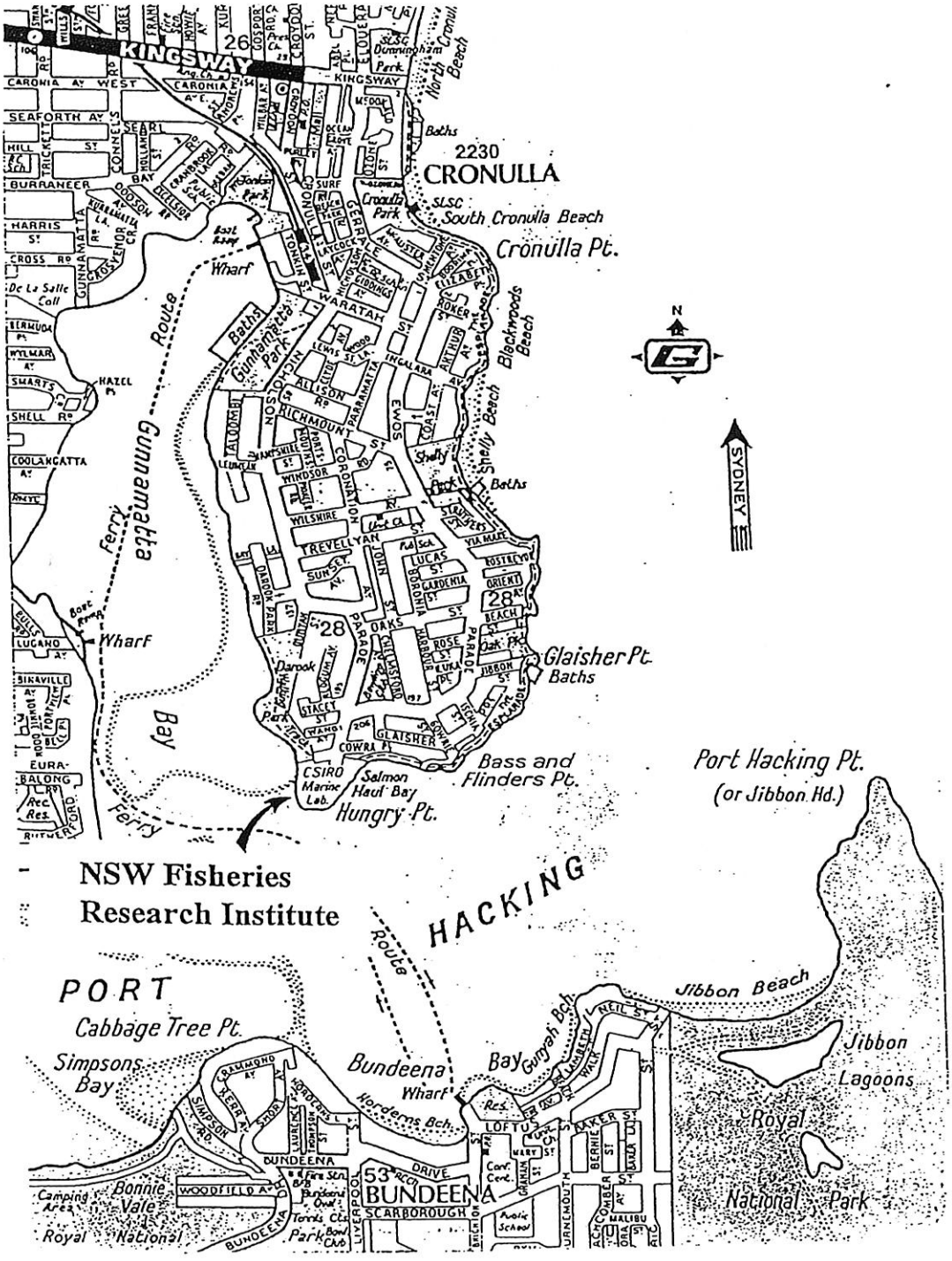


Figure 1.1 Location of NSW Fisheries Research Institute.

2.0 Aboriginal Use of and Association With the Gunnamatta

When the First Fleet straggled into Botany Bay in January 1788 the "Eora" people occupied Sydney Cove, while the northern shore of Port Jackson from the Lane Cove River to Middle Harbour belonged to the Camaraigal. North of Many was the homeland of the Gayimai and to the west the Walumeda. South from Botany Bay was Cadigal country while the Gwiyagal hunted and fished in the swamps between Botany Bay and Port Hacking. Radiocarbon dating indicates that Aborigines were using areas of the Royal National Park at least 7500 years ago.[1]

The Gwiyagal were of distinctive appearance - they stuck resin in their hair to give it a mop-like appearance - and spoke the Dharawal language. They almost certainly witnessed Cook's landing at Kurnell in 1770 as well as the First Fleet's arrival in 1788. Being a coastal group, the main food gathering occupation was fishing, although vegetables and land animals were also important.[2]

Coastal Sydney appears to be an exception to the generally accepted rule that the collection of vegetable foods was the task of Aboriginal women; accounts of coastal Sydney portray the male as the principal vegetable gatherer and women the major fish providers. While both men and women fished, they nevertheless had their own distinct fishing methods. Women fished from canoes with hook and line; a fire was kept burning in the middle of the canoe to heat and cook the catch, portions of which were chewed and spat into the water as berley. A fishing spear was used to bring in larger fish which they had hooked. Early observers believed the *mal-gun* operation (removal of the top joint of the little finger on the right hand) was to avoid the fishing line tangling with the little finger as it was wound around the hand.[3]

Aboriginal men tended to fish from the shore with the four-pronged *mooting*, but as they needed a calm surface to see the fish, a place out of the wind was necessary. They too used chewed fish or cockle as berley. Men also speared from canoes, lying across their canoes with their faces in the water and their spears immersed. For smaller surface species, the *mooting* was thrown. Strips of stringybark were used as torches for night fishing. The fishing catch was either cooked and eaten on the canoe or brought to the shore, cooked on a fire on the beach or nearby and consumed on site, resulting in huge mounds of shells and fishbones, known as middens, at popular locations on high points or secluded caves and overhangs.

Analysis of fish bones found in coastal middens indicates that snapper, bream, groper and wrasse were eaten as well as morwong, leatherjacket, flathead, tailor and blackfish. Estuarine middens produced evidence of snapper, bream, groper, mulloway, leatherjacket and wrasse. The Sydney people reportedly did not eat sharks or stingrays, although no reason for this rejection of a seemingly valuable food source was recorded. It is more surprising as whales were a prized catch. Estuarine and coastal molluscs were eaten when other foods were scarce. Men would jump off rocks and dive for shellfish which were then cooked on a fire - oysters, rather remarkably, were reputedly opened with the

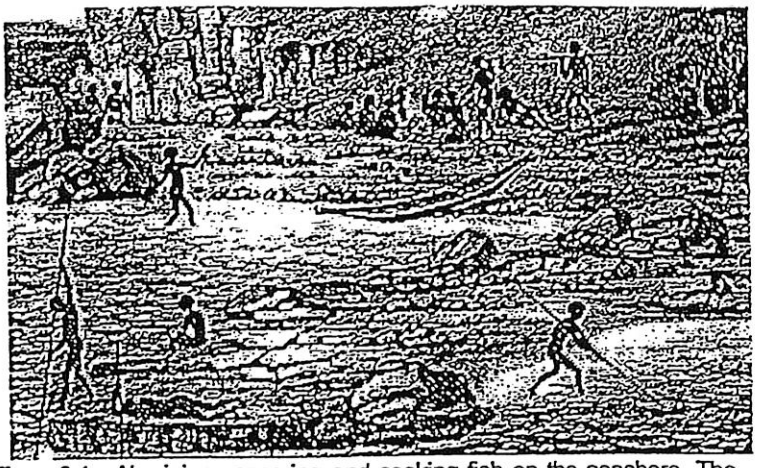


Figure 2.1 Aborigines spearing and cooking fish on the seashore. The two men in the left foreground are using woomeras but the man on the right is not.

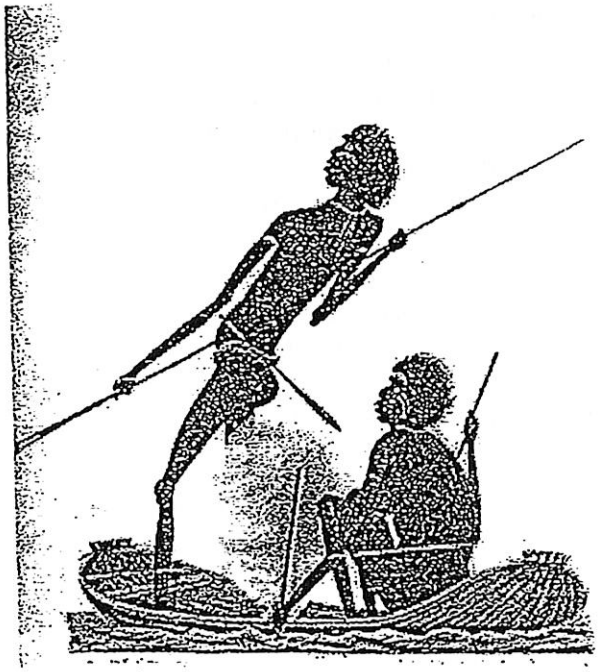


Figure 2.2 A man and his wife fishing from a canoe. A woomera is not being used. (R Browne, watercolour, 1819, Dixson Galleries.)

thumbnail in the Sydney region. In middens in the Gymea Bay and Connells Point areas the larger species commonly found in the area are well represented - Sydney rock oyster, Sydney cockle, hairy mussel, southern chama and mud oyster. In ocean-front middens limpets, rock welks, abalone, periwinkles, nerites and mussels are found, while on the southern edge of the Kurnell peninsula pipi shells were gathered on local beaches in large numbers.[4]

The three Aboriginal middens on the Gunnamatta Hatchery site [Heritage Register No F0009], registered with the National Parks & Wildlife Service in January 1996, should be analysed by appropriate personnel to ascertain the species contained therein. Adjacent Darook Park (named for a group of local Aborigines) reportedly contains carvings and spear sharpening grooves. Frank Cridland identified the locations as Darook Park and Wahgunyah cliffs. Writing in 1924 Cridland described an Aboriginal water-hole extant in Darook Park with an immense 'kitchen-midden' nearby. He wrote also of rock carvings (figures and art) in caves and overhangs along the beachfront backing onto the present Nicholson Parade.[5]

Cridland identified a number of sites around Gunnamatta Bay on Burraneer Point as well as the Darook shoreline where life-size carvings of two whales, 35′ and 38′ long, a shark and a bream could be found, as well as figures and other fish and native animals. One, a kangaroo carved into the vertical face of the cliff on Burraneer Bay was described as a splendid piece of work. Handmarkings were located in various local cave shelters. W D Campbell, a surveyor, reputedly surveyed, measured and described rock and cave drawings between 1886 and 1893 and examples of his drawings are reproduced by Cridland.[6]

While the Aboriginal population of the Sydney region appeared to the newcomers to be well provided for with fish, land animals and vegetables, the Europeans had little concept of how precarious was the balance between starvation and sufficiency. The sudden influx of over 1,000 extra mouths to feed placed unbearable strains upon the available supply of fresh food. Kangaroos, birds, herbs and fish all ended up in the pots of the newcomers, in quantities never before witnessed by the Aborigines. During the winter of 1788, when the fish supply naturally declined, Aborigines died of starvation in the bush, their spears and handlines being no match for the introduced guns and seine-nets in an environment already drastically depleted of its food resources.

The Aborigines. desperate and resentful, began taking a share of the netted catch by force. Governor Phillip had already issued a General Order to fishing parties to give part of their catch to the Aborigines if they approached, but this no longer appeared to satisfy them. As Willey comments, 'hunger and pestilence are seldom far apart in the more melancholy passages of history' - and the advent of smallpox or some other pestilence was to decimate the local population, killing perhaps half of all the Aborigines in the vicinity of Port Jackson.[7] Argument has raged ever since as to the nature of the disease. This is outside the ambit of this work and does not alter the fact that many hundreds died, relieving the pressure on the food chain in a truly tragic manner.

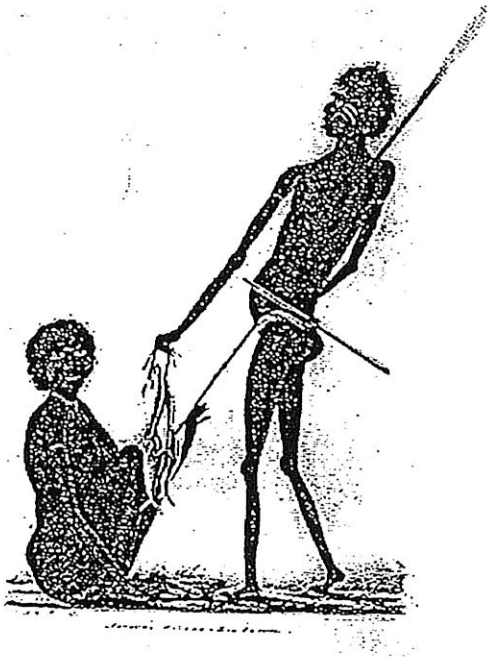


Figure 2.3 The 'Noble Savage" had become the 'Comic Savage" by the time R Browne painted this picture of an Aborigine returning with his catch of fish in 1819. (Rex Kivell Collection, National Library).

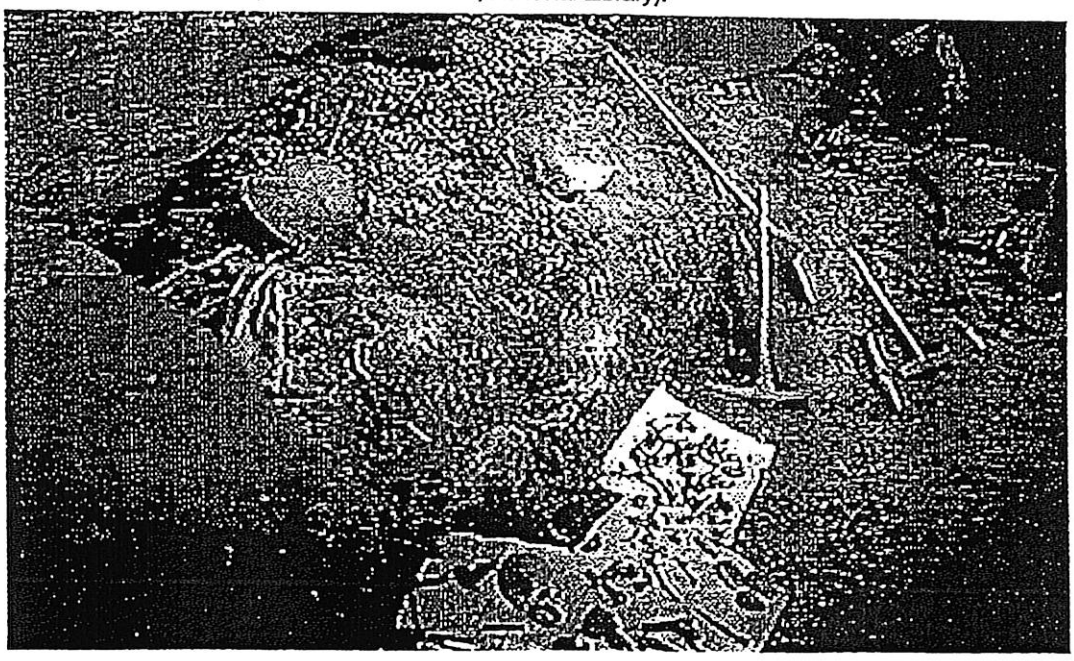


Figure 2.4 Aboriginal remains in Port Hacking, 1918.

A series of photographs in the Government Printing Office collection, taken in 1918, graphically record a large number of Aboriginal bones and artefacts, uncovered at the site of a rock or cave collapse at Port Hacking. The occupants were clearly trapped and died, remaining buried until the date of photography.[8] But the evidence of the Dreamtime occupants of the Gunnamatta Bay region is sparse.

By the time the Europeans began passing legislation to protect the fisheries they so ruthlessly appropriated and subsequently squandered, the last remnants of the Sydney tribes were decimated and dispossessed, leaving only their art and artefacts along the coastline and in isolated caves and rock overhangs. The wise husbanding of the extensive food resources which their tribal lands provided was overwhelmed by an alien economic and social system, the only evidence now it seems being middens, three ironically protected because they were located on the site of the Gunnamatta Hatchery.

2.1 Endnotes

[1] Keith Willey, *When the Sky Fell Down* (Sydney, 1979) p 15; Peter Turbet, *The Aborigines of the Sydney District Before 1788* (Kangaroo Press, 1989) p 10
[2] Turbet, *op cit,* pp 16, 23
[3] *ibid,* pp 53, 70
[4] *ibid,* pp 55/58
[5] Megan Pitt, *A Walk Around Cronulla* (Sutherland Shire Council, 1990) np
[6] Frank Cridland, *The Story of Port Hacking* (Sydney, 1924) pp 34, 44/46, 141/148
[7] Willey, *op cit,* pp70/78
[8] GPO Series I, Stills # 17919, 17920, 17928,18233, 18234, 18235

3.0 Moves Towards the Protection and Regulation of Fisheries

3.1 The Settlement of New South Wales Before 1850

As outlined in 2.0 above, fishing, with all its social and cultural associations, was a traditional use of the Port Hacking area of New South Wales (NSW), as was most of the eastern seaboard of the Australian continent. With the intrusion of Europeans into the Sydney area, the white invaders took the fisheries of the inland and seaboard as their own, in time replacing subsistence farming of the resource with private enterprise in the form of fish barrows, stalls and house to house sale of fish. The earliest documentary reference to a local fishing 'industry' appears in the *Sydney Gazette* of December 14, 1806 which reported:

> *'On Friday, a boatload of salted fish, amounting to 13 cwt. was brought in at the Hospital Wharf' (the site of the Museum of Contemporary Art in the former Maritime Services Board building)* [1]

Crews of whalers had ranged up and down the coast for some years before the newspaper report but the whalers of many nations were transient and not much interested in establishing trading links with the marginal penal colony - not at least until the 1840s when the flamboyant Ben Boyd began harvesting the ocean just as enthusiastically as he reaped the profits of inland squatting.

From a late twentieth century perspective if is difficult to calculate the importance to the fledgling penal colony of the great variety of fish available in the surrounding waters - a population largely dependent upon the salted meats transported over many months from their home ports and upon the fish and game they were able to hunt. For such as these, fish of whatever kind was a welcome addition of fresh food. The British in particular were a nation who traditionally looked to seafood as a staple food and they brought with them the trade of fishmongering, a system of mass harvesting of available fish stocks for resale to a consuming public - a far cry from the traditional Aboriginal concept of hunting and fishing for the family's immediate consumption.

Despite the vital place which fresh fish played in the diet of Sydney's traditional and early European population, the indigenous varieties were not highly esteemed during the nineteenth century, no doubt another instance of the belief that all things British were *ipso facto* superior to the local. This view was clearly enhanced in the case of fisheries by the smaller stocks of a greater variety of fish in Australian waters, compared to the huge European fishing grounds of herring, cod and salmon. Fish auctions were first held in Sydney about 1827 when a certain Boyle, agent for Mr J Lord held sales on the race-course, latterly Hyde Park. Daily supplies from Botany Bay in the 1820s and 30s exceeded that offered for sale in the 1890s. [2]

The remnants of the Eora people had long been aware the impact of the greatly enlarged population and methods of mass harvesting had upon their traditional fishing grounds; awareness of the effects of the destruction of fish fry upon the future potential of the industry became apparent but it was not until the 1860s that the dire

condition of the Colony's fisheries prompted any attempt to control the industry by legislation.

3.2 Establishment of fisheries legislation, post 1860

Throughout the first half of the nineteenth century seine-hauling for fish had been widespread and totally unrestricted with regard to net length and size of mesh, although only Port Jackson, George's River and Botany and Broken Bays could be fished with nets. The resultant depopulation of fish stocks was finally recognised by the public and the more astute fishermen who enlisted the assistance of Richard Driver Jnr MLA in bringing the matter before a Select Committee of the House. The Committee heard that the general custom was to work with nets of ¾" (20 mm) which caught and destroyed enormous quantities of fry, a major cause of the depletion of the fishing grounds. Another major cause of spoliation was the system of 'stalling' which consisted of:

> *'shooting at high tide a net of some 250 or 300 or more of fathoms across a shallow bay or around flats and leaving it until the receding tide had left the enclosure dry. By this means tons upon tons of fish were destroyed and as from these quantities only those of a saleable size and of the more choice species were selected, the large remainder of the stranded fish was left unused and to rot on the beaches...'*[3]

The Fisheries Act, 1865 (28 Vic No 10)

As a result of the evidence placed before the Committee the Fisheries Act of 1865 (Dick Driver's Act) was passed, specifying the size of mesh permitted for use in particular seasons and locations, and restricting the practice of 'stalling', making it a penal offence to fix or stake any net within a mile of the shore or at the mouth of any river. Unfortunately administration of the Act was entrusted to the Police and Customs Departments which were totally unequal to the task.

Royal Commission to enquire into and report on the actual state and prospects of Fisheries of the Colony of New South Wales, 1880

After some fifteen years of inactivity and procrastination, William Macleay MLC presided over a Royal Commission enquiring into the current situation in the Colony's fisheries and tendering advice to Government for developing and preserving them. The Commissioners heard that the present quantity of the catch did not of itself affect appreciably the available supply, the rapid decline of which was a result of the 'wanton destruction by fishermen of the spawn and young'. However they also learnt of the wide-spread practice overseas of annually liberating a much larger number of artificially-reared fish than the annual catch.[4] They also collected information on acclimatisation and pisciculture in Australia and overseas and recommended

> *'that assistance should be given by the Government to any competent association engaged in Pisciculture, by a grant of money, and the use, if required, of the "National Park" at Port Hacking.'*

The Report[5] recommended a more detailed survey of the sea bottom for a distance of twenty miles from the land; and special fisheries for mullets, herrings etc. which periodically visited the coast in large shoals, together with a closed season for the protection of young fish. Immediate legislation was urged for the protection of the oyster fishery and crayfish canning was suggested as a profitable industry. The Commissioners anticipated increased fish supplies as a result of the use of a superior class of fishing boats, improved methods of capture and preservation in ice. A closed season prohibiting net fishing in rivers and bays from 1st April to 1 October was recommended and the minimum net size to be set at 1½ inches (38 mm). Stalling was to continue to be tightly controlled and the minimum mesh size suggested was 4 inches (102 cm). Administration, control and direction of the fisheries should be vested in a central board, with competent local inspectors.[6]

The Fisheries Act, 1881 (44 Vic No 10)

As a result The Fisheries Act, 1881 (44 Vic No 10) repealed the former legislation and allowed for the appointment of five Commissioners to supervise the implementation and operation of the Act, divided the Colony into three 'Grounds' for effective administration under the supervision of Inspectors and sub-Inspectors, some of whom it was envisaged for reasons of economy would be local members of the police force. The recommendations of the Commissioners were incorporated into the new legislation, with penalties for the destruction of undersized fish and the prohibition of explosives and poisonous substances for the purpose of destroying fish.[7]

The five Commissioners, all of whom had acted as Fisheries Royal commissioners, immediately began implementing the new Act and in keeping with their obligations to develop the fish supply induced the Government to import a variety of innovative fishing-gear currently being used in England, America and Norway to assess their suitability for Colonial waters and in order that 'our fishermen might be instructed in the modes of fishing practised in those countries'.[8]

Calamity struck on the morning of 22 September 1882 when the imposing Garden Palace, erected in the Sydney Botanic Gardens for the Great International Exhibition of 1879/80, was totally destroyed by fire, obliterating amongst many irreplaceable Government records, the collection of fishing implements and all the books and records of the Fisheries Department. Soon afterwards, the entire original Fisheries Board retired, to be replaced by five new Commissioners, all but two of whom had also served on the 1880 Fisheries Royal Commission. Stability proved to be a problem for the Fisheries Board, with fifteen different appointments being made between 1881 and 1893.[9]

Nevertheless the reconstituted Board enthusiastically prepared for the Colony's contribution to the Great International Fisheries Exhibition to be held in London in 1883. The Commission also recommended a survey of the seabed outside Port Jackson, at an estimated cost of £1000, and the purchase of a seaworthy steam launch to lay down oysters on exhausted beds.[10] Claims that the 1881 Act was deficient and needed redrafting soon emerged, initiated and supported by disgruntled fishermen and interested parties who believed the Act placed undue restrictions upon them. A Select Committee of

the Legislative Assembly was established resulting in the Fisheries Act Amendment Act, 1883 which reduced the stringency of the regulation of the industry, not however sufficiently for the protesters who continued to agitate until their cause was taken up by Frank Farnell MLA.

Farnell criticised the Fisheries Commission 'for want of practical knowledge, and the officers under them for their administration of the Act'. The Select Committee subsequently appointed, including Farnell, reported in August 1889 in a negative assessment of the Act repeating Farnell's parliamentary criticisms: that it operated harshly upon those engaged in the industry, that it offered insufficient encouragement of oyster-culture and that its' regulations were unnecessarily restrictive; it recommended encouragement of trawler fishing and abolition of the Fisheries Commission, with the re-establishment of the department under direct Ministerial control, or the addition of two representatives of the fishermen to the Board. It also appended two draft Bills amending the Act, but despite a further Royal Commission in 1894 which repeated calls first articulated in 1880 for deep sea surveys and the establishment of a marine fish hatchery[11], pressure of parliamentary business and changes in the Ministry[12] resulted in these and subsequent draft Bills (1883, 1890, 1895, 1898) remaining on the table of the House. Indeed the Fisheries Commission's staff numbers and activities declined in 1893 when the Government introduced stringent economies and retrenchments as a result of the 1890's depression.

No legislative amendments took place until the turn of the century, despite representations in each Annual Report to Parliament and the appointment to the Board of its most vocal parliamentary critic, Frank Farnell, in 1895.[13] Finally responding to recommendations in previous Royal Commission Reports since 1880, Farnell supervised a trawling expedition on behalf of the Government in 1898 to test the ocean bottom off the coast to ascertain whether trawling operations were likely to be successful. The Government steamer *Thetis* was fitted out for the purpose and equipped with an otter trawl but despite a 'very interesting and instructive report' submitted to Parliament by Farnell no immediate action was taken.[14]

The perennial problems of fishery closures and catch regulation occupied much of the Board's attention:

> *'It is very difficult to adopt necessary measures for a proper protection of the fish and fishing-grounds without causing a certain amount of dissatisfaction amongst the fishermen, but, while the Commissioners are anxious to assist the licensed men as far as practicable, they find it absolutely necessary for the preservation of fish, and to maintain the supply, that breeding-grounds should be nursed and protected.'*[15]

Despite the plethora of Royal Commissions and Select Committees, draft Bills and industry criticism, the regulation of the fishing industry ground slowly into the twentieth century. The Department of Fisheries Report for 1899, presented to Parliament on 26 May 1900 again pleaded for stronger legislative support:

> *'We consider that it is our duty, in the interests of the fishing industry to again urge upon the Government the necessity of introducing more stringent laws than those at present in force for the protection of fish and oysters, and for the better administration of the fisheries.'*[16]

3.3 Endnotes

[1] Quoted M Hutton Neve, *Sutherland Shire Society Bulletin*, May 1978, p.145
[2] Lindsay G. Thompson, *History of the Fisheries of New South Wales...*, Sydney, 1893, p 44 ML981/65A1
[3] Thompson, *ibid*, , pp 26/7
[4] Thompson, *ibid*, pp 30/31
[5] *NSW Commissioners of Fisheries Report 1880, passim* ML 639N
[6] Borchardt, *Checklist of Royal Commissions, etc.,: Part IV, NSW, 1855-1960*, pp 107/8
[7] Thompson, *op cit*, pp 26/35
[8] Thompson, *ibid*, pp36/38 These implements included a purse-seine net from Maine, USA; a French trammel net; a collection of glass hooks and floats as used by Norwegian fishermen; a herring-net and otter trawl and beam trawl-net of English east coast origin.
[9] Thompson, *op cit*, pp 37/38
[10] NSWLA, *Annual Report - Fisheries of the Colony, 1883*, pp 2/3
[11] *Report of the Royal Commission into Fisheries, 20 November 1894, passim*, ML Q639.2/1A1-2. The Report recommended the immediate passage of a new Bill; systematic exploration of the sea coast by a properly equipped trawling vessel to determine the capabilities of the deepsea fisheries; inquiries into the crayfish and inland water industries; establishment of fish hatcheries; improvement in Fish Market accommodation; reduction in market dues; abolition of middlemen allowing fishermen to vend their own fish; erection of a Central Fish Market near Darling Harbour Railway Terminus, with Urban and Suburban auxiliary markets.
[12] Thompson, *op cit*, pp38/43
[13] NSWLA - *Annual Report - Fisheries of the Colony, 1895*, pp 1/2
[14] NSWLA - *ibid, 1898*, p 7
[15] NSWLA - *ibid*, p 3
[16] NSWLA - *ibid*, p 12

4.0 European Development and Management

4.1 Stage I - New South Wales Fisheries Development of the Hatchery : 1902 - 1938

4.1.1 Development in the period leading to the Fisheries Act, 1902 (Act No.119, 1902)

Predictably it took an event as life-threatening as an outbreak of bubonic plague to achieve new legislation and stricter regulation of the industry. The impact was more dramatic as the plague coincided with the revelation that a large quantity of dead fish and prawns had been found floating on the surface of Johnson's Bay, causing much alarm to the public who believed the mortality was caused by the large amounts of chemicals and disinfectants used to control disease emptying into the rivers and bays surrounding Sydney.

The public's response was to immediately refuse to purchase fish of all types; the Board's response was to close the whole of the waters of Port Jackson to net-fishing and to adopt stringent measures to prevent fish from these waters reaching the markets. A feeling of *deja vu* prevails when one reads the comment of the Annual Report of the Fisheries Department for 1900:

> *'The prejudice of the public extended to the consumption of oysters, although they came from inlets north and south of Port Jackson, and were in a healthy and sound condition.'*[1]

The Bacteriologist of the Linnean Society examined the dead fish and prawns, reporting that there was nothing to account for the disease in either. Samples of water from the localities in which the dead fish were found were examined by the Government Analyst who found that 'although charged with sewage matter, no trace of disinfectants could be detected.' The Board was inclined to accept the findings of the Commissioner of Fisheries in Ottawa, Canada, on water pollution there, that the fatalities were caused by sluggish turbid waters, especially during the summer months.

4.1.2 Fish Hatcheries and Oyster Culture

The NSW Commissioners admitted in the 1900 Annual Report that a number of fish species had been found in diminishing quantities for some years and they believed NSW should follow overseas examples (notably the USA, Norway, Canada, New Foundland and Scotland) by stocking exhausted grounds with fry hatched in sea-fish hatcheries. However they had in fact already initiated the establishment of a marine hatchery for salt-water fish and crustacea, and for the cultivation of oysters, at Cabbage Tree Creek and Basin on the southern shore of Port Hacking (described as Maianbar but apparently

located on the sandy foreshore adjacent to Bonnie Vale Camping Ground between the villages of Maianbar and Bundeena); the completion of the works associated with 'an experimental farm and fish preserve' had been reported in the previous Annual Report, which concluded that 'the hatching and propagation of fish, as carried out in England, Canada and America, will now be only a question of funds'. The Report proposed the construction of fish breeding paddocks and the laying down of oysters on the shallow flats, 'with a view to studying their habits and life history.'[2]

This was however by no means the first attempts at acclimatisation and fish culture in Australia, although initially these attempts were aimed at acclimatising Northern hemisphere inland fish varieties; as early as 1864 brown trout and salmon eggs transported from Europe were hatched out at Plenty Salmon Ponds in the Derwent Valley, Tasmania, following three unsuccessful attempts at transportation between 1841 and 1864. In that year salmon and brown trout eggs at the 'eyed' stage were shipped to the Australian mainland, packed in moss and charcoal in a special container cooled by the water from melting ice blocks. This technique was later used to transport rainbow trout eggs from California to Australia via New Zealand - the original stock from which rainbow trout farmed in southern Australia is derived.[3]

Also in 1864 10,000 salmon and 1,000 brown trout eggs were transported from England to Tasmania. However the 3,000 salmon fry eventually released were lost and only 300 brown trout were hatched. The progeny of the latter, the brood stock at Plenty Hatchery, now stock the rivers and lakes of Tasmania, mainland Australia and New Zealand.[4] In 1888 NSW Fisheries Commission, through the co-operation of the Victorian Government and the Geelong Acclimatisation Society, obtained over a thousand trout fry which were liberated in streams throughout the Colony. However attempts at oyster culture were most unsatisfactory, attributed to the very dry season.[5]

Following the erection in 1894 of hatching troughs specially erected in an old blacksmith's shop below Prospect Reservoir, three rearing ponds were constructed at Prospect and in the following year Prospect Hatchery was erected. This was the first fish hatchery in NSW and for more than 25 years the only trout hatchery in the State. It was a very low profile experiment with no mention of the prospective event in preceding Annual Reports until notice of expenditure in the appendices of the 1895 Annual Report of £250 for the erection of houses for trout hatching.[6]

Considerable success was reported in 1898 with the hatching at Prospect Hatchery of several thousand rainbow (*salmo irideus)*, brown *(salmo fario)* and loch leven *(salmo levenensis)* trout from ova obtained from the Wellington Acclimatisation Society; several thousand fry were liberated in the knowledge that previous liberations were resulting in successful acclimatisation throughout the Colony.[7] By 1899 the Commission was convinced that the rainbow trout *(salmo irideus)* was the most suitable fresh water fish for importation into NSW.[8]

It seems strange that the hatching of coastal fish took so long to be established but apart from the continuing enthusiasm for acclimatising Northern hemisphere varieties, a clue is

Figure 4.1 View of NSW's first fish hatchery at Maianbar, 1901. GPO Server 1.

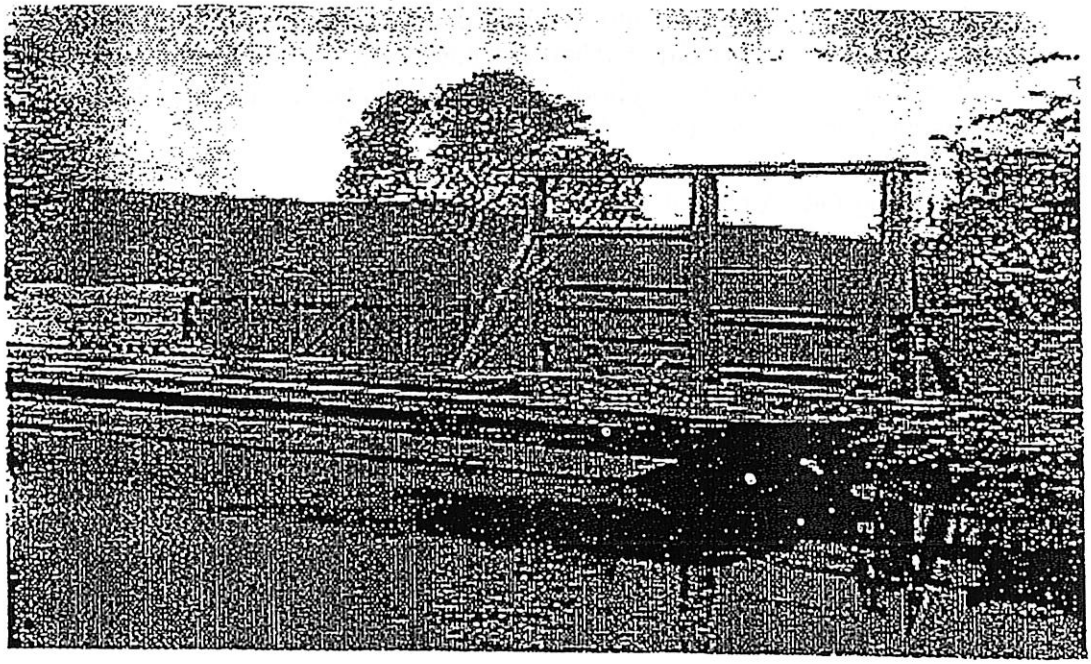


Figure 4.2 Detail of fish hatchery which proceeded Gunnamatta hatchery and received fish stocks brought to NSW by Dannevig in 1902.

found in the Commissioners' comment in the above Report that 'many of the waters in which [rainbow trout] are being liberated are devoid of edible fish life. On the eastern slopes of our northern tablelands the only edible inhabitants of the streams are eels, and on the western slopes there are no fish except where cod have been introduced from the rivers of the plain country.'[9] There may have been problems with the coastal fisheries but the situation had not yet reached the dire state of the inland rivers and lakes.

4.1.3 The Fish Hatcheries at Maianbar and Gunnamatta Bay, Port Hacking

The Maianbar Fish Nursery was modelled on that at Dunbar in Scotland, which had been established in 1893: a hatching house, spawning pond, egg collection chamber, pump and boiler house and tidal pond. A stone dyke was constructed with small-meshed wire-netting gates to admit the tidal waters, with close wire-netting wings 22 feet long and 3 feet 9 inches high which continued to the shore. Two small marine paddocks were erected in the water on the western shore for the placement of fish in order to observe the spawning. The Government provided £500 with which to make a start on the project, which initially was aimed at the study of indigenous varieties. A site for a trout hatchery in the Snowy Mountains was being actively sought, but the cost was found to be temporarily prohibitive.

The Commissioners were also interested in introducing plaice from Europe and Tasmanian crayfish and trumpeter. An experimental shipment of the latter was made but unsuccessfully. Despite the Government's best efforts over nearly forty years

> *'it is beyond doubt that some of the valuable food fishes indigenous to the waters of this State are - in close proximity to the coast about Sydney - becoming more scarce each year, we have determined to introduce some of the best food fishes from the United Kingdom when the hatchery is sufficiently equipped to successfully propagate them.'*

The Board was further convinced, after correspondence with the Gatty Marine Laboratory at St Andrews, that 'a scientific superintendent' and a reliable Fisheries Adviser, obviously trained at that institution, were vital to the success of the acclimatisation programme. The decision to construct a more ambitious sea-fish hatchery at Port Hacking was also made by 1900 when enquiries were made to obtain the services of an overseas expert in fresh water and marine fishes and oysters. This would also allow the possibility of importing European varieties under trained supervision. [10]

To this end the President, Dr James Cox, on a six-month visit to England and Scotland in 1901, visited famous fishing centres in Scotland, and inquired into methods adopted at the Aberdeen Sea-fish Hatchery, with a view to introducing a similar Marine Hatchery at Port Hacking. It had been found to be impossible to secure an expert in both fish and oysters the two studies being considered separate areas, and it was decided that a knowledge of oyster culture would not be regarded as absolutely necessary.

Parliamentary approval for the position having been obtained, the Agent-General for NSW secured the services of Harald C Dannevig (see Section 5.0) who had been

charge of the Aberdeen Marine Fish Hatchery for the previous nine years. David G. Stead (see Section 5.0) was secured as Scientific Assistant to the Department, 'as there is absolutely nothing known of the biological history of our fishes at the present time'. Stead was to investigate the habits and life history of the State's fish, crustacea and oysters, working from the Marine Fishery at Maianbar. Advice on the requirements of sea-fish hatcheries, together with plans and photographs, was furnished by T. Wemyss Fulton, Scientific Superintendent of the Aberdeen Marine Laboratory of the Fishery Board for Scotland, while selection of appropriate sites was left to H C Dannevig upon his arrival.[11]

Dannevig's appointment also allowed the accomplishment of a scheme initiated in 1900 - the importation of Scottish fish under specialist care, ova having been rejected because of the unlikelihood of their survival on a long sea voyage. He was authorised to spend no more than £200 on their capture and transportation; subsequently 722 plaice of one, two and three years' growth and a number of soles, turbot, brill, lobsters and crabs accompanied him to Sydney, only the plaice and soles being considered 'successful' importations. Live fish had previously been transported from England to America and India, but this was the first successful voyage to Australia. Nevertheless 162 plaice and 8 soles were lost on the voyage.

A wire-netting enclosure measuring 90 x 50 x 10 feet deep had been erected to receive the live fish at Turriell Point, on the northern shore of Port Hacking (in the vicinity of Shiprock Aquatic Reserve [Heritage Register No F0006]); however Dannevig preferred the one-third of an acre wire-netting paddock in the more placid waters at the Maianbar Fishery site. A number perished during the transfer to the Fishery early in August 1902, but the staff were optimistic. However, small numbers continued to die over the following three months, despite the seemingly healthy appearance of the survivors. Five days of extreme heat in December took their toll and by the end of that month all the plaice had been destroyed by octopi and starfish or the high temperature. Several soles were seen but Dannevig was loathe to disturb any remaining stocks until it was necessary to remove them to the new concrete pond being constructed at Gunnamatta Bay. Unfortunately Dannevig's report on the condition of any surviving fish stocks, an Appendix to the 1902 Annual Report was omitted 'by the direction of the Printing Committee of the Legislative Assembly.[12]

4.1.4 The Fisheries Act, 1902 (Act No. 119, 1902)

The above Act was assented to on 29th December 1902, bringing to fruition the planning and perseverance of the previous Board over some fifteen years. The Act prescribed a Board consisting of a Chairman (appointed by the Governor for three years) and nine other members, one required to be a licensed fisherman of five years' standing and an oyster lessee of equal experience, one a representative of the Inland Fisheries and six representatives of the Crown. The Board was given extensive powers and responsibilities under the new Chairman, Frank Farnell, to supervise the industry, to carry out investigations likely to be of service, and to ensure observance of regulations regarding dimension of nets, closure of inland and tidal waters, net-fishing, etc.[13]

The Land Agent at .....

TRACING.

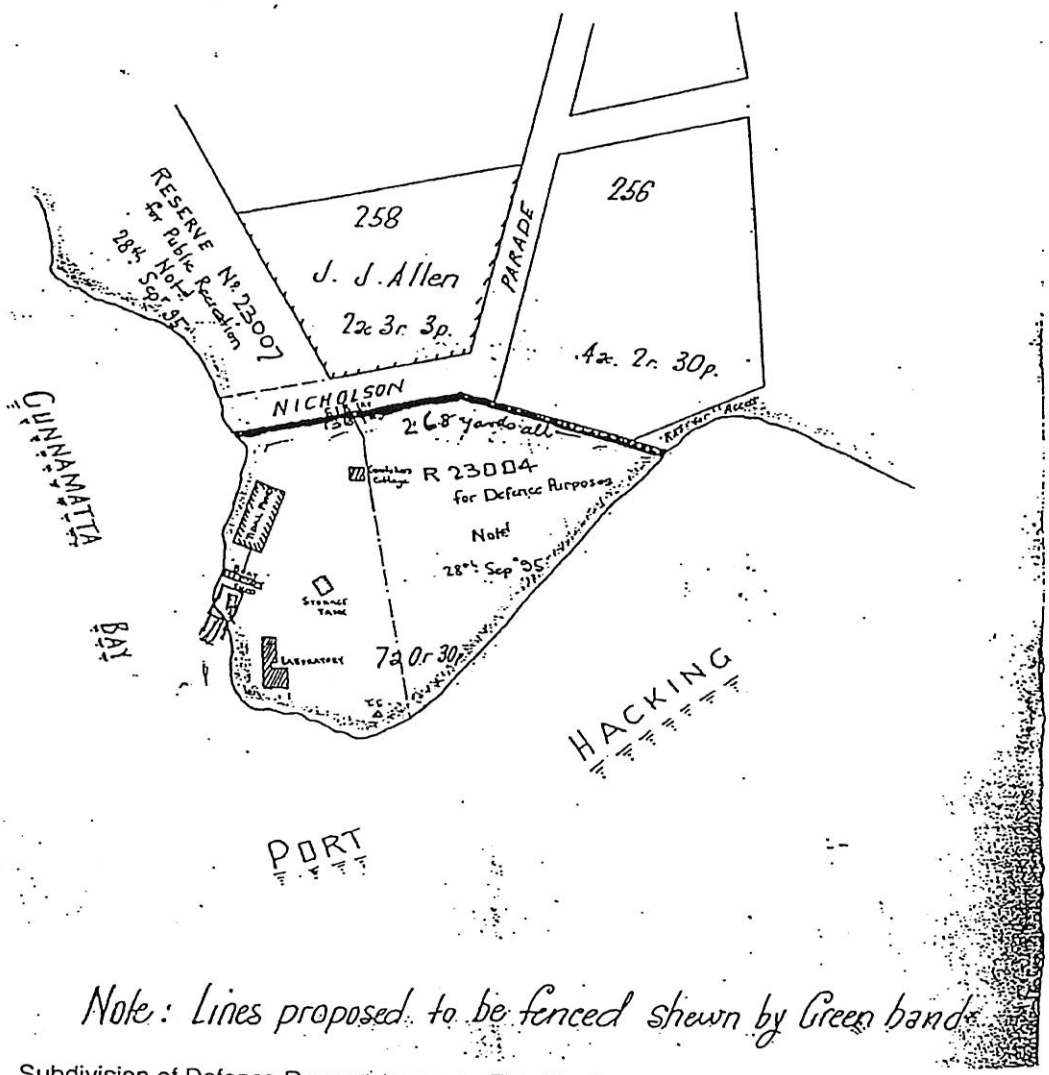
Shewing by Green band proposed lines for fencing to include Hatchery Site

at Port Hacking

Parish of Sutherland

County of Cumberland

Scale 4 Chains to an Inch



Note: Lines proposed to be fenced shewn by Green band.

Figure 4.3 Subdivision of Defence Reserve to create Fish Hatchery on 3 acres, 1 rod and 20 perches.

Clearly, however, despite the Board's insistence that legislative changes were long overdue, many of the initiatives which were to direct the control of the industry and the scope of its activities over coming decades had already commenced before the passage of the new Act. Indeed no steps were taken by Government to constitute a Board under the 1902 Act until two months after it's assent.

4.1.5 The Construction of the Gunnamatta Fish Hatchery - Stage One

Engaged as Superintendent of Fisheries Investigations and Fish Hatcheries from 1st May, 1902, Harald Dannevig left Plymouth on 21st June in the *RMS Oroya*, arriving in Sydney with his live cargo on 2nd August. Three days after his arrival he was directed to investigate the waters between Broken Bay (initially Lake Macquarie) and Port Hacking for a suitable site for 'a marine fish hatchery and fish-pond'.[14] Dannevig completed a thorough Report dated 18th August 1902,[15] for submission to the Board of Commissioners, explained in the 1902 Report as follows:

> *'After consideration of the suitability of different sites as regards the density, purity, and temperature of the salt water procurable for the development of marine fish eggs, and harbour and other required accommodation, it was decided to select a site on the eastern shore of Gunnamatta Bay, near the entrance to Port Hacking.'*[16]

Dannevig's Report recommended the acquisition of the whole of Hungry Point on Gunnamatta Bay, Port Hacking, which had been reserved as Reserve No 23004 for Defence Purposes on 28th September, 1895, simultaneously with the gazettal of the adjoining Reserve No 23007 for Public Recreation, now known as Darook Park (see Figure 4.3). This would allow for the construction of buildings and ensure sufficient privacy for marine activities. He also wanted the sandy beach to the north west of the proposed pond site, then part of the public grounds, to be included.

The Board accepted his recommendations and further agreed that 'he will reside at a suburb near Hurstville, that a conveyance will be provided for him to go out and in to the Hatchery at option and that a telephone be established between [his] residence and the Hatchery establishment'. [17] It was not a simple matter however to arrange the transfer of land. Three State governments departments were involved - Fisheries, Lands, Chief Secretary's as well as two Commonwealth - Defence and External Affairs.

Furthermore the Defence Department was unwilling to revoke the whole of the Reserve and Fisheries could not accept the other option of permission only to erect buildings, as they required exclusive control of any site where the Hatchery and Ponds were to be erected. Finally an area of 3 acres 1 rood 20 perches - roughly half the area originally requested - was placed under the control of the Fisheries Commissioners for pisciculture, leaving the way open to at last begin construction.[18] In the meantime an offer had been received to lease, with the option of purchase, the Bondi Aquarium and grounds for a site for a marine hatchery, 'but for various reasons the offer could not be accepted.'

There remained small complications such as the status of local residents' 'grace and favour' occupation of the site, resulting in the purchase for £7/10/- an iron roofed boat shed, a 240 gallon galvanised iron tank, and a 'trolly and ways', the shed to be used to store cement during the proposed construction.[19]

In 1902 in response to an estimate by the Harbours and Rivers Department of Public Works, £500 was advanced from the Colonial Treasurer's Advance Fund and construction of the fish pond 100' long 45' wide and 10' depth at centre was begun by Harbours and Rivers; however when the work was well advanced it was found that a further sum of £150 would be required to complete it. The funds not being available, work on the project stopped.[20]

With the resolution of the problems associated with the acquisition of land at Hungry Point, plans and specifications were drawn up by April 1903 for the Hatchery complex: a hatchery building, laboratory, reservoir and pumping plant, and caretaker's residence, this construction estimated to cost £1,825. A further £150 was requested to complete the fish pond. The Chairman of the Fisheries Board, Frank Farnell convinced the Colonial Treasurer of the worth of the project - it was estimated that

> *'the hatchery would be capable of propagating 100,000,000 fish every season, which will be distributed along the Coastal Waters and inlets to stock the depleted waters with the more valuable forms of fish'*

and the Treasurer provided £800 from the Advance Fund to begin the process. The balance was placed on the Estimates for 1903-4.[21]

A number of modifications were made to the plans - the box windows on the north and west side of the Hatchery were to be fitted with louvre shutters, a verandah to be erected on the south side of the laboratory building, timber was to be used instead of brick to construct the caretaker's cottage (thus reducing the cost to the sum of £200 or less) and a fireplace was to be provided in the laboratory.[22]

Tenders were called and on February 3, 1904 the Chief Secretary's Office advised that Mr Charles McCarthy of Mosman had been successful with a tender of £1,371 which included the construction of a storage tank. Construction was to be completed in 26 weeks from January 28, 1904.[23] McCarthy also completed the tidal pond, at a cost of £167 (£17 more than budgeted for, a fact which was noted with some disapproval by the Under Secretary to the Chief Secretary), although it is not clear whether this was completed before or after the main complex construction.

A handwritten note to a memo, dated August 23, 1904, confirms that the hatchery buildings and fish pond were completed but it was essential that hatching operations should be commenced without delay and this could only be done by obtaining £500 from the Advance Fund to carry on till the Estimates were passed. This was approved late in October enabling 3" and 4" piping to be fitted to the pump, as well as filtering apparatus and material and hatching and automatic apparatus for the hatchery; covering and filtering material for the tidal pond; and construction of the engine and boatshed and landing.[24]

As a result further work to a total of £318 was undertaken by McCarthy that same month

- the fish pond was covered with a roof 110' x 50' of galvanised wire and lattice on 6"x4" hardwood posts (£140)
- a combined engine shed, store room and boat house, boat slip and platform. Constructed in weather board with iron roof. Engine shed to have concrete floor, store and boat house wooden floors. Size of building 40' x 20' (£153)
- constructing 270 lineal yards of 6 wire anchor fence, including 9' gate (this was to enclose the entire Government area, including the Defence Department's Reserve) (£20)
- cutting a flight of steps in stone (£5) [25]

Following the supply of hatching boxes by McCarthy, the construction of a water wheel and pit and with the completion of the cutting of existing stone ledges and the securing of filtering mats in February 1905, the Hatchery Complex was ready for commissioning. Frederick Aldrich, formerly Inspector of Fisheries at Port Hacking was appointed Keeper at the Gunnamatta Hatchery from 1st July that year at the increased salary of £150 per annum. Already however the Commissioners were reporting the undermining by the public of the stone walls surrounding the area.[26]

The Commissioners were able to report that the Hatchery came into full operation at the beginning of 1906, the initial stock comprising whiting, red bream, flathead, trevally and crayfish. Later a few schnapper and other deep sea fish were introduced. These all flourished in their new surroundings but disappointingly refused to spawn. Dannevig travelled to Hobart to escort 1,200 flounder taken from the Derwent River to Gunnamatta. 1,050 survived the voyage and were liberated in the fish pond.

Eggs from the first collection of roe a few days later were transferred to the hatchery apparatus for development. When a second shipment of 1,100 flounder was received in July 1905, resulting in a total output for the season of over 20,000,000 liberated into Port Hacking, Botany Bay, Middle Harbour and Brisbane Water, expectations were buoyant.[27]

4.1.6 Troubled Waters

Dannevig's reputation grew with the success of the hatchery; he was 'loaned' to the Commonwealth in 1907 to prepare plans for construction of the Fisheries Investigation vessel, to Victoria to advise the Government on a site for a fish culture station and advised local councils on matters of river health and suitability. He travelled the State investigating and advising on inland fish and fisheries. David Stead, the Department's Naturalist, published and lectured widely, enhancing the Department's reputation at home and abroad.[28]

Dannevig's fame was such that in July 1908 he was appointed by the Commonwealth Government as Director of Fisheries for Australia, his main purpose to be the investigation of the deep-sea fisheries off the Australian coast. His departmental car was sold (for £35)

as there was no further use for it, his position as Superintendent of Fisheries Investigations and Fish Hatcheries being left vacant. The Fisheries Board was distracted by such issues as the Fish Markets Inquiry, a proposal to establish a Government aquarium at Manly and the 'unsuitable and inconvenient' accommodation in which they were compelled to hold their meetings.

But with the departure of Dannevig, gloom seems to have settled on the Hatchery. No flounder importations were made in 1908 and the only work carried out was some crayfish hatching. The varieties indigenous to the State's coastline would not spawn in the ponds, except for a few whiting. During the year only one and a half million fry were hatched, a small number of which were preserved as specimens and the remained liberated in Port Hacking. Observation and recording of the species occupied the staff, with visitors to the site becoming increasingly important - over 600 visitors were recorded as visiting the site in 1908. While propagation activities were stagnant, the hatchery was by no means neglected - minor improvements and repairs took place - the roof of the spawning pond at the Hatchery was strengthened by the erection of concrete pillars along the centre of the pond, a new stone path was formed from the hatchery to the boatshed and new skids for the boats were laid down.[29]

The 1909 season was more productive following a further importation of Tasmanian stock, with some 7,000,000 fish and 4,000,000 crayfish being liberated - but still a far cry from the initial projected figure of 100,000,000 (see above). More worrying was the fact that there was no evidence that the large quantities of flounder fry previously liberated were surviving, although the Board pointed out that no systematic search with suitable equipment had been made.

The Board was clearly concerned about the hatchery's viability and recommended to the Government that 'the Establishment be carried on as a Marine Biological Station...giv[ing] special attention to the investigation of the early history of our fishes and crustacea rather than to the hatching solely of sea fishes.' However the Government did 'not consider...[it] opportune to carry out the suggested alterations.'

Gunnamatta Keeper, Frederick Aldrich, increasingly spent his time involved with the development of inland fishery activities, particularly in the Jenolan Caves area. A wire-netting enclosure had been erected at the Maianbar Fishery which continued to operate using methods which allowed the flounder to 'deposit their spawn in a natural way' in Cabbage Tree Basin.[30] Over time Gunnamatta Hatchery began to release its' Tasmanian flounder fry into Cabbage Bay Basin as well as the open waters.

A new initiative was to make facilities at Gunnamatta available to the students of Sydney University to carry out biological work during September and the launch and gear were placed at their disposal. This continued for a number of years with useful research being supervised by Professor Anderson Stuart of the University and his assistant, Mr Kesteven but 'only a limited number [of students] availed themselves of the privilege.'[31]

The Gunnamatta Hatchery was not a happy working environment at this point. David Stead, who had carried out the duties of Naturalist since the Hatchery's inception had anticipated (it is not clear with what encouragement from Dannevig) to succeed the latter as Superintendent of Fisheries Investigations & Fish Hatcheries. He apparently carried out these duties for some time but when the Board were refused to formalise his position he began a deluge of at times acrimonious correspondence with the Board members and others to expedite a decision. He also appears to have felt threatened by Frederick Aldrich, the Keeper of the Hatchery, whom Stead believed undermined his authority at the Hatchery.[32] To be fair the Board had its own preoccupations with new far-reaching legislation regarding fisheries administration being prepared and a cloud hanging over their own personal prospects.

With less than spectacular results being obtained in the fish nursery activities at Gunnamatta, new avenues were obviously indicated, and here Stead was forthcoming. He was clearly the instigator of the unsuccessful suggestion [4.1.37 above] that the site be converted to a Marine Biological Station where the only hatching operations would be simply a means of pursuing marine biology. To this end he submitted a report detailing how alterations could easily be carried out to the main hatchery building to convert it into an aquarium. Stead believed the hatchery operations were superfluous because of 'our great fish-fauna, so rich in both species and individuals.'[33]

Advice from various sources was given to the Chief Secretary as to possible means of improving the viability of Gunnamatta, increasingly centred on attracting the public for educational and recreational visits; this involved extending the number of visiting days and additional assistance to the Keeper was suggested. It is not clear whether this advice was accepted.

Controversy enveloped the hatchery at this vulnerable period : in response to an earlier letter suggesting the Government find more funds for the hatchery, an anonymous letter to the editor of the *Sydney Morning Herald* on January 7, 1910. 'M' was highly critical of the methods used at the hatchery, pointing out that because there was no 'nursery' for the flounder fry, they were liberated at the three day old stage into local waters - a practice, it was claimed, 'on a par with putting three-day-old chickens into a ferret coop'. The practice was obviously unsuccessful, 'M' rightly claimed, as despite the millions of fry liberated no effect could be determined on local fish stocks. And as to the scientific study of local fish located in the unsuitable conditions 'in the dug-out pond', it was ludicrous to believe that a fish would 'exhibit...to the student as he was meant to his natural habits'.

The Chairman of the Fisheries Board, Frank Farnell, was of the opinion that the Board should not respond to anonymous criticism 'unless the gentleman came from behind the hedge' and ordered a report prepared detailing the activities of the hatchery for the Chief Secretary. The Board itself however appears not to have supported him and he prepared a note (it is not clear that this was published or circulated) which stated that he had not been involved with the foundation of the establishment, that he was opposed to its continuance purely as a sea-fish hatchery which he considered to be unnecessary and

that the Board had recommended to the Minister some time ago that the establishment should be converted into a marine station.[34]

4.1.7 Fisheries (Amendment) Act, 1910

There was clearly Government and public dissatisfaction with the management of the Fisheries Board and this event could not have improved its reputation. New legislation amended the 1902 Act by establishing the principle of Ministerial administration and the former Board of Fisheries became the Fisheries Branch of the Chief Secretary's Department.

The amended Act 'contemplated' the appointment of a Chief Inspector of Fisheries and an Advisory Board consisting of no more than five persons to advise the Minister, who was charged with the control and regulation of the sale of fish and oysters, whether produced in the Sate or imported. The Amendment was not implemented until early in 1911, when it was 'not deemed necessary to...appoint...an Advisory Board as experience has shown that such a board is not so far necessary.' The staff moved from Richmond Terrace to the Chief Secretary's Department[35].

The legislation appears to have had little effect on the hatchery operations, which continued to stagnate especially after the Keeper, Frederick Aldrich, resigned to take up the Chief Inspectorship of Fisheries in Western Australia. The long overdue appointment of a permanent replacement for Dannevig (who had resigned in 1908) eventuated in a separation of his former duties; J B Grane was appointed to the practical aspects as Supervising Inspector of Fisheries and D G Stead to the scientific as Superintendent of Fishery Investigation.

Hatchery work continued to be beset by problems; disease began to affect fish held in the spawning pond due to partial stagnation and imperfect oxygenation. In addition the pond was leaking and required re-concreting, which necessitated removal of the fish, so it was decided to let the matter stand over. The work of the hatchery was being further impeded by the influx of visitors, who reportedly interfered with the fish requiring the spawning pond to be enclosed by a wire-netting structure.[36]

During 1911 Stead was given permission to embark upon an experiment in curing and pickling fish caught at Port Hacking, adapting existing facilities at a small cost; the aim was to provide fishermen with expertise in these activities, using indigenous plants ('honeysuckle banksia' and eucalypts) as fuel for smoking. A small smoke-house already existed at the Inspector's house at Port Hacking and was removed to Gunnamatta. One side of the boat-shed was used as a drying room for suspended fish, which were arranged so as not to interfere with boat launching. Splitting was done in the net-room and a small empty area in the NE corner of the hatchery building was used for final arrangement and storage. Large quantities of product were not expected but a number of firms had expressed interest in purchasing them. J J Mair, who had experience in curing fish in Scotland was employed to take charge of this activity.[37]

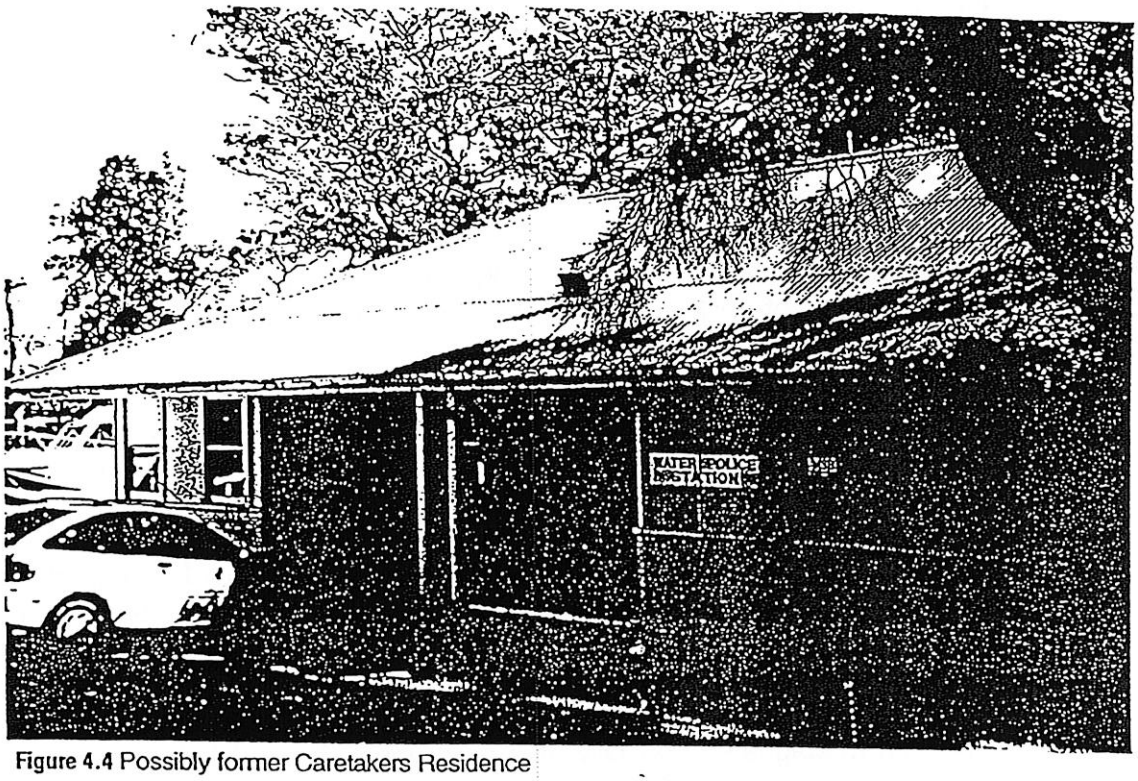


Figure 4.4 Possibly former Caretakers Residence

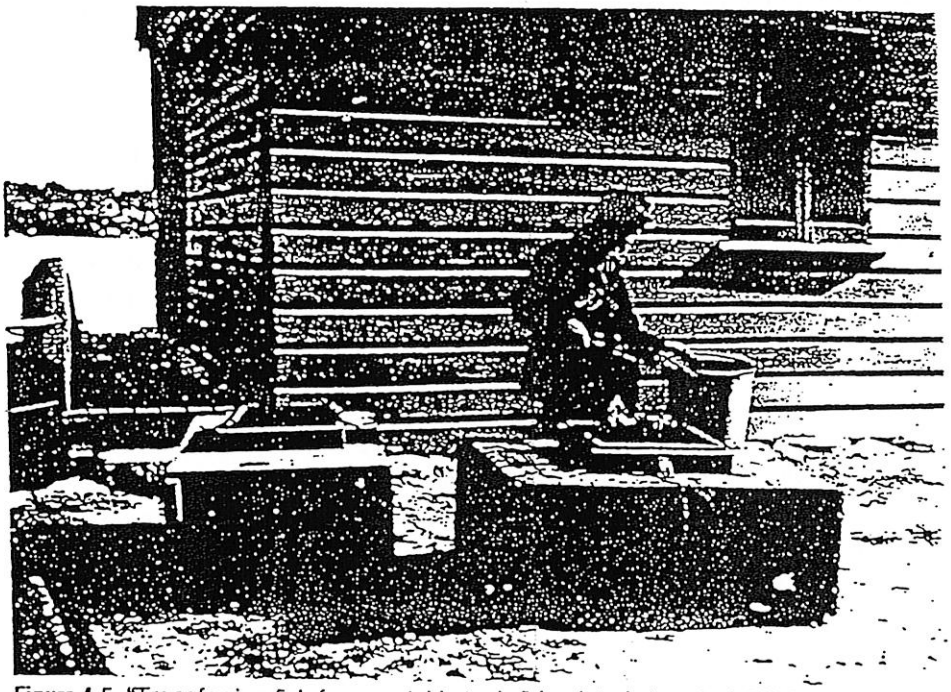


Figure 4.5 "Transferring fish from portable tanks" (undated photo in CSIRO at sea, p12). Note Boat Shed in background.

Within weeks, controversy had erupted in the press; local residents were incensed on a number of points: the downgrading of the scientific activities at the hatchery, the visual impact, not to mention the odour, of fish-curing on the site, the netting of fish in the closed waters of Port Hacking and the 'practical shutting off of the...one of the finest spots on the river...from the public.'[38]

In a letter of explanation to the Under Secretary, Stead expressed the view held by both he and the local Inspector of Fisheries that the criticism was emanating from a very influential movement in Cronulla which sought the practical handing over of the hatchery area to the public for a pleasure resort. Stead had previously complained of the intrusion at all hours of holiday-makers and picnickers, when visitation was again restricted to two afternoons per week and only on the possession of an order from the Chief Secretary. As a result of the public outcry, the curing experiment was discontinued and the assistant Mair, was eventually dispensed with.[39]

Calm descended on Gunnamatta Bay until February 1914 when during unusually muggy and thunderous weather a large number of fish at Gunnamatta died. Water samples revealed very low oxygen levels which, combined with the weather conditions, resulted in vast quantities of micro organisms which killed all the fish except the sea mullet and crayfish.

In response to this event former Chairman of the Board of Fisheries Frank Farnell wrote a long explanatory letter to the press, claiming that the original concept (which, he emphasised, had been worked by political influence and with which he had not been involved) of acclimatising English fish was mistaken. This situation was exacerbated by the Government's refusal to fund the construction of a nursery pond to allow reasonable growth of the fry before liberation. Farnell reiterated strongly that he did not want to see the hatchery closed but wished to see the continuation of hatching suitable fresh-water species and indigenous fish such as Murray cod.[40]

4.1.8 Temporary' Closure

Farnell may not have intended to hasten the Gunnamatta Hatchery by the publication of his letter and the resultant public discussion but that is what was achieved. Finally in July 1914 the decision was taken to close the hatchery 'temporarily' and the remaining sea mullet and crayfish in the spawning pond were netted and liberated into the waters of Port Hacking. A month before, David Stead had travelled to Europe to make enquiries into the fishing industry and to arrange for the initiation of the trawling industry into NSW, which was to provide a new direction for both Stead and the Fisheries Department.[41]

Despite the stated 'temporary' nature of the Gunnamatta closure, it began to appear increasingly permanent. Henry Aldrich, Fisheries Inspector at Port Hacking, was moved, with his family, to the hatchery in 1914, combining the activities of inspector and caretaker. The hatchery still received occasional visitors although no hatching was carried out.

Aldrich and his family remained at Gunnamatta until 1920 when he took charge of the Sydney fish markets.[42]

In the intervening period little mention of Gunnamatta Hatchery is found in official records: a good deal of termite damage to the buildings was reported in 1917, necessitating repairs and renewals and treatment by 'the white-ant expert'. The following year complaints were received from a local resident that fisherman had established a camp at Gunnamatta Point within the Hatchery grounds and spread their nets out to dry on the Departmental boat skids. However the offenders moved on request and those operating at Salmon Haul were given permission to spread their nets on the wall and wharf at the boatshed.[43] After nearly fifteen tempestuous years, the Hatchery 'went with a whimper rather than a bang'. A report on the Port Hacking district in the *Annual Report for Fisheries* for 1917 serves as an depressing obituary:

> *'Tests were made...in the early part of...[1917], with a specially constructed net, to endeavour to ascertain whether the Tasmanian Flounder had become acclimatised in the waters of Port Hacking.*
>
> *'The operations were carried out in Cabbage Tree Basin, Gunnamatta Bay, and various parts of the river. Several species of ground fish were captured, but no Flounder.*
>
> *'About 44,000,000 fry of the Tasmanian Flounder were liberated in Port Hacking and other coastal waters between the years 1906 and 1910, and no evidence has been obtained of their acclimatisation in the waters of this coast. It may be that the fish found the local conditions unfavourable, and returned to the southern waters from which their parents came.'*[44]

4.2. Stage 2 - CSIR and CSIRO, C 1936 - 1984

4.2.1 1936-1939

There is a direct link between the work of Harald Dannevig (as NSW Superintendent of Fisheries Investigations and for the Australian Government on the Fisheries Investigation vessel *Endeavour*) and the establishment of the Council for Scientific and Industrial Research (CSIR). Following Dannevig's work and death, an Advisory Council of Science and Industry was established in 1916 by Prime Minister Billy Hughes, modelled on the Great Britain example. The Advisory Council became the Institute of Science and Industry and in 1926, the Council for Scientific and Industrial Research. The Council's brief included the initiation and conduct of research in connection with or for the promotion of primary and secondary industries, the training of research workers, the making of grants for pure research and the supervision of the testing of scientific apparatus and standardisation.[45]

In 1926 H F Heath's *Recommendations for the Reconstitution of the Commonwealth Institute of Science and Industry* had promoted the establishment of a fisheries section and in July 1927 the National Fisheries Conference had urged the Commonwealth to set up an organisation for fisheries investigations; nothing however had eventuated. By the

mid 1930s there was a growing realisation that the problems which faced the fishing industry and the scientific investigation of indigenous varieties could best by solved by cooperation between the States (especially where they shared waterway boundaries) and a national approach supervised and funded by the Federal Government. Recognition at Federal level was apparent with the Cabinet decision of July 29, 1935 which resulted in CSIR assuming responsibility for the recently initiated fisheries investigations section originally established under the auspices of the Development Branch of the Prime Minister's Department.

Simultaneously the NSW Government determined to reinstitute scientific research in tandem with the enactment of new comprehensive fisheries legislation. It was careful however to avoid duplication of the work of other bodies such as the CSIR, Universities and Museums. G. L. Kestevan was appointed Scientific Investigating Officer to the State Fisheries organisation in March 1937 and an Advisory Council of various organisations with an interest in fisheries was established to advise the Minister. On the interstate front, a conference to discuss the position of inland fisheries was held in Melbourne in October, with particular reference to alleged depletion of supplies.[46]

The CSIR's initial program of fisheries research comprised:

(i) Exploration of fishing grounds by a specially designed vessel
(ii) Experiments in canning...and the manufacture of fish by-products
(iii) Tests for methods of curing and preserving fish, especially the more common varieties
(iv) Marine biological investigations, including research into the life histories, distribution &c. of economically important fish.

The biggest hurdle was seen to be the dearth of appropriately trained and experienced staff to implement the program. After extensive enquiries overseas Dr Harold Thompson was appointed OIC of the Fisheries Investigations Section but not before some administrative complications. Thompson, the British Government Fisheries expert in Newfoundland had accepted the post for five years at a salary of £1,000 per annum and was aghast when he found that the salary offered was in pounds Australian rather than pounds sterling. A compromise of an immediate rise of £250 was negotiated. A local candidate, Captain Flett, was appointed master of the Council's fisheries investigations vessel.[47]

To combat the lack of local expertise two Australian graduates were sent overseas for two years' postgraduate training in scientific fish preservation and marine biology, financed by the Science and Industry Endowment Fund. Over the next three years a marine biologist (Professor W J Dakin), a hydrologist, a bacteriologist (E J Fergusson Wood) and a graduate technical assistant were appointed and aerial reconnaissance was begun by Stanley Fowler in a seagull amphibian off NSW, Victoria and Tasmania.

Plans for a research vessel, the *FVR Warreen* (Aboriginal for 'the sea') were begun at Cockatoo Island Shipyard, the building of which was carried out by the Melbourne Harbour

Trust in 1936/37. The first cruise left Melbourne in May 1938. The Council's mandate to carry out fish preservation investigations was set in motion by the planning of laboratories and experimental cold chambers in Sydney and a skilled fish curer was sought to determine the most suitable fish varieties.[48] An enormous vitality and enthusiasm is evident in official documentation of the period, and coupled with previously undreamt of levels of funding, enormous progress was made in the establishment of national fisheries investigations.

This led to the re-birth and devitalisation of Gunnamatta Bay Hatchery, apparently idle since 1920. Thompson, the newly appointed OIC of Fisheries Investigations, first chose a site for the new laboratory at Portsea in Victoria but soon realised its unsuitability. In August 1937 he recommended the old Port Hacking site, which the Minister subsequently approved; the Minister further suggested that Dannevig's old buildings could still be used, a decision which David Tranter believes resulted in 'the section [being] saddled with those derelicts for the next 40 years'.[49] The site was transferred to the Commonwealth the following year, with provisions made to also house the NSW Fish Biology Branch and occasional use by students of The University of Sydney. The Fisheries Section moved from Melbourne in April 1938 and planning began for additional buildings and renovations at the site; the newly-erected biological laboratory was occupied during the last week of June, 1939. Restoration works cost £167/10/- and the main building £15,000.[50]

The CSIR Annual Report for 1938-39 gives a bird's-eye view of the site at the time of occupancy and an indication of the work being carried on:

> *The [biological laboratory] building contains offices and a strong room, one bacteriological and one chemical laboratory (with common preparation room), five biological laboratories, a dark room, a balance room, a library, a stock room, and a draughting room. Several storage rooms and a workshop are also included in the new works. The pre-existing (hatchery) works have been re-conditioned and adapted. They include a centrifugal pump with pipe-line to a 25,000-gallon concrete sea-water reservoir, from which there is a gravity feed to the former hatchery buildings, which have been converted to contain two biological laboratories, a projector room, and a large main experimental aquarium. The latter is supplied with ordinary sea-water under pressure, and conditioned (heated or chilled) sea-water is also available for experimental work. Extra working space is also available in this room, which is fitted in addition with three thermostatically controlled refrigerating chambers (two maintained at zero and one at 30° F.), and a small canning plant. A small commercial-type smokehouse and a net-storage and fish-processing shed have been built on the foreshore, while a small jetty has been constructed from the end of which certain experimental work can be carried out. The large concrete tidal pond (100 feet x 42 feet) will be re-conditioned during the coming year. For estuarial surveys, a 16-vet. 3½ h.p. skiff has been constructed, and, for field work, a 2-ton Bedford mobile unit has been acquired and fitted with the necessary apparatus.'*[51]

4.2.2.The War Years 1939-1945

The effects of the onset of World War II were slow to impact on the CSIR. Initially Harold Thompson argued against any change in the section's program, but as the reality of the war began to impact on Australia, the Fisheries Investigations Sections prepared to meet the challenge of substantially reduced if not total withdrawn of overseas food supplies. Appropriate changes were made in the direction in their research: food preservation -

canning and smoking - and fish liver oil production gained a higher profile, at the expense of bacteriological research, and the possibility of achieving the production of agar (a sea-weed by-product used commercially and pathologically) was investigated. In an effort to solve problems of winter mortality of oysters and ensure a continuous food supply, the NSW Fisheries Department provided funds for the appointment of an additional officer to the CSIR Fisheries Investigations Section. The *Warreen* was commandeered by the Navy in July 1942; this action, together with the redirection of the section's activities led to a degree of dissatisfaction amongst the staff despite their commitment to the war effort. This was unfortunate as much research of longterm value was achieved, notably in improving standards of canning tuna and other fish (in conjunction with the CSIR's Division of Food Preservation) and experimenting with various net fishing techniques.[52]

4.2.3 Post War Reconstruction and the CSIR

Immediately after peace was declared, the CSIR Executive split the fisheries division into scientific and exploration activities. No sooner was this implemented than the Government adopted an idea floated during the war that, a separate fisheries authority be set up within the Department of Commerce to control and develop fisheries. Over time this authority (later the Fisheries Department of Primary Industry) took over these elements of CSIR's activities leaving the CSIR to continue its scientific research on fisheries as had originally been intended. The *Warreen* returned to service after Naval secondment, joined by a second research vessel, the wooden ketch *Taipan,* allowing the resumption of exploratory cruises.[53]

4.2.4 Post War Expansion

The immediate post war years were times of expansion and growth for the CSIR's Fisheries Section; improvements and additions were made to the laboratory at Cronulla in 1947; branch laboratories in Melbourne, Perth and Hobart came into operation followed by marine stations at Dunwich (completed 1949) and Thursday Island (1948), the latter for pearlshell research. In addition to the laboratory additions, two wooden hostel buildings were constructed (currently the Tuna Building and the Scientific Staff Offices) located north and northwest of the Administration Building. Their initial purpose was reputedly as hostel accommodation for post World War II migrants being trained in fishing techniques but they appear to have been first used for the first technical training school for the fishing industry under the Commonwealth Reconstruction Training Scheme in January 1947. These buildings were later used to house scientific offices and, with the addition of a large radio mast, the radio operations room which maintained contact with research vessels and buoys.[54]

4.2.5 CSIR Becomes CSIRO

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) was established on 19th May 1949 with the proclamation of the Science and Industry Research Act 1949, replacing the former Council for Scientific and Industrial Research

(CSIR). The powers and functions of the new organisation differed little from its predecessor, however there was a major change in administrative responsibility - CSIRO's governing body became an Executive of five persons rather than a large Council, although an Advisory Council remained. The Executive was headed by Dr I Clunies Ross as Chairman, following the retirement of the former CEO of 20 years' service, Dr David Rivett.[55]

Over the next few years the main changes were the transfer of the work on fish preservation to the Division of Food Preservation and Transport in 1951 and the intensification of whaling investigations with a view to the development of an Australian industry in 1952. Experiments were begun at Maianbar, Moreton Island Lagoon (near Dunwich Research Station) and Lake Dobson (Tasmania) for the guidance of future large-scale experiments in estuarine fish farming. With regard to this experiment, a dyke at Maianbar was constructed, with gates to be placed in position after an ecological and hydrological survey of the area in its enclosed state had been completed.[56] It is not clear how long these experiments continued.

Without extensive research in the archives of CSIRO, information regarding Cronulla/Gunnamatta during the following twenty five years is not easily accessible. The Division was renamed Fisheries and Oceanography in January 1956 and remained so under the Division split into two separate divisions in March 1981. From 1945 a large number of state, national and international conferences were held at Cronulla in addition to training schools, meetings and workshops (see Chronology below). A Marine Biochemistry unit was established in April 1971 and an Estuarine Ecology program in Port Hacking began in April 1974. In 1976 the new Fisheries Biology building was completed.

4.2.6 CSIRO moves on

A watershed for the CSIRO, NSW Fisheries and the old Cronulla site occurred in October 1981 with the Parliamentary approval of the construction of new Marine Laboratories for the CSIRO in Hobart. Although the CSIRO Fisheries and Oceanography facilities at Cronulla were transferred back to the NSW Government in March 1984 and the new Hobart laboratories were completed in September of that year, it was not until January 1985 that the CSIRO Cronulla laboratories formally ceased operation. The site was by then already occupied by the Division of Fisheries of the Department of Agriculture for the establishment of a Fisheries Research Institute.[57]

4.3 Stage 3 - NSW Fisheries Research Institute, Cronulla 1984 to Present

4.3.1.Retrospective

Following the closure of the hatchery the Dept of Fisheries became disinterested in research and preoccupied with more pragmatic matters. The hoary question of who

should oversee the city and suburban fish markets and to what standard was eventually resolved cooperatively. Dannevig's and Stead's persistence was rewarded in 1915 with the purchase by the NSW Government of three steam trawlers from England to establish an otter trawl fishery based in Sydney. The NSW State Trawling Industry was establish under Stead's management; this state-owned enterprise was in tandem with others such as State Brickworks, and opened a fish shop in Sydney. Due to mismanagement, Stead was dismissed but by the time the fleet was sold to private enterprise it membered seven. However, state owned enterprises were deemed unsuccessful and the Fisheries Dept. concentrated on regulating the industry and supervising fish marketing.

A number of administrative changes had taken place since the Cronulla site left the management of the Fisheries Department of the Chief Secretary's Department of NSW. In 1935 the Fisheries and Oyster Farms Act had set out the powers and functions of the State Minister in relation to fisheries generally. A related event was the establishment of the NSW Fish Authority in December 1963 (renamed Fish Marketing Authority in 1970) to coordinate fish marketing throughout NSW. The Fisheries Department became NSW State Fisheries in 1975, to be almost immediately re-established as a separate Department under the Minister for Conservation and Director of Fisheries in May 1976, following the election of the Wran Government. Just prior to the re-occupation of the Cronulla site, NSW State Fisheries was abolished as a separate Government Department and became the Division of Fisheries of the Department of Agriculture.

4.3.2 Return to Cronulla

The return of the Cronulla facilities considerably strengthened the Department's fisheries' research capability. The research staff were quickly installed at the newly renamed Fisheries Institute Research, Cronulla (FRI) and facilities were considerably upgraded.[58]

During 1986-87 a review of fisheries research recommended that more senior scientific officers be appointed to the policy and management area to relieve research staff at the Institute of some administrative duties. However only one additional position was created. A review was also conducted of the Department's Aquatic Reserves activities as a result of which this function was transferred from the Institute to the policy section of the Division of Fisheries. Discussions were also held with the National Parks and Wildlife Service and the Department of Lands officers to develop a more coordinated approach to aquatic reserve management.[59]

A major research project conducted by the Institute following the election of the Liberal-National Coalition Government in March 1988 was the assessment of the Water Board Deep Ocean Outfall. This was a new application of the Institute's research skills and facilities initiated because the NSW Water Board proposed discharging treated sewage from Sydney into the ocean through outfalls located three kilometres offshore. Sewage was proposed to be pumped through a series of pipes and tunnels to dissipaters placed ten metres off the ocean floor. The Board commissioned the Institute to carry out pilot studies on the methodology as assessing and monitoring the impact of the outfalls on the habitat and aquatic fauna near the sites. As a result a four-year contract was entered into

between the Division and the Board to carry out offshore research. In addition freshwater research and development projects were carried out cooperatively with officers at Narrandera and Cronulla.[60]

In 1989 independent consultants Peat Marwick Hungerford reviewed the Division of Fisheries and recommended a restructure of the Division. Recommendations affecting the Fisheries Research Institute at Cronulla resulted in the creation of the position of Deputy Director and the deletion of three positions of Senior Biologist. Marine fisheries research, exploration and resource assessment continued to be centred at Cronulla with the support of the Fisheries Research Vessel *Kapala*. As a result of these activities it was possible for the Institute to provide accurate statistics enabling an allowable catch of 3000 tons per licence to be introduced in 1988 - a most practical application of the Institute's work.[61]

The success of the consultant research and assessment for the Water Board prompted the adoption of more entrepreneurial research activities by the Fisheries Research Institute. The Annual Report of NSW Agriculture & Fisheries for 1989-90 detailed commissions from four outside organisations (Fishing Industries Research and Development Council, Department of Defence, State Pollution Control Commission and Water Board) completed by the Institute for a revenue of $2.5 million. This represented over one third of NSW Fisheries total research budget. On a more philosophical level, recognition of the Institute's international reputation in fisheries research was acknowledged with the visit to the Fisheries Research Institute in February 1990 of Captain Jacques Cousteau. Staff engaged Cousteau in discussion of local research programs and an exchange of ideas on global marine issues including man's increasing pressure on the aquatic environment.[62]

These events occurred against a turbulent background of political controversy, administrative confusion and abysmally low staff morale. The Government determined in September 1989 that the Head Office of Fisheries would relocate to Orange, a decision which met determined and vocal opposition from the outset. Despite formidable outlay on the proposed move, the decision was rescinded in June 1991, Fisheries was transferred from Department of Agriculture to the new Ministry of Natural Resources and the Head Office of the new Division, to be known as NSW Fisheries, was eventually established at St Leonards in Sydney.

In the interim NSW Fisheries staff who had vacated the Head Office premises in the McKell Building in July 1991 were accommodated at the FRI at Cronulla, most accommodated in Building 13, with the Director located in Building 1 - until August when these staff moved to St Leonards. Refurbished premises at Cronulla were subsequently occupied by the new Finance and Personnel Branches and in March 1992 the Government announced that the Sydney Fish Markets would be retained and that the Head Office of NSW Fisheries would be located there.[63]

The FRI remains an integral part of NSW Fisheries, structurally, philosophically and physically. Over more than a century of change and development, NSW Fisheries and its forebears, while shedding much of the responsibility for management and regulation of the

industry, retains in its Corporate Goals the ideals which first led to the establishment of a fisheries industry regulatory and investigatory organisation:

1. Maximum Benefits From Use Of The Fisheries Resource
2. Appropriate Sharing Of The Fisheries Resources
3. Enhance Aquaculture Production
4. Community Ownership Of, And Responsibility For, Fisheries Resources
5. The Development And Support Of Our People And Organisation[64]

4.4 Endnotes

[1] NSWLA - *ibid, 1900,* pp 7/8. At the time of writing this Report, there is severe public resistance across Australia to the consumption of oysters and fish generally as a result of contamination of oysters from Wallis Lakes.
[2] NSWLA - *ibid, 1899,* p 6
[3] Peter Pownall, *Fisheries of Australia,* Farnham Surrey, 1979, p 14/15
[4] *ibid.* Pownall records that 'the Plenty Hatchery is no longer used extensively as a trout hatchery, but is being retained as a place of historical interest. Still in existence there is one of the wooden troughs in which were hatched the first brown trout eggs to reach Tasmania [and Australia generally] alive.'
[5] NSWLA - *Annual Report -Fisheries of the Colony, 1888,* pp 1/2
[6] NSWLA - *Annual Report, ibid., 1895,* p 6; *Brief Review of Trout Acclimatisation in NSW* in *ibid, 1938,* p 6
[7] NSWLA - *Annual Report, ibid., 1898,* pp 7/8
[8] NSWLA - *Annual Report, ibid, 1899,* p 9
[9] *ibid*
[10] *ibid, 1900,* pp 4/7, 13, 35/36
[11] *ibid, 1901,* pp 1, 3/4
[12] *ibid, 1902,* pp 2/4
[13] *Guide to Colonial Secretary/Chief Secretary's Papers, State Fisheries Branch, Administrative Summary,* AONSW
[14] *Dept of Fisheries NSW Memo 2226, 5th August 1902, AONSW, Col. Sec Papers, State Fisheries, Misc. Subject Bundles, Gunnamatta Fish Hatchery 1909-10 (4/6635.1)*
[15] *ibid, Department of Fisheries Memo 2387*
[16] *NSWLA - Annual Report, ibid, 1903,* p 9
[17] *Dept of Fisheries No 2387, 2492, Col Sec/Chief Sec, State Fisheries Misc Subject Bundles, Gunnamatta Fish Hatchery 1909-10 (AONSW 4/6635.1)*
[18] *ibid, Minute 636, Memo 3084, 789, 3519, 3112*
[19] *ibid, Fisheries Inletter 3028*
[20] *NSWLA, Fisheries Annual Report, ibid, 1902,* p 5
[21] *Dept of Fisheries, NSW Copy Memo to Principal Under Secretary of Chief Secretary's Dept., 1st April 1903 (AONSW 4/6635.1)*
[22] *ibid, Memo from Chairman of Fisheries Board to Secretary ditto, October 10, 1903*
[23] *ibid, Dept of Fisheries Incoming Letter No 489, February 3, 1904*
[24] *ibid, Memo 4/2574 from Dannevig, September 19, 1904; File note confirming same, October 24, 1904*
[25] *ibid, Letter of Tender from C McCarthy, October 19, 1904; Memo to Fisheries Board from H C Dannevig, Superintendent of Fisheries, October 19, 1904*
[26] NSWLA - *Annual Report, ibid, 1905, pp 12, 20*
[27] *ibid, 1906, pp 9/10*
[28] *ibid, 1907, pp 2, 8, 10*
[29] *ibid, 1908, pp 1, 5, 7, 9, 57*
[30] *ibid, 1909, pp 8/9, 46*
[31] *Report On Gunnamatta Fish Hatchery by the Secretary to the Board of Fisheries, February 11, 1910,* pp 3/4, *AONSW 4/6635.1*

[32] *Memo from Secretary of Fisheries Board to the Under Secretary of the Chief Secretary's Department, December 21, 1910, and other correspondence on the matter at AONSW 4/6635.1*
[33] *Suggestions as to the future use of the hatchery buildings at Gunnamatta Bay, by David G. Stead, May 18, 1909 and subsequent correspondence, AONSW 4/6635.1*
[34] *Sydney Morning Herald, January 7, 1910;* file notes and memos 118/169, AONSW 4/6635.1
[35] NSWLA, *Annual Report, Fisheries, 1910,* p1/2, 7; *1911,* p1
[36] *ibid, 1912,* pp 1,3
[37] *ibid 1912,* p3; *Memo 1581/382, Stead to Under Secretary, May 15,1911; Memo 3315/423, Scheme of Work....by Stead, August 2, 1912, AONSW 4/6635.1*
[38] *Sydney Morning Herald, Letters to the Editor, 'Gunnamatta Hatchery - Fish-Curing Experiments', October 21, 1912; 'Gunnamatta Fish Hatchery', October 22, 1912*
[39] *Memo No 3315/423 re Fish-curing experiments...J a Brodie, October 22, 1912, with attached report by Stead AONSW 4/6635.1*
[40] *Sydney Morning Herald, February 20, 1914, 'The Port Hacking Fish Hatchery'*
[41] NSWLA, *Annual Report, Fisheries, 1914,* pp 2, 4
[42] Vivienne Mawson et al, (eds) *CSIRO at Sea* (Globe Press, Melbourne, 1988, 'A Boy at the Hatchery' by Frank Aldrich, pp 7/11
[43] NSWLA, *Annual Report ibid, 1917,* p 1; *1918,* p 4
[44] *ibid, 1917,* p 2
[45] Commonwealth of Australia, Council for Scientific and Industrial Research, *19th Annual Report, 1944/5,* p 1
[46]NSWLA, *Annual Report, ibid, January 1936 to June 1937,* pp 9/10
[47] Mawson, *op cit,* pp 19/20
[48] *ibid;* Commonwealth of Australia, Tenth Annual Report for the CSIR for 1936, pp 74/75; *ibid,* 1937, pp 62/64; NSWLA, *Annual Report, Fisheries, January 1936-June 1937,* pp 9/10; Mawson, *op cit,* Chronology, pp 211/212
[49] David Tranter, 'Origins of the CSIR Fisheries Division', in Mawson, *op cit,* p 21
[50] *ibid,* p 21; *NSW Fisheries Biennial Report of Fisheries Research 1989-1991,* p 4
[51] Commonwealth of Australia, Annual Report CSIR, *ibid, 1938-39,* p 71
[52] *ibid, 1940-41,* pp 60/61
[53]Trantor, *op cit,* pp 22/26
[54] Mawson, *op cit,* Chronology; CSIRO Research Report 1981-84, p 92
[55] Commonwealth of Australia, CSIRO First Annual Report, 1949, p 1
[56] *ibid, 1951,* p 68; *1952,* pp 71/74
[57] Mawson, *op cit,* Chronology
[58] Report of the Department of Agriculture for...1985, pp 24/25
[59] *ibid,* 1986-87, pp 78-79
[60] *ibid,* 1988, pp 91, 97
[61] *ibid,* 1989, pp 49, 52, 55
[62] *ibid,* 1989-90, pp 67/69
[63] NSW Agriculture & Fisheries Staff Bulletins re Fisheries Restructure, June 17, June 26, 1991; NSW Fisheries Staff Memo re Office of Fisheries, July 24, September 11,1991; NSW Fisheries Annual Report 1991-1992, np
[64] NSW Fisheries Biennial Report of Fisheries Research 1992-1994 p 6

5.0 Personnel Who Influenced the Early Hatchery

5.1 Harald Kristian Dannevig (1871-1914)

Born near Arendal, Norway in 1871, Dannevig was born into a seafaring family. His father was a master mariner who had developed fish hatcheries and was regarded as the leading fisheries expert in Europe. Dannevig spent his childhood helping his father with his fisheries work in the hatcheries, netting and trawling. He studied at the University of Christiania (Oslo) but did not formally qualify.

Selected by the Fishery Board of Scotland in 1894 to supervise the completion of the Dunbar marine fish hatcheries, he later transferred to the Aberdeen marine station where he designed new plant and a tidal spawning pond and spent considerable time at sea trawling. He was appointed Superintendent of Fisheries Investigations and Fish Hatcheries in NSW and arrived in Sydney in August 1902.

He supervised what was claimed to be the most elaborate attempt to transport live fish ever made (mostly plaice) which were placed in landing ponds at Maianbar in Port Hacking. He chose the site of the new hatchery to be constructed at Hungry Point in Gunnamatta Bay and was soon working with Naturalist, D. G. Stead [q v] on both landbased and sea investigations.

His acclimatisation attempts were not successful but his work established recognition of the potential for fisheries research and regulation. He, with his colleague Stead, began the development of more scientific trawling and laid the basis for the ill-fated purchase of state trawlers by the NSW government.

After the breakdown of his relations with the chairman of the Board of Fisheries, Frank Farnell, he left the NSW government to become Commonwealth director of fisheries at a salary of £600 pa (reduced to £520 in 1911 for absence without leave and over-indulgence in alcohol). His main activity was centred on the investigation ship *Endeavour,* in which over the following six years he identified 6000 square miles (16000 square km) of trawlable fishing ground between Port Stephens and the south of Tasmania as well as fishing grounds in the Great Australian Bight. He published widely, convinced that Australia had rich resources which should be developed.

Dannevig was died when the *Endeavour* was lost with all hands after leaving Macquarie Island in December 1914. A shell from the Great Australian Bight and an island in the Glennie Group, off Wilson's Promontory were named after him, as was a large trawler commissioned in 1946 by the CSIR Marine Station at Cronulla.
[Adapted from S Murray-Smith, DANNEVIG, HARALD KRISTIAN in *Australian Dictionary of Biography* Vol.8, pp204/5]

5.2 David George Stead (1877-1957)

David Stead was born in St Leonards, Sydney in 1877 and grew up with a natural love of the sea and bush. He studied zoology at Sydney Technical College and joined the Linnean Society of NSW in 1898. After working as a compositor for some years, Stead was appointed a scientific assistant under Harald Dannevig [q v], but felt his lack of academic qualifications acutely all his life. He published a number of books and scientific articles and lectured widely.

After an unhappy period following Dannevig's move to the Commonwealth, when he anticipated being appointed to Dannevig's position, he was sent overseas in 1914-15 to investigate European and American fisheries for the government. From July 1915 to 1920 he was general manager of the State Trawlers Industrial Undertaking, which he had fostered and which satisfied his socialist leanings but he was dismissed because of public outcry over his controversial and costly management.

He went to Malaya in 1921 as fisheries inquiry commissioner and acting director of supplies to the British government. In 1925-26 he investigated various methods of rabbit eradication. An outspoken man with ideas before his time, he was an executive member of the State branch of the League of Nations Union and the foundation chairman of the International Peace Campaign. He was an effective popular scientific educator and advocate for conservation, not enthusiastically received in the 1920s and 1930s. In 1909 he helped found the Wild Life Preservation Society of Australia and presided over the Aquarium, Naturalists' and Geographical societies of NSW. He was involved with a wide range of naturalist associations and the Town Planning Association.

He was harshly depicted in the autobiographical work *The man who loved children,* written by his daughter Christina Stead, one of Australia's foremost literary icons. His son, David Darwin Stead, a prominent conservationist, was co-proposer of the declaration of a portion of North Sydney Harbour as an aquatic reserve in 1982.
[Adapted from G P Walsh, STEAD, DAVID GEORGE in *Australian Dictionary of Biography,* Vol. 12, pp 57/58]

6.0 Conclusion

Over the 135 years of European occupation and management of the Port Hacking Gunnamatta Bay site covered by this Study, technologies and levels of expertise have advanced to unimagined levels - from wooden exploratory vessels to aerial surveillance, modern craft and high technology monitoring equipment, computerisation, electronics and sophisticated chemistry laboratories. Yet the first Hatchery failed essentially because of insufficient funding to construct a nursery pond to nurture fish from the fry to sustainable size.

Other aspects of Fisheries' activities have a unexpected consistency and longevity. As pointed out, there is an amazing correlation between the aims of the early investigatory bodies and their modern day equivalents. Throughout the period there has been a consistent seeking of better knowledge of indigenous species and the education of the wider fishing community; the attainment of maximum benefit from the resource whilst ensuring its viability; the balancing of the needs and concerns of various sectors in the community - industry, scientific enquiry, public use and public health, environmental issues, economic constraint, political pragmatism.

Clearly the experience at both state and national level has proved that the separation of responsibility for management and regulation of the fishing industry from scientific investigation and development has resulted in the better management of all bodies concerned with fisheries activities, removing much of the tension between them and resulting in higher levels of cooperation between agencies.

Changes in the delegation of state and federal responsibilities - demonstrated at Cronulla by the pendulum swings between state and federal control - have had a dramatic effect on the conduct of fisheries research, the recognition of the need for appropriate state and/or federal management and supervision of aspects of the industry, and on the prospects and development of the industry as a whole. In addition the growing awareness over this century of need to invest more heavily in industry research and development, while never adequate for departmental needs, has nevertheless had an appreciable influence on the range of disciplines and facilities available. With philosophical roots in the 1860s, it is obvious that the work continues to be perceived as not only an appropriate activity of Government, but one which can only be effectively pursued by Government agencies.

Although the environmental movement has had a generally 'green and leafy' public image, it has greatly impacted upon fisheries across a wide range of issues, from endangered species to water quality and sewage outfalls - an interesting development from the early 1900s when the Board of Fisheries was quite complacent about the effect the level of sewerage in Sydney's coastal waters may have had upon the quality of fish supplies.

All these issues and events have impacted upon the old hatchery site at Cronulla to greater and lesser degrees over the period. Despite the occasional response that the old buildings are no longer appropriate for a modern scientific establishment, they serve as a

physical link in our group consciousness between the first stumbling attempts at scientific enquiry and the rescue of an precious endangered resource and the present level of sophisticated research which now takes place within the grounds.

Much has been achieved and much of that achievement has taken place within the confines of the old Gunnamatta Hatchery, the first marine investigation site in Australia.

Chronology of the Development of Fisheries in Australia

1865 NSW Fisheries Act, 1865 passed as a result of a public enquiry held into the loss of fish populations in the Sydney vicinity

1865 Dec: First Melbourne Fish Market opened on site of present Flinders Street Railway Station

1872 Sydney's first Fish Market opened in Forbes Street, Woolloomooloo

1881 NSW Commissioners of Fisheries appointed under Fisheries Act 1881

1902 May: Harald Kristian Dannevig appointed superintendent of NSW Fisheries Investigations

1904 Tender for £1371 for construction of a fish hatchery at Hungry Point, Cronulla accepted; construction begins

1903 Under the Fisheries Act, 1902 the NSW Commissioners of Fisheries were replaced by the Board of Fisheries

1908 July: Dannevig resigns from NSW Fisheries and appointed first Commonwealth Director of Fisheries Investigations

1911 Under the Fisheries Act, 1910 the Board was dissolved and the fisheries of NSW placed under ministerial control as Chief Secretary's Department - Fisheries Branch

1914 July: Cronulla hatchery 'temporarily' closed - fish stocks released

1915 NSW Government bought three steam trawlers from England to establish an otter trawl fishery based in Sydney

1915 A shop owned and run by the NSW State Trawling Industry opened in Sydney to sell fish - first fish shop in Australia to have airconditioning for displaying perishable goods

1917 July: Prof. WA Haswell (Zoology Dept., U/Syd.) proposes establishment of a marine biological station in Sydney

1923 NSW Government sold fleet of trawlers (now 7) to private enterprise. By 1928 increased to 17; 6.6 million kg fish. Because of overfishing, operation moved to area between Cape Everard & Flinders Is. for tiger flathead

1925 Factory ships introduced (initially for whaling)

1926 Jan: H F Heath's Recommendations for the Reconstitution of the Commonwealth Institute of Science and Industry include establishment of a Fisheries Section

1926 CSIR established by Act of Parliament

1927 Conference on Australian fisheries led to establishment of marine biological institution as part of CSIR

1929 July: National fisheries conference urges the Commonwealth government to set up an organisation for fisheries investigations

1933 Oct: Commonwealth Government allocates funds for fisheries investigations by the Development Branch. Four aspects: (I) procure survey vessel; (ii) experiments on fish-canning; (iii) curing and preserving fish; (iv) marketing fish

1935 Aug: Commonwealth fisheries investigations transferred to CSIR; Stanley Fowler seconded to CSIR; Prof. W J Dakin appointed marine biology adviser

1935 Fisheries and Oyster Farms Act, 1935 sets out the powers and functions of the State Minister in relation to fisheries generally

1936 Oct: First CSIR aerial survey of fish stocks made by Stanley Fowler in a seagull amphibian off NSW, Victoria, Tasmania

1937 Mar: Dr Harold Thompson takes up duties as OIC of CSIR Fisheries Investigation Section

1937 Aug: Thompson recommends Port Hacking site for the fisheries laboratory

1938 Mar: PM seeks acquisition of Cronulla from NSW Premier

1938 Apr: CSIR Fisheries Section transferred from Melbourne to the hatchery site in Cronulla - shares site with NSW Fish Biology Branch and research students from University of Sydney

1939 June: New Cronulla biological laboratory occupied

1940 May: CSIR Fisheries Investigation Section renamed Division of Fisheries; Chief : Harold Thompson

1941 Oct: First issue of *Fisheries Newsletter* (now *Australian Fisheries*) published at Cronulla

1943 May: West Australian branch of division established

1943 Autumn School in Oceanography organised

1943 Aug: Thompson appointed Controller of Fisheries during war period

1945 Aug: Third Marine Biology School held at Cronulla laboratories Sydney Fish Market taken over by NSW Government

1946 Oct: Commonwealth Fisheries Office established in Department of Commerce & Agriculture to co-ordinate fishing industry

1947 Jan: First technical training school for the fishing industry under the Commonwealth Reconstruction Training Scheme held in Cronulla; Hostels built to accommodate migrants to be trained in fisheries work

1947 Agreed that Commonwealth should supervise matters re extra- territorial waters; whaling, pearling, research & co-ordination between states. States maintained control of inshore fishing & fish inspection

1947 Proposal for marine stations at Dunwich and Thursday Island

1948 Thursday Island pearl shell research station established

1948 Stanley Fowler retires due to ill health

1949 Mar: Dunwich laboratory occupied

1949 May: CSIR reconstituted as CSIRO

1949 Control of Sydney Fish Market passes to Central Co-operative Trading Co.

1950 Apr: *Australian Journal of Marine and Freshwater Research* begins publication

1950 Apr: Division hosts the Second Indo-Pacific Fisheries Council

1953 Advisory Committee Review of Division of Fisheries

1954 Dec: Harold Thompson retires; Maurice Blackburn appointed Acting Chief

1956 Jan: George Frederick Humphrey appointed Chief

1956 Jan: Division renamed Division of Fisheries and Oceanography

1958 Division hosts Conference on the Oceanography of the Coral and Tasman Seas

1960 Geoffrey L Kesteven appointed Assistant Chief

1960 Division participates in International Indian Ocean Expedition (until 1965)

1961 George Humphrey, Head of Australian Delegation to Intergovernmental Oceanographic Commission (for 12 years)

1961 Jul: Humphrey elected President of Special (later Scientific) Committee on Oceanic Research

1961 Oct: First Fisheries Field Officers' School held at Cronulla

1962 Feb: Camberwell Laboratory (Melbourne) established

1962 Nov: Population Dynamics School held at Cronulla

1963 Tasmanian laboratory closed; Camberwell laboratory opened Dec NSW Fish Authority (renamed Fish Marketing Authority 1970) established to co-ordinate fish marketing throughout NSW

1964 Feb: Division hosts Symposium on the Seasonal Biological Cruises of Australia and France in the Indian Ocean

1964 Nov: Division conducts training course for FAO on mackerel and tuna research at Cronulla

1966 Feb: International Symposium on Hydrodynamics of Plankton Samplers held at Cronulla

1966 May20: Marine Science School conducted at Cronulla

1967 Oct: Division hosts Australian/New Zealand Meeting on Decapod Crustacea

1969 Camberwell laboratory closed

1970 Feb: Kesteven, overseas since 1967, resigns as Asst. Chief to work for FAO NSW Fish Authority renamed Fish Marketing Authority

1971 Apr: George Humphrey retires as Chief

1971 Aug: David J Rochford appointed Acting Chief

1971 Apr: Marine Biochemistry unit established; OIC George Humphrey

1971/72 Deception Bay laboratory completed

1972 Aug: Kenneth Radway Allen appointed Chief

1973 Cabinet approves, in principle, construction of 220 ft ocean-going vessel for fisheries and oceanographic research

1973 Estuarine Group established; First Australian National Prawn Seminar

1974 Apr: Estuarine Ecology program in Port Hacking begins

1975 Jan: The administration of the Fisheries and Oyster Farms Act, 1935 was transferred from the Chief Secretary to the Minister for Lands and Forests

1976 May: NSW State Fisheries established as a separate Department under the Minister for Conservation and Director of Fisheries

1976 Fisheries Biology building at Cronulla completed

1976 CSIRO acquires new laboratory site at Karumba

1976 Dec: Western Australian Laboratory (Marmion) completed

1977 Jan: Physical Oceanography meeting at Cronulla

1977 Aug: K Radway Allen retired; David Rochford appointed Chief

1977 Sep: Northeast Regional Laboratory officially opened

1978 Feb: Workshop on Dynamics of the East Australian Current

1978 Feb: Bioassay Workshop

1978 Oct: Chlorophyll Methodology Workshop

1979 Feb: Acoustics Workshop

1979 Feb: Marine Algae Biology Workshop

1979 Aug: Physical Oceanography meeting in Cronulla

1980 Aug: David Rochford retires as Chief; Brian Stacey appointed Acting Chief

1981 Mar: Division of Fisheries and Oceanography split into two separate divisions

1981 Mar: Angus McEwan appointed Chief, Division of Oceanography

1981 Mar: Physical Oceanography meeting in Cronulla

1981 Aug: Phytoplankton Workshop

1981 Oct: Shirley Jeffrey appointed Acting Chief, Division of Fisheries Research

1981 Oct: Parliamentary approval given for construction of Marine Laboratories in Hobart

1981 Dec: First Fisheries Divisional Seminar at Cronulla

1984 Mar: Second Fisheries Division Seminar at Cronulla

1983 Mar: NSW State Fisheries abolished as a separate Government Department and became the Division of Fisheries of the Department of Agriculture

1984 Mar: CSIRO Fisheries and Oceanography facilities at Cronulla transferred to NSW Government, the site subsequently occupied by the Division of Fisheries of the Department of Agriculture for the establishment of a Fisheries Research Institute

1984 Sept: New laboratories in Hobart completed

1985 Jan: Cronulla laboratories formally cease operation - occupied by Fisheries Research Insititute

1986-7 Review of Department of Fisheries research carried out - more senior scientific staff recommended for Cronulla Review of Department's Aquatic Reserves activities leads to transfer from FRI to Policy Section

1989 Independent review of Division of Fisheries recommends restructure - little effect on Cronulla Sept Decision to relocate Head Office of Fisheries to Orange

1991 June: Decision to relocate rescinded Fisheries transferred from Department of Agriculture to new Ministry of Natural Resources, Head Office established at St Leonards, Sydney July Head Office staff temporarily accommodated at Cronulla

1992 Mar: Announced that Sydney Fish Markets would be retained and Head Office of NSW Fisheries located there

SOURCE: Much of the above information has been extracted from the Chronology contained in Vivienne Mawson et al, CSIRO at Sea

REGISTER

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0001

NAME OF ITEM: Bushrangers Bay Aquatic Reserve

PROPOSED BY: South Coast Conservation Society

LOCATION: Eastern end of Bass Point, south of Shellharbour near Wollongong. 34%36'S, 150%54'E (approx. midpoint)

DECLARED: Govt Gazette of 14 May 1982

SIZE: Approximately 3 hectares

SIGNIFICANT FEATURES:
Littoral zone, submarine cliffs, sublittoral reefs with kelp forest. Diverse fauna including invertebrates and fishes. Nursery for juvenile fishes including expatriate tropical fish. Protected area for novice divers.

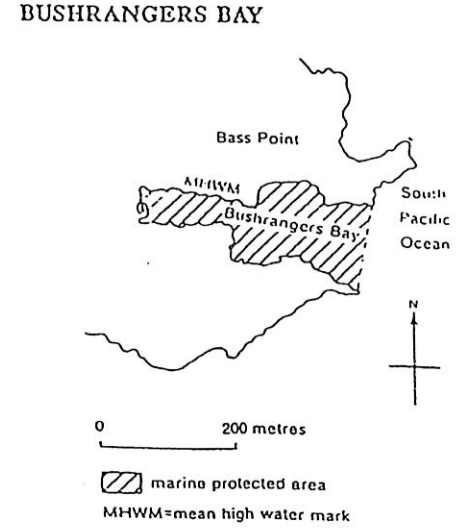
GENERAL CONSERVATION PLAN:
The taking or disturbance of any fish or marine life is prohibited. Non destructive activities, such as diving and photography, are permitted.

Known threatened species:

Eastern Blue Devil Fish
(Paraplesiops bleekeri)
Black Rock Cod
(Epinephelus daemelii)

Known threats to area:

Illegal line fishing and invertebrate collecting



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NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0002

NAME OF ITEM: Fly Point - Halifax Park Aquatic Reserve

LOCATION:	Towards the southern headland of Port Stephens, NSW 32%43'S, 152%09'E (approx. midpoint)	**DECLARED:** Govt Gazette of 28 Jan 1983

SIZE: Approximately 75 hectares

SIGNIFICANT FEATURES:
Natural features include rocky reefs, submarine cliffs and strong currents. Diverse species of invertebrates and fishes can be found, including juvenile expatriate tropical fishes. Popular spot for divers.

GENERAL CONSERVATION PLAN:
The taking or disturbance of any fish or marine life is prohibited, except as specified by Fisheries Regulations in a part of the area. Permitted activities include fishing by hook and line from the two jetties within the reserve and at Little Beach between them.

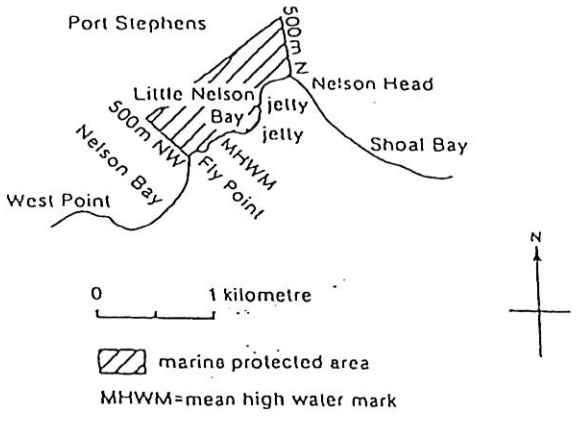
Known threatened species:

None identified, but reserve suppports juveniles of various expatriate tropical fishes.

Known threats to area:

Illegal aquarium fish and invertebrate collecting; spearfishing of resident fish species

FLY POINT—HALIFAX PARK



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NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0003

NAME OF ITEM: Julian Rocks Aquatic Reserve

PROPOSED BY: William Sylvester, Byron Bay

LOCATION:	Offshore from the southern end of Byron Bay, NSW 28%36'S, 153%38'E (approx. midpoint)	**DECLARED:** Govt Gazette of 26 March 1982

SIZE: Approximately 80 hectares

SIGNIFICANT FEATURES:
The habitat consists of rocky reefs and sublittoral coral gardens and an underwater cave. Diverse fish fauna with both tropical and temperate species.

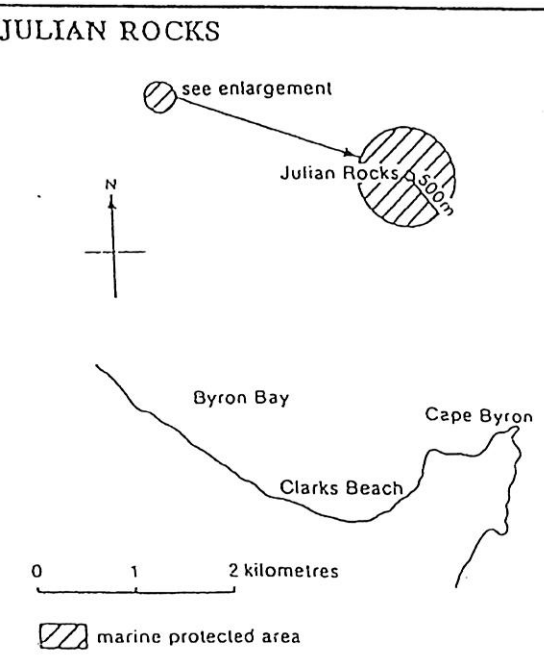
GENERAL CONSERVATION PLAN:
The taking or disturbance of any fish or marine life is prohibited except by methods specified in the Fisheries Regulations. Permitted activities include line fishing and non destructive pursuits.

Known threatened species:

Black coral (Antipatharia),
Grey Nurse Shark
(Carcharias tauras),
Large gropers
(Epinephelus spp.)

Known threats to area:

Spearfishing; collection of coral and aquarium fish.



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NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0004

NAME OF ITEM: Long Reef Aquatic Reserve

PROPOSED BY: Isobel Bennett, University of Sydney

LOCATION:	Adjacent to Long Reef Golf Course, Dee Why, Sydney 33%45'S, 151%19'E (approx. midpoint)	**DECLARED:** Govt Gazette of 30 May 1980

SIZE: Approximately 60 hectares

SIGNIFICANT FEATURES:
Intertidal and subtidal rocky reefs with numerous tropical expatriate invertebrate species. Used extensively by school and university students as a marine ecology field study site. Severe depletion of invertebrate species by food gatherers.

GENERAL CONSERVATION PLAN:
The taking of any marine life is prohibited except by those methods specified in the Fisheries Regulations. Permitted actvities include line and spearfishing, whilst collection of marine life for scientific and educational purposes is allowed under permit.

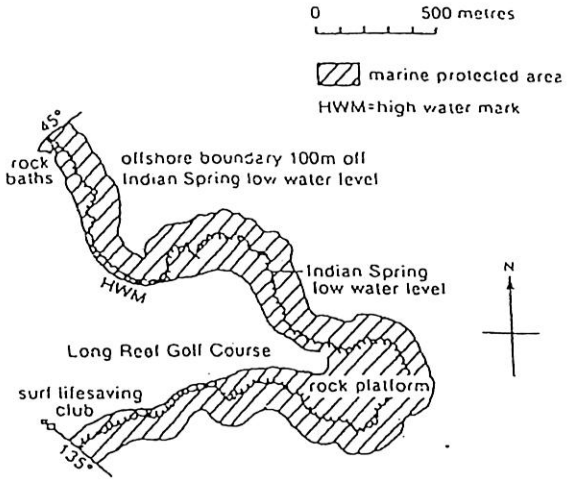
Known threatened species:

None specifically identified, although intertidal invertebrates have been greatly depleted in the past by over harvesting.

Known threats to area:

Collection of invertebrates for food and bait.

LONG REEF



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NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0005

NAME OF ITEM: North Sydney Harbour Aquatic Reserve

PROPOSED BY: David Stead and Alan Stewart, State Member for Manly

LOCATION: Adjacent to northeastern suburbs of Sydney Harbour
33%49'S, 151%17'E
(approx. midpoint)

DECLARED:
Govt Gazette of 26 March 1982

SIZE: Approximately 250 hectares

SIGNIFICANT FEATURES:
Intertidal rocky shores and sublittoral rocky reefs adjacent to the natural foreshores of part of Sydney Harbour National Park

GENERAL CONSERVATION PLAN:
Some restrictions exist on fishing and the taking of marine life although most existing commercial and recreational fishing is still permitted.

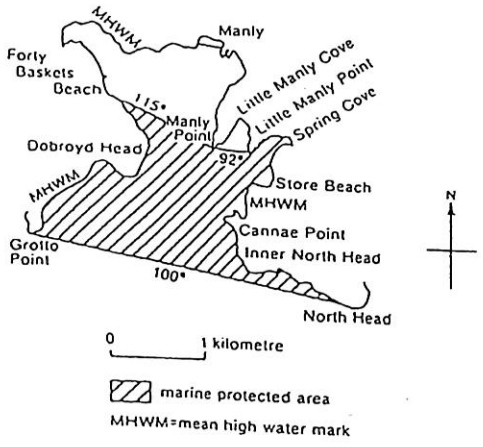
Known threatened species:

None specifically identified, although weedy sea dragons have been reported from this area.

Known threats to area:

Possible threats to water quality from surrounding urbanisation.

NORTH (SYDNEY) HARBOUR



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NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0006

NAME OF ITEM: Shiprock Aquatic Reserve

LOCATION:	Western side of Burraneer Bay off Little Turriel Pt, Pt Hacking, NSW 34%04'S, 151%08'E (approx. midpoint)	**DECLARED:** Govt Gazette of 26 March 1982

SIZE: Approximately 2 hectares

SIGNIFICANT FEATURES:

Submarine cliffs and pinnacles, strong currents. Diverse fish and invertebrate fauna including juvenile expatriate tropical fish.

GENERAL CONSERVATION PLAN:

The taking of all marine life is prohibited. Diving, underwater photography and other non destructive activities are permitted.

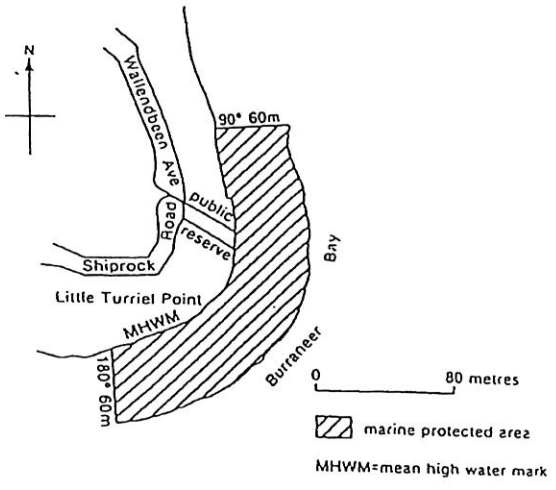
Known threatened Species:

Black rock cod
(Epinephelus daemelii)
Area also supports juveniles of various expatriate tropical fishes.

Known threats to area:

Surrounding residential development and illegal spearfishing and collecting.

SHIPROCK



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NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0007

NAME OF ITEM: Towra Point Aquatic Reserve

PROPOSED BY: Allan Fox, NSW National Parks & Wildlife Service

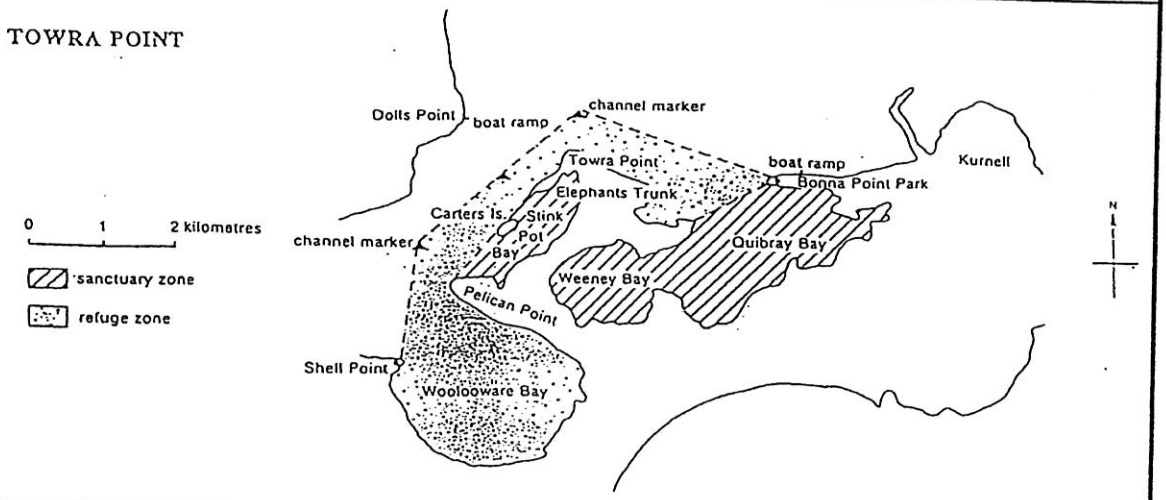
LOCATION:	Southern shores of Botany Bay covering areas known as Quibray Bay, Weeney Bay, Towra Point, Stinkpot Bay and Woolooware Bay	**DECLARED:** Govt Gazette of 18 Sept 1992

SIZE: Approximately 333 hectares

SIGNIFICANT FEATURES:
Large areas of wetlands, seagrass meadows and mangrove forests provide fish nursery and feeding grounds, as well as an important feeding, roosting and nesting areas for water fowl and wading birds.

GENERAL CONSERVATION PLAN:
Split into two zones. The sancuary zone prohibits the removal of or damage to all aquatic life. Sailing is permitted. The refuge zone allows recreational angling, commercial hauling, trapping, hoop nets and sailing, but prohibits commercial fish trawling.

Known threatened species:	**Known threats to area:**
Little tern (bird)	Industrial, port and residential development in the surrounding area, and the concommitant risk of serious water pollution



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NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0008

NAME OF ITEM: Solitary Islands Marine Reserve

PROPOSED BY: Local diving interests including Harvey Lee and John Rotar (of the Solitary Islands Marine Conservation Association) and the University of New England Underwater Club.

LOCATION:	Approximately 600km north of Sydney, between Coffs Harbour and the Sandon River and seawards to a depth of fifty metres.	**DECLARED:** Govt Gazette of 11 May 1991

SIZE: Approximately 100,000 hectares

SIGNIFICANT FEATURES:

Productive estuaries, rock platforms, secluded beaches, spectacular headlands and offshore islands. Warm northern and cool southern currents create conditions for diverse marine life, including corals and dense aggregations of giant anemones and anemone fish.

GENERAL CONSERVATION PLAN:

Split into four zones. Sanctuary zones prohibit the removal of all natural resources. Refuge zones allow very limited taking of some marine life. Recreation zones allow primarily recreational use, and general use zones allow controlled commercial uses.

SOLITARY ISLANDS MARINE RESERVE
ZONING SCHEME

ACTIVITY	GENERAL USE ZONE	RECREATION ZONE	REFUGE ZONE	SANCTUARY ZONE
RECREATIONAL				
· Line fishing	Yes	Yes	Yes	No
· Netting	Yes	Yes	No	No
· Trapping	Yes	Limited (C)	Limited (D)	No
· Spearfishing	Yes	Yes (*)	Limited (E)	No
· Collecting	Yes	Limited (B-C)	No	No
· Diving	Yes	Yes	Yes	Limited (A)
COMMERCIAL				
· Line fishing	Licenced	Licenced	Licenced	No
· Trawling	Licenced	No	No	No
· Trapping	Licenced	Limited (C)	Limited (D)	No
· Netting	Licenced	No	No	No
· Collecting	Limited (B-C)	Limited (B-C)	No	No
· Tourist Activity	Permit	Permit	Permit	Permit
COMPETITIONS				
· Line and spearfishing	Club Permit	Club Permit	Club Permit	No
COLLECTING FOR				
· Aquariums	Permit	Permit	No	No
· Group educational excursions	Permit	Permit	Permit	No
· Scientific Research	Permit	Permit	Permit	Permit

A) No precertified diver training in Sanctuary Zones.
B) For pipis, beach worms, yabbies, cunjevoi, oysters, green sea lettuce, blackfish weed, crabs, sea urchins, prawns and dead objects only.
C) Rock lobsters, crabs and abalone only.
D) Rock lobsters in headland Refuge Zones only.
E) Spanish mackerel, mulloway, cobia, wahoo, rainbow runner, yellowtail kingfish, samson fish, amberjack, chinaman leather jacket, sawtail surgeon, bream, tarwhine, tailor, diamond trevally, golden trevally, luderick, dusky flathead, red morwong, sweetlip.
(*) No spear fishing in Corindi River Recreation Zone.

NOTE:

(i) The use of anchors in Sanctuary zones is prohibited to protect fragile corals.
(ii) These activities must comply with existing Fisheries regulations, e.g. restrictions on collecting and fishing at North Solitary Island; restrictions on trapping at North and South Solitary Islands; restrictions on spearfishing, netting and trapping in estuaries and bag and size limits applying to recreational fishers.
(iii) All zones cover intertidal areas and most extend to 200m or 400m from the low tide line. A booklet detailing all zones of the Reserve is available from:-

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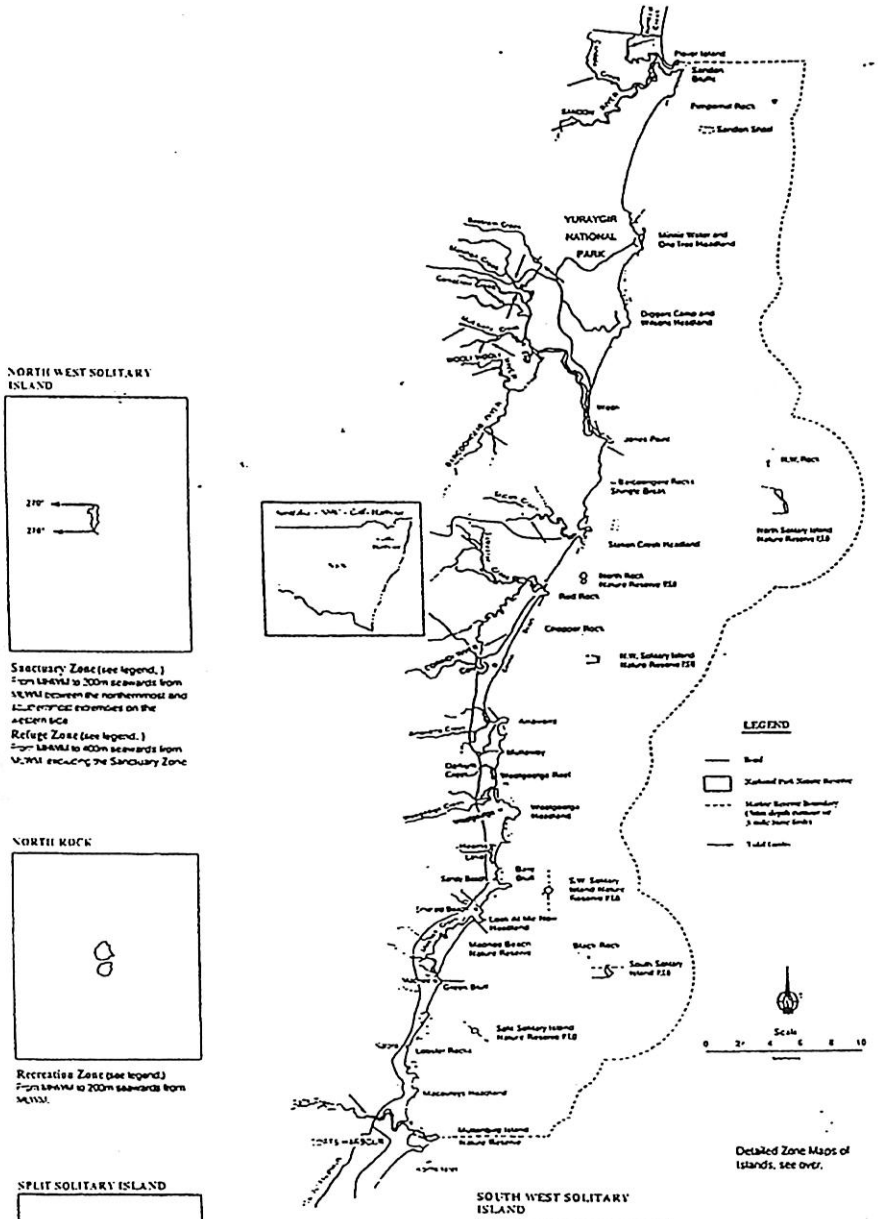
NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

SOLITARY ISLANDS MARINE RESERVE



NORTH WEST SOLITARY ISLAND

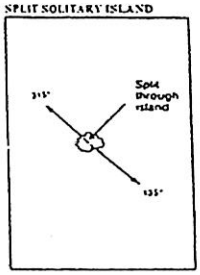
Sanctuary Zone (see legend.)
From MHWM to 200m seawards from MLWM between the northernmost and southernmost extremities on the western side

Refuge Zone (see legend.)
From MHWM to 400m seawards from MLWM excluding the Sanctuary Zone

NORTH ROCK

Recreation Zone (see legend.)
From MHWM to 200m seawards from MLWM.

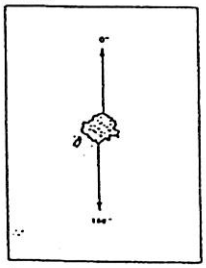
SPLIT SOLITARY ISLAND



Sanctuary Zone (see legend.)
From MHWM to 200m seaward from MLWM, on south western side of "split through island".

Refuge Zone (see legend.)
From MHWM to 400m seawards from MLWM excluding the Sanctuary Zone

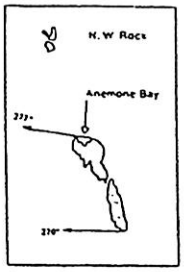
SOUTH WEST SOLITARY ISLAND



Sanctuary Zone (see legend)
From MHWM to 200m seawards from MLWM between the northernmost and southernmost extremities on the western side.

Refuge Zone (see legend)
From MHWM to 400m seawards from MHWM, excluding the Sanctuary Zone.

NORTH SOLITARY ISLAND AND NORTH WEST ROCK

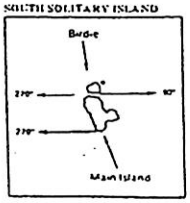


Sanctuary Zone (see legend).
From MHWM to 200m seawards from MLWM between the northernmost and southernmost extremities on the western side of North Solitary Island including "Anemone Bay".
From MHWM to 100m seawards from MLWM of North West Rock.

Refuge Zone (see legend).
From MHWM to 400m seawards from MLWM, excluding Sanctuary Zone, of North Solitary Island. From MHWM to 200m seawards from MLWM, excluding Sanctuary Zone, of North West Rock.

LEGEND
M. H. W. M.- Average high tide line
M. L. W. M.- Average low tide line
Sanctuary Zone
Refuge Zone
Recreation Zone
National Park Nature Reserve

SOUTH SOLITARY ISLAND



Sanctuary Zone (see legend.)
From MHWM to 200m seawards from MLWM on the western side of the main island and from MHWM to 100m seawards from MLWM around "Bird-e".

Refuge Zone (see legend)
From MHWM to 400m seawards from MLWM excluding the Sanctuary Zone

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0009

NAME OF ITEM: Aboriginal middens, three sites

LOCATION: Fisheries Research Centre complex, Hungry Point, Port Hacking
202 Nicholson Parade, Cronulla
Sydney

REGISTERED:
Registered with the National Parks & Wildlife Service, January, 1996

DESCRIPTION OF MIDDEN DEPOSIT 1:

Australian Map Grid Coordinate... AMG 329080E 6228040N

Rockshelter with midden deposits which extend downslope for a distance of at least five metres below the shelter.

DESCRIPTION OF MIDDEN DEPOSIT 2:

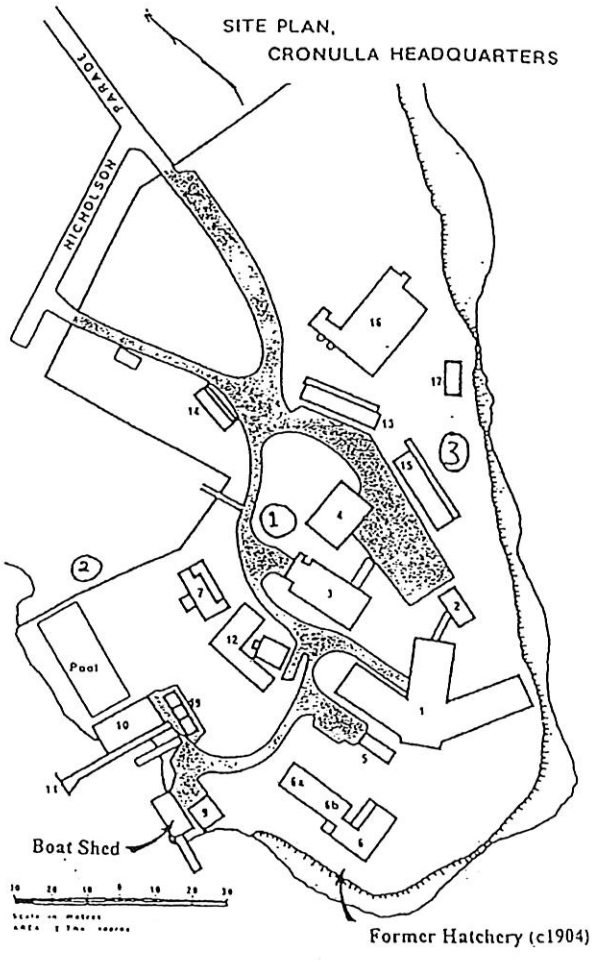
Australian Map Grid Coordinate
AMG 329010E 6228070N

Small area of midden down near holding pens on western side of complex.

DESCRIPTION OF MIDDEN DEPOSIT 3:

Australian Map Grid Coordinate
AMG 329100E 6227950N

Large area of midden along the southeastern edge of the flat area at the top of the complex between building 15 and the fuel store and beyond.



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NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F00010

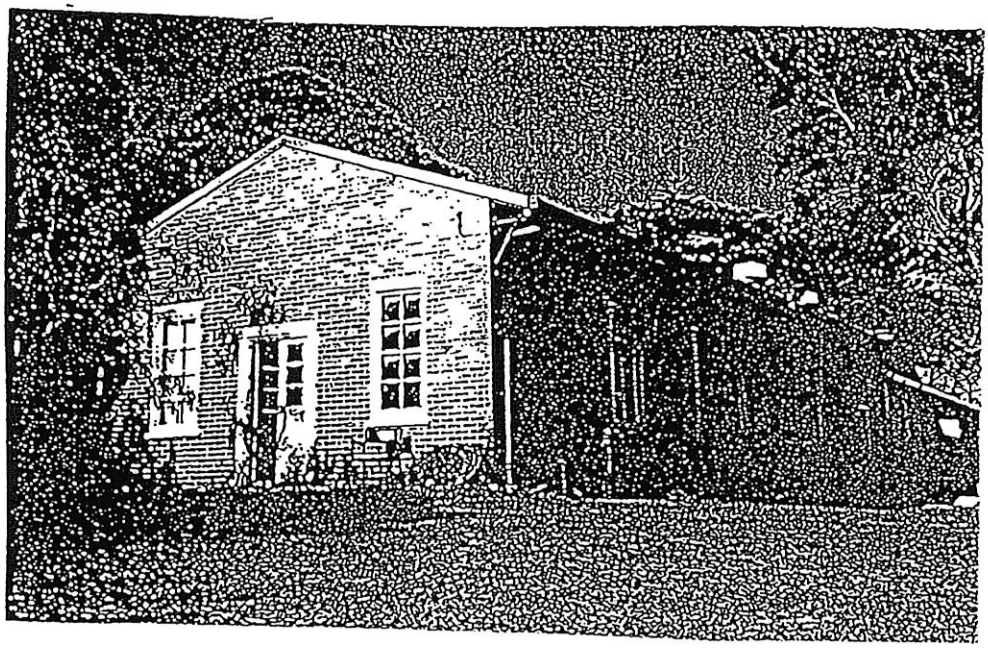
NAME OF ITEM: Building no 6 - former hatchery building

LOCATION:	Fisheries Research Centre complex, Hungry Point, Port Hacking 202 Nicholson Parade, Cronulla Sydney	**SITE CONDITION** Minor alteration

Category: Research building
Boundary: 20 metre curtilage

DESCRIPTION: (Setting/Size/Form/Roof/Walls/Features/Modifications)

An L-shaped face brick building with two wings, located on a flat (benched) area slightly above a boat shed and fish ponds at the western side of Hungry Point. Web-fired single skin brickwork walls with original single back piers and additional recent brick piers and buttresses to southern wing. New colourbond corrugated iron roof. Interior of northern wing adapted for office use; southern verandah of other wing infilled. Original features include door and window joinery.



Roll No:	Neg No:	Surveyor:	Date of Survey:
96-101-1	7	GA	May, 1996

see over

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

PRECINCT Former Hatchery Complex SUBDIVISION

DATE OF CONSTRUCTION c1904 ARCHITECT/DESIGNER Not Known

STYLE Federation BUILDER

PERIOD

1788 - 1840 ☐
1840 - 1890 ☐
1890 - 1915 ☑
1915 - 1940 ☐
1940 - 1960 ☐
1960 - ☐

HERITAGE LISTINGS

- ☑ Register of the National Estate (AHC) - Register
- ☐ Register of the National Estate (AHC) - Interim
- ☐ Regional Environmental Plan Heritage Schedule
- ☑ Local Environmental Plan Heritage Schedule
- ☐ LEP Heritage Schedule - Conservation Area
- ☐ Heritage Council Register - PCO
- ☐ Heritage Council Register - ICO
- ☐ Institute of Engineers (NSW) Heritage Register
- ☐ Heritage Council Register - s. 130 Orders
- ☐ Government Department Heritage Register
- ☐ Register of National Trust of Australia
- ☐ Within National Trust Conservation Area
- ☐ Register of Significant 20th Century Architecture (RAIA)
- ☐ Art Deco Society
- ☐ Other listing/s (please specify)

HISTORICAL NOTES

Fish hatchery established c1904. Building constructed prior to 1914, probably c1904-1907. Originally a laboratory wing (with open verandah on both sides) and a hatchery hall comprising a single open space containing fish tanks. Thought to be vacant c1920-1930. CSIR/CSIRO operations post-1938 in this building. Hall remained open until 1950.

OTHER INFORMATION SOURCES

Written: Report for NSW Fisheries by Godden Mackay, June 1996.

Oral: Former employees Clarrie Brown, R. Spinks, quoted ibid.

Graphic: Photo in F. Aldrich, "Boy at the Hatchery", in V. Mawson, et. al. (eds), CSIRO at Sea, CSIRO, 1988.

SIGNIFICANCE

Theme(s)

State Themes: Fishing, Science

Statement

The former Hatchery Building is part of the first marine fisheries investigation establishment in Australia and is associated with the work of the first Superintendent of NSW Fisheries, Harald Dannevig.

	Representative	Rare
Aesthetic	L	
Historic		S
Scientific		S
Social		L

Level of Significance: S = State R = Regional L = Local

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

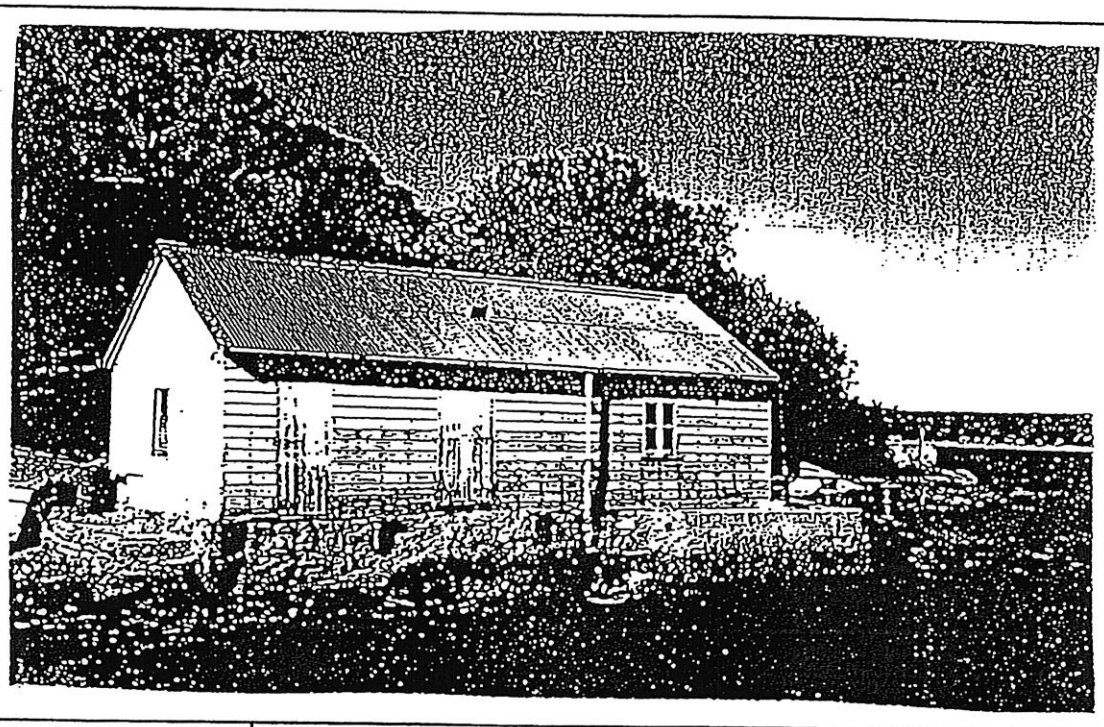
HERITAGE REGISTER NO - F00011

NAME OF ITEM: Building no 9 - boat shed

LOCATION:	Fisheries Research Centre complex, Hungry Point, Port Hacking 202 Nicholson Parade, Cronulla Sydney	**SITE CONDITION** Minor alteration

DESCRIPTION (Setting/Size/Form/Roof/Walls/Features/Modifications)

Weatherboard walls, corrugated asbestos gable roof. Located on eroded sea wall at edge of Port Hacking on western side of Hungry Point. Recent roller door on east side. Doors at west provide evidence of location of former wharf.



Roll No:	Neg No:	Surveyor:	Date of Survey:
96-101-1	17	GA	May, 1996

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

DATE OF CONSTRUCTION | ARCHITECT/DESIGNER | PERIOD

STYLE | BUILDER

PERIOD
- 1788 - 1840 ☐
- 1840 - 1890 ☐
- 1890 - 1915 ☑
- 1915 - 1940 ☐
- 1940 - 1960 ☐
- 1960 - ☐

HERITAGE LISTINGS

- ☐ Register of the National Estate (AHC) - Register
- ☐ Register of the National Estate (AHC) - Interim
- ☐ Regional Environmental Plan Heritage Schedule
- ☑ Local Environmental Plan Heritage Schedule
- ☐ LEP Heritage Schedule - Conservation Area
- ☐ Heritage Council Register - PCO
- ☐ Heritage Council Register - ICO
- ☐ Institute of Engineers (NSW) Heritage Register
- ☐ Heritage Council Register - s. 130 Orders
- ☐ Government Department Heritage Register
- ☐ Register of National Trust of Australia
- ☐ Within National Trust Conservation Area
- ☐ Register of Significant 20th Century Architecture (RAIA)
- ☐ Art Deco Society
- ☐ Other listing/s (please specify)

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HISTORICAL NOTES

Constructed between 1904 and 1914. Re-clad c1970s. Originally had wharf at western side. Engine room at east probably re-clad but original structure. Used to house boats used by fisheries inspectors in Hacking River.

OTHER INFORMATION SOURCES

Written: Report by Godden Mackay, June 1996; V. Mawson, et. al. (eds), CSIRO at Sea, CSIRO, 1988.

Oral: Mr R. Spinks, former employee.

Graphic: Photo. in V. Mawson, et. al., (eds), op. cit., p. 12.

SIGNIFICANCE

Theme(s)	Statement
State: Fishing, Science	The Boat Shed is evidence of the first marine fisheries investigation establishment in Australia and is associated with the work of the first Superintendent of NSW Fisheries, Harald Dannevig.

	Representative	Rare
Aesthetic	L	
Historic		S
Scientific		S
Social		L

Level of Significance: S = State R = Regional L = Local

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

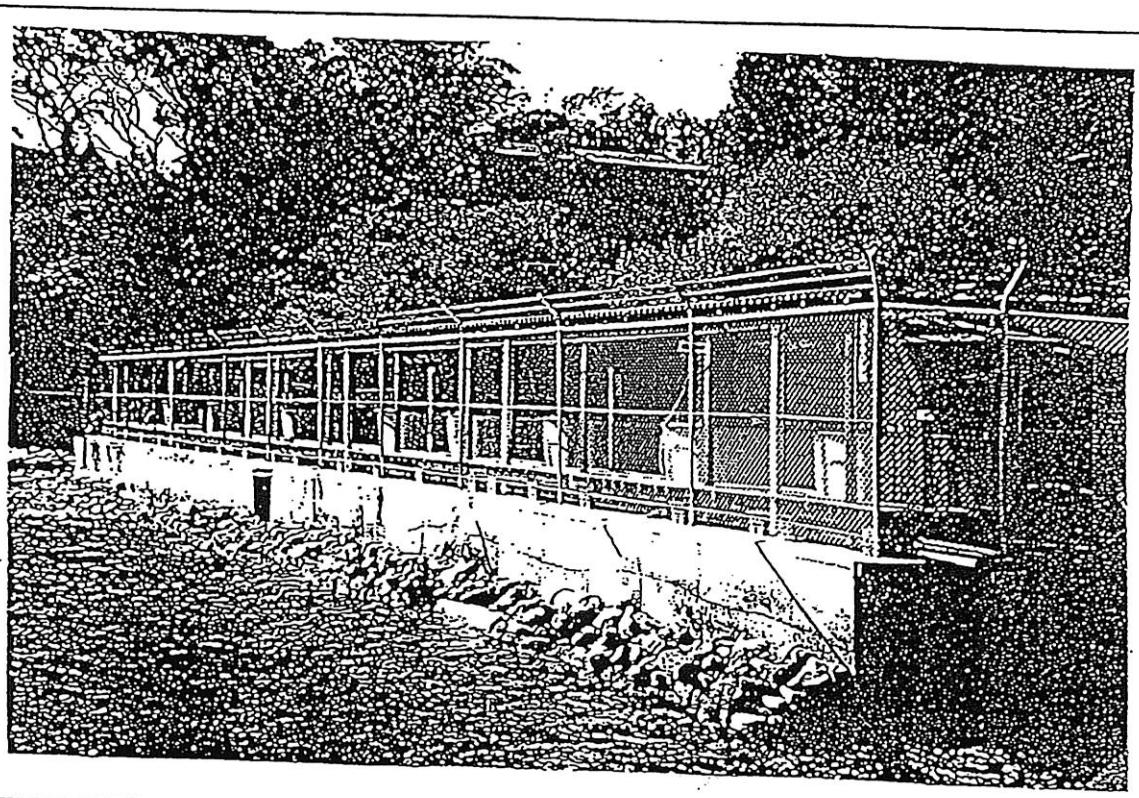
HERITAGE REGISTER NO - F00012

NAME OF ITEM: Fish Pond

LOCATION:	Fisheries Research Centre complex, Hungry Point, Port Hacking 202 Nicholson Parade, Cronulla Sydney	**SITE CONDITION** Minor alteration

DESCRIPTION (Setting/Size/Form/Roof/Walls/Features/Modifications)

Concrete pool measuring 30 x 12 x 2 metres, featuring more recent concrete sea wall, mesh sunshades and filter units.



Roll No:	Neg No:	Surveyor:	Date of Survey:
96-101-1	18	GA	May, 1996

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

DATE OF CONSTRUCTION c1907

ARCHITECT/DESIGNER

STYLE

BUILDER

PERIOD

1788 - 1840 ☐
1840 - 1890 ☐
1890 - 1915 ☑
1915 - 1940 ☐
1940 - 1960 ☐
1960 - ☐

HERITAGE LISTINGS

- ☐ Register of the National Estate (AHC) - Register
- ☐ Register of the National Estate (AHC) - Interim
- ☐ Regional Environmental Plan Heritage Schedule
- ☑ Local Environmental Plan Heritage Schedule
- ☐ LEP Heritage Schedule - Conservation Area
- ☐ Heritage Council Register - PCO
- ☐ Heritage Council Register - ICO
- ☐ Institute of Engineers (NSW) Heritage Register
- ☐ Heritage Council Register - s. 130 Orders
- ☐ Government Department Heritage Register
- ☐ Register of National Trust of Australia
- ☐ Within National Trust Conservation Area
- ☐ Register of Significant 20th Century Architecture (RAIA)
- ☐ Art Deco Society
- ☐ Other listing/s (please specify)

HISTORICAL NOTES

Constructed as part of the hatchery complex between 1904 and 1914. Complex established by Superintendent of Fisheries, Harald Dannevig.

OTHER INFORMATION SOURCES

Written: Report by Godden Mackay, June 1996; V. Mawson, et. al., (eds), CSIRO at Sea, CSIRO, 1988.

Oral: Other information held at Fisheries Library, Cronulla.

Graphic

SIGNIFICANCE

Theme(s)

State: Fishing, Science

Statement

The Fish Pond is part of the first marine fisheries investigation establishment in Australia and is associated with the work of the first Superintendent of NSW Fisheries, Harald Dannevig.

	Representative	Rare
Aesthetic		
Historic		
Scientific		
Social		

Level of Significance: S = State R = Regional L = Local

NSW FISHERIES HERITAGE AND CONSERVATION REGISTER

HERITAGE REGISTER NO - F0013

NAME OF ITEM: Fisheries Research Centre, Cronulla

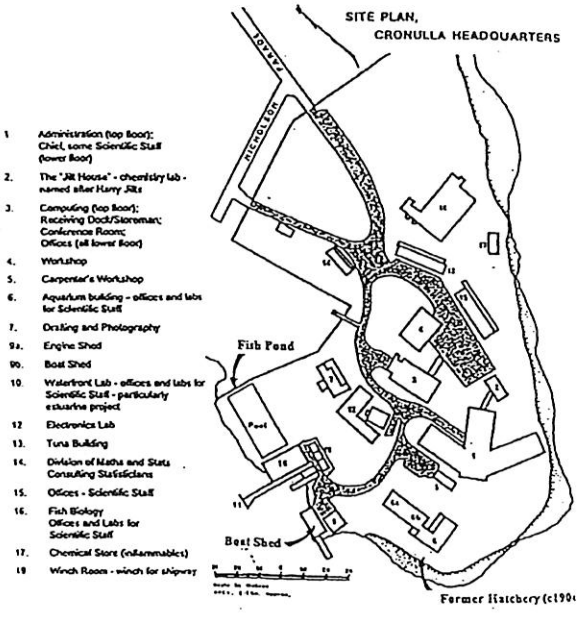
LOCATION:	Hungry Point, Port Hacking 202 Nicholson Parade, Cronulla Sydney	**DATE COMMENCED:** 1904

AREA: Approximately 2.7 ha

SIGNIFICANCE OF SITE:

The Fisheries Research Institute site as a whole is of national and state heritage significance because it is the first marine investigation establishment in Australia, commencing in 1904. It has had continual association with NSW and Commonwealth Government fisheries investigations since then.

The complex is associated with the work of the first Director of New South Wales and Commonwealth fisheries investigations, Harald Dannevig. Three original structures, the former hatchery, boat shed and concrete fish pond still exist on the site and are considered as a group to have State significance.



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MAINTENANCE OF HERITAGE ASSETS

Heritage Assets:

F0001 - F0009: Aquatic/Marine Reserves

Generally aquatic reserves are regulated/managed by the NSW Fisheries Act and Regulations. However, Julian Rocks Aquatic Reserve and Solitary Islands Marine Reserve have separate, complex management plans. Separate management plans for the other aquatic reserves may be implemented in the future.

F0009: Aboriginal Middens

These sites have been registered on the National Parks & Wildlife Service (NPWS) Aboriginal Sites Register and as such are protected under their Act. Accordingly NSW Fisheries will not damage or destroy these sites without prior permission from the Director General of the Service. All care will be taken not to disturb these sites should the department change the current use of the area. Any discovery of bone suspected of being of human origin will be reported to NPWS.

Additionally, any large scale ground disturbance on the Cronulla site will be preceded by a detailed assessment of potential impacts on aboriginal sites as part of a Review of Environmental Factors for the activity.

F0010, F0011 and F0012: Fisheries Research Centre Structures

Future management of these structures will aim to conserve all the original fabrics to maintain evidence and allow for the interpretation of their past uses.

Consideration will be given to removing detracting elements from the exterior of the former hatchery building if structural investigation is permitted and a maintenance schedule, including painting of timber joinery in period colours may be instigated for three original structures.

Proposed Maintenance for each structure:

Former Hatchery Building:

- Retain existing external building form without further addition
- Aim to improve recent external accretions, such as the slab and ancillary storage in the south west corner, to open up the verandah in this area
- Investigate building structure with the aim of eventually removing the lighter coloured brick piers, whilst retaining structural stability
- Investigate possible moisture problems in the walls, with the aim of eventually removing render from the lower part of the eastern wall of the former hatchery hall.

Boat Shed:

- Restore the sea wall below the boat shed
- Investigate the condition of the timer structure
- Paint exterior of building the light stone colour observed on weatherboards, and a darker chocolate brown on the framing/architraves.

Fish Pond:

- Maintain the existing open character of the fish pond and avoid enclosing the structure

F0013: Fisheries Research Centre Site

Retain association of the Cronulla site with fisheries research investigations, and where possible maintaining original structures within the complex with their historical usage.

POSSIBLE FUTURE INCLUSIONS

Public participation has already been invited for the establishment of another three aquatic reserves which could be included in the heritage and conservation register. These proposed aquatic reserves are located at Jervis Bay, Lord Howe Island and Cook Island.

Recommendations have been made for further examination of the Water Police building at the Fisheries Research Centre site, Cronulla to establish whether it is the original caretaker's cottage. If it is proven to be the original structure it will be included in the register.

The research centres at Narrandera, Salamander Bay and Grafton may be future inclusions in the register as important components of the fishery research network in New South Wales. The do not qualify as yet on the basis of age i.e. they are less than 50 years old.