DISCUSSION OF SESSION 5

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The presentation of each paper by individual panellists was followed by brief questions and discussion, which are reported here together with the concluding general discussion which was led by the Session Chairperson.

Following *Martin Mallen-Cooper's* panel presentation on changes in the distribution and abundance of freshwater fish due to changes in habitat, Stan Moberly suggested to the Society that a vision of the future of fish habitats is needed. By using the Society's collective wisdom, it should be possible to predict what the human impact on fish habitats would be in the future. Before such an impact occurs, these predictions should be communicated to the decision makers.

Martin Mallen-Cooper responded that the Society could already list the human impacts that have the greatest impact on freshwater fish habitats and proposed that such a list should be compiled during the workshop. It was suggested that the Society should be more proactive in promoting fish habitat issues and that scientists should communicate their existing knowledge.

Referring to water quality and fish movements, Peter Gehrke stated that a great deal was already known about freshwater fish habitats, and significant advances have been made to add to this knowledge. He proposed that scientists should capitalise on this knowledge to prevent further habitat degradation and to actively promote habitat enhancement. For example, fishways should be constructed to allow fish to move upstream above dams and weirs.

Phil Cadwallader cited the Fish Management Plan of the Murray-Darling Commission as a good example of the direction for freshwater fisheries management which involves fish habitat restoration programmes utilising techniques such as fish ladders. However, he pointed out that an essential element was the associated television advertisements produced by the Commission's educational unit which increased public awareness of freshwater habitat issues.

Given sufficient resources, Martin Mallen-Cooper agreed that even a small group of people could change public opinion at grass roots level and suggested that as an outcome of the workshop, the Society should recognise the importance of public education.

John Koehn opened the discussion on *Greg Jenkin's* presentation by commenting that the 70% loss of seagrass and the subsequent decline in commercial fin fish catches—particularly of King George whiting—in Western Port Bay was a classic case of lack of management foresight and lack of publicity about habitat degradation. The loss of seagrass could have been predicted a long time ago if the effects of draining the swampland around Western Port Bay had been thoroughly considered. The subsequent scouring of river beds in the catchments led to massive amounts of sediments entering Western Port Bay which smothered the seagrass beds and elevated the mud banks. Until a few years ago, neither coastal nor catchment managers had recog-

nised the problem. Urgent management action was required to avert the threat of sedimentation from poor land practices in order to maintain the current quality and quantity of freshwater and estuarine fish habitats. Costly habitat restoration programs were required to retrieve aquatic environments from a history of poor land use practices and to allow the quality and quantity of fish habitats to fully recover.

George Paris reiterated the importance of education and publicity about habitat loss. Referring to the proposed re-location of the Coode Island petro-chemical complex to Point Wilson in Port Phillip Bay, Victoria, he suggested that even poor or misleading information on environmental impacts was better than no information in helping to produce the right social and environmental outcome. The current lack of public advice from marine biologists would achieve nothing at all. He proposed that the Society should follow the example of the Royal Australian Ornithological Union by releasing press statements and providing advice on the impacts on the aquatic environment, fish habitats and fisheries, of threatening human activities such as the development of the proposed new site of the petro-chemical complex in Victoria.

Greg Jenkins, however, stressed the need for scientists to state the facts correctly and criticised some environmental lobby groups that made factually incorrect press statements which misled the public. It would be far better for responsible scientific organisations, such as the Society, to release accurate statements at an early stage. Once the wrong facts have been given to the public, it is very difficult to make corrections in the press. Good scientific advice to the media would be really worthwhile.

Julian Pepperell opened discussion on *Robert Campbell's* account of the effects of trawling on marine communities on the Northwest Shelf of Australia by noting that the change in the quality and quantity of habitat on the Northwest shelf has caused changes in fish species composition. He asked the panelist whether the direct fishing mortality caused by Taiwanese pair trawlers, which involved tens of millions of lutjanids and lethrinids, had made a bigger impact on the fish community than the indirect effect of trawl nets through damage to the seabed.

Robert Campbell replied that a number of models and assumptions had been tested by his co-investigator Keith Sainsbury and that the direct impact of fishing mortality on the composition of the fish community was less than the indirect impact of habitat degradation. The models indicated that the habitat-driven response was the most likely factor to have caused the change in the fish populations. Although the recovery of habitat after trawling had ceased appeared to be quite good, it was a slow process and full recovery of the habitat following heavy trawling may take up to twenty years.

Given the effects of trawling on the habitats and fish communities of the Northwest shelf, Russell Reichelt asked whether a similar effect on habitat and fish communities may have occurred in the South East Trawl Fishery. He observed that a map of all the trawl shots made over the last five years showed that there had been a complete coverage over the shelf in south eastern Australia. He suggested that the fish stocks present today represented a 50-100 year shift in population structures that is now being maintained by the effects of trawling on the fish habitat and the fish stocks.

Robert Campbell commented that there had been very heavy trawling on the Northwest shelf and the data indicated a complete coverage by trawlers during the 1970s. While fisheries management is based on a concept of the original fishery there are rarely any supporting data to indicate the composition of the initial habitat and fish communities.

Murray MacDonald opened the *general discussion* by repeating the objectives of Session 5:

- to identify the categories of human impacts on aquatic habitats;

- to assess the scientific evidence for linkages between human activities, habitats and fisheries resources; and
- to identify strategies for demonstrating to the public and decision makers the link between human impacts and the degradation of aquatic habitats.

He suggested that the Society could take a leading role in identifying the full range of human impacts on aquatic habitats and in assessing the quantity and quality of scientific evidence for the linkages between human disturbances of aquatic habitats and the subsequent effect on fish communities. When these tasks have been completed, the Society and individual scientists could then provide guidelines and recommendations on the management of human impacts on fish habitats to decision makers.

The Society could also package the existing habitat impact information in a form suitable for a broader audience of managers, legislators, politicians and the general public. Convincing the public of the need for fish habitat protection and aquatic conservation and providing scientific information in a suitable form would help to create a climate which would allow politicians to make informed decisions about the alternative management objectives and actions that are available to them. He also suggested that the Society could identify the additional information needed by scientists, managers and the public to show more clearly the effects of various human activities on aquatic habitats and therefore fish populations.

A number of categories of human impacts on aquatic habitats were listed :

Freshwater Habitats

- Habitat loss (dams, flow regulation, channelisation)
- Eutrophication (land practices, fertilisers, sewage)
- Sediment deposition (land practices, forestry)
- Salinisation (land practices)
- Contaminants (organic and inorganic)
- Introduction of non-native species (including translocations)

Estuarine Habitats

- Habitat loss (eg. shoreline development, dredging, drainage schemes)
- Changes in salinity (eg. altered river flows, artificial openings to the sea)
- Eutrophication (fertilisers, sewage)
- Sediment deposition (land use practices)
- Impact of fishing methods
- Contaminants (eg. heavy metals and hydrocarbons)
- Introduction/translocation of exotic species (eg. oriental goby, toxic algae)

Marine Habitats

- Impact of fishing methods on the seabed and benthic community (trawling/dredging)
- Hydrocarbons (oil contamination)
- Waste and debris (eg. ocean dumping)
- Effluent disposal

Global Effects on Fish Habitats

- Climate change / the Greenhouse effect
- Changes in sea level / rainfall
- Ozone depletion

Referring back to the Habitat Conservation Program of the US National Marine Fisheries Service, Murray MacDonald outlined the threats to living marine resources and habitats that had been identified and ranked on a regional and national basis in the USA. Both managers and scientists had developed strategies to address these major habitat threats, had prioritised the implementation of those strategies within the constraints of existing resources, and had also sought additional resources. Key information required to determine each human impact on fish habitats has been identified and research

tasks to address specific information requirements are undertaken in priority order. Information so obtained is used by government agencies to guide and control the human activities which have a major impact on fish habitats. Murray MacDonald suggested that perhaps Government agencies in Australia could adopt a similar approach.

Stan Moberly cautioned that in spite of the progress that had been made there was still a major requirement in the USA for more money to address fish habitat issues. The National Fish and Wildlife Foundation had recently recommended to the US government that in addition to the $8 million in the NMFS's habitat budget, an additional $12 million dollars should be provided to make a total of $20 million. However, the House of Representatives voted not to increase the level of funding to address fish habitat issues, and the Senate voted to increase funding by only $2 million. When the House and the Senate conferred on this matter they finally voted to allocate no extra funds at all. So no matter what strategy is developed, and no matter how much research on the impacts of human activities on fish habitats is done, it achieves nothing until the Government gives the issue a high priority and allocates sufficient funds to tackle the problems of habitat degradation and loss. Increasing numbers of people in the USA are becoming aware of habitat issues, but funds are not being made available to address these issues.

Murray MacDonald asked how the Society could convey the habitat message in Australia in a manner that would convince politicians to give habitat issues a high priority. Mick Olsen wondered whether the Society could support already existing public education programmes like that of the Murray Darling Basin Commission.

Phil Cadwallader agreed that the Murray-Darling Basin Commission had recognised some of the key factors that caused habitat degradation and had developed a management plan to tackle habitat issues. More importantly, the management plan had been "sold" to the public using television advertisements to ensure that there was a high level of understanding and acceptance. Land care programmes such as re-afforestation and re-vegetation have also been well supported due to effective publicity campaigns which have been developed as part of a national resource management strategy. However, he agreed with Stan Moberly that the most important requirement in addressing habitat degradation and loss is money. There is a need to convince the public of the seriousness of these issues, and scientists should adopt more of an educational or extension role, like writing popular articles and using television to get the message across. It is necessary to get away from the ivory tower mentality and from closed academic circles. If scientists leave the job of communicating habitat issues to media journalists or to public relations officers in Government departments, the message will invariably be wrong. The facts really need to be told by scientists. Martin Mallen-Cooper agreed that communication and community education need to be given priority by the Society and that the necessary funds need to be obtained.

Rob Lewis identified the need to communicate clear and simple messages to the public, and cited as an example the successful national publicity campaign to reduce littering. He claimed that people litter far less today because of the successful poster campaign and a short, simple television campaign—not because scientists put forward piles of detailed environmental impact assessments into the public domain. With simple messages, children and adults could be convinced not to cause a littering problem. He suggested that the Society should consider a poster campaign on the fish habitat issue, with short snappy phrases that will influence people over a period of time, rather than offering detailed scientific advice which most people are not going to accept or even understand.

Murray MacDonald agreed that it was vital to pitch the message at the right level depending on the audience. He asked for comments on the

role of scientists in providing simple environmental messages for public awareness campaigns, and on whether scientists actually need to collect detailed scientific information for such purposes. Rob Lewis reiterated that publicity campaigns needed to be consistent, simple and widespread, but stressed that it was vital that scientific research should continue to be conducted to provide an authoritative factual basis for the message to the public.

Margaret Shepherd added that a financial incentive, such as fines or an environmental levy, was a very effective way of rapidly bringing environmental issues to public attention. Using the example of the environmental levy imposed on water rates in NSW, she pointed out that the public was very quick to demand action when rubbish from the deepwater sewage outfalls appeared on Cronulla beach. The public had refused to pay the rates until the beaches were cleaned. She suggested that an environmental levy was a good way to raise public awareness and to obtain funds for research. Rob Lewis agreed that the public will want value for money if Governments decide to apply an environmental levy. However, the community will not demand an environmental levy without a proper marketing program which promotes habitat issues and convinces them of the need for a levy.

Bob O'Boyle returned to the problem of funding habitat research and gave a Canadian example of raising research funds from offshore oil exploration that developed in the 1970s. Initially, the Government of Canada established very strict guidelines in relation to the Environmental Impact Statements (EIS) for offshore oil exploration which involved individual companies funding large scale ichthyoplankton surveys, full scale demersal fish surveys, and oceanography. However all the data that were generated by those surveys were confidential, and all the other oil companies had to repeat the surveys if they wanted to obtain their own information. Consequently, the oil industry established a national fund, known as "The environmental studies revolving fund" (ESRF). All the oil companies put in a small percentage of their profits, thus generating millions of research dollars. A committee consisting of Government and oil industry representatives was set up to administer the tendering for all oil exploration projects requiring Environmental Impact Statements. The ESRF funds were thus used to collect scientific information which could be accessed by the entire oil industry. This approach solved the funding problem as it basically made use of the 'user pays' system - a concept which may be applied to aquaculture and other natural resource-based industries.

Peter Jackson agreed that the Society had to act now and that it could not wait for more research results. The Society could already list the threats to Australian freshwater habitats at least and, more importantly, could identify some of the broad strategies required to deal with those threats. These strategies should be communicated to politicians and managers as quickly as possible. In Queensland the state Government is frequently being asked how to protect freshwater habitat, and scientists should provide up-to-date information in response to such requests. However, it is important to recognise that gaps in our knowledge of human impacts on freshwater fish habitats still exist. Peter Jackson proposed that the Society should identify those gaps and put forward a research strategy to collect the missing information.

Jim Puckridge believed that it is the Society's responsibility to communicate available information on the impacts of human activities on fish habitats. He suggested that at a future Society workshop a session should be devoted to explaining how scientists can more effectively communicate with the media, attract media attention, and provide a coherent and effective message. David Smith identified two types of information that scientists should provide. The first type was detailed scientific advice which identified key issues and options for policy makers and set priorities for research.

The second type of information was the short, simple message to the public through the media or a poster campaign such as "Fishers Involved in Saving Habitat".

Referring to the demand for a ban on commercial scallop dredging in Port Phillip Bay, Peter Young cautioned against providing advice in the absence of supporting scientific information. He stated that, unlike the apparent situation for freshwater habitats, relatively little was known about the impacts of human activities on fish habitats in marine and estuarine environments. Russell Reichelt re-emphasised the need for solid scientific information to back up the simple messages of a publicity campaign. He expressed concerned at the apparent lack of compiled information that showed the total loss or degradation of aquatic habitats on a national or statewide basis due to human activities such as canal estate development, swamp drainage schemes, and pollution of estuaries, mangroves and seagrass beds. This broad scale information was needed to convey the seriousness of the habitat issue to the media and the public.

Julian Pepperell, as President of the Society, considered that it was well within the scope of the Society's charter to put together some good graphic material for the media and general public that showed the loss and degradation of aquatic habitat in Australia. He proposed that scientists in the Society with good computer graphic skills could produce, for example, maps showing the decline in seagrass beds and mangrove stands around the entire Australian coastline. Once the material is compiled, the next problem is to broadcast the message to the general public. However, attracting the media's attention on such issues is difficult. Television is the best way of conveying the message to a wider audience, but this would require Government funds. Another problem is that many individuals do not perceive any obvious personal responsibility for environmental impacts on fish habitats. Projects such as construction of dams, de-forestation, sewage disposal, and land use practices which cause the gradual siltation of seagrass beds, usually represent the combined activities and/or requirements of many people in the private and public sectors of the community, and their environmental impacts cannot be attributed directly to specific individuals.

John Glaister noted that there are quite a few State and Federal government agencies and non-government organisations that are already providing considerable resources for public education on fish habitats. For example, Ocean Watch, the Queensland Commercial Fishermen's Organisation and Queensland Fisheries have all conducted public awareness programs on fish habitat issues. He suggested that the Society should coordinate a national campaign and capitalise on these efforts. He proposed that the Society should establish a Threatened Habitat Group, consisting of key people from State and Federal organisations, to collate information on the status of aquatic habitats. Murray MacDonald added that to carry out these tasks more quickly and efficiently it could be appropriate to combine the resources of the Society with other professional societies like the Australian Marine Sciences Association and the Australian Society for Limnology.

Stan Moberly stressed that the Society should focus on transferring the knowledge that we have already in simple and straightfoward terms. If there are unanswered questions, these should be used to identify and focus research needed. However, this need for further research should not be the main message scientists send to the public. We need to convey to the public what we already know so that this information can be used to help make decisions the community faces now. For example, it is not worth arguing to the public exactly how bad sewage is for fish habitats; the public just needs to know that it *is* bad and does not improve fish habitats. When someone asks "Just how bad is the sewage?" , we should convey the message that "it doesn't taste very good and its not good for fish!". Another example is the reduction of river flows through water abstraction or storage in dams. The public doesn't need to hear our scien-

tific debates over *how much* water flow needs to be maintained, but rather they need to know that if we expect fish to migrate upstream and pass through fishways around dam walls, there has to be *sufficient* water flow to accommodate that movement. Simple messages are required for the public, such as :

> "Dumping dredge spoil over seagrass beds does not improve fish habitats".
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> "Fish need water to migrate upstream".
>
> "If you want seafood to taste good, don't dump sewage in the water".
>
> "If you want to swim on nice beaches don't dump sewage in the water".

These are the kind of messages that raise public awareness and consequently raise the profile of fish habitat, water quality and water quantity issues. It should be a simple process to apply the successful media campaign on littering to a simple message on fish habitat conservation. In the USA the campaign on marine debris swept the nation as a result of an aquatic education programme which pointed out the problem and suggested solutions, but didn't get into a debate about how much marine debris is bad. The same approach could be taken in Australia.

Murray MacDonald concluded the discussion and urged the membership and the executive of the Society to implement the ideas that had been put forward.