

## Appendix 1

### Proposed Research Methodology for Fish and Fisheries Surveys

#### Research Aims:

**Aim 1:** To describe the distribution and abundance of fish species in the Murray Mouth and Coorong areas, with particular emphasis on their relation to changes in salinity levels.

##### (a) Temporal Framework:

Initial general descriptions could be achieved by sampling monthly over a 12 month period. However, quantifying distribution and abundance in relation to changes in salinity caused by barrage openings would require a flexible sampling regime which could accommodate the uncertainty of these openings. Further, sampling may be required to extend well beyond 1 year to encounter freshwater outflows of sufficient magnitude to significantly affect fish patterns.

##### (b) Spatial Framework

Sampling should include all areas from Goolwa Barrage through to the North Coorong lagoon. The extent of sampling necessary in the South Lagoon would be salinity dependent, as the hardyhead *Atherinosoma microstoma* is the only fish which persists in salinities beyond 70<sup>0</sup>/<sub>00</sub> (Geddes 1987). Brief incursions of other species may occur when salinities are below this level and sampling would therefore need to accommodate these changes.

##### (c) Sampling Methods

The fine mesh seine net used in the pilot study proved capable of sampling larvae and juvenile fish from 1.5 - 6 cm length while the larger seine caught fish from 3 - 70 cm. Additional potential sampling methods are described in Eckert and Robinson (1990). A combination of these nets should therefore prove suitable for a comprehensive fish survey. In addition to the fish fauna, the temperature, salinity and turbidity of the water column should be recorded using appropriate equipment.

**Aim 2:** To describe the utilisation of the Murray Mouth and Coorong as a spawning area from the distribution of its ichthyoplankton. Such a survey would have multiple objectives:

- (i) identify which species spawn in the region
- (ii) when spawning takes place
- (iii) where spawning takes place (both geographically and in relation to the temperature / salinity regime)

##### (a) Temporal and Spatial Framework

The general descriptions provided above are suitable for this project. More intensive sampling may be required during known spawning seasons of important species.

## (b) Sampling Methods

The 363 $\mu$  plankton net used in the pilot survey adequately sampled fish larvae and effectively collects fish eggs in the marine environment. If the project is not intended to collect zooplankton as well, 500 $\mu$  mesh could be used to reduce sorting effort. Consideration of oblique tows may be necessary if the water column becomes stratified during periods of low flow and high temperatures, although this would only be possible in deeper sections of the region.

**Aim 3:** To describe the seasonal passage of ichthyofauna through the Murray Mouth.

### (a) Temporal Framework

The temporal framework would again be strongly affected by freshwater flow from the barrages. To assess the impact of freshwater outflow on ichthyofauna movement, a knowledge of movement through the Mouth when no outflow exists is necessary. Sampling therefore should be of sufficient duration to provide data for all 12 months without outflow. Sampling must also include periods of outflow of varying magnitudes. Sampling frequency may also have to encompass various tides. Given the complexity of these various factors, sampling would need to be flexible within the overall design.

### (b) Spatial Framework

Given the objective of this project, sampling would be limited to the Murray Mouth and nearby marine and estuarine environments. Sampling in this area from boats can be hazardous and the closeness of sampling to the Mouth would be limited by conditions at the time. Plankton sampling of the nearshore marine environment would assist assessment of the range of species potentially available to the estuary, but requires large vessel capability.

### (c) Sampling Methods

The plankton net described above would be suitable for the project. Oblique tows, in addition to surface tows, may be useful for the marine sampling.

For sampling the larger fauna moving through the Mouth, a seine net may be used in areas adjacent to the Mouth but would not be suitable for the Mouth itself. It is possible a modified fyke net could be used in this area, but would be limited to periods of low tidal and/or freshwater flow.

## Appendix 2

### *Proposed Research Methodology for Recreational Usage and Tourism*

#### **Research Approach:**

The most cost-effective method of estimating and quantifying recreational usage and the recreational fishery, in addition to obtaining more detailed tourism data, is to combine both into a single survey design. An appropriately stratified roving survey design would estimate fishing effort, catch rates and harvest for the recreational fishery (boat and shore based) while also providing quantitative estimates of other recreational uses of the area. The interview framework could be designed to incorporate any relevant questions for analysis of general recreation and tourism.

#### **(a) Spatial and Temporal Framework**

The study should primarily focus on the area between Goolwa Barrage and Pelican Point. Consideration could also be given to extending it to the ocean beaches adjacent to the study area. Although an initial one year study would provide useful estimates, ongoing monitoring is necessary to determine trends over time.

#### **(b) Sampling Methods**

To quantify boat and shore based fishing and other recreational activities would require a boat based roving survey. The study area is stratified (seasonally and spatially) and counts of target groups are made at predetermined times during the day within the different spatial strata. In between counts, interviews are conducted with participants of the different recreational activities.