

# Cuttlefish Update

## Issue 3 – February 2014

As we move into 2014 and start preparing for the forthcoming Giant Australian Cuttlefish breeding season, the Cuttlefish Working Group has been overseeing a suite of research projects that commenced during the 2013 breeding season.

The various projects made possible with combined State and Federal funding of \$715,000 – are being undertaken by SARDI Aquatic Sciences, the University of Adelaide, South Australian Museum and the Environment Protection Authority.

These short and long term research projects were identified by the Giant Cuttlefish Working Group to help address gaps in the knowledge of the population and the issues facing Cuttlefish populations in northern Spencer Gulf. This commitment by all levels of government to address the decline in population abundance in the region will provide valuable insight to assist in determining the future management actions required for this iconic species.

*Scott Ashby  
Cuttlefish Working Group Chair  
Chief Executive, Primary Industries and Regions South Australia*

## Management

The temporary closure to all fishing for Cuttlefish in northern Spencer Gulf has been extended until 14 February 2015, as a continuation of this precautionary management measure. The closure includes all waters north of a line commencing near Arno Bay on Eyre Peninsula to Wallaroo on the Yorke Peninsula.

This closure is in addition to the longstanding cephalopod fishing closure in the waters of False Bay (squid, cuttlefish and octopus), which was translated from an annually renewable temporary arrangement, to a permanent regulation in September 2013.

For further information on the closures visit  
[http://www.pir.sa.gov.au/fisheries/closures/closed\\_areas/cuttlefish\\_closure/map\\_of\\_cuttlefish\\_closure\\_area](http://www.pir.sa.gov.au/fisheries/closures/closed_areas/cuttlefish_closure/map_of_cuttlefish_closure_area)

## Research

Currently there are seven Giant Australian Cuttlefish related projects in progress. The objectives of each of these projects are:

1. To quantify the relative abundance and biomass of South Australia's Giant Australian Cuttlefish breeding population at Point Lowly and to provide an assessment of the spawning ground's habitat condition and water quality.
2. To search for alternate spawning areas throughout northern Spencer Gulf.

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3. To characterise the natural spawning substrate with the intention of using this information to design and develop artificial habitat that may promote spawning in areas where habitat is limited.
4. To assess whether there are abnormally high levels of metals accumulating in Giant Australian Cuttlefish in northern Spencer Gulf.
5. To quantify cuttlefish by-catch in the commercial fishing sector.
6. To determine the movement and fine scale population structure on Giant Australian Cuttlefish in northern Spencer Gulf.
7. To investigate the potential impacts of shipping on Giant Australian Cuttlefish.

The final report describing the findings from projects 1-5 is due to be released in November 2014. Results from project 6 will be finalised by early 2015 and project 7 by April 2014.

## RESEARCH PROGRESS

### 1. Cuttlefish Survey (2013)

- Diver-based surveys were successfully undertaken in May, June and July 2013.
- Cuttlefish abundance peaked at an estimated 13,492 animals in June 2013. This represented a 27% decrease in comparison to 2012 (18,531). The 2013 survey results show a reduction in the rate of decline compared to previous years with an estimated 52% between 2012 and 2011 and 64% between 2010 and 2011.
- The habitat was assessed and water samples were collected throughout the spawning area over the three surveys for analysis.
- The 2014 survey is now being planned and scheduled to commence in late May.

### 2. Search for Alternate Spawning Areas

The continuous rocky reef that fringes Point Lowly is currently considered to be the only area capable of supporting high densities of spawning cuttlefish in northern Spencer Gulf. The possibilities of the cuttlefish aggregating to spawn elsewhere, or widely distributing their spawning activity within Spencer Gulf, however needs to be considered as an alternate hypothesis in explaining the decline of the Point Lowly area. Thirty-seven sites, that were considered to have appropriate spawning habitat (i.e. low profile reef), were surveyed using a towed underwater camera in June 2013.

This culminated in approximately 8 hours of video footage which is being reviewed and analysed for evidence of cuttlefish and to provide an assessment of the 'potential' spawning habitat in northern Spencer Gulf.

Close collaboration with the Conservation Council SA and Reef Watch volunteers, has enabled the project scope to be extended with the groups to survey four additional sites outside the Point Lowly area for spawning cuttlefish during winter 2014.

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### 3. Characterise the Natural Spawning Habitat

The sub-tidal rocky reef fringing from Black Point to Point Lowly is unique in northern Spencer Gulf and its structure along with its west to east aspect. The plate-like fragmented slabs of bedrock that comprise the reef create numerous dens and crevices in which the female cuttlefish attach their eggs. These dens are vital for successful reproduction and recruitment as they provide both a stable structure for egg attachment and a refuge for hatchlings.

During the 2013 spawning season the dimensions of the natural dens were measured (width, height and depth), along with determining the number of entrances, their orientation, the substrate type, the water depth they were located in and the number of eggs held.

Analysis of the natural dens for giant cuttlefish has enabled researchers to design an artificial den to be trialed in the coming season. The artificial dens will be deployed at five sites in northern Spencer Gulf in mid-March. During the 2014 cuttlefish spawning season the artificial dens will be inspected for eggs by SARDI scientists and volunteers from the Conservation Council of South Australia.

### 4. Bioaccumulation of Heavy Metals

In 2013 the Environmental Protection Authority undertook a study to investigate whether there are abnormally high levels of metals accumulating in Giant Australian Cuttlefish and if these levels are replicated in another local cephalopod species, Southern Calamari, which has not had a comparable decline.

Results showed differences in the metal burden between the two species. Southern Calamari was frequently higher in metal burden than the Giant Australian Cuttlefish, with the exception of cadmium, lead and zinc, which was higher in the Giant Australian Cuttlefish. However, there is evidence (Bustamante et al, 2006; Miramand et al, 2006) to show that these metals, when taken up in cephalopods, are transported into the digestive gland where they are detoxified by binding with proteins and stored<sup>1</sup>.

The results were also clear that any metal burden found in the mantle of both the Giant Australian cuttlefish and Southern Calamari were well below food safety standards, confirming them safe to eat.

A report on the research is currently being peer reviewed before being finalised.

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<sup>1</sup> Bustamante, P, M Bertrand, E Boucaud-Camou and P Miramand, 2006, 'Subcellular distribution of Ag, Cd, Co, Cu, Fe, Mn, Pb, and Zn in the digestive gland of the common cuttlefish *Sepia officinalis*', *Journal of Shellfish Research*, **25**,(3): 987-993.

Miramand, P, P Bustamante, D Bentley and N Kouéta, 2006, 'Variation of heavy metal concentrations (Ag, Cd, Co, Cu, Fe, Pb, V, and Zn) during the life cycle of the common cuttlefish *Sepia officinalis*', *Science of the Total Environment*, **361**,(1): 132-143.

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## 5. Cuttlefish By-Catch

Monitoring programs to quantify cuttlefish by-catch in South Australia's Spencer Gulf Prawn fishery have been established in partnership with the fishing industry. Two programs will be conducted within the fishery, with SARDI assessing catches of cuttlefish during routine stock assessment surveys conducted throughout the fishing year, while the fishing sector will collect samples/data from commercial catches for further analysis by SARDI.

## 6. Fine-Scale Population Structure

This project is led by the University of Adelaide in collaboration with SARDI and the South Australian Museum and is funded by the Fisheries Research and Development Corporation (FRDC). This two year project commenced in March 2013 and aims to:

- a. Determine the movement throughout the life history and finer-scale population structure of the Giant Australian Cuttlefish in northern Spencer Gulf.
- b. Resolve the genetic status of Giant Australian Cuttlefish to determine the extent of its geographic boundaries. This will be an important finding to determine whether the species should be managed as a separate species or population distinct from other Giant Australian Cuttlefish.
- c. To develop an integrated model that assesses and evaluates the response of the northern Spencer Gulf population to environmental and anthropogenic factors, thereby assessing population viability.

So far, researchers have started collecting tissue samples for genetic and population analysis.

Laboratory trials to assess the effects of changes in temperature and salinity on the development of cuttlefish embryos and the effect of temperature on adult swimming rates and oxygen consumption have been completed with the data currently being analysed. Results from both investigations will feed into the population viability model.

In September 2013 a research team revisited the Point Lowly spawning grounds to collect late-stage embryos as part of the investigation into determining patterns in cuttlefish movement and migration.

## 7. Impacts of Shipping

This project is led by the University of Adelaide in collaboration with SARDI and EPA and is funded by the Department of the Environment. It includes a desktop review of cuttlefish research to date; an investigation on the potential impacts of shipping on cuttlefish.

Two laboratory projects, one investigating the effects of various shipping noise and turbidity levels on the development of cuttlefish embryos and the other on the effects of shipping noise on adults have been completed. A draft report is currently being prepared.

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## Redmap

As part of the FRDC project investigating movement patterns and population structure of the Giant Australian Cuttlefish, fishers, SCUBA divers, boaters and other marine users are being asked to assist by reporting any sightings of Cuttlefish aggregations (groups of more than 10 Cuttlefish) and their eggs via [www.redmap.org.au](http://www.redmap.org.au)

Information from the public will also help determine if this species is breeding outside Point Lowly. Photos can also be uploaded to the site, enabling scientists to verify the sighting.

For more information [visit the Redmap website](http://www.redmap.org.au)

Sightings of Giant Australian Cuttlefish (or cuttlefish eggs) can also be reported online to the Reef Watch [Feral or in Peril Program](#) run by the Conservation Council SA. You will need to register to use the system and then go through the Field Guide to make your report.



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