# Final project report

<i>Project ID: Title:</i>	2002/8.05 Fishing resources of the Antarctic coastal ecosystem: dynamics and ecology of Ross Sea populations
<i>Principal investigator:</i>	Marino Vacchi
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Duration:	24 months
Assigned funding:	€ 51.645,70

# **Activities and results**

Ross Sea is one of the most interesting areas of the Antarctic Continent not only from an oceanographic point of view but also for the coastal ecosystem structure. Its ichthyological fauna shows peculiar ecological features due also to the presence of the Ice Shelf and to the seasonal ice formation and it plays an important role in the trophic web of coastal communities. By extending our previous research activities at Terra Nova Bay (TNB), we aimed to improve the knowledge on the biodiversity of local fish fauna. These studies were coordinated in the framework of international multidisciplinary projects, such as ICOTA (French ichthyiological research at Terre Adelie), Victoria Land Transect Project (between NZ, US and Italian scientists) and the International ICEFISH 2 cruise (a research project on the fishes of the Sub-Antarctic marine habitat with the participation of scientists from nine different countries). A parallel aim of the present PNRA program was also the evaluation of the abundance and structure of cetacean populations in Italian operative Antarctic areas.

Fishing activities at TNB were carried out in new areas, such as those deeper than 400 m, during the 2002-2003 Italian Expedition in austral spring. Appropriate equipment was used, according to the season and the "fast ice" cover. In relation to catch quantities, part of fish captured were tagged and released, applying a technique already used by NZ and US scientist in Mc Murdo. Information, on the presence of cetaceans were collected from helicopter and boat based surveys at Terra Nova Bay and surrounding waters during 2003-2004 austral summer. Data on abundance of cetacean species in the Western Ross Sea were collected along the route of R/V Italica between New Zealand and Mario Zucchelli Station by observations from the deck of the ship.

The fish sampling activities at Terra Nova Bay were regularly performed through ice holes. Experimental fishing techniques to set gill nets and other stationary fishing gears under the ice was developed and successfully tested. Data showed remarkable interesting features of the fish composition in springtime when coastal area of Terra Nova Bay is ice-covered. It is worth to note the finding of the giant nototheniid *Dissotichus mawsoni* in shallow waters beneath the sea ice. Tagging on *Trematomus bernacchii* was successfully conducted. The size of the fish population in the immediate vicinity of the fishing holes was estimated by the ratio of tagged to non-tagged fish.

Acquisition of data regarding reproduction, feeding habits, growth rates of uncommon fish species improved the knowledge on fish community dynamics, in terms of trophic webs and reproductive strategies. About the cetacean survey, an overall of 71 observations of cetaceans were collected (39 *Orcinus orca*, 17 *Balaenoptera bonaerensis*, 9 *Balaenoptera* sp., 2 *Berardius arnuxii* and 4 undetermined species) between Adélie Cove and Cape Washington. Most of the killer whales were with type C ("fish eater") but, on three occasions type B ("mammal eater") were recorded. 17 killer whales (13 C and 4 B type) were identified by means of natural mark on their dorsal fins; 4 specimens were resighted. Finally, an Italian scientist attended to the Workshop on Estimating Age in Patagonian Toothfish promoted by CCAMLR with the primary aim to discuss and standardize methods for estimating age of Patagonian toothfish (*Dissostichus eleginoides*), and improve cooperation among scientists interested in studies on otoliths of Southern Ocean fishes.

### **Products**

#### A – papers in scientific magazines

- 1. LA MESA M., VACCHI M., IWAMI T., EASTMAN J.T., 2002 Taxonomic studies of the icefish genus *Cryodraco* Dollo, 1900 (Notothenioidei: Channichthyidae). *Polar Biol.*, 25(4): 384-390.
- VACCHI M., LA MESA M., GRECO S., 2002. Juvenile and larval fishes collected during Italian antarctic Cruise "ROSSMIZE" (November-December 1994, Western Ross Sea). In: Faranda F.M., Guglielmo L and Povero P. (eds) Nat. Progr. Ant. Res. ROSSMIZE. Data Report Part. II *Terra Antartica*.
- 3. LA MESA M., CAPUTO V., RAMPA R., VACCHI M., 2003 Macroscopic and histological analyses of gonads during the spawning season of *Chionodraco hamatus* (Pisces, Channichthyidae) off Terra Nova Bay, Ross Sea, Southern Ocean. *Polar Biol.*, 26: 621-628.
- 4. LA MESA M., DALU' M., VACCHI M., 2004. Trophic ecology of emerald notothen Trematomus bernacchii (Pisces, Nototheniidae) from Terra Nova Bay, Ross Sea. Polar Biology, 27 (11): 721-728.
- 5. LA MESA M., EASTMAN J.T., VACCHI M., 2004. The role of notothenioid fish in the food web of the Ross Sea shelf waters: a review. Polar Biology, 27 (6): 321-338.
- 6. LA MESA M., ASHFORD J., LARSON E., VACCHI M., 2004 Age and growth of Scotia Sea icefish *Chaenocephalus aceratus* (Lönnberg 1906), from the South. Shetland Islands. *Antarctic Science* 16 (3): 253–262.
- 7. DETRICH H. W., JONES C. D., KIM S., NORTH A. W., THURBER A., VACCHI M., 2005. Nesting behavior of the icefish *Chaenocephalus aceratus* at Bouvetøya Island, Southern Ocean. *Polar Biol.* 28(11): 828-832.
- 8. EAKIN R.R., EASTMAN J.T., VACCHI M., 2006. Sexual dimorphism and mental barbel structure in the South Georgian plunderfish *Artedidraco mirus* (Perciformes: Notothenioidei: Artedidraconidae). *Polar Biol.*, 30: 45-52.
- 9. VACCHI M., BOTTARO M., PISANO E., EASTMAN J.T., EAKIN R.R., 2007. Aspects of gonadal morphology in the South Georgian plunderfish *Artedidraco mirus* (Perciformes: Artedidraconidae). *Polar Biol.*, 30: 125-131
- 10. LAURIANO G., FORTUNA CM, VACCHI M., 2007. Observation of killer whale (*Orcinus orca*) possibly eating penguins in Terra Nova Bay, Antarctica. *Antarctic Science*, 19(1): 95-96.

#### B – book chapters

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#### **C** - proceedings of international conferences

- LA MESA M., ASHFORD J., LARSON E., VACCHI M., 2002. Age and growth of Scotia Sea icefish Chaenocephalus aceratus (Lönnberg 1906), from the South Shetland Islands. WG-FSA-/02, Working Group "Fish Stock Assessment" CCAMLR, 25 pp. October 2002, Hobart, Tasmania, Australia.
- DETRICH H. W., JONES C.D, KIM S., NORTH A.W., THURBER A., VACCHI M., 2004. Nesting behaviour of the icefish *Chaenocephalus aceratus* at Bouvetøya Island, Southern Ocean (CCAMLR Subarea 48.6). WG-FSA/04, Working Group "Fish Stock Assessment, CCAMLR, 13 pp., October 2004, Hobart, Tasmania, Australia.
- VACCHI M., M. LA MESA, M. DALÙ, E. PISANO & JOHN MACDONALD, 2004. Early life stages of Antarctic silverfish, *Pleuragramma antarcticum*, found under the seasonal pack-ice at Terra Nove Bay (Ross Sea). EASIZ (Ecology of the Antarctic Sea Ice Zone) Final Symposium: Korčula, Croatia, 27 September – 1 October 2004 (Abstract).
- 4. LA MESÁ M., R. CATTANEO-VIETTI & M. VACCHI, 2004. Species composition and distribution of the Antarctic plunderfishes (Pisces, Artedidraconidae) off the Victoria Land, Ross Sea. EASIZ (Ecology of the Antarctic Sea Ice Zone) Final Symposium: Korčula, Croatia, 27 September 1 October 2004 (Abstract)
- 5. KOUBBI P., VADUREL F., LE GUILLOUX E., VACCHI M. & J.C. HUREAU, 2004. Fish diversity in the coastal zone of Terre Adélie. XXVIII SCAR Open Science Conference, Bremen, Germany. July 2004 (Abstract).
- VACCHI M., BOTTARO M., PISANO E., EASTMAN J.T., EAKIN R.R., 2005. Aspects of gonadal morphology in the South Georgian plunderfish *Artedidraco mirus* (Perciformes: Artedidraconidae). ICEFISH Symposium, 21-24 August 2005, Darling Marine Center, Walpole, Maine, USA (Abstract).
- 7. VACCHI M., EAKIN R.R., EASTMAN J.T., 2005. Mental barbel variability and structure in the plunderfish *Artedidraco mirus* (Perciformes: Notothenioidei: Artedidraconidae) from South Georgia, Antarctica. ICEFISH Symposium, 21-24 August 2005, Darling Marine Center, Walpole, Maine, USA (Abstract).

#### D – proceedings of national meetings and conferences

1. ABELMOSCHI M. L., DALLA RIVA S., GROTTI M., SOGGIA F., FRACHE R., VACCHI M., BOTTARO M., 2004. -"Banca dati ambientali antartici: bilanci del primo decennio di attività e sviluppo di ricerche sull'utilizzo di biondicatori per il monitoraggio di metalli potenzialmente tossici". X Convegno Nazionale *La contaminazione Chimica in Antartide*, Cà Dolfin-Venezia, 10-11 Giugno 2004 (riassunti estesi, pp. 163-171).

#### E – thematic maps

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F – patents, prototypes and data bases

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#### G – exhibits, organization of conferences, editing and similar

#### H - formation (PhD thesis, research fellowships, etc.)

- 1. Barbara Catalano, PhD thesis in Polar Sciences "Ichthyplanktonic assemblages of the Ross Sea", University of Siena (supported by ICRAM Rome)
- 2. Gabriele La Mesa, Research fellow " Antarctic Coastal Fish Communities", ICRAM Rome
- 3. Massimiliano Bottaro, Research grant "Ecology and Biology of Antarctic Fishes", ICRAM Rome
- 4. Massimo Dalù, Research grant, Ecologia e biologia di pesci antartici, ICRAM Rome

## **Research units**

- 1. Diversity of fish communities of the Ross Sea (coordinator: Dr. Michele Romanelli, ICRAM, Rome)
- 2. Monitoring of Cetacean populations of the Western Ross Sea (coordinator: Dr. Giancarlo Lauriano, ICRAM, Rome)
- 3. Ecological and biological features of the Antarctic toothfish (*Dissostichus mawsoni*) (coordinator: Dr. Silvestro Greco, ICRAM, Rome)
- 4. Trophic habits of Antarctic coastal fish species (coordinator: Dr. Michele Giani, ICRAM, STS Chioggia)

Date: 12 November 2008