

Banggai cardinalfish: towards a sustainable ornamental fishery

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Abstract. Central Sulawesi Province has over 4,500km of coastline and over 700 islands including the Banggai Archipelago. Established as Banggai Kepulauan District in 1999 and covering almost all the native distribution of the Banggai cardinalfish, *Pterapogon kauderni*, though introduced populations have become established elsewhere. A paternal mouth brooder with direct development traded in large numbers as an ornamental fish, *P. kauderni* was recently proposed for listing in CITES Appendix II and has since been listed as Endangered on the IUCN (International Union for the Conservation of Nature) Red List. Local activities to develop sustainable management of *P. kauderni*, underway since 2005, aim to address concerns regarding the Banggai cardinalfish fishery and trade as well as habitat conservation. The CITES proposal in 2007 brought the Banggai cardinalfish into the limelight at national and international levels, and a multi-stakeholder multi-year national Banggai Cardinalfish Action Plan has been developed. Developments since 2004 are outlined including initiatives under the Sea Partnership Program; local research and some recent results; and early progress in implementing the Action Plan, including the establishment of the BCF Centre, District and village marine protected areas and a Banggai cardinalfish trade monitoring system.

Key words: Banggai cardinalfish, Sulawesi, ornamental fishery.

Introduction

The Banggai cardinalfish *Pterapogon kauderni* (Koumans, 1933) is an endemic, reef-associated fish with a distribution limited to the Banggai Archipelago in Central Sulawesi, Indonesia and a few nearby islands (Fig. 1). Some introduced populations have become established along the trade routes, including sites in North Sulawesi (Erdmann & Vagelli, 2001), Palu Bay (Moore & Ndobe, 2007a) and North Bali (Lilley, pers.com).

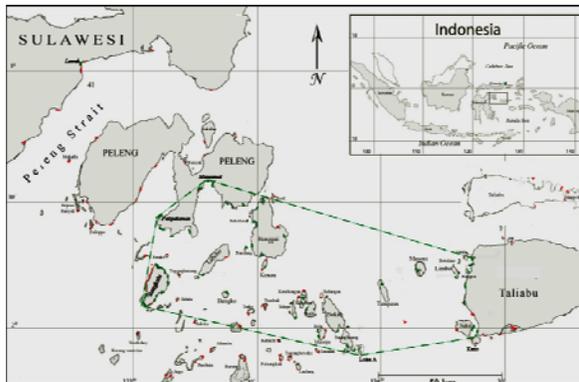


Figure 1: The endemic distribution of *P. kauderni* according to the CITES proposal (Vagelli, 2005 in Anonymous, 2007a).

The male incubates the eggs (around 20 days) and larvae (around 9 days) in his mouth, and fasts for this period. On release juveniles immediately seek shelter and food in available nearby habitat, with no pelagic dispersal phase, cannibalism by the (male) parent and other adult fish is common (Vagelli, 1999).

Locally known as *bebese tayung*, which in Bajo (sea gypsy) language means little fish in the sea urchins, since the early 1990's the Banggai cardinalfish has been internationally traded as an ornamental fish (Ndobe & Moore, 2007).

Discovered by Kaudern and classified by Koumans in 1933, *P. kauderni* was "forgotten" by the scientific community until it was "rediscovered" in 1994 (Allen & McKenna 2001). In the following 10 years there was much international interest and a considerable amount of research into the biology, ecology and exploitation of the species by visiting scientists who generally considered the trade to be unsustainable (Allen and McKenna 2001; Lunn and Moreau 2004; Kolm and Berglund 2003; Vagelli and Erdmann 2002).

Key data and information were available at international level since 2001 or even earlier but in general were not communicated to local or national

stakeholders and therefore had no impact on management (Ndobe & Moore, 2007).

Material and Methods

The paper presents a synopsis based on literature and on personal experience during the process of local awareness building regarding the Banggai cardinalfish followed by early steps in developing management activities over the period from October 2004 to the 11th ICERS in July 2008.

2004-2005: Initial Awareness Building

A case study in the Banggai Islands was undertaken by the NGO Yayasan Palu Hijau as one of several short case studies in three countries commissioned by NACA (Network of Aquaculture Centres in Asia), coordinated in Indonesia by the STREAM (Support to Regional Aquatic Resources) Hub at the Directorate General for Aquaculture, under the ECPREP (European Community Poverty Reduction Effectiveness Program) project entitled "The International Seafood Trade: Supporting Sustainable Livelihoods Among Poor Aquatic Resource Users in Asia" (EC-PREP, 2005). The main overall project aim was to identify mechanisms for reducing poverty associated with the ornamental fish trade.

The Banggai cardinalfish was found to be the main ornamental species caught by local rather than "outside" fishers and heavily (over) exploited. The fishery was poorly managed from capture through post-harvest handling and husbandry to packing and transport. The market chain was long and complex and trading patterns were often unfair and inefficient. Direct and indirect threats to *P. kauderni* populations and habitat including threats to and from other fisheries were identified. However, observations and data also indicated the possibility of a sustainable fishery. Indeed the highest population density was recorded at a site where collection had been carried out for some years on a periodic basis, with rotation between sites.

The results were presented to stakeholders at District (local), Provincial and National level. The local stakeholders recognised that action was needed. An outline program was agreed to and proposals drawn up.

2006: The First Steps

Implementation of the plans developed in 2005 began in 2006 with support from the Sea Partnership (Mitra Bahari) Program of the Department for Marine Affairs and Fisheries through the Central Sulawesi Regional Centre Sea Partnership Consortium (KMB). The KMB partners include local Universities/Higher Education Institutes and NGOs, as well as local government agencies.

Activities undertaken included a survey of *P. kauderni* populations, habitat and exploitation in

Banggai Island, which along with the data from 2004/2005 formed the basis for further local awareness building, in particular through a Marine Protected Area (MPA) Management training and workshop. As a result, two villages (Bone Baru and Tinakin Laut) decided to establish community MPAs and a local organisation for MPA development was founded.

Research into *in-situ* breeding of the Banggai cardinalfish was carried out, based on a model developed by Dr Kolm, involving undergraduate students and the introduced population in Palu Bay (Ndobe & Moore, 2007; Moore & Ndobe, 2007a). The results raised a number of questions and challenged some conclusions in the scientific literature on *P. kauderni*. Further research was planned and is still ongoing.

The key results of these and other activities were included in two books published in Indonesian as part of the KMB 2006 program. One book was on the biology, ecology and conservation of the Banggai cardinalfish and the other on the fishery and trade.

2007: CITES CoP 14 and local impacts

In early 2007 the Department of Marine Affairs and Fisheries contacted the Central Sulawesi Provincial Fisheries Service to request information about *P. kauderni* in connection with the proposal submitted by the United States of America to list the species on CITES Appendix II at the 14th Conference of the Parties (CoP) in June 2007. News of this proposal came as a great surprise to stakeholders in the endemic distribution area who had no idea that such a proposal was being prepared much less already submitted (Moore & Ndobe, 2007b).

The FAO expert panel (FAO, 2007) did not support the listing on scientific grounds. It is now history that the proposal was withdrawn and that Indonesia made a strong public commitment to Banggai cardinalfish conservation (Anonymous, 2007b).

Local Activities pre and post CITES COP 14

In addition to providing data and information to many parties including the Indonesian authorities and delegates, the FAO expert panel, the IUCN working group and others, local activities included research funded by the Higher Education Department (DIKTI) junior lecturer research programme into the phenomena of ontogenetic shift in micro-habitat first put forward by Vagelli (2004).

This research, some of which has since been presented in local and national meetings (e.g. in Ndobe & Moore, 2007), was carried out in the native habitat (three habitat types: coral reefs, seagrass beds and reef flats) around Tinakin Laut, Banggai Island and at the introduced population site in Palu Bay (homogenous habitat). The results revealed no significant difference between habitat types, but

indicated a strong preference of new recruits and small juveniles for sea anemone micro-habitat, even when *Diadema* sea urchins were abundant (Fig.2).

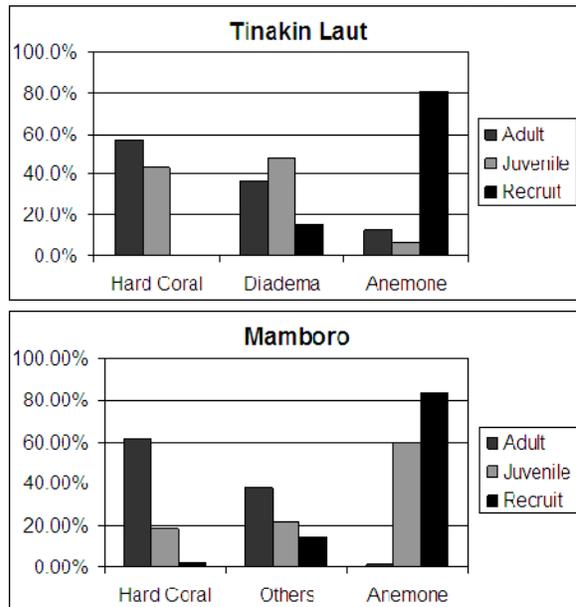


Figure 2: Size/age class distribution by micro-habitat at Tinakin Laut (Banggai Island, top) and Mamboro (Palu Bay, centre)

In addition, the highest numbers of uniform size (apparent sibling) groups of recruits and small juveniles were recorded in anemone micro-habitat. An important management implication is the need to conserve sea anemones, which were overexploited for human consumption.

Hard corals seem important for adults, and (as in 2004 and 2006), some survey locations were under severe attack from a population explosion of the corallivorous starfish *Acanthaster planci*. The results also raised questions regarding the periodicity of Banggai cardinalfish breeding and indicated that seasonal factors may influence breeding patterns, success or possibly both.

Banggai Cardinalfish Action Plan

After CITES CoP 14, a national level meeting was held in Palu, capital of Central Sulawesi, attended by senior officials from the Department of Marine Affairs and Fisheries, Provincial and District Governments, fishermen, local leaders, local and national NGOs and Academia. A multi-year action plan for sustainable management of the Banggai cardinalfish was drawn up. A synopsis of this plan (translated from the original) is described in Fig 3.

2008: Early achievements and constraints

Initial steps in implementation during 2007 included the establishment of the BCF Centre (Decree No 168/2007 of the Banggai Kepulauan District Head), and a Marine Protected Area (Decree No. 540/2007).

Activities underway and planned for 2008/2009 include:

(i) Support (mainly from the Provincial Fisheries Service in partnership with NGOs and Higher Education Institutes) for the MPAs proposed by the village communities of Bone Baru and Tinakin Laut, in the form of training, physical facilities, etc. It is anticipated that the two community MPAs will become functional during 2009.

(ii) The drafting of a Ministerial Decree regarding the (sustainable) management of the Banggai cardinalfish is in progress, completion anticipated in early 2009

(iii) Development of the BCF Centre, working closely with ornamental fishers and local traders. Despite funding constraints, anticipated activities include socialisation and management planning.

(iv) Ongoing research by local scientists (including the involvement of undergraduate students) into various aspects of Banggai cardinalfish biology, ecology and husbandry, both *in-situ* and *ex-situ*, involving the Banggai Cardinalfish Unit established at the Provincial Fisheries Hatchery Complex at Mamboro in Palu Bay, the Fisheries and Marine Higher Education Institute (STPL-Palu), the Aquaculture Study Programme at Tadulako University and other Sea Partnership members.

Results to date have shown that there is still much to learn about this fascinating species including the influence of environmental factors on growth patterns.

(v) Captive breeding research (*ex-situ*) at the Ambon Mariculture Research Station, begun in 2008.

(vi) Monitoring of the trade in *P. kauderni* by the Fisheries Resources Directorate in partnership with the District Fisheries Service, begun in 2008.

(vii) Survey/monitoring of *P. kauderni* populations, planned during 2009/2010.

(viii) Training for fishers in partnership with the Marine Aquarium Council (MAC), possibly in 2009.

(viii) Distribution of a Children's book by Yayasan Palu Hijau with support from PADI Project AWARE, the title means "The little beauty in the sea urchins".

Conclusion: Quo Vadis, BCF?

Since local awareness first began to develop in late 2004 real progress has been made, and the processes associated with the CITES proposal certainly helped raise the profile of *P. kauderni* at local and national levels. However the fact that the Banggai cardinalfish is now listed on the IUCN "Red List" as "Endangered" is a reminder that there is still a long way to go to fulfil the goal of the Banggai Cardinalfish Action Plan, which roughly translates as ensuring the conservation of the species and it's habitat for the benefit of present and future generations. As a key element of the conservation strategy there is a realistic chance that a sustainable ornamental fishery will be developed for this attractive reef-associated fish with an unusual lifecycle whose beauty has nearly been its downfall.

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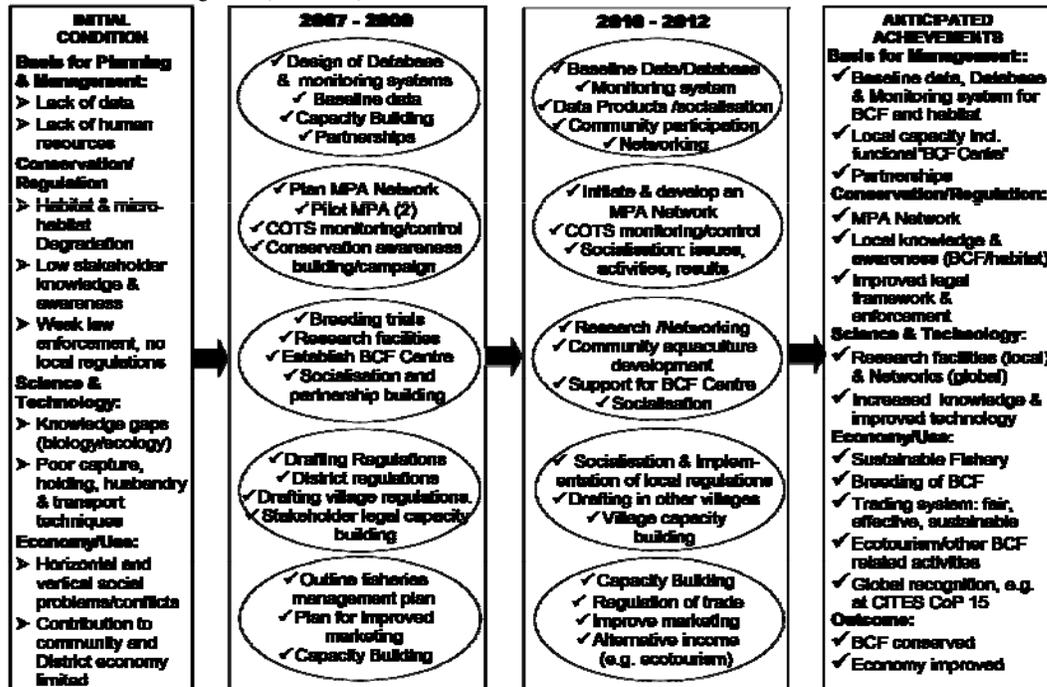


Figure 3: Outline of the Banggai cardinalfish Action Plan.

References

- Allen G.R. and McKenna S.A. (eds) (2001). A Marine Rapid Assessment of the Togeian and Banggai Islands, Sulawesi, Indonesia. RAP Bulletin of Biological Assessment 20. Conservation International, Washington DC, USA.
- Anonymous (2007a). COP 14 Prop. XX. Convention on the International Trade in Endangered Species, Fourteenth meeting of the Conference of the Parties, The Hague (Netherlands), 3-15 June 2007, Consideration of Proposals for Amendment of Appendices I and II. Proposal: Inclusion of the Banggai cardinalfish (*Pterapogon kauderni*, Koumans 1933) in Appendix II of CITES. <http://www.cites.org>. 12 pp.
- Anonymous (2007b). Summary record of the 10th session of Committee I. E14-Com-I-Rep-10. <http://www.cites.org>. 9 pp.
- Erdmann M.V. & Vagelli A.A. (2001). Banggai Cardinalfish Invasions of Lembeh Strait. *Coral Reefs* 20:252-253.
- EC-PREP (2005). The Indonesian Ornamental Fish Trade: Case Studies and Options for Improving Livelihoods while Promoting Sustainability in Banggai and Banyuwangi. EC-PREP Project EP/RO3/R14. 286 p. [also available at: <http://www.ec-prep.org>]
- FAO (2007). Report of the second FAO ad hoc expert advisory panel for the assessment of proposals to amend Appendices I and II of CITES concerning commercially-exploited aquatic species, Rome, 26-30 March 2007. Fisheries Report No. 833 FIMF/R833 (En), ISSN 0429-9337
- Kolm N. and Berglund A. (2003). Wild Populations of a Reef Fish Suffer from "Non-Destructive" Aquarium Trade Fishery. *Cons. Biol.* Vol 17 No3, pp910-914.

- Lunn K.E. & Moreau A.M. (2004). Unmonitored trade in Marine Ornamental Fishes: the Case of Indonesia's Banggai Cardinalfish (*Pterapogon kauderni*). *Coral Reefs* (2004) 23:344-341.
- Moore A. & Ndohe S. (2007a). Discovery of an introduced Banggai Cardinalfish population in Palu Bay, Central Sulawesi, Indonesia. *Coral Reefs*. Vol.26 No.3 p.569
- Moore A. & Ndohe S. (2007b). The Banggai Cardinalfish and CITES – a local perspective. *Reef Encounters* Vol.38 Sept 2007 pp.15-17
- Ndohe S. & Moore A. (2007). Peran sains dalam proses menuju sustainable ornamental fishery: kasus Banggai cardinalfish. Proc. Konperensi Sains Perikanan dan Kelautan Indonesia 2007. MSP157-169
- Vagelli A. & Erdmann M.V. (2002). First Comprehensive Survey of the Banggai Cardinalfish, *Pterapogon kauderni*. *Env. Biol. Fishes* 63:1-8.
- Vagelli A. (1999). The Reproductive biology and early ontogeny of the mouthbreeding Banggai Cardinalfish, *Pterapogon kauderni* (Perciformes, Apogonidae). *Env. Biol. Fishes* 56:79-92
- Vagelli A. (2004). Ontogenetic Shift in Habitat Preference by *Pterapogon kauderni*, a Shallow Water Coral reef Apogonid with Direct Development. *Copeia* 2004(2) pp.364-369.
- Vagelli A.A. (2005). Reproductive Biology, Geographic Distribution and Ecology of the Banggai Cardinalfish *Pterapogon kauderni* Koumans, 1933 (Perciformes, Apogonidae), with Considerations on the Conservation Status of this Species on its Natural Habitat (in Spanish). PhD. Dissertation, University of Buenos Aires. 276 pp.