Feb 13th, 10:15 AM - 11:15 AM

Damsels in Distress: A Preliminary Assessment of Pomacentridae Extinction Risk

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Hello, I’m Allison. I’ve been working with Dr. Ralph over at the Global Marine Species Assessment since 2015. Recently I’ve been working with Pomacentridae, and today I will be reviewing an assessment of their extinction risk.
First, I will introduce the organization behind the research. Then I will talk a little bit about Pomacentridae, and why they’re being assessed. I will share with you the IUCN Methods of assessment, go over the current results, and finally discuss the implications.
Introduction

*Amblyglyphidodon ternatensis*
What is the IUCN? The International Union for Conservation of Nature was founded in 1948.

- It has become the largest environmental organization in the world, and its focus is on protecting the biodiversity of the earth's species.
- The IUCN has a publicly accessible database of all known organisms, called the Red List of Threatened Species. For a species to make it onto the Red List, it must undergo extensive assessment for risk of extinction, using the IUCN Red List Categories and Criteria as a standard guide.
The majority of species currently on the Red List are terrestrial, which is where the Marine Biodiversity Unit comes in.

The MBU was formed in 2005, and is in charge of the Global Marine Species Assessment project, based here at ODU. The goal of MBU, with the support of GMSA and other similar projects, is to assess 20,000 species for the Red List.

- These will include vertebrates, habitat forming primary producers (such as seagrasses, mangroves, kelps and so on), reef building corals, and priority invertebrates.

There are unique challenges to assessing oceanic species compared to those found on land.

- For example, the fish in a given area will all look the same, making it nearly impossible to count them, and tagging is impractical.

As a result, only 4.4% of known marine species have been assessed, and only 14% of species currently on the Red List are marine organisms.
So what are the IUCN Classifications and Criteria for the Red List?

First, they are based on extinction theory.

- In a nutshell, this theory says that extinction occurs when mortality rates within a population are greater than birth rates over an extended period of time, causing populations to decline.

The IUCN has five criteria, A-E, outlined in this table.

- To be considered threatened, the species we’re looking at must exhibit symptoms of any of these criteria over an extended period of time.
  - The time will vary depending on the species, but a sufficient number of generations must be observed for a trend to be seen.

The classifications that the IUCN assigns to species after assessment are outlined here.

- Species with adequate data can be assigned one of seven categories, three of which correspond to those that are threatened, the Vulnerable, Endangered, and Critically Endangered classifications.
• A little bit about Pomacentridae:
• There are currently 395 known species in this family, which include anemonefish and damselfish.
• Pomacentridae are found all over the world, with high concentrations in the tropical waters of the Indo-West Pacific.
• They are highly restricted to coral reef habitats, some living among rocks and crevices, while most require the presence of specific coral species, such as Acropora in order to survive.
While there are some Pomacentridae species that live deeper in the water column, the majority live in the shallow photic zone, and forage near the substratum of their shallow environment.

- Diets are wide-ranging
  - some are vegetarians,
  - some are known to eat a variety of plankton, small crustaceans, and benthic worms,
  - and there are a few that exclusively eat coral.
• Of the 395 Pomacentridae, there are 24 damselfish that meet the IUCN criteria for some threatened status.
• Of these 24, 7 have been published to the Red List.
• This is where interns like myself come in.
  • What I’ve done at GMSA is I’ve searched through publications to help create assessments for newly described species,
  • I’ve used ArcGIS to create draft maps for the new species,
  • and reviewed the remaining assessments, ensuring they follow the IUCN Red List guidelines.
• Why are we assessing these fish?
  • Damsels are an iconic coral reef species, and they rely almost entirely on the coral structures of the reef.
  • Because of this, they can help us measure the health of the ecosystem.
  • We know that corals are undergoing bleaching events right now, and we know that these events are going to persist.
  • Can this fish adapt to the circumstances, or will it die off with the corals it relies on?

Why Pomacentridae?
• Rely on coral reefs for survival
• Indicator of health of coral reef habitats
• Bleaching events

Coral bleaching
IUCN Methods
• The IUCN Method of assessing the Pomacentridae begins with species-specific data collection of all 395 species. (which is what interns such as myself assist in doing)
• Publications are combed through for information regarding the taxonomy, distribution, population, ecology, life history, utilization, potential threats, and conservation measures in place for each species.
Once this is done, a workshop is held
• Local and international taxonomic experts come together and pick through the data that was collected, checking for errors, making corrections, updating information, etc.
• For Pomacentridae it was held in Fiji in 2011
• From here, the fish are assigned to one of the extinction risk levels mentioned earlier.
Results

Chrysiptera sp.

14
• This map shows the species density of the 24 threatened damselfish we've been discussing.
• As you can see, overall they have a wide distribution,
  • ranging from the east coast of Africa and the Red Sea, all the way across the Indo-Pacific region to the west coast of north and central America.
• They are highly concentrated in the Oceania region, especially in the Coral Triangle which includes the Philippines, Indonesia, and Papua New Guinea.
• This graph is showing the number of threatened species in each category.
• As you can see, most of the threatened damsels, 16 of them, are classified as vulnerable, 5 are near threatened, 2 are endangered, and 1 is critically endangered.
• What may be causing this?
• Damselfish are an ornamental fish, many people love to have them in their aquariums, making them susceptible to the aquarium trade.
• This chart is showing that about 37% of the threatened damselfish are commonly caught for this purpose.
• This is in addition to the myriad other threats they all face, including
  • climate change,
  • el Niño events,
  • coastal development, industry,
  • and destructive fishing practices
    • cyanide fishing, dynamite fishing, ghost fishing, and so on
Conclusion

Amblyglyphidodon botaniai
• The results show that human activity is the biggest threat to these damselfish.
• With the majority of the threatened species living around the Coral Triangle, a region sensitive to bleaching events, where destructive fishing methods are common, and where many areas are building up their coastline to support increased tourism, following the Damselfish may very well become paramount in future assessments of marine conditions.
  • The resiliency of this little fish may tell us what is to come of the diversity of our planet’s oceans
• Being that this is only a preliminary assessment of the Pomacentridae, questions still remain:
  • How far-reaching an impact do our destructive tendencies already have on these fish?
  • How far can they be pushed to the edge?
  • Do they have the capacity to recover?
A special thanks to Dr. Ralph and Dr. Carpenter!

Thank you for listening!

Questions?