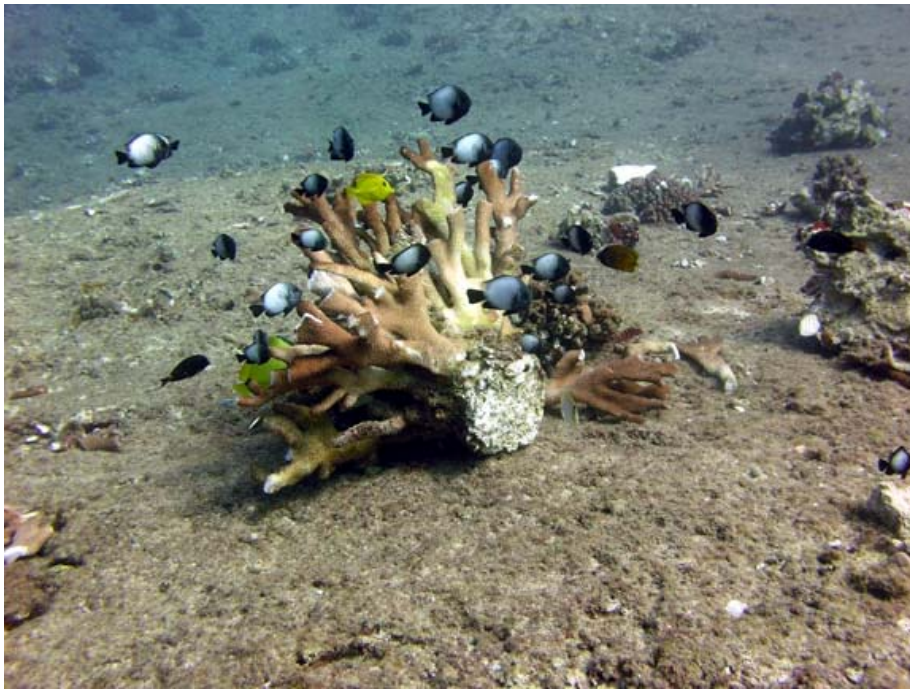


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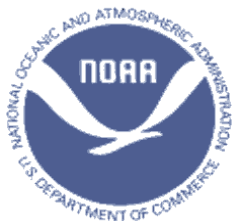
**Rapid Response Plan for Stabilizing and Monitoring Corals Detached in the Grounding
and Removal of the Ship Cape Flattery, Barbers Point, Oahu**



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The grounding and removal of the ship Cape Flattery from fringing reef south of Barbers Point Harbor, Oahu resulted in pulverization, fragmentation, detachment and upturning of coral colonies at depths ranging from 20 to 75 ft. Towed-diver surveys conducted on 15 February 2005 identified areas where efforts at overturning and stabilizing detached whole coral colonies and large fragments may enhance colony survival probabilities and reduce secondary impacts from loose colony movement and collision. A protocol for rapid stabilization of detached and overturned coral colonies is presented below.

Shallow reef Areas (20 to 25 ft depth)

Large *Porites lobata* and *Pocillopora eydouxi* colonies will be righted and cemented to substrate using techniques devised by Harold Hudson (NOAA Fisheries) in the following protocol:

1. Sites for reattaching colonies for cement stabilization will be identified and cleaned of sediment and bio-fouling organisms using wire brushes and masons hammers.
2. Portland type II cement and Moulding Plaster will be mixed in a ratio of 4:1 with just enough seawater to create firm putty in plastic buckets with trowels and gloved hands on board a support vessel and transferred down to divers. The hardening time is approximately 4 to 6 minutes if Moulding Plaster is used, thus transference and application will need to occur quickly. If the application can't be accomplished in this time period, cement without Moulding Plaster should be used.
3. One individual with gloved hands will invert buckets of cement above the cleaned substrate and tap on the bottom until the cement deposits out. The cement will be flattened into a thick (2-3 inch) "pancake" with a diameter approximately half that of the coral to be reattached.
4. A different individual(s) will press firmly with twisting the corals into the cement. No repositioned should occur after the corals have been pressed in place. Cement should be kept to the maximum extent possible away from live coral tissue (including from gloved hands) as it is toxic while setting.
5. GPS points and maps of cemented colony locations should be recorded.
6. Digital imagery should be collected of all aspects of the stabilization process.

Materials

Portland Type II cement (5-6 80 lb. bags)

Moulding Plaster

Mixing bowls/tubs (4)

Trowels (2)

Masons hammers (2)

Plastic buckets (10)

Wire brushes (4)

Rubber gloves (for every diver)
Clipboards
Underwater writing paper
Pencils
GPS unit
Digital cameras and video
Dive vessel
Dive equipment
Divers

Escarpment (50 to 75 ft depth)

Colonies of mainly *Pocillopora meandrina*, *Pocillopora eydouxi* and *Porites lobata* were detached and overturned along approximately 500 m of the top edge of the escarpment. These corals will be manually righted and twisted firmly onto existing substrate by divers using the following protocol:

1. Two teams will be established each with boat support, one working from the north end of the damaged area and one working from the south.
2. Forty meters of transect tape will be laid out parallel to the escarpment in areas of heaviest damage.
3. A PVC post will be secured in the substrate every 20 m and numbered using one or more clip ties.
4. In every other 20 m sector, divers will proceed, righting whole colonies and large fragments up to 5 m on either side of the transect line (beyond if time allows), pushing colonies firmly into substrate if possible. The species, size category (greatest diameter: ≤ 5 cm, $5 \geq 10$ cm, $10 \geq 20$ cm, $20 \geq 40$, $40 \geq 80$ cm) and visual estimate of percent damage to the colony will be recorded for each coral righted. The sector and transect position of large overturned colonies and fragments of *P. eydouxi* that require cementing for stabilization will be recorded for all sectors.
5. This process will be repeated along the length of damaged escarpment to the maximum extent possible.
6. Each diver will label their data sheet with their name, date, dive number, dive time, sector number, and turn in data sheets to a named NOAA representative at the end of each dive for data processing.
7. GPS coordinates of each post will be obtained through coordinated efforts of surface and bottom divers using a rope and buoy.

8. Efforts will be made to secure *P. eydouxi* colonies and large fragments, along with other large colonies with cement on following dives using the above listed cementing protocol.
9. Digital photography (still camera) of each transect will be collected from 0.5 m above the substrate for image analysis on later dives. General photographs and video of righting and cementing operations should occur throughout the response.

Materials

50 m transect tapes (2)
1.5 ft PVC posts (25 to 30)
Mallets/hammers (2)
Clipboards (one for each diver)
Data sheets (multiple for each diver)
Pencils (multiple for each diver)
GPS unit
Dive boats (2, or however many available)
Dive equipment
Divers
Digital cameras and video

Monitoring

NOAA Fisheries Pacific Islands Regional Office will lead and conduct monitoring of colony stabilization efforts and success over time. The status of cemented colonies will be assessed annually for over a period approximating five years. All sectors along the escarpment will be visually and photographically assessed for coral species composition, colony size distributions, coral cover, partial death, and whole colony mortality annually over a period approximating five years. Appropriate statistical analyses will be used to test the null hypothesis that stabilization efforts had no effect on long term community recovery and composition.