Establishing A Network of Coral (Acropora sp.) Nurseries Throughout The Bahamas

Agnessa Lundy1 and Felicity Burrows*
Conservation Coordinator 1 and Marine Conservation Specialist2
The Nature Conservancy Northern Caribbean Program
Nassau Bahamas, P. O. Box CB 11398, 242-336-0024 or 703-652-6369

INTRODUCTION

Atlantic Acropora reef cover has been steadily declining over the last few years due to direct physical damage, bleaching and an increase in coral diseases (Biological Review Team, 2005). The deterioration and decrease in reefs is a major threat to the Bahamian way of life as coral reefs play a vital role in the marine environment by providing critical habitat that supports abundant and diverse marine life which are economically important to the Bahamas. The branching morphology of Acropora encourages significant fish recruitment as indicated by Lirman (1999) who demonstrated that live Acropora cover was positively correlated with reef fish abundance, diversity, and distribution. Gardner et al. 2003 indicated the widespread decline of reefs have created a need for their restoration. To increase Acropora coral cover, The Northern Caribbean Program (NCP) has begun establishing an Acropora nursery network in the Bahamas. Acropora corals reproduce sexually via external fertilization of gametes and asexually via fragmentation. Self-fertilization is rarely effective therefore gametes from genetically distinct parents must unite to form viable offspring (The Biological Review Team, 2005). This nursery technique takes advantage of the asexual reproduction of the species by harvesting naturally fragmented corals to populate the nurseries. Once fully established this network will initially increase Acropora coral cover and secondarily increase Acropora larval supply to support growth in coral populations in the region. The NCP team will also harvest tissue samples to determine the degree to which genetics plays a role in influencing Acropora survivorship, growth, tolerance of bleaching and other disturbances.

Fig 1A) Healthy Acropora cervicornis tips were harvested from this diseased donor population to populate the nursery in Southwest New Providence in November 2012. Fig 1B) Fragments were affixed to PVC trees using fishing line and anchored to the seafloor with rope and small duck bill anchors. Fig 1C) Feeding polyps of Acropora cervicornis are extended and coral tissue has grown over the exposed skeleton of the fragments indicating successful growth.

Fig 2A) Parent Acropora palmata fragment of opportunity was identified to populate the nursery. Fig 2B) A palmata coral fragments were attached to the "blocks" known as coral propagation units (CPU) using epoxy adhesive. Fig 3) The first Acropora prolifera nursery was established in the Bahamas in December 2012 off the coast of Andros, Bahamas.

METHODS

Donor populations similar to the Acropora cervicornis coral shown in Fig 1 were identified in the wild for incorporation in the "tree" nursery established in South West New Providence, Bahamas (Fig 2). Nursery site selection investigations were conducted congruently to locating donor populations. After just a few weeks the fragments began to flourish. Fig 3 shows the growth of the same corals in Fig 2. Acropora palmata fragments of opportunity were identified shown in Fig 2A and further fragmented to create the A. palmata nursery shown in Fig 2B. An Acropora prolifera "block" nursery was also established using fragments of opportunity shown in Fig 3.

Fig 5A) A. cervicornis coral have more than tripled their size after only one year in the nursery off of New Providence. Fig 5B) A palmata coral began to show the characteristic "elkhorn" branching after one year of growth in the coral nursery off of New Providence. Another growth indicator is the spread of the coral tissue over the CPU.

ACKNOWLEDGEMENTS


MONITORING

Growth rates are systematically determined by measuring the height, width and thickness of corals. The growth rates will be compared with water quality parameters such as temperature and salinity, the presence or absence of bleaching and or disease prevalence within the nurseries. The Conservancy will be able to assess coral productivity based on these various water quality parameters. After one to two years of successful growth, the healthy corals are removed from the nursery and "outplanted" to a restoration site.

NEXT STEPS

1. Restoration sites will be identified to outplant nursery corals
2. Data loggers will be deployed in the coral nurseries to collect water quality parameters
3. Tissue samples will be collected for genetic testing to determine more resilient genotypes and assess population connectivity between the islands.

MAINTENANCE

Maintenance is crucial to high survivorship of the coral population within the nurseries. Stringent algal removal techniques are employed by a combination of private and public sector volunteers and the Conservancy staff to avoid coral "shading" in Fig 4. Because algae naturally grows faster than corals, the potential for the algae to grow over the corals and block sunlight necessary for coral survivorship is great. Nursery maintenance also involves isolating diseased corals from the healthy nursery population, to avoid spreading the disease, and removing dead corals from the nursery. Dead corals are replaced and CPU components reinforced.

Photo credits: E. Brian Gomes, Stuart Cow's Dive Bahamas; Agnessa Lundy & Felicity Burrows, The Nature Conservancy NCP; Kenneth Amon Lewis, The Nature Conservancy (US)