6. Individual Species Accounts—Western Atlantic

6.1 Genus *Agaricia* (Family Agariciidae)

6.1.1 *Agaricia lamarcki* Milne Edwards and Haime, 1851

Figure 6.1.1. *Agaricia lamarcki* photos copied from Veron and Stafford-Smith (2002).

Characteristics

Agaricia lamarcki has flat, unifacial or encrusting platy colonies that are commonly arranged in whorls. Corallites are in concentric valleys with centers that are widely spaced. Septo-costae clearly alternate in size. Colonies are brown in color, usually with pale margins. Mouths are characteristically white and star-shaped (Veron, 2000).

Taxonomy

Taxonomic issues: None. *Agaricia lamarcki* is similar to *Agaricia grahamae*, which lacks white mouths and has evenly sized septo-costae (Veron, 2000).

Family: Agariciidae.

Evolutionary and geologic history: *Agaricia lamarcki* is fairly common in recent fossil assemblages. However, it has not been identified from the late Pleistocene in fossil assemblages in the Cayman Islands (Hunter and Jones, 1996).

Global Distribution

The range of *Agaricia lamarcki* is restricted to the west Atlantic where it is found throughout the Caribbean; however, it is not known from Bermuda (IUCN, 2010).

Figure 6.1.2. *Agaricia lamarcki* distribution from IUCN copied from http://www.iucnredlist.org.

Figure 6.1.3. *Agaricia lamarcki* distribution copied from Veron and Stafford-Smith (2002).

U.S. Distribution

According to both the IUCN Species Account and the CITES database, *Agaricia lamarcki* is found in Florida, Puerto Rico, the U.S. Virgin Islands, and at Flower Garden Banks (IUCN, 2010).

A search of published and unpublished records of occurrence in U.S. waters indicates that *Agaricia lamarcki* has been reported in Florida (Goldberg, 1973), Puerto Rico (Acevedo et al., 1989; Garcia-Sais, 2010; Morelock et al., 2001), and the Virgin Islands (Rogers et al., 1984; Smith et al., 2010). Bright (1984) identified *Agaricia* at Flower Garden Banks only to genus, although it has been reported in low abundance at the site (Caldow et al., 2009).

Within federally protected waters, *Agaricia lamarcki* has been recorded from the following areas:

- Flower Garden Banks National Marine Sanctuary
- Florida Keys National Marine Sanctuary
- Biscayne National Park
- Dry Tortugas National Park
- Virgin Islands National Park/Monument
- Navassa Island National Wildlife Refuge
- Buck Island National Monument

Habitat

Habitat: *Agaricia lamarcki* is common in areas with reduced light or at depth (Acevedo et al., 1989). It can occur in shallow reef environments (Veron, 2000). It also inhabits reef slopes and walls and can be one of the most abundant corals on deep reefs (Humann, 1993).

Depth range: *Agaricia lamarcki* has been reported in water depths ranging from 10 to 76 m (Carpenter et al., 2008; Ghiold and Smith, 1990) and 3 to 50 m (Humann, 1993). Although *Agaricia lamarcki* can rarely be found in shaded areas in shallow waters, it primarily occurs at deeper depths. The IUCN Red List review emphasized a need for additional information on the population status and recovery potential for this species in deeper waters (IUCN, 2010). *Agaricia lamarcki* has often been found on mesophotic reefs in Curaçao, Florida, Jamaica, and the U.S. Virgin Islands (Ghiold and Smith, 1990). However, coral specimens collected on a recent mesophotic coral cruise at Pulley Ridge, Florida, suggest that corals, such as *Agaricia,* that appear live from video images may actually be covered with algae rather than live coral tissue (J. Voss, Florida Atlantic Univ., Fort Pierce, FL. pers. comm., August 2010).

Abundance

Agaricia lamarcki has been reported to be common (Veron, 2000). On reefs at 30–40 m depths in the Netherlands Antilles, *Agaricia lamarcki* has increased (Bak and Nieuwland, 1995) or shown no decline in abundance from 1973 to 1992 (Bak et al., 2005), even though other non-agariciid corals on the same deep reefs have decreased. It is not known whether this relative stability at depth holds across the full range of the species.

Life History

The specific reproductive strategy of *Agaricia lamarcki* is presently unknown, but its congeners are primarily gonochoric brooders (Delvoye, 1988; Van Moorsel, 1983). The larvae have been reported to primarily settle at relatively deep water depths (26–37 m), although the species has been found in shallow water (Bak and Engel, 1979). Congeneric larvae are known to use chemical cues from crustose coralline algae to mediate settlement (Morse et al., 1988). The species has low recruitment rates—as an example, only 1 of 1074 *Agaricia* recruits in a survey at the Flower Garden Banks may have been *Agaricia lamarcki* (Shearer and Coffroth, 2006). Net sexual recruitment over a decade can be negligible, with reproduction primarily via fission (Hughes and Jackson, 1985). It is a relatively long-lived species, with a half-life of 17 years (Hughes, 1996) and some colonies living more than a century (Hughes and Jackson, 1985).

Agaricia lamarcki deposits a relatively dense skeleton (Hughes, 1987) and is reported to be moderately susceptible to physical breakage during severe storms (Aronson et al., 1993). Maximum size for *Agaricia lamarcki* is up to ~ 2 m in diameter (Humann, 1993), with radial growth rates in Jamaica ranging from 0 to 1.4 cm per year (average growth rate of ~ 5 mm per year), but growing a bit more slowly at depths greater than 20 m (Hughes and Jackson, 1985). Respiration rates have been reported to be relatively high (~ 3.5 µL O_2 per mg per hr) compared to other shallower species, which may be related to zooxanthellae density (Davies, 1980). Photosynthesis by *Agaricia lamarcki* zooxanthellae is sufficient to exceed the coral's metabolic needs, even at depths in excess of 30 m (Porter et al., 1989).

Mortality of *Agaricia lamarcki* is size-specific (range 10%–25%), with high (22%–90%) rates of partial mortality (Hughes and Jackson, 1985). Partial mortality can be induced by interactions with algae (Nugues and Bak, 2006). Sponges can induce partial mortality, as well as cause sublethal stresses such as declines in zooxanthellae concentration, pigment concentration, and tissue condition (Porter and Targett, 1988).

In the Virgin Islands (Rogers et al., 1984) and Curaçao (Bak and Luckhurst, 1980), the overall life history characteristics of *Agaricia lamarcki* have been reported to be roughly parallel to those of *Montastraea annularis*—that is, based on low overall recruitment rates, high survival, and high partial mortality. However, in Jamaica *Agaricia lamarcki* had faster growth, higher recruitment, and lower mortality rates than *Montastraea annularis* at the same site and depth (Hughes and Jackson, 1985).

Threats

Thermal stress: *Agaricia lamarcki* has been reported to be susceptible to bleaching at elevated temperatures (Ghiold and Smith, 1990), via direct loss of zooxanthellae as well as decreased pigment content (Porter et al., 1989). In laboratory studies in Jamaica, *Agaricia lamarcki* tolerated temperatures up to 32°C (Fitt and Warner, 1995), but had virtually complete disruption of photosynthesis occur at 32°C–34°C (Warner et al., 1996). Cold stress has also produced bleaching (Bak et al., 2005). Although bleaching can often be extensive, it may not induce mortality in *Agaricia lamarcki* (Aronson and Precht, 2000; Aronson et al., 1998; Porter et al., 1989).

Acidification: No specific research has addressed the effects of acidification on the genus *Agaricia*. However, most corals studied have shown negative relationships between acidification and growth (Table 3.2.2), and acidification is likely to contribute to reef destruction in the future (Hoegh-Guldberg et al., 2007; Silverman et al., 2009). While ocean acidification has not been demonstrated to have caused appreciable declines in coral populations so far, the BRT considers it to be a significant threat to corals by 2100 (Albright et al., 2010; Hoegh-Guldberg et al., 2007; Langdon and Atkinson, 2005; Manzello, 2010; Silverman et al., 2009).

Disease: *Agaricia lamarcki* was not observed to suffer disease in the Florida Keys in 1996–1998 (Porter et al., 2001), although prior observations in Florida showed that the species may suffer from white plague (Richardson, 1998). *Agaricia lamarcki* also has been vulnerable to white plague disease in Colombia (Garzon-Ferreira et al., 2001) and St. Lucia (Nugues, 2002). Ciliate infections have been documented in *Agaricia lamarcki* (Croquer et al., 2006), and tumors may also affect this species (UNEP, 2010). The ecological and population impacts of disease have not been established for *Agaricia lamarcki*.

Predation: Predation effects on *Agaricia lamarcki* are unknown.

Land-based sources of pollution (LBSP): The effects of LBSP on the genus *Agaricia* are largely unknown. LBSP-related stresses (nutrients, sediment, toxins, and salinity) often act in concert rather than individually and are influenced by other biological (e.g., herbivory) and hydrological factors. Collectively, LBSP stresses are unlikely to produce extinction at a global scale; however, they may pose significant threats at local scales and reduce the resilience of corals to bleaching (Carilli et al., 2009a; Wooldridge, 2009b).

Agaricia sp. typically have small calices and are not efficient sediment rejecters (Hubbard and Pocock, 1972). *Agaricia lamarcki*'s platy morphology could make it sediment-susceptible. Vertical plates of *Agaricia* shed more sediment than horizontally-oriented ones (Bak and Elgershuizen, 1976), and fine sediment suspended in hurricanes can cause much higher mortality in platy corals than hemispherical or non-flat morphologies (Bak, unpublished data; Bak et al., 2005).

Collection/Trade: Some corals in this genus are involved in international trade, especially *Agaricia agaricites* (CITES, 2010). However, only light trade has been recorded for *Agaricia lamarcki*. From 2000 to 2005, gross exports averaged fewer than 10 pieces of coral (CITES, 2010).