6.3 Genus *Dendrogyra* (Family Meandrinidae)

6.3.1 *Dendrogyra cylindrus* Ehrenberg, 1834

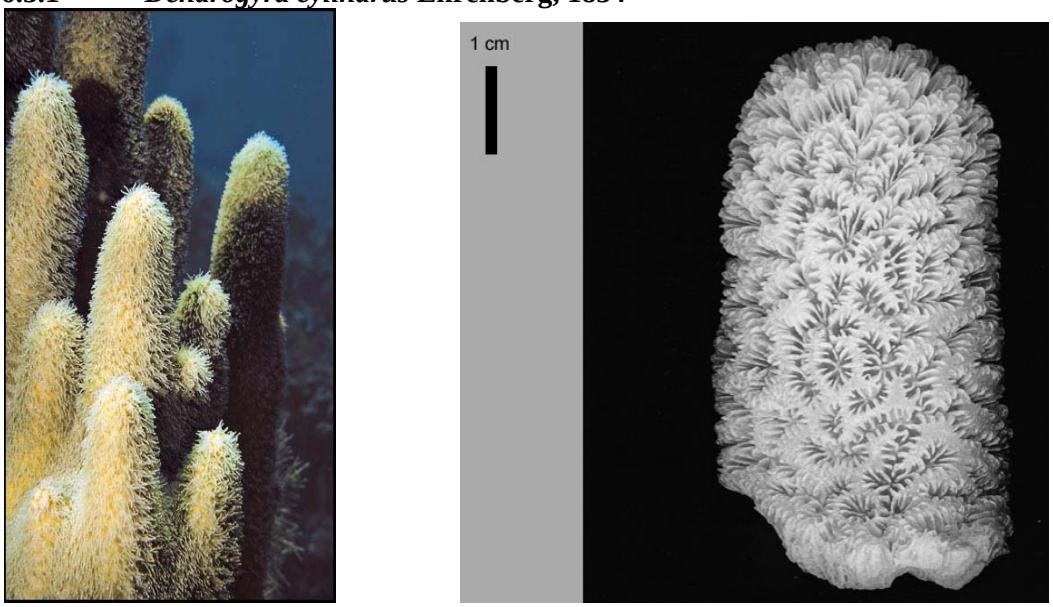

Figure 6.3.1. *Dendrogyra cylindrus* photos and corallite plan copied from Veron and Stafford-Smith (2002).

Figure 6.3.2. *Dendrogyra cylindrus* colony with rapidly progressing partial mortality characteristic of white plague disease. Photo: NOAA Southeast Fisheries Science Center.

Characteristics

Dendrogyra cylindrus colonies have encrusting bases on which cylindrical columns are developed that may reach 2 m in height. Valleys are meandroid. Septo-costae are thick, in two alternating orders; they do not join at the tops of valleys and thus leave a neat groove along the tops of walls. Tentacles remain extended during the day giving columns a furry appearance. Colonies are generally grey-brown in color (Veron, 2000).

Taxonomy

Taxonomic issues: None.

Family: Meandrinidae.

Evolutionary and geologic history: *Dendrogyra cylindrus* is reported to have appeared very recently in the fossil record (Edinger and Risk, 1995) following the Pliocene (~ 1.5 Million years ago [Ma]). *Dendrogyra cylindrus* is the

only species within its genus, perhaps posing greater evolutionary importance since extinction of this species would constitute extinction of a genus.

Global Distribution

Dendrogyra cylindrus is restricted to the west Atlantic where it is present throughout the greater Caribbean but is one of the Caribbean genera absent from the southwest Gulf of Mexico (Tunnell, 1988). A single known colony in Bermuda is reported to be in poor condition (T. Murdoch, Bermuda Zoological Society, Flatts, pers. comm.., May 2010).

Figure 6.3.3. *Dendrogyra cylindrus* distribution from IUCN copied from http://www.iucnredlist.org.


Figure 6.3.4. *Dendrogyra cylindrus* distribution from Veron and Stafford-Smith (2002).

U.S. Distribution

Dendrogyra cylindrus has been reported in the waters of south Florida and the U.S. Caribbean but appears to be absent from the Flower Garden Banks. Within federally protected U.S. waters, the species has been recorded from the following areas:

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

Habitat

Habitat: Dendrogyra cylindrus inhabits most reef environments (Veron, 2000), but in the Florida Keys it appears to be absent in nearshore hard bottoms, nearshore patch reefs, and backreef environments and more common on forereef spur-and-groove habitats (Chiappone, 2010).

Depth range: *Dendrogyra cylindrus* has been reported in water depths ranging from 2 to 25 m (Carpenter et al., 2008).

Abundance

Dendrogyra cylindrus is reported to be uncommon but conspicuous (Veron 2000) with isolated colonies scattered across a range of habitat types. Colonies are often known as landmarks by local divers. Overall colony density throughout south Florida was estimated to be ~ 0.6 colonies per 10 m^2 (Wagner et al. 2010). Overall colony density in Providencia, Columbia, was 172 (SE 177) colonies per km^2 (Acosta and Acevedo, 2006). *Dendrogyra cylindrus* is common in the geologic record of some Pleistocene reefs (Hunter and Jones, 1996), but it is likely that *Dendrogyra cylindrus* is a naturally rare species in modern times. Recent monitoring data (e.g., since 2000) from La Parguera, Puerto Rico, and St. Croix, USVI (NOAA Center for Coastal Monitoring and Assessment, randomized monitoring stations) have shown that *Dendrogyra cylindrus* cover was consistently less than 1% with individual observations up to 4% but with no apparent temporal trend, although trends would be difficult to detect with such low cover values (available online at http://www8.nos.noaa.gov/biogeo_public/query_habitat.aspx).

Life History

Dendrogyra cylindrus is characterized as a gonochoric spawner (Szmant, 1986), although no descriptions of its spawning or larval ecology have been made. The combination of gonochoric spawning reproductive mode with persistently low population densities poses somewhat of a paradox, since this combination is expected to yield very little potential for successful fertilization and, hence, larval supply. Indeed, no juveniles of this species were encountered from surveys of 566 sites in the Florida Keys during 1999–2009 (Chiappone, 2010), neither in larval settlement studies in the U.S. Virgin Islands in the early 1980s (Rogers et al., 1984), nor in juvenile surveys in the mid-1970s in the Netherlands Antilles (Bak and Engel, 1979). *Dendrogyra cylindrus* is effective in propagation by fragmentation, and rare aggregations of colonies (Hudson and Goodwin, 1997) likely result from this asexual reproductive mode following storms or other physical disturbances.

Annual growth rates of 12–20 mm per year in linear extension have been reported in the Florida Keys (Hudson and Goodwin, 1997), but growth rates of ~ 0.8 cm per year have been reported elsewhere in the Caribbean (Acosta and Acevedo, 2006; Hughes, 1987). Partial mortality rates have been size-specific but generally low (Acosta and Acevedo, 2006). Feeding clearance rates are low relative to most other Caribbean corals (Lewis, 1976), but *Dendrogyra cylindrus* has a relatively high photosynthetic rate and stable isotope values suggest it receives substantial amounts of photosynthetic products translocated from its zooxanthellae (Muscatine et al., 1989b).

Threats

Thermal stress: There are conflicting characterizations of bleaching susceptibility of *Dendrogyra cylindrus* in the literature. The species was bleaching-resistant during the 1983 mass bleaching event in Florida (Jaap, 1985). Characterizations of the 2005 mass bleaching event in southern Florida and in the U.S. Virgin Islands noted that no bleached *Dendrogyra cylindrus* colonies were observed (Clark et al., 2009; Wagner et al., 2010). In contrast, Oxenford et al. (2008) report that 100% of the 15 colonies they observed in Barbados during the 2005 mass bleaching event were bleached. Although bleaching of most coral species varies in time and space, understanding the susceptibility of *Dendrogyra cylindrus* is further confounded by the species' rarity and, hence, low sample size in any given survey.

Dendrogyra cylindrus is among the species that are known to be sensitive to cold shock in the Caribbean (Muscatine et al., 1991), potentially serving as a stress to this species in areas prone to cold winter temperatures such as the Florida Keys. *Dendrogyra cylindrus* hosts clade B zooxanthellae in Mexico (LaJeunesse, 2002), Belize, and Barbados (Finney et al., 2010). Zooxanthellae in clade B do not grow well at high temperatures (Kinzie et al., 2001), but in the field, corals with this clade may be relatively bleaching-resistant (McField, 1999). Experimental studies suggest clade B is more bleaching-resistant than clade C but less resistant than clade A (Warner et al., 2006).

Acidification: No specific research has addressed the effects of acidification on the genus *Dendrogyra*. 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: *Dendrogyra cylindrus* colonies have been affected by black-band disease (Ward et al., 2006). More extensive impacts to these rare populations likely occur from white plague, which can cause rapid tissue loss (Miller et al., 2006b). The large colony size suggests that individual colonies are less likely to suffer complete mortality from a given disease exposure, but low colony density in this species suggests that even small degrees of mortality increase extinction risk.

Predation: The corallivorous fireworm, *Hermodice carunculata*, has been observed on diseased colonies of *Dendrogyra cylindrus* (Miller et al., 2006b), but, generally, predation is not observed to cause noticeable mortality on this species, despite its rarity.

Land-based sources of pollution (LBSP): Sediment stress is a complicated response; most sediment effects are negative (Fabricius, 2005; Rogers, 1990), although some corals are sediment-tolerant. Bak and Elgershuizen (1976) found that the rate of sand removal from *Dendrogyra cylindrus* tissues in laboratory conditions was intermediate among 19 Caribbean coral species tested. Along a eutrophication gradient in Barbados, *Dendrogyra cylindrus* was found at only a single site—one of those farthest removed from pollution (Tomascik and Sander, 1987a).

Overall, 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).

Collection/Trade: Overall trade reports (CITES database) indicate very low rates of international trade of *Dendrogyra cylindrus* (exception of anomalous report of 6000 pieces imported by Portugal from Mozambique in 1996). It is possible that historical curio collecting of *Dendrogyra cylindrus* may have significantly reduced populations off Florida (Colin, 1978).