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# Developmental Anomaly and Deformity in *Fungia fungites* (Anthozoa: Scleractinia: Fungidae) from Suakin and Port Sudan, Red Sea, Sudan

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**Abstract**

Specimens of the mushroom coral *Fungia fungites* from Suakin and Port Sudan were examined to document two anomalous skeletal fusion and several deformity patterns. Measurements were taken with a tape accurate to 0.1 cm. Both specimens show two firmly fused discs separated by irregular cleavage lines. The larger Suakin specimen (≈113 $cm^2$) displays unequal discs and slight growth overlap near the attachment scar, whereas the Port Sudan specimen (≈50 $cm^2$) has nearly equal discs with multiple attachment scars. Septa remain vertically arranged in all discs. Deformed corals suggest larval settlement in confined microhabitats influencing disc shape and skeletal development in this species.

**Keywords:** Mushroom corals; Developmental anomalies; Red Sea; Sudan

## Introduction

*Fungia fungites* (L., 1758) is a solitary, free-living mushroom coral. Unlike colonial reef-building corals, it develops from a single polyp [1]. Juveniles initially remain attached during a stalked stage but later detach and live independently on sandy reef areas and rubble [2]. The species feeds on prey from bacteria to mesozooplankton [3].

Morphological and ecological characteristics of *F. fungites* and related taxa were extensively studied by Hoeksema [4] through analyses of type specimens and skeletal structures. Septo-costal ornamentation was examined using scanning electron microscopy, while photographic methods documented related taxa.

Earlier classifications recognized 30 species within Fungia. Phylogenetic studies integrating molecular data with morphological characters reduced it to a single valid species fungites within the genus [5,6]. Phylogenetic analyses place it within a clade including *Halomitra pileus*, *Halomitra clavator*, and *Danafungia scruposa*. Recently, findings by Yutaro et al. [7] suggests *F. fungites* may constitute a species complex exhibiting notable phenotypic variation among populations.

## Material

Two developmental anomalies were obtained from antique merchants. One from Suakin (Figure 1) and the second from Port Sudan (Figure 2). Measurements were by a tape accurate to 0.1 cm. In addition, several out of hundreds deformed *F. fungites* were collected from both locations for teaching and museum display.

## Results and Discussion

The Suakin specimen of *F. fungites* (Figure 1 a & b), approximately 113$cm^2$, is firmly joined. The cleavage line is not straight and led to formation of a large and a small disc. In the small disc the attachment scar is slightly raised probably due to growth overlap. The septa, above and underneath the disc are clearly vertical.

The Port Sudan specimen of *F. fungites* (Figure 2), approximately 50$cm^2$, is also firmly joined. The cleavage line is not straight, and the two discs are almost equal. One disc has 4 and the other have 2 attachment scars. The septa were clearly vertical.

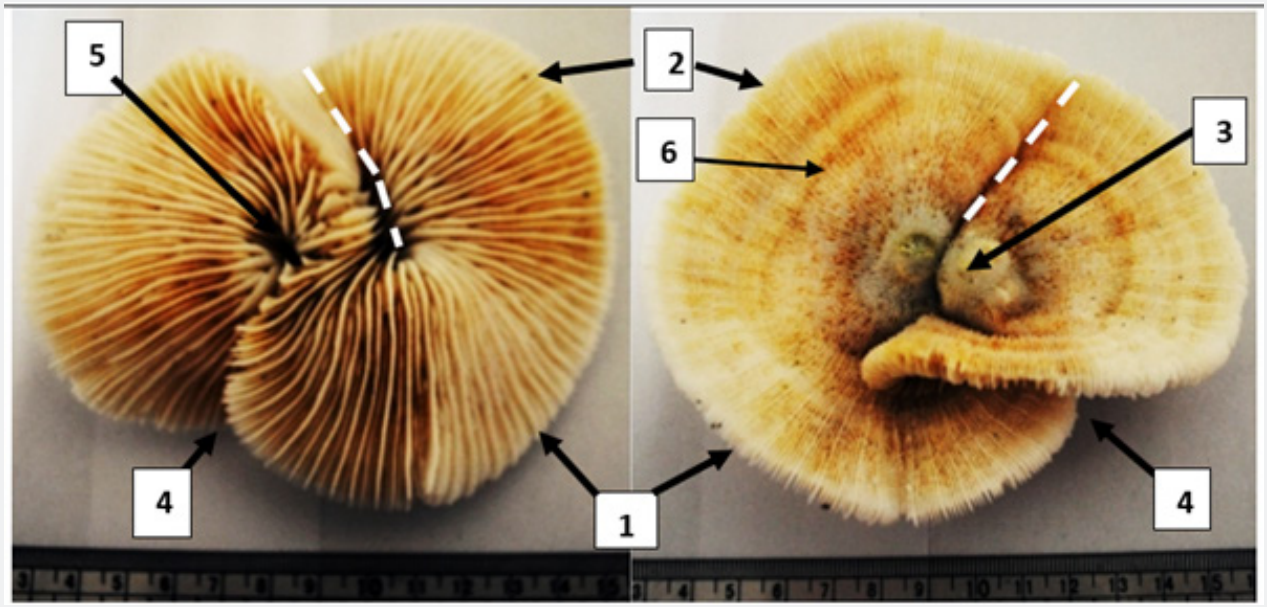


**Figure 1a:** *Fungia fungites,* oral view left, aboral view right. 1=Disc margin, 2=Septa, 3=Attachment scar, 4=Overlap, 5=Apical furrow, 6= Growth ring. Cleavage line (dashed line).

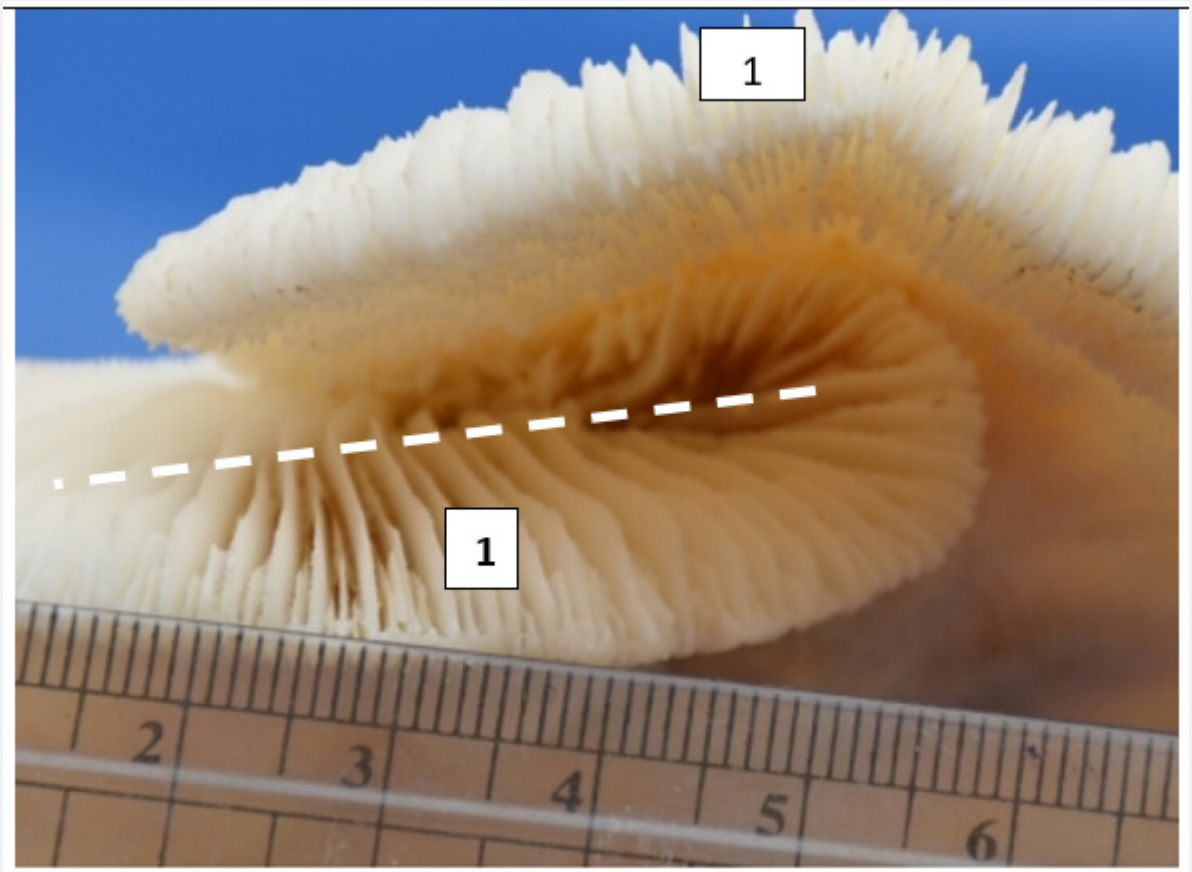


**Figure 1b:** Fungia *f. fungites* discs overlap (side view).



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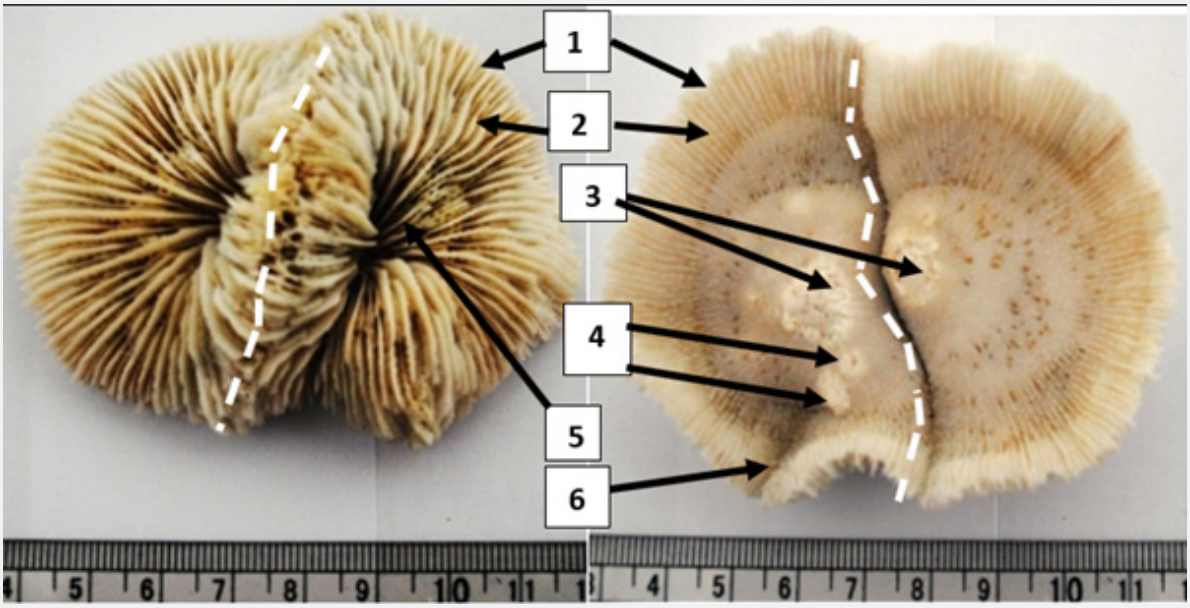


**Figure 2:** Fungia fungites, oral side view left, aboral side view right. 1=Disc margin, 2=Septa, 3=Attachment scar, 4=Two small attachment scars, 5= Apical furrow, 6=Suppressed fusion line, Cleavage line (dashed line).

**Figure 3:** Three deformed *Fungia fungites*, skewed and compressed discs in oral view (upper) and aboral view (lower).



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The occurrence of two fused polyps in mushroom corals is rare but not unknown. Fused individuals of *Fungia (Danafungia) scruposa* (Klunzinger, 1879, valid name=*F. fungites*); *Heliofungia actiniformis* (Quoy & Gaimard, 1833), *Ctenactis echinata* (Pallas, 1766) and juveniles of *Herpolitha limax* (Esper, 1797) were documented by Hoeksema (1989 and in *Fungia granulosa* (Klunzinger, 1879, valid name= *F. fungites*) was photographed and displayed at www.marinelifephotography.com [8]. The differences in measurements of Suakin and Port Sudan specimens (Table 1) is in harmony with their differences in sizes.

The examined *Fungia fungites* specimens from Suakin and Port Sudan show rare skeletal fusion and morphological variation. Irregular cleavage lines and firmly fused discs suggest developmental anomalies during early growth. The unequal discs and overlapping growth in the Suakin specimen indicate post-cleavage skeletal interaction, whereas multiple attachment scars in the Port Sudan specimen may reflect fusion of regenerating polyps. Similar fused conditions have been reported in *Heliofungia actiniformis*, *Ctenactis echinata*, and *Herpolitha limax* [9] and may be linked to developmental processes and environmental constraints [10,11].

Deformity in *F. fungites* were observed in many specimens (Figure 3). This is probably due to settlement of the tiny larvae in a narrow confinement. As the larvae start to secrete its hard carbonate exoskeleton and grow, the confinement shaped the disc growth, attachment and morphology. This is apparent from several compressions and attachment points observed in discs. The deformed discs are either round-distorted or oval- distorted but the septa are clearly vertical.

The observed disc deformities are likely a consequence from larval settlement in confined microhabitats influencing skeletal growth and disc morphology. Disc deformity in mushroom corals has been reported by Hoeksema [4], Hoeksema and Moka [9], Arrigoni et al. [12] and Eyal-Shaham et al. [13].

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