Schizoretepora hassi sp. nov. (Bryozoa: Phidoloporidae) from Lebanon (Eastern Mediterranean) and reappraisal of Schizotheca serratimargo (Hincks, 1886)

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Abstract: Schizoretepora hassi sp. nov., one of the most frequent bryozoans in shaded rocky habitats sampled along the coasts of Lebanon between 3 and 36 m depth, is described here. Its status as steno-endemic in the Levantine basin versus successful Erythraean immigrant is unresolved. Colonies erect and typically with a distinct abfrontal surface occupied by kenozooids, are variable in shape, from ramose with dichotomic branching to retetiform. The great similarity of its autozooids and avicularia with those of the bilaminate Schizotheca serratimargo argues for classing the latter in the genus Schizoretepora.

Keywords: Bryozoans ● New species ● Levantine basin ● Lessepsian species

Introduction

The Levantine basin in the Eastern Mediterranean is characterized by a particularly warm climate (Abboud-Abi Saab et al., 2004) associated with high salinity and biotic instability caused by the increasing influx of alien species from the Red Sea (e.g. Por, 1989; Galil, 2000). The bryozoan fauna of the Eastern Mediterranean is less studied than that of the Western Mediterranean (Rosso, 2003) and the deficit in knowledge is particularly acute in the Levantine area where the bryozoan fauna is known only from few papers (e.g. Powell, 1969; Ünsal & d’Hondt, 1979; d’Hondt, 1988; Nicoletti et al., 1995; Chimenz et al., 1997; Koçak et al., 2002).
Several surveys of the littoral benthos along the coast of Lebanon were undertaken by means of diving between 1999 and 2003 within the frame of the French-Lebanese programme of scientific cooperation CEDRE. Extensive sampling by the authors from 0 to 40 m depth produced a large collection of bryozoans from various habitats. This collection comprises about 95 species including a notable number of alien species never recorded in the Mediterranean (Harmelin et al., in prep.). One of the most common and conspicuous species in shaded rocky habitats was an erect phidoloporid. When compared with other Atlanto-Mediterranean phidoloporids it turned out to be a previously undescribed species of *Schizoretepora* (here named *S. hassi* sp. nov.). This comparison also led to re-examine the generic position of the well-known *Schizotheca serratimargo* (Hincks, 1886), which should be assigned to *Schizoretepora* because of its many morphological similarities with the new species.

**Material and methods**

The studied specimens were collected during four diving surveys of benthos along nearly the entire coastline of Lebanon between 1999 and 2003. SEM observations were made at the Station Marine d’Endoume with a Hitachi S-570 on specimens cleaned with commercial bleach (sodium hypochlorite) and gold coated. Measurements were made with a Wild stereomicroscope. The type material was deposited at the Muséum national d’Histoire naturelle, Paris (MNHN), Natural History Museum, London (NHM) and the Senckenberg Museum, Frankfurt (SMF). Remaining material is kept, in part, at the Lebanese University, Faculty of Science, Department of Natural Sciences, Hadath and provisionally at the Centre d’Océanologie de Marseille, Station Marine d’Endoume, 13007 Marseille.

*Schizoretepora hassi* sp. nov.

**Type material**

Holotype: Ras El Chakaa (N Batroun), 10-13 m, overhang, 19/10/1999; MNHN BRY-20060 (Fig. 1D pars).  
Paratypes: Six sets of specimens. 1: same locality as holotype, 10 colonies or fragments; SMF 3026 (Fig. 1D pars). 2: Ras El Chakaa, 3-5 m, cave, 19/10/1999, 10 colonies or fragments; NHM 2007.3.15.1-10 (Fig. 1A). 3: Tripoli, Ramkine Island, 5-7 m, cave, 14/07/2003, 10 colonies or fragments; SMF 3027, 4: Selaata (N Batroun), 6 m, cave, 23/10/1999, 6 colonies or fragments; MNHN BRY-20061 (Fig. 1B). 5: Selaata, 32 m, overhang, 2/05/2001, 2 colonies; NHM 2007.3.11-12 (Fig. 1C). 6: Beirut, Harf El Kalb, 34 m, overhang, 21/10/1999, 1 reticulate colony; MNHN BRY-20059 (Fig. 1E).


**Etymology**

Dedicated to Dr. Hans Hass, famous Austrian pioneer in scientific diving and underwater photography and cinematography, author of a thesis on reteporids collected by diving in the Mediterranean Sea during the 1940’s.

**Description**

Colonies yellow to pale pink, small (< 1 cm) to medium-sized (2.5-3 cm), erect, fan-shaped or forming a corolla; branches relatively narrow (Table 1), strongly calcified, ramifying more or less regularly directly from the base, occasionally with anastomoses resulting in elongate, irregular or more evenly reticulate fenestrae (Fig. 1). Frontal surface of branches moderately or notably convex, comprising 3 to 8 longitudinal rows of autozooids arranged quincuncially (Fig. 2A). Abfrontal surface occupied by kenozooids, very convex, often with vertical sides bordering the frontal face (Fig. 2B). Autozooids slightly longer than wide, separated by distinct sutures; frontal shield with irregularly shaped nodules and 2-4 large, marginal pores (Fig. 2A-C). Primary orifice semi-elliptical, longer than wide; distal rim with 15-18 acute to blunt, triangular denticles, proximal border with a u-shaped sinus flanked by irregularly mamillated condyles (Fig. 3A). Secondary orifice with a pseudosinus similar in size and shape to the sinus, forming a gutter as secondary calcification proceeds; peristome relatively low in young zooids, thicker in older zooids, but generally without distinct lateral flanges; four to six latero-distal oral spines, thin, moderately long (180-200 μm), easily detached from their base; bases particularly thick, fused by calcification into two arched, bilateral units, rapidly covered by secondary calcification (Fig. 3A). Adventitious avicularia single, irregularly present, typically proximo-lateral to orifice and directed latero-distally, occasionally laterally, relatively large (length: 0.4 to 0.5 times the autozooid width; table 1), crossbar proximal and oblique to pseudosinus, tip of rostrum generally reaching the level of the distal half of orifice; mandible proximal and oblique to frontal plane, on distally swollen cystid (Fig. 2A-B). Giant, vicarious avicularia present on lateral sides of branches; directed distally or laterally; rostrum...
acute, triangular, with hooked tip; crossbar robust, without a columella; uncalcified area of rostrum triangular; opesia small; cystid large, nodulous, with 2-5 large pores, extending on the abfrontal face (Fig. 2A, B & D). Ovicell recumbent on distally adjacent autozooid, with frontal wall smooth, imperforate, with broad, elliptical frontal fissure; prominent and visible on young colony parts, afterwards immersed in secondary calcification (Fig. 2C). Abfrontal avicularia large, nodular, polygonal, generally arranged in two rows along the branches, with one to 5 pores, apparent or immersed sutures, bearing small, acute, triangular avicularia sporadically present, generally more frequent at the colony base (Fig. 2D).

**Habitat**

*Schizoretepora hassi* has been collected in 9 localities along the coast of Lebanon, from Ramkine Island (off Tripoli) in the north to El Zahrani in the south, ranging from 3 to 34 m depth. However, it probably occurs in even deeper water. All samples are from shaded hard-substrate habitats such as overhangs, caves, and undersides of boulders. Colonies were found particularly abundant on vertical walls of small caves with significant water circulation. The associated sessile fauna comprised many other bryozoans, including several lessepsian species (Harmelin et al., in prep.), scleractinians (*Polycyathus mullerae,*...
Figure 2. *Schizoretepora hassi* sp. nov. Selaata, overhang, 20 m (A, B, D); El Zahrani, 14 m (C). 

A. Branch tip with 11 autozooids and two giant vicarious avicularia. B. Two giant vicarious avicularia and an autozooid. C. Ovicellate autozooid from a young branch part, a second ovicell with secondary calcification is visible at the bottom of the picture. D. Abfrontal face with two kenozooids bearing an avicularium and a spirorbid embedded in the kenozooidal calcification. Scale bars: 200 µm (A, B, D), 100 µm (C).

Figure 2. *Schizoretepora hassi* sp. nov. Selaata, surplomb, 20 m (A, B, D); El Zahrani, 14 m (C). A. Extrémité d’une branche avec 11 autozoïdes et deux aviculaires vicariants géants. B. Deux aviculaires vicariants géants et un autozoïde. C. Autozoïde ovicellé d’une partie jeune d’une branche, une seconde ovicelle avec de la calcification secondaire est visible dans le bas de la figure. D. Face dorsale avec deux kénozoïdes portant un aviculaire et un spirorbe enfoui dans la calcification secondaire. Echelle : 200 µm (A, B, D), 100 µm (C).
Phyllangia mouchezi, Abel, 1959; Madracis pharensis Lacaze-Duthiers, 1897), sponges, tunicates (in particular the conspicuous lessepsian species Herdmania momus, Savigny, 1816).

Discussion

The finding of a conspicuous, new phidoloporid widely distributed along the coast of Lebanon raised the problem of its generic identity, but also of that of a well known species, Schizotheca serratimargo, which shows many similar morphological traits. The morphological plasticity of colonies of this new species is remarkable and zooids are also variable to a lesser extent. As the Levantine basin is a hot spot for species introduction in the Mediterranean, the question of the biogeographic origin of S. hassi sp. nov. is addressed.

All morphological features of S. hassi are in accordance with the definition of genus Schizoretepora Gregory, 1893. This genus gathers phidoloporids with erect colonies either fenestrate or ramose, autozooids with sinuate primary orifice and devoid of proximal oral avicularium, and ovicell with a broad frontal fissure and without labellum (e.g. Gautier, 1962; Zabala & Maluquer, 1988). None of the Schizoretepora species listed by Phil Bock (2006) in his web site on bryozoans corresponds with the present species. Schizoretepora solandria (Risso, 1826), a ‘viculariform’ species rather common in the Mediterranean, differs from S. hassi mostly in having a well-developed peristome forming a high collar with a spiramen and an upper slit. Other differences relate to the shape and orientation of the adventitious avicularium, the lateral arrangement of the giant vicarious avicularia, the presence of abfrontal, vicarious avicularia only near the base of the peristome, and position of the adventitious avicularia and of the giant vicarious avicularia, the shape of the primary and secondary orifices including the beaded anter and the thick and fused bases of the orificial spines. However, S. hassi clearly differs from S. serratimargo in the greater number of oral spines (4-6 instead of 2-4), the smaller size of zooids and colonies (Tab. 1), and obviously in having branches with frontal and abfrontal surfaces, the latter bearing kenozooids. The great similarity between S. serratimargo, S. hassi and S. solandria in zooidal characters (Fig. 3) argues for ascribing S. serratimargo to the same genus, i.e. Schizoretepora. The bilaminate structure of branches of S. serratimargo does not preclude this attribution. The capacity of Schizoretepora to produce a bilaminate colony was already described in the case of the type species, S. tesselata (Hincks, 1878), which is normally fenestrate but can develop secondary, folded, bilaminate lobes (Harmer, 1934; Hayward & Cook, 1983). The particularity of S. serratimargo is that this capacity is permanently expressed. Therefore, we consider that S. serratimargo should be classed in Schizoretepora and that Schizotheca should be restricted to encrusting species.

Schizoretepora hassi presents a great plasticity in colony shape. Most collected colonies are ramose, with branches bifurcating irregularly in several contorted planes or more regularly in a concave fan or corolla (Fig. 1). Adjacent branches may join and fuse into an irregular mesh (Fig. 1B) or a typical fenestrate structure (Fig. 1E). The few available fenestrate colonies were collected on a deep-water (34 m), overhanging wall together with ramose colonies. However, the scarcity of those reteporiform colonies should exclude any environmental inference from their location. Young, terminal parts of branches are generally slightly compressed (Fig. 2A), but older parts are subcylindrical with the frontal and abfrontal faces separated by vertical sides bearing giant vicarious avicularia. Although smaller, colonies of S. hassi are very similar in shape to those of the Indo-Pacific species Reteporella graeffei (Kirchenpauer, 1869) (see Harmer, 1934, pl. 35, fig. 12-15), and of Reteporella elegans Harmelin, 1976. The latter, considered to be a Mediterranean endemic, occurs in coralligenous bottoms from SE Sicily (Di Geronimo et al., 2002) and in caves at Malta (J.G. Harmelin, unpublished data) but is apparently absent from Lebanon.
Figure 3. *Schizoretepora hassi* sp. nov. A, B, D. Primary and secondary orifice of young autozooids with fused bases of distal oral spines of *S. hassi* sp. nov. (A: Selaata, 20 m), *Shizoretepora solanderia* (B: France, Marseille, Riou, 14 m) and 'Schizotheca’ *serratimargo* (D: Italy, Bari, 12 m). C, *S. serratimargo*, Bari, 12 m, three older autozooids with a lateral, giant, vicarious avicularium. Scale bars: 50 µm (A, B, D), 200 µm (C).

Figure 3. *Schizoretepora hassi* sp. nov. A, B, D. Orifice primaire et secondaire de jeunes autozoïdes avec les bases fusionnées des épines orales de *S. hassi* sp. nov. (A : Selaata, 20 m), *Shizoretepora solanderia* (B : France, Marseille, Riou, 14 m) et 'Schizotheca’ *serratimargo* (D : Italie, Bari, 12 m). C, *S. serratimargo*, Bari, 12 m, trois autozoïdes plus âgés avec un aviculaire vicariant géant latéral. Echelle : 50 µm (A, B, D), 200 µm (C).
The frontal aspect of the zooids of *S. hassi* is highly variable within each colony depending on their position and age, i.e. the amount of secondary calcification. The oral spines are easily detached and their fused bases are visible only on young zooids. The same range of variation in zooidal characters was observed in colonies from different localities. The frequency of the different types of avicularia was variable but no particular pattern could be evidenced either within individual colonies or between colonies, except for the abfrontal, vicarious avicularia whose frequency tends to increase towards the base of the colony. In several samples, spirobids colonising proximal parts of the abfrontal surface were embedded by secondary calcification (Fig. 2D).

The discovery of an undescribed but common and particularly conspicuous bryozoan in the Mediterranean could be surprising considering that the bryozoan fauna of this sea and the Adriatic Sea is relatively well known. However, as stressed by Rosso (2003), knowledge of the biodiversity of the Eastern Mediterranean is still poor. This is especially obvious in the Levantine area, which contrasts considerably with other regions of the Mediterranean. This area has never been investigated in great detail, especially on the basis of collections taken by diving, which allows sampling in cryptic habitats, usually populated by many bryozoans. Another case of remarkable recent discovery in Lebanon is that of two conspicuous lithistid sponges in caves (Pérez et al., 2004). The finding of *S. hassi* suggests two alternative hypotheses: (i) it is a steno-endemic restricted to the Levantine area, or (ii) it is an alien species settled for long in this area, coming probably from the Red Sea via the Suez Canal. Further surveys in other areas of the Eastern Mediterranean and in the Red Sea will be needed to precisely map the actual distribution of this species, which presently is one of the most characteristic components of sciaphilic communities from rocky habitats along the Lebanese coast.

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**References**


