

## Morphological Analysis

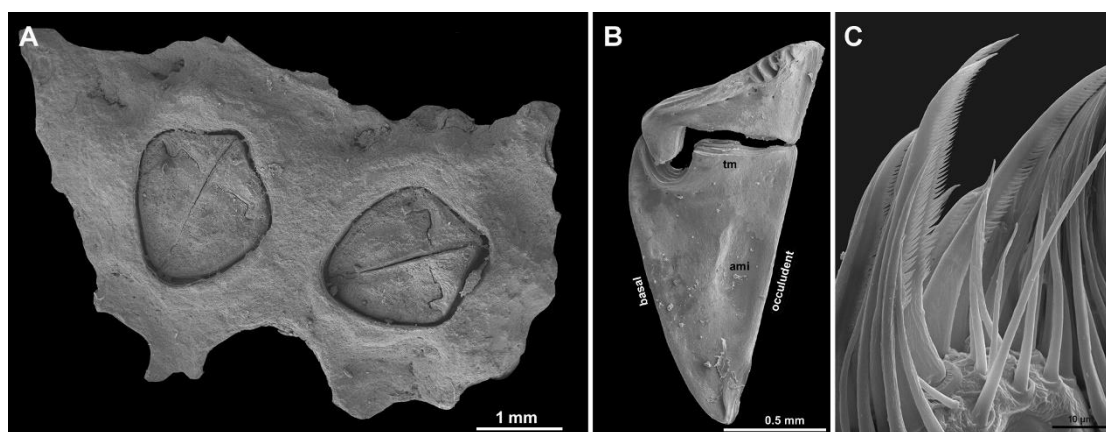
We randomly selected specimens from Agadir (Morocco) and Ngor (Senegal) for the morphological analyses. External diagnostic features were examined using an Olympus SZX10 dissecting microscope. For scanning electron microscopy (SEM) examination, air-dried specimens were soaked in diluted household bleach for two hours, washed in distilled water, and then examined under a dissecting microscope; adhering debris and chitin were removed using a fine paintbrush and entomological needles. The clean isolated opercular valves were mounted on brass stubs and then coated with gold. The scanning electron microscope (JEOL 840, Tokyo, Japan) fitted with a semaphore system (JEOL, Tokyo, Japan) was for digital imaging. Images were processed using the Autobeam software (MiTek Australia Ltd). For the morphological analysis, we measured the width and the length of the opercular valves and the width of the adductor muscle insertion at its widest point. For measurements, we used the SEM photographs of the inner side of opercular valves using vernier calipers, to the nearest millimeter.

The first and second cirri were dissected from ethanol-fixed specimens using entomological needles and were used for microscopic and SEM examination. The dissected cirri were soaked for a few minutes in 100% ethanol, then transferred to acetone for 30 min and dehydrated using the critical point drying (CPD) method. Then, the samples were mounted on the SEM brass stubs, coated with gold, and examined as described above.

In many localities, *Chthamalus montagui* occurs together with the congeneric species *C. stellatus* (Crisp et al., 1981). It is recognized and separated from it by the opening of the shell (operculum) kite-shaped or sub-quadrangular, the joint between the terga and scuta crosses the center line of the operculum, and the suture between the terga and scuta is concave towards the rostrum. These features are common to all populations of *C. montagui*, with slight differences within and between populations due to size, shell erosion, and population density (Southward, 1976). The specimens from Senegal populations exhibit these diagnostic characteristics of *C. montagui* (Figure 1A).

Pilsbry (1916) and Southward (1976) noted that within the genus *Chthamalus*, the mouthparts are indistinguishable and are of limited value in the separation of species. We, therefore, did not use the morphology of the mouthparts as

a possible marker for separation within the two clades of *C. montagui*. On the other hand, differences in the morphology of setation, mainly of the first and the second cirri, are significant characteristics for separation between species of *Chthamalus*. In *C. montagui*, there are no conical spines on the basal segments of the anterior ramus of cirrus I, the setae on terminal segments of both rami of cirri I and II are pectinate, and basal guards are absent (Dando & Southward, 1980). These features are found in the specimens from Senegal (Figure 1C).



**Figure 1.** *Chthamalus montagui*: **A.** Two specimens from Ngor, Senegal. **B.** Inner side of opercular valves from a specimen from Ngor, basal and occludent margins are indicated (tm = tergal margins, ami = adductor muscular insertion). **C.** Pectinated setae on terminal segment of ramus I. from Ngor, Senegal.

Comparison of allometric parameters between (1) *C. stellatus*, (2) *C. montagui* from different locations in the Mediterranean and Europe (Southward, 1976), and (3) *C. montagui* from Senegal, indicate that morphologically, the population from Senegal does not differ from the northeastern population (Table 1).

**Table 1.** Ratio of dimensions (mean  $\pm$  SD) of scutum and adductor muscle insertion in *C. stellatus* and in *C. montagui* from Northeast Atlantic (Southward, 1976) and from Senegal (present study). *N* represents the number of specimens examined. (A) Scutum: width to length; (B) Width of adductor muscle pit to width of scutum at the same level; (C) Adductor muscle pit (ami in Figure 2B): width to length.

Species	<i>N</i>	(A)	(B)	(C)	Source
(1) <i>C. stellatus</i>	9	0.67 $\pm$ 0.05	0.41 $\pm$ 0.06	0.70 $\pm$ 0.09	Southward, 1976
(2) <i>C. montagui</i> NE Atlantic	6	0.54 $\pm$ 0.03	0.24 $\pm$ 0.03	0.34 $\pm$ 0.07	Southward, 1976
(3) <i>C. montagui</i> Senegal	6	0.56 $\pm$ 0.02	0.25 $\pm$ 0.06	0.42 $\pm$ 0.05	This study

## References

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