CONTRIBUTIONS TO THE RUNCINIDAE.II. THREE NEW SPECIES AND COMPARATIVE STUDIES ON FIVE ESTABLISHED SPECIES OF RUNCINA (OPISTHOBRANCHIA CEPHALASPIDEA) IN THE MEDITERRANEAN

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VIE ET MILIEU, 2002, 52 (2-3) : 85-102

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RUNCINA
OPISTHOBRANCHIA
MEDITERRANEAN
RADULA
ORAL ARMATURE
SEM

ABSTRACT. – Three new species are described: *Runcina hornae* n. sp. is elongated rectangular and all over orange with a discontinuous white cross-band behind the eyes; *R. rotunda* n. sp. is plump and black with white spots bordering weakly notum and foot and densely the tail; *R. elongata* n. sp. is very slim and middle brown with a dark brown granulation, some larger dark brown spots on the head and a clear tail. An account is given of *R. coronata* (Quatrefages, 1844); *R. adriatica* Thompson, 1980; *R. africana* Pruvot-Fol, 1953; *R. brenkoae* Thompson, 1980; and *R. ferruginea* Kress, 1977; with further details on live coloration, radula and jaws by SEM. For the first time *R. coronata* is redescribed from the locus typicus, the Bretagne (France), since its original description. A synopsis of the world's Runcinacea is given.

RUNCINA
OPISTHOBRANCHIA
MÉDITERRANÉE
RADULA
ARMATURE BUCCALE
MICROSCOPIE À BALAYAGE

RÉSUMÉ. – Trois nouvelles espèces sont décrites : *Runcina hornae* n.sp., rectangulaire et allongée, entièrement orange avec une bande transversale blanche à l'arrière des yeux ; *R. rotunda* n.sp. est trapue et noire avec des points blancs espacés au bord du notum et du pied et rapprochés sur la queue ; *R. elongata* n. sp. est très grêle, brun moyen avec des granulations brun foncé, quelques taches marron foncé plus larges sur la tête et une queue claire. Une revue à propos de *R. coronata* (Quatrefages, 1844) ; *R. adriatica* Thompson, 1980 ; *R. africana* Pruvot-Fol, 1953 ; *R. brenkoae* Thompson, 1930 ; et *R. ferruginae* Kress, 1977 est donnée, avec de nouveaux détails sur la coloration sur le vivant, la radula et les machoires vues au MEB. *R. coronata* est redécrite pour la première fois depuis sa description originale à partir de la station type de Bretagne (France). Un synopsis des Runcinacea du Monde est dressé.

To the late T.E Thompson

INTRODUCTION

In the Runcinidae (Burn, 1963) there are some very well analysed species. On the other hand there are many genera and species incompletely analysed and sometimes comprising only one specimen. Therefore it is difficult to determine which character state is plesiomorphic and which is apomorphic. Synapomorphic in this group are the undivided notum, four gizzard plates (see Schmekel & Cappellato 2001), and the terminal and median anus. The first cladistically generated, testable morphology-based phylogeny for cephalaspids has been recently developed by Mikkelsen (1996). Studies on this question are in progress (Schmekel, Cappellato & Wägele).

In this paper we describe two new species based on only one specimen: *Runcina rotunda* n. sp. only one specimen out of four could be fixated, *R. elongata* n.sp. and a third species, *R. hornae* n.sp., comprising four specimens. For the first time we redescribe the dark type species *R. coronata* (Quatrefages, 1844) from very near the locus typicus, Roscoff, with SEM micrographs of jaws and radula, and give new SEM data on the very common *R. adriatica* Thompson, 1980, and *R. brenkoae* Thompson, 1980, *R. africana* Pruvot-Fol, 1953, and *R. ferruginea* Kress, 1977, all refound at Banyuls. The characteristic features of all nine new

species and the already established species reported here are given (Table I), plus a brief synopsis of the diagnostic features of the world's Runcinacea. In part I of this work the reader can find a diagnosis of the Runcinacea (Odhner, 1939), the Runcinidae (Burn, 1963) and the genus *Runcina* Forbes & Hanley, 1853, and an extensive introduction to the morphology with new SEM facts on jaws and radula. Part I (Schmekel & Cappellato 2001) contains the description of six new species, *R. langei* Schmekel & Cappellato, 2001; *R. kressae* Schmekel & Cappellato, 2001; *R. hansbechi* Schmekel & Cappellato, 2001; *R. nivale* Schmekel & Cappellato, 2001; *R. banyulensis* Schmekel & Cappellato, 2001; *R. avellana* Schmekel & Cappellato, 2001.

MATERIAL AND METHODS: see Schmekel & Cappellato 2001. Abbreviations: b.: broad; comp.: compare; c.p.d.: critical point dried; fix.: fixated; h.: height; l.: length; Lab.: Observatoire; Mus.: Museum; rad.: radula; spec.: specimen; w.: width

RESULTS

Runcina hornae n. sp. (Pl. Ic,IIa-h,Table I; Pl. IIb/ part I).

Material: 4 specs., 1.2–2.1 mm l., Banyuls, Racou, March 30th, 1996, *Posidonia* rhizomes dredged at night at 5–8 m depth (loc. typ.). Holotype at Senckenberg Mus., Frankfurt, N° 322857.

Living holotype (Pl Ic) 2.1 mm l., 0.6 mm w., and 0.3 mm h., tail 0.5 mm. Body shape elongated rectangular, widest at the rear. Notum smooth, distinct head lobes, notum rear tapered and slightly raised. Eyes small, rather dorsal and close to the buccal mass. Foot as wide as notum, tail long, slightly pointed. Anus terminal and median, one rounded, small and inconspicuous gill lamina to the right of it. Common genital orifice not detectable.

Animal (Pl. Ic) bright orange all over, resulting from a dense sprinkling of sandy, finest brown specks on a transparent yellow ground colour. Transparent anterior notum rim narrowly coloured in a more intensive orange without any brown sand. Viscera darker orange. Two triangular fields of small white spots, pointing at each other, behind the eyes, almost connected by a few smaller fields of white spots to form a thin, discontinuous cross-band (Pl. IIb/part I). Notum rear narrowly bordered with white spots. More minor fields of white spots along the median line of the notum and its lateral margins, sparsely on the flanks of the tail, and laterally at its base. Brown sand accumulated to form a distinct brown blotch on both sides of the notum rear. Smaller brown blotches anteriorly and posteriorly to the white triangles at the notal margins, another one on either side at the base of the tail. Tail slightly lighter than the body. No notable varieties among the 4 animals found.

Anatomy: Reverse side of jaws (Pl. IIa, f) of an animal of 0.8 mm (fix), set with saucer-shaped scales of 1–3 µm diameter and a row of 9 plates with mostly 4 pointed prongs (3–4 µm l., 1.5 µm strength).

Radula (Pl. IIb-e): 15 × 1.1.1 (spec. fix. 0.8 mm, rad. l. 170 µm). Rachidian teeth (21 µm w.) bilobed (Pl. IIc–d); each flat cusp with up to 14–15 dense, parallel, fine and pointed denticles of equal length (0.3 µm l.), their tips forming a slight arc which does not run down very far onto both sides (Pl. IId). A shallow and narrow central depression, mostly without central denticle; some teeth with a very small one. Sides (17 µm l.) slightly tilted inward forming lobes. Laterals (Pl. IIe) smooth, blunt, swan-necked (16 µm h.), with a long basal region (20 µm) forming a small hump. Smaller teeth more triangular, larger ones more swan-necked. Another specimen, also fix. 0.8 mm, shows a "radular metamorphosis" (Pl. IIa) in Thompson's sense (see introduction of part I), the juvenile part with the formula 4 or 5 × 1.0.1, teeth measuring 10 × 15 µm, the adult part with the formula 4 × 1.1.1 (lateral teeth10 µm × 5 µm). Cusps of juvenile teeth 3 × higher than those of adult lateral teeth!

4 quadrangular gizzard plates (Pl. IIh) of 90 µm l. in the specimen with only an adult radula, and 50 µm l. in the one showing "radular metamorphosis". The larger plates have 7-8 lamellae, the smaller ones 5. Very low basal beam, leaving two third of the 3-tipped lamellae free. No shell detectable by NaOH maceration or in histological sections.

Etymology: This species is named with love and sincere thanks for the sister of L. Schmekel, Mrs. Barbara Horn, Birmingham, GB for her continual help throughout the years.

Discussion: There are eight species world-wide that have a yellowish, orange or brown coloration. The chocolate brown *R. avellana* has clear head sides and front and a dark mark on the tail. All these features are lacking in *R. hornae*. The closest similarity of *R. hornae* is to *R. ferruginea* Kress, 1977 from Plymouth. They are rather similar in shape and their red colour but *R. ferruginea* never shows opaque white, which is abundant in *R. hornae*. In *R. ferruginea* the jaws show 7 rectangular plates with 7 very small prongs each, whereas *R. hornae* has 9 plates with 4 long prongs each (Pl. VIh, IIg). The radular formula of *R. ferruginea* is 24 × 1.1.1 (1 mm spec.), but the one of *R. hornae* 15 × 1.1.1 (0.8 mm spec.). The sides of the rachidians of *R. ferruginea* are upright (Pl. VIe), in *R. hornae* they are tilted slightly inwards (Pl. IIc). The denticles on the cusps laterally run much further down in *R. ferruginea* (Pl. VIf) than in *R. hornae* (Pl. IId). In *R. ferruginea* the bases of the laterals show a distinct hump (Pl. VIg), almost missing in *R. hornae* (Pl. IIe). *Lapinura* (*Ildica*) *divae* (du Bois-Reymond Marcus & Marcus, 1963; syn. *Lapinura divae* Marcus & du Bois-Reymond Marcus, 1970; *Runcina divae* Clark, 1984), from Curaçao, is brown with a light mantle furrow, while *R. hornae* is more orange. *L. divae* often has a veliger shell on a bilobate notum rear in the adult,

Table I. – Synopsis of nine new species and five established species of *Runcina* from the Mediterranean described in the two parts of this work.

Species/ loc. typ.	Our material, Distribution	Gills	Genital aperture	Jaws	Radula	Body shape	Colour
***Runcina coronata* (Quatrefages, 1844)** Bréhat, Bretagne, F, Atlantic (1843)	5 sp. Roscoff and Plymouth. Channel, Torbay, Azores, Gibraltar, Mediterranean	2 laminae to the right of the anus, the bigger one divided into 3 archs	1/3 of the body length in front of the anus	from reverse side: rounded field with papillae, pronged plates absent	16 x 1.1.1; rach. bilobed, each with 7 thunderbolt shaped denticles, with interdenticles, narrow median depression with central denticle; lat. triangular to hook-shaped with ~ 20 denticles	3 - 7 mm; rounded all over; notum smooth, with head lobes, front of notum notched, rear rounded; foot extends notum, tail fairly long, rounded; eyes small, distantly situated	dark brown, sprinkled with minute yellowish dots; front of notum, head sides and notum rear broadly cadmium yellow, behind the eyes a narrow curve of white spots, another one in front of the notum rear; foot sole yellowish, median of tail dark brown
***Runcina adriatica* Thompson, 1980** Rovinj, Yug.	260 sp. Banyuls, Naples Mediterranean, Azores?	3 laminae to the right of the anus; the upper 2 subdivided horizontally	1/3 of the body length in front of the anus	triangular field with scales; unforked furrows only on one side of the scales; rim with thick bulge; 7-9 plates with 4-9 blunt prongs	25 x 1.1.1; rach. bilobed, 10 -11 denticles per pad in a curved arc, pads slightly cardium-shaped, median depression small, rarely a central denticle, the most lat. denticle stands apart, sides moderately tilted inwards; lat. smooth, short, blunt hooks, bases with small hump	0.2 - 3 mm; body quadrangular; notum smooth, front notched, with head lobes, rear tapered and raised; foot slightly extends notum, tail long, pointed; eyes medium size, rather close to the front	translucent light beige with isolated, round, blackish-brown patches all over; a broad cross band of white spots behind the eyes, more white spots densely at the notum rear, sometimes narrowly along the median, and on the sides of the tail; blackish blotches on the median of the tail
***Runcina africana* Pruvot-Fol, 1953** Atlantic coast of Morocco, Témara	46 sp. Banyuls Atlantic coast of Morocco, Témara; Gibraltar	3, to the right of the anus; middle lamina subdivided horizontally into 3 leaflets, the other 2 simple laminae	1/3 of the body length in front of the anus	triangular field, from reverse side with scales and buttons; 11 plates with 1-4 thick, short prongs	31 x 1.1.1; rach. bilobed, ca. 18 dense denticles per flat pad in a weak arc, median depression shallow and narrow with a pointed central denticle; lat. smooth, blunt, sickle shaped	0.3 - 2.5 mm; body elongated oval; notum smooth, front truncate, small head lobes; foot extends notum, tail broad, rounded; eyes medium size, deep, close to buccal mass	velvety dark brown on notum, foot sole and median of tail; head sides lighter brown, sometimes with oval "pseudo-eyes"; sides of tail transparent; a straight, narrow, yellowish-white cross band behind the eyes, another curved one in front of the notum end; white very variable; gills brown
***Runcina brenkoae* Thompson, 1980** Rovinj, Yug.	54 sp. Banyuls Rovinj, Yugoslavia, northern Adriatic coast	3 laminae to the right of the anus, middle one divided once horizontally, the other two simple	1/3 of the body length in front of the anus	triangular field with scales (from reverse side); 9 plates with 4-5 prongs	27 x 1.1.1; rach. bilobed, ca.10 denticles per pad in a distinct arc; pads cardium-shaped, median depression deep and broad, beneath it a hump, mostly without central denticle, sides long, moderately high, tilted slightly angularly inwards; lat. smooth, swannecked	0.5 - 2.5 mm; body oval; notum smooth, anteriorly tapered and notched, notum rear pointed, strongly raised; foot slightly extends notum; tail long and pointed; eyes medium size, close to buccal mass	transparent yellowish with a pattern of anastomosing dark brown patches and a marginal garland; behind the eyes two white triangulars on the sides of the notum, some white spots along its margin and rear and thickly on the sides of the tail; foot sole brownish with similar dark pattern as the dorsum; median of tail broadly dark brown
***Runcina langei* Schmekel & Cappellato, 2001** Banyuls-sur-mer, France	180 sp. Banyuls	2 subdivided laminae; to the right of the anus	1/3 of the body length in front of the anus	2 triangular fields with scales; unforked furrows on either side of scales, rim forms thick bulge; 9 plates with 7-9 dense, fairly pointed prongs	15 - 22 x 1.1.1; rach. bilobed, 6 - 10 regular denticles per pad in a slight arc, pads flatly cardium shaped, median depression deep and broad, some with small central denticle, sides rather high, upper edge tilted inwards; lat. smooth, scythe-shaped to swannecked, base without hump, cusp rather blunt	0.5 - 2 mm; body rounded, widest at its rear; angular head with distinct head lobes; notum rear rounded and slightly raised with a small tip, notum smooth; foot as broad as notum; eyes of medium size, in "normal" position	ground colour yellowish-green; viscera olive green with few blackish blotches; body covered all over with fine, olive green specks; behind the eyes a broad, sometimes discontinuous white cross band; notum rear broadly contoured with small white spots; 3 paired, marginal black marks close to this white pattern, repeated on the upper foot; notum and margins of tail with white spots, variable black specks in the centre of the tail; foot greenish

Table I. – (continued).

Species/ loc. typ.	Our material, Distribution	Gills	Genital aperture	Jaws	Radula	Body shape	Colour
Runcina ferruginea **Kress, 1977** Plymouth GB, Eastern Atlantic	4 sp. Banyuls, Plymouth; Mediterranean	2 laminae, to the right of the anus, subdivided horizontally into leaflets	1/3 of the body length in front of the anus	2 triangular fields, from reverse side with scales; 7 larger rectangular plates with 7 very short prongs	24 x 1.1.1; rach. bilobed, 14 -16 fine denticles per pad in an arc which is steeper mediadly and runs down very far laterally; median depression small, mostly a triangular central denticle, sides short and high; lat. smooth, triangular to sickle-shaped, bases with a hump	1.5 - 2.1 mm; body elongated rectangular; anterior end of smooth notum notched, rear rounded and not raised; foot slightly broader than notum, tail long and rounded; eyes of medium size, in "normal" position	cadmium orange with a brownish tinge (Kress, 1977: reddish-brown all over), foot lighter than notum; no opaque white
Runcina kressae **Schmekel & Cappellato, 2001** Banyuls-sur-mer, France	57 sp. Banyuls		1/3 of the body length in front of the anus	2 triangular fields with scales; unforked furrows on either side, rim sharp without bulge; 6 - 7 plates with 6 -11 dense, pointed prongs	12 - 25 x 1.1.1; rach. bilobed, 10 - 14 regular denticles per comb-shaped flat pad in a slight arc, median depression deep and broad, rarely a short central denticle, sides rather high and erect, upper edge hardly tilted inwards; lat. smooth, seal-necked to swannecked	0.5 - 2.5 mm; body very elongated and flat; notum smooth, anterior region fairly pointed, small head lobes; rear rounded, not raised; foot as wide as notum; tail long and rounded; eyes medium size, close to and lateral from the buccal mass	ground colour yellowish; behind the eyes a broad white cross band, notum rear broadly white, white cross band and front border of white notum end lined with black blotches thus forming 3 black cross lines, often reaching onto the foot; white spots powdered over the notum, more concentrated at notum rim, here interspersed with dark patches; middle of tail with a few dark patches; foot sole yellowish, sometimes with a few dark patches forming a cross line close to the tail
Runcina hansbechi **Schmekel & Cappellato, 2001** Banyuls-sur-mer, France	6 sp. Banyuls	2 subdivided laminae; to the right of the anus	1/3 in front of the anus	2 triangular fields with scales; scales on both sides with rather short furrows often forking, rim sharp without bulge; 11 - 12 plates, 4 - 6 very long, pointed, parallel prongs	23 x 1.1.1; rach. bilobed, 8 -10 short, pointed, regular denticles per pad in a shallow arc, pads slightly cardium-shaped, median depression deep and broad, without central denticle, sides very high, upper edge tilted inwards; lat. smooth, bluntly ducknecked, base with or without hump, cusp hollow	1.8 - 2.6 mm; body oval; notum smooth, slightly notched anteriorly, distinct head lobes, rear rounded and slightly raised; foot as wide as notum; eyes rather small, wide apart	yellowish, viscera pale orange to brownish; body densely covered with irregular large black blotches of variable shape, interspersed with sinuous fields of small white spots; pattern less intensive on foot sole; sides of tail densely white
Runcina nivale **Schmekel & Cappellato, 2001** Banyuls-sur-mer, France	2 sp. Naples	3 large laminae to the right of the anus, "bipinnate" (bigger specimen), undivided (smaller specimen)				fix. 1.4, 2 mm; body drop-shaped, widest and highest at notum rear; notum smooth; foot extends notum; tail very long, wide, rounded; notum rear of the smaller animal tapered, of the larger one bilobed; eyes very large, high and close to the front	totally transparent whitish; eyes and ganglia well visible
Runcina banyulensis **Schmekel & Cappellato, 2001** Banyuls-sur-mer, France	4 sp. Banyuls	1 lamina, subdivided slightly horizontally, to the right of the anus		reverse side: 2 triangular fields with scales and papillae; up to 10 plates, mostly 4 pointed prongs	22 x 1.1.1 rach. bilobed, 8 - 9 finger-shaped, regular denticles per flat pad in a slight arc, median depression concave, deep and broad, no central denticle, sides moderately high, upper edge angularly tilted inwards; lat. smooth, sickle-shaped, base without hump, cusp hollow	0.4 - 1.4 mm; body elongated; front of smooth notum with depression, almost no head lobes; rear long, rounded and not lifted; foot as wide as notum, tail short, rounded; eyes large, high, close to the front	yellowish, viscera beige to brown; all over with isolated, fine, sharp black points, less on the foot; notum broadly bordered with white, interspersed with red-brown points in the head region, and red points further down; a 'T' of pure white on the notum; its cross band contoured with some large black points

Table I. – (continued).

Species/ loc. typ.	Our material, Distribution	Gills	Genital aperture	Jaws	Radula	Body shape	Colour
***Runcina avellana* Schmekel & Cappellato, 2001** Banyuls-sur-mer, France	3 sp. Banyuls	1 lamina, slightly to the right of the anus		reverse side: 2 triangular fields with cup-shaped scales; up to 11 plates, 8-10 pointed prongs	juvenile: 3 x 1.0.1; lat. smooth, cusp high, triangular, base short	1 - 1.5 mm; body elongated, slightly arced; notum smooth, no head lobes, front slightly notched, rear rounded, not raised; foot as wide as notum; tail long, broad, rounded; eyes small, very deep and close to the front	notum dark brown; front and sides of the head and tail transparent; some small white spots around the eyes and along the notum margins; foot sole light brown; one dark blotch in the centre of the tail
***Runcina* sp.**	1 sp. Banyuls	1 lamina, small and simple, to the right				1.9 mm; body elongated, flat; notum smooth, front straight, scarce head lobes, notum rear slightly pointed, not raised; foot as wide as notum; tail short, rounded; eyes medium size, close to the buccal mass	velvety dark green, notum margin transparent lemon yellow, enlarged at head, foot sole and tail; sprinkled with tiny brown specks and sparse small white spots all over, more dense on notum and foot margins, especially at notum rear; a single dark green spot in the centre of the tail, a pair of similar, larger marks at its insertion
***Runcina hornae* Schmekel & Cappellato, n. sp.** Banyuls-sur-mer, France	4 sp. Banyuls	1 leaflet, small, inconspicuous, to the right		from reverse side; 2 triangular fields with scales and buttons; up to 11 plates, 1 - 4 thunderbolt shaped, thick, short prongs	15 x 1.1.1; rach. bilobed, 10 -15 fine, pointed, dense, regular denticles per flat pad in a rather short arc; median depression shallow and narrow, rarely a small central denticle, upper edge of the sides slightly tilted inwards; lat. smooth, swannecked, base long with a small hump	1.5 - 2.1 mm; body elongate, rectangular, widest at its end; with distinct head lobes, notum smooth; foot as wide as notum; tail long, tapered; eyes small, dorsal, close to the oesophagus	yellowish with finest brown sand all over, thus appearing orange; behind the eyes a thin, discontinuous cross band of small white spots, notum rear narrowly bordered with white; small fields of white spots on notum and tail; 3 paired, small brown marks at the notum margin, adjacent to the white, 1 pair on the foot at the insertion of the tail
***Runcina rotunda* Schmekel & Cappellato, n. sp.** Banyuls-sur-mer, France	4 sp. Banyuls	1 small, simple leaflet, to the right of the anus				1.1 mm; body plump, convex, rounded; notum smooth, slight head lobes; foot extends notum, tail short and slightly pointed; eyes not visible	black with greenish tinge, very indistinct black blotches on the viscera; notum, foot bordered narrowly and discontinuously with small white spots, some white spots in the centre of the notum and densely on the "ears"; tail colourless with dense white spots laterally
***Runcina elongata* Schmekel & Cappellato, n. sp.** Banyuls-sur-mer, France	1 sp. Banyuls					1.2 mm; body elongated, very slim; head lobes absent, anterior notum end straight, notum rear rounded, not raised, notum smooth; foot as wide as notum, tail short, rounded; eyes medium size, extremely close to the front, deep	body middle brown all over, with fine dark brown granulation, larger dark brown spots on the head; notum margin very narrowly bordered with white; a pair of red brown patches at the insertion of the tail, tail colourless

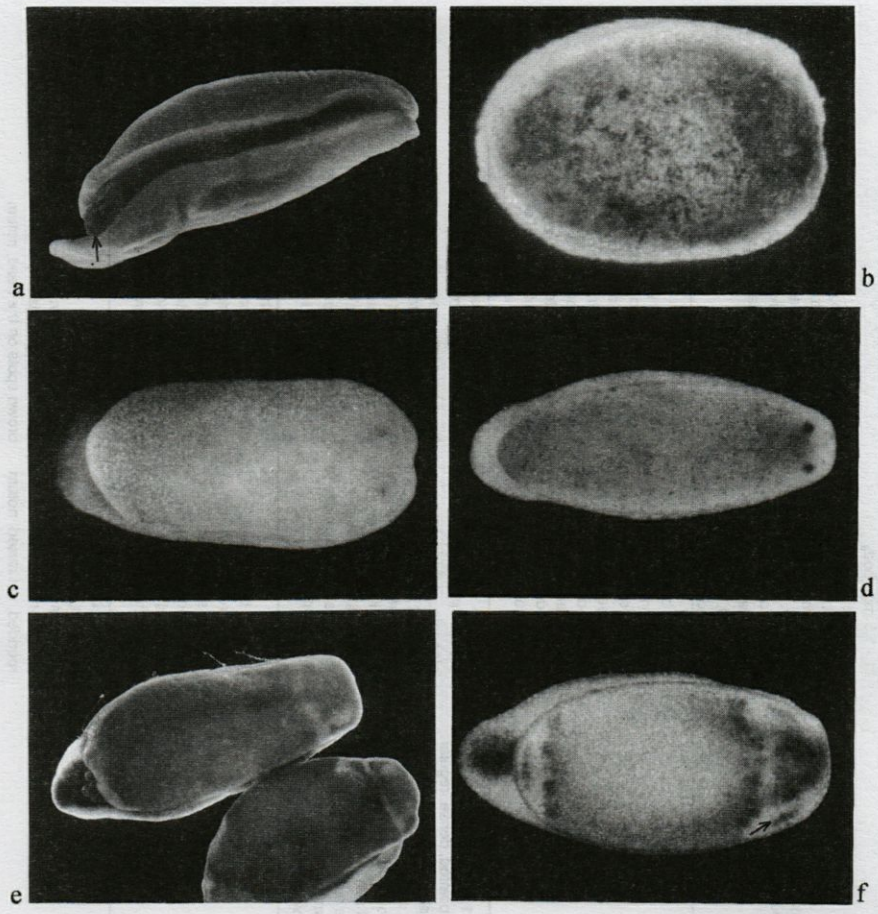

Plate I. – Light micrographs. **a**, *Runcina ferruginea* Kress, 1977, 3 mm length, from Plymouth; arrow: gills; **b**, *R. rotunda* n. sp., holotype, 0.6 mm length; specimen lost colour after fixation, revealing few irregular black blotches and a lighter notal margin; **c**, *R. hornae*, n. sp., holotype, 0.9 mm length; **d**, *R. elongata* n. sp., holotype, 1.2 mm length; **e**, *R. africana* Pruvot-Fol, 1953, 2.4 and 1.9 mm length; **f**, *R. africana,* 1.8 mm length, arrow: eye-patches.

which is absent in *R. hornae*. The denticles on the rachidians of *L. divae* form a straight cutting edge, but an arc in *R. hornae*. *R. marshae* Burn, 1966, from Fiji, is dull orange when fixated, but in contrast to *R. hornae* it has an internal shell. The reddish-brown *R.* spec found by Gosliner (1990), from the Azores, is easy to distinguish from our species by its denticulate laterals which are smooth in *R. hornae*. The ochre-coloured *R. bahiensis* Cervera, Garçía-Gomez & Garçía, 1991 from Gibraltar, in contrast to the orange *R. hornae* with a smooth notum, is covered with opaque ochre pigmentation, and the notum shows numerous small protuberances.

R. lenticula from Angola has a brown notum but unicuspidate rachidians (Gofas *et al.* 1991: 542; fig. 3: 544), in contrast to bilobate ones in *R. hornae*. *R. macfarlandi* Gosliner, 1991, from the Pacific coast of North America, has an opaque yellowish-brown notum with darker pigment in the centre, and two gill plicae standing on opposite sides of the anus, in contrast to the more transparent orange *R. hornae* whose single gill plate lies to the right of the anus. *Runcinella thompsoni* Ortea & Rodríguez, 1993, from Galapagos, is dark red with a yellow blotch on either side of the head, whereas *R. hornae* is bright orange with opaque white spots. *R. thompsoni* has a large inner shell, and its radular formula is 1.1.1.1.1, the one of the shell-less *R. hornae* is 1.1.1.

Runcina rotunda n. sp. (Pl. Ib, Table I; Pl. IId/part I)

Material: 4 specimens, 0.7–1.1 mm l., at Banyuls, le Racou, March 28th, 1996, *Posidonia* rhizomes dredged at night at 6–11 m (loc. typ.).

This species is less vigorous than other *Runcina*; they crawl very slowly, are very fragile and die quickly in their bowls. Only one specimen could be recovered for fixation. Holotype at Senckenberg Mus., Frankfurt, No. 322858.

Description of the living holotype (Pl. IId/part I) of 1.1 mm l., 0.6 mm w., 0.4 mm h., tail 0.1 mm: Body shape plump, rounded. Smooth notum very convex, slight head lobes, rear short, rounded and slightly raised. Foot extending the notum laterally, tail very short and

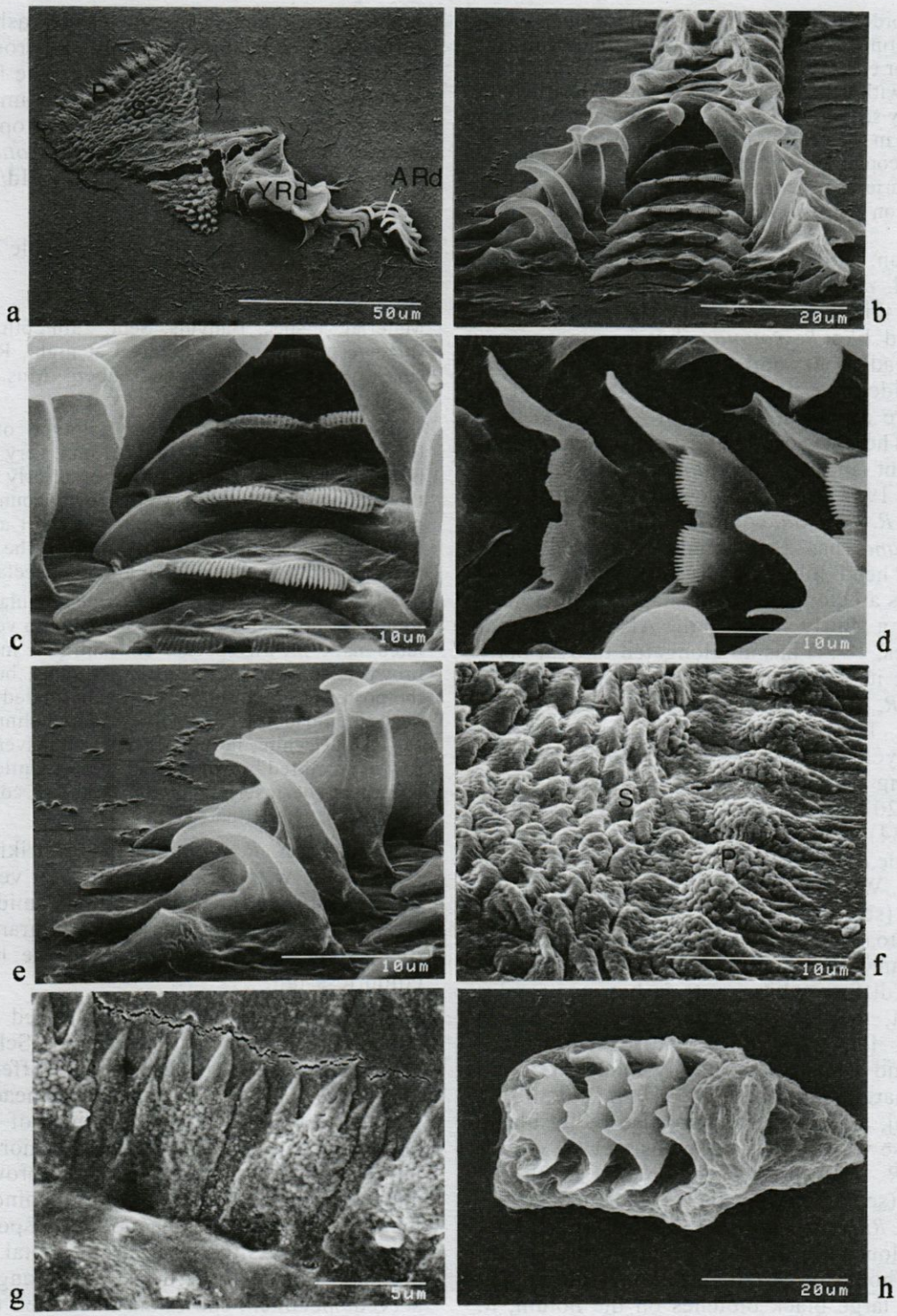

Plate II. – SEM micrographs. *Runcina hornae* n. sp., **a**, jaws, reverse side, and radula (juvenile and adult parts); P plates with prongs, S scales, YRd juvenile radula, ARd adult radula; **b**, radula, rachidian and lateral teeth; **c**, rachidian teeth; sides of rachidian teeth slightly tilted inwards; **d**, rachidian teeth with small central denticle; **e**, smooth lateral teeth; **f**, reverse side of jaws; P plates with prongs S scales; **g**, reverse side of plates with paired prongs; **h**, gizzard plate; note quadrangular shape.

slightly pointed. Eyes not visible. Anus terminal and median, one small, simple, rounded gill lamina to the right of it. Black all over with a green tinge, except the colourless tail (Pl. IId/part I). Some very indistinct black blotches above the viscera which are seen better some time after fixation (Pl. IId/part I). Notum, upper foot and

foot sole bordered narrowly by small opaque white spots, discontinuous in some places and almost missing at the anterior end of the notum. Flanks of the tail covered broadly with dense opaque white spots. Small white spots sparsely scattered over the entire notum, a bit more concentrated in the centre of it. Head lobes with field of white spots, copied just beneath on the upper face of the foot sole. Varieties: the pattern of white spots may be less distinct on the notum, the foot and the tail.

Discussion. *R. calaritana*: see discussion *R. coronata*. *R. coronata* (Quatrefages 1844, see description in this article), from the Bretagne, is oval and rounded like *R. rotunda*, but has more pronounced head lobes, and its tail is much longer. The head sides, the notum rear and the foot of *R. coronata* are cadmium yellow, in *R. rotunda* they are black. The curved white cross-bands are regularly present in *R. coronata* and *R. africana* Pruvot-Fol, 1953, from Morocco, but are absent in *R. rotunda*. *R. rotunda*, compared to our specimens of *R. africana*, has a much more rounded body, very small head lobes and a very short tail. *R. africana* has an elongated oval shape, distinct head lobes and a fairly long tail. Also *R. ornata* (Quatrefages, 1844) has an elongated to oval body shape while it is plump and convex in *R. rotunda*. The tail of *R. ornata* is long, the one of *R. rotunda* very short. Though both species are black, *R. ornata* has yellowish head sides, the yellow sometimes joining behind the eyes (see Cervera *et al.* 1991: 200-201, fig. 2; Ballesteros & Ortea 1981, fig. 1B, p. 34), and a yellowish notum rear only on the right side, while *R. rotunda* is only black with some white. While *R. capreensis* Mazzarelli, 1894, from Capri (see discussion *R. hansbechi* Schmekel & Cappellato, 2001, part I) is charcoal black, covered regularly with many large, isolated black points and diffuse white spots in-between, and a yellow foot, *R. rotunda* is more homogeneously black with few very deep and obscure black blotches, and white spots mainly along the notal and foot margins. *R. zavodniki* Thompson, 1980, from Rovinj, a species that may also be jet black, lacks opaque white spots. Like Gosliner (1990) we consider *R. zavodniki* synonymous with *R. ferruginea* (see discussion there). Gosliner (1990) describes a *Runcina* from the Azores with a dark ground colour he tentatively identifies as *R. adriatica* Thompson, 1980. While Gosliner's species shows large black blotches on the notum, *R. rotunda* bears only a few very deep blotches which can be seen clearly only after fixation (Pl. Ib). The tail of the animals from the Azores is totally black, in *R. rotunda* it is transparent with opaque white spots thickly covering the sides. Gosliner's *R. adriatica* bears a broken transverse white cross-band on its notum behind the eyes and a cross-band near the notum rear. *R. rotunda* has only some opaque white laterally on the head lobes and the notal and foot margins. The pacific species *Metaruncina setoensis* (Baba, 1954), from Kii, Japan, is blackish-brown with ashy yellow submargins of the notum running all around it, only excluding the anterior notum end. The foot sole of *M. setoensis* is lighter than the notum, in *R. rotunda* it is as black as the notum. No opaque white is mentioned for *M. setoensis* but *R. rotunda* shows a fair amount of opaque white (Pl. IId/part 1).

Runcina elongata n. sp. (Pl Id, Table I; Pl. IIf/part I)

Material: 1 spec. Banyuls, Sept. 25th/26th, 1997 from rhizomes of *Posidonia* dredged at night, Racou, 10 m (loc. typ.). Holotype: Senckenberg Mus., Frankfurt, N° 322859.

Body shape of the living holotype of 1.2 mm l., 0.5 mm w, and 0.3 mm h., tail 0.2 mm, very slim, resembling a torpedo. Smooth notum anteriorly straight without head lobes, posteriorly narrowly rounded and not raised. Foot as wide as notum; tail short and rounded. Eyes large deep and extremely close to the anterior notum end. No gill, anus or genital pore detectable (Pl Id).

Middle brown all over with a fine granulation: notum, foot sole and mantle furrow covered with very fine, isolated dark brown specks, concentrated in the lighter brown head region to form larger spots, but sparser in the posterior notal region. Notum sprinkled evenly with very fine opaque white spots, bordered slimly with denser opaque white; no opaque white transverse bands. A row of small red brown patches in the mantle furrow, the largest at the insertion of the tail. Tail colourless and translucent (Pl. IIf/part I).

Discussion. *R. elongata* has a striking torpedo body-shape with large eyes situated very close to the front (Pl. Id). It is the only middle brown *Runcina* with a fine dark brown granulation all over, somewhat larger spots on the head and a colourless tail.

Apart from the features described above, the chocolate brown *R. avellana* Schmekel & Cappellato, 2001 (Pl. IVc/part I) differs from *R. elongata* (Pl. Id) by its translucent head-sides and the single black spot in the centre of the tail. *R. hornae* (Pl. Ic; Pl. IIb/part I) has a more rectangular body shape, is orange instead of brown, and has an indistinct white cross-band behind the eyes while in *R. elongata* opaque white spots are concentrated only slightly along the notal margin. *R. marshae* from Fiji, coloured dull orange as a preserved specimen, shows an inner shell through the epidermis, which is not detectable in *R. elongata*. The all over red brown *R. ferruginea* Kress, 1977 (Pl IIn/part I), from Plymouth, has no opaque white spots whatsoever. The colour of *R. ferruginea* in Ortea & Urgorri (1981), from Northern Spain, is brown but the main difference to *R. elongata* are the "rugosités" which are absent in our species, as well as in Kress's original description of *R. ferruginea*. *R. paupera* Ortea, Rodríguez and Valdés, 1990, from Cape Verde, is rounded and greenish-brown with a translucent green notal mar-

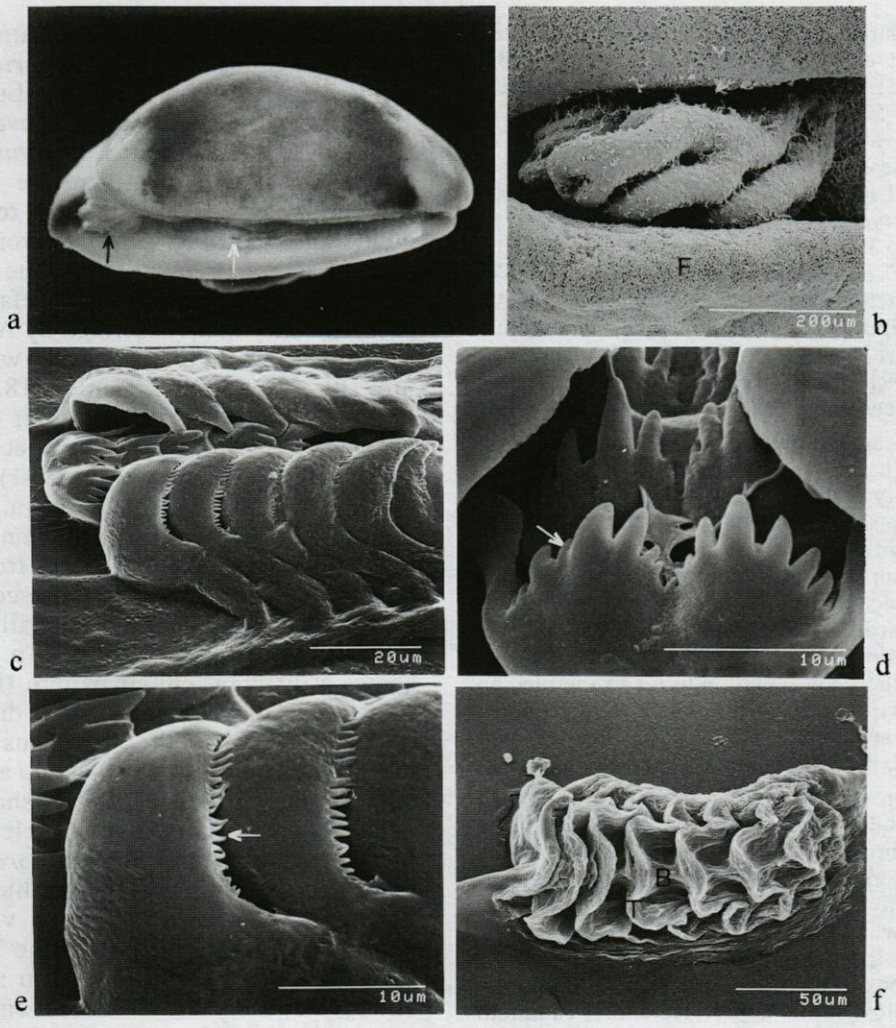

Plate III. – *Runcina coronata* (Quatrefages, 1844) from Roscoff, France. **a**, light micrograph of specimen, 5 mm length, total aspect viewed from the dorsal right side; white arrow: genital orifice, black arrow: gills; **b**, gills; F foot, SEM; **c**, radula, oldest part, SEM; **d**, rachidian teeth; arrow: interdenticle, SEM; **e**, lateral teeth; arrow: denticulate cusp, SEM; **f**, gizzard plate from above (boat shape typical for most *Runcina*); B basal beam, T lamella, SEM.

gin, without any opaque white. *R. elongata* is very elongated and slim and has a sprinkling of opaque white over the notum. The ochre-coloured *R. bahiensis* Cervera, Garçía-Gomez & Garçía, 1991 (Strait of Gibraltar) shows small protuberances on its notum, while the notum of *R. elongata* is smooth. The body shape of the brown *R. lenticula*, from Angola, is more rounded and wider than the one of *R. elongata*. The Californian *R. macfarlandi* has a broad ovoid body shape and gills on both sides of the anus. Though our specimen of 1.2 mm length has no gills, the body shape and the colour of Gosliner's (1991) species – yellowish-brown notum, darker in the centre, and no opaque white – differs clearly from *R. elongata*. *Runcinella thompsoni* Ortea & Rodríguez, 1993, from Galapagos, is dark red with a yellow blotch on either side of the head. *R. elongata* is brown with a fine darker granulation and blackish-brown spots on the head, instead. The brown *Lapinura (Ildica) divae* (du Bois-Reymond Marcus & Marcus, 1963), from Curaçao, often has a minute external veliger shell in the adult, which is absent in *R. elongata*. While *L. divae* has a light mantle furrow, in *R. elongata* it is middle brown. The eyes are not visible in living *L. divae*, but in *R. elongata* they are conspicuous.

Runcina coronata (Quatrefages, 1844)
(Pl. IIIa-f, Table I; Pl. II l/part I)

Ann Sci Nat Zool 1: 151-152, Pl. 3, fig. VI)
Pelta coronata Quatrefages, 1844. Loc. typ.: Saint-Vast-la Hougue, Bréhat, Bretagne, collected 1842/1843, Compare Opinion 811 *Bull zool Nomencl* 1967: 89-90.
Unnamed species of Alder & Hancock 1846: 289-291, p. l. IV 1-7
Runcina hancockii Forbes & Hanley, 1853: 611-612
Most probably *Runcina calaritana* Colosi, 1914/15: 1-35

Runcina aurata Garçía, López, Luque & Cervera, 1986 (compare Cervera *et al.* 1991) (Ref. Vayssière 1883, 1885, 1900, 1903; Mazzarelli 1894; Colosi 1914/15; Pruvot-Fol 1954: 53-55, fig. 10 a-r; Thompson, 1976: 143-145, fig. 77 a-f ; Thompson & Brown 1976: 37-38, fig. 15; Kress 1977; Kress 1985a; Kress 1986; Kress & Schmekel 1992; Kress *et al.* 1994; Poizat 1978; Gosliner 1990; Cervera, Garçía-Gomez & Garçía 1991) Material: 3 specs., 3, 5 and 7 mm, Roscoff (France). 03. 1973; 4 specs., 4–7 mm, Plymouth (Great Britain), 1974: Kress (coll.) – which is all from the eastern Atlantic! All from the upper littoral fringe at low tide, Vayssière's (1883) animals are from Marseille (France), those of Cervera *et al.* (1991) from Gibraltar. We did not find it in the Mediterranean: neither in Naples nor Banyuls.

A moderately agile species. An animal (6 mm l., 2.5 mm w., 3 mm h., tail 1 mm) from Roscoff, Bretagne, very near the loc. typ. of Quatrefages (1844), has a rounded all over body shape (Pl. IIIa). Anterior notum end slightly notched with head lobes; small oral bulges. Foot broader than notum, tail rather long and rounded. Eyes small, situated wide apart in the region between the yellow sides of the head and the brown central zone (eye: Mikkelsen 1996: 401, figs. 37, 38). Common genital orifice one third of the body length anterior to the median anus (Pl. IIIa). Two rounded gill laminae to the right of the anus (Pl. IIIb; spec. c.p.d. 1.5 mm), the smaller, ventral one undivided, the larger one divided into three arcs.

Notum dark brown with very, very fine yellowish points. Anterior and posterior notal end and sides of the head a bordered broadly with cadmium yellow. At the notum rear the anterior border of the cadmium yellow region is curved away from the notum end (Pl. II l/part I). Two fine opaque white curved cross bands on the notum: one, curved away from the front, behind the eyes, one, curved in the opposite direction, anterior to the notum end. Foot sole yellowish, its upper face darker cadmium yellow; mantle furrow brown all around; gills yellowish with slightly brown margins. Yellowish tail-seen from above and below–with a broad dark brown median part.

Anatomy: Reverse side of jaws with two rounded fields (diameter 100 µm) without sharp border, set with short papillae but lacking plates with prongs.

Radula: 16 × 1.1.1 (spec. 1.5 mm fix. Plymouth, rad. l. 250 µm). Rachidian teeth bilobed, each *Cardium*-shaped pad with 7 thick, blunt and thunderbolt shaped denticles of very variable size (max. 5 µm l.); tips of each set of denticles forming a high arc. The size and strength of the denticles on each pad increase towards the centre. Some short, slender interdenticles are situated almost exclusively towards the edges of each pad, but the number of strong denticles always prevails. The only measurable tooth (28 µm w., 10 µm h. and 20 µm l.) has a central denticle (0.5 µm) in a narrow but deep depression. Laterals triangular to hook-shaped with about 20 small, pointed denticles (1–2 µm) along their cutting edge (Pl IIIc,d,e).

4 gizzard plates (Pl. III f, 160 µm.l) with 7 lamellae having 1 or 2 tips each; longitudinal beam high, leaving one third of the lamellae free. No shell detectable by NaOH maceration or in histological sections.

Discussion. The history of *R. coronata* and its name is complicated. The main reason is the existence of several dark *Runcina* species in the Eastern Atlantic and Mediterranean, which show certain similarities (*R. ornata* Quatrefages,1844); *R. calaritana* Colosi, 1914/15; *R. africana* Pruvot-Fol, 1953; *R. aurata* Garçía, López, Luque & Cervera, 1986; comp. discussions of *R. avellana* Schmekel & Cappellato, 2001; part I, *R. rotunda* Schmekel & Cappellato n. sp.) and therefore have been confused in the past. This is the first recent description including SEM of *R. coronata* from near the locus typicus, in the Bretagne. After the first description from the Bretagne by Quatrefages (1844), *R. coronata* was again described by Alder & Hancock (1846) without a given name but with very fine figures (Pl. IV). Forbes & Hanley (1853: 611–612) referred to this description in their diagnosis of the genus *Runcina* and gave the species the name *R. hancockii*. Cervera *et al.* (1991) put *R. aurata* Garçía, López, Luque & Cervera, 1986 in synonymy with *R. coronata*. The specimen on the photograph in Cervera *et al.* (1991) from Gibraltar indeed looks very similar to those collected by us in Roscoff and Plymouth. The illustrated animal (Cervera *et al.* 1991, fig. 1, p. 200), however, shows a different colour pattern (black spots on a light background) and a slightly differing structure of the denticles of the rachidians than our specimens. The laterals of *R. coronata* and *R. aurata* are very similar in their triangular shape with 20 fine denticles. We cannot give sufficient data concerning the range of variety of *R. coronata* in the waters of the Atlantic and the Mediterranean, but we do suspect *R. aurata* to be a valid species. *R. calaritana* Colosi, 1915, from the Mediterranean is black with yellowish borders on mantle and foot, enlarged at the posterior notum end. We think this species is probably synonymous with *R. coronata*: Colosi's description of *R. calaritana* is most detailed in histology and anatomy while the whole animal is not depicted. Poizat (1978, p. 137, Pl. XID) collected 296 specimens from mediolittoral rocks in the sand grounds of the Marseillan Gulf which he described as *R. coronata*. The animals in his photograph are squarer than our specimens, and the pattern of the presumable opaque white spots on the dark specimen remind us more of *R. africana* Pruvot-Fol, 1953, or *R. langei* Schmekel & Cappellato, 2001. It might even be a third species yet unknown. Gosliner (1990) described a uniformly brown *Runcina* sp. from the Azores. The rachidians of his specimens lack smaller interdenticles, and the laterals bear about 50 denticles, in contrast to about 20 in our *R. coronata* (Pl. IIIc, e; Kress 1977, Pl. IF: about 25).

Runcina adriatica Thompson, 1980 (Pl. IVa-d, Table I; Pl. IIj, IIIe,f, IVb/part I)

J moll Stud 46: 54-157, figs. 1a, b; loc. typ.: Red Island (San Andrea), Rovinj, Yugoslavia, Adria.
(Ref.: Ballesteros & Ortea 1981: 33–35 fig. 1C; Thompson & Brodie 1988: 339-346, figs. 1a, b; Gosliner 1990: fig. 1B, p. 136; fig. 5A, p.140; figs 6, 7, p. 142)

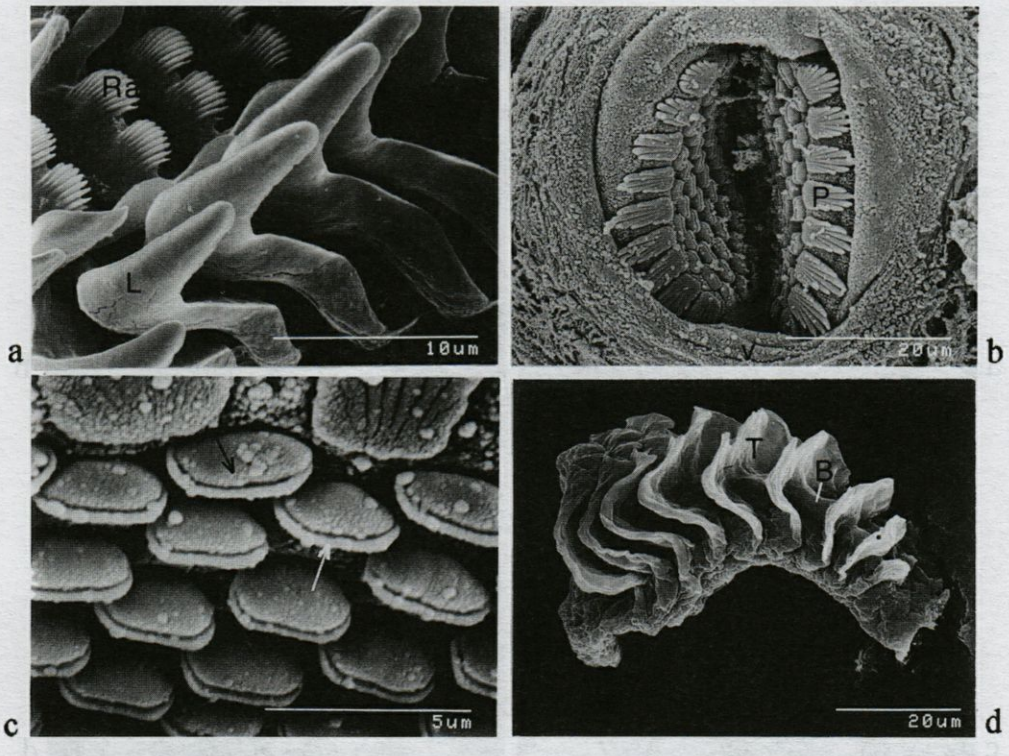

Plate IV. – SEM micrographs of *Runcina adriatica* Thompson, 1980; **a**, radula; Ra rachidian teeth, L lateral teeth; **b**, mouth with protruded jaws (hyperthermic stress method) ; P plates with prongs: note blunt tips, v ventral; **c**, scales of jaws; white arrow: bulge, black arrow: smooth side of scale facing the mouth; **d**, gizzard plate, lateral view; B basal beam, T lamellae.

Material: 260 specs., 0.2-3 mm, common at Naples and Banyuls: from Le Racou to Cap l'Abeille, 1964-1998, ca. 2-12 m depth.

A very agile, quickly crawling species. Body shape of a specimen from Banyuls, 1996 (2 mm l., 0.5 mm w., 0.4 mm h., tail 0.5 mm) squat and quadrangular (Pl. III e, f/part I), with pronounced head lobes, notum rear slightly tapered and raised. Foot as wide as notum, tail long and tapered. Eyes of medium size, deep and close to the anterior border of the head. Genital orifice one third of the body length anterior to the median anus. 3 rounded gill laminae (spec. c.p.d. 1.4 mm) to the right of the anus, the upper two subdivided horizontally, the most ventral one simple.

Body translucent yellowish to light beige; viscera mostly red-brown. Notum, foot, mantle furrow, and median of tail covered with many round to oval, dark brown to black, mostly isolated patches, in smaller animals lining mainly the notal margin and the opaque white pattern, but in larger specimens spread more evenly over the notum (Pl. IIIe/part I). Often they form a 'v', pointing to the front (Pl. IIj/part I), between the eyes. One broad, straight, opaque white cross-band behind the eyes. Notum rear broadly opaque white, with a straight border anteriorly, some more white on the sides of the tail.

Anatomy: Jaws (Pl. IVb,c; Pl. Id, IVb/part I) triangular with shell-shaped scales, broadest at the margins of the fields. Scales close to the plates with fine and parallel, vertical grooves on their side facing the gizzard, but none on the side facing the mouth, and a thick bulge along the rim. 7 to 9 large plates (7 µm), with 4 to 9 parallel blunt-tipped prongs (3 µm l.; Pl. IVb,c).

Radula (Pl. IVa; Pl. IVb/part I): 3 specs. of fix. 1.3 mm, 1.5 mm and 1.9 mm all have a radula of 25 × 1.1.1 (140 and 150 µm l.). Rachidian teeth (13 µm b. × 11 µm l.) bilobed, each flat pad with 10-11 slender, slightly diverging, pointed denticles (0.5 µm l.), the outermost shorter and a little isolated. The tips of the denticles form an arc. Mostly no central denticle in the shallow and moderately narrow central depression. Sides of rachidians moderately high, broad and tilted inwards at the upper edge. Laterals (18 µm l. 14 µm h.) smooth, blunt, short and duck-necked with slightly triangular bases forming a small hump.

Normally 4 gizzard plates with 7 to 10 lamellae (Pl. IVd) with 2 to 3 tips, but in one spec. exceptionally 5 plates (1 × 8, 3 × 9, 1 × 10 lamellae); basal beam leaving one third or more of their length free. Male copulatory organ similar to the one of *R. ferruginea* described by Kress (1985 b). No shell detectable by NaOH maceration or in histological sections (Pl. IVb, Id/part I).

Discussion. Our material is very similar to that of Thompson (1980) and Thompson & Brodie (1988). We can, however, contribute further details to the structure of the jaws of this species. The scales (Pl. IVc) of the jaws of *R. adriatica* are characteristic in having simple vertical grooves only on the side facing the gizzard, whereas the scales of *R. langei* Schmekel & Cappellato, 2001, *R. kressae* Schmekel & Cappellato, 2001 and *R. hansbechi* Schmekel & Cappellato, 2001 show grooves on both sides.

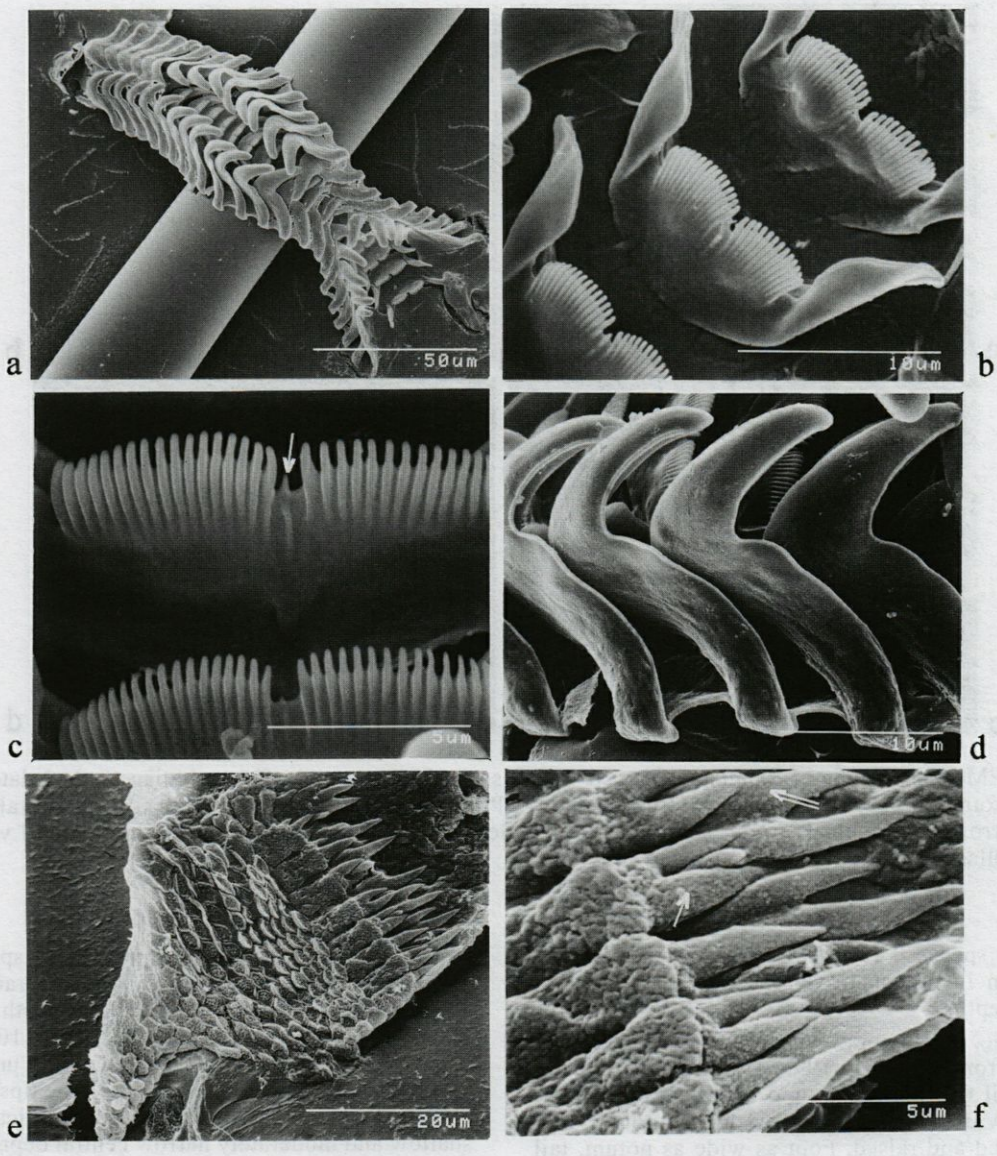

Plate V. – SEM micrographs of *Runcina africana* Pruvot-Fol, 1953. **a**, radula, placed in almost natural position on a glass thread, top view; **b**, rachidian teeth; note very narrow central depression with central denticle; **c**, detail of "b"; arrow: central denticle; **d**, lateral teeth; **e**, jaws, reverse side; **f**, plates with prongs of opposite fields of jaws; arrow: prongs from reverse side, double arrow: prongs of opposite field.

Runcina africana Pruvot-Fol, 1953 (Pl. Ie-f, Va-f, Table I; Pl IIm, Pl Ie/part I)

Trav Inst Sci Chérifien 5: 25–27., text-fig. 1, Pl. II, fig. 35; locus typicus: Témara, Atlantic coast of Morocco / Senegal, tidal zone. (Ref.: *Runcina africana* Cervera *et al.*, 199: p. 201–203, fig. 3, 6 D–F)
Material: Banyuls: 15 spec. fix. 2–2.5 mm, 05. 1958, several with up to 3 spermatophores attached: E. Sandmeier & A. Portmann (coll.); 10 spec., 0.3–2.5 mm, 05. 1986: I. Richter (coll.); 21 specs. 0.5–3.5 mm, 06. 1997 and 1998 outside the Centre Hélio-Marin (0.5–2 m depth).
R. africana is moderately agile. Body shape of adult spec. (2.1 mm l., 0.4 mm h., 0.5 mm w., tail 0.4 mm) elongated oval (Pl. Ie), juveniles droplet-shaped. Notum smooth. Anterior notum end truncate with very small head lobes. Foot broader than notum, tail broad and rounded. Eyes difficult to discern, of medium size, deep beneath oval, transparent areas. Anus terminal and median, genital pore one third of the body length anterior to it. 3 rounded gill laminae to the right of the anus, two undivided; the middle lamina divided into 3 laminae.

Dark, warm velvet brown on notum and foot, foot sole and the middle of the tail. Head sides and notum rear lighter brown, viscera dark brown. A dark oval eye-patch bordered opaque white to yellowish on both sides of the head (Pl. If; Pl. IIm part I), reaching into the mantle furrow. Two narrow, opaque white to yellowish cross-bands on the notum: the one on the head straight, the posterior one forming a concave curve towards the notum rear; both bordered by elongated oval, blackish-brown blotches. Sides of the tail transparent, gills brown. Colour varieties. As also described by Cervera *et*

al. (1991) the coloration of our specimens is very variable. The eye patches may be absent (Pl. Ie). The opaque white cross-band on the head may be very weak and the posterior one may be absent. On the notum rear the distribution of dark brown, opaque white and black are very variable, too. We sometimes found very small animals of droplet shape that had a brown notum with a lighter margin, a lighter foot sole and a discontinuous opaque white cross-band behind the large eyes. We assume these to be juveniles of *R. africana*.

Anatomy: Reverse side of jaws (Pl Ve) a triangular field (60 µm l., spec. 0.9 mm) of saucer-shaped scales and buttons; 11 plates, each with 1-4 thunderbolt shaped, thick and short processes, the innermost largest and of equal length (6 µm), the outermost the shortest (2 µm) and again of equal length.

Radula: 31 × 1.1.1 (rad. l. 260 µm, spec. fix. 2.5 mm). Rachidians (17 µm b., sides 10 µm l. and 3 µm h.; Pl. V b,c) bicuspidate with 12-20 dense, fine, finger-shaped, parallel denticles (0.5 µm l.) on each flat cusp, forming a weak arc. A very narrow central depression with a short, pointed and thin, seldom finger-shaped central denticle. Due to this narrow depression these teeth most probably have been mistaken for unicuspidate with light microscopy (Pruvot-Fol 1953). Laterals (base 17 µm l., cusps 18 µm h.; Pl V d) smooth, blunt and sickle-shaped, bases with a pronounced hump of 6 µm h.

4 triangular gizzard plates (100 µm l, spec. 1.9 mm) with 1 × 6, 2 × 7, 1 × 8 lamellae with 3 tips each. Basal beam leaves half to two third of the lamellae free. Male copulatory organ (spermatophore: pl. I/1e) similar to the one of *R. ferruginea* described by Kress (1985 b). No shell detectable by NaOH maceration or in histological sections.

Discussion. Our specimens correspond with some of those from the Strait of Gibraltar redescribed by Cervera *et al.* (1991) as *R. africana*. Meanwhile, especially those of our animals with eye-patches on the sides of the head (Pl. I f; Pl I m part I) are very similar indeed to PI. II, fig. 53, of Pruvot-Fol (1953). The light brown sides of the head and the opaque white cross-band behind the eyes may lead to misidentify this species as *R. coronata* in the Mediterranean area. The radular structure, however, is quite different between these two species.

Runcina brenkoae Thompson, 1980 (Pl. VIa-c, Table I; Pl. IIk, IIIa,b, Ig/part I)

J moll Stud 46: 154-157, fig. 1 c; locus typicus: Red Island (San Andrea), Rovinj, Yugoslavia, Adria. (Ref.: *Runcina brenkoae* Thompson & Brodie, 1988).
Material: Banyuls: 2 specs. 0.9, 2.1 mm, Sept. 1986; 52 spec. 0.5–3 mm, 1995-1998 from various materials outside the Observatoire and the Centre Hélio-Marin; and from le Racou to Cap l'Abeille at 0.5-10 m depth.
The adult *R. brenkoae* are moderately agile, juveniles are very quick creepers. Body shape of adults (1–3 mm) oval (Pl. IIk, IIIa/part I). Notum smooth, tapered and notched anteriorly without head lobes, and distinctly raised at the rear. Foot as wide as notum, tail long and pointed. Eyes medium-sized, visible often only from the sides. Anus just to the right of the median, common genital orifice one third anterior to it. Three rounded gill laminae (Pl Ig/part I, spec. fix. 1.2 mm l.) to the right of the anus, the middle one subdivided into two laminae; the other two undivided. Juveniles (0.5–1 mm) droplet-shaped, pointed at the mouth, broadest and highest at the posterior notal region (Pl. IIIb/part I)

Ground colour of the body almost transparent whitish fawn to reddish, viscera brownish. Adults with a striking dark brown, black or bordeaux pattern on notum and foot sole: margin lined by an often discontinuous garland (Pl. IIIa/part I), centre with a number of anastomosing longitudinal patches. Notal furrow with very dark patches. Thick opaque white triangular patches pointing at each other on both sides behind the eyes, more white narrowly on the head sides, notal margin and rear, and broadly on the tail sides, here flanking a broad dark median region. Very young animals have first a string of separate dark spots along the notal margin. These spots seem to merge later, thus becoming the garland. Still later dark points appear in the centre of the notum (Pl. IIIb/part I), which finally form anatsomosing patches.

Anatomy: Reverse side of jaws a triangular field (80 × 70 × 46 µm) of bowl-shaped scales; 9 plates with 4-5 pointed prongs each.

Radula (Pl. VIa,b) of two animals of 1.6 mm and 2.1 mm l. identically 27 × 1.1.1 (170 µm length). The smaller of the bilobed rachidians with up to 10 diverging, blunt denticles on each *Cardium*-shaped cusp (0.5 µm l.) forming an arc. Central depression particularly deep and broad, rarely a short, triangular and pointed central denticle. Beneath it there is a striking hump. Sides very long, remarkably diverging and moderately high, and halfway tilted slightly inwards. Laterals smooth, blunt and swan-necked (Pl. VIa,b).

4 gizzard plates, size differing distinctly in two animals of about 2 mm l.: 4 × 64 µm and 4 × 120 µm. 9-10 lamellae (pl. II/6 c), a thick longitudinal basal beam leaving one third of the 1-2 tipped lamellae free. Male copulatory organ similar to the one of *R. ferruginea* described by Kress (1985 b). No shell detectable by NaOH maceration or in histological sections.

Discussion. The specimens found by us in Banyuls correspond in all aspects with the material seen by Thompson (1980) and Thompson & Brodie (1988). We provide additional SEM data on radula, jaw and gizzard plates that had not been given by Thompson & Brodie (1988). We assume that the plates with prongs in the jaws of *R. brenkoae* are what Thompson & Brodie (1988) described as "rod like elements with much divided cusps". The shape of the rachidians is unique among the investigated species because of the extraordinarily broad central depression and the extremely long sides.

Runcina ferruginea Kress, 1977 (Pl. Ia, VId-h, Table I; Pl. If, IIn/part I)

J mar biol Ass UK 57: 201-211, PI. II, fig. 1-4; locus typicus: Plymouth (Great Britain)
Runcina zavodniki Thompson, 1980: 155–157, fig. 1d (see Thompson & Brodie 1988). (Ref.: Ortea & Urgorri 1981: 149-150, fig. 1 A; Ballesteros & Ortea 1981:

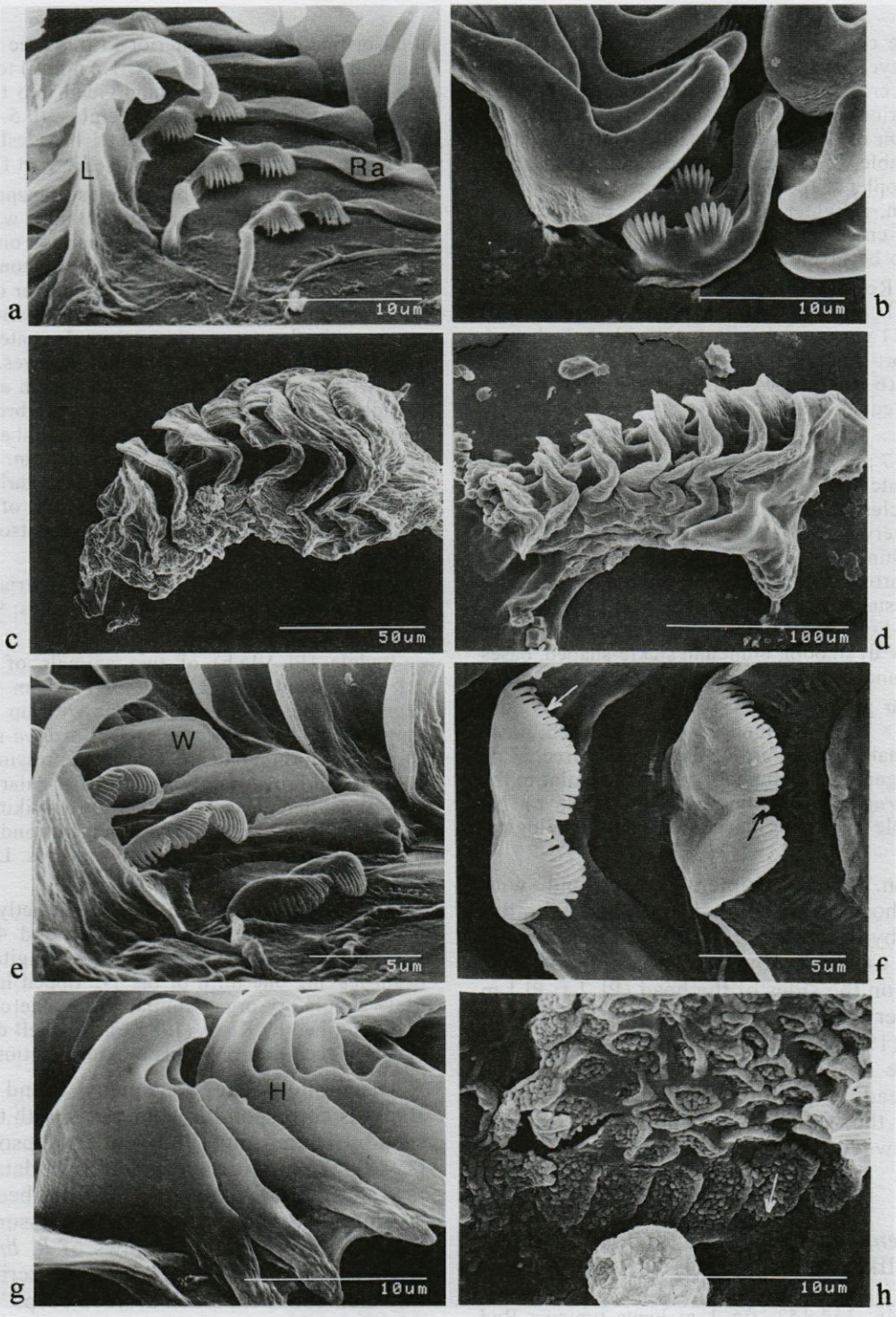

Plate VI. – **a – c**. SEM micrographs of *Runcina brenkoae* Thompson, 1980. **a**, lateral (L) and rachidian (Ra) teeth; arrow: hump; **b**, lateral and rachidian teeth; **c**, gizzard plate. **d – h**. Scanning electron micrographs of *R. ferruginea* Kress, 1977. **d**, gizzard plate; **e**, radula; W wings of rachidian teeth; **f**, rachidian teeth; black arrow: central denticle, white arrow: denticles running very far down the sides of the pads; **g**, lateral teeth; H hump; **h**, part of jaws, reverse side; note plates almost lacking prongs (arrow).

fig. 1A, p. 34; Kress 1985 a, b; Kress 1986; Kress & Schmekel 1992; Kress, Schmekel & Nott 1994).
Material: Banyuls: 4 spec. 1.5–2.1 mm, 03. 1997: Cap Oullestreil 25 m depth, from dived Coralligène; Plymouth: 4 spec. fix. 2–5 mm, 1974/1975, Kress (coll.).

R. ferruginea from Banyuls (2.1 mm l., 0.8 mm w., 0.5 mm h., tail 0.6 mm) is a slow creeper and rests often motionless. Body shape elongated rectangular with small head lobes, notum smooth, anterior border notched, rear rounded and not raised. Eyes of average size,

moderately close to the anterior border. Foot slightly broader than notum; tail long and rounded. Anus median, common genital orifice one third of the body length anterior to it. Three gill leaflets, subdivided horizontally into rounded laminae, to the right of the anus (spec. 3 mm from Plymouth). The most ventral is the largest and most divided one (Pl. Ia; Pl IIf,n/part I).

Our 4 specimens are identical in colour (Pl IIn/part I): notum, foot and tail all over cadmium-orange, viscera dark brown. Entire animal covered with very fine brown specks, somewhat more concentrated along the margins of notum and foot, thus forming a fine brown line. No trace of opaque white on the animal.

Anatomy of two Banyuls specs.: Reverse side of jaws with a triangular field of saucer-shaped scales, and a row of 7 larger rectangular plates (6 × 4 µm) with 7 very short processes each (Pl. VIh).

Radula: 24 × 1.1.1 (150 µm l.; 1 mm spec., Pl. VIe). Rachidian teeth (19 µm w., sides 13 µm l.; Kress (1977): 25 × 1.1.1; rach. 12 µm w.) bilobed, with 14-16 fine and parallel denticles of equal length (0.4 µm l.) on each pad, forming an arc with a steep slope mediadly, but less pronounced laterally, running very far down onto the sides (Pl. VIf). Small central depression with finger-shaped central denticle, often strong – sometimes worn down. Sides relatively short and high (pl. II/6e). Laterals (base 14 µm l., cusp 13 µm h.) smooth, blunt and sickle-shaped, base very high with a hump (8 µm h.; Pl. VIg).

4 gizzard plates (90 µm l.); 1 × 8, 3 × 7 lamellae with 1-2 tips each. Basal beam low, leaving two third of the lamellae free (Pl. VId). No shell detectable by NaOH maceration or in histological sections.

Discussion. Our material resembles very closely *R. ferruginea* in body shape, coloration and radula, though the colour is more orange than the brownish one described by Kress (1977). A characteristic feature of both is the complete lack of opaque white pigment. Ortea & Urgorri (1981) identified one specimen as *R. ferruginea*. However, there are a few differences: the notum has small, round "rugosites", and the tail is described as more pointed than in the type. The body shape of *R. zavodniki* Thompson, 1980, from Rovinj, according to Thompson & Brodie (1988, fig. 1C), is very similar to *R. ferruginea*. The colour of *R. zavodniki* is jet black all over, but may range over red-brown to pale orange-brown. The radula has denticulate rachidians and smooth laterals, like that of *R. ferruginea* (Pl. IVe, g). Thus we consider these two species to be conspecific (compare Gosliner 1990, p. 145).

Diagnostic features of the world's species of Runcinacea except our new species

Ildica nana Bergh, 1889; Mauritius, never rediscovered; blackish or black, notal sides lighter; foot transparent; radula 1.1.1; rach. broad plate with 1 denticle on either side; lat. smooth; external shell.

Ilbia ilbi Burn, 1963 (see Burn 1969); Victoria, Australia; pale purple with a pattern of yellow patches; radula 1.1.1; rach. tricuspidate; lat. denticulate, bifid.

Ilbia mariana Hoff & Carlson, 1990; Mariana Islands; body cream with a middorsal dark area; variable patterns in dark brown, yellow and red; radula 1.1.(1).1; assymmetrical: presumable rach. with serrate central cusp and 4 simple denticles; lat. with denticles.

Metaruncina setoensis (Baba, 1954) (see Ghiselin 1963, Baba 1967); Kii, Middle Japan; blackish, yellowish submarginal band around the notum; foot sole dirty yellowish with minute brown spots; radula 1.1.1, degraded; internal shell.

Pseudoilbia lineata Miller & Rudman, 1968; North Island, New Zealand; notum wrinkled transversely; body speckled with black in five longitudinal bands; each notum end translucent; radula 2.0.2; lat. assymmetrically triangular with a large apical denticle and smaller ones on each side.

Runcinella zelandica Odhner, 1924 (see Willan 1981); North Island of New Zealand; fulvous, sides of foot paler yellowish (fixated animals); radula 1.1.1.1.1; rach. broad, bilobed and denticulated; lat. smooth with one cusp, marginal smooth with 2 cusps.

Runcinella thompsoni Ortea & Rodríguez, 1993; Genovesa Island, Galapagos; dark red, a yellow spot on either side of the head, centre of notum blackish; radula 1.1.1.1.1; rach. bilobed and denticulated; lat. conical, marginal triangular with a thickened cutting edge; large internal, flexible shell.

Runcinida elioti Baba, 1937 (see Baba 1967); Oniike; Japan; back dark brown, yellowish green towards the margins, foot yellowish green; radula 1.1.1; rach. bilobed and denticulated; lat. smooth, hamate.

Runnica katipoides Miller & Rudman, 1968; North Island of New Zealand; dark grey speckled with reddish brown, a dorsal lanceolate, clear central area, flanked by two blackish lines; a white spot above the shell; radula 1.1.1; rach. bilobed and denticulate; lat. triangular with one fine denticle; internal shell.

Runcina adriatica Thompson, 1980; Rovinj, Yugoslavia; yellowish covered with many isolated, round to oval, black patches except on the tail sides; a broad, opaque white cross band behind the eyes, notum rear and tail sides opaque white; radula 1.1.1; rach. bilobed and denticulated; lat. short, hook-shaped, smooth.

Runcina africana Pruvot-Fol, 1953; Témara, Morocco/Senegal; dark brown, head sides and notum rear lighter brown, tail sides transparent, colourless, head sides with dark, oval eye-patches, bordered opaque white; an opaque white to yellowish,

straight cross band behind the eyes, another curved one anterior to the notum rear, both bordered with black patches; colour pattern very variable; radula 1.1.1; rach. bilobed and finely denticulated; lat. swan-necked, smooth.

Runcina aurata Garçía, López, Luque & Cervera, 1986 (Gosliner 1990, Cervera *et al.* 1991); Cádiz, Spain; brownish with dorsal dark patches, interspersed with white-golden specks, a dorsal clear curved band behind the eyes, another on the notum rear; foot greyish, median of tail dark, bordered white; radula 1.1.1; rach. bilobed and denticulated, one denticle bigger; lat. hook-shaped and denticulated.

Runcina australis Burn, 1963; Victoria, Australia; greenish-black; foot and mantle margins and a triangular area over the shell ashy-yellow; radula 1.1.1; rach. bilobed and denticulated; lat. swannecked, finely denticulated; internal shell.

Runcina bahiensis Cervera, Garçía-Gomez & Garçía, 1991; Punta del Rinconcillo, Strait of Gibraltar; notum with small protuberances; light ocre to greenish, with very dense, whitish-ocre pigmentation, except on the edges of notum and foot and the whole foot sole, where there are some small black spots instead; radula 1.1.1; rach. very small and denticulated; lat. hooked and smooth.

Runcina brenkoae Thompson, 1980; Rovinj, Yugoslavia; transparent whitish fawn, covered with anastomosing blackish or dark red patches; head sides behind the eyes with triangular, opaque white patches; notum rear and tail sides opaque white; radula 1.1.1; rach. bilobed, denticulated; lat. swan-necked, smooth.

Runcina capreensis Mazzarelli, 1894; 80 m depth, Capri, Italy, never rediscovered; charcoal black with many irregular big black patches and many small white spots; foot sole yellowish; triangular field of black dots on median of the tail; radula 1.1.1; rach. unicuspidate with one small denticle on each side; lat. hooked and smooth.

Runcina calaritana Colosi, 1915; Golfo di Gagliari, Italy; yellowish-brownish to almost black in the centre of notum and foot, all margins pale yellow or white, enlarged at head sides, notum rear and tail; young animals and larvae with a violet sheen; radula 1.1.1; rach. bilobed, probably denticulated, lat. triangular, probably denticulated.

Runcina coronata (Quatrefages,1844), Bretagne, France; dark brown with very fine yellowish sprinkling, anterior and posterior notal end and head sides broadly bordered cadmium yellow; an curved, opaque white cross band behind the eyes, another anterior to the notum rear. Foot sole and tail yellowish, tail with a dark brown median part; radula 1.1.1; rach. bilobed, irregularily denticulated; lat. triangular, denticulated.

Ildica divae du Bois-Reymond-Marcus & Marcus, 1963, syn. *Lapinura divae* Marcus & du Bois-Reymond Marcus, 1970, *Runcina divae* Clark, 1984; Lesser Antilles; brown all over, notal furrow lighter; radula 1.1.1; rach. denticulated; lat. smooth hooks; adults with external veliger shell.

Runcina falciforme Ortea, Rodríguez & Valdés, 1990; Cabo Verde; notum green with brilliant green, white or blue points on the notum rear; foot green or brown; radula 1.1.1; rach. bilobed and denticulated; lat. denticulated hooks.

Runcina ferruginea Kress, 1977; Plymouth, Great Britain; reddish brown all over, without opaque white; radula 1.1.1; rach. bilobed, denticulated; lat. sickle-shaped, smooth.

Runcina fijiensis Thompson & Brodie, 1988; Fiji; pale yellow with longitudinal black stripes on mantle and upper foot uniting smoothly at the rear; ventral surfaces of mantle and foot without stripes; radula 1.1.1; rach. bilobed with faint denticles; lat. smooth hooks.

Runcina inconspicua Verrill, 1901/02; Castle Harbor, Bermudas, never rediscovered; margins of broad foot thinly undulated; body dark green-brown, small orange margins; upper foot light green with white dots and orange-violet margins.

Runcina lenticula Gofas, Ortea & Rodríguez, 1991; Namibe, Angola; notum chestnut, darker toward the centre; foot and sides of body green; radula 1.1.1; rach. unicuspidate, arched with one single central denticle; lat. smooth (?), sickle-shaped.

Runcina macfarlandi Gosliner, 1991; Oregon, USA; notum yellowish-brown, darker in the centre; eyes only visible from the sides; radula 1.1.1; rach. bilobed and denticulated; lat smooth, elongated, curved.

Runcina macrodenticulata Garçía, Garçía-Gómez & López, 1990; Playa de Benitez, Strait of Gibraltar; brownish or olive green, with dorsal rich dark patches and white specks; head with brown median band, bordered by a longitudinal dark olive green band, and a yellowish white one; median of tail dark olive green; radula 1.1.1; rach. bilobed with irregular denticles; lat. hook-shaped with 8 big denticles

Runcina marshae Burn, 1966; Fiji; dull orange (fixed); eyes visible; radula 1.1.1 rach. denticulated; lat. smooth; internal shell.

Runcina ornata (Quatrefages, 1844) (Ballesteros & Ortea 1981, Garçía *et al.*1986, Cervera *et al.* 1991); Bretagne, France, Eastern Atlantic (1843); Quatref.: similar to *R. coronata*, but generally darker, tail transparent; Garçía *et al.*: blackish with whitish head sides, sometimes joining to an arch behind the eyes; notum rear assymmetrically whit-

ish only on the right side, median of tail blackish; radula 1.1.1; rach. bilobed, with irregular denticles; lat. hooked or triangular and denticulated.

Runcina paupera Ortea, Rodríguez & Valdés, 1990; Cabo Verde; olive greenish with central small black notal spots, clear green notal and foot margins with a yellowish rim; eyes visible; radula 1.1.1; rach. bilobed and denticulated with a straight edge; lat. denticulated (?) hooks.

Runcina prasina (Mörch, 1863); Ste. Croix Island, Antilles, never rediscovered; notum with dense, minute warts and a trilobate rear, notum "prasinum", foot yellowish-green.

Runcina zavodniki Thompson, 1980 (Thompson & Brodie, 1988, comp. description of *R. ferruginea* in the present article); jet black, red brown or pale orange brown all over, no white; radula 1.1.1; rach. bilobed and denticulated; lat. smooth hooks.

Appendix: During the printing process of this article we received two publications with the descriptions of another four new species of *Runcina*, which differ sufficiently from all new species described here in both exterior and interior characters to seperate them without doubt. The summarized descriptions are to be added to the above list.

Runcina gentiana Ortea & Nicieza, 1999; La Gomera, Canary Islands; gentian blue, narrowly bordered with pale blue along the head sides and notum rear; foot violet, tail lighter; radula 1.1.1; rach. bilobed with massive denticles; lat. denticulated.

Runcina hidalgoensis Ortea & Moro, 1999; Teneriffe, Canary Islands and Azores; various shades of rose-red to dark red; radula 1.1.1; rach. bilobed, denticulated; lat. denticulated.

Runcina medanensis Ortea & Moro, 1999; Teneriffe, Canary Islands; uniformly fairly dark red, tail lighter; radula 1.1.1; rach. bilobed with thick denticles; lat. denticulated.

Runcina palominoi Ortea & Moro, 1999; Lanzarote, Canary Islands; red with paired, lateral opaque white patches at the head front, behind the head and in front of the notum rear; sides of the granate red tail white; radula 1.1.1; rach. unicuspidate without denticles; lat. sickle-shaped, smooth.

(1) part of the thesis of the junior author, D Cappellato

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Reçu le 20 septembre 2000; received September 20, 2000
Accepté le 13 mars 2001; accepted March 13, 2001