Antarctic Science 7 (3): 277–281 (1995)

# A new Eocene crab (Crustacea, Decapoda) from Seymour Island, Antarctica

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**Abstract:** A new xanthid crab, *Tumidocarcinus foersteri* n. sp. is described from the La Meseta Formation on Seymour Island, Antarctica. The fossils were obtained from the Allomember Submeseta of Late Eocene age. As other representatives of the genus *Tumidocarcinus* were only known from New Zealand and Australia, this finding provides new insights on the palaeobiogeography of high latitude faunas during the Early Tertiary.

Received 21 November 1994, accepted 8 June 1995

**Key words:** Antarctica, Eocene, Decapoda, Xanthidae, systematics, palaeobiogeography

## Introduction

A thick sequence of clastic Palaeogene sediments is exposed at Seymour Island in the James Ross basin (Del Valle *et al.* 1992), east of the Antarctic Peninsula (Fig. 1a). Within this sequence, La Meseta Formation is world famous for its abundant and well preserved fossil invertebrates. During the 1993 summer field season, two of us (SM and SS) found well preserved specimens of a new fossil crab.

The purpose of this paper is to describe and illustrate a new species of a xanthid crabs: *Tumidocarcinus foersteri* n. sp. As representatives of this genus were only known from Eocene to Miocene deposits of New Zealand and the Oligocene of Australia, the finding has important palaeobiogeographic implications.

Other well preserved decapod crustaceans have already been described from La Meseta Formation. They include eight crabs (*Homolodromia chaneyi, Lyreidus antarcticus, L. hoskeri, Calappa zinsmeisteri, ?Callinectes sp., Chasmocarcinus seymourensis, Antarctomithrax thomsoni, ?Micromithrax minisculus*), one galatheid (*Munidopsis scabrosa*), and one callianassid (*Protocallianassa* cf. *P. faujasi*) (Feldmann 1984, 1992, 1994, Feldmann & Zinsmeister 1984, Feldmann & Wilson 1988).

One of the authors (MBAU) is responsible for the systematics while the other two (SS and SM) collected the specimens and prepared the stratigraphy.

## Repository

The specimens described here are deposited in the collections of the Palaeontology section of the University of Buenos Aires (CPBA), Ciudad Universitaria, Buenos Aires (1428), Argentina.

## Geological setting

La Meseta Formation (Elliot & Trautman 1982) is exposed on the north-eastern third of Seymour (Marambio) Island, Antarctic Peninsula (Fig. 1a). It comprises 750 m of poorly consolidated sandy to heterolytic deposits punctuated by well cemented shell beds, with marine fauna, ichnofauna, and sedimentary structures indicative of tidal, wave, and deltaic influences (Elliot & Trautman 1982, Doktor *et al.* 1988, Sadler 1988, Wiedman & Feldmann 1988, Stillwell & Zinsmeister 1992, Marenssi *et al.* 1994).

The La Meseta Formation represents a composite filling of a broad trough or valley cut down after the tilting of the Palaeocene and Maastrichtian deposits. It was first divided by Elliot & Trautman (1982) into three informal members and later by Sadler (1988) into seven major lithostratigraphic units (Fig. 2). More recently, on the basis of detailed mapping and field work, Marenssi & Santillana (1994) subdivided this formation into six unconformity-bounded units each of them representing a complete finning-coarsening up sedimentary cycle (Fig. 2).

Fossil crabs referable to this new species were collected by two of us (SM and SS) in three different localities (Fig. 1b) from the same stratigraphical interval. This level is located 120 m below the top of the La Meseta Formation within Unit III of Elliot & Trautman (1982), Telm 7 of Sadler (1988) or Allomember Submeseta of Marenssi & Santillana (1994).

This section is mainly composed of cross-bedded fine sands and bioturbated massive muddy fine sands, with minor amounts of thin heterolithic sand/mud beds and sheet-like pebble beds. Marine fauna is sparse and frequently concentrated in definite horizons. Common fossils include *Lingula* sp., *Turritella* sp., *Panopea* sp., *Eurhomalea* sp., and whale and penguin bones. Trace fossils include *Ophiomorpha, Thalassinoides, Planolites,* and possible *Skolithos* and *Teichichnus* (Marenssi & Santillana, personal observations).

Sedimentological and palaeontological data suggest to a littoral–shallow sublittoral tide-dominated and storm-influenced marine environment (Marenssi, unpublished data) similar to the model proposed for the Jura Quartzite shelf area (Anderton, 1976). The cross-bedded sands were produced by migrating sand waves (Allen, 1984) during times of enhanced (spring

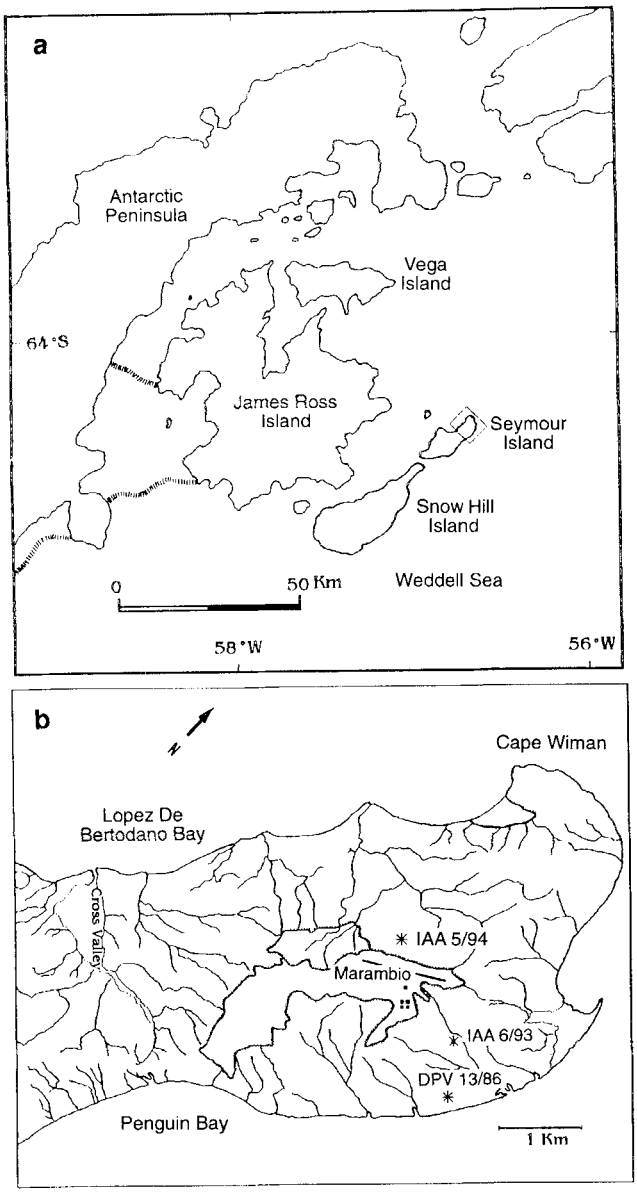


**Fig. 1. a.** Map showing the location of the James Ross basin, with indication of the study area. **b.** Fossil localities in northern Seymour Island.

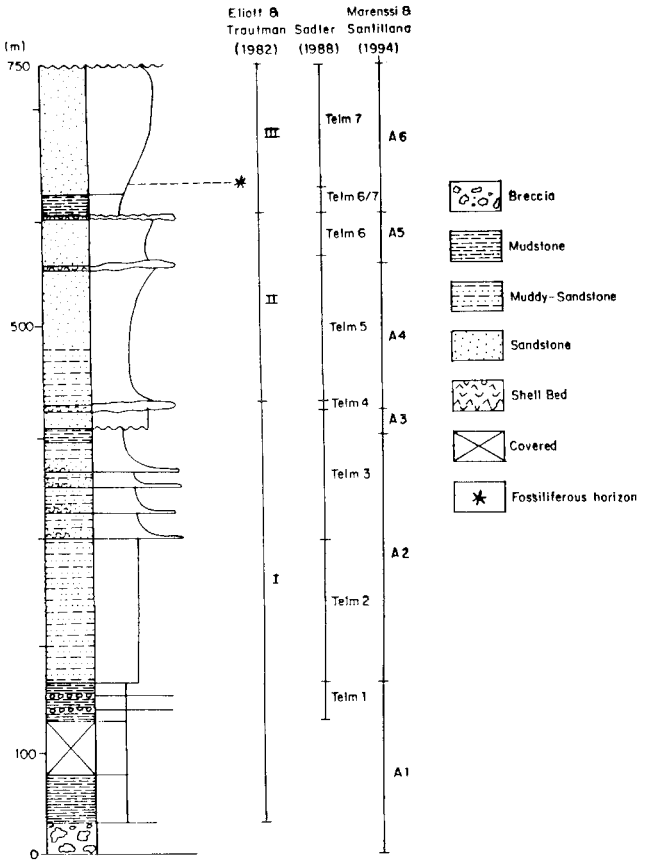


**Fig. 2.** Stratigraphical column of La Meseta Formation, with indication of fossiliferous level with *Tumidocarcinus foersteri.*

tides?, storms?) tidal flows while bioturbated muddy fine sands and heterolithic sand/mud beds represent fair weather deposits. Sheet-like pebble beds may represent winnowed pebble lags formed during intense storm surge conditions.

The age of the La Meseta Formation has been determined as late Early Eocene to Late Eocene or possibly earliest Oligocene on the basis of the molluscan fauna (Zinsmeister & Camacho 1980, Stilwell & Zinsmeister 1992), dinoflagellate flora (Wrenn & Hart 1988, Coccozza & Clarke 1992) and land-mammal fauna (Marenssi *et al.* 1994).

## Systematics

Order DECAPODA Latreille, 1803

Infraorder BRACHYURA Latreille, 1803

Family XANTHIDAE Dana, 1851

Genus *Tumidocarcinus* Glaessner, 1960

*Type species*: *Harpactocarcinus tumidus* Woodward by original designation of Glaessner (1960: 24).

*Diagnosis*: Resembles *Harpactocarcinus* but differs in the strongly inflated shape of the carapace, the absence or weak development of antero-lateral marginal spines and the absence of tuberculation on the upper edge of the propodus of the cheliped. Differs from *Xanthopsis* in the greater length of the antero-lateral margin and the absence of elevated bosses on the carapace (from Glaessner 1960: 24).

*Tumidocarcinus foersteri* n. sp.

Fig. 3 a–h

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**Fig. 3.** *Tumidocarcinus forsteri* n. sp. **a-c**, dorsal, ventral, and frontal view of holotype (CPBA 17660), **D.** Dorsal view of right first cheliped and pereiopods (CPBA 17663). **e–g.** Dorsal, frontal and ventral view (CPBA 17661).**h.** Dorsal view of heavily abraded specimen (CPBA 17662). Natural size.

*Holotype*: A specimen comprising the carapace and fragmentary right cheliped and pereiopods (CPBA N°17660).

*Material*: Apart from the holotype, another fragmentary carapace (CPBA N°17661), a heavily abraded carapace (CPBA N°17662), and part of the right cheliped and right pereiopods (CPBA N°17663).

*Etymology*: In honour of the late Reinhard Förster, a famous fossil Crustacea researcher, and a good friend.

*Diagnosis*: Medium sized for genus with ovoid outline, slightly wider than long, with weakly defined carapace regions, and two small spines along anterolateral margin.

*Description*: Medium sized xanthid, wider than long, with ovoid outline, convex in transverse and longitudinal views. Sides well defined, carapace regions weakly defined, separated by shallow grooves. Width of fronto-orbital margin is 0.38–0.40 of maximum width. Front damaged in all available specimens. Orbits small, oval in shape, without fissures. Antero-lateral margin rounded, with a finely granulated edge. Two small spines can be distinguished among the granules of the edge (arrows, Fig. 3a, e). Antero-lateral angle of carapace rounded. Postero-lateral margin convex, part of a ridge present above the base of the last pereiopods, posterolateral corner arcuate. Posterior margin not well preserved, about 53% maximum width, slightly concave. Carapace grooves generally indistinct, seen as feeble depressions, with only the cervical groove well defined, nearly straight in axial region, curving sharply toward anterolateral margin, where it becomes broad and indistinct. Regions poorly marked, and seen as convex elevated surfaces, separated by depressions. Protogastric and hepatic regions domed, separated by a broad depression. Meso- and metagastric regions flattened. Cardiac and intestinal regions indistinct. Epibranchial region ovoid, elevated, meso- and metabranchial regions not sharply differentiated. Surface of the carapace granulated, more finely ornamented in the anterior half, and more coarsely granulated towards the posterior part.

Sternum lanceolate, distorted and displaced. Somites 1–3 fused into small triangular plate, somite 4 forming the largest plate, somites 5 and 6 poorly preserved. Abdomen unknown.

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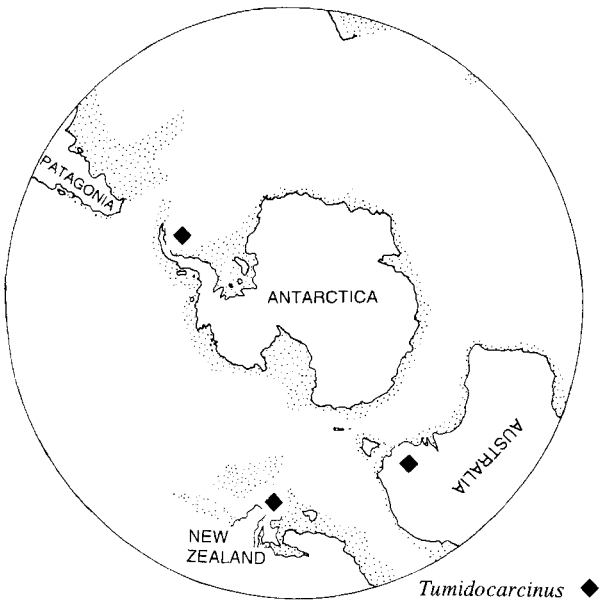


**Fig. 4.** Palaeogeographic reconstruction of southern Gondwana during the Late Eocene showing the distribution of *Tumidocarcinus* during Palaeogene times. Continental shelf stippled (base map from Lawver *et al.* 1992).

Only right cheliped preserved, strong. Carpus robust, triangular, with a single spine. Propodus inflated, with rounded outer surface and flattened inner surface, cross section oval. Fingers unknown. Pereiopods incompletely preserved, compressed oval in section, granulated.

*Measurements* (mm):

| | width | length | front | orbits |
|---|---|---|---|---|
| CPBA 17660 (holotype) | 62 | 50 | 12 | 6 |
| CPBA 17661 | 51 | – | – | 5 |
| CPBA 17662 | 56 | 48 | – | – |

*Remarks*: *Tumidocarcinus foersteri* n.sp. differs from *T. tumidus* (Woodward), type species of the genus, in the outline of the carapace, flatter gastric regions, and much smaller frontal margin. *T. giganteus* Glaessner resembles *T. foersteri* only in the flat central carapace, but differs in the large size, rounded outline of carapace, frontal margin size, and even granulation. The third known species, *T. dentatus* Glaessner is very similar to our Antarctic species, but differs in the more pronounced regions, different carapace shape, and presence of a strong lateral tooth (Glaessner 1960).

## Palaeobiogeography

The Eocene brachyuran fauna described from New Zealand (see Feldmann & Maxwell 1990) shows similar components with the Brachyura from La Meseta Formation of Antarctica — both represented by Majidae, Raninidae, Portunidae, Xanthidae and Goneplacidae.

According to Feldmann & Maxwell (1990) *Tumidocarcinus tumidus* occurs in New Zealand in both shallow and moderately deep water assemblages, and is probably a bathymetrically tolerant species. We can assume a more or less similar behaviour for the Antarctic species. However, other palaeontological data, together with sedimentological evidence suggests that the crabs and associated molluscan fauna lived in littoral–shallow sublittoral environments.

Cumulative information from different fossils and also from oxygen isotope measurements indicates that the Eocene was a warm period in the Southern continents (New Zealand, Patagonia, Antarctica, Australia)(see Prothero & Berggren 1992). Taking into consideration the current palaeogeographic reconstructions (Lawver *et al.* 1992, see also Fig. 4), the inferred oceanic circulations (Feldmann & Zinsmeister 1984), and a warmer equable climate in the Southern Hemisphere, a migration route from New Zealand to Antarctica is most probable during the Eocene. The addition of *Tumidocarcinus foersteri* to the known brachyuran fauna of La Meseta Formation provides another link to the better known New Zealand and Australian faunas. This biotic interchange has already been mentioned by Feldmann & McLay (1993) when discussing the geological history of brachyuran decapods from New Zealand.

## Acknowledgements

The authors are most grateful to M. Reguero (Museo de La Plata) for collecting one of the specimens. S. Marenssi and S. Santillana wish to thank the Instituto Antártico Argentino for their logistical support during the field season. This work was carried out by the Palaeogene Working Group of the Department of Geological Sciences, University of Buenos Aires, as a contribution to IGCP Project 301 "Palaeogene of South America".

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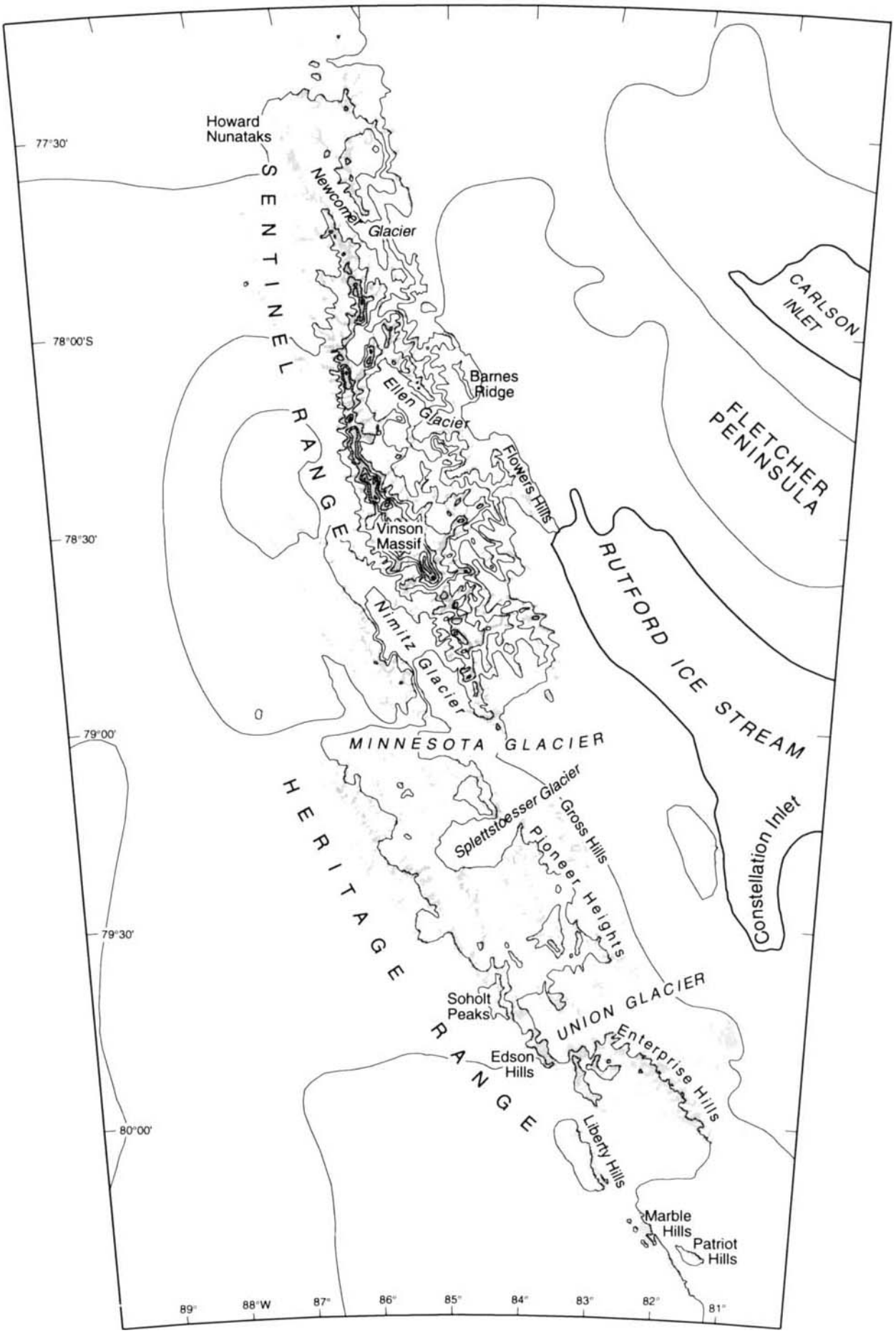
*Antarctic Science* **Handy Atlas Map No. 13.**
IMW Sheets ST 13–16, ST 17–20, SU 16–20, Ellsworth Mountains, 1:1 500 000 scale, contour interval at 500 m. Shaded areas represent rock outcrops.

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