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A new species of *Lissocidaris* (Echinodermata: Echinoidea: Cidaridae) from the Philippines: convergent evolution among smooth-spined cidaroids

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Abstract

Lissocidaris xanthe **sp. nov.** Coppard & van Noordenburg, 2007 occurs at depths of between 150 m and 250 m near Mactan Island in the Philippines. It is distinctive in having aboral interambulacral spines that measure more than twice the test's horizontal diameter at the ambitus. The neck of each spine is typically white and unconstricted. Oral primary interambulacral spines have serrated edges. Large globiferous pedicellariae have moderately narrow valves, each valve with a narrow longitudinally oval opening beneath a large terminal tooth. It is similar to the type species of *Lissocidaris* (*L. fusca*) in having smooth, aboral interambulacral spines, the smooth surface formed by dense, anastomosing cortical hairs that coalesce to form a continuous crust between longitudinal ridges. Smooth spines are also found in two other cidaroid genera: *Calocidaris* and *Compsocidaris*. However, in these genera, the glossy surface results from the cortex being devoid of hairs; this provides a marked example of convergent evolution.

Key words: Echinoid, Cidaridae, *Lissocidaris xanthe* **sp. nov.** Coppard & van Noordenburg, 2007, Philippines, taxonomy

Introduction

Lissocidaris Mortensen, 1939 is a genus of regular sea urchin in the family Cidaridae Gray, 1825 and the subfamily Cidarinae Mortensen, 1928. This family first appears in the Upper Triassic and today has a worldwide distribution. Members of this family have interambulacra with large single primary tubercles that are perforate and are typically non-crenulate in all but the most basal members (Smith, 2005). Members of the subfamily have no naked furrows or pits developed interradially or perradially, with scrobicular tubercles differentiated from extrascrobicular granules (Mortensen, 1928).

Lissocidaris was until recently thought to be monotypic, the type species *L. fusca* Mortensen, 1939 only reported from the Maldives in the Indian Ocean. This genus was erected on the basis that it has smooth primary spines, the smooth surface formed by dense, anastomosing cortical hairs that coalesce to form a continuous crust between longitudinal ridges. This character differentiates this genus from *Cidaris* Leske, 1778 (type species *Cidaris cidaris* (Linnaeus, 1758)), whose members have ornamented primary spines with beaded ribs. Two other genera of cidaroids have smooth spines: *Calocidaris* Clark, 1907 (type species *Calocidaris micans* (Mortensen, 1903)) and *Compsocidaris* Ikeda, 1939 (type species *Compsocidaris pyrsacantha* Ikeda, 1939). However, the smooth nature of their primary spines is reportedly due to the glossy surface of the cortex being devoid of hairs or other ornamentation. Based on this character, *Calocidaris* and *Compsocidaris* appear to be closely related, but are geographically widely separated (*Calocidaris micans* is reported from the northwest-

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