

Revision of the pentacrinid stalked crinoids of the genus *Endoxocrinus* (Echinodermata, Crinoidea), with a study of environmental control of characters and its consequences for taxonomy

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Abstract

A revision of the stalked crinoid species attributed to the genus *Endoxocrinus* A.H. Clark, 1908 (Diplocrininae, Pentacrinidae, Crinoidea, Echinodermata) is conducted using studies on phenotype variation and its relation with environment. Specimens collected via submersible at five sites in the Bahamas exhibit distinct phenotypes that correlate with different apparent ecological niches and serve as references for interpreting specimens dredged in Atlantic and Pacific Oceans where detailed information on their benthic environment is unknown. Documentation of ecophenotypic convergences or divergences allows us to distinguish between adaptive characters and those revealing genetic affinities, and to discuss allopatric evolution and bathymetric zonation. The results suggest the following taxonomy: the genus *Endoxocrinus* is subdivided into two subgenera, i.e., *Endoxocrinus* A.H. Clark, 1908 and *Diplocrinus* Döderlein, 1912 (*Annacrinus* A. H. Clark, 1923 becomes a junior synonym of *Diplocrinus*); the subgenus *Endoxocrinus* is monospecific with *E. (E.) parrae* [Gervais (*in* Guérin, 1835)] from the western tropical Atlantic; the subgenus *Diplocrinus* includes *E. (D.) alternicirrus* (Carpenter, 1882) from the western and central Pacific, *E. (D.) maclearanus* (Thomson, 1872) from the western tropical Atlantic, and *E. (D.) wyvillethomsoni* (Jeffreys, 1870) from the northeastern Atlantic. *Endoxocrinus (E.) parrae* includes three subspecies adapted to different habitats and depths: *E. (E.) parrae parrae* usually in 154–518 m with moderate to high current velocity and moderate turbulence to laminar flow, *E. (E.) parrae carolinae* (A.H. Clark, 1934) in 504–724 m with moderate current velocity and high turbulence, and *E. (E.) parrae prionodes* H.L. Clark, 1941 in 402–832 m with high current velocity in laminar flow. *E. (D.) alternicirrus* includes two subspecies, *E. (D.) alternicirrus alternicirrus* in 625–1476 m and *E. (D.) alternicirrus sibogae* (Döderlein, 1907) usually in 364–800 m. *E. (D.) maclearanus* has a depth range of 432–878 m and occurs as a dwarf variety *minus* n. var. in high current velocities and high turbulence. *E. (D.) wyvillethomsoni* from depths of 1214–2070 m lives on various substrates under a variety of hydrodynamic conditions.

Key words: *Endoxocrinus*, *Diplocrinus*, *Annacrinus*, stalked crinoids, Echinodermata, biogeography, phenotypes, taxonomy

Historical introduction

Pentacrinid crinoids are known from the Late Permian (Webster & Jell 1999) and were especially abundant in Jurassic seas. They display a heteromorphic pentaradiate stalk with nodals bearing cirri, and a flexible pinnulate crown with ten or, usually more, arms. They are rheophilic suspension feeders attached by cirri, which grasp the substrate. For morphological terminology see Figure 1 and Roux et al. (2002).

Guettard (1761) described the first known pentacrinid as *Palmier marin*, a species from the West Indies later described as *Isis asteria* by Linnaeus (1767) and *Encrinus*