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New record of a sea star of genus *Henricia* (Asteroidea: Spinulosida: Echinasteridae) from Jeju Island, Korea

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Received: 22 February 2019 Revised: 11 March 2019 Revision accepted: 12 March 2019 **Abstract:** An asteroid specimen that belongs to the genus *Henricia* was collected from the waters near Ongpo harbor, Jeju Island using fishing net on 24 January 2017. The specimen was identified as *Henricia anomala* Hayashi, 1973, which belongs to the family Echinasteridae and order Spinulosida. *Henricia anomala* was first described by Hayashi, 1973, who captured it from Sagami Bay at a depth of 110–116 m. This species can be distinguished from other *Henricia* species by short arms (R/r = 4), abactinal spines lining the abactinal plates and bearing about two to five spinelets, closely meshed abactinal skeleton, composed of small rod-like and subtriangular plates, a narrow papular area containing one or two papulae, and adambulacral armature composed of five to seven bluntly pointed spinelets. This is the first report of *Henricia anomala* in Korea.

Keywords: Henricia anomala, Echinasteridae, Spinulosida, Jeju Island, Korea

INTRODUCTION

The genus Henricia Gray, 1840 is composed of 91 species (Mah 2019), a number of which are taxonomically variable (Lambert 2000). Hybridization and a high degree of variations are the main reasons for difficulties in the identification and classification of Henricia species (Fisher 1911; Clark and Downey 1992). The abactinal spines, shape of the abactinal and actinal skeleton, and number of adambulacral spines are the key characters that enable the morphological identification of Henricia species (Clark and Jewett 2010). Madsen (1987) contributed significant information for the study of Henricia species, as he re-evaluated the Henricia sanguinolenta complex from the Norwegian Sea and adjacent waters of the Northeast Atlantic Ocean. He made many recommendations for the identification of the morphological characters of sea stars that were not used previously. The research of Fisher (1911) and D'yakonov (1950) was of great value as well, as they provided the baseline information on the surrounding regions of the Northern Pacific. In addition, Hayashi (1940) grouped 18 different *Henricia* species in Japan. Nine *Henricia* species have been reported in Korea, of which six species, namely, *Henricia elachys, Henricia nipponica, Henricia ohshimai, Henricia pachyderma, Henricia pacifica,* and *Henricia regularis* are distributed in Jeju Island in Korea.

MATERIALS AND METHODS

The *Henricia* specimen was collected from the waters near Ongpo harbor, Jeju Island using fishing net on 24 January 2017. The collected specimen was preserved in 95% ethanol, and morphological characteristics, such as the size of the disk, upper and proximal portions of the arms, number of abactinal spines, shape of abactinal and actinal



Fig. 1. *Henricia anomala.* A. abactinal side; B. actinal side; C. abactinal paxillae; D. adambulacral spines; E. oral part; F. madreporite; G. abactinal skeleton; H. papula (arrow), papular area (circle); I. actinal skeleton: superomarginal plates (s), intermarginal plates (in), inferomarginal plates (i), ventrolateral plates (v), adambulacral plates (a); J. abactinal spines; K. adambulacral spines. Scale bars: A, B=1 cm, C-I= 1 mm, J=100 µm, K=50 µm.

skeleton, and number of adambulacral spines were examined. The morphological features of the specimen were photographed using a scanning electron microscope (JSM-6510; JEOL Ltd., Tokyo, Japan), stereomicroscope (Nikon SMZ1000; Nikon Co., Tokyo, Japan), and digital camera (Nikon D7000). Abbreviations for the measurements were those used by Shin and Ubagan (2015a, b).

SYSTEMATIC ACCOUNT

Class Asteroidea de Blainville, 1830 Order Spinulosida Perrier, 1884 Family Echinasteridae Verrill, 1870 Genus *Henricia* Gray, 1840

Henricia anomala Hayashi, 1973

변칙애기불가사리 (신칭) (Fig. 1A-K) Henricia anomala Hayashi, 1973, p. 63, pl. 13, figs. 5, 6; Mah, 2019: 369097.

Material examined. One specimen, Ongpo harbor, Jeju Island, 24 January 2017.

Description. Arms five, thin, gradually tapering to tips (Fig. 1A, B). Abactinal paxillae scattered, containing two to five short, slender and delicate spinelets, not covered with integument. Papular areas narrow, containing one or rarely two papulae in an area (Fig. 1H). Abactinal skeleton closed meshed, imbricated, composed of subtriangular and small rod-like plates, and sub-skeleton present inside the papular areas (Fig. 1G). Madreporite small, situated near base of arm, delicate, circular in form, and bearing spines same as the abactinal spines (Fig. 1F). Actinal plate series distinguishable, superomarginal plates relatively larger than the other plate series. Intermarginal and inferomarginal plates reaching one-half length of arm, ventrolateral plates reaching tip of arm (Fig. 1I). Adambulacral armature composed of five to seven bluntly pointed spinelets, the inner spine longer than the outer spines arranged in two transverse or zigzag rows (Fig. 1D). Oral plate bearing three slender spines (Fig. 1E). Furrow spine single.

Size. R = 32 mm, r = 8 mm, R/r = 4.

Habitat. Hard substrates (rocks).

Distribution. Korea (Jeju Island); Japan (Sagami Bay).

Deposition. The collected specimen was deposited in the Marine Echinoderm Resource Bank of Korea (MERBK), Sahmyook University, Seoul, Korea.

Remarks. Henricia anomala was first reported by Hayashi,

1973, from Sagami Bay in Japan. The Korean H. anomala specimen was collected from the waters near Ongpo harbor of Jeju Island and is reported for the first time in Korea. Based on the general appearance, our specimen (R/r=4)has a superficial resemblance to H. elachys Clark and Jewett (2010) (R/r = 3.2-3.9). These Henricia species were distributed in Jeju Island, Korea. H. anomala can be easily classified because it has (1) lesser number of abactinal spines (two to five) compared to *H. elachys* (three to 14); (2) the shape of abactinal paxillae is scattered, clustered in H. elachys; (3) lesser number of papulae (one or two) compared to *H. elachys* (two to five); (4) the abactinal skeleton composed of a small rod-like, and subtriangular plates, but those of *H*. *elachys* are rounded cross plates; and (5) lesser number of adambulacral spines (five to seven) compared to *H. elachys* (10–14).

We also compared *H. anomala* to another small size (R/r=3.1-3.6) *Henricia nipponica* Uchida (1928). As a result, three major differences in morphological characters of *H. nipponica* was revealed such as (1) bearing more number of abactinal spines (seven to 15), (2) clustered abactinal paxillae, and (3) roundish shape of abactinal plates.

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