

# A newly recorded sea star of genus *Henricia* (Asteroidea: Spinulosida: Echinasteridae) from the East Sea, Korea

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*Henricia* specimens were collected using fishing nets from 14 November 2012 to 8 June 2018 from the East Sea of Korea. The specimens were identified as *Henricia sanguinolenta* (O.F. Müller, 1776), belonging to the family Echinasteridae of the order Spinulosida, which is known for its wide distribution throughout the world. This species can be distinguished from other *Henricia* species by long arms ( $R/r = 6-6.8$ ), thick arm base, coarser stubby abactinal spines with more than ten apical points, and visible longitudinal series of actinal ossicles. Previously, eight species of the genus *Henricia* were reported in the Korean fauna. The morphological characteristics of this species were prepared and described with illustrations.

Keywords: Asteroidea, Spinulosida, *Henricia*, East Sea, Korea

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## INTRODUCTION

The family Echinasteridae of the order Spinulosida contains eight accepted genera, of which the majority of species are found in genera *Echinaster* and *Henricia*. The genus *Henricia*, a typical representative of the family, comprises 91 species (Mah, 2018) with poorly understood systematics. *Henricia* species are widely distributed in the world's seas, especially in the Northern Pacific (Fisher, 1911; Hayashi, 1940; D'yakonov, 1950). Morphological characteristics of the *Henricia* species are highly variable (Fisher, 1911; Clark and Downey, 1992) and are probably caused by aging, and adaptation to their present environmental condition. These morphological variations result in difficulty with identification. Life coloration is also considered a distinguishing characteristic of some species in *Henricia*. *Henricia sanguinolenta* is found in a variety of colors, but is predominantly found to be rich red, especially the Atlantic form, as the species name suggests (Lambert, 2000). Identification of *H. sanguinolenta* was based mainly from the works of Fisher (1911), D'yakonov (1950), and Clark and Downey (1992). A total of eight *Henricia* species are reported in Korea, and the majority of the species, such as *H. leviuscula*, *H. nipponica*, *H. ohshimai*, *H. pachyderma*, *H. regularis*, and *H. reniessa*, are distributed in the East Sea of Korea.

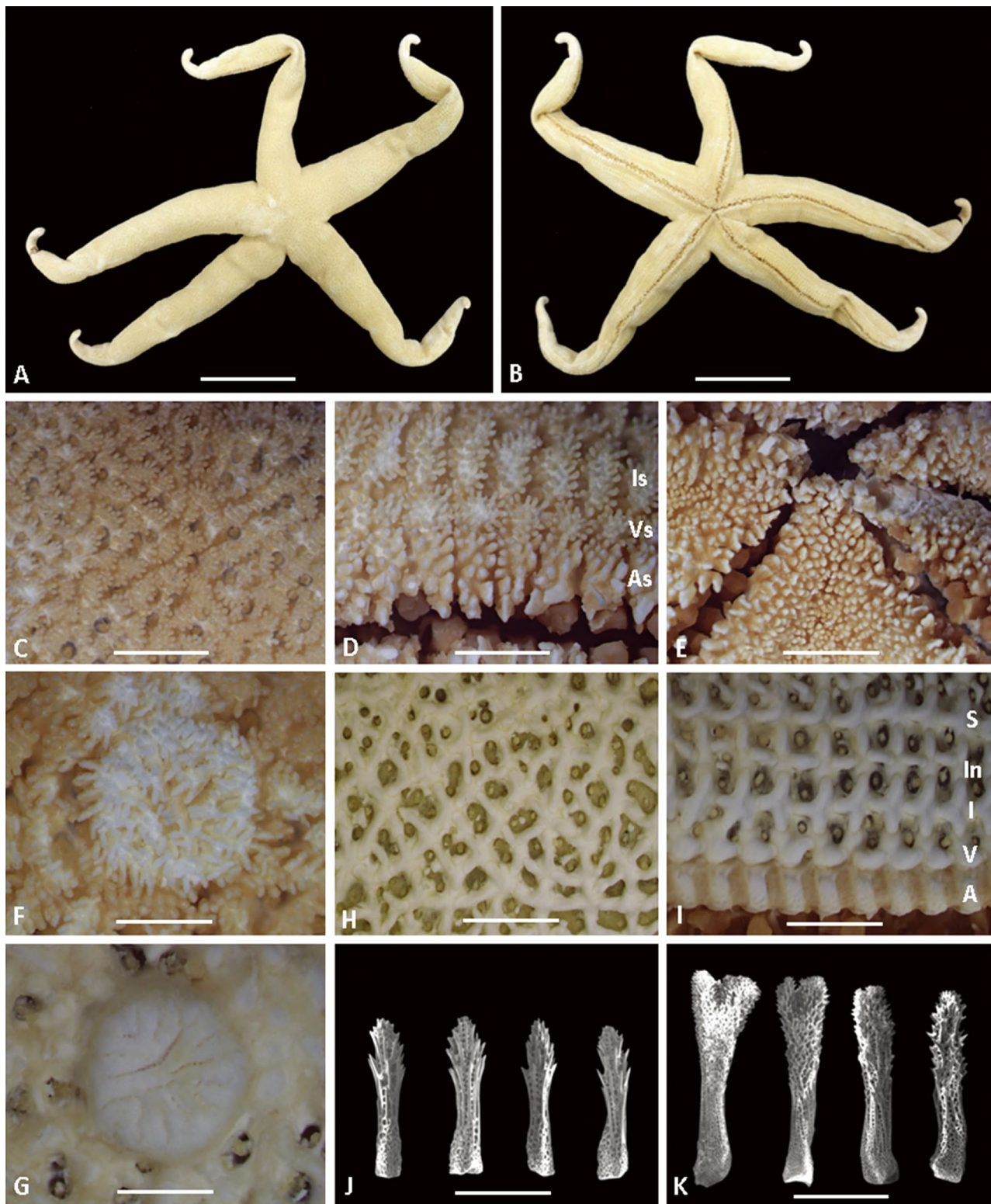
## MATERIALS AND METHODS

*Henricia* specimens were collected using fishing nets from 14 November 2012 to 8 June 2018 from the East Sea (Daejin, Geojin, Gonghyeonjin, Gisamun, Jumunjin, Sacheon, Gangneung, Imwon, Jukbyeon) of Korea. The collected specimens were preserved in 95% ethanol and their morphological characteristics examined, such as the size of the disk, upper and proximal portions of the arms, number of abactinal spines, shapes of abactinal and actinal skeletons, and number of adambulacral spines. Morphological features of the specimens 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 measurements follow Shin and Ubagan (2015a; 2015b).

## SYSTEMATIC ACCOUNTS

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

*Henricia sanguinolenta* (O.F. Müller, 1776)  
빨간애기불가사리 (신칭) (Fig. 1A-K)



**Fig. 1.** *Henricia sanguinolenta*. A. abactinal side; B. actinal side; C. abactinal paxillae; D. actinal spines: inferomarginal spines (Is), ventrolateral spines (Vs), adambulacral spines (As); E. oral part; F. madrepore with spines; G. madrepore without spines; H. abactinal skeleton; 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 = 2 cm, C-I = 1 mm, J = 100 μm, K = 50 μm.

*Asterias sanguinolenta* O.F. Müller, 1776: p. 235.

*Henricia sanguinolenta*: Fisher, 1911: p. 271, pl. 65, figs. 1, 2; pl. 66, figs. 1-5; pl. 68, fig. 3; Verrill, 1914: p. 226, pl. 49, fig. 2; pl. 88, figs. 3, 3a; D'yakonov, 1950: p. 78, figs. 38, 39; Clark and Downey, 1992: p. 396, pls. 93F, 95H-I, figs. 60o-p; Jewett *et al.*, 2012: p. 149, fig. 9E; Mah, 2018: 123974.

*Henricia sanguinolenta miliaris* Verrill, 1914: p. 234, pl. 88, figs. 4, 4a.

*Henricia sanguinolenta* var. *rudis* Verrill, 1914: p. 233, pl. 86, figs. 5, 5a.

**Material examined.** Three specimens, Geojin, 14 Nov. 2012; one specimen, Gangneung, 25 May 2013; three specimens, Jumunjin, 26 May 2013; two specimens, Daejin, 12 June 2013; two specimens, Geojin, 16 June 2013; one specimen, Gisamun, 2 March 2014; two specimens, Daejin, 3 March 2014; one specimen, Daejin, 26 May 2014; two specimens, Geojin, 27 May 2014; six specimens, Jukbyeon, 27 May 2014; four specimens, Gonghyeonjin, 29 Aug. 2014; one specimen, Imwon, 23 Dec. 2014; one specimen, Gonghyeonjin, 27 Dec. 2014; three specimens, Jukbyeon, 2 March 2017; four specimens, Sacheon, 2 March 2017; one specimen, Gonghyeonjin, 11 March 2018; and one specimen, Geojin, 8 June 2018.

**Description.** Arms five, long, usually thick arm base, gradually tapering to narrow tip of arm (Fig. 1A, B). Abactinal paxillae forming in groups with coarser stubby spinules, bearing 7-16 spinelets (Fig. 1C). After denuding, abactinal spinelets revealed more than 10 sharp apical points (Fig. 1J). Abactinal skeleton reticulated, irregular form and size (Fig. 1H). Papular area with 1-5 papulae, slightly bigger than abactinal plates, usually divided with small ossicles. Madreporite small, circular, slightly elevated, covered with spinules similar to abactinal spines (Fig. 1F, G). Superomarginal, inferomarginal, and ventrolateral plates forming in three longitudinal series to tip of arm (Fig. 1I). Superomarginal plates bearing 22-30 spines. Inferomarginal plates transversely elongated, bearing numerous 33-40 spines. Intermarginal plates forming longitudinally between inferomarginal and superomarginal plates, reaching one half length of arm. Ventrolateral plate convex form, bearing 14-22 stubby spines. Adambulacral armature composed of 11-17 spinelets, inner three or four being coarser than outer one, arranged in two or three rows of spines (Fig. 1D). Furrow spine usually single, but double near tip of arm. Oral plate bearing three to four blunt spines (Fig. 1E).

**Size.** R = 90-130 mm, r = 15-19 mm, R/r = 6-6.8.

**Habitat.** Hard substrates (rocks).

**Distribution.** Korea (East Sea); Russia (Kola Bay, Motovski Bay, North of Kildin Island); Arctic to Cape Hatteras; North Atlantic (Faeroe Islands, Iceland, Ireland, Norway, United Kingdom).

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

**Remarks.** *Henricia sanguinolenta* is known for its wide distribution throughout the world. This species is relatively large compared to other *Henricia* species, with a ratio of R/r = 6.0-6.8. It has a visible longitudinal series of actinal ossicles, as pointed out by Madsen (1987). *Henricia sanguinolenta* differs from other previously reported *Henricia* species in Korea by having more than 10 uneven apical thorns that are revealed after removing the covered integument of the abactinal spines (Fig. 1J).

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