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A new sea star of the genus *Leptasterias* (Asteroidea: Asteriidae) from the Aleutian Islands

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Abstract

A new species of asteriid sea star of the genus *Leptasterias* (Order Forcipulatida) is described from the nearshore waters of the Aleutian Islands. *Leptaterias tatei* **sp. nov**. is distinguished from *Leptasterias stolacantha* Fisher, 1930, by the characteristics of the spines and pedicellariae. Geographic distribution is discussed and a key to the five-rayed *Leptasterias* of the Aleutian Islands is provided.

Key words: sea star, *Leptasterias,* new species, Alaska, Aleutian

Introduction

The Aleutian Islands have a highly diverse asteroid fauna. An inventory of shallow water (< 20 m) sea star species yielded six families, 18 genera, and 53 species (Jewett *et al*. 2012), including 17 recently discovered species (Clark & Jewett 2010, 2011a, b). The family Asteriidae is well represented with more than 20 species (Fisher 1930; Jewett *et al*. 2012). At least 14 species of the genus *Leptasterias* Verrill, 1866 occur in the Aleutians, primarily in two subgenera, the five-rayed *Leptasterias*, and the six-rayed *Hexasterias* (Verrill 1914; Fisher 1930). The taxonomic and morphological complexity of the genus have long been recognized (e.g. Verrill 1914; Fisher 1930; Lambert 2000; Foltz *et al.* 2008).

A new species, *Leptasterias tatei* **sp. nov**., of the subgenus *Leptasterias* is described herein. It resembles the much smaller, but similarly fleshy *Leptasterias stolacantha* Fisher, 1930. *Leptaserias tatei* **sp. nov.** is also similar to several large, relatively fleshy five-rayed species from the Okhotsk Sea, but is distinguished by the characteristics of the ossicles, spines and pedicellariae.

Methods

Specimens of sea stars were collected by hand, using scuba, and digital photographs were taken *in situ* during three expeditions to the Aleutians, the Alaska Monitoring and Assessment Program (AKMAP) nearshore Aleutian Islands survey (2006–2007), the Halfar/Hetzinger Bering Sea coralline algae expedition (2008) and the USDOE Amchitka radioactivity assessment expedition (2011), in which Adak Island was used as a reference (DOE 2013). Tissue samples for genetic analysis were taken, and are deposited at the Los Angeles County Museum of Natural History (LACM). Vouchered museum specimens were fixed in 10% buffered formalin and air-dried. One ray from the holotype was cleaned by soaking in sodium hypoclorite (NaCIO), rinsed in distilled water and dried.

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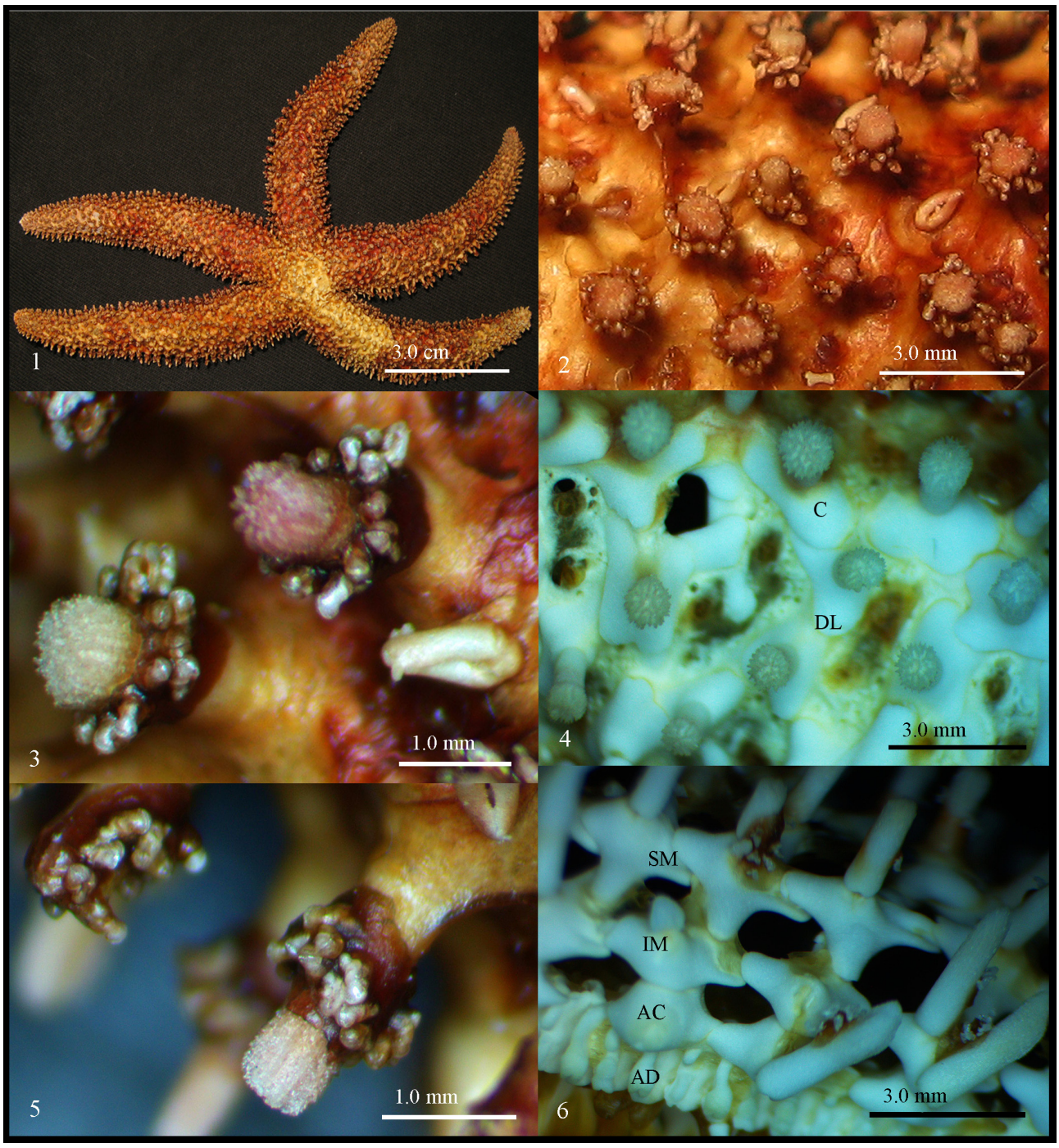
Taxonomic account

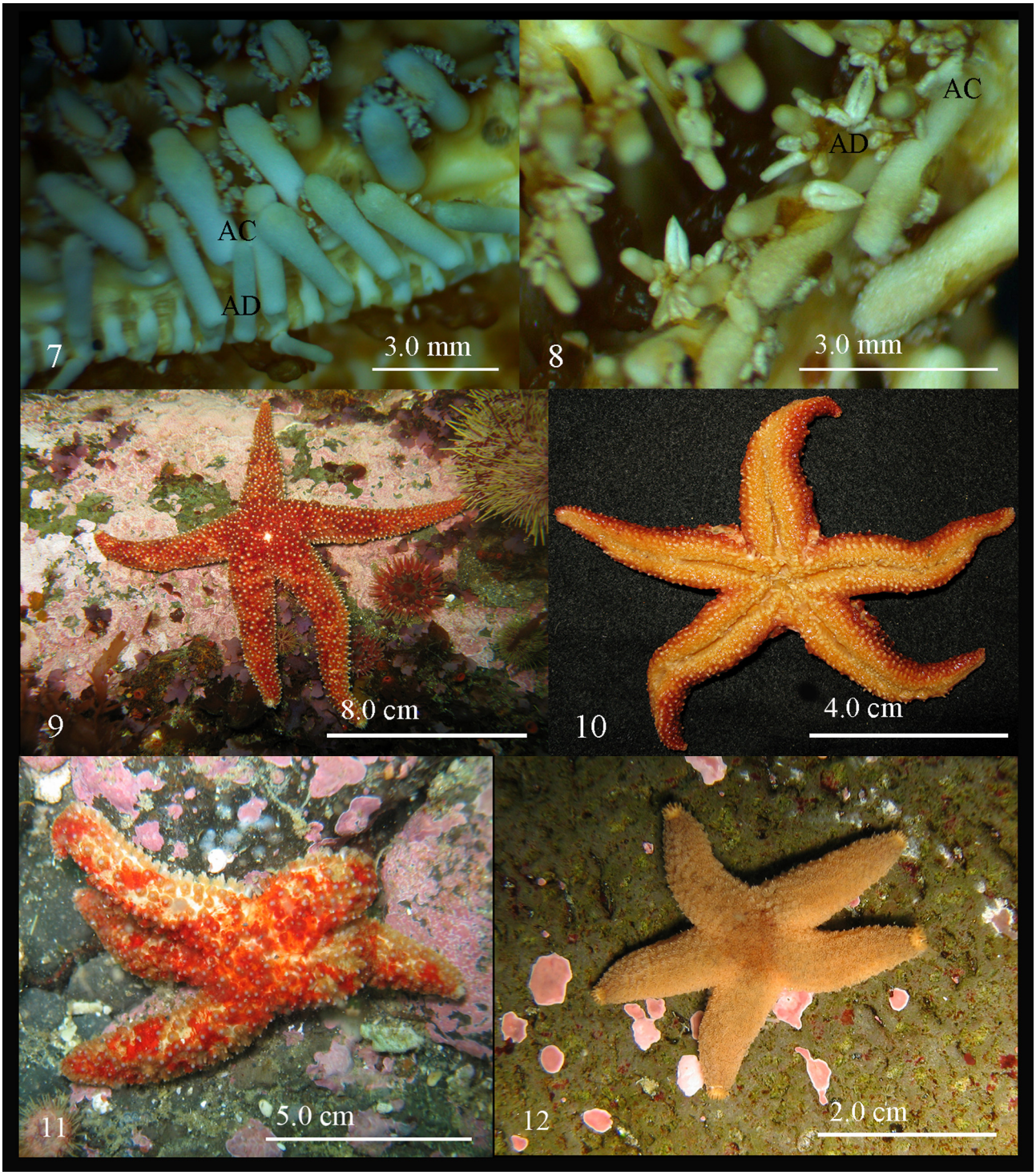
***Leptasterias tatei* sp. nov.**
Figures 1–11

Type locality. Alaska, Aleutian Islands, Adak Island, Thumb Bay entrance, W side (51°50.08 N, 176°32.31 W) (*leg.* Roger N. Clark, scuba 11 m; 20 July, 2011; R/V *Norseman*).

Holotype. LACM 2011-158.001



FIGURES 1–6. *Leptasterias tatei* **sp. nov.**, Holotype, 2011-158.001. Fig. 1, whole animal, aboral, Bar = 3.0 cm. Fig. 2, aboral surface, Bar = 3.0 mm. Fig. 3, aboral spines & pedicellariae, Bar = 1.0 mm. Fig. 4, aboral surface cleaned of tissue, showing carinal [C] and dorsolateral [DL] ossicles & spines, Bar = 3.0 mm. Fig. 5, aboral spine with pedicellariae, Bar = 1.0 mm. Fig. 6, marginal area of ray, cleaned of tissue, showing arrangement of ossicles (superomarginal [SM], inferomarginal [IM], actinal [AC], and adambulacral [AD]), Bar = 3.0 mm.



FIGURES 7–10. *Leptasterias tatei* **sp. nov.**, Holotype, 2011-158.001.Fig. 7, cleaned adambulacral region (actinal [AC] & adambulacral [AD] spines), Bar = 3.0 mm. Fig. 8, uncleaned adambulacral region, showing wreaths of straight & crossed pedicellariae. Fig. 9, Live, *in situ* Adak Island, Thumb Bay, 13 m (*leg.* R.N. Clark, 20 July, 2011), Bar = 8.0 cm. Fig. 10, Paratype, 2011-159.001. Oral side, Bar = 4 cm.

FIGURE 11. *Leptasterias tatei* **sp. nov.** Live, *in situ* Hawadax Island, N side, 13 m (*leg.* R.N. Clark, 8 June, 2008), Bar = 5.0 cm.

FIGURE 12. *Leptasterias stolacantha* Fisher, 1930. Live, *in situ* Kagamil Island, E side, 11 m (*leg.* R.N. Clark, 19 July, 2007), Bar = 2.0 cm.

Paratype. LACM 2011-159.001; genetic sample LACM 2011-159.002 Alaska, Aleutian Islands, Amchitka Island, SE side, W of Makarius Bay (51°23.16 N, 179°11.02 E).

Diagnosis.Star of moderate size; R to 9 cm, R:r 6–9 (Fig. 1). Five rays, relatively long; abactinal ossicles 2–4 lobed, with single spines; spines relatively short, stout, truncated bearing numerous fine vertical ridges; superomarginal and inferomarginal ossicles bear a single thick, blunt spine, similar to abactinal spines; all spines wreathed with numerous crossed pedicellariae. Tube feet, in four rows. Color in life reddish with lighter mottlings abactinally, actinal surface straw colored.

Description. Moderate sized star R to 9 cm, r = 1 cm, R:r 9.1 (Holotype, Fig. 1). Disc small, five rays, fairly long, tapering, relatively soft. Skeleton relatively open; papular areas relatively large, bearing 3–6 papulae, obscured by wreaths of pedicellariae on spines in live individuals; bearing scattered large straight pedicellaria to 1.25 mm long (Figs. 2–3) on papular areas; pedicellariae broadened distally, and bearing four "teeth" per valve. Carinal ossicles 2–4 lobed, bearing single spines, dorsolateral ossicles single spined, also 2–4 lobed, but forming a more open meshwork (Fig. 4), and bearing small, irregular accessory plates; spines relatively short, thick truncated, with strong vertical ridges continuing onto the dorsal surface; encircled by a fleshy wreath of small, crossed pedicellariae up to 0.25 mm in length (Figs. 4–5). Madreporite small, about 3.5 mm in diameter, roughly circular with irregular ridges.

Superomarginal ossicles 4 lobed and inferomarginal ossicles 3–4 lobed (Fig. 6), typically bearing single (rarely two) pedicellariae-wreathed spines, longer and more slender than those of the carinal and dorsolateral series.

Actinal ossicles (Fig. 6) in a single nearly complete series, and bearing a single spine. Adambulacral ossicles (Figs. 7–8) bearing single spines on proximal five, then alternating one and two, (two spines in a vertical series), the proximal spine about ¾ as long and thick as the distal spine; actinal and adambulacral spines with a partial wreath on distal side of variously sized straight pedicellariae 0.25 to 0.75 mm. Oral ossicles narrow, bearing two rather slender spines with partial wreaths of pedicellariae similar to those of the actinal and adambulacral series.

Tube feet in four rows. Color in life: dorsal surface reddish with dark and pale mottlings; spines and madreporite white; oral surface straw colored (Fig. 9–11). Paratype (Fig. 10) agrees with the holotype in all respects, but is smaller, R = 6 cm, r = 1 cm, R:r 6.1 and has somewhat stouter rays.

Distribution. The distribution of *L. tatei* **sp. nov.,** as well as *L. stolacantha* (Fig. 12) is the central Aleutian Islands, Andreanof and Rat Islands (*approx.*176° W to 178° E) (Fig. 13). *Leptasterias tatei* **sp. nov.** was found at Adak (Holotype, Fig. 1; *in situ*, Fig. 9), Amchitka (Paratype, Fig. 10), and Hawadax (formerly Rat) (*in situ*, Fig. 11; not collected) islands. Additional specimens were photographed at Adak as well, but not collected.

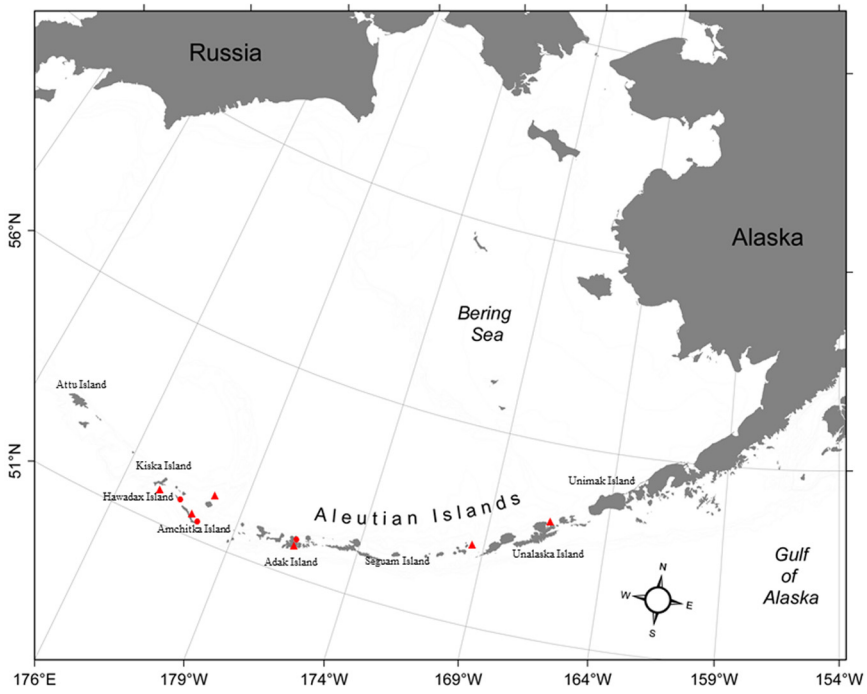


FIGURE 13. Map of Aleutian Islands, showing known geographic distributions of *Leptasterias tatei* **sp. nov.** (●) and *Leptasterias stolacantha* Fisher, 1930 (▲).

Habitat. Found on cobble, boulder and bedrock substrate encrusted with the coralline algae *Clathromorphum nereostratum*, at depths of 8–16 m, and temperatures of 3.8° to 5.0°C.

Etymology. The name honors Mr. Paul Tate. For more than 40 years he worked throughout the Aleutian Islands, first as a biologist for the Alaska Department of Fish and Game in Dutch Harbor, later as the Captain of the research vessel *Norseman*.

Remarks. *Leptasterias tatei* **sp. nov.** resembles *L. stolacantha* Fisher, 1930 (Fig. 12), but differs in 1) its larger size, 2) having thicker spines, 3) wreaths of fewer and larger crossed pedicellariae, to 0.25 mm in length, and scattered large straight, pedicellariae to 1.25 mm, as opposed to 0.13 mm and 0.37 mm, respectively in *L. stolacantha,* 4) the superomarginal and inferomarginal ossicles bear single spines in *L. tatei* **sp. nov.**, as opposed to two (sometimes three) in *L. stolacantha*. Additionally, the spines of *L. stolacantha* are slender and needle-like. The color of live *L. stolacantha* also differs in being uniformly tan or light brown.

Although its thick, truncated abactinal spines and large, straight pedicellariae clearly distinguish *Leptasterias tatei* **sp. nov.** from all other Aleutian species, it bears some resemblance to four congeners described by Dyakonov (1950) from the western part of the Okhotsk Sea, chiefly near Sakhalin Island. *Leptasterias fisheri* Dyakonov, 1929 differs from *L.tatei* **sp. nov**. by having the aboral spines arranged in more or less longitudinal rows; *L. tatei* **sp. nov.** has random arrangement. *Leptasterias tatei* **sp. nov.** is distinguished from *Leptasterias hirsuta* Dyakonov, 1938 by the truncate tips of the aboral spines, and single spines on the inferomarginals. The spines of *L. hirsuta* have rounded tips. Also, *L. hirsuta* has diverse types of straight pedicellariae scattered aborally that are smaller than those of *L. tatei* **sp. nov.** *Leptasterias tatei* **sp. nov.** differs from *Leptasterias orientalis* Dyakonov, 1929 in having only a single row of actinal ossicles. *Leptasterias orientalis* has two rows of actinal ossicles (ventolaterals in Dyakonov), and the spines on the inferomarginals change from one to two at about mid-ray. Also, the aboral spines of *L. orientalis* are long and very fine (acicular). *Leptasterias tatei* **sp. nov**. differs from *Leptasterias subarctica* Dyakonov, 1938 in having smaller actinal ossicles than inferomarginal ossicles; the actinals of *L. subarctica* are notably larger than the inferomarginals. Also, *L. tatei* **sp. nov.** has profuse wreaths of crossed pedicellaria around the aboral spines; the wreaths of *L. subarctica* are much sparser.

Key to the known species of five-rayed Aleutian *Leptasterias*

1a	Carinal ossicles large, scale-like, overlapping	*Leptasterias squamulata* Dyakonov, 1938
1b	Carinal ossicles not scale-like and overlapping	2
2a	Spines of carinal ossicles very short, thick, diameter as great, or greater than length.	3
2b	Spines of carinal ossicles longer, length at least three times diameter	4
3a	Spines of carinal ossicles dome-shaped, arranged in distinct zigzag series	*Leptasterias arctica* (Murdoch, 1885)
3b	Abactinal spines uniformly spaced, carinal series not in zigzag; tips truncated	*Leptasterias tatei* **sp. nov.**
4a	Spines of inferomarginal ossicles noticeably longer than those of the superomarginals	5
4b	Spines of inferomarginal and superomarginals about the same length; abactinal spines slender, of uniform length and distribution	6
5a	Small supplementary ossicles between superomarginals	*Leptasterias ochotensis* (Brandt, 1851)
5b	Lacking small supplementary ossicles between superomarginals	*Leptasterias derbeki* Dyakonov, 1938
6a	Partial disintegration of some dorsolateral ossicles, randomly leaving some carinal ossicles isolated	*Leptasterias stolacantha* Fisher, 1930
6b	Dorsolateral plates not partially disintegrated.	*Leptasterias hylodes* Fisher, 1930

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