



FIELD GUIDE TO

Sea Stars

of the Aleutian Islands

by Stephen C. Jewett, Roger N. Clark, H elo ise Chenelot,
Shawn Harper, and Max K. Hoberg

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Dedication

This field guide is dedicated to Dr. Howard M. Feder, professor emeritus, Institute of Marine Science, University of Alaska Fairbanks, and to Guy C. Powell, fishery biologist (retired), Alaska Department of Fish and Game, Kodiak.



For more than 40 years Howard Feder unselfishly mentored hundreds of students and marine biologists, passing on his knowledge and passion for benthic marine ecosystems in Alaska. The authors of this book are but a few of the many he inspired. Howard started his career working on arctic marine organisms in Barrow, Alaska (1949-1950) under famed Professor G.E. MacGinitie. Howard's passion for sea stars began with his classic research on the natural history of the sea star *Pisaster ochraceus* in Monterey Bay, California, in 1956. Since then he has published many journal articles and book chapters on sea stars. Sea stars still stimulate rich discussions with Howard, now in his retirement. In fact, it was Howard who planted the seed for this book to describe the sea stars of the remote Aleutian Islands.



Guy Powell served the State of Alaska for more than 30 years at the Alaska Department of Fish and Game, as the leading authority on the biology and commercial fishery of red king crab *Paralithodes camtschaticus*. Equipped with a wet suit (and later dry suit) and a Nikon underwater camera, Guy logged thousands of hours in marine waters around his home in Kodiak as he conducted research on these gigantic crabs and their environment. His research has appeared in numerous scientific journals as well as *Sea Frontiers* and *National Geographic*. As a scuba diving instructor Guy introduced hundreds of students to the wonders of marine life around Kodiak Island. In the early 1970s author S.C. Jewett had the privilege of working and diving with Guy, an opportunity that ignited a career using scientific diving as a research tool to better understand the Alaska marine environment.

About the Authors



Stephen C. Jewett, PhD, has been a research biologist at the University of Alaska Fairbanks since 1974 and a research professor at the UAF Institute of Marine Science, School of Fisheries and Ocean Sciences, since 1998. His research focused on environmental impact assessment issues in nearshore marine waters, such as the effects on marine systems from construction, commercial trawling, logging, dredging, mining, sewage discharge, volcanic eruption, the *Exxon Valdez* oil spill, the potential effect of a marine oil terminal in Port Valdez, and contamination from heavy metals and radionuclides. Stephen began diving in 1967 in Maine where he grew up. Since then he has logged more than 2,000 research dives, most in cold waters. Stephen has been the University of Alaska dive safety officer since he founded the statewide Scientific Diving Program in 1988. He is an active SDI/DAN (Scuba Diving International/Divers Alert Network) instructor. He has published nearly 100 peer-reviewed journal articles, symposium proceedings, and book chapters. Much of his research has utilized scientific diving techniques. His underwater photos have appeared in *Alaska* and *Aurora* magazines, and five books (Johnson 2003a,b; Byersdorfer and Watson 2010; Snelgrove 2010; Brewer et al. 2011).



Roger N. Clark is a marine invertebrate taxonomist and research diver specializing in Alaska mollusks and echinoderms. Roger was educated at Southern Oregon University. He has studied sea stars for more than 20 years, taking part in numerous surveys in the Aleutian Islands, Bering Sea, and Gulf of Alaska with the National Marine Fisheries Service, Alaska Fisheries Science Center. In 2004 Roger became a NOAA scientific diver, and since 2006 has participated in numerous dive and trawl projects with UAF. He has discovered and described many new species of invertebrates in the Aleutian Islands.



Héloïse Chenelot is a marine biologist specializing in nearshore ecology, marine invertebrate taxonomy, and GIS applications. She earned her MS in biological oceanography from the School of Fisheries and Ocean Sciences at UAF in 2003 and has worked as a research technician at UAF for almost 10 years. Most of her diving experience has been in Alaska, from Kachemak Bay to the Aleutians and the Arctic. Her primary focus is the study of biodiversity in nearshore environments. Héloïse feels very privileged to be involved in numerous scientific projects that explore the unique and beautiful marine life of Alaska. Her underwater photographs have appeared in *Sea Life of the Aleutians: An Underwater Exploration* (Brewer et al. 2011).



Shawn Harper is an explorer of our vast underwater world. He started diving in 2001 with the American Academy of Underwater Sciences Scientific Diver Program at UAF. From there he has moved on to perform research dives in the Arctic, Antarctic, Alaska, Oregon, California, Madagascar, and Belize, logging over 1,500 dives and counting. He is an active PADI/EFR/DAN (Professional Association of Diving Instructors/Emergency First Response/Divers Alert Network) instructor, working with scuba diving students in recreation, science, conservation, and safety. Shawn is also venturing further into the technical diving realm of closed-circuit rebreathers, in the pursuit of learning more about what lies below recreational limits. Through these ventures he continues to study the underwater world to promote quality education, outreach, research, conservation, and diving safety. One of the ways Shawn enjoys learning about and sharing his experiences is through underwater photography, as portrayed in *Sea Life of the Aleutians: An Underwater Exploration* (Brewer et al. 2011).



Max K. Hoberg is a marine biologist, research diver, and assistant dive safety officer with the UAF Institute of Marine Science, School of Fisheries and Ocean Sciences. He completed his BS in fisheries biology at UAF in 1975, and a MA in biology at Humboldt State University in 1986. He has logged nearly 900 dives, mostly in Alaska waters. His

research has involved environmental assessment investigations of the intertidal and subtidal marine waters of Alaska, emphasizing the taxonomy and ecosystem dynamics of marine invertebrates and fishes. His underwater photographs have appeared in *Sea Life of the Aleutians: An Underwater Exploration* (Brewer et al. 2011) and *Discoveries of the Census of Marine Life: Making Ocean Life Count* (Snelgrove 2010).

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Introduction

Sea stars, with several rays (arms) and a myriad of colors and markings, have intrigued people for centuries and are perhaps the most recognized marine animal worldwide. Sea stars comprise Asteroidea, the largest class in the marine invertebrate phylum Echinodermata. Other echinoderm classes include Holothuroidea (sea cucumbers), Echinoidea (sea urchins and sand dollars), Ophiuroidea (brittle stars), and Crinoidea (sea lilies). There are about 1,500 living species of sea stars worldwide, from the polar regions to the tropics, from the intertidal zone to depths of 6,000 m (19,700 ft).

The nearshore subtidal community of the Aleutian archipelago is understudied in comparison to other nearshore regions in North America. The remoteness of the region and adverse weather, coupled with the rocky substratum that limits sampling with standard remote techniques such as trawls or grabs, has resulted in few shallow collections there.

The Smithsonian Institution published an outstanding taxonomic compendium on sea stars, *Asteroidea of the North Pacific and Adjacent Waters* (Fisher 1911, 1928, 1930). Fisher's three-part treatise was based on specimens collected between 1888 and 1897 mainly by dredge from a broad geographical region, including the Aleutian Islands. In 1914, Yale University Professor A.E. Verrill compiled a taxonomic monograph on the sea stars from the 1899 Harriman Alaska Expedition, although only the eastern Aleutian Islands were covered (Verrill 1914). The US Fish and Wildlife Service opportunistically collected sea stars near a few of the Aleutian Islands in 1936-38 (Scheffer 1959). O'Clair (1977) compiled an annotated list of sea stars from intertidal and shallow subtidal waters of eastern Amchitka Island in the central Aleutians. Granger (1966) authored *Sea Stars of Arctic North America*, which included several species that extend to the Aleutians. Lambert (2000) authored the excellent handbook *Sea Stars of British Columbia, Southeast Alaska, and Puget Sound*, which included several species that range into the Aleutian Islands. Similarly, McDaniel (2013) authored *A Field Guide to Sea Stars of the Pacific Northwest*, which included some sea stars that occur in the Aleutians. Vicknair's sea star research (Vicknair 1997, Vicknair and Estes 2012) off the western Aleutian Islands of Attu and Amchitka was the first to use open-circuit scuba diving as a method of collection. More recent sea star collections throughout the Aleutians using scuba have led to descriptions

of several new species (Clark and Jewett 2010; 2011a,b; 2015; Jewett and Clark 2011). Jewett et al. (2012) presented information on sea stars recently found throughout the Aleutians, including several species endemic to the Aleutians. This field guide includes more details. Our book is not intended so much for taxonomic purposes, but rather to showcase the diverse sea stars encountered while diving and trawling in the shallow, nearshore waters of the remote Aleutian Islands. Undoubtedly we have missed some sea star species.

Sea Star External Anatomy

Mature sea stars have 4-24 rays (arms). While most genera have 5 or 6 rays, some have more, like *Stephanasterias* (6-9), *Solaster* (6-16), *Crossaster* (8-16), and *Pycnopodia* (15-24). To describe sea stars, we use terms (see glossary) and illustrations from Lambert (2000).

The main external features of a sea star are illustrated in Figure 1. The topside of the animal is called the aboral or abactinal side. The central area, or disc, grades into the rays or arms. The triangular region of the disc between the angle of two rays is the interradial area. The distance from the center of the disc to the edge where two rays join is the disc radius, designated by “r”. “R” designates the ray length or radius of the sea star, measured from the center of the disc to the tip of the ray. The ratio of the ray length to disc radius (R:r) is an important measure of body proportions used in the taxonomic descriptions. The madreporite is a calcareous, wartlike opening on the aboral surface of the disc used to filter water into the internal water-vascular system. On the oral or actinal side, the closest to the substrate, five or more ambulacral furrows containing the tube feet, or podia, radiate from the central mouth or oral area.

A hand lens or microscope is needed to study the surface details of a sea star. The papulae, also called gills or dermal branchiae, are thin-walled, fingerlike extensions of the coelom that protrude between skeletal plates to exchange respiratory gases between the water and the internal fluid. They may occur evenly over the surface, in groups, or in well-defined areas, called papularia, on the disc or rays. Plates bearing spines, granules, or tiny pincer-like appendages called pedicellariae occupy the rest of the surface; these play a role in repelling minute organisms that attempt to settle and grow on the aboral region. Common types of pedicellariae are illustrated in Figure 2.

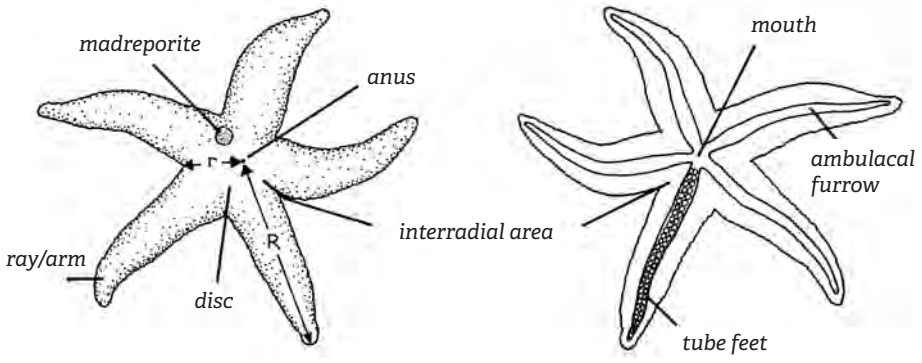


Figure 1. The external features of a sea star.

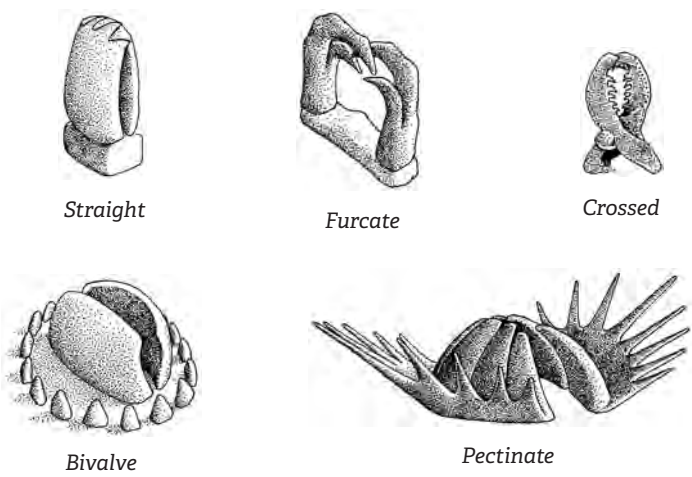


Figure 2. Types of pedicellariae.

Aboral skeleton plates, called paxillae, consist of a broad base and an erect column bearing small moveable spinelets (Figure 3). The orders Velatida and Spinulosida have similar structures, but the spinelets are extensions of the column and not moveable. These are called pseudopaxillae or metapaxillae, but for all practical purposes they look the same. The aboral plates of the genus *Ceramaster* have flat tabletops and are called tabulate plates. Each species of sea star has a characteristic pattern of plates and spines, paxillae, gills, and pedicellariae. Most sea stars have a regular series of marginal plates on the side or edge of the ray (Figure 4) made up of two rows, supermarginals and inferomarginals, and sometimes a row of intermarginals between them.

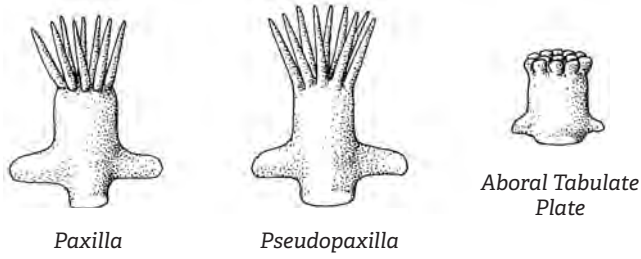


Figure 3. Plates of the aboral surface.

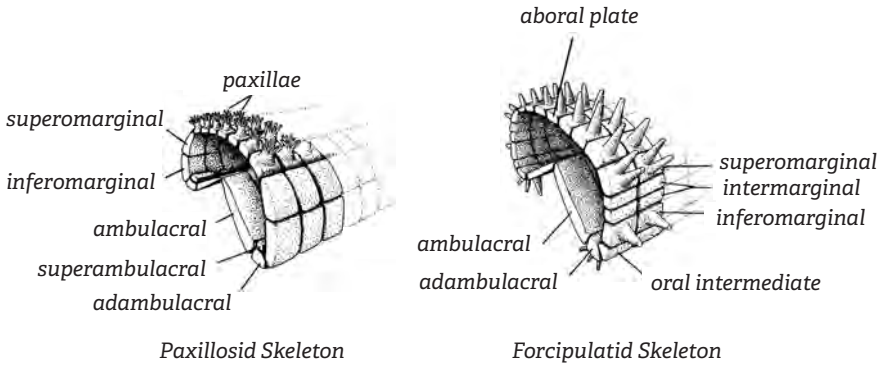


Figure 4. Calcareous plates of two skeletal types.

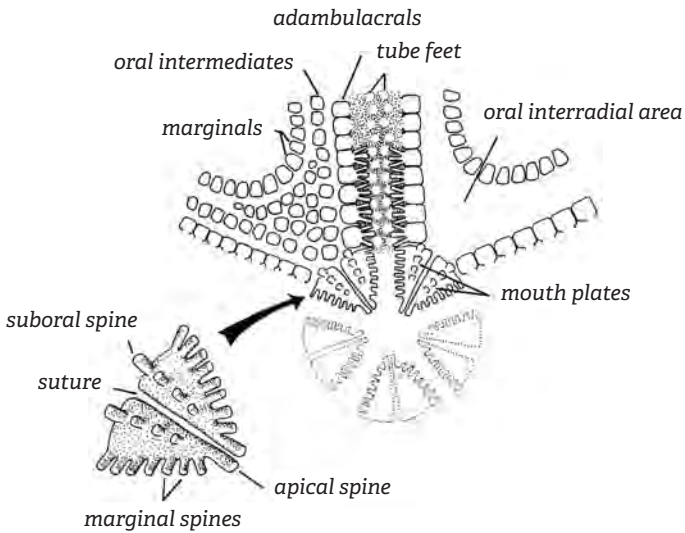


Figure 5. Calcareous plates of the oral side.

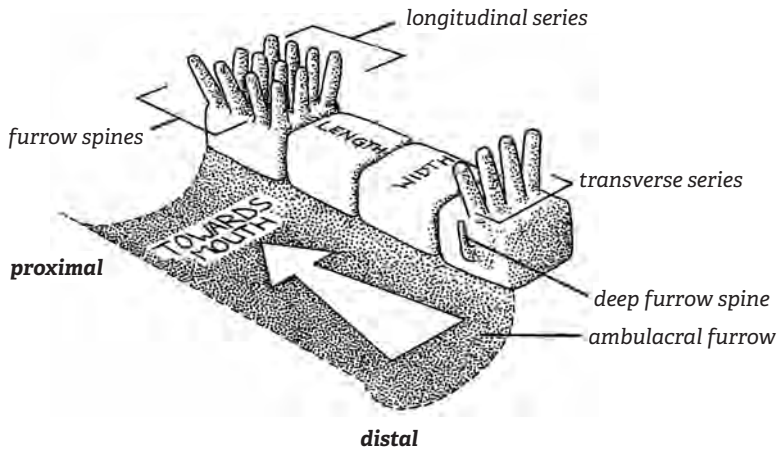


Figure 6. Adambulacral plates.

Oral intermediates (also called actinal intermediates) occur between the inferomarginals and adambulacrals (Figures 4 and 5). These may form one or more rows along the arm, or be confined to a triangular region called the oral interradiar area (Figure 5) bounded by adjacent ambulacral furrows and the edge of the disc. Adambulacral plates form the edge of the ambulacral furrow (Figures 4, 5, and 6). Each plate bears a characteristic set of spines.

Dive Surveys

Most sea stars were photographed and collected opportunistically during five dive research missions; a few specimens were also collected during NOAA NMFS trawl surveys in deeper waters by R.N. Clark. In 2004 a team of divers funded by US Department of Energy (USDOE) dived around Amchitka and Kiska Islands in the west central Aleutians to sample the nearshore benthic community for possible leaking radionuclides from nuclear detonations that occurred on Amchitka Island in 1965, 1969, and 1971 (Jewett et al. 2006). In 2006 and 2007 divers sampled 50 random sites in the nearshore Aleutian Islands during a contaminant-based US Environmental Protection Agency–funded investigation (Jewett et al. 2008; Brewer et al. 2011; Dasher et al. 2012a,b). In 2008 a few dives were made throughout the Aleutians on two research projects (R.N. Clark and H. Chenelot, pers. comm.). In 2011 USDOE again funded a dive team to gather samples around Amchitka for leaking radioactivity; Adak Island was the reference island. All diving was conducted on open-circuit

scuba under the auspices of the University of Alaska Scientific Diving Program. Digital photos were compiled during the five dive surveys and were mainly taken to assist research projects with taxonomy and to characterize project dive sites. Most photos were taken during June and July at depths less than 20 m (66 ft).

The species accounts section in this field guide is divided into four parts, for the sea star orders Valvatida, Velatida, Spinulosida, and Forcipulatida that we encountered in the Aleutian archipelago. Each species account contains a description and information on distribution and habitat, ecological notes, and remarks. Information in these headings is drawn from the literature as well as the authors' observations. The unique features of some sea stars are highlighted in bold print.

Geography of the Aleutians

Five main island groups comprise the Aleutian Islands (Figure 7): The *Fox Islands*, closest to the Alaska Peninsula, consist of Umnak, Unalaska, Akutan Islands as well as the Krenitzin Chain; *Islands of Four Mountains* include Carlisle, Chuginadak, Herbert, Kagamil, Yunaska, and Amukta Islands; the *Andreanof Islands* include Amlia, Atka, Great Sitkin, Adak, Kanaga, Seguam, Tanaga, and numerous smaller islands; *Rat Islands* include Semisopchnoi, Amchitka, Little Sitkin, Hawadax (Rat), Segula, Kiska, and Buldir; and the westernmost *Near Islands* include Agattu and Attu Islands. A smaller island group of the Semichi Islands, which includes Shemya, is a subset of the Near Island group. Not associated with any of the five island groups is Unimak Island, the largest and easternmost of the Aleutian Islands.

The southern edge the Aleutian Islands is bounded by the strong Alaska Current flowing in a westerly direction, with the easterly flowing Aleutian North Slope Current to the north of the islands. Significant flow from the Alaska Current occurs through 10 passes (Figure 8), providing relatively low-salinity surface waters and warm subsurface waters to the Bering Sea (Stabeno et al. 1999). The largest passes between the Alaska Peninsula and Attu Island are Unimak Pass (between Unimak and Tigalda Islands), Samalga Pass (between Umnak Island and Islands of Four Mountains), Amukta Pass (between Islands of Four Mountains and Seguam Island), Tanaga/Amchitka Passes (between Tanaga and Amchitka islands) and Buldir Pass (between Kiska and Agattu islands).

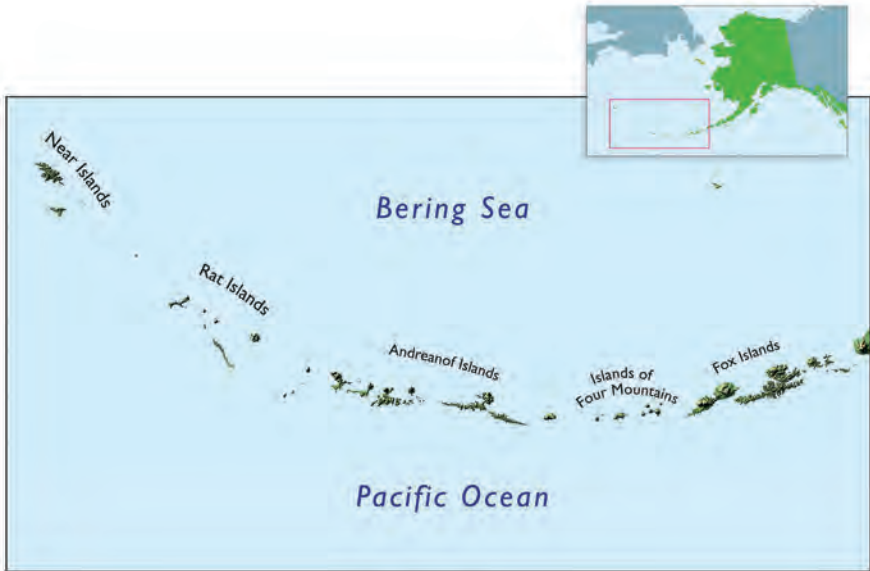


Figure 7. Aleutian Islands groups.

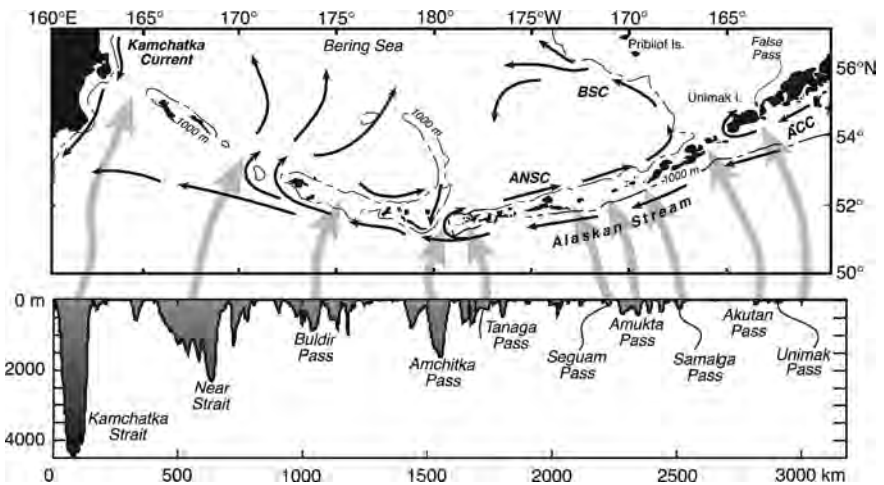


Figure 8. Aleutian Islands passes.

Photographs and Collections

Eleven divers made 841 dives for a total of 581 hours of diving to acquire sea star information during the five research cruises. Dives were made at 175 sites between Tigalda and Attu islands (Figure 9). Sea stars photographed and collected in the nearshore Aleutian Islands belong to four orders, eight families, 20 genera, and 63 species (Table 1). Most species belong to two families, Asteroiidae and Echinasteridae, with 22 and 20, respectively. Most species occur in the central Aleutians, i.e., Andreanof Islands (53) and Rat Islands (51), albeit most effort was devoted to this region. Some species occur throughout the Aleutians (29), some only in the eastern Aleutians (Fox Islands, 6), and others only in the western Aleutians (Near Islands, 3) (Table 2). A total of 22 species (35%) appear to be endemic to the Aleutian Islands, with the majority (18 or 82%) of these species newly discovered (Clark and Jewett 2010, 2011a,b, 2015). Of the 63 species presented the authors observed all but three species (*Ceramaster patagonicus*, *Asterias amurensis*, and *Pteraster octaster*). These three species are included based on literature sources.

No observations of sea star wasting disease were made in the Aleutians between 2004 and 2014 (B. Konar, UAF, pers. comm., 2014; S.C. Jewett, pers. observ.), as has been documented on the Northeast Pacific Coast from Baja California, Mexico, to southern Alaska (Hewson et al. 2014).

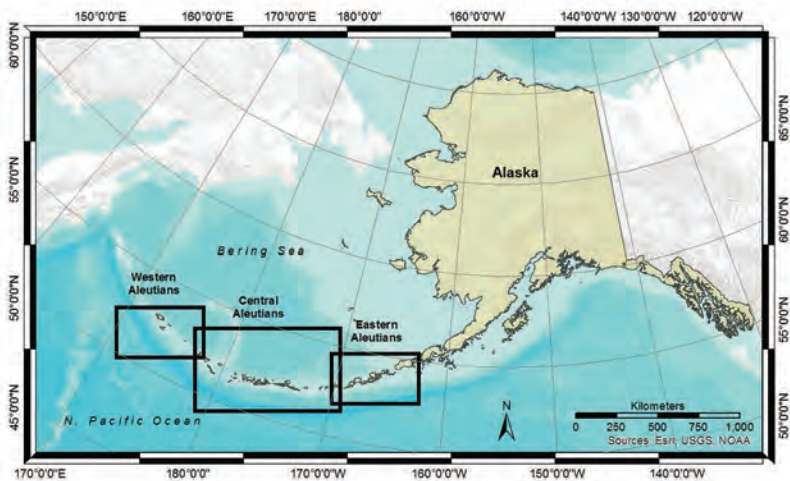


Figure 9. Aleutian Islands dive sites.

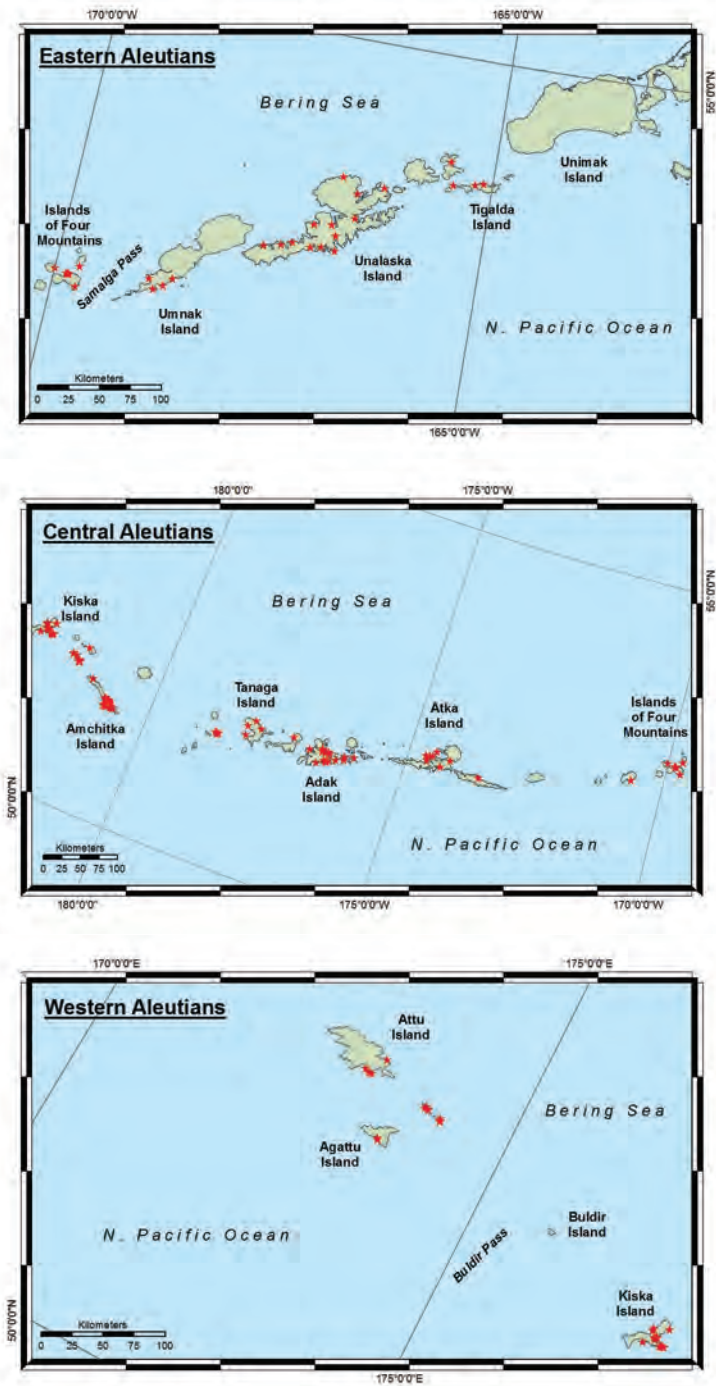


Figure 9. Aleutian Islands dive sites (continued).

Table 1. Sea Stars of the Aleutian Islands.

ORDER: VALVATIDA	ORDER: VELATIDA
FAMILY: Goniasteridae	FAMILY: Pterasteridae
Genus: <i>Ceramaster</i> <i>C. arcticus</i> (Verrill, 1909) <i>C. patagonicus</i> (Sladen, 1889)	Genus: <i>Pteraster</i> <i>P. militaris</i> (Müller, 1776) <i>P. octaster</i> Verrill, 1909 <i>P. pulvillus</i> Sars, 1861 <i>P. tessellatus</i> Ives, 1888 <i>P. willsi</i> R.N. Clark & Jewett, 2011
Genus: <i>Gephyreaster</i> <i>G. swifti</i> (Fisher, 1905)	FAMILY: Korethrasteridae
Genus: <i>Hippasteria</i> <i>Hippasteria phrygiana aleutica</i> R.N. Clark & Jewett, 2011	Genus <i>Peribolaster</i> <i>P. biserialis</i> Fisher, 1905
FAMILY: Solasteridae	ORDER: SPINULOSIDA
Genus: <i>Aleutiaster</i> <i>A. schefferi</i> A.H. Clark, 1939	FAMILY: Echinasteridae
Genus: <i>Crossaster</i> <i>C. papposus</i> (Linnaeus, 1767)	Genus: <i>Henricia</i> <i>H. sp. A</i> <i>H. asthenactis</i> Fisher, 1910 <i>H. echinata</i> R.N. Clark & Jewett, 2010 <i>H. elachys</i> R.N. Clark & Jewett, 2010 <i>H. gemma</i> R.N. Clark & Jewett, 2010 <i>H. insignis</i> R.N. Clark & Jewett, 2010 <i>H. iodinea</i> R.N. Clark & Jewett, 2010 <i>H. lineata</i> R.N. Clark & Jewett, 2010 <i>H. multispina</i> Fisher, 1910 <i>H. oculata</i> (Pennent, 1777) <i>H. rhytisma</i> R.N. Clark & Jewett, 2010 <i>H. sanguinolenta</i> (Müller, 1776) <i>H. tumida</i> Verrill, 1909 <i>H. uluudax</i> R.N. Clark & Jewett, 2010 <i>H. vermilion</i> R.N. Clark & Jewett, 2010
Genus: <i>Solaster</i> <i>S. arctica</i> Verrill, 1914 <i>S. dawsoni</i> Verrill, 1880 <i>S. endeca</i> (Linnaeus, 1771) <i>S. hexactis</i> R.N. Clark & Jewett, 2011 <i>S. spectabilis</i> R.N. Clark & Jewett, 2011 <i>S. stimpsoni</i> Verrill, 1880	Genus: <i>Odontohenricia</i> <i>O. ahearnae</i> R.N. Clark & Jewett, 2010 <i>O. aurantia</i> R.N. Clark & Jewett, 2010 <i>O. fisheri</i> Rowe & Albertson, 1988 <i>O. violacea</i> R.N. Clark & Jewett, 2010
	Genus: <i>Aleutihenricia</i> <i>A. federi</i> R.N. Clark & Jewett, 2010

ORDER: FORCIPULATIDA**FAMILY: Asteriidae**Genus: *Asterias**A. amurensis* (Lütken, 1871)Genus: *Evasterias**E. echinosoma* Fisher, 1926*E. retifera* Dyakonov, 1938*E. troschelii* (Stimpson, 1862)Genus: *Leptasterias*Subgenus: *Leptasterias**L. arctica* (Murdoch, 1885)*L. hylodes* Fisher, 1930*L. tatei* R.N. Clark & Jewett, 2015Subgenus: *Nesasterias**L. stolacantha* Fisher, 1930Subgenus: *Eoleptasterias**L. ochotensis* (Brandt, 1851)*L. squamulata* Dyakonov, 1938*L. derbeki* Dyakonov, 1938Subgenus: *Hexasterias**L. alaskensis* (Verrill, 1909)*L. aleutica* Fisher, 1930*L. asteira* Fisher, 1930*L. coei truculenta* Fisher, 1930*L. dispar* Verrill, 1914*L. leptodoma* Fisher, 1930*L. nitida* Fisher, 1930*L. polaris acervata* (Stimpson, 1862)Genus: *Orthasterias**O. koehleri* (de Loriol, 1897)Genus: *Lethasterias**L. nanimensis* (Verrill, 1914)Genus: *Stephanasterias**S. albula* (Stimpson, 1853)**FAMILY: Pycnopodiidae**Genus: *Pycnopodia**P. helianthoides* (Brandt, 1835)**FAMILY: Pedicellasteridae**Genus: *Pedicellaster**P. magister* Fisher, 1923Genus: *Tarsaster**T. alaskanus* Fisher, 1928

Table 2. Range of sea stars in the Aleutian Islands, from west to east (left to right).

SEA STARS * = endemic species	Near Islands	Buldir Pass	Rat Islands	Anchitka Pass	Andreanof Islands	Amukta Pass	Islands of 4 Mts	Samalga Pass	Fox Islands	Unimak Pass
<i>Aleutiaster schefferi</i> *	x		x		x		x		x	
<i>Ceramaster arcticus</i>	x		x		x		x		x	
<i>Ceramaster patagonicus</i>	x		x		x		x		x	
<i>Crossaster papposus</i>	x		x		x		x		x	
<i>Evasterias echinosoma</i>	x		?		x		?		?	
<i>Evasterias troschelii</i>	x		x		x		x		x	
<i>Henricia lineata</i>	x		x		x		x		x	
<i>Henricia multispina</i>	x		x		x		x		x	
<i>Henricia tumida</i>	x		x		x		x		x	
<i>Leptasterias alaskensis</i>	x		x		x		x		x	
<i>Leptasterias aleutica</i> *	x		x		x		x		x	
<i>Leptasterias arctica</i>	x		x		x		x		x	
<i>Leptasterias dispar</i>	x		x		x		x		x	
<i>Leptasterias hylodes</i>	x		x		x		x		x	
<i>Leptasterias leptodoma</i>	x		x		x		?		?	
<i>Leptasterias polaris acervata</i>	x		x		x		x		x	
<i>Lethasterias nanimensis</i>	x		x		x		x		x	
<i>Leptasterias nitida</i>	x		x		x		x		x	
<i>Pedicellaster magister</i>	x		x		x		x		x	
<i>Peribolaster biserialis</i>	x		x		x		x		x	
<i>Pteraster militaris</i>	x		x		x		x		x	
<i>Pteraster octaster</i>	?		?		?		?		?	
<i>Pteraster pulvillus</i>	x		x		x		x		x	
<i>Pteraster tessellatus</i>	x		x		x		x		x	
<i>Solaster arctica</i>	?		x		x		x		x	
<i>Solaster endeca</i>	?		x		x		x		x	
<i>Solaster stimpsoni</i>	x		x		x		x		x	
<i>Stephanasterias albula</i>	x		x		x		x		x	
<i>Hippasteria phrygiana aleutica</i> *	?		x		x		x		x	
<i>Henricia iodinea</i> *			x		x		x		x	
<i>Henricia oculata</i>			x		x		x		x	
<i>Henricia rhytisma</i> *			x		x		x		x	
<i>Henricia uluudax</i> *			x		x		x		x	

SEA STARS * = endemic species	Near Islands	Buldir Pass	Rat Islands	Amchitka Pass	Andreanof Islands	Amukta Pass	Islands of 4 Mts	Samalga Pass	Fox Islands	Unimak Pass
<i>Leptasterias asteira</i>			x		x		x		x	
<i>Leptasterias coei truculenta</i> *			x		x		x		x	
<i>Leptasterias stolacantha</i> *			x		x		x		x	
<i>Henricia insignis</i> *			x		x		x			
<i>Odontohenricia ahearnae</i> *			x		x		x			
<i>Odontohenricia aurantia</i> *			x		x		x			
<i>Solaster spectabilis</i> *			x		x		x			
<i>Aleutihenricia federi</i> *	x		x		x					
<i>Pteraster willsi</i> *	x		x		x					
<i>Leptasterias ochotensis</i>	x		x							
<i>Leptasterias tatei</i> *			x		x					
<i>Henricia asthenactis</i>			x		x					
<i>Henricia echinata</i> *			x		x					
<i>Henricia elachys</i> *			x		x					
<i>Henricia gemma</i> *			x		x					
<i>Odontohenricia violacea</i> *			x		x					
<i>Solaster hexactis</i> *			x		x					
<i>Tarsaster alaskanus</i>			x		x					
<i>Gephyreaster swifti</i>					x					
<i>Henricia sanguinolenta</i>					x		x		x	
<i>Pycnopodia helianthoides</i>					x		x		x	
<i>Asterias amurensis</i>									x	
<i>Henricia sp. A</i>									x	
<i>Henricia vermilion</i> *									x	
<i>Odontohenricia fisheri</i>									x	
<i>Orthasterias koehleri</i>									x	
<i>Solaster dawsoni</i>									x	
<i>Evasterias retifera</i>	x									
<i>Leptasterias derbeki</i>	x									
<i>Leptasterias squumulata</i> *	x									
TOTALS 63	35		51		53		42		44	

Endemism

The great diversification of sea star species in the Aleutian archipelago can be expected in such an extensive region (2,500 km [1,554 mi] east to west) that is influenced by four major faunal provinces, the Oregonian (temperate eastern Pacific) Province, the Kurile (western Pacific high boreal) Province, the Arctic Province, and the Aleutian (amphi-Pacific) Province (Briggs 1974). The Oregonian Province includes fauna characteristic of the southern Gulf of Alaska and extends west in the Aleutians to Samalga Pass. The Kurile Province includes fauna characteristic of eastern Kamchatka and the northern Kurile Islands and extends east to Buldir Pass. The Arctic Province includes fauna characteristic of the Arctic and extends south to the eastern and western extremities of the Aleutians (Fox Islands in the east and Near Islands in the west). The Aleutian Province includes fauna characteristic of the Shumagin Islands, throughout the Aleutian Islands to the Russian Commander Islands, Kamchatka, and the northern Kurile Islands.

The high number of sea stars endemic to the nearshore Aleutian Islands (35%) is presumably due to the dominance of rocky substratum, limited suspended sediment, and deep-ocean passes that create faunal barriers between some island groups. Because the Aleutians are so rocky and have little freshwater fine sediment runoff from rivers, conditions are optimal for robust sessile algal and invertebrate communities. Consequently, the sponge community there is one of the most diverse in the Northern Hemisphere. Recently researchers have discovered that the Aleutians are a “hotspot for poriferan (sponge) biodiversity” (Lehnert and Stone 2014a). Within the past two decades 32 sponge species have been discovered with the aid of submersibles and remotely operated vehicles (ROVs) from deep (>50 m; 164 ft) waters along the Aleutians (Lehnert and Stone 2011, 2013, 2014a,b; Lehnert et al. 2005a,b,c, 2006a,b,c, 2012, 2014; Stone et al. 2011). Our Aleutian diving observations also attest to a diverse sponge community in the shallow (<20 m; 66 ft) waters. We theorize the unique Aleutian sponge community is, in part, responsible for the high diversity of sea stars. Of the 63 sea star species we found, nearly half (44%) feed or are assumed to feed on sponges. Furthermore, nearly 64% of the endemic sea stars utilize sponges as a food source. That so many

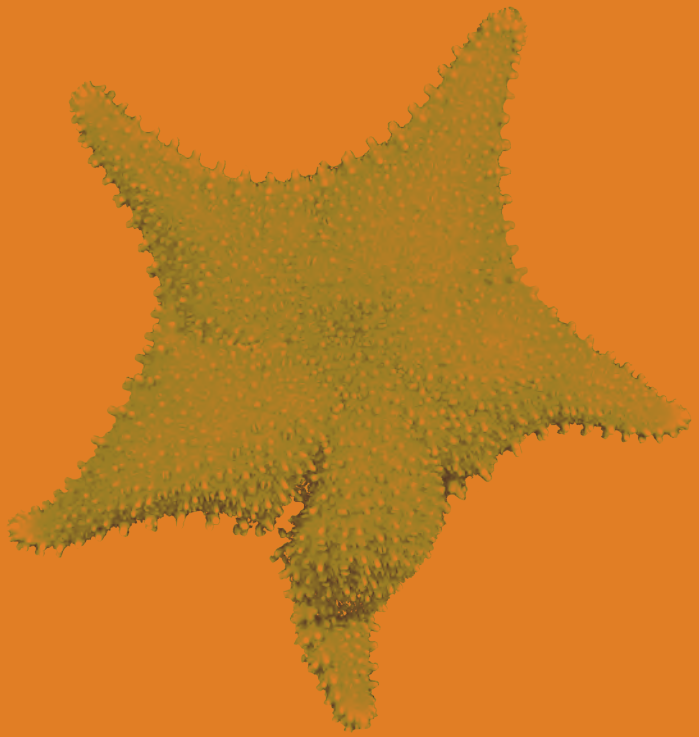
new species of sponges and sea stars have recently been discovered in the Aleutians is related to the advances in hard substrate sampling techniques, namely submersibles and ROVs in deep water and scuba in shallow water.

It is assumed that the deep-ocean passes create biogeographic barriers that limit the east-west expansion of some sea star species. The four passes contributing the most amount of net flow northward are Samalga, Amukta, Amchitka, and Buldir (Hunt and Stabeno 2005). Samalga Pass is the first deep (200 m; 656 ft) channel as one proceeds east to west. This pass appears to form a physical and biogeographic boundary between the eastern and central Aleutian marine ecosystems (Ladd et al. 2005). Our work revealed that 21 sea star species were only found west of Samalga Pass and six were only found east of the pass, including the endemic *Henricia vermillion*. The latter six species are all members of the Oregonian Province. Additionally, the kelp community east of Samalga Pass is mostly dominated by the sieve kelp *Agarum clathratum*, while west of this pass dragon kelp *Eualaria fistulosa* dominated (S.C. Jewett, pers. observ.). Also, the bull kelp *Nereocystis luetkeana* (Miller and Estes 1989) and several common mollusks (Vermeij et al. 1990) only occur west to Samalga Pass. The recently described kelp *Aureophycus aleuticus* is found on the western side of this pass, and may be endemic to Kagamil Island (Kawai et al. 2008).

Another major faunistic break occurs at the large Buldir Pass (640 m deep; 3,000 ft), between Kiska Island and the Near Islands group. This pass seems to define the eastern extent of the Kurile Province, and many notable northwestern Pacific species characteristic of eastern Kamchatka and the northern Kurile Islands fauna. Our work revealed three sea star species, including the endemic *Leptasterias squamulata*, were only found west of Buldir Pass and 19 were only found immediately east of the pass.

The central Aleutian Islands (Andreasof, Rat, and Islands of Four Mountains groups), defined between Samalga and Buldir Passes, are within the Aleutian Province. It contains a very rich and diverse fauna that includes at least 20 endemic species of asteroids. Numerous endemic species of hydroids, soft corals, and mollusks also occur here (Dr. James

H. McLean, curator emeritus, Natural History Museum of Los Angeles County, pers. comm., 2007; Clark 2006a,b; Cairns 2011; Cairns and Lindner 2011). Valentine (1966) estimated the percentage of endemic mollusks in the Aleutian province at 24%, and from our surveys in this province it appears the endemic asteroid fauna may be as high or higher. This region may represent a distinct faunistic pocket. More extensive sampling is needed before firm conclusions can be drawn as to the nature of the unique fauna of this region. The aforementioned species lists are representative, but by no means complete.



VALVATIDA Perrier, 1884

THE SEA STAR ORDER VALVATIDA has 695 species in 172 genera, in 17 families worldwide (Mah 2014a). Valvatida is primarily identified by the presence of conspicuous marginal ossicles, which characterize most of the species. Most members of this order have two rows of tube feet with suckers. Some species have paxillae, and in some the main pedicellariae are clam-like and recessed into the skeletal plates. Members of Valvatida in the nearshore Aleutian Islands include at least 12 species, six genera, and two families, which are covered in this field guide.

Arctic Cookie Star Arctic Bat Star

Ceramaster arcticus (Verrill, 1909)



Top left: Héloïse Chenelot
Top right: Shawn Harper
Bottom left: Shawn Harper
Bottom right: Roger N. Clark

VALVATIDA

Description

Stiff, broad, 5-rayed star (4- and 6-rayed specimens are uncommon); ray radius to 5.5 cm (2.2 in); R:r 1.4-1.8; marginal plates large, thick; entire aboral surface often swollen with tabulate plates covered with large, flattened polygonal granules, in groups, with 1 or 2 at the center and 5-8 around the margin; aboral color shades of reddish, pink, or lavender; oral surface flesh or cream colored.

Distribution and Habitat

Bering Sea to southern British Columbia, intertidal to about 80 m (262 ft). In the Aleutians this species is typically found on rock substrates covered with encrusting coralline algae. This species was observed throughout the Aleutians at our sites from the Fox Islands to the Near Islands.

Ecological Notes

Little is known of the natural history of *Ceramaster arcticus*, except it is known to feed on sponges such as *Suberites concinnus* (McDaniel 2013). This sea star presumably feeds by everting its stomach, as noted for *C. patagonicus* (Anderson and Shimek 1993). Although we made no feeding observations, it was on a variety of potential prey, like coralline algae, a green alga (*Codium ritteri*), sponges, hydroids, bryozoans, and tunicates.

Remarks

The cookie star *Ceramaster patagonicus* is also found in the Aleutians (Bering Sea to Cape Horn, South America), but only rarely in less than 20 m (66 ft) (10-245 m; 33-804 ft) (Lambert 2000). It may be distinguished from *C. arcticus* by (1) color, the aboral color of *C. patagonicus* is uniformly bright orange; (2) *C. patagonicus* has smaller, more numerous granules on the aboral surface, 4-8 at center; and (3) *C. patagonicus* has 12-15 marginal, and 3-5 robust adambulacral spinelets.

Cookie Star

Ceramaster patagonicus (Sladen, 1889)



Top left: Neil McDaniel

Top right: Neil McDaniel

Bottom left: Neil McDaniel

VALVATIDA

Description

Stiff, broad, 5-rayed star; radius to 8.5 cm (3.3 in); R:r 1.3-1.7; marginal plates large, thick; entire aboral surface often swollen; tabulate skeletal plates covered with flattened polygonal granules in groups, with 4-8 at the center and 12-15 around the margin; aboral color shades of orange; oral surface pale yellow or cream colored.

Distribution and Habitat

Bering Sea to Cape Horn, South America, 10-245 m (33-804 ft) (Lambert 2000). **It is the only species in this guide known to occur in both the Northern and Southern Hemispheres**, although *Asterias amurensis* was accidentally introduced in Tasmania (Morrice 1995). In the Aleutians *Ceramaster patagonicus* occurs on steeply sloping bedrock or vertical rock walls dominated by hexactinellid sponges, usually below 18 m (59 ft). In deeper waters it is found on sand, mud, and rocky bottoms.

Ecological Notes

Ceramaster patagonicus preys on sponges such as *Aphrocallistes vastus* and *Latrunculia austini* and other prey (McDaniel 2013) by everting its stomach (Anderson and Shimek 1993). *Ceramaster patagonicus* has a chemical defense against attacks by the sea star *Solaster dawsoni*, but the nature of this defense is not fully understood (McDaniel 2013).

Remarks

Although *Ceramaster patagonicus* occurs throughout the Aleutians (Fisher 1911), this species was not taken in the dive surveys, probably because we only dove in the shallow reaches of its depth range. It may be distinguished from *C. arcticus* by (1) color, the aboral color of *C. patagonicus* is uniformly bright orange; (2) *C. patagonicus* has smaller, more numerous granules on the aboral surface, 4-8 at center and 12-15 marginal; and (3) *C. patagonicus* has 3-5 robust adambulacral spinelets.

Gunpowder Star Swift's Sea Star

Gephyreaster swifti (Fisher, 1905)



Top left: Stephen C. Jewett
Top right: Stephen C. Jewett
Bottom left: Roger N. Clark

VALVATIDA

Description

Very large, broad, grainy-textured, 5-rayed star; rays to 21 cm (8.3 in) tapering to points; disc broad; R:r 2.1-2.6; puffy appearance; plates of entire aboral surface covered with large, rounded granules, particularly prominent on the marginal plates, which are separated by a distinct groove; aboral surface pink-orange or orange; oral surface cream colored.

Distribution and Habitat

Bering Sea to Washington state, 4-350 m (13-1,148 ft) (Fisher 1911; R.N. Clark, pers. observ.), on rocky and sandy bottoms. This species was observed on boulders at sites between Amukta and Amchitka Passes, along Adak Island (Andreanof Island group).

Ecological Notes

Gephyreaster swifti feeds on sea anemones such as *Metridium senile* and *Stomphia coccinea* (Mauzey et al. 1968).

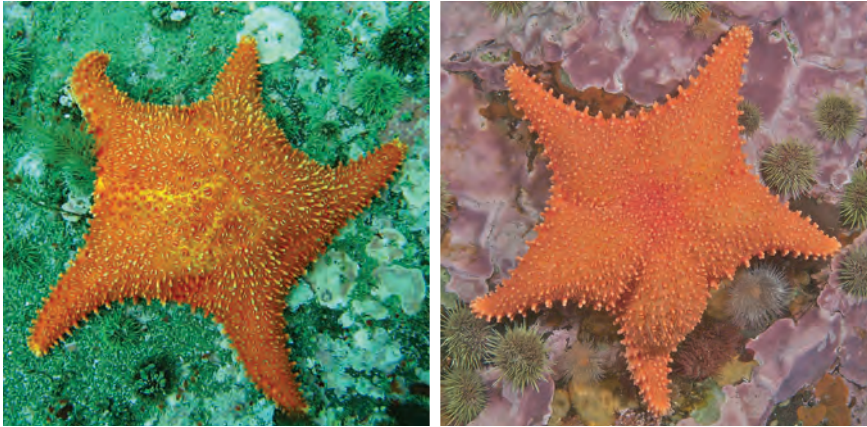
Remarks

This is one of the largest species of sea star in Alaska and is easily distinguished from others by the bright orange or pink-orange color, coarsely granular surface, and distinctive groove between marginal plates. It is unlikely to be confused with other Aleutian species.

Spiny Star

Hippasteria phrygiana aleutica

R.N. Clark & Jewett, 2011



Left: Roger N. Clark

Right: Shawn Harper

Description

Body large, broad, somewhat inflated, 5-rayed, disk broad, strongly stellate; rays short to 15 cm (6 in); R:r 2.0; aboral surface and marginal plates covered with short, stout, blunt, cylindrical spines, constricted at the base and low, broad bivalved or rarely trivalved pedicellariae; aboral surface red-orange, sometimes mottled with yellow or white, oral surface cream colored with some red-orange patches near margins.

Distribution and Habitat

Hippasteria phrygiana aleutica is endemic to the Aleutian Islands and is found throughout, except for the Near Islands. Between Unimak Pass and Buldir Island it occurs at about 15-250 m (49-820 ft) on rocky bottoms.

Ecological Notes

Hippasteria phrygiana aleutica may feed on anemones and gorgonian corals as do *H. spinosa* on hard substrates off British Columbia, Canada (McDaniel 2013). The related *H. spinosa spinosa* Verrill, 1909 is a broadcast spawner with pelagic lecithotrophic larvae (Strathmann 1987). *Hippasteria phrygiana aleutica* may also employ this mode of reproduction.

Remarks

Hippasterias aleutica was recently synonymized with *H. phrygiana* (Parelius, 1768), as were several other nominal species and subspecies or varieties of *Hippasterias*, including *H. spinosa spinosa* Verrill, 1909, *H. s. kurilensis* Fisher, 1911, and *H. leiopelta armata* Fisher, 1911 (Foltz et al. 2013; Mah et al. 2014). Genetic analyses in these papers illustrate that these forms are indeed very closely related; however, the morphological distinctions and geographic isolation of some of these forms suggest that this synonymy is premature. We believe *H. aleutica* to be distinct at least at a sub-specific level, if not a full species, based on its morphological characters that are unlike any other described forms from the North Pacific, and its isolation in the Aleutian Islands. Although *H. s. spinosa* is somewhat variable, it is very distinctive from *H. phrygiana*. While *H. l. armata* appears to be only a variety of *H. s. spinosa*, *H. s. kurilensis* appears to be at least sub-specifically distinct.

Although *Hippasteria kurilensis* was not found at diving depths (< 20 m; 66 ft) in the Aleutians, it has been taken in numerous trawl samples at depths of 80-404 m, often together with the very dissimilar *H. p. aleutica*. The hundreds of specimens examined were easily distinguished in the field and showed no overlap in characters (R.N. Clark, pers. observ., 1994-2004). Even juvenile specimens as small as R = 5 mm were recognizable on sight. Specimens of R = 10 mm differ as follows: (1) *H. p. aleutica* has 5 marginal plates (per series); *H. s. kurilensis* has 4 marginals; (2) the aboral surface of *H. p. aleutica* has tubercles or blunt, thick distally dilated or globular spines; *H. s. kurilensis* has sparse, tapering spines; and (3) *H. p. aleutica* has numerous (17-20) large, bivalve or trivalve pedicellariae to 0.6 mm.; the pedicellariae of *H. s. kurilensis* are much sparser (8-10) and smaller, to 0.3 mm. At R = 30 mm, *H. p. aleutica* has 8 marginals, *H. s. kurilensis* has 7. The (aboral) ray region of *H. p. aleutica* has 25-30 pedicellariae, to 1.4 mm; *H. s. kurilensis* has only 10-15 pedicellariae to 1.2 mm.

Hippasteria phrygiana aleutica is restricted to the Aleutian Islands, with no similar forms found in the Gulf of Alaska, Bering Sea, along the North American Pacific coast, or the Kamchatka-Kurile Islands region. *Hippasteria spinosa spinosa* (including *H. l. armata*) is found from the southeastern Bering Sea to at least southern California. *Hippasteria spinosa kurilensis* is restricted to the region from the Aleutian Islands to the Kurile Islands. The ranges of the two subspecies of *H. spinosa* do not overlap. Given these morphological distinctions and geographical restrictions, we feel that it is highly unlikely that these forms are all members of a single polymorphic cosmopolitan species. We do agree that *H. aleutica* has a subspecific relationship with *H. phrygiana*, although further investigation into the biology of these species, particularly reproduction, is needed before the relationships can be ascertained.

Scheffer's Dwarf Star

Aleutiaster schefferi A.H. Clark, 1939



Top left: Roger N. Clark
Top right: Roger N. Clark
Bottom left: Roger N. Clark

Description

Small, inflated, 6-rayed star; rays short to 0.8 cm (0.3 in), stubby; disc broad; R:r 1.7-2.3; interradial margins rounded; color uniformly white aborally and orally.

Distribution and Habitat

Aleutiaster schefferi is endemic to the Aleutians. It was observed throughout most of the Aleutian Islands, from Unalaska to Attu, from intertidal (O'Clair 1977) to at least 20 m (66 ft), on rocks and tubeworm colonies (*Chone* sp.), and among *Laminaria* spp. holdfasts.

Ecological Notes

May feed on detritus and/or epiphytes.

Remarks

This is the smallest known sea star in the world. Originally described as a member of the family Ganeriidae, it was recently re-assigned to Solasteridae (Gale et al. 2009). With its small size, inflated body, six stubby rays, and solid white color, *Aleutiaster schefferi* is unlikely to be confused with any other species in the Aleutians. It is easily overlooked because of its small size.

Rose Star Snowflake Star

Crossaster papposus (Linnaeus, 1767)



Top left: Héloïse Chenelot
Top right: Héloïse Chenelot
Bottom left: Stephen C. Jewett

VALVATIDA

Description

Medium-sized star; rays 8 to 16, 11 rays most common in the Aleutians; ray radius to 10 cm (3.9 in); disc broad; R:r 1.8-2.7; aboral and lateral surfaces covered with stalked bunches of slender spines; aboral coloration highly variable, with red, orange, white, purple, and yellow, often in concentric rings.

Distribution and Habitat

Arctic circumboreal, south to northern California, from intertidal to depths of 1,200 m (3,937 ft) or more on variable substrates. It was observed throughout the regions surveyed, always on rocky substrates.

Ecological Notes

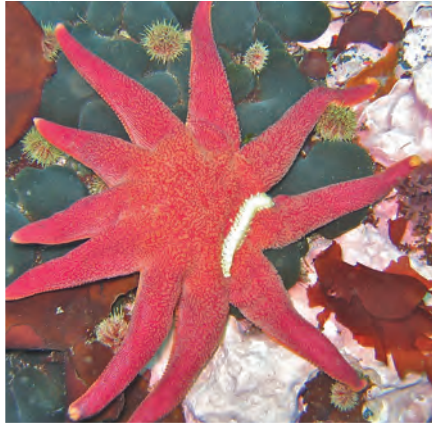
Crossaster papposus is a voracious predator as attested by numerous feeding studies throughout its range (e.g., Mauzey et al. 1968, Dyakonov 1950, Sloan 1980, O'Clair and O'Clair 1998). Its diet includes encrusting organisms, sea urchins, sea anemones, sea pens, mollusks (bivalves and nudibranchs), crustaceans, bryozoans, and *C. papposus* and other sea stars bigger than itself. It is a broadcast spawner (Strathmann 1987).

Remarks

This star is very common subtidally in the Aleutians and often occurs in large numbers. The very spinose aboral surface and concentric rings of color distinguish this species from all others in the region.

Arctic Sun Star

Solaster arctica Verrill, 1914



Top left: Roger N. Clark
Top right: Héloïse Chenelot
Bottom left: Stephen C. Jewett

VALVATIDA

Description

Large, 10-rayed star; rays broad at base, tapering to a slender point, long to 20 cm (7.9 in); disc broad; aboral coloration variable, solid purple, orange, or white, often with subtle radial stripes.

Distribution and Habitat

Beaufort, Chukchi, and Bering Seas, south to the Aleutian Islands, from Fox Islands to Rat Islands, 10-180 m (33-591 ft) on rocky, sand, or shell-hash bottoms.

Ecological Notes

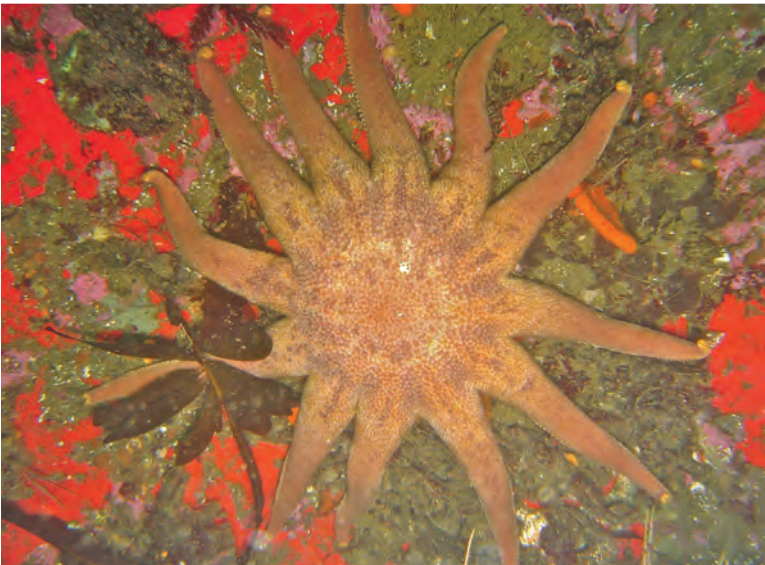
Solaster arctica appears to feed mostly on sea urchins of the genus *Strongylocentrotus* (S.C. Jewett, pers. observ.). The commensal scale worm *Arctonöe vittata* is often found on this species. *Solaster arctica* is presumably a broadcast spawner, like most other *Solaster* species.

Remarks

Fisher (1930) suggested that *Solaster arctica* was probably an arctic race or variety of *S. dawsoni*. Subsequently it was listed in the World Register of Marine Species (WoRMS) as *S. dawsoni* var. *arctica* Verrill, 1914, but later changed to *S. dawsoni arcticus* Verrill, 1914 (Mah 2014b). However, Clark and Jewett (2011) raised this taxon back to full species, based on the original description and on specimens collected by the authors from the Aleutians and the Chukchi Sea (Arctic Ocean). *Solaster arctica* is similar to *S. spectabilis*, but may be distinguished by color and the number of spines on the adambulacral plates.

Morning Sun Star

Solaster dawsoni Verrill, 1880



Top: Stephen C. Jewett
Bottom: Stephen C. Jewett

VALVATIDA

Description

Large, broad star, with 11-14 rays; rays relatively short to 25 cm (9.8 in) (about as long as disc width) and slender; disc broad, evenly textured; R:r 2.5-3.4; adambulacral plates with a nearly straight transverse series of 4-6 thick spines, and a furrow series of 3-4 slightly shorter spines. Live color aborally is orange or brown tones, often with darker markings on disc.

Distribution and Habitat

Solaster dawsoni is found from the eastern Aleutian Islands west to Umnak Island, and south to California, from intertidal to depths of about 30 m (98 ft) or more on rocky and soft bottoms.

Ecological Notes

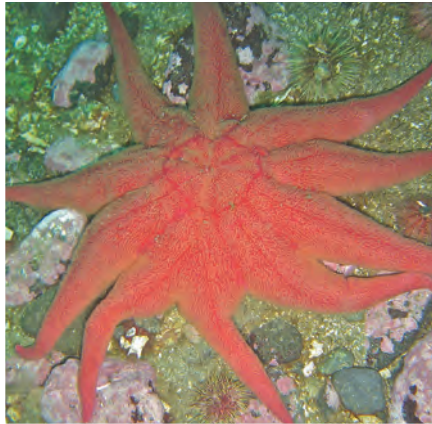
Solaster dawsoni is a voracious predator that feeds on other sea stars, especially *S. stimpsoni*, but also *Henricia* spp., *Evasterias troschelii*, *Crossaster papposus*, *Leptasterias* spp., and even the much larger *Pycnopodia helianthoides* (Mauzey et al. 1968). *Solaster dawsoni* is a broadcast spawner (Strathmann 1987).

Remarks

Solaster dawsoni is rare in the Aleutians but relatively common in the Gulf of Alaska. The color and number of rays (more than any other star in Alaska except for *Pycnopodia*) distinguish this star from all others in the region.

Northern Sun Star

Solaster endeca (Linnaeus, 1771)



Top left: Stephen C. Jewett
Top right: Stephen C. Jewett
Bottom left: Reid Brewer

VALVATIDA

Description

Large, inflated, often “pudgy” appearing star with 9-13 (normally 10) rays; rays about as long as disc width, to 20 cm (7.9 in); disc very broad; R:r 2.2-3.3; aboral surface velvet-like in appearance; aboral color may be solid red, purple, or orange, or red or purple with yellow or orange between rays.

Distribution and Habitat

Listed as arctic circumboreal, south to Puget Sound, Washington (Lambert 2000), but despite more than 400 trawl samples at depths of 10-200+ m in the western Beaufort Sea (H. Chenelot, pers. observ., 2008) and eastern Chukchi Sea (R.N. Clark, pers. observ., 2009-13), no specimens of *S. endeca* were recovered. It is likely that reports (e.g., Grainger 1966, Lambert 2000) of this species in the Alaska Arctic were misidentifications of *Solaster arctica*. Dyakonov (1950) reports the species as absent from the western Chukchi Sea and East Siberian Sea as well. In the Aleutian Islands it is found subtidally at 3-475 m (10-1,558 ft), on rocky, muddy, and sandy substrates. It was observed east of Buldir Pass, but it may also occur at the Near Islands.

Ecological Notes

Solaster endeca in the North Pacific feeds similarly to *S. dawsoni*, but also feeds heavily on sea cucumbers, sea stars (*Leptasterias* spp.), bryozoans, and tunicates (Feder and Christensen 1966, Mauzey et al. 1968, O'Clair and O'Clair 1998). The commensal scale worm *Arctonöe vittata* is often found on this species. *Solaster endeca* is a broadcast spawner (Strathmann 1987).

Remarks

The rather smooth, velvety aboral surface and relatively short pudgy rays distinguish this species from other *Solaster* species. The similarly colored *Solaster stimpsoni* has long slender rays and well-defined stripes on the rays. *Solaster arctica* has a rougher aboral surface and longer rays. Due to the apparent disjunct distribution, the possibility that *Solaster endeca* from the North Pacific region may represent a distinct species or subspecies should be investigated.

Brooding Six-rayed Sun Star

Solaster hexactis R.N. Clark & Jewett, 2011



Top left: Roger N. Clark
Top right: Roger N. Clark
Bottom left: Héloïse Chenelot

VALVATIDA

Description

Small, 6-rayed star; rays moderately long to 4.1 cm (1.6 in); disc relatively small; R:r 2.7; adambulacral plates with two long, slender furrow spines; aboral color dull, brick red, oral side cream colored.

Distribution and Habitat

Endemic to the Aleutians, from Seguam Pass to Buldir Island on rocky substrates from 10 to 385 m (33-1,263 ft).

Ecological Notes

This species is the only member of Solasteridae known to brood its young (Clark and Jewett 2011b).

Remarks

Solaster hexactis is the smallest and only known 6-rayed species of *Solaster*. This species bears a striking resemblance to members of the genus *Henricia*, of the family Echinasteridae, and may be mistaken for a 6-rayed specimen of that genus. However, it is distinguished by the nature of the mouth and adambulacral plates, particularly the 2 long, slender spines of the adambulacral furrow.

Spectacular Sun Star

Solaster spectabilis R.N. Clark & Jewett, 2011



Top left: Roger N. Clark

Top right: Piotr Kuklinski

Bottom left: Roger N. Clark

Bottom right: Stephen C. Jewett

VALVATIDA

Description

Large, 10- (rarely 11) rayed star; rays about as long as or slightly longer than disc width; ray radius to 20 cm (7.9 in); disc broad; R:r 3.1; adambulacral plates with curved actinal series of 6-8 stout spines, and a furrow series of 3 spines, 2 of the spines about equal in length, the aboral spine considerably shorter; paired oral plates with 11-12 thick, blunt, membrane-sheathed marginal spines; color variable, often with yellow-orange disc and purple rays, may be uniformly purple, yellow, or white with pink at ray-tips.

Distribution and Habitat

Appears to be endemic to the Aleutians, confined to the central Aleutians, between Samalga Pass in the east and Buldir Pass in the west, at depths of 7-212 m (23-696 ft) on rock bottoms.

Ecological Notes

Solaster spectabilis feeds on the sea urchin *Strongylocentrotus polyacanthus* (S.C. Jewett, pers. observ.). It is presumably a broadcast spawner, like most other *Solaster* species.

Remarks

Solaster spectabilis is distinguished from other *Solaster* species by the number of adambulacral spines and coloration.

Striped Sun Star

Solaster stimpsoni Verrill, 1880



Top left: Héloïse Chenelot
Top right: Héloïse Chenelot
Bottom left: Reid Brewer

VALVATIDA

Description

Large, typically 10-rayed star; rays relatively long to 23 cm (9 in), slender, usually noticeably longer than disc width; rays vary in length and thickness; R:r 2.3-4; aboral coloration shades of orange or red, with blue or purple stripe radiating from the center of the disc to the tip of each ray. Occasionally the whole body is blue.

Distribution and Habitat

Solaster stimpsoni is found throughout the Aleutian Islands and south to southern Oregon. It is particularly common in the eastern Aleutians, where it is found from intertidal to about 610 m (2,001 ft) (O'Clair and O'Clair 1998) on rocky and sandy bottoms.

Ecological Notes

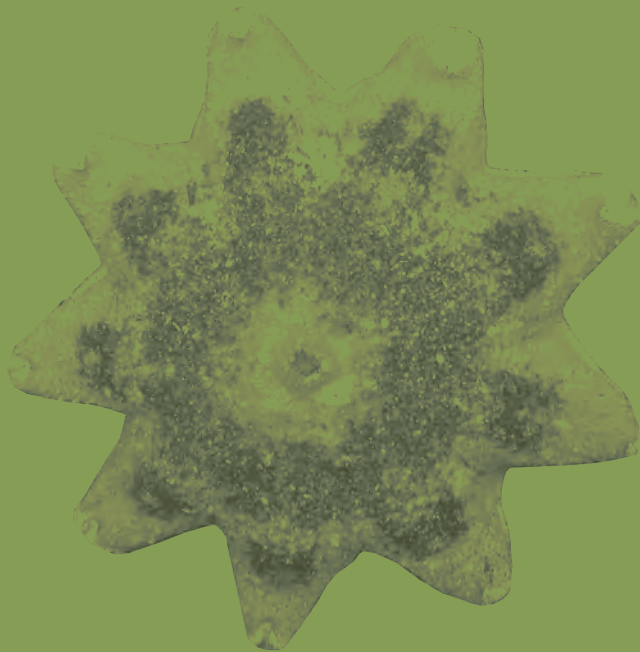
Although the diet of *Solaster stimpsoni* is varied, it primarily feeds on sea cucumbers in genera *Cucumaria*, *Eupentacta*, and *Psolus* (Mauzey et al. 1968, O'Clair and O'Clair 1998). It is not known to feed on other sea stars. *Solaster stimpsoni* is a broadcast spawner (Strathmann 1987).

Remarks

Solaster stimpsoni is distinguished from other *Solaster* species by the long slender rays and aboral coloration. *Solaster endeca* often has similar coloration, but differs in having relatively shorter, thicker rays.

VELATIDA Perrier, 1884

THE SEA STAR ORDER VELATIDA has 188 species in 18 genera in four families worldwide (Mah 2014c). These asteroids normally have thick bodies with large discs and a variable number of rays. Pedicellariae are absent. Members of Velatida in the nearshore Aleutian Islands include at least six species, two genera, and two families that are covered in this field guide.



Wrinkled Cushion Star

Pteraster militaris (Müller, 1776)



Top left: Piotr Kuklinski
Top right: Roger N. Clark
Bottom left: Stephen C. Jewett

VELATIDA

Description

Relatively large, inflated, 5-rayed star with wrinkled, fleshy aboral surface; rays short to moderately long to about 10 cm (3.9 in); disc fairly broad; R:r 2-2.5; prominent central osculum; actinolateral fringe delineates edge of ray; color uniform, cream, pale yellow, orange, or pink.

Distribution and Habitat

Arctic circumboreal, throughout the Aleutians, south to California, on soft and rocky substrates at depths of 3-1,100 m (10-3,609 ft) (Lambert 2000; R.N. Clark, pers. observ.). They are found on rocks at depths less than 30 m (98 ft). It was observed throughout the surveyed Aleutian regions.

Ecological Notes

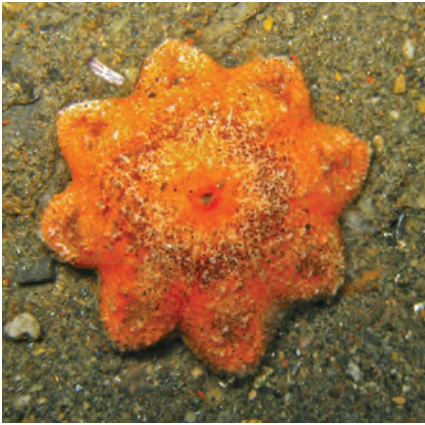
Pteraster militaris feeds primarily on sponges and hydrocorals (Lambert 2000). This species is capable of brood and broadcast spawning (McClary and Mladenov 1989).

Remarks

There are more than a dozen species of *Pteraster* in the vicinity of the Aleutians, but only 5 species occur in relatively shallow water. *Pteraster militaris* is distinguished from all other *Pteraster* species by the wrinkled aboral surface.

Multi-rayed Cushion Star

Pteraster octaster Verrill, 1909



Top left: Roger N. Clark
Top right: Roger N. Clark
Bottom left: Roger N. Clark

VELATIDA

Description

Medium size, ridged, 7-12 rays with 8-12 rays more common; disc thick, broad; rays short, stubby, to about 4 cm (1.6 in); R:r 1.2-1.5; aboral color yellow-orange, with purple or brown markings.

Distribution and Habitat

Northern Sea of Japan, Sea of Okhotsk, Bering Sea, and Chukchi Sea. Described from Bering Island of the Commander Islands of the western Bering Sea (Smirnov 1982). In Alaska waters it was reported from near the Pribilof Islands as well as the northeastern Bering Sea (Smirnov 1982; R.N. Clark, pers. observ.). Although not reported from the Aleutians, its occurrence at the Commander Islands and Pribilof Islands suggests it is likely to occur in the western Aleutians and possibly in the eastern Aleutians. It lives on variable substrates from coarse sand to rocky bottoms rich with coralline algae and sponges at depths of <20-136 m (66-446 ft) (Smirnov 1982; Sanamyan and Sanamyan 2007; R.N. Clark, pers. observ.).

Ecological Notes

Little is known of the natural history of this beautiful species except it probably eats sponges and other encrusting organisms, as do other pterasterids. *Pteraster octaster* is a brooder, as development takes place in the nidamental chamber where the young exit through bursts in the thinnest places of the wall, usually between the rays (Fisher 1911, Sanamyan and Sanamyan 2007).

Remarks

Previously confused with *Pteraster obscurus* (Fisher 1911, Dyakonov 1950), but Smirnov (1982) restored the specific status of *P. octaster*. Although the species name implies it is 8-rayed, in reality 7-12 rays have been observed (Smirnov 1982).

Small Cushion Star

Pteraster pulvillus Sars, 1861



Photo: Reid Brewer

VELATIDA

Description

Small inflated, stubby, 5-rayed star with rough surface; rays short to about 2 cm (0.8 in); disc fairly broad; R:r 1.2-1.3; prominent central osculum; suboral spine slender, glassy, encased in a thick membrane; color uniform, cream, pale yellow, orange, or tan.

Distribution and Habitat

Arctic circumboreal, throughout the Aleutians, rocky substrates at depths of 14-200 m (46-656 ft).

Ecological Notes

Little is known about this small species, but it appears to feed on sponges and anemones (S.C. Jewett, pers. observ.). *Pteraster pulvillus* is likely a brooder as are many pterasterids.

Remarks

This small species resembles *Pteraster tessellatus*, but is much smaller, rougher, and uniformly colored.

Cushion Star, Slime Star

Pteraster tesselatus Ives, 1888



Top left: Héloïse Chenelot
Top right: Héloïse Chenelot
Bottom left: Stephen C. Jewett

VELATIDA

Description

Moderately large, very inflated, 5-rayed star; rays short, stubby, reaching 12.5 cm (4.9 in); R:r 1.4-1.8; disc broad, thick; aboral surface with polygonal reticulation; prominent central osculum; color yellow, tan, blue, or gray, with brown, black, or orange markings.

Distribution and Habitat

Bering Sea to Washington, 6-440 m (20-1,444 ft) on rocky and soft bottoms. It is relatively common throughout the surveyed Aleutian regions.

Ecological Notes

Pteraster tessellatus is the only known northeastern Pacific *Pteraster* species that does not brood its young in the nidamental chamber (beneath the tent-like, inflated aboral surface). Instead it releases eggs into the water column for development. The fertilized eggs develop into nonfeeding larvae that pass directly into adults without metamorphosis (Strathmann 1987). **This is the only sea star known to have direct development** (Lambert 2000). *Pteraster tessellatus* feeds primarily on colonial tunicates, hydroids, sponges, bivalves, bryozoans, and anemones (Mauzey et al. 1968).

Remarks

Pteraster tessellatus secretes mucus when disturbed, which is highly effective in repelling predation by *Solaster dawsoni* and *Pycnopodia helianthoides* (Lambert 2000).

Smooth Cushion Star Will's Star

Pteraster willsi R.N. Clark & Jewett, 2011



Top left: Héloïse Chenelot
Top right: Stephen C. Jewett
Bottom left: Roger N. Clark

VELATIDA

Descriptions

Relatively small, inflated, 5-rayed star; rays short to 3 cm (1.2 in), stout, triangular; disc broad, thick; R:r 1.4; color uniformly white, pale yellow, or orange.

Distribution and Habitat

Endemic to the Aleutian Islands. It was observed at only a few locations in the central and western Aleutians on rocky bottoms at 10-385 m (33-1,263 ft).

Ecological Notes

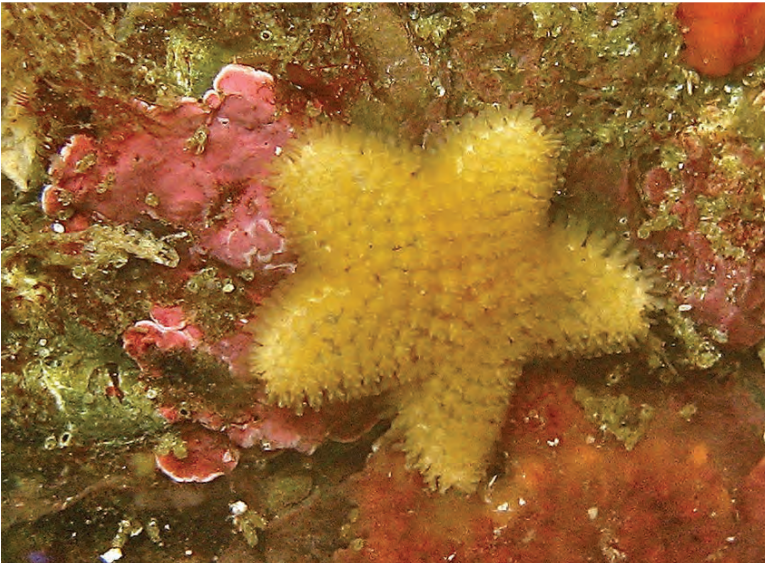
Little is known about the ecology of this small species, although specimens from deeper water appear to feed on sponges and hydroids.

Remarks

Pteraster willsi is similar to *Pteraster militaris*, but is distinguished by the rather smooth aboral surface that lacks the fleshy wrinkles.

Fuzzy Star

Peribolaster biserialis Fisher, 1905



Top: Héloïse Chenelot
Bottom: Roger N. Clark

VELATIDA

Description

Small, fuzzy-appearing, 5-rayed star; disc broad; rays short; aboral surface covered with cuplike tufts of divergent, flesh-covered spines; actinolateral spines free, not encased in membrane. Color is uniformly white, pale yellow, orange, or tan. Ray radius to 1.5 cm (0.6 in).

Distribution and Habitat

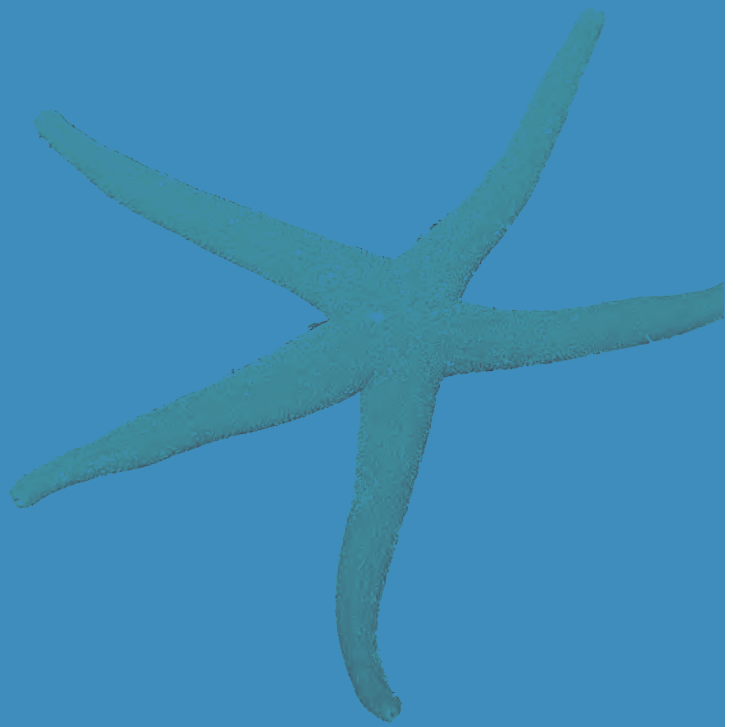
Commander Islands, Aleutian Islands and south to southern California, on rocky bottoms at depths of 20-805 m (66-2,641 ft) (Lambert 2000; R.N. Clark, pers. observ.).

Ecological Notes

Nothing is known about the natural history of this small, unusual species.

Remarks

Peribolaster biserialis somewhat resembles a small *Pteraster*, but is distinguished by (1) lack of supradorsal membrane and osculum; (2) presence of fleshy tufts of spines; and (3) free actinolateral spines.

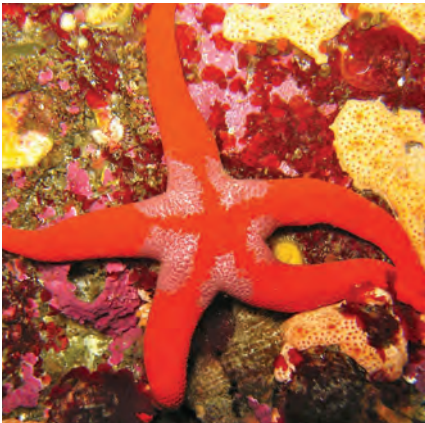


SPINULOSIDA Perrier, 1884

THE SEA STAR ORDER SPINULOSIDA has 289 species in 15 genera in two families worldwide (Mah 2014d). Members of Spinulosida completely lack pedicellariae and have a delicate skeletal arrangement. They generally have inconspicuous marginal plates, not forming a vertical edge to the disc. Spines of the aboral side are usually in groups, often paxilliform. The name Spinulosida comes from the presence of numerous low spines on the aboral surface. Podia are in two series. The members of Spinulosida in the nearshore Aleutian Islands include at least 20 species, three genera, and one family, which are covered in this field guide.

Armpit Blood Star

Henricia sp. A



Top left: Stephen C. Jewett
Top right: Stephen C. Jewett
Bottom left: Stephen C. Jewett

SPINULOSIDA

Description

Relatively large, 5-rayed star; rays long to 13 cm (5.1 in); disc small; R:r 4.8-6.6; aboral plates usually distinctly crescent-shaped; adambulacral plates with 9-15 spines in 2-3 rows; intermarginal plates irregular, restricted to near the base of the rays; color red or red-orange with gray or pinkish patches at the base of rays (armpit) and sometimes covering the disc. Solid red specimens sometimes occur.

Distribution and Habitat

Aleutian Islands to Oregon, intertidal to at least 20 m (66 ft), on rocky substrates. *Henricia* sp. A was found on boulder substrates in the eastern Aleutians, at Tigalda Island of the Fox Islands.

Ecological Notes

Henricia sp. A is very similar in appearance to both *H. vermilion* and *H. uluudax* with which it occurs. Because it often has been confused with those species (under the name *Henricia leviuscula*), it is likely that some of the biological studies of *H. leviuscula* actually may refer to *Henricia* sp. A. Although nothing is known about reproduction in *Henricia* sp. A, species of Echinasteridae are known to broadcast spawn as well as brood (Strathmann 1987).

Remarks

Henricia sp. A is morphologically very similar to both *H. vermilion* and *H. uluudax*, but their color easily distinguishes them. Additionally *Henricia* sp. A has 9-15 adambulacral spines, compared to 7-10 in *H. vermilion* and 19-24 in *H. uluudax*. *Henricia* sp. A has unique aboral spines that resemble a chalice with 8-10 upturned thorns around the upper edge, surrounding a distinctive dome-like structure at the center (D.J. Eernisse, pers. comm., 2014). No other known species of *Henricia* has spines like this. *Henricia* sp. A is a “forgotten” species, recently rediscovered by Dr. Megumi Strathmann, and its redescription is presently part of the study of the *Henricia leviuscula* complex by Strathmann and Eernisse (D.J. Eernisse, pers. comm., 2014).

Ridged Henricia

Henricia asthenactis Fisher, 1910



Top: Stephen C. Jewett
Bottom: H elo ise Chenelot

SPINULOSIDA

Description

Relatively large, 5-rayed star; rays usually somewhat inflated and long to 11 cm (4.3 in); disc small; R:r 4.4-6.6; rough textured aboral surface; ridges of meshwork on aboral surface with 2-5 stout, thornlike, flesh-covered spines; color uniformly dark pink, lavender, or purple aborally, whitish orally.

Distribution and Habitat

Bering Sea and Aleutian Islands, south to California, at depths of 10-1,250 m (33-4,101 ft) on various types of substrates, including rock, sand, and mud. It was observed on boulders in the Rat and Andreanof Islands.

Ecological Notes

Nothing is known of the biology of this species; however, members of the family Echinasteridae broadcast and brood (Strathmann 1987). *Henricia asthenactis* presumably is a sponge feeder, as are many other echinasterids.

Remarks

The thorny ridges on the aboral surface and coloration distinguish *Henricia asthenactis* from most other *Henricia* species in the region. Additionally, the adambulacral plates bear a single row of 3 or 4 grading, stout, cylindrical spines, a feature unique to this species.

Thorny Blood Star

Henricia echinata R.N. Clark & Jewett, 2010



Top left: Roger N. Clark
Top right: Héloïse Chenelot
Bottom left: Roger N. Clark

Description

Relatively small, moderately inflated, 5-rayed star; ray radius to 5.5 cm (2.2 in); R:r 4.8; aboral skeleton irregular, open meshwork; aboral plates with 5-11 blunt, rather smooth spines; adambulacral plates with 8-11 slender, blunt spines, 1 at furrow edge, followed by 2 slightly shorter spines, and 2 irregular rows of 3-4 shorter spines; oral plates with 4-5 marginal and 1 or 2 suboral spines; color is uniformly pink to dark red.

Distribution and Habitat

Henricia echinata appears to be endemic to the Aleutians. This species was only found at the Andreanof Islands (Adak Island) and Rat Islands (Amchitka Island) in our study, on rock walls, boulders, and cobbles, at 15-25 m (49-85 ft).

Ecological Notes

Little is known of the natural history of *Henricia echinata*, except it is often found on sponges. Nothing is known about the reproduction of this species; however, members of the family Echinasteridae broadcast and brood (Strathmann 1987).

Remarks

The relatively large, thornlike spines on the aboral ridges serve to separate this species from its congeners.

Dwarf Henricia

Henricia elachys R.N. Clark & Jewett, 2010



Top left: Piotr Kuklinski
Top right: Héloïse Chenelot
Bottom left: Roger N. Clark

SPINULOSIDA

Description

Small, moderately inflated, 5-rayed star; rays broad at base, tapering to slender tips; ray radius to 3 cm (1.2 in); disc relatively large; aboral skeleton fine, open-meshed aboral ridges bearing 16-27+ slender spinelets; adambulacral plates with 10-16 slender spines in 3 rows; color mustard yellow to dark orange, mottled with reddish or brown.

Distribution and Habitat

Endemic to the Aleutians. It was observed in the central Aleutian Islands of the Andreanof and Rat Islands, on rocky substrates below 12 m (39 ft).

Ecological Notes

Little is known of the natural history of this species, except it was observed to feed on sponges. Nothing is known about the reproduction of this species; however, members of the family Echinasteridae broadcast and brood (Strathmann 1987).

Remarks

This small species is very similar to *Henricia tumida* and frequently has a similarly mottled color pattern. *Henricia elachys* is separated from *H. tumida* by the open mesh of the aboral skeleton and more numerous and slender adambulacral spines; 10-16 versus 4-9 in *H. tumida*. *Henricia gemma* is also similar to *H. elachys*, but *H. gemma* is solid colored, has a tight-meshed aboral skeleton, and has 15-22+ adambulacral spines.

Gem Henricia

Henricia gemma R.N. Clark & Jewett, 2010



Top left: Roger N. Clark
Top right: Roger N. Clark
Bottom left: Roger N. Clark

SPINULOSIDA

Description

Small, inflated, 5-rayed star; rays relatively short to 3.4 cm (1.3 in), thick at base, tapering sharply to a slender tip; disc large; R:r 3-4.3; aboral plates small, tightly spaced, bearing 6-18 thorny spinelets; adambulacral plates with 4-5 large, thick, blunt spines near furrow edge (arranged 1+2 or 3+2), followed by 10-16 much finer spines in 3 irregular rows; color in life uniformly red or yellow. The spine arrangement (1+2 or 3+2) refers to the number and sequence of spines on the actinal surface of the adambulacral plate (behind those at the edge of the furrow).

Distribution and Habitat

Henricia gemma is endemic to the Aleutians. It was only observed at Adak Island and the Rat Islands in the central Aleutians at <20 m (66 ft), but may be more widespread.

Ecological Notes

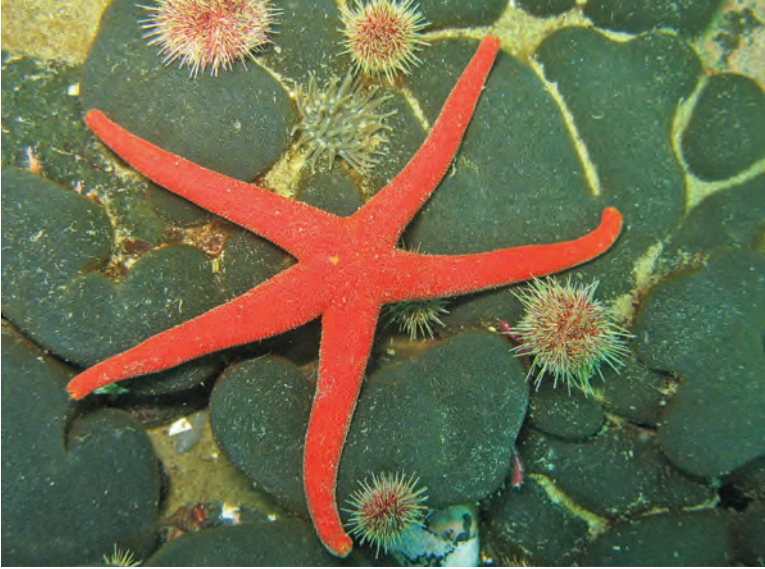
Nothing is known about the natural history of this recently discovered species; however, other members of the family Echinasteridae broadcast and brood (Strathmann 1987). It presumably feeds on sponges and other sessile organisms.

Remarks

This small species may be overlooked due to its similarity to the common and variable *H. tumida*.

Remarkable Red Henricia

Henricia insignis R.N. Clark & Jewett, 2010



Top: Roger N. Clark

Bottom: Stephen C. Jewett

SPINULOSIDA

Description

Medium size, fuzzy-textured, 5-rayed star; rays moderately long to 7 cm (2.8 in), slender to moderately inflated; disc relatively small; R:r 4.5-5.8; aboral surface with small, rounded plates bearing 17-35 spinelets tipped with 3-5 sharp thorns; rays with three faint radial lines of close-set plates; adambulacral plates with 30-35+ spines. Aboral color is red.

Distribution and Habitat

This species is endemic to the Aleutian Islands. It was observed in the central Aleutian Islands, from the Islands of Four Mountains to Kiska Island, intertidal to at least 20 m (66 ft) on rocky substrates. It is common in kelp beds, but not on the kelps.

Ecological Notes

Nothing is known about the natural history of this species, including reproduction. However, members of the family Echinasteridae broadcast and brood (Strathmann 1987). It presumably is a food generalist feeding on sessile flora and fauna, including sponges.

Remarks

Henricia insignis is distinguished from *H. multispina* by the thicker rays and red color, less numerous aboral spines (less than 40 compared to 40-100 in *H. multispina*), and 2 rows of intermarginal plates. *Henricia multispina* lacks intermarginal plates. *Henricia insignis* may be distinguished from *H. lineata* by the lack of prominent light-colored stripes and the more numerous adambulacral spines; 30-35+ compared with 14-17 in *H. lineata*. *Henricia insignis* may be distinguished from *H. uluudax* by the thicker rays and more numerous adambulacral spines than in *H. uluudax* (19-24).

Rough Purple Henricia

Henricia iodinea R.N. Clark & Jewett, 2010



Top left: David Scheel
Top right: Stephen C. Jewett
Bottom left: Stephen C. Jewett

SPINULOSIDA

Description

Large, relatively slender, 5-rayed star; rays relatively long to 15 cm (5.9 in), inflated at base, tapering to slender tips; disc small; R:r 5.1; marginal plates along sides of rays somewhat enlarged and raised; superomarginal series slanting prominently upward at base of rays, forming a distinct ridge; overall texture rough; color purple to lavender (rarely white).

Distribution and Habitat

This species is endemic to the Aleutian Islands (central to eastern), where it occurs on rocky substrates, particularly boulders, at 5-110 m (16-361 ft). It was observed from the Krenitzin Islands to the Rat Islands.

Ecological Notes

Nothing is known about the natural history of this species. Members of the family Echinasteridae are broadcasters and brooders (Strathmann 1987). It presumably feeds on sessile flora and fauna, including sponges.

Remarks

With its rough texture and purplish color, *H. iodinea* is unlikely to be confused with any other species of *Henricia* in the Aleutians.

Striped Henricia

Henricia lineata R.N. Clark & Jewett, 2010



Top left: H lo se Chenelot
Top right: Stephen C. Jewett
Bottom left: Stephen C. Jewett

Description

Medium size, 5-rayed star; rays relatively long to about 10 cm (3.9 in), slender; disc small; R:r 5-6; aboral side of rays with distinctive light colored stripes; color red or red-orange with light stripes.

Distribution and Habitat

Henricia lineata occurs throughout the Aleutian Islands on rocky substrates, particularly boulders, 5-80 m (16-262 ft). It also occurs in the Commander Islands and along the Kamchatka coast (Sanamyan and Sanamyan 2007).

Ecological Notes

Nothing is known of the natural history of this species. Members of the family Echinasteridae are known to broadcast as well as brood (Strathmann 1987). It presumably feeds on sessile flora and fauna, including sponges.

Remarks

With its distinctive stripes this well marked species is unlikely to be confused with any other species of *Henricia*.

Fuzzy Henricia

Henricia multispina Fisher, 1910



Top: Roger N. Clark

Bottom: Roger N. Clark



SPINULOSIDA

Description

Medium size, 5-rayed star; rays long to about 15 cm (5.9 in), slender; disc small; R:r 5.8-7; plates of aboral surface small, closely set, bearing 40-60+ minute glassy spines; adambulacral plates with 35-50 spines; color of aboral surface pale lavender or pink, fading to white on outer portion of rays, center of disc usually with small red spot. Some specimens are uniformly white.

Distribution and Habitat

Throughout the Aleutian Islands, west to the Kurile Islands, and Gulf of Alaska at depths of 15-150 m (49-492 ft) on rocky substrates.

Ecological Notes

Little is known of the natural history of *Henricia multispina*. Members of the family Echinasteridae broadcast as well as brood (Strathmann 1987). It presumably feeds on sessile flora and fauna, including sponges.

Remarks

The profusely spiny plates on the aboral surface give it a fuzzy appearance. The adambulacral plates as well as the distinctive color of *Henricia multispina* distinguish it from all other *Henricia* species (see comments under *Henricia insignis*). Originally described as a subspecies or variety of *Henricia leviuscula* (Stimpson, 1857), Clark and Jewett (2010) raised this to a full species based on its very distinctive morphology. These distinctions are borne out by genetic studies as well (D. Eernisse, pers. comm., 2010). Some recent authors (e.g., Lambert 2000) have called this species *Henricia leviuscula spiculifera* (H.L. Clark, 1901); however, Fisher (1911) compared the characteristics of the two nominal species and determined that *H. multispina* was distinct. Fisher also expressed doubts that the type specimen actually came from the Salish Sea (Puget Sound), noting that it was part of a collection from “somewhere south of the United States.” The type specimen has been lost (Fisher 1911) and since no specimens matching Clark’s description are available, Clark and Jewett (2010) recommended *H. leviuscula spiculifera* be treated as *nomen inquirendum* (the name cannot be applied with certainty to any known species).

Bloody Henry

Henricia oculata (Pennant, 1777)



Top: Stephen C. Jewett
Bottom: Stephen C. Jewett

Description

Relatively stiff, large, 5-rayed star; rays moderately slender; disc small; R to 8 cm (3.1 in); R:r 3.6-5.4; aboral plate ridges with 15-20 minute thorns; adambulacral plates with 4-6 spines; aboral coloration pale orange to lavender, mottled with red or brown.

Distribution and Habitat

Atlantic: British Isles (Campbell 1994); Pacific: Alaska, south to the Aleutian Islands, west to the central Aleutians and east to Kodiak Island, on rocky substrates to 20 m (66 ft) (R.N. Clark, pers. observ.; unpublished DNA results).

Ecological Notes

In the north Atlantic *Henricia oculata* is found on rocky substrates to a depth of 100 m (328 ft). It feeds as a passive suspension feeder as well as feeding on sponges, detritus, hydroids, and bryozoans. It is a brooder with a life span of 3-5 years (MarLIN 2006).

Remarks

This species closely resembles *H. rhytisma*, but differs in having much more slender rays, fewer aboral thorns (15-20 compared to 25-35 in *H. rhytisma*), and fewer adambulacral spines (4-6 compared to 8-10 in *H. rhytisma*).

Mottled Henricia

Henricia rhytisma R.N. Clark & Jewett, 2010



Top: Héloïse Chenelot
Bottom: Stephen C. Jewett

SPINULOSIDA

Description

Medium size, robust, 5-rayed star; rays moderately short to 7.5 cm (2.9 in), thick, inflated; disc relatively small; R:r 4.5-5.5; aboral surface with open meshwork of ridges, bearing 25-35 minute thorns; color variable, nearly uniform lavender, tan, yellow, or orange, usually mottled with reddish, brown, or purple.

Distribution and Habitat

This species is presumably endemic to the Aleutian Islands. It was found on boulder substrates at 10-100 m (33-328 ft) from the Fox Islands to the Rat Islands.

Ecological Notes

Although nothing is known of the reproduction of *H. rhytisma*, members of the family Echinasteridae are known to broadcast and brood (Strathmann 1987). It feeds on sponges (S.C. Jewett, pers. observ.). Little else is known about the natural history of this recently discovered species.

Remarks

In texture and color, *Henricia rhytisma* resembles *H. oculata*, which also occurs in the Aleutians, but differs in having much thicker rays and more numerous spines on the aboral plate ridges (25-30+ as opposed to less than 20 in *H. oculata*). It also has more numerous adambulacral spines, 1-2 (at furrow edge) +2+4-6 in 2 rows or a single staggered row, versus 1+3-5 in a single irregular row in *H. oculata*. The spine arrangement (e.g., +2+4-6) refers to the number and sequence of spines on the actinal surface of the adambulacral plate (behind those at the edge of the furrow).

Northern Blood Star Fat Blood Star

Henricia sanguinolenta (Müller, 1776)



Top left: Piotr Kuklinski
Top right: Héloïse Chenelot
Bottom left: Héloïse Chenelot

SPINULOSIDA

Description

Moderately large, 5-rayed star; rays relatively long, rather slender, to 10 cm (3.9 in) long; disc small; R:r 4.6-5.3; creases in armpits (base of rays) give it a puffy appearance; color usually solid deep red, orange, or purple. Aleutian specimens are generally uniformly deep purple.

Distribution and Habitat

Not clearly defined, but apparently circumpolar and possibly circumboreal. *Henricia sanguinolenta* occurs south to Washington state. In the Aleutians it is on rocky bottoms from at least 10-200 m (33-656 ft). It was only collected at the Fox and Andreanof Islands, specifically from Unalaska to Adak Islands.

Ecological Notes

This sea star is a brooder (Strathmann 1987, Booloottian 1966). In the Aleutians many observations were made of this species on sponges. Apparently it suspension feeds on plankton by ciliary action, tapping into the feeding currents of the sponge (Anderson 1960, Rasmussen 1965). Sea stars like *H. sanguinolenta* that take advantage of the currents created by its host are regarded as “energy commensals” (Anderson 1966). This species also preys directly on sponges, digesting the soft tissue and leaving distinct, nonpigmented lesions (Sheild and Witman 1993).

Remarks

Similar in appearance to *H. uluudax*, but in *H. sanguinolenta* rays are thicker at the base and taper to slender tips, and the aboral surface is velvet-like. The taxonomy of *Henricia sanguinolenta* was unresolved until Madsen (1987) reviewed the genus in Norwegian waters and redescribed the species. Much of the older (pre-1987) literature dealing with various aspects of the natural history of this species refers to related but misidentified species. It appears (morphologically) to be related to *Henricia tumida* and *H. gemma*. Authors since Fisher (1911) have misidentified various (mostly undescribed) forms of *Henricia*, *Aleutihenricia*, and *Odontohenricia* from the Pacific coast as this species. The identification herein is based on Madsen (1987).

Fat Henricia

Henricia tumida Verrill, 1909



Top left: Héloïse Chenelot
Top right: Stephen C. Jewett
Bottom left: Stephen C. Jewett

SPINULOSIDA

Description

Small, stout, 5-rayed star; rays variable, usually relatively short to about 3 cm (1.2 in), thick; disc rather inflated; R:r 2-3.7; usually has swollen or distended (tumid) appearance; color highly variable, may be uniform or mottled with brown, gray-white, tan, red, orange, yellow, or purple.

Distribution and Habitat

Sea of Okhotsk, southern Chukchi Sea to southeast Gulf of Alaska (Sitka) on sand and rocky substrates (Dyakonov 1950); intertidal to about 80 m (262 ft). In the Aleutians it was found west of Amukta Pass, from Andreanof Islands to the Near Islands, but its distribution is considered Aleutian-wide since it has been found in the eastern Gulf of Alaska (Dyakonov 1950).

Ecological Notes

This small, variable species feeds on sponges and is abundant on encrusting sponges in the Aleutian Islands (O'Clair 1977; pers. observ.). *Henricia tumida* is one of several species of *Henricia* known to brood its young by arching its disc (S.C. Jewett and R.N. Clark, pers. observ.).

Remarks

With its small size, usually short thick rays, and highly variable color, *Henricia tumida* is unlikely to be confused with other species of *Henricia*. The tumid appearance and the small R:r is the hallmark of *H. tumida*. Also see remarks on *H. elachys* and *H. gemma*.

Aleut Blood Star

Henricia uluudax R.N. Clark & Jewett, 2010



Top: Roger N. Clark

Bottom: Roger N. Clark

SPINULOSIDA

Description

Moderate size, 5-rayed star; rays slender, evenly tapering to 5.3 cm (2 in); disc small; R:r 5-5.3; aboral plates small, rounded; adambulacral plates with 19-24 spines; color red to red-orange.

Distribution and Habitat

This species is endemic to the Aleutian Islands. It was found in the eastern and central Aleutian Islands, from Unalaska Island to Amchitka Island, on rocky substrates, commonly in kelp beds to 12 m (39 ft).

Ecological Notes

Although nothing is known of the reproduction of *H. uluudax*, members of the family Echinasteridae are known to broadcast and brood (Strathmann 1987). This species feeds on sponges (S.C. Jewett and R.N. Clark, pers. observ.). Little is known of the natural history of this recently discovered species.

Remarks

Henricia uluudax is part of a complex of several very similar appearing *Henricia* in the Aleutians, some of which are undescribed. The specific name is the Aleut name for red (pronounced *ōō lōō thux*).

Common Blood Star

Henricia vermillion R.N. Clark & Jewett, 2010



Top: Roger N. Clark

Bottom: Roger N. Clark

Description

Five-rayed star with rays to 16 cm (6.3 in) long; rays slender, hard, relatively thick at base, tapering to slender tips; disc small; R:r 5.8-8.0; color usually solid red, reddish-orange, or occasionally red-brown.

Distribution and Habitat

Endemic to the Aleutian Islands, on rocky bottoms. It was commonly found in the eastern Aleutians from Tigalda Island to Umnak Island.

Ecological Notes

This species is very similar to *Henricia leviuscula* and may feed in a similar fashion, extruding its stomach to feed on encrusting sponges and bryozoans and entoprocts; it may also suspension feed. The scale worms *Arctonöe vittata* and *A. fragilis* are commensal on this species. Although nothing is known of the reproduction of *H. vermilion*, members of the family Echinasteridae are known to broadcast and brood (Strathmann 1987).

Remarks

Henricia vermilion is part of a complex of several very similar species, many of which are found in shallow water in the Aleutians. However, it may be distinguished by (1) the small, rather uniform dorsal plates; (2) the spines of the adambulacral plates which number 7-9 in *Henricia vermilion*, compared to 19-24 in the similar *H. uluudax*; and (3) the longer, thicker rays. The very similar *Henricia* sp. A differs in having distinctive gray or pink armpits (base of ray) and slightly more numerous adambulacral spines (10-13). See comments under *H. sp. A*. Further study may reveal these two species to be conspecific.

Ahearn's Toothed Henricia

Odontohenricia ahearnae

R.N. Clark & Jewett, 2010



Top: Roger N. Clark

Bottom: Roger N. Clark

SPINULOSIDA

Description

Large, slender to moderately inflated star; 5 rays somewhat long to 13 cm (5.1 in), tapering to slender tip; disc relatively small; R:r 6-6.5; aboral plates forming a relatively tight reticulation; marginal plates widely separated at base of rays; oral plates with large, curved, hyaline apical spine or tooth, with 6-8 marginal teeth on each side; color light orange-yellow to tan with large red-orange or purple blotch on center of disc.

Distribution and Habitat

Odontohenricia ahearnae appears to be endemic to the Aleutians. It is found in the central Aleutian Islands from Islands of Four Mountains to the Rat Islands at depths of 10-200 m (33-656 ft) on rocky bottoms.

Ecological Notes

All *Odontohenricia* appear to be specially modified as sponge feeders with apical spines of the paired mouth plates fused into a single large spine or (often very robust) tooth. Although nothing is known of the reproduction of *O. ahearnae*, members of the family Echinasteridae are known to broadcast and brood (Strathmann 1987).

Remarks

Odontohenricia ahearnae is similar to *O. fisheri* Rowe & Albertson, 1988, which is found in the southeastern Bering Sea and south to Washington state (Rowe and Albertson 1988). It is unclear where *Odontohenricia fisheri* occurs in the eastern Aleutians. *Odontohenricia ahearnae* differs in having a much tighter skeleton, with more numerous aboral spinelets, 25-50+ versus 27 or fewer in *O. fisheri*, and adambulacral spines, 18-24 versus about 15 in *O. fisheri*.

Orange Toothed Henricia

Odontohenricia aurantia R.N. Clark & Jewett, 2010



Top left: Stephen C. Jewett
Top right: Stephen C. Jewett
Bottom left: Roger N. Clark

SPINULOSIDA

Description

Large, slender to moderately inflated, 5-rayed star; rays somewhat long to 17 cm (6.7 in), tapering to slender tip; disc relatively small; R:r 6.5-7; aboral plates forming a relatively tight reticulation and crowned with numerous short spinelets; marginal plates widely separated at base of rays and forming two prominent series; oral plates with a single very large, curved spine or tooth at the apex of the paired plates, bounded on each side by a single slightly smaller spine, about 3/4 as large, and 3-7 much smaller marginal spines; color in life bright orange aborally and orally.

Distribution and Habitat

Odontohenricia aurantia appears to be endemic to the Aleutians. It is found in the central Aleutians at the Rat Islands (Rat Island) and Island of Four Mountains (Carlisle Island).

Ecological Notes

Although nothing is known of the reproduction of *O. aurantia*, members of the family Echinasteridae broadcast and brood (Strathmann 1987). The species of *Odontohenricia* appear to be specially adapted as sponge feeders, as is *O. ahearnae*. We found it feeding on the sponge *Phakellia* cf. *bowerbanki*. (cf. = most resembles)

Remarks

This species is distinguished from *O. ahearnae* and *O. violacea* by the following: long and slender rays, aboral plates forming a relatively tight reticulation and crowned with numerous short spinelets; marginal plates separated at base of rays and forming two prominent series; and oral plates with a single very large, curved spine at the apex of the paired plates, bounded on each side by a single slightly smaller spine.

Fisher's Toothed Henricia

Odontohenricia fisheri Rowe & Albertson, 1988



Top: Debbie Maas

Bottom: Roger N. Clark

SPINULOSIDA

Description

Moderately large, slender star; disc small; 5 rays moderately long to 10 cm (4 in), tapering; R:r 5.5-6; aboral plates forming a fairly open reticulation, aboral plates with 5-27 spinelets; marginal plates about equal in size, vertically and horizontally aligned, larger than actinal and abactinal plates; two intermarginal series, the primary series extends erratically to about mid-ray, a second one below this extends only about 1/6 of ray length; adambulacral plates with 1-2 vertically arranged spines in the furrow, 3-5 elongated (often spatulate) spines at the edge of the furrow, behind which are 9-12 spines on the actinal surface in three rows; paired oral plates with a single large, thick apically pointed spine, surface of each plate with 12-15 much smaller spines. Color uniformly cream or pale lavender, with a large red spot on the disc.

Distribution and Habitat

It occurs in the Bering Sea, southwest of Pribilof Islands and north of Unalaska Island, eastern Aleutians off the south side of Akutan Island, and Gulf of Alaska near the Shumagin Islands and off southeast Alaska (R.N. Clark, pers. observ., 1996-2010), and south to the type locality off Washington state (Rowe and Albertson 1988). It was found at depths of 21-232 m (69-761 ft) on rocky (usually vertical or steeply sloping bottoms).

Ecological Notes

Little is known of the natural history of this species, but a shallow-water (<30 m; 98 ft) specimen was photographed on barnacle colonies near Juneau, Alaska.

Remarks

Its open reticulation of the skeleton, numbers and morphology of plate spinelets, and aboral coloration may distinguish *Odontohenricia fisheri* from other members of the genus. It is most similar to *O. ahearnae* (see *O. ahearnae* remarks).

Violet Toothed Henricia

Odontohenricia violacea R.N. Clark & Jewett, 2010

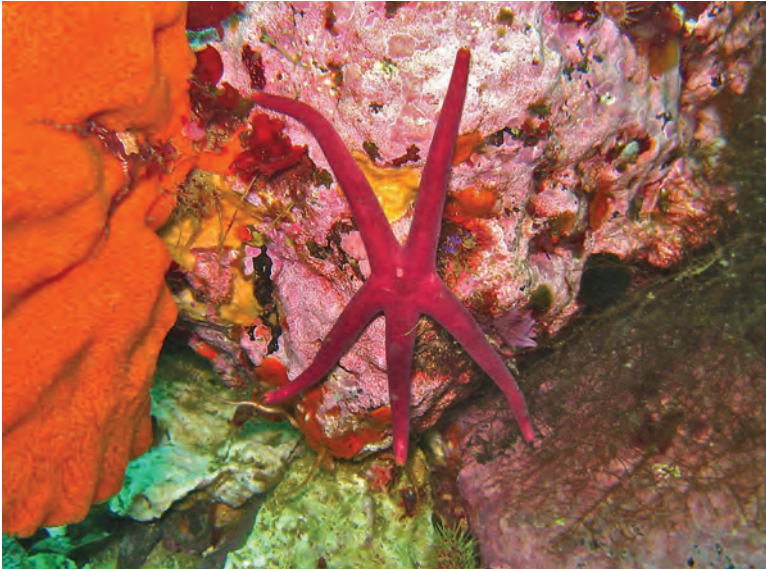


Photo: Stephen C. Jewett

SPINULOSIDA

Description

Large, slender to moderately inflated, 5-rayed star; rays moderately long to 21 cm (8.3 in), tapering to slender tip; disc relatively small; R:r 8-10.6; aboral plates small, close-set, bearing 6-12 pointed spinelets; aboral surface covered with a thick, cuticle-like epidermal layer, giving a very smooth appearance; oral plates with a large, slender, sharply pointed apical spine or tooth, beside which on each side is a similar spine about 3/4 as large as the apical spine, 5 or 6 sharply pointed marginal spines; color in life, deep violet aborally and pale yellowish-cream orally.

Distribution and Habitat

Appears to be endemic to the Aleutians. *Odontohenricia violacea* has been found only in the Rat Islands (Hawadax Island) and Andreanof Islands (Amatignak Island).

Ecological Notes

Like the other species of *Odontohenricia* that have a large recurved spine at the apex of each pair of oral plates, this species is similarly adapted for feeding on sponges. Although nothing is known of the reproduction of *O. violacea*, members of the family Echinasteridae broadcast and brood (Strathmann 1987).

Remarks

This species is distinguished from *O. ahearnae* and *O. aurantia* by a thick dermal layer, a smooth appearance, rays moderately long and slender, and oral plates with 6-12 spinelets.

Feder's Henricia

Aleutihenricia federi R.N. Clark & Jewett, 2010



Top left: Héloïse Chenelot
Top right: Stephen C. Jewett
Bottom left: Stephen C. Jewett

SPINULOSIDA

Description

Relatively large, inflated, *Henricia*-like, 5-rayed star; rays moderately long to 13 cm (5.1 in), thick, relatively soft; disc small; R:r 4.8:1; aboral plates small, with 8-15 stout spines; marginal plates small, indistinguishable from aboral plates; adambulacral plates with 9-13 spines; color yellow or yellow-orange, with irregular maroon mottling.

Distribution and Habitat

Aleutihenricia federi appears to be endemic to the Aleutians. It was found in the central and western Aleutians, at depths of 15-220 m (49-722 ft), but was never common.

Ecological Notes

This species feeds on the sponge *Halichondria (Eumastia) sitiens* (S.C. Jewett and R.N. Clark, pers. observ.). Little else is known about the natural history of this species.

Remarks

This species is similar to *A. beringiana* (Dyakonov 1950), which also occurs in the Aleutians but is usually deeper. *A. federi* may be distinguished by (1) *A. beringiana* is usually nearly uniformly reddish in color; (2) spines of aboral plates 6-9 in *A. beringiana* and 8-15 in *A. federi*; and (3) adambulacral spines 7 or 8 in *A. beringiana* and 9-13 in *A. federi*.

FORCIPULATIDA Perrier, 1884

WORLDWIDE THE FORCIPULATIDA has 272 species in 65 genera in six families (Mah 2014e). Forcipulatida sea stars usually have inconspicuous marginal plates; there is no sharp border between dorsal and oral side of the disc and arms. The spines on the dorsal side are single or in groups, which may be arranged in longitudinal series. The tube feet, each with a sucking disc, are mostly in series of four. Both crossed and straight pedicellariae are present. The presence of crossed pedicellariae is characteristic of Forcipulatida. The members of Forcipulatida in the nearshore Aleutian Islands include at least 25 species, nine genera and three families, all of which are covered in this field guide.



North Pacific Flatbottom Star

Asterias amurensis (Lütkin, 1871)



Top left: Shawn Harper
Top right: Shawn Harper
Bottom left: Shawn Harper

Description

Large, broad, fairly rigid, 5-rayed star; rays moderately long to 18.5 cm (7.3 in), broad at base, quickly tapering to slender tips; disc broad; R:r 3:7; aboral surface with open reticulum, aboral ridges with stout, white spines; oral surface flattened; prominent lateral margins; color purple, ochre, or orange, with white spinose ridges.

Distribution and Habitat

A widespread species found from northern China to the Bering and Chukchi Seas, and east to the eastern Gulf of Alaska, near the Shumagin Islands to 170 m (558 ft), but typically less than 40 m (131 ft) on variable substrates (Fisher 1930, Dyakonov 1950, Jewett and Feder 1981). Occurs at the Eastern Aleutian Islands, west to Unalaska Island, frequently found along the north side of Unimak Island. It was accidentally introduced into Tasmanian waters (Morrice 1995).

Ecological Notes

This species is one of the most ubiquitous and dominant epifaunal invertebrates of the nearshore eastern Bering and Chukchi Seas (Jewett and Feder 1981, Feder et al. 2005) at depths <40 m (131 ft). *Asterias amurensis* has a tolerance for a broad range of temperature (0-25°C; Kim 1968, Novikova 1978) and salinity (18.7-41.0 ppt; Morrice 1995), and grows rapidly (females mature in about 12 months at approximately 10 cm diameter; Kim 1968). It is capable of spawning twice annually (April-June and August-September; Kasyanov et al. 1998), has high fecundity (10-25 million eggs; Turner 1992), and is a voracious generalist predator (feeding on many epifaunal species, particularly bivalves, and demersal fish eggs) (Feder and Jewett 1981). **This species is listed among the “Top 100 World’s Worst” invaders by the International Union for Conservation of Nature, Invasive Species Specialist Group** (Global Invasive Species Database 2015).

Remarks

Although uncommon in the Aleutians, *Asterias amurensis* is the most abundant sea star on rocky and sandy bottoms below 15 m (33 ft) in the eastern Bering Sea (Jewett and Feder 1981). Fisher (1930) found *A. amurensis* at 5-11 m (18-36 ft) in Iliuliuk Bay (Unalaska Bay), Unalaska Island. At Attu Island a small specimen was identified as *A. microdiscus* (K. Vicknair, USGS, pers. comm., 2013), but was likely *A. amurensis*. *Asterias rathbuni* has been reported from the Commander Islands and the Shumagin Islands (Dyakonov 1950), but we have no knowledge that it occurs in the Aleutians. On the other hand, all three species may occur in the Aleutians.

Giant Star

Evasterias echinosoma Fisher, 1926



Top left: Stephen C. Jewett
Top right: Shawn Harper
Bottom left: Shawn Harper

Description

Very large, semi-rigid, spinose star; 5 rays, long to 50 cm (19.7 in) and relatively thick; disc small; R:r 6.4; aboral plates with stout, conical spine occurring mostly singularly, but rarely in groups of 2-4; marginal plates normally with a single spine each, but may have 2-3; adambulacral plates with 2 rarely 3 spines; adults uniformly maroon aborally, cream orally, small juveniles may be mottled with cream; spines white.

Distribution and Habitat

Scattered in the North Pacific region, from the northern Sea of Japan, throughout the Okhotsk, Bering, and Chukchi Seas, and along the Aleutian Islands, at depths of 4-106 m (13-348 ft) on mud, sand, and pebble substrates (Fisher 1930, Dyakonov 1950). However, this species was only found at Adak Island at 20 m (66 ft) and trawling in the Near Islands off Shemya Island at <100 m (328 ft).

Ecological Notes

It is assumed that this species has planktotrophic or free-swimming larvae, like other members of the genus. *Evasterias echinosoma* preys on a wide variety of mollusks (mainly bivalves) and echinoderms (Feder and Jewett 1981).

Remarks

Evasterias echinosoma is one of the largest sea stars, not only in Alaska but worldwide, reaching a full meter across and more than 5 kg (11 lb) in weight.

Blue-spined Star

Evasterias retifera Dyakonov, 1938



Top left: Héloïse Chenelot

Top right: Roger N. Clark

Bottom left: Héloïse Chenelot

Bottom right: *f. retata*, Héloïse Chenelot

Description

Large, rather robust, 5-rayed star; rays moderately long to 20 cm (7.9 in), stout; disc relatively small; R:r 3.8-4.4; center of disc with prominent pentagon pattern of spines; superomarginal plates with 5-18 spines; color red to red-orange with blue spines aborally.

Distribution and Habitat

Western Aleutian Islands to Kamtchatka and the Kurile Islands, intertidal to at least 20 m (66 ft) on rocky substrates. It was only found west of Buldir Pass, in the Near Islands (Attu).

Ecological Notes

Vicknair (1997) observed that *E. retifera* dominated the sea star biomass around Attu Island before the arrival of sea otters (pre-1983). *E. retifera* declined once the sea otters were reestablished (by 1994) and today the *E. retifera* population is small, although few sea otters inhabit the Near Islands (Vicknair and Estes 2012). Sea otters occasionally consume this sea star. Around Attu large *E. retifera* mainly feed on the horse mussel *Modiolus modiolus*; smaller ones feed on the rock jingle *Pododesmus macrochisma* and the barnacle *Semibalanus cariosus* (Vicknair 1997). They presumably are broadcast spawners like other members of the genus.

Remarks

Evasterias retifera can only be confused with *E. troschelii* where the two species occur together in the Near Island group, but can usually be distinguished by the distinctive red and blue coloration and large number of superomarginal spines. Another form, *E. retifera* f. *retata*, also occurs in the Near Islands. This form is distinguished by densely and evenly packed aboral spines not forming raised areas.

Mottled Star False Ochre Star

Evasterias troschelii (Stimpson, 1862)



Top left: Stephen C. Jewett
Top right: Piotr Kuklinski
Bottom left: Stephen C. Jewett

Description

Large star with 5 long, slender rays to 30 cm (11.8 in) long; disc small; R:r 5.0-7.6; superomarginal plates with 1-3 spines; aboral coloration is highly variable: mottled green, blue, brown, pink, or orange; spines white or very pale blue; oral surface much paler. Straight and crossed pedicellariae present.

Distribution and Habitat

Bering Sea to central California, intertidal to about 75 m (246 ft), on a variety of substrates, including wharf pilings. Especially abundant in sheltered waters. We found this species throughout the Aleutians.

Ecological Notes

Evasterias troschelii feeds on tunicates, barnacles, limpets, snails, bivalves, and brachiopods, and is particularly fond of the blue mussel *Mytilus edulis* and the rock jingle *Pododesmus macrochisma* (Mauzey et al. 1968, Feder 1980, O'Clair and Rice 1985, O'Clair and O'Clair 1998). This sea star often everts its stomach for extraoral feeding, particularly on bivalves (Christensen 1957). King crabs *Paralithodes camtschaticus* and sea otters *Enhydra lutris* occasionally consume *E. troschelii* (S.C. Jewett, pers. observ.). *Evasterias troschelii* is a broadcast spawner (Strathmann 1987).

Remarks

Evasterias troschelii is unlikely to be confused with any other Aleutian sea star with the exception of *E. retifera*, from which it may be distinguished by longer, more slender rays and variable coloration. Scale worms (Polychaeta, Polynoidae) are often found in the ambulacral groves or on the body surface (Feder 1980).

Arctic Star

Leptasterias (Leptasterias) arctica

(Murdoch, 1885)



Top left: Roger N. Clark

Top right: Roger N. Clark

Bottom left: Roger N. Clark

Description

Relatively small, rough-textured star; disc relatively broad; 5 rays, short, thick; aboral plates with relatively large, blunt, knob-like spines, surrounded by thick wreath of pedicellariae; carinal series larger than others and arranged in a zigzag row; adambulacral plates with 1-2 spines; radius to 6.5 cm (2.6 in). Color: brown tones, with lighter spines.

Distribution and Habitat

Arctic circumboreal, in Alaska south to the Aleutian and Shumagin Islands. It was found on a variety of substrates in the Aleutians, both soft and rocky, intertidal to 75 m (246 ft).

Ecological Notes

Leptasterias arctica broods eggs (S.C. Jewett and R.N. Clark, pers. observ.) and presumably also the embryos, like the other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

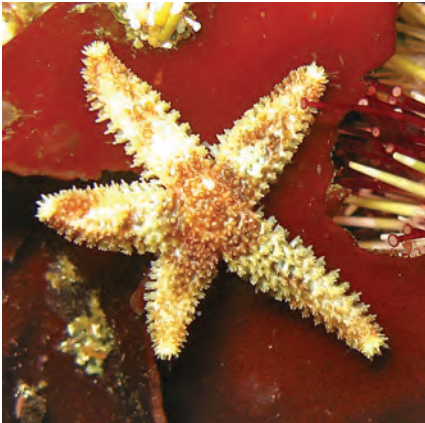
Remarks

Uncommon in the Aleutians, but usually recognizable by the zigzag series of large, blunt spines on the center of the rays aborally. (Subgenus is in parentheses on facing page.)

Aleutian Star

Leptasterias (Leptasterias) hylodes

Fisher, 1930



Top left: Roger N. Clark
Top right: Roger N. Clark
Bottom left: Stephen C. Jewett

Description

Small, swollen, 5-rayed star with prominent white spines; rays slender to stout, moderately long to 5 cm (2 in); disc small; R:r 4-5; aboral surface fleshy with prominent, evenly spaced, slender white spines; color variable uniform or mottled tan, brown, white, yellow, or purple.

Distribution and Habitat

Aleutian Islands to southeastern Alaska, intertidal to 125 m (410 ft) on a variety of substrates.

Ecological Notes

It is assumed that *Leptasterias hylodes* broods eggs and embryos, like the other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

Remarks

This small species may be distinguished from *L. arctica* by the very uniform, short aboral white spines randomly disposed. Also, the skeleton of *L. hylodes* is more open-meshed than in *L. arctica*. (Subgenus is in parentheses on facing page.)

Tate's Star

Leptasterias (Leptasterias) tatei

R.N. Clark & Jewett, 2015



Top left: Roger N. Clark
Top right: Stephen C. Jewett
Bottom left: Héloïse Chenelot

Description

A medium size 5-rayed star; ray length to 9 cm (3.5 in), R:r 6-9; disc small; rays relatively long; aboral spines short, thick, truncated, wreathed with fleshy clusters of small, crossed pedicellariae, to 0.25 mm in length; also bearing scattered large straight pedicellariae to 1.25 mm long. Superomarginal and inferomarginal plates generally have a single (rarely 2) spine each. Color in life is red with lighter, yellowish or tan mottlings.

Distribution and Habitat

Known to only occur in the central Aleutians, where it has been taken at Adak, Amchitka, and Hawadax Islands, on cobble, boulder, and bedrock substrates encrusted with the coralline algae *Clathromorphum nereostratum* at depths of 8-16 m (26-52 ft).

Ecological Notes

Newly described. Nothing is known of the natural history of this species. It presumably is a brooder as are other members of the genus (Booolootian 1966, Chia 1966).

Remarks

Leptasterias tatei resembles *L. stolacantha*, but differs in (1) its larger size; (2) 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 in *L. stolacantha*; and (4) the superomarginal and inferomarginal ossicles bear single spines in *L. tatei*, as opposed to 2 (sometimes 3) in *L. stolacantha*. Additionally, the spines of *L. stolacantha* are slender and needle-like, and the color of live *L. stolacantha* is uniformly tan or light brown. (Subgenus is in parentheses on facing page.)

Fleshy Five-rayed Star

Leptasterias (Nesasterias) stolacantha

Fisher, 1930



Top left: Stephen C. Jewett
Top right: Stephen C. Jewett
Bottom left: Roger N. Clark

Description

Moderately large, fleshy, 5-rayed star; rays moderately long to about 5.5 cm (2.2 in); rays sharply constricted at base; disc relatively small; R:r 5.8; aboral surface fleshy, with thick wreaths of pedicellariae surrounding slender spines; color uniformly brown to cream.

Distribution and Habitat

Endemic to the Aleutian Islands, where it occurs at depths of 15-120 m (33-394 ft) on a variety of rocky bottoms. It was observed from the Fox Islands to the Rat Islands. All specimens examined by Fisher (1930) came from the Fox and Rat Islands.

Ecological Notes

It is assumed that *Leptasterias stolacantha* broods eggs and embryos, like the other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

Remarks

This thick, fleshy species may be distinguished from similar stars by the rays sharply constricted at the base, thick wreaths of pedicellariae surrounding the slender spines near the tips, and the dark, mottled coloration. See remarks under *Leptasterias tatei*. (Subgenus is in parentheses on facing page.)

Okhotsk Star

Leptasterias (Eoleptasterias) ochotensis

(Brandt, 1851)



Top left: Stephen C. Jewett
Top right: Roger N. Clark
Bottom left: Roger N. Clark

Description

Small, 5-rayed star with prominent white spines; rays moderately thick and short; ray length to 5 cm (2 in); disc small; R:r 4.4-5.4; aboral surface with irregularly spaced, slender white spines; inferomarginal spines longer than superomarginal spines; adambulacral plates typically alternating 1 and 2 spines per plate; color variably mottled, white with pink or reddish.

Distribution and Habitat

Okhotsk Sea to the Rat Islands, intertidal to 130 (427 ft) on a variety of substrates.

Ecological Notes

It is assumed that *Leptasterias ochotensis* broods eggs and embryos, like the other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

Remarks

This small species may be distinguished from similar species by the long inferomarginal spines and alternating adambulacral spines (1 and 2 per plate). (Subgenus is in parentheses on facing page.)

Scaled Aleutian Star

Leptasterias (Eoleptasterias) squamulata

Dyakonov, 1938



Photo: Roger N. Clark

Description

Small, 5-rayed star with ray length to 5 cm (2 in); R:r 6.3; prominent carinal row of scale-like overlapping plates forming a broad, almost straight series; aboral spines knob-shaped; color uniformly green, brown, or reddish.

Distribution and Habitat

Leptasterias squamulata occurs in the western Aleutians (Near Islands) and eastern Commander Islands (Mednyi Island).

Ecological Notes

It is assumed that this species broods eggs and embryos, like the other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

Remarks

This small species is easily distinguished by the scale-like carinal row of plates. (Subgenus is in parentheses on facing page.)

Derbek's Star

Leptasterias (Eoleptasterias) derbeki

Dyakonov, 1938



Photo: Roger N. Clark

Description

Small, 5-rayed star with rather stout rays; ray length to 5 cm (2 in); R:r 5.2-6.5; very inflated, fleshy wreaths of small pedicellariae around spines; spines of the inframarginal plates much larger and longer than those of the superomarginal and aboral plates; adambulacral plates typically with two spines each; color nearly uniformly red aborally.

Distribution and Habitat

Sea of Okhotsk to Near Islands of the western Aleutian Islands; *Leptasterias derbeki* was only observed at Attu Island at <20 m (66 ft).

Ecological Notes

It is assumed that this species broods eggs and embryos, like the other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

Remarks

This small species resembles *Leptasterias stolacantha*, but differs in having smaller pedicellariae, long, slender inframarginal spines, and nearly uniform scarlet-red color. (Subgenus is in parentheses on facing page.)

Alaskan Six-rayed Star

Leptasterias (Hexasterias) alaskensis

(Verrill, 1909)



Top left: Héloïse Chenelot
Top right: Shawn Harper
Bottom left: Roger N. Clark

Description

Medium size, 6-rayed star; rays moderately long to 8.4 cm (3.3 in); disc relatively small; R:r 3-4.2; aboral surface with scattered large, bivalved pedicellariae; aboral color reddish, brown, violet, orange, or dark green-black, with gray-green, cream, or pale orange spines.

Distribution and Habitat

This species is distributed throughout the Aleutian Islands and the western Gulf of Alaska (east to Cook Inlet). It occurs from intertidal to about 20 m (66 ft) subtidally on rocky substrates.

Ecological Notes

It is assumed that this species broods eggs and embryos, like the other members of the genus (Booolootian 1966, Chia 1966).

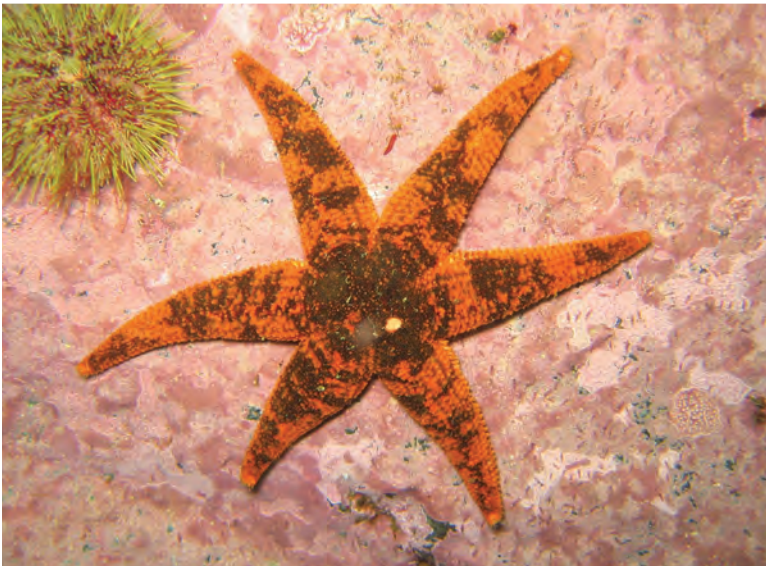
Remarks

Leptasterias alaskensis may be distinguished from the many other species of *Leptasterias* in the Aleutians by the large, bivalved pedicellariae on the oral and aboral surfaces. (Subgenus is in parentheses on facing page.)

Aleutian Six-rayed Star

Leptasterias (Hexasterias) aleutica

Fisher, 1930



Top: Héloïse Chenelot
Bottom: Héloïse Chenelot

Description

Small, short, 6-rayed star; rays usually short and thick, rarely over 2.5 cm (1 in) long; disc relatively large; R:r 2.8; aboral surface with rather evenly spinose (spines small and crowded); aboral color mottled orange and brown.

Distribution and Habitat

Endemic to the Aleutian Islands, intertidal to about 10 m (33) on rocky, rarely sandy substrates. The authors found *Leptasterias aleutica* only in the central Aleutians, but specimens examined by Fisher (1930) were collected between the Fox (Unalaska Island) and the Near islands (Agattu Island).

Ecological Notes

It is assumed that this species broods eggs and embryos, like other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

Remarks

This small species can be distinguished from other *Leptasterias* by the small size and evenly spinose aboral surface. (Subgenus is in parentheses on facing page.)

Tiny Six-rayed Star

Leptasterias (Hexasterias) asteira

Fisher, 1930



Photo: Roger N. Clark

Description

Small, stubby, 6-rayed star; rays short, robust to 2.6 cm (1 in) long; disc broad; R:r 3; aboral surface with short well-spaced spines; rays with prominent intermarginal channels; color yellow with mottled dark brown mainly on disc.

Distribution and Habitat

Found in the Shumagin, Pribilof, and Aleutian Islands where it occurs from intertidal to 10+ m (33+ ft) on rock substrates. It was only observed in the eastern Aleutians at Unalaska Island (Driftwood Bay), but Fisher (1930) found it in the Andreanof (Adak) and Rat (Kiska) Islands.

Ecological Notes

It is assumed that this species broods eggs and embryos, like the other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

Remarks

Leptasterias asteira may be distinguished from other Aleutian *Leptasterias* by its small size, robust build, and rather stout, uniformly spaced aboral spines. (Subgenus is in parentheses on facing page.)

Giant Aleutian Six-rayed Star

Leptasterias (Hexasterias) coei truculenta

Fisher, 1930



Top: Roger N. Clark
Bottom: Roger N. Clark

Description

Large, evenly textured, 6-rayed star; disc small, disc radius 3 cm (1.2 in); rays long, 22.5 cm (8.8 in); R:r 7.5. Aboral surface with profuse, rather evenly distributed, moderately thick, bluntly pointed spines; aboral, intermarginal and oral areas with numerous, scattered, very large, straight pedicellariae, bearing 3-6 interlocking teeth; aboral spines wreathed with numerous crossed pedicellariae. Marginal plates bearing a single spine each, superomarginal spines bluntly pointed or obtuse; inferomarginal notably longer than superomarginals, distal portion tapering, finely pointed, blunt or compressed. Adambulacrals with a single spine on proximal portion of rays, usually alternating 1 spine, then 2 on middle and distal portions of rays. Aborally it is reddish, pink, purple, or shades of brown, lightly mottled with cream, spines purple; orally it is uniformly cream.

Distribution and Habitat

This subspecies is endemic to the Aleutians, where it is uncommon in the eastern and central islands, from Unalaska Island west to Semisopchnoi Island (Fisher 1930; R.N. Clark, pers. observ.) to 102 m (336 ft) and rarely in depths less than 25 m (82 ft) on rocky and sandy substrates.

Ecological Notes

Although many species of *Leptasterias* are brooders, of more than 100 specimens of *Leptasterias coei truculenta* examined in trawl samples, none had eggs or larvae (R.N. Clark, pers. observ., 1994-2004). Little else is known about the natural history of this species.

Remarks

Leptasterias coei truculenta resembles *Orthasterias koehleri*, but has 6 rays as opposed to 5, and lacks color bands. It also resembles *Leptasterias polaris ascervata*, but differs in the arm-to-disc ratio, profuse, evenly distributed aboral spines, and single inferomarginal spine. Lambert (2000) notes that the subspecies *Leptasterias coei coei* Fisher, 1930 occurs uncommonly from Kodiak to Juneau, Alaska, at depths of 18-187 m (59-613 ft) on blue mud or fine sand. It has also been observed intertidally at Petersburg, Alaska (Mitkof Island), on muddy sand and shell hash (R.N. Clark, pers. observ.) (Subgenus is in parentheses on facing page.)

Aleutian Knobby Six-rayed Star

Leptasterias (Hexasterias) dispar

Verrill, 1914



Top left: Roger N. Clark
Top right: Héloïse Chenelot
Bottom left: Stephen C. Jewett

Description

Medium size, 6-rayed, rough textured star; rays moderately long to 8 cm (3.1 in); disc relatively broad; R:r 3.9; apical ridge plates on aboral surface of rays bearing large, blunt spines, usually in clusters, in an irregular series; color highly variable, may be uniform, striped, mottled with red, orange, purple, yellow, brown, gray, green, tan, or blue.

Distribution and Habitat

Found throughout the Aleutian and Pribilof Islands, and western Gulf of Alaska, east to Kodiak Island, on rocky substrates at depths to approximately 20 m (66 ft).

Ecological Notes

It is assumed that this species broods eggs and embryos, like the other members of the genus (Booolootian 1966, Chia 1966). Little is known of the natural history of this species.

Remarks

Leptasterias dispar forms a complex with *L. nitida* and *L. camtschatica*. The exact relationship is not precisely known. Fisher (1930) considered *dispar* a subspecies of *L. camtschatica* and *L. nitida*, as one of several forms; however, he stated that *L. c. dispar* "acts like a species" and suggested that all the forms could be considered species. We are tentatively taking this approach, since true *L. camtschatica* is geographically isolated from the Aleutian forms, and both *L. dispar* and *L. nitida* are found together in the same habitat. *L. dispar* may be distinguished from *L. nitida* by (1) the clusters of large obtuse spines of the carinal series; (2) 3 oral spines compared with 2 in *L. nitida*; and (3), 2 superomarginal spines in *L. dispar*, and 3-5 in *L. nitida*.

Leptasterias camtschatica differs from *L. dispar* and *L. nitida* by (1) aboral surface with more or less evenly distributed, nearly uniform size spines; (2) 2 superomarginal spines per plate, and 1 inferomarginal spine per plate on the proximal portion of the rays, changing to 2 at about mid ray; and (3) color is rather uniform greenish with white or pinkish (Fisher 1930). *Leptasterias camtschatica* is found in the Kurile, Kamchatka, and Commander Islands, and may extend to the Near Islands. (Subgenus is in parentheses on facing page.)

Fleshy Six-rayed Star

Leptasterias (Hexasterias) leptodoma

Fisher, 1930



Top left: Roger N. Clark
Top right: H eloise Chenelot
Bottom left: Roger N. Clark

Description

Small, fleshy, 6-rayed star; rays moderately short to about 3 cm (1.2 in), stout, inflated; disc relatively broad; R:r 5.8-6.1; aboral surface very fleshy, dome-like lumps of tissue covering spines that appear soft; color uniform, red, orange, brown, or violet.

Distribution and Habitat

Aleutian, Shumagin (Fisher 1930), and Commander Islands (Dyakonov 1950), although the authors only observed *Leptasterias leptodoma* from the Andreanof Islands west to the Near Islands. It occurs from intertidal to about 30 m (98 ft) on rocky substrates.

Ecological Notes

It is assumed that this species broods eggs and embryos like the other members of the genus (Booolootian 1966, Chia 1966). Nothing else is known of the natural history of this species.

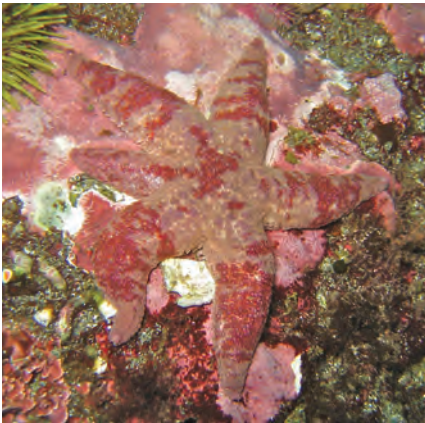
Remarks

This small species may be easily distinguished from all other *Leptasterias* species by the very fleshy aboral surface and dome-like fleshy mounds encasing spines. (Subgenus is in parentheses on facing page.)

Elegant Six-rayed Star

Leptasterias (Hexasterias) nitida

Fisher, 1930



Top left: Héloïse Chenelot
Top right: Héloïse Chenelot
Bottom left: Héloïse Chenelot

Description

Medium size, rough textured, 6-rayed star; rays moderately long to 6 cm (2.4 in); disc relatively broad; aboral surface rough, but lacking large, carinal spines; color variable, but usually shades of brown, gray, orange, or green.

Distribution and Habitat

Found throughout the Aleutian Islands, Pribilof Islands, and western Gulf of Alaska, east to Kodiak Island, on rocky substrates at depths to about 20 m (66 ft).

Ecological Notes

It is assumed that this species broods eggs and embryos, like other members of the genus (Booolootian 1966, Chia 1966). Little is known of the natural history of this species.

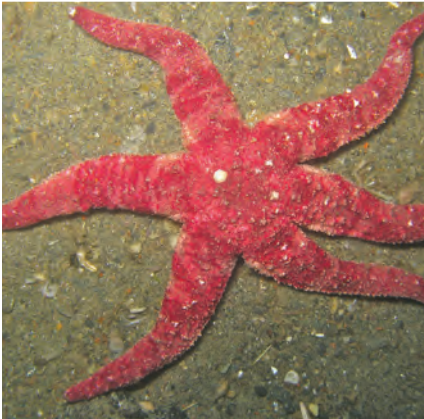
Remarks

Leptasterias nitida may be distinguished from *L. dispar* by (1) lack of large, knob-like carinal spines; (2) only 2 oral spines compared with 3 in *L. dispar*; and (3) 3-5 superomarginal spines compared with 2 in *L. dispar*. *Leptasterias nitida* differs from *L. aleutica* in having longer, more slender rays, and lacking close-set, low, broad carinal spines giving a granular appearance. (Subgenus is in parentheses on facing page.)

Polar Six-rayed Star

Leptasterias (Hexasterias) polaris acervata

(Stimpson, 1862)



Top left: *f. acervata*, Roger N. Clark

Top right: *f. polythela*, Roger N. Clark

Bottom left: *f. acervata*, Roger N. Clark

Bottom right: *f. polythela*, Roger N. Clark

Description

Large, rough textured, 6-rayed star; disc small; rays relatively long, ray length to 15 cm (5.9 in), R:r 4.5-6. Superomarginal plates with a single spine on proximal half of rays, changing to 2 spines on the distal half. Color in life is usually shades of fuchsia, purple, or brown, unicolored or with pink, yellow, or cream mottlings. This is a polymorphic species; the 2 morphs found in the North Pacific Arctic are (1) *L. p. acervata* forma *acervata*, characterized by aboral spines forming groups, with a single large, flattened spine at center, surrounded by smaller spines, with numerous small spinelets scattered about the rest of the aboral surface; and (2) *L. p. acervata* forma *polythela*, which differs in having fine, dense spines on the aboral surface, interspersed with scattered large, robust, thornlike or tubercle-like spines.

Distribution and Habitat

The distribution in North American waters is from the Arctic to Kodiak Island in the Pacific (Lambert 2000) and from the Arctic to Newfoundland in the Atlantic (Grainger 1966). It occurs to 110 m (361 ft). Both forms are found throughout the Bering and Chukchi Seas. Both are found in the Aleutians north of Unimak Island, and rarely west to the vicinity of Akun and Akutan (Unimak Pass), although forma *acervata* has also been found at Attu Island (Fisher 1930) and the Commander Islands (Dyakonov 1950).

Ecological Notes

Leptasterias polaris acervata is a food generalist, eating polychaetes, mussels, clams, cockles, snails, barnacles, sand dollars, and ascidians (Feder and Jewett 1981, Gaymer et al. 2001). This species is a brooder (Boivin et al. 1986; S.C. Jewett, pers. observ.) and females on soft substrates often place their young in a bivalve shell under their disc to keep them out of the mud (Jewett and Feder 1981). *Leptasterias polaris acervata* in the northeastern Bering Sea and southeastern Chukchi Sea have the endoparasitic gastropod *Asterophila japonica* in up to 15% of the population (Hoberg et al. 1980).

Remarks

Small specimens of this star might be confused with *L. dispar*, but can be distinguished by the (1) form and arrangement of aboral spine clusters; and (2) the unique arrangement of superomarginal spines, 1 per plate on proximal half of rays, changing to 2 on distal half of rays in *L. polaris*, and 2 all along the ray in *L. dispar*. (Subgenus is in parentheses on facing page.)

Rainbow Star Long-armed Star

Orthasterias koehleri (de Loriol, 1897)



Top left: Stephen C. Jewett

Top right: Shawn Harper

Bottom left: Stephen C. Jewett

Bottom right: Héloïse Chenelot

Description

Very large, colorful sea star; 5 long, relatively slender rays to 25 cm (9.8 in); disc small; R:r 6.5-10.0; aboral surface with prominent, white or lavender spines; color bands reddish, pink, and white.

Distribution and Habitat

Eastern Aleutian Islands to central California, intertidal to 668 m (2,192 ft) (O'Clair and O'Clair 1998) on rocky bottoms. We only found *Orthasterias koehleri* on rocky substrates east of Samalga Pass in the Fox Islands.

Ecological Notes

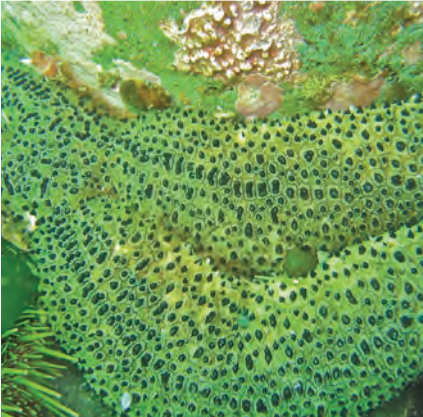
This star feeds on small snails, limpets, bivalves, chitons, barnacles, brachiopods, and tunicates (Mauzey et al. 1968, O'Clair and O'Clair 1998). It is a broadcast spawner (Strathmann 1987).

Remarks

This large, colorful star is unlikely to be confused with any other shallow water stars in the Aleutians.

Black-spined Star

Lethasterias nanimensis (Verrill, 1914)



Top left: Héloïse Chenelot
Top right: Héloïse Chenelot
Bottom left: Héloïse Chenelot

Description

Large, 5-rayed sea star; rays long and slender to 30 cm (11.8 in); disc small; R:r 8-10; aboral surface covered with prominent short, stout spines; color tan or light brown with black spines; black-tipped spines wreathed with crossed pedicellariae.

Distribution and Habitat

Chukchi Sea to northern British Columbia, 10-225 m (33-738 ft) on mixed substrates. In the southeastern Chukchi and northeastern Bering Sea it is mainly found on soft substrates of mud and sand. However, it was found on hard substrates throughout the Aleutians, mostly west of Amchitka Pass.

Ecological Notes

Lethasterias nanimensis feeds on a variety of invertebrates, e.g., cockles, snails, sea urchins, sand dollars, and sea cucumbers in the Bering Sea (Feder and Jewett 1981).

Remarks

With its large size and black spines *Lethasterias nanimensis* is unlikely to be confused with any other species in the region.

Fission Star

Stephanasterias albula (Stimpson, 1853)



Top left: Héloïse Chenelot
Top right: Roger N. Clark
Bottom left: Héloïse Chenelot
Bottom right: Max K. Hoberg

Description

Small, multi-rayed star; rays slender, of unequal length, usually 7 or 8 in number, but vary from 6 to 9; ray radius to about 6 cm (2.4 in); disc minute; 2 madreporites; color white, pale orange, lavender, or pink.

Distribution and Habitat

Arctic circumboreal, in the Pacific south to the Aleutians where it occurs throughout the chain from low intertidal to >200 m (656 ft) on rocky substrates. We found this species throughout the Aleutians, always on rocky substrates.

Ecological Notes

***Stephanasterias albula* is unique among Aleutian sea stars, as it is capable of reproducing asexually by fission** (Mladenov et al. 1986). This typically occurs by the animal sprouting several new rays on one side and then splitting between the 2 madreporites. This process explains why the rays are often unequal in length. It is not known if this species is also capable of sexual reproduction.

Remarks

With 2 madreporites and often with rays of unequal length it is unlikely to be confused with other stars.

Sunflower Star

Pycnopodia helianthoides (Brandt, 1835)



Top left: Shawn Harper
Top right: Stephen C. Jewett
Bottom left: Stephen C. Jewett

Description

Huge, multi-rayed (15-24) sea star; rays to 60 cm (23.6 in), soft, fleshy; disc broad; R:r 2.5-3.5; color purple, gray, red-orange, ochre, or blue.

Distribution and Habitat

Central and eastern Aleutian Islands to California, intertidal to 435 m (1,427 ft) on a wide variety of substrates. It was found from Fox Islands west to Adak Island (Kuluk Bay).

Ecological Notes

This star is a voracious predator, feeding on a wide variety of prey, including but not limited to snails, bivalves, helmet and hermit crabs, sea urchins, sea stars, and sea cucumbers (Feder and Christensen 1966, Mauzey et al. 1968, Paul and Feder 1975, Feder 1980, Shivji et al. 1983). At Unalaska Island *Pycnopodia helianthoides* was observed excavating pits 50 cm (19.7 in) in diameter and to 15 cm (5.9 in) deep to feed on bivalves. It is a broadcast spawner (Strathmann 1987, O'Clair and O'Clair 1998).

Remarks

Pycnopodia helianthoides is unlikely to be confused with other sea stars. **It is one of the largest and fastest sea stars in the world, reaching more than 1 m (3.2 ft) in diameter and 8 kg (17.6 lb) in weight.** It can move up to 160 cm (63 in) per minute (Lambert 2000). The much smaller *Solaster dawsoni* attacks this species, resulting in *Pycnopodia helianthoides* "dropping" a ray and fleeing. Red king crabs and sea otters feed on this sea star (S.C. Jewett, pers. observ.).

Majestic Star

Pedicellaster magister Fisher, 1923



Top: Héloïse Chenelot
Bottom: Roger N. Clark

Description

Moderate size, slender, 5-rayed star; ray radius to 8.5 cm (3.3 in), R:r 6.4-7; rays moderately long, slender; disc small; body wall thin; aboral surface with numerous small single spines and crossed pedicellariae; adambulacrals bear 2 spines in an oblique, transverse series; color uniformly orange to red-orange aborally, oral side white.

Distribution and Habitat

Throughout the Aleutian Islands to northern British Columbia, Canada. Found on rock walls as well as sand and gravel substrates in the Aleutians at 20-221 m (66-725 ft) and in British Columbia at >200 m (656 ft) (Lambert 2000). It was only observed at a few locations in the Andreanof Islands (Adak and Kanaga).

Ecological Notes

Nothing is known about the natural history of this species.

Remarks

Pedicellaster magister somewhat resembles a *Henricia*, but the pedicellariae and profuse, single spines easily distinguish it. Although typically a 5-rayed star, the one specimen we found in shallow water was an aberrant 3-rayed specimen. A specimen trawled at 149 m (489 ft) south of Kanaga Island was 5-rayed.

Slender Alaskan Star

Tarsaster alaskanus Fisher, 1928



Top left: Roger N. Clark
Top right: Roger N. Clark
Bottom left: Roger N. Clark

Description

Small, slender, 5-rayed star; rays moderately long, slender, slightly constricted at base; ray radius to 7 cm (2.7 in) long (but usually much smaller); disc small; aboral surface with transverse ridges bearing small spines and numerous minute, pedicellariae; inferomarginal plates with 2 spines, and adjacent to adambulacrals which bear 2 spines; actinolateral series absent; color uniformly light orange, yellow, or pale pinkish.

Distribution and Habitat

Central Aleutian Islands to northern British Columbia, Canada. Found on rocky substrates in the Aleutians at 15-500 m (49-1,640 ft) and in British Columbia at >200 m (656 ft) (Lambert 2000). It was observed in the Andreanof (Adak) and Rat (Amchitka) Islands.

Ecological Notes

Little is known about *Tarsaster alaskanus*. We found it on bryozoans, coralline algae, and a gastropod.

Remarks

This small species somewhat resembles a *Henricia*, but the pedicellariae and transverse rows of spines easily distinguish it.

Glossary

(modified from Lambert 2000)

Abactinal

(see aboral.)

Aboral

The upper side of a sea star; the side opposite the mouth; also abactinal.

Aboral tabulate plates

Plates shaped like a mushroom or a stout peg, with granules on the upper surface (Figure 3).

Actinal

(see oral.)

Actinolateral membrane

A membrane supported by long spines that originate on the distal ends of the adambulacrals and extend out toward the edge of the arm.

Adambulacrals

Calcareous plates that form the sides of the ambulacral furrow (Figures 5 and 6).

Ambulacral furrow

Furrow on the oral (underside) of each arm formed by pairs of ambulacral plates and from which many tube feet extend (Figure 6).

Apical spines

Spines located at the tip, or apex, of a structure, as in apical mouth spines.

Brooder

A female sea star that protects the fertilized eggs in a space around the mouth or in a special cavity beneath her body.

Bryozoans

Invertebrates that form moss-like colonies on rocks and other substrates. The individuals of the colony are packed together in boxlike cubicles of chitin, and each individual feeds with a spiral structure called a lophophore. Commonly called moss animals.

Calcareous plates

Calcium carbonate elements that make up the internal skeleton of a sea star. The shape of the plates and their arrangement is characteristic for each species. Also called ossicles.

Carinals

A row of plates running down the middle of the aboral surface of the sea star arm, usually bearing obvious spines.

Circumboreal

Geographic distribution that encompasses all marine areas in colder parts of the Northern Hemisphere.

Coelom

An internal body cavity that originates from a splitting or outpocketing (evagination) of the third embryonic layer (mesoderm). In sea stars, the coelom develops by outpocketing, and is filled with coelomic fluid that serves the function of a circulatory system.

Commensal

An organism that benefits from a host without harming or helping it.

Dermal branchiae

(see papulae.)

Detritus debris

In this book it refers to organic material in bottom sediments resulting from the decomposition of plant material.

Direct development

Growth from egg to adult without undergoing a radical metamorphosis in the larval stage.

Disc

The central part of a sea star from which the rays or arms extend (Figure 1).

Distal

In a direction or position away from the center or central axis.

Endemic

Restricted to a particular geographic region.

Furrow spines

Spines located on the inner edge of the adambulacral plates, overhanging or projecting into the ambulacral furrow (Figure 6).

Inferomarginals

Plates forming the lower side of the arm between the oral and aboral plates (Figure 4); also called infra, inferior, or lower marginal.

Intermarginals

One or more rows of plates lying between the superomarginals and inferomarginals (Figure 4).

Interradial area

The area between the radii of two arms.

Intertidal zone

The portion of a shore that lies between the highest and lowest tides of the year.

Longitudinal series

A row of spines that runs parallel to the ambulacral furrow, or some longitudinal axis (Figure 6).

Madreporite

A modified interradial plate on the aboral side of the disc, pierced by numerous small pores that connect with the water-vascular system (Figure 1).

Marginals

Series of skeletal plates along the side of the arm between aboral and oral series; the term includes superomarginals, intermarginals, and inferomarginals (Figure 4).

Marginal spines

Spines on the edge of a mouth plate (Figure 5); may also refer to spines on marginal plates.

Mouth plate

The modified adambulacral plate closest to the mouth; two adjacent mouth plates form a triangle (Figure 5).

Nidamental chamber

A space between the true aboral surface and a thin skin or supradorsal membrane supported by the tips of the pseudopaxillar spines of *Pteraster*. In some species it acts as a brood chamber; nidamental is from the Latin *nidus*, meaning nest.

Oral

The mouth side or underside of a sea star; also actinal.

Oral interradial area

A triangular area on the oral side bordered by two ambulacral furrows and the edge of the disc (Figure 5); also actinal interradial area.

Oral intermediates

The series of plates that lie between the inferomarginals and the adambulacrals; also known as actinal intermediates. These plates may run the whole length of the arm or may be restricted to the interradial area (Figures 4 and 5).

Osculum

A central pore in the supradorsal membrane of the family Pterasteridae through which water is expelled from the nidamental chamber.

Papulae

The gills of a sea star; thin-walled sacs that extend from the coelom to the outside, between the calcareous plates. Most papulae have a simple tubular or conical shape, but some are branched as in *Pycnopia*.

Papularia

Well-defined round patches of papulae on the aboral surface of a sea star.

Paxillae

The columnar or mushroomlike aboral plates of some sea stars. The expanded tops are covered with moveable spinelets (Figure 3). Singular: paxilla.

Pedicellariae

Small, jawlike structures that occur in numbers on the outer surface of many sea stars. Singular: pedicellaria. Five kinds of pedicellariae are mentioned in this book (Figure 2):

Straight

Both parts of the jaw attach to the base and do not cross each other, so that it looks similar to forceps or tongs.

Furcate

A type of straight pedicellaria.

Crossed

The two parts of the jaw cross each other like the blades of scissors.

Bivalved

Two-jawed, shaped like a clamshell, as in the genus *Hippasteria*.

Pectinate

Made up of two sets of opposing teeth that interlock when closed.

Phylum

A major division of an organism kingdom such as animals and plants. Plural: phyla.

Plankton

Organisms that float or swim weakly in a body of water; from the Greek *planktos*, meaning wandering or roaming.

Planktotrophic larva

A larva that feeds on other planktonic material rather than relying on stored food.

Polygonal granules

Flattened, multisided granules.

Proximal

Closest to the center or central axis.

Pseudopaxillae

Aboral calcareous plates similar to true paxillae but their spines or spinelets are fixed, with no muscular control. Characteristic of the family Solasteridae (Figure 3).

Reticulum

A network or weblike structure.

R value

In sea stars, the distance from the center of the disc to the tip of an arm (Figure 1).

r value

In sea stars, the distance from the center of the disc to where two arms join the aboral disc (Figure 1).

Scale worm

A family of polychaete worms characterized by a series of overlapping plates on the back.

Sea squirts

Filter-feeding animals that are primitive members of the phylum Chordata. Also called ascidians or tunicates; they can be solitary or colonial.

Species

A set of similar individuals capable of breeding successfully with one another in nature, and reproductively isolated from other sets.

Spinelet

A short, stubby spine.

Suboral spines

Spines situated on the oral surface of the mouth plates rather than on the edge (Figure 5).

Subspecies

Part of a species population that is physically distinct and confined to a geographic area within the range of the species.

Substrate

The surface or material on which an organism grows or lives. Plural: substrates.

Subtidal

Below the level of the lowest tide.

Superambulacral plate

An internal calcareous plate lying across the inner junction of ambulacral and adambulacral plates in some sea stars (Figure 4); not visible without dissection.

Superomarginals

A series of plates that form the upper lateral side or edge of the arm (Figure 4); also called supra, superior, or upper marginals.

Suture

A joint between two calcareous plates, as in the median suture between two adjoining mouth plates (Figure 5).

Taxonomic

Relating to taxonomy, the study of the classification of plants and animals according to natural relationships; from the Greek *tasso*, meaning arrange or classify.

Transverse series

A row of spines running at right angles to the ambulacral furrow or a central axis (Figure 6).

Tube feet

Extendible tubular appendages, also called podia, located in the ambulacral furrow. Tube feet may be pointed or bear a sucker at the tip.

Tunicate

A filter-feeding animal that is a primitive member of the phylum Chordata. Also called ascidian or sea squirt; it can be solitary or colonial.

Water-vascular system

An enclosed network of tubes and sacs that operates the tube feet by hydraulic pressure.

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FIELD GUIDE TO Sea Stars of the Aleutian Islands

Sea stars, with myriad colors and markings, have intrigued people for centuries and may be the most recognized marine animals worldwide. This field guide features 63 species of sea stars in the nearshore subtidal community of the Aleutian Islands, Alaska, an understudied region because of its remoteness, adverse weather, and rocky bottoms that inhibit collecting. The book is the result of sea star collections made during 840 scuba dives throughout the Aleutians by the authors, plus observation and research, and includes several recently described species. Biologists, divers, and naturalists are among those who find the guide useful, and all who view the photographs will be stunned by the beauty of the sea stars.



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