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First Record of *Elachista nigra* (Chordariales, Phaeophyceae) from California, North America

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Abstract An epiphytic brown alga, *Elachista nigra* Takamatsu was found on large brown algae collected in the Channel Islands, California, North America. Its hosts are similar to those in Japan: *E. nigra* grew on the kelp *Eisenia arborea* Areschoug (Laminariales). This is the first record of *E. nigra* from North America.

Key words : brown algae, California, *Elachista nigra*, epiphytes, Phaeophyceae.

Introductions of Asian marine algae have been reported from many parts of the world. For example, *Sargassum muticum* (Yendo) Fensholt, a large brown seaweed (order Fucales), has spread from Japan to the Northeastern Atlantic, the Mediterranean Sea, and along the Pacific coast of North America (Abbott & Hollenberg, 1976; Critchley *et al.*, 1990). *Undaria pinnatifida* (Harvey) Suringar, another large brown seaweed (order Laminariales) that is native to Japan, Korea and China, has been recorded in the Mediterranean Sea, Atlantic Europe, New Zealand, Tasmania, Argentina and California (Silva *et al.*, 2002). In California, the red algae *Gelidium vagum* Okamura (order Gelidiales), *Lomentaria hakodatensis* Yendo (order Rhodymeniales), *Caulacanthus ustulatus* (Turner) Kützing (order Gigartinales), and the green alga *Codium fragile* subsp. *tomentosoides* (van Goor) P.C. Silva (order Codiales) were probably introduced directly or indirectly from Asia (Miller, 2004). However, there is no information about introductions of minute algal epiphytes, which may depend on specific host plants for their habitats. To investigate the distribution of brown algal epiphytes in the California Channel islands, we studied dried specimens of brown algae housed in the University Herbarium, University of California (UC).

Descriptions

CHORDARIALES Setchell et Gardner
Elachistaceae Kjellman

Elachista nigra Takamatsu (Figs. 1, 2)

Saito Ho-on Kai Mus. Res. Bull. (14): 167. f. 9. pl. 21, f. 1,2. (1938). — Type: Lost! (type locality: Iwai-saki, Miyagi Pref., Japan)

Synonym: *Elachista orbicularis* (Ohta) Skinner, Br. Phycol. J. **18**: 98, figs 1–3. (1983). — *Gonodia orbicularis* Ohta, Sci. Rep. Niigata Univ., Ser. D. (Biol.) (10): 21. f. 11. (1973).

Thalli of this species grew epiphytically on blades of *Eisenia arborea* Areschoug (Fig. 1). Each thallus is composed of a hemispherical cushion with numerous free assimilatory filaments and colorless paraphyses issuing from its surface. In young thalli, narrow colorless erect filaments develop from basal prostrate filaments (Fig. 2A, "*E. orbicularis*-stage"). In older thalli they are often borne laterally on wide colorless erect filaments (Fig. 2B, "*E. nigra*-stage"). These narrow filaments are uniseriate, 5–10 μm in diameter, and dichotomously branched. They bear terminal plurilocular sporangia that are uniseri-

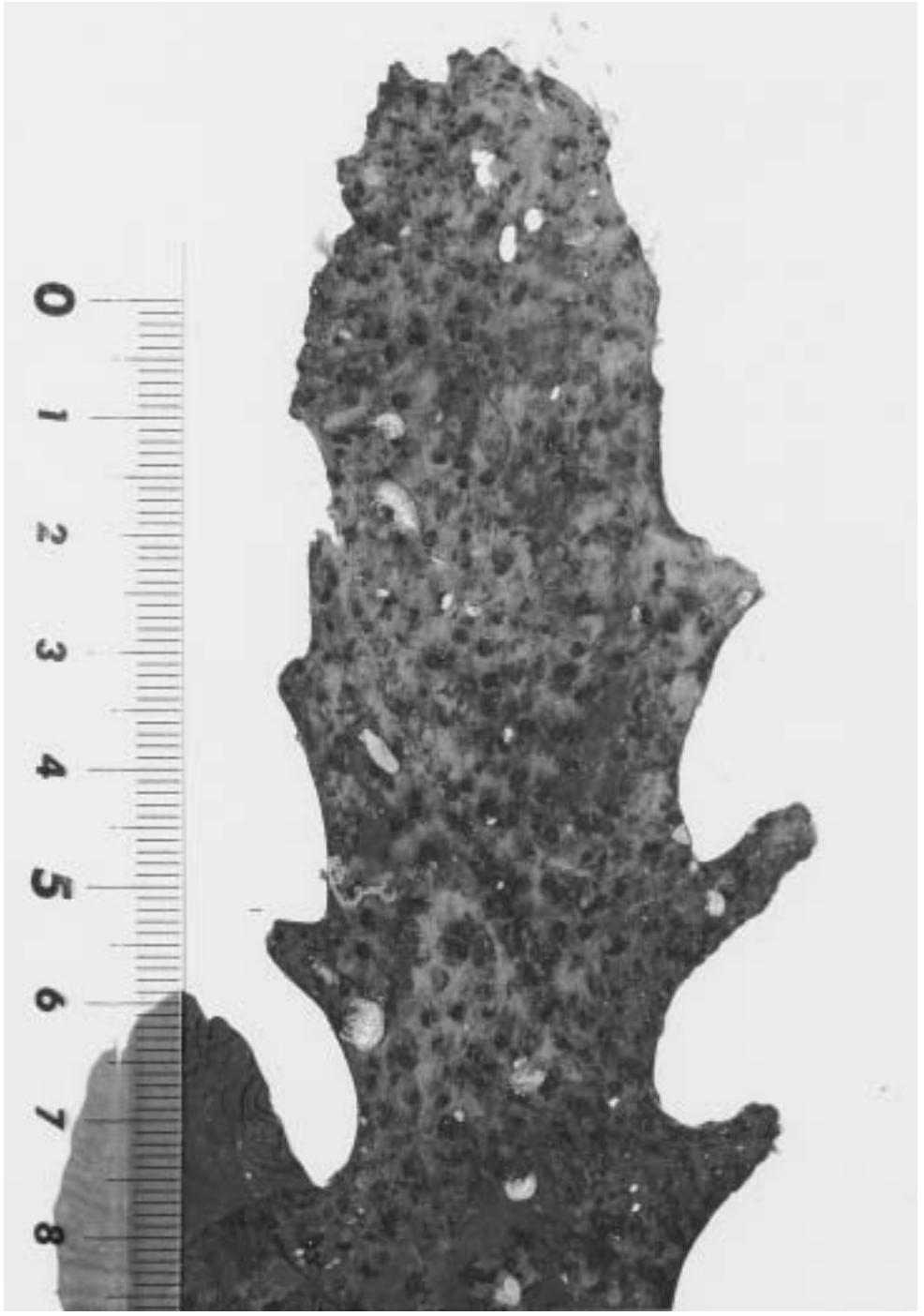

Fig. 1. *Elachista nigra* Takamatsu. Habit of the plants on *Eisenia bicyclis* (Kjellman) Setchell (UC 1574801).

ate, filiform, and 4–7 μm in diameter. Wide colorless filaments, which are also uniseriate, are 10–23 μm in diameter, do not branch, and develop into assimilatory filaments. The latter remain uniseriate and are terete, 10–27 μm in diameter, and slightly constricted distally. Cells of the as-

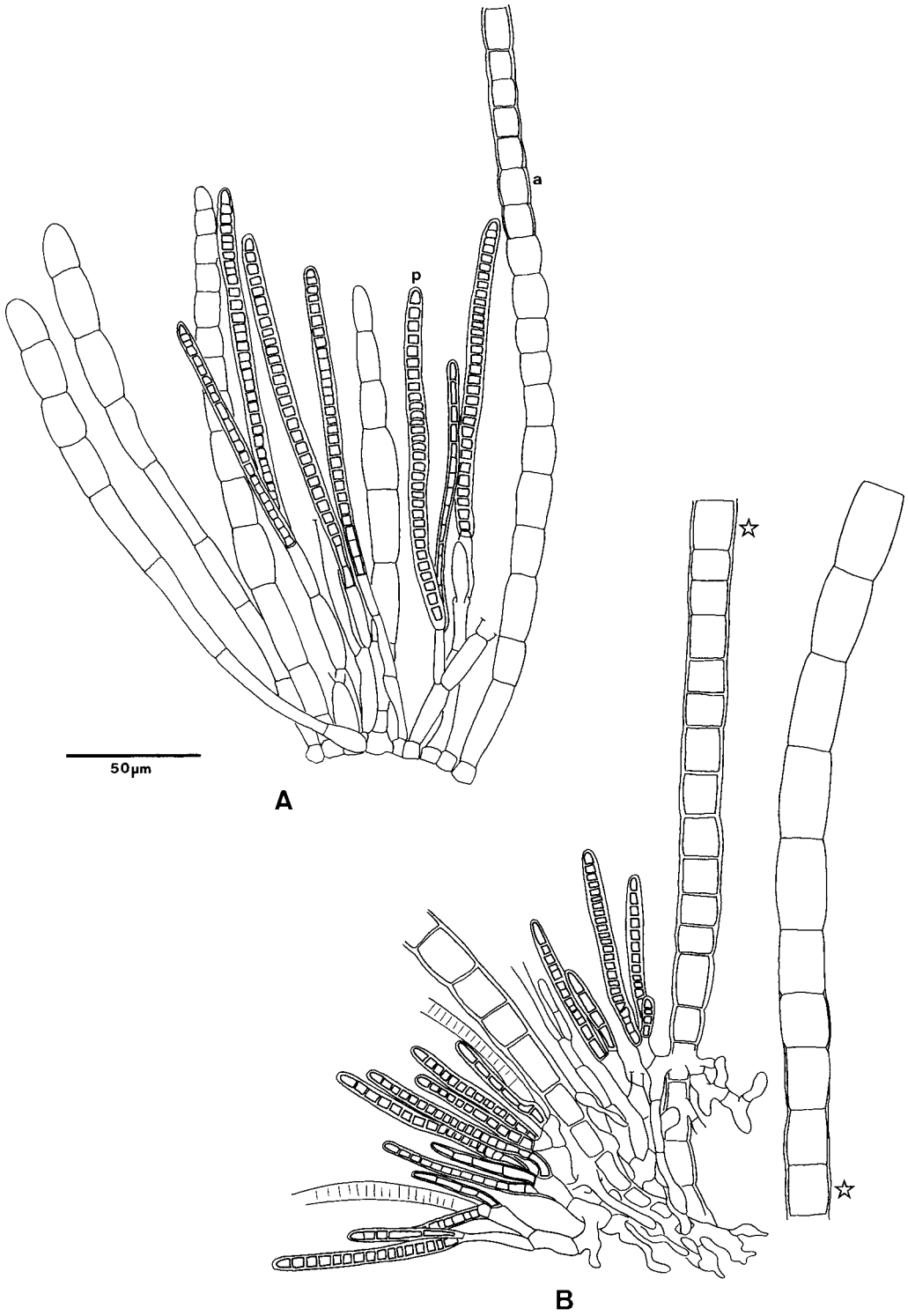

Fig. 2. *Elachista nigra* Takamatsu. A. Thallus of the *Elatista obricularis*-stage. B. Thallus of the *Elachista nigra*-stage (UC 1574801). a. assimilatory filament; p. plurilocular sporangium.

similatory filaments are cylindrical or barrel-shaped, 7–52 μm in length, with many discoid chloroplasts.

Specimen examined: Wilson's Cove, San Clemente Island, the Channel Islands, 12 Feb. 1984, leg. K.A. Miller 1903 (UC 1574801).

Geographical distribution: Japan, Australia, California.

Remarks: *Elachista nigra* Takamatsu and *Elachista orbicularis* (Ohta) Skinner were both described as occurring on laminarialean algae (kelps). *Elachista nigra* was described by Takamatsu (1938), on the basis of thalli growing on *Eisenia bicyclis* (Kjellman) Setchell and *Laminaria japonica* Areschoug in Japan. *Elachista orbicularis* was originally described as *Gonodia orbicularis* by Ohta (1973) on the basis of thalli growing on *Ecklonia stolonifera* Okamura from Japan. Later, it was transferred to *Elachista* by Skinner (1983) after studying thalli growing on *Ecklonia radiata* (C. Agardh) J. Agardh from southern Australia. Yoshida (1998) pointed out that these two species were similar, but that *E. nigra* was distinguishable on the basis of the origin of narrow erect filaments. Uwai *et al.* (2002) merged the two species on the basis of morphological observations on wild and cultured material and molecular analyses using the internal transcribed spacer 2 (ITS2) region of the nuclear ribosomal RNA gene. Our observations that both "*E. orbicularis*-stage" and "*E. nigra*-stage" grew on the same blade of the host support their opinion.

Along the coast of California, the distribution of *Elachista fucicola* (Velley) Areschoug as an epiphyte on *Fucus gardneri* P.C. Silva (Fucales) is well documented. *Elachista fucicola* is easily distinguished from *E. nigra* by host specificity as well as morphology. Assimilatory filaments of *E. fucicola* are 22–40 μm in diameter (Flectcher, 1987; Uwai *et al.*, 2000) whereas those of *E. nigra* are 6–26 μm in diameter (Uwai *et al.*, 2002; this paper). Whereas *E. nigra* has been reported only from Japan, *E. orbicularis* has been recorded from both Japan and southern Australia. Womersley (1987) suggested that *E. orbicularis* might have been introduced into Australia from Japan because it was not observed on herbarium specimens of its host (*Ecklonia radiata*) collected prior to 1976. To explore the possibility that *E. nigra* was introduced into California from Japan, we would need to make a comprehensive survey of herbarium material of kelp species that occur in California. This is the first record of *E. nigra* (including *E. orbicularis*) from North America.

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