

titillators of *N. steindachneri* begin curvature after the midpoint of the shaft and are not as strongly curved dorsally ($>90^\circ$) as seen in most other Carinata Group species (Plate 9). Stridulatory file tooth density (27–35 teeth/mm) is lower than that of *N. convexa* (2-sample *t*-test, $P = 5.48 \times 10^{-3}$) and also trends lower than *N. cascadia* (33–39 teeth/mm). The female subgenital plate is pentagonal, flat, subequal in length and width, and with curved apical margins and a strongly pointed apex, which separates this species from *N. cascadia* females which have straight apical margins and from *N. convexa* and *N. longiplutea* females which have plates that are longer than wide. The song is unique in having reduced or absent OPT. The PTR is faster than all other *convexa* clade species. This species has the most northern range of any *Neduba* (Fig. 9).

Notes. *N. steindachneri* is locally common in the forest understory of the western slopes of Oregon and Washington Cascade Range and primarily the eastern slopes of the Oregon and Washington coastal ranges. A phylogeographic break separates populations north and south of the Willamette River (Figs. 3–4) that suggests historical isolation that indicates historical isolation. Hybridization with *N. cascadia* is possible and should be sought from populations in central Oregon, where the ranges of these two species overlap.

Material examined. (n = 28) **USA, OR, Benton Co.,** 8♂, McDonald-Dunn Forest, Corvallis, 44.60382N, 123.33253W, 144 m, 18-IX-2015, JA Cole, LACM; 1♂, same data except JAC; 5♂, same data except 19-VII-1982, DC Lightfoot, CAS; **Columbia Co.,** 1♀, Wilson Creek, 46.07701N, 123.02315W, EH Nast, CAS; **Hood River Co.,** 1♂, 1♀, Hood R., 45.70556N, 121.52028W, 122 m, 17-VII-1931, RH Beamer, CAS; **Marion Co.,** 1♂, Sublimity, Silver Creek Falls, 45.000267N, 122.840916W, 167 m, 19-VIII-1945, W Blehm, CAS; **Multnomah Co.,** 3♂, Dabney State Park, 45.51766N, 122.35429W, 22 m, 19-IX-2015, JA Cole, JAC; 5♂, Oxbow Regional Park Day Use Area, SE Gordon Creek Rd., 1.2 mi. SE jct. Hurlburt Rd., 45.49821N, 122.27871W, 59 m, 19-IX-2015, JA Cole, JAC; 1♂ same data except JAC; 1♂, SE Gordon Creek Rd., 2.7 mi. S jct. Hurlburt Rd., 45.4784N, 122.28107W, 257 m, 19-IX-2015, JA Cole, JAC sound record; **Tillamook Co.,** 1♂, Tillamook, 45.51667N, 123.71667W, 30-VII-1926, CL Hubbs, CAS; **WA, Kitsap Co.,** 1♂, Holly, 47.557593N, 122.978488W, 3 m, 6-VII-1926, CL Hubbs, CAS; 5♂, Margarete Ranch, Port Orchard, 47.47137N, 122.65009W, 1525 m, 13-14-VIII-2013, JA Cole, LACM; 2♂, same data except JAC; **Mason Co.,** 1♂, 1♀, Lake Cushman, 47.487964N, 123.266471W, 244 m, 27-VIII-1919, P Putnam, CAS; **Pierce Co.,** see Type material (above). QUESTIONABLE PLACEMENT: **OR, Douglas Co.,** 1♂ nymph, Drain, 43.658731N, 123.318699W, 9-VI-2014, EC VanDyke, CAS.

Material from databases not examined by us (n = 7): CANADA, BC, Departure Bay, 49.20, 123.98W, 1925, GJ Spencer, Symbiota Collections of Arthropods Network (SCAN, <https://scan-bugs.org/portal>); UBC Campus 49.26N, 123.25W, 3-X-1946, D Evans, SCAN; Gailano Island, 48.93N, 123.45W, 4-IX-1971, J Scudder, SCAN; same data except 1971, J Scudder, SCAN; same data except 11-X-1976, GGE Scudder, SCAN; same data except 1976, GGE Scudder, SCAN; Vancouver Island, 49.66667N, 125.83333W, 9-VIII-2007, J Miskelly, SINA.

Propsti Group

The Propsti Group contains a single species, the Santa Catalina Island endemic (Fig. 8) *N. propsti*. The Group is defined by having a single spine on the fore tibia located on the posterior margin, a pair of prosternal spines, darkened male tegminal apices, and a female subgenital plate that is over half again as long as wide. Only *N. lucubrata* from mainland California shares this suite of characters, but this species has a smaller body size, a male subgenital plate that narrows from base to apex along the lateral carinae, and a song that consists of a bout (chirp) structure (Plate 5C) whereas the song of *N. propsti* is continuous (Plate 4J). The karyotype is unique.

Neduba propsti Rentz & Weissman, 1981

Fig. 19 (distribution), Fig. 20 (male and female habitus, calling song, drumming, male and female tremulation karyotype), Plate 2A (live habitus), Plate 4J (male calling song), Plate 7F (male ventral sclerite), Plate 10A (male titillators), Plate 11J (female subgenital plate).

Common name. Santa Catalina Island Shieldback.

History of recognition. Described as a Santa Catalina Island endemic (Rentz & Weissman 1981). Listed under *Aglaothorax* in OSFO for unspecified reasons (Cigliano *et al.* 2020).

Type material. The holotype male is in the CAS collection. Images of the holotype are available at OSFO (Cigliano *et al.* 2020).

Measurements. (mm, ♂n = 9, ♀n = 5) Hind femur ♂20.86–23.47, ♀24.10–25.89, pronotum total length ♂8.30–9.45, ♀9.15–9.89, prozona length ♂4.15–5.55, ♀5.15–5.93, metazona dorsal length ♂3.90–4.90, ♀3.88–4.15, pronotum constriction width ♂2.44–3.13, ♀2.98–3.22, metazona dorsal width ♂6.37–7.01, ♀6.27–7.22, head width ♂4.25–4.95, ♀5.18–5.54, ovipositor length ♀18.04–19.14.

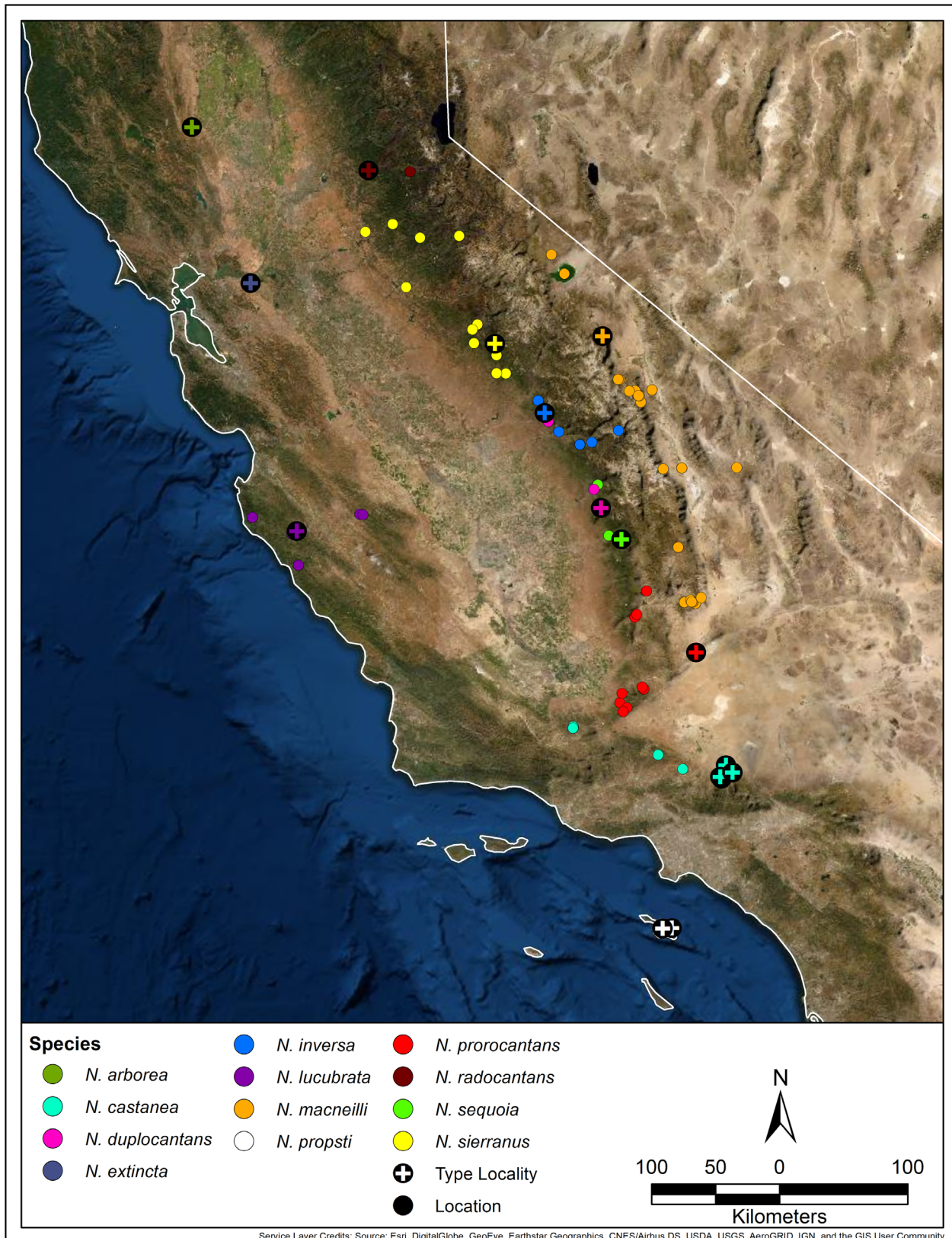
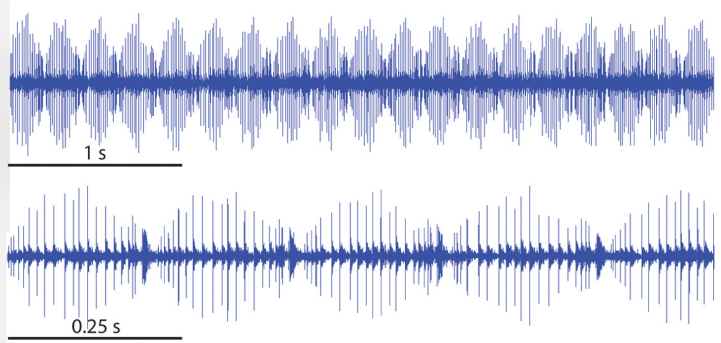


FIGURE 19. Distribution of Propsti, Castanea, Lucubrata, Sierranus, and Sequoia Group species mapping records reported in this work.

male CA: Los Angeles Co.



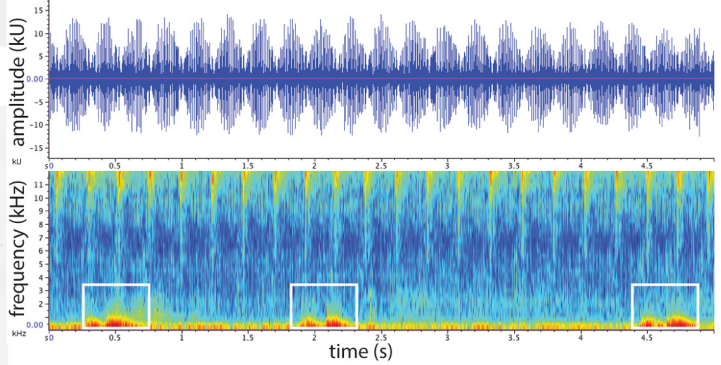
calling song CA: Los Angeles Co. 25.0°C JCR130721_01



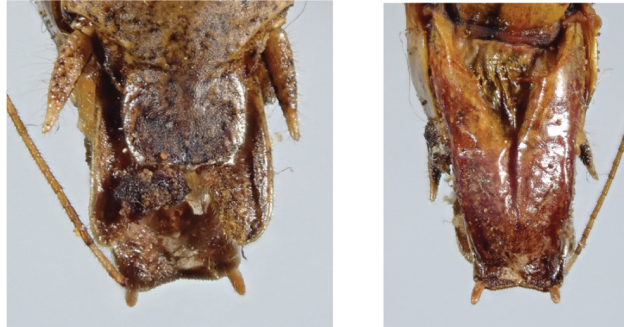
female CA: Los Angeles Co.



calling song with drumming (white boxes)
CA: Los Angeles Co. 24.4°C JCR130722_01



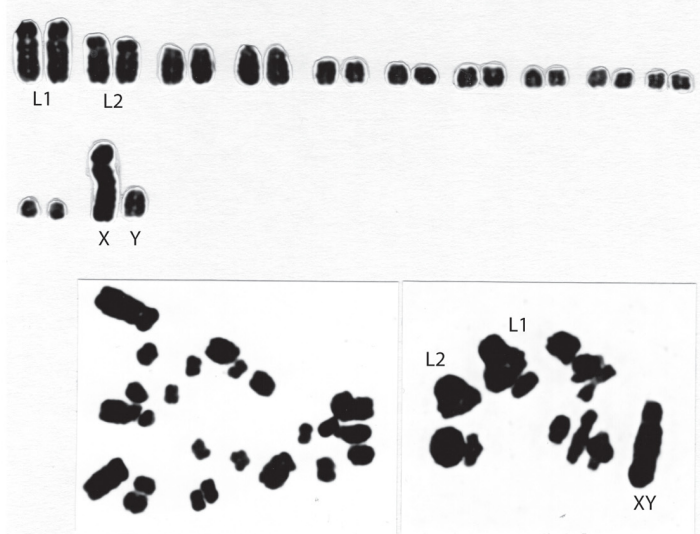
male terminalia CA: Los Angeles Co.



ventral sclerite
CA: Los Angeles Co.



karyotype CA: Los Angeles Co. S85-70 T85-12



female terminalia
CA: Los Angeles Co.



FIGURE 20. *N. propsti* male and female habitus, calling song, male and female terminalia, karyotype.

Distribution. Restricted to Santa Catalina Island, Los Angeles County, California, USA. Probably found throughout the island in suitable habitat.

Habitat. Dense chaparral vegetation, often on steep hillsides and in canyon bottoms. Individuals prefer to sit on the inner twigs of tangles. Also, in gardens on non-native vegetation. One individual taken from ornamental eucalyptus (JAC, pers. obs.).

Seasonal occurrence. Adult records from mid-June (14-VI-1985, S Bennett, CAS) through July (28-VII-1981 DB Weissman, CAS).

Stridulatory file. (n = 5) length 3.2–3.9 mm, 94–111 teeth, tooth density 30.4 ± 2.1 (28.2–33.0) teeth/mm.

Song. (n = 10) Continuous 200 ms MPTL at a brisk PTR of 4.4 ± 0.4 s⁻¹. PT consist of the least amount of pulses (toothstrikes) of any species (~20). PTF approaches the ultrasonic at 18.5 ± 3.5 kHz. A captive male drummed at irregular intervals while stridulating (Fig. 20); the drums were audible and induced considerable substrate vibration in the cage.

Karyotype. (n = 4) Unique. $2n\♂ = 24$ (4m + 18t + XmYt). T85-12, S85-70, topotype.

Recognition. Shares the following morphological characters with *N. lucubrata*: a single apical spine on the fore tibiae, prosternal spines, and tegmina darkened apically. The stridulatory file has a lower tooth density (28–33 teeth/mm) than any other species except those of the Castanea Group. Male genitalia of *N. propsti* are similar to those of *N. castanea* and *N. macneilli*, but the arms of the titillators of *N. propsti* have a shaft that is straight and not swollen at a distance of 1/6 from the base as in the latter two species (Plate 10). The song is unique in having short MPTL produced continually at a rapid PTR. Females have the longest subgenital plate of any species, approximately 1.5 times longer than wide. This is the only nedubine on Santa Catalina Island (Figs. 8, 19) with the most southerly distribution of any *Neduba*.

Notes. *N. propsti* is an early branching lineage (Figs. 3–5) that has apparently been isolated on Santa Catalina Island for a long time. The island has never been connected to mainland California (Legg *et al.* 2004) being the product of tectonic uplift. Males may be wary and cease calling at the slightest disturbance, as much as a single leaf falling, and jump with little provocation (JAC pers. obs.). This is one of a handful of *Neduba* species that drum (Weissman 2001; see also *N. castanea*, *N. macneilli*, and *N. lucubrata* below). Drumming was observed in captivity by a single male without a female present (JAC pers. obs) and not in the field; the context of drumming in the mating system is not known in this species.

Material examined. (n = 14) **All USA, CA, Los Angeles Co.:** 3♂, Hermit Gulch Campground, Avalon Canyon, Santa Catalina Island, 33.38265N, 118.33951W, 91 m, 9-10-VII-2013, JA Cole, LACM; 1♂ same data except JAC; 2♀, Santa Catalina Island, 33.383361N, 118.417576W, 1-VII-1983, DB Weissman, CAS; 1♀, same data except 20-VII-1982, S Bennett, CAS; 1♀, same data except 28-VII-1981, S Bennett, LACM; 1♂, same data except 30-VI-1973, DB Weissman, CAS; 4♂, Santa Catalina Island, Toyon Bay, 33.383N, 118.416W, 14-VI-1985, S Bennett, CAS; 1♀, same data except 5-VII-1986, S Bennett, CAS.

Castanea Group

The Castanea Group is readily recognizable on account of the robust habitus, the short hind femora, by having only one spine on the anterior margin of the fore tibiae, and by the lack of prosternal spines. The lateral carinae of the male subgenital plate converge apically, although not as dramatically as in the Sierranus and Sequoia Groups, and the styli vary from articulate to rudimentary to absent. The posterior margins of the abdominal tergites have only slight crenulations. Superficially the species of this group resemble sympatric *Aglaothorax ovata*. Karyotypes also separate the two species in this group from all other *Neduba*. Castanea Group species occupy the dry slopes of central and southern California mountain ranges (Fig. 8).

Neduba castanea (Scudder, 1899)

Fig. 19 (distribution), Fig. 21 (male and female habitus, calling song, drumming, male and female tremulation karyotype), Plate 2B–C (live habitus), Plate 5A (male calling song), Plate 7I (male ventral sclerite), Plate 10B (male titillators), Plate 11K (female subgenital plate).

Common name. Chestnut Shieldback.