

Stridulatory file. (n = 5) length 3.2–3.4 mm, 200–250 teeth, tooth density 70.6 ± 5.5 (62.5–76.9) teeth/mm.

Song. (n = 19) Unique in the high PTN of 19.9 ± 3.9 (two-way ANOVA, $P = 1.93 \times 10^{-15}$). The greater portion of airtime spent producing OPT makes the PTR slower ($0.8 \pm 0.3 \text{ s}^{-1}$, ANCOVA, $P = 3.96 \times 10^{-9}$) than that of other Sierranus Group species. PTF is $16.2 \pm 1.2 \text{ kHz}$.

Karyotype. (n = 6) Unique. $2n\text{♂} = 22$ (2m + 18t + XmYt), T95-20, S95-62, paratopotype.

Recognition. Males have both a high stridulatory file tooth density (68–73 teeth/mm) and a strongly constricted pronotum. Male *N. sierranus* have a similar high tooth density but the pronotum constriction is weak. *N. inversa* is difficult to separate but tends to have a lower stridulatory file tooth density. Female hind femora are shorter than other Sierranus and Sequoia group species. The song has the slowest PTR and highest PTN of the Sierranus Group. The latter song feature is temperature-invariant and distinct to a human listener, and thus may be used to identify this species in song surveys that lack temperature correction. Inhabiting the vicinity of the American River drainage, this species ranges the farthest north of any in the Sierranus Group (Fig. 19).

Etymology. *l. rado* “scrape” + *cantans* “singing”. Refers to the rasping, abrasive sound quality of the numerous minor PT in the male song.

Notes. Distributed at the northern limit of the Sierranus Group, *N. radocantans* is sympatric with *N. radicata*, the species with the most southerly distribution in the Carinata Group where their elevational distributions overlap. Selection for mate recognition at a contact zone could have driven the evolution of the distinctive, elaborate song with numerous OPT in this species. The population near Kyburz, California was located with a bat detector while night driving. Males were common but no females could be found, even after trampling vegetation. *N. radicata* songs were heard in trees at this locality. The type locality of Finnon Lake is private property that is owned and managed by the Mosquito Volunteer Fire Association (www.gomvfa.org). The conservation prospectus of this area is unknown.

Material examined. Type series only, see Type material above.

Sequoia Group

The phylogenetically defined Sequoia Group includes the species *extincta*, *inversa*, *sequoia*, *prorocantans*, and *duplocantans*. Males of all but one of the four species are morphologically separated from the Sierranus Group by the lower stridulatory file tooth density (46–62 teeth/mm). Like the Sierranus Group, the species are diagnosed by song and karyotype and are morphologically cryptic; only measurements of body parts and stridulatory file tooth density differ. As in the Sierranus Group, each species occupies distinct watersheds in the Sierra Nevada, albeit farther south (Fig. 8). This group contains the only pair of fully sympatric *Neduba* species within the same species Group.

Neduba extincta Rentz, 1977

Fig. 19 (distribution).

Common name. Extinct Shieldback.

History of recognition. Described from a single male museum specimen deposited at CAS (Rentz 1977).

Type material. The holotype male is the only specimen known. Images of the holotype are available at OSFO (Cigliano *et al.* 2020).

Measurements. See Rentz (1977).

Distribution. Antioch Sand Dunes, Contra Costa County, California, on the western edge of the Central Valley.

Habitat. Historically known from the sandy banks of the San Joaquin River, elevation 9 m. The 55 acre Antioch Dunes National Wildlife Refuge is the only National Wildlife Refuge in the country established to protect endangered plants and insects.

Seasonal occurrence. The only known specimen was collected 1-VII-1937 (ES Ross, CAS).

Stridulatory file. (n = 1) length 3.2 mm, 167 teeth, tooth density 52.2 teeth/mm,

Song. Unknown.

Karyotype. Unknown.

Recognition. Description indicates large body size and absence of styli on subgenital plate. The stridulatory file tooth density places this species at the upper end of variation for the Sequoia Group. The tooth density of the single known specimen is less than the closest geographic relative, *N. inversa* (density 64–68 teeth/mm). The single specimen is the only Sequoia Group individual collected in the Central Valley west of the Sierra Nevada.

Notes. This species is one of four extinct North American Orthoptera species (Hoekstra 1998) and that status has not changed; David Rentz and DBW have searched for this species at the type locality on several occasions over the last few decades, visiting during summer months when *Neduba* are active and using a bat detector. On no occasion were individuals found. The lack of molecular, bioacoustical, and cytogenetic characters make this species difficult to place in context of this revision, but the stridulatory file tooth density is consistent with the Sequoia Group. Minimally destructive molecular work may be undertaken in the future to place *N. extincta* into phylogenetic context. Among the extant Sequoia Group species, *N. inversa* is distributed near the San Joaquin River watershed and is therefore a possible relative, and this lineage could have colonized the western edge of the Central Valley across riparian corridors. The description of *N. arborea* in this work reports the only other Sierranus or Sequoia Group members known west of the Sierra Nevada. Many *Neduba* populations were no doubt extirpated as the eastern slope of the Coast Ranges became more arid and as humans modified the Central Valley for agriculture. In the case of the Antioch dunes, sand mining and commercial development drove extinction of this species. Thorough collecting efforts are needed in the eastern slopes of the Coast Ranges to search for possible unknown populations.

***Neduba inversa* Cole, Weissman, & Lightfoot, sp. n.**

Fig. 19 (distribution), Fig. 27 (male and female habitus, calling song, male and female terminalia, karyotype), Plate 3C (live habitus), Plate 5G (male calling song), Plate 8D (male ventral sclerite), Plate 10G (male titillators), Plate 12E (female subgenital plate).

Common name. Kings Canyon Shieldback.

History of recognition. Likely confused with *N. sierranus*.

Type material. HOLOTYPE MALE: USA, CA, Fresno Co., Bretz Mill Campground, Sierra National Forest, 24 mi. NE Trimmer on Big Creek Rd., 37.03775N, 119.24040W, 871 m, 13-VIII-2015, JA Cole, JCT15-15 [karyotype], 150820_01 [recording], 206 [teeth], 3.3 [mm file count], tegmen in gel capsule and genitalia in vial below insect deposited in CAS, Entomology type #19710. PARATYPES (n = 19): Fresno Co., 1♂, same data as holotype, CAS; 2♂, same data as holotype, LACM; 3♂, 1♀, Bretz Mill Campground, Sierra National Forest, 24 mi. NE Trimmer on Big Creek Rd., 37.0375N, 119.2388W, 1006 m, 29-30-VII-2012, JA Cole, LACM; 3♂, Princess Campground, Sequoia National Forest, 36.80456N, 118.94154W, 1797 m, 25-27-VII-2017, JA Cole, CAS; 7♂, 1♀, same data except LACM; 1♂, same data except JAC.

Measurements. (mm, ♂n = 17, ♀n = 2) Hind femur ♂20.22–24.12, ♀23.15–23.40, pronotum total length ♂8.17–10.54, ♀8.48–9.42, prozona length ♂3.57–5.11, ♀4.06–4.98, metazona dorsal length ♂4.29–5.95, ♀3.50–5.36, pronotum constriction width ♂2.22–2.95, ♀2.43–2.94, metazona dorsal width ♂5.68–6.63, ♀6.25–6.42, head width ♂4.84–5.47, ♀5.24–5.59, ovipositor length ♀15.81–16.78.

Distribution. West slope of the Sierra Nevada, between the San Joaquin and Kings River watersheds in the vicinity of Kings Canyon National Park.

Habitat. Understory of mixed conifer forests.

Seasonal occurrence. Available records are midsummer from July (1-VII-1935, EE Honeycutt, CAS) through mid-August (13-VIII-2015, JA Cole, LACM).

Stridulatory file. (n = 7) length 3.0–4.0 mm, 206–266 teeth, tooth density 66.3 ± 6.9 (55.5–78.3) teeth/mm.

Song. (n = 24) Qualitatively like Sierranus Group taxa, high frequency (PTF 15.9 ± 1.2 kHz) with a fluttering quality caused by multiple OPT (PTN 9.2 ± 3.4). PTR is significantly slower (1.3 ± 0.3 s⁻¹) than *N. sierranus* and faster than *N. radocantans* (ANCOVA, $P = 3.96 \times 10^{-9}$) but is indistinguishable from that of *N. arborea*.

Karyotype. (n = 5) $2n\♂ = 21$ (2m + 16t + XtXtYm). JCT15-15, paratopotype.

Recognition. Males have a high stridulatory file tooth density (64–68 teeth/mm) like *N. sierranus* and *N. radocantans*. A weakly constricted pronotum separates *N. sierranus* from this species. *N. radocantans* is morphologically separable only by its slightly higher stridulatory file tooth density (68–75 teeth/mm). This species belongs to