

Recognition. Males may be identified by the combination of a high stridulatory file tooth density (62–70 teeth/mm) and a pronotum that is not strongly constricted. *N. sierranus* has two parapatric neighbors that also have high tooth densities: *N. inversa* to the south and *N. radocantans* to the north, but those species have stronger pronotum constrictions. The PTR is faster than all other species with multiple OPT (*N. arborea*, *N. radocantans*, and *N. inversa*). Karyotype also separates this species from *N. radocantans* and *N. inversa*. The subtriangular subgenital plate that is longer than wide is unique among the Sierranus and Sequoia groups.

Notes. Based on comparison of rDNA and mtDNA topologies (Fig. 4), this species has hybridized with its parapatric neighbors to the south and north: *N. inversa* and *N. radocantans*, respectively. The three species are morphologically cryptic. Species status for Sierranus Group lineages is based on song and karyotype. Song differences between these three species may reinforce prezygotic isolation if hybrids between species that differ in chromosome arrangement suffer reduced fitness.

Material examined. DETERMINED (n = 23): **Calaveras Co.**, 1♂, 1♀, Golden Pines RV Resort and Campground, 38.29808N, 120.28773W, 1570 m, 14-15-VIII-2015, JA Cole, LACM; **Madera Co.**, 4♂, 2♀, Narrow Gauge Inn, Fish Camp, 37.45506N, 119.64345W, 1435 m, 11-12-IX-2015, JA Cole, LACM; 1♀, Narrow Gauge Inn, Fish Camp, 37.45506N, 119.64345W, 1435 m, 11-12-IX-2015, JA Cole, JAC; **Mariposa Co.**, in addition to type material (above), 1♂, 1 mi. W El Portal, 37.67465N, 119.80238W, 29-VII-1965, RP Allen, CSCA; 1♀, Hites Cove, 37.64083N, 119.84806W, 9-VII-1968, TR Haig, CSCA; 1♂, Jerseydale Campground, Sierra National Forest, 13.5 miles northeast of Mariposa, 37.5451N, 119.8386W, 1131 m, 10-11-VIII-2002, JA Cole, LACM; 1♂, 1♀, same data except JAC; 3♂, same data except 28-29-VII-2012, JA Cole, LACM; **Tuolumne Co.**, 3♂, Mill Creek Campground, Stanislaus National Forest, FR5N21 off Mono Way (SR108), 38.30168N, 119.93763W, 1918 m, 23-24-VIII-2019, JA Cole, J Bailey, SA Downing, LACM; 2♂, same data except JAC; QUESTIONABLE PLACEMENT (n = 5): **Amador Co.**, 1♀, Ponderosa Rd., 1.5 mi. N of Mokelumne River, 38.34889N, 120.77306W, 21-VIII-1984, RW, BMED; **Calaveras Co.**, 1♀, West Point, 38.399079N, 120.527426W, 18-VIII-1929, CAS; **Madera Co.**, 1♀, Bass Lake, 37.324666N, 119.566254W, 20-VII-1934, FE Blaisdell, CAS; 1♀, Oakhurst, 37.328N, 119.649315W, 914 m, 29-VI-1946, HP Chandler, CAS; **Tuolumne Co.**, 1♀, Jamestown, 37.953258N, 120.422695W, 429 m, 1978, Schultz, CSCA.

Neduba arborea Cole, Weissman, & Lightfoot sp. n.

Fig. 19 (distribution), Fig. 25 (male and female habitus, calling song, male and female terminalia, karyotype), Plate 3B (live habitus), Plate 5F (male calling song), Plate 8C (male ventral sclerite), Plate 12C (female subgenital plate).

Common name. Arboreal Shieldback.

History of recognition. None.

Type material. HOLOTYPE MALE: USA, CA, Colusa Co., SR20, mile marker 11.36, 39.1056N, 122.31903W, 129 m, 19-VII-2015, JA Cole, DB Weissman, JAC000001958 [specimen barcode], JCR150803_01 [recording], DNA159 [tissue], SING0501 [extraction], JCT15-05 [karyotype], tegmen removed in gelcap below specimen, 219 [tooth count], 3.4 mm [file length], genitalia in vial below specimen, deposited in CAS, Entomology type #19707.

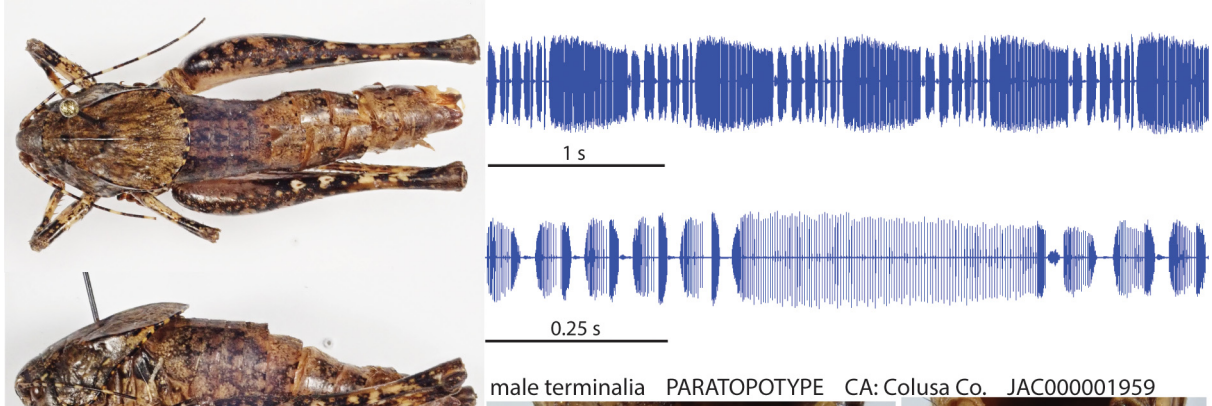
PARATYPES (n = 6): **Colusa Co.**, 2♀, SR20, 11.5 miles west of I-5 at mile post 11.22., 39.10567N, 122.32102W, 150 m, 22-IV-2007, DB Weissman, LACM; 1♂, 1♀, SR20, mile marker 11.36, 39.1056N, 122.31903W, 129 m, 19-VII-2015, JA Cole, DB Weissman, CAS; 1♂, SR20, mile marker 11.4, 39.10547N, 122.31759W, 423 m, 5-VIII-2014, JA Cole, DB Weissman, LACM; 1♀, same data except CAS.

Measurements. (mm, ♂n = 3, ♀n = 2) Hind femur ♂22.23–23.27, ♀22.44–24.09, pronotum total length ♂10.54–11.60, ♀10.09–10.49, prozona length ♂4.55–5.19, ♀4.94–5.76, metazona dorsal length ♂5.58–6.41, ♀4.33–5.55, pronotum constriction width ♂3.10–3.56, ♀3.08–3.58, metazona dorsal width ♂7.00–7.35, ♀6.72–6.80, head width ♂5.87–6.08, ♀5.72–5.87, ovipositor length ♀16.40–16.60.

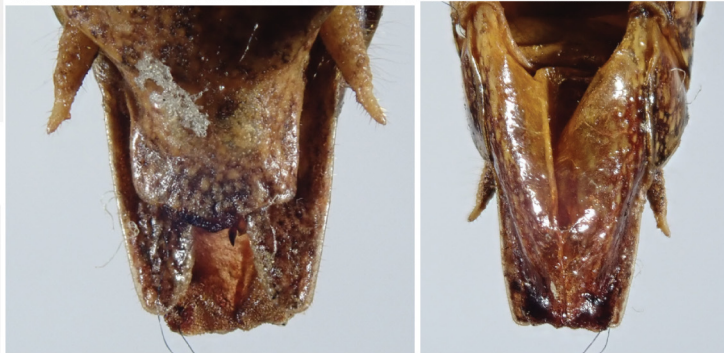
Distribution. East slopes of the North Coast Ranges bordering the California Central Valley. The type locality is along the Cortina Ridge.

Habitat. Oak woodland. Topotype males sang from ground level or from oak branches 1 m or more above the ground.

male HOLOTYPE CA: Colusa Co. JAC000001958 calling song PARATOPOTYPE CA: Colusa Co. 25.0°C JCR150806_00



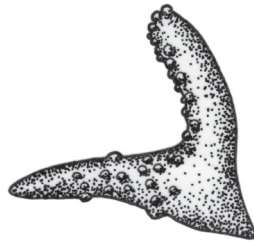
male terminalia PARATOPOTYPE CA: Colusa Co. JAC000001959



female PARATOPOTYPE CA: Colusa Co. JAC000001960



ventral sclerite HOLOTYPE



female terminalia PARATOPOTYPE CA: Colusa Co. JAC000001954



male PARATOPOTYPE CA: Colusa Co. JAC000001959



karyotype PARATOPOTYPE CA: Colusa Co. S14-61 JCT14-06

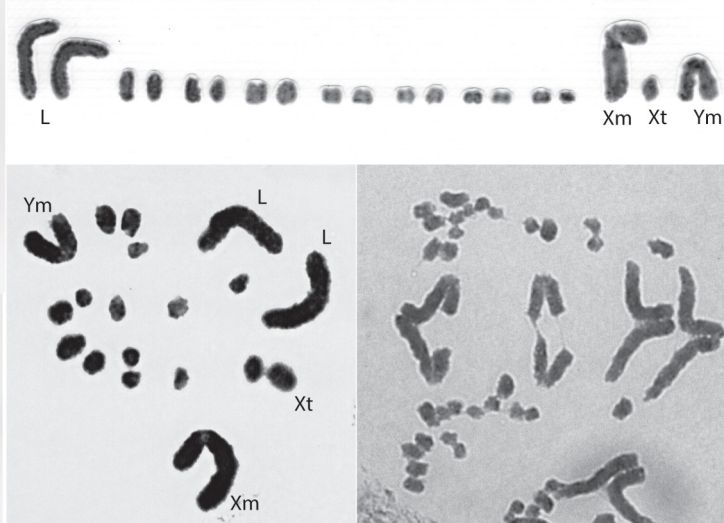


FIGURE 25. *N. arborea* male and female habitus, calling song, male and female terminalia, karyotype.

Seasonal occurrence. Limited records show that nymphs occur in April (11-IV-2007, DB Weissman, CAS) and adults are active by mid-July (19-VII-2015, JA Cole and DB Weissman, CAS) into August (5-VIII-2014, JA Cole, DB Weissman, CAS).

Stridulatory file. (n = 3), length 3.2–3.5 mm, 190–219 teeth, tooth density 60.9 ± 3.1 (58.9–64.4) teeth/mm.

Song. (n = 4) Similar to *N. sierranus* in consisting of several OPT (10.6 ± 3.7 (5.0–15.3)) that are interspersed between MPT. The PTR of 1.20 ± 0.03 is intermediate: slower than *N. sierranus*, faster than *N. radocantans*, and statistically indistinguishable from *N. inversa*. PTF is 16.9 ± 0.5 kHz.

Karyotype. (n = 3) Unique. $2n\♂ = 19$ (16t + XmXtYm). JCT14-06, S14-61, paratopotype.

Recognition. Both sexes have the largest body size (pronotum length more than 10 mm) of any Sierranus Group species and are noticeably robust in comparison with the typical fusiform shape of *Neduba*. The male pronotum is weakly constricted as in *N. prorocantans* and *N. sierranus*, but not only is *N. arborea* larger than those species but the stridulatory file tooth density is greater (59–62 teeth/mm) than the former (47–52 teeth/mm) and less than the latter (62–70 teeth/mm). *N. inversa* is also separated from this species by a higher tooth density (64–68 teeth/mm) and a strong pronotum constriction. The oval, highly convex female subgenital plate is distinctive. Song PTR will separate this species from all others in the Sierranus Group, but not from *N. inversa* in the Sequoia Group, a smaller species with a strong pronotum constriction. The karyotype is unique. This is the only extant Sierranus or Sequoia Group species known from the Coast Ranges of California.

Etymology. *l. arborea* “of the trees” in reference to the male habit of singing from oak branches above the understory.

Notes. The discovery of a member of the Sierranus Group in the Coast Ranges is significant as *N. extincta*, the only other species in either the Sierranus or the Sequoia Group distributed west of the Central Valley is, as the name suggests, extinct (Rentz 1977). Female nymphs were the first individuals of this species to be encountered. DNA from these females indicated that the population was distinct from known Sierranus Group taxa. Once males were collected the unique karyotype provided more evidence for specific distinction. Further investigation of the North Coast Ranges should be undertaken as the Sierranus Group may have crossed the Central Valley on multiple occasions.

Material examined. Type series only. See Type material above.

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

Fig. 19 (distribution), Fig. 26 (male and female habitus, calling song, male and female terminalia, karyotype), Plate 3A (live habitus), Plate 5E (male calling song), Plate 8B (male ventral sclerite), Plate 10F (male titillators), Plate 12D (female subgenital plate).

Common name. Raspy Shieldback.

History of recognition. None.

Type material. HOLOTYPE MALE: USA, CA, El Dorado Co., Finnon Reservoir, 5 mi. NE Placerville, 38.780862N, 120.732843W, 790 m, 5-6-VIII-1995, DB Weissman, S95-62 [stop], R95-49 [recording], T95-21 [testes], tegmen in gelcap and genitalia in vial below insect, deposited in CAS, Entomology type #19680.

PARATYPES (n = 17): USA, CA, El Dorado Co., 1♂, 2♀, same data as holotype; 4♂, 2♀, Finnon Reservoir, 5 mi. NE Placerville, 38.79978N, 120.74947W, 740 m, 8-9-VIII-2014, JA Cole, DB Weissman, LACM; 8♂, US50 3.7 mi. W Kyburz, 38.76427N, 120.35897W, 1112 m, 19-VII-2015, JA Cole, DB Weissman, LACM.

Measurements. (mm, ♂n = 12, ♀n = 4) Hind femur ♂18.26–20.50, ♀19.48–21.29, pronotum total length ♂7.96–9.70, ♀7.85–8.85, prozona length ♂3.46–5.07, ♀3.89–5.08, metazona dorsal length ♂3.92–5.50, ♀3.32–4.25, pronotum constriction width ♂2.20–2.63, ♀2.35–2.80, metazona dorsal width ♂5.47–6.41, ♀4.92–5.62, head width ♂4.40–4.75, ♀4.60–5.23, ovipositor length ♀13.45–18.05.

Habitat. Oak woodland understory and riparian. In tangles, leaf litter, and bunch grass under oaks. This species inhabits mixed conifer forests at lower elevations than does *N. radicata*, but the two overlap at the extremes of their elevational distributions.

Seasonal occurrence. Midsummer as indicated by scant records: July (19-VII-2015, JA Cole & DB Weissman, LACM) into August (9-VIII-2014, JA Cole, D.B. Weissman, LACM).

Distribution. West slope of the Sierra Nevada in the vicinity of the American River watershed.