

the Sequoia Group lineage but has a Sierranus Group song with multiple OPT. The high PTN of *N. radocantans* will separate that otherwise cryptic species from *N. inversa*. Males of the neighboring species to the north, *N. sierranus*, have songs with a faster PTR than those of *N. inversa*. Songs from all population of the Sequoia Group to the south have only one OPT. Karyotypes also separate *N. inversa* from the geographically proximal species mentioned above. The distribution of this species lies between the San Joaquin and Kings River drainages in the vicinity of Kings Canyon National Park.

Etymology. *l. inversa* “to change, to pervert, to turn upside down,” in reference to the mosaic of characters possessed by this species, with the song of one clade but the genetics of another.

Notes. At the type locality the species was common, but the quiet male songs were drowned out by the incessant loud calls of the shield-back katydid *Cyrtophyllicus chlorum* Hebard. The distribution of *N. inversa* lies where the Sierranus and Sequoia Groups meet in the central Sierra Nevada (Figs. 8, 19). This species combines characters from the two lineages and gene flow between neighboring lineages has occurred during its evolutionary history (Fig. 4). The stridulatory file and the calling song with a fluttering sound, caused by numerous OPT, is similar to *N. sierranus* in the Sierranus Group, which is distributed to the north in the Yosemite Valley region. DNA places this species with Sequoia Group species to the south, however, and this species shares a karyotype with *N. prorocantans*. The remaining Sequoia Group species have simple songs with one OPT between any pair of MPT. Song alleles may have introgressed across species boundaries in this contact zone region (e.g. Cole 2016).

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

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

Fig. 19 (distribution), Fig. 28 (male and female habitus, calling song, male and female terminalia, karyotype), Plate 3D–E (live habitus), Plate 5H (male calling song), Plate 8E (male ventral sclerite), Plate 10H (male titillators), Plate 12F (female subgenital plate).

Common name. Incessant Shieldback

History of recognition. Records from Dougherty Creek, Kern River Canyon, CA (Rentz & Birchim 1968) were confused with *N. sierranus*.

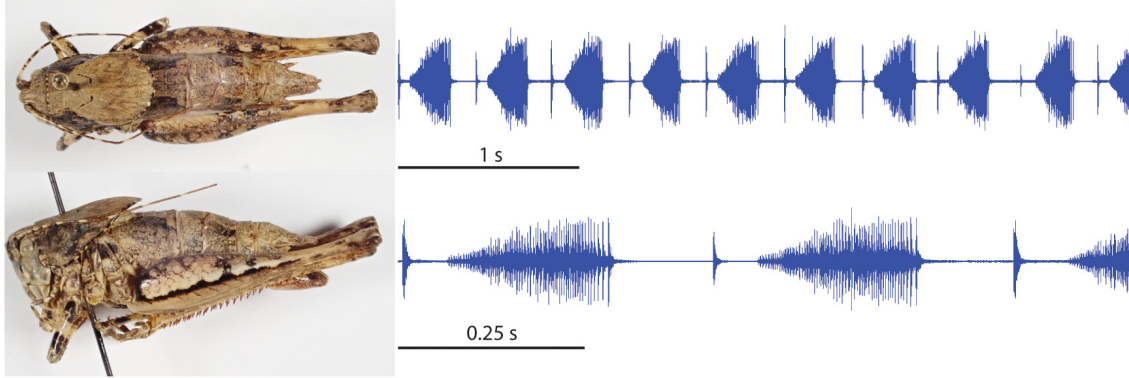
Type material. HOLOTYPE MALE: USA, CA, Kern Co., Tehachapi, Water Canyon Rd., 0.15 mi. S of intersection with Highline Rd., 35.307739N, 118.021738W, elev. 1463 m, 28-VIII-1983, DB Weissman, S83-115, R83-295 [recording], T83-46 [karyotype], 150 [teeth], 3.3 [mm file count], tegmen in gelcap and genitalia in vial below specimen, deposited at CAS, Entomology type #19681.

PARATYPES (n = 30): USA, CA, Kern Co., 3♂, 1♀, same data as holotype; 6♂, Hobo Campground overflow area, 3 miles west of Bodfish on Kern River Canyon Road, 35.5752N, 118.5305W, 700 m, 23-VI-2003, JA Cole, LACM; 1♂, horse trough spot, Tejon Ranch Conservancy, 34.97927N, 118.69159W, 1223 m, 3-VI-2017, L Pavliscak, LACM; 1♂, Kern River Rd. 1.1 mi. from jct. Caliente-Bodfish Rd., 35.59429N, 118.5141W, 1470 m, 21-VII-2015, JA Cole, DB Weissman, LACM; 1♂, Kernville, 37 Sierra Way, 35.7561N, 118.4203W, 828 m, 26-28-VII-2002, JA Cole, JAC; 2♂, same data except LACM; 2♂, same data except 27-VII-2004, JA Cole, LACM; 1♂, same data except 28-VII-2004, JA Cole, JAC; 1♀, Lopez Flat, Tejon Ranch Conservancy, 34.94264N, 118.63381W, 816 m, 3-VI-2017, JA Cole, K Halsey, LACM; 3♂, 1♀, Paradise Valley, Tehachapi Mountains, 34.91664N, 118.66759W, 7-VIII-1931, ER Tinkham, CAS; 1♂, Tehachapi Mountain Park, 35.06861N, 118.4825W, 1470 m, 20-VII-2015, JA Cole, DB Weissman, LACM; 2♂, Tehachapi Mountain Park, 35.06861N, 118.4825W, 1707 m, 28-VIII-1983, DB Weissman, CAS; 1♀, Tejon Ranch Conservancy, Indian Schoolhouse, Tejon Creek, 35.04512N, 118.67052W, 647 m, 1-IV-2018, K Moore, LACM; 4♂, Water Canyon Rd., 1.4 mi. below entrance to Tehachapi Mountain Park, 35.08258N, 118.49486W, 1571 m, 20-VII-2015, JA Cole, DB Weissman, LACM.

Measurements. (mm, ♂n = 14, ♀n = 2) Hind femur ♂19.60–22.59, ♀22.55–23.50, pronotum total length ♂8.25–10.15, ♀9.25–9.65, prozona length ♂3.83–5.09, ♀4.54–5.65, metazona dorsal length ♂4.07–5.35 ♀4.00–4.71, pronotum constriction width ♂2.44–3.50, ♀3.24–3.29, metazona dorsal width ♂4.99–6.80, ♀5.60–5.89, head width ♂4.70–5.57, ♀5.47–5.60, ovipositor length ♀8.75–9.41.

Distribution. West slope of the southern Sierra Nevada south of the Tule River watershed, south to the north slope of the Tehachapi Mountains.

male HOLOTYPE CA: Kern Co. S83-115 calling song PARATOPOTYPE CA: Kern Co. 25.0°C JCR150830_00



female PARATYPE CA: Kern Co. JAC000002279



male terminalia PARATOPOTYPE CA: Kern Co. S83-115 R83-291



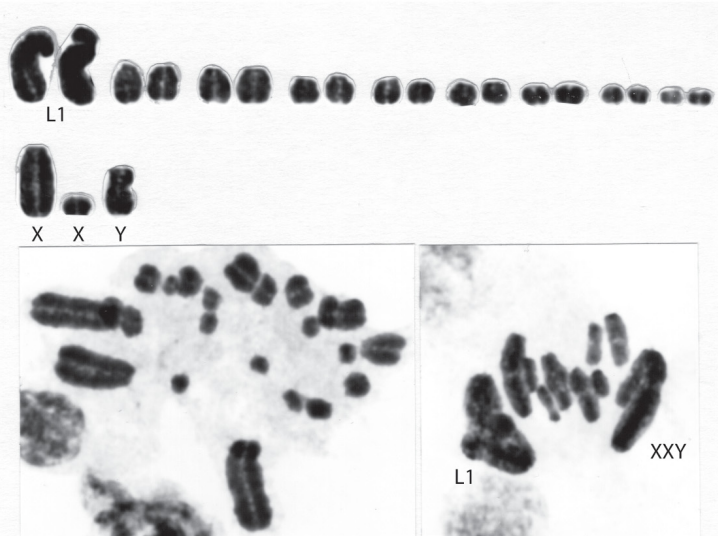
male PARATOPOTYPE CA: Kern Co. S83-115



ventral sclerite HOLOTYPE



karyotype PARATOPOTYPE CA: Kern Co. S83-115 T83-44



female terminalia PARATOPOTYPE CA: Kern Co. S83-115

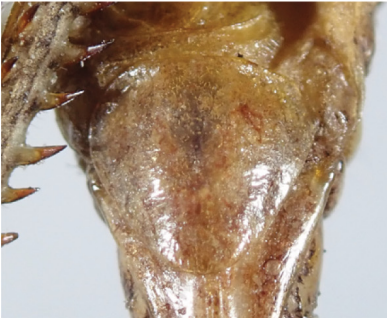


FIGURE 28. *N. prorocantans* male and female habitus, calling song, male and female terminalia, karyotype.

Habitat. Forest understory, often in thick tangles of vegetation. Taken from poison oak, willow (*Salix* spp.), and thorny brambles in riparian areas. Nymphs were collected from under bark of fallen tree limbs and from leaf litter under a valley oak tree (*Quercus lobata* Née). Museum specimens (ER Tinkham, CAS) also indicate association with oaks.

Seasonal occurrence. Adults collected in the field from late June (23-VI-2003, JA Cole, LACM) through August (28-VIII-1983, DB Weissman, CAS). Last instar nymph collected in early June (3-VI-2017, LA Pavliscak, LACM) matured 19-VI-2017.

Stridulatory file. (n = 5) length 3.3–3.8 mm, 150–183 teeth, tooth density 49.1 ± 2.7 (45.5–52.4) teeth/mm.

Song. (n = 12) A continuous train of alternating MPT and OPT delivered at PTR 2.4 ± 0.3 s⁻¹. The PTdc is $62.1 \pm 9.7\%$, which is lower than that of *N. sequoia* (ANCOVA, $P = 3.75 \times 10^{-4}$). The PTF is high at 15.6 ± 1.2 kHz.

Karyotype. (n = 7) $2n\♂ = 21$ (2m + 16t + XtXtYm). T83-44, S83-115, type locality.

Recognition. This is the most morphologically distinctive species of the Sierranus and Sequoia Groups. Males combine a weakly constricted pronotum and a low stridulatory file tooth density (below 53 teeth/mm), lower than all other Sierranus and Sequoia Group species except *N. duplocantans* (47–52 teeth/mm) which has a more strongly constricted pronotum. Females have the shortest ovipositor of any Sierranus or Sequoia Group species, 10 mm or less in length. The song has a lower PTdc than that of the related *N. sequoia*. The karyotype is shared only by *N. inversa*. This species ranges the farthest south of any Sequoia or Sierranus Group species and occurs in the Tehachapi Mountains in addition to the Sierra Nevada.

Etymology. *l. proro* “to prolong, keep going” + *cantans* “singing,” describing the incessant and repetitive nature of the male calling song.

Notes. This species may be common in years of adequate rainfall and scarce in dry years, during which populations are localized around water sources. During the summer of 2001, a wet year for California, katydids were abundant in the Kernville area and males were seen walking and singing on bare soil on hillsides some distance from riparian or forested areas (JAC pers. obs).

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

Neduba sequoia Cole, Weissman, and Lightfoot sp. n.

Fig. 19 (distribution), Fig. 29 (male and female habitus, calling song, male and female terminalia, karyotype), Plate 3F–G (live habitus), Plate 5I (male calling song), Plate 8F–H (male ventral sclerite), Plate 10I (male titillators), Plate 12G (female subgenital plate).

Common name. Big Trees Shieldback

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

Type material. HOLOTYPE MALE: USA, CA, Tulare Co., Coy Flat Campground, Sequoia National Forest, 0.5 miles south of Camp Nelson off SR190, 36.1269N, 118.6183W, 1524 m., 30-31-VII-2012, JA Cole, DNA67 [tissue], SING357 [DNA extraction], JCR120914_00 [recording], genitalia in vial below specimen, deposited in CAS, Entomology type #19714. PARATYPES (n = 29): Tulare Co., 9♂, 1♀, same data as holotype, LACM; 1♂, same data as holotype JAC; 2♂, same data as holotype except, 20-VIII-2006, DB Weissman, DC Lightfoot, CAS; 11♂, 3♀, South Fork Campground, Sequoia National Park, 36.35029N, 118.76511W, 1112 m, 12-13-VIII-2015, JA Cole, LACM; 1m, same data except JAC; 1♂, Hwy 190 7 mi. E Springville, 36.156806N, 118.724278W, 707 m, 5-V-2011, DB Weissman, DBW.

Measurements. (mm, ♂n = 23, ♀n = 5) Hind femur ♂17.48–24.26, ♀22.03–24.14, pronotum total length ♂8.36–10.66, ♀9.50–10.05, prozona length ♂3.34–5.40, ♀4.78–5.96, metazona dorsal length ♂4.08–6.05, ♀3.79–4.72, pronotum constriction width ♂2.15–3.15, ♀2.57–2.96, metazona dorsal width ♂5.40–6.97, ♀5.85–6.65, head width ♂4.45–5.72, ♀5.10–5.90, ovipositor length ♀14.68–17.42.

Distribution. Western slope of the southern Sierra Nevada Mountains between the Kaweah River and Tule River watersheds, in the vicinity of Sequoia National Park.

Habitat. Understory of mixed conifer forests, especially in riparian habitats and mesic areas. At the South Fork localities, many adults were feeding on green leaves of mountain mahogany (*Cercocarpus*). Singing males at this locality were observed and recorded in young dead cedars at the forest edge.