

We wonder if the short ovipositor is related to living in lava fields with shallow substrate for oviposition? It would be of interest to know if *G. leei* females oviposit directly into the substrate or can they use pockets of soil and debris within the lava field?

***Gryllus makhosica* Weissman & Gray, n. sp.**

Badland's National Park Field Cricket

Figs 236–238, 251–258, Table 1

'G. #26' of DBW notebooks

Distribution. Known only from Badlands National Park, South Dakota.

Recognition characters and song. A medium sized, slender, always short hind wings, dark colored, long antennae extending well past tip of ovipositor, females with short tegmina and cerci longer than ovipositor in situ. *Song* (Fig. 251, R09-95) a chirp, 3–4 (range 3–5) p/c, 105–185 c/s, PR 16–21. Distinguished from allopatric (nearest populations are ~850 km apart) sister species *G. navajo* from Utah and Arizona by the following: general body color, especially hind femurs, more reddish in *G. navajo* vs. dark in *G. makhosica*. *G. navajo* lives in sandstone badlands vs. clay badlands for *G. makhosica*. Chirps in *G. makhosica* average 3–4 p/c vs. 4–5 in *G. navajo*. Morphologically, *G. makhosica* has more teeth and longer files on average than *G. navajo* (Fig. 252), more teeth and average longer tegmina (Fig. 253), more teeth but similar male hind femur length (Fig. 254), more teeth and less variable teeth/mm (Fig. 255), while female *G. makhosica* appear to have, on average, longer hind femurs and less variable ovipositor lengths (Fig 256). While there is overlap in all of these metrics for these two species (Table 1, p. 18), *G. makhosica* is not a larger cricket than *G. navajo* as indicated by similar hind femur lengths in males (Fig. 254). Distinguished from allopatric (nearest populations are >520 km apart), rock loving sister species *G. saxatilis* with latter having file with more teeth and longer tegmina, longer cerci and longer ovipositor. Distinguished from allopatric (nearest populations over 1000 km apart), lava inhabiting sister species *G. leei* by *G. makhosica* having non-overlapping and longer files, tegmina length, and ovipositors. Distinguished from allopatric (nearest populations are >1100 km apart) *G. longicercus* by DNA and former having fewer teeth in file, fewer teeth/mm, and non-overlapping ovipositor length and pulse rate (Table 1, p. 18).

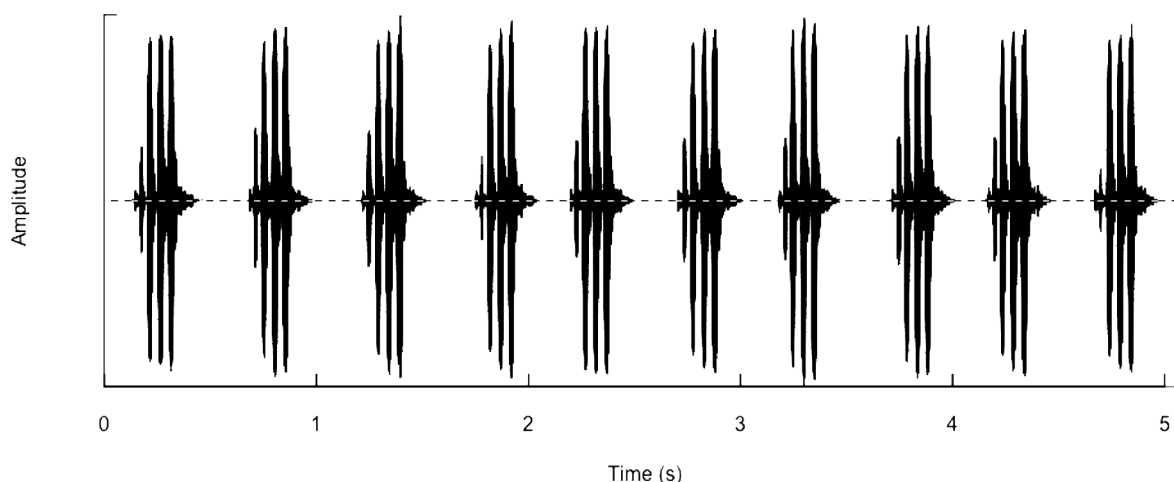


FIGURE 251. Calling song (R09-95) of *G. makhosica* from type locality (S09-89), recorded at 24.5°C.

Holotype. Male (Fig. 257): South Dakota, Jackson Co., Badlands National Park, Cedar Pass Overlook area, 3-vii-2009, 2680', 43° 45' 13.6" -101° 56' 5.1". DB Weissman & DC Lightfoot. S09-89, R09-80, DNA sample G1340. 16S GenBank accession # MK446488; ITS2 GenBank accession # MK441894. BL 20.29, HF 11.89, LC 14.81. Right tegmen removed: 172 teeth, file length 4.0, TL 13.2, TW 5.4. Type deposited in CAS, Entomology Type #19265.

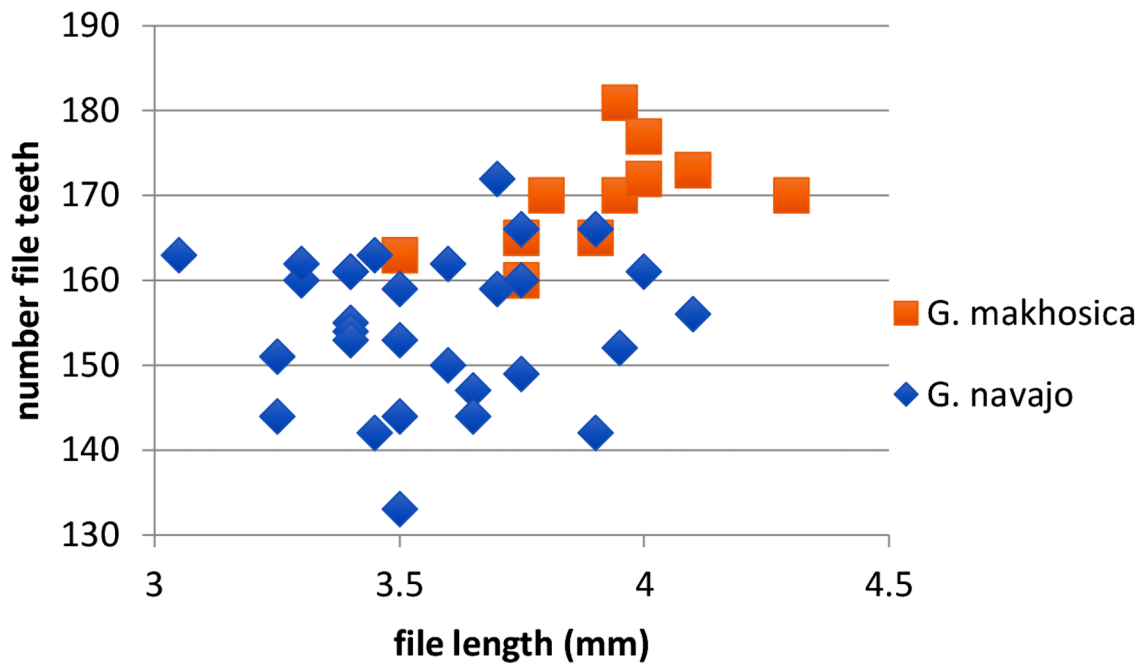


FIGURE 252. Regression file length vs. number file teeth in *G. makhosica* vs. *G. navajo*.

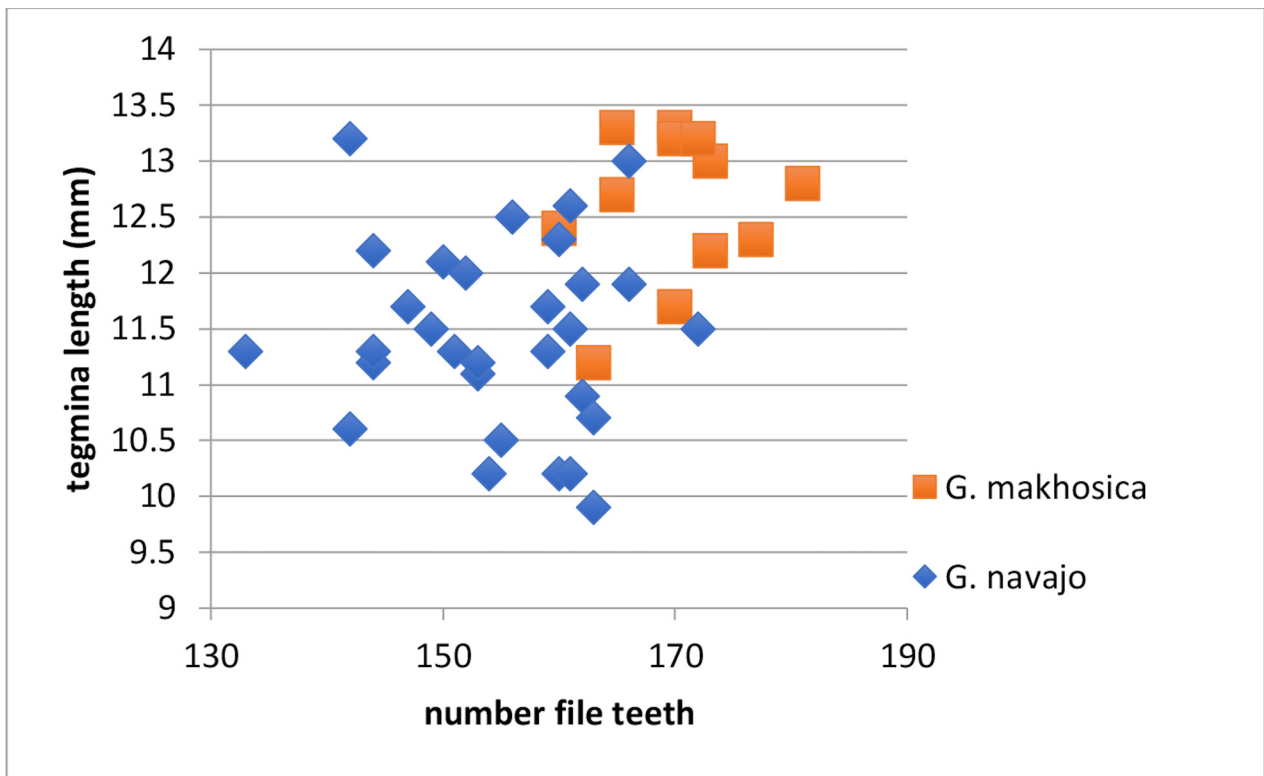


FIGURE 253. Regression number file teeth vs. tegmen length in *G. makhosica* vs. *G. navajo*.

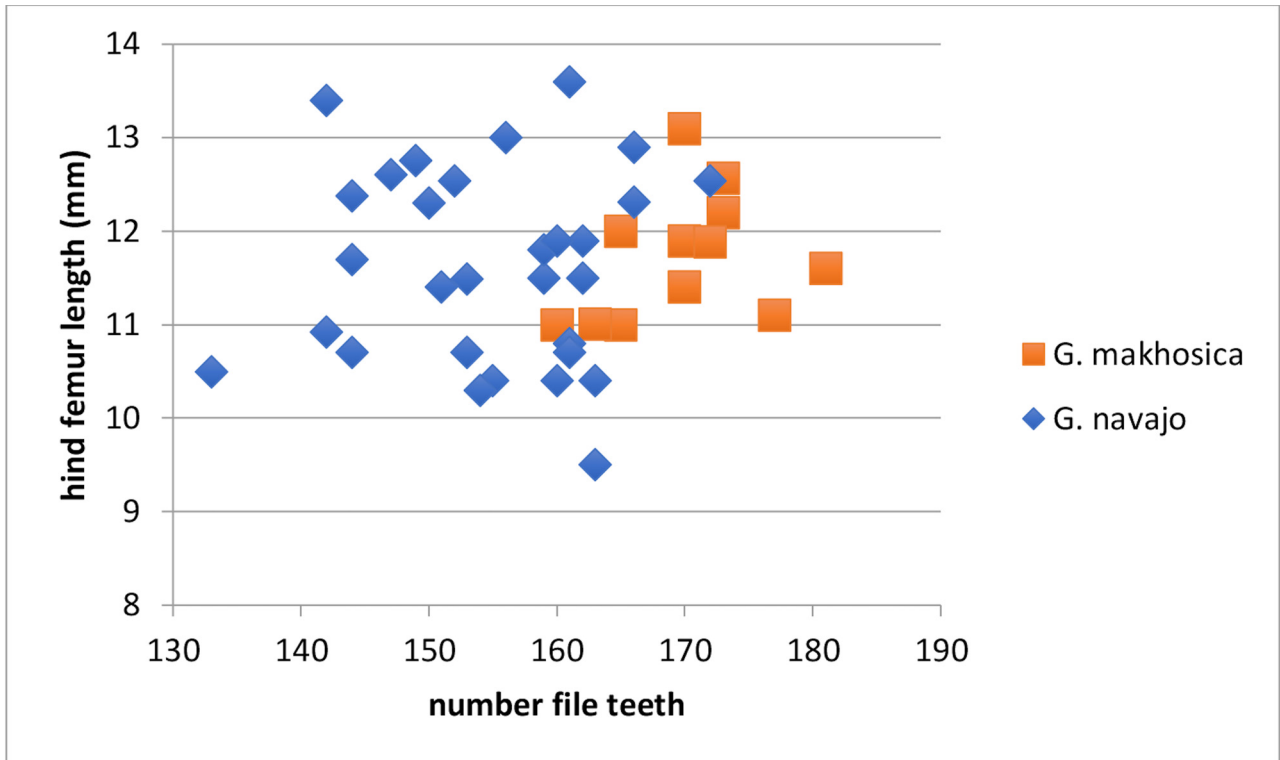


FIGURE 254. Regression number file teeth vs. hind femur length in *G. makhosica* vs. *G. navajo*.

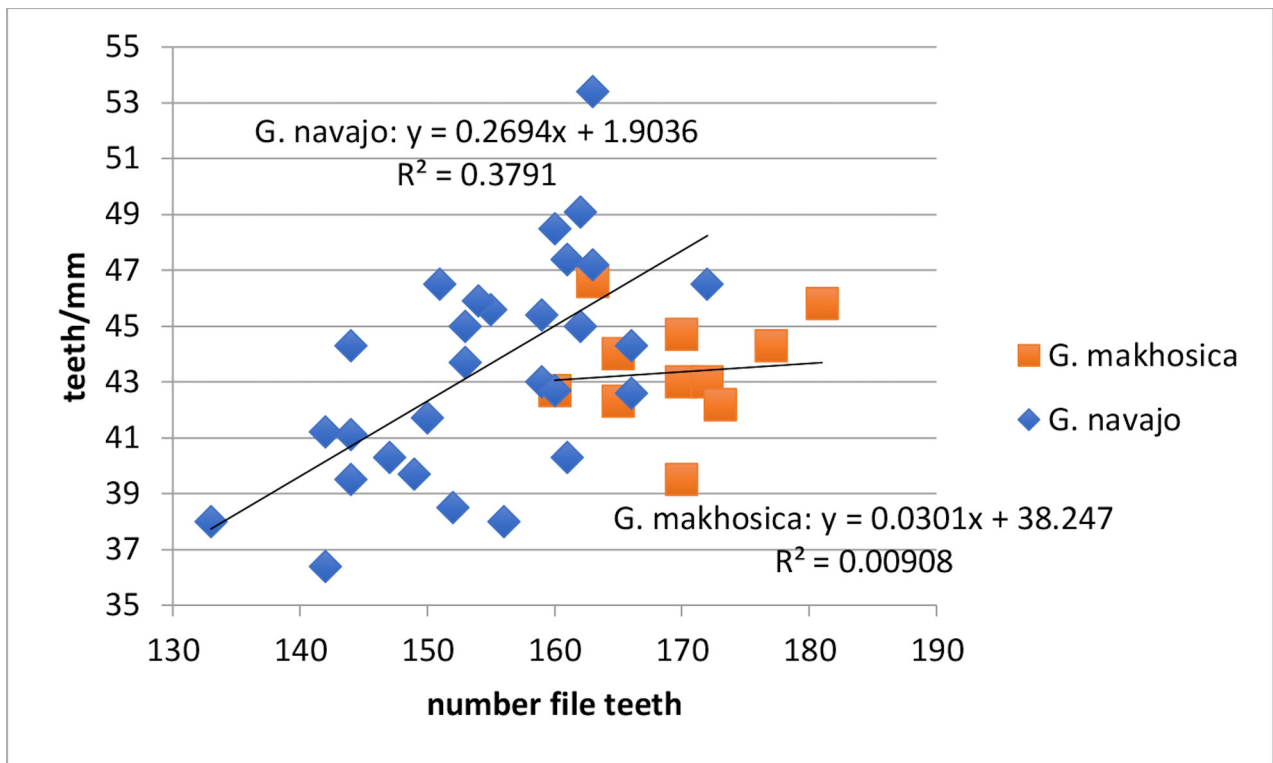


FIGURE 255. Regression number file teeth vs. teeth/mm in *G. makhosica* vs. *G. navajo*.

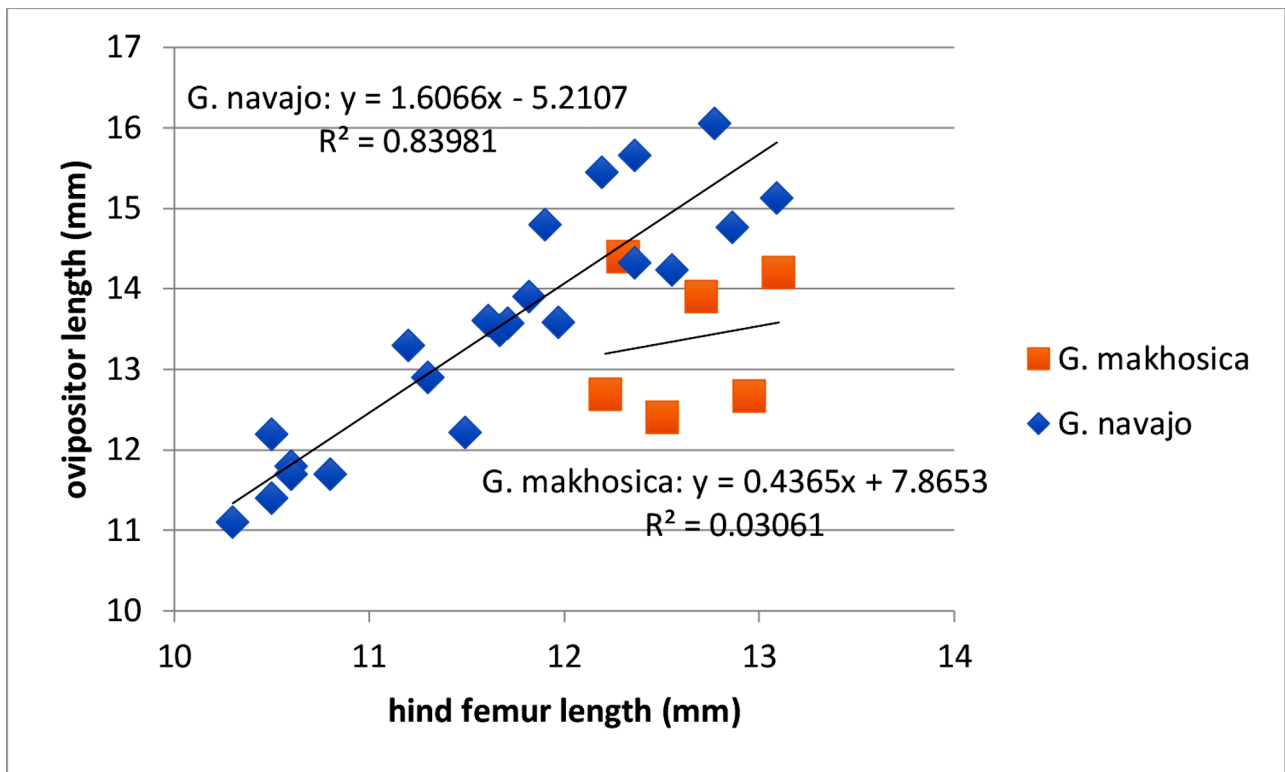


FIGURE 256. Regression hind femur length vs. ovipositor length in *G. makhosica* vs. *G. navajo*.



FIGURE 257. Holotype male *G. makhosica*. Female also from type locality (S09-89).

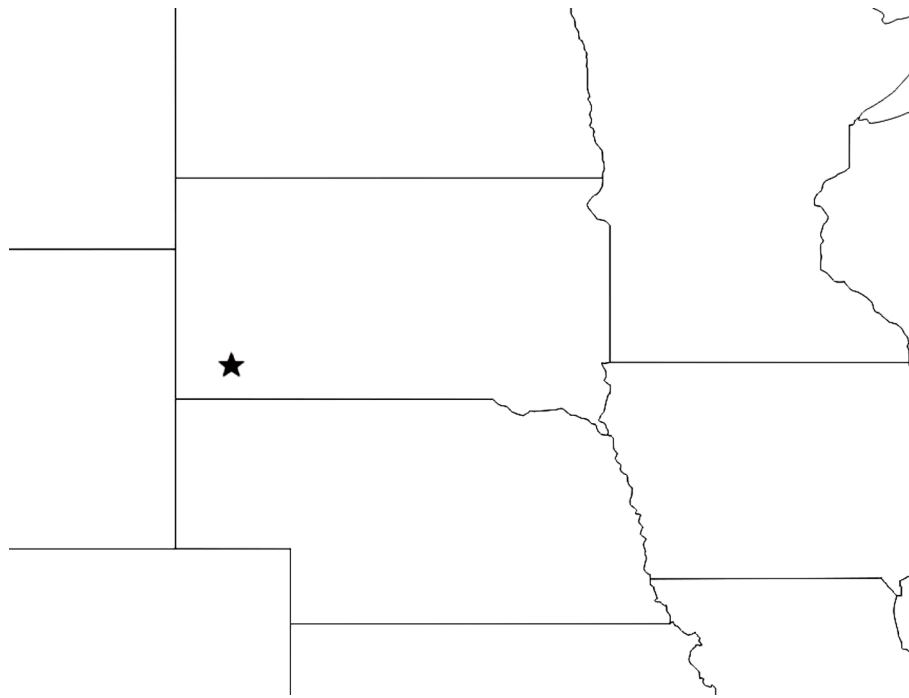


FIGURE 258. Known distribution of *G. makhosica*.

Paratypes. (Total: 12♂ 6♀). **South Dakota.** Type locality, 29-viii-1989 (S89-75) 4♂ 1♀; 22-vi-1993 (S93-53) 4♂ 3♀; 30-vii-1997 (S97-90) 2♂; 3-vii-2009 (S09-89) 2♂ 2♀.

Derivation of name. “makhosica” is Lakota for “badlands” in reference to the cricket’s preferred habitat within Badlands National Park, an area inhabited by the Lakota people, and part of a confederation of seven related Sioux tribes.

Geographic range. (Fig. 258). Known only from Badlands National Park, South Dakota, where males sing from holes and crevices in clay badlands.

Habitat. Males sing from large cracks up to 10m above ground level on the face of badland clay cliffs and escarpments. Heard throughout Park in similar environments. Main canyon at Cedar Pass area with grasses, *Atriplex*, and *Sarcobatus*.

Life cycle and seasonal occurrence. One generation/year. Egg diapause not checked but probably absent since adults singing by late June, 1993. Adults known from 22-vi until 29-viii. One late instar male at S89-75, on 29-viii-1989.

Variation. **Hind femur:** vary in color from tan-orange to black.

DNA. Multilocus G1340 (S09-89). Sister species (Gray *et al.* 2019) are widespread *G. saxatilis*, Utah *G. leeii*, and Utah and Arizona *G. navajo*.

Discussion. Easy to approach. While *G. makhosica* occurs microsympatrically at the type locality with *G. personatus* (also in clay badlands) and *G. veletis* (in adjacent grassy areas), the latter two species are never found singing much above the canyon floor.

G. makhosica is found no closer than 850 km to the nearest population of *G. navajo* in Utah, and we know of no medium to long cerci, slow chirping similar cricket species, or population, between them. Thus, given morphological and habitat differences discussed above, it seems appropriate to treat them as separate species despite their similar multilocus DNA profiles.

***Gryllus navajo* Weissman & Gray, n. sp.**

Painted Desert Field Cricket

Figs 236–238, 252–256, 259–262, Table 1

‘G. #39’ in DBW notebooks.