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A NEW APTEROUS GROUSE-LOCUST FROM  
WESTERN FLORIDA (ORTHOPTERA,  
ACRIDIDAE)<sup>1</sup>

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NEOTENY, or attainment of sexual maturity in spite of cessation of somatic development in some preadult stage, is a phenomenon well-known to occur among termites and certain beetles. I wish to point out that the peculiarities which distinguish adult brachypterous and apterous grouse-locusts from long-winged members of the same or related species are similar to the differences between late instar nymphs and adults of the latter, and that they may be interpreted as the result of neotenic development.

Many species of Acrydiinae are dimorphic, having a "short" form with abbreviated pronotum, tegmina normally developed, but wings reduced or absent, in addition to the "long" or caudate, fully-winged type. More rarely both tegmina and wings are reduced to minute remnants or entirely lost; species thus apterous rarely if ever exhibit a winged phase. Concomitantly with wing reduction the body shows other changes, marked in proportion to the degree of brachyptery; the form becomes more robust, the pronotum more

<sup>1</sup> Contribution from the Department of Biology, University of Florida, and the Museum of Zoology, University of Michigan.

strongly tectate and in side view more elevated and arched above the shoulders, the tegminal sinus shallower, and the scapular and marginal areas of the pronotum broader, covering more of the pleurae and in subapterous species concealing the tegmen and wing rudiments. All of these characteristics resemble those which distinguish nymphs of caudate species from their adults; they are evidently retentions of nymphal features into the adult state, or, in other words, sexual maturity is reached without correspondingly complete maturation of the body form.

The situation in regard to aptery in Acrydiinae appears quite comparable to that which I recently described in the advanced genera of the Ceuthophilini. In some members of that group one or more pairs of tarsi retain throughout life the late embryonic or early nymphal three-segmented condition, instead of proceeding to the four-segmented condition normal for the tribe, while others fail to lose the acuminate tips of the tarsal segments or the ventral row of setae characteristic of early instars but normally absent in the adult. Aptery in Acrydiinae and tarsal modification in the Ceuthophilini both represent specialization by inhibition of certain developmental changes, and are hence to be regarded as neotenic phenomena.

The only apterous or subapterous grouse-locusts hitherto described from North America are *Neotettix proavus* Rehn and Hebard and *N. nullisimus* (Hancock). It is therefore interesting to record the discovery in Florida of a wingless species of *Tettigidea*, a genus in which aptery has not before been encountered.

*Tettigidea empedonepia*,<sup>2</sup> n. sp.

Holotype: Male, "Camp Torreya" ravine, Twp. 2 N., R. 7 W., Liberty County, Florida, April 26, 1924 (Hubbell); allotype a female with the same data; both in the Mus. Zool. Univ. Mich.

<sup>2</sup> From ἔμπεδος = permanent, and νηπία = childhood.

This species is distinguished from all previously described members of the genus in having the wings and tegmina reduced to extremely minute, padlike rudiments completely concealed beneath the sides of the pronotum. It is not closely allied to any species occurring north of Mexico, from all of which it differs in the broader vertex, much more prominent frontal costa, and strongly tectate, granular, pronotal dorsum which lacks or shows only faint indications of supplementary carinae. Of those species occurring in the same region as *empedonepia* none could be confused with it, though late instar nymphs of *T. lateralis* are superficially similar. Such nymphs can be recognized by their weaker sclerotization, nymphal genitalia, large wing-pads hidden under the pronotum, narrower vertex and less prominent frontal costa, and by the presence of faint but evident supplementary carinae on the pronotal disk.

Closest relationship apparently exists to the Central American *Tettigidea nicaraguae* Bruner, with which *empedonepia* agrees in general facies and in pronotal form and sculpture. The new species is slightly more robust, has the frontal costa more advanced before the eyes and less deeply sulcate, and the pronotum distinctly more elevated and suberistate. The two are quite similar in head structure, but in *empedonepia* the eyes are slightly less prominent, the marginal carinae of the vertex terminate more abruptly before reaching the median carina, and the occiput and mesal part of the vertex are more tumid and more abruptly depressed adjacent to the eyes. *T. bruneri* Morse<sup>3</sup> from Mexico is also quite similar, but has more prominent eyes, and narrower vertex with its marginal carinae shorter and more prominent and median carina more delicate; the pronotal disk is also distinctly rugulose, and its median carina in side view much more strongly sinuate and less elevated. *T. nigra* Morse, described from Guerrero, Mexico, may also be related, but is unknown to me except from the description.

<sup>3</sup> Paratypes in the Mus. Zool. Univ. Mich.

DESCRIPTION OF HOLOTYPE MALE.—Size moderate for genus, form robust.

Head: Vertex broad, at anterior margins of adocular lobes barely narrower than greatest (oblique) diameter of eyes in dorsal view, occiput and base of vertex distinctly tumid, narrowly sulcate adjacent to eyes, marginal carinae slightly less coarse than in *lateralis* but similarly shaped, their cephalic margins just appreciably convex and converging at an angle of  $120^\circ$ , at junction with eye bent abruptly caudad, extending slightly less than half-way to adocular lobes, mesal ends terminating abruptly at shallow, anteriorly declivent sulcus bordering and nearly as broad as median carina, sulcus margined by groups of confluent nodules forming weak caudal extensions of mesal ends of marginal carinae; cephalic margin of vertex distinctly advanced before eyes; median carina coarse, broadly rounding into very prominent frontal costa; latter heavy, broader opposite antennal bases than proximal antennal segment, sulcate from just below vertex, but less deeply so than in *nicaraguae*, in lateral aspect broadly convex, advanced before eyes a distance equal to three-eighths their horizontal breadth, meeting lower part of front at slight angle; eyes about as in *lateralis*, less prominent than in *nicaraguae*; antennae 3.2 mm. long.

Pronotum: Short, apex reaching tip of abdomen, less slender than in *nicaraguae*, cephalic margin obtuse-angulate, disk concave-tectate, median carina subcristate, in lateral aspect elevated above humeri a distance more than half as great as caudal height of lateral lobes, broadly arcuate in prozonal region, slightly sinuate above humeri and nearly straight caudad; disk granulate, not rugose nor with distinct supplementary carinae, but some of granules aligned to form faintly indicated longitudinal rows; prozonal region moderately constricted, its carinae low and blunt but definite, subparallel, faintly concave outward; sulci moderately impressed where they cross shoulders, ending on disk in shallow, irregularly depressed fossae; humeral angles carinate, very obtusely angulate; lateral lobes two-thirds as tall as dorsal length, ventral

margin subequal to caudal height, ventral sinus large, rounded-obtuse, dorsal (tegmental) sinus very shallow. Ventral angle of metathoracic epimeron a small, acute-triangular point.

Legs: Cephalic femur distinctly tumid. Caudal femur short, moderately stout, three times as long as broad.

Genitalia: As shown in Walker's figures<sup>4</sup> of *lateralis*, except apex of pseudosternite less sclerotized and shorter than in preparations of that species made for comparison.

DESCRIPTION OF ALLOTYPIC FEMALE.—Considerably larger and more robust, but otherwise similar to male in ambisexual characters. Eyes less prominent than in male, dorsal aspect of head consequently suggesting that of *prorsa*, but vertex and frontal costa not at all as in that species; marginal carinae of vertex less prominent than in male, and terminating farther from median carina; breadth of vertex 1.1 times greatest (oblique) diameter of eye in dorsal view; pronotum slightly more compressed between shoulders than in male, median carina in side view elevated above humeri a distance two-thirds as great as caudal height of lateral lobes; ovipositor like that of *lateralis*, dorsal valves in side view subequal and tip abruptly oblique-truncate, less gradually narrowed than in *nicaraguae*.

COLORATION.—Resembling *lateralis* and differing from *nicaraguae* and *bruneri* in having the face and ventral margins of the pronotal lobes pallid in the male, concolorous with rest of body in the female. General coloration yellowish, reddish, or grayish brown, rarely with conspicuous pattern; surface dull, except polished summits of tubercles, carinae, and calloused areas of lateral lobes of pronotum. Average coloration is as follows: Male—greater part of head, ventral margins of lateral lobes of pronotum, abdominal sternites, mesal parts of thoracic sterna, and apical abdominal segments pale, generally yellowish, face often whitish; distal two segments of maxillary

<sup>4</sup>“The Terminal Abdominal Structures of Orthopteroid Insects: A Phylogenetic Study, Pt. II,” *Ann. Ent. Soc. Amer.*, 15 (1922): Pl. VI, Figs. 58, 59.

TABLE I  
MEASUREMENTS IN MILLIMETERS, SHOWING EXTREMES

	Length body	Length pronotum	Humeral breadth pronotum	Length caudal femur	Breadth caudal femur
Males					
Holotype . . . . .	8.8	8.0	2.2	5.4	1.8
Paratopotype ..	8.6	7.2	2.0	5.2	1.8
Paratopotype ..	9.1	8.2	2.1	5.6	1.9
Females					
Allotype . . . . .	11.4	10.6	3.1	6.9	2.4
Paratopotype ..	9.5	8.3	2.4	5.7	1.9
Paratopotype ..	12.0	11.4	3.1	7.0	2.4

palpi pallid; vertex and pronotal dorsum yellowish or reddish brown, sometimes immaculate, often with faintly indicated markings of darker brown; postocular macula on head, upper parts of lateral lobes of pronotum, pleurae, and base of abdomen dark brown (wood brown), this especially intense on pronotal calloused areas, pleurae, and abdominal segments; these brown areas forming a rather conspicuous oblique lateral band, generally interrupted by a paler blotch on the part of the lateral lobe next the humeral angle; legs of the dorsal coloration, femora indistinctly shaded or largely suffused with darker brown, cephalic and middle tibiae twice ringed with brown, caudal tibiae suffused with brown except for pale basal annulus. Female—coloration as in male, except head and lower margin of lateral lobes of pronotum not pale, and sides of abdomen with three rows of small pale spots extending to base, instead of base being solidly brownish.

VARIATION.—Structural variation is very slight, as would be expected in a series taken in a single restricted area. There is some variability in coloration, though less than in *lateralis* and other North American species. As a whole the series is quite uniform, but the following chromatomorphs are represented: (a) dorsum dark brown, plain, or speckled with blackish; (b) dorsum light yellowish brown, plain, or with fine brownish maculae, rarely with traces of humeral saddle-mark, one speci-

men with median pale stripe. With these conditions are variously combined the following: (a) upper part of caudal femur with three narrow pale bars; (b) caudal femur with single conspicuous pale blotch at mid-length; (c) median carina of pronotum alternately blotched with dark and light (the usual condition); (d) median carina of pronotum uniformly pale.

Specimens examined: 131—53 ♂, 74 ♀ (holotype, allotype, and paratypes), and 4 nymphs, all from the type locality, as follows:

Florida: "Camp Torreya": April 25–26, 1924, 11 ♂, 14 ♀ (including holotype and allotype); May 29, 1924, 8 ♂, 13 ♀; June 2, 1924, 20 ♂, 28 ♀; Aug. 1, 1925, 1 juvenile ♀; Oct. 16–17, 1925, 10 ♂, 1 juvenile ♂, 15 ♀, 2 juvenile ♀; March 14, 1929 (E. T. Boardman), 1 ♂, 1 ♀; April 6, 1929, 1 ♂; Nov. 15, 1931, 2 ♂, 2 ♀ (all collected by Hubbell except as indicated).

HABITAT AND LIFE HISTORY.—*Tettigidea empedonepia* has been found only in one of the ravines cutting back into the uplands which border the Apalachicola River on the east. These ravines are deep and narrow, moist, and filled with a heavy forest dominated by beech and magnolia. Isolated by the lowlands west of the river and the xeric, scrub-oak-covered uplands which surround them, they harbor an unusually interesting biota comprising coastal plain species, glacial relicts of northern affinities, and a smaller number of endemic plants and animals nearly or quite restricted to them. Such endemics are the shrubs Torreya or savron, *Tunion taxifolium* (Arr.) Greene, and Florida yew, *Taxus floridanus* Nutt., and the Orthoptera *Hubbellia praestans* Hebard, *Ceuthophilus umbrosus* Hubbell, and the present species.

"Torreya Ravine," at the point where the type series was secured, is about one hundred feet deep, with a small stream flowing through it. Torreya and needle-palm grow abundantly in the shade of the taller trees, and the steep, sandy slopes are thickly covered with dead leaves and leaf mold. *Tettigidea empedonepia* has been taken in this habitat at all times of the year, and on nearly every occasion when it was sought for. In April, 1924, it was scarce but generally distributed among

the dead leaves from about forty feet below the brink of the ravine to the bottom; May 29, 1924, five males and thirteen females were taken in two hours' intensive search, and five days later twenty males and twenty-eight females were found in three hours. On the latter occasion several pairs were taken in copula; no nymphs were present. On October 16, 1925, the species was nearly as numerous as in the spring, but November 15, 1931, only four individuals were found in an afternoon's collecting. The only immature specimens which have been taken are four late instar nymphs, one found August 1, three on October 16. It was noted on two occasions that while the species occurs sparsely throughout the ravine, small groups of six to ten individuals are sometimes found within a space of a few square yards, often about small hollows filled with an unusually deep accumulation of moist, decaying leaves.

The species is associated with the following Orthoptera characteristic of the ground stratum of the *Torreya* ravines: *Cariblatta lutea lutea* (S. and Z.), *Ischnoptera deropeltiformis* (Brunner), *Parcoblatta uhleriana* (Saussure), *P. divisa* (S. and Z.), *Eurycotis floridana* (F. Walker), *Neotettix proavus* R. and H. (much less numerous than *T. empedonepia*), *Melanoplus querneus* R. and H., *M. tepidus* Morse (mostly near brink in drier, more open margins), *Atlanticus americanus hesperus* Hebard, *Ceuthophilus gracilipes apalachicola* Hubbell, *C. umbrosus* Hubbell, *C. rogersi* Hubbell; *Nemobius ambitiosus* Scudder, *N. carolinus carolinus* Scudder, *N. confusus* Blatchley, *Hapithus agitator quadratus* Scudder, *Anaxipha exigua* (Say), and *Cycloptilum trigonipalpus* (R. and H.), the last equally numerous on the ground and on foliage and tree trunks.

GENERAL CONSIDERATIONS.—It seems highly probable that *Tettigidea empedonepia*, like the other endemics mentioned above, is a surviving relict rather than a "young" species. Its Central American affinities align it with a group of species now isolated in Florida, which have their nearest relatives in the southwestern United States or in Mexico, and which must have reached Florida by migration along the Gulf Coast in



preglacial or interglacial times. Orthoptera which are believed to have had such a history are *Arenivaga floridensis* Caudell (the other species of the genus southwestern), *Mantoida maya* S. and Z. and *Phriza maya* S. and Z. (both known from Yucatan and Florida). The characteristically Floridian genus *Aptenopedes* probably developed from migrant stock of an earlier wave coming from the southwest, and *Gymnoscirtetes* may have had a similar origin.

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PLATE I

***Tettigidea empedonepia*, n. sp.**

FIGS. 1*a*, 1*b*.—Holotypic male, approximately  $\times 8$ .

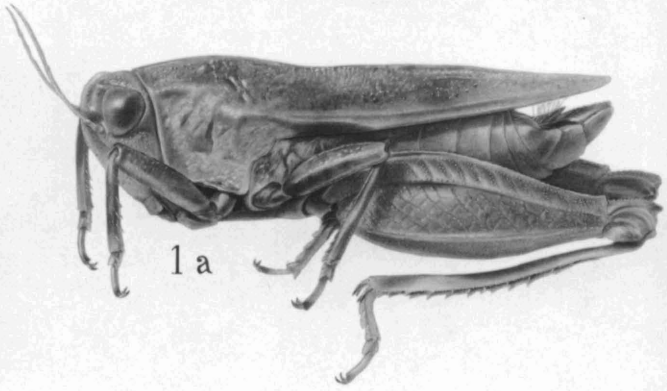
FIGS. 2*a*, 2*b*.—Allotypic female, approximately  $\times 8$ .



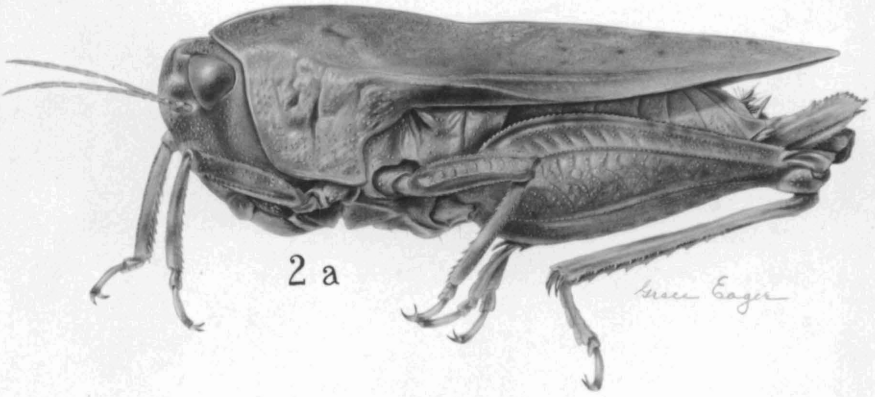
1b



2b



1a



2a

*Wm. Eger*





