GEOLOGICAL SURVEY OF ALABAMA

WALTER B. JONES, State Geologist

MUSEUM PAPER 27

ALABAMA MUSEUM OF NATURAL HISTORY

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INTRODUCTION

For many years Dr. Valentine has carried out field and laboratory studies of Anaphthalmid beetles, and has made important contributions to a fuller knowledge and understanding of that group. It is intended that Dr. Valentine prepare a complete paper on the group, to be published, along with similar studies of other forms of cave faunas by other specialists, in our forthcoming monograph on caves and caverns of Alabama. However, many caves remain to be studied, so it was decided to publish certain specific data from time to time, that the information might be available to all interested parties. Later on, the cave monograph will carry a complete discussion of the group.

ACKNOWLEDGEMENTS

We give our grateful thanks to Jim Van Antwerp, Mobile, Alabama, who generously provided funds for publication of this paper. Also we wish to thank Harvey Templeton, Dr. Edward McCrady, Jr., Leslie Hubricht, and Ira C. Royer, who contributed specimens and other valuable assistance.

WALTER B. JONES
State Geologist

NEW ANOPHTHALMID BEETLES (FAM. CARABIDAE) FROM THE APPALACHIAN REGION

J. MANSON VALENTINE

GENERAL DISCUSSION

Since the time of publication of the author's last paper* dealing with the anophthalmid fauna of the Appalachian valleys, considerable material in the group has accumulated. Study of the various collectings has revealed a number of new species and geographic races at present referable to the genus *Pseudanophthalmus* Jeannel. These new forms are described herein.

The technique of description follows very closely that employed in the article referred to above, which contains definitions of measurements and their derived indices as well as evolutionary and distributional conclusions applicable to the present work. In order better to interpret the data appearing below it is desirable to use the two papers in conjunction.

Abbreviations employed in description have the following meanings: L.—total length; W.—maximum width; D.—maximum depth; w.—width index; d.—depth index; h.—cephalic index; p.—pronital index; e.—elytral index; a.—antennal index; s.—antennal segmental index; c.—chaetotaxial index; g.—genital index.

Pseudanophthalmus intermedius templetoni new subspecies

Type locality: Higginbotham's Cave, McMinnville, Warren Co., Tenn.

Type series: Holotype, allotype, type locality, Aug. 14, 1946, McCrady, Templeton, Henrot, Valentine; 2 paratypes, type locality, earlier collecting, McCrady.

*Speciation and Raciation in *Pseudanophthalmus*: Trans. Conn. Acad. Arts Scs., vol. 36, pp. 631-672, July 1945.

Holotype male: L.—7.18 mm.; W.—2.32 mm.; D.—1.65 mm.; w.—.32; d.—.23; h.—.53; p.—1.03; e.—.59; a.—.66; s.—.68; c.—.50; g.—.52.

Allotype female: L.—6.45 mm.; W.—2.03 mm.; D.—1.40 mm.; w.—.32; d.—.22; h.—.53; p.—1.09; e.—.58; a.—.66; s.—.68; c.—.52; (Pl. I, fig. 1)

Templetoni may be readily distinguished from *intermedius* s. str. by its larger size, more elongate and less convex form, more attenuate palpi (terminal and subterminal maxillary segments subequal), more deeply impressed striae, and by its paler, testaceous coloration which differs from the darker, more ferruginous cast of typical *intermedius*. A large male specimen of the latter from Wonder Cave, Monteagle, Tenn. supplied the following measurements and indices, given here for comparison: L.—6.05 mm.; W.—2.08 mm.; D.—1.40 mm.; w.—.35; d.—.23; h.—.57; p.—1.28; e.—.64; a.—.75; s.—.72; c.—.65; g.—.24. The aedeagus of *templetoni* agrees in all major respects with that of true *intermedius* but differs in having an evenly arcuate (not flattened) apical profile, and in having a more cylindrical, less acutely pointed transfer apparatus. (Pl. II, fig. 1)

Intermedius s. lat. is a very distinctive species. It is characterized by its large size, relative convexity, long jaws and other appendages, reduced humeri, and glabrous condition. The chaetotaxial index is low, indicative of a wide gap separating the closely grouped humeral and medial sets of marginal papillae. The genital index is unusually high. Though slightly smaller, in general aspect the species is quite reminiscent of *Neaphaenops;* and it is worthy of note that the male holotype of *templetoni* is the largest single specimen of its genus so far recorded.

With *robustus* and *macradei,* smaller but related species similarly convex and devoid of pubescence, *intermedius* is associated, the group apparently being confined to caves of Cumberland River drainage in Tennessee. The type localities of the two known races of *intermedius* are about thirty miles apart.

The author takes pleasure in naming the above described form in honor of Harvey Templeton, an ardent cave enthusiast and collector who ably assisted in the capture of this and other unique cave beetles.

Pseudanophthalmus macradei new species

Type locality: Higginbotham's Cave, McMinnville, Warren Co., Tenn.

Type series: Holotype, allotype and 2 paratypes, type locality, Aug. 14 1946, McCrady, Templeton, Henrot, Valentine.

Holotype male: L.4.40 mm.; W.—1.50 mm.; D.—1.10 mm.; w.—.34; d.—.25; h.—.61; p.—1.10; e.—.64; a.—.61; s.—.77; c.—.74; g.—.24. (Pl. I, fig. 2)

Allotype female: L.—4.82 mm.; W.—1.66 mm.; D.—1.25 mm.; w.—.35; d.—.26; h.—.66; p.—1.17; e.—.65; a.—.64; s.—.78; c.—.71.

Description of Type Series.

Body: Elongate, convex; ferrugino-testaceous; finely reticulo-alutaceous.

Head: Narrow; microsculpture slightly coarser than elsewhere; labrum with well defined median tooth; tooth of mentum deeply emarginate.

Pronotum: Narrow, convex; anterior angles obtusely rounded, sides gently sinuate, posterior angles sharply rectangular or acute and somewhat produced, basal (secondary) angles very obtuse or rounded, basal margin nearly straight or slightly convex; lateral reflexed margin narrow; basal impressions rather deep, these and basal disc coarsely reticulate; disc glabrous, convex.

Elytra: Narrow, convex, glabrous; humeri rounded, sides gently arcuate, apex rounded; reflexed margin narrow, feebly serrate and ciliate at humeri, somewhat expanded apically at point of juncture with epipleura; striae fairly well impressed, vaguely punctured, anterior portion of recurved

apical stria relatively short, gently arcuate or parallel to suture; humeral papillae rather widely distributed, spread over a distance nearly equal to three fourths that between the humeral and medial sets; humeral impressions shallow, ill defined, disc only slightly flattened.

Appendages: Jaws, palpi elongate, subterminal segment of maxillary palpi 6/7ths the length of terminal; antennae, legs long, testaceous.

Aedeagus: Median lobe long, narrow, cylindrical, basal bulb well defined, basal flexure proximal; apical process, short, narrow in dorsal profile, decurved; transfer apparatus relatively short, copulatory pieces two—an internal rod and an external enveloping piece, the latter spout-shaped in dorsal, broadly spatulate in laterial view; parameres elongate, with four long, stout setae. (Pl. II, fig. 2)

Four species of *Pseudanophthalmus* are now known from the Cumberland River drainage system. Although of diverse form (*macradei* and *intermedius* elongate, *robustus* and *cumberlandus* transverse), they show a certain kinship in a general tendency toward convexity and in their complete lack of pubescence, a character rarely met with in the genus. There is also considerable correspondence in aedeagel equipment, especially between the first three species mentioned, the ranges of which overlap in west central Tennessee. *Cumberlandus* inhabits the main river valley of the Cumberland.

It is a great pleasure to name the fine species treated here in honor of Dr. Edward McCrady, Jr., of the University of the South, who first made a biological survey of the McMinnville caves several years ago and discovered their beetle fauna.

Pseudanophthalmus lodingi fulleri new combination

Pseudanophthalmus fulleri Valentine (32-272)

Type locality: Tennessee Caverns,Raccoon Mt., Chattanooga, Tenn.

Topotype male: (Aug. 11 1946, Henrot): L.—4.70 mm.; W.—1.60 mm.; D.—1.00 mm.; w.—.34; d.—.21; h.—.74; p.—1.20; e.—.60; a.—.65; s.—.82; c.—.81; g.—.12.

Topotype female: (April 19 1935, Valentine Beakley): L.—4.65 mm.; W.—1.51 mm.; D.—1.06 mm.; w.—.32; d.—.23; h.—.72; p.—1.18; e.—.59; a.—.63; s.—.81; c.—.81.

Although its resemblance to certain races of *lodingi* has been demonstrated, until males were collected, *fulleri* has necessarily been considered a distinct species. Study of the aedeagus, however, reveals very close affinity to *lodingi,* particularly to those races of the species found south of the Tennessee River in Marshall and Morgan Counties in Alabama. Populations occupying this region seem to form a natural group by virtue of their more or less complete isolation from the probable parent colonies to the north. The main point of difference lies in the apex of the median lobe of the aedeagus which is relatively wide and truncate in dorsal profile. In body form they depart slightly by being more parallel throughout, a character noticeable not only in the more conspicuous humeri and straight-sided elytra, but also in the pronotum which tends toward a wider base and more rectangular, less sinuate posterior angles. *Fulleri* represents an extreme of this evolutionary trend in material thus far collected. However, it is possible to arrange a series demonstrating an obvious cline from *lodingi* through *aladdini* and *aquaticus,* all on the north side of the river, to *meridionalis, fluviatilis, distinguens* and *fulleri* on the south side. The two last named are relatively aberrant stocks, living in caves respectively to the northwest and northeast of the more typical, (and probably ancestral) colonies inhabiting the southernmost reaches of the Tennessee Valley in Marshall County.

The aedeagus of *fulleri* resembles most closely that of *meridionalis,* having a relatively short transfer apparatus and an apical process of uniform width in dorsal view. However, the median lobe is more produced and terminates in a slight-

ly flared, very truncate tip. The parameres are shorter and are armed with three, short, stout setae. (Pl. II, fig. 3)

Pseudanophthalmus lodingi fluviatilis new subspecies

Type locality: Rock House Cave, 1 mile south of Oleander, Marshall County, Ala.

Holotype male: L.—4.35 mm.; W.—1.49 mm.; D.—1.00 mm.; w.—.34; d.—.23; h.—.68; p.—1.19; e.—.63; a.—.66; s.—.81; c.—.84; g.—.11.

Superficially, *fluviatilis* is very similar to *meridionalis*. The pronotum is narrower, the elytral pubescence, though extremely short and fine, is a little more obvious and the median tooth of the labrum is obsolete, but in other respects the two forms seem outwardly identical. The aedeagus of *fluviatilis*, however, is considerably shorter than that of *meridionalis*, and its median lobe, viewed dorsally, ends in a wider, more truncate process. (Pl. II, fig. 5)

A single male was collected by Dr. Walter B. Jones on the 23rd of June, 1942, in a cave but six miles from the Tennessee River and fifteen miles northwest of the type locality of *meridionalis*. The unique find is an unusually dark specimen, being ferruginous with pale elytral apex and appendages.

Pseudanophthalmus lodingi distinguens new subspecies

Type locality: Inge Cave, 5½ miles south of Trinity, Morgan County, Ala.

Type series: Holotype, allotype and 4 paratypes, type locality, Sept. 14 1947, Jones and Royer.

Holotype male: L.—4.38 mm.; W.—1.46 mm.; D.—1.00 mm.; w.—.33; d.—.23; h.—.66; p.—1.10; e.—.60; a.—.67; s.—.80; c.—.76; g.—.13.

Allotype female: L.—4.43 mm.; W.—1.50 mm.; D.—1.00 mm.; w.—.34; d.—.23; h.—.68; p.—1.14; e.—.61; a.—.65; s.—.87; c.—.73.

Compared with other races of *lodingi* situated south of the Tennessee River, *distinguens* agrees in having relatively

parallel-sided elytra, relatively wide pronotal base and rectangular hind angles, but differs from all so far considered in possessing a narrower, straighter-sided pronotum, the margin of which, anterior to the hind angles, is interrupted by a low convexity or tubercle, the angle apices themselves being sharp and somewhat produced. Far more striking, however, are the characters of the aedeagus. The median lobe of this organ terminates in a flared, truncate process the right contour of which is widely rounded. The transfer apparatus is short and arciform in dorsal view and the setae (3) of the parameres very small. (Pl. II, fig. 4)

Although *distinguens* may demonstrate by these aberrant traits a certain geographic isolation, it is easy to see how the race could have evolved from an ancestor like *fluviatilis* which possesses similar specializations in less exaggerated form. The latter, in turn, is easily derivable from *meridionalis*. In this connection it is important to note that a line drawn between the locations of these three races is a nearly straight one running northwest-southeast parallel to the Tennessee five to ten miles south of it; and that, furthermore, each locality represents a separate, minor drainage area, the creek involved in each case heading north to the main river. Thus a very perfect racial cline can doubtless be established between *meridionalis* at the bend of the river and *distinguens*, forty five miles to the northwest, (or between the former and races farther to the west departing still more drastically from type than does *distinguens*) when the caves of this interesting region yield additional material. A race connecting *fluviatilis* and *distinguens*, now represented by a single teneral male from an intermediate locality, awaits description until a series can be collected.

Pseudanophthalmus hubrichti new species

Type locality: Dougherty's Cave, 4½ miles north of Lebanon, Russell Co., Va.

Type series: Holotype, allotype and 1 paratype, type locality, July 25 1939, Hubricht.

Holotype male: L.—3.80 mm.; W.—1.24 mm.; D.—.73 mm.; w.—.33; d.—.19; h.—.70; p.—1.14; e.—.60; a.—.67; s.—.93; c.—1.09; g.—.14. (Pl. I, fig. 3)

Allotype female: L.—4.00 mm.; W.—1.30 mm.; D.—.80 mm.; w.—.33; d.—.20; h.—.72; p.—1.16; e.—.58; a.—.68; s.—.93; c.—.84.

Description of Type Series.

Body: Rather elongate, compressed; testaceous; very finely alutaceous.

Head: Normal, rather narrow, sides gently arcuate; pale ferrugino-testaceous; microsculpture relatively coarse, reticulo-alutaceous; median tooth of labrum obsolete; median tooth of labium finely, shallowly emarginate.

Pronotum: Normal, rather narrow, 4/5ths as long as wide, width at base 7/8ths of width at apex; anterior angles rounded, sides gently sinuate along entire extent, posterior angles sharply rectangular, basal (secondary) angles evident, obtuse, basal margin very slightly convex medially; lateral reflexed margin narrow; basal impressions rather deep, distinctly reticulate; disc convex, median line deeply impressed, glabrous.

Elytra: Normal, rather elongate, 5/8ths as wide as long, finely, sparcely pubescent; humeri rounded, sides very gently arcuate, subparallel over anterior third, apices truncate, dihiscent; reflexed margin rather wide, confluent with shallow fovea at humeri, margin obsoletely serrate at humeri, ciliate throughout; striae evident but weak, distinctly punctured, recurved portion of apical stria fairly long, straight, curved inward proximally; humeral and medial sets of marginal papillae widely distributed, especially the latter; humeral region subcarinate, disc flat.

Appendages: Normal, jaws rather short; subterminal segment of maxillary palpus ¾ths the length of terminal segment; second antennal segment approximately 9/10ths the length of third.

Aedeagus: Median lobe arciform, with basal bulb and basal flexure poorly defined; apical process short, tapering in dorsal profile to subtruncate, slightly flared apex; transfer apparatus composed of a shorter internal and a longer enveloping piece, the latter rounded at the tip; parameres relatively long, bearing three short setae. (Pl. I, fig. 4)

Noteworthy characters which set this unique species apart from others of the genus are the unusual discrepancy in size between the segments of the maxillary palpi, the near equality in length of the second and third antennal segments, the wide separation of the medial setigerous papillae of the elytral margin and the peculiarly angular, truncate elytral apices.

Of problematic affinity, *hubrichti* seems to be either a relique of an archaic stock or an extreme isolation product originating from some such conservative ancestry as *hirsutus* might provide. The general body form and aedeagus are suggestive of the latter species which inhabits caves of Powell River drainage, seventy miles or so to the southwest of *hubrichti*. The waters from the neighborhood of Dougherty's Cave evidently join the Clinch River. These parallel streams are both tributaries of the Tennessee.

The present species bears the name of its discoverer, Leslie Hubricht, who made a biological survey of many Appalachian caves in 1939.

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Explanation of plates.

PLATE I

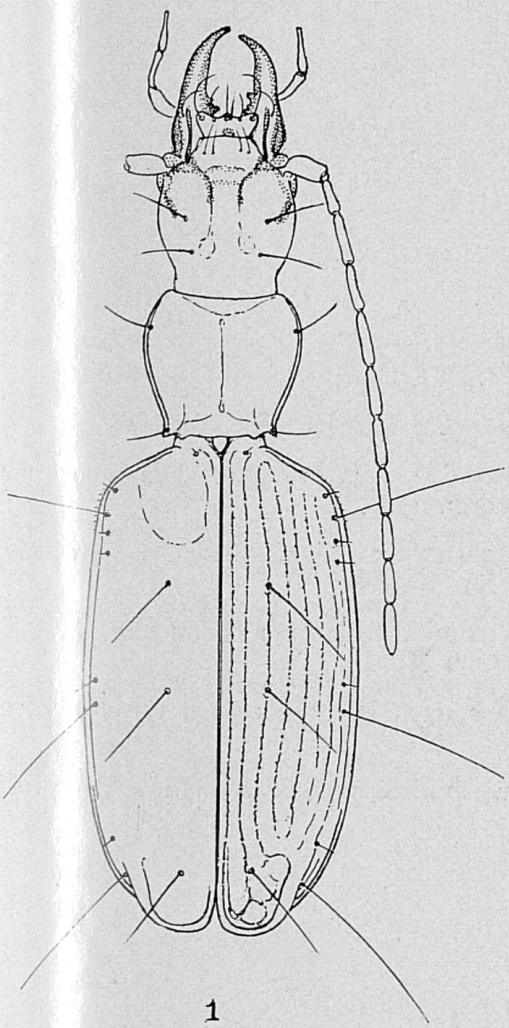
Fig. 1. *Pseudanophthalmus intermedius templetoni* n. ssp., allotype female; Higginbotham's Cave, McMinnville, Tenn. (18 X)

Fig. 2. *P. macradei* n. sp., holotype male; Higginbotham's Cave, McMinnville, Tenn. (18 X)

Fig. 3. *P. hubrichti* n. sp., holotype male; Dougherty's Cave, Lebanon, Va. (18 X)

Fig. 4. Aedeagus of *P. hubrichti* n. sp., holotype; dorsal view. (100 X)

PLATE I *Valentine*



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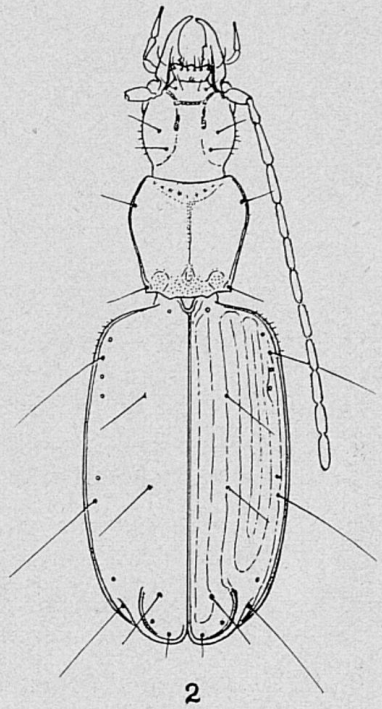

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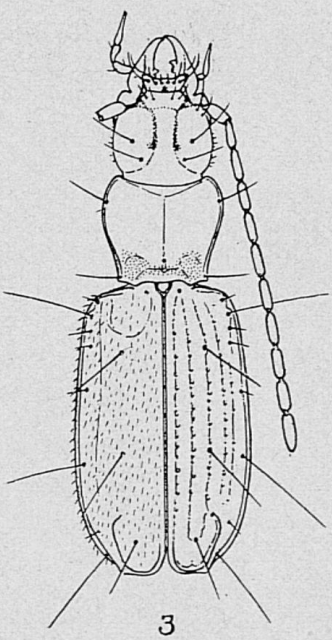

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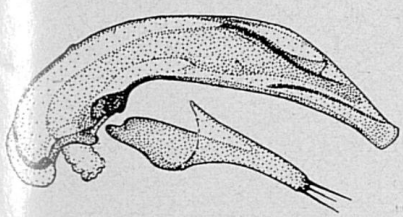

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PLATE II

Aedeagi of *Pseudanophthalmus* sps., dorsal views.

Fig. 1. *P. intermedius templetoni* n. ssp., holotype; Higginbotham's Cave, McMinnville, Tenn. (95 X)

Fig. 2. *P. macradei* n. sp., paratype; Higginbotham's Cave, McMinnville, Tenn. (95 X)

Fig. 3. *P. lodingi fulleri,* n. comb., topotype; Tennessee Caverns, Chattanooga, Tenn. (100 X)

Fig. 4. *P. lodingi distinguens* n. ssp., holotype; Inge Cave, Trinity, Ala. (100 X)

Fig. 5. *P. lodingi fluviatilis* n. ssp., holotype; Rock House Cave, Oleander, Ala. (100 X)

PLATE II *Valentine*