THE STATUS OF *CONOCEPHALUS FASCIATUS VICINUS* (MORSE, 1901) (ORTHOPTERA: CONOCEPHALIDAE)

by

JOHN E. R. STAINER[1]

ABSTRACT

It has been common practice to divide **Conocephalus fasciatus** (DeGeer, 1773) into two subspecies: **C. f. fasciatus** from eastern North America and **C. f. vicinus** (Morse, 1901) from the west. The criteria for this division are examined and evidence introduced to show that the name **vicinus** should be suppressed and that the entire taxon should be called **Conocephalus fasciatus** (DeGeer, 1773).

LITERATURE REVIEW

The name of this taxon has undergone many changes since DeGeer (1773) described a tettigoniid from Pennsylvania which he called *Locusta fasciata.* Thunberg (1815) set up the genus *Conocephalus* which was intended to include, among others, the "cone-headed grasshoppers" now placed in *Neoconocephalus* Karny, 1907, and the "meadow-grasshoppers" presently placed in the group. Audinet-Serville (1831) briefly described a genus, *Xiphidion,* which included among its species *Xiphidion fasciatum* (DeGeer). Burmeister (1839) emended the suffix so that the name of the genus became *Xiphidium.* These two names were thereafter used more or less interchangeably for the balance of the nineteenth century.

Kirby (1890) listed four references to *Xiphidion* and one to *Xiphidium.* A few authors, including Kirby (1906), used the name *Anisoptera* Latreille, 1829, for the same taxon. Rehn (1907) re-examined the situation and pronounced, as had Kirby (1906), that *Conocephalus hemipterus* Thunberg was identical with *Gryllus conocephalus* Linnaeus, 1758. As no other specias had previously been designated as type of the genus, this made *G. conocephalus* the type of the genus by tautonymy. Kirby had not accepted the tautonymic nomenclature. When Rehn and Hebard (1915a, 1915b) published their monograms on American species of the genus, the name *Conocephalus* became well established and it remains so to the present day. DeGeer's species is now known as *Conocephalus fasciatus* (DeGeer).

Xiphidium vicinum was described by Morse (1901) from the Pacific Southwest of the United States of America, as a species similar to *X. fasciatum* but with the ovipositor almost constantly longer than in the latter species. The ratio of hind femur to ovipositor was indicated as being greater than in *X. fasciatus.* Karny (1912) listed the two as separate species of *Conocephalus,* but Kirby (1906) had already recognized the two as full species, placing them in *Anisoptera,* presumably because of his lack of acceptance of tautonymic names, as noted above. The position of the "variety" *productum* of Morse (1901) remained confused, probably because of a lack of clarity in the original description. Karny (1907, 1912) considered this form to be a synonym of *C. fasciatus,* while Kirby (1906) and Rehn and Hebard (1915) both placed it under *vicinus,* which the latter authors further considered to be but a subspecies although he referred to *Conocephalus fasciatus* (DeGeer). The next author to devote much space to these members of *Conocephalus* was Cantrall (1943, 1968) who used the full trinomen of the eastern subspecies on both occasions, thus implying acceptance of the existence of another subspecies.

The ranges of the two groups were discussed by Rehn and Hebard (1915). Subsequent papers have made slight extensions in most possible directions. *C. f. fasciatus* was said to range over North America east of the Rockies and north as far as southern Canada. *C. f. vicinus* was considered to be restricted to the west: California, Oregon, Washington and the other American states to the west of the Atlantic-Pacific divide (except Alaska), and British Columbia.

MATERIALS AND METHODS

Only dried insects were used in this study. The measurements made were similar to those used by Morse (1901) as criteria for separating *fasciatus* from *C. vicinus.* Only females were used because Morse was unable to separate the males on morphological grounds. The measurements of the males have been made as part of another study but will not be discussed further in this paper.

The lengths of the ovipositor and one hind femur were recorded for each specimen. All measurements were made with a "Wild M5" stereo microscope equipped with a calibrated ocular micrometer. Measurements for reasonably-sized series of specimens from various individual localities were made and averaged

[1]Present address: Dept. of Entomology, Macdonald Campus of McGill University, Ste Anne de Bellevue, P.Q., Canada.

and the ratio of femur III to ovipositor-length calculated. The ratios were then plotted on a base map of North America.

A separate set of measurements was made for all other available females (isolated specimens and very short series). These were grouped by state or province and averaged. The averages were plotted on the same map to provide an independent confirmation of the results from data obtained from the longer series.

RESULTS

The results are summarized in the accompanying map and table. The sample numbers (which were quite randomly designated) and localities follow: (1) Sainte Anne de Bellevue, Quebec, (2) Antelope Springs, California, (3) Eugene, Oregon, (4) Ames, Iowa, (5) Rock Co., Minnesota, (6) Scott Co., Minnesota, (7) Saint Anthony Park, near St. Paul, Minnesota, (8) Ottertail Co., Minnesota, (9) Republic, Anoka Co., Minnesota, (10) Rockaway Beach, Long Island New York, (11) Juniper, Florida, (14) South Ohio, Nova Scotia, (15) Avoca, Quebec, (16) Evans, Washington, (17) Gainesville, Florida, (18) Pequaming, Michigan, (19) Thomasville, Georgia, (20) Jemez Hot Springs, New Mexico, (21) Milford, Beaver Co., Utah, (22) Klamath Falls, Oregon, (23) Castlegar, British Columbia, (24) Malta, Montana, (25) Lac Serpent, Quebec, (26) Morgan Arboretum, Sainte Anne de Bellevue, Quebec, (28) Dorion, Quebec, (29) Point Pelee National Park, Ontario, (30) Sandbanks Provincial Park, Prince Edward County, Ontario, (31) Salmon Arm, British Columbia, (32) Saint Claude, Manitoba, (33) Delorraine, Manitoba, (34) Alexandria, Ontario.

DISCUSSION

An examination of the map (Fig. 1) reveals that the ratio of femur III to ovipositor reaches a maximum in California and a minimum in the north-eastern part of the range. With minor variations, which may probably be attributed

TABLE 1

Sample number	n	Ovipositor length (mm)	SD	Femur III length (mm)	SD	Ratio ovipositor / femur III
1	94	7.1	0.40	10.8	0.69	.66
1	94	7.1	0.40	10.8	0.69	.66
2	9	10.7	0.37	11.6	0.56	.92
3	11	8.6	0.30	11.4	0.51	.75
4	12	8.6	0.52	11.8	0.87	.73
5	14	9.3	0.57	11.6	0.64	.81
6	9	8.3	0.59	10.7	0.78	.78
7	10	8.6	0.49	11.4	0.35	.75
9	13	8,9	0,38	11,5	0,48	.77
10	11	7.4	0.55	11.8	0.74	.63
11	19	8.5	0.49	12.2	0.82	.70
14	13	7.6	0.36	11.6	0.39	.65
15	31	7.3	0.30	10.8	0.42	.68
16	7	9.4	0.99	11.3	0.37	.83
17	13	8.4	0.33	12.3	0.71	.68
18	16	8.6	0.37	11.8	0.64	.73
19	12	9.1	0.54	13.3	0.7	.68
20	8	9.0	0.44	11.2	0.4	.80
21	13	10.6	0.34	12.0	0.4	.88
22	8	10.3	0.27	11.4	0.56	.90
23	13	9.9	0.45	11.6	0.37	.85
24	4	8.8	0.36	11.8	0.66	.75
25	40	7.4	0.33	11.2	0.67	.66
26	24	7.7	0.28	11.7	0.59	.66
28	10	8.1	0.28	12.1	0.33	.67
29	24	7.8	0.55	12.2	0.71	.64
30	17	7.8	0.43	11.7	0.60	.67
31	15	9.2	0.28	11.5	0.32	.80
32	19	8.6	0.37	10.8	0.71	.80
33	8	9.4	0.71	11.5	0.55	.82
34	25	7.9	0.84	11.5	0.42	.69

Conocephalus fasciatus: sample size; lengths of femur III and ovipositor and their ratios. Sample numbers as in accompanying list of localities.

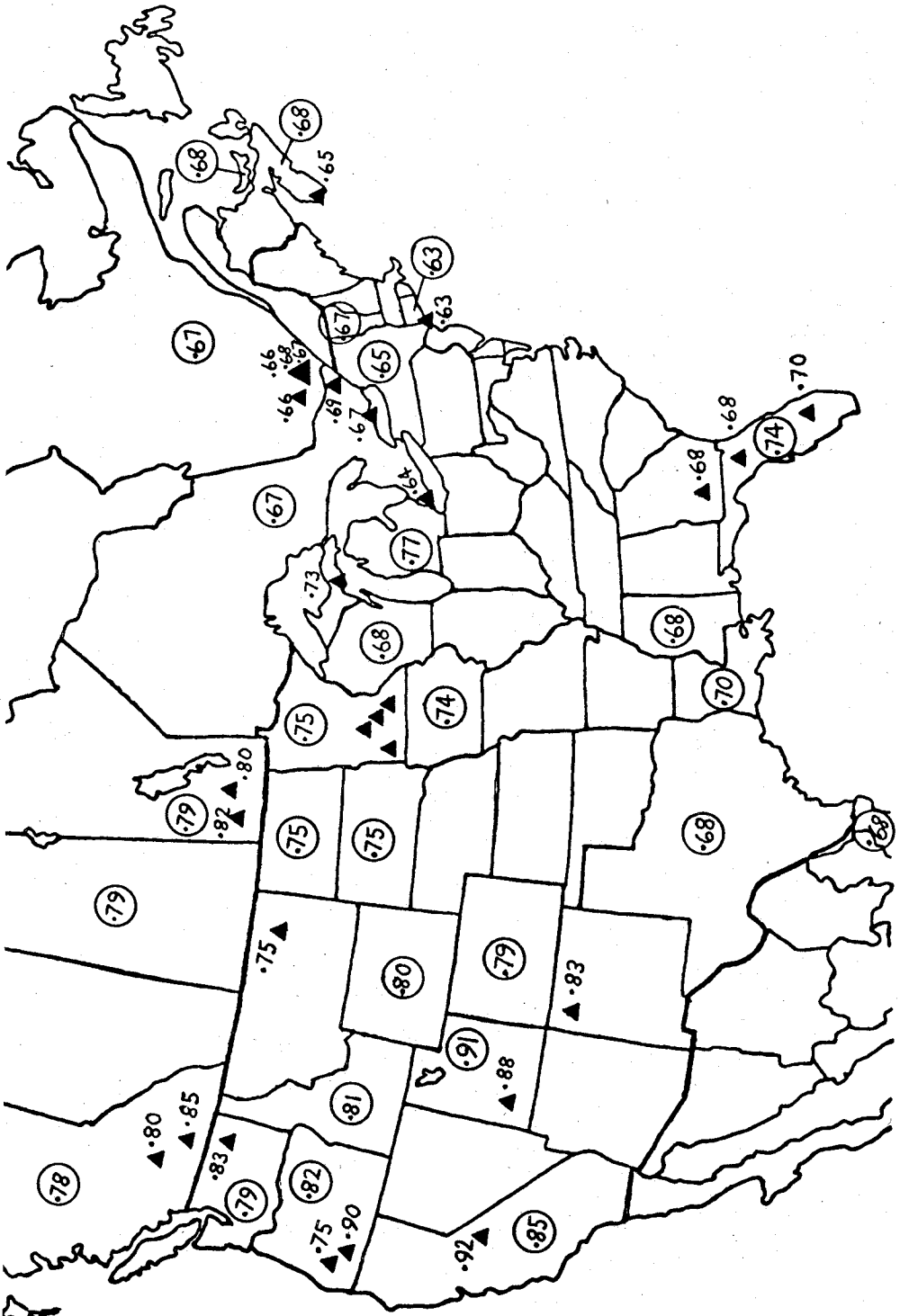

Fig. 1. **Conocephalus fasiatus:** ratio of lengths, femur III to ovipositor. ▲ single sample. ◯ state or provincial average.

to the small sample size, the ratio changes steadily between the two regions. Similar changes take place between California and British Columbia and between California and Mexico.

There were two independent sets of data as described above. the same pattern was found in the two separate sets of data, i.e., those from the long series and those grouped by state or province from individuals or short series. The pattern that emerged may be described as indicating a cline extending from a maximum ratio in California-Utah to minimum at the northern, eastern and, probably the southern limits of the range. The lowest ratios were found at the greatest distance from California; that is, in the northeastern portion of the range.

The existence of this cline calls into question the utility of Morse's name *vicinus*. Morse had examined material only from New England and California-Oregon and, apparently, nowhere between the two. he produced no usable criteria for the separation of males and was himself in many cases unable to distinguish between *vicinus* and *fasciatus* males. It should also be noted that, among other species of *Conocephalus*, it is the males that are most easily separated, the females often proving difficult. Morse was able to separate his females by use of the femur III/ovipositor ratio, but even this resulted in a "gray" area. A ratio of 0.50 to 0.67 was supposed to indicate *C. fasciatus*, while 069. to 0.95 was indicative of *vicinus*. Specimens between 0.67 and 0.69 mightbe regarded as belonging to either. In practice, the ratios do not appear to have been much used to separate the two taxa. Anything from east of the continental (Atlantic-Pacific) divide has been called *C. fasciatus* and that from the west has been called *vicinus*, either at the species or subspecies level. If one applies Morse's ratios to mid-western material, most specimens from west of Illinois would have to be called *vicinus* and there would be a very wide band of overlap with *fasciatus*. Thus it would be pointless to continue to recognize eastern and western entities as meriting separate names.

To end the confusion it is proposed to supress the name *vicinus* althogether and to refer to the whole taxon as *Conocephalus fasciatus* (DeGeer, 1773) regardless of geographical differences.

ACKNOWLEDGEMENTS

A project of this type necessitates borrowing specimens from many sources. In this case thanks are due to the curators of about twenty different institutions in North America who lent material. In addition, the Entomology Laboratories of the Academy of Natural Sciences, Philidelphia, and of the Universities of British Columbia and Idaho, and of the Museum of Comparative Zoology, Harvard University, kindly permitted the use of their facilities. Financial assistance came in part from a grant from the National Research Council of Canada to Dr. D. K. McE. Kevan. Thanks are also owed to Dr. Kevan for reading and criticizing the manuscript and to Dr. T. J. Walker for collecting a series of specimens from Florida.

References

Audinet-Serville, J. G., 1831. Revue méthodique des insectes de l'ordre des Orthoptères; II. **Anns. Sci. nat. 22:** 135-167.

Blatchley, w. S., 1920. Orthoptera of Northeastern America with especial reference to the faunas of Indiana and Florida; The Nature Publishing Company, Indianapolis.

Burmeister, H., 1839. **Handb. der Ent.**, Berlin.

Cantrall, I. J., 1943. The ecology of the Orthoptera and Dermaptera of the George Reserve, Michigan; **Misc. Publs. Mus. Zool. Univ. Mich., 54:** 182 + X.

_____ 1968. An annotated list of the Dermaptera, Dictyoptera, Phasmatoptera and Orthoptera. **Mich. Ent. 1:** 9.

Geer, C. de, 1773. Mémoires pour servir a l'histoire des insectes, Stockholm.

Karny, H., 1907. Revisio Conocephalidarum. **Abh. zool. bot. Ges. Wein IV** (3): 1-114.

_____, 1912. Genera Insectorum 135: 7-13.

Kirby, W. F., 1890. On the employment of the names proposed for genera of Orthoptera, previous to 1840. **Scient. Proc. R. Dubl. Soc. 6:** 556-597.

_____, 1906. A synonymic catalogue of the Orthoptera. **Brit. Mus.** Longmans, London.

Morse, A. P., 1901. The Xiphidiini of the Pacific Coast. **Can. Ent. XXXIII:** 201 -205.

Rehn, J. A. G., 1907. Orthoptera of the families Tettigoniidae and Gryllidae from Sapucay, Paraguay. **Proc. Acad. nat. Sci. Philad.:** 370-395.

_____ and Hebard, M., 1915a. A synopsis of the species of the genus **Conocephalus** found in North America north of Mexico. **Trans Am. ent. Soc. XLI:** 155-224.

_____, _____, 1915b. VI—A synopsis of the species of the genus Conocephalus found in America south of the southern border of the United States. **Trans. Am. Ent. Soc. XLI:** 225-290.

Thunberg, C. P., 1815. Hemiptorum maxillosum, Genera Illustrata, Plurimusque novis speciebus ditata ac descripta. **Zap. imp. Akad. Nauk V:** 218.