

Notes on the *Psorophora confinnis* Complex

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ABSTRACT. A study of approximately 2800 adult specimens from North, Central, and South America failed to reveal any morphological characters that might be used to distinguish populations from different geographical areas. The paraprocts of 50 specimens from 22 areas - Argentina to New York to California - showed no useful variations. Significant differences in the number of pecten spines on 453 larvae from 15 areas suggest the possibility that 3 populations may be recognized.

Belkin et al. (1970) in redescribing *Psorophora (Grabhamia) jamaicensis* (Theobald 1901) stated that populations of the *Ps. confinnis* complex north of the Amazon basin very likely belong to one or more species distinct from true *confinnis*. They stated, "For the present we are provisionally applying the name *columbiae* (Dyar and Knab 1906) to the populations from the eastern and southern United States and to a population from Grand Cayman Island. We have made no attempt to study carefully the extensive material of the *confinnis* complex from Mexico and Central America, but it appears that at least some of the populations in this area may be conspecific with those from eastern North America." In 1976, Dr. Belkin further stated, "Since no study of the entire *confinnis* complex has been done as yet I would suggest that in the eastern states *columbiae* be used and that in the western states (especially Arizona and California) reference be made to California (Arizona, New Mexico) population of the *Ps. confinnis* complex." (Bickley 1976). Bohart and Washino (1978) stated that the California population of the complex appears to be *columbiae*. Darsie and Ward (1981) called the *Ps. confinnis* of Carpenter and LaCasse (1955) *Ps. columbiae* in all states except Arizona and New Mexico; these were designated as belonging to the *confinnis* complex. The need for a thorough study of the *confinnis* complex is thus obvious.

A brief review of the more pertinent literature should facilitate an appreciation of the problem. *Ps. confinnis* was described by Lynch-Arribalzaga (in the new genus *Taeniorhynchus*) in 1891. He considered it to be closely related to what we now call *Aedes taeniorhynchus*. He used 5 females in making the description. One of the 5 females in the LaPlata Museum in Buenos Aires was in fairly good condition and was designated as the lectotype by O. H. Casal (Belkin et al. 1968). The description of the female conforms with current concepts of *Ps. confinnis*, but there are a few discrepancies in descriptions of tarsal and abdominal markings.

Ps. columbiae was described by Dyar and Knab in 1906 (in the genus *Janthinosoma*) along with 3 other closely related species. According to Howard et al. (1917) Coquillett, at one point, believed that *confinnis* and *columbiae*

were conspecific. Howard et al. additionally reported that there had been much confusion over the identity of *columbiae* and stated that it is entirely improbable that "the Argentine species (*confinnis*) has anything to do, even remotely, with any North American species. In fact it remains unknown today, and probably will so remain until someone procures specimens from that remote locality."

Dyar (1928), as pointed out by Aitken (1940), separated the females of 4 closely related "species" only on the basis of geographical distribution. Moreover, he did not satisfactorily characterize larvae or adult males of the 4 species, *confinnis*, *tolteca* (Dyar and Knab), *jamaicensis*, and *columbiae*. Aitken (1940) gave good reasons why he considered *columbiae*, *jamaicensis*, and *tolteca* to be synonyms of *confinnis*. He studied specimens from Arkansas, Mexico, Arizona, and California. Carpenter and LaCasse (1955) (in agreement with Aitken) reported that *confinnis* occurred throughout a large part of North America, the West Indies, and Central and South America.

Belkin et al. (1970) stated that *jamaicensis* adults can be separated from *columbiae* adults on the basis of the fact that the pale scales on the mesonotum of *jamaicensis* are silvery gray to yellowish gray without a lavender cast whereas the pale scales on the mesonotum of *columbiae* have a strong lavender cast. There are also differences in the pupae, but the word "usually" appears in almost every phrase in their key. Larvae differ in the presence or absence of a marginal tubercle or spine caudad of hair 10-C and in the length of head hair 6-C. Currently *jamaicensis* may be separated from *columbiae* or *confinnis*; but to separate *columbiae* from *confinnis* is impossible. With one exception there seem to be no reports of morphological characters which may be used to differentiate populations of *columbiae* and *confinnis* from eastern North America, western North America, Central America, or South America.

The exception is the study of chorionic patterns made by Bosworth et al. (1983). They found that the inner chorionic pattern can be used to differentiate California populations of "*Ps. confinnis*" from those occurring in other states - New Jersey to Florida and Arkansas to Texas. Although Bosworth et al. (1983) examined a relatively small number of eggs from California they provided evidence to support the "Hypothesis of Belkin that *Ps. columbiae* of the eastern states, including Texas, is not conspecific with populations from the western states." Bosworth et al. have emphasized the fact that populations of the *confinnis* complex in South America must be studied. From a practical standpoint it is unfortunate that an electron microscope must be used to examine inner chorionic sculpturing.

A study of approximately 2800 adult specimens in the collections of the Smithsonian National Museum of Natural History failed to reveal structural differences in populations from various geographical regions. Specimens examined included those collected by the late Dr. Belkin and his coworkers as a primary activity of the research project "Mosquitoes of Middle America." North, Central, South America and the West Indies were well represented. Usually the apical half of each palpus is white. The amount of white was found to vary, but variations cannot be correlated with any geographical areas. This was the only adult character that showed any potential for use in separating populations. In Lynch-Arribalzaga's description (1891) the palpi are reported to be black.

At the suggestion of A. B. Bosworth (Personal communication) the paraprocts of representative specimens were examined. Fifty specimens from 22 geographical areas were studied. In the following list the number of specimens from each area is given: Argentina 1, Arizona 4, Brazil 1, California 8, Colombia 5, Costa Rica 1, Cuba 2, District of Columbia 1, Florida 2, Haiti 1, Kentucky 1, Louisiana 3, Maryland 1, Mexico 3, Missouri 1, New York 1, Panama 2, Peru 2, Puerto Rico 2, Texas 3, Virginia 2, and Venezuela 3. Figure 1 shows that each paraproct has 3 thorn-like protuberances presumably homologous with the spicules of the crown of the paraproct that are well developed in *Culex* spp. Variations in the appearance of these thorns or hooks are attributable largely to differences in the positioning of the genitalia on the microscope slide. A microscope with differential interference capability was useful in observing the shape of the minute thorns. Paraprocts of specimens from all 22 areas were almost identical.

Larvae numbering 453 from 7 states, Mexico, and 8 Central and South American countries were studied. Inconsistencies were observed in the number of pecten spines. The usual number is 4 per row. Aitken (1940) first provided an adequate description of the larva of *confinnis* and reported that the number of pecten teeth varied from 2 to 5 referring to one row of a pair. Presumably the number of spines in each row of a pair would be the same (4/4). I found a variation from 2/2 to 5/6. In other words the total number of spines varied from 4 to 11. An analysis of the data presented in Table 1 showed that the mean number of pecten spines on specimens from California differed significantly from the mean number of spines on specimens from the other 15 areas. The mean for Brazilian larvae also differed significantly from the mean of larvae from the other 15 areas. This suggests the possibility that there are 3 different populations, California, Brazil, and the other 14 areas.

ACKNOWLEDGMENTS

Appreciation is expressed to Dr. Bruce A. Harrison, Walter Reed Biosystematics Unit, National Museum of Natural History, Smithsonian Institution for providing working facilities and for many helpful suggestions. Among others at the Museum who were especially supportive were Ralph Harbach, Tom Gaffigan, Richard Soltero, and Olimpia Areizaga. Dr. Sunthorn Sirivanakarn brought from Argentina specimens provided by Dr. J. P. Duret. This help is gratefully acknowledged. Thanks are also extended to A. B. Bosworth, J. K. Olson, R. M. Bohart, R. K. Washino, L. T. Hui and W. L. Jakob for lending specimens, and to J. M. Bickley for statistical analyses.

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Table 1. Variation in total number of pecten spines on *Psorophora confinnis* complex larvae from 16 areas.

Area	Sample Size	Mean	Standard Deviation
California	51	6.4117647	0.9628389
Florida	45	9.1777778	1.0931375
New Jersey	11	8.0000000	0.6324555
Alabama	8	8.2500000	0.7071068
Arkansas	4	7.5000000	1.0000000
Texas	51	7.9215686	1.0741161
Mississippi	6	7.8333333	0.9831921
Mexico	71	7.9295775	1.2226896
Belize	7	8.2857143	1.1126973
Guatemala	6	8.4800000	1.1432528
Honduras	6	8.8333333	0.7527727
Nicaragua	18	8.8888889	1.0786096
Costa Rica	19	9.3157895	0.7492687
Colombia	40	9.1750000	1.0594508
Venezuela	21	8.8571429	1.2761549
Brazil	20	5.6000000	0.8207827

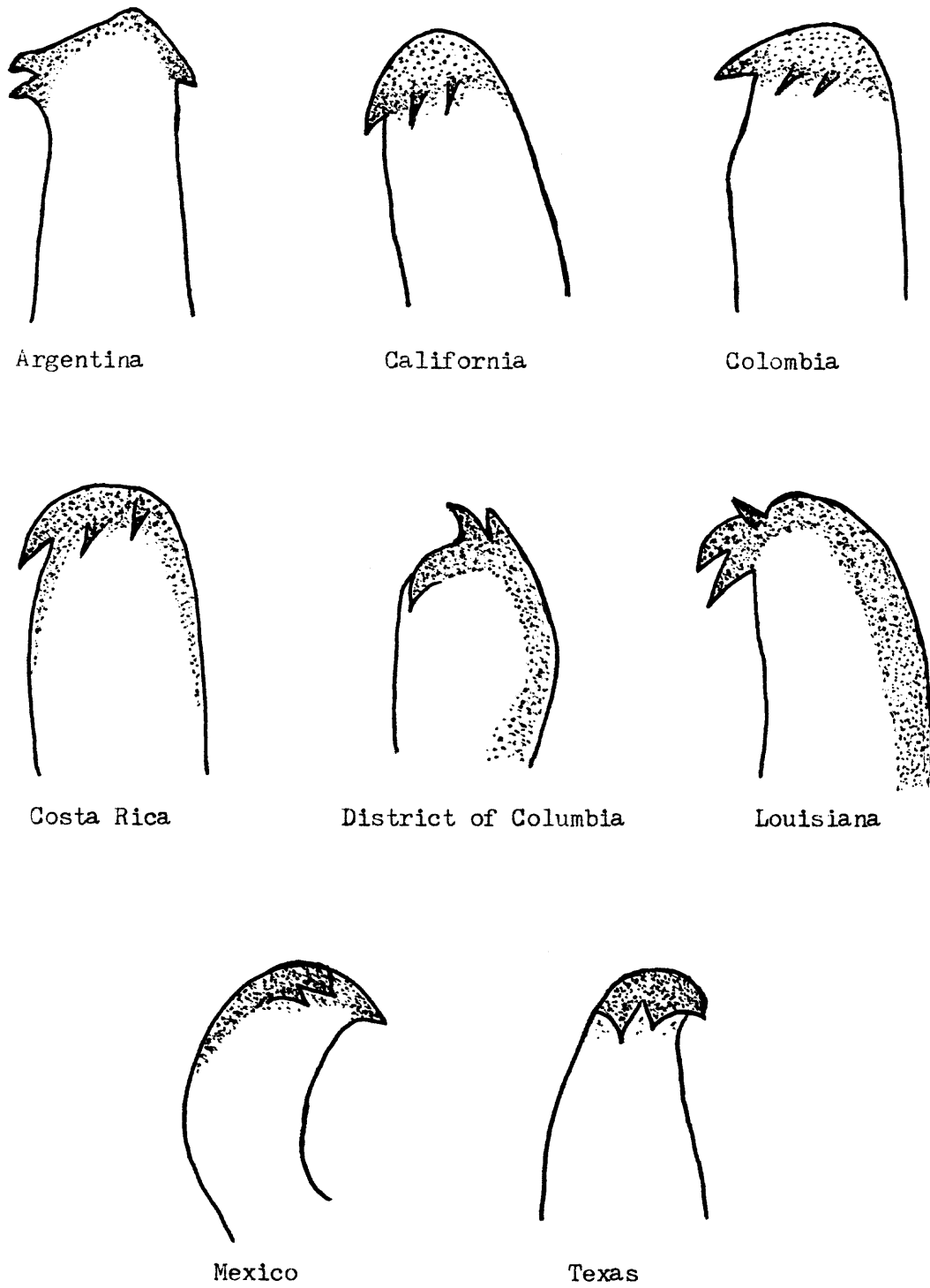


Figure 1. Diagrams of paraprocts of *Psorophora confinnis* from 8 areas.