Journal of the Lepidopterists' Society
35(1), 1981, 22–26

OCCURRENCE AND SIGNIFICANCE OF AN UNUSUAL PHENOTYPE OF *COLIAS CESONIA* STOLL (PIERIDAE) IN THE UNITED STATES

RAYMOND W. NECK

Pesquezo Museum of Natural History, 6803 Esther, Austin, Texas 78752

ABSTRACT. The unusual female form of *Colias cesonia* Stoll called immaculsecunda has been recorded from several localities in the southern United States. This form is thought to be a migrant from some Mexican *cesonia* populations and not a genetic aberration appearing sporadically in separate U.S. populations.

Colias (Zerene) cesonia cesonia Stoll is a familiar butterfly throughout much of the southern United States. The male possesses a prominent "dog-face" on the DFW while the female exhibits a less distinct but still recognizable "dog-face." A Neotropical subspecies, *C. c. therapis* (F. & F.), possesses no remnants of such a mark. A related species, *Colias (Zerene) eurydice* Bdv., occurs in California and Mexico. Males of *eurydice* also possess a distinct "dog-face" but females of this species have no "dog-face" and possess only rudimentary dark markings. There is a ♀ form of *cesonia*, however, which also lacks the "dog-face." This paper surveys the occurrence of this form in the United States and Mexico (as known) and discusses possible origins of this form.

Colias (Zerene) cesonia cesonia Stoll ♀ form immaculsecunda Gunder was first described from two specimens, one from Arizona (23 September 1927) and one from Missouri (27 September 1917) (see Gunder, 1928). The original description is as follows: "Primaries: with greatly reduced black markings; outline of 'dog-face' not clear cut, having outline at 'forehead' incomplete. Secondaries: immaculate of all usual marginal designs, cell blotch remaining as usual. Wings beneath as in typical *cesonia*, yet not over ruddy." Gunder (1928) illustrates both the holotype (from Arizona) and paratype (from Missouri) and classifies this taxon as a "form ♀," which simply indicates "forms belonging to only one sex" (Gunder, 1927).

Subsequently, this form has been reported from other localities. From Arizona, Brown (1965) reported three specimens each in different years (1950, 1957, 1963) but all in September. The 1963 specimen is illustrated (Brown, 1965: fig. 3) as an unnamed aberration. Stallings (1941) reported three specimens from Sumner Co., Kansas, on 15 April 1938. Bennett (1968) reported one specimen each in October and November of 1966 in Lubbock, Lubbock Co., Texas.

In my personal collection is a specimen collected 27 October 1968 at the Brackenridge Field Laboratory in Austin, Travis Co., Texas

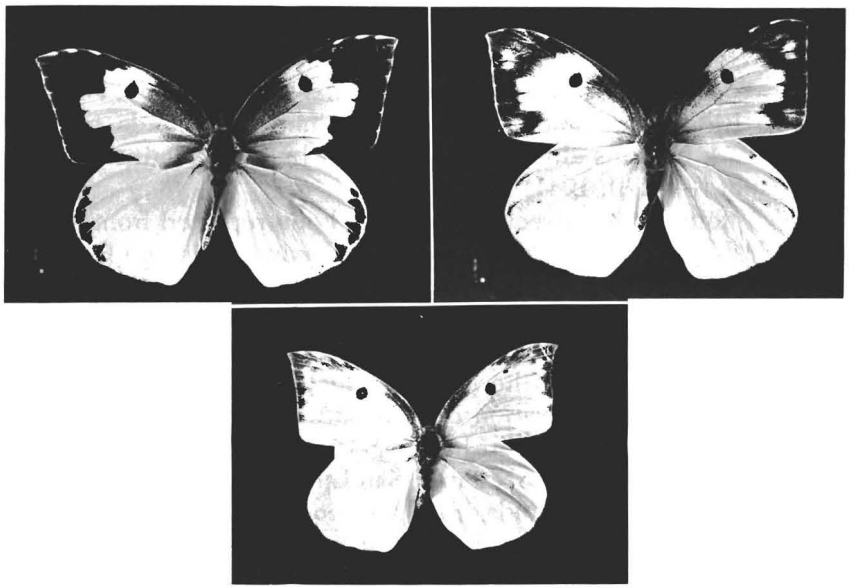

FIG. 1. Forms of *Colias (Zerene) cesonia* from Austin, Travis County, Texas. Clockwise from upper left: normal ♂, 1 November 1968; normal ♀, 19 October 1968; immaculsecunda, ♀ form, 27 October 1968.

(Fig. 1). Other specimens were seen at this time. Additionally, my field notes record the occurrence of immaculsecunda in Austin in late November 1971, although no specimens were taken. C. J. Durden (pers. comm.) also observed this form in the Austin area in late summer and fall 1971.

The specimen in my collection is slightly smaller than normal females collected at the same time (wingspan—53 mm vs. normal 60 mm). This unusual phenotype exhibits the same degree of pink suffusion of the VFW and VHW as do the normal specimens collected at the same time. This suffusion has been called rosa McNeill by some but is merely a seasonal influence which occurs in other subspecies of *cesonia* as well. The rosa influence of the 27 October 1968 Austin specimen is slightly less than one specimen figured in Howe (1975: plate 75, fig. 9). Masters (1969) demonstrates the occurrence of this roseate form in *Colias cesonia therapis* (F. & F.) with the dry season in Venezuela. The similarity in the rosa influence in both normal and immaculsecunda forms indicates that separate, and probably unlinked, genetic systems are involved. The 1968 Austin specimen of immaculsecunda exhibits slightly greater reduction of black margins of the DFW than shown by Bennett (1968); the specimen looks

very much like the Venezuelan subspecies *therapis* (see Masters, 1969) except that immaculsecunda retains the discal spot of the DFW (the "eye" of the dog-face). *Colias (Zerene) eurydice* Bdv. ab. nigrocapitata Riddell is somewhat similar to immaculsecunda in that it retains dark margins along the DFW apex but also retains the DFW discal spot (Riddell, 1941).

This ♀ form immaculsecunda has also been reported from Mexico. Vasquez G. (1952) reviewed all forms of *C. cesonia* known from Mexico. She could find no true immaculsecunda but reported "*forma femininа* n, *parecida a* immaculsecunda" which is very close to Gunder's (1928) figures but has slightly more reduced melanic markings. Locality records were from the state of Hidalgo as well as the Distrito Federal in the high-elevation central part of Mexico. No collection dates are given. L. E. Gilbert has a specimen in his collection dated 16 January 1969 from near Naranjo, San Luis Potosi. Hoffmann (1940) simply lists immaculsecunda from Mexico without reporting collection localities; he reports *cesonia* as occurring "*en todo el pais.*" However, Brown (1944) did not find this form in several collections from northern and central Mexico.

Times of occurrence of immaculsecunda in Texas reveal a significant pattern. The years 1966, 1968 and 1971 were all seasons of unusual abundance or occurrence of Lepidoptera involving population movements of various species northward from Mexico. Breeding of two heliconians [*Heliconius charitonius vasquezae* (Comstock and Brown) and *Dryas julia moderata* Stichel] which periodically occur in central Texas during autumn was observed in 1966 (Rickard, 1967, 1968). During 1968 these two heliconians were abundant in the Austin area as early as June 1968 (Neck, 1978). Two factors could explain why immaculsecunda did not appear until October in 1968. Immigration into the area could have occurred only in the fall months. On the other hand, immigration could have occurred earlier in the late spring months but this form was undiscovered by lepidopterists until the fall generation appeared. Two generations, one spring and one fall, are typical of *cesonia* in central Texas. Specimens collected in October 1968 were not worn to a degree that long-distance dispersal by those specimens was indicated. Late summer and autumn 1971 were extremely unusual times for Lepidoptera. A severe drought was broken in late July and early August. Massive northward movements of numerous butterfly species resulted, including one of the rare massive cloud migrations of *Libytheana bachmanii larvata* (Strecker) (Helfert, 1972; Neck, in prep.). The northward movement of the tropical butterfly *Dione moneta* during unusual climatic conditions was reported and analyzed by Gilbert (1969).

Occurrence of immaculsecunda in Texas during years of unusual northward movements of butterfly populations from Mexico indicates the possibility that this form is a resident female phenotype in some Mexican populations. Of the other reports of immaculsecunda in the United States (see above review) all but one were collected in the period September to November. The sole exception involves the collection of three specimens collected in Kansas in mid-April. April is an early date for *cesonia* to be found in Kansas; *cesonia* is most common in Kansas from August to October (Calkins, 1932; Field, 1928). Field (1928) does report specimens of *cesonia* in mid-May 1935. Weniger (1945) reported specimens in late June 1944.

If one accepts the thesis that immaculsecunda is an immigrant form from Mexico, these April Kansas specimens have one of two origins. They either represent an overwintering brood or an early season migration. Migrations of sub-tropical and tropical butterflies to latitudes as far north as Kansas are common but generally occur in summer and autumn (Calkins, 1936; Howe, 1958). At least one species, *Agraulis vanillae* (L.), makes almost annual migrations to Kansas, where it fails to overwinter (Randolph, 1927). Note should be made of the capture of the tropical species *Adelpha bredowii* (Geyer) by V. F. Calkins in Scott Co., Kansas on 2 May 1936 (Field, 1938). One may assume that either origin mentioned above for the April Kansas immaculsecunda could be valid. Howe (1965) felt that *cesonia* in Kansas might be a breeding migrant, although "strong evidence supports the idea that at least a few adults of *cesonia* hibernate here as well." Overwintering of *cesonia* has been suspected in areas of the neighboring state of Missouri (Masters, 1969), including the actual observation of a hibernating adult in St. Louis Co. (O'Bryne, 1941).

I believe enough evidence (admittedly circumstantial) exists to assume that immaculsecunda Gunder may well be a resident phenotype in some populations of Mexico. I do not believe that it is a genetic aberration which appears independently in various populations as has been assumed by many workers. Collectors in Mexico should make efforts to sample and study populations of *cesonia* in the field to determine the true taxonomic standing of immaculsecunda Gunder. While it has been suggested that immaculsecunda is a form responding to cold weather (Bennett, 1968), cold weather generally results in melanistic forms, not forms lacking normal melanic pigment (Robinson, 1971: 210).

LITERATURE CITED

BENNETT, D. 1968. Two variant females of *Colias* (*Zerene*) *cesonia* (Pieridae). J. Lepid. Soc. 22: 253.

BROWN, F. M. 1944. Notes on Mexican butterflies. II. Pieridae. J. N.Y. Entomol. Soc. 52: 99–119.

BROWN, K. S., JR. 1965. Some comments on Arizona butterflies (Palilionoidea). J. Lepid. Soc. 19: 107–115.

CALKINS, V. F. 1921. The rhopalocerous Lepidoptera of Scott County, Kansas. Entomol. News 43: 210–260.

——— 1936. Some unusual butterfly records taken in Scott County, Kansas. Bull. Brooklyn Entomol. Soc. 31: 66–68.

FIELD, W. D. 1938. A manual of the butterflies and skippers of Kansas (Lepidoptera, Rhopalocera). Bull. U. Kans., Biol. Ser. 39(10): 1–328.

GILBERT, L. E. 1969. On the ecology of natural dispersal: *Dione moneta poeyii* in Texas (Nymphalidae). J. Lepid. Soc. 23: 177–185.

GUNDER, J. D. 1927. Transition forms (Lepid., Rhopalocera). Entomol. News 38: 263–271.

——— 1928. A review of genus *Zerene* Hbn. in the United States (Lepid., Rhopalocera). Pan-Pac. Entomol. 4: 97–102.

HELFERT, M. R. 1972. Migratory behavior of the snout butterfly, *Libytheana bachmanni larvata* (Strecker). Entomol. News 83: 49–52.

HOFFMANN, C. C. 1940. Catalogo sistematico y zoogeografico de los lepidopteros Mexicanos. An. Inst. Biol. Mex. U. Nac. 11: 639–739.

HOWE, W. H. 1958. Capture of a *Eunica tatila* (Nymphalidae) in Kansas. Lepid. News 12–25.

——— 1965. Status of *Agraulis vanillae* in Missouri and Kansas. J. Lepid. Soc. 19: 33–34.

——— 1975. The butterflies of North America. Doubleday & Co., Garden City, N.Y., 633 pp.

MASTERS, J. H. 1969a. Butterflies of Lynch Hollow, Camden County, Missouri. J. Kans. Entomol. Soc. 42: 133–141.

——— 1969b. Seasonal variation of *Colias cesonia therapis* in Venezuela (Pieridae). J. Lepid. Soc. 23: 251–253.

NECK, R. W. 1978. Climatic regimes resulting in unusual occurrences of rhopalocera in central Texas in 1968. J. Lepid. Soc. 32: 111–115.

——— ms. Report and analysis of migrating clouds of the snout butterfly, *Libytheana bachmanni larvata* (Strecker) (Libytheidae).

O'BRYNE, H. I. 1941. The hibernation in Missouri of *Zerene cesonia* (Stall) and *Euptoieta claudia* (Cram. Lepid.: Pieridae and Nymphalidae). Entomol. News 52: 181–183.

RANDOLPH, V. 1927. On the seasonal migrations of *Dione vanillae* in Kansas. Ann. Entomol. Soc. Amer. 20: 242–244.

RICKARD, M. A. 1967. An aberrant *Heliconius charitonius* (Nymphalidae). J. Lepid. Soc. 21: -248.

——— 1968. Life history of *Dryas julia delia* (Heliconiidae). J. Lepid. Soc. 22: 75–76.

RIDDELL, J. 1941. Some remarkable forms and aberrations in the subgenus *Zerene* Hubner (Lepidoptera, Pieridae). Trans. Roy. Entomol. Soc. London 9: 447–457.

ROBINSON, R. 1971. Lepidoptera genetics. Pergamon, Oxford, 687 pp.

STALLINGS, D. B. 1941. Aberrations found in Kansas (Lepidoptera). J. Kans. Entomol. Soc. 14: 72.

VASQUEZ G., L. 1952. Observaciones sobre pieridos Mexicanos con descriptions de algunas formas nuevas. Ant. Inst. Biol. Mex. U. Nac. 23: 257–267.

WENIGER, D. 1945. A list of butterflies (Rhopalocera) collected in Cowley County in 1944. J. Kans. Entomol. Soc. 18: 112–120.