

dently has excited considerable interest (Burns 1966, *Can. Entomol.* 98: 859-866; Straley 1969, *J. Lepid. Soc.* 23: 76; Patterson 1971, *J. Lepid. Soc.* 25: 222). As far as Canada is concerned it is now listed (Gregory 1975, *Lyman Entomol. Mus.*, McGill Univ., Ste-Anne de Bellevue, Québec, p. 11) as occurring in the provinces of Québec, New Brunswick, Nova Scotia, and British Columbia, as well as Ontario, where it was first noted on this continent in 1910 (Saunders 1916, *Ottawa Nat.* 30: 116).

The butterfly was certainly present in great numbers in one spot in northeastern Nova Scotia (Cape Breton Island) on 26 July 1977 where I found it on grassy wasteland adjacent to an abandoned coal mine at Sydney Mines. This is 3 km north of Sydney whence the ferry sails for Newfoundland, a voyage of 160 km across the Cabot Strait. Having arrived in Newfoundland, I found *T. lineola* in the western part of the island, on 28 July 1977. The locality was an open grassy area a few metres wide between woodland and Highway 430, 15 km north of Deer Lake. About a dozen of the butterflies (all males) were observed, most being fresh specimens. Three specimens were collected and have been deposited in the *Can. Nat. Coll.*, Ottawa.

Holland (1969, *J. Lepid. Soc.* 23: 33-42) collected in the Deer Lake area in 1965 at the same time of year and did not report seeing this species; indeed it does not appear to have been previously reported from Newfoundland. However, the insect has certainly reached the island now, presumably by traversing the Cabot Strait from Nova Scotia in the very recent past. It is perhaps possible that this species used the ferry for the crossing.

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#### A PROBABLE NATURAL HYBRID OF *PAPILIO EURYMEDON* AND *P. RUTULUS* (PAPILIONIDAE) FROM IDAHO

Natural interspecific hybrids seem to be as rare among swallowtails as they are among butterflies in general. In the field the best evidence for hybridization comes usually from intermediacy of such characters as wing shape and color patterns.

On 18 May 1976, David H. Wagner and I encountered impressive swarms of *Papilio eurymedon* Lucas and *P. rutulus* Lucas visiting muddy spots at the edge of the town of Lowell, Idaho Co., Idaho. All of the individuals were males. Flying at the same place but much less common were *P. multicaudatus* Kirby, *P. zelicaon* Lucas, *Pteris napi* Linné, *Anthocharis sara* Boisduval, *Euphydryas chalcedona* Doubleday and Hewitson, and *Celastrina pseudargiolus* (Boisduval and LeConte). Some of the male swallowtail "clumps" on the moist soil included over 50 butterflies. They were probably seeking sodium (cf. Arms et al. 1974, *Science* 185: 372-374). Obviously the situation here was ideal for observing variations, and we examined the crowded butterflies carefully in the hope of finding aberrant forms. The differences between *P. eurymedon* and *P. rutulus* were immediately visible as they flew up and settled, often spreading their wings as they crawled over the moist earth. The gray-white ground color of the former contrasted with the bright clear yellow of the latter. Also the much broader black stripes and reduction of ground color of *P. eurymedon* quickly separated it from *P. rutulus*.

In one group of swallowtails we noticed a perplexing individual that did not fit either *P. eurymedon* or *P. rutulus*. Its ground color was whitish lemon-yellow and the

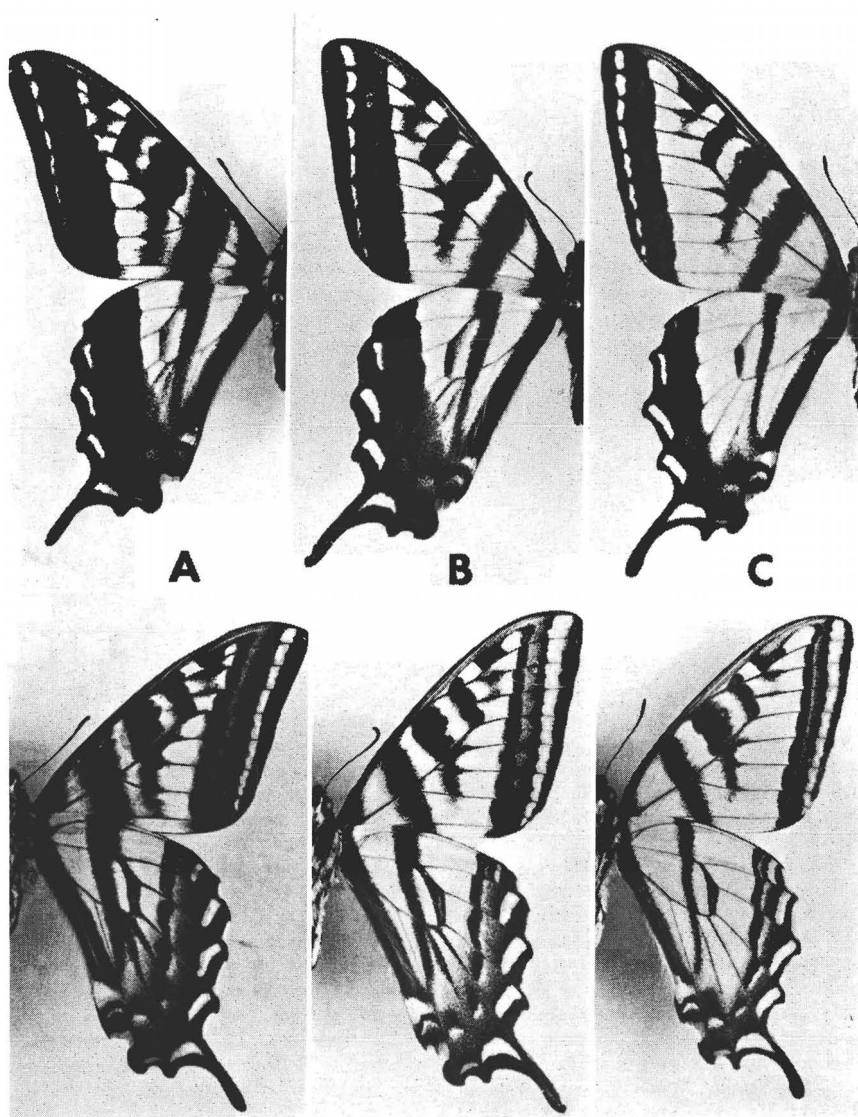


Fig. 1. Male swallowtails from Lowell, Idaho. Above, dorsal view; below, ventral view (magnifications vary slightly). A. *Papilio eurymedon*. B. Probable *P. eurymedon*  $\times$  *rutulus*. C. *P. rutulus*.

stripes were of intermediate width. The odd specimen was captured and is illustrated together with examples of the two associated species (Fig. 1). The specimen is intermediate in the position, extent, and shape of practically every stripe and spot. This evidence supports the conclusion that the odd specimen is a natural hybrid between *P. eurymedon* and *P. rutulus*.

We were especially impressed by the precise intermediacy of the individual. Generally speaking hybrid butterflies show such intermediacy, but in some cases they may resemble one parent more than the other. In the genus *Limenitis*, F<sub>1</sub> hybrids of *L. archippus* Cramer and *L. astyanax* (Fabricius) are intermediate, but backcrosses yield both hybrid-like and parent-like morphs (Platt 1975, *Evolution* 29: 120-141). In swallowtails at least, even F<sub>1</sub> hybrids may sometimes show one-sided intermediacy. For example, Clarke and Sheppard (1957, *Lepid. News* 11: 201-205) bred female *P. glaucus* L., the eastern North American counterpart of *P. rutulus*, with male *P. eurymedon*, and found that the *glaucus* wing pattern seemed generally dominant to that of *P. eurymedon* (cf. their Fig. 2 with Fig. 1 of the present paper). The F<sub>1</sub> progeny of laboratory crosses of *P. polyxenes* and *P. xuthus* were like the former parent in 11 out of 14 characters (Remington 1959, *J. Lepid. Soc.* 13: 151-164). Thus it is possible that all individuals of *P. eurymedon* × *rutulus* found in nature in the future will not be so conspicuously and precisely intermediate as the one figured here.

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#### NOTES ON SOME MOSAIC *PIERIS* (PIERIDAE)

Mosaic specimens occur in many if not all species of butterflies and moths, and are of scientific interest in that they can provide clues to the sequence of events occurring in embryonic or post-embryonic development. The origins of several types of mosaics are discussed by Ford (1945, *Butterflies*, Collins, London, Ch. 9). The mosaic nature may be sexual (various kinds of gynandromorphs) or homeotic (involving the production of a normal feature or pattern in an inappropriate location) or neither.

The checkered white, *Pieris protodice* Bdv. & LeC., is one of the most abundant and widespread North American butterflies and shows a conspicuous sexual dimorphism. There are apparently no published reports of gynandromorphs or other sexual mosaics although a bilateral non-sexual aberration inherited in a Mendelian manner has been reported (Shapiro 1970, *Wasmann J. Biol.* 28: 245-257). I have never seen a mosaic in any institutional or private collection. Figure 1 shows the first such specimen I have turned up in thirteen years of research on this species, including mass laboratory culture through over 30 generations and repeated field sampling in several states. It was collected in a sample of 10 taken 16 October 1977 at Rancho Cordova, Sacramento Co., California. It is a very unusual gynandromorph for a number of reasons. The entire body and three wings are apparently male. The right forewing appears about 40% female, with the inner margin, discal cell and apex mostly female. There are three black spots near the margin in the interspaces where no black normally occurs in either sex. The female characters are confined to the upper surface. Ventrally the forewings are symmetrical and both male. Thus the assumed chromosomal accident must have occurred in a cell all of whose progeny were fated to positions on the surface giving rise to the dorsal lamina and its scales.

I have on hand a similar mosaic gynandromorph of *Colias eurytheme* Bdv. (figured by Shapiro 1973, *J. Res. Lepid.* 12: 94) in which the apex of the left forewing is female above, and the rest of the animal male. In this case the sexes do not differ ventrally in the forewing apical area, and it cannot be said with certainty whether