# On the Nearctic Species of the *Bryoniae*- and *Oleracea*-Groups of the genus *Pieris*

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It has been suggested to me that a more detailed systematic treatment of the Nearctic insects of the *bryoniae* and *oleracea* groups of *Pieris* than I gave in my last paper on the subject (Warren, 1967), would be of interest to collectors. But it is doubtful if this is possible, at present. The following list shows the relationship of these insects as exactly as our data permits. I have added an outline of the geographical distribution of each form, but the very general habit in the past of referring to all these insects as "*P. napi*" makes it impossible to obtain anything like an accurate idea as to how closely many of the forms approach one another. Several will be found to overlap.

In the *bryoniae*-group both forms of androconial scale of the subsp. *pseudobryoniae*, though smaller, correspond so exactly with those of typical *P. bryoniae* of the European Alps that no question can remain as to its being conspecific with the latter. The photographs I gave (Warren 1961, figs. 27, *bryoniae*, 32, *pseudobryoniae*) should convince the most sceptical of the fact. The only other member of the group, *P. hulda*, is rather an uncertain quantity. It is shown to be a member by the perfect, primitive-type *bryoniae*-scale, which so far as I know does not appear in the *oleracea*-group species. But the ordinary *hulda* scale is variable, and not exactly typical of *bryoniae*, though it suggests it.

All other Nearctic species so far known, belong to the *oleracea*-group.

(A) *Bryoniae*-group.

1. *P. bryoniae pseudobryoniae* Vty. North of 64.N. to shores of Arctic Ocean. Monogenerational. Alaska and N.W.T.
2. *P. hulda* Edwards. Kodiak Island and south Alaska to Yukon. Monogenerational.

(B) *Oleracea*-group. Hyrbid species: *P. narina* Vty. × *P. dulcinea* Btlr.

1. *P. kamtschadalis* Röber. Kamchatka. (? Alaska).
2. *P. oleracea* Harris. South of 54.N. Bigenerational. Manitoba; Ontario; New Hampshire; New York; New Jersey. (2nd gen. *cruciferarum* Boisd.).
   Monogenerational race. Between 58.50 N. and 62.N. Alaska; Mackenzie (Ft. Simpson; Gt. Slave Lake; Ft. Smith); Manitoba.
   subsp. *frigida* Scudder (=*borealis* Grote). Island race between 46.50 N. and 52.N. Gt. Caribou Island, Labrador; Belle Island; Funk Island; Anticosti Island and Newfoundland. Bi- or mono-generational.
3. *P. venosa* Scudder. Bigenerational. California to British Columbia. (2nd gen. *castoria* Reakirt).
   Monogenerational race. Lake Louise, 6000 feet, Alberta; Chatanika, Alaska, 64.59 N. and Slana and Suslota, south Alaska.
4. *P. marginalis* Scudder. Bigenerational. Oregon; Washington; recorded from British Columbia and California (Barnes and McDunnough). 2nd gen. *pallida* Scudder).

5. *P. pallidissima* Barnes and McDunnough (2nd gen.). Bigenerational. Rocky Mountains, Colorado; Utah.
   Monogenerational race. *Macdunnoughii* Remington. Silverton, Colorado, at 10,000 feet. ("Single brooded, last week of July", Barnes and McDunnough).
6. *P. mogollon* Burdick. Bigenerational. Arizona. (2nd gen. *warreni* dos Passos).
7. *P. virginiensis* Edwards. Monogenerational. Ontario south to New York. Recorded from north and south Colorado (Edwards).

(C) Inter group hybrid.

*P. passosi* Warren. Hybrid *P. oleracea* × *P. hulda*. Monogenerational. Palmer, south Alaska.

As noted, the *oleacea*-group insects are of hybrid origin, obviously of great age. According to the rules of nomenclature then, they are to be dealt with as "species". But of course this would not apply in cases where one could be shown to be a derivitive of another. At the moment it seems that *frigida* is most probably a local race of *P. oleracea*, and possibly *venosa* also, for the seasonal dimorphism in both generations in the latter follows a similar line as in *oleracea*, which is suggestive of unity. Against this, however, must be set the fact that where *venosa* becomes monogenerational at high altitudes or latitudes, it tends to be reduced in size. This is not the case in *oleracea*, for in high latitudes where it produces but one generation it retains its full size.

In the case of *frigida* the first generation suggests a large, island race of *oleracea*, and there is some increase in size of the scales of the few specimens I have examined which points to some change between the two insects, for in *Pieris* as a rule the size of the scales seems independent of the size of the specimen. In some of the Nearctic hybrids, however, a reduction in size of scale appears in some small forms, which suggests that the size of the scales becomes a variable quantity in these hybrid forms. Then, the female of the second generation of *frigida* is said to be somewhat suffused with dark scaling on the upper side as in *P. bryoniae*, a phenomenon not known in any mainland *oleracea*. There are therefore some reasons for separating *frigida* and *oleracea*, but they are not decisive, and there is a lack of data concerning what forms of insect appear in New Brunswick and Nova Scotia which might throw some light on the question.

There are some who may question the likelihood of hybrids developing into so many distinctive forms as exist in the Nearctic Region, or the possibility of such forms spreading throughout great areas unimpeded by extreme alterations in climate and habitat. A recent discovery that illustrates how readily two very distinctive *Pieris* species can cross is therefore most welcome, especially as this case is obviously of fairly recent occurrence. It is a cross between *P. oleracea* (hybrid-group) and *P. hulda* (*bryoniae*-group).

My friend, Dr. Cyril F. dos Passos, obtained a series of "*P. napi*" from Palmer, south Alaska; 20 males and 9 females. With great kindness Dr. dos Passos sent me the entire series (together with other specimens). Had he only sent a few of them, I should most certainly have failed to recognise what they are, for the variation among them is so remarkable that several could not be connected with any known form. The mixture

of scale formation and characteristics was puzzling, ranging as it does from typical forms to a variety of atypical ones, and from symmetrical types to malformed ones. In some cases malformation is predominant. But the primitive-type scales led me to realise the meaning of the other fluctuating forms. In many specimens I failed to find any of the primitive-type scales. In others fully developed examples of the *bryoniae*-type existed; in yet others the primitive scale was of the *oleracea*-type, some of them much reduced in width, a feature known to occur in Palaearctic hybrids. The entire series are hybrids; a cross between *P. oleracea* and *P. hulda*. The most surprising fact is that one specimen in each of the parent species is present in typical form. As these two individuals are most striking and catch the eye at once, there is no reason to suspect they had been overlooked in collecting. It is therefore clear that the pure parent forms are now very rare: but they still exist. In view of the predominance of the hybrids it is unlikely they will continue to do so much longer.

Once the meaning of the confused state of scale development was recognised, comparison of the specimens themselves left me wondering how I failed to appreciate their true nature at once. In such cases illustrations convey the facts better than pages of descriptions would. The accompanying plate shows this. Fig. 1 is a typical *P. oleracea* from the east of the region, fig. 8 a topotypical *P. hulda*. Figs. 2 and 7, show these two species from Palmer, absolutely typical, not to be distinguished from figs. 1 and 8. Figs. 3, 4, 5 and 6 show some of the transitions which link the two extremes in Palmer. The colour changes are equally gradual; they are noted in the explanation of the plate. It must be remembered that the remaining 14 males of the series are all of the intermediate (i.e. hybrid) forms. The females are all closest to *P. hulda*, with a *bryoniae*-like, dark suffusion on the upper side and two dark, discoidal spots. Five somewhat resemble *P. oleracea* in that the markings on the under side are more sharply marked and narrower than in the other four which are more like *P. hulda*, with broader, paler and more suffused marking on the hind wings. There are not any quite typical of either parent species. The ground colour on the upper side is yellow in seven, paler, almost white in the other two, but still with a strong *bryoniae*-suffusion. This series was captured in 1965 and 1966.

In describing such a hybrid it is useless to designate a type specimen, no individual can be said to be "typical". I therefore include the Palmer series, with the exception of figs. 2 and 7, as Paratypes, that is 17 males and 9 females, and have much pleasure in naming this hybrid, *P. passosi* n. sp., to commemorate the fact that it was to the willingness of Dr. dos Passos to risk sending his entire series across the Atlantic we owe the recognition of this remarkable hybrid.

We know several long established hybrid species of *Pieris*, but *P. passosi* gives us one such hybrid in what must be a relatively early stage of development, for the parental species are still present. Some future collector will probably be able to record their disappearance. But when that time comes and *P. passosi* is represented by some particular form, or forms, between figs. 3 and 6 on our plate, it should be remembered that in spite of the superficial change, the mixed scale characteristics will still persist.

It is certain that there are localities in the great expanse of the

Nearctic Region where some of these *Pieris* species overlap, but they are known in their most remote areas in their typical forms. Possibly, here or there, a mixed race exists. This would account for difficulties in identification and divergent views. It also reminds us that the same phenomenon may appear in the Palaearctic Region. The central Balkans, for example, is one area where it is possible *P. napi* and the Palaearctic hybrid species *P. pseudorapae* or *P. dubiosa* may be in contact. (See Note at the end of this paper.)

Should such a zone of contact between *P. napi* and the hybrid species be found, the individuals would probably be in much the same condition as *P. passosi* is at the present time; i.e. hybrids mating with other hybrids of differing characters, on occasions back-crossed to one or other parent race only to be back-crossed again to some hybrid form. Under such conditions the establishment of any constant form could only follow on the elimination of many temporary vagaries and probably of the pure parent strains also. In the meantime the existing individuals will be lacking in any fundamental stability and if used for experimental breeding might well give wholly anomalous data.

I have previously described the hybrid characters of the scales which appear when *P. oleracea* is crossed with either *P. marginalis* or *P. virginiensis* (Warren, 1967). These characters prove the insects to be specifically distinct, for they are such as do not appear in crosses between races of one species. The *P. oleracea* × *P. hulda* cross gives the same characteristics seen in the other interspecific crosses. The discovery of *P. passosi* not only emphasises the likelihood of the hybrid nature of the *oleracea*-group species, but illustrates the facility with which long-established species can cross on occasions, but it should be noted by no means on every occasion when it might be possible, for if that were so the great geographical range of *P. oleracea*, and probably several other species also, could not have been achieved. One may call to mind that *P. oleracea* ranges from south Alaska to the islands off the Atlantic coast, a distance of at least 3500 miles, in the course of which it has spread over some 20 degrees of latitude. *P. hulda* occurs from Kodiak Island, south Alaska, to the borders of Yukon, perhaps even further, for it has been said to range into the western Alaskan islands also.

Such facts prove both species to have existed throughout extended periods of time, yet both are still able to cross and breed without loss of fertility, for *P. passosi* is said to be abundant in the Palmer district.

The under side of some *P. passosi* can resemble *P. bryoniae* subsp. *pseudobryoniae*. In the latter the colour on the veins is not so straight-edged as in *P. hulda* but appears more curving as seen in fig. 4, but on the whole the *pseudobryoniae* markings are somewhat broader than in that figure.

## EXPLANATION OF PLATE

1. Typical *Pieris oleracea* from New Hampshire.
2. Typical *Pieris oleracea* from Palmer, Alaska. 61.48 N., 149.7 W.
3. Hybrid *Pieris passosi*, typical of *P. oleracea* in size and marking; colouring as in *P. hulda;* from Palmer, Alaska.
4. Hybrid *Pieris passosi*, markings as in *P. oleracea;* size and colouring as in *P. hulda;* from Palmer, Alaska.

5. Hybrid *Pieris passosi*, size, marking and colour all approaching *P. hulda*, but width of spaces of ground colour between the vein markings of the hind wings approaching *P. oleracea*; from Palmer, Alaska.
6. Hybrid *Pieris passosi*, markings very suggestive of *P. hulda*, note especially the expanding, dark bulges on the veins of fore wings; size and width of spaces of ground colour between the veins of hind wings as in *P. oleracea*; colouring also as *P. hulda*; from Palmer, Alaska.
7. Typical *Pieris hulda*, slightly worn specimen, note the extreme reduction in width of the spaces of ground colour between the veins of the hind wings; from Palmer Alaska.
8. Topotypical *Pieris hulda* from Kodiak Island, Alaska. 57.30 N., 153.30 W.

All specimens exactly natural size. Colour on the veins, dense, black-brown, sharply marked in *P. oleracea*, diffused, pale brown, not completely obscuring the ground colour in *P. hulda* and *P. passosi*.

*Photograph* E. J. M. WARREN.

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[Note on the Palaearctic hybrid species of *Pieris*:—

Since I first recognised the Palaearctic hybrid species in 1966 (*Ent. Record* pp. 57-65), I have always referred to them as *P. dubiosa* in the western area and *P. pseudorapae* in the eastern. With increase of our knowledge a change of these names, unfortunately, becomes unavoidable.

In 1895 Heyne gave the name "*P. napi meridionalis*" to the *napi*-like insect of "central Italy", in Rhül's "Die Palaearktischen Grossschmetterling" p. 714. In the summer of 1967 Col. W. B. L. Manley collected a series of this insect from Toscana and Lazio: the second generation. Examination of the scales showed them to be one of the hybrid species, but a difficulty at once became apparent: the locality was in the centre of the *dubiosa* zone, but the scales were not typical of that species; further, the size and under side markings suggested the eastern *P. pseudorapae*. My first impression was that these Italian insects must be some unrecognised race, but on considering the scales I had of some specimens from central Greece which I had referred to *dubiosa* I concluded they all would have to be attached to the latter. Mr. Bowden had earlier in the year captured some specimens in south Italy of the first generation, which I also accepted (doubtfully), as *dubiosa*. Later he bred hybrids between the south Italian race and Corsican *dubiosa*. These hybrids raised further doubts for the scales showed no increase in malformation beyond that normal to *dubiosa* and there was a distinct reduction in the size of the hybrids though they were of the second generation. This change in size was evidence that the races crossed

were constitutionally different. *P. dubiosa* on the average is smaller than *P. pseudorapae*, but the hybrids are a little smaller than normal *dubiosa*. Some check to normal development was active and this could not be attributed to treatment with such an expert breeder as Mr. Bowden. Indeed, at the same time, he bred an extensive series of the second generation of the Italian race from the same stock he had used in the cross and the resulting specimens were of full size and normal in every respect. The Italian race could therefore not be *dubiosa*. As an hybrid species, however, if not *dubiosa* it must be *pseudorapae*, in spite of the western locality. The superficial characters of *pseudorapae*, its great size, in both generations; the strong, dark markings of the underside hindwing in the first generation, practically unmarked in the second, all accord exactly with the Italian race. Occasional specimens of *dubiosa* can attain an equal size in the second generation, but it is much smaller in the first in which the underside markings more resemble those of *P. napi* while the first generation of *pseudorapae* on the underside is suggestive of *P. bryoniae neobryoniae*. The second generation of *dubiosa* tends to be more marked on the underside and the black spots on the upper side are larger even in the females, and the discoidal spot on the upper side forewing in the male *dubiosa* is more constant: it is frequently wanting in *pseudorapae*.

All these facts prove that the southern Greek and central and southern Italian insects can only be *P. pseudorapae*, in spite of the distance they have spread to the west, and of the presence of *dubiosa* in the central Balkans. My previous idea that the extreme malformation existing in the scales of *pseudorapae* of the Constantinople area resulted on a cross between *dubiosa* and *pseudorapae* seems impossible and must be connected with some local disturbance.

The first result of this discovery is that the name *meridionalis* will have to replace *pseudorapae* Vty. The name *dubiosa* will still apply to the Spanish, Portuguese and Corsican hybrid insects. But it must be noted that "*meridionalis*" cannot be applied to any form of *P. napi* as it has been (incorrectly), in the past.

The distribution of the Palaearctic, hybrid species, is of considerable interest. They are completely absent from some islands in the Mediterranean yet present in others at no great distance. I have some reason for thinking that a mixed race *meridionalis* × *dubiosa* may exist in Sicily, but have only seen a very few specimens. A considerable series will be needed before one can establish the nature of the indigenous race with certainty.]

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EARLY APPEARANCES IN SOMERSET—On 20th January 1968, I was shown a specimen of *Eurrhypara hortulata* L. (small magpie moth) inside a bungalow near Weston-super-Mare. Possibly the larva had entered last autumn and its life cycle accelerated by the warmth indoors. One of the numerous house plants kept there may have aided this very early emergence.

Early dates at my light traps include 4 *Erannis marginaria* Fab. at Cheddar, 19.i.1968 and an *E. leucophaearia* Schiff. at Shipman, 21.i.1968.—TREVOR B. SILCOCKS, 3 Kenmeade Close, Shipham, near Winscombe, Somerset. 22.i.1968.