

On an instable race of *Pieris adalwinda*, located in Scotland

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In spite of all the work that has been done in connection with *P. napi* and *P. adalwinda* it may not yet be generally realised that *P. napi* has been derived from *P. adalwinda*. Recently, the study of the androconial scales of a remarkable *Pieris* race from Scotland has once again emphasised the fact; irrefutably. This race in the past has been referred to as "*P. napi*," although the great majority of the females resemble *P. adalwinda* or *P. bryoniae* closely, many of them having a yellow ground colour on the upper side as in those species.

Mr. Thomson of Dunblane, having collected this race for many years, became doubtful that it could be correct to accept it as *P. napi*. Wishing to get the scales examined he sent a few specimens to Dr. Stopher of Deal, who brought the matter to my notice. After some correspondence Mr. Thomson offered to supply me with the necessary material, and during the past summer (1968), collected a series of some 57 specimens in the months of May, June, July, August and September, from a number of localities in Perthshire, Stirlingshire and Fifeshire, which he kindly gave me. The specimens had not been set when I received them, so that I was able to mount the scales of several before they had been on the setting boards, always an advantage when scales are required, as well as from the remainder after setting. Examination of the scales gave very unexpected results. This race is in an absolutely instable condition. No fewer than four types of androconial scales are recognisable, all similar to types known in other species. In spite of this range of variation the scales are perfectly formed, even when two or three of the types appear in one individual. Each type seems to be a normal component of the race: they are not restricted to any particular locality or generation.

In the following notes I refer to these types by the names of the species in which they exist as the normal type: namely the "*narina*", "*adalwinda*", "*marginalis*" and "*napi*" types.

It must be remembered that there is some variation in the scales of all *Pieris* species. Thus in typical *P. adalwinda* from Scandinavia, the body of the scale varies in width, and often is exceptionally developed in the northern regions where the species only has one generation in the season. The scales of the second generations in all species of the *P. napi* and *P. melete* groups of the genus, are characterised by a reduction in width of the neck of the scale compared with that of the first generation scales. This reduction causes many second-generation scales of *P. adalwinda* to resemble the first-generation scale of *P. marginalis*. It may often be difficult to distinguish between those two forms; but the second-generation scale of *P. marginalis*, with its long and narrow neck, is absolutely distinct from any *adalwinda* scale.

All the figures of scales mentioned in the following definitions were published in my paper in the *Entomologist's Record* for 1967, on plates 6 and 7; and the figure numbers are those used on those plates.

1. "*Narina*" type. A primitive scale, body oval, tapering gradually from the point of greatest width to the extremity, practically or completely without any constriction marking the start of the neck (as fig. 8.

- P. marina*). This primitive form of scale, in many slightly varying forms, occurs in all Nearctic species of the *napi*-group, also in the Palaearctic *P. kamtschadalis*: a testimony to their common origin.
2. "*Adalwinda*" type. Body oval, variable in width, neck short and broad (as fig. 22, monogenerational *P. adalwinda*, Lapland; or fig. 15, 1st generation *P. marginalis*, or transitional between these). The more slender form of the body seems most frequent in the Scottish insect (as fig. 15).
 3. "*Marginalis*" type. Body oval, slender, with marked contraction to the neck, which is long and narrow (as fig. 20, *P. marginalis* 2nd generation).
 4. "*Napi*" type. Body tending to be circular, with very marked contraction to neck, which is long and somewhat variable in width, but narrower than in the *adalwinda* type. (As fig. 6, *P. napi* 1st generation).
- The "*adalwinda*" and "*marginalis*" types occur with greatest frequency.

There is no reason to doubt that these types in this case are all products of one race, for though they occur as pure types in some individuals, they also occur mixed in varying proportions in many. Thus the *narina* form occurs with the *adalwinda* or *marginalis*; *adalwinda* with *marginalis*, or with *marginalis* and *narina*; *napi* with *adalwinda*, or with *marginalis* and *adalwinda*. In all these the scales remain perfectly developed. The seasonal forms, as known elsewhere, appear in either generation in the Scottish race, and even together in some individuals.

This remarkable race seems to be a form of *P. adalwinda* in which the normal continuity of development has somehow been broken. It has been shown in the past that *P. adalwinda* has been derived from the Asiatic hybrid strain (*P. narina* \times *P. dulcinea*), which also spread to N. America where it gave rise to a number of distinct species. The appearance of these various types in a fluctuating race of *P. adalwinda* is therefore understandable as partial reversion, the *napi*-like formation springing from the *dulcinea* element. It may be recalled that breeding experiments proved that typical *P. napi* carries a very definite element of the *dulcinea* strain (Warren 1967, p. 141). This must have been passed on to *P. napi* by the medium of this fluctuating form of *P. adalwinda*. Before leaving the details concerning the scales, it may be noted that though so many types are present in the Scottish insect the true *P. bryoniae* type does not occur: one further indication that the latter species did not originate from the *narina-dulcinea* strain. But the very large, primitive scale, so often seen in *P. bryoniae* does occur in some individuals in Scotland, as in most species of the *napi* and *melete* groups, though not in *P. napi*.

Turning to the superficial features of the Scottish race, the most conspicuous are of course the markings of the females. The majority of these are of the form described as *radiata* in *P. bryoniae* by Röber. In this the nervures of the forewings, and sometimes hindwings also, on the upper side are outlined in black, lightly or heavily. In the Scottish race many have the areas between the nervures also suffused with black. They most often have a white ground-colour and a few specimens can resemble *P. napi* exactly. Some however (estimated at about 25% by Mr. Thomson), have a yellow ground-colour. In these the dark suffusion can occur as in the white specimens. The yellow colour is not that of the well-known Irish yellow specimens (as illustrated by Müller and Kauts 1939, plate 1, figs. 5, 6), but close to that of the *flavescens* form of *P. bryoniae* (as

Müller and Kautz, plate 5, fig. 7, or between that and fig. 6). All these female forms are of course characteristic of *P. adalwinda*, though they do not habitually occur in one locality. They concur with the characters of the scales in connecting the Scottish race with *P. adalwinda*.

A further character connecting with *P. adalwinda* is the colouring of the under side. This mostly is darker than in normal *P. napi*, the dark scaling on the nervures is more black than grey. There is also a not infrequent tendency for the marking on the hindwing to spread on each side of the nervures, especially on the basal half of the wing. The ground-colour is often a deeper yellow, especially in the females, with a tinge of orange, somewhat as in the figure given by Müller and Katz (pl. 10, fig. 4). These features are normal to *P. adalwinda*, but like all other characters, very variable in *thomsoni*. It is impossible to leave this race under the obliterating name of *P. napi*. It is a fluctuating race of *P. adalwinda* and must have a distinctive name. Müller and Kautz (1939), used the name "*britannica*" Vty. for it. Fortunately that misleading title is ruled out, for the types of *britannica*, which are in the Oberthür collection, came from the south of Ireland. The Irish race, though different from that of England, is certainly a race of *P. napi*. It is Mr. Thomson's work and observations that rescued this unique race from oblivion, so I am naming it *P. adalwinda* subsp. *thomsoni* n. subsp. The male holotype and female allotype and one male and female paratype (the latter being a yellow one), are from Sheriffmuir, Dunblane, Perthshire, at 600 feet altitude; and one male and one female paratype from Dunblane at 200 feet altitude, all in the Thomson collection; and 11 paratypes in the author's collection, of which two males and four females come from the Carron Valley, Stirlingshire, two males and two females from the Kilsyth Hills, Stirlingshire, and one female from St. Andrews, Fifehire. How far to the north and south the new subspecies extends will have to be worked out later; also the question whether typical *P. adalwinda* still exists in Scotland.

It is not possible to assume that *thomsoni* is a race deviating from typical *P. napi*, for as well as the facts already given connecting it with *P. adalwinda*, it is known that disturbance of the normal conditions causes *P. napi* to revert to *P. adalwinda*. In cases of natural, dwarf examples of *P. napi* taken in central or southern Europe, the scales revert to the *adalwinda*-type. Were *thomsoni* a *napi* race obstructed in normal development, a pure *adalwinda* scale would certainly exist, as it does when the two species are crossed. It seems, however, that when some change affects the normal development in *P. adalwinda* a mixture of characters, indicative of its compound parentage become evident.

It has been mentioned before that the differing neck width of the scales in *thomsoni* that are seasonal characters in other species, occur together in either generation in *thomsoni*. In *P. napi* this seasonal difference is slighter than usual, and I have frequently wondered at this failure of what must be a generic character. The reason now becomes apparent. *P. napi* is still affected by the fluctuating state that prevailed in the *thomsoni* stage.

The subsp. *thomsoni* is a living link between *P. adalwinda* and *P. napi*, which has disappeared as *P. napi* emerged. The existence of this race raises some interesting questions. Each variety of scale type it produces might have been said to be a "new" mutation (had we no previous know-

ledge about it) But are all varieties really "new" or "mutations", suddenly appearing? These ideas seem to be refuted by *thomsoni*. The scale types are not new, but characters that have long formed part of the normal elements of *P. adalwinda*. The latter occurs in Eastern Russia in Europe far to the south of Scotland, in its typical form. Change of latitude or altitude has not affected its normal development. Yet the fluctuating stage *thomsoni* must have existed in many areas. It is even quite possible that it still exists in Scandinavia in some restricted district.

The reappearance of suppressed characters is only an outburst of variation in an hitherto stable sphere. This may have been helped by a weakening of the existing state through long periods of isolation, but it may only be an instance of alternation of variation from one sphere to another, for variation is never wholly absent, in some sphere, though it may be less obvious at times. It is known that some slight varieties are repeated with frequency in a given species. This points to their being normal attributes of that species, not mutations. Those extreme aberrations, so prized by collectors, are more probably true mutations, pathological alterations. But these do not lead to the development of new races or species, or should they do so it must be an extremely rare occurrence, for most congeneric species only differ from each other by alterations in the degree of development of existing features, and not by the introduction of abnormal peculiarities.

We can note however that each scale type existing in *thomsoni* has elsewhere in the group become prevalent in a separate species; mostly in the Nearctic Region. *P. adalwinda* must date from the same remote period as those Nearctic species, for as well as a common origin with them, it has existed long enough to cross the entire width of the northern area of the Palaearctic Region, just as *P. oleracea* has crossed N. America from the Pacific to the Atlantic. But *thomsoni* is not an hybrid, merely a phase of variation in an existing species. Therefore should it give rise to a constant, new race, such a race will not show the characteristics of an hybrid, for though coming from a hybrid stock it is the direct offspring of a single species. For this reason *P. napi* has the qualities of a pure species; if it reverts it is to one form, the most recent, constant ancestral one. This is impossible for hybrids. When variation reasserts itself they cannot revert to one form, for varied features and characteristics are disclosed; contending fragments of their mixed parentage.

At present in *thomsoni* the *napi*-scale is produced, occasionally, in perfect form as the only type in an individual, also a few females marked as normal *P. napi* can be found.

Considering the presence of *P. napi* in central and western Europe and the absence from that region of *P. adalwinda* or any *Pieris* race retaining any of the other scale types present in *thomsoni*, it must be acknowledged that in all probability *thomsoni* will eventually be replaced by *P. napi* in Scotland. This makes it all the more important to record its existence at the present time.

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