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PIERIS VERNALIS A VARIETY OF PIERIS PROTODICE.

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Experiments and observations during 1874-5, supplemented by comparison of a large suite of specimens, seemed to invalidate the specific separation of *vernalis*. Submitting the facts to Mr. W. H. Edwards, he confirmed my opinion, and in the recently issued "Catalogue of the Diurnal Lepidoptera of America North of Mexico," he has placed "*vernalis*" as a variety of *P. protodice*.

The basis for my conclusion is briefly as below :

I. A BROOD FROM PROTODICE.

♀ taken August 15th, 1874. A *protodice* of normal summer form ; being of large size, with ample and dark markings on upper surface of wings and gray scales at base of primaries above, and showing yellowish and rather meagre shading beneath secondaries. This deposited eggs 21st August, which produced larvæ on 25th. Resulting imagines, seven, Sept. 15th. Two of these were not noticeably variant from usual *protodice* ; the remaining five were grades between *protodice* and *vernalis*, one female and four males ; the female and three males approximated *protodice* in varying degrees, and one male was nearer *vernalis* than *protodice* in size and marking.

2. A SERIES FROM COLLECTED LARVÆ.

In 1874, late in September and early in October, a large number of the caterpillars in various sizes were taken from naturalized mustard.

These were brought to the pupa stage with very slight loss, during October and early in November.

No parasites were observed in any stage.

The chrysalids were wintered in a cool room, without little mortality.*

Imagines appeared 1875, April 14th to May 19th, females more abundant than males, about two to one.

None of either sex were of full size of *largest* captured examples of *protodice*, though several were but little inferior.

The series included scarcely a half dozen of the extreme *vernalis* type, and about an equal number of pronounced *protodice*; between these extremes ranged the large majority of the series, exhibiting a progressive set of intergrades. The prevailing tendency among the grades was towards *vernalis*.

Gradation occurred in regard to every observable point of difference between *protodice* and *vernalis*.

The larvæ from which this series resulted were all practically alike in markings; if any difference it was not perceptible. This larval uniformity seemed to affirm the specific unity of the diverse forms resulting—a conclusion much strengthened by the numerous intergrades.

3. COMPARISON OF CAPTURED SPECIMENS.

My collected set consists of *protodice* chiefly, a less number which are grades, and a very few of the *vernalis* type; the intergrades are amply sufficient to connect the extreme forms.

The butterfly is very rare in spring. About mid-June a few may be seen, a larger brood in July, and an abundant flight in August and September. After the middle of August usually the sequency of broods is more or less obscured, as each successive week shows an increased army of individuals; in scarce years, however, the regular accession of broods is evident.

Captures during June, July, August and early September are almost invariably true *protodice*. In September some grades appear, and with

* The favorable result of this experiment—say 67 butterflies from about 80 larvæ—as compared with the uniform extreme scarcity of *protodice* here in spring in state of nature, suggests that the species is imperfectly inured to our climate, and finds its proper *winter* conditions further south. Out of doors very few of the pupæ seem to escape our severe winters. The butterfly is extremely rare in spring (May), becomes more frequent by July, common and abundant in succeeding months. I have reason to think neither larva nor imago hibernate in this locality.

cool weather a very few *vernalis* also—these in late September and in October until severe night frosts occur. In autumn the grades of earlier dates are nearer the type; those appearing later progressively approach *vernalis*.

I would suggest that the term "dimorphic variety" hardly applies properly to *vernalis*. The variation is multiform, and the intergrade examples largely outnumber the instances of the extreme "*vernalis*" type as described and figured. *Vernalis* is not a variety abruptly contrasting with a type form, but merely the extreme term of a series of variations departing from type.

Vol. I of Mr. Edwards' "Butterflies of N. A." contains plate with accurate and beautiful figures of *vernalis*.

AN ACCOUNT OF SOME FARTHER EXPERIMENTS UPON THE EFFECT OF COLD IN CHANGING THE FORM OF CERTAIN BUTTERFLIES.

BY W. H. EDWARDS, COALBURGH, W. VA.

In May, of the present year, at Coalburgh, I bred a large number of larvæ from eggs laid by *tharos*, var. *marcia*; also several from eggs laid by *ajax*, var. *Walshii*; and from eggs laid by *Lyc. pseudargiolus*; and all of the chrysalids of *tharos*, and part of those of the other two species, were placed in small tin boxes as they formed, and at different intervals thereafter, 10, 20, 60 minutes up to some hours, and one and two days, were laid in the ice box on top of the ice. The box was supplied with ice once a day. I intended removing the chrysalids at irregular periods, so as to see what length of exposure to cold would suffice to change the form of the butterfly, and hoped also to ascertain how soon after the forming of the chrysalis the cold must be applied to produce the desired effect. But the *tharos* chrysalids had scarcely begun to form when I was called to New York, and had to leave charge of them and the larvæ to a member of my family, who followed my directions faithfully as to