The New Wood White

The following is a modified version of part the chapter on The Wood White Group in
EUROPEAN BUTTERFLIES: A PORTRAIT IN PHOTOGRAPHS

Taxonomy and Systematics
The five European species in the group are:

***Leptidea sinapis* (Wood White);**
***Leptidea reali* (Real's Wood White);**
***Leptidea juvernica* (Irish Wood White);**
***Leptidea morsei* (Fenton's Wood White);**
***Leptidea duponcheli* (Eastern Wood White).**

The subfamily Dismorphiinae has many species flying in Central and South America, but in the Old World there is only the one genus, *Leptidea*. All species in the present group are closely related to each other but not closely related to other groups of European species in the Pieridae (Whites and Yellows) family.

Leptidea species have a distinctive and very similar external appearance, to the extent that before 1989 only *L. sinapis*, *L. morsei* and *L. duponcheli* were recognised in Europe. Then it was found that certain examples of what had been thought to be *L. sinapis* in the Pyrenees had distinctively large genitalia, and subsequent investigations showed that individuals across the European range of *L. sinapis* consistently had either the smaller or the larger genitalia. Thus, it was concluded, there were in fact two species, more-or-less identical in external appearance: *L. sinapis*, with the smaller genitalia, and what became named *L. reali* Reissinger 1989, with the larger genitalia.

Then, remarkably, molecular (genetic) and karyological (chromosome number) studies by Dinca *et al* (2011) discovered that the supposed single species *L. reali* (defined by the larger genitalia) was itself divided into two distinct genotypes sufficiently different to warrant them being different species. Broadly, one genotype was found in Italy, southern France and Spain, including the Pyrenees, and thus retained the name *L. reali*, while the other was found in a more extensive northerly belt and was named *L. juvernica*.

It was also concluded that these three sibling species share a common ancestor, probably in Asia, up to about three hundred thousand years ago when the line of descent divided into two lineages, one of which subsequently divided again into what now have become *L. reali* and *L. sinapis* while the other continued unbranched to become what now is *L. juvernica*. So *L. reali* and *L. sinapis* are slightly closer evolutionarily to each other than to *L. juvernica*. Presumably the common ancestor of all three had the larger genitalia, which have been retained by *L. reali* and *L. juvernica*, and *L. sinapis* has evolved to have smaller genitalia.

It will be convenient to refer sometimes to the trio of sibling-species as the *sinapis*-siblings.

There are several examples of *pairs* of sibling species in Europe, more-or-less indistinguishable from external morphology but separated by genitalic morphology, for example: *Pontia daplidice* and *P. edusa* (Western Bath White and Eastern Bath White), ch. 4.3, and *Euchloe crameri* and *E. ausonia* (Western Dappled White and Eastern Dappled White), ch. 4.4. These pairs of sibling species have a definite west-east geographical separation which naturally suggests the geo-historical origin of their speciation. But the *sinapis*-siblings are more complicated, for they consist of a trio of sibling species whose distributions overlap in pairs (*L. sinapis* and *L. reali* in southern parts and *L. sinapis* and *L. juvernica* further north). How this came about is not so obvious, but a scenario is presented by Dinca *et al*, in which *L. juvernica* became established across Europe by immigration from Asia, while *L. reali* and *L. sinapis* speciated in southwestern Europe. Subsequently, *L. sinapis* extended its range back across Europe, but *L. reali* remained in southern and southwestern Europe No doubt, if this is a correct scenario, the glacial periods would have played a role in isolating *L. reali* and *L. sinapis* for substantial periods.

The time span of little more than one hundred thousand years for *L. sinapis* and *L. reali* to diverge from *L. juvernica* is very short compared to the million or so years involved in the evolution of most new butterfly species. Actually, though, one hundred thousand years is similar to the time elapsed since the appearance of the most recently evolved *Agrodiaetus* (Anomalous Blues) species, ch. 5.5, and it may be significant in the context of the following discussion that different *Agrodiaetus* species, like the *sinapis*-siblings, have very divergent chromosome numbers.

In another paper on *Leptidea* species, the same group of workers, Lukhtanov *et al* (2011), reported a truly remarkable discovery in their genetic measurements. They found the chromosome numbers found in various individuals of *L. sinapis* ranged clinally from 2n = 106 in northeastern Spain to 2n = 56 in eastern Kazakhstan.

Although butterfly chromosome numbers may lie between about 10 and 130 in different species, normally they are constant in a given species. It is presumed that there is generally either reduced fertility and/or reduced fitness in their offspring when two individuals with different chromosome numbers mate. Indeed, any intraspecific variation of chromosome number suggests one should consider whether there may be two (or more) species involved. As a rule of thumb, however, a variation of one or two in chromosome number is commonly regarded as 'allowable' across the range of a widespread species, for example as in *Lysandra coridon* (Chalkhill Blue), ch. 5.4.

In the case of *L. sinapis*, the geographical variation of the chromosome number vastly exceeds the 'allowable' range, but variation within a population or among neighbouring populations remains small, so that gene-flow is apparently not interrupted. Lukhtanov *et al* were able to effectively rule out the involvement of another species, in part because the actual variation of the DNA sequences measured was small, especially for such a widely distributed species. In fact, it was their experiments to exclude hybridisation with another species such as *L. reali* that led to the discovery of *L. juvernica* mentioned earlier. Taking these and other points into consideration, Lukhtanov *et al* concluded that *L. sinapis* is indeed presently a single species, which may be in the early stages of speciation taking place by chromosome fission/fusion, rather than by the supposedly usual method of geographical isolation, mutation and selection.

In the present publication it is convenient to ignore the underlying complexity of the *sinapis*-siblings, and the three species will be discussed and described together in the same Species Section in the present chapter.

In Ireland, it turns out that all Wood Whites have large genitalia, except for certain isolated populations in the West. Thus, ignoring the latter *L. sinapis* populations, the species has run from being referred to as *L. sinapis* through *L. reali* to *L. juvernica*, as it now turns out to be according to its genome. Because in other regions where *L. juvernica* flies it has intermingled with *L. sinapis* to an unknown extent, the provenance of historical insects described is only reliable for those in Ireland. The name *juvernica* (Williams, 1946) was proposed by Dinca *et al* because it was the oldest taxon they could demonstrate unambiguously to refer to the new species, but future studies might evaluate even older available names, which would have priority. The type location of *L. juvernica* is Co. Kildare, Ireland.

I shall therefore use the common name Irish Wood White for *L. juvernica* to reflect the comments in the previous paragraph.

Another common name being used for *L. juvernica* is the 'Cryptic Wood White'. In my view this is unfortunate because it is certainly not cryptic, i.e. hidden, in any peculiar sense. It is true that its genetic particulars are hidden to field observation but this could be said equally of its siblings or, indeed, of any living species. On the other hand, *L. juvernica* is by no means restricted to Ireland and may be found, for example, in eastern Kazakhstan. In favour of the name 'Irish Wood White', however, it can be observed that it does have resonance as an *English* common name.

There is one final puzzle concerning the *sinapis*-siblings. What geo-historical explanation can account for the apparently complete absence of *L. juvernica* from England, but its presence, indeed preponderance, in Ireland: how did *L. juvernica* get to Ireland while leaving no trace in England? It has been suggested that it came to Ireland in the same way that various plants from the Iberian Peninsula, especially from its northwestern region, arrived (by seafaring?). This explanation seemed feasible until now, when it has become recognised that it is *L. reali* that exists in the Iberian Peninsula, not *L. juvernica*.

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References

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