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The geographical and seasonal variations of Coenonympha pamphilus L.

By **Roger Verity**, M. D., Firenze (Italia).

I have in some of my articles already remarked how sadly ıeglected this species usually is by collectors and how, in consequence, he literature about it is of the poorest description and very little is ınown about its variations. The cause, no doubt, lies in the fact he species is nearly ubiquitous and inconspicuous, so that collec-ors are not keen to pay for specimens and take no interest in :, thinking those they can find near their door-step are similar ɔ all the others. This is an entirely mistaken idea and Oberthür, ke myself, has pointed out that, on the contrary, *pamphilus* is ne of the most variable and interesting species. I maintain it is ne of the broadspread and common species, which will furnish ıe most valuable data from the general standpoint of evolution, he very object we are endeavouring to achieve by the long, toil-ome work of careful analysis carried out along the lines of an rderly synthetic plan. As I have struck in *pamphilus* a nearly nbeaten track, I am responsible for most of the descriptions and ames and some of those who will have the patience of glancing ırough the following pages may think I have pushed analysis too ır. I feel confident, however, that if the matter is gone into fully, ith sufficient materials at hand to verify my statements, it will ecome obvious I have only been lead by very positive facts and would have been a mistake to deliberately limit our knowledge ırough fear of following nature's complex developments. As to ıe number of names, I cannot go into the long-debated question ere, but I can mention the excellent example afforded in this very ɔecies by that of *lyllus*, Esper, showing the errors that arise from sisting on using existing names in cases, which are, in reality, ıtirely different and new and require a new designation. The escriptions of it given by many of the most diffused text-books eal with forms which have nothing in common with Esper's sect and in nearly every local list of butterflies, including Britain, ıe finds it recorded. Esper's *lyllus* is, instead, so distinct from *ımphilus* that lately it has been suggestad by myself and by uerci it might even be a distinct species (see Entomologist's ecord and Journal of Variation, respectively of 1916, 171, and of 1925, p. 26). This hypothesis is worth considering, though the facts I have been able to observe so far are not in vour of the conclusion that there exists sterility between *lyllus* ıd *vamphilus*, such as is essential in true specific distinctness.

On the other hand the statement made by Turner, according to th general belief, that *lyllus* is nothing but the hot dry season form of *pamphilus* and that the latter must necessarily precede it i the spring, is not correct either. True *lyllus* is perfectly distinc at all seasons, although the features of the I generation are muc less striking at first sight than those of the II. Thus, neither o these views fits facts exactly and I think the truth must b sought for in a third phenomenon, the one I have described a „exergism“ or „exclusivism“ in the Entom. Record, 1925, p. 10 In dealing with the *Zygaenae* I have pointed out that it is impo ssible to limit our knowledge of relationships to specific and racia ones. There exists at least one other kind, in which two group possess different hereditary features, but are not sterile to on another, so that when they meet they interbreed and they onl keep distinct because their constitutions are suitable to differen surroundings and usually keep them apart from each other. will thus be necessary to work out relationship more accuratel than has hitherto been done and establish in each case of group differing from each other the sort of distinctness they exhibi It is, however a mistake to attempt to judge the degree of dis tinctness from the fact that the features are more or less striking as has been done too often in the past. Even one of th most thourough and clever Entomologist's has sent me photograph of „genitalia“ and asked me to give my opinion as to whethe they were specifically distinct or not. My answer is that any kin of morphological difference can be suggestive of specific distinctio but none can be conclusive as to its existence. To my mind is only on sterility between two groups one can base specif distinction, independently of all visible features. Practically on is, of course, obliged to make use of the latter to distinguish th individuals of the two groups, but one can only come to a defin tive conclusion either by experimental breeding of more than on generation, to exclude the grades of fertility capable of producin hybrids during as many as three or four successive ones, or b inferences drawn from the following observations: When two group distinguishable by some feature, live together in some regions an no transitional individuals are met with, we can conclude they a in reality specifically distinct. When two such groups inhab different areas and replace each other entirely, never producing eac other's features, even as extreme individual variations, but the obviously interbreed where they meet along the boundary of the areas as shown by transitional individuals found in that zone onl we must conclude we have before us a case of exergism, suc

; I have defined above. When, on the contrary, two groups in-
ıbit different areas and are on the whole different in aspect, but
ıe, or both, produce individuals transitional and similar to those
: the other group in all or most localities, so that evidently the
ifferencies are only due to the direct effects of local conditions
ı the individual development and the center of oscillation of
ıriation is not modified permanently in an hereditary way, we
ust speak of r a c e s. In other words, differences which keep
ıaltered, like specific ones, when the two groups are bred arti-
:ially out of their usual surroundings, are to be considered of an
:xergic" nature; those, which are at once abolished or modified
such conditions, are racial. In this respect, if my definitions
e accepted as corresponding to facts, it will be necessary to be
ore accurate in the use of the term „race", which has hitherto
:en used indiscriminately for the two phenomena. Artificial breeds
eated by man's selection, are in the nature of „exerges" also the
)-called „races" of mankind, which some modern anthropologists
ıve been wanting to raise to the dignity of species, find their
:act position in classification as „exerges". Confusion in termino-
gy has been further increased by the use of „subspecies" and
„morphs" or „forms" in various senses, including those of
:erges and races. Thus, I think I am justified in having
ıggested to introduce a new term with a definite meaning. In
her languages, such as French and Italian, it is still more necessary,
:cause there exists only the term of „race" to cover the natural
:erges, like those of mankind, and the artificial breeds of domestic
ıimals, as well as the real races.

Returning to the question of the relationship of *tyllus* to *pam-
ıilus*, I believe I am right in stating that their distinctness is
:ither specific nor racial and that they are, instead, two exerges,
clining, if anything, rather to the lesser, racial, degree than to
e higher, specific one, in the gradual scale of distinction. This
st remark I make because I have not been able to detect any
:tual feature absolutely proper to one of the two, distinguishing
em in an absolute way, such as exist in more highly differen-
ated and characteristic cases of exergism: *Hesperia malvae* and *mal-
)ides, Melitaea athalia* and *pseudoathalia,* etc. T u r n e r, however
ys that B e t h u n e - B a k e r from his morphological examination
influenced to suggest two distinct species. This ist just what
ıe would have expected in exerges, which should be different
orphologically, but not sterile between each other. Concerning
e morphology, I must let B e t h u n e - B a k e r illustrate, himself,
e characters he has discovered and I can only say that to the

naked eye the chief difference between *lyllus* and *pamphilus*, a far as I have found out, consists in a combination of various fe tures, each of which is produced singly in extreme individu variations of the other group, but never, on any account, combine in that way, except in the particular races I will deal with, flyi in an zone of transition between their habitats. The next poi to observe is that, although they overlap in single features, th have two perfectly distinct centers of oscillation in individu variation, which are similar, at a very much higher degree, to t difference between the centers of seasonal polymorphism: in *lyll* the dry heat characters are pushed much further than they ev are in *pamphilus* and the description one can give of it amoun on the whole, precisely to that of these characters; in *C. pamph lus* the same thing occurs in connection with the damp cold ch racters. In a similar way dry cold probably accounts for the gene appearance of the I generation of *lyllus* and various degrees damp heat for that of the II generations of *C. pamphilus* in various local races. This is the principal reason which makes think they can scarcely be two species and that it is more pr bable they are even a rather low grade of exerges, because mo of their features seem due to surroundings and few to heredita factors. On the other hand, it seems also sure that some her ditary factors do come in, or one would meet with *lyllus* as individual variation in southern races of *pamphilus* living in su roundings apparently much more suitable, in some cases, to produ it than are some of those where *lyllus* exists alone. On the co trary, they exclude each other and they inhabit two different area only occuring together in the intermediate zone. It will be a ve interesting subject to work out how they stand to each other the The few materials I have been able to collect are suggestive th they blend and that transitional forms are frequent. That they a due to intercrossing of two different strains and not to simp resemblance seems to be shown by the fact noted above that the transitions do not occur elsewhere. I have series of hundreds specimens from Peninsular Italy, for instance, and I have examin hundreds of others, without finding a single *lyllus*. Instead in t Asturias Romei has found the two together; in a little series fro Seva, in northern Catalonia, consisting of perfect *pamphilus*, I ha one specimen identical to the Spanish I gen. of *lyllus* and anoth exactly intermediate. A large series of the I gen. of Palermo, whe the II is a *lyllus* of the most perfect description, consists in eve grade of transition from individuals similar to the I gen. *lyllia* of Sardinia to others similar to *emiaustralis* of Italy at high altitud

specimen from the Valais, bought by me at Martigny, from the dow of Wulschlegel, and which I have named *bipertita* in the nt. Record, 1919, p. 121, is quite similar to the I gen. of Spain upperside and resembles it considerably on underside, although is more heavily loaded with gray. Finally in Central Asia the o exerges are found in the same regions, evidently replacing each her according to local conditions, and there exist perfectly inter-ediate ones, such as a series I have from Duktan in Zarafshan, so in the II gener. We thus see that the zone of transition be-een the areas of *lyllus* and *C. pamphilus* runs through northern ain, then presumably through the south of France, where a strain *lyllus* stretches as far as the Valais, presumably spread there company with *Erynnis marrubii (= boetica)* and other Iberian ecies and races one is rather surprised to find in a Swiss Valley. rdinia (and probably Corsica) are with Sicily (and probably the treme south of Calabria) on the *lyllus* side, whilst only *pamphilus* nabits northern Calabria. From Greece I have only seen *pamphilus*, t too few specimens to affirm the absence of *lyllus*. In Crete e peculiar *thyrsis*, Freyer is a near ally of *lyllus*, but, no doubt, third exerge, as we will presently see. The zone of transition en stretches from the southern portion of Asia Minor, through rdistan, to the Transcaspian District and then, eastward, as far Eastern Turkestan, Kashgar being the furthest locality known *lyllus*.

A few interesting inferences can by drawn from the variations d distribution of these *Coenonympha*, which confirm those I have awn from the genus *Zygaena*, because they evidently follow actly the same lines of evolution. The three broader groups *rsis*, *lyllus* and *pamphilus* are obviously successive grades, on e whole, of a single line of variation and probably of descent. we take into account the remarkable transitional look of the ental (Mesopotamia to Persia) species *C. saadi*, Koll., between e type of pattern of *thyrsis* and that of the Australian *Hypocrysta*, are lead to conclude that *thyrsis* is probably the most ancient ing form of the *pamphilus* line of descent. Certain points a distant resemblance to *corinna* and to *vaucheri*, not to men-n *dorus*, gives one the impression that it was the form of *mphilus* which flew in company with them before the Glacial och and during the hot Interglacial periods, whilst during the riods of glaciation it only survived under that form in southern rts of the Palaearctic region. Further north its constitution olved into a state of organic balance suited to stand cold climates d succeeded in producing an extreme one capable of living even

in as cold ones as that of northern Finland is in our times, where *corinna* and *vaucheri*, and to a lesser extent, also *dorus*, had power of evolving that way and they had to retire southward a localise where conditions were suitable to their particular requir ments. In fact, also individually, they vary very little, as compar to *pamphilus*, showing that they are highly anabolic, and in a ve fixed and specialised state, uncapable of much physiological reacti to changes of surroundings. The oldest exerge *thyrsis* of *pa philus* may be in comparatively similar conditions. It cannot ha the same hereditary factors as *lyllus*, or the latter would in th case, produce it occasionally, at least as an extreme individ variety, whereas form *thyrsides* Stdg.; is its nearest approach in th direction. In our times the climate of the Palaearctic region h evidently drifted too far from that of the tropical ones and *thyr* is on the verge of following its ancestors of those days in extinction. The two centers of oscillation of *lyllus* and of *pamphilus* a now left alone to fluctuate respectively from south tho north a from north to south and replace each other, according to the min climatic variations of different Epochs.

Exerge lyllus, Esp.

I have stated above that there exist no constant featur proper to *lyllus*, by which to distinguish it from *pamphilus* an absolute way. The most useful for this purpose in pract is afforded by the dark marginal pattern. In *lyllus* it consists upperside of a premarginal streak or in a row of lunules, sha in outline outwardly, so that a clearly defined space of the fulvo ground-colour separates it from the capillary streak, which ru along the margin; in *pamphilus* it consists, instead, in one ba including both the streaks described above. On underside forewing the same premarginal band tends to be thinner a sharper and to have a zigzag shape in *lyllus*, whilst in *pamphi* it is usually obliterated or indefinite in outline.

The races of this exerge and their generations, as far as th are known to me, are the following:

The nymotypical form, as figured by Esper from Portug seems to constitute the broadspread race of the Iberian peninsu It is on an average small in size and often very small. Rath pale and dull in colouring on both surfaces. In the II generati a sharp and rather straight streak cuts across the underside both fore- and hind-wing, dividing the latter in two zones, of wh the basal one is darkened by a slight suffusion of dirty gr mixed with buff, and the outer one is of a clear pale buff;

rest of the pattern is scarcely discernible. Esper's very rough figure, is evidently meant to represent these features. The I gen. ***antelyllus,*** mihi, agrees with the II on upperside by its pale ochreous tinge, but the thin premarginal streak is lighter in colour and less sharp in outline, although it is distinctly separated from the margin by an ochreous space; on hindwing it is even broken up into a series of lunules; on underside it is equally thin and it contains a few silvery scales; the hindwings on this surface differ from those of the II generation, in which they are pale yellow or buff, by being of a warm brownish gray, much darker an basal half, as far as median line, than on outer half; they thus resemble *lyllides*, but they are lighter and warmer in tone. My type is from Cordova in Andalucia, collected on April 11 th, 1901 by Col. Yerbury, and the rest of the series is probably in the British Museum, whence I have received it.

I have named *torrida* in the Bull. Soc. Entom. Italiana, XLII, p. 271, p. I, fig. 11 (1911) the form collected by me, during August, at Palao, on the northern coast of Sardinia and which was perfectly racial there. At Tempio, m. 700, in the cork-oak woods, a form similar to the more usual African one, was prevalent. The characteristic of *torrida* is its extreme degree of paleness on both surfaces, with only a slight trace of the central streak on underside. The I gen. *lyllides*, Vrty., Bull. Soc. Entom. Italiana, XLV, p. 226, pl. I, fig. 34—37 (1914), of Sardinia I have described from a March series of Lanusei. Its features consist in the division of the underside of hindwing by a sharp line into a dark basal zone and a light outer one, as in *antelyllus,* but more heavily loaded withpigment generally; eye-spots prominent on all the wings and a second one between the two cubital nervures of forewing in most specimens; white spaces of underside effaced or nearly so. The I gen. *sicula*, Zeller, Isis, 1847, p. 146, described from Messina and Syracuse, in Sicily, I have already discussed above, as being intermediate between *lyllides* and *emiaustralis* and ranging with its individual variations from one to the other. Many individuals of my large series from S. Martino alle Scale m. 700, near Palermo, have such pronounced white spaces and are so variegated on underside they actually resemble the English race; this is rather interesting, considering, also the I gen. of *P. machaon* from there resembles the English one. The II gen. of Palermo I have named *gigas* in the Entomologist's Record, 1919, p. 122: it is much larger than the nymotypical Iberian *lyllus* and more pigmented and brightly coloured; the underside pattern is more variegated and prominent and a narrow white

band-like space crosses the wings, whilst the basal half of hind wings is not much darker than the outer one; their colour varies from a pale and dull buff to a bright reddish ochreous colour.

The II generaton, as far as my materials show, seems to vary very much individually everywhere, but equally little geographically when large series are compared. Thus *gigas* seems to spread to Malta, Africa and Asia and I only find the following remarks to make. Instead, the I generation is influenced much more by local conditions and produces striking races, as we will see.

From Fez, in Morocco, I possess a May form, larger than *lyllides*, of a paler ochreous yellow on upperside and with a dirty looking underside, where a reddish ochre tinge, recalling sand, is thickly veiled over by black scales, less so than in *lyllides*, but more abundantly on basal half than on outerhalf of hindwing, precisely as in that form; thin and sharp premarginal streak on both surfaces: ***arenosa,*** mihi, Oberthür informs us in his Ét. Lép. Comp. that a large percentage of African individuals have a very broad dark band on upperside and he figures one in vol. XIX, fig. 4417. This remark, no doubt, applies to the II generation. I have described it in the Entom. Record, 1916, p. 172, under the name of *latevittata,* which thus probably is very suitable to some African races, if not to most of them, to designate their most prominent differentical character as compared to *gigas,* Vrty. On upperside *latevittata* is the same as *marginata*, Rühl, but on underside it is quite different because it is like *lyllus* (ground colour of hindwing very pale yellow, lightly suffused whith pale sand-colour and with an extremely thin streak across the middle), whereas Rühl states particularly that the underside of his *marginata* is only a transition to *lyllus*, with markings much sharper than in the latter. This makes it most positively an *emilyllus* and the locality of Asia Minor of his „type" confirms it still more. Finally, in connection with Africa, I must also recall the other remark of Oberthür that in this region form *thyrsides*, Stdgr., in the sense of three or four well marked ocelli on upperside of hindwing, is extremely scarce. Instead Seitz in Groß-Schmett., I, p. 146, informs us he „found typical specimens of it in the valleys of the Atlas". The one he figures on pl. 48 is anything, but „typical", when compared to Herrich Schäffer's figures 430—1, quoted by Staudinger in his original description and thus really the „type" figure. Seitz's African insect is much more heavily marked with black on both surfaces, having a darker and bolder pattern, which produces quite a different impression, on underside, so that it somewhat recalls to mind that of *C. vaucheri*, Blach., from the

ame region. I name it ***atlantea*** and I feel sure that local race, s a whole, will be found distinct enough to be separated under his name from *gigas*, and from *latevittata* the two other African nes. The II gen. *gigas* as defined above, I have series of from Mt. Le-anon, in Syria, from Diarbekir, in Kurdistan, from Arwas, in the Trans-aspian District. The Syrian series, as observed by Oberthür, exhibit n most specimens a row of ocelli on the upperside of hindwing, so nat this race could well be designated by the name of *thyrsides*, Stdgr., at. Lep. Pal. Faun., 1901, p. 66 because they agree also in general spect with Herrich-Schäffer's figures 430—1, given as „typical" by taudinger; on underside the ocelli are, however, considerably more inute, whilst the rest of the pattern ismore accentuated. A series of une specimens from Duktan, in Zarafshan, resembles *gigas*, but it is ansitional to the *pamphilus* Group, by the marginal band of upper-de not being separated from the margin by a fulvous space, in the ale sen and only partially in the female one, and by the underside attern being softer in outline, as in *emilyllus*. This I take to e *orantia*, Frhst., Int. Ent. Zeit. Guben, 1908, p. 11, described om Kashgar in the Eastern Turkestan.

As regards the I generations of the Asiatic regions mentioned ove, I must first of all make the general remark that none of the ries I have from them have to the slightest degree the look of belon-ng to the *lyllus* group, such as, on the contrary, is so striking in e Western Mediterranean in *lyllides, antelyllus* and *arenosa,* is, however, need not surprise us, considering that also the cilian *gigas*, which is such a decided *lyllus* in the II generation, s in its I gen. *sicula*, Z., an *emiaustralis*-like aspect on upperside d in many individuals also on underside. Several species of pidoptera in Sicily resemble more the races of the Eastern Medi-rranean than those of Africa and of the West, so that *pamphilus* identy tands there, to fall in with that phenomenon.

The I gen. I have from Beyrouth, in Syria, and in a form arly identical to it from Askhabad, in the Transcaspian District, one of the most striking races: ***nitidissima,*** mihi. The upperside of a bright ochreous, either with no trace of marginal pattern with an extremely indistinct gray premarginal streak on hind-ngs only; the apical ocellus small or absent; on the contrary hindwing there stands out two or three minute, but sharp, ack ocelli, often containing a white pupil, so tiny as to be nearly visible to the naked eye. The underside of hindwings is of a ar, delicate gray, brightened by a touch of green; white space re or less developped; ocelli minute, but sharp and with a very center; as a rule, no trace of premarginal lunules. The

females often have a white space on upperside of hindwings be tween the faint lunules and the base of fringes.

Exerge pamphilus, L.

The first general remark to make in connection with thi exerge is that it produces a group of races, which stand apar from the rest by a comon character and which inhabits a definit region, so that, taken as a whole, it gives one the impression o being something more than a broad race. Its character is tha its scales are richer in pigment, so that it is more highly coloure and it exhibits on upperside a darker black and broader margina band. Its areas of distribution are Italy, the Balkans and part o Asia Minor. If in some high mountains of this same region on did not see it turn into races similar to those of Central Europ one might have suspected it to posses some slight hereditar factor different from all those of the other races, but I suppos on the strength of that remark, this hypothesis must be discarde as very unlikely and one must conclude the direct effects of su roundings are entirely responsible for the facture mentioned abov It is, however rather mysterious how it keeps perfectly consta in such different surroundings as the southern watershed of th Alps and the barren plains of southern Italy and Greece and, o the contrary, it entirely disappears on the northern watershed the Alps, as well as in the hot localities of southern France. Ev dently there are local causes we cannot grasp, because sever other species behave in the same way in producing races simil to each other from Asia Minor to Italy and abruptly changin aspect on the waterpartings of Switzerland and of southern Franc

Group *marginata, Rühl.*

I use this name for the entire group just described and di cussed, because it is the first given to a form belonging to I have already mentioned above the reasons which make me co clude that Rühl's description points to this fact. The same nam probably applies well to the II gen. of most localities in As Minor, but the high mountain race belongs to the *pamphilus* Grou and i will describe it at the end of this paper.

As far as I can judge by the scanty materials I poss from the Balkans, the races of this region are similar to the Italia one by their rich pigmentation and bright colours. The I gen. actually an *australis;* the II differs from *emilyllus* of Italy by i tendency to produce racially form *marginata*, so that probably t

entire race can bear this name in most localities. I have evidence to this effect from Macedonia (Lambet, Janes, Kireckj) and Corfu.

In Italy this form, as distinguished from *latenigrata,* is so extremely rare that I have only seen two females of it collected together at the end of August, on Mt. Fanna, m. 600, above Florence, and now in my possession. The race of Peninsular Italy, most broadspread from Liguria to Calabria, should be called *australis*, the name I gave its I generation in 1914 (Bull. Soc. Ent. Italiana, XLV, p. 227, pl. I, fig. 38). The actual „type" I have figured from the hills of Macerata, m 300 (Piceno), is an autumnal specimen of September 24th, but my original description was drawn from spring series and I remarked in it that they are identical to the one figured, so that I think it would be absurd to raise a question abut it and to create another name for the I generation. In the Entomologist's Record, 1916, p. 171, and 1919, p. 121, I have already described in english the characteristics of this race and its interesting reasonal polymorphism: *murina*, Vrty.. *australis,* Vrty., *emilyllus,* Vrty., E. R., 1919, p. 122, *aestivalis,* Rocci, followed again by a few *australis* and *murina*, with even the androconi scales like those of the spring examples. Turner has contributed a conspectus of it in the Proc. South London Ent. Soc., 1924. I thus need only recall here that in damp surroundings on the coast of Central Italy a striking race is developped, in the II generation, with a broad and very black marginal band, I have named *latenigrata* in the Ent. Rec., 1919, p. 122. In high mountains of Central Italy the I gen. is like *emiaustralis,* Vrty., of Central Europe and the II is *aestivalis,* Rocci. As far as I have been able to make out, at low altitudes in the Po Basin there exists *australis* with all its seasonal forms as in Central Italy; for instance, at Ponzone, m 800, near Acqui, in Central Piemont, I collected on Aug. 8th, 1912, a series of *emilyllus,* quite similar to the typical ones of Florence, whilst Rocci's description of *aestivalis* is from Turin. He gave the name in a general way to "the lighter forms of the summer generations found everywhere on the Continent and specially in northern and Central Italy", as a substitute to the name *lyllus* so surprisingly misapplied by all Authors" (Soc. Ligustica Sc. Nat., 1913, p. 6). By distinguishing more exactly the extreme form *emilyllus* of the early emergence (July and beginning of August) of the II generation, I restricted Rocci's name to its later forms, not as "light", but quite enough so to agree with his diagnosis and agreeing with it, in fact, better, because it is applicable, in this sense, also to the forms found on the Continent, further north

than Italy, and which be includes explicitly. In the Cottian Alps, whilst collecting there in 1925, at Oulx, m 1100, in Upper Susa Valley, at Cesana, m 1300, and at Clavières, m 1700, I found rather to my astonishment, that even at those altitudes the I generation consisted in *australis,* identical to those of the plain whereas in Central Italy, as just mentioned, it is replace in the higher mountains by a race similar to *emiaustralis* of Central Europe. The II generation, however, is in the latter race quite an *aestivalis* on both surfaces, whereas the II which emerged at Oulx from Aug. 11th onwards, was nearly identical to the I, to the naked eye, except for a very slight touch of fulvous on the underside in most individuals of both sexes, a slight increase in the extent of the white spaces and the slightly more pronounced dark bands and ocelli, all pointing only distantly to the features of *aestivalis*. I will recall further the fact, discovered by Ball, that the androconial scales of the two generations have a markedly different shape, even when visible features are scarcely perceptible, so that it would not be correct to apply the name of *australis* to the II of Oulx and I suggest calling it ***postaustralis.*** This race is probably broadspread in the Alps; the one I collected at Klobenstein, m 1300, as well as Merano, in S. Tyrol, is identical to that of Oulx. Instead, in the mountains about Lake Maggiore I have discovered a very distinct and handsome race, on account of its broad, dark marginal band above (preceded in some individualis by two premarginal dots on hindwing) somewhat as in *latenigrata*, Vrty., of Central Italy, but very different from the latter on the underside; it is of a deep gray with a marked greenish-blue sheen, especially on hairs of basal area; the white space of hindwing is abolished or scarcely perceptible, and so are the dark streaks and ocelli, so that the wing has a uniform look and individual variations are far lesser than in other races; these features strike one as particularly unusual especially in the female sex. I name ***ferrea*** the I generation, which I collected at Pian Quaggiè, m 900, above Premeno and Intra, (2nd to 18th of June) and at the Passo di Colle, m 1400 above Cannero (Juni 28th — July 6th.). Its II gen. I found at Vanzone, m 700, in the Anzasca Valley, where only a few tattered individuals of the I were surviving at the end of June and where the II emerged from Juli 12th to Aug. 25th.: it is a little smaller; marginal bands not as black and sharp; underside not quite as dark in female: ***postferrea,*** mihi. This race probably spreads to the whole of the Ticino Alps.

The European races of Group *pamphilus,* L.

In Catalonia there exist races which differ from all the others of the species and are peculiar on account of their unatractive looks: the I gen. ***barcinonis,*** mihi, resembles *emiaustralis* by its pale marginal band, but the underside is of a darker, duller gray ("types" of May from Llinas, near Barcelona); the II gen. ***post-barcinonis***, mihi, (July 7th to Sept. 10th) resembles in the same way *posteiniaustralis,* but it has on upperside a much duller and discoloured tinge, although often redder in tone; the underside has about the same pattern as *aestivalis* of Italy, but its colour is more uniformely of a dull gray mixed with tawny scales, so that it looks dirty. In the mountains, at Santa Fé, m 1200, on the Montseny, and at Seva, m 700, a smaller race is met with, of a lighter ochre yellow on upperside of II gen. and with underside more uniform in pattern, because the white space and the ocelli are less pronounced, so that there is less difference between it and the I gen.; I name it ***foeda***. From Aragon southward, to my knowledge, forms belonging to the *lyllus,* Esper, exerge prevail, if they do not actually replace entirely those of the *pamphilus* exerge. The degenerate look of the latter in its Catalonian races seems due to the fact that they hold their ground on the extreme limits of surroundings compatible with its constitution. Further south the one of the *lyllus* exerge is required to face the heat and, probably, more especially the long periods of drought.

On the northern watershed of the Alps race *emiaustralis,* Vrty., Entomologist's Record, 1919, p. 121, described from Geneva, is broadspread and my materials seem to show that this same race is produced in the whole of the southern portion of Central Europe. I possess it, for instance, from Gèdre, in the Hautes Pyrénées, from Nîmes, in the Gard, from Chambéry in Savoy, from Dombresson, in the Jura, from the Black Forest and from Vienna. The I gen., like *australis,* varies very much individually, but keeps remarkably constant, on the whole, considering the variety of localities it inhabits in that vast area: the underside is more on less the same as that of *australis,* of a uniform gray, usually clear and with a velvety surface, slightly shot with greenish or bluish; pattern very inconspicuous; white space very limited or entirely abolished; early-spring and antumnal individuals are often of the *murina,* Vrty., form, with very dark, blackish underside, shot with bluish. The distinguishing feature from *australis* consists chiefly in the marginal pattern of upperside, which belongs to the *pamphilus* Group, instead of to the *marginata* Group, by being much paler and often so indistinct as to seem entirely

effaced as compared to *australis* and to *ferrea* (form *detersa,* Vrty., Bull. Soc. Ent. Ital., XLV, p. 226). Also the II generation differs in the same way, on upperside, from that of *australis* and varies, both individually and locally to about the same extent on both surfaces. In some localities, chiefly in the mountains, it is, to the naked eye (apart from the androconial scales), more or less identical to the I generation and I should name it ***postemiaustralis,*** from specimens of Dombresson, in the Jura. In other races the underside is like that of *aestivalis;* this I believe to be the usual form in the warmest localities of the Valais and all over southern France: ***infraestivalis,*** mihi ("type" from Martigny). In the hottest and driest localities a form is produced parallel on underside to *emilyllus* and this Krulikowsky has named *semilyllus.* Some individuals of the latter have on upperside a broad marginal band, as in *marginata,* Rühl, but of a lighter, gray, tone: ***latecana,*** mihi ("type" from La Rognette in the Alpes Maritimes Departement).

In the northern part of Central Europe (Northern France, Belgium and Northern Germany) there exists a race, which is like *emiaustralis* in size and look of upperside, but which has a more variegated underside, pointing to *scota* in most individuals by the more pronounced white band and by the darker basal half of hindwing as compared to outer half: race ***centralis,*** mihi (typical series from Chantonnay in Vendée). Its II gen. ***postcentralis,*** mihi, differs from the I in most individuals of both sexes by the warmer chestnut tinge of underside and by its bolder markings, making it still more variegated. It is in this race (Bull. Soc. Ent. Belgique, 1914, p. 8) has discovered the difference between the androconial scales of the two generations, but he was baffled by the continuous emergence "during the whole of the good season" and he was not able to detect them. He found spring scales as late as June 20th and summer ones from the 26th. Nothing could confirm more perfectly the conclusion I have come to in Italy that there are only two generations, overlapping at the end of June and the beginning of July, but Ball fell short of realising this fact. He again found vernal scales at the end of September and remarks they probably were precocious autumnal individuals of the I gen.

In the British Islands there is a race remarkabe by its very variegated underside. I have named its most extreme form *scota,* in the Bull Soc. Ent. Italiana, XLII, p. 271, pl. I, fig. 10 (1911), (see Ent. Rec., 1916, p. 173), from an August series of the north coast of Scotland, but even in the South of England extreme individuals resemble it, whilst others are like *centralis.*

Neither of these names, however, can be applied to the race of the latter region, because the great majority of individuals fall between the two by the extent of the white band-like space and by the general pattern of underside, which, furthermore, is often suffused with a rich warm chestnut tinge to an extent never seen in any other race; besides this, a form is produced usually, in which the underside of forewing is divided by a sharp black streak from costa to second cubital nervure, showing the entire pattern tends to be bolder than in any other race. I thus think one is quite justified in differentiating it by the name of ***londinii,*** mihi (typical series of July, from Hartley Wood, near St. Osyth, and Shoeburyness, in Essex). Its II gen. ***postlondinii,*** mihi, does not differ much to the naked eye from the I, except that I notice in my end of August series from Stamford Hill and Hornsey, in Middlesex, and Belvedere, in Kent, a greater accentuation, on an average, of the features described above in the I generation and a sligthly darker marginal band on upperside. This race stands to the nymotypical one, I have from Norrviken, in Central Sweden, from Kuusamo, in Northern Finland, and from Leningrade, as *philoxenus* Esp., stands to *isis,* Thnb., in *C. tiphon.* It is not sufficiently known that nymotypical *pamphilus* is a peculiar race, quite different from all the others by its very small size, frail build, weakly and discoloured look on both surfaces and minute apical ocellus on underside of forewing. The frailest examples from Britain of form *pallida,* Tutt, are similar to it.

The Asiatic races of Group *pamphilus,* L.

From the Transcaspian District I have a stricking race collected at Kushk (presumably of I gen.) and sent to me by Bang Haas: race ***fulvolactea,*** mihi. Large size. On upperside it is bright ochreous with a broad marginal band of a milky gray tone and no ocelli, the apical one of underside only showing through. On underside of hindwings it is of a pale fulvous or of a milky gray, tinged with fulvous, merging softly into the central white band; some individuals have no ocelli or premarginal lunules on these wings; in others they show faintly in pearl gray.

The following race ***centralasiae,*** mihi, with its II gen. ***postcentralasiae,*** mihi, is distributed over a very large area. It evidently corresponds to the *emiaustralis* of Europe and its individual variations are to a certain degree parallel to those of that race, but they do not go, to my knowledge, so far as to include an equivalent of *semilyllus* or of *latecana.* I have series from: Vernyi, in Turkestan; Raigorodsk, in northern Zarafshan; Aulie

Ata, in Syr Darja; the Alai, in Ferghana; Juldus, in Kuldsha
I select the two generations of the Alai as "typical" because it is
the race which stands furthest from *fulvolactea.* The other series
mentioned above can be described as transitional. The characte-
ristics of *centralasiae* are: Smaller size than preceding, althoug
larger than the average *emiaustralis* of Europe and very much so
in the case of some females; upperside paler than *fulvolactea,* but rathe
brighter and less saturated than the usual *emiaustralis*; marginal banc
of about the same pale gray as in the latter and often very faint in fe
male. Underside of hindwings in male of a more or less uniform gray
with the ocelli and lunules very inconspicuous and only a smal
white space from costa to end of cell; the tone of gray varies
from a pale delicate one to a much darker blackish one; in th
females all the pattern is more pronounced. The II gen. *post*
centralasiae recalls more the Italian *aestivalis,* because the margina
band above is distinctly black and sharp in outline, whilst th
underside, of a rather bright reddish fulvous, exhibits a broa
white band across the whole wing and a very variegated patter
generally. The I gen. of Juldus agrees with the Alai one, but th
II gen. differs as follows from the corresponding one: wings mor
pointed; apical ocellus sharper; marginal band separated fron
margin by a greyish suffusion; underside grey, mixed with ches
tnut, somewhat as in the II gen. of *centralis:* race ***juldusica,*** mih
The II gen. of Raigorodsk, in Northern Zarafshan, is larger tha
the two just described being of the same size as *fuvolactea* an
recalling this form also by the soft, pale tone of underside; th
basal half of hindwing is light gray as far as the median line
beyond it there is a broad white space, shaded with touches o
very light gray, and containing the ocelli, which are only just faintl
visible; between the equally faint premarginal lunules and th
margin is a strip of pearl gray; in the female all these marking
are still fainter; in both sexes the whole wing is suffused wit
a touch of fulvous, in the gray as well as in the white parts
marginal band of upperside as in *postcentralis:* race ***infrarasa,*** mih
Finally from high altitudes in the Central Altai Mountains I hav
a very distinct and uniform race, which approaches more than an
other the nymotypical race of Sweden by its very small size, fra
build and faded colouring; the marginal band is, however, in th
male sex sharper and darker on upperside and the underside i
of a duller and more dirty looking tone of gray, with a decide
touch of chestnut about it; white space always narrow, but vari
able in length: race ***asiaemontium***, mihi.

As to Asia Minor, my scanty materials do not allow me t

describe its races. A series of the I generation from Kazamuni and specimens of both generations from the Pine Woods of Yuzgat, 5000 ft., received from the British Museum, where the rest of the series is, no doubt, presserved, belong to a very small race, smaller than *emiaustralis*, which the I generation resembles on both surfaces. The underside of hindwings is, of a clearer and more greenish gray or of a gray mixed with a rather remarkable bright yellow tinge; this colour is very uniform and there is scarcely any trace of pattern, except a small whitish space. I propose calling it ***euxina*** and naming ***posteuxina*** the II generation, which differs from it by its darker and sharper marginal band on upperside, (exactly as in the case of the mountain race of Peninsular Italy, which in the I gen. is an *emiaustralis*), and the slightly more variegated underside, where a narrow white band stretches from costa to tornus and the ocelli and premarginal lunules are perfectly distinct. This race, which, on the whole, belongs to the *amphilus* group, is probably the mountain one of Asia Minor, like the *emiaustralis* of high altitudes in Peninsular Italy. At lower altitudes, as in the latter region, there probably exist, as a rule, races belonging to the *marginata* Group. Very likely the name of *australis* can perfectly well be applied to the I generation and that of *marginata* to the II in general, in the same way as in the Balkans, because these two regions produce the same races in many species.

Synoptic List of the races and of their generations.

Race:	I generation:	II generation:	Habitat:
	Exerge thyrsis, Freyer		Crete
	Exerge lyllus, Esp.		
thyrsides, Stdgr.	*nitidissima*	*thyrsides*	Western and Central Asia
nitidissima	*nitidissima*	*gigas*	do.
atlantea	*arenosa*	*atlantea*	North Africa (Atlas vallays)
latevittata	*arenosa*	*latevittata*	North Africa
gigas	*arenosa*	*gigas*	do.
torrida	*lyllides*	*torrida*	Sardinia
lyllus, Esp.	*antelyllus*	*lyllus*	Iberian Peninsula

Transitional races and forms:

Between II gen. of race *nitidissima* and II gen. of race *centralasiae*:			
orantia, Frhst.	?	*orantia*	Central Asia
Between I gen. *lyllides* and I gen. *emiaustralis*:			
sicula, Zell.	*sicula*	*gigas*	Sicily

Race:	I generation:	II generation:	Habitat:
Between I gen *antelyllus* and II gen. *semilyllus*:			
bipertita (racial or individual form?)			Valais (and Southern France?
Exerge pamphilus, L.			
Group *marginata*, Rühl.			
marginata, Rühl	*australis*	*marginata*	Asia Minor and the Balkan
australis	*australis*	*emilyllus-aestivalis*	Italy (dry localities)
latenigrata	*australis*	*latenigrata*	Centr. Italy (swamps on coast
aestivalis, Rocci	*australis*	*aestivalis*	Italy (damp localities)
postaustralis	*australis*	*post-australis*	Po watershed of Alps (Cottian, Tyrol)
ferrea	*ferrea*	*postferrea*	do. (Mt. Rosa to Lake Maggiore)
European races of Group *pamphilus*, L.			
barcinonis	*barcinonis*	*post-barcinonis*	Catalonia (plains)
foeda	*barcinonis*	*foeda*	do. (high altitudes)
emiaustralis	*emi-australis*	*latecana semi-lyllus*, Kroul. *infra-estivalis*	Southern portion of Centra Europe (Pyrenees to Vienna) and high altit. i Central Italy.
postemiaustralis	*emi-australis*	*postemi-australis*	do. (mountains)
centralis	*centralis*	*post-centralis*	Northern p. of Centr. Eu
londinii	*londinii*	*post-londinii*	South of England
scota			Scotland
pamphilus, L.			Scandinavia, Finland.
Asiatic races of Group *pamphilus*, L.			
fulvolactea	*fulvolactea*	?	Central Asia (Kushk Transcasp.)
centralasiae	*centralasiae*	*post-centralasiae*	do. (Alai Mts.)
juldusica	*centralasiae*	*juldusica*	do. (Juldus)
infrarasa	*centralasiae*	*infrarasa*	do. (Raigor in N. Zaraf.
asiaemontium			do. (Central Altai)
euxina	*euxina*	*posteuxina*	Asia Minor (high altit.).