

**Notes on the Genus *Apatidea* MacLachlan.
With Descriptions of two New and possibly
Endemic Species from the Springs
of Himmerland.**

By

Anker Nielsen.

Freshwater Biological Laboratory, University of Copenhagen.

In a previous paper I have recorded the arctic relict *Apatidea muliebris* MacLachlan from some springs in the Lindenberg Aa valley in Himmerland, a landscape in northern Jutland, and given an account of its annual cycle (16, pp. 587 and 624—25). Briefly summarized it is as follows: The swarming season is narrowly limited, from the end of April to the end of May. In this season the imagines occur abundantly and perform a pronounced diurnal activity. In the summer months, the larvæ have a rapid growth, and towards the end of August or September they are full grown; they then migrate to the under surface of loose-lying stones, where the larval cases are transformed into pupal cases. The pupation, however, does not take place till spring; the whole winter is spent as larva in the pupal case. The larvæ do not winter in a lethargic state; taken out of the case, they are able to crawl about. Immediately after the closing of the case, the alimentary tract is filled with food, but it is soon used up, and the intestine will then be much shrivelled. The species thus spends 6-7 months as larva in the pupal case without taking any food. Under arctic conditions, where it is important

to utilize the brief summer for a rapid growth and seek protection against the cold of the arctic winter, this is certainly an adequate annual cycle. Under the conditions now prevailing in the springs, with an—at least practically—constant temperature all the year, it will seem to be a rather inadequate one, since, no doubt, the wintering larvæ are not without metabolism. The disadvantage of it must have been still greater in the Atlantic Period (about 5000—2500 a. C.), when the mean temperature of the year and hence the temperature of the springs—and probably the metabolism of the wintering larvæ—were higher than now.

These observations were made in the spring Rold Kilde (cp. 16, p. 330), in the upper part of the valley. In the spring Lille Blaakilde (cp. 16, p. 332), about 10 km farther north, in the middle part of the valley, there is also, in a limited space, a rich population of *Apatidea*. Originally I thought to be concerned with *A. muliebris* also here. From later observations it appeared, however, that the annual cycle is quite different from that in Rold Kilde, and rearings have shown that the two populations are also specifically different.

In my endeavours in identifying the species from Lille Blaakilde, which is parthenogenetic like *muliebris*, I have compared it with all available specific descriptions of *Apataniinae*, also those under other generic names, since one may never be sure which characters an author has found important enough to give a species generic rank. I have been unable to obtain the descriptions of *koizumii* Iwata and *fuscostigma* Matsamura from Japan (described in Japanese) as well as *Apatanodes sociata* Navás from Chile. It is, however, very unlikely that it should be identical with one of these three species, and it does not agree with any of the other descriptions. In some cases the ♀ is undescribed or so poorly described that no safe conclusion is possible, but since these

species are not parthenogenetic, it seems justifiable to exclude them. Thus the species from Lille Blaakilde is new to science. I have named it *cimbrica* after the district, Himmerland (= Cimbria), which is believed to be the home of the Cimbrians, known from the history of Antiquity. For comparison a detailed description of the specific characters of *muliebris* is given for the first time. The descriptions are based upon material preserved in alcohol.

A. muliebris MacLachlan, ♀ (fig. 1). Segments IX and X are coalesced, but in their dorsal half they can easily be discerned from each other, the posterior margin of segment IX being raised a little above the surface of segment X as an almost right-angled ridge. The inferior appendages ("side lobes") are very inconspicuous and for their greater part coalesced with segment IX itself, from which they may be distinguished by being a little elevated, having a duller surface, and being covered with minute setæ. Their posterior corner is rather acute. Segment X is short, especially in its ventral part. The dorsal part forms a projection above the anus. In dorsal or ventral view this projection is short, finger-like, with a somewhat irregular outline. The dorsal side has a pair of depressions leaving a median, elevated area, which posteriorly is attenuated to a thin, vertical lamella. *This structure is very characteristic.* In lateral view the ventral side and the greater part of the dorsal side of the projection are horizontal. Laterally the posterior margin of segment X forms a broad, but little prominent corner, which is not visible in dorsal view. (This is of course a little dependent on the visual angle). The supragenital plate is very much reduced and forms only a semilunular sclerite along the dorsal part of the genital opening. In lateral view it resembles a vigorous, downward and backward directed spine. (Previously — 17, p. 24 — I have designated this plate as the ventral

side of segment X. It should rather be considered as the IX. venter). In dorsal or ventral view the tongue-like process of the vaginal chamber (cp. 17, p. 26) is very slender and gradually attenuated towards the distal end (fig. 3 a, b). The "spout" in which the distal end of this process lies (fig. 3 c) is very short. Its posterior margin has, in the middle, a rounded indentation, beneath which a bulging of the lower side of the "spout" is seen. The distal ends of the dorsolateral folds of the vaginal chamber project beyond the genital opening as a pair of false "side lobes", one on each side of the vulvar scale. (The term "side lobes" ought to be avoided, since it may give rise to confusion). In ventral view the median sides of these projections are convex.

Body length 8.0—9.1 mm, length of anterior wing 9.1—10.1 mm.

A. cimbrica n. sp., ♀ (fig. 2). Closely related to *muliebris*, from which it is distinguished by segment X being still shorter. This applies especially to the dorsal part of the segment; in lateral view its dorsal outline is almost vertical. On the dorsal side there is a pair of low and very indistinct bulgings, whereas every trace of the dorsal lamella, so characteristic of *muliebris*, is lacking. The lateral corners on the posterior margin of segment X are narrower and acuter, but more prominent, clearly visible in dorsal view. The posterior corner of the inferior appendages is more rounded than in *muliebris*. The tongue-like process of the vaginal chamber (fig. 3 f-h) may be just as slender as in this species, but it is more often somewhat broader in the proximal part. (Considering the great individual variation of *cimbrica* in this respect, it is of course not impossible that *muliebris* varies to the same degree, so that specimens might be found in which the process is just as broad as in *cimbrica*). In the "spout" (fig. 3 d, e) the median indentation of the posterior margin is only slightly indicated, the bulging

of the lower side being only little or not at all visible in dorsal view. In ventral view the median side of the

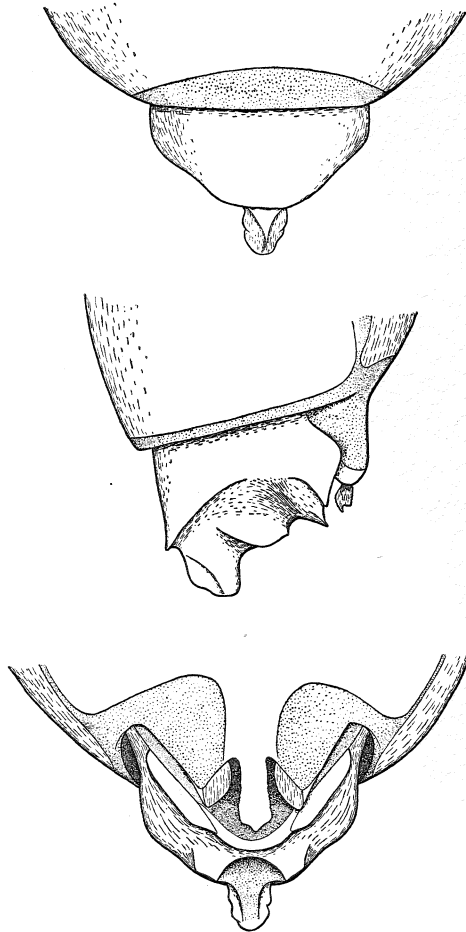


Fig. 1. *A. muliebris*. Segments (VIII), IX, and X in dorsal, lateral, and ventral view. Membranes, including genital and anal openings, dotted. $\frac{50}{1}$.

distal projection of the dorsolateral folds of the vaginal chamber is slightly S-like curved. (I am not quite sure

that this character is safe). The holotype was presented to the Zoological Museum of Copenhagen.

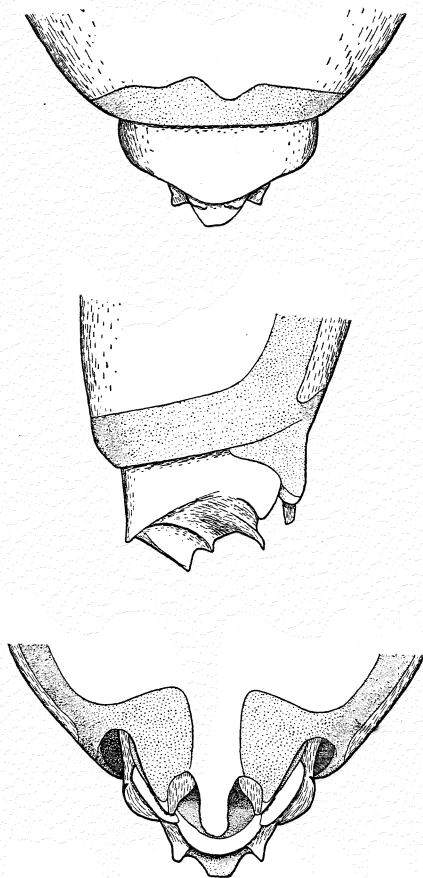


Fig. 2. *A. cimbrica*. Segments (VIII), IX, and X in dorsal, lateral, and ventral view. Membranes, including genital and anal openings, dotted. $\frac{50}{1}$.

This species is smaller and varies more in size than *muliebris*. Body length 5.3—8.0 mm, length of anterior wing 6.7—9.4 mm.

Holotype: ♀, reared in August 1945. Paratypes: 15 ♀♀, reared April—August 1946-47.

It is beyond any doubt that the two species are very closely related. As especially remarkable points of resemblance the extreme shortening of the ventral part of

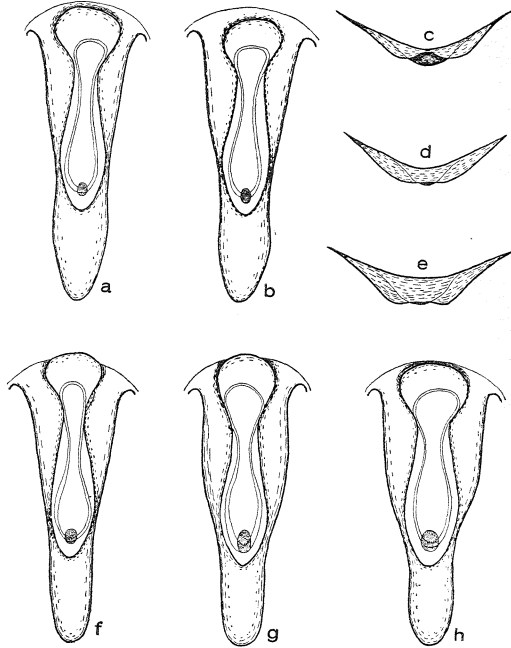


Fig. 3. a—c: *A. muliebris*; d—h: *A. cimbrica*. a, b and f—h: the tongue-like process of the vaginal chamber in ventral view. c—e: the "spout" in dorsal view. ¹⁰⁵/₁.

segment X, the shape of the much reduced supragenital plate, the distal projection of the dorsolateral folds of the vaginal chamber, and the very short "spout" may be pointed out. The only important difference is the fact that in *cimbrica* the dorsal projection of segment X is much shortened, and that the dorsal lamella on this pro-

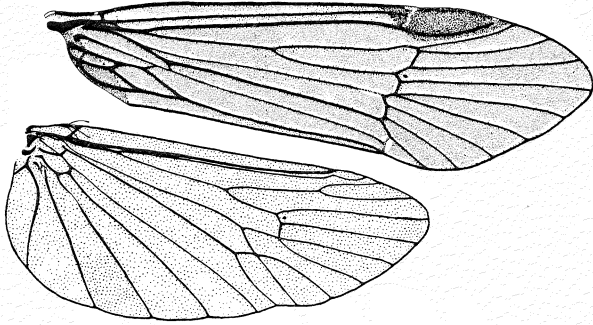


Fig. 4. *A. muliebris*; right wings $7.5/1$.

jection has been obliterated. In other respects the two species are — at least practically — alike. In *cimbrica* the basal width of apical cell I in the anterior wing generally is greater than in *muliebris*; in this respect the figs. 4 and 5 may be considered as representative. It may be considerably greater than in the specimen pictured, in extreme cases being as broad as apical cell II, but it may also be as narrow as in the *muliebris* specimen figured. In the latter it may be as broad as or even a little broader than in the *cimbrica* specimen pictured. In the posterior wing the cross-vein between

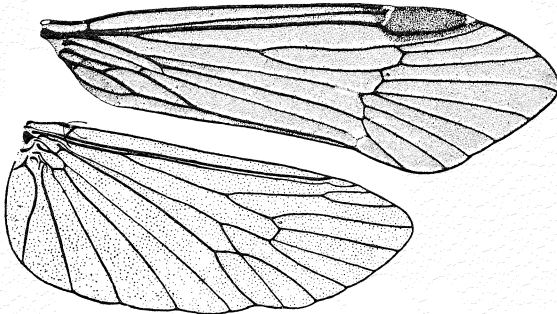


Fig. 5. *A. cimbrica*; right wings $7.5/1$.

r_5 and $m_{1,2}$ more often joins the latter at the point of bifurcation, but fork 3 may also have a minute pedicel. On the other hand, in some few specimens of *cimbrica* the cross-vein joins the most proximal part of m_1 . In both species the connection between m_{3+4} and cu_1 varies from a very short cross-vein (fig. 6 C) to a rather long anastomosis (fig. 6 D). The former condition is more common in *muliebris* than in *cimbrica*, in which species the longest anastomoses were found. The colour is very uniform within the genus, but it may perhaps be mentioned that in both species only the extreme apex of the femur is more light-coloured like tibia and tarsus.

In two specimens of *cimbrica* abnormalities of the venation of the anterior wing were found. In one fork 1 of the left wing has a short pedicel. In the other r_4 is double in its greater, middle part, enclosing an elongate cell (fig. 6 A). In both specimens the other wing is normal.

Till now I have not subjected the *cimbrica* larva to a morphological examination. Preliminarily it may be said that it is distinguished from the *muliebris* larva by a somewhat different shade of the main colour of the sclerotized parts. Possibly, however, this difference will only be noted by direct comparison.

During the years 1945—47 I have made fairly regular observations of the annual cycle of *cimbrica*. The results are given in the table below, in which "winter larvæ" means larvæ having closed their case, but not attained the prepupal stage. (+) means that the stage in question has not been collected, but its presence appears from the notes made on the excursion, or — in the case of imagines — that fresh, empty pupal cases were found. A + placed between two larval instars means moulting larvæ, between the 5th instar and "winter larvæ" that larvæ closing their cases were present, between pupæ and imagines it means "ripe" pupæ.

	2. instar	3. instar	4. instar	5. instar	winter larvæ	pre- pupæ	pupæ	ima- gines
Jan. 3. 1947		(+)	(+)	(+)	(+)			
Jan. 4. 1946		+	+	+	+	+		
Jan. 5. 1949		+	(+)	(+)	+			
Apr. 10. 1936		+					+	+
Apr. 11. 1947	+	+	+	+	(+)	(+)	+	+
Apr. 15. 1947								+
Apr. 27. 1946		+	+	(+)		+	+	(+)
May 16. 1947								+
June 7. 1946		+		+	+		(+)	(+)
July 21. 1947								+
July 23. 1946		+	+	+	+		(+)	
July 25. 1945				+			(+)	
July 31. 1947		+	+	+	+		+	+
Aug. 7. 1947								+
Aug. 8. 1946								+
Aug. 16. 1947								+
Aug. 19. 1946								+
Aug. 24. 1945			+	+	+	+		+

The table fully confirms the general impression that very different stages of development are found together in all seasons of the year. Apart from the "winter larvæ" the larvæ are active in winter. The presence of 3. and even 2. instar larvæ in early April shows that in winter the growth is reduced, despite the constant temperature of the water, an observation which has also been made in other spring-frequenting Trichoptera (16, pp. 621—22). It does not, however, stop entirely, which will appear from the fact that moulting larvæ and larvæ closing their cases were found in January. During winter neither pupæ nor prepupæ have been found; (on Jan. 5th 1949 20 pupal cases were collected, all containing "winter larvæ"). The larvæ which happen to attain the full-grown state in winter obviously spend the remainder of this season in the same way as does *muliebris* in Rold Kilde. From the table it will appear also that the swarming season lasts at least from early April to late August. From the latter time till the begin of

January there is a gap in my observations. There is, however, all possible reason to believe that the swarming season continues in the remainder of the summer and in early autumn, since prepupæ were found on August 24th.

Under recent conditions this annual cycle is certainly more adequate than that of *muliebris*; in a possible

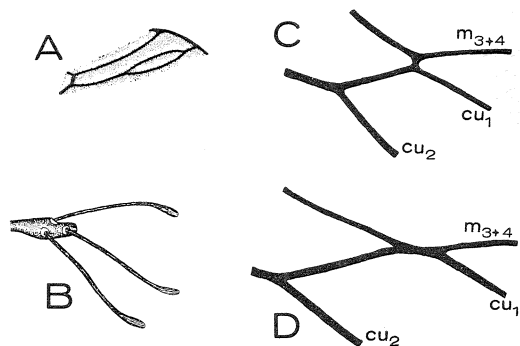


Fig. 6. Details of wings. B: *A. muliebris*; A, C, and D: *A. cimbrica*. A: r₃ and r₄ of aberrant anterior wing. B: distal end of the humeral plate of right posterior wing with the three clavate setae which together with the downward deflection of the anal corner of the anterior wing form the wing coupling apparatus. C and D: variation of the connection between m₃₊₄ and cu₁ in right posterior wing. A: 7.5/1; B—D: 40/1.

competition with this species it most probably would give *cimbrica* an advantage. During winter the larvæ at least can meet their metabolism by eating and also perform a moderate growth. This of course does not apply to the larvæ which attain the full-grown state in the course of the winter (cp. above). Only comparatively few, however, will stay in the "winter stage" for so long a time as does *muliebris*, and in return the imagines which emerge early in spring may possibly give rise to a new generation in the following summer. (In order not to encroach too much on the population I have not

collected material enough for a statistic analysis, which might have allowed for a definite solution of the latter question).

For the greater part at least of the Late Glacial Period *Apatidea* had, no doubt, a continuous distribution in the water-courses of the district. Towards the end of the Late Glacial Period the mean temperature of the warmest month rose to 10° C., the forest immigrated, and the Boreal Period commenced (about 7200 a. C.). This temperature is the lower limit for the forest, but it is also the upper limit for *Apatidea*. Experiments have shown that pupæ cannot be reared, if the temperature rises only a little above this level—the cause of many failures. In the Boreal Period the distribution of the genus therefore became discontinuous, restricted to the springs, in which its temperature requirements are fulfilled. The question is now why the populations in the two springs are specifically different. It might of course be that both species, *muliebris* and *cimbrica*, were present in the water-courses of the district even in the Late Glacial Period, and that for some reason the former has been confined to Rold Kilde, the latter to Lille Blaakilde. Considering the very close relationship between the two species, and the fact that *cimbrica* has not been found in other places, though the caddis-fly fauna of North Europe has been comparatively well investigated, I find, however, the explanation given below much more probable.

Originally a population of *muliebris* was confined in Lille Blaakilde as well as in Rold Kilde. During the Post Glacial Period a mutation has then occurred in Lille Blaakilde, a mutation which changed the stiff annual cycle of *muliebris* into a more plastic one. Under the altered life conditions this has been of selective value, so that gradually the progeny of the mutant has ousted the primitive form. (For some years the spring was

rather often subjected to outrage, causing an almost catastrophic decrease of the population. When these evils had come to an end, it soon reached its former size. This indicates a high population pressure and hence an effective selection). The morphologic differences distinguishing *cimbrica* are pleiotropic, and in themselves probably indifferent, effects of the mutation.

Some other facts speak in favour of this theory. Out of 20 specimens reared from Lille Blaakilde pupæ four deviate more or less from the description given above. In one (reared May 13th 1947) the dorsal outline of segment X is scarcely so steep as in the typical *cimbrica*. In another one (reared May 16th 1947) this outline much approaches the horizontal line, though it is a little convex. The two remaining specimens are so different from the typical *cimbrica* that, according to general usage, they deserve a specific name of their own.

A. intermedia n. sp., ♀ (fig. 7). Intermediate in specific characters between *muliebris* and *cimbrica*. As in the former segment X has a distinct projection above the anus, provided with a dorsal, vertical lamella. Anally the latter, however, is lower, its dorsal outline in lateral view being much descending. On each side of the lamella a short and broad, laterally directed bulging is seen, so that the projection in dorsal or ventral view is broader than in *muliebris*. The lateral corners on the posterior margin of segment X are more prominent than in *muliebris* and just visible in dorsal view. The posterior corner of the inferior appendages is rounded as in *cimbrica*, and also the distal projection of the dorsolateral folds of the vaginal chamber has the same shape as in this species. In the specimen chosen as holotype the emergence partly failed, the imago having died before shedding the pupal cuticle. In the paratype the apical cells I and II of the anterior wing have the same basal width. In the posterior wing fork 3 has no pedicel;

m_{3+4} and cu_1 are connected by a rather long anastomosis.

Body length 8.0 mm, length of the anterior wing 8.9 mm (paratype).

Holotype: ♀, reared August 8th 1946. Paratype: ♀, reared August 19th 1946. Holotype in the Zoological Museum of Copenhagen.

Especially the presence of the vertical lamella on the dorsal projection of segment X makes it almost cer-

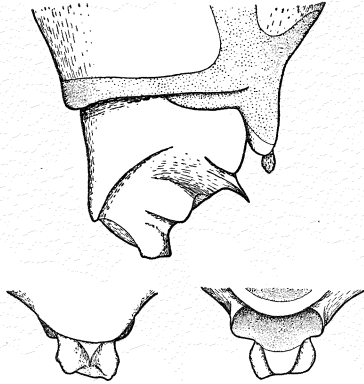


Fig. 7. *A. intermedia*. Above: segments (VIII), IX, and X in lateral view. Below: segment X (and part of segment IX) in dorsal (left) and ventral view (right). $50/1$.

tain that *intermedia* is a mutant of *muliebris*, and then the same is probably the case with *cimbrica*. (In the two species the mutations have had the same physiological, but somewhat different morphologic effects). A cytological investigation of the *Apatidea* species might perhaps give further evidence. Considering the huge size of the cells of the larval spinning glands the Trichoptera should be suitable objects for such studies.

In the spring Ravnkilde, 2 km SSW of Lille Blaa-kilde, there is a rather sparse population of *Apatidea*. I have only one imago from this locality (May 17th

1936), which will seem to represent a fourth species. The structure of the genito-anal segments are, however, so peculiar that perhaps we are concerned with a sheer abnormality. I shall return to the question when I have got material enough. In the spring Dybdal Bæk, about 1 km south of Rold Kilde, there is a fairly rich population of *Apatidea*. In its annual cycle it will seem to agree with that in Rold Kilde. At present I have no imagines from this locality.

Apart from its main distribution in the Arctic, *A. muliebris* has been found in some few other places in Europe, especially in England, where it must also be considered as an arctic relict. In the type locality, a spring in Arundel Park (South Downs), MacLachlan (8, p. 216) states the swarming season to be May—September, and in the same locality King (5, p. 215) found imagines abundant in late August. In the latter half of September MacLachlan (9, p. 217) found the imago at Lynton (Exmoor District). British records which agree with conditions in Rold Kilde are from Tinto (South Lanarkshire; 11, p. 10), "Old Man" at Coniston (Lake District; 12, p. 130—31), and Talybont-on-Usk (Black Mountains, Wales; 4, p. 158), but of course, this does not necessarily mean that imagines do not occur at other seasons in the localities in question. In the latter half of October Klapálek (7, p. 241) found pupæ in a spring with "clear and very cold water in the neighbourhood of Leitomischel in Eastern Bohemia".

Thus it may seem that the population in Rold Kilde is rather unique in having preserved its arctic biology. In (most of) the other localities mutations have probably occurred which have had the same physiological effect as, but a smaller morphologic effect than those in Lille Blaakilde. In this way the relict populations have been split up into subspecies. *A. muliebris* should be an exceptionally suitable object for studies on speciation, more

so since the time for which the populations have been isolated can be estimated with a fairly high degree of accuracy. I hope to return to this question later on.

It might seem that I have been too generous in attributing specific rank to *cimbrica* and *intermedia*, and that they should rather be considered as subspecies of *muliebris*. (Though the distance between the two springs is only small, *muliebris* and *cimbrica* fulfil the demand for geographic isolation. As to *cimbrica* and *intermedia* the parthenogenesis is as effective an isolation as any geographic barrier). When I have not done so, it is partly because the two forms are distinguished by characters which trichopterologists generally consider as specific, partly because I will not state the mutation theory as a proved fact, though personally I believe in it.

As mentioned above *cimbrica* is considerably smaller than *muliebris*. The fact that it also varies much more in this respect suggests that the small size is phenotypical, and this again may indicate that life conditions are harder in Lille Blaakilde than in Rold Kilde. As a matter of fact, the *muliebris* from the latter locality will seem to be distinguished by an unusual size. MacLachlan's (8, p. 215) and Mosely's (15, p. 210) statements of the size of English *muliebris* agree better with *cimbrica*. This means probably that life conditions are exceptionally favourable in Rold Kilde, and that hence mutations of this kind have not had so great a selective value as in other localities, which may be the reason why the population has preserved its arctic biology.

The objection might perhaps be raised that also the morphologic differences between *muliebris* and *cimbrica-intermedia* were phenotypical, correlated with body size. For two reasons this objection can be rejected. In the first place the small English specimens — at least in their main features — have the same specific character as *muliebris* from Rold Kilde. Secondly, the characters distinguishing *cimbrica* are distinctly qualitative and not quantitative. In this respect there is no difference between the smallest

and the largest specimens. The upper picture in fig. 2 was drawn after one of the largest *cimbrica* specimens, the upper and the lower picture in fig. 1 after one of the smallest *muliebris* specimens; actually the two animals were of the same size. The wing characters which — statistically — distinguish the two species are perhaps correlated with body size; my material is, however, too small to make a decision as to this point.

In a previous paper (17, pp. 21—28) I have given a morphologic description of an *Apatidea* species from Ulatjern in the Norwegian high mountains. I then thought that possibly it was identical with *A. auricula*, of which species Forsslund (2, p. 217) has given a very rough description. Forsslund has informed me that this is not the case, but we are concerned with *A. arctica* Boheman. In my endeavours to identify the Ulatjern *Apatidea* I committed the error to ignore *arctica*, which I then thought was an exclusively parthenogenetic species. Mosely (13, p. 238) has, however, described a ♂, caught in Iceland together with a long series of *arctica* ♀♀. A comparison between Mosely's and my figs. convinced me that it is the same species, and a reidentification of the ♀♀ showed that they must also be referred to *arctica*. Later on (14, p. 34) Mosely points out that the animal which he considered as an *arctica* ♂ is identical with *palmeni* Sahlberg (cp. 19, p. 11), the ♀ of which is unknown, and lets the question open, if *palmeni* actually is the ♂ of *arctica*. There cannot be much doubt that the ♂♂ and ♀♀ from Ulatjern belong to the same species, and thus it is fairly certain that *palmeni* is the ♂ of *arctica*, the former name being a synonym of the latter.

Though the material is referred to a wrong species, I think that the descriptions, and especially that of the female genital apparatus, will be of some value. (In order to bring this description in agreement with Snødgrass' terminology — 20, pp. 563—66 — the organ which I have called bursa copulatrix should be designated as recepta-

culum seminis, and vice versa). Mosely's statement that the distal joint of the inferior appendage of the ♂ has three branches is not correct; what he considers the third branch is actually the distal process of the first joint (17, p. 22).

The *arctica* ♂ does not seem to be very common, and from many localities there are a copious material of ♀♀ without a single ♂. At Ulatjern, however, the ♂♂ would seem to constitute a fairly great proportion of the population. Thus there is probably a facultative parthenogenesis in this species. The same is possibly the case with other members of the subfamily. On May 15th—22nd King & Morton at Loch Rannoch in Scotland took a long series of *Apatania wallengreni*, of which hardly 10 per cent were ♂♂ (6, p. 46). I do not find it very likely that the explanation should be that they "have been too late for the ♂". It is interesting to note that this condition is connected with a highly developed copulatory apparatus in the ♀.

Forsslund (1, p. 189) states that the type of *Phryganea stigmatella* var. *zonella* Zetterstedt is an *arctica* ♀, and that hence the latter name should be considered as a synonym of *zonella*. Nevertheless, I shall propose to retain the name *arctica* Boheman, under which the species is well-known.

To the remarks on the generic name made previously (17, pp. 28—29) the following may be added: That the number of spurs on the posterior tibia cannot be attributed generic value appears clearly from the fact that this number in *Radema infernale* Hagen and *R. uncinatum* Martynov is subjected to individual variation (10, p. 93). Forsslund (3, pp. 94—95) has erected the genera *Parapatania* and *Gynapatania* for *Apatania stigmatella* Zetterstedt and *Apatidea muliebris* MacLachlan, resp. I find this procedure entirely unjustified. Ross (18, pp. 101—02), on the other hand, will unite the genera

Apatania, *Apatidea*, and *Radema* into one genus and, claiming that Forsslund has demonstrated that *Apatania* Kolenati is a synonym of *Molanna* Curtis, attribute to them the name *Radema* Hagen, which is older than *Apatidea* MacLachlan. It is possible that the genera *Apatidea* and *Radema* ought to be united, but even in this case I shall prefer the former name as being the best known. Still, there are good reasons for keeping apart the genera *Apatania* and *Apatidea*, distinguished by the following characters:

Apatania Kolenati. In the posterior wing sc and r_1 run parallel for the greater part of their length and diverge distally. In the ♂ the superior appendages are lacking.

Apatidea MacLachlan. The posterior wings as in *Apatania* except that r_1 makes a forward bend towards sc just before the divergence; (there is no anastomosis between the two veins as is often stated). Superior appendages present in the ♂; (this character must be supposed to hold good also in the "disappeared" ♂ of *muliebris*).

We then have either to make a new name for the former genus or to retain the well-known name *Apatania*, which has been lent to the subfamily; of course, I shall prefer the latter possibility. In general, considering the truth of Forsslund's statement that "Vor MacLachlans Zeit war die Trichopteren-Systematik sehr verwirrt" (1, p. 185), I shall propose not to take the rule of priority too seriously, but consider the generic and specific names used by MacLachlan in his monograph as *nomina conservanda*, if not very special reasons speak against this. It will contribute to simplify the nomenclature, making it a tool and not a hindrance.

Below is given a list of the species of *Apataniinae* described since the appearance of Ulmer's record (21, pp. 76—77), apart from the North American genus *Neophylax* MacLachlan, which possibly — according to its developmental stages — ought to be

included in the subfamily. The generic names are those used in the original descriptions. As to the last years the list is perhaps not complete.

Apatania subtilis, mirabilis, Martynov '09; *groenlandica*, Kolbe '12 (syn. of *arctica* Boheman); *baicalensis, nigrostriata, mongolica, sachalinensis, sinensis*, Martynov '14 (Zool. Rec. 1916); *stylata* Navás '16 (Zool. Rec. 1935); *bulbosa*, Martynov '22; *canadensis, shoshone*, Banks '24; *koizumii*, Iwata '27 (Zool. Rec. 1929); *fuscostigma* Matsumura '31 (Zool. Rec. 1932); *yenchigensis* Ulmer '32; *nikkoensis, kyotensis*, Tsuda '39 (Zool. Rec. 1940); *pictula*, Banks '43.

Apatelia hispida, auricula, Forsslund '31; (the latter name, at least, is perhaps to be considered as a *nomen nudum*); *aberrans*, Martynov '33; *parvula* Martynov '35; *ænicta*, Ross '38.

Apatidea brevis, Mosely '36; *zonella* var. *dalecarlia*, Forsslund '42; *cimbrica, intermedia*, Anker Nielsen '50.

Radema uncinatum, setosum, Martynov '24; *sorex*, Ross '41.

Apatamiana hutchinsoni, Mosely '36.

Apatanodes sociata, Navás '34 (from Chile!).

Apatelina incerta, Mosely '36.

Apatidelia martynovi, Mosely '43.

Baicalina bellicosa, spinosa, ovalis, foliata, thamastoides, Martynov '14 (Zool. Rec. 1916); *reducta*, Martynov '24.

Summary.

Two new parthenogenetic species of Trichoptera, *Apatidea cimbrica* and *A. intermedia*, are described. They are possibly endemic to the spring Lille Blaakilde in Himmerland, northern Jutland, arisen in the Postglacial Period as mutants of the arctic relict *A. muliebris* MacLachlan. The principal effect of the mutations was to change the stiff annual cycle of *muliebris* into a more plastic one, which has been of selective value under the altered life conditions. The morphologic characters distinguishing the two new species are pleiotropic effects of the mutation. These cases may contribute to throw some light upon the problems of speciation, and also upon the question of the origin of specific characters, which will more often seem to be non-adaptive. The holotypes are in the Zoological Museum, Copenhagen.

References.

1. Forsslund, Karl-Hermann, 1929: Revision der Zetterstedtschen Trichopteren aus Lappland. Ent. Tidskr. Stockholm. **50**.
 2. — 1930: Zwei neue *Apatelia*-Arten. Ibid. **51**.
 3. — & Bo Tjeder, 1942: Catalogus Insectorum Sueciae II. Trichoptera. Opusc. Ent. Lund. **7**.
 4. Kimmins, D. E., 1932: British Trichoptera, Ephemeroptera, and Plecoptera 1930—31. Ent. Mon. Mag. London. **68**.
 5. King, J. F. X., 1888: *Apatania muliebris* MacLachl. Ibid. **24**.
 6. — & Kenneth J. Morton, 1891: List of Neuroptera observed at Rannoch in June, 1889. Ibid. **27**.
 7. Klapálek, F., 1888: The Metamorphosis of *Apatania muliebris* MacLachl. Ibid. **25**.
 8. MacLachlan, Robert, 1874—80: A Monographic Revision and Synopsis of the Trichoptera of the European Fauna. London.
 9. — 1890: Trichoptera observed in the Exmoor District in Autumn. Ent. Mon. Mag. London. **26**.
 10. Martynov, Andreas, 1924: To the Knowledge of Baicalini, a Group of Endemic Baicalian Trichoptera. C. R. Acad. Sci. Russ. Leningrad.
 11. Morton, Kenneth J., 1902: *Apatania muliebris* McLachl. in Lanarkshire. Ent. Mon. Mag. London. **38**.
 12. — 1925: *Mystrophora intermedia* Klap., new to the British Fauna, and *Apatania muliebris* McLach., two Species of Trichoptera from the Lake District. Ibid. **61**.
 13. Mosely, Martin E., 1930: New European Trichoptera and Plecoptera. Trans. Ent. Soc. London. **78**.
 14. — 1931: *Apatania arctica* Bohem., ♂. Entomologist. London. **64**.
 15. — 1939: The British Caddis Flies. London.
 16. Nielsen, Anker, 1942: Über die Entwicklung und Biologie der Trichopteren mit besonderer Berücksichtigung der Quelltrichopteren Himmerlands. Arch. Hydrobiol. Stuttgart. Suppl.-Bd. **17**.
 17. — 1943: *Apatidea auricula* Forsslund from a Norwegian Mountain Lake. Ent. Medd. København. **23**.
 18. Ross, Herbert H., 1941: Descriptions and Records of North American Trichoptera. Trans. Amer. Ent. Soc. Philad. **67**.
 19. Siltala, A. J., 1908: Zur Trichopterenfauna der nordlichen Fenno-Skandia. Acta Soc. Fauna Flora Fenn. **31**₂.
 20. Snodgrass, R. E., 1935: Principles of Insect Morphology. New York.
 21. Ulmer, Georg, 1907: Trichoptera. Wytzman Gen. Ins. Fasc. **60**.
-