

careous pellicle or epitheca, left after incineration in *H. pelliculata*. The internal structure, as regards the interzoöcial pores and canals, appears to be very much the same in both, except that in *H. neozelanica* there is no appearance in the walls of the zoöcia of the constrictions, giving them a beaded aspect, described and figured by Mr. Waters, and to which he is inclined to attribute the apparent constrictions of the zoöcia which are so common in most of the fossil species. In some of these, however, as I may take this opportunity of remarking, there are, besides the deceptive appearance of constrictions above referred to, distinct transverse dissepiments, which, as Mr. Waters remarks, are distinctly figured by M. J. Haime in his *H. pustulosa*. They are, however, equally evident in other fossil species.

#### DESCRIPTION OF PLATE XV.

- Fig. 1. *Heteropora neozelanica*, natural size.  
 2. Portion of surface, magnified.  
 3. Transverse section, also highly magnified.  
 4. Portion of surface, showing openings, zoöcia, and cancelli, much enlarged.  
 5. A dead fragment of *Myrionozoum* ——? resembling *Heteropora*.  
 6. Portion of surface of same, enlarged.  
 7. A doubtful form, resembling *Heteropora* of a globular form.  
 8. A small portion of the surface, magnified.

The two latter forms (figs. 5-8) are from the 'Challenger' collection.

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An Analysis of the Species of Caddis-flies (*Phryganea*) described by Linnæus in his 'Fauna Suecica.' By Pastor H. D. J. WALLENGREN. Communicated (with Notes) by R. M'LACHLAN, F.R.S., F.L.S.

THE identification of the Swedish species of *Phryganea* described by Linnæus cannot fail to be of value to science; and I have therefore attempted to render them more clear. But it is not to be expected that all the enigmatical questions propounded in his descriptions can be answered; and I shall be glad if some of them, at least, are elucidated by the remarks that follow.

PHRYGANEA PHALÆNOIDES (No. 1481).—The identity of this with *Neuronia phalænoides* of succeeding authors is proved be-



yond doubt, notwithstanding the words “ antennæ corpore dimidio breviores.”

PHRYGANEÆ RETICULATA (No. 1482).—The description has been applied to *Neuronia reticulata* of modern authors. This species is tolerably common in Sweden, but *N. clathrata*, Kol., is more so. The accepted idea may, however, be justifiable, for Linnæus says “ inferiores subferrugineæ fascia nigra.” It is nevertheless to be assumed that he had both species before him and confused them.

PH. STRIATA (No. 1483).—Recent authors have, on the authority of Hagen (Linnæa Entomologica, Band v. pp. 363–369), referred this to *Ph. striata* auct., but, as I think, unjustly. That Linnæus did not aim at this latter species is apparent by the words “ alis testaceis nervoso-striatis,” “ alæ latæ subtestaceæ sive fusco-testaceæ.” Without doubt he would have termed the wings of *striata* auct., “ cinereo-testaceæ,” as he did with *Ph. grandis*, and he would not have said “ alæ nervoso-striatæ” if he had had *striata* auct. before him when writing his description. These words have a different sense to “ alæ reticulatæ.” The attention of the reader is directed by them to the nervures and not to the colour of the wings. The nervures in *striata* auct. are concealed in the pubescence, and do not strike the eye, as the words lead us to understand. It is to be remembered that Linnæus, in describing an animal, always points to the most salient character; and the nervures in *striata* auct. are not striking. Amongst the Swedish Caddis-flies, *Neuronia ruficus* and *Agrypnia Pagetana* have “ alæ nervoso-striatæ.” That Linnæus did not intend the latter is evident by the words “ alæ magnæ latæ,” which are not applicable. Thus *Neuronia ruficus* only can be the species described by him as *Ph. striata*, and Burmeister was right in his identification (Handbuch, ii. 2, p. 935). Nothing in the description is opposed to this; the “ punctum album postice in ala superiore” is seen when the wings are closed. Only the words “ facies Phalænæ majoris” appear not to accord with my supposition; but if “ major” be understood in the sense of *Bombyx pavonia*, *quercus*, etc., it could neither agree with *striata* auct. nor with *ruficus*. But Linnæus wished the reader to have in view some of his smaller *Phalænæ*, such as *Tortrix* and *Tinea*; and it must also be remembered that he, in his description of *Ph. reticulata*, says “ media, statura Phalænæ;” and he desired, in the words quoted, to institute a comparison between the two. *N. ruficus*, which is common in Southern and



Central Sweden, is larger than *reticulata*. If Linnæus had *striata* auct. in view, he would undoubtedly have said "magna," as he does in his description of *grandis*, next to which he would, moreover, have placed the species. *Neuronia ruficrus* should therefore take the name *N. striata*.

PHRYGANEA GRISEA (No. 1484).—The intention of Linnæus has been misunderstood in referring the name to the *grisea* of almost all succeeding authors. If the latter were intended it is not explainable why no mention is made of the "fenestrate spot" and "anastomosal space," which are very evident in that species; and in connexion with this should be added the words "mediæ magnitudinis est," in comparison with the other species known to him. In the males of *grisea* auct. it is true that these markings are more obsolete than in the females, but very rarely are they obliterated altogether. The dark pterostigma is, moreover, but faintly indicated, whereas the *grisea* of Linnæus has a distinct "macula marginali nigra" on the anterior (inferior in regarding an unexpanded insect) margin. Moreover, in describing the *grisea* of authors, he would not have said "alæ superiores *griseæ*," but rather "alæ cinereo-testaceæ," or "subferrugineæ," as used elsewhere. He would not have said "corpus griseum," but "corpus fuscum" or "nigrum." Thus his description cannot concern *grisea* auct., but another species with a strongly-marked pterostigma; and the only Swedish species possessing this character is *Limnophilus stigma*, Curt. The wings of the Linnæan insect are "*griseæ*;" and the sense of this is to be learned from the description of *Ph. rhombica*, where he says "alæ subluteæ sive *griseæ*." *Ph. rhombica* never approaches *grisea* auct. in colour, but often resembles *L. stigma* in this respect, the wings of which are, moreover, "fusco obsolete nebulosæ," as is said; and the colour of the body is similar, as is also indicated by the words "alæ superiores (uti totum corpus) *griseæ*." The example in the Linnæan collection is therefore typical, bearing, as it does, the label "*grisea*" in Sir J. E. Smith's handwriting; and No. 749, in Linnæus's handwriting, corresponding to *grisea* in the 1st edition of the 'Fauna Suecica.' *Limnophilus stigma*, Curt., should thus take the name of *L. griseus*, L.

PH. GRANDIS (No. 1485).—There can be no question as to what Linnæus intended; but it is evident that he had not separated *striata* auct. (= *bipunctata*, Retz.) from *grandis* auct. In all



the old Swedish collections both species are mixed under "*grandis*;" but *grandis* auct. may continue to bear the name, the description agreeing. Both are common in Sweden, especially in "Scania."

PHRYGANEA RHOMBICA (No. 1486).—According to Mr. M'Lachlan *Limnophilus marmoratus*, Curt., and *L. subcentralis*, Brauer, exist in the Linnæan collection, but not *L. rhombicus* auct. The first-named bears the label "*rhombica*" in Sir J. E. Smith's handwriting, and the No. "741" in that of Linnæus, corresponding with the 1st edition of the 'Fauna Suecica.' Nothing in the description indicates that he had *subcentralis* before him when writing it; and it is, moreover, a very rare species in Sweden, of which I have as yet seen only three specimens. *L. marmoratus* has usually a very dark pterostigma, of which Linnæus makes no mention, nor does he allude to the dark irrorations so marked in the dorsal area of that species; and it cannot therefore be his *rhombica*. But it may be *rhombicus* auct., to which only the words "in medio alæ exteriores macula rhombica albida obliqua, et pone hanc alia albida vix notabilis—supra et pone maculam alarem aliquid fusci" will apply. The latter words evidently allude to the dark marks at the fenestrate spot as seen in *L. rhombicus* auct., which should continue to bear the name, notwithstanding that it is not represented in the Linnæan collection.

PH. BIMACULATA (No. 1487).—This, like many other Linnean species, has been misinterpreted. The name is commonly referred to *Neureclipsis bimaculata* auct., although the description says "non autem inter *minimas*," and the minute species known to Linnæus are compared by him with *Musca* or *Culex*. *N. bimaculata* auct. is not larger than *Ph. longicornis*, *azurea*, or *albifrons*, L.; and if he had intended it, he would have described it as "inter *minimas*" without the negation; and furthermore, concerning the double spot on the wings, he would have said "*altera supra alteram*" (perhaps inserting the word "oblique"), and not "*altera pone alteram*," as he does. With Linnæus the anterior margin of the wing is the "*margo inferior*," and the posterior (or inner) margin is the "*margo exterior vel superior*;" so that in describing the *Neureclipsis* he would have used "*supra*" and not "*pone*," as regards the spots, as he does in his other descriptions; for in *Neureclipsis* one spot is on the disk of the wing, and the other on the anterior margin only a little before the former obliquely



and not *behind* it in the Linnæan sense. Thus the *Neureclipsis* is not his species. What the latter really is should not be difficult to determine. He describes it as "non autem inter minimas;" and by these words all species so small as *Ph. longicornis* etc. are excluded; and the first word, "minor," is also opposed to the species intended by the foregoing descriptions, as, for example (*Ph. rhombica*), "Est hæc inter majusculas sui generis," and (*Ph. grisea*) "mediæ magnitudinis est." The Linnean species should therefore be larger than the "small" species (*P. longicornis*, *azurea*, &c.), but smaller than *Ph. rhombica* and *grisea*; and the wings should, furthermore, be "fuscæ," which excludes all pale species. All species of *Anabolia* and *Stenophylax* are also excluded, partly because they are ordinarily too large, partly because they have no "macula duplex flava, altera pone alteram." There remain only the dark species of *Limnophilus*, and of these only *L. bipunctatus* and *L. griseus* auct. With the former the words "macula duplex flava" will not agree, the anastomosal space being indistinct and scarcely paler than the ground-colour. *L. bipunctatus* is, moreover, too large, being of the size of *Ph. grisea* (*stigma* auct.), of which Linnæus says, "mediæ magnitudinis est;" the words "minor, non autem inter minimas" are thus not applicable to *L. bipunctatus*. Therefore only *L. griseus* auct. agrees with the description, it having the "fenestrate spot" and "anastomosal space" very distinct; these are the spots that Linnæus describes, and they are not unfrequently yellowish or yellow, as he says. This species also stands in the collections of the old Swedish entomologists as *Ph. bimaculata*, L., proving that such an application of the name had occurred to those who lived near the time of Linnæus, and who were partly his disciples (see also Zetterstedt, 'Insecta Lapponica,' p. 1062, who says, "sub nomine *Ph. bimaculata*, L., exempla hujus speciei mihi etiam communicata fuerunt"). Thus the example in the Linnean collection is typical (see M'Lachlan, 'Revision and Synopsis,' p. 87, footnote); and *bimaculata*, L., equals *Limnophilus griseus* auct. It could not possibly be *Neureclipsis bimaculata* auct., which, moreover, is not common in Sweden, whereas *L. griseus* auct. is very common.

PHRYGANEÆ FLAVILATERA (No. 1488).—This is an apocryphal insect, and no one has essayed a determination of it, other than that it may be *Sialis lutaria* auct. It should be sufficient, by pointing out the words "thoracis lateribus flavis" in the descrip-



tion, to convince us that the author did not intend the *Sialis*, which he, moreover, probably describes as *Hemerobius lutarius* at p. 384 (No. 1513). His words, "Sedet alis deflexis uti Phalæna," clearly indicate the family to which it belongs. If used in comparison with all the foregoing species, they have special weight, for of the next following (*P. bicaudata*) is said "alæ incumbentes, non deflexis." The same may be said of the words "cauda simplex absque stylis prominulis," whereas the following species is indicated by "cauda duabus setis antenniformibus." It is therefore a true "*Phryganea*" and not a *Perla*. Its wings are described as "reticulatæ; venis fuscis maxime reticulatis, præsertim ad margine exteriorem." The colour of the wings has thus some resemblance to that of *Ph. reticulata*, L.; and the insect can be sought for neither amongst the *Limnophilidæ* nor the *Leptoceridæ*, for there is no species in these families with such a colour. Only the *Hydropsychidæ* and *Rhyacophilidæ* remain, and it is possible that in one of these the species may be found. The families have the "margo exterior" (inner margin) "admodum dilatatus" in comparison with the others, and some of them by day are more tranquil than is usual, thus justifying the use of the words "ubi sedet tranquilla." The words "os duobus denticulis et quatuor a palpis" point to a *Hydropsyche* and not to a *Rhyacophila*, which the strong fuscous reticulation also makes clear. The denticulation of the mouth and palpi is such that it may not have escaped the notice of such an acute observer as Linnæus. His words probably refer to the maxillary processes and the processes of the labial palpi; but the words "antennæ corpore dimidio breviores" seem to nullify this supposition. The antennæ in *Hydropsyche* are seldom longer than the wings, but they are always more than half the length of the body. They may have been broken in Linnæus's type, as they were in that of his *Ph. phalænoides*, of which he equally says, "antennæ corpore dimidio breviores." I am therefore convinced that he did intend a *Hydropsyche*; and among the Swedish species only *H. instabilis* auct. could be intended, for the description agrees tolerably well with it. The wings are cinereous, their fuscous reticulation is especially strong toward the inner margin, and the thorax is yellowish at the sides.

PHRYGANEA BICAUDATA (No. 1489) is a *Perla*, as is well known.

PH. NIGRA (No. 1490) is *Mystacides atra*, Pict., as I have already shown in the Öfversigt af K. Vet.-Ak. Förhandl. 1870, p. 151.



PHRYGANEAZUREA (No. 1491) is *Mystacides nigra*, Pict.; and PH. LONGICORNIS (No. 1492) is *M. quadrifasciata*, F.

PH. FILOSA (No. 1493).—This cannot be *Æcetis ochracea* auct. (= *Ph. hectica*, Zett.), which is rare in Sweden, and has not the wings “flavescentes,” but “flavæ vel flavidæ” according to the Linnæan terminology. The old Swedish entomologists have named the latter species “*hectica*,” and under this name it stands in their collections. *Leptocerus tineoides* (Scopoli), Brauer, is, on the contrary, assumed by them to be the *filosa* of Linnæus; but his description is too brief. The “alæ cylindrico-incumbentes” suggest a *Molanna*; but the “antennæ corpore triplo longiores” will not agree.

PH. WÆNERI (No. 1494) is *Tinodes luridus*, Curt., as I have already shown.

PH. ALBIFRONS (No. 1495). All authors agree as to this.

PH. BILINEATA (No. 1496) is *Mystacides bifasciata*, Pict., as Mr. M'Lachlan has shown (*Leptocerus bilineatus*) in his ‘Revision and Synopsis,’ p. 308.

PH. CILIARIS (No. 1497) is *Notidobia ciliaris* auct. as accepted.

PH. UMBROSA (No. 1498).—Mr. M'Lachlan (‘Revision and Synopsis,’ p. 399) believes that this was a collective name for various species belonging to the genus *Polycentropus* and allies. The *diagnosis* undoubtedly refers to *P. flavomaculatus* auct., from the words “alæ lutescenti-nebulosis;” but the *description* refers to *Holocentropus dubius*, Rambur, for Linnæus there says “alæ irroratæ glauco-fuscescente colore.” Both occur in Sweden.

PH. NEBULOSA (No. 1499) and FUSCA (No. 1500) belong to the *Perlidæ*, as is well known.

PH. MINUTA (No. 1501) is probably *Beræodes minuta* auct.; but I am not yet fully convinced.

PH. FLAVA (No. 1502) cannot be *Limnophilus vittatus*, F., for Linnæus does not mention the fuscous vitta in the wings; but it may be *L. centralis*, Curt., as Swedish entomologists have assumed. The words “flava, alis flavo-reticulatis” agree with no other Swedish species.

PH. SALTATRIX (No. 1503) is not a true “*Phryganea*,” and cannot be a *Chermes* or *Psylla*, to which the words “adeoque non *Chermes*”



are opposed. Hagen has conjectured that it may be a *Psocus*; and the words "antennæ, lente inspectæ villosæ apparent; os ut in reliquis cum palpis" favour this opinion; but the species is not to be settled with certainty. I think it may be *Stenopsocus im-maculatus*, Steph.

Linnæus has furthermore described an insect as *Tinea Robertella* (No. 1394) that cannot be Lepidopterous, for neither in Sweden nor in Europe is there to be found a species of that order to which the description will apply. It may have been a "*Phryganea*" that Linnæus had before him, and we know that he often made a comparison between the *Phryganeæ* and Lepidoptera. It may therefore not be strange if we find him describing a "*Phryganea*" as a "*Tinea*." The words "antennæ longissimæ" may therefore signify some species of *Leptoceridæ*. The *Tineæ* (*De-geerella*, *Swammerdamella*, &c.), amongst which he places the species, have a striking resemblance to this family. The words "alæ fusæ seu nigræ, vix manifeste cinereo-inaurata, macula alba ad angulum ani" are only applicable to *Leptocerus aterrimus*, Steph., or *L. dissimilis*, Steph.; but the words "antennis albis" do not agree. However, the Linnæan terminology is not as accurate as that of the present day, and the antennæ of *L. dissimilis* appear to be white and unicolorous if viewed in a certain light. I am convinced that this is the Linnæan species; the size is the same, and the words "alæ vix manifeste cinereo-auratæ" indicate the pale brown iridescent pubescence of the wings.

#### *Notes by R. M'LACHLAN.*

It was, I think, partly at my suggestion that my valued correspondent Pastor Wallengren undertook an analysis of the Swedish Trichopterous insects described by his great compatriot. He had already casually alluded to several species in his notes on those described by Zetterstedt (*cf.* 'Öfversigt af K. Vet.-Akad. För-handlingar,' 1870, No. 3). The foregoing notes have especial reference to the nomenclature adopted by me in my 'Revision and Synopsis of European Trichoptera,' now completed as far as the Linnæan species are concerned. In this work I have generally adopted Pastor Wallengren's already published views, on the principle that a Swedish entomologist should be the best able to elucidate the Linnæan species; moreover I satisfied myself that these views were sufficiently borne out by the original description.



and I propose to pass over his present remarks without comment, so far as regards them. But in a few other instances the results arrived at appear to be open to question, and they bear also the inconvenience of upsetting widely and generally adopted nomenclature, which should be avoided so far as is consistent with the due recognition of the rule of priority. In these few instances I do not feel justified in abandoning existing nomenclature; but on points of this nature there must exist differences of opinion, and other workers may feel inclined to regard the evidence in a different light. Pastor Wallengren does not allude to the 'Systema Naturæ,' ed. xii., in which Linné adds references wanting in the 'Fauna;' and it should be noted that still other references exist in MS. in his own annotated copy of the 'Systema' in the Library of the Linnean Society.

The Linnæan collection affords very little evidence. There are in it a moderate number of Trichoptera, but only two or three bear labels in Linné's hand: and, as is usual, there is much uncertainty as to whether they are now on the specimens to which they were originally attached.

PHRYGANEA STRIATA (No. 1483).—Up to the year 1851 no author had separated by sure *structural* characters the two species which now generally bear the names of *Ph. grandis*, L., and *striata*, L. In that year Hagen demonstrated most clearly the existence of two very distinct species, to the second of which he applied the name *striata*, retaining that of *grandis* for the first, in which he has been generally followed. Considering the great outward resemblance of these two species, and that Linné was unaware of the importance of the structural characters in Trichoptera, it has always been with me doubtful that he could possibly have separated the two; and it is rendered still more doubtful in my mind from the interposition of a small and very different insect between them (*cf.* my 'Revision and Synopsis,' p. 24). Still there does exist (although Hagen states the contrary) in Linné's collection a ♀ of that which we now term *striata* bearing a label (No. 738) in Linné's hand: it is considerably rubbed, and in that condition is not opposed to the words of the description, and the objections stated by Pastor Wallengren are so far not well grounded. I find it impossible to accept the latter's views as to the identity of *striata* with *Neuronis ruficrus*. The word "subtestaceæ," even with the addition of "sive fusce," be



seems to me to render such a connexion most unlikely, whereas they are not opposed to the example in the collection, which also still shows the "punctum album" (the spot in the 6th apical cellule). Therefore, notwithstanding the objection I have taken to the application of the name *striata*, it may be that he really intended by it the insect now so called; and I would continue to so apply it instead of upsetting long existing nomenclature by transferring it to the species we know as *Neuronia ruficrus*. Hagen (*l. c.*) enters largely into the references in the 'Systema'; it should be added that Linné also cites (in MS.) "Scopoli, fig. 688" (from the rare and unpublished vol. of figures to that author's work), which appears to me quite unrecognizable.

**PHRYGANEA GRISEA** (No. 1484).—There exists in Linné's collection an insect bearing a label "No. 739" (corresponding to the 'Fauna,' ed. 1) in his hand, which is certainly not the *grisea* universally so called by authors. It is a small ♂ (similar in size to most of the Swedish specimens I have seen) of *Limnophilus stigma*, Curtis (*cf.* my 'Revision and Synopsis,' p. 58, footnote); and confessedly Pastor Wallengren's ideas appear to have at least a *primâ facie* appearance of being well grounded; such a change will, however, be little palatable to authors.

**PH. BIMACULATA** (No. 1487).—Pastor Wallengren would consider this as representing *Limnophilus griseus* of authors. I, on my part, hesitate to adopt his view. It appears to me that the words relating to the spots, "altera pone alteram," are applicable to the position of these markings in *Neureclipsis bimaculata* of authors. In effect the prepositions "pone" and "supra" would be equally correct; for the second spot is placed decidedly after or behind the first, although more towards the costal margin; and, moreover, the words "lunularis" (not quoted by Wallengren) and "flava" are more suitable to the *Neureclipsis* than to the *Limnophilus*. Nevertheless it is quite true that the insect in Linné's collection, referring to his *grisea*, is the latter (*cf.* my 'Revision and Synopsis,' p. 87, footnote). Supposing Pastor Wallengren's views be accepted, the *Neureclipsis* will take the specific name of *figurinensis*, Fabricius. Linné has added the following MS. citations:—"De Geer, Ins. ii. p. 568, tab. 15. fig. 5" (*Leptoceridæ*); "Schäff. Icon. tab. 109. figs. 3, 4" (probably *Limnophilus sparsus*); and "Geoff. Ins. ii. p. 248. no. 5" (*Leptocerus*).  
la-  
nui-



PHRYGANEA FLAVILATERA (No. 1488).—Notwithstanding his elaborate argument, I scarcely think Pastor Wallengren would adopt this name as replacing (*Hydropsyche*) *instabilis*, and I confess myself unable to entirely follow him. It has been repeatedly suggested that Linné had *Sialis lutaria* auct. before him; and his reference in the 'Systema' to "Geoffroy, Paris., 2, p. 255, *Hemerobius*, 3," would bear this out; for Geoffroy clearly indicates the *Sialis*, and the dilatation of the margin of the wings so strongly indicated by him refers to the costal margin; the strong fuscous reticulation also, to my mind, refers to the neuration, and is very applicable to the *Sialis*, as also are the words "ubi sedet tranquilla," and "Sedet alis deflexis uti Phalæna." But there remains the difficulty that *Hemerobius lutarius*, Linné (No. 1513), is represented in his collection by the *Sialis*, that some of his citations for the latter in the 'Systema' equally refer thereto (but not "Schäff. Elem. t. 97," which represents a *Perla*), and that he has added in MS. (to *lutarius*), "De Geer, 2, t. 22. f. 14-15," and "Schäf. Icon. 37. figs. 9-10," which do the same. The confusion appears inextricable, and the suggested relationship of *flavilatera* with the *Hydropsyche* far-fetched.

TINEA ROBERTELLA (No. 1394).—That Linné may have described something allied to *Leptocerus* under this name is quite possible, considering the great resemblance many of the species bear to the long-horned Moths; but I would not go so far as to identify *Robertella* with any particular species. The words "antennis albis" appear to be an insuperable objection to its identity with *L. dissimilis*, and almost to its connexion with any true species of *Leptocerus*, although they would apply to species of allied genera.

Having thus fairly stated my objections to some of the results arrived at by Pastor Wallengren, I conclude by remarking that, although I do not feel justified in accepting some of his proposed changes at present, it is but right that his views should be circulated. No more appropriate medium for this purpose could possibly exist than the Journal of the Linnean Society.





Wallengren, H. D. J. and McLachlan, Robert. 1879. "An Analysis of the Species of Caddis-flies (Phryganea) described by Linnaeus in his 'Fauna Suecica.'." *The Journal of the Linnean Society of London. Zoology* 14(80), 726–736.

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