LVI.—*On the Pierine Butterflies of the Genus* Catophaga.

By Arthur G. Butler, Ph.D., F.L.S., F.Z.S., &c.

[Concluded from p. 401.]

Group 4. Tachyris, Wall.

The largest group in the genus, containing species of tolerably uniform outline, though differing considerably in coloration: the first and most typical species resemble the earlier forms of *Saletara* in the coloration of the males, whilst their females much more nearly resemble those of *Catophaga*; then we meet with a series of bright scarlet or orange insects, gradually changing to species with the upper surface white and brown-bordered. In nearly the whole of the species the dark outer borders on the under surface of the wings are regular in outline, and in most of the white species the seasonal forms seem to be characterized by the width of these borders in the males and the amount of white on the upper surface of the females, the dry-season males having narrower borders and the dry-season females being marked with broad white patches *.

1. *Tachyris celestina.*

Pieris celestina, Boisduval, Voy. de l'Astr., Lép. p. 46 (1832); Lucas, Lep. Exot. pl. xxiii. fig. 1 (1835).
Appias delicata, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. ix. p. 153 (1882).

Waigiou, Mysol, Aru, Duke of York Island. B. M.

2. *Tachyris clementina.*

Pieris clementina, Felder, Sitzb. Ak. Wiss. Wien, math.-nat. Cl. xl. p. 448 (1860); Reise der Nov., Lep. ii. p. 162, pl. xxv. fig. 6 (1865).
Tachyris adelpha, Röber, Tijd. voor Ent. 1891, p. 281.

Tenimber, Timor-Laut. 2 ♂, 1 ♀, B. M.

3. *Tachyris placidia.*

Papilio placidia, Stoll, Suppl. Cramer, pl. xxviii. figs. 4, 4 *c* (1790).
Tachyris placidia, var. *maculata*, Staudinger, Exot. Schmett. p. 30, pl. xvi. (1884).

Amboina, Ceram, Batchian. B. M.

* I have not included *Tachyris maculata* of Grose-Smith in this paper, as I believe it to be a *Huphina* near to *H. acrisa*.

4. *Tachyris zarinda.*

♂. *Pieris zarinda*, Boisduval, Sp. Gén. Lép. i. p. 486, pl. xviii. fig. 4 (1865).
♀. *Pieris fatima*, Vollenhoven, Tijd. voor Ent. 1866, p. 59, pl. ii. figs. 1, 2.
♀. *Tachyris phestus*, Westwood, Trans. Ent. Soc. 1888, p. 469, pl. xii. fig. 2.

Celebes. B. M.

The female sometimes has orange and sometimes white markings, but whether seasonally or not there is no evidence to show.

5. *Tachyris bouruensis.*

♀. *Tachyris bouruensis*, Wallace, Trans. Ent. Soc. ser. 3, vol. iv. p. 379 (1867).

Bourou.

Allied to *T. zarinda*. The type should be in Hewitson's collection, but was probably not in good enough condition to induce him to retain it.

6. *Tachyris nebo.*

Appias nebo, Grose-Smith and Kirby, Rhop. Exot., Pier., *Appias*, i. figs. 1, 2 (1894).

Burma.

Nearest to *T. galba*; much more yellow and without discal band on primaries.

7. *Tachyris galba.*

Tachyris galba, Wallace, Trans. Ent. Soc. ser. 3, vol. iv. p. 378 (1867).

Manipur and Silhet. B. M.

8. *Tachyris nero.*

Papilio nero, Fabricius, Ent Syst. iii. 1, p. 153 (1793); Donovan, Ins. Ind. pl. xxxii. fig. 1 (1800).
Pieris thyria, Godart, Enc. Méth. ix. p. 147 (1819); Lucas, Lep. Exot. pl. xxv. fig. 3 (1835).
Pieris figulina, Butler, Ann. & Mag. Nat. Hist. ser. 3, vol. xx. p. 399, pl. viii. fig. 1 (1867).

Burma, Malacca, Penang, Singapore, Java, Sumatra, Borneo. B. M.

This species varies a good deal both in depth of colour above and below and in dusky veining and clouding. *T. thyria* and *T. figulina* are both separable as varieties, but whether they are seasonal forms or mere sports remains to be discovered.

9. *Tachyris domitia.*

Pieris domitia, Felder, Wien. ent. Monatschr. vi. p. 285 (1862); Semper, Reisen im Arch. Phil. v. pl. xl. figs. 1, 2, and 4 (1891).
Pieris zamboanga, Felder, *l. c.*
Pieris asterope, Felder, *l. c.* p. 286 (1862).
Appias mindanensis, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xi. p. 421 (1883); Semper, Reisen im Arch. Phil. pl. xl. figs. 3, 5 (1891).

Philippines. Twenty-seven examples. B. M.

A male from Borneo in the Hewitson collection agrees with Semper's male of *P. asterope*.

10. *Tachyris palawanica.*

Appias nero, var. *palawanica*, Staudinger, Lep. v. Palawan, p. 22 (1889).

The male varying above from brick-red to bright orange, the veins of primaries, and sometimes the veins on apical area of secondaries, dusky; the apex and outer margin of primaries sometimes with a soft graded brownish border: under surface much more ochraceous, without markings, the centre of primaries more orange than the remainder of the under surface.

Expanse of wings 72–77 millim.

The female varies above from bright orange, through mixed ochreous and tawny, to pure white with dusky basal area and spotted black-brown outer border (as in *T. nero* and allies); below also the wings vary from bright ochreous to ochreous and white commingled or to tawny and ochreous primaries with white subapical streak and pearl-white secondaries clouded with sandy greyish; the ordinary markings (corresponding with those of the upper surface) more or less defined.

Expanse of wings 59–66 millim.

Palawan and Labuan. Ten examples, B. M.

I cannot regard this as a variation of any known species; the primaries of the male are more acute than in *T. domitia* and the under surface unmarked, whilst the female is extremely variable, but has not at all the character of *T. zamboanga* (*T. domitia* ♀), but more nearly resembles *T. figulina* (*T. nero*, var., ♀); its small size and invariably paler colour readily mark it as a different species.

11. *Tachyris flavius.*

Appias flavius, Grose-Smith, Ann. & Mag. Nat. Hist. ser. 6, vol. x. p. 427 (1892); Rhop. Exot. ii., Pier., *Appias*, i. figs. 3–5 (1894).

Taganac Island, N.E. Borneo.

12. *Tachyris ithome.*

Pieris ithome, Felder, Wien. ent. Monatschr. iii. p. 180, pl. iv. fig. 1 (1859).

Celebes. 6 ♂, 1 ♀, B. M.

13. *Tachyris nephele.*

♂. *Pieris nephele*, Hewitson, Exot. Butt. ii., *Pier.* pl. v. fig. 33 (1861)
♀. *Pieris zamora*, Felder, Wien. ent. Monatschr. vi. p. 286 (1862).

Philippines, Celebes. 9 ♂, 6 ♀, B. M.

Local form *Tachyris dilutior.*

Tachyris nephele, var. *dilutior*, Staudinger, Lepid. v. Palawan, p. 21 (1889).

Palawan. 3 ♂, 1 ♀, B. M.

T. nephele is extremely variable as regards the amount of white on the primaries and the width of the blackish outer border of the secondaries; but whether these differences are seasonal we have no data to prove. The Palawan examples show as much white on the primaries of the males as in any of the males of typical *T. nephele*, and the border of the secondaries is slightly narrower than in any, whilst it is more or less abruptly excised at apex.

14. *Tachyris florentia.*

Appias florentia, Grose-Smith and Kirby, Rhop. Exot. ii., Pier *Appias*, i. figs. 6–8 (1894).

Solomon Islands. 3 ♂, 3 ♀, B. M.

We received three pairs of this species from the Godman and Salvin collection.

15. *Tachyris ada.*

Papilio ada, Cramer, Pap. Exot. iv. pl. cccIxiii. C, D (1782).

Amboina. 1 ♂, 2 ♀, B. M.

16. *Tachyris solstitialis*, sp. n.

♂. Above similar to *T. florentia*, but with the dark brown outer border of the primaries more abruptly tapered; below also much like *T. florentia*, but with the dark brown outer border of the secondaries of only half the width, and the bright orange internal triangular patch consequently of twice the size.

Expanse of wings 75 millim.

♀. Above at once distinguishable from *T. florentia* ♀ by the much less lavender tint of the greyish basal suffusion, its almost entire absence from the secondaries, the dentate-sinuate inner edging of the external border, which narrows almost to a point at the external angle of the primaries, and is distinctly narrower than in *T. florentia* on the secondaries on both surfaces.

Expanse of wings 72 millim.

New Ireland (G. & S. coll.). Two pairs, B. M.

If this insect occurred in the same island with *T. florentia*, I should unhesitatingly regard it as the dry-season form of that species.

17. *Tachyris leucosticta*, sp. n.

Intermediate between the preceding and *T. cilla*, nearly resembling *T. solstitialis* above in both sexes, but below both sexes have the subapical spot of the primaries yellow instead of white and the orange on the secondaries considerably more restricted; the width of the outer border appears to vary seasonally, the wet-season form has the outer border of the secondaries decidedly narrower and less regular than in *T. florentia*, whilst the dry-season form is paler in colour and has a slightly narrower border than *T. solstitialis*.

Expanse of wings, ♂ 69–83, ♀ 72 millim.

Bourou, Ceram, Salwatty, Waigiou. 5 ♂, 1 ♀, B. M.

It is probable that this species has been confounded in collections with *T. cilla*.

18. *Tachyris cilla*.

Pieris cilla, Felder, Reise der Nov., Lep. ii. p. 165 (1865).
Tachyris clavis, Wallace, Trans. Ent. Soc. 3, vol. iv. p. 367 (1867).

Ké Island, Normanby Island, Aru. 3 ♂, B. M.

T. clavis is the wet-season form and *T. cilla* the dry. The females of both are in the Hewitson collection: that of *T. clavis* white above and not unlike that sex of *T. florentia*, excepting that the blackish border of the secondaries occupies nearly half the wing-surface; that of *T. cilla* is yellower and resembles that sex of *T. leucosticta* on the upper surface, excepting that it is greyer at base and has the inner edging of the outer borders less sharply defined, whilst below it has a broader outer border to the secondaries and the orange area deeper in colour and much more extended. Hewitson's examples of this species are from Ké, Aru, and New Guinea.

The males of *T. cilla*=*clavis* are characterized by the fact that the apical border of the primaries completely encloses

the subapical spot on the upper surface *, and on the under surface this spot is bright yellow; but these differences alone would not be sufficient to separate it from *T. leucosticta*; the much greater orange area on the under surface of the secondaries (corresponding with that of *T. solstitialis*) distinguishes it at once.

The following species was received in 1874 from the Godeffroy Museum under the name of *T. ada*.

19. *Tachyris ella*, sp. n.

Allied to *T. cilla*, but with the subapical spot white below in the male, as in *T. ada*; it is considerably smaller than the latter in both sexes and the dark border to the secondaries on the under surface of only about half the width; the orange on these wings is very much restricted, even more so than in *T. leucosticta*. On the upper surface the male resembles *T. cilla* in the extension of the dark brown apical area of the primaries so as to enclose the subapical spot; the secondaries, however, have a narrower and very sharply defined dentate-sinuate outer border.

Expanse of wings, ♂ 68, ♀ 62 millim.

Yap, Caroline Islands. ♂ ♀, B. M.

The female has the under surface of the secondaries whiter than in any of the preceding species, the costa and veins towards the base feebly washed with sulphur and the apex clear ochreous.

20. *Tachyris ardens*, sp. n.

Appias andrea (part.), Semper, Reisen im Arch. Phil. v., Rhop. p. 242 (1891).

The Philippine representative of *T. cilla*; invariably distinctly smaller. The primaries with the subapical spot completely enclosed by the blackish apical border as in that species, but the border of the secondaries with strongly dentate-sinuate internal edging; the subapical spot on the under surface of the primaries varies from sulphur- to saffron-yellow, and the secondaries below are either daffodil-yellow, with rather less orange suffusion than in *T. cilla*, or are wholly orange from base to border †. The female nearly resembles in every respect that sex of *T. ella*, but shows less colour on the under surface, the yellow and ochreous being extremely weak.

* In our male example of *T. leucosticta* from Waigiou the same thing occurs, but to a slightly less prominent extent.

† Whether these are seasonal differences I am not in a position to say.

Expanse of wings, ♂ 68–69, ♀ 59–66 millim.

2 ♂, 4 ♀, Philippines, and ♀, Pelew Island. (Seven examples.) B. M.

This is also in the Hewitson collection; it certainly belongs to the *T. ada* (not *T. hippo* group), both sexes being at once distinguishable from *T. andrea*.

21. *Tachyris Dohertiella*, sp. n.

A very distinct little species; male milk-white, the costa bluish grey, browner on the costal border; apex and outer border occupied by a black-brown band, with acutely dentated inner margin; no subapical spot: secondaries with a rather narrow and tolerably regular black-brown border on a faintly blue-greyish ground from apex to below second median branch; fringe brown: body rather greyer than in any of the preceding species. Primaries with the costal border excepting at base chocolate-brown, continuous with the outer border, which is much broader than above, blackish internally, with much less dentated irregularly sinuated inner margin: secondaries slightly nacreous, with the outer border chocolate-brown and broader than above: body below white.

Expanse of wings 55 millim.

♀. Primaries dark brown, blackish towards apex; two narrow superposed creamy-yellowish streaks beyond the cell; an irregular white patch from just above second median branch to inner margin, its inner edge diffused, its outer edge acutely zigzag: secondaries with a smoke-grey basal patch; a moderately broad dark brown outer border on a pale brownish ground from apex to just beyond second median branch. Primaries below with the pale markings of the upper surface extended; the base and lower two thirds of the discoidal cell whitish: secondaries nacreous, the outer border paler and much wider than above.

Expanse of wings 55 millim.

♂ ♀, Wetter (May 1892, *W. Doherty*). B. M.

Received from the Godman and Salvin collection.

22. *Tachyris timorensis*, sp. n.

♂. Very like *T. lyncida*, but with the black-brown outer borders distinctly broader, less irregular, the subapical spot sometimes reduced to a short narrow streak.

Expanse of wings 54–60 millim.

♀. Very like *T. Dohertiella*, but the creamy streaks beyond the cell of primaries broader and confluent; the outer border

of secondaries rather wider and bordered internally by a smoky-brownish suffused belt.

Expanse of wings 54 millim.

3 ♂, 1 ♀, Timor (ex Godman and Salvin coll.). B. M.

23. *Tachyris lyncida.*

Papilio lyncida, Cramer, Pap. Exot. ii. pl. cxxxi. B (1779).
Pieris enyo, Boisduval, Sp. Gén. Lép. i. p. 481 (1836).
Pieris lynceola, Felder, Reise der Nov., Lep. ii. p. 164 (1865).

Java, Bali, Lombock. B. M.

The females vary somewhat as regards the amount of creamy or buffish white on the wings. I suspect that these differences are seasonal.

24. *Tachyris floresiana*, sp. n.

A local representative of *T. lyncida*; the males with the dentated blackish border of primaries not reaching external angle and that of the secondaries reduced almost to a line on the upper surface; on the under surface the outer borders vary a good deal (probably seasonally) in width; the secondaries are more creamy than in *T. lyncida*.

Expanse of wings, ♂ 54–69 millim.

The females above show a much smaller whitish patch than any females of *T. lyncida*.

Expanse of wings, ♀ 61–63 millim.

Flores. Seven examples. B. M.

25. *Tachyris lycaste.*

Pieris lycaste, Felder, Reise der Nov., Lep. ii. p. 164 (1865).

Celebes, 4 ♂, 4 ♀. Eight examples. B. M.

The males of this species nearly resemble those of *T. floresiana*, but the secondaries on the under surface are suffused towards the base with sulphur-yellow (in what I regard as the wet-season form), the females being heavily suffused with smoky brown.

26. *Tachyris formosana.*

Pieris formosana, Wallace, P. Z. S. 1866, p. 356.
Appias inornata, Moore, P. Z. S. 1878, p. 700.

Formosa and Hainan. B. M.

We possess Dr. Moore's type and a similar male from Formosa. It appears to me that the differences between the typical forms are only seasonal; at any rate they have no specific value.

27. *Tachyris andrea.*

Colias andrea, Eschscholtz, Kotzeb. Reise, iii. p. 215, pl. xxiii. *a*, *b* (1821).

Philippines. ♂ ♀, B. M.

The males of this form differ very little from those of *T. hippo*, but the females have a decidedly broader dark outer border to the secondaries; what I regard as probably the dry-season form has also a much purer white ground to the wings on both surfaces.

28. *Tachyris hippo.*

♀. *Papilio hippo*, Cramer, Pap. Exot. iii. pl. cxcv. B, C (1782).
♂. *Pieris eleonora*, Boisduval, Sp. Gén. Lép. i. p. 481 (1836).
♀. *Appias vacans*, Butler, Trans. Ent. Soc. 1870, p. 490; Lep. Exot. p. 90, pl. xxxiv. figs. 5, 6 (1872).
♂. *Appias hippoides*, Moore, Trans. Ent. Soc. 1881, p. 312.
Appias epicæna, Swinhoe, P. Z. S. 1889, p. 398.

N.E. India, Pegu, Burma, Tonkin, Malacca, and Penang. B. M.

Our series is represented by sixty-eight examples, showing every possible gradation between the extreme wet form *T. hippoides* and the extreme dry form *T. epicæna*. The Indian forms have the subapical spot on the under surface of the male primaries bright yellow; in Pegu, Burma, Malacca, and Penang this spot is sometimes bright or pale yellow, but much more frequently quite white.

29. *Tachyris taprobana.*

Appias taprobana, Moore, P. Z. S. 1879, p. 143; Lep. Ceylon, i. pl. lii. figs. 1, 1 *a*, *b*, *c*.
Appias aperta, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xviii. p. 188 (1886).

Ceylon. B. M.

I regard *T. aperta* as the dry form of *T. taprobana*. The species stands between *T. hippo* and *T. enarete*, the costal and subcostal veins on the under surface of the secondaries being blackened, though less prominently than in *T. enarete*.

30. *Tachyris enarete.*

Pieris enarete, Boisduval, Sp. Gén. Lép. i. p. 480 (1836).

Borneo. 15 ♂, 6 ♀. B. M.

31. *Tachyris latifasciata.*

Appias latifasciata, Moore, Trans. Ent. Soc. 1881, p. 312.

Kollar, Nilghiris. 5 ♂. B. M.

32. *Tachyris cardena.*

Pieris cardena, Hewitson, Exot. Butt. ii., *Pier.* pl. iii. figs. 17, 18 (1861).

Borneo, Sumatra, Malacca. 13 ♂, 1 ♀. B. M.

The examples from Malacca may have to be separated, th yellow on the under surface of the secondaries being replace by a much more restricted abdominal patch of orange.

33. *Tachyris hagar.*

♂. *Pieris hagar*, Vollenhoven, Mon. Pier. p. 38, pl. iv. fig. 6 (1865).

Sumatra.

I think it quite likely that this is only a dry-season form of the preceding species.

34. *Tachyris Hombronii.*

Pieris Hombronii, Lucas, Rev. et Mag. de Zool. 1852, p. 325; ♀, Vollenhoven, Mon. Pier. p. 5, pl. ii. fig. 3 (1865).

Celebes. 3 ♂, 1 ♀. B. M.

This curious and handsome species leads pleasantly from the present group towards *Prioneris*, of which it has the general form and aspect, though without the serrated costa.

LVII. — *The Entomostraca of Lake Bassenthwaite.* By Edith M. Pratt, B.Sc. *With an Introductory Note* by Sydney J. Hickson, M.A., F.R.S., Beyer Professor of Zoology in the Owens College, Manchester.

Introduction.

The splendid researches on the character of the fresh-water fauna which have of recent years been made by Zacharias at Plön, by Birge at Mendota, and by many others abroad, serve to remind us how ignorant we are of the fauna of our own English lakes.

Investigations of the inland waters of Scotland have been conducted for some years by Scott*; but Beck's† paper is the only one that gives a systematic account of the Entomostraca of the English lakes.

As Beck's investigations were chiefly made in the autumn months it occurred to me that it might be of interest to inquire into the character of the fauna earlier in the year, with the

* Scott, T., Scottish Fishery Reports. Scient. Invest. 1890 onward. Invertebrate Fauna of Inland Waters of Scotland.

† Beck, C., J. R. Micr. Soc. (2) iii. p. 780