

Flowers and Insects in Great Britain.

PART III.

Observations on the most Specialized Flowers of the Clova Mountains.

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WE now publish our observations on the fertilization, about Clova in the Eastern Grampians, of the flowers specially adapted for the visits of bees and butterflies¹. The next part of our paper will complete the series, and will terminate with a general review.

CLASS F § II. SUITED FOR DIURNAL LEPIDOPTERA.

91. *Silene acaulis*, Linn. [Lit. *Brit.*, Wilson 2567; *Arct.* 7, 34, 36, 38; Aurivillius 78; Axell 81; *Alps* 2, 9, 21 b, 34; Ricca 2071; *Pyren.* 17.] A marked Lepidoptera-flower at Clova as in the Alps and Pyrenees, Bombi having only been recorded as visiting it in Arctic regions. The flowers are polygamo-trioecious, the hermaphrodite condition being common, and fruit ripening very abundantly. The perfect flowers are proterandrous. The larger flowers have a breadth

¹ Pt. I (Lowland flowers), *Ann. of Bot.* 1895, p. 227; II (Clova), do. 1903, p. 313.

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of 10 mm. and a depth of 8 mm. Two points call for mention: (1) the apparently greater separation of the sexes on the continent, and (2) the more accessible honey in a form of the species found in Greenland.

Visitors. **Lepidoptera.** Heterocera: *Geometridae*: (1) *Thera variata* Schiff., 8. VII. 94, 4. VII. 95, 22. VI. 96, 23–2,700 ft. (2) *Larentia salicata* Hb., 8. VII. 94, 2,400 ft. *Pyrallidae*: (3) *Scopula alpinalis* Schiff., sh. 4. VII. 95, 26–2,700 ft. **Hymenoptera.** Aculeata: *Apidae*: (4) *Bombus jonellus* Kirby, sh. 22. VI. 96, 2,300 ft. **Diptera.** *Empidae*: (5) *Empis tessellata* F., sh. 22. VI. 96, 2,300 ft. *Chironomidae*: (6) *Chironomus* sp., ? sh. 6–13. VII. 95, 2,000 ft. **Coleoptera.** (7) *Anthophagus alpinus* Payk., sh. 4. VII. 96, 22. VI. 96, 25–2,700 ft. (8) *Meligethes* sp., sh. 15. VI. 99, 1,900 ft. **Thysanoptera.** (9) *Thrips* sp., sh. 4. VII. 95, 2,700 ft.

92. *Habenaria conopsea*, Reichb. [Lit. *Brit.* 23; Darwin 483; *N.C.E.* 1, 4, 16, 44; *Arct.* 36; *Alps* 2, 9, 21 b.] A *Lepidoptera*-flower known to be fertilized by moths and butterflies in North Norway, Scotland, England, and the Alps. Some differences in the length of the spur are to be noted; it is recorded as 10–11 mm. long in North Norway, 15 mm. in South Sweden, 13–14 mm. in the Alps, and is 10–12 mm. long at Clova. We have watched flowers at night without observing insects to visit them.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Argynnis aglaia* L., sh. 25. VI. 95, 900 ft. once. (2) *Lycaena icarus* Rott., sh. 1. VII. 95, 900 ft. once. Heterocera: *Crambidae*: (3) *Crambus* sp., sh. 2. VII. 95, 900 ft. *Eriocephalidae*: (4) *Eriocephala calthella* L., 8. VI.–2. VII. 95, 8–900 ft. **Diptera.** *Tachinidae*: (5) *Siphona geniculata* Deg., 22. VI. 95, 800 ft. once. *Anthomyiidae*: (6) *Anthomyia* sp., 2. VII. 95, 900 ft., 26. VI. 96, 1,100 ft.

CLASS F § 12. SUITED FOR NOCTURNAL LEPIDOPTERA.

93. *Lonicera Periclymenum*, Linn. [Lit. *Brit.* 23, 39; *N.C.E.* 1, 3 c, 8, 11, 14, 14 a, 18, 31, 33; Knuth 1234; Warnstorf 2508; *Alps* 9.] A moth-flower but somewhat visited by bumble-bees. *Apis* was seen to lick the stigma.

Visitors. **Lepidoptera.** Heterocera: *Noctuidae*: (1) *Plusia pulchra* Haw., sh. 22. VI. 95. **Hymenoptera.** Aculeata: *Apidae*: (2) *Apis mellifica* L., cp. and seeking h. 20-22. VI. 95. (3) *Bombus hortorum* L., sh. 22. VI. 96, 18. VI. 99. **Diptera.** *Empidae*: (4) *Empis punctata* Mg., seeking h. 21. VI. 96. *Anthomyiidae*: (5) *Trichophthicus* sp., fp. 20-23?. VI. 95. All at 800 ft.

CLASS H § 13. LYCHNIS TYPE.

94. *Lychnis diurna*, Sibth. [Lit. *Brit.* 23, 39; White 2548; *N.C.E.* 1, 11, 21 a, 34; De Vries 2460; *Arct.* 36; *Alps* 2, 9, 16.] This flower is little visited at Clova, where the tube is 10-15 mm. long. In the Alps many butterflies seem to go to it.

Visitors. **Diptera.** *Syrphidae*: (1) *Platychirus manicatus* Mg., ? fp. 15. VI. 99, 900 ft. (2) *Rhingia campestris* Mg., sh. 25. VI. 95, 800 ft. **Coleoptera.** (3) *Meligethes viridescens* F., sh. and fp. 25. VI.-4. VII. 95, 15. VI. 99, 8-900 ft.

95. *Lychnis flos-cuculi*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 3 b, 14, 16, 18, 21 a, 21 b, 25, 34; De Vries 2460; *Alps* 9.] A bee and Lepidoptera-flower, with (at Clova) a tube 7-9 mm. long.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Lycaena icarus* Rott., sh. 26. VI. 95, 800 ft. **Hymenoptera.** Aculeata: *Apidae*: (2) *Bombus lapponicus* F., seeking h. 26. VI. 95, 800 ft. (3) *B. agrorum* F., sh. 21. IX. 95, 900 ft. **Diptera.** *Syrphidae*: (4) *Rhingia campestris* Mg., sh. 26. VI.-1. VII. 95, 800 ft. (5) *Platychirus manicatus* Mg., seeking h. and fp. 23. VI.-4. VII. 95, 800 ft. *Empidae*: (6) *Empis tessellata* F., sh. 1. VII. 95, 800 ft. *Anthomyiidae*: (7) 1 sp., 23. VI. 95, 800 ft.

96. *Lychnis alpina*, Linn. [Lit. *Brit.* 26; *Arct.* 36, 38; Axell 81; *Alps* 9, 34; Kirchner 1185.] The following account is drawn up from Clova specimens. The flower is strongly proterandrous. After the dehiscence of the anthers, the stamens bend outwards; then the styles elongate and separate, bending so as eventually to be at right angles to the ovary across the mouth of the flower. Ultimate autogamy is possible by

means of anthers still adhering to their filaments, and seems to take place, fruiting being regular. The flowers are 12–14 mm. in diameter; the petals have a claw 3 mm. long and a limb 4 mm. notched to halfway. As the internode between sepals and petals is about 1 mm. long, the honey at the base of the flower is about 4 mm. removed from the mouth, a distance a little less than the width of the mouth. Thus the tube is rather funnel-shaped than tubular. The flowers are very variable in the number of parts, six petals being frequently, seven occasionally, present. It is possible that the flower should be regarded as belonging to Class B.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Psithyrus quadricolor* Lep., sh. 2. VII. 96, once. **Diptera.** *Chironomidae*: (2) 1 sp., 2. VII. 96. *Anthomyiidae*: (3) *Trichophthicus* sp., sh. 27. VI.–2. VII. 96. **Thysanoptera.** (4) *Thrips* sp., 2. VII. 96. All at 2,850 ft.

97. *Primula vulgaris*, Huds. [Lit. *Brit.* 23, 29; Christy in Trans. Essex Field Club, iii. p. 195; Darwin 470 and 485; Briggs 290; Scott 2253; *N.C.E.* 1, 33.] One of us gave some account of the fertilization of the Primrose (see lit. 29) a few years ago, showing how the conditions of its fertilization are hardly known. Since then we have noticed that it is very abundantly visited at Kew by a bee, *Anthophora acervorum*, and is visited also by it in Essex (see Miller Christy, loc. cit.). This insect does not occur at Clova. We have seen few visitors in our district. The tube is 12.5–16 mm. long there; it is longer in England and Germany. We found certain long-styled flowers with the style dwarfed, probably in deformity, and in them the *Anthomyiids* were able to push their way down the throat to the stamens.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus hortorum* L., sh. 20. V. 97, 800 ft. once. **Diptera.** *Anthomyiidae*: (2) *Anthomyia sulciventris* Ztt., fp. and seeking h. 20–22. V. 97, 6–1,200 ft. freq. (3) *Hylemyia* sp., fp. 20. V. 97, 900 ft. **Coleoptera.** (4) *Meligethes* sp., fp. 22. V. 97, 10. VI. 99, 700 ft. **Araneida.** (5) *Xysticus* sp., lying in wait on the corolla, 22. V. 97, 600 ft.

CLASS H § 14. CROCUS TYPE.

98. *Crocus aureus*, Linn. [Lit. *Brit.* 29.] In cultivation.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Apis mellifica* L., sh. and cp. 2-15. IV. 95, very ab. **Diptera.** *Muscidae*: (2) *Pollenia rudis* F., fp. 2. IV. 95, freq. (3) *Lucilia cornicina* F., fp. 2. IV. 95, freq. All at 800 ft.

CLASS H § 15. VIOLA TYPE.

99. *Viola palustris*, Linn. [Lit. *Brit.* 23; *N.C.E.* 14.] Reproduction is largely by runners. The flowers are insignificant, with a spur only 2 mm. long and with little honey. The stigma projects beyond the stamens. They are neglected by insects, so that we have only seen three individuals on them; the fourth (*B. lapponicus*) was observed on the flowers by the father of one of us, Mr. I. H. Burkill, sen. Knuth observed no visitors in the North Friesian Islands.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus lapponicus* F., sh. 19. V. 98, 1,400 ft. once. **Diptera.** *Empidae*: (2) *Empis lucida* Ztt., sh. 12. VI. 99, 17-2,500 ft. *Anthomyiidae*: (3) 1 sp., 18. V. 98, 800 ft.

100. *Viola canina*, Linn., and *V. sylvatica*, Fries. [Lit. *Brit.* 23, 29; Bennett 219; *N.C.E.* 1, 3 b, 14, 18, 25, 33, 40; MacLeod 1471; *Alps* 2.] Pronounced bee-flowers, but not well visited at Clova. The spur of *V. sylvatica* sometimes attains the length of 8 mm., that of *V. canina* (segregate) is about 5 mm. long. Once in the first-named it was found bitten through. The butterflies abroad in spring visit the flowers on the continent as at Clova; *Bombi* are recorded as visitors in Dumfriesshire and Yorkshire. The chasmogamic flowers seem to set little seed (cf. Linton in Bot. Exchange Club Rep. 1890, p. 284). Cleistogamic flowers follow them.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Pieris napi* L., sh. 21. V. 96, 23. V. 97, 15. VI. 99, 6-1,000 ft. (2) *Argynnis selene* Schiff., sh. 15-16. VI. 99, 900 ft. **Hymenoptera.** Aculeata: *Apidae*: (3)

Bombus agrorum F., sh. 22. V. 97, 600 ft. **Diptera.** *Tachinidae*: (4) *Siphona geniculata* Deg., 21. V. 96, 800 ft. *Anthomyiidae*: (5) *Anthomyia sulciventris* Ztt., fp. 20-27. V. 97, 7-800 ft. **Araneida.** (6) *Xysticus* sp., lying in wait inside a flower, 21. V. 97, 800 ft.

101. *Viola tricolor*, Linn. [Lit. *Brit.*, Bennett 209; Darwin 482; Kitchener 1197; *N.C.E.* 1, 3 b, 9, 11, 14, 18, 25, 35, 40; *Scand.*, Wittrock 2592; *Alps* 9, 34; *Pyren.* 17.] The following statement shows it to be at Clova a neglected bee-flower; it is not abundant, and owes its position high up the glen perhaps to cultivation. Verhoeff points out the possibility of self-pollination in the Friesian islands and the frequency with which the spur is bitten through for its honey.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Pieris napi* L., sh. 17. VII. 95, 800 ft. **Diptera.** *Anthomyiidae*: (2) *Hyetodesia incana* W., 19. VI. 95, 800 ft.

102. *Viola lutea*, Smith. [Lit. *Brit.* 39; *Scand.* 34.] A neglected bee-flower. Bombi and butterflies are recorded as visiting it near Stockholm. On the hundreds of thousands of flowers seen by us at Clova, but fifty insects have been recorded, representing sixteen species, mostly flies which sit on the flower licking the hairs at the mouth of the tube or feeding on pollen. Four species of Lepidoptera were seen on the flowers, each once. The flowers are almost always wholly yellow, and all turn towards the south. The spur is 5-6 mm. long.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Pieris napi* L., 24. V. 96, 800 ft. (2) *Lycaena icarus* Rott., sh. 18. VII. 96, 800 ft. Heterocera: *Tineidae*: (3) *Glyphipteryx fuscoviridella* Haw., sh. 2. VII. 95, 900 ft. *Eriocephalidae*: (4) *Eriocephala calthella* L., 2. VII. 95, 800 ft. **Hymenoptera.** Aculeata: *Apidae*: (5) *Andrena analis* Panz., 22. VI. 96, 1,000 ft. **Diptera.** *Syrphidae*: (6) *Sphaerophoria* sp., 6. VII. 94. *Bibionidae*: (7) *Dilophus* sp., 19. V. 97, 800 ft. *Muscidae*: (8) *Pollenia rudis* F., licking the hairs at the mouth of the tube, 21. V. 96, 800 ft. *Anthomyiidae*: (9) *Drymia hamata* Fln., sh. 4. VII. 95, 800 ft. (10) *Hyetodesia incana* W., 21. VI. 95, 800 ft. (11) *Anthomyia sulciventris* Ztt., seeking h. and fp. 19-27. V. 97, 16. V. 98,

7-800 ft. (12 and 13) A. 2 spp., fp. 4. VII. and 21. IX. 95; 10. VI. 99, 7-1,500 ft. (14) *Coenosia* sp., 1. VII. 95, 900 ft. *Cordyluridae*: (15) *Scatophaga stercoraria* L., 4. VII. 95, 800 ft. (16) 1 sp., 2. VII. 95, 800 ft.

CLASS H § 16. ORCHIS TYPE.

103. *Orchis maculata*, Linn. [Lit. *Brit.*, Darwin 483; *N.C.E.* 1, 3a, 14, 18, 34, 40; Warnstorf 2506; *Alps* 2.] A bee-flower apparently much neglected about Clova. The spur contains no free honey and requires a breaking of the tissues to yield any sweet juice.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Pieris napi* L., seeking h. 19. VI. 96, 1,500 ft. **Diptera.** *Anthomyiidae*: (2) *Hylemyia variata* Fln., seeking h. 21. V. 95, 800 ft. (3) *H. nigrescens* Rnd., sitting on flower, 16. VI. 99, 800 ft.

104. *Orchis mascula*, Linn. [Lit. *Brit.*, Darwin 483; *N.C.E.* 1.]

Visitors. **Diptera.** *Anthomyiidae*: (1) One sp., 22. VI. 95, 1,400 ft. *Cordyluridae*: (2) *Scatophaga stercoraria* L., 5. VII. 94, 800 ft.

CLASS H § 17. TROPAEOLUM TYPE.

105. *Tropaeolum speciosum*, Poepp. and Endl. In cultivation.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus agrorum* F., sh. 19. IX. 95, 800 ft.

CLASS H § 18. PINGUICULA TYPE.

106. *Pinguicula vulgaris*, Linn. [Lit. *N.C.E.* 14; Buchenau in *Bot. Zeitung*, 1865, p. 95; Hildebrandt 1041; *Arct.* 36, 38; Warming 2498; *Alps* 2, 9.] A self-fertilizing flower, abundant, but as neglected by insects about Clova as elsewhere. Lindman remarks the great rarity of visitors. Sprengel, Kerner, and Warming describe the way in which the stigma rolls back on to the anthers, and in sections of the flower we have seen the pollen-tubes passing into the stigmatic tissue. Abnormal flowers are very common; in these it is usual for the number

of lobes of the corolla to be increased. Lindman speaks of it being frequently abnormal, and he also notices the occurrence in the Dovrefjeld of flowers which are almost cleistogamic. At Clova it is very frequently abnormal, generally by the addition of extra lobes to the corolla.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Pieris napi* L., sh. going from flower to flower, 15. VI. 99, 800 ft. **Hymenoptera.** Aculeata: *Apidae*: (2) *Bombus lapponicus* F., settled on a flower but did not stay to sh. 1. VII. 96, 2,000 ft. **Diptera.** *Anthomyiidae*: 1 sp., seen settled on flowers on five occasions, 27. VI. 96, 10. VI. 99, 8–2,500 ft.

CLASS H § 19. PEDICULARIS TYPE.

107. *Pedicularis sylvatica*, Linn. [Lit. *Brit.* 23; Ogle 1904; *N.C.E.* 1, 3 c, 4, 12, 14, 18, 21 b, 34.] The position of the flowers of this species is constant, the hood always above and vertical. The tube is 14–16 mm. long.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Pieris napi* L., sh. 19. VI. 96, 15. VI. 99, 8–1,500 ft. **Hymenoptera.** Aculeata: *Apidae*: (2) *Bombus lapponicus* F., seeking h. 11. VII. 96, 800 ft. once. (3) *B. jonellus* Kirby, ? sh. 22. VII. 95, 1,200 ft. once. **Diptera.** *Anthomyiidae*: (4) *Anthomyia sulciventris* Ztt., seeking h. or p. 23. V. 97, 900 ft.

108. *Pedicularis palustris*, Linn. [Lit. *Brit.* 23; *N.C.E.* 4, 8, 14, 16, 18, 21 a; *Arct.* 36; *Alps* 2.] The position of the flowers is not constant. No one has seen this plant richly visited.

Visitors. **Diptera.** *Syrphidae*: (1) *Rhingia campestris*, Mg., sh. 2. VII. 95, 800 ft.

109. *Melampyrum pratense*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 3 c, 4, 16, 18, 21 b, 32, 33, 34, 40; *Alps* 9.] A flower distinctly suited to Bombi, but not much visited.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus lapponicus* F., sh. 27. VI. 95, 2,100 ft.

CLASS H § 20. 'LABIATE' TYPE.

110. *Euphrasia officinalis*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 3 c, 4, 14, 18, 21 b, 30, 40; Wettstein 2539; *Arct.* 36, 37 c, 38; *Alps* 2, 9, 21 b, 34; Wettstein 2539; *Pyren.* 17.] The flower varies considerably in size, but the mechanism does not change. In the glen the tube is usually 2.5 mm. long.

Visitors. Hymenoptera. Aculeata: *Apidae*: (1) *Apis mellifica* L., sh. 15. IX. 95, 800 ft. once. Diptera. *Syrphidae*: (2) *Platychirus manicatus* Mg., fp. 14. IX. 95, 800 ft.

111. *Nepeta Glechoma*, Benth. [Lit. *Brit.* 23, 29, 34; Bennett 212; Marquand 1513; *N.C.E.* 1, 3 c, 4, 16, 18, 21 a, 21 b, 33, 34, 40; De Vries 2460; *Alps* 34; *N.Am.* 19 c.] Gynodioecious; the tube of the flower is 4 mm. long.

Visitors. Hymenoptera. Aculeata: *Apidae*: (1) *Apis mellifica* L., sh. 20. V. 97, 800 ft. Diptera. *Anthomyiidae*: (2) *Anthomyia* sp., fp. 20. V. 97, 800 ft.

112. *Prunella vulgaris*, Linn. [Lit. *Brit.* 23, 39; Ogle, 1904; *N.C.E.* 1, 3 c, 4, 11, 14, 14 a, 16, 18, 21 a, 21 b, 30, 32, 34; De Vries 2460; MacLeod 1473; *Arct.* 34; *Alps* 2, 16, 21 b, 34; *Pyren.* 17; *N.Am.* 19 c.] The tube of the decidedly proterandrous flower is usually 9-10 mm. long. We found, however, a larger-flowered form on the crags at 2,000-2,800 feet.

Visitors. Hymenoptera. Aculeata: *Apidae*: (1) *Bombus hortorum* L., sh. 11. VII. 96, 800 ft.

113. *Stachys palustris*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 3 c, 4, 8, 11, 18, 21 b, 32, 33; *Alps* 16; *Pyren.* 17.]

Visitors. Hymenoptera. Aculeata: *Apidae*: (1) *Bombus agrorum* F., sh. 2. VII. 95. Diptera. *Syrphidae*: (2) *Rhingia campestris* Mg., sh. and fp. 2-6. VII. 95. All at 800 ft.

114. *Galeopsis Tetrahit*, Linn. [Lit. *Brit.* 23, 39; *N.C.E.* 1, 3 c, 4, 18, 21 b, 33, 40; *Alps* 2, 9, 34; Briquet 293; *Pyren.* 17.] The form with rose flowers is very rare.

Visitors. Lepidoptera. Rhopalocera: (1) *Lycaena icarus* Rott.,

sh. 5. VII. 95, 800 ft. (2) *Coenonympha pamphilus* L., sh. 5. VII. 95, 800 ft. each once. **Hymenoptera.** Aculeata: *Apidae*: (3) *Bombus terrestris* L., sh. 16-17. IX. 95, 7-800 ft. (4) *B. agrorum* F., sh. 5. VII. and 13. IX. 95, 7-800 ft. **Diptera.** *Syrphidae*: (5) *Melanostoma mellinum* L., fp. 22. IX. 95, 800 ft. (6) *Platychirus albimanus* F., fp. 16-17. IX. 95, 800 ft. (7) *P. manicatus* Mg., fp. 5. VII. 95, 800 ft. *Muscidae*: (8) *Calliphora erythrocephala* Mg., fp. 5. VII. 95, 800 ft. *Anthomyiidae*: (9) *Anthomyia* sp., fp. 17. IX. 95, 800 ft. (10) *Trichophthicus* sp., fp. 16. IX. 95, 800 ft. **Coleoptera.** (11) *Meligethes viridescens* F., 16-17. IX. 95, 800 ft.

115. *Lamium purpureum*, Linn. [Lit. *Brit.* 23, 29, 34; Bennett 212; *N.C.E.* 1, 3 c, 4, 11, 14, 16, 18, 21 b, 34, 40; De Vries 2460; *Alps* 34.] The flower is proterandrous; the stigma gradually passes above the stamens to a point beyond them, but not so much as to make self-fertilization impossible.

Visitors. **Diptera.** *Syrphidae*: (1) *Platychirus discimanus* Lw., ? fp. 15. V. 98, 800 ft.

116. *Lamium maculatum*, Linn. [Lit. *N.C.E.* 1, 3 c, 4, 21 b, 33, 34, 35; *Alps* 2, 34.] This plant has been established since at least 1840 without spreading to any extent. Some *Bombus*, not seen by us in the act, bores the corolla, and *Apis* makes use of the holes.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Apis mellifica* L., cp. 20. V. 97, and sh. through holes in corolla and cp. hanging under hood, 7-15. V. 98. (2) *Bombus hortorum* L., sh. 22. V. 97. (3) *B. agrorum* F., sh. 23. V. 97, 11. VI. 99. **Diptera.** *Syrphidae*: (4) *Platychirus* sp., fp. 23. V. 97. *Muscidae*: (5) *Lucilia cornicina* F., 7. V. 98. *Anthomyiidae*: (6) *Anthomyia* sp., fp. 16. V. 98. All at 800 ft.

117. *Ajuga reptans*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 3 c, 4, 16, 18, 21 a, 21 b, 33, 40; *Alps* 2, 34; *Pyren.* 17.]

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus agrorum* F., sh. 24. VI. 95, 10. VI. 99, 7-800 ft. **Diptera.** *Anthomyiidae*: (2) 1 sp., fp. 10. VI. 99, 700 ft.

CLASS H § 21. EXPLOSIVE LEGUMINOUS TYPE.

118. *Genista anglica*, Linn. [Lit. *N.C.E.* 1, 3 b, 14, 14 a, 34, 40.] A species little visited at Clova, where the genera of mid-tongued Hymenoptera observed on it by Müller, Alfken, and Höppner are poorly represented.

Visitors. Hymenoptera. Aculeata: Apidae: (1) *Apis mellifica* L., cp. 2. V. 97, 7-800 ft. (2) *Bombus terrestris* L., cp. and seeking h. 25. V. 97, 800 ft. (3) *B. lapponicus* F., seeking h. 22. V. 97, 700 ft. *Diptera. Anthomyiidae:* (4) *Anthomyia sulciventris* Ztt., fp. and seeking h. 20-22. V. 97, 8-900 ft.

119. *Ulex europaeus*, Linn. [Lit. *Brit.* 23, 29; Ogle 1905; *N.C.E.* 8, 14, 18, 33.] *Apis* is a more frequent visitor than the *Bombi*, but both genera are regular visitors in Scotland and in England. *Apis* visits the flowers abundantly in Flanders. After explosion a variety of flies find pollen enough to attract them. Many times we have seen the *Bombi* and *Apis* thrusting their proboscis into the base of the flower seeking for honey.

Visitors. Hymenoptera. Aculeata: Apidae: (1) *Apis mellifica* L., cp. and seeking h. 21. V. 96, 20-22. V. 97, 7-16. V. 98, 10. VI. 99, 6-900 ft. (2) *Bombus terrestris* L., cp. and seeking h. 20-27. V. 97, 10-19. VI. 99, 7-800 ft. (3) *B. lapponicus* F., seeking h. 20-27. V. 97, 7-800 ft. (4) *B. agrorum* F., 27. V. 97, 800 ft. *Diptera. Syrphidae:* (5) *Syrphus* sp., fp. 20-27. VI. 97, 800 ft. *Muscidae:* (6) *Pollenia vespillo* F., fp. 27. V. 97, 800 ft. *Anthomyiidae:* (7) *Anthomyia sulciventris* Ztt., fp. 19-27. V. 97, 7-900 ft. (8) *A. sp.*, fp. on exploded flowers, 16. V. 98, 700 ft. *Thysanoptera.* (9) *Thrips* sp., 21. V. 97, 800 ft.

120. *Cytisus scoparius*, Link. [Lit. *Brit.* 23, 34; Henslow 990; Darwin 991; *N.C.E.* 1, 3 b, 14, 16, 18, 25, 33, 34, 40; De Vries 2460.] The flowers are very well visited, the bees (*Apis* and *Bombi*) proceeding from flower to flower regularly. *Apis* is more abundant than the *Bombi*: second in abundance is *Bombus terrestris*; *Anthomyiids* and *Meligethes viridescens* are very common on exploded flowers. It is obvious, as

Müller remarks, that the flower is more sure of advantage from the visits of Bombi than of Apis; but at Clova, in Flanders, Westphalia, &c., the latter is the more abundant visitor.

Visitors. Hymenoptera. Aculeata: Apidae: (1) *Apis mellifica* L., cp. and seeking h. 19. VI. 95, 21–22. V. 96, 24. V. 97, 10. VI. 99, 7–800 ft. freq. (2) *Bombus terrestris* L., cp. and seeking h. 21–22. V. 96, 22–27. V. 97, 16. VI. 99, 7–800 ft. freq. (3) *B. lapponicus* F., sp. and seeking h. 23. VI. 96, 800 ft. once. (4) *B. agrorum* F., seeking h. 21. VI. 95, 800 ft. once. (5) *B. pratorum* L., 10. VI. 99, 800 ft. once. *Myrmicidae:* (6) *Myrmica rubra* L., seeking h. 23. VI. 95, 800 ft. once. *Formicidae:* (7) *Formica fusca* Latr., seeking h. 23. VI. 95, 800 ft. once. *Diptera. Syrphidae:* (8) *Syrphus* ? *ribesii* L., seeking h. 17–23. VI. 95, 800 ft. and ? the same once at 2,300 ft. *Muscidae:* (9) *Calliphora* sp., 17. VI. 95, 2,300 ft. *Anthomyiidae:* (10) *Hyetodesia incana* W., seeking h. 17. VI. 95, 2,300 ft. (11) *Anthomyia* sp., fp. 19–23. V. 97, 16. VI. 96, 20–26. V. 97, 10. VI. 99, 7–800 ft. (12) *Trichophthicus* sp., fp. 19–23. V. 97, 7–800 ft. (13) *Azelia aterrima* Mg., seeking h. 17. VI. 95, 2,300 ft. *Sapromyzidae:* (14) *Lauxania cylindricornis* F., 23. VI. 95, 800 ft. (15) *L. elizae* Mg., 23. VI. 96, 800 ft. *Coleoptera.* (16) *Meligethes viridescens* F., fp. 15. VI. 95, 24. VI. 96, 10. VI. 99, 800 ft. (17) *M. aeneus* F., 15. VI. 95, 800 ft. (18) *Anthobium torquatum* Marsh., seeking h. 23. VI. 95, 24. VI. 96, 800 ft. (19) *Ceuthorrhynchidius* sp., ? sucking the juice of the flower, 24. VI. 96, 800 ft. *Hemiptera.* (20) *Heterocordylus tibialis* Hahn., 19–23. VI. 95, 8–900 ft. freq.

CLASS H § 22. LEGUMINOUS TYPE.

121. *Cytisus Laburnum*, Linn. [Lit. *N.C.E.* 1, 9, 33, 40.] In cultivation. As honey is obtained by boring the tissues the range of visitors is narrowed considerably, for none but *Apis* and *Bombi* find how to obtain it.

Visitors. Hymenoptera. Aculeata: Apidae: (1) *Apis mellifica* L., ab. (2) *Bombus terrestris* L. (3) *B. lapidarius* L. All sucking the juices of the flower, 21. V. 96, 800 ft.

122. *Trifolium pratense*, Linn. [Lit. *Brit.* 23; Darwin 482; *N.C.E.* 1, 3 b, 11, 14, 14 a, 15, 16, 18, 21 b, 25, 30, 31,

32, 33, 34, 40; De Vries 2460; *Arct.* 36; *Alps* 2, 34; *Pyren.* 17; *N.Am.* 19 a.] Contrasting it with *T. repens* the effect of the greater length of the tube in inviting long-tongued Hymenoptera and Lepidoptera is evident. According to Verhoeff insects on the Friesian coast require tongues 11–12 mm. long, and to Müller 9 mm. long; at Clova 8 mm. would suffice. *Apis* and some of the shorter-tongued *Bombi* and other Hymenoptera are recorded as obtaining honey by perforation of the calyx. A honey-bird visits it in the United States. Our observations need extending.

Visitors. Hymenoptera. Aculeata: *Apidae*: (1) *Bombus terrestris* L., sh. 22. IX. 95, 800 ft. (2) *B. venustus* Smith, sh. 11. VII. 96, 700 ft. *Diptera.* *Bibionidae*: (3) *Bibio pomonae* F., seeking h. 11. VII. 96, 700 ft. *Muscidae*: (4) *Lucilia cornicina* F., fp. 5. VII. 95, 700 ft. *Anthomyiidae*: (5) *Anthomyia sulciventris* Ztt., fp. 2. VII. 95, 900 ft. (6) *A. sp.*, fp. 22. IX. 95, 800 ft. *Coleoptera.* (7) *Meligethes viridescens* F., cp. and fp. 23. VI. 95, 800 ft. Each once.

123. *Trifolium hybridum*, Linn. [Lit. *N.C.E.* 3 b, 9, 33, 34; Kirchner 1183.] Cultivated, and well visited by *Apis*.

Visitors. Hymenoptera. Aculeata: *Apidae*: (1) *Apis mellifica* L., sh. 5. VII. and 22. IX. 95, 25. VI. 96, 7–800 ft. *Diptera.* *Muscidae*: (2) *Lucilia cornicina* F., fp. 5. VII. 95, 700 ft.

124. *Trifolium repens*, Linn. [Lit. *Brit.* 23; Darwin 468 and 482; Marquand 1513; *N.C.E.* 1, 3 b, 4, 11, 14, 14 a, 15, 16, 18, 25, 30, 31, 32, 33, 34, 40; De Vries 2460; *Arct.* 34, 36; *Alps* 2, 34; *Pyren.* 17.] A *Bombus*-flower which by the accessibility of the honey attracts *Apis* in great numbers. In Arctic Norway *Bombi* are its only recorded visitors; they are the most abundant visitors in the Alps and in the Pyrenees. In North Central Europe and in Britain where bees are kept *Apis* is perhaps more frequent than the *Bombi*. Darwin demonstrated in England the need of insect aid in pollination.

Visitors. Lepidoptera. Rhopalocera: (1) *Coenonympha pamphilus* L., sh. 22. VI. 95, 800 ft. (2) *Lycaena icarus* Rott., sh. 26. VI.–I. VII. 95, 10. VII. 96, 800 ft. Heterocera: *Geometridae*: (3) *Cam-*

ptogramma?, sh. 11. VII. 96, 700 ft. **Hymenoptera.** Aculeata: *Apidae*: (4) *Apis mellifica* L., sh. 24. VI.-22. VII. 95, 5-11. VII. 96, 7-800 ft. (5) *Bombus pratorum* L., sh. 4. VII. 95, 800 ft. (6) *B. lapponicus* F., sh. 20. VI. 95, 18. VI.-10. VII. 96, 8-2,300 ft. (7) *B. agrorum* F., sh. 22. VI.-6. VII. 95, 800 ft. (8) *B. venustus* Smith, sh. 26. VI. 95, 800 ft. **Diptera.** *Empidae*: (9) *Empis tessellata* F., sh. 5. VII. 95, 800 ft. *Bibionidae*: (10) *Bibio pomonae* F., ? fp. 11. VII. 96, 700 ft. *Cordyluridae*: (11) *Scatophaga maculipes* Zett., ? fp. 2. VII. 95, 800 ft.

125. *Lotus corniculatus*, Linn. [Lit. *Brit.* 23, 34; Farrer 653; *N.C.E.* 1, 3 b, 11, 12, 14, 14 a, 15, 16, 18, 21 b, 25, 30, 32, 33, 34; Warnstorf 2507; *Alps* 2, 9, 16, 34; *Pyren.* 17; *Medit.* 34.] A *Bombus*-flower, fertilized at Clova by *B. lapponicus* and *B. agrorum*. The butterflies, which visit, are to it robbers. The tongue of *Apis* is hardly long enough to reach the honey. Kerner speaks of dark-coloured flowers occurring at high levels; once we found such at 2,400 ft.

Visitors. **Lepidoptera.** Rhopalocera: (1) *Argynnis aglaia* L., sh. 23. VI. 95, 900 ft. once. (2) *Lycaena icarus* Rott., sh. 22. VI.-8. VII. 95, 18. VI.-10. VII. 96, 7-1,000 ft., the male much more freq. than the female. Heterocera: *Geometridae*: (3) *Fidonia atomaria* L., 15. VI. 99, 1,100 ft. (4) Another sp. 15. VI. 99, 12-1,500 ft. **Hymenoptera.** Aculeata: *Apidae*: (5) *Apis mellifica* L., sh. 16. VI. 95, 700 ft. (6) *Bombus terrestris* L., sh. 1-8. VII. 95, 800 ft. (7) *B. pratorum* L., 26. VI. 95, 800 ft. (8) *B. lapponicus* F., cp. and sh. 26. VI.-1. VII. 95, 22. VI.-10. VII. 96, 19. VI. 99, 8-2,300 ft. (9) *B. lapidarius* L., sh. 6-11. VII. 96, 800 ft. (10) *B. agrorum* F., sh. and cp. 25. VI.-23. VII. 95, 14-15. VI. 99, 8-1,100 ft. (11) *B. venustus* Smith, sh. 16. VI.-11. VII. 96, 700 ft. (12) *B. hortorum* L., sh. 15. VI. 99, 800 ft. Petiolata tubulifera: *Vespidae*: (13) *Odynerus pictus* Curt., 25. VI. 95, 800 ft. **Diptera.** *Tachinidae*: (14) *Siphona geniculata* Deg., seeking h. 16. VI. 99, 800 ft. *Muscidae*: (15) *Calliphora* sp., seeking h. 15. V. 95, 900 ft. *Anthomyiidae*: (16) *Hyetodesia incana* W., 22. VI. 95, 800 ft. (17) *Drymia hamata* Fln., 26. VI. 96, 2,300 ft.

126. *Oxytropis campestris*, DC. [Lit. *Arct.* 7; *Alps* 2, 16.] The flower is usually creamy white with two yellow

patches on the standard and a purple tip to the keel, not pure white as stated in *Trans. Bot. Soc. Edin.*, xviii. 391; but it is whiter and larger than the usual form of the Eastern Alps. The colour varies from this creamy white to a pale lemon-yellow or a pale violet. The flower has a sweet scent and abundant honey. The calyx-tube is 7 mm. long, and its teeth an additional 2 mm., and is rather thin, so that it offers but little resistance to the insects which rob the honey by biting through it. The narrow part of the flower is 10 mm. long. The passages to the honey between the bases of the stamens are very long. The stigma stands 1 mm. above the stamens, and is touched by its own pollen. Rubbing appears to be necessary to make it receptive. The rough areas on the petals, which afford a foothold to insects, have been fully described by Loew for *O. pilosa* (*Flora*, 1891, p. 84). In plants from Clova they are distributed as follows: standard very smooth below, less so above on the inner face; wings very rough on the surface directed upwards, especially towards the interlocking processes; keel slightly rough on both sides towards the tip, perfectly smooth below, and rather smooth along the middle line. The plant fruits very freely.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus lapponicus* F., sh. 26. VI.-2. VII. 96, 2,300 ft. *Formicidae*: (2) *Formica fusca* Latr., seeking h. 26. VI. 96, 22-2,300 ft. *Petiolata parasitica*: (3) 1 sp., seeking h. 26. VI. 96, 2,200 ft. **Diptera.** *Bibionidae*: (4) *Scatopse* sp., fp. 26. VI. 96, 22-2,300 ft. *Anthomyiidae*: (5) *Limnophora solitaria* Ztt., seeking h. 26. VI. 96, 2,200 ft. *Sapromyzidae*: (6) *Sapromyza* sp., seeking h. 2. VII. 96, 2,300 ft. **Coleoptera.** (7) *Meligethes aeneus* F., seeking h. 2. VII. 96, 2,300 ft. (8) *M. viridescens* F., fp. 26. VI. 96, 22-2,300 ft. **Thysanoptera.** (9) *Thrips* sp., 22. VI.-2. VII. 96, 22-2,300 ft. very ab.

127. *Vicia Cracca*, Linn. [*Lit. Brit.* 23; *N.C.E.* 1, 3 b, 8, 14, 18, 21 b, 32, 33, 34, 40; De Vries 2460; *Arct.* 36; *Alps* 2, 9, 16, 21 b; *Pyren.* 17.] A *Bombus*-flower with honey attainable to all the *Bombi*, but not readily to *Apis*; rare at Clova. The calyx is sometimes bitten through. The tubular part of the flower is 5-6 mm. long.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus terrestris* L., sh. 11. VII. 96, 700 ft. **Diptera.** *Sarcophagidae*: (2) *Sarcophaga* sp., sh. through boring in the calyx, 11. VII. 96, 700 ft.

128. *Vicia sylvatica*, Linn. [Lit. *Brit.* 23.] The flowers are so massed together that the plant is very conspicuous, and there is a sweet scent. The petals are veined with mauve. The stigma projects a trifle beyond the anthers, and the style has a long brush of sweeping hairs. If rubbed the stigma leaves a sticky streak, and does not become self-fertilized in the absence of insect visitors. Hence the mechanism of the flower seems to be that suggested for the genus by H. Müller. The petals are 16–18 mm. long, and the narrow part of the flower 10–12 mm. The honey is secreted in the position usual for the genus. We have seen the calyx with a hole bitten through it. Schulz, in error, states that Darwin observed bees to bite through the calyx; the plant referred to is, however, *Lathyrus sylvestris*. Scott Elliot observed *Bombus muscorum* and *B. hortorum* as visitors.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus lapponicus* F., seeking h. and cp. 10. VII. 96, 2,300 ft. *Petiolata tubulifera*: *Vespidae*: (2) *Odynerus* sp., sh. through borings in calyx, 10. VII. 96, 2,300 ft. **Diptera.** *Bibionidae*: (3) *Dilophus albipennis* Mg., sh. through borings in calyx, 26. VI. 96, 2,300 ft. *Anthomyiidae*: (4) 1 sp., seeking h. 2. VII. 96, 2,300 ft. *Sapromyzidae*: (5) *Sapromyza* sp., sh. through borings in calyx, 10. VII. 96, 2,300 ft. **Coleoptera.** (6) *Meligethes viridescens* F., 26. VI. 96, 2,300 ft. (7) *M. aeneus* F., seeking h. 10. VII. 96, 2,100 ft. **Thysanoptera.** (8) *Thrips* sp., 26. VI. 96, 2,300 ft.

129. *Vicia sepium*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 3 b, 11, 16, 18, 21 b, 33, 34, 40; De Vries 2460; *Alps* 2, 9, 34; *Pyren.* 17.] *Vicia sepium* is, as Müller points out, a *Bombus*-flower in which the honey is too difficult of access for *Lepidoptera*, and to *Bombus terrestris* is most readily obtained by a biting through of the calyx. We have found bitten flowers at Clova; and they have been noted abundantly by Müller, Schulz, Knuth, and Alfken in Germany, and by MacLeod in

Flanders. *Myrmica rubra* was seen (24. VI. 95) on the stipules apparently on account of the honey there.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus venustus* Smith, sh. **Diptera.** *Anthomyiidae*: (2) *Hyetodesia incana* W., seeking h. *Sepsidae*: (3) *Sepsis cynipsea* L., seeking h. All at 800 ft. 18. VI. 96.

130. *Lathyrus pratensis*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 3 b, 14, 14 a, 18, 21 b, 32, 34, 40; *Arct.* 36; *Alps* 2, 34; *Medit.* 34.] A bee-flower, but not freely visited. Fertilization is, however, dependent on insect visits.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Apis mellifica* L., sh. 11. VII. 96, 700 ft. once. **Diptera.** *Anthomyiidae*: (2) *Anthomyia* sp., fp. 4-5. VII. 95, 800 ft. **Hemiptera.** (3) *Anthocoris* ? *memorum* L., seeking h. 16. IX. 95, 900 ft.

131. *Lathyrus macrorrhizus*, Wimm. [Lit. *Brit.* 23; *N.C.E.* 14, 21 b, 34, 40; Loew 1358; *Pyren.* 17.] A *Bombus*-flower needing insect aid for fertilization, and, as it is not freely visited by insects, commonly sterile.

Visitors. **Lepidoptera.** *Rhopalocera*: (1) *Pieris napi* L., sh. 10. VI. 99, 700 ft. **Hymenoptera.** Aculeata: *Apidae*: (2) *Bombus lapidarius* L., sh. 21. V. 96, 800 ft. (3) *B. agrorum* F., 1. VI. 97, 19. VI. 99, 800 ft. **Diptera.** *Anthomyiidae*: (4) *Anthomyia sulciventris* Ztt., seeking h. 24. V. 97, 800 ft.

132. *Polygala vulgaris*, Linn. [Lit. *Brit.*, Hart. 933; *N.C.E.* 1, 3 b, 14, 18, 21 b, 34; *Pyren.* 17.] *Polygala vulgaris* is another neglected bee-flower. *Apis* and *Bombi* are recorded—the one or the other—as frequent visitors by Müller in Germany, by MacLeod in the Pyrenees, and (to *P. deprena*) by MacLeod in Flanders; both have been observed on *P. vulgaris* by Knuth in the North Friesian islands. At Clova spontaneous self-fertilization is the rule. Self-fertilization likewise is common on the Continent. At Clova the wings are usually bright blue, and, when the flower is open, 7 mm. long. A tongue 4 mm. long is sufficient to reach the honey.

Visitors. **Diptera.** *Muscidae*: (1) 1 sp., 6. VII. 94, about 2,000 ft.

CLASS H § 23. DIGITALIS TYPE.

133. *Digitalis purpurea*, Linn. [Lit. *Brit.* 23, 39 ; Ogle 1904 ; Darwin 482 ; *N.C.E.* 1, 4, 21 b, 30, 32, 33, 34 ; *Alps* 9.] Bees and beetles visit this plant. Contabescence was observed.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus terrestris* L., sh. 25. IX. 95, 800 ft. and ? 29. VI. 95, 1,100 ft. (2) *B. agrorum* F., cp. and sh. 5. VII. 95, 800 ft. once. (3) *B. venustus* Smith, sh. 18. VI. 96, 800 ft. once. **Diptera.** *Anthomyiidae*: (4) *Drymia hamata* Fln., 25. VI. 95, 800 ft. (5) *Anthomyia* sp., seeking h. 21. IX. 95, 800 ft. **Coleoptera.** (6) *Meligethes viridescens* F., 2. VII. and 21. IX. 95, 800 ft., 29. VI. 96, 11–1,500 ft. freq. **Thysanoptera.** (7) *Thrips* sp., sh. 21. VI. 96, 1,500 ft.

134. *Mimulus Langsdorffii*, Donn. (*M. luteus*, auctorum anglorum). [Lit. *N.C.E.* 1, 9 ; Batalin 147.] Self-pollination occurs in the fall of the corolla by the anthers sliding up the style to the stigma. The stigma is very sensitive. The flower is obviously suited to *Bombus*-like insects ; but the throat is rather low for our British *Bombi*. We have not seen them to visit.

Visitors. **Diptera.** *Anthomyiidae*: (1) *Anthomyia* sp., sh. 22. VI. 96, 800 ft.

CLASS H § 24. ERICA TYPE.

135. *Arctostaphylos Uva-ursi*, Spreng. [Lit. *N.C.E.* 34 ; *Arct.* 36, 37 a ; *Alps* 2, 9 ; *Pyren.* 17.] As the snows melt the young inflorescences can be found in the newly cleared patches of ground. The first flowers open in early May, and at mid May the plant is in full flower. These flowers are strongly scented, and are entirely visited by *Bombi*, chiefly *B. lapponicus*, which runs along the ground eagerly from bunch to bunch, sucks hanging back downwards, and then flies or crawls off to another plant. A bee, probably *Bombus terrestris*, often bites the corolla. Seed is freely formed, and ripens in September.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus terres-*

tris L., sh. 20-23. V. 97, 15-1,900 ft. not infreq. (2) *B. lapponicus* F., sh. 20-23. V. 97, 8-1,900 ft. ab.

136. *Vaccinium myrtillus*, Linn. [Lit. *Brit.* 23, 29, 39; *Ogle* 1905; *N.C.E.* 1, 4, 16, 18, 33, 34, 40; *Arct.* 34, 36; *Alps* 2, 34; *Pyren.* 17.] A very typical bee-flower, attracting *Bombus lapponicus* in great quantity and other *Bombi* also. The honey is particularly abundant, and drops appear on the bell within the reach of insects which cannot obtain it from the nectary. Fruit may ripen very abundantly.

Visitors. **Lepidoptera.** Heterocera: *Geometridae*: (1) *Larentia salicata* Hb., sh. 25. VI. 95, 2,300 ft. twice. **Hymenoptera.** Aculeata: *Apidae*: (2) *Bombus terrestris* L., sh. 16. VI.-17. VII. 95, 22-23. V. 96, 18-27. V. 97, 12. VII. 99, 7-2,300 ft. (3) *B. pratorum* L., sh. 19. VI. 95, 2,000 ft. (4) *B. lapponicus* F., sh. 16-25. VI. 95, 18-25. V. 97, 12. VI. 99, 7-2,400 ft. very ab. (5) *B. hortorum* L., sh. 17. VI. 99, 2,500 ft. *Formicidae*: (6) *Formica fusca* Latr., seeking h. 18. V. 97, 1,900 ft. and inside a flower, the edge of which had been eaten, 12. V. 98, 800 ft. **Diptera.** *Empidae*: (7) *Empis lucida* Ztt., 24. V. 97; 12. VI. 99, 1,600-2,300 ft. *Anthomyiidae*: (8) *Anthomyia sulciventris* Ztt., seeking h. 25. VI. 95, 2,300 ft.

137. *Vaccinium Vitis-idaea*, Linn. [Lit. *Brit.* 23, 26; *N.C.E.* 14, 33, 34, 40; *Arct.* 7, 36, 37 a, 38; *Alps* 2, 9.] Bees and hemitropous flies visit this flower. Fruit is set abundantly.

Visitors. **Lepidoptera.** Heterocera: *Noctuidae*: (1) *Triphaena* sp., 19. VI. 95, 2,000 ft. **Hymenoptera.** Aculeata: *Apidae*: (2) *Bombus terrestris* L., sh. 24. IX. 95, 1,200 ft. (3) *B. lapponicus* F., sh. 19-27. VI. 95, 20-2,100 ft. (4) *Nomada ruficornis* L., sh. 12. VI. 99, 1,000 ft. **Diptera.** *Syrphidae*: (5) *Melanostoma quadrimaculatum* Verrall, sh. 19. VI. 95, 2,000 ft. *Empidae*: (6) *Empis lucida* Ztt., 19. VI. 95, 13. VI. 99, 19-2,000 ft. (7) *E. livida* L., sh. 19. VI. 99, 2,000 ft.

138. *Erica Tetralix*, Linn. [Lit. *Brit.* 23, 29, 34, 39; *N.C.E.* 1, 3 c, 11, 12, 14, 14 a, 18, 21 a, 30, 35, 40.] *Bombi* are the chief visitors. By flowering just after midsummer, when butterflies are numerous, it obtains a certain number

of visits from them. *Apis* visits it freely. A species of *Bombus*, probably *B. terrestris*, bites through the corolla. Abnormally, more or less polypetalous flowers (such as Sigerson described in Proc. Royal Irish Acad., 1871, Ser. II, vol. i, and Price in Proc. Bot. Soc. Edinb., xi, p. 256) are not uncommon in certain seasons.

Visitors. Lepidoptera. Rhopalocera: (1) *Argynnis selene* Schiff., sh. 23. VI. 95, 900 ft. (2) *A. aglaia* L., sh. 15-25. VI. 95, 1. VII. 96, 9-1,000 ft. (3) *Polyommatus phloeo* L., sh. 1. VII. 95, 800 ft. Heterocera: *Noctuidae*: (4) *Celaena haworthii* Curt., sh. 23. IX. 95, 1,100 ft. *Geometridae*: (5) *Cidaria* sp., sh. 2. VII. 95, 1,100 ft. *Hymenoptera.* Aculeata: *Apidae*: (6) *Apis mellifica* L., sh. 17-21. VII. 95, 9-1,200 ft. (7) *Bombus terrestris* L., sh. 23. VI.-23. IX. 95, 22. VI.-9. VII. 96, 8-1,400 ft. ab. (8) *B. lapponicus* F., sh. 23. VI.-19. IX. 95, 8-10. VII. 96, 8-1,500 ft. (9) *B. jonellus* Kirby, cp. and sh. 21-22. VII. 95, 11-1,200 ft. (10) *B. agrorum* F., sh. 5. VII. and 23. IX. 95, 8-900 ft. (11) *B. venustus* Smith, sh. 22. VI. 95, 1,100 ft. *Vespidae*: (12) *Vespa norvegica* F., sh. by means of borings, 21-22. VII. 95, 11-1,200 ft. *Diptera.* *Syrphidae*: (13) *Eristalis pertinax* Scop., 20. IX. 95, 9-1,000 ft. *Muscidae*: (14) *Pollenia rudis* F., sh. and fp. 22-23. IX. 95, 9-1,110 ft. *Anthomyiidae*: (15) *Hyetodesia incana* W., 20. IX. 95, 9-1,100 ft. *Ortaliidae*: (16) *Pteropaectria frondescentiae* L., seeking h. 6. VII. 95, 900 ft. *Coleoptera.* (17) *Meligethes viridescens* F., sh. by means of a boring, 23. IX. 95, 1,100 ft.

139. *Erica cinerea*, Linn. [Lit. *Brit.* 23, 26, 29, 34, 39; Ogle 1905; Powell 2020; *N.C.E.* 14, 14a, 15, 16, 18, 21a, 21b.] *Apis* visits this plant more freely than it does *E. Tetralix*. *Bombi* are however the chief visitors, one of them, *B. terrestris*, often bites through the corolla in order to obtain the honey. *Vespa* and other short-tongued insects afterwards take advantage of the borings.

Visitors. Lepidoptera. Rhopalocera: (1) *Argynnis aglaia* L., sh. 18. VI. 96, 800 ft. (2) *A. selene* Schiff., sh. 23. VI. 95, 900 ft. (3) *Coenonympha pamphilus* L., sh. 26. VI. 95, 800 ft. (4) *Polyommatus phloeo* L., sh. 15. IX. 95 and 18. VI. 96, 800 ft. *Hymenoptera.* Aculeata: *Apidae*: (5) *Apis mellifica* L., sh. 17-22. VII. 95,

9-1,200 ft. freq. (6) *Bombus terrestris* L., sh. in the proper manner and biting through, 23. VI.-24. IX. 95, 18. VI.-9. VII. 96, 8-1,700 ft. very ab. (7) *B. jonellus* Kirby, sh. 21-22. VII. 95, 11-1,300 ft. (8) *B. lapponicus* F., sh. 25. VI.-14. IX. 95, 18. VI.-10. VII. 96, 8-2,300 ft. freq. (9) *B. smithanus* White, 14. IX. 95, 800 ft. (10) *B. pratorum* L., sh. 27. VI. 95, 800 ft. (11) *Psithyrus quadricolor* Lep., sh. 22. VII. 95, 1,700 ft. *Vespidæ*: (12) *Vespa norvegica* ? F., sh. by means of borings, 21. VII. 95, 11-1,200 ft. twice. **Diptera.** *Syrphidæ*: (13) *Volucella bombylans* L., sh. 23. VI. 95, 900 ft. once. *Muscidæ*: (14) *Pollenia rudis* F., sh. by means of a boring, 14. IX. 95, 900 ft. once.

CLASS H § 25. SIMPLE PENDULOUS TYPE.

140. *Geranium phaeum*, Linn. [Lit. *Brit.*, Darwin 482; *N.C.E.* 1, 21 b, 33, 34; Errera 633; Loew 1358; *Pyren.* 17.] Errera found it in Belgium to be a very characteristic bee-flower. At Clova *Bombus agrorum* is a regular visitor, but *Syrphids* are not infrequent.

Visitors. **Lepidoptera.** *Heterocera*: *Noctuidæ*: (1) *Habrostola urticae* Hb., sh. 14. VI. 99, 800 ft. *Tineidæ*: (2) *Gelechia* sp., sh. 26. VI. 95. **Hymenoptera.** *Aculeata*: *Apidæ*: (3) *Bombus agrorum* F., sh. 16-21. VI. 95, 10-12. VI. 99, fairly constant. (4) *B. terrestris* L., sh. 22. VI. 96, 12. VI. 99. *Petiolata tubulifera*: *Vespidæ*: (5) *Odynerus trimarginatus* Ztt., sh. 22. VI. 96. **Diptera.** *Syrphidæ*: (6) *Platychirus manicatus* Mg., sh. 10. VI. 99. (7) *Rhingia campestris* Mg., 17. VI. 96. *Empidæ*: (8) *Empis* sp., sh. 22. VI. 96. (9) *E. punctata* Mg., 22. VI. 96. *Tachinidæ*: (10) *Siphona geniculata* Deg., sh. 18. VI. 96. *Anthomyiidae*: (11) *Anthomyia* sp., sh. 19-22. VI. 96. All at 800 ft.

141. *Prunus avium*, Linn. [Lit. *N.C.E.* 1, 3 b, 16, 18, 33.] This tree is very well visited by *Bombus lapponicus*.

Visitors. **Lepidoptera.** *Rhopalocera*: (1) *Pieris rapae* L., sh. 22. VI. 97, 600 ft. (2) *Vanessa urticae* L., sh. 21. V. 97, 600 ft. **Hymenoptera.** *Aculeata*: *Apidæ*: (3) *Apis mellifica* L., sh. 21. V. 97, 800 ft. (4) *Bombus lapponicus* F., 21-25. V. 97, 800 ft. freq. **Diptera.** *Syrphidæ*: (5) *Syrphus punctulatus* Verrall, sh. 21. V. 97,

800 ft. (6) *P. discimanus* Lw., fp. 21. V. 97, 800 ft. *Empidae*: (7) *Rhamphomyia cinerascens* Mg., sh. 24. V. 97, 800 ft. *Anthomyiidae*: (8) *Anthomyia sulciventris* Ztt., 21–25. V. 97, 6–800 ft. **Thysanoptera**: (9) *Thrips* sp., in base of the flower, 16. V. 98, 800 ft.

142. *Rubus Idaeus*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 16, 18, 32, 34, 40; MacLeod 1473; *Alps* 2, 9.] We found moths frequent visitors; MacLeod observed the same in Belgium.

Visitors. Lepidoptera. Heterocera: *Bombycidae*: (1) *Hepialis humilis* L., sh. 27. VI.–3. VII. 95, 800 ft. *Noctuidae*: (2) *Apamea gemina* Hb., sh. 27. VI. 95, 800 ft. (3) *Dianthecia cucubali* Fues., sh. 24–27. VI. 95, 800 ft. (4) *Xylocampa areola*, Esp., sh. 27. VI. 95, 800 ft. (5) *Habrostola tripartita* Hufn., sh. 27. VI. 95, 800 ft. (6) *Plusia chrisitis* L., sh. 27. VI.–6. VII. 95, 800 ft. (7) *P. festucae* L., sh. 27. VI. 95, 800 ft. (8) *P. pulchrina* Haw., sh. 27–30. VI. 95, 800 ft. *Geometridae*: (9) *Cabera pusaria* L., sh. 27. VI. 95, 800 ft. (10) *Thera variata* Schiff., sh. 27. VI. 95, 800 ft. **Hymenoptera.** Aculeata: *Apidae*: (11) *Apis mellifica* L., sh. 20–23. VI. 95, 800 ft. (12) *Bombus terrestris* L., 27. VI. 95, 800 ft. (13) *B. pratorum* L., 27. VI. 95, 800 ft. (14) *B. lapponicus* F., sh. 3–6. VII. 96, 21–2,300 ft. (15) *B. agrorum* F., sh. 20. VI.–2. VII. 95, 19. VI. 99, 800 ft. freq. *Vespidae*: (16) *Vespa norvegica* F., sh. 29. VI. 96, 800 ft. (17) *Vespa sylvestris* Scop., 27. VI. 95, 800 ft. **Diptera.** *Syrphidae*: (18) *Sericomyia lapponum* L., sh. 23. VI. 95, 800 ft. (19) *Eristalis arbustorum* L., sh. 23. VI. 97, 800 ft. *Anthomyiidae*: (20) *Hyetodesia incana* W., sh. 21–23. VI. 95, 26. VI. 96, 8–1,000 ft. (21) *Anthomyia* sp., sh. 23. VI. 95, 800 ft. (22) *Hydrotaea* sp., sh. 19. VI. 99, 800 ft.

143. *Geum rivale*, Linn. [Lit. *Brit.* 23; *N.C.E.* 1, 16, 21a, 21b, 33, 34; Warnstorf 2507; *Arct.* 34; *Alps* 2, 9.]

Visitors. Hymenoptera. Aculeata: *Apidae*: (1) *Bombus lapponicus* F., sh. 6. VII. 95, 20. VI.–6. VII. 96, 23–2,500 ft. (2) *B. agrorum* F., sh. 24. VI. 95, 800 ft. (3) *Psithyrus quadricolor* Lep., sh. 20. VI. 96, 2,400 ft. **Diptera.** *Anthomyiidae*: (4) *Anthomyia* sp., fp. 6. VII. 96, 2,400 ft. **Coleoptera.** (5) *Meligethes viridescens* F., sh. 20. VI. 96, 2,400 ft.

CLASS H § 26. PYROLA SECUNDA TYPE.

144. *Pyrola secunda*, Linn. [Lit. *N.C.E.* 1, 4, 34; *Alps* 9.] The stigma protrudes from the opening bud, and the stamens seem to force their way between the petals. The openings of the anthers are turned away from the stigma.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus lapponicus* F., sh. **Coleoptera.** (2) *Meligethes aeneus* F., fp. (3) *Epuraea aestiva* L., ? fp. All 6. VII. 96, 1,900 ft.

145. *Ribes sanguineum*, Pursh. [Lit. *Brit.* 29; *N.C.E.* 3 a, 40.] In cultivation.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Bombus terrestris* L., sh. 14. V. 98, 800 ft.

CLASS H § 27. GALANTHUS TYPE.

146. *Galanthus nivalis*, Linn. [Lit. *N.C.E.* 1, 9, 18, 33, 34; Knuth 2871.] In cultivation.

Visitors. **Hymenoptera.** Aculeata: *Apidae*: (1) *Apis mellifica* L., 15. IV. 95, 800 ft.

CLASS H § 28. CAMPANULA TYPE.

147. *Campanula rotundifolia*, Linn. [Lit. *Brit.* 23, 34, 39; Marquand 1513; *N.C.E.* 1, 11, 14, 14 a, 16, 18, 30, 32, 34, 35; *Arct.* 36, 38; *Alps* 2, 34; *Pyren.* 17.] A flower in a measure specialized for *Melitta*, *Eriades*, and *Halictoides*, and a shelter-flower to small flies, which are abundant in its bells, and also sometimes a shelter-flower to *Andrena*. *Bombi*, *Apis*, *Melitta*, *Cilissa*, *Eriades*, *Halictoides*, and other similar bees visit the flower in Germany and the Alps; *Bombi* have been seen on it in Scandinavia and the Pyrenees, and *Bombus terrestris* in Southern Scotland; it is worth remark that we have seen no bees in the flowers except two species of *Andrena*. Insects with a tongue of 3 mm. and upwards can reach the honey.

Visitors. **Lepidoptera.** Heterocera: *Pyralidae*: (1) *Scopula alpi-*

TABLE XX.

Individuals visiting the different species.

	Apis.	Bomb.	Hm.	Phyt.	Entom.	Ants.	Wasps.	Lep.l.	Lep.m.	Lep.s.	Dm.	Ds.	Col.	Etc.	Total.
91. <i>Silene acaulis</i>	—	1	—	—	—	—	—	24	3	—	1	6	13	2	59
92. <i>Habenaria conopsea</i>	—	—	—	—	—	—	—	2	1	2	—	3	—	—	8
93. <i>Lonicera Periclymenum</i>	3	3	—	—	—	—	—	3	—	—	—	6	—	—	16
94. <i>Lychnis diurna</i>	—	—	—	—	—	—	—	—	—	—	2	—	5	—	7
95. <i>Lychnis flos-cuculi</i>	—	2	—	—	—	—	—	1	—	—	—	1	—	—	9
96. <i>Lychnis alpina</i>	—	1	—	—	—	—	—	—	—	—	5	3	—	4	8
97. <i>Primula vulgaris</i>	—	1	—	—	—	—	—	—	—	—	—	17	5	1	24
98. <i>Crocus aureus</i>	*	—	—	—	—	—	—	—	—	—	—	*	—	—	*
99. <i>Viola palustris</i>	—	*	—	—	—	—	—	—	—	—	2	1	—	—	3
100. <i>Viola canina and sylvatica</i>	—	1	—	—	—	—	—	8	—	—	—	11	—	1	21
101. <i>Viola tricolor</i>	—	—	—	—	—	—	—	1	—	—	—	1	—	—	2
102. <i>Viola lutea</i>	—	—	1	—	—	—	—	2	1	1	—	45	—	—	50
103. <i>Orchis maculata</i>	—	—	—	—	—	—	—	1	—	—	—	2	—	—	3
104. <i>Orchis mascula</i>	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
105. <i>Tropaeolum speciosum</i>	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2
106. <i>Pinguicula vulgaris</i>	—	1	—	—	—	—	—	—	—	—	—	5	—	—	7
107. <i>Pedicularis sylvatica</i>	—	2	—	—	—	—	—	2	—	—	—	2	—	—	6
108. <i>Pedicularis palustris</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
109. <i>Melampyrum pratense</i>	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2
110. <i>Euphrasia officinalis</i>	1	—	—	—	—	—	—	—	—	—	1	—	—	—	2
111. <i>Nepeta Glechoma</i>	1	—	—	—	—	—	—	—	—	—	—	1	—	—	2
112. <i>Prunella vulgaris</i>	—	3	—	—	—	—	—	—	—	—	—	—	—	—	3
113. <i>Stachys palustris</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	4
114. <i>Galeopsis Tetrabit</i>	—	7	—	—	—	—	—	2	—	—	—	8	7	—	31
115. <i>Lamium purpureum</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
116. <i>Lamium maculatum</i>	4	7	—	—	—	—	—	—	—	—	1	2	—	—	14
117. <i>Ajuga reptans</i>	—	2	—	—	—	—	—	—	—	—	—	2	—	—	4
118. <i>Genista anglica</i>	2	—	—	—	—	—	—	—	—	—	—	2	—	—	6
119. <i>Ulex europaeus</i>	35	17	—	—	—	—	—	—	—	—	3	8	—	1	64

nalis Schiff., sh. 27. VI. 95, 2,000 ft. once. *Tineidae*: (2) *Glyphipteryx fuscoviridella* Haw., sh. 27. VI. 95, 800 ft. once. *Erioccephalidae*: (3) *Erioccephala calthella* L., 23. VII. 95, 800 ft. **Hymenoptera**. *Aculeata*: *Apidae*: (4) *Andrena analis* Panz, cp. 17. VII. 95, and sh. 10. VII. 96, 800 ft. (5) *A. coitana* Kirby, sh. freq. and sheltering (?), 2-23. VII. 95, 800 ft. *Petiolata parasitica*: *Cynipidae*: (6 and 7) 2 spp., 16. VI. and 23. VII. 95, 800 ft. **Diptera**. *Syrphidae*: (8) *Rhingia campestris* Mg., sh. 10. VII. 96, 800 ft. once. (9) *Platychirus manicatus* Mg., sh. 3-17. VII. 95, 800 ft.; 8. VII. 96, 2,400 ft. (10) *Melanostoma mellinum* L., 3. VII. 95, 800 ft. *Tachinidae*: (11) *Siphona geniculata* Deg., sh. 26. VI. 95; 13-16. IX. 95, 7-800 ft. *Muscidae*: (12) *Calliphora erythrocephala* Mg., sh. 10. VII. 96, 800 ft. *Anthomyiidae*: (13) *Drymia hamata* Fln., fp. 2. VII. 96, 2,100 ft. (14) *Anthomyia* sp., 16. VI.-23. VII. 95, 8-1,800 ft. (15) *Trichophthicus hirsutulus* Ztt., 6. VII. 96, 2,000 ft. (16) *Trichophthicus* sp., sh. and fp. 17-23. VII. 95, 800 ft. **Thysanoptera**. (17) *Thrips* sp., sh. 22. IX. 95, 800 ft.

We have had under observation the following flowers of Classes F and H, but have seen no insects visiting them:—

Polygala serpyllacea, Weihe, *Anthyllis vulneraria*, Linn., *Rubus saxatilis*, Linn., *Vaccinium uliginosum*, Linn., *Gentiana campestris*, Linn., *Rhinanthus Crista-galli*, Linn., *Habenaria albida*, R. Br.; however, from the last-named the pollinia were observed to be regularly removed at night. We have seen in flower at Clova, but have not had suitable opportunities for watching: *Lobelia Dortmanna*, Linn., *Primula veris*, Linn., and *Utricularia minor*, Linn. *Silene Cucubalus*, Wibel, *Vicia hirsuta*, Koch, *Arctostaphylos alpina*, Spreng., and *Scrophularia nodosa*, Linn., are other Clova plants of Class H which we have not seen in our district, although we have every reason to believe that they have been observed. *Symphytum officinale*, Linn., we have observed just outside our limits at 500 feet to be diligently visited by *Bombus agrorum*.

Out of the whole available anthophilous insect-fauna of (for the time of our observations) 17,306 individuals, 1,507 went to

Classes F and H. It is not worth while to separate the two classes here; for there are but three species assigned to F, and of them only one (*Silene acaulis*) appeared as a true Lepidoptera-flower. The species of plants obtained attention as in Table XX. The decidedly desirable insects showed their marked preference; and nearly one half of the total number of individuals of them, which we observed to visit, went to flowers of these two classes, and made 57·73 per cent. of their visitors.

TABLE XXI.

	Available.		F and H.	
	No.	%	No.	%
Distinctly desirable	1,763	10·19	870	57·73
Desirable	1,277	7·37	87	5·77
Indifferent	12,993	75·08	413	27·41
Injurious	1,273	7·36	137	9·09

We found that in Class B' the blue-lilac flowers attracted the best of the insects, that the rose-purple came next, that yellow followed, and that white or eyed flowers came last. Experience with Classes F and H is different, and our figures are as follows: with white at the top, rose-purple second. yellow third, and lilac-blue last.

TABLE XXII.

	Lilac and blue.	Rose and purple.	Yellow and scarlet.	White.
Decidedly desirable	16·66	74·67	46·26	76·55
Desirable	12·35	5·95	1·77	7·24
Indifferent	60·31	16·50	32·75	15·86
Injurious	10·67	2·88	19·22	·34

In the table which follows and which amplifies XXI, we have kept *Campanula* apart, for it certainly is a peculiar type;

but still the lilac-blue flowers remain those which get fewest of the decidedly desirable insects.

TABLE XXIII.

	Apis.	Bomb.	Hm.	Phyt. Entom. Ants.	Wasps.	Lep.l.	Lep.m.	Lep.s.	Dm.	Ds.	Col.	Etc.
Campanula	—	—	12.82	1.71	—	—	1.71	.85	4.27	63.25	—	15.39
Other blue-lilac flowers .	1.45	13.04	1.45	—	—	18.84	1.45	2.90	2.90	44.93	8.70	4.35
Rose-purple	12.09	54.13	.19	.38	2.30	8.45	.77	—	4.99	7.10	7.10	2.50
Yellow	17.24	19.02	.39	.98	—	10.00	.20	.20	1.18	25.69	6.86	18.24
White	27.93	30.00	.34	—	1.03	18.62	—	—	6.90	8.97	5.86	.34

In our enumeration of visitors, and in Table XX, we have taken the flowers of Class H in such order that first come those with erect actinomorphic flowers, secondly those with horizontal zygomorphic flowers, and thirdly, those with pendent actinomorphic flowers. We may add to them the three flowers of Class F—one erect actinomorphic and two horizontal zygomorphic—whereupon we get:—

1. Six erect actinomorphic in which to reach the honey a tongue 4–16 mm. long is required, average 10 mm.
2. Thirty-eight horizontal zygomorphic in which to reach the honey a tongue 4–20 mm. long is required, average 8 mm.
3. Thirteen pendent actinomorphic in which to reach the honey a tongue 1–7 mm. long is required, average 4.5 mm.

It is very easy to show that a greater exclusion of the undesirable or little desirable insects is effected by the simple inversion of the flower than by lengthening the tube.

TABLE XXIV.

Effect of the position of the flower upon the groups of the visitors.

	Apis.	Bomb.	Hm.	Entom. Phyt. Ants.	Wasps.	Lep.l.	Lep.m.	Lep.s.	Dm.	Ds.	Col.	Etc.
Erect . . .	—	5.10	—	—	—	25.51	3.06	—	8.16	27.55	23.47	7.14
Horizontal .	23.57	19.01	.39	.65	—	9.64	.26	.39	2.29	22.01	7.81	13.28
Pendent . .	8.11	50.55	2.65	.62	2.34	9.83	.47	.16	4.37	16.07	1.87	2.96

TABLE XXV.

Effect of the position of the flower upon the desirability of the visitors.

	Erect.	Horizontal.	Pendent.
Decidedly desirable .	30.61	52.22	68.49
Desirable	11.22	3.64	7.49
Indifferent	51.02	30.21	20.44
Injurious	7.14	13.93	3.58

The pendent flowers thus, despite the shallowness of their honey, are seen to get the greater proportion of distinctly desirable insects, this proportion being chiefly made up by *Bombi*.

It happens that the majority of the white flowers are pendent, all the lilac-blue flowers, except *Campanula rotundifolia*, are horizontal, and most of the yellow flowers also, while the rose-purple flowers are divided.

TABLE XXVI.

Colour and position of flowers of Classes F and H.

	Lilac-Blue.	Rose-Purple.	Yellow-Scarlet.	White.
Erect . .	0	4	2	0
Horizontal	14	10	11	3
Pendent .	1	5	1	6

But the observation recorded by means of Tables XXII and XXIII, that white and rose-purple flowers of Classes F and H get the best of the insects is, however, not entirely due to so many of the pendent flowers being white or rose-purple; and if we take the horizontal flowers by themselves, the result remains the same, but the differences are somewhat lessened.

By season the distinctly desirable insects get fewer towards autumn, the indifferent get a little fewer, while the desirable and injurious increase, especially the latter.

TABLE XXVII.

Desirability of visitors to the various colours of the horizontal zygomorphic flowers.

	Lilac and Blue.	Rose and Purple.	Yellow and Scarlet.	White.
Decidedly desirable	33.33	52.08	47.69	79.53
Desirable	5.80	6.25	1.89	7.09
Indifferent	56.52	34.37	29.83	13.39
Injurious	4.35	7.29	20.04	0.00

TABLE XXVIII.

Visitors to Classes F and H by season.

	Spring.		Summer.		Autumn.	
	No.	%	No.	%	No.	%
Distinctly desirable	211	65.94	605	56.23	54	48.65
Desirable	10	3.12	68	6.32	9	8.11
Indifferent	93	29.06	291	27.04	29	26.13
Injurious	6	1.88	112	10.41	19	17.12
Total . . .	320	—	1076	—	111	—

The actual numbers and percentages in the different groups are as follows:—

TABLE XXIX.

Visitors to Classes F and H by season.

	Apis.	Bomb.	Hm.	Phyt. Entom. Ants.	Wasps.	Lep.l.	Lep.m.	Lep.s.	Dm.	Ds.	Col.	Etc.	Total.
Totals. { Spring	62	141	—	2	—	8	—	—	10	91	2	4	320
Summer	168	285	20	7	15	152	8	4	40	189	83	105	1076
Autumn	3	49	—	—	—	2	—	—	9	19	10	19	111
Percentages. { Spring	1.38	44.06	—	.62	—	2.50	—	—	3.13	28.44	.62	1.25	—
Summer	1.61	26.49	1.86	.65	1.39	14.13	.74	.37	3.71	17.56	7.71	9.76	—
Autumn	2.70	44.14	—	—	—	1.81	—	—	8.11	17.12	9.01	17.12	—

As the flowers of the classes under consideration set themselves apart almost completely for the larger Apidae, we give here the seasonal distribution of these bees:—

TABLE XXX.

Seasonal distribution of Bees. The sequence is the sequence of their tongue-lengths.

Name.	Spring (23 days).	Summer (88).	Autumn (12).	Total.
<i>Bombus hortorum</i> .	3	12	—	15
<i>B. agrorum</i>	5	49	44	98
<i>B. venustus</i>	—	9	—	9
<i>B. smithianus</i>	—	—	1	1
<i>B. cognatus</i>	—	—	2	2
<i>B. lapidarius</i>	3	—	3	6
<i>B. lapponicus</i> , with <i>B. pratorum</i>	182	163	11	356
<i>B. jonellus</i> , and . . .				
<i>B. scrimshirani</i> . . .				
<i>Psithyrus quadricolor</i>	—	10	1	11
<i>Bombus terrestris</i> . .	77	76	240	393
<i>Bombi</i> (unidentified)	2	43	1	46
<i>Apis mellifica</i>	160	266	4	430
Total	432	628	307	1367

We may class these bees by their tongue-lengths: *Bombus hortorum* to *B. cognatus* first, *B. lapidarius* and *B. lapponicus* second, *Psithyrus quadricolor* and *Bombus terrestris* third, and *Apis* last.

TABLE XXXI.

Bees in season by their tongue-lengths.

	Spring.		Summer.		Autumn.	
	No.	Percentage of total insects.	No.	Percentage of total insects.	No.	Percentage of total insects.
Tongue 15 mm. and over .	8	.19	70	.72	47	1.41
Tongue 10-15 mm. long .	185	4.41	163	1.67	14	.42
Tongue 7-10 mm. long . .	77	1.83	86	.88	241	7.25
Tongue 6 mm. long	160	3.81	266	2.72	4	.01

It remains now to compare our results with those of other observers, and the table which follows does this. As in the case of B' and A', we again find Müller's observations very closely supported by those of Knuth, Verhoeff, Alfken and others on the coast of North Germany. Again we see the Alps showing an abundance of Lepidoptera, and our own country an abundance of short-tongued flies. Further comment is reserved.

TABLE XXXII.

Comparison of species-visits to Clova flowers of Classes F and H in various parts of Europe.

	Apis.	Hl.	Hm.	Hs.	Lep.	Dm.	Ds.	Col.	Etc.	Total.
Clova (57 plants)	17	85	3	14	56	36	95	19	12	337
Germany—Müller . (35 „)	25	230	78	2	73	46	1	19	2	476
Flanders—MacLeod (25 „)	10	74	15	10	46	12	7	8	—	182
Friesian Coast—Knuth, Verhoeff, &c. . . (37 „)	23	293	66	8	54	32	12	6	1	495
Alps—Müller . . . (23 „)	3	90	2	1	179	10	1	6	2	294
Pyrenees—MacLeod. (11 „)	—	41	2	—	21	9	1	1	—	75

In conclusion, Classes F and B obtained the visits of *Apis mellifica*, of nine species of *Bombi* (all in the district except *B. cognatus* and *B. scrimshiranus*), of *Psithyrus quadricolor*, of two species of *Andrena*, of a *Nomada*, and two species of *Odynerus*, of two species of *Vespa*, of two kinds of ants, and of two species of ichneumons, of eight butterflies, of twelve of the Noctuid moths which are almost entirely crepuscular or nocturnal, of five geometers, of five ordinary Micro-lepidoptera, including *Hepialis humuli*, and also of *Eriocephala calthella*; among Diptera, of thirteen Syrphidae including *Rhingia campestris*, of five species of *Empis*, of one *Rhamphomyia*, of four Muscids, of one *Sarcophaga*, and of *Siphona geniculata*, of eight Anthomyiids including *Drymia hamata*, of two Scatophagids, and of eleven other flies; of six Coleoptera, of two Hemiptera, of Thrips and of a spider.

Thus 109 species of insects visited the two classes, making 1,507 individual visits, the average constancy being 13.83.



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