Notes on the Animal Life of the Hothouses of the Royal Botanic Garden, Edinburgh.

BY

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During the summer of 1903 Mr. James Waterston recognised an exotic ant running on one of the botanical specimens in the Botany class-room, and was in consequence prompted to begin in the following year a series of enquiries—in which he generously asked me to co-operate—into the natural history of the hothouses. Through the kindness of Professor Bayley Balfour we were allowed unrestrained access to the hothouses, and in the foreman of the Glass Department, Mr. Stewart, and his subordinates we have found very willing allies.

The animal life of the hothouses, both in its wealth and in its variety, surpassed all our expectations; and, imported unintentionally as it has been from all quarters of the globe, it affords the most striking evidence possible of the part played by man in the distribution of species. Insects and shells from Central and Southern Europe are living here side by side with species from America and the West Indies. Under inverted flowerpots and in similar dark corners the Australian cockroach hides by day, and among the plants in the Orchid-house a large jumping-spider—identified by Rev. O. Pickard-Cambridge as *Hasarius adansonii*, Sav.—lives and thrives, spending part of his time in stalking bluebottles and other insects and springing upon his prey from as great a distance as eighteen inches (a spring of this extent having been carefully measured by Mr. Stewart). In the mould of the propagating-frames a millipede, strange to the eyes of Scottish naturalists, and a large planarian worm have long been thoroughly acclimatised, and a pretty little isopod is established in the same retreats. Among the other

[Notes, R.B.G,. Edin., No. XVII., April 1907.]

curious tenants of the houses may be mentioned a tiny phasmid noticed on one of the plants in the autumn of 1904.

The real difficulties connected with the study of these exotic forms arise from the inability of determining with accuracy the place of origin of the different species, and from the trouble experienced in getting into touch with specialists in the various branches represented by the different creatures. Yet, in connection with the shells and the ants at least, we have achieved some success, and we venture to think that a few notes regarding these branches of natural history as exhibited in the hothouses may not be unwelcome to those who have hitherto regarded these buildings as strictly reserved for plants.

SHELLS.

Of shells, we make out at present seven exotic species, exclusive of the possibly imported but genuinely British *Cæcilioides acicula*, Müller, a dead specimen of which was found on the under side of a brick in the old Fern-house, on February 28, 1905.

Stenogyra goodallii, Miller.—A very common hothouse species, *Stenogyra goodallii*, Miller, a transparent white turreted shell, flourishes in the side pots in the hotter portion of the Palm-house, where we noticed it first on June 9, 1904.

Hyalinia cantabrica, Westerl.—In the old Fern-house, where *Cæcilioides* occurred, a large dark *Hyalinia* used to thrive among the gravel covering the various platforms, and probably still exists in the new locality to which the gravel has been removed. This has been identified by Mr. G. K. Gude as *Hyalinia cantabrica*, Westerl., a native of Spain. A second species of *Hyalinia*, small and delicate, from a different hothouse, cannot be determined at present.

Zonitoides minusculus, Binn.—Much smaller than this last-mentioned shell is a white helicoid species, which Mr. Gude thinks may be *Zonitoides minusculus*, Binn., a native of the United States of America and of Japan.

Besides these we have a dead pupa, found by Mr. Stewart in a propagating-frame on June 13, 1904, but not yet identified.

Two species of fresh-water shells—a *Limnæa* and a *Physa*—live in the water-tubs in the hotter part of the Palm-house. The *Limnæa* remains still undetermined, but the *Physa* is apparently *Ph. acuta.*

ANTS.

In the other branch to which we have devoted special attention —the ants—we have detected six species.

Tetramorium guineense, Fabr.—By far the most abundant is the species which led us to these investigations, and which has been identified for us by Mr. Edward Saunders as *Tetramorium guineense*, Fabr. It is almost universally distributed through the houses, running actively about the wooden platforms and over the plants. This species sometimes attends on the scale-insects, "milking its cows," according to the popular phraseology. It makes its nests in the corner of the frames, and forms occasionally as the approach to its nest an ingenious earth tunnel along the angle formed by two sides of the frame. Winged specimens are about by June 9, and may be met with till the end of September. On September 28, 1904, I observed a number of workers tugging viciously at the wings and head of winged females, as if they would tear the creatures in pieces. On being disturbed, both workers and females ran off, but ere long the females were again helpless in the workers' hands. I took this as the sign of the settling of a new nest.

Technomyrmex albipes, Smith, var. **brunneipes,** Forel.—The second species to which we were introduced is a black ant, of even more active habits than the last, but much more restricted in its distribution than that species. By preference it haunts plants infested by scale-insects, over which insects it builds chambers of earth to protect them and to keep them prisoners. Mr. Stewart, who introduced us to this ant in June 1904, opened several such chambers in our presence and

directed our attention to an ant "milking one of the cows." Colonel Bingham identifies this species as *Technomyrmex albipes*, Smith, var. *brunneipes*, Forel.

Strumigenys incisa, Forel.—On June 10, 1904, I detected in a propagating-frame a minute yellowish-red ant, furnished with a formidable mouth-apparatus. I sent it off at once to South Kensington, and, inferring from the nature of the reply received that special interest attached to the find, I instituted a careful search for additional specimens, which were also in their turns dispatched to South Kensington. The species was determined to be *Strumigenys incisa*, Forel., from the West Indies, and up to that time had been represented in the National Collection by a single female only, the type specimen. This species was again found in the summer of 1905 by Mr. Stewart.

Ponera punctatissima, Roger.—Mr. Stewart, on June 13, 1904, found a colony of a fourth species in a propagating-frame, where the heat was about 85° Fahr. This proved to be *Ponera punctatissima*, Roger, a South European species. It has not turned up elsewhere in the hothouses.

Tapinoma melanocephalum, Fabr.—The fifth species of ant was met with in the first instance under circumstances which graphically indicated the means of importation. On the morning of June 14, 1904, Mr. Stewart was re-potting an orchid that had newly arrived from Hamburg; in addition to the plant there was in the pot a nest of ants, *Tapinoma melanocephalum*, Fabr., belonging to a species which, as Colonel Bingham, who identified it, informs us, has spread pretty nearly over both hemispheres. That this ant is firmly established in the hothouses was proved by the finding of colonies later on. Mr. Stewart handed me further supplies of this species on August 3, 1904, and on February 28, 1905.

Plagiolepis exigua, Forel.—The sixth species is so abundant in parts of the hothouses that, but for its exceedingly minute size, it could not have remained so long undetected. I first noticed it on August 3, 1904, on the woodwork of the hotter portion of the Palm-house, where it ran so rapidly as almost to

defy my attempts to capture unharmed specimens. I had indeed to spend a second day collecting with the greatest care before I had specimens fit for proper examination. To Colonel Bingham again we are indebted for the name, *Plagiolepis exigua*, Forel. Later on Mr. Stewart discovered this species in the Aroid-house, and in December 1905 he showed me their nesting haunts, inside the hollow metal rods from which the pitcher-plants are suspended.