Note on the Fertilisation of Musa, Strelitzia reginae, and Ravenala madagascariensis.

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With Plate XIV.

Musa.

THE flowers are some $2\frac{1}{2}$ inches long and arranged in whorls along the drooping peduncles. The three sepals and two inferior petals are united into a tubular sheath enclosing the stamens and style. There is a slight exudation of gum at the tip of this sheath which renders the union of the parts very close.

The odd petal eventually emerges between the superior sepals and swells out into a sort of concave dome guarding the honey (see Fig. 21).

Partly by this emergence, and partly by intercalary growth of the two lower petals, the sheath enclosing the stamens and style is forced open. There does not appear to be an explosion of pollen (as in *Ravenala*), but on emergence the sheath and stamens are strongly bent downwards and the style curved upwards. In this position the flower is ready for fertilisation, and the position of the stigma above the stamens will lead to cross-fertilisation although self-fertilisation is not excluded.

The following additional details may be worth noticing. There is a marked S-shaped curve in the middle line of the superior petal. As may be well seen from young flowers, this is due to the petal (while enclosed in the sheath) being unable

to develope longitudinally while it can expand laterally. The upper stamen is not developed, being probably in the way, and there is sometimes a reduction in length of the next superior stamens.

The usual fertilisers of the banana, at least in Natal, are sunbirds, but insects appear often to assist[1] (notably bees), while in Mauritius insects must be the only fertilisers.

Ravenala madagascariensis.

This flower shows a great advance on *Musa* in specialisation. The flowers are very large, but each peduncle has only seven to nine (in some cases twelve) bracts which correspond to the almost indefinite number of whorls in the banana.

The bracts, each of which contains a large number of flowers closely packed together, are large (16 inches long) and very rigid, their upper edges being in contact above the flowers, which emerge between their superior edges one by one as they ripen. The three sepals are free in *Ravenala* before the flower rises between the edges of the bracts[2], but a sheath quite similar to that of *Musa* is formed by the close union of the two lower petals only. This encloses the stamens and is hard and sclerenchymatous in structure.

The odd petal is much shorter than the other two, but not very different in shape.

The six stamens enclosed in this sheath are unable to elongate, and hence become very strained. The style has six longitudinal grooves on which the anthers shed most of their pollen (though some is retained in the anthers). Part of the extremity of the style projects through the end of the petal sheath.

When the flower rises between the rigid edges of the bract, it is in a very strained condition, and the two upper edges of the united sepals gradually separate. In this state, a touch on the end of the sheath sets the two petals free, the stamens and style at once spring into the position shown in Fig. 24,

[1] Cf. Müller, Verh. d. natur. Ver. d. preuss. Rhein. ü. West. i. 1878, and Hildebrand, Bot. Zeit., xxviii, p. 273, 1870.

[2] In the bud they are closely united round the petals, just as in *Musa*.

while a cloud of pollen is scattered. The two stigmatic lips subsequently open.

It is interesting to note that the two upper edges of the inferior petals overlap, as in *Strelitzia*, though not to the same extent.

The flowers are often visited by sunbirds: *Nectarinia souimanga* was the commonest near Fort Dauphin. The correct position of the bird is to sit on the next highest bract and then bend forwards and downwards to suck the sugary liquid by introducing its beak below the odd petal. In doing this it will explode a virgin flower, dusting its breast with pollen, while in older flowers it will touch the stigmatic surface and so effect cross-fertilisation. Sometimes it hops into the middle of the flower, however, or tries to reach the honey from the same bract by bending round the petals. Beetles and Hymenoptera often visit the flowers to suck the sugary liquid which exudes over the edges of the bract. They will only produce fertilisation by accident, however, while the narrow curved beak of the bird is excellently adapted to pass between the edges of the rigid bracts and suck the honey.

Strelitzia reginae. Ait.[1]

The flowers, though similar to those of *Ravenala*, are still more specialised. The sepals are bright scarlet, while the petals are a deep purplish blue[2], instead of the pure white of *Ravenala*. The spathe is quite similar to that in *Ravenala*, but there is only one to each peduncle out of which the flowers emerge one by one.

The petaline sheath particularly is still more specialised. The shape of the united pair being somewhat like that of an arrowhead with the flanges slightly turned up (see Figs. 26, 27).

[1] The structure of this flower is roughly described by Hildebrand (Botan. Zeit. 1869, p. 508), but several important points are not alluded to; cf. also Delpino (Atti della Soc. Ital. d. Sci. Nat. in Milano, vol. xi and xii). Darwin mentions the fact of its being fertilised by birds (Effects of Cross- and Self-fertilisation. London, 1876).

[2] The shades both of red and blue being exactly the same as those on the breast of the beautiful *Cinnyris* (*Nectarinia Afra*) its visitor.

The breadth across the broadest part of the arrowhead is about ten lines. The odd petal is small, three quarters of an inch long and dome-shaped, completely covering the entrance to the honey.

The anthers occupy the whole length of the broad part of the arrowhead (some 2½ inches), while the style projects almost an inch in front of the petals. If the flanges are pressed down, the tubular cavity opens and exposes the six anthers.

The superior edges of the united petals have a peculiar structure. In the broadened portion they are only about a line broad (though overlapping), but where the narrow part of the arrow-head begins they suddenly expand to about half an inch, at the same time overlapping in the peculiarly perfect way shown in Fig. 30. Insects must be completely prevented therefore from entering the flower from above.

Professor Maccowan informs me that the bird walks along the flanges (probably developed for this purpose) and in bending down beneath the dome-shaped odd petal probably causes the petaline sheath to open so as to dust its breast with pollen. The stigma being in front of the petals will of course be touched first.

I have often seen the honey-bee and Diptera (*Lucilia argyrocephala* and others) sucking the gummy juice which exudes from the spathe, but it is not I think possible for insects to produce fertilisation as Hildebrand [1] supposes may happen, unless very exceptionally indeed. Unfortunately I could not visit its proper habitat, and, in spite of several days watching, I never saw any birds near it in the Cape Town Gardens.

[1] Hildebrand, loc. cit.

EXPLANATION OF FIGURES IN PLATE XIV.

Illustrating Mr. G. F. Scott-Elliot's paper on the Fertilisation of *Musa*, *Strelitzia reginae*, and *Ravenala madagascariensis*.

Figs. 21–23. *Musa species*. Nat. size.

Fig. 21. Longitudinal mesial section of flower.

Fig. 22. Young flower not open, seen from above.

Fig. 23. Transverse section to show arrangement of petals and sepals.

s, sepals; *p*, petals; *p o*, odd petal; *st*, stamens; *sti*, style; *h*, horny tip to sepals.

Figs. 24, 25. *Ravenala madagascariensis*.

Fig. 24. Open flower. One quarter natural size.

Fig. 25. Young flower not open.

Lettering as above, except *fl*, young flower.

Figs. 26–30. *Strelitzia reginae*.

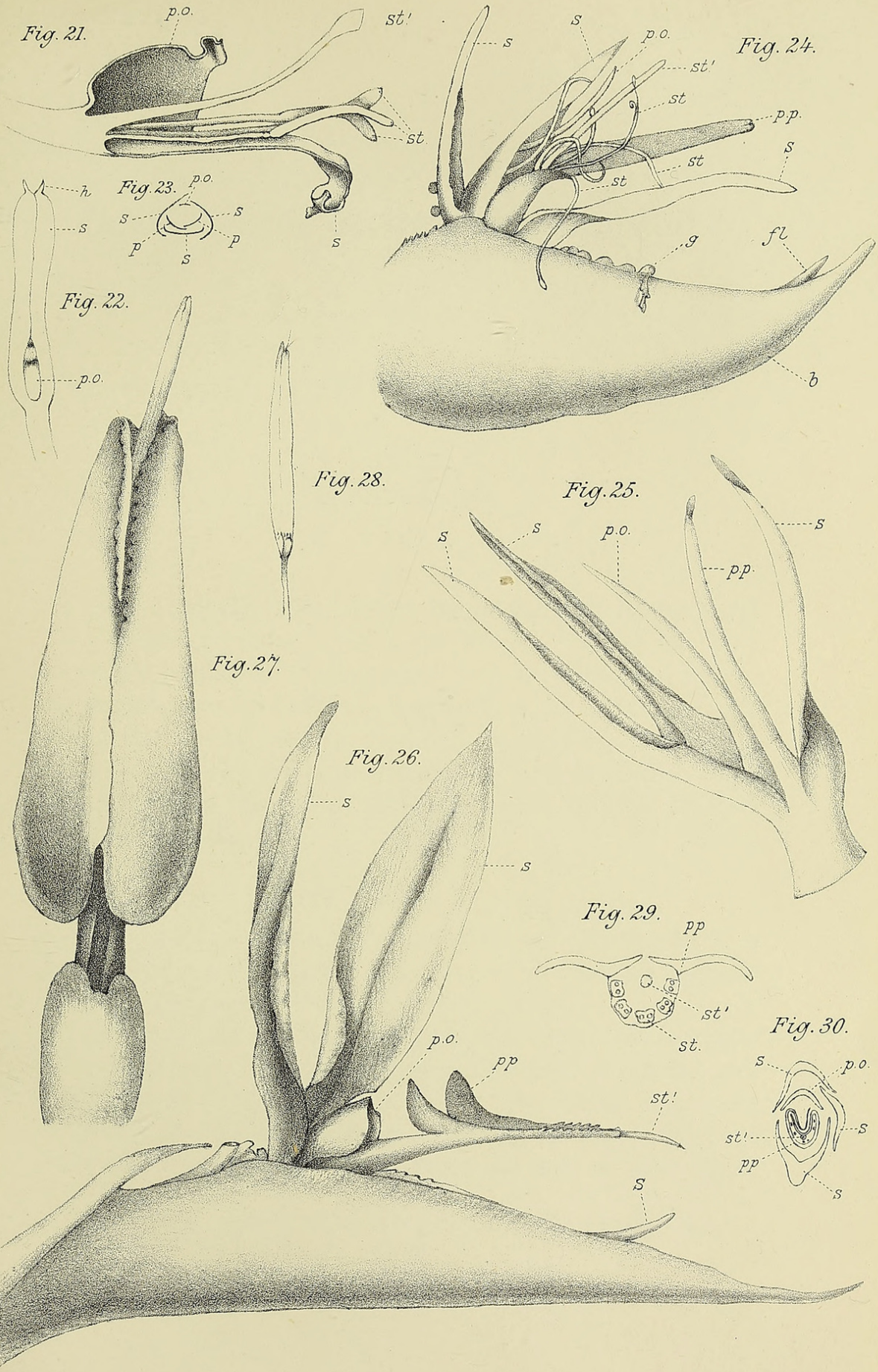
Fig. 26. Flower. One half natural size.

Fig. 27. View of arrow-shaped petal sheath from above.

Fig. 28. Style, thickened extremity.

Fig. 29. Transverse section of petal sheath, broad portion.

Fig. 30. Same in narrow tubular portion near the base. Showing manner in which the upper ends of united petals are folded within each other.



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