A Revision of the Genus Nomocharis.

BY

W. EDGAR EVANS, B.Sc., F.R.S.E.,
Assistant in Herbarium, Royal Botanic Garden, Edinburgh.

With Plates CXCIX-CCXII.

DURING the six years which have elapsed since the late Sir Isaac Balfour published his paper on "The Genus Nomocharis,"* the Edinburgh Herbarium has been enriched by the addition of much material, collected by Messrs George Forrest, Reginald Farrer, and F. Kingdon Ward, in the course of their more recent expeditions to Burma and Western China. No less than ten forms, which are here regarded as belonging to *Nomocharis,* are represented in this material, almost in every case by a long series of specimens, so that it has been possible to ascertain with considerable accuracy what are the limits of the species concerned. In addition, several types, amongst them those of *Lilium apertum,* Franch. and *Lilium Henrici,* Franch., which had not been seen by Sir Isaac, have been courteously lent for comparison, with the result that certain relationships, previously in doubt, have now been made clear and a revision of the genus can with some confidence be undertaken.

The critical examination of this new material and of these types seems to strengthen the general conclusions arrived at by Sir Isaac. Those forms included by him in his enlarged conception of the genus *Nomocharis* appear to have the best expression of their past and present relationships given only by being so grouped. Their affinity would, on the whole, seem to be less with *Fritillaria* than with *Lilium,* to which they are undoubtedly closely linked by *Nomocharis oxypetala,* Balf. f. and its allies. Notwithstanding this, the writer feels assured that Sir Isaac's treatment of these forms as a Section (*Oxypetala*) of *Nomocharis,* as well as his separation of the more typically nomocharoid species into the two further Sections *Eunomocharis* and *Ecristata* according as the basal glandular areas of their inner perianth-segments are fringed or naked, are both supported by the extended knowledge now available.

* Trans. Bot. Soc. Edin., xxvii (1918), 273.

[Notes, R.B.G., Edin. No. LXXI, June 1925.]

All the species here included in the genus *Nomocharis* differ from *Fritillaria* in the more open less dice-box shaped perianth (Plates CCI, CCV), of which the almost basal glandular areas, when at all conspicuous, are confined to the inner segments and are separated into a right and a left portion by the pronounced midrib; they differ also in their scaly bulb, lily-like in appearance (Plates CXCIX, CCX), a character upon which increased experience leads one to lay considerable stress. From *Lilium*, in some cases, they differ in hardly anything but the form of the perianth, which is without any suggestion of the trumpet shape so characteristic of that genus, being composed of segments which spread almost from their very base. In the Section *Eunomocharis* the fan-like fringing of the twin glandular areas of the inner perianth-segments, as well as the much swollen basal portion of the filaments (Plate CCXI), are very distinctive characteristics which, however, are wanting in the other Sections, for the type of cresting of the nectaries found in the *Oxypetala* differs from that of *Eunomocharis* as has been pointed out by Sir Isaac Balfour,* and is indeed very similar to that of certain true Lilies.†

While, then, the additional material now available seems to show that the general treatment of the genus proposed by Sir Isaac is sound, this is not always the case as regards the individual species, and here it has been found necessary to make several changes, for the most part in the direction of uniting forms thought by him to be distinct. The light afforded by the fine series of specimens in the Edinburgh Herbarium, amongst which those collected by Mr Forrest are outstanding, makes it clear that certain differences, purely vegetative in character, are frequently of no specific value, particularly so in the Sections *Eunomocharis* and *Ecristata*. As instances there may be cited the arrangement of the leaves upon the stem, the degree of attenuation of the leaf-apex, and the number of flowers produced by the plant. In these respects several of the species show within their limits very considerable diversity; even among specimens gathered in one locality and at one time there may frequently be seen a complete range from slender examples having scattered or paired leaves and a solitary terminal bloom to those of robust growth with at least the upper foliage whorled, and bearing a number of flowers in a short leafy raceme. Again, the drier conditions pertaining in eastern Yunnan probably sufficiently account for the slightly less elongated leaf-apices found in *Nomocharis Mairei*, Lévl. from that

* Trans. Bot. Soc. Edin., xxvii (1918), 287.

† Since the above was written, attention has been drawn to this relationship between *Nomocharis* and *Lilium* in a paper by A. Grove in the Gardeners' Chronicle, 3rd Ser., lxxvii (28th Feb. 1925), 148.

area, as compared with the perhaps more attenuated tips thought to distinguish the form from western Yunnan, described under the name *Nomocharis leucantha,* Balf. f. (Plate CCVI).

It is, however, in the reproductive parts of the plant that the most interesting modifications, apparently not previously suspected by systematists, have come to light. These consist in the more or less complete suppression of the gynaeceum and of the correlated basal glandular structures of the inner perianth-segments, and are chiefly to be found in the blooms of young or poorly developed plants, being probably the result of lack of vigour due to youth or malnutrition. In such cases the stamens are always fully developed, whereas the female parts of the flower are either entirely wanting or are greatly reduced and non-functional; a converse state of affairs has never been observed, nor has any condition been met with suggesting the possibility of its occurrence. That a strong tendency to produce such agynous flowers is characteristic of certain species, became known to horticulturists on the introduction of the genus to cultivation. Writing in 1919 regarding one of the plants first grown from seed in this country, Mr J. H. Watson made the earliest allusion to the matter as follows*:—" . . . strange to say, the single flower produced [in 1917] was agynous, the ovary and style being missing. I therefore did not describe it, but waited till this year, when the plant has bloomed with two flowers, one perfect as illustrated, and the apical one again agynous. It did not bloom in 1918." In the Royal Botanic Garden, Edinburgh, where numerous batches of seedlings have been raised, it has been found that Mr Watson's experience in the case *Nomocharis pardanthina,* Franch. seems to be quite characteristic of that species and also of *N. Mairei,* Lévl. in cultivation; while the examination of copious dried specimens leads to the conclusion that this suppression of the gynaeceum may, under natural conditions, occur quite frequently in these species, as it undoubtedly does in the allied *N. basilissa,* Farrer and in *N. aperta,* W. W. Sm. et W. E. Evans. To indicate the extent to which the peculiarity may assert itself in wild plants it may be stated that among the eleven specimens of *N. basilissa* sent home by Mr Farrer were found no less than five bearing agynous blooms.† It should, however, be noted that all those species in which the production of such flowers has been observed belong to the Sections *Eunomocharis* and *Ecristata,* there being at present no evidence of their occurrence in the Section *Oxypetala.*

* The Garden, lxxxiii (1919), 275.
† Infra p. 26.

From the systematic point of view the knowledge that functionally male flowers with correspondingly reduced glandular structures may not infrequently be produced, in certain cases at least, is of considerable importance. Besides making it clear that measurements of the style and ovary cannot be used to separate the species of *Nomocharis,* except with the greatest caution, it has brought to light the quite unexpected fact that two plants, till now regarded as altogether different, are actually conspecific. The forms in question are *Lilium apertum,* Franch. and *Nomocharis Forrestii,* Balf. f., the first of these being clearly only the agynous or greatly reduced condition of the second.*

Turning now to the androecium, there is one point to which attention needs to be drawn. The anthers in all the previously described species of *Nomocharis* have, almost invariably, been stated to be dorsifixed or versatile, these being the terms applied to them by such authorities as Franchet† and Sir Isaac Balfour.‡ On the contrary, J. H. Watson§ refers to them as basifixed in a living example of *N. pardanthina,* Franch. examined by him. It is only possible here to say that in dried material collected in the natural habitats the filaments undoubtedly generally seem to be attached behind the anthers at such a height as to justify the use of the terms dorsifixed or versatile; occasionally, however, examples have been met with in which the anthers appeared almost or quite basifixed, this being observed more frequently in some forms, such as *N. basilissa,* Farrer, than in others, and only in the Sections *Eunomocharis* and *Ecristata.* Opportunities of examining flowers in the fresh state have unfortunately been very limited, only about a dozen blooms produced by cultivated plants of *N. pardanthina, N. Mairei,* Lévl. and *N. saluenensis,* Balf. f. being available to the writer. In the species last mentioned the anthers were clearly versatile, but in the others they were in every case unquestionably basifixed, a condition which remained unaltered even when the pollen had been shed and after the stamens had eventually dropped away from the flower-axis. The elucidation of this apparent contradiction will require the study of much additional living material, and is, in any case, scarcely within the scope of this paper.

Here it may be as well to indicate concisely the principal additions and changes made in the pages which follow. These include :—

* For full details see infra p. 31.
† For example in his diagnosis of the genus in Journ. de Bôt., iii (1889), 113.
‡ Trans. Bot. Soc. Edin., xxvii (1918), 293 etc.
§ The Garden, lxxxiii (1919), 275.

i. The description for the first time of two species, namely, *Nomocharis euxantha,* W. W. Sm. et W. E. Evans (p. 14) and *N. basilissa,* Farrer (p. 25).

ii. The transference to *Nomocharis* from other genera of six species, namely *Lilium apertum,* Franch. (p. 30), *L. Henrici,* Franch. (p. 38), *L. nanum,* Klotzsch (p. 16), *L. triceps,* Klotzsch (p. 7), *Fritillaria Gardneriana,* Wall. (p. 16), and *F. Souliei,* Franch. (p. 40).

iii. The reduction of four reputed species of *Nomocharis,* namely *N. Wardii,* Balf. f. (p. 12), *N. Farreri,* Cox (p. 20), *N. leucantha,* Balf. f. (p. 27) and *N. Forrestii,* Balf. f. (p. 30).

Before bringing to a conclusion these introductory remarks the writer desires to express his indebtedness to the Director of the Royal Botanic Gardens, Kew, of the Paris Herbarium, and of the Botanic Garden and Museum, Berlin-Dahlem; and also to the Superintendent of the Royal Botanic Garden, Calcutta, for the courteous loan of specimens, including several types without which it would have been impossible to have satisfactorily completed this account of the genus. In particular, his thanks are due to Professor Wright Smith for most generously handing on to him the whole of the material in the herbarium at the Royal Botanic Garden, Edinburgh, and for much help in other ways. The photographs illustrating this paper are by Mr R. M. Adam, Royal Botanic Garden, Edinburgh, to whom thanks are also due for this assistance.

Key to the Sections and Species.

The forms included below in the Section *Eunomocharis* and treated as species are so closely allied and so subject to intergradation that it is hardly possible at times to distinguish them, and the characters given here should be used with caution. The species in the Sections *Oxypetala* and *Ecristata* are generally more distinct and easily separable.

A. Inner perianth-segments with crested or fringed glandular bases (rarely glabrous in 3) :—

1. Filaments slender, gradually tapering from a rather narrow base . . . Section **Oxypetala** :—

a. Upper cauline leaves not overtopping the flower; perianth yellow or yellowish, usually speckled or flushed with purple towards the base :—

i. Perianth-segments 4–6 cm. long (occasionally shorter in stunted plants), cresting conspicuous; leaves usually over 4 cm. in length :—

α. Cauline leaves many (15–25); perianth-segments quickly narrowed above into a very short apiculus (Plate CC a) . 1. *N. oxypetala* (p. 7).

β. Cauline leaves fewer (5–10); perianth segments gradually narrowed into a long, slender apex . . . 2. *N. lophophora* (p. 11).

ii. Perianth-segments about 2.5 cm. long, cresting feebly developed or wanting (var. *imberbis*); leaves not exceeding 4 cm. in length (Plate CCI) . . . . . 3. *N. euxantha* (p. 14).

b. Upper cauline leaves longer, narrowly linear, usually distinctly overtopping the medium sized flower (Plate CC b); perianth more or less purplish or pallid (? sometimes yellowish), speckled below with purple . . . 4. *N. nana* (p. 16).

2. Filaments much swollen below, suddenly contracted above into a short needle-like prolongation bearing the anthers (Plate CCXI) . Section **Eunomocharis** :—

a. Ground-colour of the perianth not normally white in full-blown flowers, usually purplish, rose-coloured or flame-coloured; inner segments little broader than the outer or if broader elliptic or ovate in outline, hardly as broad as long; all segments entire or the inner alone erose :—

i. Inner segments frequently distinctly broader than the outer, their spotting usually most marked towards the base (but very variable); outer segments normally unspotted . 5. *N. pardanthina* (p. 19).

ii. Inner segments never greatly exceeding the outer, similar to them in ground-colour and markings :—

α. All the segments spotted throughout with rather large, diffuse, purplish blotches; the inner erose above (Plate CCIV) . 6. *N. melegrina* (p. 23).

β. All the segments flame-coloured, unspotted, entire (Plate CCV) . 7. *N. basilissa* (p. 25).

b. Ground-colour of the perianth in full-blown flowers watery- or satiny-white; inner segments much exceeding the outer in width, about as broad as long, deeply and copiously erose-dentate, usually heavily blotched with reddish-purple throughout (Plate CCVI) . . . 8. *N. Mairei* (p. 27).

B. Inner perianth-segments glabrous, basal glands when present not bearded or fringed . Section **Ecristata** ;—

1. Perianth whitish or pinkish, inner segments usually purple at the base :—
   a. Style not exceeding 10 mm. in length; glandular base of the inner perianth-segments (except where the gynaeceum is abortive) at least slightly swollen or cushion-like :—
      i. Perianth-segments more or less spotted and blotched with reddish-purple, the spots usually smaller and more defined near the base of the perianth, becoming larger and more diffused above; style in fully functional flowers generally a little exceeding the ovary, about 10 mm. in length (Plate CCVII) . . . . . 9. *N. aperta* (p. 30).
      ii. Perianth-segments finely freckled with small purplish spots, chiefly towards the base (rarely entirely whitish); style generally rather shorter than the ovary, about 5–9 mm. long (Plate CCVIII) . . . . . 10. *N. saluenensis* (p. 33).
   b. Style about 30 mm. in length or even longer; glandular base of the inner perianth-segments not swollen or cushion-like (Plate CCXII b) . . . . . 11. *N. Henrici* (p. 38).
2. Perianth of a uniform deep purple-black or wine-colour, bases of the segments somewhat gibbous (Plate CCX); style equalling or much exceeding the ovary . . . . . 12. *N. souliei* (p. 40).

Enumeration of the Species.

1. **Nomocharis oxypetala,** Balf. f. comb. nov.,* descr. emend. W. E. Evans, Plates CXCIX, CC a.

   Fritillaria oxypetala, Royle, Ill. Bot. Himal., i (1839), 388 apud Strachey et Winterbottom, Cat. Pl. Kumaon (1882), 75, No. 4; Hook. f., Flor. Brit. Ind., vi (1892), 352 quoad specimina citata.

   Lilium triceps, Klotzsch, in Bot. Ergeb. Waldem. Reise (1862), 53, t. 93.

   Lilium oxypetalum, Baker in Journ. Linn. Soc., xiv (1874), 234 quoad specimina ex Pindari citata.

   Nomocharis oxypetala, E. H. Wilson, The Lilies of Eastern Asia (1925), 13, pro pte.

   Species ex affinitate *N. lophophorae* (Bur. et Franch.), Balf. f., a qua foliis plurimis et perianthi segmentorum figura inter alia differt.

* Trans. Bot. Soc. Edin., xxvii (1918), 293.

Bulbus laxus 3–4 cm. longus e squamis haud numerosis lanceolatis ad 1 cm. latis carnosis, extimis siccis chartaceis compositus. Radices carnosulae rugosae ramulisque paucis praeditae. Caulis unicus gracilis (circ. 2–3 mm. diametro) 20–25 cm. altus foliis 15–25 sparsis instructus; folia infima saepius valde reducta membranacea, cetera sessilia elliptico-lanceolata (majora 4.0–8.5 cm. longa 0.8–1.5 cm. lata, suprema sensim decrescentia) acuta vel obtusiuscula integra, supra opaca viridia subtus glauca nervis tenuibus distinctis. Flos solitarius terminalis pedunculo folia suprema haud superante suffultus; perianthi lutei vel galbani segmenta inter se valde similia anguste ovato-elliptica 4.0–5.5 cm. longa 1.3–2.0 cm. lata integra apiculo brevi crassiusculo obtuso ornata, exteriora concoloria glaberrima, interiora basi maculis eminentibus paucis minutis elongatis atropurpureis glandulisque supra dense cristatis munita; staminum glabrorum circ. 2.5 cm. longorum filamenta gracilia, antherae circ. 5 mm. longae versatiles infra medium affixae; ovarium glabrum sub anthesi circ. 13 mm. longum 2–3 mm. latum, stylo ovarium clare superante 16–20 mm. longo normaliter integro (rarissime trifido) e basi leviter atque gradatim expanso, stigmate valido trilobato; capsula matura circ. 2.4 cm. longa 2.0 cm. lata.

NORTH-WEST HIMALAYA. Without exact locality, Dr. W. Hoffmeister in Herb. Pr. Waldemar, 1845!

Bashahr; Runang Forest, alt. 9,500 ft. In flower, June 1890. J. H. Lace, 289! Plate CC a.

Garhwal; in birch forest, Nila Valley, Tihri, alt. 10–11,000 ft. In flower, June 1883. J. F. Duthie, 182!

Kumaon; Pindari, alt. 12,500 ft. Flower and fruit. Strachey and Winterbottom "Lilium No. 4" (Plate CXCIX)! Palang Gadh, Byans, alt. 12–13,000 ft. In flower, July 1886. J. F. Duthie, 6039! and J. R. Reid sine no.!

W. Nepal; opposite Budhi Village, alt. 10–11,000 ft. In immature fruit, July 1886. J. F. Duthie 6031!

The original account of *Fritillaria oxypetala* given by Royle is, unfortunately, very meagre, being in the following terms: "*F. oxypetala,* caule unifloro, foliis lanceolatis obtuse acuminatis, flore erectiusculo, sepalis acutis unguiculatis, stylo subdeclinato ovarii longitudine, stigmate trifido." Most subsequent descriptions of the plant, though fuller, are inaccurate in several particulars owing to the confusion of two altogether distinct species, and it is now a matter of some difficulty to decide which of these Royle had in view, the only point in his diagnosis which throws any light on the question, indeed, being his statement regarding the shape of the leaves. It seems advisable, therefore, to give here a short account of the history of the plant since his time.

Between the years 1846 and 1849, probably in 1848, specimens were collected at Pindari in Kumaon by Strachey and Winterbottom, which were in the first instance, apparently, included in their herbarium under the designation "Lilium No. 4" but which were subsequently identified as *Fritillaria oxypetala,* Royle. These have been kindly lent by the Director of the Royal Botanic Gardens, Kew, and a photograph of them, half natural size, is given in Plate CXCIX. From this it will be seen that these specimens include both flowering and fruiting plants, no doubt gathered at different times. The foliage of the former agrees well with Royle's description; but from the Catalogue of the Strachey and Winterbottom Collection* one learns, however, that they had a greenish-yellow perianth, not a purple one as has generally been assumed. Turning to the fruiting plants, that to the right is clearly conspecific with those in flower, but the central specimen has much narrower, linear foliage and a smaller capsule being, in fact, the purple or pallid flowered species of which an account is given later under the name *Nomocharis nana,* E. H. Wilson (p. 15).

The confusion thus commenced was added to when, in 1852,† Strachey and Winterbottom forwarded to Kew from Pindari living bulbs, under the impression that they were sending their "Lilium No 4" this being taken for granted also at Kew. Collected, as they would be, during the resting season, it is not altogether surprising that these plants, when they bloomed the following year, proved to have purple flowers. A drawing of one of them was made by Fitch, and under the name *Fritillaria oxypetala,* Royle, was reproduced in the Botanical Magazine,‡ though it is clear that Sir W. J. Hooker, judging by his remarks which accompany the plate, had doubts as to the accuracy of this identification. "If I am correct," he writes, "in referring it to the *F. oxypetala* of Dr. Royle, of which he has given a brief character, it was discovered at Taranda, in Kumaon."

In July 1874, J. G. Baker published his "Revision of the Genera and Species of Tulipeae." He there transferred Royle's plant to the genus *Lilium* and gave a fuller description§ which, for the reasons already shown, includes characters belonging to both the species involved, though he correctly cites as a synonym *Lilium triceps,* Klotzsch. The issue is still further obscured by the fact that the same paper contains an account of a plant from Gossain Than in Nepal (Wall. Cat. no.

* "Catalogue of Plants found in Kumaon and Garhwal and the Adjoining Parts of Tibet," first published in 1882 in Atkinson's "Gazetteer of the Himalayan Districts of the N.W. Provinces and Oudh."

† Teste Elwes, Monog. of the Genus Lilium, sub t. V, fig. 2 (1877).

‡ Hook. in Bot. Mag., t. 4731 (1853).

§ Journ. Linn. Soc., xiv (1874), 234

5080) under the mss. name attached to it, namely *Fritillaria Gardeneriana*, Wall.* This specimen has been examined for the writer by Professor Wright Smith, and there is no doubt that it is identical with the narrow leaved, purple flowered species forming a component of *Lilium oxypetalum*, Baker, though the account given of it would not lead one to conclude that this is the case.

Previous to this, however, in 1862, Klotzsch had correctly separated the two forms under the names *Lilium triceps* and *L. nanum* respectively.† His diagnoses were based upon material collected by Hoffmeister in the Himalayas in 1845 and the types, which the writer has had the privilege of examining, clearly show that the former name covers the plant now under consideration and here called *Nomocharis oxypetala*, Balf. f. It has not been ascertained upon what grounds both of Klotzsch's species came to be treated as synonyms of *Lilium nepalense*, D. Don, as has been done in the "Index Kewensis," and it is to be regretted that this botanist's work seems in the present instance to have been overlooked by those who followed him, thus giving rise to still further confusion.

The year 1880 saw the completion by H. J. Elwes of his "Monograph of the Genus Lilium." In this work *L. oxypetalum*, Baker, is figured and discussed in Plate V, fig. 2, and the accompanying letterpress, both of which appeared in 1877. The figure, by Fitch, represents a plant with purple flowers, and is, as is stated, a transposed copy of his earlier drawing for the Botanical Magazine. The letterpress follows Baker, except that *Lilium nanum*, Klotzsch, which Elwes doubtfully regarded as a reduced state of *L. triceps*, Klotzsch, is included in the synonymy.

Finally, in 1892, there appeared Sir J. D. Hooker's account of the Order *Liliaceae* in the "Flora of British India." Here‡ the two species hitherto so often confounded are again separated, replaced in the genus *Fritillaria* and the specific name *oxypetala* used as applying exclusively to that having broader foliage, and, as the specimens cited clearly prove, a yellowish perianth. Unfortunately two errors, derived from previous descriptions, are retained; the flowers are referred to as purple, and the style is stated to be shorter than the ovary, whereas it is always distinctly longer than that organ (Plate CC a). Under the name *F. Stracheyi*, Hook. f. is given a short diagnosis of those purple flowered specimens with linear foliage which, unknown to Sir Joseph, had already been distinguished by Klotzsch as *L. nanum;* while *F. Gardneriana*, Wall. is upheld as a distinct

* Journ. Linn. Soc., xiv (1874), 265.
† Pot. Ergeb. Pr. Waldem. Reise (1862), 53.
‡ Flor. Brit. Ind., vi (1890-94), 352.

species since Baker's wording gives the false impression that it lacks the basal cresting of the inner perianth-segments which is so characteristic of the former. That some uncertainty still remained is, however, clear from the fact that, whereas the drawing in the Botanical Magazine* is correctly stated to be a portrait, not of the true *F. oxypetala,* Royle, but of the plant separated from it as *F. Stracheyi,* Hook. f., the admittedly copied figure given by Elwes is said to represent the former.

From the above summary it will be seen that the evidence supporting the application of Royle's specific name to the present plant is chiefly of a circumstantial nature. It seems best, however, to uphold the name and to use it as is here done, with the object of avoiding further change and confusion; but at the same time to obviate future dubiety by giving a re-description of the species as now defined.

Nomocharis oxypetala, Balf. f. has its nearest ally in the Chinese *N. lophophora,* Balf. f., from which it may be at once distinguished by its more numerous cauline leaves and much less acuminate perianth-lobes. It apparently only occurs, as may be judged from the details of distribution already given, in a quite restricted area in the N.W. Himalaya, and does not appear ever to have been in cultivation.

2. **Nomocharis lophophora,** Balf. f. comb. nov. in Trans. Bot. Soc. Edin., xxvii (1918), 293.

Fritillaria lophophora, Bur. et Franch. in Journ. de Bot., v. (1891), 153; Oliv. in Hook. Icon., xxii (1892), t. 2219.

Lilium lophophorum, Franch. in Journ. de Bot., xii (1898), 221; E. H. Wilson, The Lilies of Eastern Asia (1925), 104.

WESTERN CHINA. *S.E. Tibet;* "Edges of forests, Doker-la. Alt. 14,000 ft." In flower, July 1913. Kingdon Ward, 711!

W. Szechuan; "Open alpine pasture and on the margins of pine forests, Mu-li mountains. Lat. 28° 12′ N. Alt. 11–13,000 ft." In flower, August 1918. G. Forrest, 16664!

"Amongst scattered shrubs on sheltered slopes, Litang River divide (S.W. of Mu-li). Alt. 13,000 ft. Flowers canary yellow." In flower, June 1921. Kingdon Ward, 4074!

"Entre Batang et Litang, sur les gazons secs;"† "Entre Litang et Ta-tsien-lou."‡ M. Bonvalot and Prince Henry of Orleans, 1890, sine no.

* Hook. in Bot. Mag., t. 4731 (1853).
† Bur. et Franch. in Journ. de Bot., v (1891), 153.
‡ Franchet in Journ. de Bot., xii (1898), 221.

" In a collection from West Szechuan and the Tibetan frontier, chiefly made near Tachienlu, alt. 9,000–13,500 feet."* Pratt, 261 and 568.

"Tongolo, dans les forêts de sapins et sur la montagne Daratha-phong."† J. A. Soulié, 296 and 326.

N.W. Yunnan; " Alpine grassland, A-tun-tsi. Alt. 14,000 ft."; 1911. Kingdon Ward, 157!

" Mountains of the Chungtien plateau. Lat. 27° 55′ N. Alt. 13,000 ft." In flower, July 1913. G. Forrest, 10624!

" Prairies très élevées, au glacier de Likiang (Delavay, 28 et 237); Fang-yang-tchang (id.)."†

" Open alpine pasture, eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11–13,000 ft. Plant of 6–8 inches. Flowers bright yellow with a few maroon markings." In flower, July 1910. G. Forrest, 6156!

" Grassy openings in pine forests and on mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 16′ N. Alt. 10–11,000 ft. Plant of 10–18 inches. Flowers rich canary-yellow with a few dark brown markings at the base, fragrant, pendulous." In flower, June 1906. G. Forrest, 2390!

" Inter Hunka et Woholo, in pratis subalpinis. Flor. extus flavi, in medio paulo viridescentes, nutantes. Alt. circiter 3,300 m." In flower, June 1914. C. Schneider, 1512!

" On screes and stony pasture on the margins of forest and scrub, Chien-chuan-Mekong divide." Lat. 26° 36′ N. Long. 99° 40′ E. Alt. 12–13,000 ft. Plant of 3–4 inches. Flowers light to dark canary-yellow." In flower, July 1922. G. Forrest, 23074!

var. **Wardii,** W. W. Sm. et W. E. Evans, comb. nov. in Notes, Roy. Bot. Gard. Edin., No. lxix-lxx (Feb. 1925), 120.

Nomocharis Wardii, Balf. f. in Trans. Bot. Soc. Edin., xxvii (1918), 297.

A typo, quocum crescit, foliis anguste lanceolatis vel linearilanceolatis solum differt.

WESTERN CHINA. *S.E. Tibet;* Open grassland, shrub and forest belt, Doker-la, alt. 13–14,000 ft." In flower, July 1913. Kingdon Ward, 741!

" Alpine meadow turf, Ka-gwr-pu, alt. 15,000 ft." In flower, July 1913. Kingdon Ward, 813!

N.W. Yunnan; " An alpine grassland plant, A-tun-tsi, alt. 14,000 ft." In flower, July 1911. Kingdon Ward, 156!

" Open pasture, Mekong-Salween divide. Lat. 28° 12′ N.

* Oliv. in Hook. Icon., xxii (1892) sub t. 2219.
† Franchet in Journ. de Bot. xii (1898), 221.

Alt. 12,000 ft. Leaves much narrower than type." In flower, July 1917. G. Forrest, 14109!

" On open grassy slopes, Mekong-Salween divide. Lat. 27° 36′ N. Long. 98° 56′ E. Alt. 12,000 ft. Plant of 4–6 inches. Flowers pale yellow." In flower, July 1921. G. Forrest, 19846!

In the present species, as stated by Bureau and Franchet* and as the writer has also observed, the cresting of the basal glandular areas of the perianth-segments is subject to considerable variation as regards the extent to which it is developed. In many examples it is confined to the petaline segments where, except in the case of stunted specimens which are generally smaller flowered, it is conspicuous. In others, however, it may be found also at the bases of the segments of the outer whorl, but, in the specimens seen by the writer at least, it is there less pronounced. The type of cresting found in those species of *Nomocharis* forming the Section *Oxypetala* is much like that characteristic of certain Lilies and its supposed restriction to the petaline segments in the former has been regarded as of some importance. Here one has evidence, however, that such a distinction does not always hold good, though in the main it seems to do so, no similar tendency having been observed elsewhere in the genus.

It is now impossible to regard as specifically distinct the plant described by Sir Isaac Balfour under the name *Nomocharis Wardii*. " Ward's plant," he writes,† " can be recognised by its grass-like foliage and the many more leaves which each stem bears. I do not find on the petaline segments of *N. Wardii* any marginal fimbriation at the base such as characterises Franchet's species, and is perhaps more constant than Franchet supposed to be the case." Further specimens, collected both by Ward and Forrest, show that the leaves are only exceptionally more numerous than is usual in typical *N. lophophora*, Balf. f., and that Bureau and Franchet‡ were quite correct in indicating that the basal fimbriation of the inner perianth-segments is subject to variation. Even in its fullest development this fimbriation is very slight, and it is not infrequently wanting in specimens having broadly lanceolate foliage and does not, therefore, constitute a specific distinction. The only remaining character, then, lies in the width of the leaves, but since, as the distributional data given above clearly show, both forms grow together and moreover specimens somewhat intermediate in this respect occur, one can only regard this as of varietal significance.

* Journ. de Bot., v (1891), 153.
† Trans. Bot. Soc. Edin, xxvii (1918), 298.
‡ Journ. de Bot., v (1891), 153.

The staminal filaments in *N. Wardii* are described by Sir Isaac as slightly swollen, and are stated to be, in this respect, intermediate between the usual form found in the Sections *Oxypetala* and *Ecristata* and the much inflated condition so characteristic of the Section *Eunomocharis*. They appear to the writer, however, to be better regarded as subulate or linear-subulate, sometimes contracted only above the middle, and are just like those of typical *N. lophophora,* which Bureau and Franchet call subulate. They seem clearly to be flattened in their lower portion, not inflated or swollen.

In his "Lilies of Eastern Asia," E. H. Wilson somewhat tentatively retains this species in the genus *Lilium,* introducing for its reception the new sub-genus *Lophophorum;* in the same work, however, he acquiesces in the transference of *Lilium oxypetalum,* Baker to the genus *Nomocharis* as had already been done by Sir Isaac Balfour. It has been pointed out above that these two plants are apparently very closely related, and it would hardly seem possible to allot them to different genera. The writer, therefore, prefers to follow Sir Isaac, placing them together in the latter genus.

N. lophophora, Balf. f. is confined, so far as is known, to that botanically rich corner of south-western China where Tibet, Szechuan and Yunnan adjoin one another. There it occurs at elevations of from 9,000 to 15,000 feet. It is not, apparently, at present in cultivation.

3. **Nomocharis euxantha,** W. W. Sm. et W. E. Evans, sp. nov. Plate CCI.

Species haec *N. nanam,* E. H. Wilson himalayensem statura atque florum magnitudine revocat; foliis, praesertim supremis, latioribus brevioribusque, perianthi crocei purpureo-maculati segmentis interioribus parce barbatis differt.

Bulbus angustus parvus laxissime squamatus circ. 2.0–3.5 c.m. longus, squamis paucis (haud 10 excedentibus) lanceolatis vel angusti-lanceolatis pallidis, externis membranaceis ceteris apice indurato sicco excepto carnosis. Radices paucae graciles vix carnosulae parce ramosae. Caulis unicus glaberrimus gracilis (circ. 2 mm. diametro) 15–30 cm. altus foliis 6–7 sparsis late lineari-lanceolatis vel lineari-lanceolatis (majoribus 30–40 mm. longis 4.5–6.0 mm. latis) sessilibus integris acutiusculis supra opacis subtus glaucescentibus, nervo primario saepius 1 plus minus distincto instructus. Flos solitarius terminalis mediocris nutans, folia suprema paulo superans; perianthi crocei basim versus saepius minute et eminenter purpureo-punc tati rarius purpureo-suffusi segmenta inter se valde similia

ovato-elliptica vel elliptica integra, exteriora 21–22 mm. longa 8–9 mm. lata glaberrima acuta vel acutiuscula infra gradatim angustata, interiora 21–23 mm. longa 9–10 mm. lata obtusissima basi saepius subito contracta plus minusve (sed nunquam copiose) cristata. Stamina 14–15 mm. longa, filamentis gracilibus subulatis, antheris versatilibus infra medium affixis per typum 4–5 mm. longis. Ovarium sub anthesi 6–9 mm. longum 2–3 mm. latum, stylo 6–9 mm. longo e basi gradatim expanso triangulato stigmate inconspicuo terminato. Capsula matura ignota.

WESTERN CHINA. *S.E. Tibet;* "Open pasture on the margins of forests on Ka-gwr-pu, Mekong-Salween divide, Tsarong. Lat. 28° 40′ N. Alt. 13,000 ft. Plant of 6–16 inches. Flowers nodding, fragrant, deep yellow, spotted purple." In flower, July 1918. G. Forrest, 16738! Plate CCI.

N.W. Yunnan; "Stony meadow on the margin of Rhododendron scrub, Londre pass, Mekong-Salween divide. Lat. 28° 12′ N. Long. 98° 40′ E. Alt. 14,000 ft. Plant of 3–5 inches. Flowers golden-yellow, very faintly spotted and tinged crimson on interior base." In flower, June 1921. G. Forrest, 19527!

var. **imberbis,** W. W. Sm. et W. E. Evans, var. nov.

A typo perianthi segmentis petalinis basi glabris, antheris haud 2 mm. excedentibus differt.

UPPER BURMA. "Chawchi Pass and Moku-ji Pass. Alt. 12–13,000 ft. Occasional among the dwarfest Rhododendron scrub, in deep moss of the highest alpine zone. Also commonly occurring in the highest alpine stretches of coarse moorland turf. Flowers soft clear yellow, freckled internally towards the base, scentless." In flower, July 1920. R. Farrer, 1687!

This species is of small stature, recalling *Nomocharis nana,* E. H. Wilson in this respect and in the medium size of its solitary flowers. The uppermost cauline leaves are, however, much shorter than is usual in that plant and are overtopped by the perianth (Plate CCI), which is of a clear yellow, speckled or flushed at the base with reddish-purple. A specimen collected by Kingdon Ward during his exploration in Yunnan and Tibet during 1913 (No. 758) is perhaps this species; it has apparently had the exterior of the perianth flushed throughout with reddish-purple, though this appearance may only be due to the rather advanced state of the flowers.

In the Burmese form obtained by Farrer, the perianth is quite devoid of the weakly developed cresting of the inner segments seen in the Chinese specimens and, in addition, the anthers are constantly shorter. Further knowledge of it may

show it to be a distinct species, but for the present it seems preferable to regard it as a variety of *N. euxantha*.

4. **Nomocharis nana**, E. H. Wilson, comb. nov.,* descr. emend. W. E. Evans. Plates CXCIX, CC b, CCII, CCIII.

Fritillaria oxypetala, Hook. in Bot. Mag., t. 4731 (1853).

Fritillaria Gardneriana, Wall. Cat. 5080, Baker in Journ. Linn. Soc., xiv (1874), 265.

Fritillaria Stracheyi, Hook. f., Flor. Brit. Ind., vi (1892), 353.

Fritillaria flavida, Rendle in Journ. Bot., xliv (1906), 45.

Lilium nanum, Klotzsch in Bot. Ergeb. Waldem. Reise (1862), 53.

Lilium oxypetalum, Baker in Journ. Linn. Soc., xiv (1874), 234 pro pte.; Elwes, Monog. Genus Lilium, t. V, fig. 2 (1877).

Nomocharis flavida, Balf. f. comb. nov. in Trans. Bot. Soc. Edin., xxvii (1918), 293.

Nomocharis oxypetala, E. H. Wilson, The Lilies of Eastern Asia (1925), 13, pro pte.

Species haec inter congeneres Sectionis *Oxypetalae* foliis supremis angusti-linearibus valde elongatis ultra florem terminalem saepius multo attingentibus, et perianthi colore purpureo vel pallido facile distinguenda.

Bulbus laxus parvus circ. 2–3 cm. longus e squamis haud 20 excedentibus lanceolatis ad 7 mm. latis, extimis siccis ceteris apice indurato sicco excepto carnosis, compositus. Radices carnosae rugosae parce ramosae. Caulis unicus gracilis (haud 3 mm. diametro excedens) 15–40 cm. altus foliis 10–12 sparsis glaberrimis integris instructis; folia infima saepius valde reducta membranacea cetera sessilia linearia (majora 6–14 cm. longa 2–6 mm. lata suprema angustata florem superantia) acuta opaco-viridia nervis indistinctis. Flos mediocris solitarius terminalis nutans; perianthi purpurei vel pallidi (interdum lutescenti?) segmenta integra, exteriora ovato-lanceolata vel lanceolata 18–32 mm. longa 5–10 mm. lata acuta, interiora valde similia sed apice plus minusve rotundata obtusata atque basi maculis atropurpureis glandulisque cristatis munita; staminum glabrorum circ. 15 mm. longorum filamenta subulata, antherae versatiles 3–3.5 mm. longae; ovarium glabrum sub anthesi circ. 8 mm. longum 2–2.5 mm. latum saepius stylo circ. 6 mm. longo integro stigmate trilobulato superans, rarius eo equans vel paulo brevior; capsula matura circ. 16–18 mm. longa 10–16 mm. lata.

* The Lilies of Eastern Asia (1925), 13.

ALPINE HIMALAYA. Without precise locality, Dr. W. Hoffmeister in Herb. Pr. Waldemar, 1845!

Bashahr; above Sdeeling, alt. 10,500–11,500 ft. In flower, July 1890. J. H. Lace, 333! Plate CC b.

Garhwal; ridge above Jhala in the Ganges valley, Tihri, alt. 12–14,000 ft. In flower, June 1883. J. F. Duthie, 173! Taulea under Grikanta, Tihri, alt. 13–14,000 ft. In fruit, August 1883. J. F. Duthie, 500! Kidar Kantha, Mussooria, alt. 13–15,000 ft. In flower, May-June 1904. J. R. Drummond, sine no.!

Kumaon; Pindari, alt. 12,500 ft. In fruit. Strachey and Winterbottom "Lilium No. 4" (Plate CXCIX) pro pte.! Above Galja, Byans, alt. about 13,000 ft. In flower, July 1886. J. R. Reid, sine no.!

Nepal; Nampa Gadh, alt. 12–13,000 ft. In flower, July 1886. J. F. Duthie, 6032! Gossain Than; Wall. Cat. 5080. In flower. Gardner (teste Baker)!

Sikkim; Zemu River, alt. 9–10,000 ft. In flower. J. D. Hooker, sine no. (Plate CCII)! Zemu Valley, on watery flats near the Kangchenjunga glacier, alt. 14,500 ft. In flower, July 1909. W. W. Sm. and Cave, 1376! Changa, alt. 10,000 ft. In flower, July 1910. W. W. Smith, 3104! Jongri, alt. 14,000 ft. In flower, August 1913. Rohmoo Lepcha, 935! and 951! Yampung, alt. 14,000 ft. In flower and immature fruit, August 1913. Rohmoo Lepcha, 1097!

S. Tibet; Yuo-so, June 1882, Dr. King's Collector! Koo-mapy-a, Chumbi, July 1884, Dr. King's Collector, 611! Pit-zee-lu, Chumbi and Phari, July 1879, Dungboo! Cho-leh-la, near Chumbi, July 1878, Dungboo (Plate CCIII)! Yatung, lat. 27° 51′ N., long. 88° 35′ E. In flower, 1897. H. E. Hobson, sine no. in Herb. Kew!

In 1845 Dr. W. Hoffmeister, collecting in the Himalayas, obtained specimens of the present species as well as of that now known as *Nomocharis oxypetala,* Balf. f. These two forms were recognised as distinct by Klotzsch who, in 1862, named them respectively *Lilium nanum* and *L. triceps** but, unfortunately, this seems to have been misunderstood or overlooked until, early this year, E. H. Wilson drew attention to the facts in his "Lilies of Eastern Asia."† Under these circumstances it seems advisable to give some account of the plant's vicissitudes since the time of its discovery.

Between the years 1846 and 1849, probably in 1848, Strachey and Winterbottom collected at Pindari in Kumaon a series of specimens, both in flower and fruit, which were apparently at

* Bot. Ergeb. Waldem. Reise (1862), 53.
† Loc. cit. p. 13.

first included in their herbarium under the designation " Lilium No. 4" but which were subsequently named *Fritillaria oxypetala,* Royle. Most of these specimens were correctly so identified, but amongst them was at least one fruiting example of the present species*; while a consignment of bulbs from the same locality forwarded to Kew by these gentlemen in 1852† contained only the purplish-flowered, linear-leaved plant now being considered. As has already been pointed out (ante p. 9), this gave rise to much confusion and the two forms continued to be confounded up to the year 1892 when Sir J. D. Hooker's account of the Order *Liliaceae* in the "Flora of British India" was published. There,‡ for the first time, the specific name *oxypetala* was correctly limited to those plants having lanceolate foliage and a yellow perianth, while the present species was segregated as *Fritillaria Stracheyi,* Hook. f., Sir Joseph apparently not having seen Klotzsch's type, and in consequence not realising its identity with the *Lilium nanum* of that author.‡

Previous to this, however, in 1874, J. G. Baker had given a diagnosis of a specimen from Gossain Than in Nepal (Wall. Cat. 5080) under Wallich's mss. name *Fritillaria Gardneriana*§ and had simultaneously cited as identical plants collected by Sir J. D. Hooker in the Zemu Valley, Sikkim (Plate CCII). His wording is such as to convey the impression that this species had an entirely glabrous perianth, lacking the crested grandular areas of the inner segments found in Hooker's *F. Stracheyi.* Consequently, in the "Flora of British India," both names appear, under the belief that two distinct forms did indeed exist, separable by this character, though Sir Joseph, finding that his Zemu specimens possessed a crested perianth, removed them from Baker's *F. Gardneriana* to his own *F. Stracheyi.* Professor Wright Smith has kindly made a critical examination of the type of the former (Wall. Cat. 5080) in the Kew Herbarium and it can be definitely stated that this also has a crested perianth as, moreover, have Duthie's Nepal examples, thought by Sir Joseph to be Baker's *F. Gardneriana.* The length of the style, the only other possible distinction, has equally little specific importance, and is in fact subject to the same great variation as is found in several other species of the genus *Nomocharis.* In the majority of cases it is slightly shorter than the ovary (Plates CC b, CCII) but a specimen has been examined in which it was only about half the length of that organ while in others it equalled or even somewhat exceeded it. For the reason, then, that no character

* See Plate CXCIX, central fruiting specimen.
† Teste Elwes, Monog. Genus Lilium, sub t. V., fig. 2 (1877).
‡ Flor. Brit. Ind., vi (1892). 352.
§ Journ. Linn. Soc., xiv (1874) 234.

has been found by which these two forms can be separated they are here regarded as conspecific, Klotzsch's earlier name being used as proposed by E. H. Wilson and a fuller diagnosis given.

There still remains to be considered *Fritillaria flavida,* Rendle (Plate CCIII), the description of which, based on four gatherings made by native collectors in southern Tibet, was published in 1906.* The chief point thought to distinguish it would appear to be the colouration of the perianth, for it is stated to be " near the Himalayan *F. Stracheyi,* Hook. f., from which it differs in its yellow flowers with rather narrower petals." All four of the original gathering have fortunately been available to the writer for examination, as well as other specimens in the herbaria at Kew and Edinburgh obtained in the same area and agreeing in all structural respects with the diagnosis, and it seems certain that this form also is conspecific with *Nomocharis nana,* E. H. Wilson. It is questionable, indeed whether the plants now being discussed actually had in life a yellow or yellowish perianth; in every case the tint of the flowers is given on the authority of the native collector only and they appear, when dried, to differ but little from the type of *N. nana* in this respect.

The range of the present plant is comparatively wide in a genus remarkable for the often extremely localised distribution of its component species and extends throughout alpine Himalaya from Bashahr on the west to Sikkim and Tibet on the east. It occurs at altitudes of from 9,000 to 15,000 feet above sea-level.

5. **Nomocharis pardanthina,** Franch. in Journ. de Bot., iii (1889), 113, t. III; Gard. Chron., lix (1916), t. 138 and The Garden, lxxx (1916), figure on p. 295.

WESTERN CHINA. *W. Yunnan;* " Open situations on the margins of pine forests on the range forming the eastern boundary of the Lichiang valley. Lat. 27° 25′ N. Alt. 11,000 ft. Plant of 1–2½ ft. Flowers dull rose, deepest on the exterior, spotted crimson with a deep maroon blotch at the base." In flower, June 1910. G. Forrest, 5816!

" In pascuis montis Koua-la-po, supra Hokin; fl. 2 jun. 1883."† Delavay, 257.

* Journ. Bot. xliv (1906), 45.

† Hoking is in lat. 26° 32′ N. long. 100° 9′ E. Franchet's wording is quoted above, the writer not having seen the type specimens. In Journ. de Bot., iii (1880), 114 Franchet gives additional information regarding Delavay's plant as follows:—"Cette charmante Liliacée, qu'on peut espérer voir cultiver un jour, fait l'ornement des pâturages à sol calcaire de la montagne de Koua-la-po, dans le district de Tali, ou elle végète parmi les herbes, à la manière des Lis."

" Open situations in cane-brakes, Shweli-Salween divide. Lat. 25° 40′ N. Alt. 10–11,000 ft. Plant 12–20 inches. Flowers heavily flushed purple-rose, with very few markings on the interior." In advanced flower, August 1919. G. Forrest, 18274!

var. **Farreri,** W. E. Evans, comb. nov.

Nomocharis pardanthina, Farrer in Gard. Chron., lxvi (1919), 221, t. 102; lxvii (1920), 29, t. 13.

Nomocharis Farreri, Cox nomen in Country Life, lv (1924), 66 and 141, figs. on pp. 65 and 140.

Fortasse a typo perianthi segmentis interioribus parcissime fimbriatis vel subintegris, latitudine inter se valde diversis, sat differt.

UPPER BURMA. " Hpimaw Pass, alt. 10–11,000 ft. In a wild state the plant is even finer [than when cultivated] and abounds in millions over the open alp-slopes on either side of the Pass and below it, descending even into light glades of bamboo, and little dells on the woodland edges. Shape, colour and spotting variable; flowers from 1–10 a plant, and a spectacle of unsurpassed beauty and charm. Fullest bloom will be about June 25th." June 1919. R. Farrer, 1031! Cultivated specimens from the same neighbourhood were sent by Mr Farrer under the number 988! He states that the bulbs are eaten.

" Ridge of Naung-chaung-Nwai Divide, alt. 11–12,000 ft. In shade of bamboo brake, or in more open situations amongst dwarf bamboo. Flowers rose-pink to pure white with mottling of reddish purple at the base. Height 2–2½ ft." In flower, July 1914. Kingdon Ward, 1809 (white form)! and 1810 (rose-coloured form)! K. Ward 1686, also collected in 1914 in the same district, but without precise particulars, is similar to his 1810.

As information and material accumulate, it becomes increasingly evident that clear lines of demarcation cannot be drawn between the very closely related forms which together comprise the section *Eunomocharis* and which have been, and here are, treated as species. Of these the present and *N. meleagrina,* Franch., while sufficiently distinct when quite typical, seem in certain areas to grade into one another and into *N. Mairei,* Lévl. in the most disconcerting manner, making it a matter of great difficulty to decide in which of the presumed species to place certain forms such as, for instance, those from Upper Burma.

When the peculiarities which have been thought to separate *N. pardanthina* and *N. meleagrina* are passed under review, it

can be confidently stated that those which may be termed purely vegetative in character, such as the shape and the width of the leaves and their arrangement on the stem, express only individual differences or response to local environmental conditions and can be dismissed at once as having no special significance. Even such as concern the size of the flowers and the relative length of the stamens are unreliable, there being much variation amongst clearly conspecific plants in the measurements of the perianth and consequently in the relation borne to them by those of the androecium and gynaeceum. The characters which appear to offer the most hopeful means of classifying the forms concerned lie in the shape of the inner perianth-segments and the degree of their erosion or fimbriation, taken in conjunction with the ground-colour of the flowers and, to a less extent, the distribution of their spotting. Owing to the instability of even these points, however, it is only by considering them in the aggregate and observing how they preponderate that the most appropriate position and name can be assigned to not a few of the specimens the writer has examined.

Nomocharis pardanthina is here taken to include those plants having, in a greater or less degree, the following features. The perianth, except in rare instances, is of a lighter or deeper rosy-purple tint, not pure white; it is spotted chiefly towards its base, and less upon the outer than the inner segments, which have usually a somewhat oval or elliptic outline, their width not approximately equalling their length, and an irregularly and often very faintly erose or subentire margin. The outer segments are generally much narrower than the inner, though this character seems to be very liable to variation.

The two gatherings made by Mr Forrest in Yunnan agree wonderfully well with Franchet's description and figure and may be looked upon as being the typical form, though their perianths show rather less spotting and fimbriation than would appear to have been present in some at least of the type specimens, the inner segments being sometimes, in addition, almost as broad as long and thus approaching those of *N. Mairei,* Lévl. In the plants collected by Farrer and Ward in Upper Burma, where the species appears to be locally abundant, the inner segments of the perianth are extremely variable in width, sometimes scarcely broader than the outer, at others much exceeding them, and are, in addition, very little and very irregularly erose, frequently having a sub-entire margin. In these respects they show an approach to *N. meleagrina;* from it, however, they differ in the more restricted spotting, which is quite that of *N. pardanthina,* and it is most probable that Mr Farrer was correct in regarding them as a form of that

species. His account of the plant in its native habitat is well worth quoting here.* "How shall I describe it," he writes, "for the benefit of those who have only seen its lovely flowers drooping lonely in a pot at a show? It is like some hybrid of a minor Lily with Odontoglossum Rossii, combining the perverse and sinister spottings of the one with the frank and graceful loveliness of the other, alike in proud, meek port and delicacy of shell-pink colouring. And when you see it on the open high Alpine grass-slopes of Hpimaw Pass nodding down at you with myriads of wide-open, dark-eyed faces, in every shade of pale rose and every degree of freckling, there is nothing very much left for you to look at on Hpimaw Pass. All over the open slopes it incredibly abounds among the grass and even descends into light cane-brakes and little dells on the fringes of the wood, seeding with such profusion and growing with such hearty goodwill that though for some thousand years or thereabouts the Chinese have sedulously devoured its bulbs like onions, and so continue to devour them, you could never believe the smallest difference had been made to the unbroken profusion of its drifted masses. Such is *Nomocharis pardanthina* at home, and such, no doubt, are the other recorded Nomocharis."

Quite recently Mr E. H. M. Cox has tentatively used the name *Nomocharis Farreri* for this Burmese form,† pointing out at the same time the very close relationship it bears to *N. pardanthina*. In the writer's opinion the best expression of its relationships is given by regarding it as a variety of that species, and accordingly the name proposed by Mr Cox is here adopted in that sense. The species, as a whole, has not been found north of lat. 27° 25′ N. while its very near ally *N. meleagrina*, into which it appears to run, has not been met with south of lat. 28° 12′ N. It is, indeed, possible that the two supposed species may in reality be the southern and northern expressions of one very variable species.

N. pardanthina occurs at altitudes varying only from 10,000 to 11,000 ft. It has been in cultivation for some years, the typical form having been raised from Mr Forrest's seed at the Royal Botanic Garden, Edinburgh, where it first flowered in 1914.‡ The var. *Farreri* is also in cultivation and is now on the market. The flowers first produced by plants raised from seed are frequently without a functional gynaeceum, which tends to be undeveloped until the bulbs become vigorous with age.§

* Gard. Chron., lxvi (1919), 221, t. 102; lxvii (1920), 29, t. 13. The photographs which illustrate Mr Farrer's articles, though representing only a few specimens, show wonderfully well the variation in breadth and erosion of the inner perianth-segments.

† Country Life, lv (1924), 66 and 141, figs. on pp. 65 and 140.

‡ See Trans. Bot. Soc. Edin., xxvii (1918), 275.

§ For the first reference to this see The Garden, lxxxiii (1919), 275.

What has been said above regarding the unreliability of relative measurements of the flower parts as a means of separating the species in the Section *Eunomocharis* is strengthened by this peculiarity.

Though described by Franchet as dorsifixed, and appearing to be so in dried material, the anthers in all living flowers examined by the writer were basi-fixed. This was also the case in a cultivated plant described by Mr J. H. Watson.*

6. **Nomocharis meleagrina,** Franch. in Journ. de Bot., xii (1898), 196. Plates CCIV, CCXI a.

WESTERN CHINA. *S.E. Tibet;* " Margins of thickets and on open meadows, Ka-gwr-pw, Mekong-Salween divide, Tsarong. Lat. 28° 40′ N. Alt. 11–12,000 ft." In flower, July 1918. G. Forrest, 16717!

" Margins of mixed and pine forests on the Salween-Kiu-chiang divide, Tsarong. Lat. 28° 40′ N. Long. 98° 15′ E." In flower, August 1919. G. Forrest, 19003!

" Open alpine pasture on the margins of forests, Salween-Kiu-chiang divide, Tsarong. Lat. 28° 24′ N. Long. 98° 24′ E. Alt. 11,000 ft." In flower, August 1921. G. Forrest, 20051!

W. Szechuan; " sur les montagnes de Séla, sur les bords du Mékong."† J. A. Soulié, 1032! Plate CCIV.

N. W. Yunnan; " Open moist pasture on the margins of forests and scrub, Mekong-Salween divide. Lat. 28° 12′ N. Alt. 12–13,000 ft." In flower, July 1917. G. Forrest, 14184! Plate CCXI a.

The type of *N. meleagrina* (Plate CCIV) and that of *N. pardanthina,* Franch., taken by themselves, give the impression that they represent two quite distinct and easily separable species. As has already been pointed out when writing of the latter, however, this is by no means the case. An examination of fuller material and a consideration of the characteristic variability and intergradation found throughout the Section *Eunomocharis* indicate that many of the supposed differences separating the species in question can only be regarded as individual or as the result of purely local response to environmental conditions. Indeed, as has already been said, the only hopeful characters lie in the shape of the perianth-segments and in their fimbriation, ground colour and spotting.

The points in which the two species were thought to differ, taken from Franchet's diagnosis and notes in each case, are

* The Garden, lxxxiii (1919), 275.

† Quoted from Franchet, l.c. The brief label with the type, written by Soulié, reads: "Séla, 1-15 juillet 1895."

well summarised by Sir Isaac Balfour as follows.* "By description and by Franchet's comments we can recognise that this *N. meleagrina* is markedly different from *N. pardanthina* in the much larger leaves, apparently 15 cm. long, which are not whorled in the upper part of the stem; long pedicels as long as the leaves; larger flowers; perianth-segments equal in length and breadth; all the perianth segments equally and densely spotted; faint erosion only of the upper part of petaline segments; stamens only one fifth of length of perianth." The length and arrangement of the leaves, the length of the pedicels, the size of the flowers and the relative length of the stamens must be discarded as being of no specific value, since they are altogether too liable to variation. Of the remaining features, the only one which appears to almost always separate *N. meleagrina* from *N. pardanthina* is the spotting of the flowers, which consists of large and numerous blotches of reddish-purple spread nearly evenly over the whole inner surface of both whorls of the perianth (Plate CCXI a). The relative width of the sepaline and petaline segments seems to be more variable than Franchet thought and does not serve as a means of separation, particularly from the var. *Farreri* of *N. pardanthina,* which also shows the reduced erosion of the inner segments believed to be another characteristic of *N. meleagrina.*

It would be impossible to regard the gatherings made by Mr Forrest, and quoted above, as specifically distinct from *N. meleagrina,* but the leaves are constantly much shorter in his material than in the type, quite similar in fact to those of the other species of *Eunomocharis.* Under his No. 16717, most of the plants of which have the characteristic blotching, two were sent with flowers in which the spotting is confined to the base of the perianth and which consequently cannot be distinguished from the Burmese variety of *N. pardanthina.* Mr Forrest has unfortunately made no mention of the tint of the perianth in any of his specimens, though they give the impression of having had the rose ground-colour of the type. From these remarks it will be clear that no hard and fast line can be drawn between the two supposed species, which may, indeed, be the southern lower-level and northern higher-level forms of one very variable species. In this connection it should be noticed that whereas *N. pardanthina* has not been met with north of lat 27° 25′ N. and at elevations of from 10,000 to 11,000 ft., *N. meleagrina* is only known to occur between 28° 40′ and 28° 12′ N. lat., at the meeting-point of extreme S.E. Tibet, W. Szechuan and N.W. Yunnan, at the greater heights of from 11,000 to 13,000 ft. above sea-level.

* Trans. Bot. Soc. Edin., xxvii (1918), 279.

It may be stated in conclusion, that *N. meleagrina* is here regarded as a somewhat doubtfully distinct species with the following characteristics. Perianth, at least typically, rose-coloured, boldly and usually very evenly spotted over its whole inner surface with large reddish-purple blotches; the petaline segments elliptic in outline, not greatly exceeding the sepaline in width and only more or less irregularly erose, chiefly in their upper portion. The form so defined is not in cultivation.

7. **Nomocharis basilissa,** Farrer mss. descr. W. E. Evans. Plates CCV, CCXII a.

Inter species staminum filamentis valde inflatis munitas haec perianthi colore et segmentis integerrimis sat distincta videtur.

Bulbus parvus ovato-orbicularis laxe pauci-squamatus, squamis carnosis lanceolatis vel ovato-lanceolatis. Caulis gracilis vel robustus 35–95 cm. altus vel ex collectore ultra. Folia caulina numerosa approximata vel distantia sparsa vel subverticillata lanceolata vel angusti-lanceolata (majora 6–10 cm. longa 0.5–1.5 cm. lata) longe acuminata 3–5-nervia supra atroviridia subtus glauca. Flores 1–5 nutantes saepius terminales vel rarius laxe racemosi; perianthi aperte patentis 6–10 cm. diametro segmenta integerrima breviter acuminata immaculata ex collectore flammea vel coccinea basi purpurescentia, calycina ovato-lanceolata circ. 4.0 cm. longa 1.6–1.8 cm. lata, petalina latiora (circ. 4.0 cm. longa 2.0–2.5 cm. lata) basi glandulis geminatis atropurpureis superne cristatis munita (Tab. ccxii a). Stamina circ. 12 mm. longa; parte filamenti inferiore (circ. 7 mm. longa) valde inflata purpurea, parte superiore gracillima; antherae sub-basifixae (vix versatiles) circ. 3 mm. longae. Ovarium sub-anthesi 6–7 mm. longum stylo 8–10 mm. longo apicem versus gradatim expanso superatum, stigmate magno trilobulato. Capsula matura ignota.

UPPER BURMA AND YUNNAN. "Chawchi Pass, alt. 12,000–12,800 ft. This species occurs, not abundantly, but occasionally, in the dwarf cane-brakes of the upper alpine region, so densely impacted in the roots that I have not yet succeeded in getting bulbs; it also has one small point of occurrence only, on the crest of the Chawchi Pass, in open grass. I suspect it also in an undeveloped *Nomocharis* down on the Chinese side. The flower colour is of a pure and luminous salmon scarlet, unspotted, like nothing so much as some wonderful strain of *Papaver orientale*. There is no 'eye' of pallor between the uniform fire-colour of the corolla and the pit of darkness at its base. The style and stigma are not green but maroon-purple so are also the swollen parts of the filaments; their upper parts,

like the anthers, are bright yellow. Aberrant monoecious specimens are not of very rare occurrence, with style and ovary wanting, but with the sixth stamen sitting in the middle of the other five pretending to be the style." In flower, July 1920. R. Farrer, 1738! Plate CCV.

" Mokuji Pass, alt. 11,800 ft. Another set of this with bulb. It is never an abundant plant like the others, but there is quite a lot of it, dotted sporadically and singly in the light cane-brakes, where, down on the Chinese side, it occasionally meets Farrer 1785 [*Nomocharis saluenensis,* Balf. f.]. When well developed it can attain 3–4 feet, and can carry as many as five or six flowers, always absolutely pendent, not horizontal." In flower, August 1920. R. Farrer, 1800a!

Though structurally very closely akin to *N. meleagrina,* Franch. in particular, this form would appear to deserve rank as a distinct species. Apart from the marked difference in colouration which, according to Mr Farrer's description, seems very remarkable, the absolutely entire perianth-segments are distinctive in the whole of the available material—some ten specimens from two distinct localities (Plate CCV). The foliage is, moreover, somewhat narrower than is usual in the allied species, except perhaps in *N. pardanthina,* Franch. var. *Farreri,* W. E. Evans, in which the leaves tend to be somewhat similar. As has previously been said, however, little importance should be attached to such a purely vegetative and at best slight peculiarity.

Doubtless this is the plant referred to by Mr E. H. M. Cox in "Country Life"* in these words. "In the following year Farrer found another species with scarlet flowers, unspotted, which sounds as if it were even finer than *N. Farreri* [*N. pardanthina* var. *Farreri*], but unfortunately, seed was never collected." The specific name adopted here is that suggested by Mr Farrer on the ticket accompanying his dried specimens.

As is indicated in the field notes published above, the tendency to produce agynous flowers is particularly strong in this species. Full corroboration of this is found in the eleven examples sent home, in no less than five of which such functionally male flowers were observed on dissection. In all of these the female organs were entirely suppressed.

The anthers, as apparently sometimes is the case in the sections *Eunomocharis* and *Ecristata,* are here seemingly usually almost basifixed, standing rather stiffly upright on the tips of the filaments. Stamens have, however, been seen in which the anthers were attached at a point considerably above their base and were, in consequence, almost versatile.

* Country Life, lv (1924), 141.

8. **Nomocharis Mairei,** Lévl. in Fedde, Repertorium, xii (1913), 287; Balf. f. in Trans. Bot. Soc. Edin., xxvii (1918), 281.

Nomocharis leucantha, Balf. f. in Trans. Bot. Soc. Edin., xxvii (1918), 276.

Plates CCVI, CCXI b.

WESTERN CHINA. *S.W. Szechuan;* "Open grassy slopes on the margins of conifer forests, mountains around Mu-li. Lat. 28° 12′ N. Long. 100° 50′ E. Alt. 10–11,000 ft. Plant of 2½–4 ft. Flowers pure white, or faintly flushed purple on the exterior, spotted rose-purple." In flower, June 1921. G. Forrest, 20441! Plate CCXI b.

"Among scrub and on the margins of thickets, mountains E. of Yungning. Lat. 27° 48′ N. Long. 101° E. Alt. 11–12,000 ft. Plant of 1½–3 ft. Flowers fleshy, satiny-white, blotched and marbled crimson-purple." In flower, July 1922. G. Forrest, 21450!

"Dry pine woods on the steep limestone Rhododendron-clad slopes, with Morina, Stellera, Cypripedium, Androsace, etc., above the lake, Yungning. Alt. 10,000 ft. Outer and inner perianth leaves white. The outer sparsely spotted with reddish purple, the inner thickly and equally spotted all over. Edges of inner perianth leaves frilled and crimped. In the centre is a purple-black eye and the stamens are the same dark colour. Flowers nodding, standing more or less vertical." In flower, May 1921. Kingdon Ward, 4,000!

N.W. Yunnan; "Mountains N.E. of Chungtien. Lat. 28° N. Alt. 12–13,000 ft." In flower, July 1918. G. Forrest, 16644!

"Grassy situations on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. Plant of 18–24 inches. Flowers watery-white, blotched and spotted pale-purple (rarely unspotted), base of perianth deep purplish-maroon, faintly fragrant." In flower, June 1906. G. Forrest, 3844 (white form)! and 3845 (spotted form)! Plate CCVI b.

"Pasture on the margins of pine forests, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–13,000 ft. Plant of 18–30 inches. Flowers satiny-white spotted crimson maroon." In flower, September 1910 (G. Forrest, 7160!), August 1913 (G. Forrest, 11624!) and August 1917 (G. Forrest, 15488!).

"Pâturages du plateau de Ta-hai, alt. 3,200 m. Fleurs blanches monchetées de noir." In flower, July 1912. E. E. Maire, sine no.! Plate CCVI a.

"Pâturages des sommets à Pe-long-tsin, alt. 3,200 m. Fleurs blanches." In flower, July 1912. E. E. Maire, sine no.!

In 1913 Mgr. Léveillé* described *Nomocharis Mairei* from specimens collected by Maire in July of the previous year at Ta-hai in N.E. Yunnan (Plate CCVI a). Under the name *N. leucantha,* Sir Isaac Balfour, in 1918, gave an account of plants obtained by Forrest on the Tali Range, W. Yunnan (Plate CCVI b), on several occasions between the years 1906 and 1913† and, at the same time, took the opportunity of amplifying the inadequate original diagnosis of *N. Mairei* after having examined cotypes in the Edinburgh Herbarium.

From the material then available Sir Isaac was of opinion that the plant occurring in north-eastern Yunnan, a comparatively dry area, was specifically distinct from that found growing in the more moist conditions which exist in western Yunnan. He made clear what characters, in his opinion, distinguished the two forms, when he wrote as follows of *N. Mairei.*‡ "This plant resembles in white flowers with dark spottings *N. leucantha* rather than *N. pardanthina,* which has rose-coloured flowers. It is altogether a smaller plant than *N. leucantha,* has thicker leaves, more close-set, and without the long delicate acuminate tips we find in *N. leucantha.* The flowers, too, are much smaller. Most of the specimens have solitary terminal flowers, but one has a ripening ovary of a second flower below the terminal one." It may be pointed out that such reduction of stature accompanied by the production of fewer and smaller flowers, as well as the development of thicker, more close-set leaves with less acuminate tips, are just the peculiarities which might be expected to make their appearance in those individuals of a species collected in a more than ordinarily dry part of its distributional area. Apart from this, however, the more complete series of specimens now available for study, some of them from Szechuan, shows conclusively that these supposed points of difference can hardly be said to exist. In more than one of Mr Forrest's gatherings,§ indeed, plants can be selected which it is quite impossible to separate from the types of *N. Mairei* in stature, leaf form or number and size of the flowers (Plate CCVI).

The shape and ground-colour of the perianth segments seem to be wonderfully constant under natural conditions and appear to offer a reliable means of recognising *N. Mairei* in the wild state, when it would appear to be one of the most distinct and stable of the closely related forms which together comprise the Section *Eunomocharis.* The petaline segments of the perianth

* Fedde, Repert., xii (1913), 287.
† Trans. Bot. Soc. Edin., xxvii (1918), 276.
‡ Trans. Bot. Soc. Edin., xxvii (1918), 282.
§ Even from amongst the type specimens of *N. leucantha.*

are normally of nearly equal length and breadth, with the result that they have a distinctly orbicular outline as compared with the more elliptic or ovate appearance of the same segments in the allied species (Plate CCXI). The ground-colour of the perianth, on its inner surface at all events, is a watery- or satiny-white in fully mature flowers as opposed to the more or less rosy or red tints usual in *N. pardanthina,* Franch., *N. meleagrina,* Franch., and *N. basilissa,* Farrer. The great disparity between the breadth of the entire outer segments and the deeply, copiously fimbriated inner segments, as well as the very flat appearance of the perianth when completely expanded in life are also characteristic of *N. Mairei.* Under cultivation, however, these points of difference are less marked in some cases and plants grown from seed of typical *N. Mairei* have been seen by the writer which were somewhat intermediate between that species and *N. pardanthina,* having narrower petaline segments and a perianth distinctly rose-tinted on the first opening of the blooms.

Two colour-forms have been found, apparently both by Maire and Forrest. By far the more common is that in which the perianth-segments, particularly the inner, are boldly and thickly spotted with large purplish markings. The second form, of much rarer occurrence evidently, has no such markings, the flowers being of a pure, watery-white. These seem worthy of formal names, and since Sir Isaac Balfour has used the name *leucantha* in connection with the finer of the spotted-flowered plants it is proposed to preserve that connection as follows :—

Forma α. **leucantha.** Perianth watery- or satiny-white, rarely flushed with purple on the exterior, boldly spotted with more or less deep purple on the interior and with deep purple glandular areas at the base of each inner segment.

Forma β. **candida.** Perianth, except the glandular areas of the inner segments, pure watery-white, totally unspotted.

The distributional range of this species, though wider than that of certain of its near allies, is yet comparatively circumscribed, being limited, so far as is at present known, to S.W. Szechuan and N.W. and N.E. Yunnan, between 28° 12′ and 25° 40′ N. latitude at elevations of from 10,000 to 13,000 ft. It would appear to be particularly characteristic of the Tali Range, where Mr Forrest has repeatedly collected it at its best both as regards size and marking of the flowers.

Nomocharis Mairei forma *leucantha* has been in cultivation since 1914, when a plant, raised from seed obtained by Mr Forrest, flowered for the first time in the Royal Botanic Garden,

Edinburgh, where the species still survives. It has there been found that the flowers first borne by seedling plants are usually functionally male, the gynaeceum being abortive, and that this condition may persist for more than one season; later, when greater vigour has resulted from age, fully functional flowers are produced and seed has been successfully ripened. This experience under cultivation provides further proof of the suggestion made regarding *N. aperta,* W. W. Sm. et W. E. Evans,* that the suppression or development of the gynaeceum seems to be governed by nutrition.

Though the anthers were described by Sir Isaac Balfour† as dorsifixed in the present plant and appear to be so in the dried material which the writer has carefully examined, they have been found to be basifixed in the few living flowers seen, the same having been the case in *N. pardanthina,* Franch.

9. **Nomocharis aperta,** W. W. Sm. et W. E. Evans, comb. nov. in Notes, Roy. Bot. Gard. Edin., No. lxix-lxx (Feb. 1925), 96. Plate CCVII.

Lilium oxypetalum, Franch. in Journ. de Bot., vi (1892), 320 excl. syn., non Baker.

Lilium apertum, Franch. in Journ. de Bot., xii (1898), 220 excl. var. *thibeticum.*

Fritillaria yunnanensis, Franch. mss. in scheda excl. var. *tibetica,* Franch. mss. in scheda.

Nomocharis Forrestii, Balf. f. in Trans. Bot. Soc. Edin., xxvii (1918), 293; Journ. Roy. Hort. Soc., xlix (1924), t. 4.

WESTERN CHINA. *S.W. Szechuan;* "Open pasture on the margins of pine forests, Mu-li mountains. Lat. 28° 12′ N. Alt. 11–12,000 ft. Plant of 14–20 inches. Flowers heavily flushed purple with darker markings." In flower, August 1918. G. Forrest, 16663!

"On open alpine meadows, mountains E. of Yungning. Lat. 27° 50′ N. Long. 100° 56′ E. Alt. 12,000 ft. Plant of 16–24 inches. Flowers heavily flushed rose-purple, faintly spotted crimson, with base deep crimson." In flower, July 1921. G. Forrest, 20499!

N.W. Yunnan; "Open moist pasture and amongst scrub on the Mekong-Salween divide. Lat. 28° 12′ N. Alt. 12,000 ft." In flower, July 1917. G. Forrest, 14287 pro pte.

"Open alpine pasture, mountains in the N.E. of the Yangtze

* Infra, p. 31.
† Trans. Bot. Soc. Edin., xxvii (1918), 281.

bend. Lat. 27° 45′ N. Alt. 13,000 ft. Plant of 2 ft. Flowers of satiny, pale rose, spotted and blotched with deep crimson." In flower, July 1913. G. Forrest, 10620!

" Open meadows on the margins of pine forest on the Li-ti-ping. Lat. 27° 12′ N. Long. 99° 38′ E. Alt. 11,500–12,000 ft. Plant of 12–18 inches. Flowers white, more or less flushed rose-purple on exterior, with interior spotted and a crimson-purple blotch at base." In flower, June 1921. G. Forrest, 19551!

" Parmi les buissons sur le Tsang-chan près de Tali. Alt. 3,000 m. Fleures roses, petales moins étalés que celles du *Nomocharis,* pointillés pourpre brun à leur base." In flower, June 1889. Delavay, 4178! Plate CCVII.

" In deep hay-meadows, ascending high-up, on the Chinese side of Chawchi Pass. Alt. 11–12,000 ft. The spotting is very variable in size and colour (as it always is, I believe, in *Nomocharis*)." In flower, July 1920. R. Farrer, 1730!

There is in the present species a strong tendency, seen also in *Nomocharis basilissa,* Farrer, and to a lesser degree in *N. pardanthina,* Franch. *N. Mairei,* Lévl., and others, towards more or less complete abortion of the female parts of the flower and of the associated nectaries of the perianth. In the series of gatherings examined every transition was found from flowers possessing a fully-developed, completely functional ovary to those in which that organ was represented by a minute protuberance, less than 1 mm. in size, sometimes bearing a style. The paired glands, situated at the base of each inner perianth segment, one on either side of the midrib, are normally large, deep crimson and much swollen. In functionally male flowers, as those having a more or less suppressed gynaeceum undoubtedly are, there is a corresponding tendency to reduction in the size, colouration and swelling of the glands, which may even become quite colourless and flat, when they can only with difficulty be distinguished, at least in dried material, from the surrounding tissue of the perianth. This correlated abortion of gynaeceum and glands is not altogether surprising; the latter doubtless are of use in attracting to the flowers the insects which normally fertilise them, so that the factors which produce sterility might be expected indirectly to react also upon the development of the glands. What these factors are cannot with certainty be stated, but it is noticeable that agynous flowers are, in the majority of cases, borne by plants of reduced vigour, suggesting that nutrition may be found to be, if not the only, at least a principal factor in bringing about that condition.

The writer has examined the types of *Lilium apertum,* Franch. in the Paris Herbarium (Plate CCVII) and also cotypes

from the collection of the late Mgr. Léveillé, now in the Edinburgh Herbarium. All these are slender plants bearing solitary flowers with extremely reduced ovaries and glands, the latter being, except in one instance, devoid of distinctive colouration. No styles now exist, but Franchet writes* "stylus incurvus ascendens ovario duplo longior,"—a statement best accounted for by the diminutive size of the non-functional ovaries,† which would make the styles relatively longer than, as shown below, is normally the case.

Nomocharis Forrestii, Balf. f.‡ was described from specimens collected by Forrest in 1913, all of which had perfect flowers with correspondingly well developed glands, so that it is by no means remarkable that they were regarded as a distinct species. Since then the plant has been found again, four times by Forrest and once by Farrer. In this additional material every intermediate condition between the forms described respectively as *N. Forrestii* and *Lilium apertum* can be seen; indeed, even in a single gathering (Forrest 14287) an almost complete series of examples can be observed bridging those extremes, which appear at first sight so different.§ No doubt whatever can remain that all these forms are one and the same species.

From *Nomocharis saluenensis,* Balf. f., its nearest ally, *N. aperta* appears to be constantly separable by its somewhat longer style which moreover slightly exceeds the ovary instead of falling somewhat short of it. In 28 flowers examined, the style was found to vary from 8.5 mm. to 14.5 mm., the corresponding length of the ovary being 8.0 mm. and 11.0 mm. For comparison with the data given on p. 36 in the case of *N. saluenensis,* the average measurements observed in 6 gatherings of *N. aperta* are here shown.‖

Collector's number.	Average length of style.	Average length of ovary.
Forrest 10620	11.7 mm.	10.3 mm.
14287	10.8 ,,	7.9 ,,
16663	9.0 ,,	7.0 ,,
19551	9.8 ,,	6.9 ,,
20499	8.7 ,,	7.8 ,,
Farrer 1730	11.9 ,,	9.3 ,,

As regards the colouration of the flowers, the present plant appears to show much less variation than is the case in *N.*

* Journ. de Bot., xii (1898), 221.

† Franchet's description of the capsule, which concludes his diagnosis, was from fruiting specimens, which the writer has seen, gathered at quite a different time from the flowering examples on which the rest of his account is based.

‡ Trans. Bot. Soc. Edin., xxvii (1918), 293.

§ For this reason it has been found impossible to distinguish, as var. *Forrestii*, the fully functional condition of the species, as was at one time contemplated. Cf. Notes, R.B.G., Edin., No. lxix-lxx (Feb. 1925), 96.

‖ Only measurements of fully functional ovaries and styles are included.

saluenensis. The ground-colour seems always to be of a more or less distinct rose or rose-purple, the actual depth of tint varying, according to Mr Forrest's notes, from "pale-rose" to "heavily flushed rose-purple." The spotting of the perianth-segments is somewhat different in the two species; in *N. saluenensis* it is best described as being composed of minute, sharply defined dots speckling only the base of each segment, whereas, in *N. aperta,* whether so restricted or distributed equally over the whole inner surface of the flower, the spots tend to be larger, less clearly outlined and less intense in colour, these features becoming rapidly more pronounced the further the markings are situated from the base of the perianth. So variable are the plants of any gathering as regards the extent of this spotting that it is quite impossible to segregate under distinctive varietal names any of the forms represented. In support of this contention Mr Farrer's remark, regarding his No. 1730, may here be repeated. "The spotting," he says, "is very variable in size and colour (as it always is, I believe, in *Nomocharis*)."

After a careful examination of the glandular areas of the inner perianth-segments, there seems little doubt that the description of them in their fully developed state given by Sir Isaac Balfour is apt to be misleading. He refers to them in these words:* "petaline segments bearing a basal dark-coloured two-lobed nectariferous gland the large lobes separated by the prominent midrib, each lobe with a free rounded swollen not fringed or crested flap" the same idea being conveyed in the latin diagnosis as follows:† "segmenta . . . . petalina basi bifoveolata foviolae cujusque labio integra." To the writer these nectaries appear to be much swollen areas, narrow below and broader above, with the result that, not infrequently, in the drying press, the upper margin becomes folded in such a way as to suggest the presence of an apical 'pocket' inclosed by a 'flap' or 'lip,' whereas no such structure actually exists.

So far as is known, *N. aperta* has a very limited distribution, being confined to a small area in S.W. Szechuan and N.W. Yunnan, with an altitudinal range of from 11,000 to 13,000 ft. above sea-level.

10. **Nomocharis saluenensis,** Balf. f. in Trans. Bot. Soc. Edin., xxvii (1918), 294.

Lilium apertum, Franch. var. *thibeticum,* Franch. in Journ. de Bot., xii (1898), 221.

* Trans. Bot. Soc. Edin., xxvii (1918), 294. † l. c., p. 293.

Fritillaria yunnanensis, Franch. mss. in scheda var. *tibetica,* Franch. mss. in scheda.

Nomocharis tricolor, Balf. f. in Trans. Bot. Soc. Edin., xxvii (1918), 296.

Plate CCVIII.

WESTERN CHINA AND UPPER BURMA. *S.E. Tibet;* "On open alpine meadows in Ka-gwr-pu, Mekong-Salween divide, Tsarong. Lat. 28° 40′ N. Alt. 12–13,000 ft. Plant of 1–1½ ft. Flowers flushed pale purple-rose (sometimes yellowish below), with a few crimson markings at base." In flower, July 1918. G. Forrest, 16716! and 16718! Same locality, alt. 14,000 ft. In flower, July 1913. Kingdon Ward, 801!

"In and on the margins of thickets, Salween-Kiu-chiang divide, Tsarong. Lat. 28° 40′ N. Plant of 10–16 inches. Flowers flushed pale purplish-rose, blotched and minutely spotted deep crimson at the base." In flower, July 1919. G. Forrest, 18871!

"Open pasture on the margins of thickets, openings in pine forests and open bouldery slopes, Salween-Kiu-chiang divide, Tsarong. Lat. 28° 40′ N. Long. 98° 15′ E. Plant of 1½–3 ft. Flowers white, purplish on exterior, with a deep crimson blotch or only a faint colouration at base." In flower, August 1919. G. Forrest, 18929! and 18932!

"On open alpine meadows, Salween-Kiu-chiang divide, Tsarong. Lat. 28° 24′ N. Long. 98° 24′ E. Alt. 13–14,000 ft. Plant of 12–26 inches. Flowers pure white, very faintly marked crimson on interior base." In flower, August 1921. G. Forrest, 20035!

"By streams amongst heavy grass in shady situations, Salween-Kiu-chiang divide, Tsarong. Lat. 28° 24′ N. Long. 98° 24′ E. Alt. 12–13,000 ft. Plant of 20–24 inches. Flowers pale-yellow, minutely speckled maroon on interior base." In flower, August 1921. G. Forrest, 20048!

W. Szechuan; "Région du Mékong, aux environs de Séla. Fleur rouge." In flower, July 1895. J. A. Soulié, 1031! Plate CCVIII.

N.W. Yunnan; "Open lush meadows on the margins of pine forests on the Bei-ma Shan. Lat. 28° 18′ N. Long. 99° 10′ E. Alt. 11,000 ft. Plant of 1 to fully 2 ft. Flowers rose-purple, with a clear yellowish centre minutely spotted and based deep crimson-purple." In flower, July 1921. G. Forrest, 19617!

"Open moist situations on the Mekong-Salween divide. Lat. 28° 12′ N. Alt. 9–10,500 ft. Plant of 2–3 ft. Flowers

pale whitish rose marked purplish-rose on interior." In flower, September 1904. G. Forrest, 493!*

"Open moist pasture and amongst scrub, Mekong-Salween divide. Lat. 28° 12′ N. Alt. 12,000 ft." In flower, July 1917. G. Forrest, 14287 pro pte.!

"Openings in and on the margins of mixed forest, Mekong-Salween divide. Lat. 28° N. Long. 98° 40′ E. Alt. 10–11,000 ft. Plant of 10–16 inches. Flowers white, flushed rose-purple on the exterior, speckled purple on interior base." In flower, August 1921. G. Forrest, 20076!

"Tsekou." Lat. 28° N. Long. 98° 52′ E. In flower and young fruit, June 1911. Monbeig, in Herb. Edin., 68/1912!

"Open lush meadows, Mekong-Salween divide. Lat. 27° 30′ N. Long. 98° 56′ E. Alt. 12–13,000 ft. Plant 16–24 inches. Flowers white, flushed purplish-rose on exterior, interior base marked crimson." In flower, July 1921. G. Forrest, 19833!

Upper Burma; "Abounds in the cliffs and meadow-slopes at the top of Moku-ji Pass, alt. 12,000 ft., extending down into deep meadows in the valley-head over in China. Flowers one to eight, minutely dotted impartially all over with crimson and themselves of a most lovely soft rose-scarlet, central eye very dark lucent green with a narrow dim margin of yellow almost concealed by minute black speckling." In flower, July 1920. R. Farrer, 1785!

The writer has to thank the Director of the Paris Herbarium for an opportunity of examining the type of *Lilium apertum,* Franch. var. *thibeticum,* Franch. (Plate CCVIII), the name under which the present plant was first described. As a result of the examination it is clear that the view taken by Sir Isaac Balfour† is correct; this is indeed a distinct species and the position and name he assigned to it should be retained.

Nomocharis saluenensis, Balf. f. is undoubtedly very closely allied to *Nomocharis aperta,* as it is proposed to call Franchet's *Lilium apertum;* but may be distinguished from the latter by the possession of a shorter style and by certain differences in the markings of the perianth segments as well as their usually less conspicuously swollen glandular areas.

In 38 flowers taken from 14 distinct gatherings, which the writer has examined, the style in the present species was found to vary from 3.5 mm. to 7.0 mm. in length; only in one instance, in which the perianth had already fallen, did it measure as much as 8.0 mm. The length of the ovary, in the same examples, almost invariably exceeded that of the style by a

* G. Forrest No. 457, from the same locality is identical with his No. 493, despite what is said to the contrary in Trans. Bot. Soc. Edin., xxvii (1918), 296.

† See Trans. Bot. Soc. Edin., xxvii (1918), 295.

few mm. The exceptions, three in number, were met with in starved and dwarfed plants in which, no doubt, that tendency to suppression of the gynaeceum which, under such circumstances, is so marked a peculiarity of several species of the genus, had begun to operate; in these three cases the ovary was shorter than usual and exactly equalled the style.* For comparison with the measurements given on page 32, in the case of *N. aperta,* the average lengths of style and ovary in ten gatherings of *N. saluenensis* made by Mr Forrest are given below :—

Forrest's number.	Average length of style.	Average length of ovary.
493	4·7 mm.	7·7 mm.
16716	6·0 ,,	7·5 ,,
16718	5·5 ,,	7·5 ,,
18929	5·0 ,,	6·8 ,,
18932	5·2 ,,	7·3 ,,
19617	6·3 ,,	7·3 ,,
19833	5·5 ,,	8·1 ,,
20035	5·2 ,,	6·1 ,,
20048	5·1 ,,	6·4 ,,
20076	5·2 ,,	7·3 ,,

The colouration of the perianth, as disclosed by the numerous collectors' notes given above, appears to be subject to great variation. While its exterior would seem to be, in most cases, flushed with rose-purple, its interior is stated to be generally white, very rarely pale yellow or, not infrequently, more or less tinted with rose-purple, sometimes with a basal eye of yellow. The spotting, or rather speckling, is much finer than is usual in *N. aperta* and is moreover almost always more confined to the base of the perianth, while the glandular areas of the inner segments, usually more or less deep crimson, may be much paler or even greenish.

Should these various colour forms prove stable and be introduced into cultivation, they would undoubtedly be horticulturally valuable and deserving of differentiation. It is scarcely possible to suggest a system of grouping and naming them which is not open to much criticism, but the following may be tentatively put forward :—

Forma α. **typica.** Perianth white or very rarely pale yellow within, exterior in most cases flushed with rose-purple. Glandular areas usually deep crimson, sometimes paler or greenish.

To this form would seem to belong the following :—Forrest 18929, 18932, 19833, 20035, 20048, 20076.

Forma β. **purpurascens.** Perianth more or less deeply tinted rose-purple within. Otherwise as in forma α.

* This agrees sufficiently well with Franchet's description of *Lilium apertum* var. *thibeticum*, of which he writes: "stylus claviformis ovario brevior, vel illo vix longior" Journ. de Bot., xii (1898), 221.

To this probably belong :—Forrest 493, 16718, 18871; Farrer 1785.

Forma γ. **tricolor.*** Perianth rose-purple above, more or less yellow in its lower third; glandular areas deep purple-red.

To this belong :—Ward 801; Forrest 16716, 19617.

The experience obtained this season (1925) at the Royal Botanic Garden, Edinburgh, seems to indicate, however, that these colour forms cannot be depended upon to come true. Two batches of plants, raised from seed sent by Mr Forrest under numbers referring to specimens having a white perianth, produced flowers of a bright rose-purple colour; while some of the plants concerned bore, along with the normal blooms, others showing the greenish-yellow centre typical of *N. tricolor,* Balf. f., this apparently being caused by some check to the normal development of the perianth.

The nectaries or basal glandular areas of the inner perianth-segments vary much in size, as well as in colouration and are never as conspicuous as is the case in the fully developed condition of *N. aperta.* In *N. saluenensis,* on the other hand, they are commonly by no means strongly developed, and indeed are quite frequently more or less obsolete, especially in the more weakly or stunted plants. These glandular areas are, in previous accounts, said to have a ' pocket,' ' lip ' or ' flap ' above. It seems unlikely that they warrant such a description in life, and the writer is inclined to the opinion that they are merely more or less thickened, cushion-like areas, the apparent ' flap ' or ' pocket,' when it appears in herbarium material, being only the result of pressure in drying.

The species is seemingly abundant within a small area in the extreme S.E. of Tibet and N.W. of Yunnan, from 27° 28′ to 28° N. lat. and from 98° to 99° E. long., while it has been recorded by Franchet from western Szechuan and has been found by Farrer just over the Burmese frontier from Yunnan. It has been gathered at elevations of from 9,000 to 14,000 ft.

A number of specimens, of the form here named *purpurascens,* have flowered in the Royal Botanic Garden, Edinburgh, having been raised from seed collected by Mr Forrest in 1921-22. The blooms are stiffly upright and widely open, the gynaeceum being usually rather smaller then is normally the case but functional, and the stamens markedly versatile.

* This form was described, under the name *Nomocharis tricolor,* by Sir I. B. Balfour in Trans. Bot. Soc. Edin., xxvii (1918), 296. It has, however, the short style and ovary so characteristic of *N. saluenensis* and, with the whole series in view, one can only regard it as belonging to that species. Other forms occur having the perianth wholly pale yellow or wholly rose-purple, so that the present is not an altogether unexpected combination of tints.

11. **Nomocharis Henrici,** E. H. Wilson comb. nov., The Lilies of Eastern Asia (1925), 13. Plates CCIX, CCXII b.

Lilium Henrici, Franch. in Journ. de Bot., xii (1898), 220.

Lilium Franchetianum, Lévl., Liliographia (1919), 7.

WESTERN CHINA. *W. Yunnan;* " Rive gauche du Mékong, vers Lou-kou (Prince Henri d'Orléans, 11 juillet 1895) "! Plate CCIX.

" Margins of forests and among open scrub, Mekong-Salween divide. Lat. 26° 30′ N. Alt. 10–11,000 ft. Plant of 2–2½ ft. Flowers white, more or less flushed purplish-rose on exterior, with a few deep crimson markings on interior base." In flower, July 1919. G. Forrest, 18208!

" In and on margins of thickets, Mekong-Salween divide. Lat. 26° 30′ N. Alt. 10–11,000 ft. Plant of 2–4 ft. Flowers pure white, or faintly flushed purplish on exterior, interior base crimson, no other markings." In flower, July 1919. G. Forrest, 18250! Plate CCXII b.

" In cane-brakes and on the margins of thickets, Mekong-Salween divide. Lat. 26° 10′ N. Alt. 10,000 ft. Plant 2–3 ft. Bulb deep purple-crimson. Flowers white, very faintly flushed rose-purple on exterior, crimson at base of interior, no other markings." In flower, August 1919. G. Forrest, 18282!

" Margins of pine forests and in shady side valleys, Shweli-Salween divide. Lat. 25° 30′ N. Alt. 10,000 ft. Plant 1–2 ft. Flowers white with a few crimson markings at base." In flower, July 1918. G. Forrest, 17590!

" Shady margins of thickets and forests, Shweli-Salween divide. Lat. 25° 25′ N. Alt. 10–11,000 ft. Plant of 1½–2 ft. Flowers white flushed on exterior purplish-rose." In flower, June 1918. G. Forrest, 17487!

" Open stony pasture on margins of pine forests, Shweli-Salween divide. Lat. 25° 20′ N. Alt. 10–11,000 ft. Plant of 12–24 inches. Flowers white, flushed rose on exterior and faintly marked at base on interior." In flower, July 1913. G. Forrest, 12024!

" Open stony pasture, Shweli-Salween divide. Lat. 25° 20′ N. Alt. 9,000 ft. Plant 2–3 ft. Flowers white, flushed purplish-rose on exterior." In flower, August 1917. G. Forrest, 15827!

This interesting species, described by Franchet in 1898 under the name *Lilium Henrici* should, the writer believes, be placed in the genus *Nomocharis* close to *N. saluenensis,* Balf. f. to which, both in general appearance and detailed structure, it is undoubtedly closely allied.*

Several of Mr Forrest's gatherings were sent home under the name '*Nomocharis sp.*' and were not, for that reason, at first associated with *Lilium Henrici.*

In the latter plant, as well as in the nearly related *N. aperta*, W. W. Sm. et W. E. Evans, the glandular base of each petaline segment of the perianth, which is generally clearly distinguishable as a swollen cushion-like area, becoming flap-like above when subjected to pressure in drying, is, under certain circumstances already referred to* hardly or not at all differentiated. For this reason it would seem that the objection which might be urged against the inclusion of *Lilium Henrici* in *Nomocharis*, namely the complete and constant absence from its perianth of such structurally modified glandular areas, though at first sight a somewhat weighty one, is not actually of much importance. These basal areas are usually of a deep crimson colour in the present species, just as they typically are in *N. saluenensis* and *N. aperta*, while the form of the perianth as a whole, spreading from the base and not at all trumpet shaped, is that of a *Nomocharis* as opposed to a *Lilium*.

The type specimen (Plate CCIX), collected by Prince Henri d'Orléans in 1895, which has been examined by courtesy of the Director of the Paris Herbarium, has remarkably long pedicels as compared with most of the numerous specimens sent home by Mr Forrest. Of the latter, those plants obtained on the Mekong-Salween divide between lat. 26° 10′ N. and lat. 26° 30′ N., especially his No. 18250, agree well with the type in all respects; while these from the Shweli-Salween divide to the south-west, between lat. 25° 20′ N. and lat. 25° 30′ N., tend to be less robust and to have much shorter pedicels. As might be expected, the taller, stouter plants are the more floriferous, bearing sometimes as many as seven flowers; and in addition, at the base of each outer segment of the perianth, show a distinct gibbosity like that of the type. On the other hand, those specimens which are most slender bear only a solitary flower and the bases of their outer perianth-segment are only slightly or even not at all gibbous. Between these extremes every intermediate condition can be found among the rich gatherings made by Mr Forrest so that, with the whole series as a guide, the writer has no hesitation in pronouncing them all conspecific.

In the present species there would appear to be remarkably little variation in the colouration of the perianth. The length of the style is constantly relatively great—from almost twice to about thrice the length of the ovary in the numerous flowers examined—and is apparently very characteristic of *N. Henrici* as compared with allied species, as are also the large, long anthers (Plate CCXII b). The measurements of style and ovary in carefully dissected flowers of 7 of Mr Forrest's numbers are given below :—

* Ante p. 31.

Forrest's number.	Length of style.	Length of ovary.
12024	15.0 mm.	7.5 mm.
15827	21.0 ,,	10.5 ,,
17487	19.5 ,,	8.5 ,,
17590	21.5 ,,	9.0 ,,
18208	27.0 ,,	9.0 ,,
18250	26.5 ,,	9.5 ,,
18282	24.5 ,,	9.0 ,,

So far as is known, the distribution of *N. Henrici,* E. H. Wilson is very limited indeed. Excluding a fragmentary specimen obtained by Kingdon Ward in 1919 at Laktang on the Burmese side, which may possibly belong to the present species, it seems to be confined to those parts of the Mekong-Salween and Shweli-Salween divides lying between 26° 30′ N. and 25° 20′ N. latitude, within the boundaries of Yunnan. So limited is this area that it can be enclosed by a rectangle only some eighty miles in length by thirty in breadth. The remarkably restricted areas occupied by several species of this genus are worth emphasising; for example, neither *N. saluenensis,* Balf. f. nor *N. Souliei,* W. W. Sm. et W. E. Evans both apparently locally of frequent occurrence a short distance to the north, nor *N. aperta,* W. W. Sm. et W. E. Evans which is distributed to the north and east, are found, seemingly, with *N. Henrici.* Indeed the only other species definitely known to inhabit the same ground, as shown by Mr Forrest's careful explorations, is *N. pardanthina,* Franch. of which only a single gathering has been made (Forrest 18274).

The altitudes at which *N. Henrici* has been found range from 9,000 to 11,000 ft. above sea-level.

12. **Nomocharis Souliei,** W. W. Sm. et W. E. Evans, comb. nov. in Notes, R.B.G. Edin., No. lxix-lxx (Feb. 1925), 102. Plate CCX.

Fritillaria Souliei, Franch. in Journ. de Bot., xii (1898), 221.

WESTERN CHINA. *S.E. Tibet;* "On open stony meadows, Salween-Kiu-chiang divide, Tsarong. Lat. 28° 40′ N. Long. 98° 15′ E." In flower, July 1919. G. Forrest, 18983!

"Open moist meadows on the margins of scrub, Doker-la, Mekong-Salween divide. Lat. 28° 20′ N. Long. 98° 40′ E. Alt. 13,000 ft. Plant of 9–14 inches. Flowers nodding, fragrant, deep crimson-maroon." In flower, July 1921. G. Forrest, 19832!

"Moist pasture in and on the margins of thickets, Londre Pass, Mekong-Salween divide. Lat. 28° 14′ N. Long. 98° 40′ E. Alt. 12–13,000 ft. Plant of 6–14 inches. Flowers

nodding, fragrant, deep crimson-maroon." In flower, July 1921. G. Forrest, 19632! Plate CCX.

" Grassy openings in pine forests, Mekong-Salween divide. Lat. 28° 12′ N. Alt. 10–11,000 ft. Flowers purplish-crimson, fragrant." In flower, October 1904. G. Forrest, 495! and 497!

" East slope of the Mekong-Salween divide. Alt. 13,000 ft. An alpine meadow and open forest plant. The bulbs are eaten by the Tibetans." In flower, June 1911. Kingdon Ward, 154!

S.W. Szechuan; "à Dong-ching-tchra-tsong, près de Tsékou, sur le Mékong." J. A. Soulié, 1029!*

N. W. Yunnan; " Open, moist, stony pasture and amongst scrub, Mekong-Salween divide. Lat. 28° 12′ N. Alt. 12–13,000 ft. Plant of 9–18 inches. Flowers nodding, deep brown-crimson, strongly fragrant." In flower, July 1917. G. Forrest, 14178!

" On margins of scrub on alpine meadows, Mekong-Salween divide. Lat. 27° 30′ N. Long. 98° 56′ E. Alt. 14,000 ft." In fruit, September 1921. G. Forrest, 20725!

" Open stony pasture, mountains of the Chungtien Plateau. Lat. 27° 55′ N. Alt. 12–13,000 ft. Plant 9–18 inches. Flowers deep black-crimson, fragrant." In flower, July 1913. G. Forrest, 10641!

The material from which Franchet drew up his description of *Fritillaria Souliei* lacked bulbs, this being clearly stated in the diagnosis. Had these been present, it seems likely that he would have regarded the plant rather as a *Lilium* than a *Fritillaria,* for on the same page† he transfers *Fritillaria lophophora,* Bur. et Franch. to the former genus, largely on account of its scaly lily-like bulbs, a character which it shares with the present species (Plate CCX). Again, in indicating its affinity, Franchet links *Fritillaria Souliei* to another plant having similar bulbs when he writes of it thus.‡ "Espèce voisine surtout du *F. Gardneriana,* Wall.; elle s'en distingue facilement par ses feuilles lancéolées et son style allongé." There would appear to be no doubt that the best expression of the relationship of both *F. lophophora* and *F. Gardneriana* is given by including them in *Nomocharis,* as redescribed by Sir Isaac Balfour,§ rather than in either *Fritillaria* or *Lilium* and consequently the present species, showing as it does their form of perianth and bulb, should be placed in the same genus.

Somewhat less easily determined is its position within

* This locality is stated by Franchet to be in Szechuan, though Tsekou on the Mekong is in Yunnan, fully 30 miles from the nearest point in Szechuan.

† Journ. de Bot., xii (1898), 221.

‡ l. c., p. 222.

§ Trans. Bot. Soc. Edin., xxvii (1918), 292.

Nomocharis; it might, in fact, be put into either of the Sections *Oxypetala* or *Ecristata*. If, as Franchet suggests, it is indeed closely related to *Nomocharis Gardneriana* (=*N. nana*, E. H. Wilson) it should go beside that species in the former; on the other hand it seems more natural to include it in the latter, since its perianth-segments are constantly and completely glabrous, a condition which would appear to be quite exceptional in those plants clearly belonging to the *Oxypetala*, all the species of that Section having typically a crested perianth.

The bulbs of *Nomocharis Souliei** measure in the dried state 2–3.5 cm. in length by 1.25–2.0 cm. in width and are composed of rather few, somewhat loosely arranged, lanceolate scales, which diminish in size towards the heart of the bulb. The larger scales are usually about 5–8 mm. in breadth but in rare instances may reach as much as 14 mm. The outermost are generally more or less membranous, frequently being purple-tinted at the base, while the previous season's stem seems to arise within them so that they doubtless represent the remains of the bulb of a former year. The majority of the scales, which only in one instance numbered as many as twelve, are thick and fleshy, becoming hard in drying.

The colour of the perianth appears to show little variation, but the width of the segments as well as the shape of their apices, are much less constant. Some idea of this may be obtained from the following measurements, taken from specimens included in a single gathering (Forrest 14178). In these the outer perianth-segments were found, in different flowers, to vary from 1.2 × 3.3 cm. to 1.9 × 2.7 cm. or, in other words, their width in some plants was about one-third, in others nearly two-thirds of their length. Where the segments were narrow, they had a more or less acute apex, whereas the broadest were rounded above, very obtuse, with a somewhat hooded apex. Franchet states† that the length of the style is thrice that of the ovary, evidently believing that this character separated the present species from its allies. In the writer's experience the styles are commonly relatively much shorter than this; the longest seen were only very slightly over twice the length of the ovary, while just as frequently they barely exceeded it. It would thus appear certain that great differences in this character occur, and that it is of no value as a means of differentiating *N. Souliei* from related forms.

The geographical distribution of the species, so far as our present knowledge goes, would seem to be restricted to a small

* Bulbus parvus, 2.0–3.5 cm. longus, 1.25–2.0 cm. latus, laxe pauci-squamatus, squamis lanceolatis vel rarius ovato-lanceolatis, 5–8 (rarissime 14) mm. latis, ad 3–5 cm. longis, exterioribus (2 vel 3) saepe membranaceis purpureo-tinctis, interioribus carnosis.

† Journ. de Bot., xii (1898), 222.

area including the extreme north-west corner of Yunnan and the adjoining parts of Tibet and Szechuan, if indeed the specimens collected by Soulié actually came from the latter Province. Mr Forrest has not met with the plant north of lat. 27° 30′ N., and only between long. 98° 15′ E. and long. 100° E. at an altitude of from 10,000 to 14,000 ft.

Numerical List of Herbarium Material referred to in this Paper.

Delavay, J. M.

28, 237 } N. lophophora.
257 N. pardanthina.
4178 N. aperta.

Drummond, J. R.

Garhwal, 1904 sine no. N. nana.

Dungboo.

Chumbi et Phari, 1878-79 sine no. N. nana.

Duthie, J. F.

137 N. nana.
182 N. oxypetala.
500 N. nana.
6031 N. oxypetala.
6032 N. nana.
6039 N. oxypetala.

Farrer, R.

988, 1031 } N. pardanthina var. Farreri.
1687 N. euxantha var. imberbis.
1730 N. aperta.
1738 N. basilissa.
1785 N. saluenensis.
1800 a N. basilissa.

Forrest, G.

457, 493 } N. saluenensis.
495, 497 } N. Souliei.
2390 N. lophophora.
3844, 3845 } N. Mairei.
5816 N. pardanthina.
6156 N. lophophora.
7160 N. Mairei.
9024 Nomocharis sp., in fruit.
10620 N. aperta.
10624 N. lophophora.
10641 N. Souliei.
11624 N. Mairei.

(Forrest, G.—contd.)

12024 N. Henrici.
14109 N. lophophora var. Wardii.
14178 N. Souliei.
14184 N. meleagrina.
14287 N. aperta et N. saluenensis.
14768, 14996 } Nomocharis sp., in fruit.
15488 N. Mairei.
15827 N. Henrici.
16644 N. Mairei.
16663 N. aperta.
16664 N. lophophora.
16716 N. saluenensis.
16717 N. meleagrina.
16718 N. saluenensis.
16738 N. euxantha.
17265, 17266 } Nomocharis sp., in fruit.
17487, 17590, 18208, 18250 } N. Henrici.
18274 N. pardanthina.
18282 N. Henrici.
18871, 18929, 18932 } N. saluenensis.
18983 N. Souliei.
19003 N. meleagrina.
19527 N. euxantha.
19551 N. aperta.
19617 N. saluenensis.
19632, 19832 } N. Souliei.
19833 N. saluenensis.
19846 N. lophophora var. Wardii.
20035, 20048 } N. saluenensis.
20051 N. meleagrina.
20076 N. saluenensis.
20441 N. Mairei.
20499 N. aperta.
20725 N. Souliei.
20858, 20874 } Nomocharis sp., in fruit.
21450 N. Mairei.
23074 N. lophophora.

Hobson, H. E.
Yatung, 1897 sine no. N. nana.

Hooker, J. D.
Zemu, sine no. N. nana.

King's Collector.
Yuo-so, 1882 sine no. } N. nana.
611 }

Lace, J. H.
289 N. oxypetala.
333 N. nana.

Maire, E. E.
Ta-hai et Pe-long-tsin, 1912 sine no. N. Mairei.

Monbeig, T.
Tsekou, 1911 sine no. N. saluenensis.

d'Orléans, Prince H.
Szechuan, 1890 sine no. N. lophophora.
Lou-kou, 1895 sine no. N. Henrici.

Pratt, A. E.
261 } N. lophophora.
568 }

Reid, J. R.
Kumaon, 1886, sine no. N. oxypetala et N. nana.

Rohmoo.
935 }
951 } N. nana.
1097 }

Schneider, C.
1512 N. lophophora.

Soulié, J. A.
296 } N. lophophora.
326 }
1029 N. Souliei.
1031 N. saluenensis.
1032 N. meleagrina.

Strachey, R. et Winterbottom, J. E.
"Lilium No. 4." N. oxypetala et N. nana.

Smith, W. W.
3104 N. nana.

Smith, W. W. et Cave, G. H.
1376 N. nana.

Wallich, N.
Wall. Cat. 5080 N. nana.

Ward, F. K.
154 N. Souliei.
156 N. lophophora var. Wardii.
157 } N. lophophora.
711 }
741 N. lophophora var. Wardii.
758 N. euxantha?
801 N. saluenensis.
813 N. lophophora var. Wardii.
1686 }
1809 } N. pardanthina var. Farreri.
1810 }
4000 N. Mairei.
4074 N. lophophora.

Incomplete Material.

The following field-numbers, covering material examined while preparing this paper refer to fruiting specimens of *Nomocharis* which, for that reason, cannot be determined with certainty.

G. Forrest, Nos. 9024, 14768, 14996, 17265, 17266, 20858 and 20874.

List of the Species of Nomocharis and their Synonyms :—

Fritillaria flavida, Rendle = N. nana, *E. H. Wilson.*
Fritillaria Gardneriana, Wall. = N. nana, *E. H. Wilson.*
Fritillaria lophophora, Bur. et Franch. = N. lophophora, *Balf. f.*
Fritillaria oxypetala, Royle = N. oxypetala, *Balf. f.*
Fritillaria Souliei, Franch. = N. Souliei, *W. W. Sm. et W. E. Evans.*
Fritillaria Stracheyi, Hook. f. = N. nana, *E. H. Wilson.*
Fritillaria yunnanensis, Franch. mss. in scheda = N. aperta, *W. W. Sm. et W. E. Evans.*
Fritillaria yunnanensis, var. *tibetica*, Franch. mss. in scheda = N. saluenensis, *Balf. f.*

Lilium apertum, Franch. = N. aperta, *W. W. Sm. et W. E. Evans.*
Lilium apertum, var. *thibeticum*, Franch. = N. saluenensis, *Balf. f.*
Lilium Franchetianum, Lévl. = N. Henrici, *E. H. Wilson.*
Lilium Henrici, Franch. = N. Henrici, *E. H. Wilson.*
Lilium lophophorum, Franch. = N. lophophora, *Balf. f.*
Lilium nanum, Klotzsch = N. nana, *E. H. Wilson.*
Lilium oxypetalum, Baker = N. oxypetala, *Balf. f.*, et N. nana, *E. H. Wilson.*
Lilium oxypetalum, Franch. = N. aperta, *W. W. Sm. et W. E. Evans.*
Lilium triceps, Klotzsch = N. oxypetala, *Balf. f.*

Nomocharis aperta, *W. W. Sm. et W. E. Evans*, p. 30.
Nomocharis basilissa, *Farrer, sp. nov.*; p. 25.
Nomocharis euxantha, *W. W. Sm. et W. E. Evans, sp. nov.*; p. 14.
Nomocharis Farreri, Cox nomen = N. pardanthina, *Franch.*, var. Farreri, *W. E. Evans, comb. nov.*, p. 20.
Nomocharis flavida, Balf. f. = N. nana, *E. H. Wilson.*
Nomocharis Forrestii, Balf. f. = N. aperta. *W. W. Sm. et W. E. Evans.*
Nomocharis Henrici, *E. H. Wilson*; p. 38.
Nomocharis leucantha, Balf. f. = N. Mairei, *fa.* leucantha, *W. E. Evans, comb. nov.*; pp. 27 and 29.
Nomocharis lophophora, *Balf. f.*; p. 11.
Nomocharis Mairei, *Lévl.*; p. 27.
Nomocharis meleagrina, *Franch.*; p. 23.
Nomocharis nana, *E. H. Wilson*; p. 16.
Nomocharis oxypetala, *Balf. f.*; p. 7.
Nomocharis oxypetala, E. H. Wilson = N. nana, *E. H. Wilson* et N. oxypetala, *Balf. f.*
Nomocharis pardanthina, *Franch.*; p. 19.
Nomocharis saluenensis, *Balf. f.*; p. 33.
Nomocharis Souliei, *W. W. Sm. et W. E. Evans*; p. 40.
Nomocharis Stracheyi, Balf. f. = N. nana, *E. H. Wilson.*
Nomocharis tricolor, Balf. f. = N. saluenensis, *fa.* tricolor, *W. E. Evans, comb. nov.*; p. 37.
Nomocharis Wardii, Balf. f. = N. lophophora, *var.* Wardii, *W. W. Sm. et W. E. Evans*,; p. 12.

EXPLANATION OF PLATES.

Illustrating Mr Evans' Paper on the Genus Nomocharis.

(Photographs by R. M. Adam, Assistant in Studio, Royal Botanic Garden, Edinburgh.)

PLATE CXCIX. *N. oxypetala*, Balf. f. and *N. nana*, E. H. Wilson. Strachey and Winterbottom "Lilium No. 4" in Herb. Kew.; × ½. The central fruiting specimen is the former species, the remainder the latter.

PLATE CC. a. *N. oxypetala*, Balf. f. J. H. Lace 289 in Herb. Edin.; × ½.

b. *N. nana*, E. H. Wilson. J. H. Lace 333, in Herb. Edin.; × ½. Typical specimens of the two species to show the characters, including the longer style of the former.

PLATE CCI. *N. euxantha*, W. W. Sm. et W. E. Evans, sp. nov. Type, Forrest 16738, in Herb. Edin.; × ½.

PLATE CCII. *N. nana*, E. H. Wilson. Specimens quoted as *Fritillaria Gardneriana*, Wall. by Baker but later re-named *F. Stracheyi*, Hook. f., in Herb. Kew.; × ½.

PLATE CCIII. *N. nana*, E. H. Wilson. Cotypes of *Fritillaria flavida*, Rendle in Herb. Edin.; × ½.

PLATE CCIV. *N. meleagrina*, Franch. Type, Soulié 1032, in Herb. Paris; × ½.

PLATE CCV. *N. basilissa*, Farrer, sp. nov. Type, Farrer 1738, in Herb. Edin.; × ½.

PLATE CCVI. a. *N. Mairei*, Lévl.; part of type in Herb. Lévl. (now in Herb. Edin.); × ½.

b. Part of type of *N. leucantha*, Balf. f., Forrest 3845, in Herb. Edin., × ½. Placed side by side for comparison.

PLATE CCVII. *N. aperta*, W. W. Sm. et W. E. Evans. Type of *Lilium apertum*, Franch., Delavay 4178, in Herb. Paris; × ½.

PLATE CCVIII. *N. saluenensis*, Balf. f. Type of *Lilium apertum*, var. *thibetica*, Franch., Soulié 103, in Herb. Paris; × ½.

PLATE CCIX. *N. Henrici*, E. H. Wilson. Type of *Lilium Henrici*, Franch. in Herb. Paris; × ½.

PLATE CCX. *N Souliei*, W. W. Sm. et W. E. Evans. Typical specimens showing the bulb, Forrest 19632, in Herb. Edin.; × ½.

PLATE CCXI. a. *N. meleagrina*, Franch. Dissection of flower of Forrest 14184, in Herb. Edin.; × ⅔.

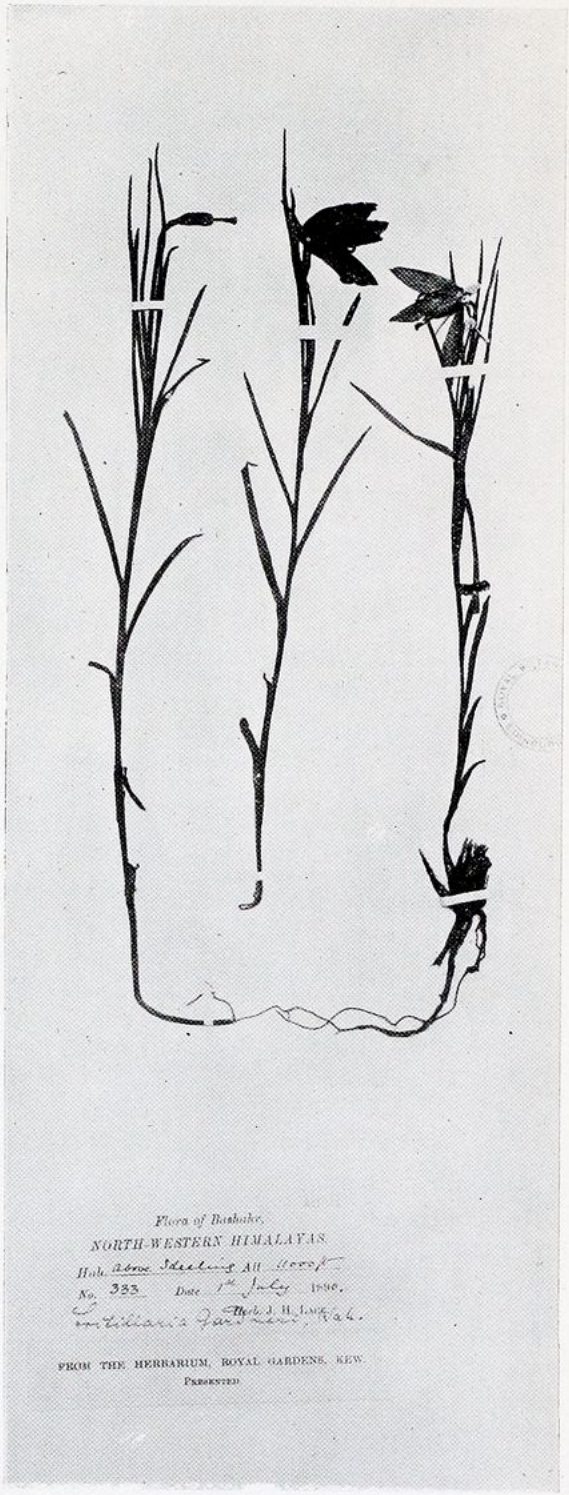
b. *N. Mairei*, Lévl. Dissection of flower of Forrest 20441, in Herb. Edin.; × ⅔.

PLATE CCXII. a *N. basilissa*, Farrer, sp. nov. Dissection of flower of Farrer 1738, in Herb. Edin.; × ⅔.

b. *N. Henrici*, E. H. Wilson. Dissection of flower of Forrest 18250, in Herb. Edin., × ⅔.

Nomocharis oxypetala (Royle), Balf. f. and N. nana (Klotzsch), E. H. Wilson

a.

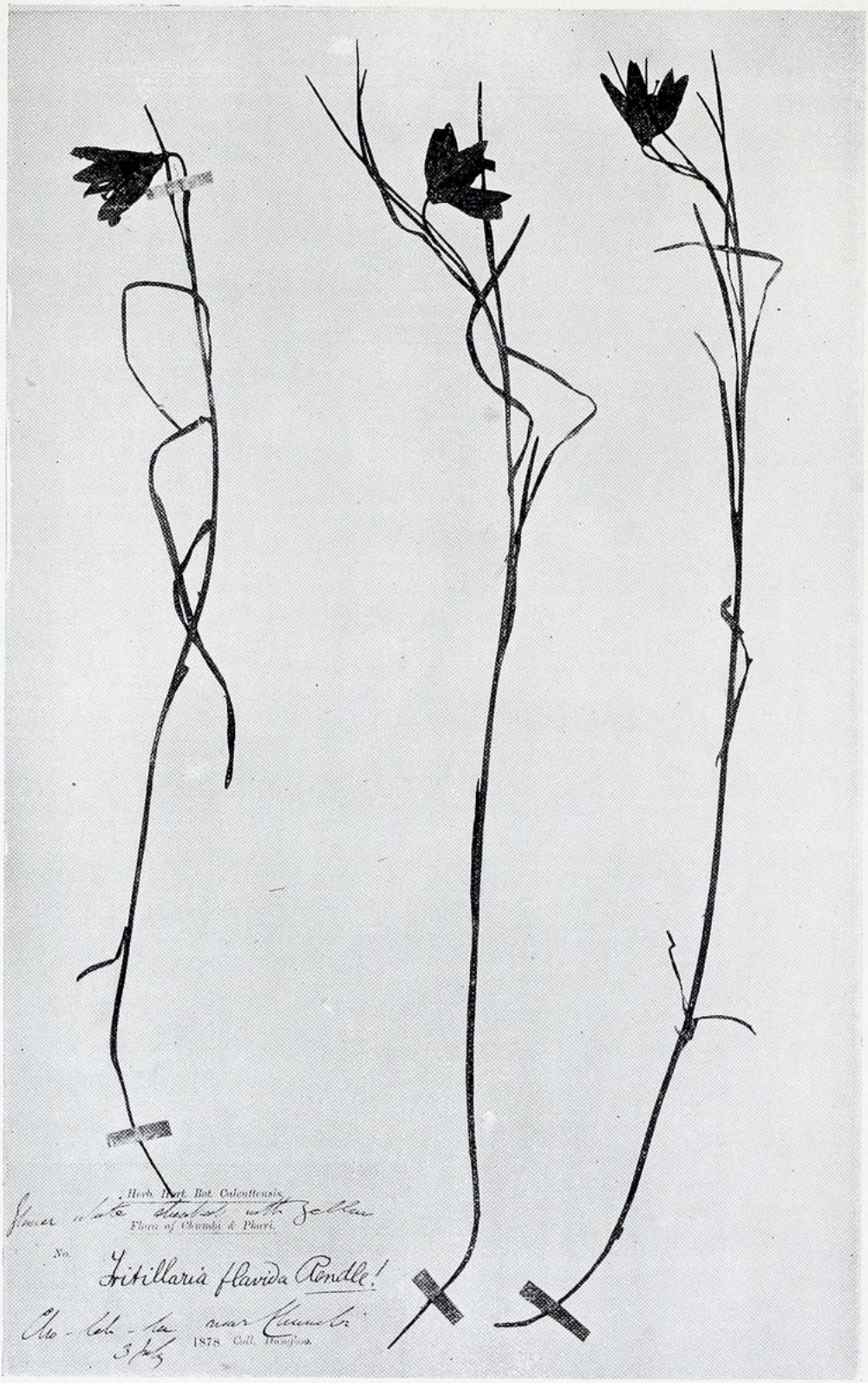


b.

a. Nomocharis oxypetala (Royle), Balf. f. b. N. nana (Klotzsch), E. H. Wilson

Nomocharis euxantha, W. W. Sm. et W. E. Evans

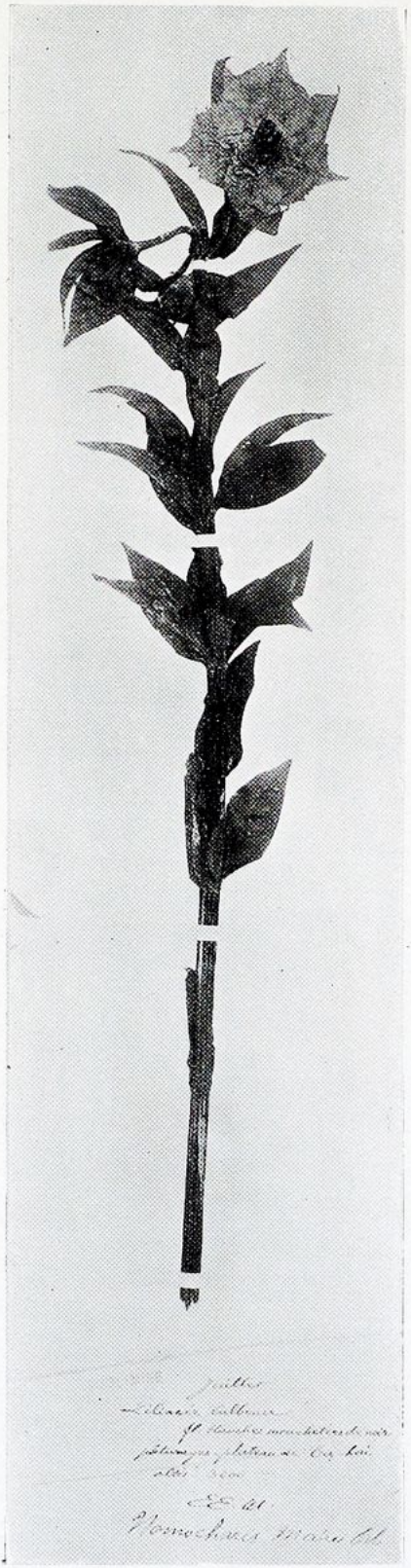
Nomocharis nana (Klotzsch), E. H. Wilson

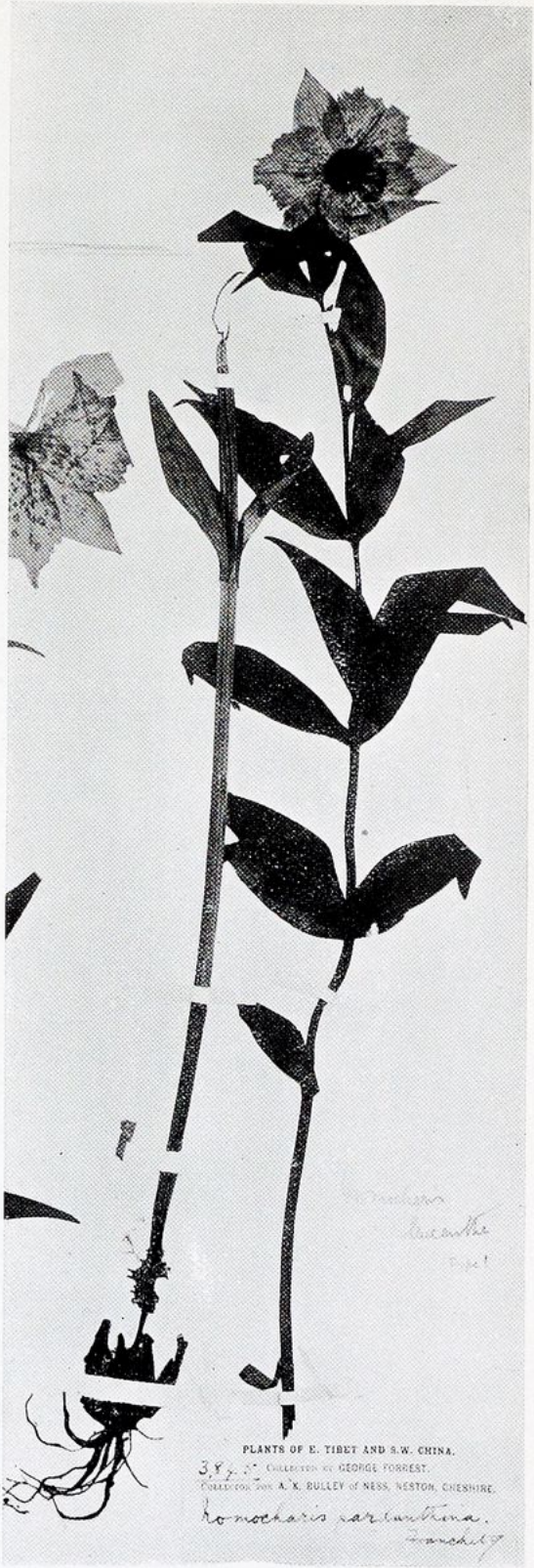


Nomocharis nana (Klotzsch), E. H. Wilson

Nomocharis meleagrina, Franch

Nomocharis basilissa, Farrer





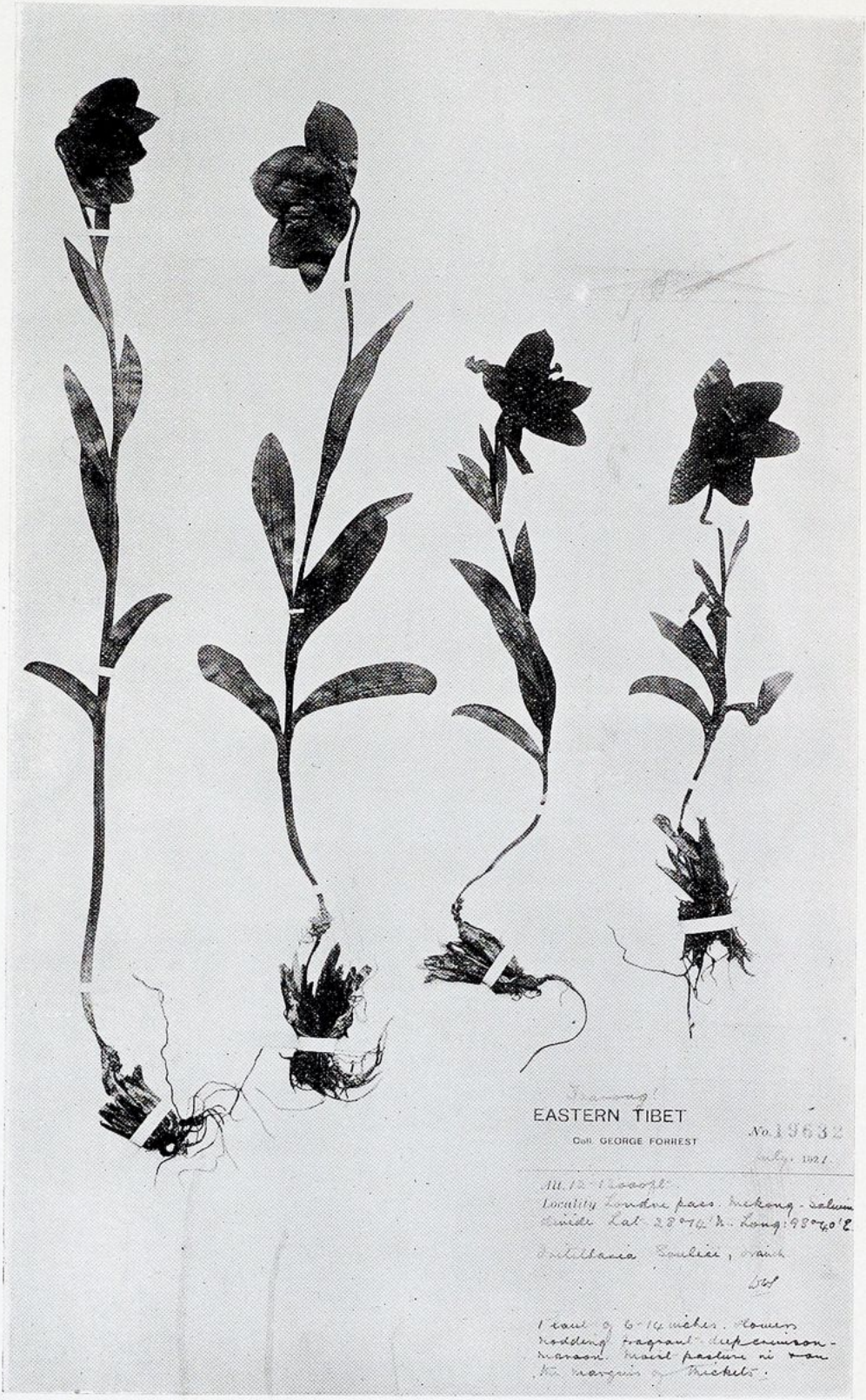
a. b.

Nomocharis Mairei, Lévl.

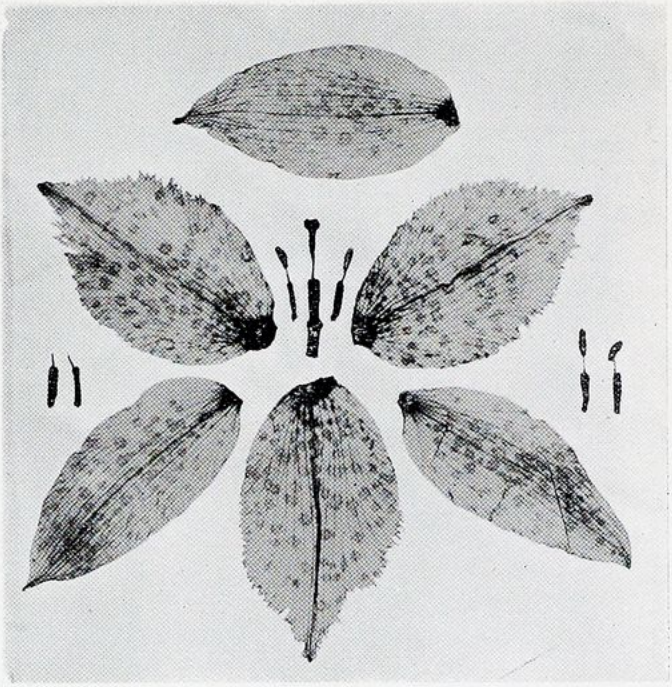
Nomocharis aperta (Franch), W. W. Sm. et W. E. Evans

Nomocharis saluensis, Balf. f.

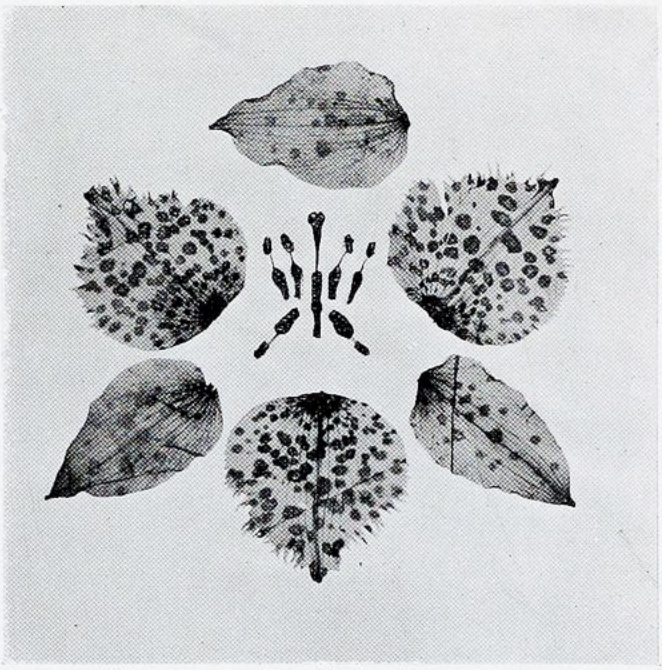
Nomocharis Henrici (Franch.), E. H. Wilson



Nomocharis Souliei (Franch), W. W. Sm. et W. E. Evans

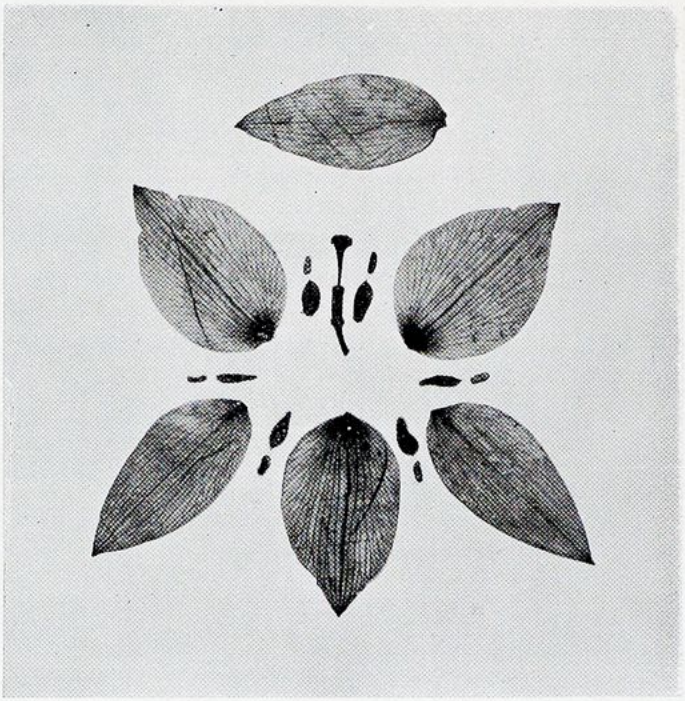


a.

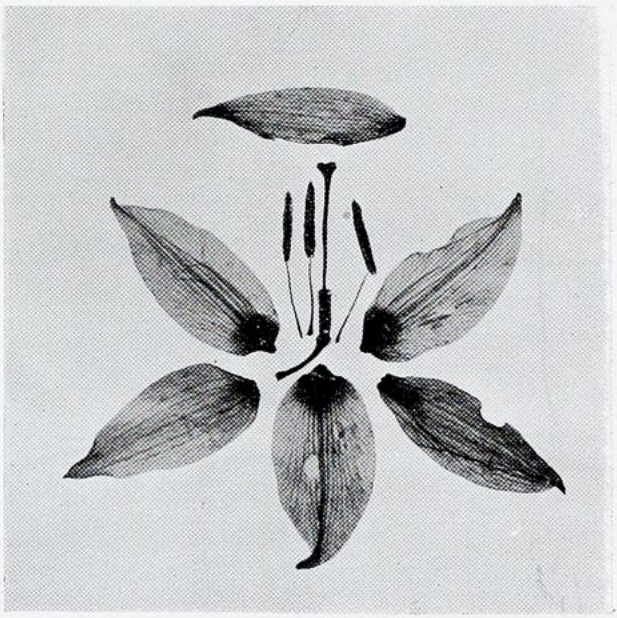


b.

a. Nomocharis meleagrina, Franch.
b. Nomocharis Mairei, Lévl.



a.



b.

a. Nomocharis basilissa, Farrer
b. Nomocharis Henrici (Franch.), E. H. Wilson