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be seen without careful search. Moreover, it might be readily confounded with *S. sylvatica* or one of its hybrids; and this has in fact happened within the last few weeks, when the plant was submitted to an eminent botanist.

I am not aware that *S. alpina* has ever been met with in Britain as an introduced plant, and it seems most unlikely that, possessing no beauty or interest except to a botanist, it should have been deliberately sown or planted in many different places in such a locality.

With regard to its limited range, which will no doubt be extended on further search being made, a comparison may be made with several other plants which are confined to one or at most two limited areas in Britain, and have a similar distribution in neighbouring countries on the Continent: e. g. *Arabis stricta* (France, Spain), *Helianthemum polifolium* (France, Spain, Belgium), and *Cotoneaster integerrima* (France, Spain, Belgium, Scandinavia). *Stachys alpina* occurs in France, Spain, and Belgium.

In spite of its name, judging by its distribution and by the plants in whose company it is to be found, *S. alpina* is by no means an alpine plant. Amongst the species with which it is associated on the Gloucestershire hill are *Pyrus Aria*, *Valeriana Mikanii*, *Campanula glomerata*, *Stachys sylvatica*, *Polygonatum officinale* and *Convallaria majalis*; and it may be noted that, during a recent visit to South Tyrol in company with Mr. J. W. White, we met with *S. alpina* accompanied by all these plants.

Taking into account all the circumstances, Mr. White, who, as I have mentioned, has seen the plant growing both in Gloucestershire and in South Tyrol, fully concurs with me in the opinion that we are justified in looking upon *Stachys alpina* as an addition to the British flora.

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## NOTES ON SPECIES OF LOTUS § PEDROSIA.

BY THE REV. R. P. MURRAY, M.A., F.L.S.

The Pedrosian species of *Lotus* present a very interesting study to any botanist who may find himself at the right time of year in any of the oceanic islands of the North Atlantic; at least in Madeira, the Canaries, or the Cape Verds. One species only seems to reach the Azores. The text-book for Madeira is of course Lowe's *Flora of Madeira*, while many of the Canarian forms are described and figured in Webb and Berthelot's well-known *Phytographia Canariensis*. The Cape Verd species I only know from herbarium specimens and from Webb's *Spicilegia Gorgonea*.

Each group of islands possesses its own peculiar species. *Lotus glaucus* is common to Madeira and the Canaries, and *L. argyroides* to Madeira and the Azores. *L. arenarius*, a plant of Spain, Portugal, and North-west Africa, and the only European \* *Pedrosia*, is found also in the Canaries. *L. maroccanus* Ball is endemic in Marocco.

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\* *Lotus Salzmanni* Boiss. et Reut., judging from a specimen sent out by Messrs. Porta and Rigo under this name (No. 82, iter iii. hispanicum, 1891), shows a distinct approach to *Pedrosia* in the character of the style.



*LOTUS GLAUCUS* Ait. This is quite the most common of the species, occurring both in Madeira and the Canaries, though it does not reach either the Azores or Cape Verd islands. The plant sent from the last-named group under this name is, I believe, quite distinct, and has been described under the name of *L. Bollei* by Dr. H. Christ in Engler's *Bot. Jahrbücher* ix. 123 (1887).

Generally a well-marked species, easily recognisable, but several slightly varying forms have been described as species. The typical plant is quite prostrate, forming a dense mat of entangled branches, with short peduncles rarely exceeding three-quarters of an inch in length, and stipules similar to the leaflets in size and shape.

This is the common plant of the Madeira coast, and I cannot distinguish from it *Pedrosia leptophylla*, under which name Lowe describes the grand Canarian form of the species. It is true that of *P. leptophylla* it is said "foliolis stipulisque subdifformibus," but I can find no other difference, and a careful examination of Madeira specimens will show many instances in which the same character may be observed.

*Pedrosia tenella* Lowe (Tenerife) differs by "its peculiar bristly or hispidulous pubescence spreading or reflexed on the branches and fringing the leaflets," but this character is variable, and at most it can only be considered as a slight variety or local form.

*P. neglecta* Lowe (Madeira) differs considerably in habit, has stipules unlike the leaflets, and longer peduncles (one to three inches); but is probably only a very marked variety of *L. glaucus*.

*P. florida* Lowe (Porto Santo) seems to be a mere local state of *L. glaucus*, and appears from a paragraph in *Flora of Madeira*, 178, to have been finally discarded as a species by its author.

*LOTUS GLAUCUS* Ait. var. nov. *ANGUSTIFOLIUS*. Prostrate, much branched, the branches not interlacing. Leaves all distinctly stalked, the petioles mostly 1-2 lines long; leaflets linear acute or narrowly obovate-cuneate, three or four times longer than broad; stipules similar, but smaller, exceeding the petiole.

A very striking plant when well marked, but a long series shows many intermediate forms connecting it with ordinary *L. glaucus*. Gran Canaria: Caldera de Bandama, Ginamar, Las Palmas, Gando. Here also, I think, may be best placed a curious plant which I once found on coast rocks between S. Cruz and S. Andres, Tenerife.

In habit and general appearance this variety bears much the same resemblance to the type that *L. tenuis* Kit. bears to *L. corniculatus* L. *Lotus glaucus* seems never to be found far from the sea. It occurs in Madeira and the adjoining islets, and in Tenerife, Gran Canaria, and Fuerteventura.

*Lotus salvagensis*, n. sp. or n. var.—Biennial, procumbent, with numerous branched stems, clothed with short adpressed hairs, becoming bald below. Leaves very shortly petioled, leaflets and stipules dissimilar. Leaflets narrowly obovate, about three times as long as broad (not six to eight times, as in *Pedrosia Paivæ* Lowe), subpetiolate, clothed with scattered adpressed hairs. Stipules exceeding the petiole, unequal sided, generally markedly so, rather



acute, broader below, distinctly subpetiolate. Peduncles very short, hardly exceeding  $\frac{1}{4}$  in. in length, 1- to 3- or 4-flowered (in the specimens before me nearly all 2-flowered). Flowers yellow. Bract normally trifoliate. Calyx clothed with adpressed hairs, subbilabiate, teeth subulate, about as long as the tube. Style with a short but very distinct tooth. Stigma capitate. Pod about  $\frac{3}{4}$  in. long, straight, rather thick, more or less strangulate from abortion of seeds, which are about twelve to fifteen in number in the specimens before me.

Salvages (Grand Piton); apparently common. Collected by Ogilvey Grant, Esq., in May, 1895.

Very distinct from *Pedrosia Paivæ*, judging from Lowe's description and from the specimens (which are in very poor condition) at Kew. I should have referred these to ordinary *L. glaucus*. No doubt *L. salvagensis* comes also very near that species, if taken in an extended sense, but even so it seems to be sufficiently distinct to be kept apart. In the structure of the stipules it approaches *Pedrosia neglecta* Lowe, but differs markedly in the extremely short peduncles, a character in which it resembles *P. Paivæ*, and which led Lowe (in the absence of flowers) to surmise that the last-mentioned form belonged to the group of which *L. macranthus* Lowe may be taken as the type. But I can see no valid ground for this suggestion.

LOTUS SESSILIFOLIUS DC. DeCandolle remarks that this species is allied to *L. glaucus*, but differs by its perennial habit, shrubby stem, longer and narrower leaves, larger and more numerous flowers, and cylindrical pods. I doubt whether any of these characters can be absolutely depended on except the perennial habit and somewhat shrubby stems. The leaves of *L. glaucus* var. *angustifolius* sometimes hardly differ from those of *L. sessilifolius* except in being stalked, while I have occasionally, though very rarely, found plants of *L. sessilifolius* with a few of the leaves with a distinct though short petiole. The floral characters are still less to be depended on. However, the habit and general appearance of the plant is very different from that of *L. glaucus*, and I have no doubt that it is a good species. It is quite confined to the Canarian archipelago, occurring, always in maritime or sub-maritime situations, in Tenerife (Guimar, S. Cruz, S. Juan de la Rambla). It is also reported from Hierro (Bourgeau, 798) and from Gomera (near S. Sebastiano), but these plants require further study. The plant from S. Juan de la Rambla is remarkable for the very silky-villous clothing of the calyx, and for a tendency to produce a certain number of more or less spatulate leaves.

LOTUS LANZEROTTENSIS Webb & Berth. Another species of the *glaucus* group, but readily distinguishable from *L. glaucus* by the broad obcordate leaflets and roundish or obcordate-rhomboid subpetiolate stipules, recalling those of *L. salvagensis*. The clothing of the leaves recalls *L. sessilifolius*.

Canaries: only in the islands of Lanzerote and Fuerteventura, from the latter of which a var. *villosa* is recorded in *Phyt. Can.*



**Lotus dumetorum** (Webb MS.) Bourgeau 803, 1321, 1322. Perennial, erect or ascending, much branched, sparingly pilose with adpressed hairs. Leaves shortly but distinctly stalked, clothed with adpressed hairs, leaflets oblanceolate; stipules similar to the leaflets, much exceeding the petiole, subpetiolate; peduncles 10–15 lines long; bract normally trifoliate; heads conspicuous, 3- to 5- or 6-flowered, yellow; calyx bilabiate, teeth subulate, exceeding the tube; pod linear, cylindric, torulose, often strangulate, 5- to 12- or 14-seeded.

Tenerife (Anaga Hills, Bufadero, Taganana). These localities are all close together.

A very curious plant, known only, as I believe, from Bourgeau's specimens, until I refound it a few years since on the Anaga Hills. Cosson suggested that it might be a variety of *L. arenarius* Brot., and this view was adopted by Ball, who identified it with a plant collected in Marocco, and gave it the varietal name of *Webbii*, remarking "differt a specie habitu procumbente, herba hirsutissima incana, foliis minoribus, sed characteres graviore satis constantes non video." This, however, does not at all suit the Tenerife plant, and I cannot help suspecting that some confusion has occurred. At all events the varietal name "*Webbii*" must disappear, so far as the Tenerife plant is concerned. Lowe (*Flora of Madeira*, 176) thinks that "there seems less objection to 'Bourgeau's plants' being regarded as extremely luxuriant states or varieties of *L. glaucus* Ait."; but inclining rather to consider them as "constituting a distinct and undescribed species." The perennial habit with distinct woody rootstock seems by itself at once to remove *L. dumetorum* from all connexion with *L. arenarius*, which is, I believe, strictly annual. The stipules, also, are very different. Nor, after studying the magnificent specimens which I collected in June, 1894, on the Anaga Hills, can I consent to regard it as only a luxuriant state of *L. glaucus*. It is suffrutescent, not biennial, and other differences may be found, especially in the leaves, stipules, and calyx, which compel me to treat it as a distinct species.

**Lotus emeroides**, n. sp.—Perennial or subperennial, much branched, sparingly villose-pubescent. Leaves distinctly stalked; leaflets roundish obovate, about 3 in. long; stipules resembling the leaves, but smaller, subpetiolate, equalling or exceeding the petiole. Peduncles 1–2 in. long; bract trifoliate; heads 3–4-flowered, flowers yellow, rather large; calyx hairy only on the ribs, bilabiate, teeth ciliate, 2 superior triangular-lanceolate, 3 inferior (shorter) subulate-lanceolate, all longer than the tube; style flattened, the tooth very distinct. Pods short, about an inch long, slightly winged, almost as in *L. siliquosus*, torulose, often strangulate, 8–10-seeded. Seeds (immature) testaceous.

Gomera (Degollada de S. Sebastiano, on rocks; near Hermigua, in bushy ground).

There is a specimen of this plant in herb. Webb (Florence), collected near Hermigua "in arvis," to which the MS. name of *emeroides* is appended. I have therefore adopted it as the specific name.



LOTUS ARENARIUS Brot. This species is recorded from Palma (Fuencaliente) in *Phyt. Can.* The only specimen which I have seen is scrappy, and perhaps hardly sufficient for a satisfactory identification if it stood alone. But in June, 1892, I found specimens about the Combrecita (3800 ft.) in the same island, which seem to me indistinguishable from certain Portuguese plants collected near Cintra, which must, at least for the present, be placed under *L. arenarius*, though from the description in the *Prodromus Floræ Hispanicæ* they should be very near *L. canescens* Kze., but as I have never seen authentic examples of this plant, I am afraid to speak more definitely.

In his essay on Canarian botany (Engler's *Bot. Jahrbücher*, ix. 1887) Dr. Christ has described a new species of *Lotus* from Palma (Barranco de Angustias, where it was collected by Hillebrand) under the name of *L. Hillebrandii*. This he treats as intermediate between *L. spartioides* and *L. arenarius*, quoting from Hillebrand's notes: "Affinis *L. spartioides* Webb et *arenarii* Brot. erectus"; and adding, after a long diagnosis, "*L. spartioides* Webb *Phyt.* 81 differt statura altiore diffusa, foliis minoribus sericeis linearibus stipulis conformibus, pedunculis tenuibus paucifloris, capitulis folio trifoliato suffultis. *L. arenarius* Brot. differt caule decumbente foliolis obovatis pube breviori, calycis dentibus lanceolatis vexillo brevior, legumine minus nodoso." I have seen the types, and, except in one particular, they seem to be identical with my Combrecita plant. I can see no resemblance whatever to *L. spartioides*, and suspect that neither Dr. Hillebrand nor Dr. Christ had much acquaintance with that species, except from description, or from herbarium "scraps." The erect habit ascribed to the plant may easily have been accidental. There remains only the absence of a floral bract, which is certainly curious. But it is a somewhat variable character in other species of the genus. It is strange that Dr. Christ in the same essay says of *L. arenarius* "capitulis floralibus aphyllis," which as a general statement is certainly incorrect. I have therefore no hesitation in considering *L. Hillebrandii* as identical with my Combrecita plant, which I believe to be a marked form or subspecies of *L. arenarius* Brot.

LOTUS CAMPYLOCLADUS Webb & Berth. A difficult and apparently little known species, which seems to have been confused, sometimes with *L. holosericeus*, sometimes with *L. arenarius*. I suspect that it is confined to Tenerife, though there is a scrap from Palma so named in herb. Webb. This probably belongs to *L. arenarius*.

The original description in *Phyt. Can.* is as follows:—"L. villosus, foliis breviter petiolatis, foliolis anguste obovato-cuneatis; stipulis ovatis petiolo subbrevioribus, calyce ultra medium diviso, laciniis lineari-lanceolatis, apice subulatis, stylo 1-dentato." I find, however, that the stipules equal or exceed the petiole, and are subpetiolate. The habit is more or less prostrate or ascending; the colour a curious ashy green. From *L. holosericeus* this species may be readily distinguished by its much less erect habit, the stipules unlike the leaflets, which are frequently retuse, and by the



much less forward direction assumed by the lateral leaflets. From *L. arenarius* it differs by the shape of the stipules, the much smaller leaves, and by its biennial (? subperennial) duration. Nevertheless several authors (Webb, Masferrer, Colmeiro) agree in thinking that it is almost too closely allied, and may perhaps be only of subspecific rank. For the present, however, it seems better to retain it as distinct.

Bourgeau's *L. holosericeus* of Pl. Can. 1325 is, judging from my specimen, really *L. campylocladus*. It was collected in Tenerife (Cañadas del Teyde, in rupibus). I collected it, once only, among loose pumice above Guimar in the same island at about 4500 ft.

**LOTUS HOLOSERICEUS** Webb & Berth. One of the most striking and distinct of the group. Probably quite confined to Gran Canaria, and extremely local even there. The type specimens were found near Mogan, and I have collected it in the same neighbourhood, and also near Tiraxana. This would give a range of 2000–3000 ft. above sea-level.

This species may be easily known from *L. campylocladus* by its more erect habit, by the very beautiful silky-villose clothing of the whole plant, and by the stipules similar to the leaflets. The lateral leaflets are markedly assurgent, *i. e.* lying almost close to the terminal leaflet, instead of spreading at right angles. Webb notes: "Foliola inferiora petiolata, superiora subsessilia."

In herb. Webb a plant from Palma (Caldera) is labelled *L. holosericeus*; I have no note about it, but have little doubt that it is really *L. arenarius*. And in herb. Schinz there is a specimen from S. Juan de la Rambla in Tenerife also labelled *L. holosericeus*. Unless my memory deceives me, it really belongs to an aberrant form of *L. sessilifolius*, which I have myself collected in the same locality.

**LOTUS SPARTIOIDES** Webb & Berth. This species, like the last, is confined to Gran Canaria, where it seems to be exceedingly rare. I have only once seen it; on the mountain side near Artenara, at above 4000 ft. It formed a large patch, several feet across, and being in full flower was conspicuous at a distance of nearly a quarter of a mile.

Very distinct from every other species; it is recognizable at once by its shrubby habit, distinctly stalked leaves, linear leaflets and stipules, lateral leaflets forming an acute angle with the terminal, long peduncles, furnished with an inconspicuous, often unifoliate, floral bract, and linear-lanceolate setaceous calyx teeth.

**LOTUS ARGYRODES.** I venture to propose this name for the Porto Santo and Madeira plant described by Lowe (Hook. *J. Bot.* viii. 293) under the name of *Pedrosia argentea* (*Lotus argenteus* Masferrer, 1880). Unfortunately this name had been already used to designate an Egyptian and totally different species, *viz.* *Lotus argenteus* Webb & Berth. = *Dorycnium argenteum* Delile. A new name is therefore necessary.

The range of the species is somewhat peculiar. It occurs (but rarely) along a line of somewhat over thirty miles from Porto Santo to the Desertas, just touching the extreme eastern point of Madeira



half way between them. Its only other known habitat is in the island of S. Mary, one of the Azores, whence it was sent by the late Mr. T. C. Hunt. Through (as I suppose) quoting from memory, Watson has recorded this plant in Godman's *The Azores* under the name of "*Pedrosia macrantha* Lowe?"; adding, "Whether this be the *macrantha* or *argentea* of Lowe, I cannot absolutely determine, though the long and decidedly stalked legumes seem to place the Azore specimens under the former name." But a reference to the *Flora of Madeira* shows that the stalked legumes are characteristic of *P. argentea*, i. e. *Lotus argyroides*, not of *L. macranthus*. And my own specimen from the Azores (T. C. Hunt, 1848) agrees perfectly with Madeira *L. argyroides*, and not at all with *L. macranthus*, which should therefore be erased from the Azores Flora.

## OBSERVATIONS ON PLANT PLANKTON.\*

BY GEORGE MURRAY, F.R.S.

AT the request of the Board I have carried out a series of observations on the minute free-floating vegetation, especially of the west coast. The importance of a study of such organisms, as the basis of nutrition of all life in the sea, has long been recognised, but very little has hitherto been done in the way of investigation. The main observations were made [in 1896] on board the 'Garland' in three series, viz. the first from 26th March to 6th April; the second from 28th July to 15th August; and the third from 2nd December to 8th December. In March to April, the observations were made in the North Sea, and on the west coast of Loch Linnhe, the Sound of Jura, and principally in the Clyde sea-area. In July to August a week was spent in visiting the former stations and others in the Clyde sea-area, and the remaining time in the Sound of Islay, Sound of Jura, Firth of Lorn, Loch Etive, Loch Linnhe, Loch Aber, Sound of Mull, the sea round Rum, Eigg, and Ardnamurchan, Loch Nevis, Loch Hourn, Raasay Sound, &c. In December, observations were made in Loch Aber, Loch Linnhe, Firth of Lorn, and the Clyde sea-area. The material obtained at these times was all preserved, and its working out in detail occupied me for a considerable period in London.

METHODS.—In addition to tow-netting with fine silk nets—the method of capture usually employed—I have made use of a cylindrical silk bag, about 1½ feet long and 3 or 4 inches wide. This was tied to the nozzle of the hose, there being a lateral overflow vent near the top of the bag; and, on pumping through it with the donkey engine from an intake pipe 8 feet below the surface, good results were obtained. This method, first employed by Dr. John Murray, enables one to work when steaming, and is often convenient in weather that is too rough for tow-netting. The fixing and

\* Reprinted from the *Fifteenth Annual Report of the Fishery Board of Scotland*, part iii. pp. 212–218.



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Ogilvey Grant, Esq., iu May, 1895.

Very distinct from *Pedrosia Paha*, judging from Lowe's description and from the specimens (which are in very poor condition) at Kew. I should have referred these to ordinary *L. glaucm*. No doubt *L. salvagemis* comes also very near that species, if taken in an extended sense, but even so it seems to be sufficiently distinct to be kept apart. In the structure of the stipules it approaches *Pedrosin nerjlecta* Lowe, but diflers markedly iu the extremely short peduncles, a character in which it resembles *P. Paivte*, and which led Lowe (in the absence of flowers) to surmise that the last-mentioned form belonged to the group of which *L. macranthus* Lowe may be taken as the type. But I can see no valid ground for this suggestion.

*Lotus sessilifolius* DC. DeCandoUe remarks that this species is allied to *L. fjlaucus*, but differs by its perennial habit, shrubby stem, longer and narrower leaves, larger and more numerous flowers, and cylindrical pods. I doubt whether any of these characters can be absolutely depended on except the perennial habit and somewhat shrubby stems. The leaves of *L. ylaucus* var. *an<jmtifolius* sometimes hardly differ from those of *L. sessilifolius* except in being stalked, while I have occasionally, though very rarely, found plants of *L. sessilifolius* with a few of the leaves with a distinct though short petiole. The floral characters are still less to be depended on. However, the habit and general appearance of the plant is very different from that of *L. glaucus*, and I have no doubt that it is a good species. It is quite confined to the Canarian



archipelago, occurring, always in maritime or sub-maritime situations, in Tenerife (Guimar, S. Cruz, S. Juan de la Rambla). It is also reported from Hierro (Bourgeau, 798) and from Gomera (near S. Sebastiano), but these plants require further study. The plant from S. Juan de la Rambla is remarkable for the very silky-villous clothing of the calyx, and for a tendency to produce a certain number of more or less spatulate leaves.

*Lotus lanzerottensis* Webb & Berth. Another species of the *filia* group, but readily distinguishable from *L. filia* by the broad obcordate leaflets and roundish or obcordate-rhomboid subpetiolate stipules, recalling those of *L. salvatensis*. The clothing of the leaves recalls *L. sessilifolius*.

Canaries : only in the islands of Lanzerote and Fuerteventura, from the latter of which a var. *villosa* is recorded in Phyt. Can.

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384 NOTES ON SPECIES OF *LOTUS* ^ PKDTIOSIA.

*Lotus dumetorum* (Webb MS.) Bourgeau 803, 1321, 1322.

Perennial, erect or ascending, much branched, sparingly pilose with adpressed hairs. Leaves shortly but distinctly stalked, clothed with adpressed hairs, leaflets oblanceolate ; stipules similar to the leaflets, much exceeding the petiole, subpetiolate ; peduncles 10-15 lines long; bract normally trifoliate; heads conspicuous, 3- to 5- or 6-flowered, yellow; calyx bilabiate, teeth subulate, exceeding



the tube ; pod linear, cylindrical, torulose, often strangulate, 5- to 12- or 14-seeded.

Tenerife (Anaga Hills, Bufadero, Taganana). These localities are all close together.

A very curious plant, known only, as I believe, from Bourgeau's specimens, until I refound it a few years since on the Anaga Hills. Cosson suggested that it might be a variety of *L. arenarius* Brot., and this view was adopted by Ball, who identified it with a plant collected in Marocco, and gave it the varietal name of *Wehhii*, remarking "differt a specie habitu procumbente, herba hirsutissima incana, foliis minoribus, sed characteres graviores satis constantes non video." This, however, does not at all suit the Tenerife plant, and I cannot help suspecting that some confusion has occurred. At all events the varietal name "*Wehhii*" must disappear, so far as the Tenerife plant is concerned. Lowe [Flora of Madeira, 176) thinks that " there seems less objection to ' Bourgeau's plants ' being regarded as extremely luxuriant states or varieties of *L. glaucus* Ait." ; but inclining rather to consider them as "constituting a distinct and undescribed species." The perennial habit with distinct woody rootstock seems by itself at once to remove *L. dumetorum* from all connexion with *L. arenarius*, which is, I believe, strictly annual. The stipules, also, are very different. Nor, after studying the magnificent specimens which I collected in June, 1894, on the Anaga Hills, can I consent to regard it as only a luxuriant state of *L. glaucus*. It is suffrutescent, not biennial, and other differences may be found, especially in the leaves, stipules, and calyx, which compel me to treat it as a distinct species.



*Lotus emeroides*, n. sp. — Perennial or subperennial, much branched, sparingly villose-pubescent. Leaves distinctly stalked ; leaflets roundish obovate, about 3 in. long; stipules resembling the leaves, but smaller, subpetiolate, equalling or exceeding the petiole. Peduncles 1-2 in. long ; bract trifoliate ; heads 3-4-flowered, flowers yellow, rather large; calyx hairy only on the ribs, bilabiate, teeth ciliate, 2 superior triangular-lanceolate, 3 inferior (shorter) subulate-lanceolate, all longer than the tube ; style flattened, the tooth very distinct. Pods short, about an inch long, slightly winged, almost as in *L. siUqxiosus*, torulose, often strangulate, 8-10-seeded. Seeds (immature) testaceous.

Gomera (Degollada de S. Sebastiano, on rocks; near Hermigua, in bushy ground).

There is a specimen of this plant in herb. Webb (Florence), collected near Hermigua "in arvis," to which the MS. name of *emeroides* is appended. I have therefore adopted it as the specific name.

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NOTES ON SPECIES OF *LOTUS* § *PEDROSIA*. 385

*Lotus arenarius* Brot. This species is recorded from Palma (Fueucaliente) in *Phyt. Can.* The only specimen which I have seen is scrappy, and perhaps hardly sufficient for a satisfactory



identification if it stood alone. But in June, 1892, I found specimens about the Combrecita (3800 ft.) in the same island, which seem to me indistinguishable from certain Portuguese plants collected near Cintra, which must, at least for the present, be placed under *L. arenarius*, though from the description in the *Frodromus Florm HispanictE* they should be very near *L. canescens* Kze., but as I have never seen authentic examples of this plant, I am afraid to speak more definitely.

In his essay on Canarian botany (Engler's *Bot. Jahrbilcher*, ix. 1887) Dr. Christ has described a new species of *Lotus* from Palma (Barranco de Angustias, where it was collected by Hillebrand) under the name of *L. Hillebrandii*. This he treats as intermediate between *L. spartioides* and *L. arenarius*, quoting from Hillebrand's notes : " *Affinis L. spartioides* Webb et *arenarii* Brot. erectus" ; and adding, after a long diagnosis, ^ *L. spartioides* Webb *Phyt.* 81 differt statura altiore diffusa, foliis miuoribus sericeis linearibus stipulis conformibus, pedunculis teuuibus paucifloris, capitalis folio trifoliato suffultis. *L. arenarius* Brot. diff'ert caule decumbente foliolis obovatis pube breviori, calycis dentibus lanceolatis vexillo brevior, legumine minus nodoso." I have seen the types, and, except in one particular, they seem to be identical with my Combrecita plant. I can see no resemblance whatever to *L. spartioides*, and suspect that neither Dr. Hillebrand nor Dr. Christ had much acquaintance with that species, except from description, or from herbarium "scraps." The erect habit ascribed to the plant may easily have been accidental. There remains only the absence of a floral bract, which is certainly curious. But it is a somewhat variable character



in other species of the genus. It is strange that Dr. Christ in the same essay says of *L. arenarius* "capitulis floralibus aphyllis," which as a general statement is certainly incorrect. I have therefore no hesitation in considering *L. lillebraudii* as identical with my Combrecita plant, which I believe to be a marked form or subspecies of *L. arenarius* Brot.

*Lotus campylocladus* Webb & Berth. A difficult and apparently little known species, which seems to have been confused, sometimes with *L. holosericeus*, sometimes with *L. arenarius*. I suspect that it is confined to Tenerife, though there is a scrap from Palma so named in herb. Webb. This probably belongs to *L. arenarius*.

The original description in Phyt. *is as follows* : — " *Jj. villosus, foliis breviter petiolatis, foliolis angustis obovato-ovatis ; stipulis ovatis petiolo sub brevioribus, calyce ultra medium diviso, laciniis lineari-lanceolatis, apice subulatis, stylo 1-dentato.*" I find, however, that the stipules equal or exceed the petiole, and are subpetiolate. The habit is more or less prostrate or ascending; the colour a curious ashy green From *L. holosericeus* this species may be readily distinguished by its much less erect habit, the stipules unlike the leaflets, which are frequently retuse, and by the

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much less forward direction assumed by the lateral leaflets. From *L. arenarius* it differs by the shape of the stipules, the much smaller leaves, and by its biennial (? subperennial) duration. Nevertheless several authors (Webb, Masferrer, Colmeiro) agree in thinking that it is almost too closely allied, and may perhaps be only of subspecific rank. For the present, however, it seems better to retain it as distinct.

Bourgeau's *L. holosericeus* of Pl. Can. 1325 is, judging from my specimen, really *L. campylodadus*. It was collected in Tenerife (Cahadas del Teyde, in rupibus). I collected it, once only, among loose pumice above Guimar in the same island at about 1500 ft.

*Lotus holosericeus* Webb & Berth. One of the most striking and distinct of the group. Probably quite confined to Gran Canaria, and extremely local even there. The type specimens were found near Mogan, and I have collected it in the same neighbourhood, and also near Tiraxaua. This would give a range of 2000-3000 ft. above sea-level.

This species may be easily known from *L. campylodadus* by its more erect habit, by the very beautiful silky-villose clothing of the whole plant, and by the stipules similar to the leaflets. The lateral leaflets are markedly assurgent, i.e. lying almost close to the terminal leaflet, instead of spreading at right angles. Webb notes: "Foliola inferiora petiolata, superiora subsessilia."



In herb. Webb a plant from Palma (Caldera) is labelled *L. holosericeus* ; I have no note about it, but have little doubt that it is really *L. arenarius*. And in herb. Schinz there is a specimen from S. Juan de la Kambla in Tenerife also labelled *L. holosericeus*. Unless my memory deceives me, it really belongs to an aberrant form of *L. sessilifolius*, which I have myself collected in the same locality.

*Lotus spartioides* Webb & Berth. This species, like the last, is confined to Gran Canaria, where it seems to be exceedingly rare. I have only once seen it ; on the mountain side near Artenara, at above 4000 ft. It formed a large patch, several feet across, and being in full flower was conspicuous at a distance of nearly a quarter of a mile.

Very distinct from every other species ; it is recognizable at once by its shrubby habit, distinctly stalked leaves, linear leaflets and stipules, lateral leaflets forming an acute angle with the terminal, long peduncles, furnished with an inconspicuous, often unifoliate, floral bract, and linear-lanceolate setaceous calyx teeth.

*Lotus argyroides*, I venture to propose this name for the Porto Santo and Madeira plant described by Lowe (Hook. J. Bot. viii, 293) under the name of *Pedrosia artjentea* [*Lotus argenteus* Masferrer, 1880). Unfortunately this name had been already used to designate an Egyptian and totally different species, viz. *Lotus an/enteus* Webb & Berth. = *L)ori/c)uu)n argenteum* Delile. A new name is therefore necessary.



The range of the species is somewhat peculiar. It occurs (but rarely) along a line of somewhat over thirty miles from Porto Santo to the Desertas, just touching the extreme eastern point of Madeira

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OBSERVATIONS ON PLANT PLANKTON. 38?

half way between them. Its only other known habitat is in the island of S. Mary, one of the Azores, whence it was sent by the late Mr. T. C. Hunt. Through (as I suppose) quoting from memory, Watson has recorded this plant in Godman's *The Azores* under the name of "*Pediosia macrantha* Lowe '?'"; adding, "Whether this be the *macrantha* or *arcjentea* of Lowe, I cannot absolutely determine, though the long and decidedly stalked legumes seem to place the Azore specimens under the former name." But a reference to the *Flora of Madeira* shows that the stalked legumes are characteristic of *P. arcjentea*, i.e. *Lotus arriyodes*, not of *L. macranthms*. And my own specimen from the Azores (T. C. Hunt, 1848) agrees perfectly with Madeira *L. argyodes*, and not at all with *L. macranthus*, which should therefore be erased from the Azores Flora.

OBSERVATIONS ON PLANT PLANKTON.\*

By George Murray, F.R.S.

At the request of the Board I have carried out a series of observations on the minute free-floating vegetation, especially of



the west coast. The importance of a study of such organisms, as the basis of nutrition of all life in the sea, has long been recognised, but very little has hitherto been done in the way of investigation.

The main observations were made [in 1896] on board the 'Garland' in three series, viz. the first from 26th March to 6th April ; the second from 28th July to 15th August; and the third from 2nd December to 8th December. In March to April, the observations were made in the North Sea, and on the west coast of Loch Linnhe, the Sound of Jura, and principally in the Clyde sea-area. In July to August a week was spent in visiting the former stations and others in the Clyde sea-area, and the remaining time in the Sound of Islay, Sound of Jura, Firth of Lorn, Loch Etive, Loch Linnhe, Loch Aber, Sound of Mull, the sea round Rum, Eigg, and Ardnamurchau, Loch Nevis, Loch Houru, Raasay Sound, &c. In December, observations were made in Loch Aber, Loch Linnhe, Firth of Lorn, and the Clyde sea-area. The material obtained at these times was all preserved, and its working out in detail occupied me for a considerable period in London.

Methods. — In addition to tow-netting with fine silk nets — the method of capture usually employed — I have made use of a cylindrical silk bag, about 11 feet long and 3 or 4 inches wide. This was tied to the nozzle of the hose, there being a lateral overflow vent near the top of the bag ; and, on pumping through it with the donkey engine from an intake pipe 8 feet below the surface, good results were obtained. This method, first employed by Dr. John Murray, enables one to work when steaming, and is often convenient in weather that is too rough for tow-netting. The fixing and



\* Beprinted from the Fifteenth Annual Report of the Fishery Board of  
Scutluiul, part iii. pp. 212-218.

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