Report of the Director of the Botanical Survey of India for the year 1900-1901.

THE allotment for Botnnicil Survey in Burma, As^nm, and Bengal during the year ending March 1901 was fully expended. In Hurmn, collections chiefly of orchids, were made by Mr. ,L C. Prnzer, Kalewa, Upp^r Burma, and during the latter linlf of 'the year two native collectors **collected** in **the** Smuh Tennsserim district, **whew their** vrork was more or less supervised from time, to **time** by the TWost Officers of **tli<?** 'IVtmsserim Forest Circle. In Assam in the cold weather » special collection of grusse* was marie by a native collector, whd **accompanied** and worked under the direction of Dr, Bourne, F.TL.S., of Madras, who was then malting a trip to Assam up the Hrahrouputrn. **Towards** the end of the cold weather Mr, Norman **Gill,** the Assistant Curator of the Royal Botanic Gardens, was deputed to collect in the **region** of Assam about 1U0 miles to the east and south-east of Shillong. This tract which Ivis not hitherto been explored botanically lias **been toads accessible** by tin* constructing of the line between **Gaubati** and Silctiar. In Bengal collections were **made** also by Mr. Gill 'in **Tippers** in addition to tiis Assam collections. **la** the Da.rjeeling district trained Lepcha collectors were kept at work under the supervision of Mr. G. II. Cars, Assistant on tlie Government Cinchona plantations.

2. *Survey of Northern India.*—The report of this Survey for 1000-1901, prepared by Mr. Duthie who **held** clirugc of the D^parlinenD throughout the year, is submitted iti original.

3. *Survey of the Bomh&y Presidency.*—Mr. *(}.* A. G;imrnie, Professor of **Botany** and **Agriculture,** his been in charge of tliis Survey tliruujjhout the yean His report is submitted in **original.**

4. *Survey of Southern **India,*** —Mr. C. A. Barber, Government Botanist, Madras, beainne an effective offioer of the Botanical Survey early in the year under review, tmd has been in charge throughout the leiiininder of the year, iiv has submitted no report direct to the Director of the Botanical Survey, but a copy of an extract from his annual report aa Government Botanist to the Board of Revenue, Madras, Ins b^en forwarded to tlie Director by the Board of Rsvenue, with :ia endorsement by the latter to the effect that the copy of the extract relates to the work of tue Botanical Survey of India. The copy of tho extract is submitted.

5. *Publications.*—The thirteenth part of tli« *Records of Ike Botanical Survey,* giving an **account** of a Botanical Excursion to the South Lusliai llills by the writer of this report, was >ent to [»rfss in January of the current year. Part VIII of the Bynojjsis of tha *Flora of Western L'dia* by Mr, Woodrow, formerly in charge of the Hotanical Survey of the Bombay 1'reaidency, has been. published. A c^py of it accompanies Mr. Gammie's rcpo t. A severe and prolonged illness has seriuualy impeded Mr. Duthie's la'wuraon his *Flora oflhe Uppei' Gatigetic Plain,* which otherwise would have been well on toward completion.

6. *Economic and Agricultural Botany.*—The Director of the Botanical Survey bas during the yar published a paper of great economic importance, embodying the result of his investigations into the true sources of the various timbers known a:-. *Paihitk.* Two now timber yielding trees, one from Burma, the other from Assam, have also been described and published by him during tlie year. A good deal of attention continues to be paid by the Director (o **indigenous** leguminous crops, the results of which may form a subject fot[1] future publication, but which cannot be detailed **here.** Tlie Director has given special study during the year to the clearing up of the obscurities enveloping

the true botanical position and distribution of certain extra-Tndian species of *Indigqfera,* which have recently become of practical importance to Indigo planters. The Director will take the opportunity of his having been granted leave to Europe to consult several Europaan herbaria in clearing up doubtful points. Until that has baen done, definite conclusions cannot be attained. The true source of ohaulmoogra oil has been now determined by the Director in conjunction with Dr. Watt, O.I.E., to be *Taraktogenos Kurzii.* During the year supplies of *JPaspalum dilatatum,* a recently introduced drought-resisting fodder grass from Australia, were distributed freely all over India. The results of the investigations into the causes of sugarcane disease in Bengal, undertaken by the writer of this report, have been published during the year. The other economic enquiries which have been undertaken during the year by the officers in charge of the Northern India, Bombay, and Madras Surveys, respectively, are sufficiently referred to in the reports of those officers, and it is unnecessary to recapitulate them here.

7. *Staff.*—Major Train, I.M.S., the Director of the Survey, held charge of the office throughout the official year. Since the close of the official year he has gone to Europe on six months' leave. Exceedingly short notice was given to him by telegram of his leave having been granted. He had, however, to make arrangements for the work of the Survey *to* be carried on. Accordingly, in the absence of specific instructions—which at the moment of writing still remain to be issued—from Government, the writer of this report formally took over charge of the office of Director of Botanical Survey of India, and reported that fact to Government. The other Surveys have been held charge of by their proper officers throughout the year in the Survey of Northern India and the Bombay Presidency and, with official effect from the 25th April 1900, in the Madras Survey. Mr. E. J. Butler, M.B., was appointed Cryptogamic Botanist to the Government of India, by the Right Honourable the Secretary of State for India, on the 2nd January 1901. He became an effective officer of the Botanical Survey of India subordinate to the Director on 17th March 1901. At that date he was in Ceylon on his way to Calcutta, where, however, he had not arrived at the close of the year under review.

A. T. GAGE, M.B., ***Captain, I.M.S.,***

Acting Director, Botanical Survey of India.

Annual Eeport of the Director of the Botanical Department, Northern India, for the year 1900-1901.

I was at head-quarters till the 10th of April, on which day I started Fov Jauns&r to join the camp of the Forest School students nt Konain. I accompanied them on the usual hill tour through the forests of Jaimsår and portions of Tehrt-Garhwål until the 31st of May. I arrived on the 2nd of June at Mussoorie, where I remained until the 15th of October, except for a few daya spent at Saharanpur between the 10th and 15th. I remained at bead-quarters from the 15th of October till the 1th of February, on the eveniug of which day I started for Calcutta, With the kind as-istanee of Dr. Prain I managed to get some very satisfactory work done at the Herbarium of the H<>yal Botanic Q&rden during the two weeks I spent there. On my return to Saharanpur I halted for a fow hours at Allahabad to inspect the Kushi'u Bdgh. On the 18th of MarcU I left for. Delira to assist at the Final Examinations at the Imperial Forest School, and remained there until the end ol the mouth.

BOTANICAL TOT:RS.

Northern Oudh and Nepal Terni.—My head plant collector, Xnayat Khån, was sent œE early in A.pril to collect botanical specimens in the northern districts of Oudh and the adjacent portions of the Nepal Xerai, I wish to acknowledge the great assistance he received from the officers in charge of the forests in the Conda, Babraich and Kheri divisions. Of the many interesting plants found during this tour is a small tree called *Piptadenia oiidhemis*, Brandis For. Fl. 168, belonging to the natural order Leguminosfe, and allied to Adenanthcra. It was originally discovered in 1871 by Mr. Richard Thompson, formerly in the Forest Department, in the northern portion of the Gonda district. My plant collector saw it there, and also more abundantly in ravines within the Nepal frontier, growing near water. He was fortunate in finding the tree in flower as well as in fruit. The genus *Piptudenia* contains about forty species, mostly natives of America, Another interesting plant discovered by him *U Cephalanthv8 Qccide?itali8, L.*, a eh rub belonging to the natural order Jlubiaceoo. It was ioi.nd growing in jhils in the Kheri district, and specimens of the same plant were collected by Inayat Khdu in a similar locality in the Pilibhit district in 1898. Previously it was not known to occur westward of Assam. It is also recorded from Burma, Central China and North America where it is known under the names of " Button bush " or " Globe flower." Two new species of *Brachyslelvia* (Nat. Ord, Aselepiadacese) were also discovered during this tour, and specimens of several interesting orchMs were collected.

Kumaon Tour.—A very successful and extensive tour was undertaken by my head plant collector, Inayat Khán, through a large portion of Kumaon during the rainy season of last year. He started from Sahuranpur on the lsth of July and returned on the 6th of October. BU instructions were to collect specimens of every kind of balsam (Itnpatiens), as well as flowering specimens of all the orchids he could find. As both balsams and orchids are with difficulty determinable if collected and dried in the ordinary way, he WHS ordered to put Into a preservative solution some flowers of each kind, also to dry very carefully the separated portions of the flowers. The balsams were collected specially at the request of Sir Joseph Hooker, who is now preparing a revised account of all the Indian species. The collection from Kumaon, representing 110 gatherings, were despatched as soon as possible to Sir Joseph Hooker, together with the glass lubes containing flowers in solution, and it was gratifying to hear from bim how completely satisfied he IVOS with this collection and **with** the excellent condition of the specimens prepared by my collector. The latter also was much pleased on hearing that Sir Joseph Hooker had proposed to name one of tlie

many novelties of this collection after him. The collection of orchids was also a very good one, and contained many varieties, such as :—

Bulbophyllum affine, *Lindl.*
Coelogyne ovalis, *Lindl,*
Cymbidium macrorhizon, *Lindl*
„ pendulum, *Swartz.*
Dendrobium chrysanthum, *Wall**
Habenaria arietina, *Hkf.*
„ Elisabethso, Outhie *(ined.)*
„ n. sp. allied to H. reniformis, *Hkf.*
Her minimum Duthie, *Hkf.*
Liparis Duthiei, *Hkf.*
„ longipes, *Lindl:*
Orchis habenarioides, *King and Faulting.*
Ornithochilus fuscus, *Wall.*
Saceolubium papillosura, *Lindl.*

A large number of very interesting plants belonging to other natural orders were also collected.

Tours undertaken in the neighbourhood of Mussoorie.—One of my plant collectors was employed durijig the rainy season in procuring from Dehra Dun and the Siwalik range specimens of certain plants required in connection with my "Flora of the Upper Gangetic Plain." He was also sent, in company with a trained collector belonging to Mr. Phillip Mackinnon, to Sok Hill in Tehri-Garhwal, where many rare orchids were found, also a very curious and rare Orobanchaceous plant, called *Boschniackia himalaica,* found on the roots of Rhododendron arboreum. Specimens of another very remarkable leafless parasite, belonging to the same natural order, were sent to me from Deoban, beyond Ohakrata, by Mr. B. B. Osmaston. It was originally discovered three years ago by Mr. Qleadow, Deputy Director of the Forest School, and has recently been described and published in the Journal of the Asiatic Society of Bengal, by Dr. Prain and Mr. Gamble, under the name of *Gleadovia ruborum.* It is found abundantly on the roots of Rubus nivens, which forms a large portion of the undergrowth in the forests on the northern slopes of the Deoban range.

THE HERBARIUM.

The additions to the Herbarium during the past year include a very fine collection of American grasses received from the Agrostologist to the Department of Agriculture, Washington; an interesting set of Natal plants from Mr. J. Medley Wood; a collection of New Zealand mosses from Mr- T. W. ST. Bėckett; a valuable set of Assam ferns from Mr, Gustav Mann (purchased). From the Herbarium of the Royal Botanic Garden, Calcutta, 331 sheets mounted specimens have been received. Mr. J. H. Lace has sent a large collection of specimens from Fángi; it includes some interesting additions *to* the Flora of British India, also a new species of orchids. Mr. CTpendranath Kánjilál, whose minual of the forest flora of the School Circle, will soon be published, has contributed many interesting specimens. Mr. W. Gollan, Superintendent of the Saharanpur Garden, has presented for the Herbarium a set of named fungi, collected locally. These specimens are interesting as showing the result of a process invented by him of drying without pressure in hot air, it has proved a very successful means of preserving the more deliquescent kinds. I am again much indebted *tg* Mr. P. W. Mackinnon for numerous specimens of orchids and other plants collected in Dehra Dun and in the neighbourhood of Mussoorie. Finally, from the collections brought from Oudh and Kuinaon, a large number of selected specimens have been mounted for the Saharanpur Herbarium.

LOCAL FLORAS AND OTHER PUBLICATIONS.

The progress made towards the completion of the "Flora of the Upper Gangetic Plain" has occupied the greater portion of my time. I much regret* however, that owing to a severe attack of influenza caught in Dehra last March followed very soon afterwards by acute sciatica, from which I am now suffering, the work has unfortunately been very much interrupted. A considerable portion of the work is ready for printing, ai*d I shall do my best to have the

whole of the manuscript in the hands of the Press by the end of December next. The material in preparation for the illustrated volume on the orchids of North-West India is being added to as far as time and opportunity admits of. Forty-eight drawings have been despatched to Calcutta to be lithographed, and those which remain for the completion of the plates will be submitted before the end of the calendar year.

DISTRIBUTION.

To the Herbarium, Royal Botanic Garden, Calcutta, a large collection of mounted specimens of North-West Indian plants.

Jo the Department of Agriculture, Washington, United States, America, a large collection of Indian grasses.

To J. Sykes Gamble, Esq., C.I.E., F.R.S., etc., a collection of Indian grasses.

To C. B. Clarke, Esq., F.R.S., etc., a collection of Indian Cyperacese.

To Sir Joseph Hooker, G.C.S.L, E.&.S., etc., sets of Impatiens Spp., from Kumaon and other parts of the Western Himalaya.

To Sir Dietrich Brandis, K.C.I.E., F.li.S., etc., specimen* of Indian trees and shrubs.

To Lord Arthur Cecil, President of the Horse-breeding Commission, sets of mounted specimens of Indian Fodder grasses, also a copy of " The Fodder Grasses of Northern India " (in three parts).

To Mons. H. Buysman, Holland, specimens of economic plants.

To Professor Solms-Launbach, Strassburg, roots of Acorus Calamus and of Hemerocallis fulva.

To the Superintendent of the Saharanpur Garden, 7 maunds and 25 seers of fodder grass seed.

Seeds of Kumaon plants were sent to the Royal Gardens at Kew, to the Botanical Gardens at Edinburgh, Dublin, Cambridge, St. Petersburg, Berlin, Vienna, Florence, Strassburg, Geneva, Zurich, also to Mr. W. Thompson at Ipswich, and to Mr. T. Ware, Tottenham.

Wood specimens of *Piptadenia oudhemis* were sent to Mr. Gamble! Sir Dietrich Brandis, and to the Director of the Forest School at Dehra.

OFFICE ESTABLISHMENT.

The draughtsman, H. Hormusji, Daboo, has, as usual, been doing excellent work during the year. I am glad also to be able to report favourably regarding the work done by my Head Clerk, Umrao Singh, and the Assistant Clerk, N^ffutchinson.

J. F. DUTHIE,
Director^ Botanical Dept., N. India.

MUSSOORTE ;»
The 6th June 1901.

APPENDIX.

Fkamebl Statement of lite Botanical department, Nortiern India, during lie ytar 1900-1901.

BOTAVIOAt DIPABTMBJTT.	KIPBKDITUBI.							RECEIPT.			
	Directors' salary.	Exchange compensation allowance.	Establishment.	Travelling allowance ofGaietted Officers.	Travelling allowance of Establishment.	Contingencies!	Total.	t odder GmBB books.	Fodder Grass albums.	Miscellaneous.	Total.
	* «. p.	« a. p.	* a. p.	ft a. p.	ft a p.	ft a. p.	ft «.*.				
Budget Gnnt for 1900.1901.	12,000 0 0	760 0 0	4,070 0 0	1.700 0 0	300 0 0	2,240 0 0	21,060 0 0	...	Mt	...	...
Expenditure daring 1900-1901.	12,000 0 0	746 13 2	4,172 2 7	1,386 6 0	26114 9	2,183 0 3	20,760 4 9	...	...	...	...
Balance .	...	3 2 10	...	313 10 0	98 1 3	66 16 9	309 11 3		...	...	...
Bealized by sale daring 1900-1901.	...		...	...	...	...	...		16 0 0	...	42 2 •

• Includes R116 paid for halting allowance to the Draftsman at MasaooTie.
ftThe actaal exf euditare daring the year under thin head, fil.066-2-7.

3. **F. DUTHIE,**
Director, Botanical Department, Northern India.

MUSSOORIEJ
The Blh June 1901.

Report on the Botanical Survey Operations in the Bombay Presidency for the year 1900-1901, by G. A. Gammie, F.L.S., Officer in charge of the Botanical Survey, Bombay Presidency.

I held charge of the office of the Botanical Survey, Bombay Presidency, throughout the year.

1. *Tours.*—During the hot-weather vacation I travelled through parts of the Dharwar and Kanara Colleetorates, and also the forests bordering on Goa territory from Castle Rock to Londa. During the autumn vacation I toured along the Ghats on the southern and western sides of the Foona District, re-collecting many of Mr. Woodrow's discoveries to provide material for distribution. I also paid a visit to Nandgaon to inspect the experimental plantation of Sisal Hemp. Mr. Bhide, the Herbarium Keeper, completed a tour from Poona to Nagotna. He found many interesting plants, but his purpose was more especially to collect good material of *Podostemon Hookerianus* and other species on behalf of Mr. J. 0. Willis, the Director of the B/Oyal Botanic Gardens, Peradeniya, Ceylon, who is making a special study of the order *Podostemonacece.* Mr. Willis, during his visit to the Bombay Presidency, in search of these plants, was good enough to give us valuable information and identifications of the materials in this Herbarium.

During the tours special attention was devoted to obscure plants and many—specially orchids—were brought back alive to Poona, so that Mr. Bhide could figure them at leisure as they came into flower-

Drawings of many Bombay orchids were despatched to the Bombay Natural History Society for future publication in its Journal.

2. *Herbarium.*—The following sheets of specimens were collected by members of the Department and weie incorporated in the Herbarium after identification :—

Plants collected by G. A. Gammie in various parts of Kanara, Belgaum, and Poona Districts	492 sheets.
Plants collected by Mr. Bhide between Poona and Nagotna	209 „
Specimens of cereals grown under their vernacular names in Poona Farm and referred for identification by the Director and Deputy Director of Agriculture	42S „
TOTAL	1,1*9 „

The following sheets of specimens were received from other sources :—

From Royal Botanic Garden, Calcutta	279 sheets.
„ W. P. Symonds, Esq., I.C.S , Poona	93 „
» Superintendent, Victoria Gardens, Bombay	S3 „
„ „ Empress Gardens, Poona	10 „
„ Abdul Kader, Esq., Mir Munshi to the Commissioner in Sind	12 „
„ miscellaneous sources	7 „
TOTAL	434, „

To Mr. Symonds, the Director of Agriculture, who is an enthusiastic botanist, I am indebted for interesting plants collected by him when travelling and also for samples of plants, said to have been utilized by the people when reduced to straits by famine. I append a list of these plants identified by me as the information may prove of interest to botanists :—

Plants used for their leaves are;—

Portulaca suffruticosa, *Wight, (vern.* Morad).
„ quadrifida, *Linn.'{pern?* Chighal).
Abutilon indicum, *G. Von. {vern.* Kachnia).
Tribulus terrestris. *Linn. (vern.* Sarata).
Rims mysorensisj *TIeyne. {vern.* Ambogna).
Launsaa nudicaulis, *Less. {vern.* Pathari).
Dregea volubilie, *Bth. (vern.* Phandi).
Rivea hypocrateriformis, *Choisy. (vern.* Fangi).
Hygrophila Serpyllum, *T. Anderss.{vern.* Godadi).
Digera urvensis, *Forsk. (vern.* Kern jar).
Chenopodium album, *Linn. (vern.* Chil),

The only bulbous plant used was :—

Cyperas bulbosus, *Vahl. (vern.* Theg).

The plants utilized for their seeds and grains are :—

Indigofera linifolia, *Retz. (vern.* Pandarphale).
„ glandnlosa, *Willd. (vern.* Defri, Barbada).
„ . cordifolia, *Linn. (vern.* Vakal, Godadia).
Ocimum canum, *Sims.*
Cyauotis axillaris, *R. Sf S. (vern.* Damrs, Narids, Ichaka).
Soirpiis maritimus, *Linn. (vern.* Dero, Chids).
Panicum pro9tratum *La mi. (vern.* Pahatu, Bateru).
„ colonum, *Linn. (vern.* Samo).
„ flavidum, *Retz. (vern.* Garin).
Setaria *verticillnto, Bezuv. (vern* Kulelu).
iEluropus villosus, *Trin.* (vern. Del.)-
E leu sine segyptiaea, *Desf. (vern.* Manaclia; Manachobi; Manchi; Anchi Manclii).
Dinebra arabicn, *Jacq. (vern.* Kharin).
Polytoca barbata, *Stapf. (vern.* Khad-Khadio).
Apluda varia, *Had. (vern.* Bhangaru).
Anthistiria ciliata, *Linn. f. (vern.* Ratadin).
IseilemaWight.fi, *Anders*, (vern.* Gadhu),
„ laxuna, *H*ck. {vern.* Rahn^holvi).
I6chaemum rugosura, *Salisb. (vern.* Varchu).
Andropogon annulatus, *Forsk. (vern.* Zanjjroo).
„ contortus, *Linn. {vern.* Soor^valu).
Chlóris pallida, *Hook. f. (vtrn** Chakalio).
Aristida (sp. inc.) *(vern.* Tholvi).
Sporobolus diander, *Beauv. (vern.* Dhul).
Eragrostis inlerrupta, *Beauv. (vern** Dhadi).

Of all these plants, *Panic urn colonum (Samo)* seems to have been most esteemed as a makeshift for better food.

The cereals grown in the Poona Farm in sample plcfts under many vernacular names had these correlated with their proper botanical designations and, at Mr. Mollison's request, I drew up for use, in his forthcoming Text-Book on Agriculture for Bombay, a botanical classification of all the cereal crops grown in the Bombay Presidency, with all the vernacular names known to us arranged according to my identifi* ations.

Mr. Abdul Eader, Mir Munshi to the Conirr hsioner in Sind, sent some interesting plants, and his specimens were often accompanied by valuable notes on their economic uses.

The Superintendents of the Victoria Gardens, Bombay, and Emp$_A$?ss Gardens, Poona, were good enough to send me specimens of plants unknown fo them as they came into flower.

Information regarding doubtful plants was supplied to Dr. T. Coo'ke, C.I.E., who is elaborating a Flora of Bombay in the Herbarium at Kew, and he, in return, from time to time generously sends notes which supplement or correct our knowledge of Bombay plants.

Mr. G. M. Woodrow, my predecessor, still retains an interest in the Survey work, for which he did so much during his service, and, while drawing up the final part of the list, he supplied me with correct names for many gatherings of specimens.

3. *Publications.*—The final number of Mr. Woodrow's Synoptical List of the Flora of the Bombay Presidency, was published in the Journal of the Bombay Natural History Society.

4. *Experimental Culture of Sisal Kemp.*—The station at Nandgaon was fully planted up during the early part of the rains and the plants under observation there now number 3,000. The plants were in a flourishing condition at the time of my visit, and there is a certainty of the plantation ultimately proving a success. Twenty-one thousand young plants and bulbils were distributed to various applroants and a large number have been promised for this season to the Divisional Forest Officer at Nasik. As the area at my disposal is so circumscribed and as Sisal culture has become established in several parts of India, this Department may now restrict itself to the growth of plants solely for distribution.

During the year ten plants flowered and produced bulbils which were gathered and planted. The bulbils were carefully collected from each plant separately and the results were as follows:—

Number of Plant	1	2	8	4	5	6	7	8	9	10	
Number of Bulbils	2,820	3,152	3,501	3,320	2,912	1,962	1,787	1,512	1,773	3,012	
										TOTAL	25,750

5. *Sabai Grass Experiment.*—No applications for seeds were received during the year. The crop of grass, as usual, was cut and disposed of to the Deccan Paper Mills. It was reported on as being of good quality. The proprietors of the Deccan Paper Mills are now growing this grass successfully as a commercial venture, so, in future, this Department need only preserve a number of plants sufficient to supply applicants with seeds, and the ground, occupied so long by this experiment, can be devoted to the working out of other problems in Economic Botany.

G. A. GAMMIE.

THE FLORA OF WESTERN INDIA.

BY G. MARSHALL WOODROW, Professor of Botany, COLLEGE OF SCIENCE, Poona.

PART VIII.

[Continued from page 526 of VoU XIL)

CLXIIL—PALME2B—*(eontd.)*

33. *Borassus.*

B. flabellifer, *Linn.*, F.B.I.—VI-482. *Tad.* Konkan. Planted.

34. *Cocoa.*

C. nucifera, *Linn.*, F.B.I.—VI-482. *Narel. Cocoanut Tree.* Konkan. Planted.

CLXIV,-—PANDAKBJS.

1. *Pandanus.*

P. furcatns, *Roxb.*, F.B.I.—VI-484.
P. faBcicularis* *Lam.*, F.B.I.—VI-485. *Keura.* N. Kanara. Planted widely.

CUYCLAKTHACB-E.

Carludoviea. (Tropical America.)

C. palmata, *Ruiz, and Pav. Syst.* 291. *Nich. Die. Oard.* 268. Gardens. Nov-Feb.

CLXV.—TXPHACEJB.

1. *Typha.*

T. elepliantina, *Boxh.*, F.B.I.—VI-439. *Mota pan-kanis.* Planted. Bombay.
T. anguatata, *Chaub. and Berry.*, F.B.I.—V1-489. *Pan-kanis.* Poona. *Aug.*

CLXVL—ABOIDEJE.

Cryptocoryne.

C. retrospiratis, *Kunth.*, F B.I — VI-493. Peon River. *Dalzell.* NOT.
C. spiralis, *Fisch.*, F.B.I.—VI-494. Beccnn. Nov.
C. c gnata, *Schott.*, F.B.I.—Vi-494. Koukan. *Mr. Law.*
C. Boxburghii, *Sehott.*, F.BI. VI-494. Poona. Nov.
C. Dalzellii, *Sehott.*, F.B.I.—VI-495. This remarkable plant is represented at Kew by half a sheet of fruits in various stages, and a drawing of a leaf, evidently sessile, having measures about*2& by 1 inch, lanceolate, with serrulate margin and three nerved. The fruit is ovate, about £ inch by £ inch on a solitary staik 2 - 3 inches in length. The specimen is markdd *Dalzell,* Bombay, and the plant probably gtows in the bed of a river.

2. *Lagenandra.*

L. toxicaria, *Dazl.*, F.B.I.—VI-495. *Vutsunab.* Konkan, Belgaum. *Dalzell.* (Cocssi, N. Kanara. *TalbC*< March.)

8. *Pistia.*

P. Stratiotes, *Linn.*, F.B.I.—YI-497. Poona. widely. Jnly-Nov.

4. *Ariseama.*

A. tortuosum, *Sehott.*, F.B.I.—Vl-502. Panchgani. Jnlr.
A. Leschenanltii, *Bl*, F.B.I.—V1-504. Western Ghats.
A. Murrayi, *Hook*, F.B.I.—VI-508. Shinvaghad. Julv-Sepf.

A. caudatom, *ISngler.*, F.B.I.—Vl-608. Konkan. *Stocks.*

5. *Sauromatum.*

8. guttatam, *Sehott.*, F.B.I.—VI-508. *Nurhi.* Mawal. April.

7. *Typhonium.*

T. bulbiferum, *Dah.*, F.B.I.—VI-511. S. Konkon. *Stocks.*

8. *Theriphonum.*

T. Dalzelli,iScAo«., F.B.I.—VI-513. Kalyan. Konkan. Karwar. Aug.

9. *Amorphophallus.*

A. campanulatus, *BL*, F.B.I.—VI-513. *Suran.* Cult.
A. bulbifer, *BL*, F.B.I.—V1-515. Londa. In flower April. (In leaf Jtme-Jnlv.)
A. commutatus, *Engler*, F.B.I.—VI-615. *Skewla. Sooringudell.* Marmagao. (Shewdi, nr. Bom bar. Ahir-

Sept.)

10. *Synantherias.*

8. sylaticus, *Schott.*, F.B.I.—VI-518. Marmagoa. May.

13. *Ariopsis.*

A. peltata, *Nimmo.*, F.B.I.—VI-519. Narel. Sept

16. *Bemnsatia.*

R vivipara, *Schott.*, P.B.I.— VI 521. Laooli. Jnly-Aag.

18. *Colocasia.*

G. Antiquorum, *Schott.*, F.B.I.—VI-523. Gardens.

19. *Alooasia.*

A. indica, *Schott.*, F.B.I.—Vl-426. Gardens.
A. maororrhiza, *Schott.*, F.B.I.—V1-526. Gardens.
A. portia, *N.E.B.* Gardens.

25. *Baphidophora.*

R. ptr̥tnsa, *Schott.*, F.B.I.—VI-546. Gardens.

31. *Pothos.*

P. Bcandena, Z»?m., F.B.I.—V1-65 L Kadgul, N. Eanara. Nov.

32. *Acorns.*

A. Calamus, Z»»»., F.B.I.-VI-555. *Vehkand.* Gardens.

CLXVIL—LBUNACEJJ.

1. *Lemna.*

L. gibba, *Linn.*, F.U.^YI-666. *Nil.* Boshri, nr. Poona. Sept.
L. poljrrhiza, *Linn.*, F.BI.—V 1-557. Poona. Sept.

2. *Wolffia.*

W. arrhiza, *Wimm.*, F.B.I.—VI-557. Tauke, Konkan. Deccan.

CLXIX.—ALISMACEJE.

1. *Alisma.*

There is a good specimen of *A. renfbrme*, Don., in DalzelPs Bombay Herbarium at Kew, without locality. Its occurrence in Western Iudia as an indigenous plant is questionable.

2. *Limmphyton.*

L. obtusifolium, *Mig.*, F.B.I.—VI-560. *Nulkoot.* Ankleshwar. Guzerat. Feb.

3. *Sagittaria.*

S. flftgittifolia, *Linn.*, F.B.I.—VI-561. Malwan. Sept.

4. *Wisveria.*

W. triandra, *Mich.*, F.B.I.—VI-562. Mai wan, *Dalzell.* Aug.

6. *Butomopsis.*

B.lanceolata, *Kunth.*, F,B.I.—V 1-662. Godra. Nov.

CLXIL—NAIADAOEJE.

2. *Aponogeton.*

A. monostachyon, Xtmi., F.B.I.—YI-564. Godra. Samasgi, Dnarwar. Jnly-Dec.

3. *Potamogeton**

P. indicns, *Boxb.*, F B.I.—VI-566. Poona. Bee.
P. perfoliatus, *Linn.*, F.B.I.—VJ-666. Poona, Dec.
P. orispus, *Linn.*, F.B.I.—VI-566. n c, Poona.
P. peotinatus, *Linn.*, F.B.I.—VI-566. Poona. Sind. Aug.

4. *Buppia.*

K. rostellata, *Koch.*, F.B.I.—YI-568. Mahim. Deo*

5. *Zannichellia.*

Z. palustris, *Linn.*, F.B.I.—VI-568. Moola River, Poona. March.

6. *Naias.*

N. minor, All *F» Fed em.* Poona. March.

CLXXI.—EBIOCAFISJS.

1. *Eriocaulon.*

The following list is oompiled from specimens at Kew :—

£. oapillue-naiadis, *Hgok.f.*, F.B.I.—VI-572. Konkan. Oct. Dec.
E. odloratum, *Dalz.*, F.B.I.—VI-574. Konkan, widely. Kulgi. Sapa. Aug.
E. breviscapum, *Koern.*, F.B.I.—V1-575. Anmode, N. Kanara. *Talbot.* Nov.
E. Wightianum, *Mart.*, F.B.I.—VI-576. Eonkan. *Dalzell.* Gairsoppa. Ta/ob*. Nov.
E. lanceolatam, *Mig.*, F.B.I.—VI-577. Supa, N. Kanara. *1 allot.* Nor.
E. Siebddianiim, flteb. ^ *Zuec*, F.B.I.—VI-577. Karwar, *Talbot.* Sept.
E. stellnlatum, *Koern.*, F.BI.—VI-579. Eonkan. £W/fo.
E. sexangulare, Z., F.B.I.—VI-580. Eonkan & Western Ghats. Sept,
E. minutum, *Hook.f.*, F. B.I.—YI-579. Konkan, *Mr. Law.*
E. Lalzellii, *Zoern.*, *T.B.1.*—VI-580. Eonkan, *Stocks.* Oct. Dec.
E. euspidatum, Zta/s., P.B.I.—VI-581. Siddapore, *Talbot.* Nov.
E. kzulifolium, ilfar*., F.B.I.—VI-582. Konkan, *Stocks**
E. trilobum, *Ham.*, F.B.I.—VI-583. Konkan. *Storks**
E. xeranthemum, *Mart,* F B.I.—VI-584. Karwar, 2Wfto*. Sept.

CLXXII. CYPERACIE.

1. *Kyllingia.*

K. triceps, JBoftft., F.B.I.—VI-587. Poona. Sept.
K. monocephala, *Bottb.*, P.B.I.—VI-589.

2 *Pycreus.*

P. latispicatus, C.P.C., F B.I.—VI-590. Mawal. Poona. Sept.
P. malabarieus, *C.B.C.*, Linn. Soc. Jour. XXXIV-12. Khandala. Lanoli. 9ept.
P. sanguinolentos, i^M.9 F.B.I.—VI-590. Khandala. Sept.
P. nitens, *flees.*, r.B.i.—VI-B91. Kanara. Lanoli. Mawal. Sept.
P. pnmilns, *Nees.*, F.B.I.—VI-591. Sion. Bombay. Sept.
P. globosus, *Beiehb.*, F.B.I. - VI-591. Poona. ifov. Jan.
P. globoflus, var. Nilagirica, *C.B.C.*
P. „ „ striota.
P. polystaohyns, *Beauv.*, F.B.I.—VI-592. Malwan. Surat. Dec.
P. Baocha, *Nees.*, F.B.I.—VI-593.
%P. albomarginatus, *Nees.*, F.B.I.^VI-591. Londa. Sept.

3. *Juncellus.*

J. alopecuroidei, C.B.C, F.B.I.—VI-598. Jalodh. Panch Mahals, Deoean. Sind. Dec.
J. pyginans, *C.B.C.*, F.B.I.—VI-596. Surat. Poon.t. Oct.
J. lavigatus, *C.B.C,* F.B.L—VI-596. Kathiawad. Sind. Bombay. Salt marshes. Oct.

4. *Cyperus.*

C. cephalotne, *Vahl.* P.B.I.—VI- 697. Bombay. ·Oct.-Dec.
C. caetanens, *Willi.*, F.B.I.—VI-589. Lanoli.
C. cuspidatas, *H. and K.t* F.B.I.—VI-598. Khandala. Chinch wad. Ocfc.-Jan.
C. difformis, *Linn.*, F.B.I.—VI-599. Butoagiri. Lanoli. Oct.-Dec.
C. haBpan, *Linn.*, F.B.I.—VI-600. Pooia. Sept.
C. teneriffa, *Poiret,* F.B.I.—VI-601. Hyderabad. Sind. Nov.
C. nirens, *Bet.*. F.B.I.—VI-601. Konkan. *Mr. Law.*
C. leucocephalufi, *Bete.*, F.B.I. - V1-602. Karwar. *Talbot.* Karachi. Ahmedabad. Domus. Nov.
C. arenarius, *Bets.*, F.B.I.—VI-602. Sibi. *Lace.* Ahmeoabad. Nov.^Feb.
C. conglomoratns, *BeU.*, F.B.I.—VI-602. Porebander. Verawal. Nov.-Dec.
C. paehyrihizns, *Boeex.*, F.B.I.,-VI-B03. Jamadar. Eallanda near Karachi.
C. Atkinsoni, *C.B.C,* F.B.I.^ VI-603. Poona. *Stocks.* Sept.
G. compressor, *Linn.*, F.B.I.—VI-605. Poona. Sept.
C. aristatuR, J?O«6.,-F.B.I.—VI-606. Khandala. Dec.
C. Iria, *Linn.*, F.B.I.—VI-606. Khandala. Sept.
C. Iria, *Linn.*, vnr. paniciformis, F.B.I.—VI-606. Khandala. Sept.
G. natans, *Vahl.*. F.B.I.-VI-607. Mawal. Sept.
C. elensinoiles, *Kunth,* F.B.I.—VI 608. Goa. Bind. Kalyan, Dec.
C. malaocensw, *Lam.*, F.B.I.—VI-608. Uoa. Dec.
C. procerus, *Bottb.*, F B.I,—VI-610. Hyderabad. Sind. Dec.
C. bnlbosus, *Vahl.*, F.B.I.—71-612. Kniyan. Sept.
C. te^etifonnw, *Bxb.t* F.B.I.—VI-612. Kolva Sept
C. eorymbosuff, *Bottb.*, F.B.I.—71-612. Konkan. *Mr. Law.* Lnnofi. Sept!
C. tegetum, *Boxb.*, F.B.I.—VI-513. Poona. Lunoli. Bhubak. 8ind. S^pt.
C. rotnndus, *Linn.*, *v* B.I.—VI-614. Poona. Thana. Sept.
C. tuberosus, *Bottb.*, F.B.I.—Vl-616.

C. esculentus, *Linn.*, F.B.I.—VI-616. Poona. *Jacqucmont.*
C. exultatuB, *Betz,* F.B I.—VI-617. Knrjat. Lanuli. Sept.
G. digitatus, *Roxb.*, F.B.I.—VL618. Lanoli. Foona. 8ept.
C. Papyrus, *Linn.*, Sp. Fl. 47. Gard. Chron. 1875. 78. Gardens.
C. alternifoliuB, *Linn.*, Mant. 28. Flor de serre. 1861. 233. Gardens.

5. *Mariseus.*

M. bulbosus, *C.B.C.*, F.B.I.—VI-619. Badami. Dharwar. Oct.
M. panioeus, *Vahl.*, F.B.I.—V1-620. Koṇkan. *Mr. Law,*
M. Sieberianus, *Nees.*, F.B.I.—VI-622. Western Ghats. Oct.
It. albesceus, *Gand.*, F.B.I.—VI-624. Mhad. Konkan. Oct.

6. *Courtoisia.*

C. oyperoides, *Sees.*, F.B.I.—VI-625.

7. *Eleocharis.*

B. plantaginea, *Br.*, r.B.i.—VI-625. Baroda. Sept.
£. fietulosa, *Link.*, F.B.I.—VI-626. Goa. Dec. Salsette. *Jaequemont.*
E. spiralis, *Br.*, F.B.I.—VI-627. Godhra. Sept.
E. atropurpurea, *Kunth.*, F.B.I.—VI-627. Poona. Bind. *Stocks.* Sept.
E. capitata, *Br.*, " * • — • " « £ . . Hyderabad. Sind. Dec.
E. palnstris, *Br.*, F.B.I.-VI-628Vg. Londa. Dharwar. Deo.
E. chataria, *Boem Sr Seh.*, F.B.I.-VI-629.

8. *Fimbrittylis.*

F. tetragona, *Br.*, F.D.I.—YI-631. Hirdosi. Mawai. Oct.
F. polytriohoides, *VahL*, F.B.I.—Yl-632. Sion, Bombay. Oct.
F. schoenoides, *Vahl.* F.B.I.—VI-634. Konkan. Sept.
F. dichotoma, *Vahl.*, F.B.I.—VI-635. Bodeli. Guzerat. Ebandala. Oct.-Apl.
F. diphylla, *VahL*, F.B.I.—VI-636. Shelarwadi, Konkan. Aug.
F. ©stivalis, *Vahl.*, F.B.I.—YI-687. Mawai. Matheran. Sept,Dec.
F. ferruginea, *Vahl.*, F.B.I.—VI-638. Poona. Hyderabad, Sind. Ehandaia. Sept.-Oct.
F. spathaoea, *Both.*, I., F.B.I.—YI-640. Karachi. Dec.
•F. montioola, *Steud.*, F.B.I.-VI-642. Sholarwadi. Poona. Aug.
F. quinquangularig, *Kunth.*, F.B.I.—VI-644. Baroda. Sept.
F. miliaeea), Fa«.,F.B.i.—VI-644. Kalyan. Sept.
F. complanata. *Link.*, F.B.I.—YI-646.
b\ „ var. miorooarpa. Hewra, Poona. *Da hell.*
F.J^oodrowi, *C.B. Clark,* Ex. Jour. Liun. Soc. XXXIV. 68. Kbandala. Malwan. Got.
F. Junciformis, *Kunth.*, F.B.I.—V1-647. Karli. Nov.
F. digitata, *Boech.*, F.B.I.—VI-64S. Poona. Marmagoa. *Talbot* Lanoli. Bilckerry, N. Kaoara. Oct.
F. monostaohya, *Ma*sk.*, F.B.I.—VI-640. Badami. Poona. *JacQuemont,* July.

9. *Bulbostylis.*

B. barbata, *Bah.*, ».B.L—VI-651. Badami. July.

10. *Seirpus.*

8. Bupinus, *Law,* F.B.I.—VI-655. Bansda. Knlyan. Sind. Oct.-Feb.
8. articulatus, *Linn.*, F.B.I.—VI-656. Konkan. Sind. Oot.-Feb.
8. quinqueEarius, *Beeck.*, F.B.I.—VI-657. Bhubak, Sind. Umrat, Guzerat. Nov.-Deo.
6. coryiubosuB, *lleyne.*, F.B.I.—VI-657. Goa. Sind. Dec.
8. marrtinnus, *Linn.*, F.B.I.—VI-658. Miraj. Karachi. Bombay. *Nov.*
8. littoralis, *Schrad.*, F.B.I.—VI-659. Sind. *Dalzell.*
8. grossus, *Linn.*, F'.B.I.—Vl-659. Kalyan. Sept.
8. „ var., *Kf/soor, C.B.C.*, F.B.I.—VI-660. *Kachara,* Bombay, cult. Sept.
8. kyllinpioides, *Boech,* r.B.i.—VI-662. Kanara. *Young.*
8. Miohelianup, *Linn.*, F.B.I.—VI-662. Palee. Konkan. Sind. Bhubak. Oct.
8. eqcarrosuB, *Linn,*, F.B.I.—VI-663. Widely. Oot.-Dec.

11. *Eriophorum.*

E. oomoBum, *Wall,* F.B-I.—Y 1-664. Junir. Champaner. Oct.

12. *Fuirena.*

F. Wallichiana, *Kunth.*, *.B.I.--VI-665. Poona. Sept.
F. glomerata, *lam.*, « - - — ^ " ^. Godhra. Sawantwadi. Nov.
F. uneinRta, *Kunth.*, »-W--T Kanara. *Dr. Thomson.* Dec.
F umbellata, *Bottb.*, F.B.I.—^VI-666. Londa. Alandi. Nov.

14. *Bhynchospora.*

R. Wallichiana, *JCunth.*, '•B.I.-VI.668. Kalyan. Aug.
B. Wigbtiana, *C.B.C.*, F.B.I.—VI-669. Poonn. Khandala. Aug.
B, attrea, *Vahl.*, F.BJ.-V 1-670. Southern Maratha Country. *Young.*

20. *Bemirea.*

R. maritima, *AubL*, F.B.I.—VI-677. Seabhore, Kanara. *Dr. Thomson.*

21. *Hypolytrim.*

H. Wightianum, *Boeck.*, F.B.I.—VI-678. *Bhimlo.* Castle Book. Eatgai. N. Kanara. Feb.

26. *Scleria.*

S. lithosperma, *Stoartz.*, F.B.I.—VI-685. Matheran. Deo.
S. biflora, *Roxb*, F.B.I.—Vi-687. Matheran. Dec.
S. tasselata, *Wtld.*, F.B.I.—VI-687. Between Poona and Pannaola. (Panwel). *Jacguemont.*
S. Sfcacksiana, *Boeak.*, F.B.I.- VI-687. • Talegaon. Bombay. Deo.
S. annularUi, *Kunth.*, F.B.I.—VI-687. Konkan. *Mr. Law.*
8. hebecarpa, JV«?*, F.B.I. -VI-689. N. Kanara. *Talbot.*

28. *Carets.*

C. mercarensis., *Steud.*, F.B.I.—VI- 719. Mahableshwar. Londa. Hulgi. N. Oanara. *Talbot.* Oct.
C. speciosa, -£«»**., F.B.I.—Vl-729. Hulgi. N. Kanara. *Talbot,* Oct'.

CLXXIII. GBAMINBJ3.

1. *Paspalum.*

P. gerobiculatum, *Linn.*, F B.I.—VIL *Barika.* Cult, widely. Oct.
P. conipactum, itolA., F.B.I.—VII-12. JSTur*. Kanara. Mahableehwar. Lanoli. Sept.
P. diatichum, i*ẇ»., F.B.I.— VII-12. Seashore, Bombay. Mai wan. Got.
P. sanguinale, *Lamk*, F.B.I.—VI1-13. *Boega. Dinohi.* Sind. Panel. Oct.
P. penoatum, *Hook./.*, F.B.I.—VII-16. Kaiaohi. *Stocks.* Morvi. *J. Beck.* Oct.
P. ternatuin, *Book,/.*, F.B.I.—VII-17. Belgauin. *Ritchie.*
P. longifloruin, *Bets.*, F.B.I.—VII-17.
P. BoyUanum, *Nees*, F.B.I.—VII-18. Snwaani Ghat. Deo.
P. pedicellare, *Trin. ex. Steud.*, F.B.I.—VII-19. Konkan. *Stocks.*

2. *Eriochloa.*

E. polystaohya, *H. B. $ K.*, F.B.I.— VI1-20. Mahiu, Bombay. Oct.

3. *Itachne.*

I. Lisboae, *Hook, /., Bombay Grasses, Lisboa,* 6. Mahableshwar. Oot.
1. elogans, *Date.*, F.B.I.—VII-23. Lanoli. Poona. Sept.
I. auslralis, *Br.*, F.B.I.—VI1-24. Mahableahwar. Qct.
I. iniliacea, *Both.*, F.B.I.—VII-25. Koukan. Oct.

4. *Panicum.*

P. Isaohne, *Roth.*, F.B.I.—VII-28. TIU ^ i « . Poonft» Sept.-Jan.
P. flavidum, *Retz.*, F.B.I.—VII-28. Khandala. Morvi. Porbunder. Oct.
P. punotatum, *Burm.*, F.B.I.—VII-29. Ahmednagar. Poona. Nov.
P. paspaloiuen, *Pers.*, F.B.I.-V11-29. Munchar Lake. Sind. *Stocks.*
P. ernsgalli, *Linn*, F.B.I.-VII-30. Poona. Bombay. Morvi. Oct.
P. „ var. frumeutaccQin.
P. colonum, *Linn.*, F.B.I.—VII-32. *Savri.* Sind. *Pakor.* Londa. Morvi. Shikarpur. Oct
P. prostratum, *Lamk.*, F.B.I. -VII-33. *Pooi.* Sind. *ChimancAara.* Poona. Kathiawad. Sept'
P. muticum, *Forth*, F.B.I.—VII-35. *Water Grass of Mauritius.* CnU. Kirkee. Snrat
P. javanicnm, *Poir.*, F.B.I.—VII-35. *Phadjfa. Gonaltja.* & Kbaudesh. Poona. Badami. Aug.-Ncv'
P. ramojuni, *Linn.*, F.B.I.—VI i-36. Poona. Badami. Aug.-Nov.
P. eetigerum, *Retz.*, F.B.I.—VII-37. Poona. Bajkot. Sept.-Dec.
P. anritum, *Presl.*, F.B.I.—VI1-40.
P. interruptum, *Willd.*, F.B.I. - V11-40. Sind. Panwel. Vengurla. Oct.-Feb.
P. indicum, *Linn.*, F.B.I.—VIL41.
P. myosnroidcs, *Br.*, F.B.I.—VII-42. Sawantwadi. Nov.
P. ncdosum, *Kuntk.*, F.B.I.—Vll-43.
P. turgidum, *Forsk.*, F.B.I.—VI1-44.
P. miliaceam, *Linn.*, F.B.I.- VI1-45. *Vari.* Bajkot. Deesa. Nov. Cult.
P. miliare, *Lamk.*, F.B.I.—VII-40.
P. psilopodiuiD, *Trin.*, F.B.I.—VI1-46.
P. trypheron, *Schult.*, F.B.I.—VII-47. *Bhatur.* Jeur. Sholapur. Kalyan. Pajpl. Sept. Mulhargad. Poona. Sept.
P. maximum, *Jacq.*, F.B.I.—V1I-4?. *Guinea Grass.* Cult,
P. proliferum, *Lann.*, F.B.I.—VII-60.
P. obscurans, *Stapf. Tan Sawa. Bhatur.* Jeur. Sholapur Diet. Deo.
P. subeglume, 2V»?*-toF.B.i.—VII-557. Badami. Sept.
P. antidotale, *Retz.*, F.B.I.—VI1-52. Kathiawad. Sukar. Sind. Londa. Mar.
P. iuontanuin, *Roxb.*, F.B.I. •· V11-53. *Tokarbund.* Bansda. Dang. Jan.
P. plicatum, *Lamk.*, F.B.I.—VI1-55. Cult. Nov.
P. rhachitriohum, *Ho7hst.*, F.B.I.—VI1-56. Londa, " on a tree." *G. A. Gammie.* Oot.
P. trigonum, *Retz.*, F.B.I.—VII-56.
P. patens. *Linn.*, V.B.I.— VII-57. Kadgul. N. Kanara. Deo.

6. *Tfysanolana.*

T. agrostis, *Nees.*, F.B.I.—VII-61. Dang. Bansda. Feb.

7. *Chamoeraphis.*

G. Bpinescens, *Poir.*, F.B.I.-VI1-62. Wangni. Koukan. Sept.

8. ***Spintfex.***

S. squarrosuB, *Linn.*, F.B.I.—:VII-63« — Eumta. Shriwardhan. Nov.

9. ***Axonopus.***

A. cimicinus, *Beauv.*, F.B.I.—VI1-6 4. — Badami. Dharwar. Oct.

10. ***Tricholcena.***

T. Teneriffse, *Parlat,* P.B.I.—VII-65. — Thano Bub Kh:in. Sind. An?.
T. Wightii, *Nees.*, F,B.I.—VII-65. — *Chota Kagli.* Mulhargad. Poona. Sapt

11. ***Oplumenu*.***

O. composite, *Beauv.*. F.BJ.—VII-66. — Kadgal. MatWan. Nov.-Dec.
0. Bnrmannii, *Beauv.*, F.B.I—VII-68. — Panchgani. Parel. Oot.-Scpt.

12. ***Arundintlla.***

A. avenacea, *Munro,* F.B.I.—VII-69. — Ratnagiri. Castle Rock. Oct.
A. tnberoulata, *Munro.*, F.B.I.—V11-69. — Poona. Oct.
A. eetoaa, *Trin.*, F.B.I.—VI1-70. — Near Bombay. *Ritchie.*
A. agrosoideB, *Trin.*, F.B.I.—VII-71.
A. tenella, *flees.*, F.B.I.—VLI-71. — Lanoli. Mahableswar. Nov.
A. pygmen, *Hook.f.*, F.B.I.—VI1-72. — Crest of W- Ghats. Sept.
A. metzii, *Hochst.y* F.BJ.—VII-72. — Lar.oli. Oct.
A. brasiliensis, *Raddi,* F.B.I.—VII-73. — Panchgani. Ra4jouri. Oct. Near Poona. *Jacquemont.*
A. capillariB, *Rook.f,* F.B.I.—VII-74. — *Kotir.* Parel. Kalanuddee. Oct.
A. fusoata, *flees.*, F.B.I.—VI1-74.
A. gigantea, *Date.*, F B.I.—VII 76. — Castle Rook. Konkan. Oct.
A. spicata, *Bah.*, Bombay Flora, 293. — Mahableshwar. Nov.
A. Lawii, *Mook.f.*, Ceylon Flora.

13. ***Setaria.***

8. italica, *Beauv.*, F.B I,—VII-78. — *Rala.* — CuH. widely.
8. glauoa, *Beauv.*, F.B.I.—VI1-79. — *Kolara. Kolada.* MabsMeshwar. Oct.
8. intermedia, *Roem. and Sch.*, F B.I.—VII-79. — *Pander.* Konkan. *Mr. Law.* Poona. Belgaum. *Ritchie.* Aug.-Oct.
8. verticillata, *Beauv.*, F.B.I.—VII-80. — *Pandar. Dungunee.* Baroda. Morvi. Dec,

U. ***Pennketutn.***

P. typhoideum, *Rich.*, F.B.I.—VII-82. — *Bajri.* — Cult.
P. alopeouros, *Steud,* F B.I.—VI1-84. — *Mold.* — Poona. Belgaum. Sind. Oct.
P. dichotomum, *JDelile,* F B.I.—VII-85. — Sind. *Stocks.*
P. orientale, *Rich.*, F B.I.—VII-86 — Abu, *Sir G. Zing.* July.
P. pedicellatum, *Trin.*, F.B I.—Vli-86. — Kajkot. Got.
P. eetosum, *Rich*, F.B.I.—V1I-87. — Hyderabad. Sind. Dec.
P. cenohroides, *Rich.*, F.B.I.—VII-88. — Kajkot. Near Karachi. Dec.

15. ***Cenchrus.***

C. biflornB, *RoxK* F.B.I.—VII-89. — Karachi. Morvi, *J Beck* Dec.

18. ***Oryza.***

0. sativa, *Linn.*, F.B.I.—VII-92. — *Nawar. Bhat.* — Colt, widely.
O. coarotato, *Roxb.*, F.B.I.—VII-93.

19. ***Leersia.***

I. hexandra, *Sw.*, F.B.I.—VI1-94. — Londa, 0. *A. Gammie.* Oct.

20. ***Eygrorhiza.***

H. arietata, *Nees,* F.B.I. -VII-95. — *Devabhata.* — Chickhle, Guzerat. April.

22. ***Trachys.***

T. mucrohata, *Pers.*, F.B.I.—VI1-96. — Badami. Dharwar. Aug.

23. ***Tragus.***

T. raoemoBUB, *Scop.*, F.B I.—VII-97. Badanv. Bijapor. Rajkot. Poona *Jacquemont.* Sind. *Stocks.* Sept.

24 ***Latipes.***

L. senegalensis, *Eunth.*% F.B I.—VII-97. — 20 miles N. of Karachi. Aug.

26. ***Perotis.***

P. latifolia, *Ait.*, F.B.I.—VII-98. — *Kuras.* Badami. Majwan. Oct.-Aug.

27. ***Zoysia.***

Z. pungent, *WUld.*, F.B.I.—VII 99. — Damaun, *Lisboa.*

28. ***Coix.***

C. Lachryma Jobi, *Linn.*, F.B.I.—VII-100. — *Rany'ondhala. Kaseda.* Lanoli. Oct.

P. Cookii, *Stapf.*. F.B.I.—VIM01.
P. barbata, *Stapf.*, F.B.I.—VII-102.

Z. Mays, *Linn.*, F.B.I.—VII-102.

D. nmithopoda, *Trin.*, P.BJ.—VII-10A.
D. Woodrowii, *Stapf.*, F.B.I.—VIL104.
D. gracilis, *Nees*, F.B I.—VIM05.

I. amndinaoea, *Cyrill.*, F.B.I.—VII-106.

S. albidus, *Benth.*, F.B.I.—VII-103.

P.argentea, *Trin.*, P.B.I.—V1I-111.
P. fimbriata, *Hack.*, p B.I.—VII-112.

S. offioinarum, *Linn*, P.B.I.—VII-] 18.
8. spontanum, *Linn.*, P.B.I.— VII-118.
S. arundinaceum, *Betz.*, P.B.I.—VIL119.
S. fuBcum, *Boxb.*, F.B.I.—ViI-120.

E. ravenn©, *Beauu.*, F.B.I.—VIM21.
E. fastigiatus, *Nees*, F.B.I.—V1M25.

I. aristatnm, *Linn.*, P.B.I.—VII126.
I. rugoeum, *Salisb.*, F.B.I.—VJI-127.
1. molle, *Hook, f*, F.B.I.—VII-126.
I. diplopogon, *Hook.*, P.B.I.—129.
I. anguetifolium, *Hack.*, F.B.I.-V11-129.
I. pilosum, *Hact.*, F.B.I.—VII-130.
I. semisagittatum, *Boxb.*, F.B I.—VIM 39.
I. conjugatnm, *Boxb.*, F.B.I.—VIM31.
I. Lisbon*, *Hook.*, I., P.B.I.—VIM33.
I. oiliare, *Betz.*, P.B.I.—VII-133.
I. Bir4woodii.
I. lixum, *Br.*, F.B.I.—VIH136
I. Bulcatmn, *Hack.*, F.B.I.—VI1-137.
I. Bpathiflorum, *Hook.f.*, F.B.I.—VII-138.

P. gaceharoidenni, *Baouv-*, P.B.I.—VII-141.
P. crinitum, *Trin.*, P.B.I.—VII-141.

A. vaginatus, *Hackel* in Osterr. Bot. Zeitschr.

A. lanceolatus, *Hochst.*, P.B.I.—VII-143.
A. inormis, *Hook, f.*, P.B.I.—VII-145.
A. cilwris, *Beouv.*, F.B.I.—VII-145.
A. microphyllus, *Hochst.*, F.B.I.—VIM47.
A. jubatus, *Hack.*, F.B.I.—VII-157.

T. elegan«, *Both.*, P.B.I.—V1H48.

£. tridentatas, *Each.*, F.B.I.-VIM49.

A. varia, *Hack.*, F.B.I.-VII-150.

K. co f.pressa, *Linn.*, F.B I.-VIT-153.
R. aouminata, *Hack.*, F.B I.-VII-156.
R. diven?ens, *Hark.* /„ F.B.I.—\ 11-155.
». Tulboti, *Hook.* /., P.B.I.—VIM55.

29/ *Polytoca.*

Kurisal. Mahableshwar. Sept.
Kanta. *Rarwel.* Poona. Sept.

29. *Zea.*

Maka, *Maize.* Cult.

SO. *Dimeria.*

Khap *Kurdi.* Khandala. Panobgani. Oct«
Ratna^iri. Oct.
Lanoli. Deo.

31. *Imperata.*

Louda. Sind. *Stocks.* Aug.

33. *Spodiopogon.*

Khandala. Salsette. Oot.

34. *Follinia.*

Lanoli. Ratnagiri. Oct.-Deo.
Lanoli. Oot.

35. *Saccharum.*

Us. *JJsa Gunderi.* Cult.
Bagberi. *Zamis.* *Khair.* Poona. Karjat. Shikarpur. Nov.
Planted.

36. *Erianthus.*

Karachi. Deo.
Belgaum. *Bitchie.*

37. *Ischamtm.*

Bherdi. *Ouz.* Salsette. Konkan. Belgaum, *Ritchie.* Oct.-Dec.
Poona. Oct.
Lanoli. Oct.-Dec.
Boknsnr. Poona. Matberan. Mahableshwar. Oct.iDec.
Sabai. fiajkot. Cnlt. at Poona. Dec.-Feb.
Koonda. *Nuth.* Widely in black soil. Oct.-Mar.
Yellapore. Parel. Lanoli. Sept.-Oct.
Divimana. Konkan. Deo.
N. Kanara. *Lisboa.*
Putena. Parel. Karti. N. Kanara. *Mr. Young.Oott*

Sheda. *Chopda.* *Paunat.* Poona. Sept.
Gotud. *Mr. Young.* Oot. 30th, 18-4.
Baeer. *Ber.* Palasdari. Khandala. Sept.

39. *Pogonetherum.*

Bamboo *Grass.* Gardens, cult. Matheran P
Sumpkund; N. Kanara. July.

40. *Apocoyis.*

Vol. 4, page 8. Kalyan, N. Kanara. *Talboh*

41. *Arthraxon.*

Harjala. *Qovindair.* Lanoli. Jamjodhhapur. Morri. Katbiawad.
Oota
Vaguarin. *Guz.* Matheran. Mahableshwar. Oot.
Vanguarin. Chamargaon. *Ouz.* Oct.
Parel. Sept.
Koiiacba Kila. Ambowni, Western Ghats. Oct.

42. *Thelokogon.*

Poona. Bombay. Belgaum. Sept.

43. *Lokhopogon.*

Poona. Belgaum. Oct.-Dec.

44. *Apluda.*

Ghagara. Eonkan. Deooan, Guzerat. Oct.-Deo.

46. *Bottbcellia.*

Baikah. Sind. Godm. Sbikarpur. Nov.
Marmitgoa. Malwan. Oot.
Marti. Khandala, Mahableshwar. Sept.
Goa, *W. A. Talbvt.* Oct.

R. ejaltata, *Linn, f.*, F.B.I.—VII-156. *Bursali.* Poona. Nov.
B. Clarkei, *Each*; F.B.I.—VI1-156. Birchy. N. Kanara. *W. A. Talbot.* Nor.

47. *ManUuris.*

M. grauularis, Zia». /., F.B.I.—VI1-159. Khandala. Pooaa. Dharwar. Oct.

48. *Ophiurus.*

0. corymbosus, *Qaertn.*, F.B.I.—VII-160. *Hootia.* Gazerat. Poona. Jeur. Dec.

50. *Eli>nuruu*

E. Royleanns, *Nees*, F.B.I.—VII-151. Rajkot. Sind..
E. hirsutus, *Munro*, F.B.I.—VII-J62. *Sain.* Bind. *Siock*.*

53. *Andropogon.*

A. foveolatus, 2>CJ,F.B.I.—VIM68. *Ghandel.* Poona. Widely. Oct.
A. pumiluB, #(«•&., r B.I.-VII-170. *Qondwal. Baerki.* Diwas Ghat. Surat. Dec
A. oompressus, Hbo*./., F B.I.-VIM72. Mawal. Poona. Deo.
A. Woodrowii, *Hook.* /-, F.B.I.—VI1-173. Ehorbarsa, Mawal. Deo.
A. pertuflus, *WUld.*, FB.I.—VIM 73. Lanoli. Sept.
A. concanensis, *Hook.* /., F.B I.—VI1-174. Matheran. Oct.
A. ensiformis, *Hook. f.*, F.B.I.—VI1-175. Lanoli. Sept.
A. Kuntzeanus, *Hacked* F.B.I.—VII-175. var. psendointermediata. Mawal. Kookan. Oct.
A. intermedium *Br.*, F.B.I.—VIM75. Poona. Mawal. Dec.
A. montanus, jRoa?6., F.B.I.—VI1-176. Suvasni-Ghat. Dec.
A. ©doratuB, *Dna. Lisboa* , F.B.I.—VII-177. Mawal. Poona. Oct.
A. mioranthus, *Kunth.,v.B* i.—VII-178.
A. aBsimilis, *Steud.*, F B.I.—VII-179. Snvasni-Ghat. Do.
A. Hugelii, 5acAr.-, F.BI.—VII-180. Poona. Belgaum. Sept.
A. filicalmia, JETo«^./., F.B.I.—711-181. Sirsi. Dhonshi. Poona, Noy.-Dec.
A. halepensis, *Brot.*, F.B.I.-VII-182. *Boru.* Poona. Eonkan. Dang. Dec.
A. Sorghum, *Brot.*, F.B I.—VI1-183. Cult,
A. purpureo-sericuB, *Hochst.*, F B.I.—VII-185. N. Kanara, *Young.* Poona. Kohiapur. Nov.
A. squarrosus, *Linn.* /., F.B I.—VI1-186. *Wala.* The Kuskus Boot Grass. Planted widely. Indigenous P Jan.
A. aciculatos, *Betz.*, F.B.I.-VIM88. Karwar. T)ct.
A. lanoearius, *Hook./.*, F.B.I.-VII-190. Castle Rock. Oct.
A. montioola, ^cA^., F.B.I.—VI1-192. *Ajiva.* Gus. Poona. Ebandala. Eohlapur. Oct.
A. niootanuB, *Hook.* /., F.B I —VII. Dharwar. *Talbot.*
A, Auoheri, *Boiss*, F B I.—VII-196. • N«-ar Karachi. *Stocks.*
A. oaricoBUS, *Linn.*, F.B.I.—VII-196. Eelgaum. Mawal. 1'oona. Dec
A. annulatus,-ftwvfc.. FBI.—VII-196. Poona. tiind. *Stocks.* Oct.
A. armatuB, *Hook.* /., F.B.I.—VI1-197- Konkan. *Stocks.*
A. contortuB, Xwm. /, F.B.I.—V1I-199. *Kursali.* Poona. Guzerat. Nov.
A. Cookei, *Stapf.*, MSS.A New species. Sukkar. Pathar. Lanoli, Oct. 98.
A. tritioeuB, *Br.*9 F.B.I.-VII-200. Mawal. Poona. Dec
A. Bitchiei, *Hook./.*, F.B.I.—VII-201. Belganm. Poona. M.thableshwar. Oct.-Deo.
A. polystachyos, *Boxb.*. F.B.I.—VI1-202. Khandala. Nov.
A. Iwaranousa, *Jones*, F.B.I.—VII-203. Karachi. Dec.
A. „ var. Laniger. Sind. Widely. July-Dec.
A. Schamanthus, *IAnn.*% F.B I.—VII-204 *Surwai.* Poona Konkan. Sept.-Deo.
A. Nardus, *Linn.*> F.B.I.—V11-205. Probably occurs within our limits.

54. *Anthistiria.*

A. imberbis, *Betz.*, F.B.I.—VII-211.
A. oiliata, *Linn.*, F.B.I.—VI1-213. *Bhatada-Bati,* Peint. Pooaa. Eonkan. Deccan. Sept.-Jan. Oct. Poona.
A. tremila, *Met,* F B.I.—VII-214.

55. *Iseilema.*

I. Wightii, *Anders.*, F B.I.—VII-218 Belganm, Poona. Morvi. Eathiawad. Nov.
1. laxum, *Hack.*, F.B.I.—VII-218. Poona. Belgaum. Nov.-Dec.

68. *Pseudanthistiria.*

P. bispida, *Hook.*, F.B.I.—VI1-219. *Pokalya.* Panohgani, Ealyan. Lonla. Oct.-Nov.

59. *Aristada.*

A.AscentioniiB,Xi»n.,F.B.i.-VII.224. Poona. Jetalsar. Eathiawad Oot.-May.

A. setacea,
A. Hystrix
A. funioula
A. hystricula, *Edgw.*, F.B.I.
A. redacta, *Stapf.*, F.B.I —VII-227. Dharwar
A. hirtigluma, *Steud.*, F.B.I.—VII-227. Bulo Khan Sind. Aug.

63. *Heleoekloa.*

H. «clK>enoid«, JTorf, J.B.I.-VH-235. Bhubak. Sind. Dec.

H. dura, *Bout.*, r.B.i.—VII-236. Dwarka. Deo.

67. *Woodrowia.*

W. diandm, *Statf*, P.B.I.-VII 24L *MMr.* Lanoli. Sept-Oct.

68. *Garnotia,.*

G. arboram, *Stapf%* — Crest of Ghats S. of Lanoli. Nandgaon. Sept.
G. striotn, *Brongn.*, F.B.I.—VII-243. — Narel to Eurjat roid. Sept.
G. patens, *Stapf.* — Nandgaon, on trees. Oct.

69. *Polypogon.*

P. monspeliensis, *Desfi,* F.B.I.-V11-245.

71. *Sporobolus.*

8. diander, *Beauv.*, F.B.I.—VII-247. — Poona. *Jacquemont.*
S.indieus, £r.,-r.B.I.—VII-247. — Kolhapur. Oct.
S. minutiflorus, *Link.*, F.B.I.—VII-248. — Pare!. Oct.
8. ioclados, *Nees,* F.B.I.—VI1-249. — Sind. *Stocks.*
8. glanoifolins, *Bochst.*, F.B.I.—VII-250. — Porebander. Karachi. Nov.
8. aindious, *Stapf., Kew* Ball. — 20 miles from Karachi. Nov.
8. orientalis, *Kunth.*, F.B.I.—VI1-251. — Umrat. Guz. salt land. Nov.
H. piliferus, *Kunth.*, F.B.I.—VII-251. — Belganm. *Bitchie.*
8. arabicus, M f , , F.B.I.—VII-252. — Eaiachi.
S. coromandelianus, *Kunth.*, FB.I.—VII-252. — Sind. Nagpnr Dist. Jan.

79. *Tristaahya.*

T. barbata, *Nees,* F.B.I.—VII-272. — Sind. *Stocks.*

82. *Avena.*

A. sativa, *Linn.*, F.B.I.-VI1-275. — Cnlt. Hyderabad. Sind.

84. *Micrvchloa.*

M. setaoea, *Br.*, F.B.I.—V11-283. — Dharwar. Aug.

85. *Gracilea.*

G. Rojleana, *Hook./.*, F.B.I.—VI1-284. — Konkan. Sind.

87. *Tripogon.*

T. oapillatus, *Jaub.* and *Spach.* F.B.T.—TUI-285. — On trees, Matheran. Sept.
T. pauperoulas, *Stapf.*, F.B.I.—VI1-285. — Ou rook« near Karli. Sept.
T. Lisbffl, *Stapf.*, F.B.I.—V11-286. *Chirana.* — Matheran. Oct.
T.Jaoquemoutii, *8tapf.*, F.B.I.—VII-287. — Poona. Matherau. Sept

88. *Cynodon.*

G. daotylon, *Per*.*, F.B.I.—VII-288. *Eeraili. Durva.* — Throughout India.

89. *Chloris.*

C. inoompleta, *Both,*, F.B.I.—VI1-290. — N. Kanara. Fob.
C. tenella, *Roxb.*, F.B.I.—VII-290. — Surat. Bijapur, in shade-ouly. Oct.
C. villosa, *Pers.*, F.B.I.—VII-291. — Sind *S'ocks.*
C. barbata, *Sto.*, F.B.I.—VI1-2J2. *Gondwail.* — Siud. Deccan. Widely. Nov.

90. *Eleusine.*

£. iodioa, *Gaertw.*, V.B.X.—VII-293. — *Mahar-nachani.* Poona. Jan.
E. flagellifera, *Nees,* F.B.I.—VII-294. — Sind. *Stocks.*
£. verticillata, *Boxb.*, F.B.I_VI1-295.
E. segyptiaoa, *Desf.*, F.B.I.—VI1-295. — Kutnagiri. Badami. Saharanpoor Dist 8ept.-Nov.
E. aristata, *Ehrenb.*, F.B.I.—VI1-296. — Butnagiri. Ahmedabad.

91. *Dinebra.*

D. arabica, *Jacq.*, F.B.I.—VII-297. — Poona. Morvi. Surat. Aug.

92. *Leptochloa.*

L. chineneis, *liees,* F.tft.—VII-299. — Dr. LUboa records that he has seen specimens from Pnr«*l and fr.m Guzerat. There are no specimens from Western India in the Herbarium at Poona or at Kew.

95. *Pappaphorum.*

P. elegans, *Nees,* F.B.I.—V11-301. — Khajuri. Karachi Dist. Aug.

96. *Arundo.*

A. Donax, *Linn.* — Gardens.

97. *Phragmites.*

P. communls, *T»in.*, F.B.I.—VIJ-30J. — *Gardener's garter.* Variegated form. Gardens.
P. Karka, *Trin.*, F.B I.-VI1-304. — Dhon. *Lisboa.*

99. *Elitrophorus.*

E. artiQulatos, *Beauv.*, F.B.I.—VII-3O3. *Jungli Bala.* Kalyan, Lcnda. Godlira. Nov.-Feb.

104. *Eragrostis,*

E. aspen, *Nees,* F.B.I.—VII-314. N. Kanara. *Lisboa.*
E. ciliaris, *Link.*, F.B i.—VII-314. Baroda. Nov.
E. tenella,*Boer*, to Sch.*, F.B.I.—VII-315. *Woya. Buchraloo.* Sind. Sarat. Foona. Nov.
E. interrupta, *Beauv.*, F.B.X.—VII-316. Surat. Bfaowdeo, near Poona. Nov.
E. amabilis. *Wgt. & Am.*, F.B.I.—V1I-317. Parel. Basisein. Poona. Sept.-Nov.
E. interrupts, var. Koenigii, *Stapf.*, F.B1.- VII-316.
B. stenopbylla, *Hochst.*, F.B.I.—VI1-318. Bborkng. Mawal. Dec.
E. elegantnla, *Steud.*, F.B.I.—VI1-398. BhorkoB. Mawrtl. Deo.-Apr.
E. tremula, *Ebchsh*, F.B.I.—VII-320. Gazerat. Deesa. Falanpur. Nov.
E. major, *Host,* P.B.I.—VII-320. Sind Poona. Morvi. Nov.-Jan.
E. minor, *Host,* F.B.I.—VII-821. Godbra. Panohmahuls. Nov.
E. tenuifolia, *Rochet.*, F.B.I.-VII-322. Belgaum.
E. pilosa, *Beauv* , F.B.I.—VI1-323. Sind. Dharwar. Wagboti, Poona. Sept.-Oct.
E. ovnosuroideB, *Beauv.*, F.B.I.—VI1-321. *Darbha. Kusha.* Mandvi. Hydei-abad. Sind. Deo.
E. bifaria, *Wgt.*, F.B.I.—VII-325. Belganm. *Bitohie.* Khandala. Aug.

106. *Ralopyrum.*

H. micronatum, *Stapf.*, r.B.i.—VI1-328. Porebnnder. Sind. *Stocks.* Nov.

103. *Diplachne.*

D. fusoa, *Beauv.*, F.B.I.—VII-329. Bice fields, Matunga near Bombay, Nov.

111. *Centotheca.*

C. lappacea, *Besv.* F.B.I.—VI1-3 32. Kadgal, Eanara Dist. Oct.

113. *JEluropuB**

JE. villoeuB, *Trin.*, F.BJ.-V1I-334 Umrat. Gaz. Karachi. Nov.-Dec.

127. *Oropetium.*

O.Tbomeaum, *Trin*^ F.B.I.—VI1-366. Junir. Poona. Jnly-Sipt.

121. *Triticum.*

T. Speltam, var. *Khapli. Jod. Pumban.* Covered grain wteat. Cnlt. widely.
T. Vulsare, *YilU* F.B.I.-V11-367. *Qhui.* Cult, widely.
T. pilogum, *Dalz & Gibs.* *Bakshi. Kola. Kusali, Kanno.* Colt, widely.
T. monococcam, *Linn.* Guzerat.

130. *Hordeum.*

H. vnlgare, var. Hexastichon, *Linn.*, F.B.I.—V11-.H71. *Satu Jau* , Cnlt. widely.
H. „ var. distiohon *Jau.* 8ind, cult.
H. „ var. nudum, *Ua. TJjan.* Naked or loose grained Barley. Guzerat. Sind.

Bambusa

B. nana. *Boxb.*, F.B.I.—VII-390. *Barik. Bamboo** Jap. Bamboo. Gardens.
B. VulgariB, *Schrad.*, F.B.I.—VII-391. *Oodha. Bans.* Planted.
R „ var. straita, *Bot. Mag.* «079. Gold and green striped Bamboo. Gardens.
B. arundinacea, *Wiltd.*, F.B.I.-VII-395. *Kulluk.* Dang. Widely planted.

138. *Offtenanthera*

O. monostigma, *Bedd.*, F.B.I.—VII-402. N. Kanara. 8ukkar-Pathar. Widely W. Ghats.
O. Stock*ii, *Munro*, F.B.I.-V11-403, *Chiwari.* N. Kanara, *Talbot.* Paucbgani. Planted. Nov.

138. *Dendrocalamvs.*

D. atrictns, *Sees.*, F.B.I.-V11-401. *Kania Wans.* Panchmabals. Planted in Konkan.
D. gigauteus, *Munro*, F.B.I.—VII-406. Gardens.

146. *Ochlandra.*

a stridula, *Munro*, F.B.I.-VIII-41». *Eooda.* N. Kanara, *Talbot.*

Copy of Extract from Annual Report by Mr. 0. A. Barber, Government Botanist, Madras, to the Board of Revenue, Madras.

I have the honour to forward the following annual report of the work done by the Department. The period included is from April 1st, 1900, to March 31st, 1901.

2. The following were my movements :—

The first half of April was spent at Head Office and devoted to routine clerical work. Several visits were also paid to the Dodabetta Cinchona plantations.

Immediately after the Easter Holidays, I proceeded to Waltair (which I reached on April 22) to collect over the Vizagapatam forests. Under the circumstances detailed in my last report, much as I would have liked it, I was quite unable to attempt the more enticing higher Agency tracts, but, because of the condition of my staff, I had to confine myself to the lower, hot hills of the Golgonda taluk. Prom the specimens obtained, however, I do not think that these parts have been collected over before.

I visited the following places in the Vizagapatam District:—

Pollavaram on the sea-coast (April 27—30) ; Bagupalem, in the drv scrub forest near the Kailway (May 2—10); Karaka, on the fine slopes of Karakakonda (If ay 12—21); Krishnadevipota, just within the Agency tracts (May 22—June « 2); Nathavaram (June 2—12).

Krishnapuram again within the Agency (June 10—18).

After this 1 devoted myself to the study of date palms and examined them wherever I couW, on my return eastwards. They were inspected at Lakshrnipuram, near Narasapatnam, Makarapalem and around Anakapalli and Kondakerla.

I reached Ootacamund on July 4. During the next three months, with one short interval, I rema'ned at Head-Quarters. The monsoon was an extremely long-continued one and touring on the West Coast was i.ot to be thought of. The short visit to Devala, referred to below, was during continuous heavy rain.

This period at Head Office was, however, not so productive of good work as could be wished. My staff was, for the first six weeks, almost continuously absent owing to fever contracted during the Vizagapatam tour, and the wri-er was practically absent from his duties during the whole of this period. He finally left the Office through ill-health, and my new clerk did not join until the eve of my departure for South Canara.

Under these circumstances, a good deal of clerical work fell to my lot.

An attempt was, however, made to grapple with the naming of specimens collected on tour; and the general lines of work were for the first time settled with my assistant. The more important work of an economic nature during this period was the examination of specimens of tea seedlings from Dovala which had been attacked by a root eel-worm.

For this purpose also a short visit was paid to the infected estate (August 80 to September 7). A few orchids were collected which were new to the collection; theJtea estate was inspected and visits were paid *en ro.ute* to the Nadavattam oinohona plantation and one Nilgiri tea estate.

On October 5,1 left Head Office for a tour in the Sauth Ganara forests. The following places were visited :—

Sullia (October 25—November 5).

Sampagi, at the foot of the Mercara Ghat (November 5—16.) During my stay at Sampngi, I proceeded on November 11 up the Ghat to Mercara. And on November 12, I collected specimens for the first 18 miles down towards the Coorg boundnry. A number (over 100) of interesting plauts were found during this little trip.

Jahlsur (November 16—22).

Beltangadi (November 21—29).

I reached Ootacamund on December 8. The remainder of the month was taken in arranging my collections and working up Office arrears.

During the Christmas Holidays I had the pleasure to entertain Mr. Willis, the Director of the Ceylon Botanical Department. As his object was the same as my own, the exploration of the South Indian Flora, I accompanied him on a short tour to Pykarato to examine the river flora there.

I remained at Head-Quarters from December 9 till January 26.

During this time I was without the help of my assistant Mr. K, Hanumantha Row, who desired to present himself for the M. A. examination in Botany in Madras. At the end of the month, however, instead of returning to his duties, he sent in his resignation in an entirely unexpected manner, thus placing the department in a very awkward position on the eve of my next long tour.

I prepared in January a long memorandum upon the work cf the Office, a report on the tea-eel-worm disease at Devala and a shorter one on an infestation of white grub which has been known for many years in the Nilgiris.

I left Ootacamund on January 26 and remained in Madras till February 6, engaged among other things in examining candidates for the post of assistant.

I then proceeded to the Godavari district and spent from February 7 to 28 in the examination of the sugar cane field.

I visited the following places :—

Tapeswaram, Mandapeta, Pasalapudi, Vulapallc, Panwalapaku, Tossipudi, Komaripalem, Koppavaram and Biccavol in the Ramachandrapuram taluk : Mondepulanka, Nagadulanka, Tatipaka, Rozole and Sivaoodu in the Narsapur taluk : Feddabrahmadeva, Medapadu and Bhimavaram in the Co Canada taluk : and Ragampeta, Vedlamurru-Pulimeru and Gudivada in the Poddapuram taluk.

On February 28 I proceeded to Calcutta by train and remained there until March 18. In Calcutta I spent most of my time with the Director of the Survey at the Royal Botanic Gardens, Sib pur. I also spent several days with the Reporter on Economic Products and called upon the Entomologist to the Government of India.

I reached Ootacamund on March 27, and then had the pleasure of receiving visits from Dr. Stuhlman, the Director of Agriculture in German East Africa, and Mr. Augustine Henry, the pioneer botanical explorer in Central China.

3. The collections made during the past year were again large. Part of them were noticed in my last year's report. The districts may be divided up as follow :—

(a) Evergreen forests.—South Canara, Mercara and Wynaad.
(6) Mixed forests.—Vizagapatam District.
(c) Sea-side flora.—Pollavaram (Vizasrapatam).
(d) River flora of Podostenonaceāa, Boltangadi, Sullia, Sampagi in South Canara and Pykara on the Nilgiris.

It is difficult to speak of the character of the collection because they are far from being thoroughly studied yet.

The West Coast was visited for the first time, and it is quite evident from the collections made that a series of visits down the entire length of the western Ghats will be of advantage. The portion examined during the South Canara tour was the Mangalore-Mercara road and in this district further visits should be paid to the portions north and south of this tract where tba flora evidently differ a good deal. Both the north and south portions of South Canara near the hills seem to be little known, and have certainly not been visited by botanists frequent ly, if at aU.

During the South Canara tour a good deal of attention was devoted to the curious little river group of PodostemonacesB. These plants, like mosses and lichens iu appearance, are in reality degraded forms of higher plants, the body of the plant simulating the lowest forms in the vegetable kingdom, but minute flowers, consisting of one stamen and one ovary each indicating their true taxonoinic position. The relationship of the order among the higher plants has not been determined, and the collections from South Indian rivers, one of their principal habitats, are extremely meagre.

My attention was specially drawn to the group by Mr. Willis who has just concluded a tour down the Western Ghats in search of material for a monograph which he is preparing. I found the river at Sullea full of three species, and again at Boltagadi there was such a mass of interesting specimens that I devoted myself to the river bed during the whole of my stay there. The result has exceeded expectations! and a very interesting series of specimens has been handed over to Mr. Willis for determination. Curious transitional forms were found which will necessitate an alteration of the classification, and some of the species are new to science.

During the Christmas Holidays the short tour to Fykara in Mr. Willis' company was devoted to the same group.

The tour in Vizagapatam was also interesting in its way although the time of year, May to June, was hardly the most desirable to explore this hot region. From the plants collected it is at once evident that the parts nearer the hills had not been previously visited. Some of the species described as extremely rare in Hooker's Flora and not represented in the later collections of the Madras and Calcutta Herbaria, was found in great abundance.

During the short tour in the Wynaad in September while examining the tea-eel-worm disease, a few roadside orchids were collected. Several of these appear to be new to South India and one at least is a new species.

These facts will sufficiently show that there is plenty of work to be done in various parts of the Peninsula. To leave the more distant places out of the consideration, the results from the neighbourhood of Devala, not more than 40 miles from Ootacamund, indicate that this tract is by no means worked out, and during the year a new species of orchid has been found abundantly in the neighbourhood of Ootacamund itself.

4. In my last report the accumulation of arrears in naming the plants collected was adverted to. Since that time a change has been made in the distribution of the Government Botanist's time in the field and at Head-Quarters. Instead of four months at Ootacamund, a stay of six months has been sanctioned. One tour in each year will presumably be devoted to economic work, and there will thus be a smaller accumulation of plants to be booked through, in that fewer plants will be collected during the year.

It will be evident that during the past year there were unusual difficulties caused by the sickness and absence of the clerk, and more specially by the unexpected resignation of the assistant. But a serious effort was made in August and September to put the past collections in order. About 1,200 sheets were examined, named and added to the Herbarium.

It has not, however, been possible to devote more time than this to the purely systematic work while at Head-Quarters.

In spite of the Government order sanctioning the longer stay at Ootacamund, considerably the greater portion of the working year was spent in the field. An attempt will be made in the current year to remedy this state of affairs, but it will not be easy. So much time is taken in getting to and returning from the centres of collection, especially on the West Coast, that the two months provided for each tour are hardly sufficient, and is especially felt when, as is frequently the case, matters of routine or questions of economic interest have also to be attended to.

It thus remains to be determined whether three principal tours will be possible each year, unless one of these is carried out, in part at least, by an assistant. At present, however, the assistants are hardly fit to be entrusted with such work.

5. The strength of the staff remained the same as last year, but, as already explained, the department was frequently short-handed when the Government Botanist was at Head-Quarters.

In February 1901, Mr. Venkata Krishnama Nayudu, M.A., of the Madras University, joined as assistant in place of Mr. K. Hanumantha Row, B.A., resigned.

The new year will open with two assistants at Head Office instead of one, and a considerable increase in the usefulness of the department may be confidently expected. It must be borne, however, in mind that these will have to be trained and that a couple of years must elapse before they will be of much service

in the more responsible work of naming plants. After two years of training, the late assistant was entrusted with certain portions of the work, such as making a preliminary study of the field collections and naming the orchids and grasses. It will require a proportional period of time before the new assistants can be entrusted with this work, and, for the present, with the necessary training that they will require, the Government Botanist's hands will be rather fuller than before.

6. As reported last year, a request was forwarded from the Government Botanist, that he might be allowed, like the Government Botanist of the North-Western Provinces, to pay a visit to Calcutta for consultation with the Director of the Survey of India. This was granted by Government and the visit took place during March 1901.

One hundred and seventy specimens were taken to be named. These did not include all the plants about which doubt was felt or for which local material was insufficient to determine, but were those set apart during the earlier tours alone. Of them, 101 were worked through and the rest brought back to Ootacamund. About four new specimens were noted and the Grewias, so abundant a feature of our mixed forests, were subjected to a careful analysis.

A great deal of useful information was gathered in conversation with the Director, whose advice was sought on many matters which had arisen since the Government Botanist had taken over Mr. Lawson's duties.

A careful study of the mode of working and the requirements of the Reporter on Economic Products was made, as far as they referred to economic Botany and every facility was placed in the way of the Government Botanist to make use of the files and specimens collected in the Calcutta Office and Museum. In questions of difficulty, it has been arranged that the files on particular subjects may be sent down to the Office of the Government Botanist and thus the stores of information accumulated in the Office of the Reporter on Economic Products will be available for this Presidency, without the necessity of sending a series of enquiries to be dealt with at a distance and without full knowledge of local conditions. In return the Government Botanist has agreed to assist in the collection of specimens and photographs of the more important trees which hive their habitat in this Presidency.

Altogether the amount of assistance obtained during the short visit to Calcutta was so great that an early opportunity will be sought to repeat the visit and deal with another batch of the doubtful and interesting plants, and also, if time permit, to work up any of the pests among South Indian plants concerning which there is insufficient information in the Presidency. The cold weather tour will frequently be in the northern part of the Peninsula, and since the Government Botanist is then nearer to Calcutta than to Madras, there would appear to be less difficulty in his making the visit at that time of year.

7. A good deal of attention has been given during the past year to grasses. A collection has been forwarded to the United States Government Agrostologist in exchange for those received from him last year.

As the result of correspondence with the Government Botanist of New South Wales, a set of grasses is expected from him and a series of exchanges will be entered into.

The attention of the Government Botanist has been directed to the question of grasses and fodder plants in the Madras Presidency, and a list has boon commenced at the instance of the Eorest Department. This work has been definitely postponed for the present by the change of the assistants, since the naming of grasses was p\rt of Mr. ifanumantha Bow's special work. It will, however, be token up again as soon as the new second assistant is able to devote himself to it.

The invitation of the Government Botanist to Forest Officers to send up special collections of interesting forest plants has met with some recognition during the year.

Three sets of grasses were sent by the District Forest Officer of Coimbatore and the names forwarded to him.

Two parcels were received from the Conservator of Forests, Northern Circle, and one from the District Forest Officer, Vizagapatam. These have not yet been attended to, but will occupy the second assistant's attention immediately.

8* Various requests for specimens have been received from scientific men in other parts of the world.

Enquiries have been received by specialists in Germany for South Indian MyrsinesB and GaricesB.

Fodostemonacese are being collected for special monographic purposes.

Bequests have been received for South Indian Hepaticsa, Ebenacese and parasitic plants.

The Reporter on Economic Products requires specimens of timbers, of foliage and photographs for his museum in Calcutta and various other enquiries have been received.

It will be obvious that, for the department to be useful in the true sonse of the word, it is advisable to endeavour, as far as possible, to meet with these requests, and an attempt will be made to do so. On the other hand, it will be equally obvious that no special expeditions can be undertaken excepting for Government work, and the particular specimens referred to can only be collected during the ordinary tours. The Government Botanist i*, however, still practically single-handed, and work of this nature will be slow.

9 . * • * * * «

Q. I. a P. O.- No. 22) B. & A.-26-7-19O1.-36O.-H. R. & B. P.

Report of the Director of the Botanical Survey of India for the year 1901-02.

1. *Survey of Eastern, India.*—The allotments provided for Botanical Surveys in Bengal, Assam, and Burma have been expended in full. In Bengal attention has been mainly confined during the past year to the Tributary States of Chutia Nagpur and to other outlying parts of the province. In Sikkim trained Lepchas have been employed in making collections of particular natural groups of plants that call for special study. In Assam attention was principally devoted to an exhaustive collection of the plants constituting the rabi crops of the province. In Burma the botanical exploration of the Tenasserim forests was continued.

2. *Survey of Northern India.*—The principal botanical survey work of the year was in Kashmir where, as in the Eastern Himalaya, attention was chiefly given to particular families of plants that require special study.

3. *Survey of Western India,*—The chief botanical survey work of the year was done in the Southern Mahratta country and in the districts of Satara and Foona. Special visits were also paid to various localities in order to obtain material illustrative of particular species required to assist Dr. T. Cooke in the preparation of his *Mora of the Presidency of Bombay*\ of which two parts have so far appeared.

4 *Survey cf Southern India,*—In connection with this survey special attention was devoted to the nature and composition of the Tinivelly and Anamalai forests,

5. *Publications.*—The concluding part of the first volume of the *Eecords of the Botanical Survey* (No. 13), which had been sent to press before the close of the previous year, was issued in July 1901. Two contributions to a second volume, Part 1, on the *Flora of Chutia Nagpur* by Surgeon Lieutenant-Colonel J. J. Wood, I.M.S., retired, and Part 2, on the *Plants used during famines and seasons of scarcity in the Bombay Presidency,* by Mr. G. A. Gammie, were sent to press, but were still unissued at the close of the year. The Director, while on leave in Europe, prepared in conjunction with Mr. E. G. Baker, of the British (Natural History) Museum, some *Notes on Indigofera,* in connection with his enquiry into the cultivated Indigos; this paper was published in the *Journal of Botany.* The *Flora of the Upper Oangetic Plain,* on which Mr. J. F. Duthie is engaged, haa made considerable progress during tne year.

6. *Economic and Agricultural Botany.*—Much attention continued to be given to various fibre-yielding species and to the question of the introduction from countries other than India of fodder-plants with a reputation for drought-resistance. Regarding plants of this class often exaggerated and sometimes erroneous opinions are entertained. The loss of cattle during seasons of drought is a calamity of appalling magnitute, the remedy for which is, unfortunately, not to be found in the introduction of exotic salt-bushes and similar drought-resisting plants. The numerous attempts that have been made to naturalise plants of this class in India show that, in tracts where, in a season of scarcity, the existence of such as fodders would be invaluable, they will not survive under what are to be considered normal meteorological conditions ; while in tracts where they do thrive, and their cultivation or natural propagation might be pursued or encouraged with advantage, the introduction of exotic species is practically uncalled for, since these tracts already possess many quite as suitable and valuable native species. The systematic endeavours of the past two years to introduce into India an American fodder-grass, *Paspalum dilatatum,* which, on being imported to the Australian colonies,

gained in these latter a high reputation for its drought-resisting properties, affords an instructive instance of these facts. Various correspondents to whom seeds of this grass have been issued by the Director have kindly complied with his request to supply him with accounts of their experience. The reports from different provinces are somewhat conflicting. Partly on this account, and partly because the period over which the operations have extended does not coincide with the limits of an official year, the *precis* of these reports which has been prepared is given as an appendix to this report. It may, on the whole, *be* concluded that, as is usual in the case of popular estimates, the superlative merits attributed to this grass in public journals are not justified by actual facts. The Director's investigations of the natural characteristics of the dye-yielding Indigos have not yet been concluded. So far as they have gone they seem to indicate that the species now chiefly cultivated in Northern India is not the plant employed for the purpose in the time of the Emperor Akbar. The change of species no doubt resulted from the empirical discovery that the plant now grown, which is a Malayan form, is better suited to local conditions and more valuable as a source of the dye than the North African species which it replaced. It appears, however, that in a third species which is widely spread in South-Eastern and Eastern Africa we have a plant possessing many advantages over the kind now cultivated, and it becomes a question, if indeed the interest now shown by Indigo-producers in the plant from which the dye is obtained has not been too late of being aroused, whether a change similar to that effected a century ago might not again take place.

The experimental cultivation of the various Indian Tarns *{Dioscorea* sp.) has been undertaken on behalf of the Reporter on Economic Products. The results of the first year's experiment have shown that another season's observation is necessary in order to clear up points that are still doubtful. It is proposed that a joint revie v of the results be drawn up by the two departments when the enquiry is complete.

* The officer in charge of the Botanical Surrey of Western India has made an exhaustive study of the various plants used in times of famine and scarcity in the Bombay Presidency. The officer in charge of the Survey of Southern India has continued his careful study of sugar-cultivation in the Godavari district. The various other economic enquiries undertaken during the year in Northern, Western and Southern India are referred to in the reports prepared by the respective officers in charge, and need not be recapitulated here, the three reports being submitted in original.

7. *Gryptogamio Botanist.*—This officer arrived at Calcutta on April 5th 1901, and was attached to JheJBotanical Survey throughout the year. The new officer, Dr. E. J. Butler, did much excellent work and greatly impressed the Director by the enthusiasm with which· he laboured as well as by the expert knowledge and sound judgment he displayed in carrying out his investigations, which were all of a useful and practical nature. It having been found undesirable that the Oryptogamic Botanist should continue to be an officer of the Botanical Survey, he was removed at the close of the financial year. A detailed report on the work accomplished by him during 1901-02 will therefore reach Government through another channel.

8. *Staff.*—The Director was absent for six months from 20th June to 19th December 1901. The officer who officiated was Captain A. T. Gage, I.M.S. The surveys of Northern, Western and Southern India have been in charge of Messrs. J. *F.* Duthie, G. A. Gammie, and 0. A. Barber, respectively, all of whom have done excellent work.

DAVID PRAIN,
Director, Botanical Survey of India.

Annual Report of the Director of the Botanical Deparfcnnnt, Northern India, for the year 1901-02-

On the 1st of April. I returned to Sab d ran pur from Dehra, after taking part in the final examinations at the Imperial Forest School, and on the 10th of that month I left for Mussoorie, where I remained (except for a few days spent at Simla towards the end of September) until the 12th of November, A. severe attack of influenza whilst at Dehra, followed by acute sciatica, unfortunately prevented my accompanying the Eorest School students on their hill tour during the months of April and May, and also seriously interfered with my work at Mussoorie. I left Sahdranpur about the middle of January for Calcutta, where I spent about a fortnight at the Royal Botanic Garden with Dr. Prain, to whom I am always much indebted for valuable assistance and kind hospitality. From the 18th. of March until the end of thit month I was at Dehra for the examinations at the Imperial Eorest School.

Botanical Tours.—The only extensive tour undertaken during the year was in Kashmir, where I sent In&yat Khdn, my head plant collector, early in May. He spent about four months in that country, and the specimens he brought back were of great value. As the Kashmir flora is very largely represented in the Saháranpur herbarium, he was instructed to confine his attention chiefly to the collection of certain kinds of plants, specimens of which were required for special study. These special collections include very fine sets of all the different kinds of Balsams *(Impatiens),* and one complete set, together with flowers of each gathering preserved in spirit, has been despatched to Sir Joseph Hooker, who is preparing a monograph of the Indian species. He also made a very gooi collection of the Kashmir Irises, prepared in the same manner, and these have been sent to Mr. J. G. Baker, late Keeper of the Royal Herbarium and Library at Kew, and an eminent specialist in regard to the Iridacese and other allied natural orders. Some interesting orchids were also collected, including an undescribed species of *Neottia* and another belonging to the genus Orchis ; also *Epipo'jum aphyllwn* and *Lister* ovata,* which latter had not been collected by anyone in India sinc3 Dr. Ealconer discovered it in Kashmir many years ago. The particular parts of Kashmir explored by Indyat Khan last year were the Pir Fanjal range, and the Liddar, Sind, Dras and Gurais valleys ; he also travelled as far as Astoe on the Gilgit road, returning by the Kamri route.

Herbarium.—The additions made to the herbarium during the past year include the following valuable contributions :—

1. From the Herbarium of the Royal B >tanioal Garden, Calcutta—230 sheets of interesting miscellaneous specimens.
2. From Dr. George Watt, Reporter on Economic Products to the Government of India, 4 kinds of Aconite which were not represented in the Sahdranpur herbarium.
3. Prom Dr. R. G. Leavitt, the Ames Botanical Laboratory, North Easton, United States, America.—A. collection of rare North American plants, including many kinds of orchids.
4. From Dr. A. Engler, Director of the Berlin Botanical Garden and Museum.—Siity-four kinds of Mosses and Hepaticse.
5. From Dr. N. Bryhn.—A large collection of beautifully prepared Norwegian Mosses.

Complete sets of the specimens collected in Hazára during 1899, in Kumdon in 1900, and in Kashmir during the past year have been mounted and incorporated. Fresh material representing the vegetation of North-West and Central India is being constantly added, and the value of the herbarium as a basis for the preparation of local floras has been increasing every year.

Local Floras.—The excellent Handbook on the Forest Flora of the School Circle, prepared by Mr. Upendranáth Kanjilál, Extra-Assistant Conservator of Forests, cannot fail to be of very great use, not only to those for whom the book was specially prepared, but to all who may wish to learn about the trees and shrubs of this part of India.

The late Sir Henry Collett's " Flora of the Simla District " is now being printed, and copies of this work ought soon to be in the hands of those who are anxious to study the botany of a characteristic portion of the Western Himalaya. This hook will satisfy a demand far beyond the limits of the particular area dealt with, aa so many of the Simla plants are found in other parts of the Himalaya. A special feature of the work i3 the large number of admirable illustrations.

* The Flora of the Upper Gangetic Plain and of the adjacent Siwdlik and Sub-Himalayan tracts.' The area dealt with in this work, on which I have been engaged for the last three or four years, is much larger than was originally intended, *viz.*, the *Upper Gangetic Plain*, as defined in the Introductory Essay of Hooker and Thomson's "* Flora Indica" published in 1855. By extending the area towards the south and west, so as to include the whole of the watershed supplying tributaries to the Jumna and Ganges as far as the Sone and Gandak junctions on the west; and by moving the boundary on the north-east up to t\\& base of the Himalaya proper, so as to include the Siw&lik range of hills and the intervening duns, such as Dehra Dun, a more compact area and a better defined boundary was possible. As, however, the flora of a large portion of the country included within the extended boundary is much richer than that of the original area, a very larga number of additional species have to be accounted for. Notwithstanding the extra work entailed I am doing my best to have the book completed by the end of December next.

As to the remaining area allotted to the Botanical Survey Department of North India, the Saháranpur Herbarium contains ample material for the preparation of at least four more local floras :—

1. The plains of Punjab and Rdjputána.
2. The Central Provinces.
3. The North-West Frontier.
4. The North-West Himalaya from Hazára and Kashmir to Kumáon.

DISTRIBUTION.

Herbarium specimens.—Sets of duplicate specimens were distributed to the following addresses :—The Director, Botanical Survey of India, Calcutta; Director, Imperial Forest School, Dehra; the Director, Eoyal Gardens, Kew; the Keeper, LI oval Botanic Garden, Edinburgh; Sir Dietrich Brandis, K.C.I.E., F.R.S., Kew; J. Sykes Gamble, Jisquire, C.I R, F. R. 8., Hants, England ; the Directors of the Royal Botanic Gardens at Berlin, Vienna, Florence and Strasburg; the Director, Imperial Gardens, St. Petersburg ; the Director, Jardin des Plantes, Paris; M. Casimir DeCandolle, Geneva; the Boissier Herbarium, Geneva; MM. Copineau and Mouillefarine, France; Professor M. Gandoger, France; Dr. W. Lambart, Saxony, Germany; Dr. E. Rosenstock, Gotha, Germany; Sig. G. E. Mattei, Bologna, Italy; M. Usteri, Zurich, Switzerland 5 J- Medley Wood, Esquire, A.L.S., Durban, Natal; Mr. P. W. Wilson, Philadelphia Commercial Museum, U.S.A.; P. W, Mackinnon, Esquire, Mussoorie; Dr. R. G. Leavitt, N. Easton, Mass., United fctates, America (orchids); "Professor R. Sohlechter, Berlin (orchids and Asclepiadaoese); Dr. Fritz Kräuzlin, Berlin (orchids); Professor H. Marshall Ward, Cambridge (Indian species of Bromus); the Reporter on Economic Products to the Government of India (two kinds of Andropogon yielding Rusa or Nimár oil, together with samples of the oil); Dr. Alwah, Eaton, Seabrook, United States,' America (species of Equisetum); Dr. N. Bryhn, JLLonesfoss, Norway (a collection of Indian mosses;; U. M. Lenox-Conyngham, Esquire, A.V.D., Allahábad (a collection of Indian Fodder grasses); Dr. Hemchandra Sen, Campbell Medical School, Calcutta (specimens of Indian mediciual plauts).

In addition to tbe above,. collections of Iris bulbs were despatcbed to Sir Michel Foster, K.C.B., E.R.S., Cambridge; seeds of Himalayan plants to A. K. Bulley, Esquire, Cheshire, England; and seeds of Apocynum venetum, a valuable fibre plant, were sent to the Superintendent, Residency Garden, Quetta.

Office Establishment.—The draughtsman, H. Hormusji, has completed several excellent drawings of new and interesting plants, including nine kinds of orchids for the book now in preparation on the Orchids of North-West and Central India. His time is now fully occupied in colouring sets of the lithographed plates for that work.

My Head Clerk, TJmrdo Singh, and the Assistant Clerk, N. Hutchinson, have worked satisfactorily during the past year.

J. P. DUTHIE,

Director, Botanical Department, Northern India.

MUSSOORIB ;

Tie 27th June 1909.

APPENDIX.

Financial Statement of tie Botanical Department, Northern India, during tkt year 1901-02.

BOTAVIOAL DmUXfITT.	EXFEVDITUBV.							BBQIUTB.			
	Director's salary.	Exchange -sr allowance.	Establish-ment.	Travelling allowances ofGaietted Officers.	Travelling allowances of Estab-lishment.	Contin-gencieSi	Total.	Fodder Grass books.	Fodder Grass albums.	Miscel-laneous.	Total.
	* a. p.	* a. p.	* a. p.	* a. p.	* a p.	K a. p.	* «. P.				
Budget Grant for 1901-02 .	12.000 0 0	760 0 0	4,070 0 0	1,700 O 0	800 0 0	2,240 0 0	21,060 0 0	...	wt	...	•..
Expenditure during 1901-02	12,000 0 0	749 1 5	•4.20410 4	992 8 0	290 5 0	2,23111 0	20,488 4 3	...	MI	...	...
Balance .	•!•	on 7	·M	707 8 0	9 10 6	8 6 0	69111 9	...	...	...	...
Realized bj sale during 1901-1902.	...		...	...	...	Mi	...	34 8 6	...	...	34 8 8

* Includes B184-0-9 paid for halting allowances to the Draftsman and Assistant Clerk for ballings at Museoorie.
The aototl expenditure during the rear under this head, 84,060-9.7.

3. **F. DUTHIE,**
Director, Botanical Department, Northern India.

MUSSOORIE;
The 37th June 1902.

Report on the Botanical Survey Operations in the Bombay Presidency for the year 1901-02, by G. A. Gammie, F. L. S$_M$ Officer in charge of the Botanical Survey, Bombay Presidency.

I held charge of the office of the Botanical Survey, Bombay Presidency, throughout the year. Owing to the loss of my records in the disastrous fire which utterly destroyed the Herbarium on the 1st May 1902,1 am unable to furnish complete details of some important investigations conducted during the year under report. Thanks to the generous offers of assistance tendered by many botanists, the labour of re-forming a Herbarium will be appreciably lightened.

1. *Towrs.*— During the hot weather vacation I botanized closely over a part of the Foona Ghats on special researches and also undertook a journey through a portion of the Southern Maharatta country lying between Londa and Gokak. During the autumn vacation I went over the eastern and northern parts of the Poona district, engaged on special researches, and finally I visited the adjoining parts of Satara. I also paid a visit to Nandgaon to inspect the experimental plantation of Sisal Hemp.

Mr. Bhide, the Herbarium Keeper, made a tour in Kanara from Haveri to Devimona Ghat and to Castle Rock, and also visited the forests in the vicinity of the Kanheri Oaves in Thana in search of plants required by Dr. Gooke to assist him in clearing up doubtful points for his Flora of Bombay. In addition I devoted much time to the supervision of plant-breeding experiments on the Poona Farm.

2. *Herbarium.*—Many sheets of specimens were incorporated, but these, of course, shared in the general destruction. The Superintendents of Victoria Gardens, Bombay and Empress Gardens, Foona, supplied many interesting plants for identification. Mr. V. R. Damb, a passed student of the college, now in the Forest service, was good enough to send specimens of noteworthy plants.

3. *Publications.*—In compliance with the instructions conveyed in the Resolution on my last report, I put myself in communication with the Collectors of the districts affected by the recent famine and, in response, I received a great number of plants said to have been used as food during that time. These were identified after much labour, as many arrived in a condition unfavourable for botanical examination. The vernacular names under which they were sent were carefully noted. Being plants used as food I thought that the names given would probably be correct. Our knowledge of the vernacular names of the smaller plants, especially those of Gujerat, is still very incomplete. A full list of these plants was supplied to the Director, Land Records and Agriculture, for incorporation in the next edition of the Statistical Atlas, and a detailed account with notes was despatched as a contribution to the Records of the Botanical Survey of India. This will probably be published at an early date. Dr. T. Gooke (under the auspices of the Secretary of State for India) has published the second part of his Flora of Bombay, bringing his account down to the *Leguminosce.*

4. *Catha ednlis* Forsk,—*kdt* of Arabia. My predecessor, Mr. Woodrow, drew the attention of the Director of Agriculture to the fact that a plant of this species grows in the College of Science Garden. It has attained a good height and its appearance is that of an overgrown tea plant. Within reach of irrigation it would thrive admirably in Foona and its history marks it as a plant worthy of a place in every large garden.

5. *Sisal Hemp.*—A large number of young plants were supplied to the Divisional Forest Officer, Nasik, and smaller numbers were despatched to the Revenue Department, Government of Madras, and to various applicants for experimental purposes.

By the courtesy of the Director, Land Records and Agriculture, I was allowed to put out 4,000 plants on a piece of grass land in the old Botanic

Garden at Ganesh Khind. These plants established themselves quickly and appear very vigorous and healthy. The plants at the experiment plot at NandgSon are also thriving. As sisal culture is now an established industry, these two plots will suffice for experimental purposes. Another large consignment has been promised to the Divisional Forest Officer, Nasik. The plant could also be utilized as a profitable hedge in most localities in the Demean. During the year eleven plants flowered and produced bulbils, but as their production has still not ceased, the number cannot be given till next year.

6. *Sabai Grass.*—No application for seed was received during the year. The Managing Agents of the Reay Paper Mills complain of the number of hard flower stalks which have to be sorted out before the material is fit for paper-making. I observed on their land that clumps in the shade did not develop flower stalks so numerously and therefore recommended that *Shevri* (Sesbania scgyptiaca, *Pers.)* should be grown throughout the plots. This is one of the quickest growing shrubs in the Deocan. It has a beneficial effect on the soil and is also a good fodder. An experiment was tried to test the suitability or otherwise of the climate for *Esparto* (Stipa tenacissima). The grains germinated well and the plants made fair growth during the cool season, but during the hot weather, they languished and merely lingered. As they did not altogether die they may yet become acclimatised, but the outlook is not promising.

7. *Economic Work.*—The examination of the famine plants has already been alluded to. An exhaustive study was made of the wheats grown on the Poona Farm, and the results of the investigation were forwarded to the Inspector General of Agriculture. A commencement was also made in the selection and hybridisation of several forms, and some men were trained to perform the latter operation. It will, of course, entail patient work for several years to produce tangible results. Several varieties liable to be affected with rust were crossed with *khapli* or spelt (which is absolutely rust-proof) to discover whether the progeny would inherit the rust-proof habit. A gentleman in the United Srates, who has paid much attention to the breeding of cereals, gave me the interesting information that the *khapli* of Western India is identical with the *emmer* of Siberia, which he was utilizing to produce rust resisting crosses.

The *Triticwn pilosum* of Dalzell and Gibson is the *Bakshi,* which yields the finest hard white Bombay wheats. It is not, however, cultivated in the Concan but in the Deccan. I have to thank Mr. R. E. Bhide for his assiduous work in the Herbarium and field. Mr. Madane, the Head Plant Collector (who has since died, to my great regret), worked well, as did also Mr. L. D. Gharade, the Second Plant Collector.

GEORGE A. GAMMIE,

In charge of the Botanical Survey qf Bombay Presidency.

POONA;

The Uth July 1902.

Annual Report of the Government Botanist, Madras.

I have the honour to forward the folio *mass* annual report on the work done by my department. The period included is from 1st April 1901 to 31st March 1902.

2. The following were my movements during the year:—

The month of April was spent at Head Office. A careful study of the plague of cockchafers was made at Ootacamund and a long report prepared on the G6ddvari sugar-canes.

On 8th May I left Head Office on a three months[9] tour in Tinnevelly. Collections of grasses were made at different parts of the district and special attention throughout the tour was devoted to forest trees in the mixed and evergreen forests. A short visit was paid to the sub-alpine region around Kalivayalpil and a large number of interesting plants were obtained in an ascent of Agastiar Malai (6,000 feet).

I reached Ootacamund after a short visit to Madras and remained there from 1st August to 2nd October. As some of the specimens were found to be mouldy, the whole collection was thoroughly overhauled. A certain amount of herbarium work was done during the monsoon, special attentions being devoted to the forest trees.

At the request of the Forest Department, the next tour, 2nd October to 17th November, was spent in the Ana malai forests. Here the evergreen forests were again carefully collected over. The weather was exceptionally bad, and most of the trees had neither flowers nor fruits upon them. A trip to the Grass Hills (7,000—8,000 feet) produced some interesting mountain plants.

From 17th November to 23rd January I remained at Head Office. A preliminary study was made of the Anamalai forest trees and a good deal of attention was devoted to experiments with white grubs and to preparations for the G6dávari sugar-cane station.

The remainder of the year was spent in the G6d£vari district. A considerable time was devoted to the sugar-cane station, but the canals were toured over and a special study was made of the date palms of the neighbourhood.

3. It will be seen that there were two main collecting tours, both primarily in the evergreen forests, although other tracts were also traversed.

The high forest was studied at Kannikatti in the Tinnevelly Hills and at Faralai in the Anamalais.

Deciduous or mixed forest at Mundanthorai, Kannikatti, Courtallam and below Poonachi.

The sub-alpine flora was collected at Poonachi (5,000 feet), Kalivayalpil (4,000 feet), Agastiar Malai (6,000 feet), and the Grass Hills above Paralai (7,000—8,000 feet).

Considerable attention was paid throughout the year to grasses, and special collections were made at Palamcottah, Amb&sainudram, Mundanthorai, Courtallam, Aulankolam, Pollachi, Poonachi, Ootacarnund, Dwarapudi and Mandapeta, in order to determine their relative distribution.

It is too early to speak i.f the value of the collections made. Several undoubtedly new species have been found, and many valuable additions have been made to our collections of forest trees and grasses.

4. Progress in the herbarium has been considerably greater during the year. The work was hampered by a somewhat serious accideut which kept the plant collector in hospital for some months, but the addition of a second assistant to the staff has made itself very distinctly felt. A larger number of plants was collected than in any previous year. This will be seen from the accompanying figures of plants collected during the last three years.

From January 1899 to March. 1900 (toura in Madras, Tinnevelly, South Arcot and Qanjam) collection Nos. 1—1,500.

From 1st April 1900 to 31st March 1901 (tours in Vizagapatam and South Canara) collection Nos. 1,501—2,700.

From 1st April 1901 to 31st March 1902 (tours in Tinnevelly and the Anamalais) collection Nos. 2,701—4,300.

Over 4,000 sheets of specimens have heen poisoned and mounted. The heavy arrears in the herbarium are being taken in hand and the constant attention one assistant is devoted to the collections.

6. Several additions have been made to the herbarium from outside sources. A fine set of Assam ferns has been obtained by purchase ; a set of grasses has been received from the Director of the Botanic Department, Sydney, New South Wales ; and a certain number of ebonies and grewias from Oeylon. Sets of spècimens were sent to the United States of America Agrostologist and the Botanic Departments in New South Wales, Oeylon, and Calcutta. A few specimens were sent to the Madras Museum for the Index collection and a number of spirit and dried plants obtained for Dr. Bourne for class work in the Presidency College.

e. A good deal more work of an economic character has been done during the year than in any previous one. Nevertheless, many matters have had to be left untouched and scant attention has been given to others.

The subject which has received most attention has been sugar-cane cultivation. A parcel of canes from Udamalpet was found to be infested with moth-borer, Ohilo simplex. Traces of fangi were also found, but only in the hyphal condition, and therefore not determinate, The moth-borer, which causes the appearance known as " dead-heart " in the young canes, is known wherever the sugar-cane is grown. It usually is most abundant when the plants have had unseasonable weather in the early stages of growth. A short correspondence wa9 carried on concerning the recent introduction into Vizianasjram of a number of kinds of Mauritius canes. Special attention was again devoted to the canes in the G6d£vari district. A long report was prepared at the begining of the year on the introduction of Hospet canes, and the months of January to March were devoted to the founding of an experimental sugar-cane station at Samalkot.

7. During the long halts at Samalkot a careful study was made of the mode of tapping and general life of the date palms of the district. It was noted that the mode of cutting the trees for toddy was very different from that practised in Vizagapatam, also that the number of deaths from overtappihg was very much larger. It was not difficult also to find the palm weevil, IJhynchophorus ferrugineus, in the trees.

As it was not found possible to arrive at certain conclusions from casual visits to a number of different plantations, a definite area was submitted to an exhaustive analyses. Half a mile of date trees were counted and all the dead ones carefully examined. Two facts were at once evident. Firstly, all the trees had died shortly after tapping, for they always showed the slanting cut at the top, and secondly, the great majority of them had no trace of borer or other such injury, so that the conclusion was forced upon one that the chief cause of death was overtapping. A report on the subject was forwarded to the Board of Revenue.

8. The "white grub*' of the Nilgiris received a good deal of attention during the year. These, it will be remembered, were held to be responsible for the failure of sowings of Seont wheat which it was sought to introduce, and the Government Hotanist was directed to make a study of them.

The " white grub " is the larval form of the cockchafer beetle. As it was discovered that the chief flights of the latter occurred during the April-May rains, collections were made with a view to identifying the species which were causing the d&mag. Specimens sent to Cambridge for determination proved them to be new or rare species, and a series of experiments were instituted in order to learn -something of their lite-history.

As is well known, the study of the life-history of cockchafers is one of great difficulty and takes years to accomplish. Pits were dug at various periods to find out the condition of the pests and the different species were sown in order to find out which grubs belonged to the different beetles. These observations are not yet completed. A number of facts have, however, been brought to light which indicate **the** way in which the pest can be combated.

9. A disease in the Wynaad pepper plantations received a certain amount of attention. After a careful examination of the specimens received it was decided that study at a distance was useless. Several pests were found, and it is always a matter of difficulty to determine which of these has attacked plants weakened from some other cause and which has made an onslaught on originally healthy plants.

10. In conclusion of this review of the economic work during the year, I will mention some of the many other subjects of minor importance which have engaged our attention.

The following were dealt with :—Bust in wheat from the Palnis; minute insects (Aptera) among Cinchona seedlings, determined to be harmless because of the character of their mouthparts ; smutted Sorghum, remedies suggested and a scheme of experiments with recent methods dra*n up for the Saidapet farm; turnip fleas (Bagrada piota) in the Ootacamund gardens ; plant bugs (Nezara viridula var.) in the gardens and notably in the Cinchona plantations; difference in colour of coffee beans; a destructive outbreak of green scale (Aspidiotus Camelliae) in the Kanan Devan Tea plantations; a coffee-root fungus in Ooorg; a disease of the prickly-pear, unfortunately received in bad condition; Striga euphrasioides, etc., as pests in badly cultivated lands; sandbinding plants as protection on the East Coast; salt bashes as fodder plants ; the requirements of the Durian tree as regards climate and elevation; fibre machines suitable for " Aloe fibre" ; and questions on Hydnooarpus, mosquitoes, Balsamodendron Berryi as a hedge plant, various species of Cassia as " senna/9 Tephrosia or " wild indigo " for green dressing, and many other references of minor importance.

11. A number of photographs have been taken of subjects of economic interest and a set of negatives has been sent to Dr. Watt for copying.

A considerable number of forest trees and shrubs have been named for forest officers.

A labelled collection of barks of Anamalai trees was made. These are to be handed over to the Conservator of Forests, Southern Circle, for his Museum at Coimbatore.

As already stated a large collection of grasses has been made during the year. A set of 4.6 species was obtained in the neighbourhood of Ootacamund for the Supply and Transport Officer, Southern Circle, Wellington, and a preliminary list of South Indian grasses was prepared at the request of the Forest Department.

Considerable additions have been made to the collection of pests and diseases during the year, but efforts in this -direction have been discouraged because the staff is fully occupied with other matters.

A commencement has been made towards the formation of a herbarium of plants grown as crops. This will form an important part of our future work. Such plants as sugar-cane cannot be preserved in this way, but a series of photographs to scale and analytical drawings have been made. For this kind of work, however, an artist will be needed and descriptions of varieties will be incomplete without a simple chemical analysis.

Appendix to Botanical Survey of India Report for 1901-1902-

PASPALTJM DILATATTJM *Poir.*

Early in 1900 several enquiries regarding this grass were addressed to the Superintendent, Royal Botanic Garden, Calcutta, who at once took steps to obtain a supply of seeds adequate to the sudden demand. This demand was the direct outcome of certain newspsipar notices in which the grass was highly spoken of as a fodder and greatly praised for its drought-resisting qualities.

The grass itself is not unlike and is nearly allied to a well-known Indian species, *P asp alum scroMculatum—Hindi lcodo*; best known, perhaps, in connection with the poisonous properties it develops at certain seasons and under certain conditions. So far as is known, P. *dilatatum*, which is a native of both North and South America, is free from this reproach. In America, the grass, which extends into extra-tropical latitudes, has always been held in high repute for the excellent quality of its fodder and because it keeps green during the hottest months of summer.

It was, with many other fodder grasses, intro duced to Australia by the late Baron von Mueller and in the Australian colonies has found much favour owing to its hardy qualities, from the rapidity of its growth when heavy rains follow drought, and especially because of its great drought-resistance. The notices in Indi an Journals were merely echoes of its Australian reputation.

In reply to requisitions addressed to them, the Grovernm ent Botanists at Brisbane and Sydney were able to send small quantities of seed; other Au stralian officers were unable at the time to assist. As the quantity received was wholly inadequate for his purposes, the Superintendent asked the help of the Agr ostologist to the United States' Department of Agriculture, who kindly arranged with a well- known firm of seed merchants (Wood & Sons, Richmond, Va.) for a substantial supply. The quantity asked for was 100 lbs. but, even from America, only 28 lbs. could be got.

Shortly thereafter the Government of India, in the Depa rtment of Revenue and Agriculture, also took the matt er up and, learning that their wishes had already been anticipated, have taken a warm interest in this effort to introduce the grass on an adequate scale into India. The seed received was, in consequence of this interest, issued not only to those parties who had applied to the Royal Botanic Garden for assistance, but to others who had applied to the Government of India direct or through the Reporter on Economic Products. For this reason, and in consequen ce of the interest felt by Government in the subject, a *precis* of the report which parties receiving supplies of the seed were requested to send, is appended to the Report on the Botanical Survey for the year. The experiment, it may be remarked, is not yet concluded, nor have all the parties to whom seed was originally sent yet submitted reports, Moreover, the Government Botanist, Melbourne, who in 1900 was unable to help, has this year (1902) sent a large consignment of seed; this seed, with a considerable quantity harvested at Calcutta in 1901, and again in 19;J£, has also been freely distributed, and at least a year must elapse before the results of these fresh sowing* can be stated. A sufficient number of reports has, nevertheless, been received to warrant the formation of at least a preliminary estimate of the grass as regards its suitability for India and Iudian conditions.

EASTERN INDIA.—*Central Bengal.—At* Calcutta the seed was sown in the open in February 1901; only a small percentaga of the seed gennimtel. A seoond trial was therefore made in March 1901; the seed was then sown in pans in nurseries. The percentage wa9 carefully estimated; of 18,950 seeds planted, only 105 germinated, or just over one-half per cent. These plants were put out in June 1901 when the rains had set in, by which time the plants of the February sawing were in flower. The plants of the February sowing formed sparse tussocks; the transplanted plants of the March sowing, having been placed close together, formed a dense patch. In other respects the plants of the two sowings did not differ, all being equally healthy and robust and all yielding ultimately a copious crop of seed. The plot in which the first sowing was made and the pans used in the second sowing were watered daily and shaded till the seed germinated. After this no attention was given to or required by the plants; the subsequent appearance of many self-sown seedlings makes it clear that the grass is quite at home under the conditions that prevail in Lower Bengal. These conditions, however, are such that the experiment at Calcutta throws no light on the main question, the suitability or otherwise of this plant for poor or parched soils. As a fodder the grass as grown at Calcutta is excellent.

C/intia Naypur.Seei sent through the Director, Land Records and Agriculture, to Palamow, in Chutia Nagpur and sown in August failed to germinate at all. Seed of the same consignment, sent through the Reporter on Economic Products, to Manbhmn, where the conditions are uot unlike those at Palamow, did not germinate well in proportion to the bulk sown, but the plants that did come up flowered and seeded. The grass did not grow luxuriantly; indeed, self-sown plants of the native *Elemine agyptiaca,* which germinated along with *Faspalum dilatation,* grew so much more vigorously that they had to be weeded out, else

the *Paspalum* could not; have survived. After the rains ceased some of the plants dried up and the rest were only kept alive by watering The Revd. Mr. Campbell, a particularly careful observer, who reports this experiment, concludes that ' it does not appear that *Paspalum dilatatum* is suited for the dry climate of Chota Nagpur.'

Burma.—The only report received relates to experimental sowings at Meiktila in May, in June and again in July 1001. Not a single seed germinated.

NORTHERN INDIA.— *United Provinces.*—At Cawnpore seed received by the Direstor of Land Records and Agriculture from the Agricultural and Horticultural Society of India, and sown in July 1900 did not germinate at all. Seed from the same source s>wn in December 1900 was equally unsuccessful. Seed received from the Royal Botanic Garden, sown in February, equally failed. The Director obtained some seed direct from the firm of P. Henderson & Co., New York, which was sown in two instalments. Of the first sowing, in September 1901, no seed germinated ; from the second sowing, made in November, a few small plants were obtained, which were still alive in February 1902. About 12 per cent, of this seed germinated—7 per cent, well; 5 per cent, feebly. The experiments " did not give any good results/'

Central Provinces.—SeeA received by the Commissioner of Settlements and Agriculture from the Royal Botanic Garden was sown experimentally in the Sironcha Tahsil, both in the Government Garden and in low land along the river bank, but not a single seed germinated. Seed, however, that had been received from the Wollongbar Experimental Farm in November 1900 was sown at the Nagpur Experimental Farm and in the Fuel and Fodder Reserves at Nagpur which are situated on a low range of barren hills. The seed sown at the farm gave a good yield of fodder grass. That sown in the reserves germinated well, but it dried up at the same time as other local grasses. The quality of the *Paspalum* was superior to that of the native grasses. It appeared that *Paspalum* throve better on black soil than on stony hilly land; and the experiment seemed to indicate that P. *dilatatum* does not resist drought but is likely to thrive on the banks of rivers and streams where there is moisture throughout the year *(vide* Report, Nagpur Experimental Farm, 1900-1901, paragraph *0).

*JRajputana.~*Sea&* sent through the Reporter on Economic Products to Jaipur Raj did not germinate at all, though other plants and seeds got on well at the commencement of the rains which, though the monsoon ultimately failed, were at first normal.

Punjab.—A quantity of s»ed was sent to the Director of Farms, Punjab Command. This was sown at Jullunder, Ferozepur, Multan and Dera Ismail Khan. It failed to germinate in any place.

Seed sent to the Superintendent of the Hissar Cattle Farm sown in March 1901 did not germinate at all. Part of the same Beed was sown in the garden attached to the office of the Director, Land Records and Agriculture, Punjab, in the same month in land twice ploughed aud carefully watered before sowing. At first it was feared it would not germinate as the seed lay dormant for over a fortnight, but it ultimately came up after receiving four waterings at intervals of eight days.

The land on which the seed was sown was of the poor quality known as *Kalrati* (clayey) soil impregnated with saline matter. Four plots were set apart for the *Paspalum,* two o£ them being manured and two of them not. On one of the manured plots the grasf grew abundantly, attaining a height of four feet and spreading well. On the other plot which was very saline it did not germinate at all. One of the unmanured plots which was little affected by salts gave as good results as the corresponding manured plot; on the other which was very saline the grass did not grow at all. The roots in both the manured and the unmanured plots in which the grass throve, went 10 inches into the soil and took firm hold of the ground. The grass gave an excel lent fodder. These Lahore experiments " seem to show that the grass will not thrive at all on salty soils, but with care in watering it thrives well iu clay soils, if not very decidedly impregnated with salts.[91]

The Officiating Reporter on Economic Products early in 1901 visited the Government Farms at Allahabad and Cawnpoie and the experimental garden attached to the office of the Director, Land Records and Agriculture, Panjab, at each of which he saw *Paspalum dilatatum* growing. At Allahabad the grass had been sown right and left of a drain which brings it abundant water and a considerable amount of manurial matter. Where the overflow of the drain reaches it the *Paspalum* is very dense and grows to the exclusion of every thing else ; where the water-supply does not reach it the growth is miserable and apparently very slow.

At the Government Farm, Nawabganj, near Cawnpore, the *Paspalum* had been planted on a plot where it obtains irrigation. The plants were small and appeared unlikely to cover the ground for a long time. Both at Cawnpore and at Allahabad it was observed that where the grass was exposed to the sun the shoots of small plants tended very much to lie along the ground so as to the give breadth without depth.

At Lahore the grass was grown under irrigation and partially under shade. It formed a deuse and deep bed, but the tussocks did not touch so that there was some loss of space; suggesting that the most remunerative place for growing the *Paspalum* might be in a grass mixture with other fodder plants to fill the waste corners between the *Paspalum* tussocks.

Mr. Burkill concludes his interesting note by expressing the opinion that in In«lia the grass will not become established unless it can obtain a large water-supply, and he doubts very

much "if it will be found to maintain itself in the drier parts of India, when established, unless irrigated."

WESTERN INDIA.—Seed sent to the Director, Land Records and Agriculture, Bombay, was sown at Deesa, both on manured and on unmanured ground, but failed to germinate in both cases. The ground was not watered but good rain fell on it a few days after the seed was sown. On the Poona Farm a few seeds germinated, but the plants have not flourished.

SOUTHERN INDIA.—*Coorg.*—Seed sent through the Reporter on Economic Products to Mr. P. G. Tipping, Sidapur, was tried on a piece of land from which *Lantana* had been cleared, but none came up. In marked contrast to this was the experience with part of the same consignment of seed sent direct to Mr. Q. L. Newbery, Pollibeta, South Coorg, who planted some seed in virgin soil and some in very barren and dry soil, similar to that of the Mysore plains. Both lots came on very well indeed and throve equally. Some seed was also scattered broadcast in the jangles; that grew well also. The seed was put out in September 1901, the altitude of the place of experiment being 3,022 feet, the average rainfall 53 inches. No water was applied to encourage growth when the hot weather set in, nor did the grass seem to require much water. In North Coorg at a greater elevation and with an average rainfall of 120 inches it was said not to be a success, but iu Mysore, 20-30 inches rainfall, it did well. Mr Newbery states that cattle are very fond of the grass and that it seems much hardier than Guinea grass, and is inclined to give a more luxuriant crop during the dry season.

The manager of the Saidapet Farm sowed *Paspalum* seeds received in June 1900 in a small 'bed ; transplanting half to another plot after two mouths, the remainder after about a year. Tne grass did well under irrigation. Tne grass at SaicUpet did not appear to possess any advantage over Guinea grass.

The Conservator of Forests, Northern Circle, Madras, furnishes an interesting *reswni* of the results obtained by the District Forest Officers of Bellary and Gjnjarn, Iu Bellary the seed failed to germinate. In Ganjam seed sown at Chatrapur, in a bed of sandy loam, in July, failed to germinate. Seed sown in pots, however, germinated exceedingly well and on the pots becoming crowded with the grass, the plants were put out. The contents of one pot transplanted into a patch of ordinary indigenous grasses all died; this was supposed to be owing to their not having been watered. Another lot of plants, put out in two beds in the nursery at Chatrapur, and all the plants left in pots throve well. The plants in the beds and pots were watered daily. At Agustinogam, where the rest of the seed sent to Ganjam was sown, the results were as follows :— Seed sown in a bed in the nursery in good soil germinated well. The plants were afterwards transplanted to other beds and produced seeds which when sown also germinated well, and all the plants so obtained have since thriven perfectly. Some seed was sown in a patch uuder Casuarina trees 10 years old, the soil being pare sand with a covering of dead Casuarina twigs. The ground was slightly hoed without removing the dead leaves. The seed germinated well; subsequently the plants were transferred to the nursery beds. Finally, two small patches of pure sea shore sand were enclosed in a fencing of Casuarina branches six feet high so as to protect the plots from the sun. In these plots the seed was sown broadcast and no other soil was added. The seed germinated well, but the plants, with the exception of a few sickly specimens, seemed to die off though they were watered daily. After a considerable interval a certain number of the sickly surviving plants became healthy and quite green so that it is hoped that if, by watering, they survive the hot weather, they may afterwards survive without watering. The plants form scattered tufts.

The Honorary Secretary, Madras Agri,-Horticultural Society has very obligingly furnished a report, embodying the experience of several parties to whom the Society forwarded seeds. At Old College Park the grass was by no means a success. The seeds did not germinate for two months and then did so only sparingly. At Oo'aoamund the grass proved decidedly valuable at 5,600 feet elevation. The seed was rather difficult to germinate and the same correspondent found some seed, independently obtained by him, a failure. At Virrudupattee tne seed did not germinate at all. At Adyar the seeds came up but did not mature. Grown in a flower-pot the success was rather greater, but the plant was not a good drought resisting fodder. At Sivaganga the points noticed were (1) that the seed is long in germinating, (2) that the growth is stunted and poor unless the plant receives as much water as most other fodder grasses require, and (3) that grown along side of *Pennuetum ce nek rôutes* and under similar conditions, *Paspalnm* is much inferior both iu facility and in luxuriance of growth. On the Kaiuia Betta estate, South Coorg, the seed was put down in the dry weather and made very slow progress although watered and looked after. In the wet reason a number of plants were put out as Guinea grass is and did well. But it seemed doubtful if it had any advantage over Guinea grass or indeed if it were as good. The only point in its favour would be that it should grow during the long dry weather, which Guinea grass will not. But there was rain iu December fast in South Coorg, so that it is premature to say what its drought resisting powers may be. At Bangalore half the seed was planted in the open on carefully prepared fenced land. None of this seed germinated, most of the other half of the seed, sown in good soil in flat pans and carefully watered and shaded, germinated but the resulting plants grew slowly. They were transplanted during the rains to a piece of ground raised in ridges. Here the *Paspalum* subsequently did fairly well, but it appeared certain that without attention and if left unwatered it must have perished. The conclusion formed at Bangalore is that *Paspalum dilatatum* has bean greatly over-rated ; that unless car*fally atteuded to it will be unsuited for luiia as a fodder-**rasa ; that it is uot to be compared lor usefulness'

with the well-known *Cynodon dactylon*, the *Eariali* of South India, or *Dub* of North Iudia, which as a fodder-plant in India cannot be equalled and which, if only given a fair chance and not rooted out of the ground, as the custom in India is, during the dry weather, is capable of propagatiug itself by its widely spreading roots.

At the Agri.-Horticultural Society's Gardens in Madras some of the seed was sown in beds and very carefully attended to, but barely 1 percent, of ths seed germinated. At the same time seed was sown in flat pans. This germinated well and the plants were treated as ordinary annual seedlings, being first pricked off into pans, three weeks later transferred to 3 inch pota, finally put out into prepired beds and carefully watered. Under this? treatment the grass did very well and the plants formed large tufts which were in September 1901 divided up and partly transplanted, the surplus being distributed. Plants left unwatered were of hard and stunted growth. The plants at Madras flowered in November 1901 and seeded freely, but this seed failed to germinate.

In the Annual Report on Government Gardens and Parks in Mysore for 1900-1901, page 10, Mr. J. Cameron refers fully to this grass. Seeds were received from the Madras Agri.-Hortioultural Society, from Trivandrum, from the Government Botanist, Melbourne ; some seed was also purchased from the firm of Somner & Co., Melbourne. (The Madras seed came from Calcutta and was of American origin, so that the Mysore experiments were conducted with both American and Australian seed.) Cultivation in the Lai Bagh and the Palace Gardens was encouraging, and seel was gathered from the first crop. With manure and irrigation a single crop of green grass, averaging 12-15 tons per acre, could easily be raised. Such a crop takes 2£ to 3 months to grow. Grown in the rainy season without manure or irrigation, at least half the above out-turn might be expected. The result of leaving the grass to its own resources during the dry season had yet to be recorded when the report was written. But with regard to the question of its value Mr. Cameron quotes the guarded statement of Dr. Luehmann, the Government Botanist at Melbourne, made when presenting a quantity of seed:—" It is no doubt a very useful grass, but whether it will come up to the extravagant expectations entart lined about it may well be doubted."

Thi'3 *retumf* of results so far obtained shows very clearly that there is a great initial difficulty in getting the seed to germinate. This difficulty has been experienced both with seed of American and of Australian origin, and that it ha? been due to no special defect in the quality of seed imported by the Superintendent of the Royal Botanic Garden is evident from the experience of the Director of Land Records and Agriculture, United Provinces, and of the Superintendent of Government Gardens, Mysore, who obtained also independent supplies of seed from America aud Australia respectively. It is still more evident from the fact that when treated with special care, as at Calcutta, at Lahore, at Madras, and at Bangalore it was got to germinate. The seed evidently takes a considerable time to germinate, and is thus, except under special conditions, apt to be a complete failure. This discouraging result must not, however, be assumed, by chose who have failed, to indicate that the seed supplied them was bad; nor must it be assumed, by those who have succeeded in raising plants, to indicate any want of care or undue impatience on the part of those whose results have been negative. The latter may, however, in the light of the experience here recorded, be encouraged to try again. The results obtained by Mr. Newbery in South Coorg, which are in striking contrast to those of all the others who have been good enough to supply information, really only prove what has been said ; by some happy accident the conditions under wlmh the seed supplied to him was sown were those that suited the grass, so that he obtained, without trouble, the results that at Calcutta, Madras, Lahore, and Bangalore have only been realised by giving special care and attention to the seed.

As regards its drought-resisting qualities everything so far goes to show that they are, under Indian conditions, of the slightest, and that the outcome of our efforts has merely been the introduction to India of a new fodder of excellent quality which will thrive well in regions where, and in seasons when, folder is plentiful in any case. But we have not in *Paspalum dilalatum* obtained that ideal plaut, whose attributes, if considered soberly, are practically a contradiction in terms;] a fodder that will grow in times of famine and in seasons of scarcity.

D. PEAIN.

G. 1. C. P. O.-No. 535 R. & A.-1-8-19G2.—360.-C. W.

Report of the Director of the Botanical Survey of India for the year 1902-03.

1. *Survey of Eastern India.*—The allotments provided for Botanical Surveys in Bengal, Assam, and Burma have been expended in full. In Bengal the Director, through the courtesy and with the assistance of the Conservator of Forests, Bengal, was enabled to make a personal tour in the Sundribuns, a forest tract of much interest and value, during the latter part of July and the early part of August 1902, with the result that it was possible to prepare for the Records of the Botanical Survey an account of the vegetation of the region that, it is hoped, may prove of use to the various officers of Government in charge of it. In Sikkim, collections were made by the Curator, Lloyd Botanic Garden, Darjeeling, and by trained Lepcha collectors. In Chota Nagpur, the Commissioner of the division most kindiy supervised the work of a native collector in the Tributary States, with the result that very considerable additions were made to out acquaintance with the vegetation of the region.

In Assam, the services of a native collector were utilized for part of the season in the Assam valley, while during November and December 1902 it was possible, through the kind co-operation of the Superintendent, Lushai Hills, to depute the Assistant Curator of the Royal Botanic Garden to make a botanical collection in the North Lushai Hills, a region regarding which hitherto little was known botanically. In Burma, the Curator of the Calcutta Herbarium was deputed to make a systematic study of the vegetation of Minbu, a district typical of the desert zone in Burma, our knowledge of which has hitherto been very inadequate. During this visit the Curator received much assistance from the local officers at Minbu, and particularly from the Superintendent of Land Records there. The services of native collectors were utilized prior to this deputation and as ancillary to this investigation in the districts of Miubu and Myanaung. The results both of the Lushai and Minbu deputations promise to be of great interest.

2. *Survey of Northern India.*—During the early portion of the year the services of native collectors were utilized in providing material for the completion of Mr. Duthie's *Flora of the Tipper Oangetic Plain.*

3. *Survey of Western India.*—The chief botanical survey work of the year was done on the Western Ghats by the officer in charge of the survey and his Herbarium Assistant; native collectors were also sent to various localities in order to obtain material illustrative of particular species dealt with in the *Flora of the Presidency of Bombay.*

4. *Survey of Southern India.*—The main botanical survey work of the year was done in the Godaveri gorges.

5. *Publications.* — The two parts of *Records of the Botanical Survey of India,* volume II, which were in the press at the close of the preceding year, were issued on 15th August 1902. The first, entitled *Plants of Ghutia Nagpur,* by Lieutenant-Colonel J. J. Wood, I.M.S., provides a useful hand-list of the species hitherto reputed for that important province; the second entitled *A note on plants used for food during famines and seasons of scarcity in the Bombay Presidency,* by Mr, G. A. Gammie, E.L.S., gives a convenient *resume'* of all the information available on this subject. A third part, a *Systematic enumeration of the species of Calamus and Dtsmonorops,* by Siguor O. Beccari, is a most valuable guide to the various species of rattans and canes; this was issued on September 27th, 1902. Two other parts were completed and sent to press during the year, but had not been issued at its close. The Director also prepared during the year an account of *Qdt, or Arab Tea,* and various other papers.

The *Flora of the Bombay Presidency* > by Dr. T. Cooke, continues to make steady progress, part III, completing volume I having been published. The *Flora of the Upper Gangetic Plain* has also made substantial progress, volume I having been completed before the close of the year though its issue had not then taken place.

6. *Economic and Agricultural Botany.*—The continued attention of the Director has been given to economic and agricultural questions. The investigation of the Indian yams has made steady progress, and now approaches completion. It has involved the necessity of asking for assistance and material from Ceylon, Malaya, and China in order to render the results of the enquiry accurate and, as far as possible, complete ; the Director of the Survey and the Reporter on Economic Products, in whose hands this investigation conjointly is, are much indebted for great and readily granted assistance to the Directors of the Botanical Gardens at Buitenzorg, Peradeniya and Hong-Kong. There appears to be no little confusion in the fibre trade regarding the sources of the fibres vaguely classed as Indian Hemp: the questions that have arisen can only be settled by the cultivation and identification of the plants yielding the various fibres as classified by dealers. This is accordingly being systematically done. A collection of specimens of plants from Africa yielding Tndigo are being submitted for report. The examination of these will be taken in hand by the Director on their arrival. , In connection with this subject, the Director visited Behar in August 1902, and the Curator of the Herbarium was deputed, in September and October 1902, to investigate along with the Biologist to the Bihar.Planter's Association the sources and nature of the Indigo seed supply in Upper India. '^Numerous minor economic questions have been dealt with during .the year. The economic enquiries undertaken in Western and Southern India are fully dealt with by the respective officers in charge, whose reports are submitted in original.

7. *Staff.*—The. Director was in charge of his post throughout the year. The Director of the Botanical Department, Northern India, Mr- J. P. Duthie, retired from the service of Government on 31st December 1902, and the post held by him was abolished with effect from that date. The Herbarium of the Department has been placed, *pro tempore,* under a care-taker over whose work the Superintendent, Government Gardens, Saharanpur, exercises a general supervision. The surveys of Western India and of Southern India have been in charge of Messrs. G. A. Gammie and C. A. Barber, respectively, both of whom have done excellent work.

DAVID PRAIN,

Director, Botanical Survey of India.

Eeport on the Botanical Survey Operations in the Bombay Presidency for the year 1902-03, by 6. A. Gammie, F.L.S., Officer in charge of the Botanical Survey, Bombay Presidency.

I held charge of the office of the Botanical Survey, Bombay Presidency, throughout the year.

1. *Tours.*—During the hot weather vacation Mr. Bhide and I travelled over parts of Belgaum, Sawantvadi and Ratnagiri. In the cold weather vacation Mr. Bhide botanized from Poona to Poorandhar; to Jeur in the Sholapur District; and also from Wathar to Mahableshwar and Pertabgarh during which journey he found a fine new species which Dr. Cookehas described as *Kalanchcs Bhidoi.* At the same time I refcrayersed parts of the Poona Ghats, Bhor State, Kolaba, and Thana Districts. Besides these journeys some minor ones for definite objects wer‹3 undertaken by the plant collectors alone. I paid several visits to the Sisal plantation at Nandgaon and devoted much time to botanical investigations on the Poona and Manjri farms.

2. *Herbarium.*—As I mentioned in the last report, the Herbarium with its contents, was completely destroyed by fire on the 1st May 1902. Since then the building and fittings have been reconstructed, and it will be seen from the detailed list of specimens incorporated that no pains have been spared in the attempt to restore the Herbarium to its former high standard. I have to thank the following gentlemen for the assistanca they have afforded me. Dr. T. Cooke, who presented the specimens forming his own Herbarium up to the end of Liguminosft. He has generously promised to present the remainder of his Herbarium as his work on the Flora of Bombay progress. His collection is invaluable because it is named in accordance with his book.

Mr. G. M. Ryan, Deputy Conservator of Eorests, Central Thana, has sent* and still continues to send, valuable sets of plants from his district. The accompanying notes are of great value, and we purpose issuing a record of the whole when completed. The Superintendent, Victoria Gardens, Bombay, has kindly sent a large set of specimens which replace many that were lost.

Mr. Woodrow sent a set of the rarer grasses and sedges which is of the utmost value to the Herbarium. Lieutenant-Colonel Jencken, R.A.M.C., was good enough to give us a small set of Nilgiri specimens, and Mr. V. R. Damle sent interesting plants from Kolaba.

The following is the year's record of specimens incorporated in the Herbarium :—

Specimens collected by Mr. G. A. Gammie	5,806	sheets.
„ „ „ „ E. K. Bhide	1,568	„
„ „ „ „ L. D. Garade	2,630	33
„ presented „ „ V. B. Damle	47	99
„ „ „ Dr. T. Cooke	2,891	JI
„ Herbarium, Botanic Garden, Calcutta	110	99
„ presented by Mr. G. M. Ryan	553	3%
„ G. M. Woodrow	157	„
„ „ „ [illegible]	22	if
„ „ „ Lieutenant-Colonel Jencken	398	93
„ „ „ Superintendent, Victoria Gardens, Bombay		
TOTAL	14,182	„

3. *Publications.*—A note^on the Plants used during famine and times of scarcity was published as a contribution to the Records of the Botanical Survey of India. A botanical account of the Indian wheats grown at the Foona and Manjri farms was despatched to the Inspector General oE Agriculture in India, and a similar account of the cottons is almost ready.

4. Owing to the IOBS of my records I was unable to complete the reference to *Catha edulis,* but, by the kindness of the Director of Laud Records and Agriculture$_9$1 am now able to do so from fresh copies of the correspondence on

the subject. As so little is known of the plant in India ... in Mler information, I drew out the following lisfc of questions w h i t ' f ^ answered by the courtesy of the Political Resident, Aden:— * were answ

1. Where is it grown and how ?

   It is groTtn on the mountains of Yemen. It is brought to Adu^n from the Turkish District Makatra, situate to the north and west h^f ^e Subaihai country under British protection,

2. What are its requirements as regards climate and soil ?

   Where coffee grows the plant will thrive. Some years ago good coffee berries from Yemen were sent from Aden to the Victoria Gardens, Bombay, where the plants are thriving well and some coffee is collected from them.

3. If it is a cultivated plant, where did it originate ?

   It is not known where the plant originated,

4. Is the plant subjected to any particular cultural treatment ?

   It is planted from cuttings, and after it takes root it is transplanted once or twice and then finally planted in the places required. It is said that it grows like the Indian tamarind tree. As often as the leaves sprout the plant is trimmed. The tender twigs with leaves are cut as the plant grows.

5. How often are the leaves collected in a year, and are old or young leaves made use of ?

   The tender twigs with leaves are cut as often as required and the rest allowed to grow to a tree. Only young leaves are made use of.

6. What is the process of manufacture ?

   There is no process of manufacture. The fresh leaves are chewed and are said to produce great hilarity of spirit.

7. How is it prepared or packed for export ?

   Small bundles are made consisting of about 30 or 40 twigs, which are wrapped up in twigs and leaves of the kåt tree or other plants.

8. Whence is it shipped or transported ?

   It is imported from places near Aden and sold here.

   It is also exported to ports on the Arabian and African coasts.

9. How is it used for drinking ?

   It is not used for drinking since the use of coffee has become general.

An excellent account of kåt, which is often quoted, is published in the historical account of Aden, by Captain P. M. Hunter. On sending samples of kåt to Mr. D. Hooper, the Curator of the Economic and Art Section, Indian Museum, Calcutta, that gentleman generously furnished me with the following particulars :—IC Albert Beither finds that the previously described alkaloid *katine* is associated with a new caoutchouc substance C_{10} H_{17} O_x, which softens at 50°C., and melts at 120°C. Traces of a volatile oil lighter than water, which darkens on keeping, ultimately depositing crystals and lias a powerful odour, were also obtained. The alkaloid is present in only a very small quantity. The leavesTrom Aden yielding only 0*076 per cent., while those from Harrar yielded only half as much. It is purified with difficulty and gives precipitates with the usual alkaloidal reagents, but only when present in fairly strong solution. (Arch, do Pharm 239, Peb. 8, 1901.)fi

5. *Sisal Hemp.*—The 11 plants, which flowered the previous year, produced nearly 20,000 bulbils, of which over 12,000 were despatched to the Divisional Purest Officer, Nasik, and the remainder were distributed to various applicants lor experimental purposes. During the year under report, 16 plants flowered and they have produced 38,800 bulbils.

The plants put out in the Botanic Garden, Ganeshkhind, made fair progress, and those at the experimental plot at Nandgaon are also in a thriving condition.

6. *Sabai grass.—TSo* application for seed was received during the year. The Managing Agents of the Reay Paper Mills have decided to grow the plants without irrigation, so that now the plant only yields one crop per annum. On irrigated land the difficulty regarding the flower-stalks appears to he insurmountable.

The plants of *Esparto* (Stipa tenacissima) remained small and never recovered from the effects of the hot weather. The plant is thus manifestly unsuitable for cultivation at Poona.

7. *Economic work.*—The examination of the wheat and cotton varieties was continued. During the present year I hope to come to some definite conclusion regarding the classification of the *Jowars* and some minor crops. Two interesting discoveries among the latter were a peculiar form of *M&g* (Phaseolus Mungo *Linn.)* from Guzerat and a luxuriant form of *Panicum ramosum* Linn., which is cultivated as a cereal in one taluka of Ahmednagar.

I have to thank Mr. R. K. Bhide for his cheerful assistance in the Herbarium and field. Mr. L. D. Garade, who succeeded the late Mr. Madane as Head Plant Collector, took entire charge of the preparation of the very large number of specimens and by the exercise of unremitting industry, he avoided any accumulation of arrears. Mr. L. Khomne has taken up the duties of Second Plant Collector which he has performed to my entire satisfaction.

GEORGE A. GAMMIE,

In charge of the Botanical Survey of the Bombay Presidency.

POONA ;

The 2nd July 1903.

Annual Eeport of the Government Botanist, Madras.

I have the honour to forward the following report of the work of my office during the year 1902-03.

2. Owing to the transfer of my head-quarters to Madras the ordinary course of touring was considerably interfered with. The following were the chief places visited:—

Ootacamund.—This was my head-office until 1st July and some two months were spent there in arranging the collections for the transfer.

Madras.—After 1st July my office was located in the Board's buildings at Chepauk. Eor reasons given below, only two months of the remaining nine were spent in Madras, the rest being devoted to travelling.

Samalkot.—Nine visits were made during the year to the experimental sugar station. The longest of these was for the month of March during which the crop was reaped.

Coorg.—The first half of June was spent, chiefly at Praserpet, in the investigation of the sandalwood disease known as " spike."

Kistna District.—A general agricultural tour was made through the dry taluks of this district, from the end of September to the beginning of November.

Godavari gorges.—A plant-collecting tour was made up the river during the latter part of November and the first half of December.

South Wynaad.—A fortnight in January was devoted to a tour through the planting districts of the Wyuaad, most of the time being spent in the investigation of the pepper disease.

3. An important change was made during the year in the work of the Government Botanist. By G. O., No. 292, Revenue, dated 25th March 1902, he was transferred to the Agricultural Department and his work became mainly economic. As a consequence of this, his office was moved from Ootacamund to Madras. The collections were safely transmitted at the end of June. The rooms in the Board's offices are ill-suited for microscopic and general laboratory work, and, pending the erection of suitable quarters, the Government Botanist found it advisable to spend a considerable part of the year on tour.

4. The only tour devoted definitely to the botanical survey was the short one in the Godavari gorges. The dry flora along the banks of the river were carefully collected, and a number of species were also obtained on a five days' trip among the evergreen forests of the Eastern Ghats near Bison Hill.

Besides this main tour, smaller collections were made in the Kistna District, in Coorg, around Coonoor and Ootacamund, at Gudalur, in the Wynaad and down the Tambracherry ghat. No great effort was, however, made to increase the collections, since the preparing work was completely disorganised by the removal of the herbarium.

5. A commencement was made towards collecting a fungus flora of the Presidency, the Cryptogamic Botanist to the Government of India having expressed a desire for Madras specimens. Thirty-two collections were made and forwarded to Dehra Dun during the year.

6. Among the numerous specimens received for identification, five parcels of grasses were sent in by different Forest officers. The work of naming these is proceeding, but little progress has been made in this direction because of other work. About 130 sheets of grasses have been named during the year and 500 more await attention.

A collection of 102 sheets of plants was received from Calcutta, but, owing to press of work, none have been sent in return. About 250 sheets have, however, been prepared for this purpose and will be forwarded as soon as they can be dealt with.

7. On the initiative of the Officiating Reporter on Economic Produots to the Government of India, considerable attention has been paid to the different

varieties of sorghum grown in the Presidency. Altogether 94 sets of sorghum heads have passed through the offi.03 for transmission to Calcutta, duplicates being retained in all cases for future reference.

8. The Superintendent of the Royal Botanical Gardens in Calcutta and the Reporter on Economic Products having decided to work up the varieties of yams, wild and cultivated, throughout India, the somewhat delicate task of forwarding living specimens of the tubers for growth in the Calcutta gardens devolved onthis office. Fifty baskets of these have been despatched during the year. The importance of having such sendings passed through a Central office may be gathered from the fact that many have had to be rejected because of small size, decay *en route,* or because they were not yams at all but tuberous plants of other orders.

^ 9. An attempt has been made to collect information regarding th9 wild indigos of the Madras Presidency. It is supposed that among these there is one at least of great economic value, and the search has bean commenced for it. A numbar of plants have already been received in this office, but, since their state of preservation on arrival has been almost uniformly bad, little progress has been made in the enquiry. Such indigos as the Government Botanist was able to collect on tour have been carefully examined and sent for checking to the Superintendent of the Royal Gardens in Calcutta, and several interesting species have been found among them. The cultivated forms so far collected have been uniformly referred to *Indigo/era sumatrana,* and not to *Indigo/era tinctoria* as had been supposed.

10. The sandalwood plantations of Mysore and Coorg have recently developed a new and alarming disease called " spike." In this the plant slowly or rapidly alters the character of its foliage, the leaves becoming smaller and less numerous as the disease advances. Ultimately the affected plant dies out altogether. Large areas where the sandalwood was formerly abundant are now completely devoid of these trees, the disease having made a clean sweep of them. The sandalwood of commerce is entirely collected from dead trees. While therefore the visible supply is not likely to decrease during the next few years and might indeed be greatly increased with little difficulty, there is some prospect of this profitable source of revenue being lost to the State. Considering the importance of the product, the Government Botanist was lent to the Government of India to examine the plants *in situ.* No trace of any parasite was found in the tissues, but a number of interesting facts were brought to light in the investigation, the report on which was reproduced in the *Indian Forester.*

11. A fortnight was devoted to an examination of the pepper plantations of the South Wynaad. After some years of phenomenal success, many of the vines are seen to be dying out. A number of diseases were met with, but there was no *one* which was universally found. The plants were extremely liable to cankerous growths, and in some cases severe attacks of eelworms on the roots were met with. In certain vines a hyphal infestation was found throughout the vessels in the fibrovascular bundles, but the presence of this fungus did not appear to have any relation to the relative " sickness " of the vines. A preliminary report was issued and the investigation postponed until the Government Botanist should have the opportunity of examining the plants during the dry weather.

12. The cockchafers of the Nilgiris continued to receive attention, although the completion of the work was interfered with by the removal of the Government Botanist's office to Madras.

13. By far the most important economic work of the year was that in connection with the Samalkot experimental sugar station. The complete management of this passed into the Government Botanist's hands on 28th April, and throughout the year its affairs have occupied much of his time-

In spite of the hurried manner in which the land was acquired, and the lateness of the time of planting, the year's work may be considered generally as successful. A change was unfortunately necessary in the Agricultural Inspector in charge, and the land proved in most cases to be in very poor physical condition, but the growth of the canes was, on the whole, satisfactory. Some of the fourteen varieties showed remarkable growth, and the results obtained from the

" methods " plots were interesting. The manurial plots were, on the other hand, of little value, in that the physical condition of the soil was quite unfit for this line of work. A second large piece has been taken up, a number of varieties have been added to the station, the manurial experiments have been simplified, while the different methods of growing the cane have received far greater attention. At the close of the official year the whole station was planted up, and over 100 experiments were being carried out in sixty separate plots. The work of reaping the crop and planting the station up was very heavy, and the bulk of the office staff were employed during the month of March in the necessary counting and weighing operations. The varieties grown were analysed through the kindness of Messrs. Parry & Co. at the Deccan Factory. As was perhaps to be expected at first, the local varieties proved to be superior to those introduced from Bombay and elsewhere. The unoccupied land was laid out in paddy of which several varieties were tried. At the instance of the Deputy Director of Agriculture the short " two-months " paddy of the Tanjore District was successfully introduced and the seed sold to the ryots.

14. A short visit was paid to the sugarcane experimental garden at Vizianagram. Here a number of Mauritius canes have been grown for several years in comparative isolation. These were inspected, and the planting for the current year was superintended by the Agricultural Inspector stationed at Samalkot. By the kindness of the authorities nine oE the varieties were planted at Samalkot and subjected to a preliminary analysis, forming a valuable addition to our set of varieties there. It is proposed to pay occasional visits during the year to this interesting little garden.

15. An important innovation in the usual touring arrangements was made, in that a tract of country w is selected for detailed agricultural examination. The Government Botanist toured for about six weeks through the upland taluks of the Kistna District, studied the crop3 and modes of cultivation and collected examples of the various pests.

The chief crop* thus submitted to detailed study were indigo, chillies, cotton, cholam, maize, tobacco, dry paddy, sazza, korra, white variga, the various grams and other crops were also noted where met with. It is proposed to devote one tour each year to the study of the crops of a district in this manner.

Among the many fungus and insect pests collected during this tour, perhaps the most interesting was a CoUetotrichum so closely allied to the existing species attacking the sugarcane that it was not possible to distinguish the two under the microscope. It was abundant on dying cholam leaves and appeared to be saprophytic. It is probably widely distributed, and, if so, attempts to stamp out the sugarcane disease must take tho proximity of cholam into account. The matter has been referred to the Cryptogamic Botanist to the Government of India. Most of the remaining pests have been merely " recorded " in the office collections until such time as may allow of their being worked out in detail.

16. During the year under review the following additions were made to the office staff. An entomological assistant, an artist, an additional plant-collector and an extra peon. These officers, who joined at the commencement of March, were employed during that month at the Samalkot sugar station, the artist making careful paintings of all the varieties of sugarcane grown.

17. No useful purpose would be served by giving references to the many minor matters which have engaged the Government Botanist's attention during the year. - Suffice it to say that the number of subjects brought before him was far in excess of what could be properly dealt with, and the wideness of the field of study has never been more keenly felt than during the period under review.

Appendix to Botanical Survey of India Report for 1902-03.

PASPALUM DILATATUM, *Pair.*

A number of reports on the cultivation of this grass having been courteously forwarded by various correspondents during the year 1902-03, *aTresumd* of the further experience thus recorded is given in continuation of the appendix to the Annual Report of the Botanical Survey for 1901-08.

The seed supplied for these experiments, it should be premised, was obtained from 'Australia in two consignments, one packed in a bag, the other in a zinc-lined case.

*Punjab**—Seed sown on the military grass farms at Umballa and Mian Mir failed to germinate at either place.

Burma.—Seed of both kinds sown at Mandalay were equally a failure although the Deputy Commissioner made several attempts to raise them. Seed sown in the open .did not even germinate.

United Provinces.—Both kinds of seeds were tried both in the rains and in the cold season' but failed to give anything like satisfactory germination. Some seed received from America* after several trials and with great care and attention, germinated on one plot at Cawnpur. By frequent waterings it was kept in existence for two years, but never produced any fodder worth considering. The Deputy Director of Land Records who supplies the information gives it as his opinion, without hesitation, that as a fodder for the United Provinces *Paspalum dilatatum* is worthless.

Bombay.—The Inspector General of Supply and Transport, Bombay Command, reports regarding the experimental cultivation of *Paspalum* in the Mhow and Deesa Commands.

The seed sown both at Deesa and at Ahmadabad failed to germinate. Ten pounds of seed imported from Australia by the General Officer commanding the Mhow District gave very good results. At Mhow this seed germinated thoroughly when watered by hand labour. Though the seed was sown late in the season owing to the late monsoon the crop was fit for cutting by the middle of September, but was left in order to obtain seed for further propagation. The crop was covered with old chopped bro&en hay to protect it from the scorching heat of the sun and by this means was kt-pt green without any watering. This, the General Officer Commanding the Mhow District add?," undoubtedly proves that it is one of the most drought-resibting grasses/[1] The Supply and Transport Officer, Nasirabad, reports that seed sown iu manured and iirigated ground germinated well, but seed sown in unirrigated and unmanured land did not germinate at all. Growth was fair but irregular, a good deal of the grass dying off and leaving the field patchy. The grass was cut and issued green during September, an average period of 80 days; under better conditions it would have been ready for cutting some days earlier.

The officer of the battery to whijh it waa issued thought well of it as a fodder. The yield was equal to 5,8fc2 lbs. green grass, or 3,000 lbs. hay per acre, the usual rate of hay for Nasirabad being 1,000 lbs. per acre. This officer further reports the experience of others in Nasirabad with *Paspalum.* In 1901 some seed received by the Cantonment Magistrate was sown *{a)* in his own garden, *(b)* by the Mission, and (c) in the Commissariat garden. The sowings *ib)* and *(c)* were failures, the seed not germinating. The sowing by the Cantonment Magistrate himself was a success, three crops having been cut from the grass during the rains and cold weather. The roots were subsequently given by the Cantonment Magistrate to the Suppl. and Transport Officer who planted them on poor soil, lightly manured but liberally wateredy 'lhe glass grew vigorously and was cut in the beginning of October to save the seed which was ready for collection though the grass itself was still green. The interest of this experiment lay in its showing that the grass ◄£ the second year was of more vigorous growth, and much richer in colour, than the grass raise! from new seed. Whether this was due to acclimatisation or to the soil (kunkur) being more suitable was not clear. The outturn in this experiment was equal to 7,616 lbs. of green grass per aare.

Another officer at Nasirabad imported fresh seed and put it down in his compound; the land was softened by ploughing but was not manured. Though watered, very little of the seed germinated and the plants withered very soon.

On the Military Dairy Farm the seed completely failed to germinate.

The conclusion come to by the Supply and Transport Officer, Nasirabad, on these experiments deserves to be given in full. " From these trials/' he says, " it appears that the seed when freshly imported will not always germinate if either too wet or too dry, and that there is alar<re percentage of failure in what does germinate; that acclimatised roots can be transplanted and do°well, none failing if sufficiently watered; also, that the crop is better in quality and heavier in the second year/'

Andaman.—A* report has been forwarded by the Superintendent of Port Blair embodying the opinion of the Executive Commissariat Officer there, who reports that, although the seed sown in 1901 had germinated, the result was disappointing, the grass only reaching a height of

12 to 18 inches, and being of poor quality. Cattle fed with it did not appear to eat it with the same relish as they did guinea grass. The seed sown in 1902 is reported as having failed to germinate at all.

Madras.—The Conservator of Forests, Northern Circle, has forwarded a note on the experiments made with the seed of 1902. In Oanjam the seed was sown under various conditions but except some 20 seedlings in a flower-pot none germinated. In Godavari the seed was sown in four beds, soil similar in all, but two in shade, two in the open. After 3 days' cousecutiye rain the seed was sown; that in the beds in shade germinated, that in the beds in the open did not germinate at all. The growth was good, the maximum height being 3 feet; flowering took place in September and seed was collected during October and November. In Kistna there seemed to be no difference between the seed that had come in a bag and that received in a zinc-lined case, both kinds germinating equally well. Most of the seed *as sown in July in raised beds of sandy soil which had been manured. Germination commenced in 5 days and continued for a month, a large percentage germinating. Some seed sown in unprepared beds* of sand germinated poorly, some of the seeds germinating as late as in December 1902. The grass in the better soil flowered towards the end of August; the growth was luxuriant and yield of 6eed fair. In the beds of nearly pure sand the growth was poor and flowering meagre. All the beds were steadily watered. Half of ihe prepared beds were in the open, h »lf under shade; the germination in the shaded half was rather more plentiful, the maximum height was 30 inches. In the unprepared beds the grdtoth was insignificant, the plants spreading along the ground. Some seed was sown on ordinary soil in Khanakhallu reserve on 28th August lfcOfc. On 22nd November about 16 plants only were found growing spread along the ground, so that the germination here had been poor. la Bellary the beds for sowing were made under shade, the soil well worked but not manured. Of the four beds, two were insi le the nursery, here the seed received in a zinc-lined case was sown; two were outside the nursery and in these the other seed was sown. The seed germinated in all, but the seed recaived in the zinc-lined case did BO more vigorously and profusely. The plants of both kinds subsequently grew well. In Anantapur both kinds of seed were sown broadcast in the District Forest Officer's Bungalow Compound. Both kinds germinated equally well, about 30 per cent, in each case. Seed sown in two beds in inferior toil and in a more exposed position almost failed to germinate at all, though the few plants that did appear have done well. In the UpparipaMi reserve two beds were sown broadcast in the open, and here again about 30 per cent, of each kind of sped germinated, the plants subsequently growing* vigorously. No a(preciable difference has been observed between the plants raised from the two sets of seeds etcept those from the teed received in a bag appeared to be greener than the others. In forwarding these reports the Conservator of Forests, Northern Circle, remarks : " I understood that *the* great feature about this grass was that it could withstand drought and do without watering, but this does not appear to be the case at all, and in fact the whole experiment seems to be a very doubtful success."

Bengal.—The Commissioner of Chota Nagpur reports that some of the seed sent to him was sown in a box, the rest in two beds in the open, one bed in shade, the other not in shade. The seeds in the open germinated very poorly, in the box very fairly. The seedlings in the box were transplanted, some to a bed under shade, the rest to a bed in the open. Up to the end of December the four beds were regularly watered, otherwise the plants would not have lived. After the beginning of January the plants were not watered but at the beginning of May 1903, they were still healthy enough except in one of the plots in the open where very few remained alive. The Commissioner, who took great pains over the experiment, concludes his report as follows: "Personally I think that the trouble and the watering needed to keep the plants alive during the past year make the grass quite unsuitable for this Division." In the Royal Botanic Garden at Shibpur, where the conditions are those typical of the Lower Gangetic Plain, no attention was bestowed on the grass as regards its cultivation, because none was uecessary. It yielded a very large supply of excellent fodder, which was used to feed the garden cattle who ate it readily, and it afforded an abundant supply of seed. Many stray tussocks are now appearing spontaneously at considerable distances from the plots in which it was originally sown. The quantity of green fodder yielded was much greater than it was during 1901-02, and the growth of the plants during the past year has been more vigorous. The species is in fact satkfactorily established. But while this is the case it will be seen from this year's reports on the subject that the conclusion hazarded last year has been amply oon-inrmed. The attempt to introduce *Patpatum dilatatum* has provided India with a now fodder grass of good quality, though not superior to many of the fodders already in use, but it has not supplied the country with a fodder that will thrive in seasons of scarcity and drought. It will not, 1 believe, be necessary to report further on this particular species.

D. PBA1N.

G. I. C. P. O—No. 7W B. *k* A.-23.7-19Q3.- 3G).-J. X. s .

REPORT OF THE DIRECTOR OF THE BOTANICAL SURVEY OF INDIA FOR THE YEAR 1903-04.

1. *Survey of Eastern India.*—The allotments provided for Botanical Surveys in Bengal, Assam and Burmp, were expended in full. On the North-Eastern frontier the Superintendent was enabled to undertake a visit to Independent Sikkim and Tibet, in order to organise Botanical Survey operations in the latter country in connection with a frontier mission. The results of this visit which was paid by the invitation of the Political Officer in charge of the mission and with the sanction of Government have been most satisfactory. The Curator of the Calcutta Herbarium was deputed to Assam to make a systematic survey of the district of Cachar with the object of linking up the results of investigations recently made in the Lushai country with results previously obtained during the exploration of the hill tracts of Assam by various explorers. This deputation gave very satisfactory results but more exploration work remains to be done both in Cachar and in the Lushai country before it is possible to give a connected account of the botanical features of the region lying between the Barak and the Irrawady valleys. In Burma use was made of the agency of native collectors, while in Tenasserim the co-operation of the Forest Department has led to the communication of a number of valuable specimens.

2. *Survey of Western India.*—In the coarse of the year the officer in charge of this sarvey botanized, during his hot weather vacation from duties at the College of Science, along the Poona Gh&ts, over part of the Thana District, around the Kanher i caves and on the hills near Matheran. His cold weather vacation was utilised in investigating the Katraj Gh&t and in exploring parts of the Guzerat and Ehandesh Districts.

3. *Survey of Southern India.*—The principal systematic survey work of the year was done in the Anamalai forests by the Government Botanist and an Assistant. Similar work was also undertaken in the coffee zone of the Mysore forests. Collections were also made during the course of agricultural and economic tours in Malabar, on the Mysore Gh&ts and in the Coimbatore district.

4 *Publications.*—The chief publications issued during the year have been a monograph of the species of Dalbergia of South-Eastern Asia, an account of the Flora of the Sundribuns, and various minor notes and papers by the Director of the Survey; a census of the Indian *Polygonums* by the Curator of the Calcutta Herbarium, published in the Records of the Survey; part I of the first volume of a Flora of the Tipper Gangetio Plain by the officer lately in charge of the Botanical Survey of Northern India was issued; a botanical account of the Indian Cottons vras prepared, for issue by the Agricultural Department, by the officer in charge of the Botanical Survey of Western India, and part I of the second volume of the Flora of the Bombay Presidency by an officer formerly in charge of this survey was completed. The officer in charge of the Botanical Survey of Southern India has published a memorandum on the pressing, preservation and despatch of specimens; a note on the experimental sugarcane cultivation at Samalkata; an account of the diseases of Andropogon Sorghum in the Madras Presidency; two reports on the Wynaad Pepper plantations.

5. *Economic and Agricultural Botany.—Oh** continued attention o£ the various officers of the survey has been given to economic and agricultural questions. During the year the Director made several tours of inspection on behalf of the Agricultural Department in connection with enquiries into the cultivation of Cotton, of Indian Hemp, of Agave and of Jute in Northern India; the officer in charge of the Botanical Survey of Western India visited the Sisal plantations at Nandgaon and devoted much time to botanical investigation at the Foona and Manjri farms; the officer in charge of the Botanical Survey of Southern India devoted much time and attention to the management and study of experiments on the Samalkota Sugarcane farm; to the study of the pepper crop in the Wynaad and in Malabar, and to an investigation of the crops of the Coimbatore district.

The Director examined and reported on a large series of specimens of plants from Africa yielding Indigo, sent for investigation through the Secretary of State for India by the Colonial Office. The enquiry into the sources of Indian Hemp fibre made steady progress* Seeds received from parties interested in the trade in this article from places so remote as Coconada, Central India, the United Provinces and Lower Bengal, were cultivated experimentally with the result that the fibre was shown in each case to be the product of the same plant, *Crotalaria juncea.* Grown as the plants were side by side, under the same conditions as to cultivation and with identical treatment as regards the extraction of their fibre the difference in value in their products practically disappeared. The fibres from the plants that yielded the seeds vary in valu$_e$ in the trade, according to locality of origin, from £9 to £18 per ton. Yet as grown in Calcutta, the greatest variation experienced was of only £2 per ton ^{a}nd it was reported from London that all the fibres submitted for valuation could have been sold under the same mark. The experiments are to be reported on a more comprehensive scale so as to put the results on a wider and firmer basis. The interest taken by the public in other plants yielding useful fibres has continued to be great and in connection with this it has been found necessary to institute a sustained enquiry, with the co-operation of officers in charge of public gardens throughout India and with the aid of other Government officials and private planters, into the identity and distribution of the various *Agaves* *nd *Furcroeas* that are naturalised in different parts of India. Among those who have chiefly aided the Director in this enquiry may be specially mentioned the Superintendent of the Botanic Garden, Saharanpur, and J. R. Drummond, Esq., LC.S., who has given close attention for sometime to this extremely intricate and very important problem. It is too soon yet to say how many different Agaves have really become naturalised in India; to state precisely the areas to which such ;is limited; or to enumerate the characters by which they may most certainly be distinguished. The differences in their value as fibre-producing species are, however, in some cases marked and sufficient information has been obtained to show that considerable caution must be exercised by those desirous of laying down extensive plantations of local *Agaves.* A note on the subject is under preparation, which is intended to serve a double purpose; to make conveniently available all the information that it has so far been possible to obtain and to direct the attention of those interested in this subject to the points that are still in debate, in the hope of thereby inducing those in a position to do so, to help the officers of the survey in rendering the investigation accurate and complete. The enquiry into the characters and distribution of the various Indian Yams on which the Director

of the Survey and the Reporter on Economic Products have been for some seasons steadily engaged is making satisfactory progress. The enquiry, as has already been explained, is one of peculiar difficulty and has involved the experimental cultivation of much material from all parts of the Empire and from adjacent countries. The cultivation of living plants from tubers, bulbs, cuttings and seeds, for the purpose of identifying the sources of economic articles on behalf of the Reporter on Economic Products, has gone on as usual, the number planted or sown during the year exceeding 6,000. The economic and agricultural enquiries undertaken in Western and Southern India during the. year are fully dealt with by the respective officers in charge, whose reports are submitted in original.

6. ££a#\—The Director of the Botanical Survey was in charge of his post throughout the year. The work of the Botanical Survey of. Northern India has been in abeyance throughout the year. The survey work of Western India was in charge of Mr. G. A. Gammie till 19th March 1901 on which date that officer, whose work has been of the usual high quality, availed himself of six months[9] leave to England, his duties being entrusted to Mr. R. K. Bhide by whom the report of the Western India branch of the survey is submitted. The work of the Botanical Survey of Southern India has been throughout the year in the charge of Mr. 0. A. Barber and has been performed with great care and ability.

DAVID PRAIN,

Director, Botanical Survey of India.

REPOET ON THE BOTANICAL SURVEY OPERATIONS IN THE BOMBAY PRESIDENCY FOB THE TEAR 1903-04 BT B* E. BHIDEJ OFFICES IN CHARGE OF THE BOTANICAL SURVEY OF BOMBAT PRESIDENCY.

Professor G. A. Gammie, F.L.S., Officer in charge of the Botanical Survey of Bombay Presidency, having gone home to England on leave of six months, at the close of the year under report, I was given charge of his office on the 19th March 1904.

1. ZWr*.—During the hot weather vacation Mr. Gammie botanised along the Poona Gh&ts and part of the Thana District around the Kanheri caves, and the hills near Matherau. He also paid a visit to the Sisal Plantation at Nandgaon and devoted much time to botanical investigation at the Poona and Muujri farms. I botauised near the Kanheri caves again and Mr. L. D. Garade, the Plant Collector, re-traversed the Poona Gh&ts later in the rains. In the cold weather vacation Mr. Gamraie botanised Katraj Gh&t and travelled over parts of the Guzerat and Khandesh Districts. The Plant Collectors also made s >me interesting collections in the Thana District. Owing to ill-liealtli I could not go out on any long journey during the year.

2. *The Herbarium.*—The Botanical Survey Department of this Presidency is greatly indebted to the following gentlemen for the valuable specimens they have presented to the herbarium :—

Dr. T. Cooke, who presented the specimens forming his own herbarium up to the end of BubiacesB. He has also promised the remainder of his herbarium as his work on the Flora of Bombay progresses. As mentioned in the last report, his collection is invaluable as it is named in accordance with his book.

Mr. G. M. Ryan, Deputy Conservator of Forests, Central Thana, who continues to send valuable specimens from his district accompanied by notes which are of equally great value.

Mr. Woodrow, who still takes an interest in the herbarium and has presented some very valuable specimens of mosses collected in Great Britain.

The Superintendent of Victoria Gardens, Bombay, and Empress Gardens, Poona, who send miscellaneous specimens of garden plants from time to time.

The following is the record of specimens incorporated in the Herbarium :—

		Sheets.
Specimens collected by	Mr. G. A. Gammie.	1,251
„ „	„ R. K. Bhide.	173
„ „	„ L. D. Garade.	597
„ presented by	Dr. T. Cooke.	1,194
„ „	Mr. G. M. Ryan.	1,460
„ „	„ G.M. Woodrow.	307
„ „	Superintendent, Victoria GaxdenB, Bombay	8
„ „	„ Empress »• Poona	10
„ „	„ Royal Botanic Garden, Calcutta	791
	Total	5,791

The following is the number of specimens distributed :—

Specimens sent to the Principal, Pergnsson College, Poona	478
if *$i n* Veterinary „ Bombay	68
Total	546

3. *Publications.—A* botanical account of the Indian cottons was despatched to the Inspector General of Agriculture in India, by Mr. Gammie. Volume I, Part III oE Dr. Cooke's Flora of the Presidency of Bombay was published.

4. *Sisal Hemj*><—Eight plants flowered during the year and they have produced 16,300 bulbils.

The following: bulbils were despatched to the Sub-Divisional Officer, Ekruk Tank, Sholapur, and the Forest Officer, Eolhapur :—

Bulbils despatched to the Sub-Divisional Officer, Sholapur	5,000
„ „ „ Forest Officer, Kolhapur.	1,000
Total bulbils	6,000

The plants jmt out in the Ganeshkhind Botanical Garden as well as those at the experimental plot at Nandgaon are making fair progress.

5. *Sabai Grass**—No application for seeds was received during the year. The Managing Agents of the Keay Paper Mills, Mundwa, Poona, are now growing this grass successfully as a commercial venture and this Department has now plants only sufficient to supply applicants with seeds. I have to thank Mr. L. D. Garade, Plant Collector, who knows many Bombay plants by their vernacular names and who is thus very useful at times in identifying specimens. He had entire oharge of the preparation of specimens in addition to his duties and on the whole he has done his work satisfactorily. Mr. L. B. Khomne, the secood Plant Collector, has been doing his work fairly well, and with some experience ,he will also prove to be a good Plant Collector

B. K. BHIDE,

Acting Professor of Botany and Agriculture, College of Science, Poona,

" *"» ** Survey of Bombay Presidency.*

O«B« OP SC»K«, POOH*:

"Tk«4th July 1904.

ANNUAL REPOBT OF THE GOVERNMENT BOTANIST, MADRAS.

I have the honour to present the following report of work done in my office during the year 1903-04.

2. There has been a very great increase in the number of subjects dealt with, especially in connection with Economic Botany, and it has been found impossible to refer to all individually In the space assigued for this report The working room at our disposal has remained unchanged. This has proved so inadequate that active collecting has been largely in abeyance, and the time of the staff has been devoted to the attempt to keep the existing collections in a proper condition. In spite of all our efforts, a number of specimens have been destroyed by dust and damp, by rats and insects. The actual investigating work has been conducted under the greatest disadvantages as regards light and spaoe, and many matters which would otherwise have occupied our attention have been perforce left over until a more suitable accommodation is provided.

3. The Government Botanist spent ?30 days on tour and 136 at head office. The Anamalais, the Wynaad, Malabar, the Mysore Ghâts, the Mysore sandalwoud tract, Dharwar, the Bombay Agricultural farms, Coimbatore, Bellary and various parts of the Gtfdávari district have been visited for longer or shorter periods, and the Assistants have now commenced to take their part in this important work. They have been sent to Ootaoamund, Bellary, the Gódávari district, North Aroot, South Areot, Erode and Chingleput on independent missions.

^ 4. Collections have been made of forest trees, grasses, peppery indigos, and the most various economic plants, while a very large number of seeds have been sent to the Reporter on Economic Products to the Government of India. Collections of special groups have been sent to authorities at home for naming, an active correspsndence has been kept up with those interested in agriculture in the Presidency and numerous reports have been prepared for the Director of Agriculture,

5. The following are among the more important pieces of work undertaken during the year:—

In connection with the systematic part of the survey, the Auamalai forests were visited by the Government Botanist and an Assistant from April 7th to May 25th. This was at the instigation of the Forest Department, who wished to know what the botanical names were of their forest trees. Three hundred and eighty numbers were collected consisting of 180 different plants. Of the 100 trees, 70 have been named and 30 are not at present determined. The 80 ferns and shrubs have mostly been named. A valuable collection of the peppers of these and other forests has been made, including dried and spirit specimens. A list of the trees with their vernacular names (about 200 of which have been collected from the Kaders) has been sent to the Conservator of Forests in the Southern Circle and a small named collection of 45 trees has been placed in the Coimbatore Museum as a nucleus of a forest herbarium.

This was the main systematic work of the year, but smaller collections were made at such places as the Government Botanist visited.

6. An Assistant was also sent to make a study of the trees of the coffee zone of the Mysore forests. His first tour, which was more or less preparatory, was iu December. Most, of the trees were found to be* without flowers or fruits, but a set of about 200 were got together, of which 109 have now been named. This toar, which was made with the idea of ultimately helping the planters iu their study of suitable shade trees and the causes of stump-rot in coffee, was undertaken with the assistance of Mr. Graham Anderson, C.I.E., to whom we are indebted for many facts concerning the vernacular names and uses of the different trees collected. The work is still being carried on as opportunity permits with the help of Mr. Anderson.

7. Collections have been received as usual from District Forest-officers, two lots of grasses (37 species) from North Salem, one lot of grasses (34 species, of which 19 are unfortunately indeterminable) from Nellore, and one small lot of 12 species from Cuddapah. While welcoming these collections, we are considerably behindhand in naming them, as well as those sent in previous years. Four collections have been named during the year, but none of those referred to have been completed. Our present staff is unable to cope with much systematic work.

8. Many individual plants have been received for naming. A set of *Eucalyptus* specimens has been collected at our request by the Curator of the Ootacamuud Gardens and forwardel to the Government Botanist at Sydney, as he is monographing the group.

9. Our collection of 78 sheets of yams has been sent to Dr. Prain at the Calcutta gardens, and he has very kindly named them for us. Oar whole collection of ebonies, with the Government Botanist's drawings, has also been sent to Dr. Prain, as he has made a special ifcudy of the group and there seem to be new species among those collected. A large number of sheets of iudigos have als > been sent to Dr. Prain, who has named these difficult plants for us. A full set of our balsams, together with the paintings of Mr. Lawson's artist, has been sent to Sir Joseph Hooker, who is now engaged in monographing the balsams of India. He h»s been pleased to speak well of their general get up, and it is perhaps admissible to quote his words of appreciation as they will show more than any thing else that this work of systematic botany, although taking a subordinate place at present, is not being neglected altogether.

"The collection is in splendid order, well colleoted, well mounted, and well arranged. It is by far the finest collection of Indian balsams that I have seen and will afford me great help in many ways." Our small collection, finally, of *Pandanacecs* has been sent to Professor U. Martelli, in Italy, who is monographing the genus.

It may be explained that this sending of sheets from oar collection to Various correspondents is not at all an unusual thing. Also, that before doing so the collections are worked out to the best of our abil ity in the office, *by* this method we obtain a flumber of valuable and authoritative namings which from our position we are quite unable to give, and, furthermore, the collections are greatly enriched by the annotations of monographers who are for the time being the greatest authorities on their respective orders.

10. The herbarium work has been conducted under the disadvantages already alluded to. About 2,000 sheets have been mounted for the systematic survey, 700 of which were from the Gddávari gorges and about 1,200 from the Anamalais. A large number (604 sheets) of plants have been prepared for transmission to Calcutta, but the congested state of our office has prevented them from being forwarded. In exchange, a considerable number of sheets (289) have been received from Dr. Prain for incorporation in our herbarium.

11. The collection of fungi, commenced last year at the instigation of Dr. Butler, has been discontinued for lack of space. All our sorghum smuts have, however, been sent to him for naming. Added to them was a large collection of grasses with smuts on them. These have a certain economic importance in that they affect the feedings value of pastures considerably.

Among the most interesting fungi sent to Dr. Butler was the red spot disease found so abundantly on sorghum leaves. This appeared at first sight to be identical with the red smut of sugarcane, *Colletotrichum falcatum.* But Dr. Butler has determined it to be the closely allied *Colletotrichnm lineola.* Various fungus diseases of sugarcane, prickly-pear, sorghum, etc., were also forwarded while many fungus diseases of sorghum, tenai, cumbu, paddy and other crops were collected. A certain amount of this work was collated in the bulletin on the diseases of sorghum in the Madras Presidency. A considerable amount of time was spent over the fungus diseases of the pepper plantations and a report was written on the subject. Casuarina trees, dying in numbers on the east coast, were also examined, but, after long search in the specimens forwarded, no fungus hyphsa were observed which appeared likely to cause the diseased condition of the trees. In the short tour to Yelwal with Dr. Butler some attention was paid to the spike disease in sandal which has much the character of a fungoid attack. Generally speaking, however, this part of our work, the study of cryptogamic botany, has been neglected. There is no one at present in the office who can be entrusted with the difficult microscopic examination needed, and the time of the Government Botanist has been taken up with other matters.

12. The study of fungi is closely connected with that of insect pests. The entomological work of the year has been of a desultory and more or less preparatory character. Owing to pressure in the office, the Sub-Assistant appointed for this work has been frequently employed in other ways. The previous collections have been gone over and got into good order. *By* the advice of Mr. Lefroy and in the absence of proper reference collections we hava contented ourselves largely with determining the families of the insects collected. This method has been a useful education for the Sub-Assistant and has undoubtedly strengthened our hands iu enabling us to deal more rapidly with such entomological work as is placed before us,

A couple of brightly coloured moths, which are accustomed to attack the sunn hemp fields in the Gódávari district disastrously, were worked out and, on reference to the Indian Museum, were named *Deiopia pulckella* and *Argina cribraria.* Some attention was devoted to the *Aleurodes* common in the diseased cane fields, but it was thought that this pest was secondary in its nature and only appeared on weakly plants. It has been used as an outward sign of the presence of red smut in the cane stem. The study of the Nilgiri white grub was continued, but comparatively few additions were made to our knowledge of this serious pest. The work on this subject will, it is hoped, be shortly presented for publication in the form of a bulletin. A ready method has been discovered of freeing individual gardens from these depredations. Many references of a minor character have been received and dealt with, but as a rule the details forwarded have been too meagre and the specimens immature. It is felt that the present arrangement of having one sub-assistant is hardly sufficient for dealing with this difficult subject. A certain amount of work on insect pests was included in the bulletin published on the diseases of sorghum in the Madras Presidency, but the Government Botanist has not been able to devote such attention to the subject as it merits.

13. The subject in Economic Botany which has engaged the attention of the office most has been the management and study of the experiments on the Samalkota Sugarcane farm. Ten visits were paid to the farm by the Government Botanist during the year. The longest of these was for twelve days in June after the opening of the canals, but, during the months of February and March, the attention of the office as a whole was almost entirely devoted to sugircane matters, including the reaping of the crop and the planting for the new season. A number of canes were distributed to the ryots for experimental cultivation. A careful study, with the co-operation of the Chemist of the Deccan Factory, was made as to the possible improvement of the local jaggery. The Samalkota canal was surveyed with the idea of finding a suitable place for * combined sugarcane and paddy station, but the result was not satisfactory. A number of canes were brought down to Madras and exhibited at the annual show of the Agri-Horticultural Society. A visit was paid to the Vizianagram plantations of five years' acclimatised Mauritius canes, and a considerable number of plants were added to the Samalkota collection through the kindness of the Collector. In return for this generous treatment a

scheme was prepared for the future sugarcane experiments at Vizianagram and the crop wae taken off and the jaggery prepared by the Agricultural Inspector attached to the Samalkota farm. A number of canes were received from the Inspector-General of Agriculture, representing the two best Bengal varieties, and local kinds were collected from South Arcot, Madras and North Aroot for detailed study at the farm. Trie collection of different varieties of cane under observation at Samalkota now numbers about thirty. A series of reports on the results obtained has been submitted to4he Board so that further details are unnecessary here.

In connection with this subject it may be stated that the sugarcane cultivation was carefully studied in the Coimbatore district (where a serious attack of a sereh-like disease was noted), in North and South Arcot.

14. At the instance of the South Wynaad Planters' Association, the subject of pepper diseases was taken up with some amount of care. Since the diseases appeared to be chiefly of fungoid nature, it was not possible to do much, but a couple of reports were written and printed by the association. South India being the original home of the pepper of commerce, and the classification of these puzzling plants being, according- to Sir Joseph Hooker, in a state of almost hopeless confusion, the wild peppers were investigated and a good collection was made for future study. A visit was paid to the pepper gardens in Malabar (May 26th—June 11th). These were found also to be suffering from a number of diseases chiefly of fungoid and nematode origin. On the whole it was considered that the pepper plantations o£ the Presidency were not in a healthy condition and well merited experimental cultivation. A visit was paid to the Cadamaney pepper plantations on the Mysore Ghâts, but although the mode of growing the plants was in many respects diametrically opposed to that in Tellicherry and the Wyuaad, the disease appeared to be as prevalent and evasive as ever. The plantations at Cadamaney are very largely natural, that is to say self-sown in the jungle. The constant presence of a definite fuqgas on the dying branches led to a series of inoculation experiments being commenced. But the results thus far seem to indicate that this fungus (a *Nectria ?)* :,is saprophytio and not the cause of the disease. The disease at Cadamaney was stated by the Kew authorities to be caused by a root fungus called *Eosellinia necatrix Prill, fy Del.*, but a careful search on the spot failed to reveal its presence. A projected visit to the Bomba tihaîcs was frustrated by the laok of information placed at our disposal. From all accounts the pepper there seems to be in a more flourishing condition than elsewhere in India, and for this reason the plantations would be worth a visit later on.

15. The maiu agricultural tour set apart for the economic survey of the Presidency was in the Coimbatorc district (July 9th—August 11th). The line chosen was Coimbatore, Udumalpet, Madaturkolam and Dharapuram. The crops inspected were oholam, cotton, tenai, ragi, cumbu, betel, pepper, cummin, coriander, fenugreek, sugarcane, gingslly, varagu, brinjals and several minor ones. Careful notes were taken on these crops and their pests, together with the water supply and mode of irrigation and the character of the soil and climate. Large collections were added to the economic herbarium and many specimens were placed in spirit for future investigation. The bazar at Udumalpet was visited aud numerous samples of different agricultural produce were taken.

16. During the month of September advantage was taken of a tour in South India by the Cryptogamic Botanist and Entomologist to the Government of India to discuss matters connected with future joint wort. The first place visited was the Samalkota farm where the various experiments were explained and specimens of pests were collected. The Madras office was then carefully gone over and a number of specimens in our collections were noted and some of them named for us. The Entomologist kindly drafted a set of instructions for the guidance of the Entomological Sub-Assistant. The Mysore State was then visited. The planters took advantage of our presence to hold a general meeting at Saklaspur. The Cadamaney pepper plantations were then visited by me and I again joined Drs. Butler and Lehmann at Yelwal for the investigation of the spike disease in sandalwood. The study of this disease having been placed definitely in the hands of Dr. Butler by the Government of India, I assumed a merely helpful attitude. Incidentally I learnt daring this visit that the same disease had appeared within a few miles of the sandal-bearing tract of Kollegal in the Madras Presidency. This I at once reported to the Board and subsequently learnt from the District tforest Officer of North Coimbatore that spike had made its appearance in Eollega] at some distance from the Mysore boundary. I have placed the authorities in communication with Dr. Butler, who is conducting the investigation.

The futile attempt to reach the pepper plantations of the Bombay Ghâts belongs to the same tour and has already been referred to. I turned my attention to the crops in Dharwar and made collections and notes. The betel gardens of the little native state of Savanur were carefully gone over with Dr. Butler and a number of pests in this usually healthy crop were noted and collected.

17. In the earlier half of November I accompanied the Deputy Director on a tour of inspection through the Bombay farms. This was at the instance of the Inspector-General of Agriculture, who hid assembled agricultural officials from various parts of India. As already reported in detail, we visited Poona, Bombay, Surat, Ahmedabad, Chharodi, Nadiad, noted the experiments of Professor Gamraie in cotton crossing, and observed the sugarcane, groundnut, tobacco and sorghums plots. Some observations made during this tour were incorporated in a recent report to the Board.

18. The Bellary farm was visited twica during the year in company with the Deputy Director of Agriculture! in connection with a scheme I hid drawn up for ootton crossing in

the Madras Presidency. The plants were examined and numbered, herbarium specimens were collected, and the lint collected was sorted. A more detailed scheme for crossing was prepared for the plants growing at the Saidapet farm, hut the weather proved most inauspicious and the floods of December nearly washed the whole place away. Separate reports have been prepared on these places, in connection with the improvement of Indian cottons.

19. These were the main agricultural tours conducted by the Government Botanist during the year. An Assistant was deputed to Ootacamnnd to study thAwarming of the cockchafers in April and May, and again in September to examine the remits of sowing- some of the chief forms in boxes with grass on them. He was however new to the work and little success attended his efforts. Reference has been made to the tour in the Mysore coffee zone by another Assistant to collect the shola trees. An Assistant was deputed to Bellary to collect heads of the different kinds of cholam growing at the Experimental Farm. Au Assistant was deputed to South Aroot and at the same time another to North Aroot to study the sugarcane growth in these two districts, and by this means our knowledge has been largely increased in both these directions. An Assistant was sent with good results among the Godavari ryots to ; familiarise them with the methods of cultivation adopted in the Samalkot farm and to show them the kinds of cane we were distributing. Another Assistant was deputed to collect seed of Bourbon naturalised cotton in the Erode taluk for the Inspector-General of Agriculture. The Agricultural Inspector in charge of the Samalkot farm made several tours in the Godavari district and visited the Vizianagram plantation to make preparations for milling their canes for them there. Besides these tours among the Assistants, one accompanied me on the Anamalai tour, another went with me to Tellicherry, and a third accompanied me throughout the Coimbatore Economic tour.

This is the first year in which systematic touring has been done by Assistants, and the results have been eminently satisfactory iu a general increase of their usefulness.

20. About 1,000 sheets of economic plants have been added to the herbarium. These are made up as follows:—257 sheets of cholams, 93 of cumbu, tenai, etc., 66 sheets of sorghum diseases, 292 sheets of cottons and over 200 of various others. Besides these a large number have been added to the spirit collections all of which are in a fit state to be examined under the microscope when a suitable opportunity occurs.

21. A number of seeds of different kinds of crops have passed through the office, during the year under review, to the Reporter on Economic Products to the Government of India, This work, which has largely occupied the clerical section, included 136 lots of paddy, 51 of cholam, 15 of chillies, 11 of ragi, 17 of cumbu and tenai, and others in smaller quantfty, such as gingelly, cow-gram and varagu. A sample of each has been retained in the office, the economic collections being thereby considerably strengthened.

22. Twenty-three parcels of indigos were received from different parts of the Presidency. As recently reported, these include 17 kinds of wild and cultivated forms, and although therefore connected with the systematic survey, several species of high economic value have been recorded. Tims the wished-for *Indigo/era longeracemos* has been rediscovered in Travancore — a plant which has the reputation, rightly or wrongly, of being the most valuable indigo-producing plant in the world, and now cultivated in Madagascar and Zanzibar. *Indigofera sumatrpna* appears to be the main cultivated form in the Madras Presidency, but /. *tinctoria, I. Anil and 1. articulata* have been met with wild in different parts, and it seems not improbable that they may be escaped from former cultivation. We have in this study been much indebted to Major Prain, without whose help the work could not have been done.

28. The artist has worked steadily throughout the year and has added a fine series of drawings and paintings to the herbarium. He was deputed for one month to study the methods of the artist working under Mr. Cameron at Bangalore, and his work has profited much thereby. We are indebted to Mr. Cameron for his kind personal superintendence in this matter. The artiBt'B work consists of 88 paintings, chiefly of flowers and varities of sugarcane, and 53 folio pages of drawings, the latter being reproductions of sketches on tour by the Government Botanist, and chiefly consisting of analyses of various forest trees.

24. The following publications have been issued daring the year:—

(1) A Memorandum on the Pressing, Preservation and Despatch of specimens to the office of the Government Botanist.

(2) A Note on the Experimental Sugarcane Cultivation at Samalkota. This was issued as Bulletin No. 48 of Vol. II of the Madras Department of Agriculture.

(8) The diseases of Andropogon Sorghum in the Madras Presidency, Bulletin No. 49, in the same series.

(4) Two reports on the Wynaad Pepper plantations have been printed and circulated by the South Wynaad Planters' Association.

^ J[5]* ?[oU]* Of L Flora* have been *Prepared for various publication.—The* Madias Presidency, the South Aroot District, the Goddvari District. ™wency>

A Hit of papers published during tie year 1903-1904, in or regarding India, hearing on the work of the Botanical Survey Department.

BARBER, C. A.—Note on the experimental Surgar-Cane station at Samalkot, Godavari District; *Madras Agric. Bull.* vol. II., No. 48.

BARBER, G. A.—Diseases of *Andropogon Sorghum* in the Madras Presidency; *Madras Agric. Bull.* vol. II., Mo. 49.

BARTON, E. S.—(Mrs. Antony Gepp) List of Marine Algae collected *at the Maldive and Laccadive Islands by J. S. Gardiner, Esq., M.A.; *Jour. Linn. Soc.* vol. XXXV., p. 475.

Boss, J. C—Electric Response in ordinary plants under mechanical stimulus; *Jour. Linn* Soc.* vol. XXXV., p. 875.

Boss, J. C—'On the Electric Pulsation accompanying automatic movements in *Desmodium gyransj Jour. Linn. Soc.* vol. XXXVI., p. 405.

BOURDILLON, J. *Y.—*Holigarna nigra,* a new species; *2nd. Forester* vol. XXX., p. 95.

BRANDIS, SIR ^.—A note on *Oelsemium elegans; Pharmaceutical Journal* vol. LXX., p. 868.

BRANDIS, SIR D.—The Bamboo Fungus of Burma; *Pharmaceutical Journal* vol. LXX., p. 868.

COOKE, *T.—ffleiotis trifoliolata ; Hooker's Icones Plantarum vol.* XXVIIL, t. 2753.

COOKB, T.—Flora of the Bombay Presidency, vol. II., part I.

FINET ET GAQNEPAIN.—Contribution a la flore de l'Aeie orientate; *Bull. Soc. Bot. de France* vol. L., p. 647 : vol. LI., p. 56; p. 130.

FISHER, W. B.—Sweet Chestnuts in India; *Ind. Forester* vol. XXIX., p. 190.

GAGE, A. T.—A census of the Indian Folygonums; *Records Bot. Surv. India,* vol. II., p. 371.

GAMBLE, J. S.—*{See* KING, Sir G.)

GAGNBPAIN— *(See* FINET).

GAMMIE, G. A.—The trees and shrubs of the Lonavla and Karla groves; *Jour. Bomb. If at. Hist. Soc.* vol. XV., p 279.

GLEADOW, *Y.—Jatropha Curcas; Jour. Bom. N at. Hist. Soc.* vol. XV., p. 865.

HEMSLEY, W. B.—*Btilbophyllum auric omum; Bot. Mag.* vol. LX., t. 7938.

HOOKER, Sir J. D.~Jm *Collettii% Impatiens falcifer, Agapete* Moorei, Sauromatum brevipes; Bot. Mag.* vol. LIX., t. 7889, t. 7923, t. 7923, vol. LX., t. 7940.

HOPE, C. W.—The Ferns of North-Western India, Part IIL—The General List; *Jour. Bom. Nat. Hist. Soc.* vol. XV., p. 78; p. 415.

KING, Sip G, AND GAMBLE, J. S.—Materials for a Flora of the Malayan Peninsula, No. 14, *Jour. As. Soc. Beng.* vol. LXXII., part 2, p. 111.

KIBTIKAB, Lieut.-Col. K. B.—The Poisonous plants of Bombay, Part XX.; *Jour. Bom. Nat. Hist. Soc.* vol. XV., p. 56 (with Plate).

PEAIN, D.—Some additional *Scrophularinea; Jour. As. Soc. Beng.* vol. LXXII., patt 2, p. 11.

PRAIN, D.—The Species of *Dalbergia* of S. E. Asia; *Ann. Soy. Bot. Gard., Calcutta,* vol. X.> part 2.

PEAIN D.—Flora of the Sundribuns *; Records Bot. Surv., India,* vol. II., p. 231.

PRAIN, D.—Notes on Sundribuns Plants; *Proc. As. Soc. Beng.* for 1908, p. 107.

PRAIN, D.—Bengal Plants; 2 vols. : Calcutta, October 1903.

RAO, M. RAMA.—Boot-parasitism of the Sandal Tree ; *Ind. Forester* vol. XXIX., p. 386.

BTAN, G. *M.—Dioscorea daemona* Roxb.; *Jour. Bomb. Nat. Hist. Soc.* vol. XV., p. 366.

WOODBOW, G. M.—Four Interesting Bombay Plants; *Jotr. Bomb. Nat. Hist. Soc.* vol. XV., p. 363.

O. I. C. P. O.—No. 983 D. B. S. I.—2-8-1904,—6a—Be N. D.

Report of the Director of the Botanical Survey of India for the year 19044905.

1. Survey of Eastern India.—It was not found possible to depute a botanist to do any botanical survey work in the proper sense in the area under the Superintendent of the Royal .Botanic Garden, Calcutta. Native collectors —who however are not in the remotest sense botanists—were sent to Sylhet, to Tenasserim and—by the kindness of Mr. Merk, Chief Commissioner of the Andamans—to the Nicobar Islands. Lepcha collectors were also employed in the Chumbi valley, working under the supervision of Mr. G. L. Searight, the officer then in charge of the ftoad Survey there. Native collectors were also made use of in Ohota Nagpur through the kindness of the Reverend Father Cardon, S.J. The officers of the Tenasserim Forest Circle also contributed a good few interesting plants. Although the efforts of the native collectors resulted in a goodly accumulation of specimens, a true picture of the character and aspect of the vegetation of any district collected over can be formed only by a qualified botanist surveying it at first hand and unhurriedly. So far as the survey has to depend on collectors quite ignorant of botany so far is it an unsatisfactory make-shift.

2. **Survey of Western India.—**During the hot weather vacation Mr. Bhide, the officer then in charge of Mr. Gammie's duties, made a botanical excursion from Eolhapur to Ratnagiri *vid* Amba Ghat, returning by the Phonda Ghat. In the cold weather Mr. Gammie botanised over parts of Guzerat and the Khandesh district.

8. Survey of Southern India.—The Government Botanist—for reasons fully set forth in his report as Government Botanist—could give but little attention to systematic survey work during the year. He, however, made collectionsat various places wherever he was on tour in connection with his economic duties. *A* sub-assistant also collected in the Travancore backwaters and along the chief sandal-bearing tracts of Mysore.

4. Survey of Northern India.—The Economic Botanist to the Government of the United Provinces is shewn in the classified list of officers of the Botanical Survey. He states that he is unable to furnish a report.

6. **Publications.**—During the year there were issued the following **numbers of the *Jtecords of the Botanical Survey* :—**

Volume III. No. 1__*The Vegetation qf the district of Minbu in Upper Burma* by *A. T. Gage.*

Volume III. No. 2.—*The Vegetation of the districts of Sughli-Bowrah and the 24-Pergunnahs* by *D. Prain.*

Volume IV. No. 1.—*An Epitome of the British Indian Species of Impatient Part I,* by *Sir J. 0. Booker.*

Various other papers have been published during the year, which have got little or nothing to do with the Botanical Survey of India as a Department. They are mentioned in the appendix to this report.

6. **Economic Botany.—**The Officiating Director attended the Conference of the Board of Agriculture held at Fusa in January 1905.

The enquiry—referred to in last year's report—into the identity and distribution of the various *Agaves* and *Furcroeas,* was finished during the year, and the results have been embodied in a Bulletin of the Bengal Agri* cultural Department still in the press. Samples of the fibre obtained from plants of *Crotalaria juncea* in cultivation during the year were sent to England for valuation. On the whole these samples were bad as compared with those of the previous year, but it was clearly enough brought out that there is not any real difference in the plants raised from seed received from widely separated parts of India. The samples sent to England from the Botanic Garden compared well enough with trade samples from Cawnpore, Coconada a»d elsewhere which reached the London market about the same time in

November but compared badly with the Bengal or Belgatchia brand of Sunn-hemp which reached London about February. This may have been due to the fact that the sowing of the seeds for experiment in the Calcutta Garden apparently took plaqe at an unsuitable time, and the fibre consequently was harvested under unfavourable conditions. In Northern and Central Bengal, Cliota Nagpur and in the United Provinces, Sunn-hemp is sown in May or June and harvested in August or September, the product reaching the London market in November. In the moister districts, especially in Eastern Bengal, Sunn-hemp is sown after the Jute harvest in September and October and harvested in December and January so that the Bengal brand of Sunn-hemp may reach the London market in February. The experimental cultivation is to be repeated, sowing this time in accordance with the Eastern Bengal practice.

The Director in conjunction with the Inspector General of Agriculture and the Reporter on Economic Products to the Government of India, investigated the alleged deterioration of Jute, and a report thereon was submitted to Government. A great number of various kinds of cotton received from the Inspector General of Agriculture have been, cultivated during the year for botanical identification. The cultivation of plants and the identification of plants and specimens of economic importance on behalf of the Reporter on Economic Products has gone on as usual.

The Economic and Agricultural problems dealt with by the Economic Botanist to the Bombay Government and by the Government Botanist, Madras, are referred to in their respective reports subjoined. This economic and Agricultural work which takes up most of the time of those officers, is initiated and entirely controlled by their respective Governments so that it does not come directly under the cognizance of the head of the Botanical Survey.

7. **Staff.**—Lieutenant-Colonel Prain, I.M.S., was in charge of his post as Director of the Survey until he went on furlough on 1st November 1904. For the remainder of the financial year Captain A. T. Gage, I.M.3., officiated. Mr. G. A. Gammie was on leave from 19th March 1904 to 19th September 1904, during which period Mr. B, 0. E. Bhide, officiated. Mr. C. A. Barber had charge of his post during the year. Mr. H. M. Leake is shown in the classified list of officers of the Botanical Survey as appointed to the Department in November 1904.

A. T. GAGE,

Acting Director, Botanical Survey of India.

Report on the Botanical Survey Operations in the Bombay Presidency for the year 1904-1905 by G. A. Gammie, Economic Botanist, in charge of the Botanical Survey of the Bombay Presidency.

I was absent on leave from the 1st April to the 19th September, and again on deputation to the conference at the Agricultural Research Institute, Pusa, from January 3rd to January 11th, 1905. During these periods Mr. B. K. Bhide, the keeper of the Herbarium, held charge of the office.

1. TOURS.—During the hot weather vacation Mr. Bhide, accompanied by Mr. Shevade, Assistant Biological Botanist at the Fusa Research Institute, completed a botanical excursion from Kolhapur to Ratnagiri *viâ* Amba Ghat, returning *viâ* the Fhonda Ghat. During the cold weather vacation I botanized over parts of Ouzerat and the Khandesh District. In addition I devoted much time to the conduct of botanical researches in the Government Farms at Kirkee, Manjri and Surat. The work effected at the Ganesh Ehind Botanical Gardens forms the subject of a separate report submitted through the Director of Land Records and Agriculture. The two plant collectors paid several visits to Lonawla, Khandala, Matheran and other places in search of particular plants.

2. THE HEBBABIUM.—The following gentlemen have made most valuable contributions during the year. Dr. T. Cooke, who presented a further instalment of his Herbarium up to the end of Boraginacese. His collection is invaluable as it is named in accordance with his book.

The Superintendent! Royal Botanic Gardens, Calcutta, who presented a valuable series of specimens.

Mr. G. M. Eyan completed his collection of Thana plants and these now remain for us to conjointly work up for publication.

Mr. A. 0. Hartless presented a large set of Eastern Himalayan plants.

The Superintendents of the Victoria Gardens, Bombay, and Empress Gardens, Poona, sent specimens of many rare plants primarily for purposes of identification.

The following is the reoord of specimens incorporated into the Herbarium during the year:—

Collected by Mr. Gammie		954 sheets.
„ „ Bhide		1,459 „
„ „ Shevade		695 „
„ „ (iarade		1.243 „
Presented by Dr. T. Cooke		1,066 „
„ Mr. Hartless		1,007 „
» ;, Hyan		760 „
„ fi Mollison		142 „
„ Superintendent, Royal Botanic Gardens, Calcutta		871 „
„ „ Empress Gardens, Poona		60 „
„ „ Victoria Gardens, Bombay		SO „
	Total	8,287 „

The following is the number of specimens distributed :—

To Ganesh Khind Botanical Gardens	109 sheets.

5. PUBLICATIONS.—Part 1 of Volume II of Dr. T. Cooke's Flora of the Bombay Presidency was published. I supplied a revised Botanical account of the Indian cottons with coloured illustrations drawn by Mr. Bhide, to the Inspector General of Agriculture in India who is arranging for its publication. Preliminary classifications on the wheats, juars, rices, etc., of Bombay have now been drawn out and I hope to publish them after another season's experience.

4 SISAL HEMP.—NO healthy plants flowered during the year. Those already in cultivation at the Ganesh Khind Botanical Gardens are making good progress. Those at Nandgaon increase in size very slowly and it will be some years before they attain their full size.

5. SABAI GRASS.—This experiment is now being conducted at the Ganesh Khind Botanical Gardens. It has been proved that this grass can be successfully grown in the Deccan as a commercial venture so that it is not necessary to continue the report on this subject.

6. ESTABLISHMENT.—X have to thank Mr. K. *K.* Bhide for his efficient control of survey operations during my absence and also for his assistance in the work throughout the year. Mr. Shevade, B.Sc, also assisted as a part of his training for the post of Assistant Biological Botanist at Pusa. Messrs* Garade and Khomna, the two plant collectors, have done good work.

G. A. GAMMIE,
Economic Botanist and Officer in charge
Botanical Survey of Bombay.

COLLEGE OF SCIENCE,
PoovA;
Th* 22nd June 1905.

«. 1 0 . P. 0,-No. 1021D. B. S. L~S8-74905.-53.-B. N. D.

APPENDIX I.

Table of Contents.

ANtfUAL REPORT OF THE GOVERNMENT BOTANIST, MADRAS.

I have the honour to present the Mowing report of work done in my office during the year 1904.-1905.

2. Owing to various causes this work suffered considerable derangement—

(1) The office was transferred during the year to the Drill Hall of the Madras Volunteer Guards. The collections were rearranged and spread out, the new premises were furnished, [a] laboratory was constructed and the library brought into order.

(2) There was a great extension in the work of the Samalkota sugarcane farm. Land was acquired for a permanent farm and building operations commenced. Two new farms were opened—one at Palur in South Arcot for the study of ground-nut, sugarcane and indigo, and °ae at Taliparamba in Malabar for the study of pepper.

(3) The ordinary work of the office was further disturbed by the deputation of the government Botanist to the Pusa Conference and the ensuing heavy work in connection with the development of the Agricultural Department in Madras.

3. An important addition was made to the staff in the shape of fieldmen. This experiment promises to be of the greatest assistance in various directions. There has, however, been considerable difficulty in obtaining suitable candidates, because of the absence of an assurance of future prospects. Only two of the three posts have been filled.

4. The Government Botanist spent 200 days on tour during the year. The tours projected and sanctioned by Government were(l) an economic tour in the Ceded Districts and (2) a systematic survey tour in the Travancore forests. The former was given up in favour of a thorough study of the South Arcot district in connection with the Palur farm and the latter ^Postponed in favour of a similar study of Malabar pepper plantations in preparation for the Taliparamba farm. Seven visits were made to Samalkota during the year. A visit was paid to Koilpatti to observe the cotton crossing experiment, to Burliyar and Kallar plantations of the Nilgiris and to the Melrosapuram farm. Frequent visits were paid to the Saidapet [illegible] to observe the experiments in ground-nut, indigo, sugarcane and cotton. A short tour was made to Alamuru in the Godavari district to study the palmyra disease and the deputation to *W was made use of for special studies at the fioyal Botanic Gardens, Calcutta, and the office of the Reporter on Ecōnomic Products to the Government of India.

The various assistants spent about 860 days on tour including visits to ^vancore, Mysore, Godavari,.South Arcot, Koilpatti, Ootacamund, Erode, Guntur, Malabar, Udamalpet, Saidapet, Coimbatore, Tanjore and Salem.

5. The systematic botanical survey of the Presidency has had comparatively little attention paid to it during the yearTM One Sub-Assistant is set apart for the work of keeping the coDeçtions of the Madras flora in order. He has also to make occasional collecting tours. But this officer has during the year been frequently employed on economic work.

A tour was made by him alone the Travancore backwaters• partly for the purpose of

tk» sa/w-Jood . tt£ w u f a S S f p t a t . for » «mv^H" Btodj o. which tie Qnm*
Rent Botanist is engaged.

Collections of minor importance were made at various places whei ever the Government Botanist was on tour.

b. The herbarium received a considerable amount of attention. The whole of the cases were rearranged and the sheets examined and cleaned upon transference to more commodious quarters, and the regular monthly iuspection was rigidly adhered to. About 2,000 sheets were mounted, this number being made np of 1,000 from the Godavari gorges, 7(:0 from the Wynaad and 300 from the Kistna uplands. Three hundred sheets were mounted for the Calcutta herbarium and about the same number was despatched. In exchange for these, 291 sheets were received from Calcutta.

Only 500 sheets were written on and incorporated in the finished collections, and this fact is worthy of attention. There is a very large collection of mounted specimens in the herbarium not yet written upon. Many of these are already worked out, but there has not been time for the Sub-Assistant or the Government Botanist to put the finishing[1] touch and add them to the collection. During the year 2,000 sheets have been mounted and only 500 have written upon, the mass of sheets undealt with having thus been increased by 1,500, and this in a year when active collection was in abeyance. The Botanical survey of tùe Presidency takes up a very small portion of the time of the staff at present. But, considering the value of the collection and the advisability of keeping pace with Bengal, Bombay and the United Provinces in all of which floras have now been prepared, it should be placed upon a more satisfactory basis.

7. During the intervals of economic work, the Government Botanist devoted some of his time to a biological study of the parasitic phanerogams of the Presidency. These have considerable economic importance. The various species of Loranthus severely injure many of the forest trees and a careful study of their mode of life has been instituted. Considerable collections have been made of all stages of their development from the seed to the mature plant. Observations are much needed by Forest officers as to the special birds which distribute the seeds of the different varieties.

A close study has been undertaken of the sandal haustoria. It is felt that a biological study of this curious parasitic tree is needed in order to prepare the way for successful plantations. Some of the results of this investigation have been published in a couple of papers in the " Indian Forester".

8. Although no great strides have been made in the collection of economic plants during the year (for the reasons stated in paragraph 2), the tendency towards the development of this branch of herbarium work at the expense of the systematic survey has been very marked. The *ttw'y* of plant diseases generally has received a check because of the absence of competent assistants and the necessity of employing the whole staff on general agricultural matters. Practically the whole strength of the office has been thrown into the foundation of the th»ee faims mentioned below.

9. The work of the *sugarcane farm at Samalkota* has been carried on with energy. Great attention has been paid to the collection and study of the different varieties of canes, 30 or 40 of which have now been got together. Large numbers of the Red Mauritius canes were distributed to the ryots at the commencement of the year and the plots on which these were planted were inspected twice during their growth by the Agricultural inspector. The success of this variety as compared with the local kinds was so marked that the demands for seed were in far excess of the capacity of the farm. The experiments with methods of planting, the application of different kinds of manures, the formation of a weed compost, the raising of seedling canes and the collection cf sports have been continued.

Under instructions from the Director of Agriculture, a block of 86 acres has been selected for the formation of a permanent sugarcane farm, the land during the past ? y*ars Having been rented each season, a jaggery shed and store-house has been erected and plans have been prepared for the laying out of the farm, the erection of quarters for the Inspector in charge and an inspection bungalow for European officers.

The farm has received many visitors including the Director of Agriculture, the Deputy Director of Agriculture, the Collector of the district, Dr. Lehmann, the Hon'ble Mr. Yorke, the Raja of Yenkatagiri, three Zamindars of Peddapur, the Manager of Pithapuram Estate, the Cocanada Chamber of Commerce, the District Association and hundreds of ryots, many of whom have travelled great distances. Selected cultivators deputed by various land-owners have been received upofh the farm and instructed in the methods of cane cultivation adopted. During the year a set of Barbados seedlings have been successfully introduced and are being grown under observation at Saidapet farm and the Agri-Horticultural Society's gardens in Madras.

10. Consequent upon the study of the conditions of the pepper plantations commenced last year, it was decided by Government that a special farm should be devoted to the subject. After a considerable tmount of touring, it was considered advisable that this farm should be placed in Malabar, the home of the pepper plant, and not in the Wynaad, although a subsidiiuy farm might be formed there later. A site has been accordingly selected at Taliparamba in the Chirakkal tduk. Although most of the preliminary work has been accomplished, the land had not been acquired at the close of the official year.

11. The importance of the ground-nut in South Arcot and the occurrence of a serious disease in this staple in the Poona farm led to a careful study of this crop. Three tours were made by the Government Botanist and several by his assistants in the South Arcot district and, finally, a

site for the farm was selected near Palur in the Cuddalore taluk. Arrangements were made by the inclusion of 5 acres of wet land for the formation of a sugarcane nursery in the south of the Presidency, and a truck-load of the best Samalkota varieties were sent down and planted. A number of indigo varieties had been collected in the Government Botanist's office, as detailed elsewhere in this report, and these have been planted as a rotation crop on the dry land not required for ground-nut. The land for this farm has been rented for two years. It has been enclosed and planted up and an office and cattle-shed have been erected.

12. The following subjects of economic interest have received special attention during the year :—

Grasses.—Seven hundred and eighty-five sheets were mounted during the year, comprising collections from Tinnevelly, the Nilgiris, Madras and the Wynaad. Seventy-one of these sheets refer to diseases. A set of grass-smuts, gent for determination in November 1903, were worked oat by Dr. Butler, and, out of the fifteen kinds sent, six were found to be new species, while three have not been finally named.

13. *Lemon-grass.*—Two lots of lemon-grass have been received for the herbarium, one from Mr. Jowitt of Ceylon, who is specially studying the group, and one from Mr. Barton Wright of the Nilgiris. These have been determined as regards the species, but the naming of the varieties has not been possible in the absence of authentic herbarium specimens.

A wardian case of Cochin lemon-grass was carefully packed and forwarded to Kew for the Imperial Commissioner of Agriculture in the West Indies. The result was a failure, the plants being dead on their arrival in England. A third lot has been obtained from Cochin for another attempt. Seed will also be collected for transmission.

14. *Agaves.*—At the instance of the Superintendent of the Calcutta Botanical Gardens, and of Mr. J. R. Drnmmond, I.C.S., a thorough survey has been made of the agaves of the Presidency. These plants, although widely scattered, are not natives of India, having been introduced at various periods. One hundred and nine lots were received and forwarded to Calcutta. The sending of such large specimens involved a considerable amount of labour and the collection of their vernacular names and uses entailed an active correspondence throughout the year. The results, however, have justified the trouble, for it has been found that the names locally applied are pretty generally incorrect. The economic importance of this cannot be over-estimated. Various attempts have been made in South India to start fibre plantations, and, for this, the true determination of the species is of prime importance. For instance, the plant usually called *Agave amerieana* proves to be *Agave vera-cruz* and the fibre value of these plants i» probably very different. A bulletin on the subject is about to be published by the Calcutta authorities and full details will be found in it regarding the Madras varieties.

15. *Sorghums (cholum,jonna),—S*-veTity-one* numbers of sorghums were forwarded to the Reporter on Economic Products in continuation of last year's collections. Specimens of all these have been retained in the local office herbarium. A study was made of the Irungu eholums in the Koilpatti farm and these were divided into fifteen varieties which, it was recommended, should be kept apart. An attempt was made to classify all the sorghums thus far collected and an assistant went over all the sheets with the Deputy Director of Agriculture. The collection of sorghums in the office is now large and fairly representative. It includes 680 sheets of sorghum heads and 70 sheets of diseased specimens, filling six large herbarium cases.

16. *Tarns, etc.*—The survey of the wild yams of the Presidency has been continued and 51 sets of leaves and tubers have been forwarded to the Reporter on Economic Products for further growth and determination. Besides these, various packages of paddy, kudiraivali *(Panicum frumentaceum, Roxb.),* varagu, cumbu, tenai, pepper chillies and so forth were also forwarded for experimental growth at Sibpur, duplicates being retained in the office collection.

17. *Indigo* —Indigo seed has been collected from various sources for growth on the Palur farm. An assistant was sent to Travancore to obtain peed of *lndigofera longeracemosa.* He succeeded in finding a number of plants, the peed of which was selected and has been planted at Palur, Saidapet, Pusa, Calcutta and Java. Seed of *Indigofera anil,* discovered only in the Satyamanglam taluk of the Coimbatore district, has also been shown, but *lndigofera articulata,* found in the Palnad taluk of the Kistna district, was not obtainable because of the failure of the north-east monsoon. *Delhi indigo* was obtained from Colonel Prain. *lndigofera arrecta* was received from Mr. Coventry at Pusa, while the *Cocanada, Tanjore* and *Nandyal* varieties have been obtained from various parts and have been planted in the series.

18. *Cotton.*—The investigation of cotton problems has been relegated to the office of the Deputy Director of Agriculture. A certain amount of attention was, however, devoted t# the subject. A large collection of the *tree cottons* from all parts of the Presidency was grown on the Saidapet farm for the Inspector General of Agriculture, and herbarium specimens of these were collected during the year. Similarly, eighteen varieties of *American cottons,* considered suitable for cultivation on light soil with irrigation, were obtained from the Koilpatti farm and erown at Saidapet. Herbarium specimens have been taken of these. A couple of plots of light-soil cotton, the *Terrapatty* of Karnool and the *Bourboun* of Erod were also grown at Saidapet under the Government Botanist's directions. Three minor experiments m cotton-growing were tried in the Salem, Tanjore and Coimbatore Jails, an attempt being made to determine the nature of the plants grown torn bazaar seed in each case. Owing to

unfavourable nature of the weather, aQ of these plots which were inspected several times during the year, have failed.

19. *Castor*.—At the instance of the Ceylon Agricultural Department, a small collectioir* of the different varieties of castor was made and the following were transmitted :— *Pedda* and *Chitta amudam* from Bezwada, *Pkriya* and *Chitta amanakku* from Coimbatore, *payira amudam* from OJuntur, *Tota amudam* from Hindupur* and' *Skenlcottai*, from Erode. The results of sowing these different varieties in the Ceylon agricultural farm will be followed with interest and should be of use to Madras.

20. A great amount of miscellaneous work has been accomplished by the office during the year and the correspondence has been large. Attention has already been drawn to the absence of the skilled assistants in the investigation of plant diseases. Considerable numbers of specimens have, however, been obtained during* the year and have received as careful attentiou as was possible under the circumstances. No large additions have been made to the collection of Madras plant-pests. The Cryptogamic Botanist to the Government of India, besides naming our grass-smuts, has forwarded a useful herbarium set of sugarcane diseases in North India and has helped us in various other ways. Both he and the Inspector General of Agriculture have visited Madras during the year to the great benefit of the Department. Upon removal of the office to more commodious quarters, the collection of photographic negatives has been got into order and now numbers between 300 and 400. Work in this direction has,- however, been hampered by an injury in the Government Botanist's fingers and the absence of any one else in the office capable of doing the work. A photographic subordinate is badly needed. The office has sustained a severe loss in the death of the artist Govindarajulu who showed great talent and whose place it will be difficult to fill.

C. A. BARBER,
Government Botanist, Madras,

MADBAS ;
The 12th June 1905.

G. I. a P. O.-No. 1021 D. B. 8. L—26-7-19O5.-62.-B. N. D.

*'A list of papers published during 1904*1905 hearing on tie Botany of India.*

BOURDILLON, T. F. — Eugenia Rama-Varma, a new species. *Indian Forester,* xxx, No. 4, p. 147.

BoUBDILLON, T. F. — Eugenia occidentalis, a new species. *Indian Forester,* xxx, No. 5, p. 195.

BOUBDILLON, T. F. — Dialium traTancoricum, a new species. *Indian Forester,* xxx, No. 6, p. 243.

BOURDILLON, T. F. — On two species of blackwood found in Southern India. *Indian Forester,* xxxi, No. 3, p. 124.

BRANDIS, SIR D. — Lindera aiymatica. *Hoot Icones Plant,* viii, t. 2784.

BuBKJLL, I. H. — See *Prain.*

DBUMMOND, J. R, — On a new Scirpus from Baluchistan and certain of its allies. *Journ. As. Soc. Bengal,* lxxiii, pt. ii, 1904, pp. 137—143.

FINET ET GAGNEPAIN — Contributions a la Flore de l'Asie orientale. *BulU Soc. Bot. de France,* li, p. 384, 461.

FISCHER, C. E. C. — Notes on the Flora of Northern Ganjam. *Journ. Bombay Nat. Hist. Soc.,* xv, No. 4. p. 537.

GAGE, A. T. — The vegetation of the district of Minbu in Upper Burma. *Records Bot. Survey India,* iii, No. 1.

GAGNBPAIN, F. — Zingiberacees et Marantacees Nouvelles. *Bull, Soc. Bot. de France,* li, No. 4, p. 164.

GAMBLE! J. S. — See *King.*

HSMSLBT, W. B. — Loropetalum chinense. *Sot. Mag.,* 3rd Series, lx, t. 7979.

HEMSLEY, W. B. — Rosa gigantea. *Bot. Mag.,* 3rd Series, lx, t. 7972.

HEMSLRY, W. B. — Dendrobium Williamsoni. *Bot. Mag.,* 3rd Series, lx, t. 7947.

HBMSLEY, W, B. — Vanda pumila. *Bot. Mag.,* 3rd Series, lx, t. 7968.

HEMSLEY, W. B. — Tupistra Clarkei. *Bot. Mag.,* 3rd Series, lx, t. 7957.

HOLE, B. S. — A contribution to the Forest Flora of the Jhbbulpore Division, C. P. *Ind. Forest,* xxx, pt. 11, p. 499, pt. 12, p. 566.

HOOKER, SIB J. D. — An Epitome of the species of Impatiens of British India, Part I. *Records Bot. Survey India, iv,* No. 1.

HOOKER, SIR J. D. — On the species of Impatiens in the Wallichian Herbarium of the Linnean Society. *Journ. Linn. Soc.,* xxxvii, No. 257, p. 22.

KING, SIB G,, AKD GAMBLE, J.S. — Materials for a Flora of the Malayan Peninsula, No. 15. *Journ. Asiat. Soc. Bengal,* lxxiii, Part II, No. 3, p. 47.

MAHALUXMIVALA, C. D. — Notes on some of the plants introduced into the Victoria Gardens, Bombay, during the past eight years. *Journ. Bombay Nat. Hist. Boc,* xv, No. 4, p. 674.

MARTELLI, U. — Pandani Asiatici nuovi. *Bull. Soc. Bot. ltd.,* 1904, No. 6, p. 298.

NSOHITCH, A. — Sur les ferments de deux levains de l'Inde, le Mucor Prainii et le Demotidium Chodati. *Bull. Soc. Bot. de France,* v., p. 106.

PRAIN, D. — The vegetation of the districts of Hughli-Howrah and the 24-Pergunnahs. *Records, Bot. Survey of India,* iii, No. 2.

PRAIN, D. — An undescribed Indian Musa. *Journ. Asiatic Soc. Bengal,* lxxiii, Part II, No. 1, p. 21. (Novicise Indie* XXI).

PRAIN, D. — An undescribed Araliaceous Genus from Upper Burma. *Journ. Asiat. Soc. Bengal,* lxxiii, Part II, No. 1, p. 23, with plate. (Novicise Indie© XXII).

PRAIN, D. — Four orchids new to the Indian Flora. *Journ. Jfstat. Soc. Bengal,* lxxiii, Part II, No. 5, p. 189. (Novicise Indies XXIII).

PRAIN, D. — Some new Indian Plants. *Journ. Asiat. Soc. Bengal,* lxxiii, Part II, No. 5, p. 192, with 2 plates. (Novici© Indicae XXIV).

On the Morphology, Teratology and Diclinism of the Flowers of Cannabis. *Sd. Mem. officers of the Med* and Sanit. Depts. of tie Government of India.* New Series, No, 14.

PRAIN, *M. D.* . Notes on the Roxburghiacea, with a description of a new species of Stemona. *Journ. Asiat. Soc. Bengal,* lxxiii, Part II, No. 2, p. 39.

PBAIN, D. • The Asiatic species of Ormosia. *Journ. Asiat. Soc. Bengal.* lxxiii, Part II, No. 2, p. 45.

PRAIN, D.J AND BURKILL, I. H. On Dioscorea birmanica—a new species from Burma—and two allied species. *Journ. Asiat. Soc. Bengal,* lxxiii, Part ii, 1904, pp. 188—187.

ROLPB, R. A. . Dendrobium regium. *Botanical Magazine,* 4th Series, i, t. 8003.

ROLPB, R. A. . Spathoglottis Hardingiana. *Bot. Mag.* 3rd Series, lx, t. 7964.

RYAN, O. M. . . The Wild Plantain (Musa superba, Roxb.) *Journ. Bombay Nat. His. Soc.* xv, No. 4, pp. 586—598, with plate.

RYAN, O. M. • Water-yielding plants found in the Thana forests. *Journ. Bombay Nat. Hist. Soc.* xvi, No. 1, p. 65.

SpntB, C, . Contribution a l'etude Kles Apocynees indo-chinoises. *Trav. Labor. Mat. Med.* Paris, 1904. Tom. 2, Part. 4.

STAFF* O. • On the fruit of Melocanna bambusoides. *Trans. Linn. Soc.* 2nd Series, vi, Part 9.

STAFF, O. . Arundinaria Falconeri. *Bot. Mag.* 3rd Series, lx, t. 7947.

%. L C P. 0.—No. 1021D. B. a 1^-26-7-1906.—52.—B. N. D.

Report of the Director of the Botanical Survey of India for the year 1005-06.

1. Eastern India.—In Bengal one collector **was** sent to Orissa and another to Pusa, the latter to collect the interesting plants of the still wild parts of the estate. Collections of living plants continued to be made in Chota Nagpur by men working under the supervision of the Bey. Father Cardon, S.J. In the Darjeeling district collections were made by the Acting Director to supplement the herbaria in the Lloyd Botanic Garden, Darjeeling, and at the Government Cinchona Plantation. The Curator of the Lloyd Botanic Garden collected on the high levels of 8ikkim both plants and seeds. In the Chumbi valley one of the garden collectors accompanied Mr. J. 0. White, C.I.E., on a tour, and did some collecting along the route. In Assam the Botanical Survey was fortunate in having collections made on its behalf by Mr. A. Meebold, a German Botanist, during a journey across the Naga Hills to Manipur and thence to Silchar.

In Burma the Survey was unfortunate in its own collector. He was sent to the district of Pakdkku to collect material to serve as a northward continuation of the survey of Minbu district made in 1903. However, the inhabitants of Pakdkku appear to have considered the harmless enough operations of the plant collector as of a nefarious character connected in some mysterious way with a fancied poisoning of wells. The result was that collecting in Pakdkku came to an abrupt conclusion and the collector had to be recalled. From Pegu Mr. J. H. Lace, Conservator of Forests, contributed interesting and as usual excellently prepared collections. From Tenasserim very interesting and important collections continued to be contributed by the Forest Department. A thorough botanical survey of the district by a trained botanist, for several years in succession, would be likely to yield very interesting results, but at present there is unfortunately no officer available.

2. **Western India.—**Mr. G. **A.** Garamie collected in Bassein, Ahmedabad, Kaira, Surat, Khandesh, Ahmednagar, Poona, Belgaum and Dharwar. His report is appended. In addition to those official collections, Mr. O. M. Ryan, of the Forest Department, has completed his collection of plants of the Thana district. The same officer has also collected largely in the Poona district during the year.

3. **Southern India.**—The time of the Government Botanist, Madras, is so largely taken up with agricultural and general economic work, that only very limited attention can be given to systematic survey work. What has been done during the year in the latter direction is detailed in paragraph 4. of Mr. Barber's Report as Government Botanist, a copy of which is appended. Mr. C. B. C. Fischer, Deputy Conservator of Forests, Goimbatore, although he has no official connection with the itotanical Survey, has done excellent work in his leisure, time and the Calcutta Herbarium is indebted to him for a rich and excellently prepared collection of Coimbatore plants.

4. **Northern India.—**Officially nothing whatever has been done. Mr. Meebold, however, the same gentleman who collected in Assam, made an extensive tour in the N.-W. Himalaya, chiefly in Kashmir. He was allowed all facilities for working in the Calcutta Herbarium, to which he has kindly presented a duplicate set of his collections. The bulk of them are being worked up at Breslau, and already several novelties have been discovered.

6. **Publications.—**During the year there was issued No. 2 of Volume IV of the Records of the Botanical Survey of India, forming Part II of *An Epitome* ***of the British Indian species of Impatient*** **by Sir J. D. Hooker, G.C.SL** Part II of Volume II of Dr. Cooke's *Flora of the Presidency of Bombay* bringing the work up to the natural order Verbenace© has appeared during the year. Amongst other publications not immediately connected with the Botanical Survey as a Department, the more important are:—*The Aconites of India* with 24 plates, a monograph by Dr. O. Stapf, principal Assistant in the

Kew Herbarium, forming Part II of Volume X of tbe Annals of the Royal Botanic Garden, Calcutta, and a very valuable contribution to the study of systematic Botany; Sir George King and Mr. Gamble's *Materials for a Flora qfthe Malayan "Peninsula,* Nos. 16,17» 18 in the Journal of the Asiatic Society of Bengal; an interesting series of papers in the *Indian Forester* by Mr. W. A. Talbot, Conservator of Forests, Bombay Presidency, on *The Distribution of* ***the Forest Flora of the Bombay Presidency and Sind*** **; several articles in the** same journal on *Indian Forest Fungi* by Dr. E. J. Butler; a series of papers on the *Orchids of the Bombay Presidency* by Mr. G. A. Gammie in tbe Journal of the Bombay Natural History Society. A list of papers published during the year is appended to this report.

6. **Economic Botany.**—The study of economic problems forms no part of the work of the Botanical Survey as such, but has nevertheless taken up most of the time of the officers composing it in their capacities as Economic Botanists to the various Local Governments. Their economic work is fully detailed in the individual report of each officer, and it seems unnecessary to repeat their accounts here, Economic work, however, comes under the consideration of the Director in an advisory capacity, and in this last the Acting Director, in association with the Inspector-General of Agriculture and the Reporter on Economic Products, has submitted to Government reports on such subjects as the growing of flax for fibre in India, the investigation of the causes of lathyrism, the improvement of Indian cotton; and in association with the Inspector-General of Forests and the Reporter on Economic Products reports on the utilisation of Indian timbers for railway sleepers, the production of creosote, and the manufacture of wood pulp for paper making.

7. Staff.—Lieutenant-Colonel Prain, I.M.S., was on furlough throughout the year, during the whole of which Captain A. T. Gage, I.M.S., officiated. The other officers of the Survey held charge of their respective posts throughout the year.

A. T. GAGE, ***Captain, I.M.S.,***
Acting Director of Botanical Survey of India.

Eeport on the Botanical Survey Operations in the Bombay Presidency for the year 1905-06 by Q. A. Gammie, Economic Botanist, in charge of the Botanical Survey of the Bombay Presidency.

I held charge of the Botanical Survey operations throughout the year.

1. TOURS.—As the greater part of my time was devoted to investigations in Economic Botany and to the organization and supervision of the Ganeshkhind Botanical Gardens, and the Botanical Garden and Experimenta 1 Farm at Bassein, the following districts only were visited and survey operations conducted in them in conjunction with other duties:—Bassein and the surrounding country, Ahmedabad, Kaira, Surat, Khandesh, Ahmednagar, Poona, Belgaum and Dharwar. An exhaustive enquiry was made into the distribution of the various forms of wheat and rice throughout the Presidency, and the results will be summarized as soon as possible in separate reports.

Special researches were carried out on behalf of Sir George Watt on an edible species of Cyperus and several species of the same genus, which yield perfumes; for Dr. T. Oooke, information and specimens were obtained of some doubtful plants. Many references were dealt with regarding the identification of plants and in many cases also their economic uses.

2. HERBARIUM.—The following sheets were added during the year: —

Specimens collected departmentally	2,480 sheets.
„ presented by Dr. T. Cooke, C.I.E. . . .	2,412 „
„ „ Calcutta Herbarium • • •	56 „ *
Total .	4,947 „

The specimens presented by Dr. T. Cooke are particularly valuable as they form part of the material on which he is elaborating a Flora of the Bombay Presidency. Mr. G. M. Ryan has completed his collection of Thana plants and we are conjointly drawing up a paper on the Flora of the district. Since his transfer to the Poona district he has collected many specimens during his tours and these will also be used ultimately in the preparation of another paper.

3. PUBLICATIONS.—Another number of the Flora of the Bombay Presidency has been issued by Dr. Oooke bringing the account down to Yerbenacese. I published three parts of an account of the orchids of the Bombay Presidency in the Journal of the Bombay Natural History. A revision of my paper on the Indian cottons was published by the Inspector General of Agriculture and a set of coloured plates and photographs were submitted for a new edition. Various botanical notes were also supplied to the Journal of the Agri-Horticultural Society of Western India.

4. ECONOMIC WOBK.—As this was conducted mainly in the Ganeshkhind Botanical Gardens and on the Experimental Farms, detail* will be furnished in my report as Economic Botanist.

5. SISAL.—Six plants flowered during the year and produced 9,546 bulbils. Nearly 20,000 bulbils were distributed for experimental purposes to many applicants,

6 ESTABLISHMENT.—Mr. B. K. Bide, senior Assistant Economic Botanist, was in charge of the Office and Herbarium of the Survey during the year • m He wnrlcp^ with his usual industry and intelligence and his skill as an artist is of ^ ^ *s t r ^ e T m t* MnGharade and Mr. Khomne, the plant collectors, worked well during the year.

Q A. GAMMIB>

Economic Botanist and Officer in charge,
Botanical Survey of Bombay.

COLLEGE OF SCIENCE,
POONA;
The 22nd June 1906.

G. I. C. P. 0.-N* 4 D. B. S. L-30.M906.-6a - W. i. D'B.

Extract, paragraph 4, from the Report of the Government Botanist, Madras, for the year 1905-06.

4. The work in *Systematic Botany* has been of a varied character. The whole collection has been kept thoroughly cleaned during the year. The sheets " not yet added to the herbarium " have been completely rearranged for ready reference. This necessary work was somewhat laborious as the number has now reached over 10,000 sheets. A very large number of sheets have been mounted during the year. Of these the chief collection was that of *peppers* with 679 sheets while the *balsams* numbered 115. Of other plants 3,825 sheets were mounted, bringing up the total to 4,619.

The *balsams (Impatient)* received some attention and further collections were forwarded to Sir Joseph Hooker for determination. The results were unexpectedly interesting in that some ten new species were discovered to occur in South India.

The *sandal (Santalum album)* flora collected in the typical Mysore zone was worked out by the assistant.

A very large number of *peppers {Piper nigrum)* was collected and worked out by the Government Botanist, chiefly from the Nilgiris, the Tambracherry ghaut and the Wynaad, the Palnais and the Anamalais. Valuable drawings of the more important species were added to the collection.

The flora of the Taliparamba farm received marked attention, the trees and shrubs growing on the farm being collected and named.

A collection of the different species of *barberry (Berberi*)* was made for Mr. Drummond, I.O.S., chiefly from the Nilgiris, and a set of the seeds of *sundew (Drosera)* was obtained for an American correspondent.

The whole collection of *Gentians (Gentianaceoe)* was forwarded to the Reporter on Economic Products for naming. Part of the collection of ebonies *(Diospyros)* sent to Calcutta for the same purpose was returned. The *Lemon grasses (Andropogon Sohoenanthus* and *A. Nardus)* were also forwarded to Calcutta and afterwards to Kew for similar treatment.

A special expedition was undertaken to the Travancore hills for the collection of germination stages of *Ochlandra travancorica.* This was done at the instigation of Sir Joseph Hooker, and the results were the formation of a very fine collection in spirit of all stages, which was forwarded to Dr. Stapf at Kew.

A special study was made of the Madras *root-parasites* and their hosts, the latter being named by the assistant. A very large collection of the root connections (haustoria) was made in spirit for future work. This was chiefly of *Santalum, Osyris, Thesium, Olax, Cansjera* and *Ximenia.* A first paper on the sandal haustoria was sent to the editor of the Pusa Memoirs in September.

Numerous minor lots of plants were named for correspondents, largely Forest officers, during the year. Among these was a set of plants forwarded by the Collector of Malabar from the *Laceadives.*

Two hundred sheets of plants were forwarded to the Director of the Botanical Survey for incorporation into the local floras of the Calcutta Herbarium, and forty Calcutta sheets were received in exchange from him.

O. I.C. P. 0.—No. 4 D. B. 8. L—3-7-1906—60.-J. A.

A list of Papers bearing on the Botany of India published during 1905-06.

BABBER, C. A. . The Haustoria of Sandal roots. *Indian Forester, XXXI No. 4, p. 189, with 6 plates.*

BIBBAL, BABU . The Ripening of Cones of Pinus longifolia. The formation of Pseudo-cones or Galls. *Indian Forester, XXXI, No. 8, p. 425.*

"BLATTER, E. The Mangrove of the Bombay Presidency, and its Biology. *Joum. Bombay Nat. Eist. Soc. XFJ, No. 4, p. 644, with 2 plates.*

BLATTER, E. The "Pectinate organs" of Trapa bispinosa, Rozb. *Joum. Bombay Nat. Hist. Soc. XVII, No. l,p. 84, with a plate.*

BUTLER, E. J. . Some Indian Forest Fungi. *Indian Forester, XXXI, Nos. 10, 11,12, pp. 548, 661, 670.*

COOKE, T. . . The Flora of the Presidency of Bombay, Vol. II, Part II.

DUTHIE, J. F. . A new species of Diospyros. Diospyros Kanjilali. *Indian Forester, XXXI, No. 6, p. 807, with plate.*

FINET ET Q-AGNEPAIN Espfeces nouvelles de l'Asie Orientate. *Bull. Soc. Bot. de France, LIII, No. 2, p. 125.*

FINETET GAQNBPAIN Contributions k l'étude de la flore de l'Asie Orientate. *Bull. Soc. Bot. de France, Memoire 4,1905.*

GAGE, A. T. Eugenia praetermissa, a hitherto undescribed species from Assam and Burma. *Indian Forester, XXXII, No. 1, p. 6, with plate.*

GAGE, A. T. Hedyotis sisaparensis, a hitherto undescribed Indian species. *Joum. Asiat. Soc. Bengal, I, No. 9, 1905.*

GAGNEPAIN, F. Zingibéracées nouvelles de l'herbier du Museum. *Bull. Soc. Bot. de France, L1II, No. 2, p. 132.*

GAMMIE, G. A. The Orchids of the Bombay Presidency, Part II. *Joum. Bombay Nat. Hist. Soc. XVI, No. 4, p. 562, with plate.*

HOOKER, SIR J. D. . An Epitome of the species of Impatiens of British India, Part II. *Records Bot. Survey, India, IV, No. 2.*

KING, SIR G., & GAMBLE, J. S. Materials for a Flora of the Malayan Peninsula, Nos. 16, 17, 18. *Joum. Asiat. Soc. Bengal, I, Extra Number, 1905.*

LEAL, F. The Origin of Anonas. *Anona squamosa* L., *Anona reticulata.* L. *Joum. Bombay Nat. Hist. Soc. XVII, No. 1, p. 195.*

MIYES, W. . Note on the occurrenc^of a parasitic fungus on Pinus ezcelsa. *Indian Forester, XXXI, No. 7, p. 369.*

OSTENFELD, C. H. A List of plants collected in the Raheng District, Upper Siam* *Bull. I'Herb. Boissier, 2nd Ser., 1905, No. 8, p. 729.*

PIERRE, L. . Pfentes nouvelles de l'Asie tropicale. *Bull. Soc. Bot. de France, LII,No. 7, p. 490.*

PRAIN, D. . The species of Meconopsis. *The Card. Chronicle, XXXVIL No. 964, p. 369.*

PRATN, D. . The Genus Ceratostigma. *Joum. of Botany, XLIV, No. 517, p. 4.*

PRAIN, D. » MansoniesB, a new Tribe of the Natural Order Sterculiacea. *Joum. Linn. Society, XXXVII, No. 259, p. 250, with plate.*

RAO, M. RAMA Chickrassia* tabularis. *Indian Forester, XXXII, No. 2, p. 55.*

SCHLECHTER, R. . Neue Orchidaceen de Flora des Mousun-Gebietes. *Bull. I'Herb., Boissier, 2nd Ser., 1906, No. 4, p. 295.*

SCHNEIDER, C. K, . Die Oattuing Berberie (Euberberis). *Bull. VHcrb. Boisner, 2nd Ser., 1905.*

SPIRE, DR. . Contribution a l'&ude de la flore Indo-Chinoise. *Bull. Soc. Bot. de France, LI1, No. 7, p. 551.*

STEBBING, E. P. . On the Ceoidomyid [Cecidomyia (?) sp.] forming the Galls or Pseudo-cones on Pinus longifolia. *Indian forester, XXXI, No. 8 p. 429.*

STAPF, O. . The Aconites of India. *Annals Royal Bot. Garden, Calcutta, vol. X, part II, with 24 plates.*

TALBOT, W. A. . The Distribution of the Forest Flora of the Bombay Presidency and Sind. *Indian Forester, XXXII, Nos. 1, 2, 3, pp. 8> 56, 126.*

WILLIAMS, F. N. Liste des Plantes oonnues du Siam. *Bull. VHcrb. Boissier, 2nd Ser., 1902, pp. 428, 949.*

0.1. C. P. O.-No. 4 D. B. S. I. —S0-7-1906.-60.-O. T.

Report of the Director of the Botanical Survey of India for the year 1906-07.

1. Eastern India.—BENGAL.—In the Sunderbuns collections were made **of species *ol Sonneratia, Carapa, Kandelia, Ceriops, Bruguiera, Heretiera,* etc,** which are specially interesting on account of their morphological modifications characteristic of such an estuarial flora. In Ohota Nagpur, plants of various monocotyledonous genera were collected by men working under the supervision of the Reverend Father Cardon, S.J. In the Darjeeling district and in Sikkim, collections both of plants and seeds were made as ustial. Another collector made a special collection of water lilies in the Midnapore district.

EASTERN BENGAL AND ASSAM.—An Indian collector was sent to the district of Myxnensingh, where he spent some time, making as representative a collection as time would allow of the flora of that district.

BURMA,—By the kindness of Mr. I. H. Burkill, M.A., F.L.S., Reporter on Economic Products to the Government of India, a collector of the Botanical Survey was attached to him during his tour in the district of Arracan. The vegetation of this district is very imperfectly known, so that interesting results are anticipated from the collection, when once opportunity of working it up occurs. As usual the officers of the Tenasserim Forest Circle contributed interesting and excellent specimens from Lower Burma. A fair collection of orchidaceous and other moaocotyledonous plants was obtained from the Shan Hills.

2. Western India.—Pressure of other duties prevented the officer in charge of the Botanical Survey of Western India from making any tour solely in the interests of the Botanical Survey, although in his capacity as Economic Botanist to the Government of Bombay, he toured in the Karnatak and Gujarat. Mr. Gammie's Report is appended *in extenso.*

3. Southern India.—The official work in connection with systematic Botany is detailed in the. Report of the Government Botanist, Madras, paragraph 5, a copy of which is appended. JVIr. C. E. C. .Fischer of the Forest Department continued his investigations of the Flora of Coimbatore and contributed largely to the Calcutta Herbarium.

North-West India.—There being no official arrangements for conducting systematic investigations in Northern India, what work has been done has been performed by individuals unconnected with the Botanical Survey. A considerable amount of collecting work has been done in Baluchistan, chiefly for economic reasons and the collections themselves have been worked up in the Calcutta Herbarium by Mr. I. H. Burkill. A collection of plants from Koweit, collected by Captain Knox, the Political Agent there and forwarded by Mr. J. G. Lorimer, I.C.S., C.I.E., have been worked out as far as possible. An excellent collection of plants from the N.-W. Frontier district of Bannu was presented by Mr. James Marten of the Forest Survey Department, while the Survey is indebted to Mr. A. R. Tucker of the Revenue and Agricultural Department for a fine collection of North-West Himalayan plants.

Publications.-—Of the Records of the Botanical Survey there was issued No. 3 of Vol. IV forming the concluding part of Sir Joseph Hooker's *Epitome* ***of the British Indian Species of Impatient.*** **Another number embodying** descriptions of new species of *Sapindacea* by Professor Radlkofer of Munich was in the Press at the end of the year. Dr. Cooke's *Flora of the Presidency of Bombay* has advanced a further stage, Part III of Vol. II being published during the year, bringing the work down to the end of *Enphorhiace<e.* Since last report, Part II of Vol. IX of the Annals of the Royal Botanic Garden, Calcutta, **being'a Monograph of the *Orchids of the Uorth-West Himalaya* by** Mr. J. P. Duthie, B.A., F.L.S., formerly Director of the Botanical Department of Northern India and now at Kew, has appeared. Tbis volume csmprises descriptions of all the orchids of the North-West Himalaya, with keys to facilitate the identification and 58 plates of those species which are not or only

unsatisfactorily figured elsewhere. Two other volumes of the Annals are also in the Press and nearing completion. An important work on Indian Trees by the late Sir Dietrich Brandis, K.C.I.E., appeared just a short time before the death of its illustrious author. The other publications which appeared during the year are given in the list appended to this report.

General.—In October and November 1906 the Director visited the Botanical Institutions and Gardens of Southern India, and in February and March 1907 made a similar tour through Upper India. A special report on the present state of the Botanical Survey Department, and proposals for its reorganisation on a proper footing have been recently submitted to Government.

Staff.—Captain A. T. Gage, I.M.S., officiated as Director until 30th July 1906, and on the retirement of Lieutenant-Colonel D. Frain, I.M.S., F.B.S., C.I.E., was confirmed in the post from 30th July 1906.

A. T. GAGE,

Director, Botanical Survey oj India.

Report on the Botanical Survey operations in the Bombay Presidency for the year 1908-1907 by G. A. Gammie, Economic Botanist, in charge of the Botanical Survey of the Bombay Presidency.

The Economic Botanist toured in the Karnatak and Gujrat but, owing to pressure of other duties, no tour could be undertaken solely in the interests of the Botanical Survey. Arrangements are being made during the succeeding year for the establishment of continuous research work by himself and his assistants.

1. THE HERBARIUM:.—Numerous specimens were added to the Herbarium during the year. The chief contributors were Dr. Cooke, who presented 1012 sheets from his own Herbarium. Mr. Ryan presented collections made by him during his tours in the forest areas of the Poona District. The remainder was collected by the Economic Botanist and his assistants. 274 sheets were presented to the Bombay Natural History Society.

2. PUBLICATIONS.—Dr. Cooke, C.I.E., has published another number of his Flora of Bombay, bringing the account down to the end of *JEuphorbiacece.* The Economic Botanist supplied an account of the vegetation of Bombay Island for inclusion in the forthcoming Gazetteer; a further instalment of his notes on the Orchids of the Bombay Presidency to the Bombay Natural History Society; a revised account of Indian Cottons and a note on American Tree Cottons to the Inspector General of Agriculture in India. A botanical account of the field, garden, and Orchard crops of the Presidency has been drawn up and will be submitted for publication at an early date.

The collection of specimens of the indigenous fodder grasses has now been completed. The Economic Botanist has been generously assisted in this work by a great number of district officers. The working up of this material is now taken in hand and the results will be ready for publication during the ensuing year.

3. SISAL.—Seven plants flowered during the year and produced 11,780 bulbils. These have been reserved for distribution to applicants.

4. STAPF.—Mr. TJ. K. Bhide, Assistant Economic Botanist, has been in executive charge of the Herbarium during the year. He has worked steadily and well and has made fair progress in figuring dissections of the indigenous grasses. Messrs. Earade and Khonme, the Plant Collectors, have also performed their duties to my satisfaction.

G. A. GAMMIE,.

Economic ***Botanist, in charge Botanical Survey,***

Bombay Presidency.

GANESHKHIND BOTANICAL GARDENS,

KIEKEB ;

The *4th July 1907.*

Extract, paragraph 5, from the Report of the Government Botanist, Madras, for the year 1906-07.

5. WOEK OP THE SYSTEMATIC ASSISTANT.—The Systematic Assistant attended also to the duties of the Economic Assistant and to the general management of the office during Mr. Barber's tour. Owing to illness, he could not spend more than 27 days on tour. He identified grasses sent by several officers, and 2,000 plants of Mr. Barber's collection including all the host plants of *Olax scandens*, a root parasite of the prickly-pear, etc. In October, he explored the Nallamalais to find new kinds of haustoria, collected at Digunametta many root connections of *Ximenia americana*, discovered a new root parasite, *viz.*, *Opilia amentacea* of the order of Olacineae and made also a general botanical collection. The tour on the Nallamalais lasted about three weeks. The naming of the barks collected on the Anamalais and of the grasses collected in South Canara was finished. He contributed notes on sundry botanical subjects to the Reporter on Economic Products, the Director of Agriculture, etc., and also assisted Professor JFyson of the Presidency College. While he was preparing for a tour in the Travancore forests he was attacked with malarious fever. The Director of the Botanical Survey of India inspected the Botanical collections in the office on the 12th October 1906.

A list of Papers bearing on the Botany of India mostly published during 1906-07.

BEBR, B. • On the development of the spores of Helminthostaohys zeylanica *Ann. of Bot., xx, 1906, pp. 177—186, with 2 plates.*

BBBGTHEIL, G, & D. L. DAY, On the cause of " Hardness " in the seeds of Indigof era arrecta *Ann. of Bot., 1907, pp. 67—60.*

BLATTER, E. . Flowering season and climate. *Journ. Bomb. Nat. Hist. Soc. xvii, 334, 697, with 5 plates.*

BRAND, A. • Additameota nova ad cognitionem generis Symplocos. *Bull Herb. Bois., vi, 1906, pp. 747-750.*

BBANDIS, SIB D. • Indian trees. An account of trees, shrubs, woody climbers, Bamboos and Palms indigenous or commonly cultivated in the British Indian Empire. *London, 1906, p. xxxiv, 767, with many figures.*

BRANDIS, SIB D. • Remarks on the structure of bamboo leaves. *Trans. Linn. Soc., viij 1907, pp. 69—92, with 4 plates.*

BBANDIS, SIR D. . Mastizia euonymoides, *Prain. Ind. For. xxxiii, 1907, p. 67, with 1 plate.*

BRANDIS, SIB D. . Phcebe Hainesiana, *Brandis,* n. sp. *Hoot. Ic. Plant, ix, 4th 8er.9 pt. 7,1906.*

BBANDIS, SIB D. • The spruce of Sikkim and the Chumbi Valley. *Ind. For. xxxiv 1906, pp. 579—581.*

BURKILL, I. H. • Alpine notes from Sikkim. *Kew Bulletin, 1907, pp. 92—94, with I plate.*

BURKILL, I. H. . Goa Beans in India. *Agri. Ledger, No. 4,1906, pp 51—64.*

BURKILL, I. H. • The pollination of Thunbergia grandiflora *Roxb.* in Calcutta; and the pollination of Corchorus in Bengal and Assam ; and also the mechanism of six flowers of the North-West Himalaya. *Journ. Asiat. Soc. Bengal, it, pp. 511—525, 1906.*

CANDOLLS, C. DB • Meliace® nova vel iterum lectse et Butacesa nova. *Bull. Herb. Bois., vi, No. 12, pp. 981—986,1906.*

CARANO, E. . Bicerche sulla morfologia delle Pandanacee. *Ann. di Bot., v, pp. 1—46,1906, with 5 plates.*

CLARKE, C. B. . Reductions of the Wallichian herbarium. I Bignoniaces; Pedalineae. *Kew Bulletin, 1907, pp. 16—18.*
II Gesneracea. *Kew bulletin, 1907, pp. 16—18 and 94—97.*

Coou, T. . The Flora of the Presidency of Bombay, Vol. ii, Part iii, *Ferbenacea to Euphorbiacea.*

DEMILLY, I. . Les plantes du genre Laportea *Gaudich.,* leurs caracteres, leur action urticante dangereuse. *Bull. 8c. Pharmacol; xiii, p. 144,1906.*

DEYj SURBNDRANATH . A short account of the seeds and oil of Cochlospermum Gossypium. *Agri. Ledger, 1906, pp. 65—68.*

DIELS, L. . Die primitivste Form von Lygodium. *Hedwigia, xliv, 1905, pp. 133-136.*

DIELS, L. . Droseracea*. *Das Pflanzenreich, IK No. 112, 1906.*

Dop, P. . Physiologic des mouvements des etamines de Mahonia nepalensis *DO. Bull. Soc. Bot. France, 1906, p. 136.*

DRABBLE, E. . The Transition from stem to root in some palm seedlings. *New Phytologist, v, 1906, pp. 56-66, with 7 figs.*

DRUMMOND, J. R. • Chlamydites: A new genus of Composite. *Kew Bulletin, 1907, pp. 90—92.*

DRUHMOND, J. R. & PBAIN, D. Notes on Agave and Furcrsea in India. *Bengal Agric. Bulletin. No. 8,1906.*

DUTHIE, J. F. . The Orchids of the North-Western Himalaya. *Ann. Soy. Bot. Oard., Calcutta, ix, Part II, pp. i—H, and 81—211, with 68 plates.*

FIKET ET GAONEPAIN. Especes nouvelles de TAsie Orientate. *Bull. Soc. Bot. France, Mi, pp. 673-576,1906% with fig.*

GAGR, A. T. . Bulbophyllum Burkilli, a hitherto undescribed species from Burma. *Journ. An at. Soc. Bengal, U, p. 343,1906.*

GAGE, A. T. • The varieties of Bombax insigne *Wall,* in Burma. *Ind. For. xxxiii, No. 3,1907.*

GAGE, A. T. . Wormia Mansoni: a hitherto undescribed species from Burma. *Journ. Asiat. Soc. Bengal, ii, 1906, p. 73.*

GAGE, A. T. . Sketch of the Herbaceous Vegetation of Burma. *In Sir George Scott's "Burma," 1906.*

GAGNEPAIN, F. • Zingiberacees nouvelles de ltierbier du Museum. *Bull. Soc. Bot. France, 1906, Hit, pp. 351—356.*

GAMBLE, J. S. . Gutta percha trees of the Malay Peninsula. *Eew Bulletin, 1907, No. 4,pp. 109-121.*

GAMMIE, G. A. . The orcbids of the Bombay Presidency. Part iii, *Journ. Bom. Nat. Hist. Soc. xvii, 31, with plate.*

GATIN, C. L. . Nouvelle contribution a l'etude chimique de la germination du Borassus flabelliformiB, *L. Rev. Gen. Bot., xviii, 216, pp. 481—483.*

GUENOT, J. F. . Contributions & l'etude anatomique des Pittosporacea. *These, Paris, 1906.*

GuBRIN, P. . Cellules *k* mucilage des Dipterocarpees. *Bull. Soc. Bot. France, liii, pp. 443—451,1906.*

HAINBS, H. H. . On two new species of Populus from Darjeeling. *Journ. Linn. Soc, xxxvii, No. 262, pp. 407—409,1906, with text figs.*

HEMSUSY, W. B. A Nepenthes Macfarlanii, *EemsL, Hook. Ic. Plant, ix, 4th Ser., pt. I., 1906.*

HILL, A. W. . A revision of the geophilous species of Peperomia, with some additional notes on their morphology and seedling structure. *Ann. of Bot., 1906, xxi, pp. 139—161, with 1 plate.*

HOOKER, SIR J. D. . Triomma malaccensis, *Hook. /., Hook. Ic. Plant, ix, 4th Ser*, pt. 1,1906.*

HOOKER, SIR J. D. . Epitome of the British Indian Species of Impatiens. Part III. *Rec. Bot. Sur. Ind., iv, No. 3., 1906.*

HUTCHINSON, J. . Gentiana ornata. *Bot. Mag. Hi, No. 30,1907.*

JAENSCH, O. . Beitrag zur Embryologie von Ardisia crispa, *A. DC. Dissert Breslau, p. 35, 1905.*

KANNGIESSEE, F. . Blattziechnungen bei Oxalis acetosella. *Gartenfiora, 1906, p. 441.*

KINDEEMANN, V. . Zur Anatomie und Biologie des Samens von Hydrocharis Morsus-rana, *L. Lotos, Prag. Bd., xxvi, No. 4,1906,pp. 105—109.*

KEUTPP, E. DE • Quelques recherches sur la composition de l'eau et sur lesMiastases du fruit de Cocos nucifera. *Bull. Dept. Agri. Indes Neerland. 1906, No. 4, pp. 1—8.*

MAHEN, J. . Sur les organes secreteurs des Mimospermacees. *Bull. Soc. Bot. France, 1906, pp. 651—663.*

MTJTH, FR. • Untersuchungen iiber die Friichte des Hanfes. (Cannabis sativa *L.) Jahrbuch der Vereinig. Vertreter angewand. Botanik Berlin, 1906, pp. 76—122, with 1 plate.*

POND, B. H. . The Incapacity of the Date endosperm for self-digestion. *Ann of Bot., pp. 62—78,1906.*

REED, H. S.& SHOOT, I. •1 The mechanism of seed-dispersal in Polygonum virginianum• • J *Bull. TorreyBot. Club, xxxiii,pp. 377-386, 1906.*

SOHOUTE, J. C. • Ueber die Verastelung bei monokotylen Baumen. I. Die Verästelung von Pandanus. *Ann. du Jard. Bot. de Buitenzorg, xx, pp. 53—87,1905, with 2/Jigs.*

, SOAVE, M. . II ferro neUa Trapa natans. *Ann. Ace. Agri. Torino., xlviii, pp. 409—415.*

SPLENDOEE, A. . Sinossi descrittiva ed iconographica dei semi del genere Nicotiana. *Portid, 1906, p. 163, with 60 plates.*

SFRBNGBR, C. . Die Crinum Asiens. *Osterreich. Garten-Zeit. Wien, 1906, Heft 10, pp. 361—366.*

STAPF, O. . The Oil Grasws of India and Ceylon, *Kew Bulletin, 1906, pp. 297—363, with plate.*

STOPEB, M. C. . On the double Nature of the cadean Integument. *Ann. Bot., XIX, pp. 561—566, \$ 16.*

SVBDELICSj N. • Reports on the Marine Alga of Ceylon, No. I. Ecological and Systematic Studies of the Ceylon species of Caulerpa. *Ceylon Marine Biological Reports, ii9 No. 4, 1906, pp. 81—144, with 51 figs, in text.*

SVEDELIUS, N. • Uber die Achnlichkeit' zwischen der Marinen Vegetation Westindiens und des indischen und stiUen Ozeans. *Botanıka Notiser, 1906, pp. 49—57.*

TODD, F. H. • Pterocarpus dalbergioides. *Ind. For. xxxii, No. 12, pp. 581—587,1906.*

TREUB, M. • L' Apogamie de l'Elatostemma acnminatum *Brongn. Ann. dm Jard. Bot. de Buitenzorg, v, 3 8er., pp., 141—102, 1905.*

VIGUIER, R. • Recherches anatomiques sur la classification des Aialiacees. *Ann 8c. Nat. Bot. iv, 1906, pp. 1—208.*

WALTER, H. . Die Diagramme der Phytolaccaceen. *Ungler's Bot. Jahrh., xxxvii. 1906,4th Heft. Beibb. 85, pp. 1—57.*

WEHNERT, A. • Anatomisch—systematische Untersuchung der Blatter der Gattung " Symplocos." *Diss. Munchen, 1906, p. 57.*

WILLIAMS, F. N. . On the genus Clarkella (Bubiaoeso). *Journ. of Bot., xliv, pp. 377-379,1906.*

WILLIS, J. CL . The Progress of Botanical and Agricultural Science in Ceylon. *Science Progress, i,pp. 308—324,1906.*

YAPP, R. H. . Fruit-dispersal in Adenostemma viscosum. *Ann. of Bot., xx, 1906, pp. 311—316, with plate.*

Report of the Director of the Botanical Survey of India for the year 1907-08.

1. Eastern India.—BENGAL.—Collections were made from Several localities, chiefly of seeds required for various parts of India and for abroad. A beginning was made of a photographic survey of the chief types of vegetation in the province.

The usual collections of both plants and seeds were made in the Darjeeling District and in Sikkim and these were distributed chiefly to European and American Botanic Gardens and Herbaria. Captain F. H. Stewart, I.M.S., made a large collection of Tibetan plants in the neighbourhood of Gyantse and these—over 1,000 in number—he generously presented to the Calcutta Herbarium and they are now under examination. Mr. I. H. Burkill contributed plants collected on the Singlela ridge.

EASTERN BENGAL AND ASSAM.—Herr A. Meebold visited various districts on behalf of the Survey and obtained valuable collections from this area* Native collectors forwarded specimens chiefly *Or chide a* from Manipur and neighbourhood.

BURMA.—Herr Meebold collected in various localities from Rangoon to Mandalay and his specimens are now being worked up and incorporated in the Herbarium. Mr. I. H. Burkill contributed to the Herbarium from his collection of Arraean specimens. Interesting specimens continue to be received from Forest Officers, and further collections of *Or chide a* were obtained from the Shan Hills.

2. Western India.—The report of the Government Botanist is appended.

3. Southern India.—Extracts from the report of the Government Botanist, Madras, are appended. Mr. C. E. G. Fischer of the Forest Department forwarded to the Calcutta Herbarium collections made in North Coimbatore and North Malabar. Mr. I. H. Burkill sent a collection of Deccan grasses.

North-West India.—From this area the Survey is indebted to the following for valuable contributions:—

Sir H. A. Deane, K.C.S.L, Obief Commissioner of the North-West Frontier Province, forwarded several collections from Pesbawar and Afghanistan; Mr. I. IL Burkill, a series of Baluchistan plants, collected by the Gazetteer staff under the direction of Mr. R. Hughes Buller, I.C-S., and a collection from Simla; Colonel J. M. Carpendale, plants from Kashmir; Mr. James Marten of the Forest Survey Department, plants from Bannu; Mr. T. F. Main from Umballa; Mr. A. B. Tucker of the Department of Revenue and Agriculture, a further collection of North-West Himalayan plants.

Of the more important foreign contributions bearing on Indian Botany may be mentioned collections from Turkestan, the Philippines, Siam, and the Andamans.

Publications.—Of the Records of the Botanical Survey there were published No. 3 of Vol. Ill (Professor L. Radlkofer's *Sapindacete nova Indices et malaica,* and of No. 4 of Vol. Ill (Professor 0. deCandolle's *Revision of the Indo-Malayan species of Oedrela).* No. 5 of Vol. Ill, an index completing the volume, is now in the Press and should shortly appear.

Another part of Dr. Cooke's *Flora of the Presidency of Bombay* has been issued bringing the work down to the beginning of *Aracea.*

The two volumes of the Annals of the Royal Botanic Garden, Calcutta-Vol. VI, part 2, Messrs. West's *Fresh Water Alq* from Burma,* and Vol. XI, part I, Professor Beccari's *Monograph of the species qf Calami,* reported last ?ear is still in the Press, have not yet been issued but should both appear Sn six months Parts 19 and 20 of Sir George King and Mr. H. S. Gamble's *Materials for a Flora of the Malayan Peninsula* were issued during the work to the end of *Plantaginea.*

The other publications on Indian Botany published during the year are given in the list appended to this report.

Staff.—Captain A. T. Gage, I.M.S., Director of the Botanical Survey of India, held charge until 14th March 1908. He then went on privilege leave, and Mr. W. TV. Smith, Curator of the Herbarium, officiated until the end of the financial year.

W. W. SMITH,

Officiating Director, Botanical Survey of India*

Report on the Botanical Survey operations in the Bombay Presidency for the year 1907-1008 by Mr. G. A. Gammie, Economic Botanist, in charge of the Botanical Survey of the Bombay Presidency

TOURS.—Mr. H. M. Ghibber, Assistant Professor of Botany, toured through Kathiawar, Panoh Mahals, Ahmedabad, Khandesh, Satara, and Belgaum districts. Messrs. E. K. Bhide, 6. B. Patwardhan, and H. P. Paranjape, Assistants to the Economic Botanist, toured through Belgaum, Ratnagiri, Thana, Nasik, Ahmednagar and Poona Districts, the junior staff, Messrs. L. D. Garade, L. R. Khomne, 8. R. Jogadeo and R. G. Jawlekar accompanying them.

HBBBARITJM.—The following is the number of specimens collected and incorporated into the Herbarium:—

	Specimen*.
Collected by -	
Mr. G. A. Qammie	968
Mr. H. M. Chibber	1,482
Messrs. Bhide, Patwardhan, and Paranjape	2,858
Presented by Dr. T. Cook	906
TOTAL	6,164

The following is the number of specimens distributed :—

	Sheets.
Presented to the Bombay Natural History Society	104
Presented to the Fergussou College, Poona	806
Presented to the Yokohama Specie Bank, Limited	7
TOTAL	417

PUBLICATION.—Dr. T. Gooke, C.I.E., has published another number of his Flora of Bombay bringing the account down to the end of *Typhacets.*

A further note on the Orchids of the Bombay Presidency was supplied to the Bombay Natural History Society. A note on the introduction of American Cottons in the Bombay Presidency was supplied to the Inspector-General of Agriculture in India and a note on the Setarias was also supplied to the same officer. A note on the Flora of Thana is almost ready for publication. The specimens of the indigenous fodder grasses kindly supplied by the several District Officers of the Presidency have nearly all been identified together with the millets under cultivation and descriptions accompanied by drawings of them will shortly be published.

STAFF.—Mr. Bhide, Assistant Economic Botanist, has been in charge of the Herbarium throughout the year. Mr. Paranjape has also assisted him in clearing up arrears.

G. A. GAMMIE,

Economic Botanist, Bombay, JPoona.

Extracts from the Annual Report of the Government Botanist, Madias, 1907-1908.

" Mr. (now Dr.) G. A. Barber continued to be on leave in England and the Director of -Agriculture was in charge of the office for one month in the beginning of the year. On the 1st May M. R. By. Rao Bahadur G. E. Subba Bow Avargal took charge as Acting Government Botanist and continued in this capacity for the rest of the year. In his untimely death, which has just been reported, the department has sustained an irreparable loss. His knowledge of the agriculture of tbe Presidency was unequalled, and he had the gift of acquiring the confidence of the agricultural classes in a unique degree."

" The flora and fauna of the Eolair lake were studied, and even though the monsoon there was a failure " Alliyalu [M] *(NymphcBa Lotus)* largely used as a food by some classes was found to grow extensively, and the best economic use of its seeds noted and a short report written on it."

" During the year two papers of Dr. Barber (on leave) on studies in root parasitism—(1) Haustorium of *Santalum album,* part II, and (2) Haustorium of *Olax scandens*—were published in the Botanical series of the Agricultural memoirs."

" WORK IN SYSTEMATIC BOTANY.—The Systematic Assistant was on leave on medical certificate during the first nine weeks of the year owing to a severe attack of the Nallamalais fever, and on joining duty he attended to the thorough cleaning of the Herbarium collections and office in" general and to the preparation of a full list of the host plants of different root parasites for f orwardal to Dr. Barber in England."

" Seeds of the following root parasites were sent to Dr. Barber in England for experimental sowing and special study :—*Santalum album* from Mysore, *Olax scandens* from Falur, *Ximenia* and *Opilia* obtained from tbe Nallamalais forests and lastly *Cansjera Rheedii* collected by the Assistant in the Madura and Tinnevelly lower hills."

" About the end of the official year the Madura and Tinnevelly lower hills were visited for re-examining the root system of *Cansjera Rheedii* and collecting its fruits. In this tour *Olax Wightiana* was also found to be a root parasite.

The Assistant was on tour for 119 days, of which 104 days were spent in the study and collection of grasses in the Circars and 15 days in Tinnevelly and Madura hills regarding *Cansjera.*

No special systematic survey was made owing to the absence of Dr. Barber in England."

APPENDIX TO BOTANICAL SURVEY OF INDIA REPORT FOR 1907-08.

*A list of papers on the Botany of India published during 1907*08.*

ANONYMOUS — .Patchouli. *(Kew Bull., 1908, p. 78.)*

ASCHEBSON P. UND p. GBAEBNBB. — Potamogetonacea. *(Das Pflanzenreieh. xexi,* p. *184, with plates, 1907.)*

BABBEB, C. A. — . Parasitic trees in Southern India. *(Proe. Cambridge Philos. Soc., xiv, 3, pp. 246—256, with plates.)*

BABBEB, C. A. — . Studies in root parasitism. The Haustorium of *Bant alum album,* part *i,* the structure of the mature Haustorium and the inter-relations between host and parasite. *(Memo. Dept. Agri. India, i, 1, 2, pp. 1—58, with plates.)*

BASBEB, C. A. — • The Haustorium of Olax Scandens. *(Memo. Dept. Agri. India, 1, No. 4.)*

BEDDOME, R. H. — . Notes on Indian Ferns. *(Journ. Bom. Nat. Hist. Soc, xviii, 2, pp. 338—342,1908.)*

BLATTEB, E. — . Contributions to the Flora of North Coimbatore. *(Journ. Bom* Nat. Hist. Soc, xviii, 2, pp. 390—429,1907, with map.)*

BLATTEB, E. — • Acta et agenda by the Bombay Botanists. *(Journ. Bom. Nat. Hist. 8oc} xvii, 3, pp. 562—577,1907.)*

BLATTER* E. — . Cassia renigera, Wall. *(Journ. Bom. Nat. His. Soc, xvii, 4. pp. 1036—1037, with plates, 1907.)*

BLATTEE, E. — . Flowering season and climate. Part II, 1907. *(Journ. Bom. Nat. His. Soc, xvii, 3, pp. 697—708, with plates.)*

BONATI, G. — • Les Pediculaires de Chine de M. Wilson dans l'herbier du Museum de Paris. *(Bull. Soc. Bot. France T. Uv, pp. 183—188,1907.)*

BONATI, G. — . Sur qnelques espèces nouvelles du genre Pedicularis. *(Bull. Soc Bot. France T. liv,pp. 371—377, June 1907.)*

BTOKILL, I. H. — , A note on Swertia tcngluensis, and on a new variety of Swertia purpurascens. *(Journ. and Proe. Asiat. Soc, Bengal, Hi, 1, p. 00, 1907.)*

BUBKILL, I. H. — • On Gentiana coronata, Boyle. *(Journ. and Proe. Asiat. Soc, Bengal, Hi, 3, p. 149, with plates.)*

BUKILL,I.H.,AJn> FINLOW, R. S# — On three varieties of *Corchorus capsularis,* Linn., which are eaten. *{Journ. and Proe. Asiat. Soc, Bengal, Hi, 10, 1907, p. 633.)*

BIIEKILL, I. H. — • Note on the Pollination of flowers in India. Note No. 4 on Cotton in Behar. *(Journ. Asiat. Soc, Bengal, Hi, 7 July 1907.)*

BUBKILLj L H. — . Anguillicarpus— a new genus of the Crucifera, *(Journ. and Proe Asiat. Soc, Bengal, N. 8., Hi, 8,* pp. *659—561, with plates, 1907.)*

BUBKILL, I. H. — . A variety of Ducrosia anethifolia, Boies, from Baluchistan. *(Journ. and Proe. Asiat. Soc, Bengal, N.8., Hi, 8, pp. 563—664,1907, with plates.)*

BUTLEB, E. J. — . Beport on Coconut palm Disease in Travancore. *(Bull. Research Institute, Pusa, No. 9,1908.)*

BUTLER, E. J., AND LEVBOY, H. M. — Beport on trials of the South African Locust Fungus in India. *(Bull. Agri. Research InsU, Pusa, 1907, 5, pp.* 1—5.)

BUTLEB, E. J. — 'tSome diseases of cereals caused by *Schrospora graminicola* Schroet. *(Memoirs of the Dept. Agri. in India, Vol. II, No. 1, March 1907, pp. 19 with plates.)*

CAMERON, J. — # List of Botanical drawings in water colour in the collection of the State Botanical Gardens, Lai Bagh. *(Bangalore, 1907, pp.56.)*

CANDOLLB, C. DE — A revision of the Indo-Malayan species of Cedrela. *(Rec Bot. Surv.Ind.,iii,pt.4,1908.)*

CLARKE, C B. — Seductions of the WaJlichian Herbarium, iii, Cyperace©. *(Kew Bull. 1907,7, pp. 261-281.)*

COOK, T. — . The Flora of the Bombay Presidency, ii, pt iv. Euphorbiacea to Aracea, pp. 625—816.

COTTON, A. D. — New or little known marine alga from the East. *(Kew Bull. 7, 1907, pp. 260—264, with plates.)*

DRUHMOND, J. B.* — Literature of Furcrsea with Synopsis of the known species. *(St. Louis Bep. Bot. Qard., 1907, with plates.)*

ELLIS, E. V, — Cephalostachynm pergracile in flower. *(Indian Forester, xxxiii, 7, pp. 323—324, 11)07.)*

ENBRS, D. T. — The evergreen forests of the Maunjarabad Fon>st Range, Mysore State. *(Indian forester, xxxiii, 7, pp. 324—328, 1V07.)*

FINLOW, R. S., AND BERGTHEIL, C. J. — A Method for producing immediate germination of "Hard coated seeds." *(Journ. and Froc. Asiat. Soc, Bengal', in, 10th Deer. 1907, p. 625.)*

FISCHEB, C. E. C. — Host plants of Loranthaceae. *(Indian Forester, xxxiii. 8. pn. 353 355,1907.)*

FISCHER, C. E. C. — Summary of genera and species described in the Flora of British India. *(Indian Forester, xxxiii, 8, pp. 355—862, 1907.)*

FISCHBB, C. E C

FLETCHER* T. — A remarkable tree. *(Journ. Bom. A at. His. Soc, xvii, 4, pn 1027,1907.)*

F&ITSCH, F. E. — Note on a toxic substance excreted by the roots of plants. *(Memo. Dept. Agri. India, II, No. 3.)*

A general consideration cf the Subserial and Fresh-water Algal Flora of Ceylon. A contribution to the study of Tropical Alga and Algro of the inland Fresh-waters. *(Proc. Hoy. Soc, London, B. Vol. lxxix, pp.l97—254, with plates and map.)*

GAGE, A. T. — A case of lateral Floral Prolification of the inflorescence of the Pine-apple (Ananas eativus $chult. f.) *(Journ. Asiat. Soc Bengal, Vol. Hi, 9, Nov. 1907, p. 593.)*

GAGNEPAIN, F. — Quelques Burmannia asiatiques nouveaux de rHerbier du Museum. *(Bull. Soc. Bot. France liv, pp. 459—465, Juin 1907.)*

GAMBLE, J. S. — Guttapercha trees of the Malay Peninsula. *(Kew Bull. 1907 an 109—121.)*

GAMMIE, G. A. — The Indian Cottons. *(Memo. Dept. Agri. India Bot. ser. ii, 2 23, pp 14, col. pi.)*

GAMMIB, G. A. — The orchids of the Bombay Presidency. *(Journ. Bomb. Nat. His. Soc, xviii, 1, Novr. 1907, pp. 88—91, with plates, and also part iv, Journ. Bom. Nat. His. Soc, xvii, 4, pp. 940—942, with plate, 1907.)*

Goms, A. ET WALLABT, J. — Grains et huile de Chaulmoogra, *(Bull. Se. Pharm. t. xiv, p. 203, 1907.)*

GRAY, O. B. — The India Tulsi Plant (Ocymum sanctum). *(Pharm. Journ. Ixxix, 1947, pp. 506—507, 1907.)*

HEINIG, R. L. — Flora of Chittagong.

HKMSLEY, W. B. AND WATSON, W. — Saxifraga Brunoniana. *(Curtis Bot. Mag. 1908,4, ser. 4, Nr. 40.)*

HILL, M. — Note on the introduction and acclimatization of the Mahogany *(Swietenia, Mahogani)* in India. *(Indian Forester, xxxiii 7 pp. 308—312, 1907.)*

HOLTERMANN, K. — Der Einfluss des Elimas auf den Bau der Pflanzengewebe. Anatomisch-pbysiologische Untprsurhungen in den Tropen. *(Leipzig, W. Engelmann. 244, p. 6, Pegetationsbilder und 16 lithographiscke Tafeln Mh. 12,1907.)*

HOOPER, J). — Hclianthus annuus. The sunflower. *(Agri. Ledger 1907, 1, pp. 1—11.)*

HOOPER, D. — Taroarindus indica. The uses and composition of Tamarind seeds. *(Agri. Ledger 1907, 2, pp. 13—16)*

HOOPER, D. — The fats of Garcinia species. *(Journ. and Proc. AsiaL Son, Bengal Hi, 5, pp. 257—259.)*

HOOPER, D. — The seeds and oil of the Mexican Poppy, Argemone mexicana. *(Agri. Ledger, 1907, No. 5, pp. 35—39.)*

HOOPER, D. — The oil of Lawsonia alba. *(Journ. and Proc. Asiat. Soc. Benaal 111,1908, p. 35.)*

HOOPER, D. — The fats of India Nutmegs. *(The Agri. Ledger No. 3 of 1907, p. 17.)*

HOOPER, D. — Amphicome Emodi. *(Pharmaceutical Journal, Vol. 79, p. 506.)*

JOWITT, J. F. . Note on Apluda varia, Hack. *(Ann. Hoy. Bot. Gard., Perz* deniya, iv, 2, pp. 85—88, 1907.)*

KA&STEN, O. . Das indische Phytoplankton. *(Wiss. Ergebn. A. dentseh. Tiefsee Exp. a. d. Dampfer Taldlvia. 1898-1899, Hrsg. v. C. chum. Bd. ii Tl. 2, Lfrg. 3, pp. 223—345, 20 Taf, 5bb. Jena, G. Fischer, 1907.)*

KING, SIB GEOEGB, AND GAMBLE, J- S. Materials for a Flora of the Malayan Peninsula, Nos. 19 and 20. *(Journ. and Proc. Asiat. Soc, Bengal, Ixxiv, pt. 2, pp. 383—728,1908.)*

KlRTIKAR, K. B. . A note on an edible Fungus from Lahore. *(Journ. Bomb. Nat. His. Soc. xvii, 4, pp. 1030—1031, 1907.)*

KORCZYNSKF, A., AND MAKCHBEWSKI, L. Studies on the colouring matters of Datisa cannabina roots. *(Bull. Acad. Soc. Cracoioie, II, 1907, p. 124.)*

LEASE, H. M. . Studies in the Experimental Breeding[1] of the Indian Cottons—an introductory noter. *(Journ. and Proc. Asiat. Soc, Bengal, iv, 1, Jany. 1&08, p. 13.)*

LUSHINGTON, A. W. . Note on some sucker-produced forests of the Krishna District Madras. *(Indian Forester, xxxiii, 10, pp. 445—451,1907.)*

MANN, H. H. AND HUTCHINSON, C. M. Cephaleuros virescens Kunze, the red rust of tea. *(Memo. Dept. Agri. India, Bot. Series, 1, 6, p. 35, with plates, 1907.)*

MASSES, *Or.* . Fungi Exotici. vi. *(Keu> Bull. 1907, Ao. 4, pp. 121—124.)*

PEEKINS, J. . Styrncaceae. *(Das Pflanzenreich, herausg. von A. Engler Hqft 30, (iv, 241.) Verlag von With. Engelmann, Leipzig. Preis Mk. 5, 60,1907.)*

PETCH, T. . Revisions of Ceylon fungi. *(Ann. Roy. Bot. Gard. Peradeniya, iv., 2, pp. Hi—68,1907.)*

PETCH, T. *m* A stem disease of tea *(Massaria theieola Petch). (Circulars and Agri. Journ. Boy. Gard. Ceylon, Vol. iv, 4, July 1907, pp. 21—30.)*

PITTZER, E. TOD KEANZLIN, F. Orohidacese-MonandrsB-C&logynmaB. *(Das Pflanzenreich. Heft 32, p. 169, with plates, 1907.)*

PEAIN, D. • Diospyros Kaki, Linn. f. and Meconopsis *(Eumeeonopsis)* bella, Prain. *(Curtis's Bot. Magazine 4th ser, Hi, 28, April 1907.)*

PRAIN, D. • Codonopsis convolvulacea. *(Bot. Magazine iv, 38, February 1908.)*

BADLKOPEB, L. . Sapindacese novsB indicsB et malaica ex herbario calcuttensi. *(Bee. Bot. Surv. Ind. Hi, pt. 3, 1907.)*

RAM, D. . Notes on the flowering, seeding, and cutting of Strobilanthes in Jaunsar Division in 1906. *(Indian Forester xxxiii, 10, pp. 451—452,1907.)*

Srmruz O. E. • Erythroxylacea. *(Das Pflanzenreich, heransg. F. A. Engler, iv, 134, Leipzig, Engelmann. Preis ML 8, 80,1907.)*

SYDOW, H. *m* P. BUTLEB. Jir E. J. Fungi India ori^ntalis. Pars ii. *(Annalis. Mycologid v, 1907, PP- 485—515, with plates.)*

TURNER, T. E. C. . Note on Terminalia Chebula and its fruit the Myrabolam of commerce. *(Indian Forester, xxxiii, pp. 362—365,1907.)*

WATT, SIB G. . Handbook of Commercial Products of India.

WILLIS, J. C. . The geographical distribution of the Dilleniacese, as illustrating the treatment of this subject on the theory of mutation. *(Ann. Boy. Bot. Gard. Peradeniya iv, 2, pp. 69—77, lf*O7.)*

YATES, K. ABBEY • Account of an enquiry with regard to the Candle-nut tree (Aleurites molluccana) in India. *(Agri. Ledger, No. 4, 1907, p. 25.)*

CALCUTTA: PBINTED BY SUPDT. GOVT. PRINTING, INDIA, 8, HASTINGS STBEET.

Report of the Direetor of the Botanical Survey of India for the year 1908-09.

1. Eastern India.-BENGAL-AS there no longer exists any pressing necessity fur exploring the plains of Bengal for the Sora of which a handhooV exists in Colonel Pram's" Bengal Plants », attention has been concentrated on the vegetation of the hills of the Province more eraedallv of thn fKii-n™ Himalaya. Mr. W. W. Smith, M.A. the Curator of t£ Calcutta HerbariurS who has been directed to devote special attention to the Himalayan flora haq collected largely in the outer and lower hills, and his work in this region' has been supplemented by collections made under the supervision of Mr B Pant lin<*. ib.3 Assistant Superintendent of the Cinchona Plantation and hv collections made by Mr. G. E. Sliaw, B.Sc, F.O.S., the Government Quiuologist.

EASTERN BENGAL AND ASSAM—In As<am collections were made in the hills of the North Cachar district by Mr. W. G. Craib, M.A, Officiating Curator of the Herbarium, to supplement the collections made by the writer in the plains of the South Cachar district several years ago. Mr. A Meebold a gentleman to whom the Survey has already been much indebted also collected largely on behalf of the Survey on the eastern side of Assam mostly' in the State of Manipur.

BrBMA.—In Burma collecting work was restricted mostly ts brin-in* together o living collection of the orchids of that province In addition" the Forest Department contributed a am ill but interesting general collection.

2. Western **India.—**Tlie Presidency of Bombay has now been added to the as yet short list of the Provinces for which local floras have been finished, the last part of Dr. I. Cookes " Flora of the Presidency of Bombay " having appeared in December 1908. The Economic Botanist to the Government of Bombay has lurnishod an account of what systematic work has been done by his Department during the year from which' it appears that different members of his stnH toured through the districts of Poona, Thana, Belganm Kanaraand Sindh and collected a number of interesting specimens. The' Herbarium collection was increased by 3,585 sheets while 4,504 sheets' were distributed. Additions to our knowledge of the vegetation of the Presidency h<tve been made by various gentlemen. Mr. G. A. Gammie, F.L.S., continues what is practically a monograph of the Orchids of the Bombay Presidency while the Rev. Father E. Blatter, S. J., is doing excelleut service to the science by liis work on the Forns of the Bombay Presidency, on the Flora of Cutch and by his Statistiuo-Biological studies of tlie general flora of the Presidenoy.

3. Southern India.—The official work done on behalf of the Survey does not bulk largely in the prosrnt report. Dr. Barber's Assistant was on tour 45 days during the year and accompnnied tlio Acting Government Botanist to the Anamalais where hft made a few collections. About 2,500 sheets were added to the Herbarium which was kept in good condition during the year.

Mr. A. Meebold in addition to his Assam material presented to the Calcutta Herbarium a set of his collections which he had gathered while tonr-**isg** in Southern India, mostly in Mysore. The Hcv. Father Blatter, S J lias added to our knowledge of the vegetation of the Peninsula by ivorkin[w] up'and publishing tlia collections made in the Coimbatore district by Mr C E O Fischer of the Forest Department.

Mr T. F. Bourdillon, F.L.S., Conservator of Forests, Travancorc, has made however the most important contribution in his " Forest Tree* of Travancoro " which should prove a most useful handbook to the Forest Flora of that State.

4. North-West India.—No official work whatever lias been done on **behalf** of the Hotanieal Survey. The " Flora of the Upper Gangetio Plain " bv Mr. J. F. Duthic, B A,, F.L.S., formerly Direetor of tbc Botank-al Department of Northern India has advanced **a** stage further, descriptions of species up to

the natural order *Scrophularineas* being now in the Press. The Flora of the Punjab and North-West Frontier Provinces is still in the hands of Mr. J. B. Drummond, LOS., (retired)9 but I am unaware of what progress has been made with it. Meanwhile in default of a regular flora the descriptive key to the Flora of the Punjab, North-West Frontier Province and Kashmir by Lieut-Colonel 0. J. Bamber, I. M.S., in course of publication should prove most useful. Mr. I. H. Burkill, M.A., F.L.S., in his working List of the Flowering Plants of Baluchistan has brought together in compact form the scattered results of previous collections as well as much new information regarding the Flora of that region gathered by the staff employed on the Gazetteers of Baluchistan.

5. Publications.—Volume III of the Records of the Botanical Survey was brought to a conclusion during the year by the issue of title page and index. Since last report publication of the two long delayed volumes of the Annals of the Royal Botanic Garden has been accomplished. The first which forms the second and concluding part of Volume YI is an account of a collection made by Mr. I. H. Burkill, of Fresh Water Algae from Burma and is written by W. West, F.L.S., and Professor G. 8. West, M.A., F.L.S. The authors mention or describe 276 species of which 35 are new to science, while two new genera are described. Seven beautifully executed plates accompany the paper to which is appended a very full bibliograpy. The other Volume No. XI of the Annals is a sumptuous monograph of the Asiatic climbing palms of the genus *Calamus* by Signor O. Beccari, the distinguished Italian Botanist and traveller. There are over 500 pages of descriptive matter comprising in addition to a learned introductory essay on the morphology and distribution of the genus detailed descriptions of over 200 species of which over 20 are new. The monograph is illustrated with 230 magnificient double plates and as a whole constitutes one of the finest contributions to botanical science that have ever appeared in this or in any other country. The " Materials for a Flora of the Malayan Peninsula" initiated by the late Sir George King, K.G.I.E., formerly Director of the Botanical Survey of India, are being continued by Mr. J. Sykes Gamble, G.I.E , F.H.S., formerly of the Imperial Forest Department, and during the year part 21 comprising descriptions of the natural order *Gesneracece* and *Verbenaceoe* was published.

A list of publications on the Botany of India that have appeared during the year is appended to this Report.

6. Staff.—Captain A. T. Gage, I.M.S., was absent on combined leave from the beginning of the financial year until 14th December 1908 during which period Mr. W. W. Smith, M.A., Curator of the Herbarium, Royal Botanic Garden, Calcutta, officiated.

A. T. GAGE, *Captain, I.M.S.*,

Director of the Botanical Survey of India..

A list of papers on the Botany of India published during 1908-09.

BAMBER, C. J. . Plants of the Punjab. *(Journ. Bom. Nat. His. Soc. xviii, 4, 885—861, 1908 and xix, \, 59—86, 1909.)*

BARBER, C. A. Studies in root-parasitism,. The haustorium of Canejera Rheedii. *(Mem. Dept. Agri. lnd. Bot. Ser. ii, 5, 37, with plates, 1908.)*

BECKER, W. Ein Beitrage zur Veilchenflora Aeiens *(Beth. Bot. Cbl. xx, Abt. 2,195—127,1906.)*

BERNARD, CH. Sur une anomalie des fruits de Carica Papaya. *Ann. du Jard. Bot. de Buitenzotg. Ser. 2, vii, 56—68, with plates, 1908.)*

BLATTER, E. Ferns of the Bombay Presidency. *{Journ. Bom. Nat. His. Soe. xviii, 3, 599—612,1908.)*

BLATTER, E. The Flora of the Bombay Presidency. (Statistico-Biological Notes.) *(Journ. Bom. Nat. His. Soc. xviii, 3, 562—571, 1908.)*

BLATTER, E. On the Flora of Cutch. *(Journ. Bom. Nat. His. Soc. xviii, 4, pp. 756—777,1908, and xix,* i, *157—176, 1909.)*

BONATI, G. Scrofularinees nouvelles de l'Indo-Chine. *(Bull. Soe. Bot. trance, lv, 609 et 537,1908.)*

BOSE, J. C. Comparative Electro-Physiology. *(London, 1907.)*

BOUBDILLON, T. F. The Forest Trees of Travancore. *(Travancore Oovt. Press, 1908.)*

BURKILL, I. H., & FINLOW, R.S. The races of Jute. *(Agric. Ledger 1907-08,6, 41—137.)*

BURKILL, I. H. A working list of the Flowering Plants of Baluchistan. *(Calcutta, 1909.)*

COMPTON, R. H. The Morphology and Anatomy of *Utricularia brachiata* Oliver. *(New Phgtologist, viti, 4,117—130.)*

COOKE, T. & STAFF, O. *Andropogon (Dichant&ium?) serrafalcoides* Cooke staff. *(Kew. Bull. 10,1908, 450.)*

COOKB, T. Flora of the Bombay Presidency, ii, pt. 5, with Index, *Araeeae* to *Gramineae*

COSTERUS, J. C. Pistillody of the stamens in Nicotiana. *(Sec. Trav. Bot. Neerland, iv, 221, with plate.)*

DANGUY, P. Note sur une collection botanique rapportée du Pamir par le commandant de Lacoste. *(Journ. Bot. xxi,* 3, *49 ~ 53,1908.)*

DIXON, Ht N. Mosses from the Western Ghats. *{Journ. of Bot. xlvii, 657, May 1909,157-164.)*

DODE, L. A. Revue des espfeces du continent asiatique de la section *Tetradium* et de la section nouvelle *Evodioceras* du genre *Evodia. (Ball. Soc. Bot. France. 1908, lv, 9, 701—707,1909.)*

DOP, P. Contribution it Tflude des Malpighiacees d'lndo-Chine. *(Bull. Soc. Bot. France, lv, 427—430% 1908.)*

FINET ET GAONEPAIN Additions i la flore de l'Asie Orientals *(Bull. Soc. Bot. Ranee, liv, 82- 90, with plates, 1908.)*

QACNEPAIN, F, Bixacees et Pittosporaoees asiatiques. *(Bull. Soe. Bot. France.lv, 544,1308.)*

GAGNBPAIN, F. . Contribution & la oonnaissanoe dea Xanthophyllum, *(Journ . de Bot. xxi, 10, 241—253,1908.)*

GACMBPAIN, F. . Essai de classification des Scolopia et Flacoartia asiatiques. *{Journ. de Bot. xxi, 7,164—173, 1908.)*

GAGNEPAIS, F. . Nouveautés asiatiques de Fherbier du Muséum. (L Hydrocharitaoees, II. Menispermacees, III. Lardizabalees.) *Bull. Soc. Bot. France. 1908, lv., 34r41, et. 43-48.)*

GAGNBPAIN, F. . Un arbre oleifere d'Indo-Chine. L'huile de Chaulmoogra et le faux Chaulmoogra. *{Journ. de Bot. xxi., 6,137-144, 1903.)*

GAMBLE, J. S. . Materials for a Flora of the Malayan Peninsula pt. 21, Verbenacea. 1908*

GAMBLE, J. S. . *Acer Osmasloni* Gamble. *(Kew Bull. 10,1908, 446.)*

GAMBLE, J. S. . *Boschia Mansoni* Gamble. *(Kew Bull. 10, 1908, 445.)*

GAMBLE, J. 8. . *Cynometra Bourdilloni* Gamble. *{Kew Bull. 10, 1908, 446.)*

GAMBLE, J. S. . *Wrightia SiJckimmensi** Gamble. *{Kew Bull. 10, 1908, 447.)*

GAMMIE, G. A. . Indigenous trees and shrubs under observation. *{Report of Exp. Work, Ganeshkhind Bot. 8tat. 4—15,1908.)*

GAMMIE, G. A. . The Orchids of the Bombay Presidency, pts. VI—VIII *{Journ. Bom. Nat. Hist. Soc. xviii., 3.y 586-590, 1908, 4 833-834,19081 xix, I.} 1909,139—141.)*

GEIIEMANN, E. . Vorarbeiten zu einer Monographie der Gattung *Bridelia {Engler's Bot. Jahrb. xli.9 Beihl. 95, 1—42, 1908 with plates.)*

GUEGUEN, P. . Enations hypophylles du *Coloeasia esculenla* Schott. *{Bull. Soc. Bot. France, lv. 26—32, with plates, 1908.)*

HEBTBR,W. . *Lycopodium sikhimense* Hert. *{Bot. Jahrbuch Band xliii., 23 Feb. 1909, 42.)*

HILLIER, J. M. . Lalang grass *{Imperata arundinacca* Cyrill.) *{Kew Bull. 1909, 2,55—59.)*

HOOKEB, J. D. . On some species of Impatiens. *{Hooker's Icones Plantarum ix., 3, 2851—2876,1908.)*

HOOKBB, J. D. . On some species of Impatiens from Indo-China and the Malayan Peninsula. *{Kew Bull. /., 1909.)*

HtJTOHINSON, J. . Notes on the Indian species of *Sambucu**. *(Kew Bull. 4, 1909,191—193.)*

KTJSANO, S. . Further studies on Aginetia indlca. *{Bull. Coll. Agric. Tokyo viii., 1, 59—78, with plates, 1908.)*

LBCOMTB, H. . Sabiacees asiatiques nouvelles del'herbier du Muséum. *{Bull. Soc. Bot. France. 1907, liv., 671—678.)*

LINSBAUB, K. . Ueber Reizleitungsgeschwindigkeit und Latenzzeit bei *Mimosapudica. {Wiesner-Festsch. Wein, 1908, 396, wit A plates.)*

LiUSHINGTON, A. "W. Some notes on Palms. *{Indian Forester, xxxv. March 1909, 148—153.)*

MAETEN, J. . List of Perns found at and around Mussoorie 1908. *(Journ. B*m. Nat. Hi,. Soe. xiz., I., 1909,179—183.)*

MASTERS, M. T. — On the distribution of the species of Conifers in China and on the occurrence of the same species in neighbouring countries. *(Journ. linn. 8oc.. London, xxxviiu, 198—205,1908.)*

NBSTLBR, A. — Die hautriezende Wirkung der *Primula mollis* Hook, und *Pr. Arendsii* Pax. *(Ber. deutseh Bot. Ges. xxvia. 468-475, 1908.)*

PBTITICBNGIK, M. — Bevue critique des Primulacees asiatiques* *(Bull. Acad Intern. Qeogr. Bot. svii., Nos. 225—226, 334—338, 1908.)*

PBAIN, D. — A new species of *Butea,* with notes on the genus. *(Koto Bull. 1908, 9, 381—387.)*

PBAIN, D., & BURKILL, I. H. — Diosoorearum novarum descriptions qua&dam. *(Journ. and Proe. Asiat. 8oc. Bengal, iv, 9, 447—467, Septr. 1908.)*

[illegible] O. — Beiträge zur Anatomie und Systematik der Arlocarpeen und Conocephaleen inbesondere der Gattung Ficus. *(Diss. München 1906,129.)*

SPRAGUB, T. A. — The prickly-fruited species of *Euonymus (Rev> Bull. I, 29—36, 1908.)*

STAFF, 0. — *Arthraxon Meeboldii* Stapf.(fc« *Bull. 10,1908, 449.)*

STAFF, 0. — *Mussanda Treulleri* Stapf. *(Kew Bull. 10,1908, 449.)*

STAFF, 0. — *Pgrus Pashia* var. *Kumaoni* Stapf. *(Curt. Bot. Mag." .53, May 1909.)*

WILLIAMS, F. N. — The CaryophyllacesB of Tibet. *(Journ. Linn. Soc. xxxviii, 268, leb. 1909, 395—407.)*

WITT, D. O. — Forest Flora of the Berar Circle. *(Central Provinces Secretariat Press, 1909.)*

WRIGHT, C, H. — *Alpinia bracteata* Bozb. *(Curt. Bot. Mag. 60, Feb.1909.)*

8. Q. P. L-Ho. 1 D. B. S. I.-27.M909.-W.-C. L. M.

Report of the Director of the Botanical Survey of India for the year 1909-1910.

1. Eastern India.—BENGAL.—During July and August 1909 Mr. W. W. Smith, M.A., Curator of the Herbarium, and Mr. G. H. Cave, Curator of the Lloyd Botanic Gardens, Darjeeling, were deputed to thoroughly explore the little known north-west corner of Sikkim that comprises the valleys of the Zemu and Llonakh rivers with their tributaries. Messrs. Smith and Cave did their work well and returned with some 6,000 specimens including about twenty species new to science. Mr. Smith has prepared a detailed account of the tour and its botanical results, with descriptions of the new species, that will appear in the Eecords of the Botanical Survey as soon as the press can arrange for it. Collections from the outer hills were contributed by the late Mr. R. Pantling and by Mr. G. E. Shaw, B.Sc, F.C.S., both of the Cinchona Department, and by Mr. R. E. Cooper.

EASTERN BENGAL AND ASSAM.—In this province work was necessarily restricted to the agency of native collectors. Trained Lepchas worked for part of the year in the Terai of the Jalpaiguri district.

BURMA.—Large accessions of material, that will prove very useful when the flora of Burma comes to be worked up, were received during the year. Mr. J. H. Lace, Chief Conservator of Forests, presented over 1,000 excellently preserved specimens that contained many species previously very inadequately represented in the Calcutta Herbarium. Important contributions that included species hitherto undescribed were also received from Captain R. W. MacGregor, I.M.S., Southern Shan States, and from the following Deputy Conservators, Mr. G. E. S. Cubitt of Bhamo, Mr. H. W. A. Watson of the Southern Shan States, Mr. A. Rodger of the Ruby Mines, and Mr. E. M. Buchanan of Myitkyina. To all those officers the Botanical Survey is much indebted. From the Burma-Yunnan frontier a particularly fine collection of over 1,000 sheets was obtained from Mr. G. Forrest, well known for his botanical explorations in China.

2. **Western India.**—The most important contribution during the year to our knowledge of the vegetation of the Bombay Presidency has been furnished by Mr. W. A. Talbot, F.L.S., late Conservator of Forests, the first volume of whose illustrated *Flora of the Bombay Presidency* has appeared, including the **orders from *Rmunculacea* to *Rosacece.***

Mr. G. A. Gammie, F.L.S., continues his account of the Orchids of the Bombay Presidency, his latest contribution being a description of the species of *Vanda* occurring in Western India. The Reverend Father Blatter, S.J., has studied in detail the flora of Panchgani, a hill station on the Western Ghats near Mahableshwar. The moss flora of this side of India continues to be studied by Mr. L. J. Sedgwick, I.C.S.

Mr. W. Burns, B.Sc, Economic Botanist to the Government of Bombay, has collected in the Dharwar and Broach Districts and has studied the plant life of certain limited areas in relation to environment. He has given attention to the genera *Mangifera* and *Tamarip* as they occur in the Presidency. His assistants toured through various districts and made collections chiefly of grasses. About 1,000 sheets were added to the local Herbarium.

3. Southern India.—For help in collecting and in enlarging our knowledge of South Indian plants, the Botanical Survey has been indebted during the year as heretofore to Mr. C. E. C. Fischer, Deputy Conservator of Forests, Coimbatore, through whose energy many gaps in the Calcutta Herbarium have been filled up.

4. **North-West India.—**Prom Nepal was received a collection of about 1,000 sheets made by Mr. I. H., Burkill, M.A., F.L.S., Reporter on Economic Products, mostly from the district around Katmandu. From the Kumaon district **i** collection of about 600 specimens was made by native collectors under the supervision of Mr. N. Gill, F.L.S., Superintendent of the Government

Gardens there. Mr. A. E,. Tucker, late of the Revenue and Agricultural Department, presented over 300 specimens of plants from the neighbourhood of Simla. Colonel 0. J. Bamber, I.M.8., F.L.S., has continued his work on the plants of the Punjab, North-West Frontier Province and Kashmir. Mr. J. P. Duthie, B.A., F.L.S., has during the year finished his material for Volume II **of *The Flora of the Upper Gangetic Plain.*** **Mr. James Marten has devoted** attention to the plants in and about Mussoorie and ha? published a list of them with their times of flowering and other information.

5. Publications.—No official publication appeared during the year, not for lack of material but simply because the press has not been able to issue the work on hand during the year. There are in the press the following :—*The Species of the Genus Dcemonorops* by Signor Beccari, which will form Yolume XII or part of Volume XII of the *Annals of the Botanic Garden,* and will be a work with about 100 double plates after the manner of the previous volume on the species of the genus *Calamus,* referred to in last year's report; *Notes from a Journey to Nepal* by Mr. I. H. Burkill forming No. 4 of Volume IV of the *Records of the Botanical Survey,* and embodying an account of the botanical results of the author's tour to Nepal in 1907 ; *Catalogue of Non-herbaceous* ***Phanerogams cultivated in the Royal Botanic Garden, Calcutta, Part I$_9$*** *{numerical) 1st Fasciculus,* by the writer of this report, forming No. 1 of Volume V of the Records, and furnishing an index to the first 4,000 plants of the Garden; the complete material for Volume II of *The Flora of the Upper Gangetic Plain* by Mr. J. E. Duthie. There are ready for the press *A Botanical* ***Tour in the Zemu and Llonakh Valleys of Sikkim,*** **and** ***Nova species Indicce*** both by Mr. W. W. Smith, M.A., Curator of the Herbarium, the former being a detailed account of the tour referred to in the first paragraph of this report, the latter being descriptions of new species from various parts of India; also 2nd Fasciculus of the Catalogue referred to already. A list of selected publications bearing on the Botany of India is appended to this report.

A more detailed account of botanical work in India or concerned with India than is consistent with the scope of this report will be submitted later on in connection with the Board of Scientific Advice.

6. Financial and Staff. —The Imperial and Provincial grants were spent in full. The Director was in charge of the department throughout the year.

A. T. GAGE, ***M.B., Major, I.M.S.,***
Director, Botanical Survey of India.

ADAMSON, B. S. . Note on the roots of *Terminalia Arjuna* Bedd. *(New Phyto., 1910, ix,150.)*

BAMBKK, C. J. . Plants of the Punjab. *(Journ. Bomb. Nat. His. Soc, 1909-10, xix, 370, 683, 943.)*

BLATTER, E. . The Flora of Panchgani. *(Journ. Bomb. Nat. His. Soc, 1909, xix, 314.)*

BBOWN, N. E. . *Micholitzia obcordata* N. E. Brown. *(Kew Bull., 1909, No. 9, 368.)*

BBCHL, P. J. . Recent Plant Immigrants. *(Journ. Asiat. Soc Beng., iv, 2, 603.)*

BURKILL, I. H. . First Notes on *Cymbopogon Martini* Stapf. *(Journ. Asiat. Soc Beng., 1909, v, 89.)*

On Coptis. *(Journ. Asiat. $oc Being., 1909, v, 73.)*

CLARKE, C. B. • New Genera and Species of *Cyperacea. (Kew Bull., Add. Ser. viii, 1908.)*

Illustrations of *Cyperacea. (Plates 144, London, 1909.)*

DUBABD, M. . Les Sapotacées du groupe des Isonandrées. *(Rev. Gen. Bot., 1909, xxi, 392.)*

Sur les Isonandra des Indes orientales. *(Bull. Mus. Nat. Hist., Paris, 1909, 27.)*

DRUMMOND, J. B. , *Anaphalis deserta, Zeontopodium fimbrilligerum, Zeontopodium paradoxum, and Saussurea tangnensis. (Kew Bull., 1910, 76—78.)*

ENGLER, A. . Die Bedeut. der Araceen für die Pflanzengeograph. Gleider. des tropischen und extratropischen Ostasiens. *(Sitzber. Kgl. preuss. %Ak. Wiss.¡lii,1909.)*

GAGNEPAIN, F. . Bixacées et Fittosporées asiatiques. *(Bull Soc. Bot. France, 1908. Iv, 521, 544.)*

Essai de classification des *Scolopia* et *Flacourtia* aiiatiquei, *(Journ. Bot., 1908, xxi, 164).*

Essai (Tune classification des *Cratoxylon* asiatiques. *(Notul. System, 1909,14.)*

Essai (Tune classification des *Sida* asiatiques. *(Notul* System, 1909* 87.)*

Nouveautés asiatiques de l'herbier du Museum. *(Bull. Soc Bot. France, Ivi, 1909,15,35.)*

GAMMIB, G. A. . Orchids of the Bombay Presidency, Part IX. *(Journ. Bomb. Nat. His. Soc, 1909, xix, 624, with 1 plate.)*

GEHBMANN, E. • Die geograph. Verbreit. und Entwick. der Gattung *Bridelia. (Jahrber. Schlesesch. Ges. vaterl. Kultur, Ixxxvi, 1909, 28.)*

GOEBEL, K. . *Monoselenium tenerum* Griffith. *(M. Allgem. Bot. Zeit., 1910, 45.)*

HAMET, B. . *Sedum Prainii, 8. lenity S. lida* sp. nor. *(Bull. Soc Bot. France, Ivi, 1909, 566.)*

HEMSLBY, W. B. . *Cornus macrophylla* and some Asiatic congeners. *(Kew Bull., 1909, 8,329.)*

HILL, A. W. . The Genus Myxopyrum. *(Kew Bull., 1910,40.)*

HOOKER, J. D. . Les especes du genre "Impatiens" dans l'Herbier du Museum de Paris. *(N. Arch. Mus. Hist. Nat., 1909, x, 2, 233, with plates.)*

JOWITT, J. F. • Note on Dr. Otto Stapf s Nomenclature of *Cymbopogon Nardus* Rendl.,andC. *confertifiorus* Stapf. *(Ann. Roy. Bot. Gard. Peraden. 1908, iv, 185.)*

KRANTTBE, L. . A comparative study of the genus *Pentestemon. (Contr. Bot. lab., Univ. of Philadelphia, 1908, iii, 93.)*

KUSANO, S). . Further studies on *Aeginetia indica. (BulL Coll. Agric Tokyo Imp. Univ. 1908, viii, I.)*

MARTEN, J. . Plants gathered in and about Mussoorie during 1908. *(Journ. Bom. Nat. His. 8oc, 1909, xix, 475.)*

PRAIN, D. . *Corydalis spathulata.* *(Kew Bull., 1910, 73.)*

. *Rheum inopinatum* **Prain.** *(Bot. Mag., 1908, Tab. 8190.)*

BADLKOFER, L. . **Ueber die Gattung** *Alloplyiu** **nnd die Ordnung ihrer Arten.** *(Sitzber. MatA-pAys. Klasse Kgl. layer Ah. Wits., 1908, . 201.)*

BOLFE, B. A. . *Saccolabium (Calceolaria) platycalcaratum* **Bolfe** *(Kew Bull., 1909, 368.)*

ScHWERIN, F. V. • **Monographic der Gattung** *Sambucus.* *(AfitteiL der Deulsch Dendrolog. Gesell, 1909, p. 1.)*

SEDGWICK, L. I. • **A first List of Mosses from Western India.** *(Journ. Bom. Nat. His. 8oc, 1910, xix, 938.)* .

SERVETTAZ, G. . **Monographic des Eleagnacées.** *(BeiAefte Bot. Centralbl 1909, xxv, pp. 1 % 129.)'* -

SKAN, S. A. . *Scutellaria violacea* **Hejne.** *(Bot. Mag., 1910, Tab. 8320.)*

SPRAGUE, T. A. . *CAirita barbata* **Sprague.** *(Bot. Mag., 1908, Tab. 8200.)*

TAIJBOT, W. A. . **Forest Flora of the Bombay Presidency and Sind.** *(Poona, 1909, fp.608).*

WOLF, T. • **tjber die neue •" Monographie der Gattung Potentilla". (7m,** *1908, 52.)*

WRIGHT, C. H. . *Peliosantles violacea* **Wall VAR.** *Clarkei.* *(Bot. Mag., 1909, Tab. 8276.)*

CALCUTTA **r PBIMiaD BI BUPDT. OOVT. PRINTINO, INDIA, 8, HABTINO8 STBWT**