but it can still be used in meat canning. There are large beds of Gracilaria in the Manukau Harbour, Auckland. The growth of the weed up there seems to be promoted by the sewage outfall that flows into the area, and the warmer temperatures in Auckland seem to allow a longer growing period. A pilot scheme is being financed by the Auckland Regional Authority and Davis Gelatine (N.Z.) Ltd to see if this Gracilaria can be cultured in concrete tanks using the sewage effluent diluted with seawater. Initial experiments in Auckland and similar ones being done in America indicate that there is every possibility that we might yet see a seaweed farm to produce agar weed established here in New Zealand.

As Gracilaria grows on soft mud sometimes 2-3 feet deep, it is not likely to be collected by hand. Some way of harvesting the weed from a boat or floating platform needs to be devised. If the weed is cut off the surface of the mud, small fragments will be left to regenerate vegetatively. This will be more reliable than waiting for chance spore regeneration. It is also possible that Gracilaria will be grown in culture. In America long shallow concrete raceways have been built to grow the weed in continuously flowing water. This method seems to speed up the growth rate. It has been found that all the nitrogen and most of the phosphorus present in sewage effluent can be reclaimed by the seaweeds and almost pure seawater is released finally from the culture system.

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SEDGES (CYPERACEAE) OF BANKS PENINSULA, INCLUDING (KAITORETE) ELLESMERE SPIT, LYTTELTON HILLS & NORTH TO NEW BRIGHTON

(A Provisional List)

M.J.A. Simpson & E. Edgar

Sedges tend to be the cinderellas of the plant world, often overlooked and unrecorded although many are attractive plants both in form and colour. Those of Banks Peninsula have not been listed since Laing (1919, 1924) wrote his accounts of the vegetation of Banks Peninsula. He listed 18 species of Carex and 4 of Uncinia. Since then a number of new species have been recognised in the genera Carex, Scirpus and Uncinia, some records of J.B. Armstrong have been confirmed and a good many new records have been added to the list of species. As will be noted, some are known from solitary specimens, others have not been collected or recorded for many years and, apart from the more common species, little is known of their ecology. The distribution of plants on Banks Peninsula is always of interest, as is the occurrence there of species not known in localities nearby. It is sometimes difficult to find uncinias here in fruit, especially the finer leaved forest dwellers e.g. U. silvestris, and positive identification is therefore difficult.

In this list species which are known from one or only a few collections are noted and the locality and herbarium number are given. Any additions to these localities would be welcomed, as would records for species which have not recently been collected.

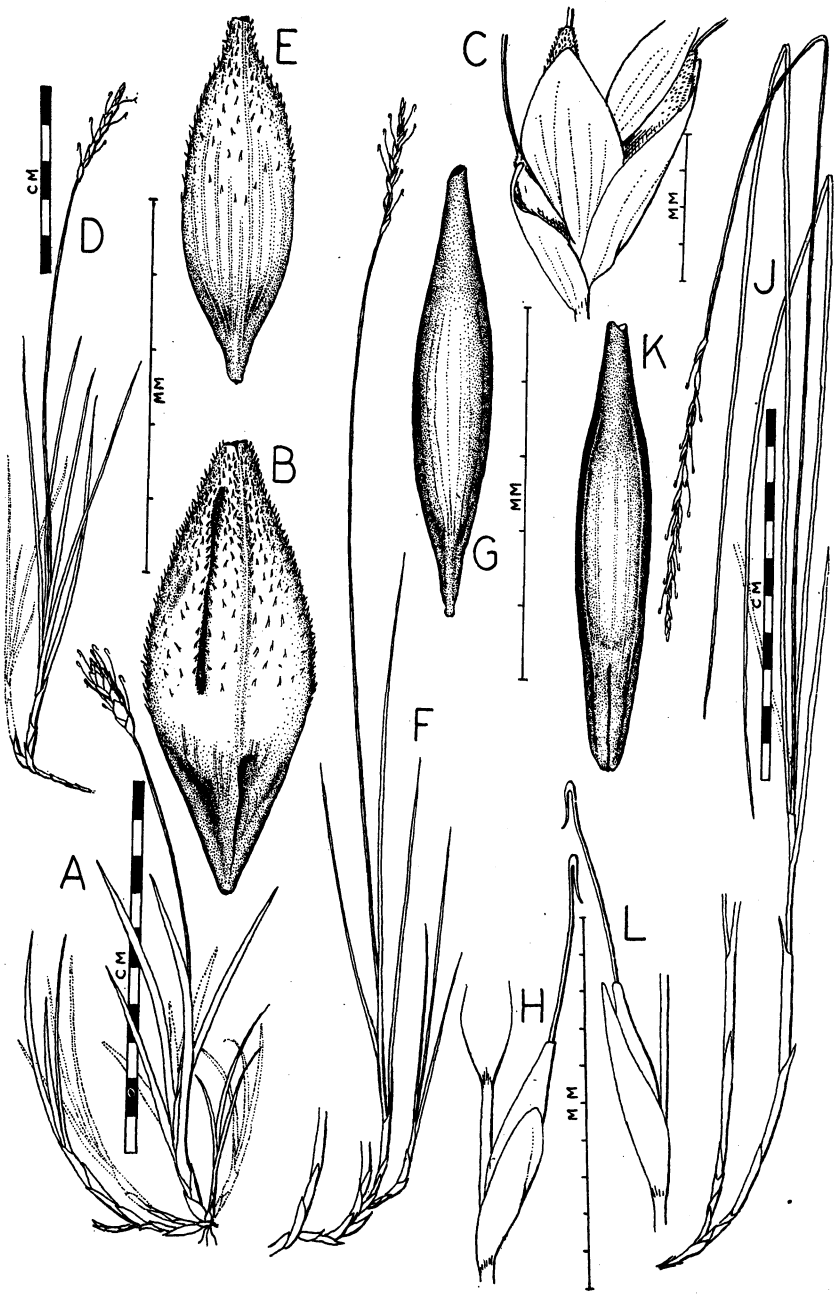

PLATE 1 —*Uncinia sinclairii:* A Habit, B Utricle, C Female flowers. *Uncinia elegans:* D Habit, E Utricle. *Uncinia rubra:* F Habit, G Utricle, H Female flower. *Uncinia egmontiana:* J Habit, K Utricle, L Female flower.

The list has been compiled from herbarium specimens in the Botany Division (CHR), the J.B. Armstrong herbarium held at the Botanic Gardens, Christchurch (CHBG), and University of Canterbury (CANU) herbarium. Records by Laing (1919), Kelly (1972) and Burrows (1969) are included as well as our own information gathered over many years pleasant botanising in the area. John Thompson has provided a good deal of information about localities and the distribution of individual species.

** indicates that there are no recent specimens:
++ probably not present:

Cyperus ustulatus A.Rich.

Roadside near Tai Tapu and Motukarara. John Thompson reported one clump near highway bridge at Kaituna (Canty Bot. Soc. J. 10). Laing (1919) records "Peraki: L.C., Near Long Lookout, Island Bay: R.M.L.".

7 pl. 25/5/87

Desmoschoenus spiralis (A.Rich.) Hook.f.

Sandhills at Sumner and Taylors Mistake: common on Kaitorete Spit.

Scirpus americanus Pers.

L. Ellesmere; L. Forsyth; Motukarara; Ohinitahi, Governors Bay; South Brighton estuary.

Scirpus antarcticus L.

"Sign of the Kiwi, Port Hills", L. Stemmer 4.9.1974, CHR 287138 also Sugar Loaf, J. Thompson.

** Scirpus aucklandicus (Hook.f.) Boeck.

Listed by Laing (1919 as S. antarcticus). Corrected to S. aucklandicus (Laing 1924) but we have seen no specimen.

Scirpus basilaris (Hook.f.) C.B. Clarke in Cheeseman

"Near shore of L. Forsyth, near outlet", A.J. Healy 18.2.1945 CHR 48726; also South Brighton.

Scirpus caldwellii Cook

Common on stream edges Tai Tapu, Motukarara, Birdlings Flat and L. Forsyth; also Ohinitahi, Governors Bay, L. Ellesmere and elsewhere. (Laing 1919, as S. americanus Pers.).

Scirpus cernuus Vahl

Common in damp hollows in sandhills, estuary margins, salt meadows.

** Scirpus fluviatilis (Torr.) Gray

T. Kirk collected a specimen at Akaroa CHR 288788 (Canty Bot. Soc. J. 12) but it is not now known from Banks Peninsula.

Scirpus inundatus (R.Br.) Spreng.

"Long Bay Scenic Reserve, Banks Peninsula, S94/20-25- , 12 m", D. Kelly 13.7.1971, CHR 221925. Also "damp spots on Lyttelton Hills" (Laing 1919).

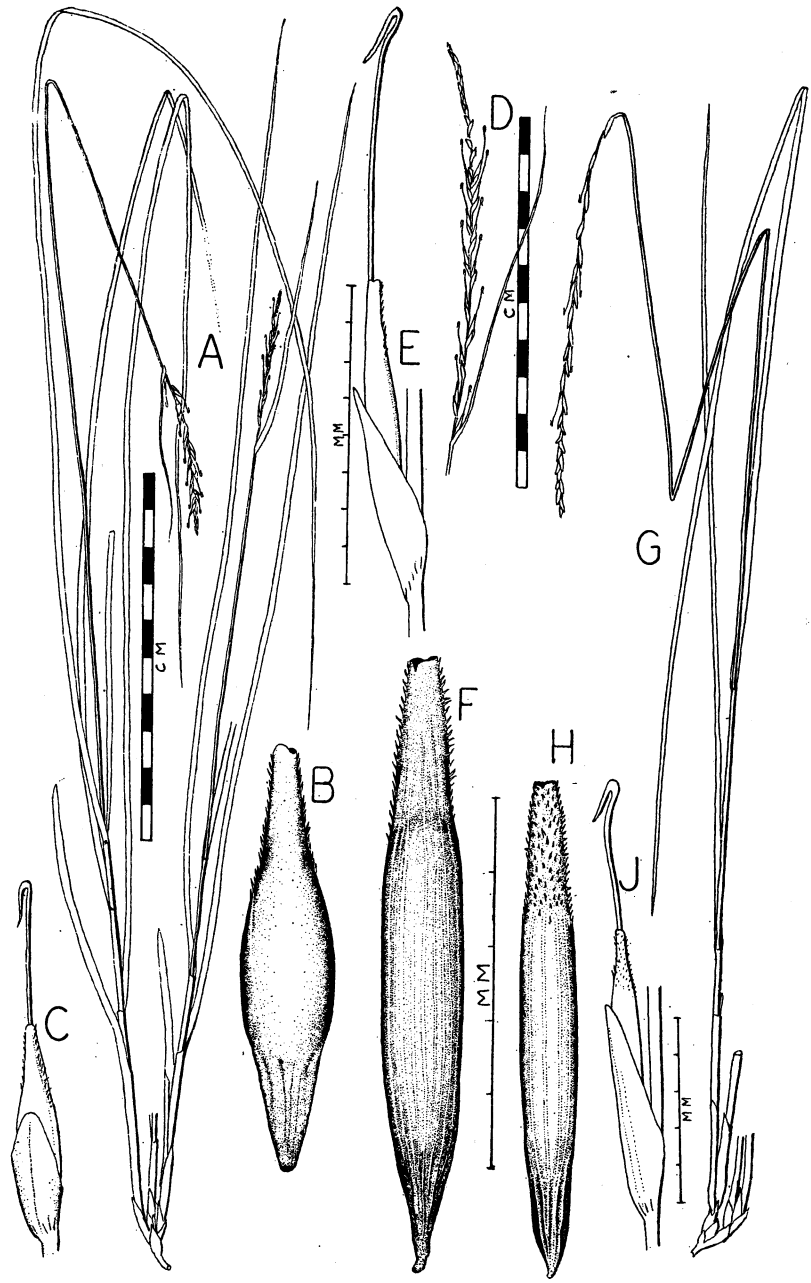

PLATE 2 — *Uncinia scabra:* A Habit, B Utricle, C Female flower. *Uncinia distans:* D Inflorescence, E Female flower, F Utricle. *Uncinia leptostachya:* G Habit, H Utricle, J Female flower.

• Scirpus lacustris L.

Near main highway between Tai Tapu and Motukarara, near highway at Kaituna, margin of estuary at Pleasant Point, South Brighton and Heathcote; also "Heathcote: B.D. Cross" (Laing 1919).

Scirpus nodosus Rottb.

Common in damp places in sandhills and in dry watercourses; also seaside cliffs.

Scirpus pottsii Cook

Stony Bay Peak and Flag Peak, M.J.A. Simpson and E.M. Chapman 16.2.1972, CHR 226570; Kaituna Valley, E. Edgar. Also Island Bay and head of bay, Lyttelton Harbour (see below).

Scirpus setaceus L.

This introduced scirpus is known from "South Brighton, low-lying Salt Marsh" T.W. Rawson 2.3.1955 CHR 124769.

** Scirpus sulcatus Thouars var. distigmatosus C.B. Clarke in Cheesem.

Laing (1919) records this species from "Wainui in Watercourses" but no specimens have been seen. Specimens collected by R.M. Laing from "Island Bay" CANU 612 and "head of bay, Lyttelton Harbour" CANU 627 and determined as S. sulcatus var. distigmatosus are Scirpus pottsii Cook which was not distinguished from S. sulcatus var. distigmatosus until 1953. Plants of S. pottsii are leafy and though both S. pottsii and S. sulcatus var. distigmatosus have biconvex nuts S. pottsii has 2 or 3 style-branches in the flowers of each spikelet, while in S. sulcatus the style-branches are invariably 2. There are no recent records of S. sulcatus var. distigmatosus from the Peninsula, it is, in fact, rather rare in Canterbury.

Eleocharis acuta R.Br.

Common at lake edges and other damp places; in brackish water in estuary at South Brighton; Okains Bay.

• Eleocharis gracilis R.Br.

"In bog, c. 780 m, Mt. Herbert, Banks Peninsula". J. Thompson 3.1.1975 CHR 285592 (see Laing 1919, p.381 under E. cunninghamii).

** Eleocharis neo-zelandica C.B. Clarke ex Kirk

There are four specimens in the Armstrong Herbarium CHBG 5564 from "North New Brighton" (as Scirpus? antarcticus?); CHBG 5565 from "mouth of Waimakariri"; CHBG 5567 from "mouth of Waimakariri"; CHBG 5566 from near Christchurch. There is also a specimen in the Lincoln College herbarium from New Brighton collected by H.P. Donald. In spite of much searching this species has not been relocated on the Canterbury coast. In my (M.J.A.S.) experience on Farewell Spit it has often proved difficult to find, only showing up at certain times of the year when the culms and heads become rich gold in colour.

++ E. sphacelata R.Br.

Recorded by J.B. Armstrong but no specimens exist.

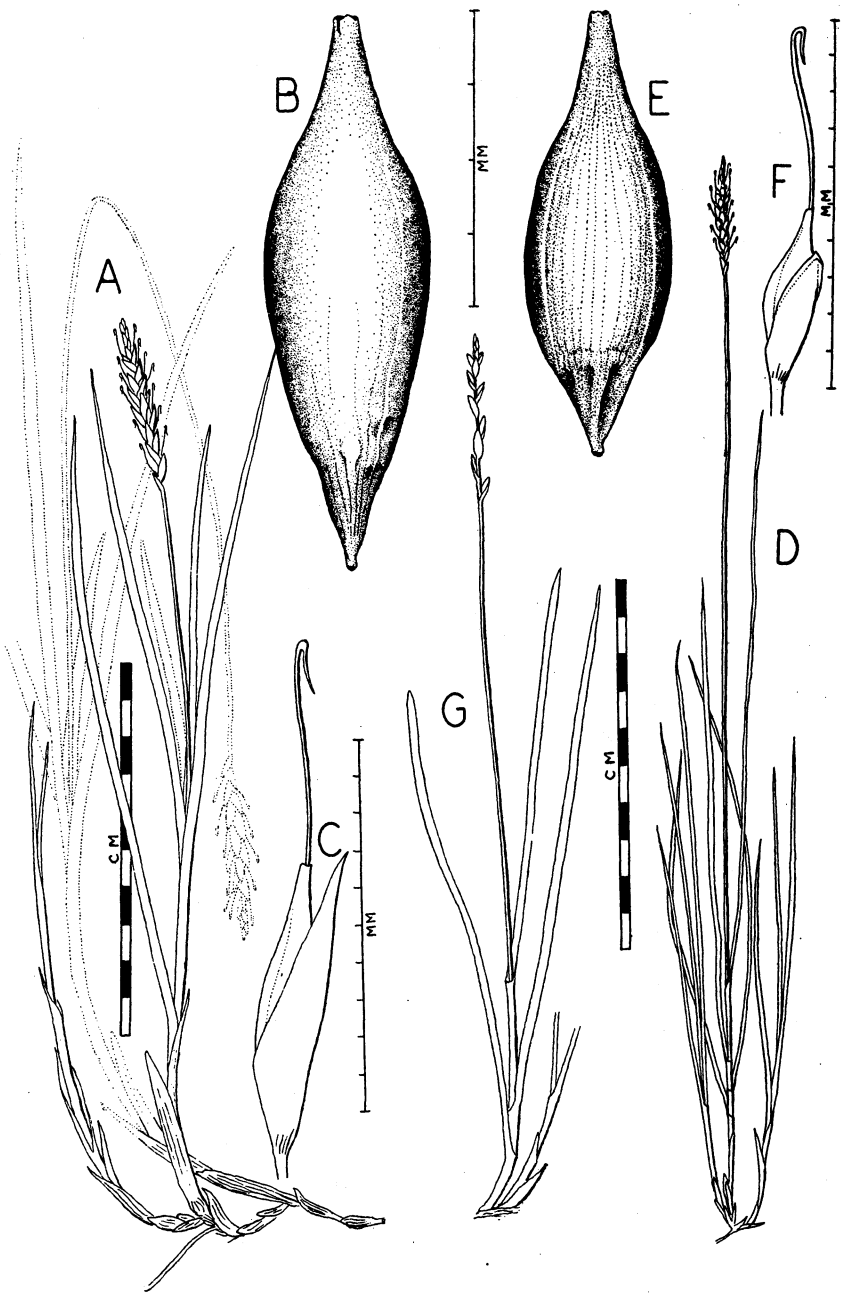

PLATE 3 — *Uncinia fuscovaginata:* A Habit, B Utricle, C Female flower. *Uncinia X rubrovaginata:* G Habit. *Uncinia fuscovaginata* var. *caespitans:* D Habit, E Utricle, F Female flower.

Schoenus nitens (R.Br.) Hook.f. var. concinnus (Hook.f.) Cheeseman.

New Brighton dunes, A. Wall 1918; South Brighton, T.W. Rawson 1958.

Schoenus pauciflorus (Hook.f.) Hook.f.

Quite common in damp places on the higher tops, e.g. Mt. Sinclair (see Laing 1919, p.381).

** Lepidosperma australe (A.Rich.) Hook.f.

J.B. Armstrong listed this species (as L. tetragona) and this is supported by a specimen from "Lake Ellesmere, J.B.A." CHR 294949. There are no recent records from Banks Peninsula although it is still to be found at Kairaki Beach, Amberley Beach, Brooklands and Spencer Park and in wet places south of Lincoln.

** Baumea juncea (R.Br.) Palla.

There is a specimen in the J.B. Armstrong herbarium, CHBG 5548 (as Schoenus tendo) from Banks Peninsula collected in 1869.

++ Baumea teretifolia (as Cladium teretifolium) is listed by J.B. Armstrong, but there are no specimens.

Baumea rubiginosa (Spreng.) Boeck.

The saga of this species in Canterbury has been well documented in the Canty Bot. Soc. J. Nos 8 and 9. Since then a specimen has been collected at "Charteris Bay, Bradley Park, wet area under Kanuka", by J. Thompson 1.1.1979 CHR 309864, and another specimen has come to light from "New Brighton Reserve, Carex secta swamp with raupo", collected by B.P.J. Molloy 7.11.1970 CHR 212102.

** Gahnia

We have not seen any Gahnia on Banks Peninsula and have located only one specimen, "Gahnia pauciflora, Mt. Pleasant", CHBG 5541, in the Armstrong herbarium.

Uncinia affinis (C.B. Clarke) Hamlin

A specimen collected by R.M. Laing from Mt. Sinclair in April 1913 CANU 544 and named by him U. leptostachya was placed in U. affinis by B.G. Hamlin. Another specimen has been collected recently by A.T. Dobson from "Totara/broadleaf forest, alt. 1500', Kaituna forest, CANU 097350, 12.1.1971".

** Uncinia angustifolia Hamlin

M.J.A.S. recorded this species from beech forest near the Cabstand, Akaroa (Canty Bot. Soc. J. 5) but A.P. Druce assures us that the specimen is in fact U. rupestris. Kelly (1972) lists U. angustifolia for Otepatotu Scenic Reserve but there are no specimens in the CHR herbarium.

** Uncinia banksii Boott in Hook.f.

Kelly (1972) records this species from Glenralloch Scenic Reserve and Laing (1919) lists it (as U. riparia R.Br. var. banksii C.B. Clarke) from Mt. Pleasant and Akaroa.

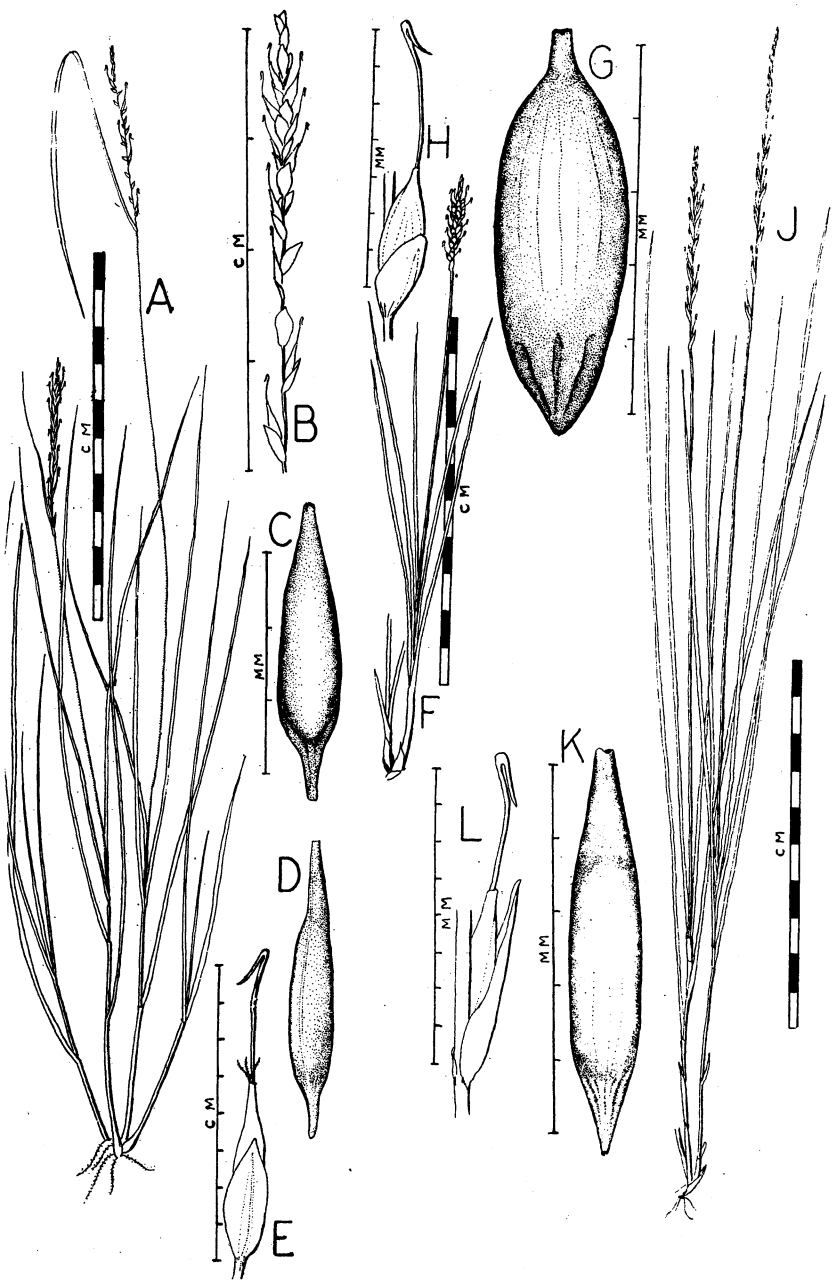

PLATE 4 — *Uncinia silvestris:* A Habit, B Inflorescence, C Utricle, dorsal view, D the same, lateral view, E Female flower. *Uncinia purpurata:* F Habit, G Utricle, H Female flower. *Uncinia silvestris* var. *squamata:* J Habit, K Utricle, L Female flower.

Uncinia clavata (Kük.) Hamlin

Known from Kaituna Valley, Lake Forsyth, Otepatotu Scenic Reserve, Mt. Sinclair, Armstrong Reserve and other localities along the Hilltop-Akaroa summit road.

** Uncinia ferruginea Boott in Hook.f.

Hamlin (1959) lists this species from "Table Hill, Banks Peninsula, 15 January 1911, Oliver (WELT 2713, 7889)". Anderson (1927) does not include Table Hill in his "Place Names of Banks Peninsula" but there is an entry for "Tableland Hill, A hilltop near Coopers Knobs in the Tai Tapu Valley". Also collected by J.B. Armstrong, from "Banks Peninsula, 1864", CHBG 5612.

** Uncinia laxiflora Petrie

Kelly (1972) lists this species from Purau Track Scenic Reserve and M.J.A.S. recorded it from beech forest at the Cabstand (Canty Bot. Soc. J. 3), but we have no specimens at CHR from the Peninsula.

Uncinia leptostachya Raoul

Common in forest areas throughout. Akaroa is the type locality.

Uncinia rubra Boott in Hook.f.

Common in grassland on the tops.

Uncinia rupestris Raoul

Beech forest near the Cabstand; Akaroa is the type locality.

Uncinia scabra Boott in Hook.f.

Kaituna Valley, collected by E. Edgar and C.J. Burrows and recorded by G.C. Kelly.

Uncinia silvestris Hamlin

Specimens collected by M.J.A.S. from the Monument are tentatively assigned here; R.M. Laing collected a specimen from Kaituna Track and Kelly (1972) records the species from Kaituna Spur, Mt. Fitzgerald, Mt. Sinclair, Purau Track, Sign of the Packhorse, Armstrong and Hay Scenic Reserves.

Uncinia uncinata (Linn.f.) Kuk.

Probably the commonest species, present in forests and elsewhere throughout.

Carex appressa R.Br.

Only known from near lighthouse at Godley Heads.

Carex breviculmis R.Br.

Drier ground on the tops and Birdlings Flat, widespread.

Carex colensoi Boott in Hook.f.

Near Lyttelton Reserve; Stony Bay Peak; Mt. Herbert; Te Oka; Kennedys Bush, etc. Also Castle Rock (Laing 1919).

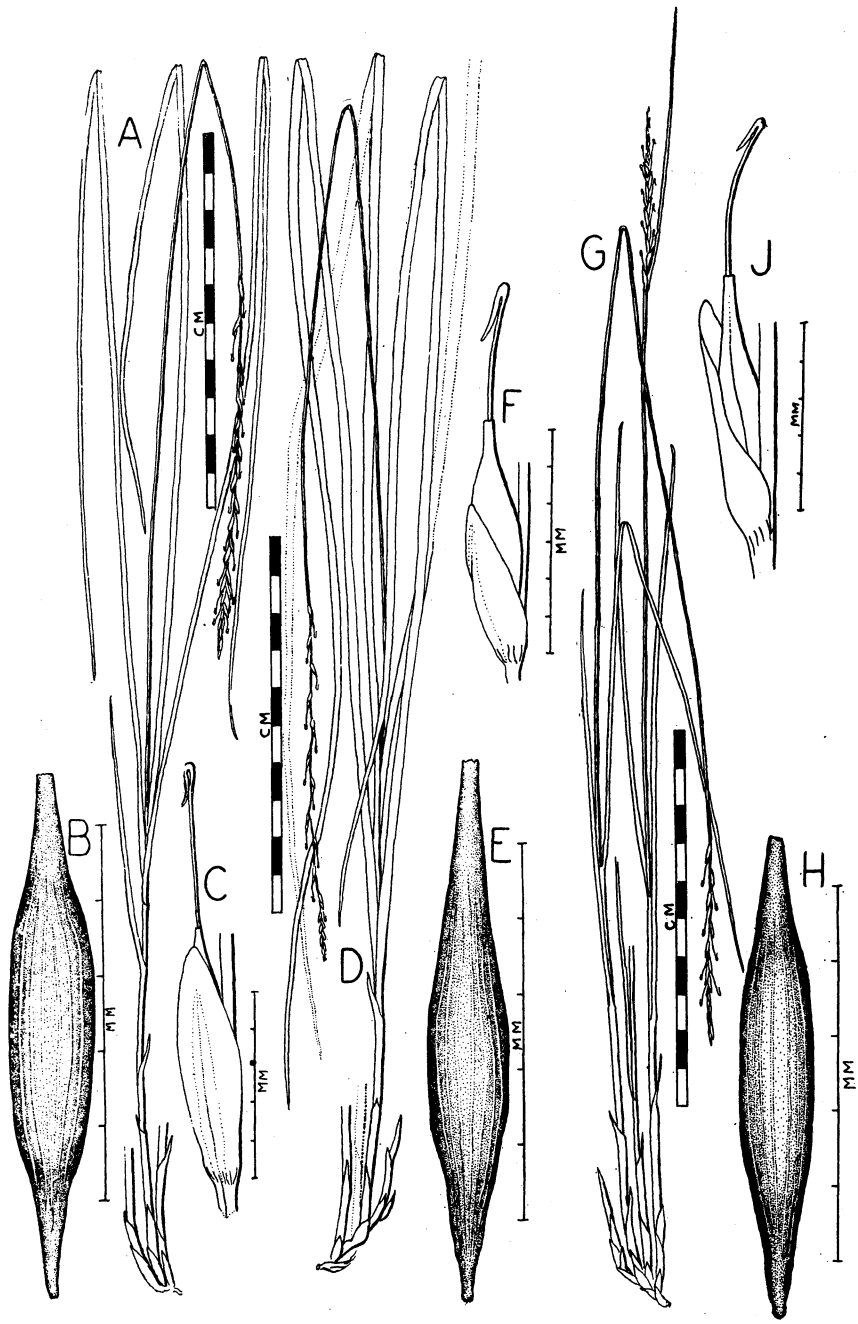

PLATE 5 — *Uncinia affinis:* A Habit, B Utricle, C Female flower. *Uncinia laxiflora:* D Habit, E Female flower, F Utricle. *Uncinia strictissima:* G Habit, H Utricle, J Female flower.

* Carex coriacea Hamlin

Roadside New Brighton; Mt. Herbert; Bossu Rd; Dan Rogers Reserve; damp hillsides elsewhere. The record of C. ternaria from Dry Bush (Canty Bot. Soc. J. 9), should be corrected to C. coriacea. Probably C. ternaria Forst.f. of Laing (1919).

Carex dipsacea Bergg.

Herbert Peak, A.T. Dobson 2900' CANU 14515, 12.1.1971.

Carex dissita Boott in Hook.f.

Mt. Herbert; pastures and forests (Laing 1919).

*? Carex flagellifera Col.

Palm Gully (red and green forms); Dan Rogers Creek. Laing (1919) says of C. lucida (= C. flagellifera) "Common in damp spots in the Cashmere Hills, in the neighbourhood of Governors Bay and Teddington and possibly elsewhere".

++ Carex flaviformis Nelmes.

Laing (1919) recorded this (as C. flava Linn var. cataractae R.Br.) from "Top of Castle Rock" but later (1924) removed it from his list because of a possible mistake in the locality.

Carex forsteri Wahl.

Common in Kaituna Valley, and known elsewhere from Summit Road, Port Hills; coastal hills, Akaroa; Dan Rogers Creek; Governors Bay; Dry Bush; Port Levy, etc.

Carex geminata Schkuhr

Wainui Bay, Akaroa Harbour, V.D. Zotov 10.4.1958, CHR 98216, also collected from Wainui Bay, Jan. 1919, CANU 459 (as C. pseudocyperus) Marleys Rd, CANU 421, and from New Brighton swamp CANU 459 (as C. ternaria) by R.M. Laing.

** Carex goyenii Petrie

"Mt. Herbert, in bush", A. Wall, March 1921 CHR 292456; no recent collections.

Carex inversa R.Br.

Lawn weed on Moncks Spur CHR 177013; also recorded by J.B. Armstrong (1880).

** Carex litorosa Bailey

Collected at New Brighton by A. Wall in December 1918, CHR 292489; also from Heathcote, B.D. Cross (Laing 1919) but there are no recent collections.

Carex maorica Hamlin

Okute Valley; localities near L. Ellesmere; Horseshoe Lake, New Brighton. Also watercourse Port Levy (Laing 1919 as C. pseudo-cyperus Linn.), CANU 458.

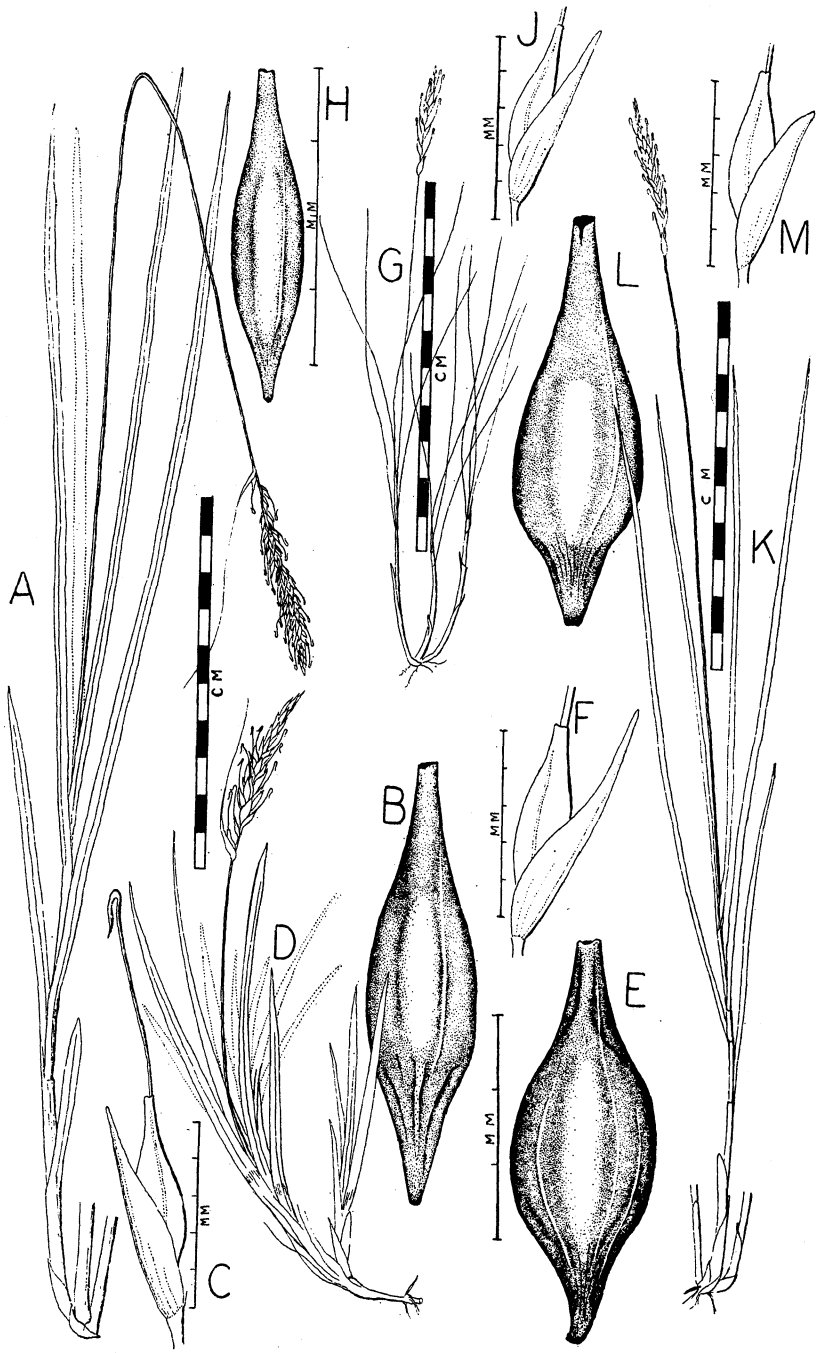

PLATE 6 — *Uncinia zotovii:* A Habit, B Utricle, C Female flower. *Uncinia caespitosa:* D Habit, E Utricle, F Female flower. *Uncinia filiformis:* G Habit, H Utricle, J Female flower. *Uncinia rupestris:* K Habit, L Utricle, M Female flower.

** Carex ovalis Good.

There is a specimen in the Armstrong Herbarium collected from "mouth of Avon R." (as C. leporina) CHBG 5483. This species is considered as probably introduced (Moore and Edgar 1970, p.242).

Carex pumila Thunb.

New Brighton; Sumner; Purau; Ellesmere Spit; Tumbledown Bay and probably elsewhere. Recorded from Wainui CANU 522 and Akaroa in Laing (1919).

Carex raoulii Boott in Hook.f.

Akaroa Domain; Dan Rogers Creek; shady damp places above Reynolds Valley.

Carex resectans Cheesem.

Port Hills and Mt. Herbert. This small straw coloured sedge usually found in rough grassland is easily overlooked.

Carex secta Boott in Hook.f.

South Brighton; Lake Forsyth; stream banks around Motukarara; Birdlings Flat; Prices Valley, Port Levy, Teddington etc. Laing (1919) says "not uncommon in swampy places and by the sides of streams".

Carex sinclairii Boott in Cheesem.

Little River; Lake Ellesmere; New Brighton.

Carex solandri Boott in Hook.f.

Lyttelton Reserve; near lighthouse Godley Heads; Dry Bush; Mt. Herbert; Palm Gully; bush, Mt. Herbert.

++ Carex spinirostris Col.

Carex vacillans Boott (now known as C. spinirostris Col.) was recorded from Lyttelton Reserve 101 in Canty Bot. Soc. J. 3, Dec. 1970. It was determined by E.E. with the remark "first recorded finding in the South Island". However, J.B. Armstrong (1880) had previously listed this species for Banks Peninsula. We have re-examined the specimen collected by John Thompson and consider that it is C. forsteri Wahl. The utricles are deeply cleft on either side of the mouth and this is very unusual for C. forsteri which is generally quickly recognised by the "oblique" utricle mouth, with a shallow cleft on one side and a much deeper cleft on the other. In C. vacillans the clefts are equally deep and this is why the specimen from Lyttelton was misidentified as C. vacillans. However, the basal sheaths in C. vacillans are reddish-tinged, but light brown in C. forsteri, and the glumes are usually shorter than the utricle in C. vacillans and more or less ovate, while in C. forsteri they are slightly longer than the utricle and narrow-lanceolate. The Lyttelton plant agrees with C. forsteri in sheath-colour and glume shape, and John Thompson collected another specimen from the Reserve (CHR 285568) in which the utricle had the normal "oblique" mouth of C. forsteri.

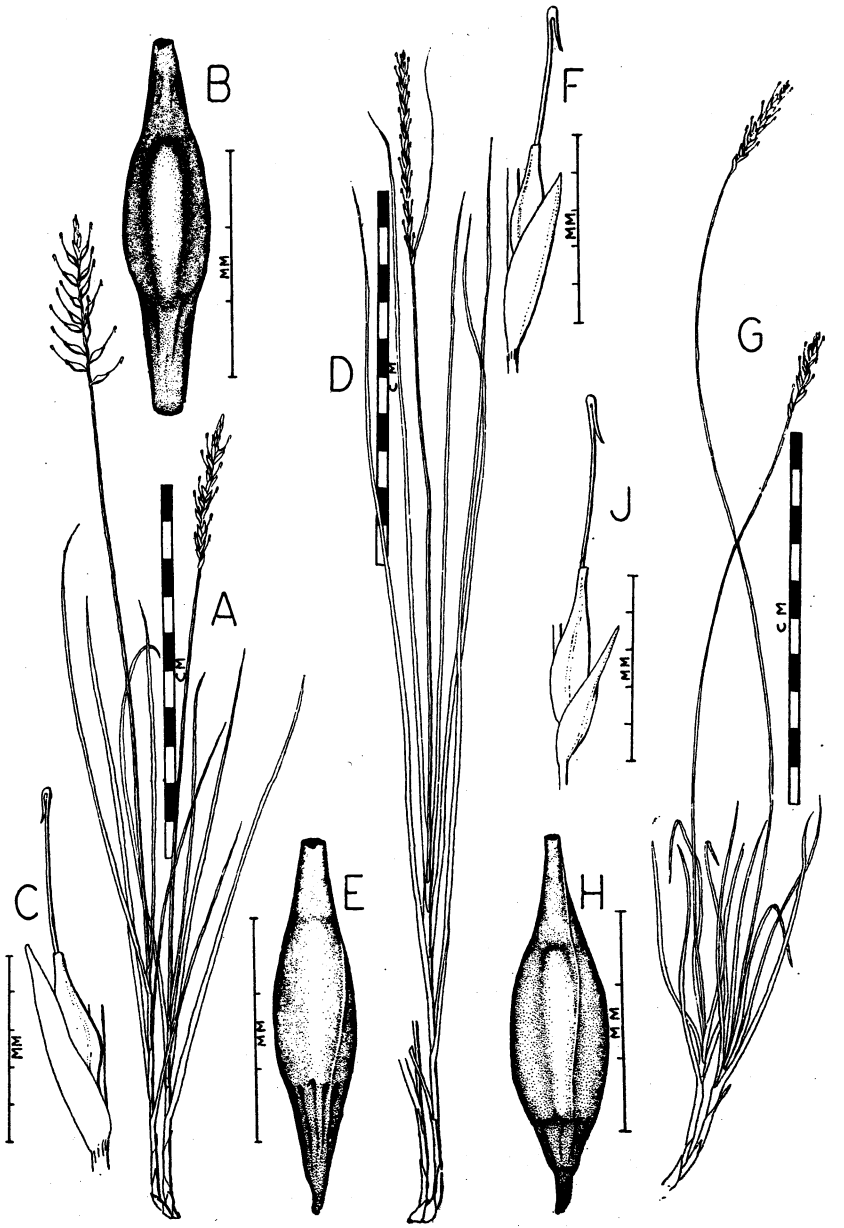

PLATE 7 — ***Uncinia involuta:*** **A Habit, B Utricle, C Female flower.** ***Uncinia gracilenta:*** **D Habit, E Utricle, F Female flower.** ***Uncinia angustifolia:*** **G Habit, H Utricle, J Female flower.**

Carex testacea Boott in Hook.f.

Flag Peak, near Stony Bay Saddle, M.J.A. Simpson and E.M. Chapman 16.2.1972, CHR 226559, also known from Redcliffs Gully and Akaroa (Laing 1919) and recorded by J.B.A.

Carex trifida Cav.

Palm Gully; also recorded from Akaroa by Raoul.

Carex virgata Boott in Hook.f.

Kaituna Valley; Dry Bush; Horseshoe Lake, New Brighton, Bottle Lake Plantation. Laing (1919) lists "Cashmere Valley, below Marleys Rd: R.M.L., Stony Bay: J. Anderson!".

Carex wakatipu Petrie

Summits, Mt.Herbert and Mt. Sinclair; and Castle Rock, 2500 ft.

We need more specimens of Baumea spp., Scirpus pottsii, Eleocharis neo-zelandica, Uncinia affinis, U. angustifolia, U. banksii, U. ferruginea, U. laxiflora, U. rupestris, and U. silvestris. Also Carex dipsacea, C. geminata, C. inversa, C. goyenii, C. litorosa, C. ovalis, and details of distribution of all the sedges.

ACKNOWLEDGMENT:

For permission to use drawings by B.G. Hamlin of Uncinia spp. from the Bulletin of the Dominion Museum 19., we are indebted to Dr. R.K. Dell, Director, National Museum.

We have not only taken this opportunity of printing the drawings of the Uncinias mentioned in this paper, but have also included all of the drawings in B.G. Hamlin's paper. These will be of considerable help to students of Uncinias.

Ed.

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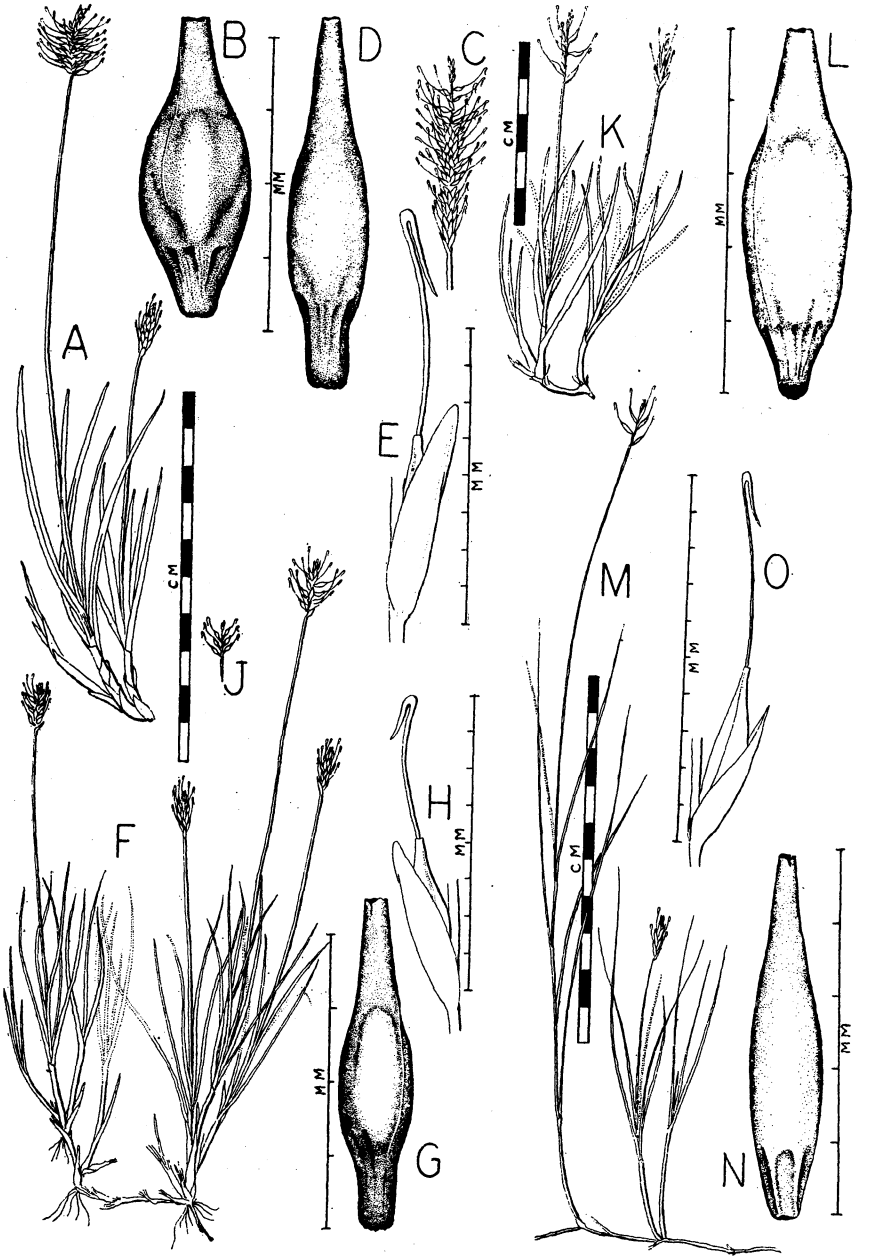

PLATE 8 —*Uncinia divaricata:* A Habit, B Utricle. *Uncinia divaricata* var. *petriei:* C Inflorescence, D Utricle, E Female flower. *Uncinia drucei:* F Habit, G Utricle, H Female flower. *Uncinia drucei* var. *pauciflora:* J Inflorescence. *Uncinia caespitosa* var. *viridis:* K Habit, L Utricle. *Uncinia longifructus:* M Habit, N Utricle, O Female flower.

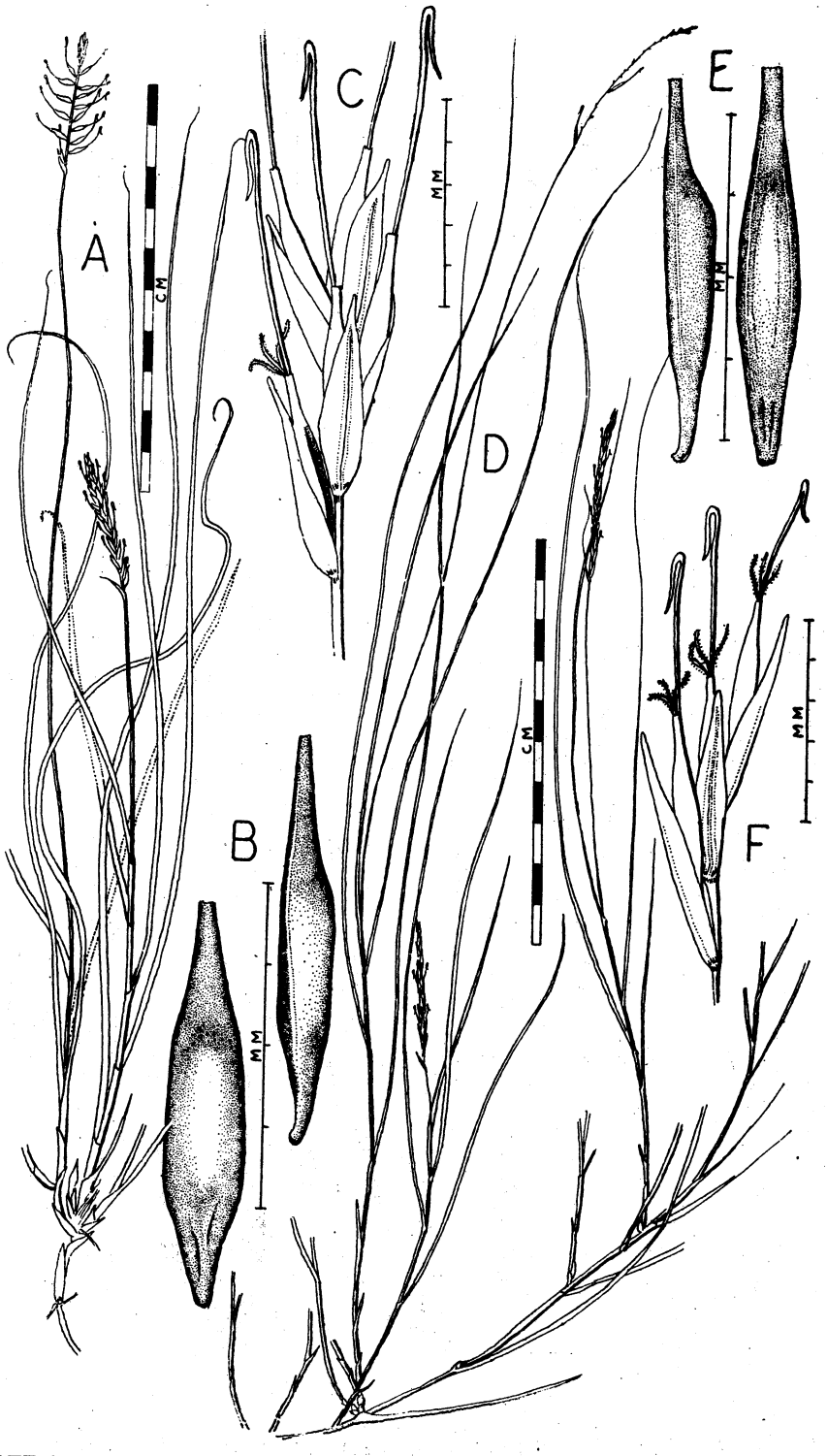

PLATE 9 —*Uncinia hookeri:* A Habit, B Utricle, dorsal and lateral views, C Female flowers. *Uncinia aucklandica:* D Habit, E Utricle, dorsal and lateral views, F Female flowers.

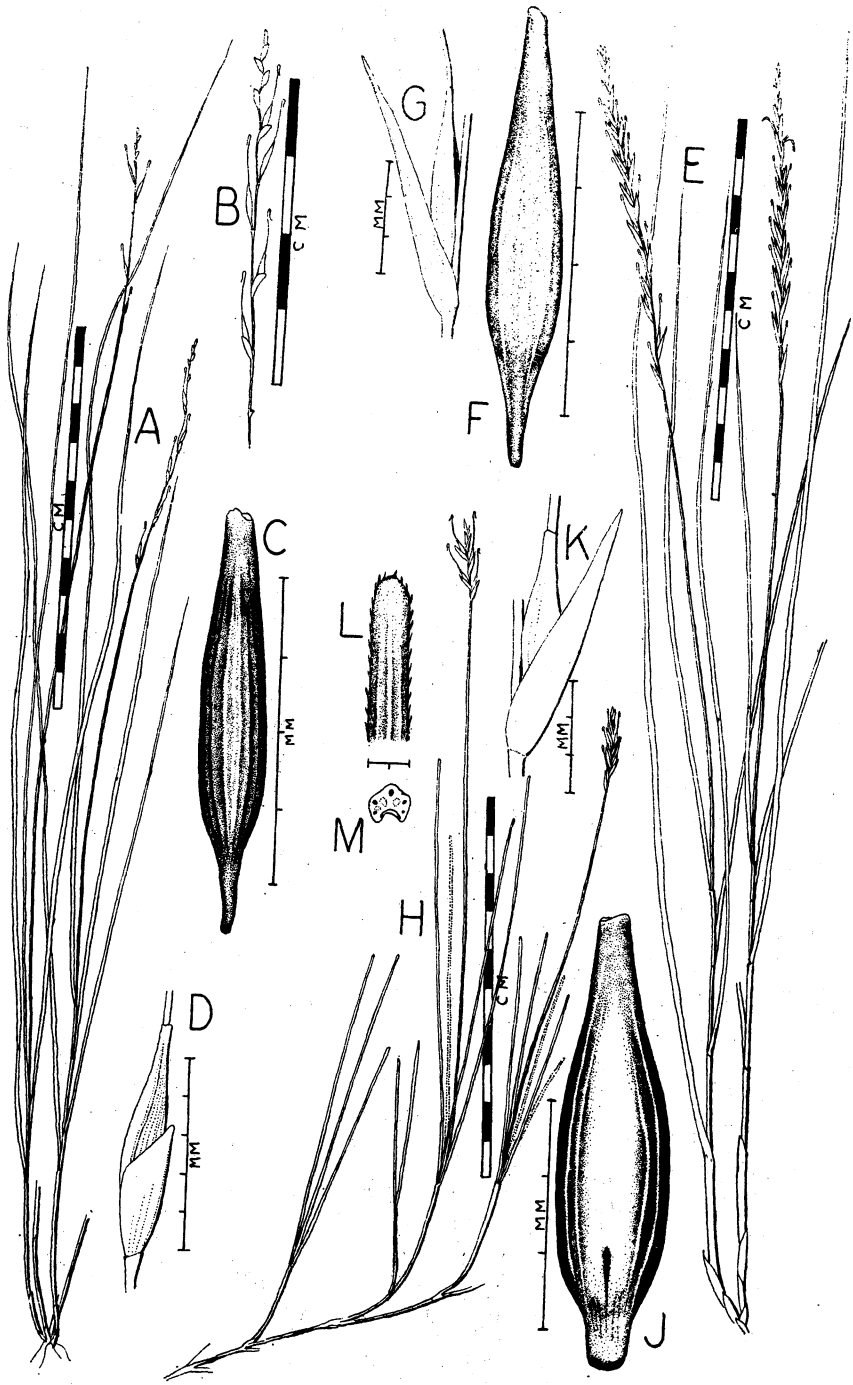

PLATE 10 —*Uncinia banksii:* A Habit, B Inflorescence, C Utricle, D Female flower. *Uncinia nervosa:* H Habit, J Utricle, K Female flower, L Leaf tip, M Transverse section of leaf.

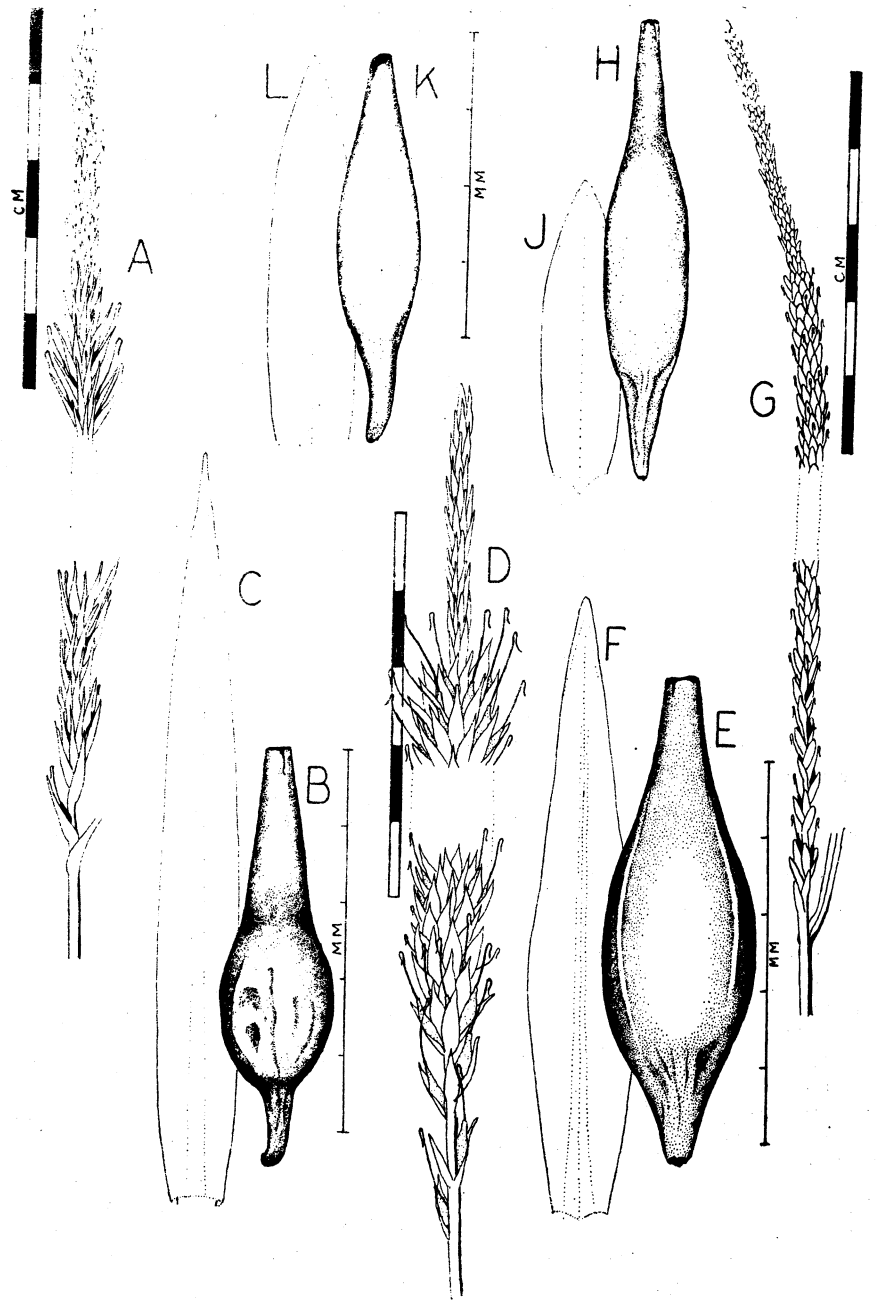

PLATE 11 —*Uncinia ferruginea:* A Inflorescence, B Utricle, C Glume. *Uncinia clavata:* D Inflorescence, E Utricle, F Glume. *Uncinia uncinata:* G Inflorescence, H & K Utricles, J & L Glumes.

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FERNS OF THE CHRISTCHURCH PORT HILLS

John Thompson

On the 13th July, 1918 the Lyttelton Times printed an article written by Professor Arnold Wall. In this article he listed the ferns he had seen growing on the Port Hills during an investigation made in the autumn and winter of 1918.

He also wrote a book "The Botany of Christchurch" in 1922 which was revised in 1953. In this he mentions six more ferns seen on the Port Hills not in his 1918 list.

During the period from March 1978 to June 1979 my wife and I made a survey of the ferns growing on the Port Hills. The purpose of our efforts was to check our list with Arnold Wall's and so ascertain what had happened to the fern population of the Port Hills during the past 60 years. When we commenced the task we did not quite realise how much time and how much walking and climbing would be required. In all we made over 30 trips to the Port Hills searching for ferns, though a number were half-day excursions. Arnold Wall's own words are still apt.

"One word of general advice to any person desiring to study the Port Hills ferns: Admirable as Mr. Ell's tracks are for taking the traveller from point to point, nothing can be done by sticking to them. Both the rocks and the bush must be tackled at close quarters; the most difficult and steepest and most thickly obstructed routes must often be followed; nettles five feet high, bracken over one's head; biddy-biddies and lawyers beyond belief must be fearlessly faced; precipitous rocks must be skirted, craned over, scanned from above and below, and climbed if the work is to be thoroughly done; old clothes are desirable, and not too many of them, for the slopes of the inner or harbour side of the hills are terribly steep. All these little