Gollans Valley Swamp

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Gollans Valley lies behind the low range of hills on the eastern side of Wellington Harbour. The valley is long and narrow and opens into Fitzroy Bay, Cook Strait, about one and a-half miles east of Pencarrow Head. A deep swamp into which Gollans Stream flows lies in the southern half of the valley. The upper portions of the valley floor are used for dairying and the steep hillsides, covered with *Leptospermum scoparium* (manuka) and *Cassinia leptophylla* (tauhinu) scrub, are grazed by cattle and sheep. *Ulex europaeus* (gorse) is present. A few remnants of the original forest are found in steep gullies which open into the swamp.

The swamp is about two miles long, and at one place is just over a quarter of a mile wide. At the northern end Gollans Stream, which is clearly defined and slightly below the level of the swamp surface, gradually loses its identity and spreads out over the swamp in a series of ill-defined channels. At the southern end the swamp drains into Lake Kohangatera which is about half a mile long. Half way down the swamp there is a deep lagoon with treacherous unstable margins.

As one walks down the swamp-filled valley, truncated spurs which become very conspicuous at Lake Kohangatera can be seen. At the northern end of the lake a rounded hillock, separated from the steep hills, is also seen. These features indicate that at one time the lower end of the valley formed a marine inlet. The truncated spurs were formed by wave action, and the isolated hillock is a small stack not completely eroded.

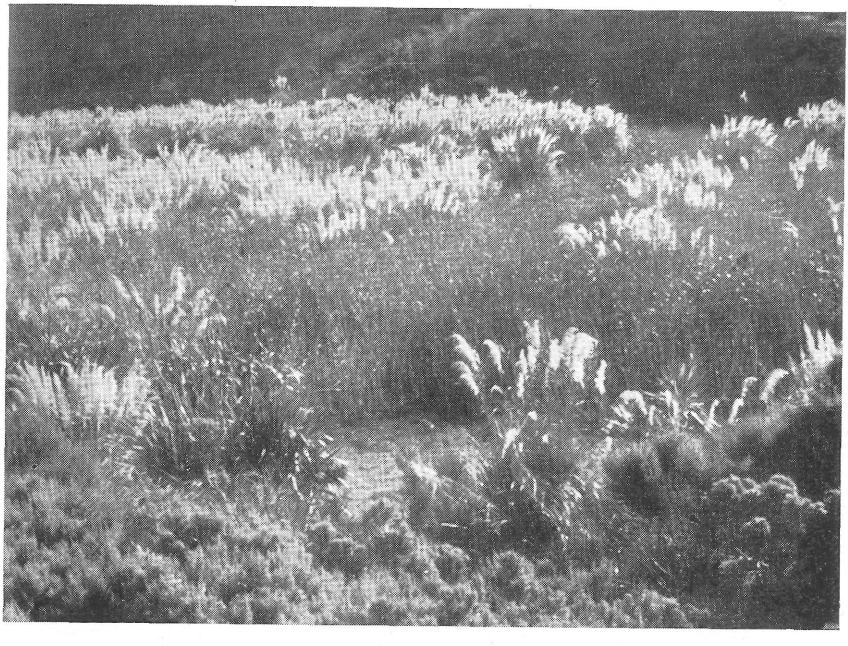
Before the 1855 earthquake the valley was open to the sea and the lower parts submerged. At the time of the earthquake the valley was raised and blocked from direct contact with the sea by a high gravel bar. As a result Lake Kohangatera, which was probably larger than it is today, was formed. The lake finds an outlet through the raised gravel bar. Thus the necessary conditions for the formation of the swamp as it is today were initiated. The swamp is now covered by a vegetation of tall monocotyledonous herbaceous plants which are typical of a high water table swamp. An indication that at one time another vegetation-type existed under different conditions is found in the presence of clumps of *Leptocarpus simplex* (oioi) which can be readily distinguished by the thin, rush-like, reddish-brown stems with closely appressed black sheaths, giving the plant a jointed appearance.

Although the swamp vegetation is the most primitive to be found near Wellington, it has been affected by biotic factors. Fires started on the hills every summer sometimes burn the marginal communities, as evidenced by charred remains of *Phormium tenax* (phormium or New Zealand flax) near the northern limit of the swamp. A fairly large and comparatively dry community of *Carex ternaria* is occasionally burnt to the ground. An unsuccessful effort has been made to

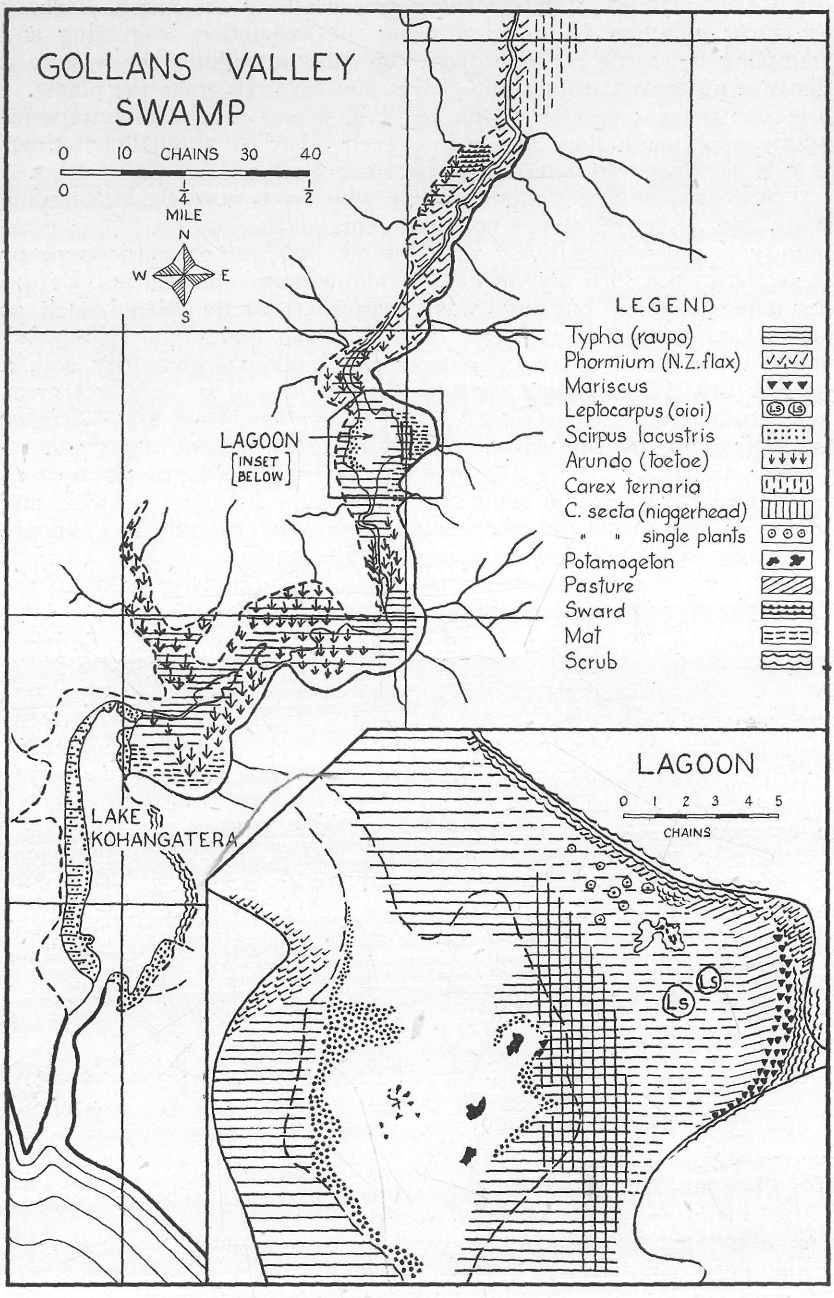
drain the swamp by straightening and draining the creek. Perhaps the most effective factor in altering the vegetation is grazing and trampling by cattle. Cattle from the hills wade into the swamp a distance of approximately two chains and severely graze the plants.

The present vegetation can be divided into several distinct communities although these grade into each other so gradually at times that it is difficult to determine where one ends and another begins.

A community of *Carex ternaria,* which was severely burnt some years ago, is found at the northern limit of the swamp. This community is on comparatively dry ground, but wet depressions occur throughout in which *Typha angustifolia* (raupo) flourishes. Before regeneration from burning was complete, rosette plants such as *Hypochaeris radicata* (catsear) and *Plantago lanceolata* (rib-grass) covered the burnt ground. Nearer the creek, on quite dry soil, a narrow belt of phormium replaces the carex, and in very wet areas and at the creek edge *Carex secta* (niggerhead) occurs. *Scirpus lacustris* grows in the water. In dry marginal areas *Juncus polyanthemos* and other rushes are present and introduced grasses such as Yorkshire fog are quite common. Phormium follows the creek, and where it flows close to the eastern and western hillsides a dense phormium community is established. The surface in these areas is quite firm and comparatively well drained, a necessary factor in the development of a phormium community. Where the creek flows



Toetoe and raupo in Gollans Valley swamp, with tauhinu in foreground.


GOLLANS VALLEY
SWAMP
0 10 CHAINS 30 40
0 1/4 1/2
MILE
N
W E
S
LAGOON
[INSET BELOW]
LEGEND
Typha (raupo)
Phormium (N.Z. flax)
Mariscus
Leptocarpus (oioi)
Scirpus lacustris
Arundo (toetoe)
Carex ternaria
C. secta (niggerhead)
" " single plants
Potamogeton
Pasture
Sward
Mat
Scrub
LAKE KOHANGATERA
LAGOON
0 1 2 3 4 5
CHAINS
LS
LS

through the middle of the valley, the swamp is very wet and is covered by a mosaic of vegetation comprising phormium and *Cladium glomeratum* with large clumps of oioi throughout. Other species present are *Isolepis prolifer, Eleocharis acuta,* niggerhead and introduced grasses.

Nearer the lagoon the creek becomes less clearly defined and runs over the swamp surface in numerous anastomosing channels. Here, especially in the centre of the swamp, raupo becomes dominant; with it *Arundo conspicua* (toetoe) is associated. Niggerhead, phormium and *Mariscus ustulatus* form a belt of varying width along the swamp margin. Between these two communities a low mat community is established. At the lagoon toetoe is absent, leaving an almost pure stand of raupo, in which niggerhead is ocassionally present. This community is extensive, but is replaced by a community of mat plants on the eastern side of the lagoon. Close to the edge of the lagoon niggerhead is common and occasional plants of mariscus and phormium are also seen. *Eleocharis acuta* is dense. *Scirpus lacustris* replaces the raupo in parts, especially on the western side of the lagoon, to form a dense pioneer belt. The raupo community is continued south of the lagoon, but is abruptly replaced by a dense community of toetoe.

The toetoe extends across the width of the swamp and has associated with it a quite dense understorey of niggerhead. In the centre, and wettest part of the swamp, toetoe is occasionally replaced by colonies of raupo and niggerhead. Between this community of toetoe and the hills there is a narrow channel of water, bounded by phormium and mariscus growing on the shallow marginal swamp soil. The toetoe community is characterised by the large solid mounds of debris, mainly dead leaves and leaf-bases, which have formed around the toetoe plants and through which the living leaves grow. These mounds, which overlie a treacherous substratum of almost liquid mud, may protect the living plant from any sudden rise in water-level. *Cordyline australis* (cabbage-tree) is scattered throughout the community. Raupo forms a narrow border at the marginal areas, and growing in mud or shallow pools are *Isolepis prolifer, Epilobium pallidiflorum* (willow-herb), *Polygonum* sp. (willow-weed), *Myriophyllum propinquum,* the introduced *Ludwigia palustris* (water purslane) and *Cotula coronopifolia* (soldier's button).

In a not particularly wide part of the swamp, the toetoe community is replaced by another raupo community, the eastern margins of which are grazed heavily by cattle. This part of the swamp is similar to that part where the lagoon is found, and it is possible that another lagoon existed which has only recently been invaded by raupo. This community is again replaced by a toetoe community, which is similar in all respects to that described above. An extensive raupo community, bordered with toetoe, becomes dominant and terminates at the northern margins of Lake Kohangatera. Cabbage-trees are scattered throughout the raupo community as is that characteristic swamp plant, niggerhead. Interesting features of the more open

parts of this community are the large, scattered, relict clumps of oioi.

The communtiy of mat plants previously mentioned is found along the eastern margin of the swamp, and finds its best development near Lake Kohangatera, between the two toetoe communities, and at the lagoon. This community is formed of low growing, sometimes prostrate plants, developed, at least in part, as a result of the grazing and trampling by stock. Raupo has been seen at the limits of this community to be grazed almost to the swamp surface. Characteristic species are *Isolepis prolifer, I. inundata, Juncus lampocarpus* and *Eleocharis acuta. Ranunculus rivularis, Centella uniflora,* soldier's button and *Myriophyllum propinquum* are scattered throughout, and in shallow muddy pools *Potamogeton cheesemanii* is frequently found. At the lagoon area *Sparganium antipodum* occurs, but only beyond the zone effectively grazed by cattle. This species seems to be increasing, as two years previously only a few plants were present, whereas in the summer of 1949-50 there were a considerable number. In the zone most heavily grazed by cattle *Juncus lampocarpus* is dominant. At the lagoon, grasses, mariscus and tauhinu are found on a small delta which slopes to the edge of the mat vegetation. Throughout these areas of mat vegetation, but especially at the lagoon area, oioi occurs in scattered clumps.

A small but interesting community is found at the north-west corner of the swamp. On a silt and gravel delta formed at the mouth of a small gully, a close, firm sward has developed. Two species are characteristic, *Cotula minor* and a stunted form of *Myriophyllum propinquum. Isolepis* sp. and *Centella uniflora* are present, and *Carex virgata* and phormium are scattered over the delta. As the delta merges into swamp, a vegetation dominated by *Cladium glomeratum* and oioi replaces the sward. The delta has been formed by the deposition of debris carried out of the gully.

Throughout the swamp there are small pools of water in which submerged aquatic or floating aquatic plants are found. In the stream, the lagoon, and also Lake Kohangatera, aquatic plants occur. Where the creek enters the swamp there is a scattered community of *Potamogeton ochreatus.* In deep water and on a peaty substream *Myriophyllum propinquum* is present, and rooted in the stream bed at the base of this water plant, *Glossostigma elatinoides* forms a quite extensive colony.

At the lagoon patches of the reddish-brown, floating leaves of *Potamogeton cheesemanii* are scattered over the surface of the water. This plant as mentioned before occurs in small pools and muddy areas throughout the swamp. Close to the edge of the lagoon, and in quite deep water, a dense community of a submerged alga, one of the Charales, is present. This alga is characterized by whorls of " leaves," actually secondary stems, which are spaced along its main axis. *Myriophyllum propinquum,* a common aquatic and swamp plant, occurs frequently. Its habit is very variable and it can be found in Gollans Valley swamp as a long, completely submerged plant with fine, divided leaves; as a stunted plant with fleshy leaves,

only slightly lobed, growing on mud; or as forms intermediate between these two extremes.

Lake Kohangatera has a gravel bed, but along the more sheltered western shore there is some deposition of silt and organic material. Along the sheltered sides and at the northern margin, where the swamp terminates, there is a narrow girdle of *Scirpus lacustris,* behind which a raupo community is found. The eastern shore is devoid of vegetation except for occasional clumps of oioi and *Juncus pallidus.* Remains of *Ruppia spiralis* at the eastern shore-line indicate that this plant forms a part at least of the submerged aquatic vegetation. *Lilaeopsis* sp. occurs in small colonies near the shore line. The waters of the lake are probably somewhat saline, as sea spray is blown across the lake in high southerly winds.

The habit of some species in the swamp vegetation is interesting. Niggerhead generally develops a characteristic "trunk" of matted rootlets and rhizomes, on which the drooping scabrid leaves and inflorescence are supported. By means of the trunk, leaves and inflorescence are kept clear of the swamp surface and are protected against any sudden rise in water-level. The trunk forms a seed and spore bed for several species. *Blechnum procerum* is often found flourishing in this situation, and so also are seedlings of manuka. Near the lagoon, manuka seedlings and some quite well developed plants were growing on the dying or dead trunks of niggerheads. The seedling grows from the trunk almost horizontally, but when it has grown beyond the shade effect of the niggerhead leaves it begins to grow vertically. Thus occasionally manuka plants are seen with a noticeable bend in their stems. Other plants such as phormium and mariscus can also develop on the trunks of niggerheads. The presence of an occasional mariscus in a very wet habitat, as at the lagoon, is thus explained, as this plant is usually confined to a drier habitat and a much firmer substratum.

Oioi builds mounds of silt and debris trapped by the numerous tufted stems. A large clump of this species may be as much as five feet high. From these clumps one or all of the following may grow: phormium, manuka, toetoe, *Blechnum procerum.* Thus oioi plays a role similar to that of niggerhead. By developing on these clumps, species not normally capable of growing under such wet habitat conditions can enter a communtiy and possibly eventually dominate it.

Summary. The present vegetation has developed mainly since the raising of the valley above sea-level. Possibly in the upper reaches a partly swamp vegetation had developed. In general, however, those areas of the marine inlet not constantly covered by the sea, and which probably had a muddy or silty substratum, would have supported a salt marsh vegetation in which oioi would be conspicuous. With the leaching of salts and a continual supply of fresh water, the area would rapidly be invaded by plants such as *Scirpus lacustris,* phormium and raupo. The present vegetation is then a result of uplift, allowing the valley to become gradually a fresh water swamp, and the not very great effect of the biotic factors already mentioned. The presence of oioi scattered throughout the swamp indicates the earlier salt marsh vegetation which occupied the area.