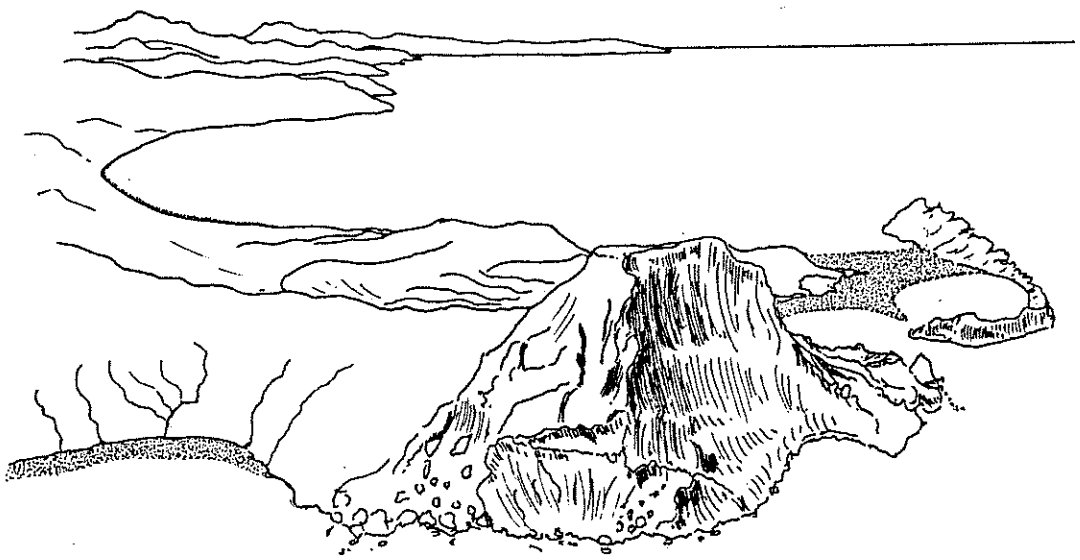
V. C. Neall

CASTLEPOINT
SURVEY



—FIRST REPORT—

JULY 1965

VUC University Field Club

INTRODUCTION

The natural history of the Castlepoint area has not been systematically studied, though biologists have previously visited the area. This trip was conceived as a primary survey of the animals and plants of the area; and we wish to make it clear that this is only a preliminary report, and that we regard this trip as little more than a beginning. With this in mind, it is our hope that future workers will investigate the animals and plants of this area more fully.

The students on this trip had little knowledge of biological field investigations and the information gained, although revealing more problems than were solved, was considered a guide for future visits to Castlepoint.

Castlepoint is an excellent area in which to carry out a study of this type. It is within reasonable travelling distance of Wellington and accommodation is available; the coastal location is advantageous in that it affords access to a great variety of habitats including marine, terrestrial and fresh water.

Much of the material collected was referred to biologists in Wellington for identification and checking, and we wish to thank them for the interest they have shown in this direction. The collections are deposited with the V.U.W. Botany and Zoology Departments.

We are in debt to the Botany and Zoology Departments, V.U.W., who, with loans of equipment, staff encouragement and assistance with preparatory work, have made this study possible. Our thanks also go to Biological Society, V.U.W. for sponsorship and financial assistance. Also, we would like to express gratitude to Mr. R. G. Wear who acted as staff supervisor.

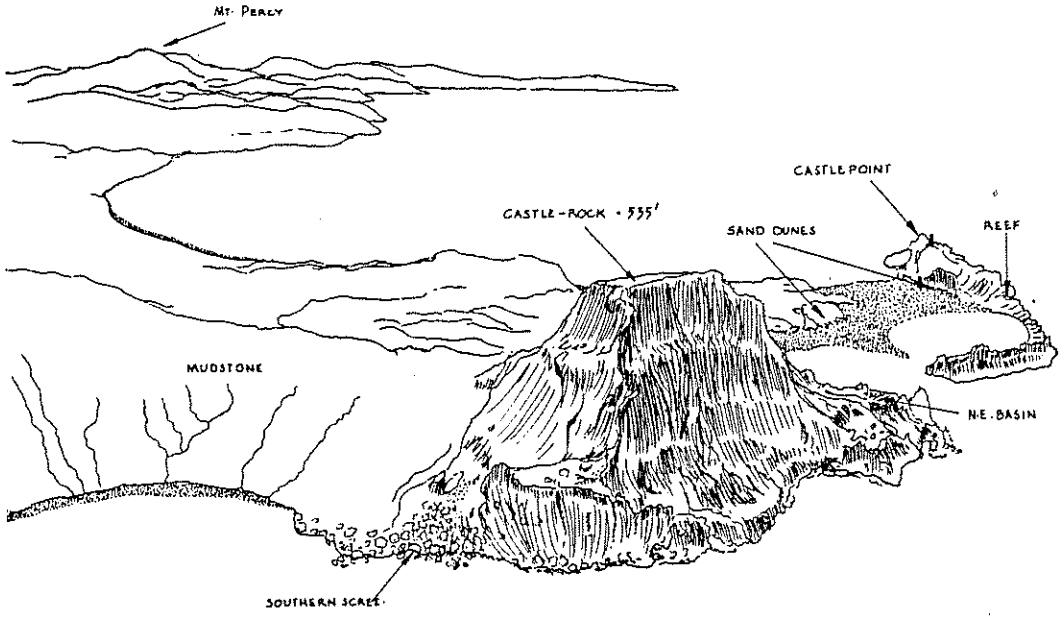
The Marine Department kindly made available their house at Castlepoint and allowed us use of the lighthouse itself for observations. Mr. Tatham, of Carterton, generously made available one of his flats at Castlepoint. At Castlepoint Mr. Holmes, the lighthouse keeper, extended his hospitality and we learned much from his local knowledge. To Mr. L. Johnston of Whakataki we are deeply indebted for the use of his boat and outboard motor: without this several aspects of our work would have been impossible.

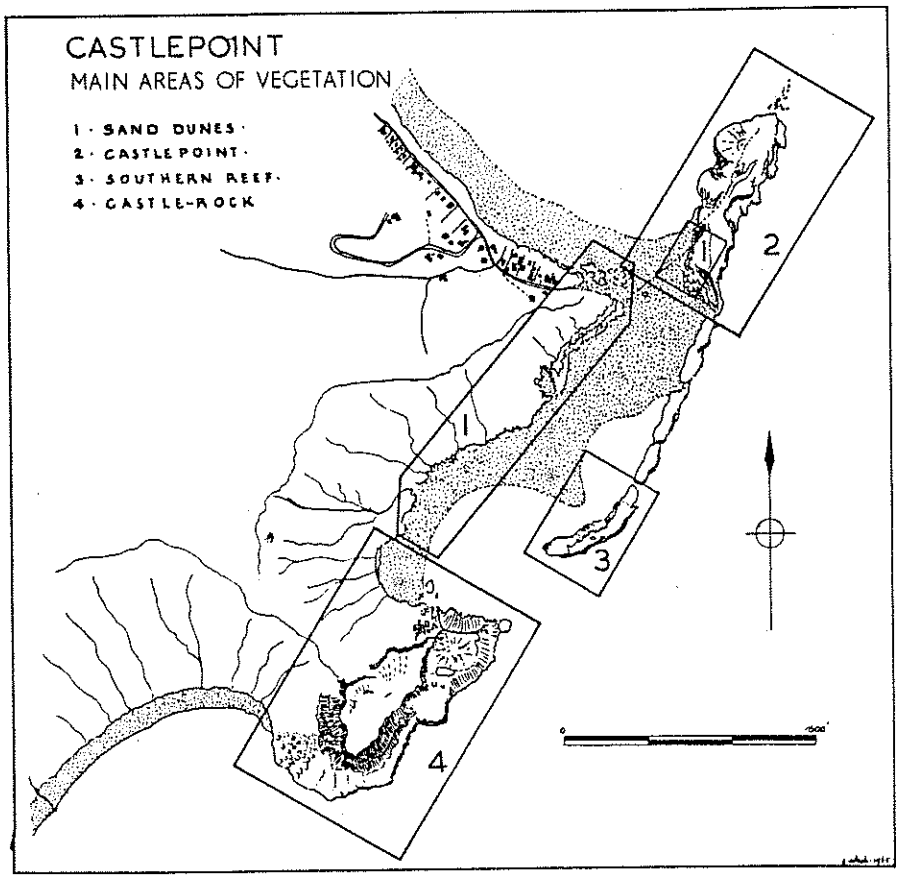
Similarly, we took advantage of the interest and local knowledge of many people living at Castlepoint, and we wish to express thanks to them for their helpfulness.

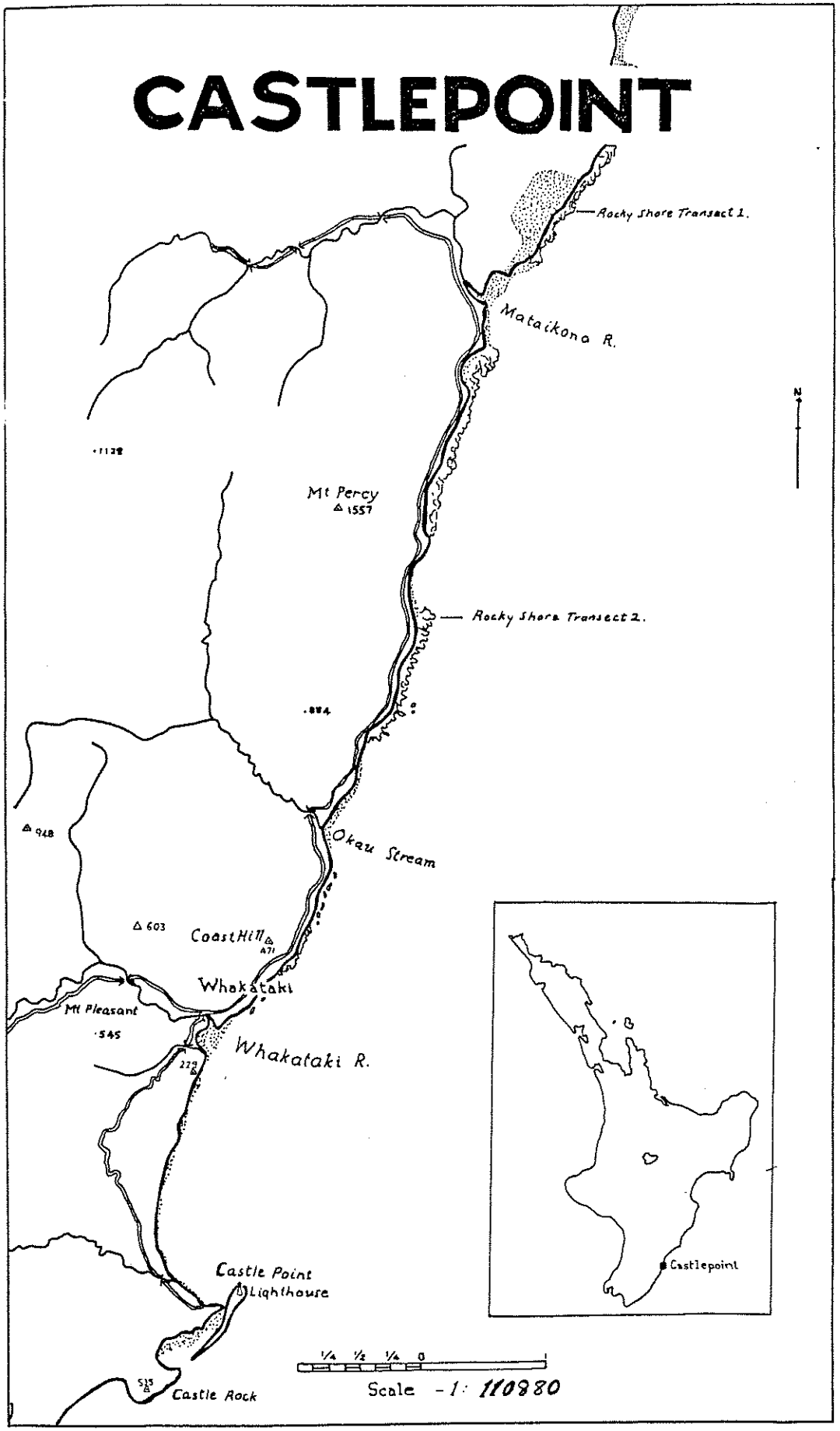
Finally, we must record our appreciation of the facilities for the preparation of this report which Professor Salmon of the Zoology Department kindly allowed us. Without this help, the preparation of the report would have been very difficult, if not impossible.

CASTLEPOINT AREA

OBLIQUE AERIAL VIEW FROM ABOVE CASTLE-ROCK SHOWING MAIN RELIEF






CASTLEPOINT
Rocky Shore Transect 1.
Matakona R.
N
Mt Percy
△ 1557
Rocky Shore Transect 2.
Okau Stream
△ 948
△ 603
Coast Hill
△ 471
Whakataki
Mt Pleasant
545
Whakataki R.
Castle Point
Lighthouse
Castle Rock
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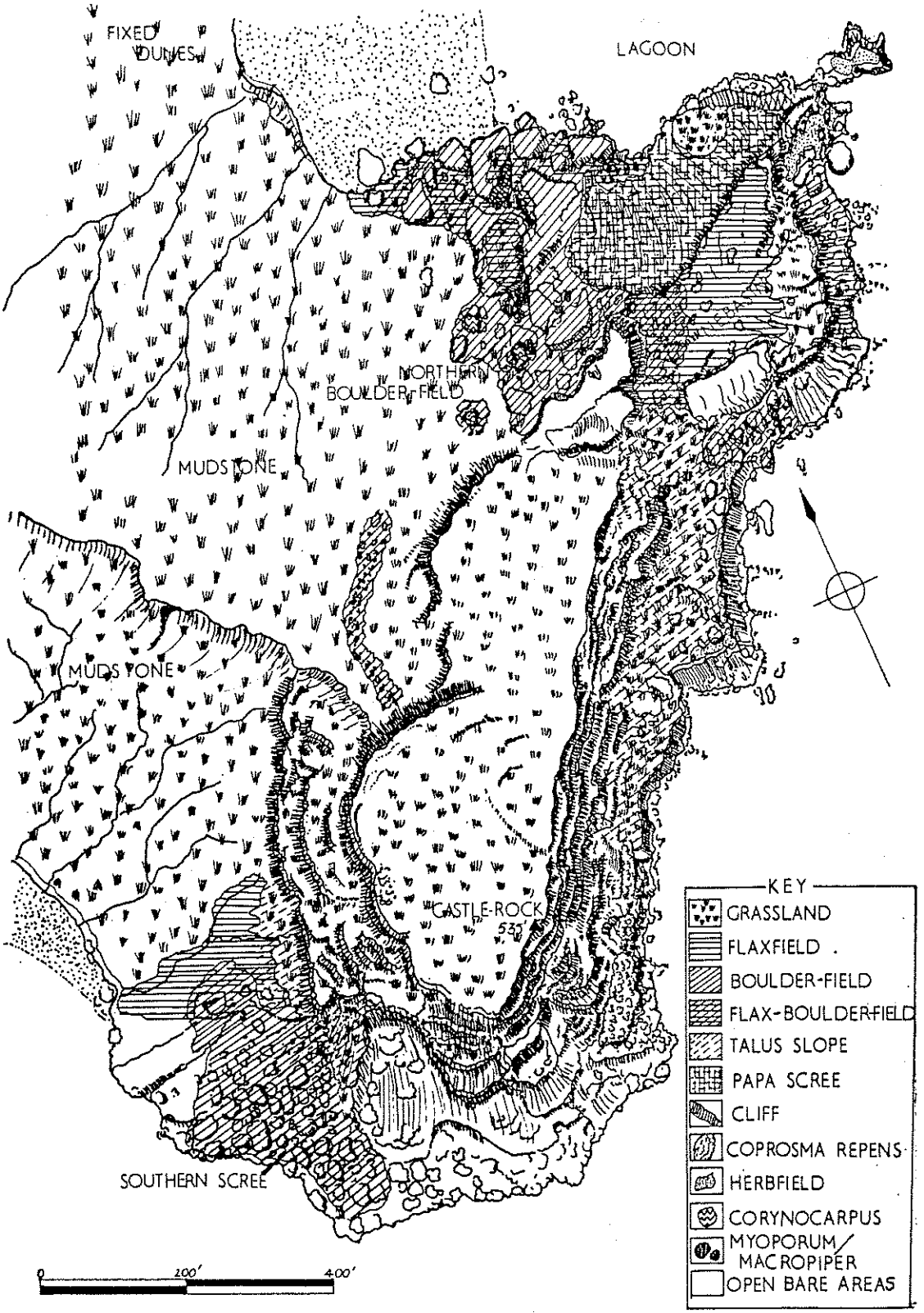
VEGETATION OF CASTLE-ROCK



THE VEGETATION OF THE CASTLEPOINT AREA

G.N. Park

Introduction:

Although the Castlepoint Area is well known as an area distinctive for its geology, the vegetation, which is also very distinctive, has in past years received relatively little attention.

The area is distinctive because of its geology; the strip of coquina limestone stands out from the surrounding papa country which comprises much of the coastal Wairarapa. The harder limestone produces a different type of topography from the mudstone and this point is strongly reflected in the vegetation, bearing out the strong relations of vegetation and geology in ecological studies. The geology of the area was studied by Kustanovich (1964). He describes the limestone of the Reef and Castle Rock as lower Pleistocene in age, overlying unconformably a lower Pleistocene mudstone which forms the adjoining ridge and appears at the coast in two places.

This study was carried out to provide a basis for further studies on aspects of the vegetation.

The aims of the study were:

(1) To compile a vegetation map of the coast from Castle Point to the papa country slightly south of Castle Rock.

(2) To describe the main areas of vegetation and their associated communities.

(3) A brief descussion of the vegetation and suggestions for further study.

The Vegetation Pattern: (see Areas of Vegetation)

The vegetation in some places has been considerably modified and this fact has separated facets of the vegetation. We can divide the area into 4 separate portions, each with a number of communities which, in some cases, (e.g. the Samolus-Disphyma herbfield) are found in more than one of these areas.

The areas studied are as follows:

(A) The Sand-dunes.
(B) Castle Point.
(C) The Reef.
(D) Castle Rock.

The Sand Dunes: (see map of vegetation areas)

The topography here is typical of most sand-dune areas; very broad smooth slopes, permanent further back from and temporary near to the beach. There are striking differences with regard to the vegetation between the inland shrub covered and the more coastal grass covered dunes.

(i) Shrub-Dune Vegetation: The vegetation is close but is still very young; practically no sign of developing scrub being evident. The flax and toetoe near the edge suggest that the sand has been relatively stable for some time, but the only shrubs of any importance are scattered. The low sprawling Coprosma acerosa which is concentrated in some areas is conspicuous by its orange-red colour. The only other shrubs are Olearia solandri and Cassinia leptophylla. C. leptophylla (tawhinu) is more abundant further up the slope, and on the neighbouring papa country, which is under pasture. This poor quality pasture extends into the upper portions of the inland dunes. Important species in these intermittent grassed areas

Herbfield: This very interesting aspect of the vegetation of many coastal areas is highly abundant in the Castlepoint area, especially so on the Reef, an area which will be discussed later.

On Castlepoint itself, the herbfield is restricted to relatively flat areas on the otherwise bare platforms on the coastal side of the point. These areas are where the limestone has been worn to a temporary base-level. This rock-floor becomes covered with an accumulation of coarse sand and small rocks. From observations made at Castlepoint this sand is first colonised by Samolus repens. The binding properties of this sprawling plant enables other species to survive in an area which they themselves could not successfully colonise. When any bare debris is colonised there is in the coastal herbfield, at first, a very rapid series of changes in the composition of the plant community. Although Samolus repens is still the dominant species the familiar patches of Disphyma australe and upstanding clumps of Apium australe are are numerous. A few plants of Puccinellia stricta, and Poa caespitosa are present and in lesser numbers Senecio lautus and Spergularia marginata. However, overall the plant life is sparse on the seaward platforms. The lower platforms and much of the upper one are bare even though a sand and gravel accumulation may be present. The area is fully exposed to the open sea and probably exposure is restricting growth to the more-sheltered upper platform which is quite elevated from the coastline.

Cliff Vegetation: Two main areas of cliff vegetation occur; the coastal cliff and another bordering the dunes. The coastal cliff is sparsely populated except in the more protected rock crevices. (The sea-cliff of the eastern side is omitted here simply because it is absolutely devoid of terrestrial plants.) The only notable plant in the rock crevices is Senecio compactus which is also found on the upper grass-slopes, but not on the southern cliff. Poa caespitosa and Scirpus nodosus are common on ledges. Other common species are Coprosma repens and Asplenium lucidum in crevices, and Pimelea prostrata on the more open rock.

Grassland: This comprises by far the most widespread vegetation on Castlepoint and a continuous grass cover of the headland is only interrupted by cliffs and open bare areas caused by both natural and artificial means. Wind erosion is very marked due to opening up of the grass cover by tracks etc. Only two species stand out as dominants, Poa caespitosa and Scirpus nodosus. Senecio compactus occurs in the grass on the western side but there are only a few large plants. The eastern side of the headland is obviously wetter. A distinct belt of Scirpus nodosus occurs between the herbfield vegetation and an upper area of Poa caespitosa (plants of which are considerably larger). In addition taupata is present as scattered plants up to 3 ft. in height. Three plants of Senecio compactus were found on this side. Although the wind-eroded bare hollows on the west of the headland are normally devoid of any vegetation, the coloniser, Samolus repens does occur, occasionally accompanied by Disphyma australe and Senecio lautus. At the southern end of the headland a separate grassland-type of vegetation has developed. Where beach sand has blown up high on to the headland, not in large enough quantities to form dunes, as it is below where the sand can accumulate against the cliff, there is a combination of the normal Poa caespitosa - Scirpus nodosus grassland and shrub-dune plants, e.g. Phormium colensoi, Coprosma acerosa, Pimelea arenaria, tauhinu and harestail. These sand-dune plants can only enter into the grassland where sand has filled up the spaces between the limestone gravel. The characteristic species of this vegetation is the small grass Zoisia minima, its habitat being those areas of wind-blown sand mixed with, in this case, the crumbly limestone.

are the introduced harestail, lupin (bordering the sand-grass dunes), Scirpus nodosus and the silver tussock of the Wellington coast, Poa caespitosa. In moister hollows, flax (Phormium tenax) occurs in small patches as a continuous cover with the abundant toetoe and scattered cabbage trees.

(ii) Sand-Grass Vegetation: (Sand-grass dunes). These unstable dunes are typical of nearly all New Zealand sandy beaches. The dominant species, is the introduced marram grass (Ammophila arenaria)which is supplemented by the other sand-binding species, the distinctive orange Desmoschoenus spiralis (pingao), and in lesser numbers Spinifex hirsutus, whose large seed heads litter the area. Where there is more permanent cover another sand binder lupin is found. It is notable that these four species do not inhabit the more stable fixed dunes, but will only grow in pure sand. The sand binders do not form an overall continuous cover and"wind bowls" are a common feature. However,where the cover is extensive other species occur, notably Pimelea arenaria, Olearia solandri (and some tuahinu) harestail, Scirpus nodosus, Calystegia soldanella and a few Coprosma acerosa. The sand-grass dunes occur all along the inside western edge of the lagoon (more shrub-dunes at the southern end) and where sand has accumulated against the southern end of Castlepoint. Most of the dunes are covered by marram grass but they change rapidly until about 40 ft. up the slope of Castlepoint there is a mixture of sand and limestone soil, characterised by the presence of the grass Zoisia minima.

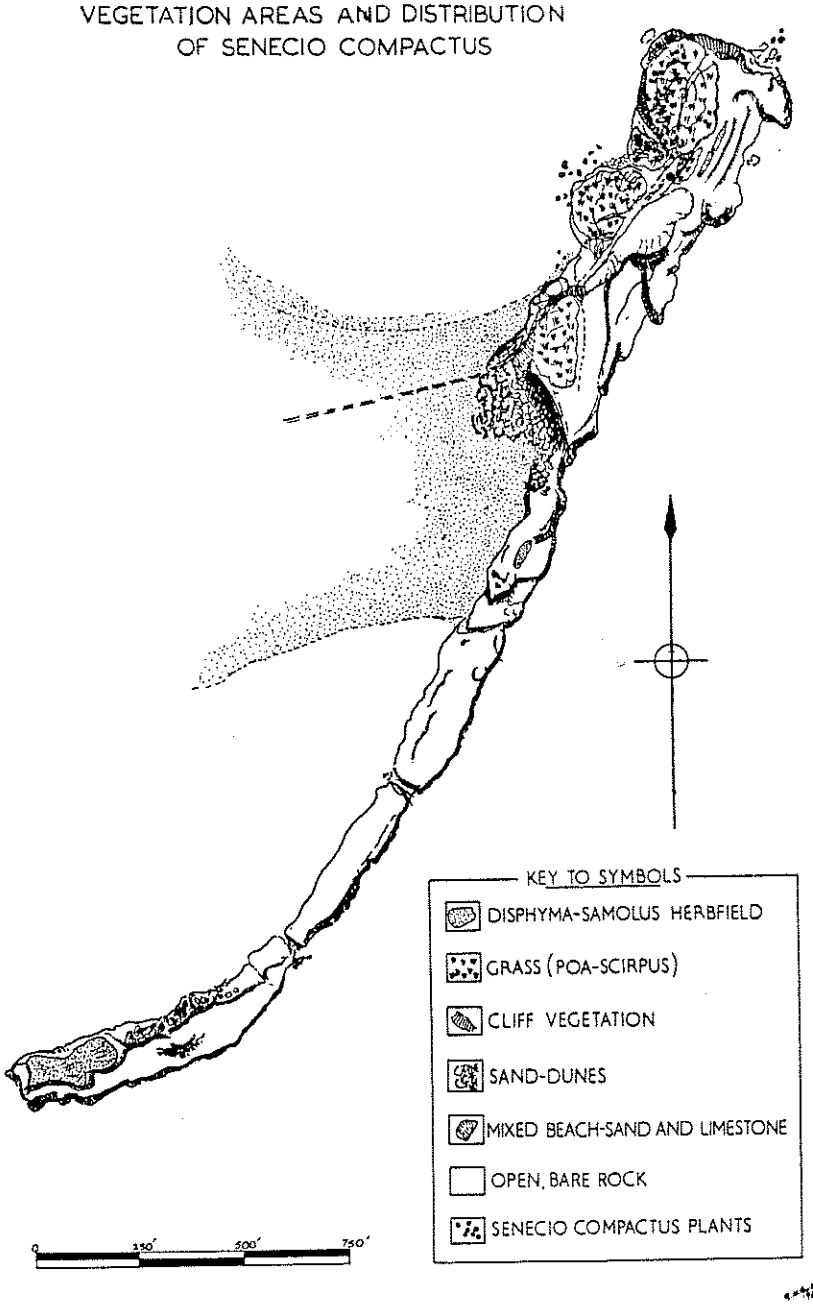
Castle Point: (see vegetation map of Castle Point)

This area includes the northern high portion of the limestone reef; from the Point to the start of the "veranda" portion of the reef. Much of the area has been bared of vegetation either by natural means, or by human modification, or both. Consequently the Point is riddled with wind-channels; this is especially marked near the lighthouse. In some places the wind channels have formed seepages and in others the wind has concentrated limestone sand in channels and on the platforms giving rise to a herbfield of Samolus - Disphyma and associated species. In addition there are the cliff and Poa - Scirpus grassland vegetations. All are determined by topographic discontinuities.

Seepage Vegetation: This occurs in an area of predominantly bare rock with a sparse distribution of plants, many species of which are at the endpoint of their distribution in the grass vegetation. The described area is just south of the lighthouse. The seepage vegetation is, however, unique in that it is not found elsewhere in the Castlepoint area. This is demonstrated by the occurrence here of species not found, for example, on Cast le Rock, e.g., Selliera radicans and Plantago coronopus. Whether these species are strictly plants of seepage areas is open to discussion. Dr. L.B. Moore in "Plants of the N.Z. Coast" states that these two species, along with Samolus repens are plants of "damp sand flats", which in this case could be considered as rather too general a description as Samolus occurs with abundance in all areas of low level vegetation on Castle Rock and to a lesser extent on the sand-dunes, but in neither community accompanied by Selliera radicans or Plantago coronopus. Samolus repens does occur in the seepage area but the dominant plant would be Selliera radicans. Samolus repens and Plantago coronopus occur as secondarily important species, Selliera radicans and Samolus repens starting their growth in small patches of soil and sending vegetative runners across the bare moist rock. Plantago coronopus is confined to the small wet patches of soil along with a species of grass. Another common plant is the ubiquitous Scirpus nodosus.

CASTLEPOINT AND THE REEF

VEGETATION AREAS AND DISTRIBUTION OF SENECIO COMPACTUS



The Reef: (see vegetation map of Reef)

The reef is a southern extension of the coquina limestone forming Castle Point. Most of the reef rises no more than 20 feet out of the water. Because of this it receives occasional washing by the surf; waves can pound over part of the reef at high tide in rough weather. This immersion and the smoothness of the rock surface, prevent any accumulation of sand and gravel on the reef. Only in three sheltered areas does any vegetation occur. Primarily, due to exposure, the vegetation is of a salt meadow or herbfield type. As two of these areas are small the only mention of them made here will be on the accompanying map (both are dominantly Disphyma). At the southern end of the reef, there are ideal conditions present for the development of coastal herbfield. Beneath the 100 ft. cliffs vegetation has developed in two adjoining areas; on the boulder field or rock-fall at the central portion of the lagoon-shore, and on the talus slope at the southern end, also facing the lagoon. Both consist of debris weathered from the cliffs and where boulders are largest, vegetation is most scanty. Few plants are found on the actual rock-surface, practically all occur on the finer detritus which accumulates on and between the boulders, and is the only substratum on the broad southern slope.

Due to the greater depth and extent of the detritus on the southern end of the reef, characteristic landforms and associated herbfield vegetation are more developed than on Castlepoint. With a large area it is easier to study the nature of each contributing species; e.g., the large patches of pure Disphyma, the isolated clumps of Apium, and the presence of Samolus on the edges where its colonising and binding nature is fully employed. From the lagoon, the loose and crumbly limestone seems to support a full cover of vegetation, but a closer study of the upper areas, up to80 ft. above sea-level, shows numerous wind-terraces. The terraces run parallel to the reef and display distinct zoning of the important species. On the faces of the terraces Disphyma, is dominant and Apium, Puccinellia etc., occur only occasionally. In contrast the tread of the terrace is completely bare and scooped out. Similarly Samolus does not occur on the tread of the terraces but it is abundant on the terrace edge.

That the herbfield, or salt-meadow (as Cockayne calls it) is part of a succession is indicated by the numerous young plants of Coprosma repens, the number of plants of grass species (Poa caespitosa, Deyeuxia billiardierii and Puccinellia stricta) and the very rapid increase in the size of the Disphyma patches. In a photograph by Kustanowich, probably taken in 1962/63 from the western side of the lagoon, these patches are noticeably smaller.

Salicornia australis is a common plant in areas often drenched by salt spray and may occur up to 80 ft. above sea-level, indicating that the area is liable to occasional drenching by salt-spray. The lagoon is obviously no handicap to distribution of seeds from the mainland; e.g., there are no plants of Spinifex hirsutus on the Reef, but a seed-head was found on the beach, obviously blown across the lagoon from the sand-dune area.

Castle Rock: (see vegetation map of Castle Rock)

Separated from the reef by 50 yards of water, Castle Rock is a continuation of the same Pleistocene limestone. The Rock is land-tied by the adjoining mudstone ridge and this mudstone appears in two places, the N.E. and S.E. corners, both of which are characteristically unstable and have only a sparse vegetable cover. The cliffs, which rise to over 500 ft., are the most striking feature of Castle Rock but here plant-life is sparse, restricted to occasional ledges and a few rock crevices. The most distinctive plant habitats on

There are boulders on the talus slopes but they are small and of little importance in controlling the type of community unlike the case in the boulderfield. Here age and soil moisture are more important. On the boulderfield a limestone block provides shade moisture and shelter which encourages the growth of coastal forest species. On the talus-slope little moisture is retained in the upper layers of the porous, crumbly limestone and consequently, species like flax that need excessive moisture are restricted to the damper areas in small basins and at the heads of fans. An increase of Scirpus nodosus in these situations is characteristic. Over the rest of the talus slopes and broader cliff-ledges, grasses (mainly Poa caespitosa) are the dominant plants. The broadest area of the talus slope community is on the western side of Castle Rock. A continuous vegetation cover is composed of grasses (Poa caespitosa), Scirpus nodosus, numerous scattered Phormium colensoi and a few large plants of Senecio compactus, 2 - 2ft. 6ins high. This is repeated on the first cliff-ledge.

Towards the sea-cliff there is a transition through pure Poa, to 6 - 7 ft. of Samolus - Disphyma herbfield. Disphyma, however, is more abundant in the immediate vicinity of boulders throughout the area. The greatest concentration of flax is within a very gently sloping depression. The vegetation of the southern third of this western talus-slope forms a community of almost pure Coprosma repens (taupata) scrub, unique because elsewhere in the area Coprosma grows only as scattered plants. The soil here is damper than the rest of the talus slope due to the greater amount of vertical cliff directly above, which would greatly increase the run-off through this area of scrub. The open canopy of taupata is about 6 ft. high and the very sparse ground cover consists of salt-burnt stock plants probably Trisionic 6 - 12 ins high with long bare stems, Deyeuxia billiardierri, Apium australe and Tetragonia trigyna. South of the taupata scrub is a small gull rookery where scattered patches of Deyeuxia, Poa and a few stock plants constitute the only vegetation. The talus-slope community is abruptly terminated at the south end of the rookery by cliffs. At the southern corner of Castle Rock the talus slope vegetation is resumed again as an area of almost pure Senecio compactus. That this area is far younger than any other talus-slope is indicated by the relative absence of grasses, especially on the top of the fan.

Flaxfield Vegetation: Although flax occurs throughout all the Cast lepoint area as scattered plants, communities dominated by flax occur only in three areas: the wetter, lower slopes of the northern boulderfield, the stream immediately west of the southern boulderfield and in the N.E. basin. In each case the species is Phormium tenax. P. colensoi is more scattered and limited to some dry rocky areas. In the first two areas flax is associated with toetoe. The basin consists of pure flax only in the damper lower portion. Nearer the cliffs a rock-fall extending well down into the basin supports a more open vegetation of Senecio compactus, on and between boulders, and grasses, both of which are being replaced by flax. Beneath the flax plants the ground is covered by flax-debris and a few plants of Apium australe. On the drier coastal side of the basin, patches of Poa caespitosa and Scirpus nodosus occur among the flax and gradually they become merged towards the sea cliff. Two plants of taupata were found at the southern end of the basin where it opens onto a younger talus slope vegetation of Phormium - Senecio compactus / Poa - Scirpus.

The Cliff Vegetation: The almost vertical cliffs, in places up to 500 ft. high, are very conspicuous, extending almost completely around the Castle Rock. The cliffs are devoid of vegetation, except for the occasional ledge. The greater number of species is exhibited on the coastal side.

Castle Rock are the boulder-fields, and talus slopes which are found below the cliffs nearly all around the Rock, and the small basin on the N.E. corner, which is almost pure flax. Common on the cliff edges and on the sea-cliffs themselves is the aforementioned herbfield, and in some damper cliff-faces, hanging mats of Disphyma australe are not uncommon, especially on the cliffs more exposed to salt spray.

Boulderfield: These areas, which are physiognomically the most interesting, consist of piles of often immense blocks of limestone (up to 25 ft. high) deposited at the base of the cliffs. The boulderfields occur only at the southern and northern corners of Castle Rock, and on a smaller scale as a small rock-fall in a depression beneath the western cliffs. It is on the southern boulderfield that gradation from the finer talus material to boulders is most marked, yet apart from the abundance here of Senecio compactus this area is not as varied in its vegetation as the northern boulderfield.

In the southern area Senecio compactus is the sole dominant and is abundant on and between the boulders. That Senecio is still on the finer detritus, and that other species are not physiognomically important, suggests that the southern boulderfield is far younger than the northern area where there is a mixture of light coastal forest species, with S. compactus only on the larger limestone blocks. The other species present among the boulders include Phormium colensoi, tauhinu, Scirpus nodosus, and Poa caespitosa, all of which have increased in importance in the older vegetation to the North. These species increase in number at the S.W. side of the boulderfield (cliffs prevent this at the other side) until Senecio compactus is replaced by pasture and a small concentration of flax within a seepage area. On the northern boulderfield, the presence of coastal forest species such as karaka, kawakawa, ngaio and poroporo produce an entirely different vegetation. Much has been modified by past burning but the vegetation is still controlled by the position and size of the limestone blocks. The coastal forest plants are confined to only a few clumps, where the only canopy plant is karaka (C. laevigatus). Much of the shrub layer has been browsed but probably the only sub-canopy plant of any importance was kawakawa, with ngaio restricted to open areas where it is still a common plant. Both species are up to 7 ft. in height.

In the open areas, grasses (Poa caespitosa and introd. species) are dominant. Flax is restricted to the wetter lower depressions along with toetoe and kawakawa. Tauhinu occurs throughout the boulderfield on the fine detritus between the boulders. Both flax and Senecio compactus are common as rock plants. Higher up the boulderfield, S. compactus growing as large plants becomes more important and in places is growing on the open ground, as well as its usual habitat. Browsing affects some species here much more than others; e.g., Hebe stricta var. macroura and Sophora microphylla are almost completely destroyed, while Senecio compactus and most of the forest species show only occasional browsing, some of which is by oppossums. The mudstone surface on the eastern side of the northern boulderfield is very unstable with much bare ground, due to continual slipping. The dominant species is the common garden stock (probably Trisionic). In addition a few grasses occur and the abundance of Senecio compactus is greater here than in the rest of the northern area.

Talus-Slope Vegetation: This zone, of finer detritus than the lower boulderfields, occurs immediately below the cliffs all around Castle Rock. The talus slope vegetation is more extensive than the boulderfield vegetation because there is a greater amount of fine material. In most cases the boulders from the cliffs have rolled straight into the sea or piled up in such a way as to prevent terrestrial plant growth as evidenced by the area just south of the N.E. Basin.

This vegetation study is intended as a broad introduction to the Castlepoint vegetation and as a basis for future investigators. Many questions are to be answered. What is the status of the herbfields or salt meadows? Are they all only part of a succession or are some, because of their habitat, really a climax? What is the future of the remnant of coastal forest on Castle Rock? Is it really comparable to that further north or does its habitat make it too distinct? Why does Selliera radicans only occur in the one seepage area? Studies of individual species, their role and status in a community are worthy of investigation in a similar manner to that already attempted for Senecio compactus (see the study of Park and Williams in this report). Samolus repens and Disphyma australe occur throughout the area in a few of the communities, and an ecological study of each would be worthy of investigation. The herbfields and sand-dunes are especially interesting for ecological studies as they are some of the very few communities where all the stages in the colonisation of an originally bare habitat can be observed, over a wide area, taking place at the same time.

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LIST OF THE VASCULAR PLANTS OF THE CASTLEPOINT AREA

S: Sand-dunes
C: Castlepoint (lighthouse area)
R: Reef
C.R.: Castle Rock
*: Adventive

The following preliminary list was compiled over a period of 5 days during the winter season.

Botanical Name	Common Name or Group	Distribution
Adiantum cunninghamii	maidenhair fern	C.R.:
*Ammophila arenaria	marram grass	S: C:
Apium australe	native celery	C: C.R.: R:
Asplenium flaccidum (aggr.)	fern	C.R.:
A. lucidum	"	C: C.R.:
Blechnum banksii	"	C.R.:
*Bromus sp.	brome	S: C.R.:
Calystegia soldanella	sand convolvulus	S:
Carex sp.	sedge	C.R.:
*Carpobrotus edulis	ice plant	S:
Cassinia leptophylla	tauhinu	S: C: C.R.:
Coprosma accrosa	sand coprosma	S: C: C.R.:
C. repens	taupata	C: C.R.: R:
Cordyline australis	cabbage tree	S:
Cortaderia sp.	toetoe	S: C.R.:
Corynocarpus laevigatus	karaka	C.R.:
Desmoschoenus spiralis	pingao	S:
Deyeuxia billardieri	grass	S: C: C.R.: R:

Grasses (Poa caespitosa, P. anceps, Deyeuxia billiarderii) are almost continuous on most of the ledges. Garden stock is limited to the coastal cliff only, where it is often very abundant and at a distance, confused with another frequent cliff plant, Senecio compactus, which occurs all around Castle Rock. Disphyma australe and taupata favour accumulations of guano (one rookery of Black Shags is present, at a height of 450 ft. at the southern end) and damper situations. These plants, often with Phormium colensoi constitute the entire vegetation of the cliffs.

Herbfield Vegetation: Herbfield comparable to that already described for Castle Point and the Reef is present, though generally not well defined. Two areas only show broad herbfield; the stock near the lagoon entrance and an area of crumbly limestone detritus just below the basin. Throughout the rest of Castle Rock the herbfield community occurs with scattered distribution on this strips up to 7 ft. wide on the seaward margins of the sea-cliffs. Generally only Samolus repens and Disphyma are dominant although Apium, Senecio lautus and Puccinellia stricta are present. Inland these communities grade rapidly into the talus slope communities already described. Scattered Samolus repens and Disphyma australe occur along the sea-cliff down to 10 ft. above sea level. In softer material Salicornia is abundant, particularly just below the basin.

At the base of the cliff face around the head of the basin there is a strip 7 ft. wide in which a specialised herbfield vegetation occurs. The presence of this vegetation could be due to a greater runoff than elsewhere in the basin. Most of the vegetation consists of large patches of Disphyma australe with scattered clumps of Apium australe, Senecio lautus, Bromus sp. Spergularia marginata, Deyeuxia billiardierii and the species of small hair-like grass which is also found in the seepage community of Castlepoint. A few plants of stock are found in drier areas. A notable feature is the comparatively large leaves of most of these species.

Pasture: Pasture covers the rest of Castle Rock. This pasture is predominantly ryegrass, clover and Danthonia although Poa caespitosa and Scirpus nodosus are common. A common plant on the wetter adjoining mudstone pasture is an unknown species of Carex with wide olive-green leaves. Tauhinu is very common in this pasture and is increasing in numbers.

DISCUSSION AND SUGGESTIONS FOR FUTURE STUDIES

The vegetation of the Castlepoint area, except for the area now in broad grassland or pasture, is relatively unmodified by man. The karaka trees, ngaio and kawakawa are probably remnants of a light coastal forest that extended around the damp and sheltered papa slopes west of Castle Rock and to a lesser degree up on to its broad, now grassy, summit. Previously this would have been more of a mixed shrub community with ngaio, kawakawa, flax, Hebe stricta var. macroura and fern. It is probable that this light coastal vegetation continued along the papa coastline south of Castle Rock, but more as a fairly dense scrub. Flax, Hebe stricta var. macroura and kawakawa are still common in the valleys. Probably karaka was limited to the broad damp area west of Castle Rock. The rest of the area was probably, as Hill (1963) says, referring to D'Urville (1826-27) "mainly in grass with small quantities of toetoe, manuka and fern". Manuka is absent from the area studied at Castlepoint although abundant on the hills to the north, but tauhinu was probably the commoner plant, even at that time.

The coastal forest was probably similar to that found north of Castlepoint, but a few species that are dominants to the north, are absent here - mahoe, and manuka and kanuka. Possibly mahoe is one species that has been completely removed by burning.

SENECIO COMPACTUS AT CASTLEPOINT

G.N. Park & P.A. Williams

Senecio compactus was first described in 1880 by Kirk, in the transactions of the New Zealand Institute and even in this first description it was noted that it had a very limited distribution. Allan's flora later states that Senecio compactus was "known only from the type locality, limestone cliffs at and near Castle Point". Previously, the species was also recorded from Cape Turnagain, but this seems to have been a mistaken record.

The plant is a low, woody shrub, with small, revolute leaves, which are light greyish green. The undersides are white and tomentose, the density of this tomentum depending on the exposure. The flowers are yellow, and it has a drawn out flowering season. Most of the plants are 1 - 2 ft. high, but on the older areas they range up to 4 ft. with a few exceptional plants in sheltered positions reaching 5 ft.

The conspicuous features of Senecio compactus are:

(1) Its limitation to this small area.

(2) Its pioneering and colonising nature.

(3) The ease with which it is eliminated by aggressive species.

Senecio compactus is confined to a small area which is divisible into several major plant habitats, each based on the geological and edaphic factors present.

The habitats are: (1) Talus slope,
(2) Coastal Cliff,
(3) Boulderfield,
(4) Castle Point proper,

(see map - distribution of S. compactus). Castle Point is essentially a composite of the preceding 3 communities, but warrants separate discussion because of its isolation.

An attempt has been made to analyse the factors limiting distribution, and to account for its isolation to this area.

Methods: Profiles were taken from transects in four areas, using a Point-Analysis method. In this, a 60 ft. straight line, marked at 1 ft. intervals was stretched between two points on the area being studied. A record was then made of what occurred directly beneath the marker. Plant species, bare ground, and rocks (including boulders), were then converted to a percentage, this representing ground cover along the line. The height of the plants was measured along the transect. Profiles were then constructed from this data. The slopes indicated are only estimates to show the relative differences. On the South West Talus slope, large numbers of Senecio compactus were measured at random, to determine any difference in height between the plants on the ridges and those on the flanks.

DESCRIPTION OF THE MAJOR HABITATS

The Talus Slopes: The Talus Slope areas are found on: the North Screes of Castle Rock; along a wide platform on the Western side of Castle Rock; on the wider cliff edges, and on the upper portion of the Southern Scree. (See map - Distribution S. compactus).

The talus slopes are comprised of fine colluvium weathered from the limestone cliffs. The slope of the Southern Talus is steeper than that of the lower Southern Boulderfield and this division of the Southern Scree is so conspicuous that the two areas will be treated separately (see transect diagrams 1, 2, 3).

Botanical Name	Common Name or Group	Distribution
Dichondra repens	dichondra	C: C.R.:
Disphyma australe	ice plant	S: C: C.R.: R:
*Geranium molle	dovesfoot	C.R.:
G. sessiliflorum	geranium	C.R.:
Gnaphalium collinum (aggr.)	cudweed	C: C.R.:
G. luteo-album	"	C.R.:
Haloragis crecta	haloragis	C.R.:
Hebe stricta var. macroura	hebe	C.R.:
*Hypochoeris radicata	catsear	S: C: C.R.: R:
*Lagurus ovatus	harestail	S: C: C.R.:
Linum monogynum	linum	S: C.R.:
Lobelia anceps	lobelia	S: C:
*Lupinus arboreus	lupin	S:
Macropiper excelsum var. excelsum	kawakawa	C.R.:
*Marrubium vulgare	horehound	C.R.:
Microseris scapigera (aggr.)	native dandelion	C.R.:
Microsorium diversifolium	fern	C.R.:
Microtis unifolia	orchid	C.R.:
Myoporum laetum	ngaio	C.R.:
Olearia solandri	olearia	C.R.:
Oxalis sp.	oxalis	C.R.:
Phormium colensoi	flax	S: C: C.R.:
P. tenax	"	S: C.R.:
*Picris echioides (Helminthia)	oxtongue	C.R.:
Pimelea arenaria	sand pimelea	S: C:
P. prostrata	pimelea	C: C.R.:
*Plantago coronopus	buckshorn plantain	C:
P. spathulata	plantain	C: C.R.:
Poa anceps var. condensata	poa	S: C: C.R.:
P. anceps var. anceps	"	S: C.R.:
P. caespitosa	silver tussock	S: C: R: C.R.:
Polystichum richardii	fern	C.R.:
Puccinellia (Atropis) stricta	grass	C: R: C.R.:
Pyrosia serpens (Cyclophorus)	fern	C.R.:
Salicornia australis	glasswort	C: R: C.R.:
Samolus repens	sea primrose	C: R: C.R.:
Scirpus nodosus	sedge	S: C: R: C.R.:
Selliera radicans	selliera	C:
Senecio compactus	senecio	C: C.R.:
S. lautus var. lautus	groundsel	C: R:
S. sp.	ragwort	C.R.:
Solanum aviculare	poroporo	C.R.:
S. nigrum	black nightshade	C.R.:
Sophora microphylla	kowhai	C.R.:
Spergularia media	sea spurry	C: R: C.R.:
Spinifex hirsutus	silver sand-grass	S:
*Stellaria media	chickweed	C.R.:
Tetragonia trigyna	native spinach	C: R: C.R.:
Thelymitra sp. (prob. longifolia)	orchid	C.R.:
*Trifolium sp.	clover	C.R.:
*Trisionic sp. (prob.)	stock	C.R.: R:
Vittadinia australis	daisy	C: C.R.:
Wahlengerbia gracilis (aggr.)	bluebell	C.R.:
Zoisia minima	grass	C:

Also: Buffalo grass (Stenotaphrum secundatum), Elderberry (Sambucus nigra), Tasmanian Ngaio (Myoporum serratum).

On the Southern Talus Slope, in contrast to the older areas, there has been very little development of soil horizons. Yet it is here that Senecio compactus reaches its greatest concentration. Distribution of other species however is relatively sparse. Development of humus is concentrated around the clumps of grasses, mainly Poa caespitosa and Pimelea prostrata.

A series of slips has occurred on the Southern Talus Slope, each one following along the path of its predecessor. There appears to be two major age communities on this area, which seem to be correlated with the relative age of the slips. The most recent slips have not completely covered the preceding slips; therefore the top of each ridge has a younger vegetation cover than the two flanks. The vegetation at the top of each ridge is smaller than that on the flank of the ridges (see Transect diagrams 1 and 2), but this is due to the younger age of the ridge top plants as much as to the excessive exposure to which they are subjected. That this difference is not entirely due to exposure affecting the plants on the ridge tops is seen on smaller lateral slips where the ridges and the flanks have been sered at the same time. On these lateral slips there is far less difference in height between the ridge top and the flank plants.

The Coastal Cliff: On the East and South side of Castle Rock, the cliffs rise vertically to approximately 500 ft., with occasional ledges. The cliff appears to be very unstable and actively decaying. Senecio compactus is almost absent from these two areas. (See map - Distribution of S. compactus.) S. compactus occurs on the Western slope of Castle Rock and on some of the more stable South Western cliffs,where there are more ledges and protruding boulders providing favourable rooting conditions. The majority of the S. compactus plants are 1 - 2 ft. high, but some may reach 3 ft. in height.

On top of the cliffs where there is pasture, S. compactus does not occur. In more exposed areas S. compactus has developed semi-eraphytic features (see factors limiting distribution). Senecio compactus was not found on the unstable papa cliffs on the Northern end of Castle Rock. Small slumps have occurred on the Western slope of Castle Rock, to form spoon shaped basins from which the soil has been removed to expose the limestone, on which S. compactus has become established.

Boulderfields: These are areas composed of large boulders, found below the cliff faces. There are three main areas:

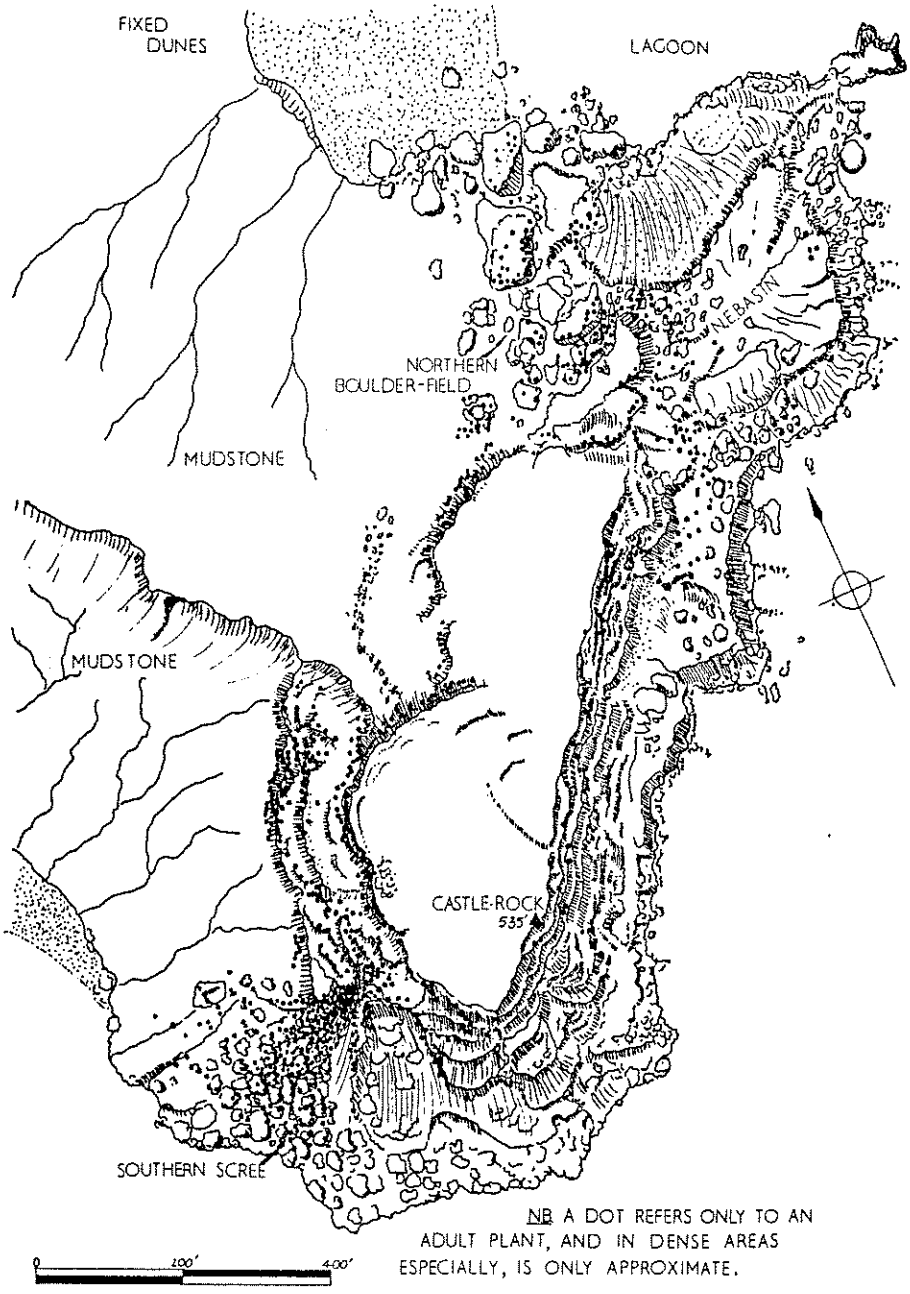
(1) Southern boulderfield (see transect diagram, 3)
(2) Northern boulderfield (see map - Distribution of S. compactus)
(3) Above and around the North East Basin (see transect diagram, 4).

Boulders of the Southern Boulderfield are closely spaced and increase in size towards the bottom of the fan, near the sea. Throughout this area Senecio compactus grows between and on the boulders, and is often associated with Phormium colensoi.

On the Norther Boulderfield, a skeletal soil has developed, and it is occupied by coastal scrub and grasses (mainly Poa caespitosa). Other less hardy species include Myoporum laetum, and Macropiper excelsum. The presence of some karakas (Coryhocarpus laevigatus), suggests that this area was once coastal forest with these karakas as emergents. In recent times this area has been burned and much of what was formerly scrub has been replaced by pasture grasses, among which there are no Senecio compactus. Therefore in the Northern Boulderfield, S. compactus has been limited to less favourable positions, in close proximity to boulders. These boulders have undergone some weathering since their dislodgement, and the small crevices and depressions so formed have offered

CASTLE-ROCK

DISTRIBUTION OF SENECIO COMPACTUS



NB A DOT REFERS ONLY TO AN ADULT PLANT, AND IN DENSE AREAS ESPECIALLY, IS ONLY APPROXIMATE.