THE FOREST OF ANISEED STREAM NEAR KAIKOURA

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SYNOPSIS

The forest of Aniseed Stream is podocarp-hardwood, with mountain beech present on ridges and spurs. Tawa finds its southern limit in this forest, at an altitude of 1,100-1,400 ft. The distribution and regeneration of the major trees are discussed in terms of geology and climate.

Aniseed (or Rakautara) Stream, which enters the sea eleven miles north-east of Kaikoura, includes in its catchment one of the largest surviving forests near the east coast of the South Island (Locality map, Fig. 1). Smith (1935), in briefly reporting his discovery in this forest of the southernmost known stand of tawa, draws attention to some peculiar features of the forest and stresses the need for further investi-

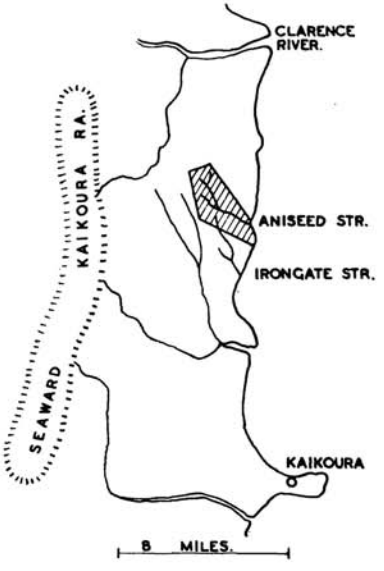

Fig. 1. Locality Map

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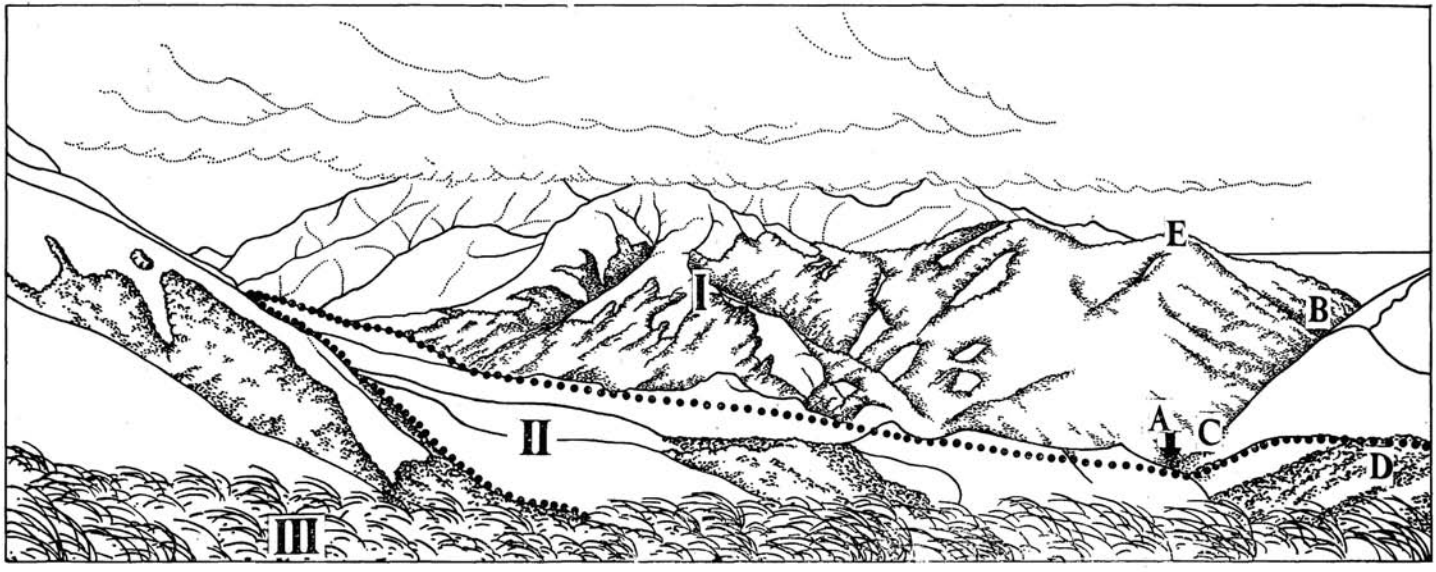
gation; to this end I spent two days in the area in February 1961. A description of the forest follows, together with corrections to Smith's report.

Steep slopes of greywacke covered by partly-milled podocarp-hardwood forest form the greater part of the catchment (I in Fig. 2). Through most of this area the main podocarps are matai, rimu, and totara. Together with miro, these ascend to at least 2,265 ft, though above 1,800 ft they tend to be replaced by thin-barked totara. Rimu is clearly dominant on moist, lower slopes at 700 ft near the main forks of the stream (A in Fig. 2); this is presumably the "magnificent stand of rimu" mentioned by Smith. Kahikatea is present on narrow, swampy terraces in the same vicinity. Hinau, pigeonwood, and mahoe are perhaps the most abundant hardwoods. Rata and kamahi, on the other hand, were not seen. Extensive slopes of coarse loose talus support dense communities of mahoe, patete, putaputaweta, and other small hardwoods, together with supplejack and kawakawa. Within half a mile of the coast, ngaio, titoki, and karaka are abundant, and two nikau palms were seen, at 800 ft above sea level (B). *Cyathea dealbata* is the most abundant tree fern through most of the forest, but *C. smithii* replaces it on moister sites, for example in the rimu stand at A.

Mountain beech, together with a sprinkling of trees which approach black beech in leaf characters, occurs on ridges and spurs throughout the greywacke area except near the coast. It is generally abundant below 1,000 ft and becomes increasingly scarce at higher altitudes, though trees were seen at 2,200 ft and may well occur higher. A quite extensive stand occupies north-facing slopes above the main forks at 700-900 ft (C). Rimu trees of moderate size (e.g. 18in. diameter) are scattered through this stand, and hinau and miro are also present. *Blechnum discolor* dominates on the floor and *Cyathea smithii* occurs in moister parts. One might have expected this assemblage to be associated with red beech rather than with mountain beech. (Smith does not mention the stand, although it lies athwart his sequence of communities.)

To the west of the greywacke, there are Cretaceous sandstones, sandy mudstones, and mudstones, which together with superficial deposits of coarse greywacke gravels and angular fragments of limestone form a shelf which slopes gently towards the east (II). This shelf has mostly been cleared to pasture, but 200 acres of scenic reserve encompass Smith's "very fine stand of milling timber" in which the tawa occurs (D). Matai, rimu, and totara are again the main podocarps, and kahikatea and miro are more sparingly present. Hinau, mahoe, pigeonwood, and titoki are the most abundant hardwoods. The reserve extends from 900 ft to 1,400 ft. Tawa occurs between 1,100 ft and 1,400 ft (not at 700-800 ft as stated by Smith), mostly as small colonies among the other hardwoods, but in at least one place it forms a nearly pure second story beneath the podocarps.



Drawing by K. R. West

Fig. 2. Panoramic sketch of the catchment of Aniseed Stream, looking east.
Explanation of symbols in text.

Mountain beech extends into the podocarp-hardwood forest as tongues from the beech forest below, and as outlying clumps up to 1,200 ft.

A steep-sided ridge of limestone rises behind the Cretaceous shelf and forms the western rim of the Aniseed catchment (III). The forest here has mostly been destroyed, and the remnants (which are probably largely second growth following fire) consist mainly of ribbon wood *(Plagianthus betulinus)*, lacebark *(Hoheria sexstylosa)*, broadleaf, and kowhai, together with occasional trees of totara.

Problems concerning the forest of the Aniseed catchment are the geographical isolation of the tawa, the relationship of mountain beech to the podocarp-hardwood forest, and the patterns of regeneration of the main trees. The Aniseed tawa is 60 miles south of the nearest neighbouring stands. Does it represent chance establishment from bird-carried seed, or is it a surviving remnant of stands which may have been more extensive during the post-glacial climatic optimum? Relevant to this question are the fragmentary occurrences near Kaikoura of other northern species; Martin (1932) lists *Freycinetia banksii, Melicope ternata, Myrtus bullata, Metrosideros colensoi, M. perforata, Griselinia lucida* and *Olea cunninghamii,* and nikau may be added. Whatever the origin of the tawa stand, its confinement to the Cretaceous shelf is certainly related to the relatively fertile soils there. Its altitude is even greater than stated by Smith, and though signs of snowbreak were not obvious to me, the stag-headed condition of some larger tawa and other trees may have resulted from snowbreak which was more obvious at the time of Smith's visit.

Smith (op. cit.) expresses astonishment that tawa should occur at a higher level than mountain beech, but since the latter usually avoids limestone, it should not, therefore, be expected on the ridge above the tawa. Nor should one expect mountain beech to be prominent in association with tawa in the particularly vigorous facies of podocarp-hardwood forest which occupies the Cretaceous shelf. On the greywacke, mountain beech is mainly restricted to spurs, in keeping with its relatively light-demanding seedlings and its tolerance of dry conditions. Its scarcity at higher altitudes is probably caused by wet fogs which lie persistently on the coastal hills of the Kaikoura district. There is evidence that fogs are inimical to species of *Nothofagus* (Zotov, 1938).

The tawa colonies include a full range of size-classes. Populations of mountain beech also include a full range of size-classes, though there are two exceptions: the stand of rimu (A) includes mountain beech, but only as young trees up to eight inches in diameter; and young trees predominate in the tongues of beech which project into the podocarp-hardwood forest where the tawa occurs. These tongues, however, are crossed by a road and have been disturbed by axe and fire. To verify Holloway's interpretation of the role of mountain beech in the Aniseed forest (1954, p.398) would require careful enumeration of undisturbed populations.

The podocarps are mostly large trees (the diameter of a totara was estimated as 70 inches), while young trees are nearly absent. However, seedlings of totara, matai, kahikatea, and miro are quite plentiful, though mostly less than three feet tall. Rimu seedlings were seen in podocarp-hardwood stands only at 2,200 ft on the crest of a ridge (E), but they are not infrequent in beech stands, together with seedlings of other podocarps. An identical pattern of podocarp regeneration is found elsewhere in the east of the South Island. If, as Holloway postulates, rarity of young podocarp trees is due to a past change to a cooler and drier climate, it may be suggested that subsequent amelioration of the climate has now progressed far enough to allow further establishment of seedlings of the species which tolerate relatively low rainfall, i.e. totara, matai, and kahikatea, but not rimu.

ACKNOWLEDGEMENT

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REFERENCES

Holloway, J. T., 1954. Forests and climate in the South Island of New Zealand. *Trans. Roy. Soc. N.Z. 82(2)*: 329-410.

Martin, W., 1932. The Vegetation of Marlborough. Reprinted from the *Marlborough Express*. 46 pp.

Smith, C. M., 1935. Notes on the southern limit of *Beilschmiedia tawa*. *N.Z. J. F. 3(5)*: 222-3.

Zotov, V. D., 1938. Some correlations between vegetation and climate in New Zealand. *N.Z. J. Sci. & Tech. 19(8)*: 474-87.