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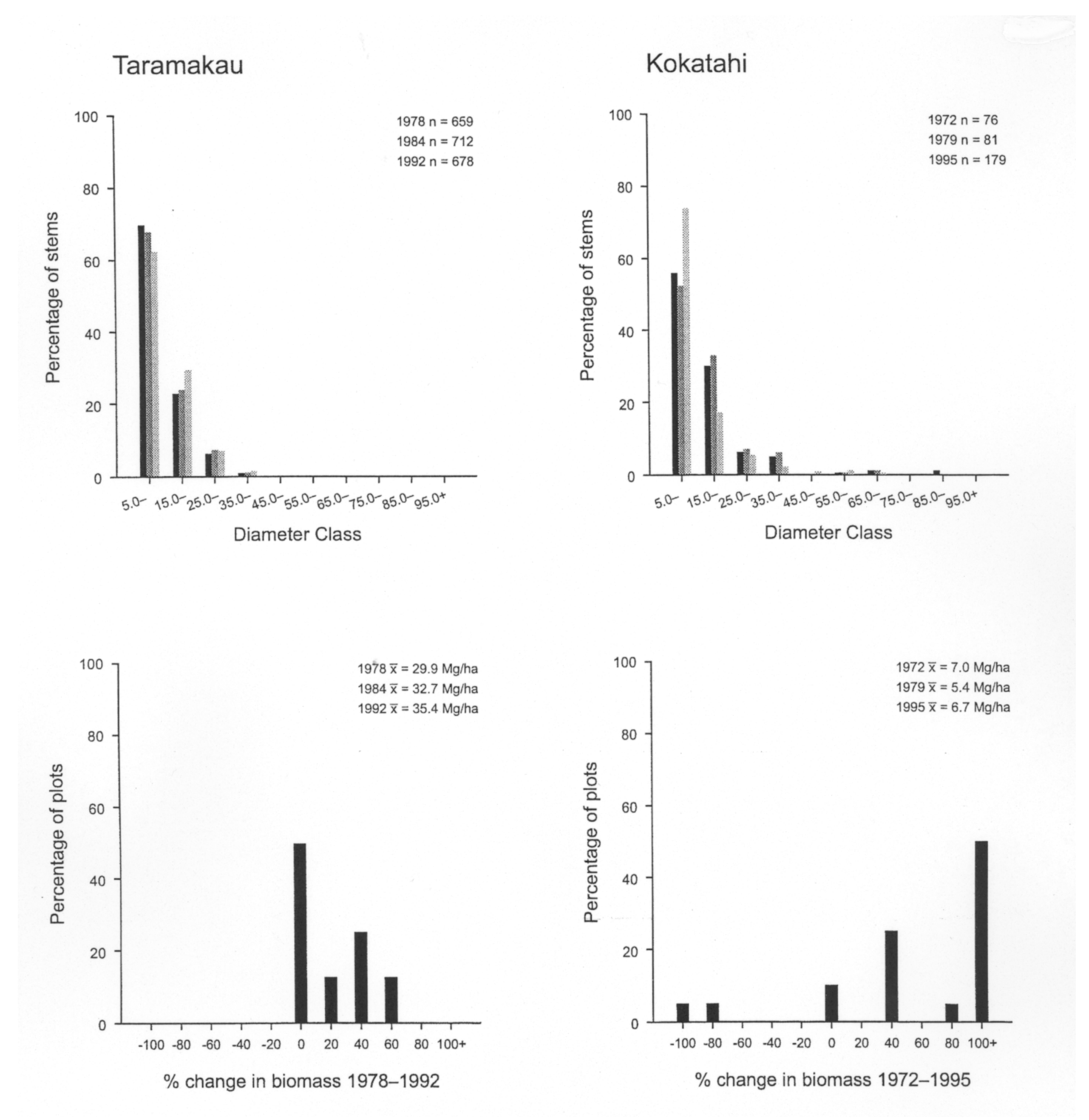
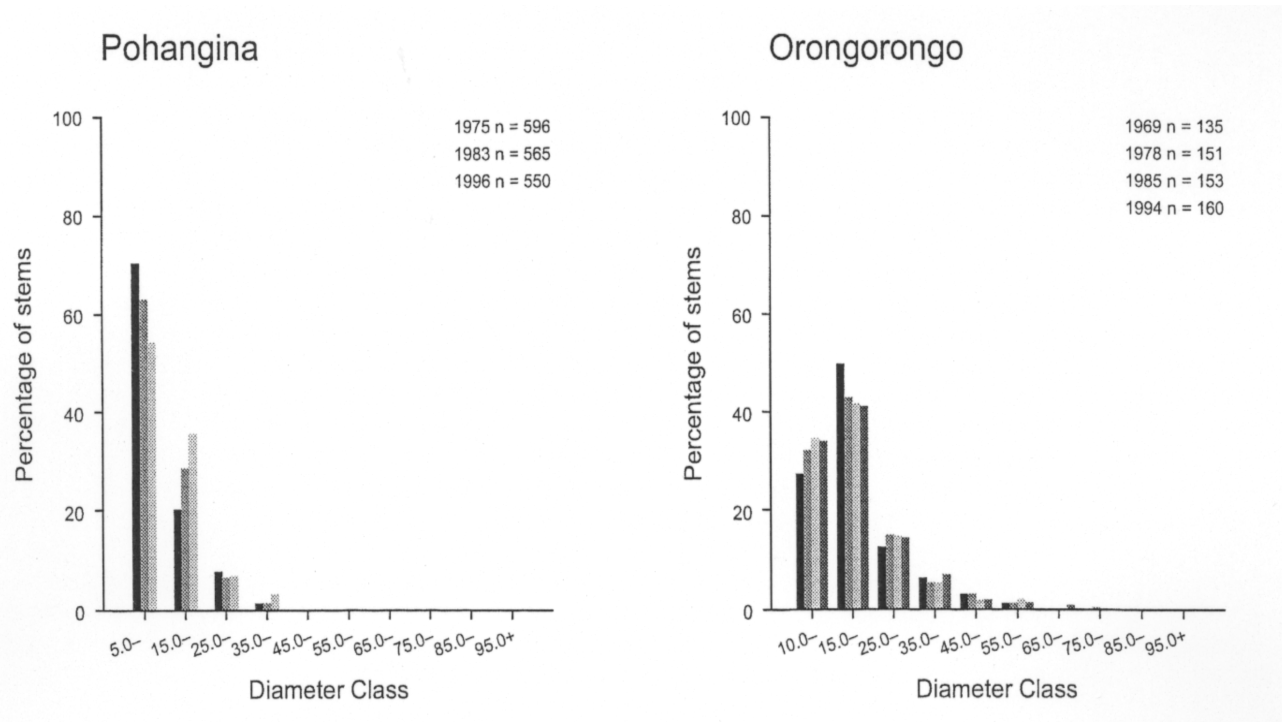


Figure 6. Changes over time in stem size-class distribution and in biomass for tawheowheo (*Quintinia acutifolia*) in two study areas. The size-class distribution is shown as percentage of stems in 10 cm diameter size-class intervals. Within each size class, bars in the histograms show the earliest census at the left and the most recent census at the right. Total numbers of stems at each census are shown. The percentage of plots exhibiting change in biomass of tawheowheo during the census period are shown, in intervals of 20% change in biomass. Total biomass at each census is shown.

5.2.2 Unchanged

*(a) Mahoe (***Melicytus ramiflorus***) (Fig. 7)*

Mahoe was common in Pohangina and Orongorongo. Stem numbers changed little over time in both study areas. Total biomass of mahoe increased slightly in both sites, but less than 1% compounded per annum. The overall increase in biomass recorded in Pohangina over 12 years is consistent with an aging population of mahoe. Among individual plots, the pattern is less clear, with



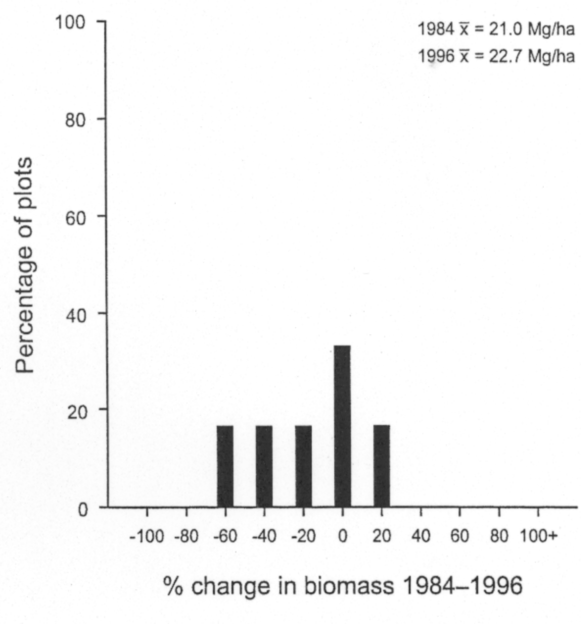


Figure 7. changes over time in stem size-class distribution and in biomass for mahoe (*Melicytus ramiflorus*) in two study areas. The size class distribution is shown as percentage of stems in 10 cm diameter size-class intervals (smallest size-class interval in orongorongo is 10 cm). Within each size class, bars in the histograms show the earliest census at the left and the most recent census at the right. Total numbers of stems at each census are shown, in intervals of 20% change in biomass. Total biomass at the earliest and most recent census is shown.

some plots showing quite large reductions in biomass of mahoe (>20%), but in most cases biomass either remained constant or increased slightly.

In Pohangina, the size class distribution of mahoe was a ‘reverse J’ heavily skewed to smaller stems. As the total number of stems in this study area declined over time, the proportion of stems in larger size classes increased. Over the 25-year census period in Orongorongo, the total number of stems increased, but the size class distribution also changed to a greater proportion of stems in larger size classes. Differences between the population structure in Orongorongo compared with Pohangina may also be because of the larger minimum diameter class (10 cm) in Orongorongo. In both sites, the size class distribution is likely to reflect an aging population of stems, with recruitment of smaller stems typically occurring by basal sprouts about original single stems.

*(b) Kamahi (*Weinmannia racemosa*) (Fig. 8)*

Kamahi was common in the three Westland study areas. In all areas, total numbers of stems remained similar throughout the census periods, and in Taramakau and Copland, total biomass of kamahi remained very similar over 14 years. In Kokatahi, kamahi biomass declined slightly, less than 1% compounded per annum, at both higher and lower altitude sites. In Taramakau, biomass of kamahi remained more or less constant over 14 years on most plots, while in Copland kamahi biomass increased slightly over 14 years in most plots but declined by as much as 100% in a few. In Kokatahi, changes in biomass of kamahi over 23 years were variable, with some plots losing as much as 100% of kamahi biomass (often the result of landslides) and others increasing by more than 100%.

Population size structures in all three study areas in Westland were 'reverse J' distributions, and showed little change over the census periods. This lack of change over time suggests a slow rate of recruitment to offset growth into larger size classes, and a mortality rate similar to the recruitment rate.

In Pohangina, kamahi was absent from the main study plots throughout the census period, although it had probably been a major canopy constituent of these plots before their establishment. In Cattle Creek, where kamahi is a major understorey tree under a canopy of red beech, kamahi declined only slightly in basal area and density over 21 years (i.e. 11.8 m^2/ha in 1975 to 10.1 m^2/ha in 1996, and 371 stems/ha in 1975 to 336 stems/ha in 1996).

*(c) Southern rata (*Metrosideros umbellata*) (Fig. 9)*

Southern rata was the dominant tree of all plots in Taramakau and Copland and a locally important component of Kokatahi plots. Total stem numbers declined in all three study areas, but only at a rate greater than 1% compounded per annum in Kokatahi over 23 years. Total biomass declined in Copland at a rate greater than 1% compounded per annum over 14 years. In Kokatahi, southern rata was an 'increaser' in low altitude plots (stem density: 32 stems/ha in 1972 to 40 stems/ha in 1995; basal area: 1.96 m^2/ha in 1972 to 2.95 m^2/ha in 1995), but at higher altitude it was a 'decreaser' in stem density (168 stems/ha in 1972 to 111 stems/ha in 1995).

Changes in biomass of southern rata at a plot level differed markedly among the three study areas. In Taramakau, the biomass of southern rata either remained unchanged or increased slightly in nearly all plots. In contrast, in Copland the biomass of southern rata declined in most plots. A more complex picture emerges from Kokatahi, where some plots lost more than 80% of biomass of southern rata, while others gained appreciably in percentage of biomass.

Population size structures of southern rata were most similar in Kokatahi and Copland, with greatest numbers in medium size classes, a few individuals in very large size classes, and relatively few in the smallest size class. During the census period, the Copland population size structure remained almost constant, while in Kokatahi the proportion of the population in medium size classes increased, and the frequency of stems in the smallest size classes declined. The bimodal size structure in the Taramakau population of southern rata was quite different from the other two study areas. Most stems were in the smallest size class; this is because of the contribution of dense, small stems, which had colonised a stabilised landslide (cf. Stewart and Veblen 1982), in a single plot.

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