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SIGNIFICANCE OF AN EARLY DATE FROM AN ADZED TREE STUMP IN NORTHLAND

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Introduction

Ogle, Jones, Sutton and Wallace (1998) have recently investigated the radiocarbon dating of a tree stump ('Ogle's stump') which had evidence of adze marks, near the site of Taumatawhana pa, Houhora, Northland. The conventional radiocarbon age of 938 ± 31 BP was obtained at the Institute of Geological and Nuclear Sciences Ltd (formerly INS) laboratory in 1971. Ogle *et al.* (1998) considered the 'inbuilt age' of the wood (see McFadgen, 1982) and assessed its contribution to the radiocarbon determination. In this brief paper we re-evaluate that methodology and question the conclusion of Ogle *et al.* (1998) that the date is reliable. We are particularly concerned with the comparison of the date with an associated radiocarbon result obtained by Elliot *et al.* (1995) from a nearby site at Lake Taumatawhana, which we think is misleading.

Radiocarbon Date

Ogle *et al.* (1998) identified the dated stump as *Podocarpus totara* or *P. hallii* (totara or Hall's totara). These species may live for more than 500 years (some specimens are estimated to be 800 or more years old: B. Molloy pers. comm. 1998) and are therefore clearly prone to a major inbuilt age error (McFadgen, Knox and Cole, 1994). The base of the Ogle tree stump, which measures 40 cm in diameter, is suggested by Ogle *et al.* (1998) to represent ~250 years. They estimated that the radiocarbon age of 938 ± 31 BP is likely to be affected by inbuilt age ranging between 50 and 200 years. Ogle *et al.* (1998) obtained a calibrated age from the radiocarbon determination of 1033-1216 AD at the two sigma level and, taking into account the estimated inbuilt age factor, suggested that a truer reflection of the age is probably

between 1080-1420 AD, or about 870-530 Cal BP.

Calibration

The method of taking the estimated inbuilt age into account when calibrating was not given by Ogle *et al.* (1998). We think that they obtained the calibrated age range of 1033-1216 AD, and then applied an estimated inbuilt age of 50-200 years: they apparently added 50 years to 1033 to obtain ~1080 AD and added 200 years to 1216 to obtain ~1420 AD. This single estimated range, then, accounts for the inbuilt age of 50-200 years. An inbuilt age of 50 years, however, will produce an older calibrated age range than a 200 year inbuilt age. We consider it more realistic to consider the estimates of error in increasing increments. We have, therefore, recalibrated the radiocarbon age using the bidecadal curve of Stuiver and Pearson (1993) incorporating the -27 yr offset to account for the Southern Hemisphere correction (McCormac *et al.*, 1998), and OxCal 2.01 which allows an 'OFFSET' to be incorporated into the calibration model (Bronk Ramsey, 1995) to account for estimated inbuilt age. This method assigns calibrated age ranges and then shifts the calendar ages after calibration using the estimated inbuilt age offsets. We applied offsets of 50, 100, 150, 200 and 250 years to the conventional radiocarbon age. The results show that the uncorrected determination produces an age range of 1030-1220 AD at two sigma. A minimal 50 year offset in age produces a calibration range of 1090-1140, 1160-1190 and 1200-1260 AD at one sigma, and 1080-1270 AD at two sigma. With a 200 year offset, we obtained an age range of 1240-1290, 1310-1340 and 1350-1410 AD at one sigma and 1230-1420 AD at two sigma. As would be expected, increasing the offset, or inbuilt, age makes the calibrated ages significantly younger (Figure 1).

The OxCal OFFSET technique is useful when the precise inbuilt age can be determined. In the case of Ogle's tree stump, only a general idea of the inbuilt age can be obtained. Our re-analysis shows that an improvement in the measurement precision of inbuilt age could result in a more useful calibration age range. In the absence of these data, the reliability of the date from the stump is obviously limited and its only real importance is that it shows the tree stump probably does not originate from some significantly earlier human occupation in New Zealand.

Interpretation

Ogle *et al.* (1998:137) stated that their calibrated age range is 'entirely consistent with the date range for earliest human environmental impact

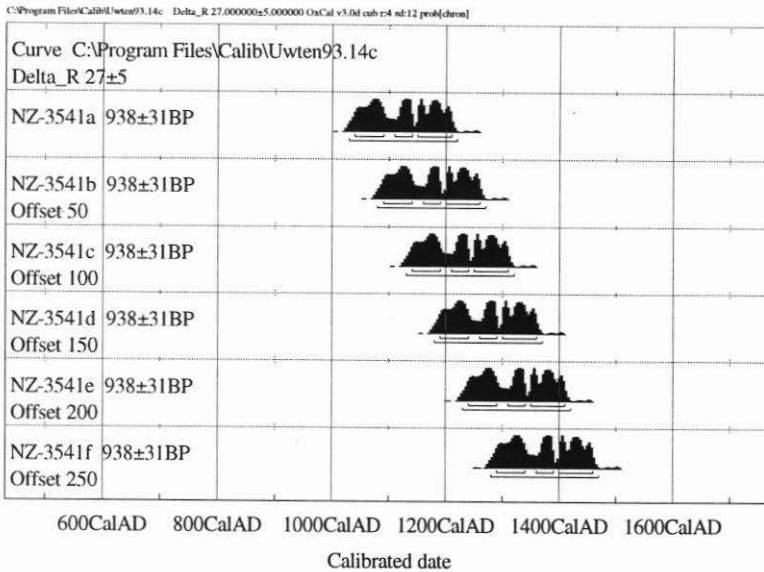


Figure 1. Calibrated age ranges for the Ogle tree stump derived using the OFFSET method of OxCal (Bronk Ramsey, 1995). NZ-3541a was calibrated with no correction for inbuilt age, subsequent samples (b-f) are calibrated with an offset which increases the inbuilt age by a factor of 50 yr.

reported by Elliot *et al.* (1995) on the basis of a pollen core from the immediately adjacent Taumatahana (*sic*) swamp'. This conclusion requires consideration. We think that the reliability of the radiocarbon dating evidence of Elliot *et al.* (1995), which purports to show 'earliest human environmental impact' (Ogle *et al.*, 1998:137), is highly questionable. Elliot *et al.* (1995) correlated a pollen record which showed a decline in forest species with replacement by a *Pteridium*-dominated community and an associated increase in charcoal in the upper sediments of the lake. They argued that this probably represented human-influenced environmental impact. The critical timing of this phase was determined using a series of AMS radiocarbon determinations from samples of bulk organic sediment. The conventional radiocarbon determinations from the recent (uppermost) zone were 1434 ± 77 BP and 1741 ± 83 BP. These results were rejected by Elliot *et al.* (1995) because of probable contamination by older carbon following deforestation and the development of pasture land by Europeans. Below these two determinations

in the core were two others: NZA-3882 (686 ± 72 BP) and NZA-3819 (913 ± 65 BP). Elliot *et al.* (1995) argued that these latter determinations were reliable and dated significant anthropogenic disturbance some time after 900 ^{14}C yr BP. Although inwash by old soil carbon probably affected the uppermost dates, the lower two, 'which indicate the period of first human impact', were perversely *not* considered to be contaminated. Elliot *et al.* (1995:914) concluded that the results provided 'the strongest argument for major human-induced environmental change', and with reference to early human presence in New Zealand that '[T]he date of *ca.* 900 BP (800 cal BP) is somewhat earlier than 700 BP suggested previously'. The calibrated age range of NZA-3819 is 1020-1160, 1170-1190 AD (one sigma) and 990-1260 AD (two sigma). Ogle *et al.* (1998), then, consider that the radiocarbon result from Ogle's stump is in agreement with these data and the conclusions of Elliot *et al.* (1995).

Recent research by Newnham *et al.* (1998) and McGlone and Wilmshurst (in press) has shown that ambiguous radiocarbon chronologies often result at sites such as Lake Taumatawhana, and that they cannot be expected to provide reliable chronological data relating to the earliest phase of human colonisation in New Zealand. They have shown that radiocarbon chronologies from sediments in lakes and swamps are almost always prone to the influx of old carbon. In the absence of independent tephrochronological evidence, the radiocarbon results can therefore be misleading. McGlone and Wilmshurst (in press) have analysed radiocarbon determinations from sediment sampled from many natural sites in New Zealand in which inferred anthropogenic influences are archived and shown that lake sediments and swamps produce older radiocarbon ages than those of bogs and ombrogenous (raised) mires. This is due mainly to inwash of old carbon. Radiocarbon results which at face value support Sutton's (1987) suggestion of a possible earlier settlement of New Zealand tend to come from such lake and swamp environments (McGlone and Wilmshurst, in press). McGlone and Wilmshurst (in press) have also questioned the AMS date of NZA-3819 from Taumatawhana in the light of these conclusions and suggested that it is imprecisely sampled from a rather excessive 6-cm-long section of lake sediments in the core. They also identified a peak in sand-sized particles between 875 and 1200 mm in the core from the sampling position, and suggested that this influx confirms catchment erosion and inwash of old carbon presumably at the time of forest clearance. We point out that a similar conclusion about reworking, on the basis of coarsening grain size and sediment chemistry, was reported by Elliot *et al.* (1997) for their palynological study of the Wharau Road Swamp in

Northland - but in this case the deforestation event was estimated at *ca.* 600 ¹⁴C yr BP.

McGlone and Wilmshurst (in press) and Newnham *et al.* (1998) concluded that because of the problematic nature of dating human environmental impact at sites such as Lake Taumatawhana, great caution is required in the interpretation of results which are considerably older than that established from archaeological sites. Rather than providing, as Ogle *et al.* (1998:138) argued, 'a perfectly reasonable date that directly corresponds to independent evidence provided by palynology', we think the date is affected by an inbuilt age offset which is not well understood, and corresponds to a lake sediment-based deforestation chronology which is similarly unreliable.

Archaeological evidence of first colonisation and settlement in New Zealand generally produces less contentious radiocarbon results than palaeoenvironmental based studies such as those described at Lake Taumatawhana. Recent analyses of the radiocarbon determinations from archaeological sites in New Zealand, for instance, show no secure evidence for colonisation before ~1250 AD (700 Cal BP) after erroneous determinations are set aside (McFadgen, Knox and Cole, 1994; Higham and Hogg, 1997). These studies not only support Anderson's (1991) late settlement model, they suggest an even more recent occupation. Palaeoenvironmental investigations at sites which contain the isochronous Kaharoa Tephra further support this conclusion. Newnham *et al.* (1998) examined around twelve North Island pollen profiles containing both Kaharoa Tephra and palynological indications for the onset of significant deforestation and sustained rise in open land *Pteridium esculentum* (bracken) spores and charcoal. The inferred deforestation occurs at close to the time of deposition of the tephra, which is dated by cluster analysis of multiple radiocarbon ages at 665 ± 15 BP (1300-1390 AD) (Lowe *et al.* 1998). Thus, the earliest deforestation signals are close to 1300 AD, consistent with the fact that no human cultural remains have been identified with confidence beneath the Kaharoa Tephra (Anderson, 1991; Shepherd *et al.* 1997).

Wilmshurst (1997) and Wilmshurst, McGlone and Partridge (1997) have shown that in the Hawkes Bay region forest clearance by Polynesians proceeded rapidly and the dates of deforestation are similar to those from other North Island sites (i.e. ranging between 450 and 700 ¹⁴C yr BP). Wilmshurst (1997) suggested that the similarity in the ages at most of these sites suggests that deforestation across the northern parts of New Zealand was

virtually simultaneous. A similar finding was reported by Ogden, Basher and McGlone (in press) for New Zealand as a whole. Taken together, these data therefore suggest sustained human settlement and subsequent palaeoenvironmental impact beginning sometime after ~1250-1300 AD (Lowe *et al.* in press).

Conclusion

In contrast to Ogle *et al.* (1998), therefore, we think that the date from Ogle's stump does not correspond perfectly with the earliest phase of human presence in Northland for two principal reasons. First, the dating of inferred earliest human presence in the nearby lake at Taumatawhana is flawed and unreliable, being clearly affected by old carbon inwash and therefore too old. Consequently, a comparison between this date and the date of the tree stump is unjustifiable. Second, evidence from securely dated archaeological, tephro-palynological and botanical investigations suggests strongly that colonisation occurred after ~1250 AD. In our view, the result from Ogle's stump is of interest only in the fact that it provides an age close enough to the accepted phase of human prehistory in New Zealand such that, when inbuilt age is considered, it is reasonably close to that era.

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