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TARO IN THE BAY OF ISLANDS

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A study is being made of the variation and distribution of taro (Colocasia esculenta) in New Zealand. This work has two purposes: botanical exploration, and to provide new information for the discussion of the origins and development of horticulture in New Zealand.

In May 1982 the opportunity was taken to work in the Bay of Islands area with members of the Department of Anthropology, University of Auckland (Sutton, 1982; see Fig. 1). The aims of the one week of field work were:

1. To establish what distinct forms are present in the Bay of Islands.
2. To search for sites with wild taro, and to determine by casual observation something of the extent of present cultivation as a food crop.
3. To collect samples for propagation and for counts of 2n chromosome numbers.
4. To attempt application in the field of a scheme for classifying the historical status of taro sites.

This paper records initial observations on the morphology and distribution of two forms of taro found wild in the Bay of Islands. Some problems inherent in the study of New Zealand taro are identified in the light of these observations and historical evidence.

Chromosome numbers have been used to identify likely routes of introduction of taro cultivars into the Pacific (Yen and Wheeler, 1968; Cable, 1982). Little new information appears to have been published since the 1968 paper. An origin for New Zealand plants in Melanesia was indicated by the discovery in both New Caledonia and New Zealand of plants with chromosome numbers of $2n=42$. The $2n=42$ number has not been reported for any other location in Melanesia or Polynesia. On the other hand, taro with the chromosome number $2n=28$ have been found throughout the South Pacific. The 42-chromosome form has been reported in New Zealand on the Cavalli Islands (Rattenbury, 1956), Spirit's Bay and Great Barrier Island (Yen and Wheeler, 1968). Yen and Wheeler drew no definite conclusion from their discussion of whether this likely introduction from Melanesia occurred before or after the arrival of Europeans.

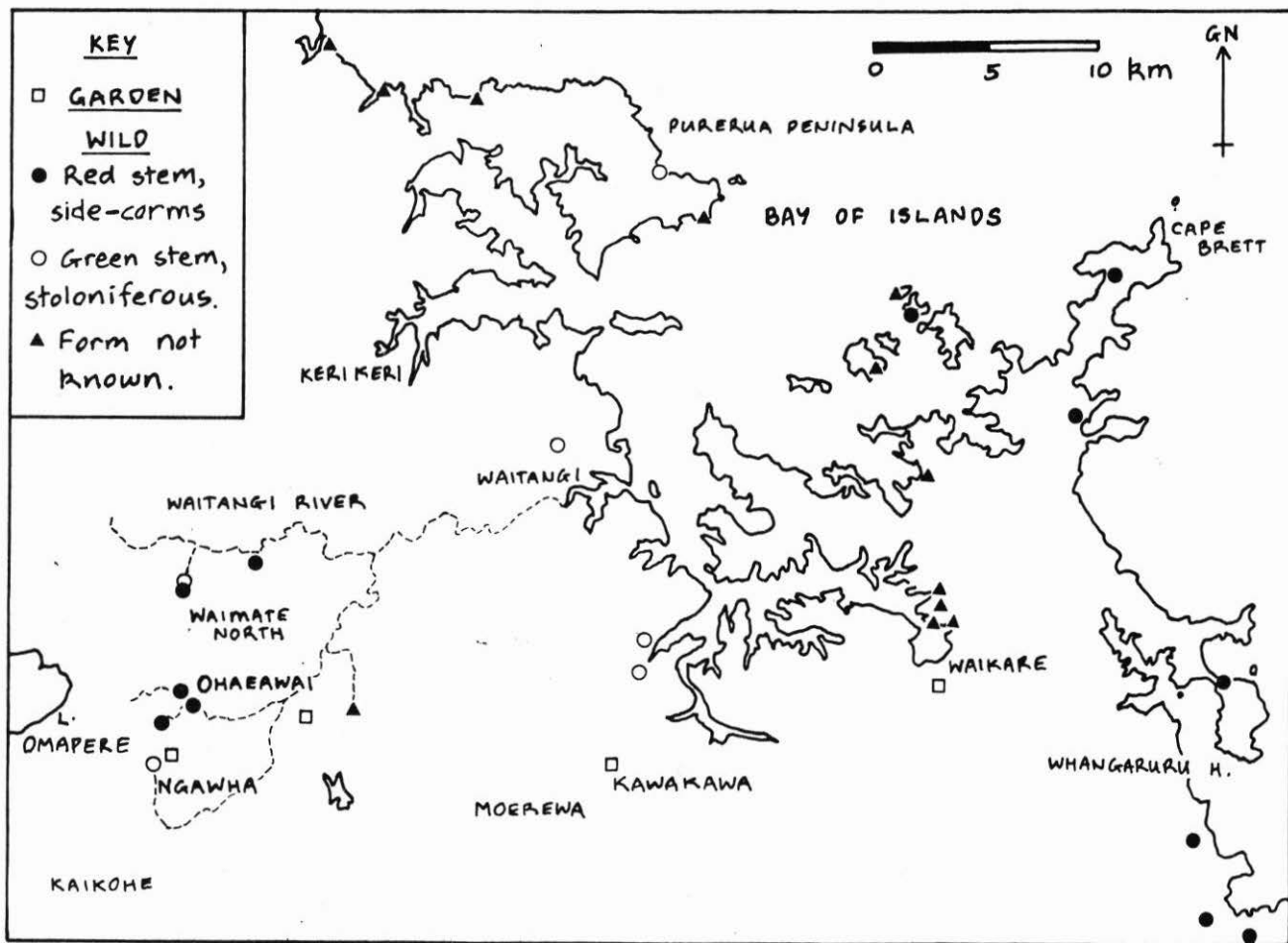


FIGURE 1. Distribution of taro in the Bay of Islands district.

The present study of New Zealand taro is aimed at establishing whether or not taro of $2n=42$ can be assigned definite pre-European status in New Zealand. The study must show how varieties are distributed, and whether $2n=42$ taro exists in such wide distribution or in such remote sites that introduction only after the arrival of Europeans seems unlikely.

Plucknett *et al* (1970:414) and Purseglove (1972:61) note that the taxonomy of Colocasia is confused and that cultivars exhibit considerable variation. Both authors follow Hill (1939) in recognising only one polymorphic species, namely Colocasia esculenta (L.) Schott. This nomenclature is used by Healy and Edgar (1980) for taro in New Zealand. Plucknett *et al* (1970) and Purseglove (1972) do not mention stolon formation by Colocasia, but cultivars which produce stolons are briefly discussed by Wilson (1982:284).

Taro is primarily adapted to moist environments but can grow under a wide range of moisture regimes (Plucknett *et al*, 1970:416). The survival of different forms of taro in New Zealand streams or other locations thus provides no indication of how these forms were cultivated. Evidence on pre-European cultivation techniques, wetland or dryland or otherwise, may be found by the study of archaeology, early ethnographic records, and perhaps from present-day cultivators of taro.

Observations of flowering plants by Cooper (1969) and by the present author indicate the viable seed is not produced in New Zealand. Natural dispersal by seed almost certainly never occurs here.

Field method

Most sites were located by conversation with farmers and members of Maori communities. To make best use of travelling time, new road routes were taken each day and roadside streams viewed from the elevated position of the rental van passenger seat. Permission was sought before removing plants. Plant samples (cut tops of corms, corms, cormels and stolons with nodes) were washed, wrapped damp in newspaper, and stored in unsealed plastic bags in a refrigerator until the return to Auckland.

Results and discussion

Variation. Two morphologically distinct forms of taro were found in the Bay of Islands. Both forms have been illustrated by Matthews (1982:81) using material from outside the Bay of Islands. Although a number of botanical varieties have been described outside New Zealand, it is too soon to assign varietal names to the present forms.

Plate 1 shows the acutely lobed, peltate leaves of the form which produces stolons. Cormels were found infrequently on plants of this form. Leaf blades and petioles are a light green. Petioles of up to approximately 2 m height were observed.

Plate 2 shows the broadly lobed leaves of the form which produces cormels. Stolons have not been observed on plants of this form. Leaf blades are a dark green on the upper surface and light underneath. Petioles have variable red coloration.

A third form is known from the Bay of Islands, but no plants of this form were seen during the May trip. Plants from a garden at Pakaraka (inland Bay of Islands) have been propagated near Whangarei (K. Reynolds, pers comm.). Plate 3 shows the Whangarei stock with a small central corm and many cormels sprouting around it. The petioles of this form are green.

Distribution. The known distribution of taro through inland and coastal areas of the Bay of Islands is shown in Figure 1. Most sites on the Purerua Peninsula and in the eastern Bay of Islands have not been seen or visited by the author. They have been located by the reports of residents and visitors, and by a computer search of the N.Z.A.A. site records in the New Zealand Historic Places Trust Site Index. The oldest record not since reconfirmed is from about 1953. All the sites shown between Waitangi, Kawakawa and Kaikohe were either seen or visited during May 1982. All sites are recorded in a Botany Department site register. Where appropriate, records will be copied for the N.Z. A.A. archaeological site record file. To protect sites, details of location are not published.

The gardens shown in Figure 1 are those in which plants are grown as a food crop, with cultivation of the soil. Ornamental gardens are not shown, although two were recorded. Gardens were only viewed from the road, despite their potential ethnographic importance, because present interest centres on wild taro sites. For this reason identifications of morphological form can not be given in Figure 1.

Cultivation of taro appears on casual observation to be quite common in the Bay of Islands. Contemporary cultivation in Northland is reported by Ishida (1966:134) and Yen and Wheeler (1968: 264). On the return to Auckland via southern Hokianga, fifteen food gardens were counted from the main highway. Further south, cultivations were seen at Kaihu near the west coast.

The distribution of wild taro is the product of two factors: transfer and planting by people, and natural dispersal by water. Wild taro sites are those in which propagation is all or almost

entirely by natural means, and in which the soil is not cultivated. Many wild taro sites, whatever their origin, are used with varying frequency as food sources. For example, it was learned that taro growing in natural light, boggy ground, behind a marae, is occasionally used during occupation of the marae. Unwanted corm tops and small cormels are replanted at the time of digging. The site has been classed as wild although it lies near the head of a stream and therefore almost certainly arose by planting at the site.

The above example and many other sites could be placed in a category of semi-wild. However, since information on use cannot be obtained consistently, both fully and semi-wild sites are identified wild in Figure 1.

Wild taro in New Zealand may have had some importance as a food source in pre-European times also, even if taro cultivation was common. Although taro is commonly cultivated, wild taro found in streams and under bush is an important green vegetable for villages throughout Fiji (Thaman, 1982:208-9).

Natural dispersal down streams appears common and was reported by farmers visited during May. One patch was reported washed out in a recent flood of a Waitangi River tributary, with subsequent colonisation of swamp down stream.

A wild taro site at Ngawha (Plate 4) was photographed eleven years ago in 1971 by R.C. Cooper, then botanist at the Auckland Institute and Museum. The stoloniferous plants still found there grow in light, boggy ground for a distance of over half a kilometre. In the wet ground the patch could have survived from the scrub or forest burnoff suggested by a surviving stand of large tree ferns.

Taro growing in a swamp in the Waitangi State Forest may have an origin predating the late 1930s clearance of regenerating forest in this area (Mr Olsen, Forest Ranger, pers. comm.).

Both forms encountered in the wild have widespread distributions within the Bay of Islands. There is an indication that the stoloniferous form may be absent from the eastern Bay of Islands, but field work in the area is needed to establish this point.

The present evidence on distribution suggests that both forms are possibly of pre-European origin. More field work to locate remote sites such as that found in the Waitangi State Forest may provide circumstantial confirmation or otherwise of this suggestion. So too might a search for wider distribution both within and beyond the Bay of Islands.

Collection of propagating material. Samples were collected from ten of the eleven sites visited in the area. Reference numbers for the plants now held in Auckland are AKL 21 to AKL 31. Chromosome counts have not yet been made. A collection of plants is being assembled in Auckland at the Department of Botany and at the Department of Scientific and Industrial Research, Mt Albert.

Classification of historical status. Prior to field work a scheme was developed for classifying in a consistent fashion the historical status of taro sites. Categories (definitely old, probably old, probably recent and definitely recent) were defined on the basis of geographical distance from present settlements and taro cultivations. The basic assumption used was that geographically remote sites have a greater probability of pre-European origin. Such a classification would, in a circumstantial way, aid interpretation of the distributions of different taro varieties. Different varieties might be found consistently in sites of a particular assigned historical status.

The scheme was found impossible to apply for two reasons which became obvious in the field:

1. The shifting nature of settlement patterns within post-European contact times. Remains of post-contact settlement were frequently met in the field.
2. The strong likelihood that cultivation and transfer of taro has continued from pre-European times to the present day. Early European records exist of taro cultivation in the Bay of Islands. Gardens may have been abandoned or provided a source for natural dispersal at any time.

A geographically wide picture of distributions may nevertheless show general pre-European patterns if most movement of plants by people and natural dispersal has taken place within local communities. Diamond (1982) however records the use of taro by Northlands' bushmen and other poor rural transients in the first half of this century. These people transferred plants as well as using plants found growing wild.

Further consideration of the above factors affecting taro distribution will be necessary as the study of New Zealand taro proceeds.

Historical records

Wild taro is today distributed on a number of tributaries of the Waitangi River. European records of taro in this catchment span most of the nineteenth century (Nicholas, 1817 I; Cheeseman, in Cooper, 1969).

In January 1815 (Leach, 1980:136) Nicholas, in the company of Samuel Marsden, crossed the Waitangi River after staying at a village on its banks (Nicholas, 1817 I:332). Four miles further he encountered thirty to forty acres of kumara and potato plantations at the edge of forest. After passing half a mile through forest he came to Waimate, a fortified village at the summit of a lofty hill. He writes:

"In the plantations adjoining this village, I observed a plant very common in our West India settlements, where it is called tacca. It does not appear to me that this plant is indigenous to New Zealand, but must, in my opinion, have been brought hither, either by Captain Cook or some other European navigator who has visited the country."

(Nicholas, 1817 I:351)

Nicholas also describes the cultivation method at Waimate: plants were in rows 18 inches apart, with the earth dug up and pressed around the roots of each plant. Cheeseman, in February 1895, collected a taro flower at Waimate. The specimen is lodged at the herbarium of the Auckland Institute and Museum and has been described by Cooper (1969).

A number of records exist of the nineteenth century cultivation of European crops in the vicinity of the Waimate Mission Station (see Leach, 1980). These records were made at different times by the various European visitors to the Mission Station. Wade (1842:18) describes for January 1838, wheat being gathered in at Rangaunu, close to the Mission Station. He notes that the missionaries introduced European crops amongst the Maori, and that throughout the island the Maori have potato cultivations and in many parts, kumara, taro, maize, pumpkins and gourd. He also states (ibid:20) that taro is rarely planted to any extent because it fails to multiply at the root like potato. Wade presumably refers to the extent of planting within cultivations.

Three points may be made with regard to the above records:

1. Identifying the origin of New Zealand taro was a problem for Europeans from the time they first observed the plant here. The opinion expressed by Nicholas in 1817 probably reflects ignorance of the Pacific-wide distribution of taro and the voyaging capabilities of Oceanic peoples.

Accepting that taro was introduced to New Zealand in pre-European times does not however deny the suggestion that it was introduced by Europeans from other European colonies.

2. Taro was displaced in importance by European crops by the early nineteenth century, but nevertheless remained in wide dis-

tribution in Maori cultivations. Hargreaves (1959:62,64) notes notes that by the time the first European settlers arrived in the North Island, Maori agriculture had developed to such an extent that it was able to provide the settlers with regular supplies of pigs, potatoes, maize and wheat.

3. It is possible to speculate that Wade had observed roots of the stoloniferous taro. This is the only form known to the present author that does not multiply at the root by forming cornels that would make extensive planting easy. There is thus a hint that the stoloniferous form presently growing in the Waitangi River catchment was also observed there last century. It is not known with which vegetative form the 1895 flower is associated.

Conclusions

The present field evidence together with historical records strongly suggest that taro found today in the Bay of Islands is the same stock as that grown in Maori cultivations early last century.

Taro has probably persisted since that time for two main reasons:

1. The plant readily grows in the wild and self-propagates vegetatively.
 2. The plant has probably never fully ceased to be used and cultivated as a food crop.
- Further, by either or both of these mechanisms taro has undoubtedly persisted in the Bay of Islands and elsewhere since pre-European times. Taro of pre-European origin may also persist today in ornamental gardens.

Archaeological evidence may establish the pre-European antiquity of taro cultivation practices, but is unlikely to include remains of the soft, herbaceous taro plant. Evidence for the pre-European antiquity of particular forms of taro found wild in New Zealand may come from further study of their distribution. For very recent introductions, in the present century, direct evidence may come from importers and cultivators.

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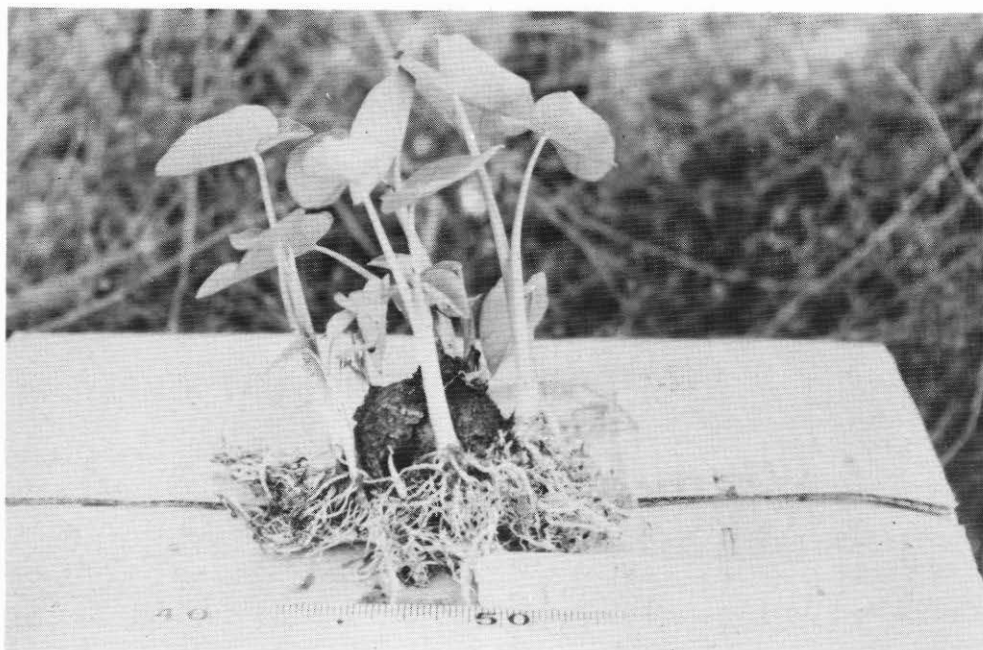
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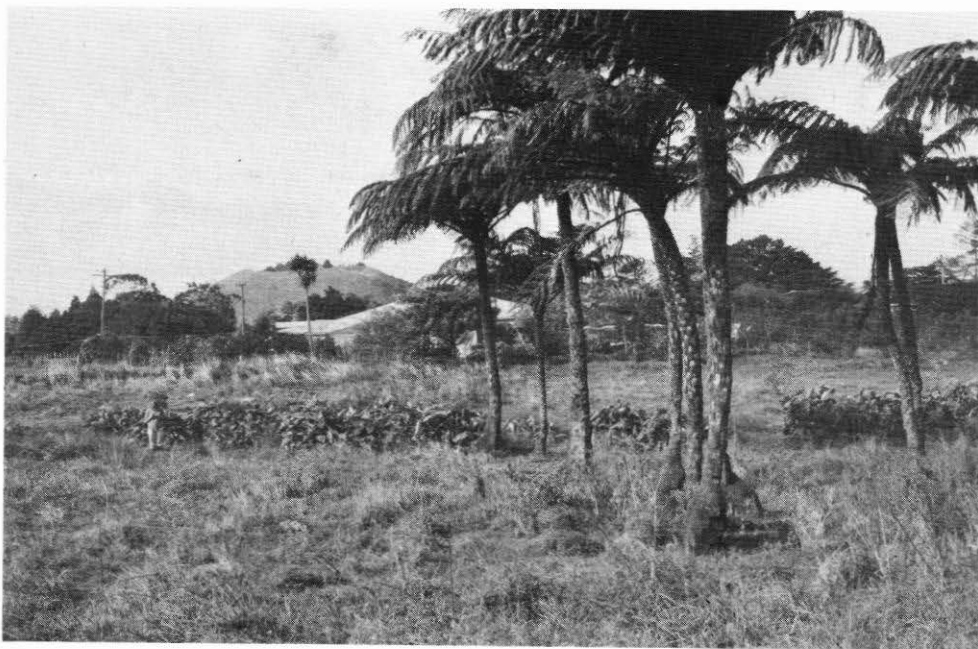
TARO Plate 1. Acutely lobed, peltate leaves of stoloniferous form.



TARO Plate 2. Broadly lobed leaves of form which produces cormels.



TARO Plate 3. Whangarei plant.



TARO Plate 4. Taro at Ngawha, May 1982.