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An Overlooked Naturalized Aroid for the Hawaiian Flora

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Introduction

In 1990 the Bishop Museum published (with the University of Hawaii Press) the *Manual of the Flowering Plants of Hawai‘i* (Wagner *et al.*, 1990) and thereby ushered in a new era of botanical endeavor in the Hawaiian Islands. The publication of any definitive reference work seems inevitably to result in an outpouring of information not included in the reference. This has certainly been the case with the *Manual*. From many quarters botanists, conservationists, and land stewards came forward with information not contained in the *Manual* concerning the occurrence, identity, abundance, distribution, ecology, and reproductive biology of native and naturalized plant species. The principal authors are now compiling these new data in preparation for a revised second edition of the *Manual* (D. Herbst, pers. comm.).

In particular, a number of taxa were pointed out as “missing” from the *Manual* or at least not recorded from islands where they are well known to occur. Some of these seeming omissions are attributable to the criterion for inclusion in the *Manual* that was established by the authors at the start of their work. In deciding the scope of coverage, they adopted a conservative approach: they included taxa only if they were supported by voucher specimens deposited in herbaria. Thus, absence of a plant taxon from the *Manual* may be an artifact based on the paucity of that taxon in the herbaria that were consulted and bears no relation to the taxon’s abundance in the environment.

This note reports a naturalized aroid common in the Hawaiian flora that was omitted from the *Manual*, apparently because there were no voucher specimens for it in the herbarium of the Bishop Museum (BISH), the principal repository for the vouchers on which the *Manual* was based. While it seems incredible that a conspicuous and widespread species, present in the Hawaiian Islands for at least half a century, has never previously been vouchered for the BISH herbarium, that is the case insofar as we can determine.

Statement of the Problem

As early as 1993, one of us (KW) pointed out that a large aroid of the “elephant ear” type, widespread in the Hawaiian Islands as a naturalized plant, was missing from the *Manual*. Two similar-sized aroid species having this habit of growth are abundant in sunny places along roadsides, in pastures, wet meadows, and forest margins in mesic habi-

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tats. Both are called by the Hawaiian name *'ape*; Neal (1965) identified one as *Alocasia macrorrhiza*[1] (L.) Schott and the other as *Xanthosoma robustum* Schott [Syn. *X. roseum* Schott], noting however that *'ape* is applied to other species of *Xanthosoma* as well. After comparing living plants with the descriptions, keys, and illustration presented in the *Manual* (Croat *in* Wagner *et al.,* 1990) it was clear that *A. macrorrhizos* was treated there with no mention of any species of *Xanthosoma*.

In order to identify the naturalized *Xanthosoma* with certainty it was necessary to collect and photograph fertile plants. In our experience, these plants flower erratically and some populations we observed do not seem to flower at all. The few flowering events we have detected all occurred during short-day months between November and February. Fruits have not been observed. After more than 2 years of observation, flowering material was finally collected in 1995 from plants cultivated at the Waimea Arboretum and Botanical Gardens, which had been accessioned from a naturalized population growing along the stream that runs through the Arboretum grounds. These vouchers and 35 mm color slides were sent to the Smithsonian Institution, Department of Botany, for identification. This single fertile collection was identified as *Xanthosoma roseum* Schott by Dan Nicolson, an aroid specialist.

The application of the name *X. roseum* must be considered provisional, as there is no comprehensive monograph of *Xanthosoma* presently available that sorts out the taxonomy and nomenclature for the genus. Furthermore, the Hawaiian botanical and horticultural literature contains a number of names that have to be investigated and satisfactorily placed before the name *X. roseum* can be confidently accepted as the correct one for these naturalized Hawaiian plants. It is possible that more than one species, or hybrids, may be involved. We feel it worthwhile to call attention to the problem in order to encourage field collectors to make additional vouchers, photographs, and observations of the plants here provisionally called *X. roseum* in order to generate sufficient new information to make a better identification.

The account of the Araceae that appears in the *Manual* (Croat *in* Wagner *et al.,* 1990) should be modified to include the genus *Xanthosoma* and the naturalized species *X. roseum*. Preparation of full descriptions and revised keys must await the second edition of that work, and also, hopefully, the completion of the revisionary study of *Xanthosoma* currently underway by Sue Thompson, Carnegie Museum of Natural History, Pittsburgh, PA. In the interim, the following diagnoses present the characters we have found useful for differentiating the genus *Xanthosoma* from *Alocasia* and *X. roseum* from the similar-appearing *Alocasia macrorrhizos*. Living material or good color photographs are essential for making an identification.

Diagnosis of genera:

Spadix with a sterile appendage, fertile staminate flowers confined to a narrow band in the lower portion, sterile staminate flowers extending to the apex; ovary 1-celled; ovules 1–few per cell; berries 1–few-seeded ..... **Alocasia**

Spadix without a sterile appendage, fertile staminate flowers extending all the way to apex; ovary 2–4-celled; ovules several to many per cell; berries many-seeded ..... **Xanthosoma**

1. D. Nicolson (*Taxon* 35: 326–28, 1986) pointed out that the correct orthography for this species epithet should be spelled *macrorrhizos.* It is so spelled throughout the remainder of this paper.

Diagnosis of *'ape* species (elephant ear) naturalized in Hawaii:
Leaves erect to arching, blade and petiole forming one smooth arc, apex (especially of youngest leaves) upward-pointing; petiole and underside of blade glossy green, not at all glaucous, upperside of blade glossy medium green; open portion of spathe whitish to yellowish ..... **Alocasia macrorrhizos** (L.) Schott

Leaves spreading or deflexed, the blade set at an angle to the petiole, apex usually downward-pointing; petiole and underside of blade glaucous with a ± dense whitish bloom, upperside of blade dull (not glossy) dark green; open portion of spathe cream flushed pinkish ..... **Xanthosoma roseum** Schott

Distribution in the Hawaiian Islands

Xanthosoma roseum is commonly naturalized in mesic habitats such as roadside swales, banks of freshwater courses (streams, canals, ponds, etc.), moist forest margins, and disturbed sites near human habitations and agricultural fields on Oahu and Kauai; it is also sparingly cultivated. On Kauai, *X. roseum* has been observed in several localities (T. Flynn, pers. comm.) and one of these has been vouchered. It has also been observed at several locations on Maui (R. Hobdy, pers. comm.) though no herbarium vouchers exist to document these sight records. Its status on the other Hawaiian Islands is uncertain, though we suspect it is present and naturalized on all islands where suitably moist habitats are found. Further vouchers and observations are desirable to broaden our knowledge of the existence, identity, and precise distribution of this naturalized aroid in the Hawaiian Islands. Despite the plants presence here for more than half a century, the following recent voucher specimens appear to be the first documentation for this species' existence in Hawaii.

Material examined. KAUAI: Halelea Distr., Hwy. 55 fronting Maniniholo Cave, 15 Feb 1990, *T. Flynn 3768* (2 sheets PTBG). OAHU: Haleiwa, Waimea Arboretum & Botanical Gardens, cultivated in the living collections (accession 73p59)[2], 16 Jun 1995, *K. Woolliams s.n.* (BISH sheets 641379, 641380), same loc., 2 Nov 1995, *Waimea Arboretum staff [D. Orr] s.n.* (BISH sheets 642260–642266); Kane'ohe, roadside along Kamehameha Hwy., just E of H-3 Hale Kou interchange, 5 Nov 1996, *G. Staples 1131* (5 sheets BISH).

Ethnobotanical Observations

For several years we have seen unidentified aroid petioles sold in Southeast Asian markets in Honolulu's Chinatown. These are 3–6 feet in length, as much as 4 or 5 inches in diameter at the base, deeply grooved in the lower half and elliptical in cross-section in the upper half. The outer surface is covered in a whitish waxy bloom that rubs off when the petiole is handled while the inner core is spongy, with large air spaces embedded in a translucent whitish matrix that has a texture like plastic bubble-wrap. The petioles are sold as vegetable and one of us (GS) has eaten them in Vietnamese restaurants. The petiole is peeled, thinly sliced cross-wise and laid on the surface of very hot soup; the steam rising from the soup lightly cooks the slices, which retain a crisp texture that contrasts with the cooked vegetables and seafood in the soup itself. We were unable to identify the source of this aroid petiole for several years, but it seems to us that they can only be *X. roseum*. The size, color, and texture of the market product matches exactly those of the plants we have observed and collected. It is quite possible that the petioles sold in Chinatown are being gathered from naturalized populations by enterprising businessmen.

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2. This accession was obtained from a naturalized population that occurs wild along the Kamananui Stream, which runs through Waimea Falls Park, between Waihe'e Falls (often called Waimea Falls) and the river estuary.

We found no mention of *Xanthosoma* petioles being eaten in recent local literature but a much older publication on oriental vegetables in Hawaii contained an interesting reference that caught our eye. In the booklet *Utilization and composition of oriental vegetables in Hawaii* (Chung & Ripperton, 1929) an edible petiole is described thus: "The variety which is known on the market as Tow-Imo is 4 to 6 feet long and 2 to 4 inches thick at the base. It is light green and may or may not be covered with a bloom or whitish substance. This variety is cultivated primarily for the edible petioles." Interestingly, Chung and Ripperton thought this large petiole was a cultivated form of *Colocasia esculenta*, the taro plant. We have never seen taro petioles 4–6 feet long and suspect that these edible petioles are actually *X. roseum*.

Conclusion

One fact is clear: much work remains to be done to adequately document the naturalized component of the Hawaiian flora. The 6 years that have elapsed since publication of the *Manual* (Wagner *et al*., 1990) have demonstrated that, generally speaking, while there is adequate representation for endemic and indigenous Hawaiian taxa in herbaria, inadequate voucher material exists for many of the plant species introduced to the Hawaiian Islands. This applies to taxa considered to be adventive weeds, naturalized, and cultivated. Preparing adequate voucher material of **all** plant taxa that occur in the Hawaiian Islands and depositing those vouchers in recognized herbaria where they form a permanent record for the existence, identity, distribution, and abundance of those taxa is a highly desirable goal for the botanical community.

We do not think that the example described here is unique by any means. While it is true that "Aroids make notoriously bad herbarium specimens . . . " (Hay & Wise, 1991) and for that reason collectors tend to avoid them, other equally conspicuous taxa may be overlooked or deliberately avoided by collectors. In Hawaii, as in many places, there seems to be a bias against collecting introduced plants in general, yet this is shortsighted. If it is true that introduced plants comprise the single greatest biotic threat to the Hawaiian flora, then we can scarcely expect to understand the extent and depth of the problems introduced plants cause without adequate documentation for what they are, where they are, and how abundant they are, can we?

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