

# **Reinterpretation of Stone Fish Weirs mentioned to Freycinet in 1819 on Guam**

Boyd Dixon  
CARDNO GS Inc.  
Tamuning, Guam

## **Abstract**

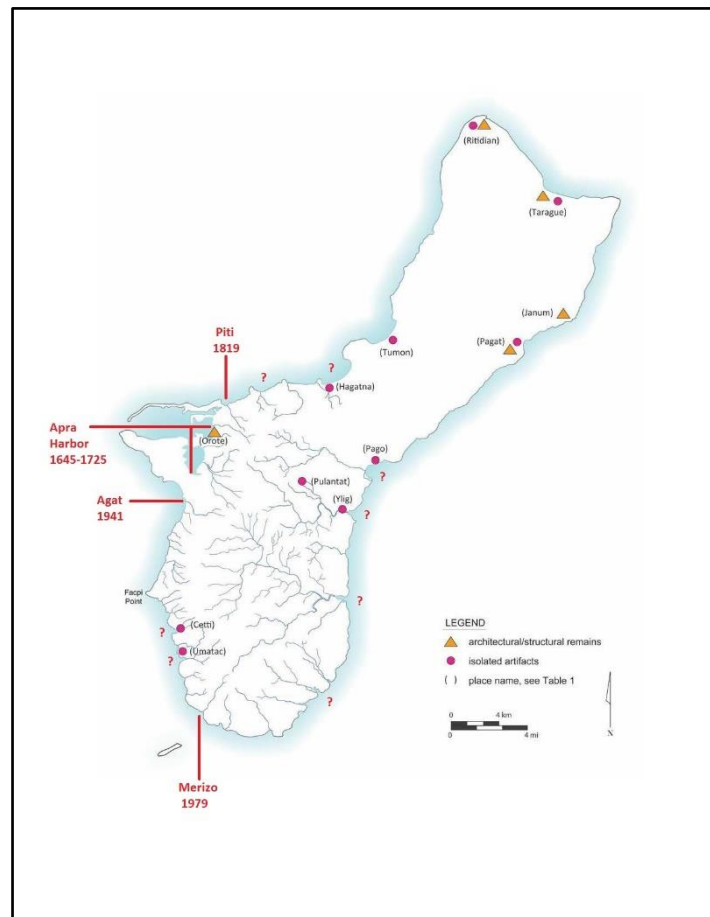
*In 1819 the French Corvette L' Uranie anchored off Apra Harbor on Guam where its captain Louis Claude de Freycinet was told of the former presence of stone fish weirs, no longer in use. Archaeological surveys of Apra Harbor tidal flats identified several low-walled coral enclosures at the mouth of two freshwater estuaries. Controlled excavation of small sites adjacent to one of these complexes yielded late Latte Period pottery and wood charcoal radiocarbon dated with a Bayesian calibration to A.D. 1645-1725. Besides Chamorro fishermen using the weirs to feed local populations, it is plausible they were expanded to feed visiting sailors during the seasonal arrival of the Manila Galleons. More challenging to former notions of Colonial domination is archaeological evidence documenting the continuity of communal aquaculture practices well after sustained Contact. The apparent resistance of Chamorro fishermen to La Reduccion circa 1700 is provocative, especially after the introduction of Eurocentric food ways and enforced settlement patterns.*

**Key words: Guam, Fishing Weirs, Pacific, Radiocarbon**

## **Introduction**

In 1998, an archaeological survey for the U.S. Navy of Outer Apra Harbor tidal flats on the Micronesian island of Guam (Fig. 1) identified several low-walled coral enclosures at the mouth of a freshwater estuary (Dixon et al. 2013), first recorded in 1991 (Wylie and Madsen 1991). Piles of WWII-era bottles of Japanese manufacture and discarded bivalve shells were also found on the surface at these shoreline sites, suggesting that the walls themselves may have been constructed to foster shellfish production by forced native labor known to have been used to expand

wartime rice fields nearby. However, interviews with a local Chamorro resident who abandoned the area with his family in 1941 yielded no memory of the walls in Apra Harbor during their periodic harvesting of shellfish before the war<sup>1</sup>.



*Fig. 1: Location of Gigao on Guam. (Modified from Dixon, et al. 2017:196)*

Another archaeological survey of Inner Apra Harbor tidal flats in 2002 identified more low-walled coral enclosures at the mouth of two freshwater estuaries, many overgrown by mangroves or half-buried by silt, thus bringing archival documents in the Micronesian Area Research Center (MARC) at the University of Guam (UOG) under new scrutiny. A rereading of Captain Louis Claude de Freycinet's account of his 1819 visit to Apra

Harbor aboard the French Corvette *L' Uranie* suggested these sites might be the stone fish weirs or *gigao* mentioned by Chamorro residents.

On March 17, 1819, the French corvette *L' Uranie* anchored off Apra Harbor in Guam on a three year scientific mission to the Pacific which eventually circumnavigated the globe (Freycinet 2003), finishing the voyage in the vessel *Physicienne* (Arago 2013). While surveying the island and its inhabitants' customs, Captain Louis de Freycinet was told of the former presence of stone fish weirs no longer in use. Most archaeologists and historians assumed that Freycinet was misinformed or such features had not survived the frequent typhoons that affect the region, as well as the ravages of WWII and subsequent U.S. Navy harbor construction.

WWII therefore seemed the most logical date of origin for these walls (Dixon et al. 2013), until scholars of Japanese history on Guam who were consulted found no record of non-military construction projects along the shores of Apra Harbor during the 1941-1944 occupation. A more thorough examination of archaeological and historical literature from across Micronesia housed at the Micronesian Area Research Center then revealed close parallels between construction methods and environmental settings in Apra Harbor and traditional stone fish weirs recorded in coastal Yap, Pohnpei, and Kosrae. Marine science literature housed at the Marine Science Laboratory of UOG also confirmed the former use of fenced fish weirs by Chamorro residents near Apra Harbor from before WWII until the 1970s when such methods were outlawed.

Freycinet's informants therefore appear to be vindicated by the convergence of archaeological, historical, and circumstantial evidence. So besides Pre-Contact fishermen using the weirs to feed local populations before the arrival of Ferdinand Magellan in 1521, it is hypothesized they were expanded to exchange fish and shellfish for metal

and trade goods with visiting sailors during the seasonal arrival of the Manila Galleons, perhaps until well after the arrival of Jesuit missionaries in 1668. Traditional sailing techniques, ancestor veneration, ritual cohabitation, matrilineal land tenure, herbal healing specialists, and communal redistribution of natural resources were by then all discouraged in favor of Spanish Colonial norms of behavior and economy. In contrast, the *gigao* might have been maintained until after the forced relocation of northern Guam residents into traditional southern Guam villages like Sumay during *La Reduccion* circa 1700 and even the subsequent development of Apra Harbor to accommodate periodic Spanish shipping before Freycinet's arrival.

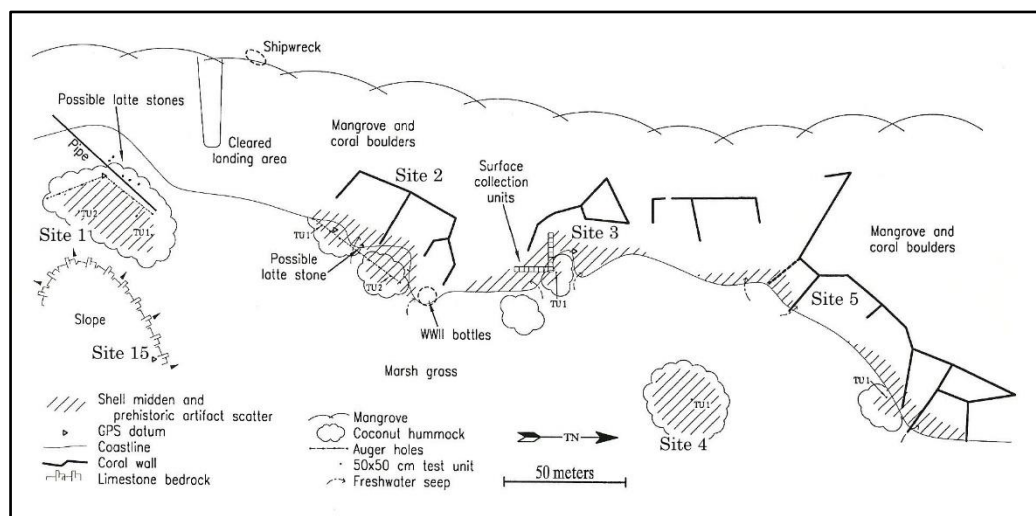
More challenging to former notions of Colonial domination is archaeological evidence for continued traditional aquaculture methods and pottery production radiocarbon dated generations after the Spanish *entrada*, generally perceived as the end of the traditional era (Dixon et al. 2017). Documenting the continuity of subsistence practices from before until well after initial Contact and the apparent resistance of Chamorro fishermen to *La Reduccion* is provocative, especially after the introduction of Eurocentric food ways and settlement patterns.

### **Archaeological Identification of Fish Weirs around Apra Harbor**

During the first survey in the mangroves along the edge of Outer Apra Harbor in 1998 (Dixon et al. 2013), a complex of 14 previously unrecorded low-walled coral enclosures and nearby sites was encountered on the coral shelf and within the

low tide area (Fig. 2), near fresh water seeps situated between the mouths of two small estuaries. At irregular intervals along the shoreline opposite this wall system were scatters of late Latte Period style prehistoric ceramics and marine bivalve shells (Fig. 3), mostly of *Anadara* sp. with fewer *Gafrarium* sp. Site 1 on-shore appeared to be the battered remains

of a low *latte* set or raised Latte Period habitation with midden, Site 4 was a coconut hummock located about 50 m inland with shell midden and more pottery, and Sites 2, 3, and 5 contained the stone enclosures off shore. Site 15 was a natural limestone hill with WWII Japanese defenses dug into the hillside. A subsequent survey of a segment of the Inner Apra Harbor shoreline in 2002 (Dixon et al. 2013) revealed another complex of seven walled constructions on the coral shelf near the mouth of another small estuary.



*Fig. 2: Outer Apra Harbor Fish Weir Map. (Dixon, et al. 2013:360)*

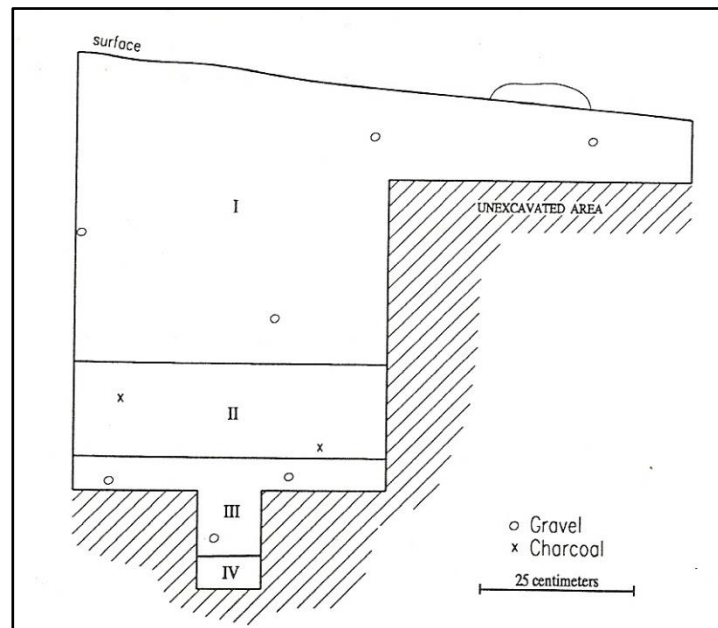


*Fig. 3 (left): Outer Apra Harbor Site 3, Shell Midden and Pottery, View to the Southeast. (Dixon, et al. 2013:359)*

*Fig. 4 (right): Outer Apra Harbor Site 3, Coral Wall, view to the Northwest. (Dixon, et al. 2013:358)*

The walled enclosures of Outer Apra Harbor were composed of irregularly shaped, medium to large coral heads (Fig. 4), removed from inside the enclosures and piled directly on the tidally inundated coral substrate without the aid of mortar or fill. While some stacking was evident, the walls were very porous and today attract mangrove growth due to their stability and entrapment of sediment from the small estuaries flowing into the features. The outer walls of the roughly rectangular shaped enclosures measured approximately 3 m wide and 90 cm tall, accounting for some collapse after years of abandonment and typhoon damage, while some of the inner walls were less substantial. Many of the walls did not reach the modern shoreline during high tide, and much of their interiors were exposed during low tide. Controlled excavation adjacent to one of these complexes at Site 2 (Fig. 5) yielded late Latte Period pottery and wood

charcoal radiocarbon dated with a Bayesian calibration to A.D. 1645-1725 (Fig. 6).



*Fig. 5: Outer Apra Harbor Site 2, TU. 2, East Profile. (Dixon, et al. 2013:363)*



Radiocarbon Dating Results.						
Provenience	Material Type	Measured C14 Age ± Years BP	C13/C12 Ratio	C14 Age ± Years BP	Calibrated Radiocarbon Age	Bayesian Calibrated Age
Site 2,	<i>Bruguiera</i>	210±50	-27.2%	170±50	AD	AD
TU 2, II/2	<i>gymnorhiza</i>				1645-1950**	1645-1725
Site 13,	<i>Cynometra</i>	1180±80	-25.9%	1170±80	AD	Not
ST 1, III	<i>ramiflora</i>				675-1015*	performed
Site 16,	Cocos	260±40	-27.1%	220±40	AD	Not
TU 1, II/1	<i>nucifera</i> shell				1635-1950**	performed
Site 39,	<i>Gafrarium</i>	1860±50	+2.2%	2310±50	AD	Not
TU 1, III/1	bivalve shell				10-360***	performed

\* Standard radiocarbon age with extended counting, calibrated at 2 sigma, 95% probability (Stuiver and Reimer 1993).

\*\* Standard AMS radiocarbon age calibrated at 2 sigma, 95% probability (Stuiver and Reimer 1993).

\*\*\* Conventional radiocarbon age adjusted for Alpha R reservoir correction factor (115±50) at 2 sigma, 95% probability (Stuiver and Reimer 1993).

*Fig. 6: Radiocarbon Dating Results, Site 2, TU.2. (Dixon, et al. 2013:365)*

## Regional Context of Fish Weirs on Guam within Micronesia

A regionally appropriate comparison with the Apra Harbor walled enclosures in design and construction may be made with other Micronesian islands that have undergone less impact from modern development (Moore 1987), and hence maintained traditional prehistoric fish weirs into modern times. Low islands as far away as the Gilberts and Nauru farmed juvenile milkfish in artificial interior ponds for later harvest (Alkire 1972). On Kosrae, stone holding pens for turtles and fish were built along the mangrove-lined coastline near chiefly residential complexes indicating their ownership by specific high-ranking families over time (Cordy 1981). On Pohnpei, basalt stone weirs were constructed near shore to trap fish driven into the mangroves by high tides of the tradewind season from December to February. Weirs of coral were longer and more



irregular in shape, constructed closer to the deeper water lagoon to enable their incorporation in group fish drives to generate chiefly tribute (Ayers et al. 1979).

The Micronesian island group best known for their fish weir diversity is Yap, where several varieties of offshore construction provide the best comparison for interpreting the function of the Apra Harbor enclosures. The arrow trap may be the oldest technique employed on Yap, where a V-shaped enclosure with a central shaft is built facing away from the shore toward the direction of the outgoing tide and the reef, although some were built facing deeper channels and holes within the lagoon (Hunter-Anderson 1981). Baskets were placed at the ends and apex of these weirs to trap fish attempting to escape. Another type of multiple V-shaped trap was built just inside the reef to catch fish running both in and out with the tide, while other Z-shapes traps were built on the crest of the reef pointing in both directions for a similar purpose. Rock and coral piles were also constructed in relatively clear areas of the lagoon to provide refuge for certain fish before they were speared or netted, although the yield of such features was lower than the V-shaped constructions. Closer to shore and along main channels were rectangular surrounds which reportedly functioned as corrals or holding pens for fish captured in deeper waters, as well as foundations for guardhouses associated with the more productive V-shaped arrow traps owned by chiefly families.

## **Conclusions**

After comparison of the walled enclosures within Apra Harbor on Guam to their regional counterparts in Micronesia, it appears that the majority of features recorded archaeologically likely functioned as holding pens or corrals for high tide fish collection in deeper waters and as traps for fish stranded as the tide receded. The partial arrow-shaped wall extending seaward from the west end of Site 5 in the Outer Apra complex suggests

its function in trapping fish returning to the reef at low tide as seen in Yapese constructions. Its spatial proximity to a set of rectangular walls in Site 3 that do not reach the shore suggests a similar function. Given the holding capacity of these pens, it is reasonable to expect that deeper water features similar to those on Yap also existed in mid-harbor (i.e. rock or coral piles) or nearer the reef (i.e. V- or Z-shaped traps).

It is possible that 19<sup>th</sup> century Spanish Colonial sailors may have found some aquaculture features at shallower depths within Outer Apra Harbor to be an obstacle to safe entry and mooring, although many vessels remained in deeper anchorage or at Umatac. The organization of Chamorro labor by local *alcaldes* to clear such impediments as payment of labor tax in the late 17<sup>th</sup> and early 18<sup>th</sup> century would have been challenging however, given native participation in numerous revolts against Spanish demands (Lon Bulgrin, personal communication 2017). Almost yearly visits by the Manila-bound *situado* ship from Acapulco by the 1580s and at least 24 Dutch and English visits by 1686 also noted the increasingly poor health of many inhabitants (Levesque 1997). Instead, if these deeper aquaculture features indeed existed at mid-harbor then many may have been dismantled to build Fort Santa Cruz in 1801 (Driver and Brunal-Perry 1994), a generation or more after their use had been discontinued by native fishermen when Freycinet arrived. The shoreline pens nevertheless, could still have been useful settings for family fishing even with declining population and Colonial entanglement, until mangrove growth reclaimed them in the 20<sup>th</sup> century.

Forms of indigenous resistance in the face of Spanish Colonial influences were varied in the 16<sup>th</sup> through 18<sup>th</sup> century Pacific, but included the maintenance and transformation of native food ways in coastal California missions: “European-introduced foods... were prepared and cooked... according to traditional native prescriptions...” (Lightfoot 2005:196).

Reuse of European objects was another method of resisting their intended uses: “instead of using the objects in the European fashion as ceramic and glass tableware, the people transformed them into native objects such as pendants, beads, scrapers, and projectile points” (Lightfoot 2005:196). Traditional political structures and marriage patterns did change as native populations suffered catastrophic mortality rates from introduced disease, but religious dances continued and Catholic symbols and rituals were incorporated into native belief systems (Lightfoot 2005).

Similarly, one might expect Chamorro use of the near-coastal fish holding pens in Apra Harbor to continue for a generation or more after *La Reduccion* circa 1700, albeit in smaller scale family collection endeavors not inviting Colonial taxation. The continued use of specific coastal settings for aquaculture in the Mariana Islands thus emphasizes the longevity of cultural memory as encoded in marine resource exploitation practices, even in the face of sustained Colonial enculturation. Cultural revitalization movements as expressed in the maintenance of traditional fishing practices remain active in the region today in the face of new challenges, as they appear to have been after the initial shock of Spanish contact in the Mariana Islands. Further archaeological evidence remains to be sought in Guam’s other embayments, as well as off the west coast of Saipan that represents a much larger lagoon system of equal antiquity.

---

<sup>1</sup>This manuscript in no way reflects the opinions of the U.S. Navy or its contractors. Permanent site locations are not revealed here for their protection.

---

## References

Alkire, W. 1972. An Introduction to the Peoples and Cultures of Micronesia. In W. Alkire, editor, *The Peoples and Cultures of Micronesia*, Addison-Wesley Publications, 1-56, Canada.

Arago, J. 2013. *Narrative of A Voyage Round the World IN the Uranie and Physicienne Corvettes, Commanded by Captain Freycinet, During the Years 1817, 1818, 1819, and 1820* Cambridge University Press, London.

Ayers, W., A. Haun, and C. Severance. 1979. *Ponape Archaeological Survey: 1978 Research*. Micronesian Archaeological Survey Report Number 4, Historic Preservation Office, Trust Territory of the Pacific Islands, Saipan.

Cordy, R. 1981. *Archaeological Survey of Inem, Okat and Loal Kosrae Island*. Micronesian Archaeological Survey Report Number 7, Historic Preservation Office, Trust Territory of the Pacific Islands, Saipan.

Dixon, B., L. Gilda, and T. Mangieri. 2013. Archaeological Identification of Stone Fish Weirs Mentioned to Freycinet in 1819 on the Island of Guam. *Journal of Pacific History* 48(4):349-368.

Dixon, B., A. Jalandoni, and C. Craft. 2017. The Archaeological Remains of Early Modern Spanish Colonialism on Guam and their Implications. In M. Cruz Berrocal and C. Tsang, *Historical and Archaeological Perspectives on Early Modern Colonialism in Asia-Pacific and the Pacific*, Volume 1, University Press of Florida, Gainesville, in press.

Driver, M., and O. Brunal-Perry. 1994. *Architectural Sketches of the Spanish Era Forts of Guam*. MARC, University of Guam, Mangilao.

Freycinet, L. C. de. 2003. *An Account of the Corvette L'Uranie's Sojourn at the Marianas Islands, 1819*. Occasional Historical Papers No. 13, CNMI Division of Historic Preservation, Saipan.

Hunter-Anderson, R., 1981. Yapese Stone Fish Weirs. *Asian Perspectives* 24(1): 81-91.

Levesque, R. 1998. Accounts of Early Contact: Non-Spanish Visitors to Guam before 1830. In *Guam History: Perspectives Volume Two*. L. Carter, W. Wuerch, and R. Carter Editoris, pp. 37-66, MARC Educational Series No. 22, University of Guam, Mangilao.

Lightfoot, K. 2005. *Indians, Missionaries, and Merchants The Legacy of Colonial Encounters on the California Frontiers*. University of California Press, Berkeley.

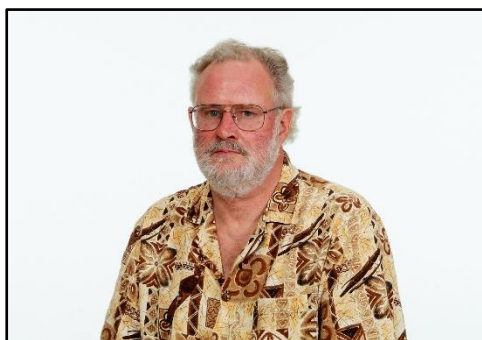
Moore, J. 1987. *Current Fishing Practices and Use of Marine Resources in the Outer Islands*. Yap State Fishing Authority, Manuscript of file at MARC, Mangilao.

Wylie, J., and D. Madsen 1991. *Guam's Excess Military Lands: Opportunities for the Multiple-Use and Protection of World-Class Natural and Cultural Resources*. Department of Agriculture – Division of Forestry and Soil Resources, Territory of Guam.

## **Acknowledgments**

The author would like to extend his appreciation to Jeannette Simons and Dr. Eric West, then of NAVFACPAC, and Jennings Bunn and Lon Bulgrin of NAVFACMAR who freely gave advice and council during the field surveys and technical reporting. The assistance of *Journal of Pacific History* editor Vicki Luckner with an earlier interpretation of this paper is also greatly appreciated as is the sage advice of Professor Bill Jeffery at UOG.

## **Biography**



Dr. Boyd Dixon is a Senior Archaeologist for the Cardno GS office in the U.S. Territory of Guam. With over 40 years of archaeological experience in North America, Latin America, Western Europe, and the Pacific Basin, his interests are equally varied. They embrace prehistoric and historic patterns of settlement, subsistence, interaction, power, and conflict.

