Easter Island Fishing

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Introduction

The study of fishing gear, fishhooks in particular, has proven fruitful in investigating technological change and past cultural relations in Polynesia. Previous examinations of Easter Island fishhooks established their basic Polynesian affinities (Métraux 1940; Golson 1965; Emory 1972; but see Heyerdahl 1961, 1968), emphasized similarities with those from the Marquesas and Mangareva (Sinoto 1967, 1970), and identified the Easter Island two-piece fishhook as a local development comparable to innovations in Hawaii and in New Zealand (Emory, Bonk, and Sinoto 1968).

In contrast to many other Polynesian islands, Easter Island offers little historic and ethnographic information about local marine subsistence (Ayres n.d.*a*); the little that is known suggests technological and methodological elaboration consistent with the locally limited material resources and the impoverished marine biota. The shortage of canoe timber was noted even in the earliest historic times, suggesting that deep water angling for large fish was quite restricted, particularly during the last three to four hundred years. Evidence for an emphasis on netting techniques is offset by the rocky coastline, which lacks productive shallow coral reef flats. Weirs or traps were never elaborated; pre-European spear fishing is not well documented.

Despite Métraux's assertion (1940:172) that the nature of the earlier Easter Island marine subsistence is virtually unknowable, examination of comparative data on fishing methods and technology, of ecological factors, and of archaeological remains provides a base for formulating testable hypotheses characterizing the nature and development of the island's marine subsistence economy.

Morphological variation in Easter Island fishing gear must be considered from three

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perspectives: (a) culture-historical, so that differences in form can be related to innovations within styles or to differing sources of fishhook tradition; (b) technological, so that variation can be related to raw materials and manufacturing techniques; and (c) functional and ecological, so that variation can be connected to exploitative strategies and varying biotopes and habitats.

This paper aims to (1) employ ethnoarchaeological and ethnographic data to reconstruct traditional Easter Island fishing strategies and technology, and (2) devise and archaeologically test hypotheses about Easter Island fishing gear derivation and variability.

Early Polynesian Fishing Gear

Relating Easter Island fishing equipment to other Polynesian gear requires comparisons with other East Polynesian and early West Polynesian settlements. Study of fishing gear, as a technological subset, can provide insight into earlier cultural relationships in the same way that examination of stone adzes (Figueroa and Sanchez 1965; Emory 1968) has shed light on Polynesian tool developments. To avoid confusion over terms such as "composite hook" (see, for example, Métraux 1940), I use the designations established by Emory, Bonk, and Sinoto in 1959 (1968) and the coding system (key) implemented by Sinoto for Hawaiian hooks (Kirch 1979: Appendix C).

Early Polynesian fishing gear can be derived from archaeological evidence for marine subsistence activities associated with Lapita sites in eastern Melanesia and West Polynesia (Poulsen 1968; Kirch and Rosendahl 1973; Kirch 1978; Green 1979:36–37). Here, minimal hook elaboration and an emphasis on netting are evident. Table 1 synthesizes information on pre-East Polynesian fishing gear (c. 500 B.C.) from the western extremes of Polynesia.

It is also possible to establish an early East Polynesian fishing gear assemblage based on Table 1 and on materials from the Marquesas, the Society Islands, Hawaii, New Zealand, and West Polynesia; this collection in turn provides a specific base for reconstructing the Easter Island fishing technology. Although there are several possible derivation points for the early Easter Island settlers from within East Polynesia, or even Central Polynesia, the Marquesas offer the best data base—because of temporal priority and the recovery of a large amount of fishing gear—for reconstructing an early fishing gear set (Sinoto 1970; Suggs 1961; Bellwood 1979:325).

Table 2 presents a synthesis of the derived gear characteristics of East Polynesia, primarily the Marquesas, around A.D. 300–900. Early Marquesan Phase I (A.D. 300–600) artifacts reflect a marine-oriented economy with coastal, hook-and-line emphasis, but trolling hooks are also well represented (Sinoto 1970:106). Netting, although not archaeologically identified, must have been important as well (Kirch 1973:33). Easter Island settlement took place before A.D. 600, and so the Marquesan Phase I fishing gear should provide the specifics; because of the small sample size and the lack of precise dating for this phase, however, the expected fishing gear assemblage in use when the Easter Island settlers departed includes some hook forms from the Marquesas Phase II (A.D. 600–1300) that also appear in other early Polynesian contexts. It should be noted that there is little quantitative information published on fishing gear from the early Marquesan occupation levels.

Fishhooks make up only one aspect of the marine exploitation; netting, spearing, snaring, and trapping must also be considered, even though they show up only rarely or indi-

rectly in the archaeological record. Early netting is documented by preserved net sinkers (e.g., stone or shell), by remains of fish known to be caught often by netting (e.g., parrotfish, Scaridae, or labrids, Labridae), and by the Proto-Polynesian (PPN) reconstructions **kupenga,* 'net', 'fishnet', and **tili,* 'throw net' (Walsh and Biggs 1966:41,114). That snares were in use is suggested by my PPN reconstruction **fele,* 'cord snare'.

The implications of Tables 1 and 2 provide the basis for a working hypothesis regarding the derivation and content of Easter Island fishing technology:

Hypothesis

The fishing methods and technology brought by the first migrants to Easter Island included the following:

Angling

The fishhook kit contained jabbing and rotating hooks of shell and, possibly, of bone. Rotating hooks predominated over jabbing forms. The heads were primarily flat to rounded, with a posterior knob formed by shank notching; rounded to pointed heads with posterior notching appear less frequently. Unknobbed heads with a single posterior notch or a rare circumferential head V-groove or neck constriction were present also. In some forms a transverse groove across the head top and an anterior head notch were used.

Other hooks included shell trolling lures and octopus lures with conical sinkers.

Known manufacturing tools included files and abraders of branch coral *(Acropora), Porites* coral (rare), and echinoid spines.

Netting

Seine, bag, scoop or dip, and throw nets were in use.

Trapping/Snaring

Noose snares for eels, woven traps (?), reef enclosures, and weirs were used.

Spearing

Wooden spears, possibly with small barbs; harpoons (?), mostly of pearl shell and multiple barbed, were in use.

Hand Collecting

Simple collecting and with smaller hand nets, no other equipment necessary.

This hypothesis may be tested by deductively identifying testable implications and explicitly establishing a set of archaeological test criteria. These are:

1. That the expected technological traits are present in the Easter Island Settlement and Adaptive Phases (A.D. 400–1000) artifacts, *or*
2. That the expected technological traits appear in later archaeological remains or in ethnographically and linguistically documented Easter Island gear, and
3. That those later archaeological and ethnographic gear characteristics not predicted by the hypothesis resulted from:

TABLE 1. PROTO-EAST POLYNESIAN FISHING GEAR

	SHAPE	HEAD FORMS	MATERIAL
Hooks			
One-Piece	predominantly rotating forms		
Jabbing	U-shaped with point leg parallel to or slightly in- or outcurved; some with point leg at a sharp angle to the shank	a. flat, simple posterior notching (1)* b. flat to rounded, multiple, posterior notching (2) c. flat to rounded, with posterior knob formed by notching (3)	turbo shell (2) pearl shell turtle shell?
Rotating	circular, some U-shaped; mostly with point incurved	same as a–c above (4)	turbo shell (2) pearl shell turtle bone
Two-Piece	none known		
Composite			
Trolling	none known		
Octopus	known from cowrie shell caps (5)		
Other Gear			
Sinkers	perforated shell (6) minimally modified stone or coral (?)		*Anadara* shell net sinkers
Harpoons	none known		
Tools	files/abraders, rounded and V-shaped (7)		branch coral echinoid spine files

*SOURCES: (1) Poulsen 1968:Fig. 2, no. 18; (2) Kirch and Rosendahl 1973:Figs. 18, 19; (3) same as (2); (4) same as (2); Chikamori et al. 1975:Fig. 15; (5) Poulsen 1968:Fig. 2; (6) Poulsen 1968:Fig. 2, a "knife"; these are also reported ethnographically as net weights; (7) Kirch and Rosendahl 1973:Fig. 26; Poulsen 1968:Fig. 2.

Summary and Hypothesis Test Criteria

The archaeologically collected fishing gear indicates the following continuities from the early East Polynesian assemblage specified in the hypothesis:

1. One-piece rotating hooks occur in high numbers; even in the hooks made of new kinds of raw material there is a strong emphasis on rotating forms.
2. Jabbing hooks have simple U and V shapes; rotating hooks have U to circular shapes.
3. The use of barbs is minimal. There are no outer barbs and point barbs are rare; barbs on rotating hooks are even rarer.
4. Gambreled shanks, which parallel Sinoto's Marquesan "wiggly-shanks," are present.
5. Rounded heads are found on slightly more than half of all hooks, but rotating hook heads are often flat.
6. A posterior knob formed by notching is the most common head lashing device (90%).
7. Transverse top lashing grooves and anterior notching/reduction are present.
8. Two fishhook sizes are distinguishable.
9. Nets were present and were probably very important in prehistoric times.

Changes or innovations in Easter Island fishing technology include:

1. The loss of shell as a raw material and consequently, the loss of trolling lures.
2. The invention of the two-piece hook that is unique in manufacture and shape, although it appears similar to some Hawaiian forms.
3. A very high percentage of two-piece hooks used a rotating point; later ones have ingenious, near-circular shapes.
4. The use of stone for hooks.
5. Very elaborate, stylized head types—particularly in stone, but also in bone—including the flat-based notch or groove applied to heads and to two-piece point and shank legs.

Comparisons

The simple posterior notch (Sinoto's Head Type 1a) is the oldest head improvement in Polynesian line attachment devices; the distinctive, protruding posterior knob (Sinoto's HT4) represents a later development on Easter Island and elsewhere in East Polynesia. This latter head type is closely associated with the use of bone as the hook material. Fashioning methods for bone tended to be similar throughout Polynesia. Stone hooks from Pitcairn (Green 1959) suggest that some other Polynesians faced the same material depri-

a. Subsequent introductions after initial settlement, that is, through population replacement or augmentation, solely through diffusion of technology, and/or
b. Lack of suitable raw materials, or through innovation and stylistic change and evolution of form related to local subsistence adaptation.

Test criterion 1 cannot be met at this time because there is no direct archaeological evidence of the fishing activities conducted by the earliest Easter Island settlers. The hypothesis test must focus on criteria 2 and 3.

EASTER ISLAND ETHNOGRAPHY AND FUNCTIONAL STUDY

The ethnographic and historic record for Easter Island reaches from 1722 to modern times. Specific information on fishing technology dates back to 1786 with the visit of La Pérouse, but most information about traditional fishing comes from Métraux (1940) and Englert (1948, 1974).

Angling

The terminology recorded for Easter Island hooks is useful for differentiating major categories in the traditional classification. Métraux (1940:174–175) records the names *rou, mangai maea,* and *mangai kahi* for the large stone hooks; Englert (1974:199), however, refers to the large stone hooks and, apparently, all rotating hooks as *mangai* and reserves the label *rou* for small bone hooks, mostly, if not entirely, with jabbing points. Englert emphasizes a clear distinction between *mangai* and *rou.* He refers to two-piece hooks as *mangai ivi,* which follows from the previous distinction between rotating *(mangai)* and jabbing *(rou)* forms and *ivi,* bone; however, this distinction is complicated by the presence of large two-piece jabbing hooks and Palmer's (1870:173) reference to stone hooks (which are rotating) as *rou.* Métraux uses the term *mangai verevere* for the two-piece hooks; this designation is apparently derived from 'hackle' (*verevere,* hair, down), but little description of hackle exists (Métraux 1940:180). The terms *mangai ivi* or *mangai ivi tangata* seem to have been applied to all bone rotating hooks as the term *ivi,* 'bone', implies, and their application was not limited to two-piece forms. Very small examples of bone hooks, *mangai ivi,* were designated as *piko* (twisted, bent; Métraux 1940:178).

With the exception of *kave,* for snood, recorded by Thomson (1889:549), references to hook parts are limited to two-piece forms. The shank leg and the point leg have been distinguished as *va'e* (foot) and *mata* (eye) by Englert (1948:180) and as *reke* (heel, talon) and *kainga* (food, i.e., bait?) for the same parts by Métraux (1940:180). *Va'e* may refer also to 'a divided part' and *mata* to 'point' when used in reference to the two-piece hook (see, for example, Tregear 1969:220, 584–585). *Reke* describes the fishhook shank in parts of the Tuamotus and also identifies a special type of strong-shanked eel hook with a sharp angle (heel) used for eeling (Emory 1975:198, 204).

Because only limited and confusing traditional naming of fishing hooks is known, comparative linguistic study is needed to resolve the classification problems. The term *rou* or *rourou* is used throughout Polynesia to describe a reaching stick or pole; most specifically, *rou* refers to a breadfruit-gathering pole, but any stick with a crook or hook at one end might be called *rou* (e.g., Tregear 1969:428–429). The use of *rou* for fishhook is exclusive to Easter Island where it acquired a more specific meaning than the general Polynesian

TABLE 2. EARLY EAST POLYNESIAN FISHING GEAR

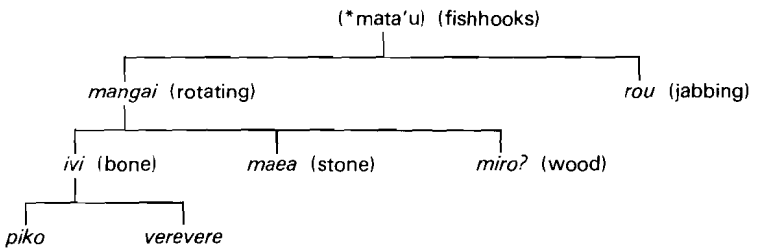
	SHAPE	HEAD FORMS	MATERIAL
Hooks			
One-Piece	predominantly rotating forms		
Jabbing	U-shaped, with point leg parallel or slightly in- or outcurved; some with bend and point at a sharp angle to shank; some V-shaped	a. flat, V-grooved (1)* b. flat, knob protruding posteriorly, knob from notching or reduction (2) c. flat to pointed, knob protruding posteriorly, notched anteriorly (3)	pearl shell bone? (porpoise, dog)
Rotating	U-shaped to circular, with either shank or point, or both, incurved; angular shank	a. flat, single notched posteriorly (4) b. flat, double flange or constriction (5) c. pointed, knob protruding posteriorly (6) d. pointed, knob protruding posteriorly, notched anteriorly (7)	pearl shell rare porpoise bone
Two-Piece	none known; composite hooks would provide a general model (8)		

Composite	bonito lure shanks, points with proximal base extension octopus lures compound shanks(?) biflanged points and inset points(?) (9)	 pearl shell turtle shell probably bone wood?
Other Gear		
Sinkers	conical sinkers with one flat side coffee-bean type sinker (10)	stone, basalt
Harpoons	multiple barbed (11)	pearl shell bone
Tools	files, abraders (12)	*Porites* coral branch coral echinoid spines

*Sources: (1) Sinoto 1970:Fig. 1*g,* Marquesas Phase I; (2) Sinoto 1970:Fig. 1*a,* Marquesas Phase II; Kirch 1975:65; Sinoto 1979:Fig. 11*e;* (3) Sinoto 1970:Fig. 1*b,d,* Marquesas Phase II; Sinoto and McCoy 1975:Pl. 3B*a,b;* (4) Sinoto 1962:164; Sinoto 1970:Fig. 1*h,* Marquesas Phase I; Emory, Bonk, and Sinoto 1968:Pl. 1, no.43; (5) Sinoto 1970:Fig. 1*j,k,* Marquesas Phase I; (6) Sinoto 1970:Fig. 1*f*?, Marquesas Phase II; (7) Sinoto 1970:Fig. 1*e*?, Marquesas Phase II; (8) Sinoto 1967:347; see also Emory, Bonk, and Sinoto 1968:Pl. 3; (9) Sinoto 1970:106–110, Fig. 6; biflanged points, inset points, and compound shanks are Marquesas Phase II only; Emory, Bonk, and Sinoto 1968:38; (10) coffee-bean type is Marquesas Phase II only, Sinoto 1970:110–111; (11) Sinoto 1970:117; known Marquesan harpoons are Phase II only; (12) Sinoto 1970:106–110; *Porites* coral files increase in later Marquesan phases; branch coral and sea urchin spine files decrease in Phase II.

'hook'. Easter Island *mangai* is again unique and is used in place of the common Polynesian term for fishhook, *matau* (Walsh and Biggs 1966:62, **mata'u* as reconstructed PPN). Stephen-Chauvet's (1946:80, 306) source of *matau* for Easter Island hooks is not verified. *Mangai,* referring to the mouth or chewing—interestingly, in a combined Maori form, *mangamangai,* as 'an uneasy sensation in the mouth' (Tregear 1969:210)—identifies the derivation of the Easter Island term as it is applied to fishhooks (bait hooks) because it describes chewing instead of striking as the fish behavior toward the bait on a rotating hook; thus *mangai* is descriptive. Englert (1948:264) gives Easter Island *maanga* as Spanish *carnada,* 'bait'.

Based on the recorded terminology and the reconstructed PPN and PEPN terms, I postulate the following relationships in the traditional Easter Island classification system:



The Easter Island fishhooks described above fall into two major use categories: (1) the small jabbing hooks *(rou)* and small rotating hooks *(piko?)* used along the shore and often by women (Métraux 1940:172–173), and (2) the large one-piece and two-piece hooks used in offshore zones *(toka, hakakainga,* and especially the *hakanononga)* for deep handline fishing (Fig. 1). The latter were employed in catching prestige fish for high-status persons, the *ariki,* particularly for the *ariki henua,* and the *tangata honui.* Offshore fishing was performed by the expert fishermen, *tangata rava ika ma'a,* and the boat handlers, *tangata tere vaka.* The *ariki henua* also had a *tuura,* servant, who fished, probably inshore, for him. These fishing specialists, paralleled in Hawai'i by the *po'o lawai'a* ('professional fishermen', Titcomb 1972:5) who fished for the chief, are the likely makers of the necessary specialized gear, for example, the stone fishhooks which they used for deep water tuna fishing. It is noteworthy that only the tuna hook, *mangai kahi,* has a specific association with a fish name.

Lavachery's petroglyph survey underscores the special significance of the relationship between tuna and canoes and rotating fishhooks (1939: especially XII, Fig. 116, XV, Figs. 151–159). Virtually all of the many hooks depicted in petroglyphs are rotating forms; tuna appear twice as often as do turtles, which were also reserved for the *ariki.* Both are much more common than any other marine form represented in petroglyphs.

Eels—particularly the *koreha* (*Gymnothorax* spp.) but also the *koiro* (*Conger* sp.)—were taken mostly with snares; the heavy jabbing hooks that would be most effective in catching eels are rare in the Easter Island collection (see Emory 1975:204–206 for Tuamotuan eel hooks). Nets were used for eeling as well. That they were sought by nonspecialist fishermen is confirmed by the inshore fishing techniques recorded by Englert (1948:263–265; my translation) and others; these techniques are listed in Table 3. Of interest are the distinctions between methods used by men and women, the diversity of eel-capturing methods, and the fact that only three named techniques employ hook and line. The latter contrasts with other Pacific Islands, for example, modern Niuatoputapu, Tonga (Kirch and Dye 1979:61), where twelve angling methods are known and are still in use. Most of

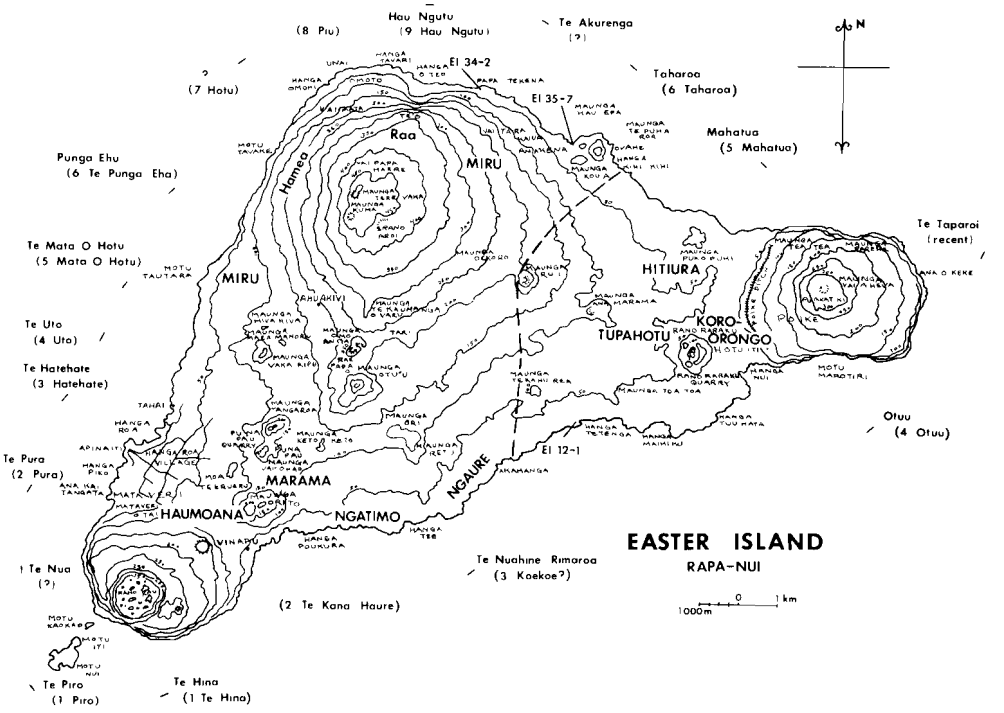


Fig. 1 Easter Island map showing locations of offshore fishing locations *(hakanononga)* and traditional areas held by large kin groups (*máta,* ramages or "tribes"). The dashed line separates the Ko Tu'u, western confederacy, from the Hotu iti, eastern confederacy. *Hakanononga* names and locations are from Englert (1948) and from Barthel (in parentheses; 1978).

the Easter Island techniques recorded by Englert are ones used by nonspecialists; only the operation of the large nets required supervision and direction by a specialist. The undoubtedly more esoteric traditional knowledge of specialist offshore fishing has been lost.

Netting

All the net types included in the reconstructed Early East Polynesian gear are known from Easter Island. In historic times, twelve types of Easter Island nets have been distinguished according to the kind of fish taken in them. Basalt sinkers, some with perforations, have been found, but their direct association with nets cannot be established because the stone sinkers on historic nets are mostly unshaped (*maea rengorengo* or *kaka,* Métraux 1940:185, 187). No shell weights were used. Historic gauges *(ha'a)* in 5 mm and 35 mm widths and wooden shuttles called *hika* for net manufacture are known (Ayres n.d.*b*). Table 4 presents a composite picture of net types and uses, based primarily on Métraux (1940).

Trapping and Snaring

The only trap or snare system recorded for the island is the snare called *here koreha* (see Table 3); this is made of two sticks and a cord with the cord tied to one end of each stick

TABLE 3. EASTER ISLAND FISHING TECHNIQUES

INSHORE	
For men	
hi/hii	to fish with a line *(hau)* while swimming in the sea; also *ika kato omai* (sic. Thomson 1889:549); *ika hi, ika kohau* (Churchill 1912:211)
rukuruku	to dive to the bottom to fish for eels, especially *koiro* (*Conger* sp.) with hook and line, and to capture langosta *(ura)*
here koreha	to capture eels (*koreha, Gymnothorax* spp.) with snares *(here)*
here ruku	to capture eels with the *here* (snare), but by diving to the bottom
tuutonga	to fish for eels from a high point of land with hook and line
hura (kupenga)	to fish with a small net *(kupenga hura?)* on the end of long pole
tukutuku	to fish with the *tukutuku* net while swimming
puhi	to fish for langosta at night (see also Churchill 1912:211, *ikapuhi,* to fish with a torch)
For women	
hahaki	to collect shellfish such as *takatore* (a small, black shell), *mama* (chiton), *pure* (cowrie), or *auke* (seaweed) using a pointed stick called *"uuki"* (sic; *ruruki?*)
haha i te tuamingo	to take fish such as *raemae* (*Coris* sp.) and *vare paohu* (a labrid fish), which hide in small rock crevices, by hand at night; only if taken in this way are these fish called *"tuamingo"*
uru-uru	to take small fish, like *paroko* (gobies) and *patuki* (blennies), which serve as bait *(maanga)* for the men
hakapari	to wade in the sea at night when the tide is low, looking for octopus *(heke)* and shellfish; done by women and children
OFFSHORE	
(No named techniques known)	
hi?	deep water angling using *hau moroki* (Englert 1948:265)
?	trolling?

and fashioned into a noose at the end of one. The loop was pulled over the eel's head as it was lured out of the rocks to get the bait which was attached to the other stick. This snaring method is widely used in Polynesia.

Some rudimentary weir-type constructions are known on the coast, but none is a true tidal weir. They may have been used with inshore netting.

Spearing

Very little is known about traditional spear fishing, even though it was probably practiced. Small spears or sticks, called *ruruki,* were used by women fishing along the coast. Spear guns are popular today.

Hand Collecting

Octopus *(heke),* langosta *(ura),* small crabs *(pikea),* sea urchins *(hatuke),* trepang *(hotake),* and smaller fish were captured by hand along the shore. The special term *tua-*

TABLE 4. EASTER ISLAND NET TYPES AND USES

NET NAME	TECHNIQUE NAME AND CHARACTERISTICS
kupenga (general)	*tangu:* to catch fish with a net
kupenga tuku/tukutuku	*tuku:* to scoop with a hand net, to walk with any open net; any net with poles or handles?
kupenga puhi	*puhi:* scoop net or dip net for shore fish (see Table 3)
kupenga hakatoro	*hakatoro?:* smaller than the *puhi;* to catch fish among the rocks; also used for catching eels and langosta
kupenga ature	the largest bag nets; for *ature* fish *(Decapterus scombrinus),* the bait for *kahi,* tuna
kupenga koreva	bag net, smaller than ones for *ature;* for *koreva* fish (Monacanthidae) caught while tuna fishing
*kupenga ura/hura**	bag net, small; for *ura,* langosta, and for *korea*†
kupenga tuku/tukutuku?	seine or set net; used at night in coves; commonly for *kototi* fish (*Stegastes fasciolatus* Ogilby)⊕
kupenga maito	seine or set net with floats; commonly for *maito* fish (*Acanthurus* sp.)£
kupenga viri	identical to the *maito;* used at night
kupenga matiro	smaller mesh than *maito;* used for *matiro* fish (*Schedophilus labyrinthicus* McAllister and Randall)⊕
kupenga ihe	net larger than the *maito* but with smaller meshes, *mata;* used for the *ihe* fish (*Hyporhamphus* sp.)
kupenga honu	similar to *matiro* but with wider mesh and stronger ropes; for *honu,* turtle
No name recorded	a casting/throwing net

* Englert 1948:258.
† Métraux 1940:185.
⊕ Randall and Cea Egaña n.d.
£ Thomson 1889:535.

mingo applied to a number of species of small fish when caught in this manner. Shellfish, despite their small size, were gathered in large quantities.

Fish Distribution and Seasonality

Details about fish distribution—as presently known by Easter Islanders and from my earlier studies (Ayres 1975, n.d.*a*)—are illustrated in Table 5. These distributions are correlated with specific taking methods—such as netting, for example—for a particular kind of fish. This table is not complete because much of the traditional knowledge about fishing zones and fish types is no longer remembered by the present populace. Nevertheless, fish distribution and traditional taking methods can be reconstructed reasonably well because the fish type names and species are limited (e.g., compared to Tahiti; Randall 1973). The island provides a valuable setting for fish distribution and traditional technology study.

Table 5 reveals a major emphasis on inshore biotopes and resources *(hakaranga* and *rua);* this is reflected in the diversity of taking methods and in the concomitant diversity of fish types; both decrease as one moves out into offshore zones.

Seasonality of access to fish seems to have been determined primarily by ritually de-

TABLE 5. FISH DISTRIBUTION BY FISHING ZONE AND METHOD OF CAPTURE

	HAKARANGA AND RUA	HANGA	TOKA	HAKAKAINGA	HAKANONONGA*	TOTAL
Fish names (total 54)†	40 (74%)	10 (18%)	8 (15%)	17 (31%)	13 (24%)	88
Names unique to zone⊕	30 (56% of total) (75% within zone)	2 (4%) (20%)	2 (4%) (25%)	11 (20%) (65%)	9 (17%) (69%)	54
Taxonomic genera represented£	34 (49%)	7 (10%)	4 (6%)	14 (20%)	10 (14%)	69
Percent capture						
Net:	40 (74%)	10 (18%)	7 (13%)	3 (6%)	1 (2%)	
Hook:	27 (50%)	3 (6%)	3 (6%)	15 (28%)	13 (24%)	
Trap/Snare:	2 (4%)	2 (4%)	1 (2%)	0	0	
Hand:	6+(11%)	0	0	0	0	
Spear:	?	?	?			

* The six fishing zones extend out from the coast: (1) *hakaranga* (*haka,* verb marker; *ranga,* fishing along the shore for small fish) extends all along the coast, (2) *rua* (hole or pit) are deep holes along the shore, (3) *hanga* (bay) extend all around the coast, (4) *toka* (large submerged rocks that are smooth and free of seaweed) are found normally about 100 m offshore, (5) *hakakainga* (food, thus bait?) extends all around the island between 500 and 1000 m offshore, and (6) *hakanononga* (*nono,* fish that jump into the boat; *nga,* group or plural marker—this may refer to schooling pelagic fish in the offshore zone) are specific locations best known for tuna fishing mostly beyond 1 km from shore (see Fig. 1).

† These Easter Island names sometimes distinguish fish growth stages of the same species and, on the other hand, occasionally lump fishes of different species (Ayres 1975:101-102; n.d.*a*). The total of 54 represents the number I have been able to verify; Englert's (1948:254-255) list of 81 names contains some duplicates or alternates and some names that are no longer remembered. The same fish may appear in more than one zone; thus the sum is greater than the number of names.

⊕ The fish name associations with the six zones are based on references to where the fish types are most commonly caught and thus identify a cognitive, effective technology distribution and, to a lesser extent, actual ecological-based distributions of various fish species; the latter are found within a broader range of habitats than those in one zone. The inshore biotope, as expected, contains the largest number of distinct names.

£ The taxonomic distribution is based on the Easter Island name distribution and not on actual ecological and icthyological study.

fined fishing periods, which are probably correlated with seasonal pelagic fish movements, especially that of the tuna *(kahi).* Traditional fishing seasons cannot be matched to calendar months and so their duration is difficult to specify. It is clear from ethnographic reports, however, that offshore fishing was severely limited during a major part of the year (*tonga* or winter). All fish were tapu during this time (Métraux 1940:173) and tuna and other large fish such as *pe'i* (Carangidae), *po'opo'o* (*Pseudocaranx cheilio* Snyder), *toremo* (*Seriola lalandi* Cuvier and Valenciennes), and *remoremo* (?) were tapu over a longer period that must have included the *vaha tonga* (autumn) and *vaha hora/ora* (spring). It is not clear whether inshore fishing was allowed during the winter months; the limitation concerned tuna and other prestige fishing. The importance of tuna fishing is indicated by the practice of feeding the *ature* fish (*Decapterus* sp.)—which were netted in the *hakakainga* zone for *moroki* type (a whole fish tied on a hook) tuna bait—during the winter tapu season just to keep them schooling around the coast and thus to have them available in the following season.

Ethnoarchaeological and ethnographic documentation provide details of the traditional—clearly Polynesian—classification systems for fishing gear, capture methods, and fishing zones. For the second step in testing the proposed hypothesis, information about fishing strategies and uses of specific gear types needs to be correlated with archaeological evidence of earlier, developmental stages of Easter Island marine exploitation.

COLLECTIONS OF EASTER ISLAND FISHING GEAR

Although several of the earliest Europeans contacting Easter Island refer to fishing, the first fishing gear on record, a fishhook, was collected by La Pérouse in 1786. This specimen is a two-piece bone hook with "authentic, archaic binding" (Stephen-Chauvet 1946:Figs.73, 253, 307). In his 1870 article, J. Linton Palmer first mentions fishhooks and provides a name, *rou,* for the stone hooks.

The earliest large collections were made by Geiseler in 1882 (Ayres n.d.*b*) and by Thomson in 1886 (1889). These collections include several fishnets, net-making tools, two stone fishhooks, and several bone and metal hooks. Geiseler (Ayres n.d.*b*) says that by the time of his visit the metal rotating hooks replaced the earlier, hard-to-make stone kinds and that stone hooks were no longer available. Both collections are useful for the present analysis because they are specifically datable to a late European contact period and because later visitors were unable to make such complete collections.

Métraux (1940) reviews the island's fishing technology in detail and describes hook specimens he collected as well as ones held in the Bishop Museum. All of these were specimens of unknown antiquity; most were clearly recent examples made of cow bone (Bishop Museum Cat. B3525*a–k,n*). Métraux (1940:177–180) estimates that the manufacture of fake fishhooks began in the early 1900s. Several he collected are nonfunctional stone copies (e.g., Bishop Museum Cat. B3540*a,b,g*).

A large corpus of fishhooks—and some degree of chronological control—became available only with the Norwegian Archaeological Expedition's publications (Heyerdahl and Ferdon 1961). Heyerdahl's discussion of surface finds (1961) yields good comparative data on fishhook forms; Golson's (1965) review of the expedition's 1961 publication points out the need for further analysis and that is undertaken here.

The present study examines a collection of 144 Easter Island fishhooks; it includes 25 hooks from my 1973 excavations on the island, other published hooks, and some museum specimens. The collection consists of the widespread bone rotating and jabbing hooks made of one or two pieces, large stone rotating hooks, and wood hooks; historic metal hooks are also considered. A description of raw materials and manufacturing methods precedes the discussion of known forms, their functions, and variations.

Angling

Fishhook Materials and Technology

Traditional raw materials for Easter Island hooks include human, whale, bird, or chicken, and possibly porpoise or seal bone; stone; and wood. In the present study, 104 (72%) hooks are of bone, 37 (26%) of stone, and 3 (2%) of wood. Metal hooks were introduced in historic times. Métraux (1940:180) believes that wood hooks—for example, a two-piece hook consisting of a wood shank attached to a stone point—may be recent imitations. The

other two wood hooks examined here (Heyerdahl 1961:431) are quite large, one-piece forms with particularly long shanks; they replicate the metal rotating hooks of the type Geiseler recovered. The handmade bronze hooks appear to have been shaped locally and may reflect traditional wood forms rather than the other way around (see Kirch 1979: 157–161 for examples of Hawaiian wood hooks). No record of shell hooks exists; shells on Easter Island are too small for hook making. The one-piece shell hook illustrated by Stephen-Chauvet (1946:Fig.75) must be from elsewhere, probably Central Polynesia.

Drilling, grinding, and filing were used to shape fishhooks. With the exception of small obsidian drill bits, no drill parts are known; other drilling apparatus elements have been found only in Hawaii within East Polynesia. The obsidian bits were probably used on bone. A sample of obsidian drill bit edges shows evidence of work on hard material, on bone or hard wood (Spear n.d.). Abrasive grit, rather than a cutting point, must have been used for boring holes in stone blanks (see Métraux 1940:177, 179 and Heyerdahl 1961:Figs. 102, 103, for examples). Brown (1924:190) was told that small *Terebra* shells were used as hand drill bits for making the center holes in stone hooks, but this remains unconfirmed. Although shell bits were used in Hawaii (Sinoto 1967:Fig. 5), it seems that the small shells on Easter Island could not have been used for drilling stone because the diameters (10 to 20 mm) of the initial concave bored depressions in blanks (see, for example, Heyerdahl 1961:Fig. 102) are greater than even the largest local Terebridae (genus *Acuminia* or *Hastula*).

Grinding or filing tools used on Easter Island include *Porites* coral files (Ayres 1975, n.d.*a*) and rough cortex obsidian abraders or files. No echinoid-spine files—which are most useful for working shell—were employed because of the very small size of the available urchin spines (most are less than 3 cm in length). Shark skin was reportedly used for fine sanding.

After the hook blank tab was formed by cutting (with obsidian knives or saws) and grinding, a small hole was drilled within the bend of the hook. This was always done, except in quite small, barbed jabbing hooks where a V-shaped cut was carved or filed into the bone blank (Métraux 1940:Fig. 10*c*). Single drill holes, Sinoto's "simple drilling" (1967:352), are the most common, but multiple drill holes have been recorded in stone and in bone. Stone blanks normally show drilling from both sides for removing the blank center.

In summary, drilling, grinding, and filing are the basic techniques used on bone, stone, and wood. The methods for stone boring remain somewhat obscure and require a more exhaustive microscopic and use-wear study.

Basic Hook Types

Easter Island fishhooks are either jabbing or rotating types in one- or two-piece forms. No composite (trolling lures or octopus lures) are known.

Jabbing Hooks

All jabbing hooks are one-piece form in bone, except for one two-piece jabbing point leg. Slightly over half of these hooks are U-shaped (Code *U*) and the remainder are V-shaped (Métraux 1940:179; McCoy 1979:Fig. 6.6). The shank leg (SL) is longer than the point leg (PL) and the points are primarily straight. Jabbing forms with the point and shank legs parallel (Code IA1) comprise 60 percent of the hooks measured; hooks with

tipped-out (IA2) or slightly incurved points (IA3) each account for 20 percent of the total. The SL/PL ratio and the degree of point incurving are closely related to hook effectiveness because these factors affect the directness of pull or the force applied to the point and determine the point's penetrating ability. Emory, Bonk, and Sinoto (1968:14) use mean measurements of SL and of width and represent these as a proportion of mean PL; because this figure differs from the mean of measured ratios of individual hooks (see Table 6), I use the latter because I believe it is more reliable and significant but I also continue to use the former for comparative purposes. The mean of SL/PL ratios for jabbing hooks is 1.32 (n = 13). The mean width (W)/PL ratio is .67 (n = 16), which describes a hook that is narrow relative to point height (Table 6).

Inner shank barbs are found on 11 jabbing hooks (22% of 50 one-piece shank legs, IA, IB, IA/B). Inner point barbs are rare and appear on only two specimens and, even then, only with inner shank barbs (Table 7, Fig. 2*j*).

Head types are uniform: 81 percent are rounded, 14 percent are single notched on the posterior (outer) side (Sinoto's HT1a, 1962:Fig. 1), and 62 percent are notched on the posterior side to form a knob (Code 2a), a variant of Sinoto's original designation HT1a. I distinguish this latter type from a distinctive, posteriorly protruding knob (Code 2b; Sinoto's HT4 has this projecting type knob). Specimens with pointed heads are found with jabbing points (19%, n = 4; Table 8). Inner (anterior) head notching or reduction—the latter is distinguished here from the sharper simple notching—is not found among the known jabbing forms.

Jabbing hooks account for only about 32 percent of the 94 bone and stone hooks that are clearly IA or IB. This is a low percentage compared to the Hawaiian sample examined by Emory, Bonk, and Sinoto (1968:14, Table 1); in Hawaii, jabbing hooks comprise 68 percent of the one-piece forms of bone and the same percentage of those in shell. Jabbing forms comprise 53 percent of the Easter Island bone one-piece IA and IB hooks.

Rotating Hooks

The stone hooks, all of which are rotating, tend to be circular (Code O) and have incurved shanks as well as incurved point legs. Reinman (1970:51, 55) notes the structural advantages of strongly incurved points and shanks. By contrast, shanks on bone rotating one-piece hooks are invariably straight or only slightly incurved, except for one type which has the head at an angle to a strongly incurved shank; of this type three examples (14%) are known (Fig. 3*a,e*). Golson (1965:68) calls this form "gambreled." In the stone forms, 29 percent (5 of 17) have angled point tips; in the bone forms, angled point tips occur infrequently.

The mean of SL/PL ratios for stone hooks is 1.44; this is higher than the ratio for bone jabbing (1.32) or even for bone rotating hooks (1.41). The SL/PL ratio for one measurable wood rotating hook is 2.15; that for Geiseler's three closely related bronze rotating hooks is 2.18. The mean width to point leg (W/PL) ratio is 1.04 for the stone hooks and only .86 for the bone rotating forms. The W/PL ratio noted above for jabbing hooks is even smaller at .67. These figures illustrate that the stone hooks are more circular than all other groups.

No barbs are found on stone rotating hooks and they are very rare on bone forms (4%); an inner shank barb is found only on one hook with an incurved point (see Table 7). The "barb" (Heyerdahl 1961:428, Cat. No. 829) on a similarly shaped hook is an inner shank projection or "knob" (Hjarno 1967:13) and is not a true barb. These two hooks are quite

TABLE 6. FISHHOOK SIZE RELATIONSHIPS

	NUMBER		MEAN SIZE AND RANGE						
	TOTAL	MEASURED	SL	PL	W	SL/PL*	W/PL*	$\bar{X}$SL/$\bar{X}$PL	$\bar{X}$W/$\bar{X}$PL
Bone									
Jabbing	30	23	32.4 (15–65mm)	25.8 (12–56mm)	15.9 (7.7–32mm)	1.32	.67	1.26	.62
Rotating	27	16	30.1 (14–73)	25.0 (9–51)	21.3 (8–52)	1.41	.86	1.20	.85
IA/B	18	6	43.4 (20.3–56)	—	16.0 (10–23)	—	—	—	—
II-Piece									
Rotating	28	14–20	54.5 (30–66)	49.2 (41–64)	44.2 (40–48)	1.34	.86	1.09	.90
Jabbing	1	1	—	63	—	—	—	—	—
Stone									
Rotating	37	9	93.1 (55–140)	68 (51–98)	66.9 (34–106)	1.44	1.04	1.37	.98
II-Piece PL	1	1	—	65	—	—	—	—	—
Wood									
Rotating	2	1	98	45.5	51.5	2.15	1.13	2.15	1.13
II-Piece SL	1	1	84	—	—	—	—	—	—
Metal									
Rotating	3	3	71.7 (69–75)	33.3 (29–39)	33.7 (31–36)	2.18	1.02	2.15	1.01
Total	148								
Rotating									
Bone and Stone			62.0	46.1	43.8	1.43	.94		
Bone and Stone:									
I and II-Piece			59.5	47.4	43.9	1.40	.92		

* Figures represent the mean of SL/PL and W/PL ratios calculated for individual measurable hooks, not the ratios of mean sizes, which are given in the last two columns.

TABLE 7. BARBED BONE FISHHOOKS

CATEGORY	CAT. NO.*	CODE	LOCATION OF BARB			S LENGTH	P LENGTH	WIDTH	HEAD TYPE	REMARKS
			S	PL	P					
IA	118 (Trocad.)	IA3U(5)a	x			65	50	32	HTR2a	
	119 (Trocad.)	IA2U(5)a	x			27	12+	16	R2a	
	120 (Trocad.)	IA3U(2,5)a	x		x	16	15	11	R2a	
	189 (Tupa)	S-IA1U(5)(b,c)a	x			40	?	18	R2a	compare no. 187,188
	215 (12-1-105)	IA1U(2,5)(x)a	x		x	21	19+	12	—	prehistoric; compare no. 120
	220 (35-8-110)	S-IA/B(5)(a,b)a	x		?	36	?	?	P	probably IA; probably historic
	222 (14-1-112)	S-IA/BU(5)(a,b)a	x		?	25	?	?	P2a	probably IA; compare no. 118; prehistoric
	187 (Puapau)	S-IA/B(5)(b)a	x		?	22	?	?	R	probably IA
	188 (Puapau)	S-IA/B(5)(b)a	x		?	23	?	?	R	probably IA
	223 (7-1-931)	S-IA/BU(5) (a,b)a	x		?	20	?	?	R2a	probably IA
	225 (34-2-114)	S-IA/BU(5)(b,c)a	x		?	16	?	11	—	probably IA
IB	128 (H #829)	IB2U(5)a	x			27	19	16	F2a5,7	not a true barb, a "shank projection"
	129 (H #809)	IB2U(5)a	x			67	51	45	F2c	
II	249	IIB(5)a	x			?	?	?		Métraux 1940:182; no details

* Ayres catalogue system. Shank length: $n=13$; $\bar{X}_n=31$, r = 16–67. Point length: n = 6; $\bar{X}_n$ = 28, r = 21–51. Width: n = 6; $\bar{X}_n$ = 25, r = 11–45.
SL/PL: $\bar{X}_5$ = 1.41 compared to total jabbing (IA) ratio of 1.32 (less no. 119).
W/PL: $\bar{X}_5$ = .50 compared to total jabbing ratio of .67 (less no. 119).

TABLE 8. DISTRIBUTION OF FISHHOOK HEAD TYPES IN STUDY COLLECTION

	BONE								STONE		TOTAL		TOTAL		TOTAL	
HT* (n)	JABBING (21)		ROTATING (20)		IA/B (11)		II-PIECE (11)		(20)		ROTATING (40)		I-PIECE (72)		(83)	
F	—		8	40%	4	36%	2	18%	19	95%	27	68%	31	43%	33	40%
R	17	81%	9	45%	7	64%	9	82%	1	5%	10	25%	34	47%	43	52%
P	4	19%	3	15%	—		—		—		3	8%	7	10%	7	8%
0	3	14%	—		—		—		—		—		3	4%	3	4%
1a	3	14%	1	5%	—		—		—		1	2%	4	6%	4	5%
b	—		—		—		—		—		—		—		—	
2a	13	62%	10	50%	8	73%	8	73%	18	90%	28	70%	49	68%	57	69%
b	—		4	20%	1	9%	1	9%	2	10%	6	15%	7	10%	8	10%
c	1	5%	6	30%	2	18%	—		—		6	15%	9	12%	9	11%
3a	—		—		1	9%	3	27%	1	5%	1	2%	2	3%	5	6%
b	—		—		—		—		—		—		—		—	
4	—		7	35%	2	18%	1	9%	15	75%	22	55%	24	33%	25	30%
5	—		5	25%	—		—		1	5%	6	15%	6	8%	6	7%
6a	2	10%	5	25%	2	18%	2	18%	9	45%	14	35%	18	25%	20	24%
b	—		1	5%	2	18%	—		2	10%	3	8%	5	7%	5	6%
Total with heads	21	70%	20	74%	11	61%	11	79%	20	54%	40	62%	72	64%	83	66%
Total	30		27		18		14		37		64		112		126	

*Head Type (HT) Code:

Basic form

F Flat
R Rounded
P Pointed

Attributes

0 No modification
1a Notched, posterior (outer)
b Notched, anterior (inner)
2a Knobbed (through notching, shank reduction)
b Knobbed, distinctive, protruding posteriorly
c Knobbed, distinctive, protruding posteriorly and proximally
3a Constricted neck, reduced all around
b V-groove
4 Flat-based neck groove
5 Reduced, anterior
6a Top transverse groove, right angle to side of head
b Top transverse groove, oblique

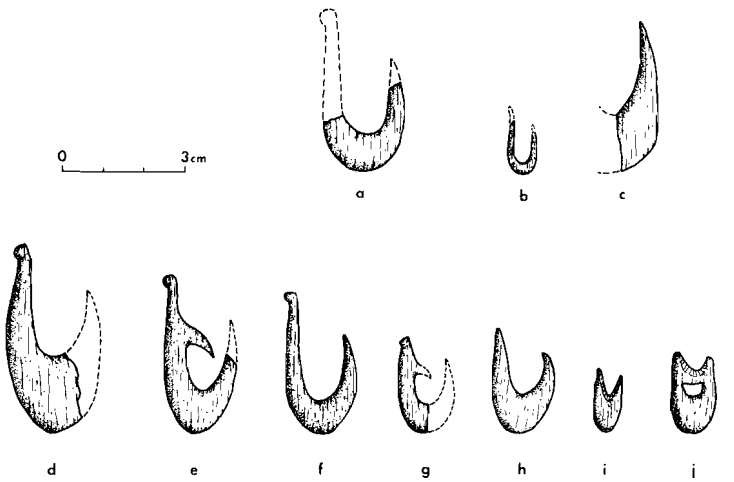


Fig. 2 Easter Island bone jabbing hooks (IA). Specimens a-c date to c. A.D. 1200; d-j to late prehistoric times, c. A.D. 1400–1700. (a) Cat. no. 197: Mulloy 1961*a:* Fig. 48*m*, (b) 196: Mulloy 1961*a:* Fig. 48*b*, (c) 173: Heyerdahl 1961: Fig. 106*w*, (d) 195: Mulloy 1961*a:* Fig. 48*d*, (e) 189: Mulloy 1961*b:* Fig. 87*j*, (f) 194: Smith 1961: Pl. 34*a*, (g) 222: Ayres EI 14-1-112, (h) 212: Ayres EI 3-3-102, (i) 214: Ayres EI 12-1-103, unfinished, (j) 215: Ayres EI 12-1-105, unfinished.

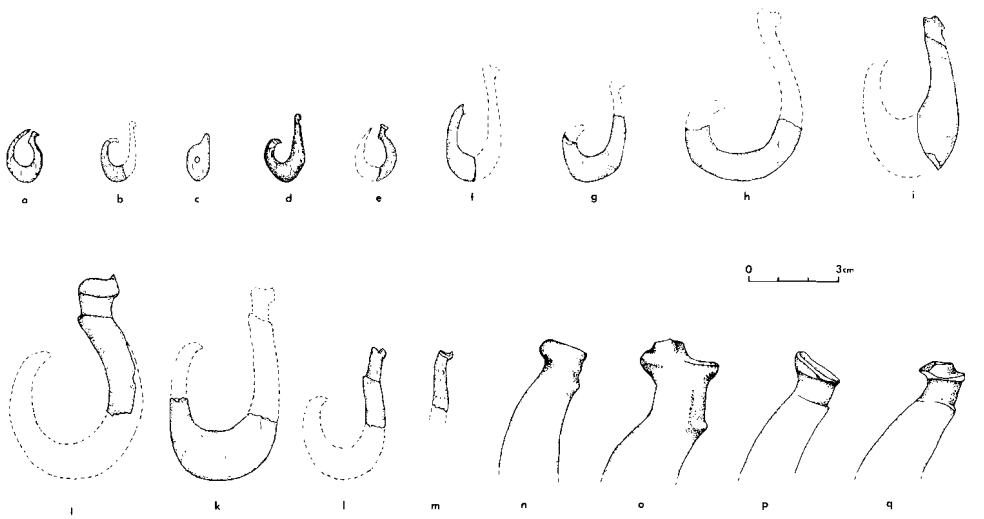


Fig. 3 Easter Island bone and stone rotating hooks (IB). Bone: a, e, f, g, h, m date to c. A.D. 1200; i-l to c. A.D. 1400–1450; b, c, and d to A.D. 1400–1500. Stone hook heads show development of neck groove and stylized lashing devices: n, o date to c. A.D. 1400–1450; p, q, indeterminate age, probably late prehistoric. (a) Cat. no. 126: Heyerdahl 1961: Fig.106*e*, (b) 217: Ayres EI 35-8-103, (c) 218: Ayres EI 7-1-171, (d) 216: Ayres EI 35-7-127, (e) 201: Mulloy 1961*a:* Fig. 481, (f) 203: Mulloy 1961*a:* Fig. 48*a*, (g) 204: Mulloy 1961*a:* Fig. 48*c*, (h) 208: Mulloy 1961*a:* Fig. 48*i*, (i) 235: Mulloy and Figueroa 1978: Fig. 46-1, (j) 236: Mulloy and Figueroa 1978: Fig. 46-2, (k) 237: Mulloy and Figueroa 1978: Fig. 46-3, (l) 238: Mulloy and Figueroa 1978: Fig. 46-4, (m) 199: Mulloy 1961*a:* Fig. 48*j*, (n) 240: Mulloy and Figueroa 1978: Fig. 46-6, (o) 239: Mulloy and Figueroa 1978: Fig. 46-5, (p) 211: Ayres EI 35-8-215, (q) 131: Heyerdahl 1961: Fig. 102*e*.

open and have only slightly incurved points; these features place them closer to the jabbing hooks than to the rotating forms.

Head types on rotating hooks include the simple forms found on jabbing hooks but several more complicated designs also occur (Table 8). Stylized head types appear only in the rotating hooks; these are found in both stone and bone.

Stone rotating hooks have flat heads (95%) and posterior knobs formed by notching (Head Type Code 2a, 90%) or full projecting knobs (Code 2b, 10%). Only one fully rounded head is known (Thomson 1889:Fig. 3). Flat-based neck grooves for lashing appear on 75 percent of the stone hooks; included in this group are two demonstrably early hooks from Ahu A Kivi that may be described as "incipient" flat-based neck grooved (Fig. 3*n,o*). Transverse grooves on the head top (Code 6) show up in 55 percent of the stone sample.

The predominance of flat or rounded heads is also evident in the bone rotating hooks (40% and 45%), but among these hooks there are pointed to only slightly rounded heads as well (15%). Posterior knobs are common to all these specimens. Only one bone rotating hook shows a simple posterior notch; this hook also has a head knob (Métraux 1940:Fig. 9*f*). Flat-based neck grooves, characteristic of the stone forms, appear on 35 percent of the bone rotating hooks. Single or multiple transverse top grooves are found on 30 percent of the bone sample. Anterior notching is absent, but anterior reduction (Code 5) is evident in 25 percent. The two wood shanks have similar, less stylized heads (HTF3a and R3a).

Of the one-piece rotating forms (bone and stone heads only, $n = 40$), 68 percent have flat, 25 percent have rounded, and only 8 percent (all bone) have pointed heads. Simple posterior notching is rare (2%), but notching to produce posterior projecting knobs is present in 100 percent of the sample. Flat-based neck grooves are evident in 55 percent of the combined sample, and transverse top grooves are found in 43 percent.

Rotating hooks comprise the following percentages of the total: 47 percent of all bone one-piece (all identifiable IA and IB); 68 percent of all one-piece, including the stone ones; and 75 percent of all bone hooks (IA, IB, and II, included because the 28 two-piece hooks are also rotating) and stone hooks. Unless there was a severe bias in collecting, rotating hooks appear to have been considerably more important on Easter Island than in Hawaii or the later stages of Marquesan settlement.

Two-Piece Hooks

Two-piece hooks are rotating forms—note the one exception mentioned above—mostly with straight shank leg (14) attached to point legs with sharply incurved point tips (23 PL known). The shank legs have a distal end groove (mortise) running lengthwise for inserting the posteriorly flattened or ridged point leg base (tenon).

Most shanks are of heavy bone and have rounded to oval cross-sections with the outer, posterior sides often converging to a slight ridge; knobs appear at either end. Straight, cylindrical shanks have been differentiated from those which are slightly convex on the posterior side (Métraux 1940:182); however, this distinction is not always a clear one (see Fig. 4). Métraux (1940:180) makes mention but no illustration of one shank leg with an interior barb; he compares this barb to the kind of interior shank barbs that are illustrated in Figure 2 here. Goñi and Nuñez (1973:390–393) illustrate an unusual bird bone shank which is only 27 mm long (the base, which was probably knobbed, is now partly broken off; the original length was perhaps 30 mm) and which has a flat head with a neck constriction (HTF3a). This is the only example of a posterior-curved shank (Fig. 4*h*). The

shank could have been attached to a relatively straight point leg, but presently no point legs are known that would fit this small shank.

Given that there are considerably more point legs (23) than shank legs (14) and that many of the points are from crematoria where a wood shank would have burned completely, it would appear that wood was a common prehistoric shank material. Wood shanks could be used successfully with bone or stone point legs; curved wood pieces could have provided a good shank to fit with the early straight-faced (unfaced?) point legs that have a low point-to-tenon base angle (e.g., Mulloy 1961*a*:Fig. 48; Fig. 4*a–f* here). Experimentation with stone as a material for two-piece shank legs is suggested by a basalt fragment apparently broken in the process of manufacture (Bishop Museum Cat. B3539*k*); it has a flat, unmortised facing 21.1 mm long by 9.3 mm wide. No other examples are known.

The mean of SL/PL ratios for two-piece hooks is 1.34; the W/PL ratio is .86. These figures place the two-piece bone hooks between the one-piece bone jabbing and rotating ones (see Table 6).

Head types on two-piece shank legs (12 total) are simpler than those on one-piece hooks (see Table 8). Most shanks end in a rounded knob (HTR2a) with posterior shank reduction (Fig. 4*i*). Two specimens show some reduction of the anterior shank head below the

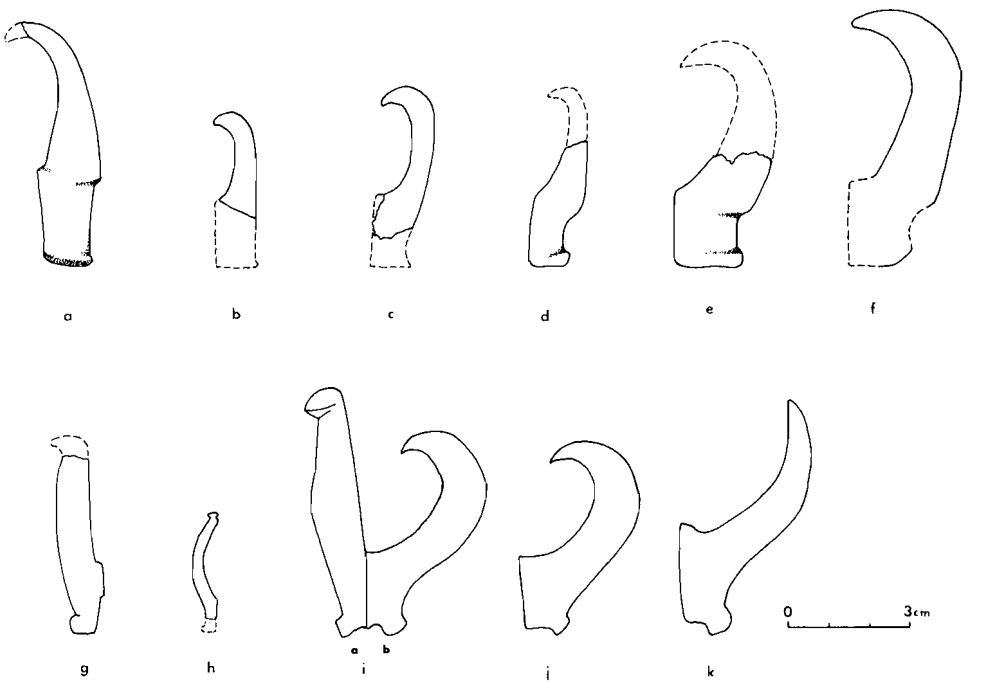


Fig. 4 Two-piece fishhook points and shanks (all bone except f, which is stone). Hooks a-e date to c. A.D. 1200; j, to c. A.D. 1500; i, k, to late prehistoric-early historic times; f-h, indeterminate age. Type FG shank: g, h?; Type FGa point: a, b; Type FGb point: c-f. Type K (knobbed) shank: i(a); Type K point: i(b), j, and k. (a) Cat. no. 206: Mulloy 1961*a:* Fig. 48*f*, (b) 205: Mulloy 1961*a:* Fig. 48*e*, (c) 210: Ayres EI 8-1, (d) 178: Heyerdahl 1961: Fig. 107*k*, (e) 207: Mulloy 1961*a:* Fig. 48*g*, (f) 121: Métraux 1940: Fig. 11*a*, (g) 202: Mulloy 1961*b:* Fig. 87*m*, (h) 231; Goñi and Nuñez 1973: Lámina VI, personal communication, (i) 192: Heyerdahl 1961: Fig. 107*a, b*, (j) 230: Ayres EI 34-2-107, (k) 185: Heyerdahl 1961: Fig. 107*c*.

knob; one is Métraux's recent wood shank coupled with the stone point (1940:Fig. 11*a*) and the other is also one collected by Métraux (1940:Fig. 11*b*). Two heads among Métraux's specimens have transverse V-grooves or notches cut into the head top; shank distal ends usually have transverse grooves to facilitate lashing. Thomson's specimen is unusual because it has the only flat-topped head on a heavy bone shank.

The mean length of seven bone shanks—excluding the wood one—is 53.7 mm. The means of two shank groups, large and small, at 57.8 and 31.5 mm, suggest that two major two-piece fishhook sizes were in use on Easter Island as in Hawaii (Emory, Bonk, and Sinoto 1968:16). A larger sample is needed to test this conclusion statistically. A total range of shank lengths (30 to 84 mm) shows unusual specimens at either extreme; the bird bone piece at about 30 mm and the wood shank at 84 mm.

Two-piece point legs fall into two types but all are quite similar. The total point length range is 41 to 65 mm; the mean of 13 measurable point legs is 50 mm. The mean of all (12) measurable bone rotating point legs is 49.2 mm. The unique stone point leg is the longest at 65 mm; it fits with the longest wood shank.

The two-pieced forms which I call Flat Grooved and Knobbed Types appear to have chronological significance (see Golson 1965:68). The Flat Grooved Type point leg is straight with a sharply incurved, but short, point tip and a broad flat-based reduction (flat-based groove; "flat-bottomed depression," Mulloy 1961*a*:158) on the outer distal end to facilitate lashing (Fig. 4*a–f*). A slight lip or projection remains at the outer base corner. The six specimens of FG Type appear to fall into two subtypes: one, FGa (Fig. 4*a,b*), has somewhat straighter point legs than the other subtype, FGb (Fig. 4*c–f*). Subtype FGa has less pronounced grooving and lipping on the lower anterior base than does FGb.

Hypothetically, the FG point leg projection later becomes stylized in the Knobbed Type, where a complete knob projects out from the lower anterior base (Fig. 4*i,j*). The Knobbed Type point leg curves into a circular shape. Thirteen point legs show the knob development and a knobbed point leg is attached to a knobbed shank in four historic examples. All Knobbed Type specimens are similar in shape.

Only one shank leg of type FG is known (Fig. 4*g*); this bone piece from the Tupa of Hiramoko (Mulloy 1961*b*:326) has a slightly offset or projecting facing with a mortise groove for attaching a relatively straight point leg. This piece is undated. Because type FG point legs are straight—Mulloy shows one specimen (Fig. 4*a* here) with the point curved in 5° beyond the facing of the point leg base—it appears that curved shanks or ones with the flat mortise facing at an angle to the shank shaft must have been used. Thus, wood shanks, perhaps like ones from Hawaii (Emory, Bonk, and Sinoto 1968:Pl. 3, no. 25), are suggested, especially for early type FG.

Shanks with knobbed projections on the distal end for matching the Knobbed point legs have squared, flat base, and V-shaped mortise grooves in the shank distal end. Square, flat tenons are found on four examples (including the jabbing point leg) and convex to strongly convex tenon faces—which fit the V-groove shanks—total six. All of these are of the Knobbed Type. The range of tenon length is 11 to 25.2 mm; the mean tenon length is 19.4 mm. Most mortises are 5 mm wide and 2 mm deep.

Fishhook Summary

Of the 144 whole and fragmentary hooks (bone, stone, wood) included in Tables 3–5, 114 (79%) are one-piece (IA, IB, or IA/B), 30 (21%) are two-piece hooks. Thirty-two percent of all the classifiable one-piece bone and stone hooks (n = 94) are jabbing and 68 per-

cent are rotating. The mean height (SL) of one-piece jabbing hooks is 33.4 mm and the mean height for rotating hooks is 31.6 (bone) and 93.1 (stone). The mean SL of two-piece hooks is 54.5 mm. The mean PL figures are 27.3 mm for jabbing, 25.0 (bone) and 68 mm (stone) for rotating, and 49.2 mm for two-piece hooks (Fig. 5).

Context and Chronological Relationships

A large portion of the datable hooks come from the crematoria at Ahu Vinapu, Ahu A Kivi, and Ahu Tahai. The oldest hooks are of bone and come from Vinapu and Ahu Tahai; these date to the early 13th century A.D. (Mulloy 1961*a*:100; Ayres 1971, n.d.*a*). The cremated bone deposits at Ahu A Kivi yielded two later dates (a range of A.D. 1290 to 1590 at one standard deviation), and these deposits suggest use over an extended period of time (Mulloy and Figueroa 1978:118). Both one- and two-piece forms are represented in these crematoria, as are rotating and jabbing hooks. Thus, the earliest dated hooks or other fishing gear can be assigned only to the early Expansion Phase (Ayres 1971, n.d.*a*). Other hooks can be associated with later prehistoric times on the bases of stratigraphy and obsidian hydration dates.

The thick-bend jabbing and rotating forms of one-piece bone hooks appear to be early and date to the cremation deposits at Vinapu and Ahu A Kivi (Figs. 2*c,d,h;* 3*i,k*). The two earliest accurately dated stone hooks are from the Ahu A Kivi crematorium 1 (Mulloy and Figueroa 1978:54 and 115, provide conflicting statements on which crematorium, 1 or 2, contained these hooks). Even the earliest stone and bone forms exhibit neck constrictions; the first hooks exhibiting flat-based neck grooves appear somewhat later. The proximally projecting knobs or "lugs" (Mulloy and Figueroa 1978:115; Code 2c here, Fig. 3*j,m*) and the gambreled shank date as early as the Vinapu cremation pits (Fig. 3*a,e*). Shank and point barbs are late; the earliest dated barb is associated with deposits at Site 12-1 that were dated by obsidian hydration readings to the mid-15th century (Fig. 2*j;* Ayres 1975:53).

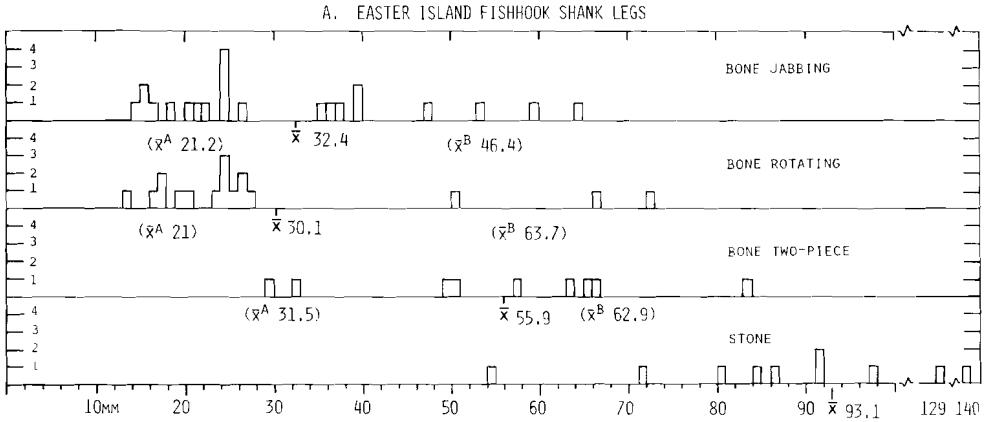
The two-piece Type FG is represented among the early hooks at Vinapu and at Tahai (Fig. 4*a,c*). Examples of the Knobbed Type have not yet been securely dated to other than early historic contexts.

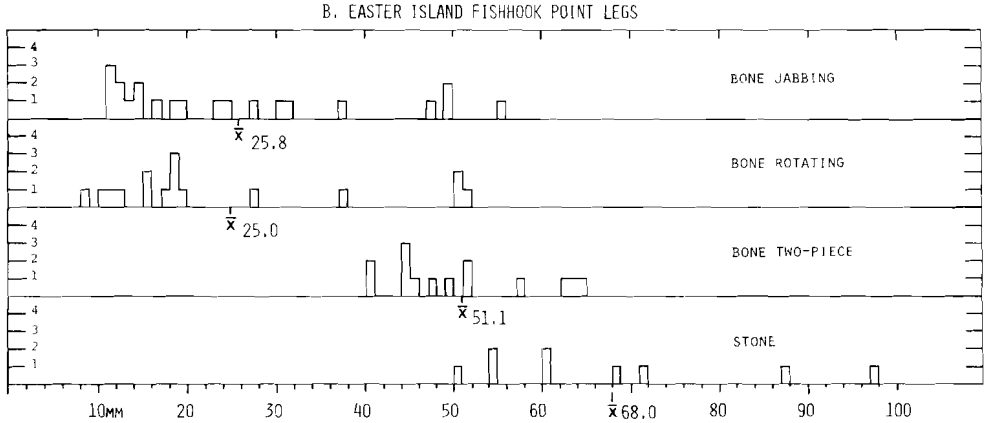
Variations among contemporaneous forms in use at approximately A.D. 1200 and at the late prehistoric/early historic boundary are depicted in Figs. 2, 3, and 4.

Netting and Other Fishing Techniques and Gear

Netting and other fishing techniques are rarely identifiable archaeologically, even though they were certainly practiced by the early Easter Island settlers. Netting needles are one of the few kinds of artifacts that evidence net use; four, all surface specimens, are illustrated by Heyerdahl (1961:Fig. 109*k–n*). These are short, thin, bone pieces with a deep V notch at one end. Another bone needle of the same type, recently recovered at Anakena Site 35-7, is a prehistoric example and dates to around the 14th century A.D. (Ayres 1975:75). These needles or netting tools are much smaller than the wooden shuttles *(hika)* found in ethnological collections.

Excavations have produced small, grooved stone line sinkers, but stylized net sinkers are absent from the archaeological record. Direct evidence of trapping, snaring, spearing, or hand collecting is lacking in the archaeological materials; these taking methods are suggested through fish and shellfish remains.





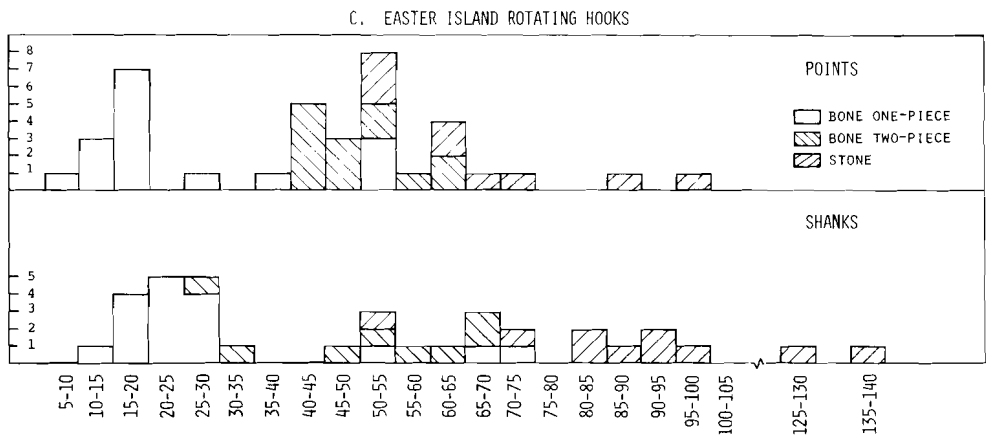


Fig. 5 Histogram A, distribution of fishhook shank lengths. $\bar{X}$ is the mean of the total distribution; $\bar{x}^a$ and $\bar{x}^b$ are means of small and large sizes when distinguishable. Note that two-piece forms duplicate the size distinctions evident in bone one-piece rotating hooks. Histogram B, distribution of fishhook point lengths. $\bar{X}$ is the mean of the total distribution; clustering into small and large sizes is less clear in point lengths than in shanks. Histogram C, distribution (5 mm intervals) of combined rotating hook points (top) and shanks (bottom). Note the strong tendency toward bimodal distribution.

vation as the Easter Islanders. Wood hooks, known throughout East Polynesia, were also used on Easter Island, despite minimal direct evidence for this during prehistoric times.

When compared to Hawaiian, New Zealand, and the late Marquesan collections, the Easter Island sample shows a particularly high percentage of rotating hooks; this can be explained by:

a. The dispersal of settlers to Easter Island at an early time when rotating hooks formed a larger portion of the total fishhook kit.

b. The conservative, retentive character of the Easter Island technology (see, for example, Emory 1968:161-162 on early adze form retention).

c. Limited raw material availability; jabbing hooks are difficult to fashion from stone (Reinman 1970:51).

d. The use of sharply incurving points in place of barbs for holding the fish once they were hooked.

The last item requires further comment. Sharply incurved points, so important for hook point strength and holding ability, characterize Easter Island hooks in bone and stone, particularly the larger forms; these contrast with Hawaiian and New Zealand barbed forms. Although strongly incurved or strongly angled shanks would be expected among the Easter Island forms because of their importance in the early Marquesan shell hook collection, the structural weakness of bone in hooks where both shank and point curve across the direction of the grain explains their absence. The straighter, but shorter, shank was the Easter Island solution. The circular stone hooks show that, when appropriate material was available, incurving of both point and shank was considered desirable.

Early hooks from the Marquesas, Hawaii, and the Society Islands when compared to Easter Island specimens show consistently high SL/PL ratios—the shanks are longer relative to point height. Easter Island two-piece shank legs appear to be relatively shorter than Hawaiian examples—few actual figures are available for the latter—because the Easter Island points are sharply incurved. Table 9 compares major Polynesian ratios as groups; here an atemporal comparison is presented because the sample of measured early hooks is very limited. Sinoto (1967:Table 5) shows that the early East Polynesian jabbing SL/PL— in Hawaii and the Marquesas—was also high.

Table 9 suggests that the Easter Island hooks fall at one extreme of the broader Polynesian pattern; both jabbing and rotating forms show relatively longer points than found in other available assemblages. Rotating hooks, with the exception of the stone ones, have longer points than jabbing hooks. Easter Island hooks are more similar to those of Central Polynesia, particularly to hooks from Mangareva (Sinoto 1967:354), than to ones from the Marquesas or Hawaii in regard to point height. Because most of the Easter Island hooks are recent, this relatively high point is likely due to locally developed styles.

Archaeological Context and Gear Variability

Although variability in contemporaneous gear is not well documented, gear for both inshore and offshore fishing is present on Easter Island throughout the known prehistoric period. The dichotomy in gear parallels the marked distinction between male fishing

TABLE 9. COMPARISON OF MEAN SL/MEAN PL FOR EAST POLYNESIAN ONE-PIECE HOOKS

	JABBING*		ROTATING*		
	UNBARBED	BARBED	UNBARBED	BARBED	STONE
Marquesas	1.95	—	1.43	—	—
Hawaii	1.65	—	1.46	—	—
Society Islands	1.41	—	1.36	—	—
Easter Island	1.24 (n=16)	1.36 (n=4)	1.19 (n=15)	1.31 (n=1)	1.37 (n=9)
(combined barbed and unbarbed)	(1.26)		(1.20)		
Early assemblages					
Marquesas					
(Hane, LL)	1.92				
Hawaii					
(Hl, II-1)	1.80				
Society Islands					
(note: n = 1)	1.78				

* Bone and shell one-piece hooks are included; figures for other than Easter Island are based on Sinoto 1967:354–355, Tables 4 and 5; all unbarbed specimens, no minimum numbers given.

practices (eeling, netting, and offshore angling) and female activities (inshore gathering) reported ethnographically.

Variations in fishing gear related to regional and environmental factors and differences in gear use among components of the society are recognizable through known archaeological contexts. Inshore fishing, as reflected by faunal remains, shows little variation around the island's coast, except in areas where microenvironmental differences exist, for example, such as sandy or rocky shore and shallow or deep inshore waters (Ayres n.d.*a*). Although the eastern end of the island has been studied less than the west, in spatial terms offshore fishing is most closely tied to the west and northwest coast sites which were traditionally under the control of the Miru descent group *(ramage)* and, more broadly, the Ko Tu'u confederation (see Fig. 1). Excavations in south coast sites produced only one-piece hooks but none larger than 25 mm in length (Ayres 1975; n.d.*a*). All of the provenienced stone hooks (only 3) come from west or north coast sites. Most of the provenienced two-piece forms (9)—except for Ohae (1) and early Vinapu (5)—come from the traditional Miru territory.

Within the Miru area, another aspect of the offshore fishing specialization may be seen in the similarities between the flat-based neck groove of the fishhooks and the flat-based neck groove of the more stylized stone images (e.g., Heyerdahl and Ferdon 1961:Pl.46*a,d;* Pl. 48*a*); a symbolic, stylistic, and temporal connection is envisioned between the two in the following ways: (a) the statues are traditionally associated with fishing (for example, see Barthel 1978:255–257); (b) statues—but not solely in the Miru area—and the more elaborate fishhooks are for high-status persons, the latter in the sense that large fish were reserved for the *ariki* and other high-ranking persons (the absence of pig and dog led to great dependence on the large fish and turtle); (c) a high level of craft specialization is apparent in the manufacture of both statues and fishing gear; and (d) two stone hooks and over 46 bone hooks have been found in crematoria directly associated with *ahu* ritual.

Mulloy's (1961*a*:156) three stone hooks from the Vinapu surface should be noted here as well. Thus, archaeological evidence supporting the ethnographic documentation for the Miru *ariki*'s control over the fishing specialists and offshore fishing is also consistent with ethnographic and environmental data pointing to the *hakanononga* on the west and north coasts as the most productive (Ayres n.d.*a*). Regional differences such as these are important for the present analysis because (as in Hawaii and the Marquesas) considerable variation is evident and it influences our ability to identify chronological change in fishing gear.

In sum, inshore techniques and gear show little island-wide variation; offshore techniques and gear are spatially differentiated and are focused within the Miru area of the island.

Conclusions

Even though the emphasis in Easter Island marine-related technology has been on offshore, deepwater angling for large prestige fish, inshore angling and other capturing methods—netting, snaring, spearing, and hand collecting—appear to have been of greater subsistence impact. Nets were crucial in bait catching for offshore fishing.

Hook and net use can be correlated with the five traditional fishing zones. The hook was the predominant fishing implement in the three outer zones, although hooks and one or more net forms were used in all zones. A reconstructed hook classification system can be coordinated with the known hook specimens and also with fish remains in archaeological sites. In the known fishhook collection, 50 percent of the measurable hooks (68% of all measurable one-piece hooks) are associated with inshore angling (*rou* or *piko* types, based on shank length) and 50 percent are connected with offshore deepwater angling.

A specialist class of fishermen was responsible for making and using most of the fishhooks and probably most of the nets, particularly larger ones, as well. Assemblage variability in styles of Easter Island hooks can be explained to a certain extent by differences in gear used by specialist and nonspecialist fishermen. A general stylistic connection between the more stylized stone images and fishhooks is conjectured in that both are related to fishing in general and specific cases. This relationship is also supported by the high level of craft specialization, which is characteristic of developing chiefdoms like prehistoric Easter Island. Both groups of craftsmen were under the control of the highest ritual and political leader, the Miru *ariki henua,* during at least the Expansion Phase.

A trend in marine subsistence toward greater use of fishhooks and angling in East Polynesian high islands seems to be due to limited reef flat exploitation, which contrasts with West Polynesia, especially Tonga (Kirch and Dye 1979), and atolls elsewhere where reef netting is more effective. The Marquesas, Easter Island, New Zealand, and Hawaii stand out as the clearest examples of this trend. A shift in net forms and methods, evident to some extent on Easter Island, is likely to have taken place in these same high island East Polynesian habitats. The small number of fishhooks from Easter Island compared to the other three large marginal high islands seems to be due to limitations of raw materials—particularly shell, but also bone—and to some extent, the continuing reliance on netting.

Easter Island fishing gear is clearly derivable from an East Polynesian ancestral kit, most specifically the one represented in the Marquesas. Present data limitations make consideration of alternative East Polynesian settlement hypotheses incomplete or inconclusive. Easter Island forms not included within the Early East Polynesian reconstructed

assemblage are local innovations reflecting raw material limitations, local adaptations to environmental or ecological factors, and increasing specialization.

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