11

NON-CERAMIC PORTABLE ARTIFACTS FROM TO'AGA

PATRICK V. KIRCH

ASIDE FROM THE SUBSTANTIAL quantities of pottery described above in chapter 9, the To'aga site excavations yielded a small but typologically diverse assemblage of non-ceramic portable artifacts. Because the site's alkaline, calcareous depositional environment (particularly in the lower levels) favors the preservation of bone, shell, and sea urchin, a variety of artifacts made from these organic materials was recovered, in addition to objects of basalt and coral. This contrasts with most early Samoan archaeological sites, such as Vailele or Sasoa'a on 'Upolu (Green and Davidson 1969, 1974), in which the acidic soils did not preserve a wide range of materials. Prior to our work at To'aga, only the Potusa and Falemoa sites on Manono Islet (Janetski 1980) had yielded a significant array of artifacts of shell, bone, and sea-urchin spine in association with Samoan ceramics. Thus, our knowledge of early Samoan material culture was largely restricted to basalt adzes, non-retouched lithics, and ceramics (Green 1974). This was in contrast to the situation with sites of comparable age in Tonga, where excavations on Tongatapu (Poulsen 1987), Niuatoputapu (Kirch 1988), and Ha'apai (Dye 1987) had produced a diverse array of material culture dating to the Ancestral Polynesian period. Hence, the To'aga artifact assemblage, described in full below, significantly expands our knowledge of the Samoan variants of Ancestral Polynesian material culture in the first millennium B.C.

The non-ceramic artifacts from To'aga are described below according to broad functional classes in general use by Polynesian archaeologists. Comparisons are also made between the To'aga assemblage and other assemblages from Ancestral Polynesian period sites in Samoa and elsewhere in Western Polynesia.

STONE ADZES

Six adzes which were either whole or sufficiently intact to be classified were excavated, primarily from pottery-bearing contexts. These adzes are classified according to the system devised by Green and Davidson (1969) for adzes from Western Samoa. In addition, we recovered five small flakes with ground or polished surfaces, which appear to have been derived from adzes during use or bevel resharpening. Most of these diagnostic specimens were petro-chemically analyzed by M. Weisler in order to determine the range in quarry sources utilized. Weisler used the non-destructive XRF technique and presents the results of his study in chapter 12.

From Layer IIA-1 in Unit 9 we excavated a finely ground and polished, complete adz of Samoan Type V (Green and Davidson 1969:24-26). The adz is of a very fine-grained, light grey basalt or andesite, and most of the original flaking scars have been removed by extensive polishing (fig. 11.1, c).

The bevel is curved, and the poll shows distinct battering, indicating use as a hammer while hafted. The adz is 136.8 mm long, 54 mm wide, and 35.2 mm thick at the midpoint. It weighs 422 g. Type V adzes are commonly associated with plainware ceramics both in Samoa (Green 1974) and in other early Western Polynesian contexts (Kirch 1988:192, 203).

An incomplete section of another Type V adz, consisting of the bevel to the midsection, was found in Layer IIIB of Unit 20 (fig. 11.1, a). The adz is of a light-grey, fine-grained basalt. The bevel is curved and very highly polished, while other parts exhibit remnant flake scars. The plano-convex section is rather high. The incomplete length of the adz is 78.4 mm; the width, 38.2 mm; and the thickness at midsection. 29.1 mm.

Another partial adz of Type V, consisting of the butt to midsection, was found in Layer IIIB of Unit 23 (fig. 11.1, b). Made of greyish basalt, the adz has a low (flattened) plano-convex cross section. In plan view, it also distinctly narrows toward the butt. The front and sides are partially ground and polished, but some flake scars remain. The midsection break displays considerable battering, indicating that the specimen was used as a hammerstone after breaking. The incomplete length is 68.1 mm; its width at the butt, 29.0 mm; the width at midsection, 53.3 mm; and the thickness at midsection, 27.3 mm.

A small adz of fine-grained basalt was recovered from the disturbed landfill site at To'aga during the 1986 reconnaissance. The adz has a sub-triangular cross section, and thus would be classified as Type VI in the Green and Davidson (1969) system. However, it has been well ground on the front, removing the original flaked ridge (and thus rounding off the apex of the triangle). Hence, in some respects, the adz resembles a Type V.

A rather battered remnant section of an adz, possibly of Type V or another type with a sub-quadrangular section, was excavated from Layer IIIA of Unit 27. This specimen is of dark grey basalt and has polished front and back surfaces. The butt is largely intact, but the artifact has been heavily battered from use as a hammerstone. The thickness is 25.4 mm, and the incomplete length, 75.4 mm.

From Unit 3, in an aceramic depositional context, we recovered the midsection of a partially ground, fine-grained basalt or andesite adz with trapezoidal cross section, probably of Samoan type IV (Green and Davidson 1969:24). The midsection is 24.2 mm thick, with the width ranging from 30.6 to 50.5 mm. Petrochemical analysis by non-destructive XRF, described further in chapter 12, suggests that this adz was manufactured at the large Tatagamatau quarry site on Tutuila Island (Best et al. 1989, 1992; Leach and Witter 1987, 1990). This is noteworthy, since most of the Manu'a adzes assignable to the Tatagamatau quarry were surface finds, also of trapezoidal sectioned types typical of later Samoan prehistory. This adz from Unit 3 is associated with a ^{14}C date of 1389-1287 cal B.P., which indicates that adzes from the Tatagamatau quarry were being distributed as far as the Manu'a Group by at least the mid-first millennium A.D.

In Layer IIIA of Unit 27 we excavated a flaked, tabular piece of dark gray basalt, extensively flaked, but retaining some cortex on one surface. The flake which measures 63.9 by 58.6 mm, and is 16.4 mm thick, may be a large decortication or trimming flake from adz manufacture.

In addition to the large diagnostic specimens described above, we excavated five small flakes, each with one or more ground and polished facets. These are from Units 16, 17, 20, and 22 and all derive from adzes, either from use or resharpening. Four flakes were analyzed by XRF (see Weisler, chapter 12). Two of these can be ascribed to the Tatagamatau quarry site on Tutuila Island.

SHELL ADZ

A small adz of heavy shell, possibly *Cassis* sp., was found in association with plainware pottery at the landfill site during the 1986 reconnaissance. The adz is rectangular in shape with a slightly rounded bevel. Shell adzes are very rare in Samoa and may have been restricted to the earlier ceramic period. Buck (1930:353-54) records only two shell adzes in the Bishop Museum collection from Samoa.

HAMMERSTONES

Two hammerstones, both from Layer IIA-1 of Unit 9 in the main trench, were excavated. One is an ovoid cobble of porphyritic igneous stone (with abundant feldspars). It is 30 mm thick, has a diameter of 93-105 mm, flat sides, and distinct

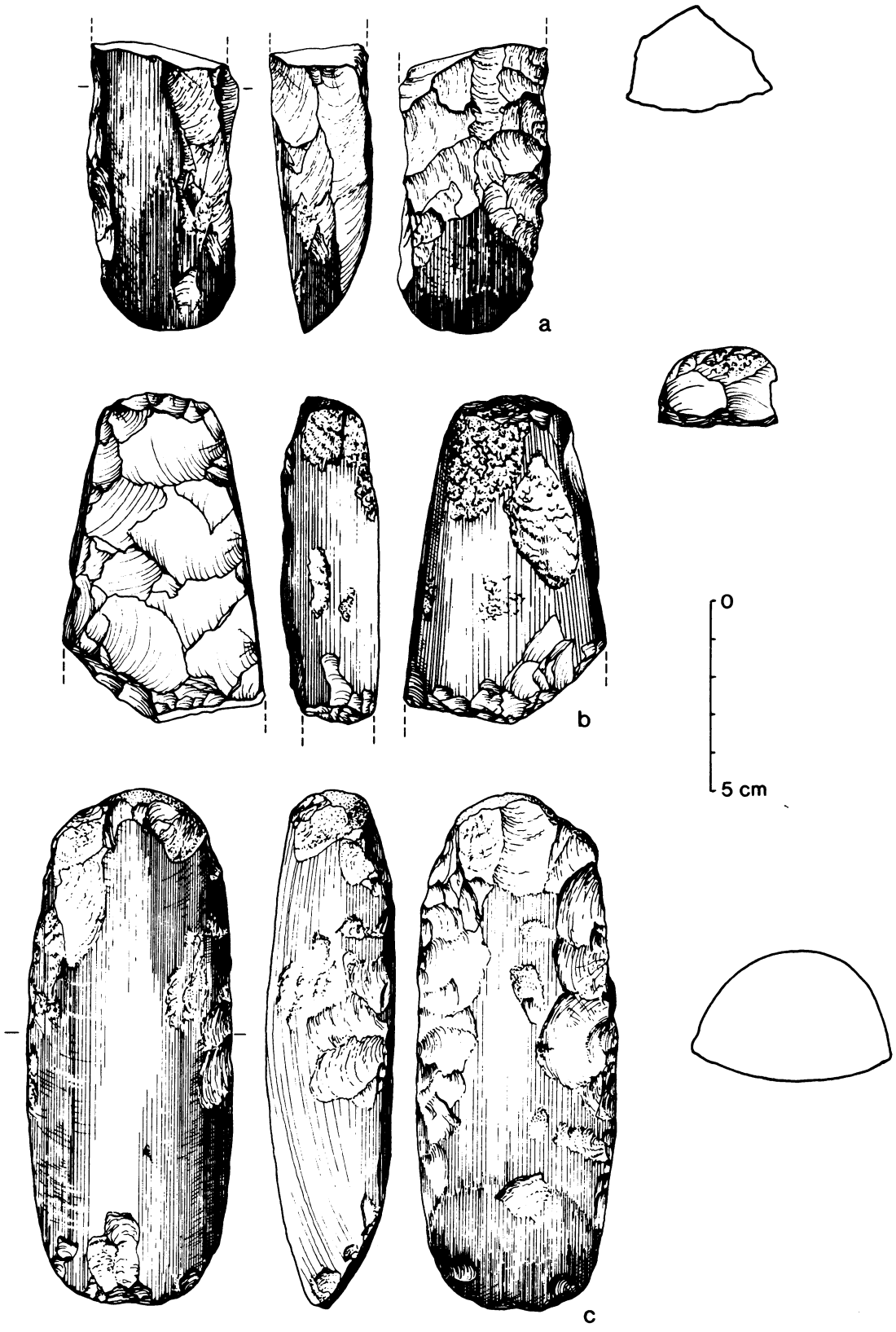

Figure 11.1 Basalt adzes from the To'aga site: a, bevel section from Unit 20, Layer IIIB; b, butt section from Unit 23, Layer IIIB; c, complete Type V adz from Unit 9, Layer IIA-1 (drawings by J. Ogden).

pecking or damage along the margins. One face appears to be ground smooth, perhaps during use as an abrading or polishing stone. The second specimen is an elongate basalt cobble, beach-worn, with pecking damage on the broader end. The cobble measures 147 mm long (max. width 70 mm), and the damaged surface has an area of 17.1 by 26.9 mm.

FISHING GEAR

Turbo-*Shell Fishhooks*

Samoan archaeological sites have been notoriously poor in the preservation of bone or shell artifacts, and only a few specimens of fishing gear have ever been excavated (Green and Davidson 1969, pl. 23; Janetski 1980). The same has been true of other Western Polynesian sites in Tonga and Futuna (Kirch and Dye 1979). In our 1986 test excavation at To'aga, two fragments of small *Turbo*-shell one-piece fishhooks were recovered (Hunt and Kirch 1988:175, fig. 8, b-c). In 1987 the expanded excavations yielded four nearly complete hooks and fourteen hook fragments. In 1989, we recovered an additional eight hooks or hook fragments, and a large number of prepared tabs and unfinished *Turbo* shell fragments. Thus, the total fishhook assemblage from To'aga now stands at twenty-eight whole or incomplete specimens, not including tabs and unfinished fragments. This is by far the largest assemblage of prehistoric fishing gear recovered from Samoa and is a major addition to our knowledge of early Polynesian fishing.

The To'aga fishhook assemblage is remarkably uniform in size and morphology, with only minor variations. The hooks were all manufactured from the body whorls of *Turbo setosus*, a gastropod common on the reef edge of Ofu Island. The various midden deposits contained large quantities of *T. setosus* shell, some of which was probably manufacture debris (see Nagaoka, chapter 13). One worked fragment from Layer IIB of the 1987 trench, probably an unfinished hook tab, was of the larger and less commonly occurring species *Turbo marmoratus*.

Examples of the hooks are illustrated in figures 11.2 and 11.3. They are small, and rather delicate, and were probably used to take smaller reef fish. The complete hooks have shank heights ranging from 13.1 to 30.4 mm. Hook widths range from 10.1 to >20.8 mm. Most hooks appear to have been

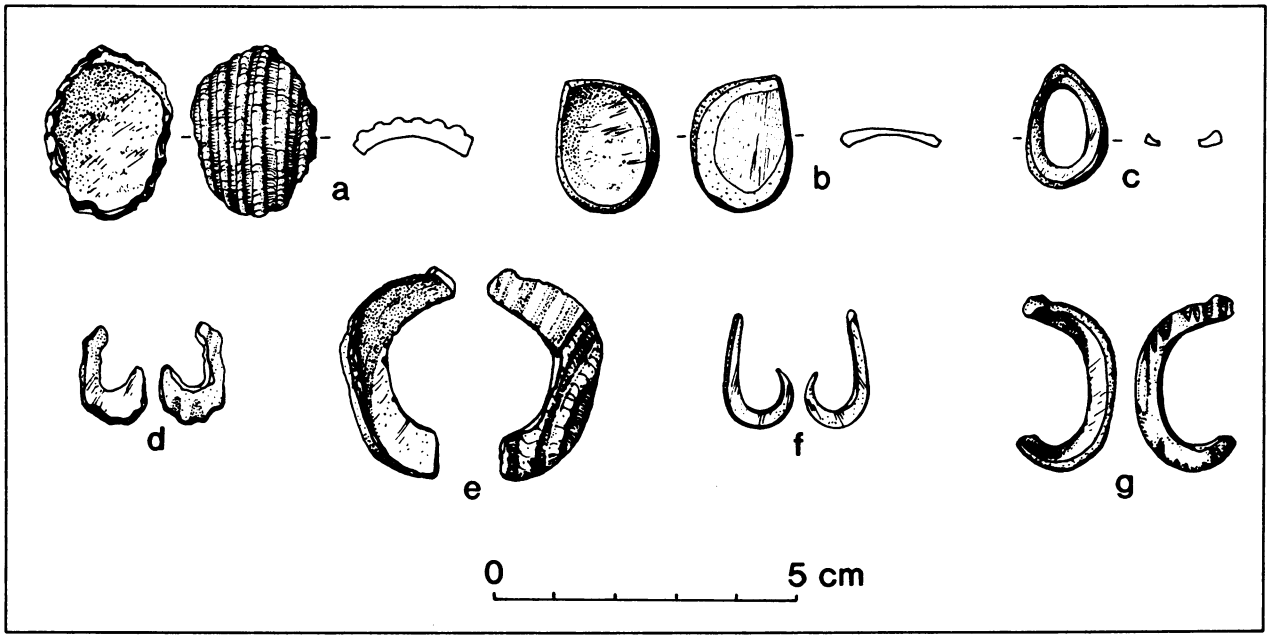

Figure 11.2 *Turbo*-shell fishhooks from the To'aga site: a, roughed-out fishhook tab from Unit 21, Layer IIB; b, well-ground fishhook tab from Unit 23, Layer IIIB; c, ground and perforated tab from Unit 30, Layer II; d, unfinished fishhook from Unit 15, Layer II; e, head and shank from Unit 27, Layer IIIA; f, complete hook from Unit 23, Layer IIIB; and g, hook with sharply inturned shank and head from Unit 20, Layer IIIB (drawings by J. Ogden).

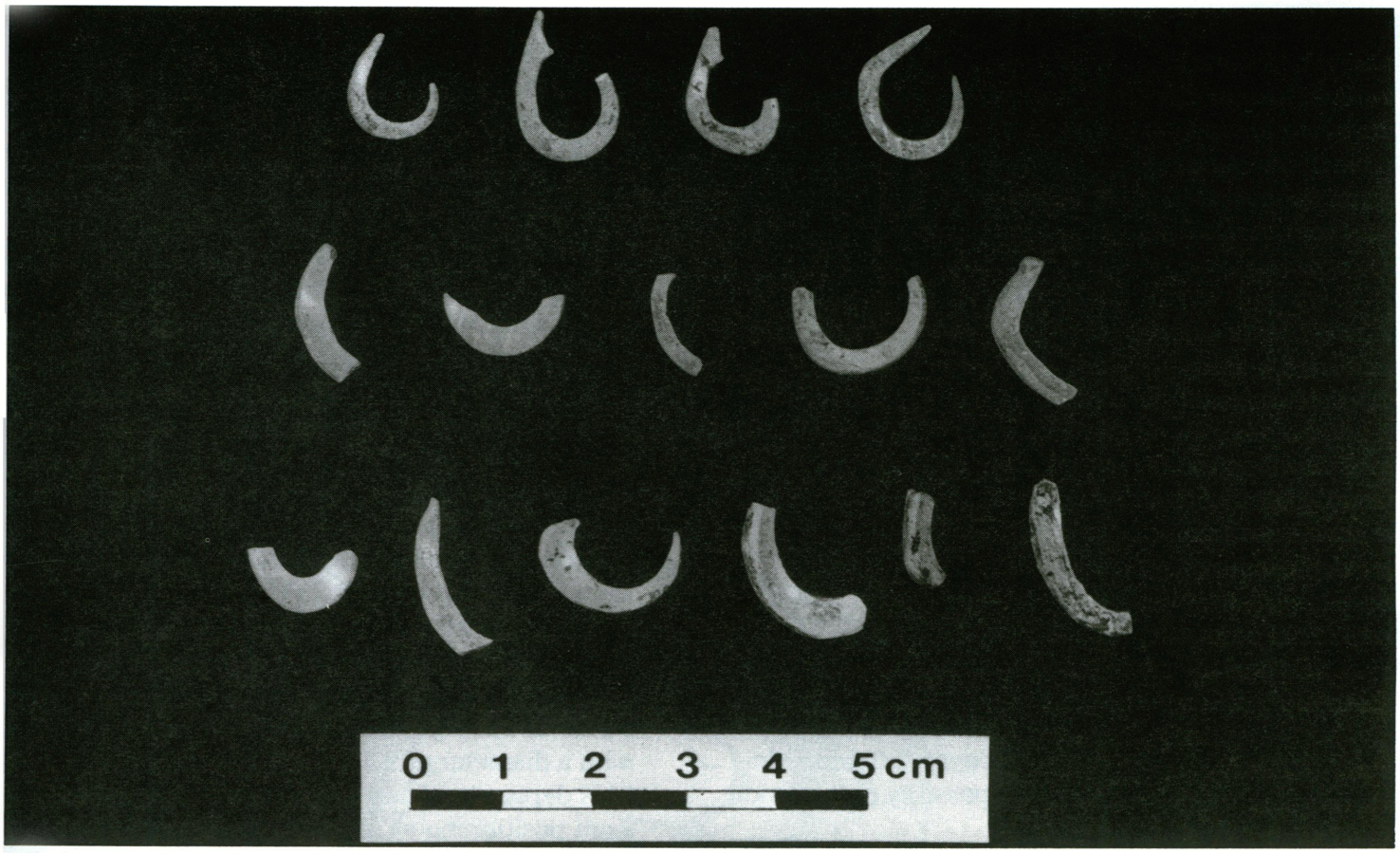

Figure 11.3 *Turbo*-shell fishhooks and fishhook fragments from the 1987 excavation at To'aga.

rotating in form, although one hook is technically of the jabbing variety. The bends have an 'O' or 'U' shape. Three hooks have a distinctive in-curved or "bent" shank, strongly reminiscent of some early Marquesan hooks (Suggs 1961:81, fig. 26). Two specimens have an inner shank knob, presumably to assist in line attachment. Several other shanks have small notches or grooves on the outer shank face, also for line attachment.

Turbo-*Shell Fishhook Tabs*

The manufacture of fishhooks from *Turbo setosus* shell is well attested in the To'aga site by the presence of numerous preforms or tabs roughed out of the body whorls of this gastropod as well as by worked shell fragments and many kinds of abrading tools (see below). Several examples of fishhook tabs are illustrated in figure 11.2. Of particular note is a specimen from Unit 23, Layer IIIB, which has been carefully shaped and fully ground on the exterior surface and around the margins (fig. 11.2, b). This tab measures 21.7 by 16.4 mm. Another specimen (fig. 11.2, c), from Layer II of Unit 30, represents yet a further stage in manufacture, with the entire center of the tab removed by drilling and filing. This specimen measures 19.8 by 13.4 mm. These tabs indicate that the reduction procedure for the manufacture of *Turbo*-shell hooks at To'aga was as follows: (1) a tab was first roughed out of the body whorl of *Turbo*; (2) this roughout was then ground flat on the exterior surface and carefully shaped by grinding around the margins; (3) the interior was then removed by drilling and filing; and (4) the gap between the shank and point was opened last by cutting and filing. Sinoto (1967:353, table 3) remarks that "simple drilling" and "chipping and filing" were the methods used by early Marquesans in hook manufacture. Thus, not only the forms of the To'aga hooks, but the specific manufacture methods, are consistent with the Marquesan hooks for which the To'aga specimens may have been

prototypes.

During the 1987 excavations we did not make a special effort to distinguish *Turbo*-shell tabs from *Turbo*-shell midden or worked debris, and no exact counts are therefore available. For the 1989 materials, however, shaped tabs were carefully separated from the shell midden during the laboratory study of faunal materials by L. Nagaoka. The following counts by unit indicate the frequency of such prepared tabs:

Unit 15:	2 tabs
Unit 16:	1 tab
Unit 20:	7 tabs
Unit 21:	11 tabs
Unit 23:	9 tabs
Unit 30:	1 tab

Cypraea-*Shell Caps*

The caps or dorsa of large *Cypraea* shells (especially *C. tigris*) comprised one component of the Samoan octopus lure. Buck (1930:434-38, fig. 257, pl. XLI, B) describes and illustrates this apparatus. Three such dorsa were recovered together in Layer III of Unit 28 and were possibly part of such an octopus lure rig.

ABRADING TOOLS

Coral Abrader

From Layer III of Unit 11 we recovered a tabular shaped abrader of *Porites* sp. coral. The abraded facet has a surface area measuring 50 x 60 mm.

Echinoid-Spine Abraders

The long spines of the slate-pencil sea-urchin (*Heterocentrotus mammillatus*) have a natural abrasiveness and thus were used throughout most of Polynesia to manufacture fishhooks and other objects of shell and bone. Two such abraders were excavated from Layer IIA-1 in the main trench. Both have distally abraded facets at an angle to the longitudinal axis, as do the abraders reported by Janetski (1980, fig. 43, g-i) from the early Falemoa site in Western Samoa. A complete spine which has been slightly faceted at the distal tip was excavated in Layer II of Unit 15. From Layer IIIC in Unit 23 we recovered a sea urchin spine abrader which had been distally abraded to a point (circular section), presumably from use as a drill in the manufacture of *Turbo*-shell fishhooks (fig. 11.4, a). The tip only of a circularly abraded echinoid spine was also found in Layer IIB of Unit 20. A particularly interesting echinoid abrader was found in Layer IIB of Unit 28, and is illustrated in figure 11.4, j. This spine, 73.2 mm long, has been equally reduced on two sides from the distal end to form a thin, saw-like blade. It would appear that this blade edge was purposefully produced in order to cut shell or bone objects. Also from Unit 28 (Layer III) was a small fragment of sea urchin spine which was abraded laterally to form a flat surface. All of these abraders were likely used to manufacture the *Turbo* hooks and other artifacts of shell.

Shell-Bead Abrader

An abrader of *Porites* coral, specifically adapted for grinding small *Conus*-shell beads, was recovered from Layer IIIB of Unit 23 (fig. 11.4, h). The abrader consists of a naturally waterworn coral pebble (68.6 by 46.4 mm and 19 mm thick) which has been flattened on one face by grinding. In the center of this face is a single depression or "cupule" with a diameter of 9.1 mm, about 1-2 mm deep. This depression has a central "nipple" which results from positioning a *Conus*-shell spire in the depression, and then using the abrader to grind the shell against a larger grindstone. Such specialized *Conus*-shell bead abraders had been reported from Vanuatu (Garanger 1972) and from Vanikoro in the Santa Cruz Islands of eastern Melanesia (Kirch 1983:102-104, fig. 16), but were previously unknown from Western Polynesia. Recently, however, Sand (pers. comm.) excavated such an abrader from the Asipani Lapita site on Futuna Island.

ORNAMENTS

Conus-*Shell Beads*

From Layer IIB in the main trench are two delicate beads of *Conus* sp., very well ground, with diameters of 5.6 and 5.9 mm, and thicknesses of 1.9 and 2.1 mm (fig. 11.5). A slightly larger bead or ring of *Conus*, complete and very well ground (fig. 11.4, g), was found in Layer IIIC of Unit 20. This has an external diameter of 15.8 mm and is 2.4 mm thick.

Conus-*Shell Rings*

Layer IIB in the 1987 main trench produced two fragments of larger *Conus* sp. rings, very well ground, with original diameters of about 50 mm (fig.

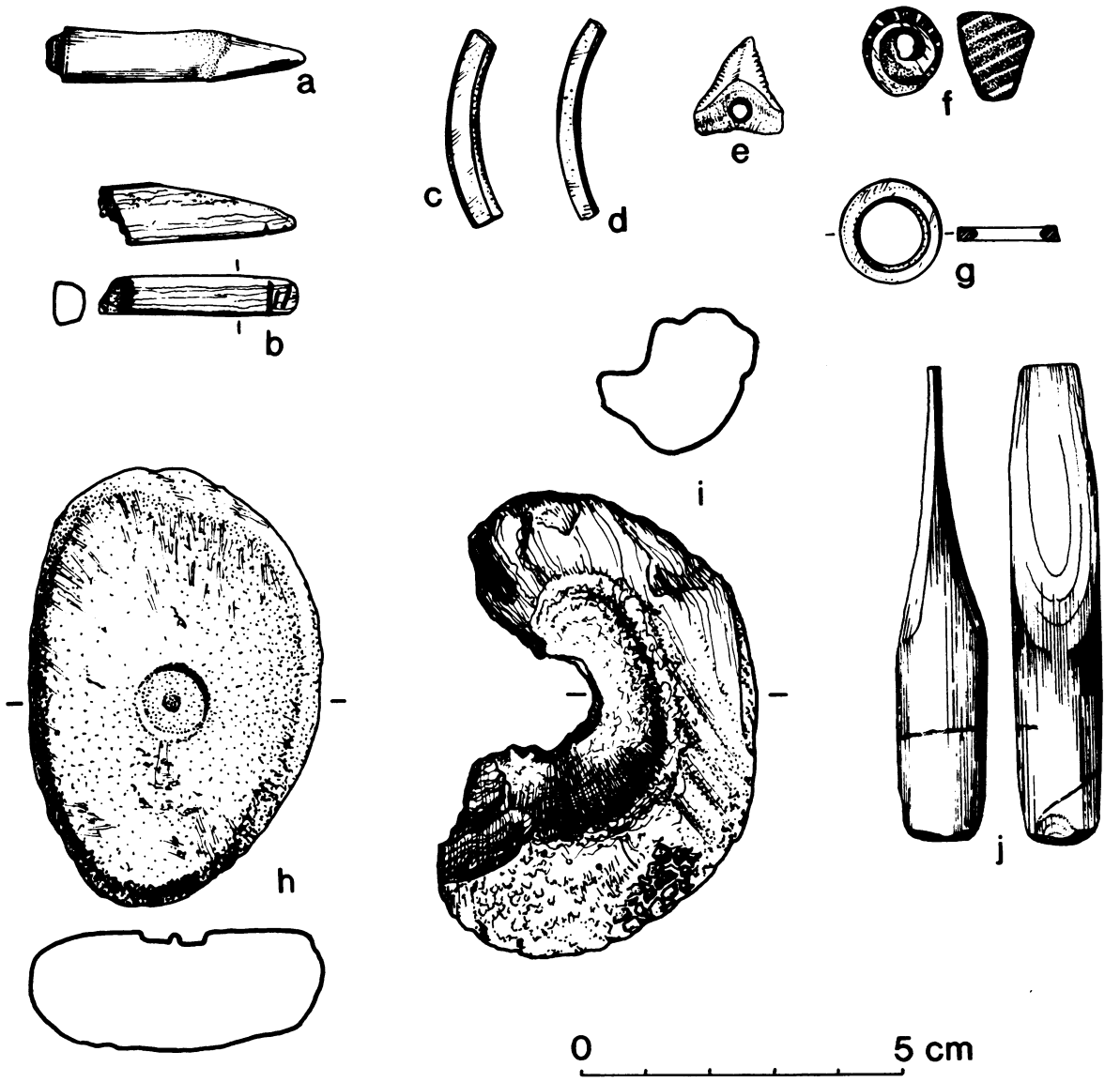

Figure 11.4 Miscellaneous artifacts from the To'aga site: a, echninoid spine abrader from Unit 23, Layer IIIC; b, bone point from Unit 27, Layer IIIB; c, *Conus*-shell ring fragment from Unit 29, Layer IIIB; d, *Conus*-shell ring fragment from Unit 29, layer IIIB; e, drilled shark's tooth from Unit 21, Layer III; f, *Conus*-shell bead from Unit 30, Layer II; g, *Conus*-shell bead from Unit 20, Layer IIIC; h, coral abrading stone for grinding shell beads, from Unit 23, Layer IIIB; i, unfinished*Tridacna*-shell ring from Unit 23, Layer IIIC; and j, echinoid-spine abrader from Unit 28, Layer IIB (drawings by J. Ogden).

11.5). One fragment had been sharpened to a point after breaking. Layer II in Unit 11 produced a fragment of a large shell ring or armband, made either of a large species of *Conus*, or possibly of *Tridacna*. The ring fragment is 7.3 by 11.6 mm in thickness, and has a reconstructed diameter of about 70 mm (fig. 11.5). A similar armband fragment from the Falemoa site is illustrated by Janetski (1980: fig. 45, b). From Layer III of Unit 16 we recovered a fragment of a *Conus*-shell ring with a cross section measuring 3.5 by 4.8 mm, and a reconstructed diameter of about 35 mm. Layer IIIB of Unit 29 produced another *Conus*-shell ring fragment (fig. 11.4, d) with a roughly rectangular

cross section (5.3 by 4.8 mm), which would have had an original diameter of about 30 mm. Based on Buck's extensive compilation of Samoan material culture (1930), *Conus*-shell rings were not a part of the Samoan ornamental repertoire in historic times. Indeed, they were probably associated only with the early ceramic period.

Unfinished Tridacna-*Shell Ring*

Approximately one-half of a *Tridacna*-shell ring which broke during the process of manufacture was found in Layer IIIC of Unit 23 (fig. 11.4, i). The *Tridacna* valve incorporates part of the hinge. It was worked by chipping and pecking to create a central perforation. Presumably the artifact broke during this chipping process, prior to the initiation of grinding. The specimen has an outer diameter of 73 mm, and the central perforation is 15 mm in diameter.

Nerita-*Shell Beads*

From Layer IIB in the 1987 main trench were two *Nerita* sp. shells with artificial perforations in the basal whorl, perhaps for stringing as beads. A third specimen was found in Unit 21. Buck (1930:638) mentions the use of sea shells as beads but does not illustrate examples or provide further details.

Gastropod Bead

A small gastropod (species unknown) from Layer II of Unit 30 has had both the spire and basal whorl removed by grinding (fig. 11.4, f), leaving only the midsection of the shell as a bead. It has a diameter of 14.0 mm.

Echinoid-Spine Bead

In Layer IIIC of Unit 20 we found a unique bead made from a section of *Heterocentrotus mammillatus* spine which was double-drilled to form a central perforation. The bead measures 13.5 mm in diameter and is 10.5 mm thick.

MISCELLANEOUS ARTIFACTS

Drilled Shark's Tooth

A small shark's tooth (14.7 mm high) was found in Layer IIB of Unit 21 (fig. 11.4, e). This has been drilled (hole diameter 2.6 mm), presumably in order to lash the tooth to a handle.

Bone Point

From Layer IIIB of Unit 27 was recovered a facet bone "point" of unknown function (fig. 11.4, b). The bone, of either dog or pig, has been carefully faceted to a chisel-like tip, across which were abraded a series of fine grooves.

WORKED SHELL

A large piece of *Tridacna* shell (possibly from *T. gigas*) which has been chipped around the edges to a roughly rectangular shape (measuring 170 by 135 mm) was found in Layer IIIB of Unit 29. This may have been intended as a *Tridacna* adz preform or may have been for the manufacture of some other object, such as a shell ring.

From Layer III of Unit 28 we recovered two matching pieces of worked *Conus* shell. These consist of part of the main body whorl, with a cut and beveled edge near the spire. These are presumably rejected material resulting from the removal of a large *Conus* spire, as a part of the manufacture process for *Conus*-shell rings.

The chipped basal whorl section of a species of *Trochus* or *Textus* shell was found in Unit 21. This may have been intended to be a ring or armband.

Various small pieces of worked shell were recovered throughout the excavations. Most of these are of *Turbo* spp. and relate to fishhook manufacture. In the 1987 excavated material these were not distinguished from the *Turbo*-shell midden. In 1989, however, all worked *Turbo* shell was carefully segregated during faunal analysis by L. Nagaoka, yielding the following frequencies by excavation unit:

Unit 15	2 specimen(s)
Unit 16	5
Unit 17	1
Unit 20	14
Unit 21	3
Unit 22	1
Unit 23	9
Unit 25	2
Unit 26	1
Unit 28	5
Unit 30	1

Five specimens of worked pearl shell (*Pinctada* sp.), were also recovered from Units 11, 22, 23, 29, and 30. A triangular-shaped specimen from Layer

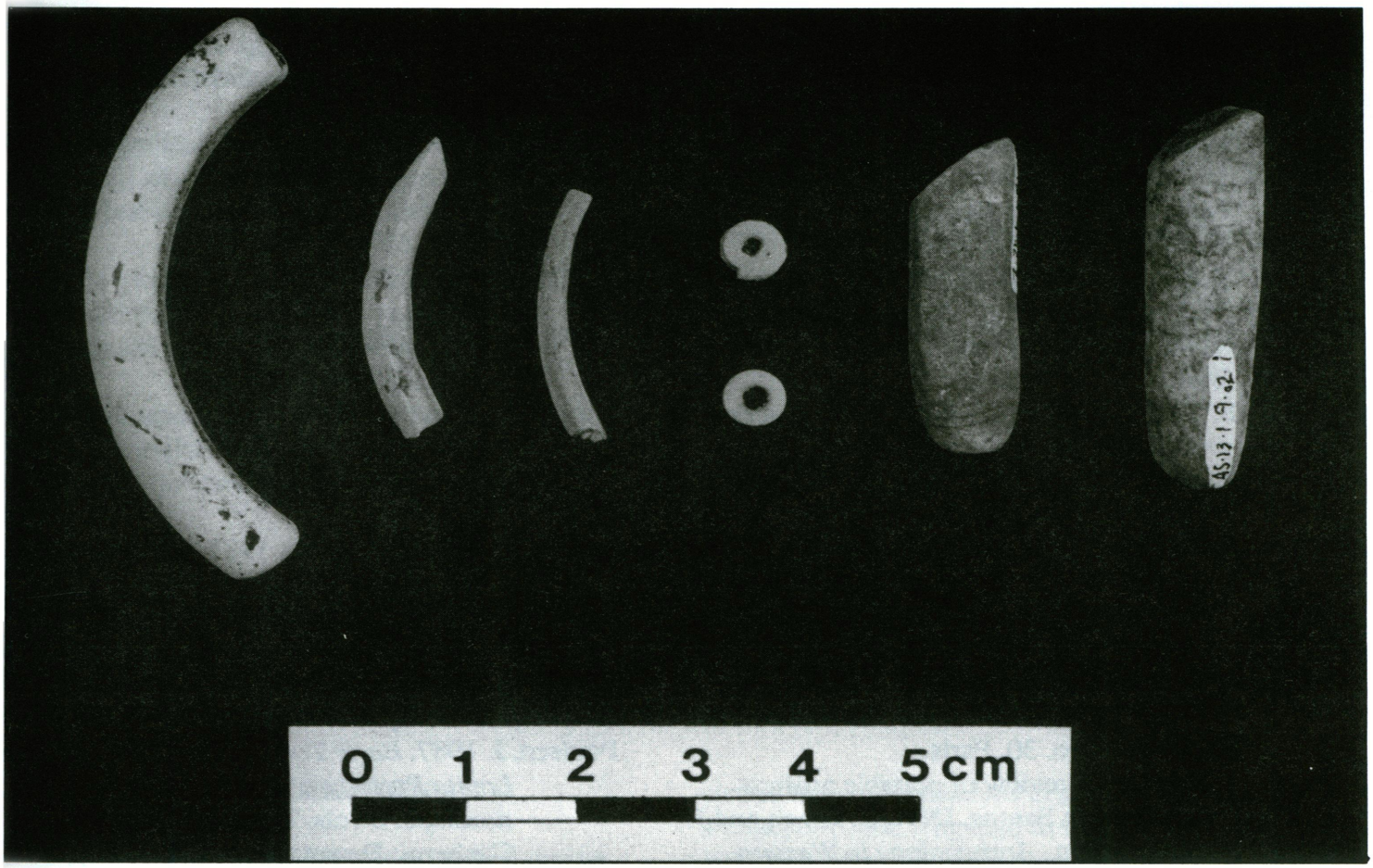

Figure 11.5 Miscellaneous artifacts from the To'aga site: left to right, *Conus*-shell ring fragments, *Conus*-shell beads, and echinoid-spine abraders.

IIIB of Unit 23 is of special interest because it shows distinct filing or cutting marks on all three margins. This piece, measuring 24.9 by 16.9 mm, is probably detritus from the manufacture of some other object, rather than a preform.

UNRETOUCHED LITHICS

Basalt Flakes

Flakes of basalt were surprisingly uncommon in the To'aga excavations. During the 1989 excavations, when particular attention was paid toward the recovery of such lithics during screening, only eighteen flakes were noted. Eleven of these are from Unit 23 [Layer III], suggesting that this may have been a locus of basalt flaking activity. The other flakes are from Unit 28 (three flakes) and Unit 29 (four flakes). Most of these are rather small and could derive from adz use, although they do not show polished surfaces.

Obsidian Flakes

A number of very small flakes of an opaque, black, low-silica volcanic glass or obsidian were found from various excavation contexts. Most of these are less than 5 mm in size. As the dike complex of Leolo Ridge overlooking the To'aga site has many glassy chills along the dike margins (see chapter 2), it is most probable that these "flakes" are natural and simply derive from the talus rockfall above the site.

One small core from Layer IIIC of Unit 23 is completely different, however, from the other obsidian specimens. This is of a reddish-brown color, with black spots and banding. The "core" measures 12.2 by 13.3 mm. Its geological provenance is unknown, but it is very likely an import to Ofu.

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