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Middle Holocene Production of Mussel Shell Fishing Artifacts on the Coast of Taltal (25° Lat South), Atacama Desert, Chile

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ABSTRACT

*Shell fishhooks have been found in several sites along the Pacific Coast of the Americas, but little is known about prehistoric workshops of these tools and the socio-economic context of their production and distribution. The present study provides new data about the production of mussel (*Choromytilus chorus*) shell fishing tools (MSFT) at Morro Colorado and Zapatero, two Middle Holocene sites on the coast of Taltal, northern Chile. The MSFT assemblages of the two sites suggest the existence of workshop areas and a specialized manufacture of *C. chorus* fishhooks associated with an increased dependence on fishing in local subsistence practices. Abundance and type of mussel shell fishing artifacts, preforms, and shell debris at these two shell midden sites are discussed to better understand Prehispanic workshops, the techniques used to work *C. chorus* shells, and the possible relationship between raw material acquisition, technological change and overall transformations in subsistence practices and levels of social complexity among Middle Holocene coastal groups along the northern coast of Chile.*

Keywords *Choromytilus chorus*, shell fishing tools, hunter-gatherer-fisher groups, Middle Holocene

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INTRODUCTION

Fishing tools made of marine shells were an important toolkit for prehistoric groups living in coastal environments around the world (e.g., Heizer 1949; McKenzie 2007; O'Connor et al. 2011; Rick et al. 2002; Sinoto 1962). Shell fishhooks are particularly conspicuous and have been found in several sites along the Pacific Coast, including South America (e.g., Des Lauriers 2010; Landberg 1966; Moseley 1968; Strudwick 1985; Rick et al. 2002). However, very little has been investigated about the manufacture of these tools or the existence of prehistoric workshops of shell artifacts in general or shell fishing tools in particular (but see Fujita 2014; Hocquenghem and Peña 1994; Masucci 1995). This lack of research is regrettable given the importance of shell fishing artifacts in prehistoric coastal economies. In fact, in places like Southern California, single-piece shell fishhooks were the most important and widespread fishing technology during the Late Holocene, a period when fish dominated the human subsistence economy (e.g., Arnold 2004; Erlandson and Jones 2002; Rick et al. 2002), and their appearance has been related to population growth and cultural complexity (e.g., Arnold 2004; Erlandson and Jones 2002; Rick et al. 2002).

The Middle Holocene (~8000–4500 years BP) in the area of Taltal, on the southern coast of the Atacama Desert (Figure 1), presents a similar situation. Archaeological deposits show evidence of a specialized maritime economy, a semi-sedentary settlement system, and growing social complexity during this period (Ballester and Gallardo 2011; Castelleti 2007; Núñez 1984; Salazar et al. in press). Shell fishhooks on *C. chorus* appear throughout the Middle Holocene, not only in the Taltal area, but also further north in Chile (e.g., Bird 1943; Capdeville 1921; Durán 1985; Llagostera 1989; Schiappacasse and Niemeyer 1984; Standen et al. 2004). In fact, these artifacts were the ones used by Bird (1943, 1946) as diagnostics for defining the “Shell Fishhook Culture,” from Arica (18° Lat South) to Taltal (25° Lat South).

One of the sites used to define the “Shell Fishhook Culture” was Morro Colorado. The site is located 3.5 kilometers north of the city of Taltal (Figure 1) and was originally excavated by Capdeville, Uhle, Latcham, and Bird (Andrade and Salazar 2011). Recent research at Morro Colorado, has dated its early deposits containing mussel shell fishhooks and weights, between 8260 and 6470 cal BP (Table 1). These earliest dates from Morro Colorado coincide with mussel shell fishhooks found at other early sites along the northern coast of Chile (Boisset et al. 1969), such as Tiliviche 1b and Camarones 14 (dated to 7850 BP and 7000 BP—non calibrated—according to Núñez 1983 and Schiappacasse and Niemeyer 1984, respectively). Early evidence of shell fishhooks along the Pacific Coast of America comes from Baja California, Mexico, where Cedros Island mussel shell fishhooks have been dated to 9970 ± 25 BP (Des Lauriers 2010) and Espiritu Santo Island pearl oyster fishhooks have been dated to 8380 ± 50 cal BP (Fujita 2014).

The site of Zapatero is located nearly 60 kilometers north of Morro Colorado (Figure 1). It was first excavated in 2011, and shell fishing artifacts were found in stratigraphic contexts dated between 7365 and 5817 cal BP (Table 1), as well as in undated later deposits that may correspond to periods between 5500 and 4500 cal BP (given their association with the characteristic architecture of this period). The dates from Zapatero are contemporaneous with a proliferation of mussel fishing tools in other sites from the northern coast of Chile (Bird 1943; Boisset et al. 1969; Capdeville 1921; Durán 1985; Llagostera 1989; Núñez 1983; Schiappacasse and Niemeyer 1984; Standen et al. 2004). After ~4500 cal BP mussel shell fishhooks disappear from the archaeological record of Taltal and the entire region (Llagostera 1989; Standen et al. 2004).

The present study provides new data about the production of MSFT from the sites of Morro Colorado and Zapatero, encompassing most of the Middle Holocene along the coast of Taltal (Figure 1). Information on abundance and types of mussel shell fishing artifacts, preforms, and shell debris from these sites is presented as a contribution

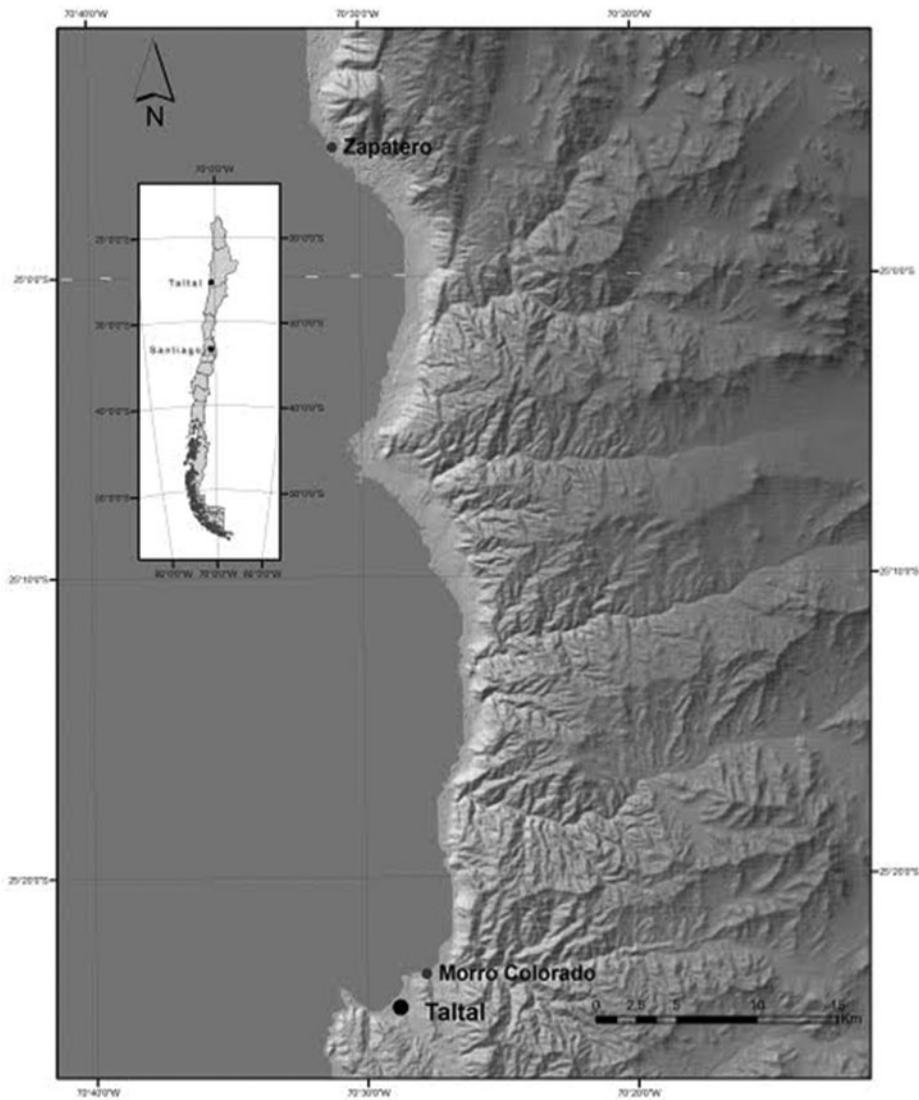


Figure 1. Map with the city of Taltal and the study sites of Morro Colorado and Zapatero.

to the understanding of Prehispanic workshops of fishermen from the Pacific Coast. The results of this study improve our understanding of archaeological marine shells as raw material and their relationship to social processes among prehistoric coastal groups, such as the decrease in residential mobility, technological change, and social complexity.

THE MIDDLE HOLOCENE IN TALTAL AND THE STUDY SITES

The study area is characterized by a narrow coastal platform and a mountain range of up to 2,000 mts above sea level. Almost all the archaeological sites along Taltal are located along this narrow coast where rocky shores dominate the landscape, ex-

Table 1. Dates from Zapatero and Morro Colorado sites (Salazar et al. 2015).

Site	Material	Radiocarbon age (BP)	Calibrated age BP (2σ)	Sample code
Zapatero	Charcoal	5110 \pm 30	5820(5730–5910)	Beta-333513
	Charcoal	5230 \pm 25	5940(5900–6000)	UGAMS 18076
	Charcoal	5230 \pm 30	5950(5780–6170)	Beta-312877
	Charcoal	5780 \pm 30	6530(6440–6640)	Beta-312879
	Charcoal	5810 \pm 30	6570(6480–6660)	Beta-333511
	Charcoal	6180 \pm 25	7040(6940–7160)	UGAMS 18075
	Charcoal	6340 \pm 30	7220(7160–7300)	Beta-312878
	Charcoal	6490 \pm 40	7370(7280–7430)	Beta-333512
Morro Colorado	Shell	6270 \pm 40	6470(6350–6710)	Beta-305495
	Fish bone	6710 \pm 30	7540(7470–7600)	UGAMS 16863
	Charcoal	6830 \pm 25	7630(7580–7680)	UGAMS 13093
	Charcoal	7070 \pm 40	7870(7750–7960)	Beta-305494
	Charcoal	7470 \pm 30	8260(8180–8340)	UGAMS 13094

cept for two small sandy beaches, one located 3 kilometers south of Morro Colorado and the other 30 kilometers south of Zapatero. The study area is an arid coastal desert with fresh water available only in small and dispersed springs, but with a highly productive marine ecosystem as a consequence of the influence of the Humboldt Current (Thiel et al. 2007). Paleoenvironmental records suggest that along the coast of northern Chile, the Middle Holocene period was dominated by hyper-arid conditions, during which marine resources became crucial to the subsistence of fishing and gathering groups (Grosjean et al. 2007; Marquet et al. 2012; Sandweiss 2003). In fact, the faunal assemblages from Middle Holocene sites at Taltal document a subsistence economy based almost entirely on coastal and marine resources, including mollusks, and fish, bird, and marine mammal remains (Castelleti 2007; Salazar et al. 2015). The fish assemblages are dominated by the offshore fish jack mackerel (*Trachurus murphyi*, ~80% of the total fish assemblages, NISP) and in mollusk shell assemblages, intertidal gastropods such as *T. atra*, *Fissurellidae*, and *C. concholepas* (98% of the total shellfish assemblages, MNI) dominate the sample (Olguín et al. 2014; Rebolledo et al. 2015; Salazar et al. 2015).

The artifact assemblages of the Middle Holocene sites of Taltal are characterized by a specialized technology for extracting and processing marine and coastal resources. These include circular and J-shape shell fishhooks, diverse types of fishing weights made from shell (*C. chorus*), stone, and bone, a variety of bone instruments, including shell openers, harpoons, composite fishhooks, harpoon barbs, and drills, and finally, an equally diverse lithic industry including bifacial projectile points, scrapers, awls, knives, files, choppers, manos, bifaces, and multi-functional artifacts (Castelleti 2007; Núñez 1984; Salazar et al. 2015). There is also evidence of navigation devices and offshore hunting with harpoons during this period (Ballester et al. 2014; Olguín et al. 2014).

From around 5500 to 4500 cal BP, circular residential rock structures were built over or around many Middle Holocene sites located in our study area and along the northern coast of Chile (Castelleti 2007; Contreras et al. 2011; Núñez 1984; Salazar et al. in press). Some of these structures contain human burials at the base. The appearance of these structures with funerary remains has been related to increasing territoriality and social complexity in the area (Ballester and Gallardo 2011; Salazar et al. in press).

The sites of Morro Colorado and Zapatero (Figure 1), like other archaeological sites dated during the Middle Holocene around the Taltal area, correspond to stratified open-air shell middens, with deposits around 2 meters deep and with evidence of circular structures at the top of the deposits (Late Middle Holocene). Some of the MSFT sample comes from contexts associated with these structures in the case of Zapatero, but not in the case of Morro Colorado, since they were excavated by Capdeville during the 1920s (Capdeville 1921). Both sites are located around 10 to 20 m.a.s.l. and less than 50 meters from rocky shores, with no significant geomorphological differences between them. Zapatero and Morro Colorado have been interpreted as residential occupations with complex stratigraphic deposits including numerous and, often, dense hearths and secondary refuse areas, faunal remains from a high variety of habitats locally available, and diverse artifacts and manufacture debris evidencing multiple activities carried out at these locations (Salazar et al. 2015). However, despite the high degree of similarities between the geomorphological and archaeological contexts of the two shell midden sites under study, Morro Colorado and Zapatero show interesting differences in abundance and types of *C. chorus* mussel shell fishing artifacts, preforms, and shell debris.

MATERIALS AND METHODS

The mussel species (*C. chorus*) that was used for the manufacture of fishing tools in coastal northern Chile during the Middle Holocene is a subtidal species (4 to 13 meters below tide line) and in present times is almost absent from the coast around Taltal (Avenidaño and Cantillán 2011; Urban 1994). Based on the low abundance of *C. chorus* shells at archaeological sites around this area, including Morro Colorado and Zapatero (Olguín 2014), it is possible that during the occupation of these sites natural conditions of this mussel species were similar to present times. In fact, in the shellfish assemblages of the archaeological sites, *C. chorus* shells do not represent more than 1% of the sample (Olguín 2014)

and are always associated with the presence of preforms and shell tools like fishhooks and fishing weights (Figuroa et al. 2013).

The *C. chorus* mussel shell assemblage used in this study comes from the Middle Holocene archaeological sites of Zapatero and Morro Colorado and correspond to all the shells recovered on sieves (1/4") from the 5 m³ of sediment excavated at Morro Colorado and 11.1 m³ excavated at Zapatero. All the analyzed *C. chorus* shell fragments come from stratigraphic layers dated between 8200 and 5800 cal BP and include fishing artifacts, preforms, and shell debris. Some mussel shell fragments come from undated layers that, given their association with circular structures, may correspond to Middle Holocene deposits (around 5500–4500 cal BP). The total number of artifacts, preforms, and shell debris were quantified for each archaeological site, identifying also the part of the shell represented by each shell fragment (Figure 2) and any manufacture mark present on them (Figure 3). *C. chorus* shell fragments were observed using a 10 × binocular microscope. Fishing artifacts were all fishing weights and hooks made of *C. chorus* shells (complete or fragmented) with finished edges (sanded and/or polished) (Figure 5 and 6). Preforms were all unfinished fishing weights and hooks (Figure 4) and shell debris corresponds to shell fragments of different sizes and shapes (with or without manufacture marks) lost in the manufacture process of *C. chorus* shell fishing tools (Figure 4).

RESULTS

Between 8200 and 5800 years BP, the habitational camps of Morro Colorado and Zapatero show a continuity in the overall technological toolkit, as well as a specialized maritime economy based on shellfish gathering and jack mackerel fishing. However, as stated above, these two Middle Holocene sites show differences in their MSFT assemblages (Table 2). In Morro Colorado (~5 m³ of excavation and with dates from 8260 to 6470 cal BP), MSFT are characterized by a high abundance of shell fishhooks (complete

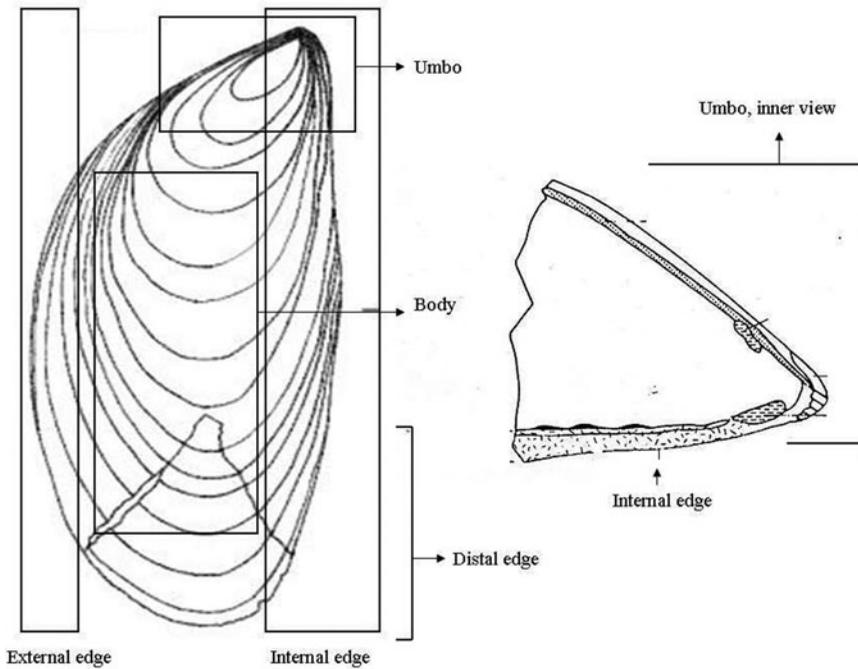


Figure 2. Parts of mussel shells identified in the analysis. Modified from Buchanan (1985).

and fragmented, $n = 65$) and mussel debris ($n = 319$), together with the absence of fishing weights (Table 2). Preforms are mainly of shell fishhooks ($n = 28$) with also preforms of beads ($n = 6$), pendants ($n = 1$), and one possible preform of a shell weight (Table 2). Body parts are the main portion of the shell represented at Morro Colorado ($n = 234$) followed by a similar abundance of shell fragments from internal ($n = 75$), external ($n = 43$), and distal edges ($n = 69$) of the valve (Table 3 and Figure 2). Evidence of manufacture is observed on artifacts, preforms and shell debris including sanding, cutting, and notching marks (Table 4 and Figure 3). From the total number of shells with manufacture marks ($n = 163$), the majority shows sanding marks ($n = 112$), followed by cutting marks ($n = 51$), and the presence of notches ($n = 5$) (Table 4, Figure 3). On the other hand, MSFT at Zapatero ($\sim 11 \text{ m}^3$ of excavation and with dates from 7370 to 5820 cal BP) are characterized by a lower abundance of shell fishhooks ($n = 4$) and mussel debris ($n = 178$), to-

gether with the presence of fishing weights ($n = 3$) (Table 2). Preforms are mainly of fishhooks ($n = 4$), beads ($n = 1$), and fishing weights ($n = 3$) (Table 2). As in Morro Colorado, mussel debris in Zapatero are dominated by body parts ($n = 149$) followed by internal edges of mussel shells ($n = 32$), which corresponds to the thicker part of the valve (Table 3 and Figure 2). From 193 mussel shells found at Zapatero, only 21 fragments show manufacture marks: sanding marks ($n = 18$), one cutting mark, and one polishing mark (Table 4, Figure 3).

DISCUSSION

The analysis of *C. chorus* shell remains from the two study sites suggests differences in the emphasis of mussel shell fishing tool production with the manufacture of high quantity of fishhooks at Morro Colorado and low quantity of fishhooks and fishing weights at Zapatero (Table 2). Morro Col-

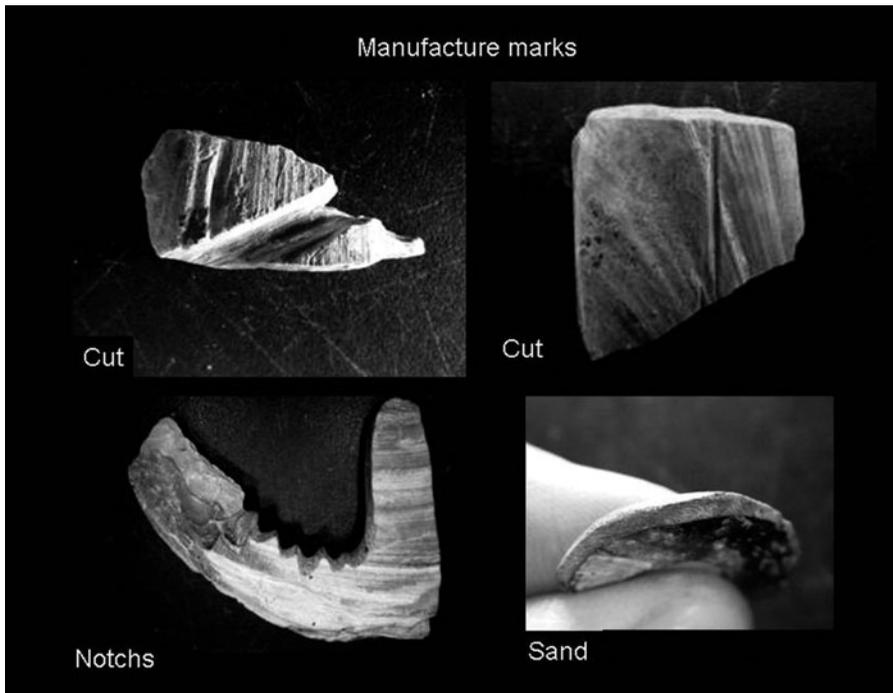


Figure 3. Marks on mussel shells.

orado shows higher diversity of manufacture marks on mussel shell debris which suggests different techniques or activities performed during the production of fishing artifacts (Table 3). On the other hand, sanding is the main manufacture mark at Zapatero, suggesting the predominance of one activity in the manufacturing process of mussel shell artifacts (Table 4). The predominance of sanding marks and the higher abundance of body parts and interior edges of mussel shells in Zapatero may suggest, as proposed previously by Boisset et al. (1969), the production of fishing weights over fishhooks.

Together with the differences in the relative abundance of shell artifacts, preforms, and manufacture marks between Morro Colorado and Zapatero, there is also a marked difference in the density of overall MSFT present in each deposit. Morro Colorado with 84 mussel shell fragments per m³ (421 mussel fragments/5 m³ of excavated soil) has



Figure 4. A mussel shell fishhook (top center), fishhook preforms (in the middle, lower center, and lower left), and shell debris from Morro Colorado site.



Figure 5. Fishing weight and fishhooks on mussel shells from the Zapatero site. Both books have straight shanks but the one in the center of the figure has a long shank and the book on the right has a short shank.

higher density of MSFT than Zapatero which shows 16 mussel shell fragments per cubic meter (178 mussel fragments/11.1 m³). These differences are interpreted as linked to different emphasis in the manufacture of



Figure 6. Fishhooks on mussel shells from Morro Colorado site. All the three books have no shanks and pointed ends.

mussel shell artifacts and/or to the overall importance of the activities done with these artifacts in local subsistence practices. The tools used to make the shell artifacts found at Morro Colorado and Zapatero are mostly unknown, except for the presence of stone files at each site which have been related to the action of cutting *C. chorus* shells (Figueroa et al. 2013). Studies done in California on shell fishhooks have proposed slender stone files as the tools used to “cut” the shell, stone drills to make central holes, and sandstone to sand shell edges (Kendig et al. 2010; McKenzie 2007; Robinson 1942).

It is interesting to consider that the types of mussel fishhooks are also different between Morro Colorado and Zapatero. Fishhooks from Zapatero are mainly of circular shape with long and straight shank (Figure 5), while in Morro Colorado fishhooks are also of circular shape, but with no shank and pointed ends (Figure 6) (Figueroa et al. 2013). This morphological difference has chronological implications, since the circular fishhooks with shanks are usually later and appear in the region after 6500 cal BP (Llagostera 2005). These differences could also be related to the capture of certain fish species or the exploitation of different habitats (e.g., McKenzie 2007; Robinson 1942; Smith et al. 2015), in which case, MSFT at each site should be related to their specific archaeological fish assemblage. However, the amount of fish remains at Zapatero and Morro Colorado sites is similar. Zapatero has 1,449 fish bones per m³ (15,943 NISP/11.1 m³) and Morro Colorado 1,854 (9,273/5m³) and at both sites Chilean jack mackerel (*Trachurus Murphy* ~80% of the total fish assemblage, NISP) and Snoek (*Thyrsites atun* ~12% of the total fish assemblage, NISP) are the main fish species (Rebolledo et al. 2015; Salazar et al. 2015). Based on these similarities, the morphological difference of fishhooks seem to be more related to changes in technological styles and/or fishing techniques than to the fish species targeted. If we consider the similar abundance of fish remains and types of species at both sites, together with the lower abundance of mussel shell fishhooks at Zapatero, as well as the fact that both Jack mackerel and Snoek can be caught with either nets

Table 2. Artifacts, preforms and debris of mussel shells (*C. Chorus*) at Morro Colorado and Zapatero sites.

Artifacts	Morro Colorado	Zapatero	Total
Fishhook	65	4	69
Fishing weight		3	3
Total	65	7	72
Preforms	Morro Colorado	Zapatero	Total
Fishhook	28	4	32
Bead	6	1	7
Bead/pendant	1		1
Pendant	1		1
Fishing weight	1	3	4
Total	37	8	45
Debris	319	178	497
Total mussel shells	421	193	614

or fishhooks (Rebolledo et al. 2015), we may consider the predominance of a fishing technique that implies the wider use of fishhooks at Morro Colorado (from 8261 to 6471 cal BP), and the more extensive use of nets at Zapatero (from 7365 to 5817 cal BP and possibly until 4500 cal BP). Unfortunately, due to the bad preservation of organic materials in the archaeological record and to the fact that simple pebbles without any visible mark can be used as net weights (e.g., Torres 2007), there is no direct evidence for the use of nets in the archaeological record of Zapatero.

After 7000 cal BP, there is evidence for the use of navigation devices in Taltal (Olguín et al. 2014) and of new and denser residential shell midden sites around the study area

(Castelleti 2007; Durán 1985; Salazar et al. 2015). The use of nets and navigation devices after this time could have provided higher yields of fish as compared to the use of shell fishhooks, and therefore, could have affected the production of this fishing tool in Zapatero. However, it is worth noting that fishhooks did not disappear from the study area until around 4500 cal BP (Standen et al. 2004).

The low abundance of *C. chorus* mussel shells in the archaeological record of the study area, and their presence in exclusive association with shell fishing tools, especially fishhooks, suggest that this subtidal mussel species was a scarce raw material, linked to the manufacture of a very impor-

Table 3. Shell parts represented in the overall assemblage of mussel shell debris (*C. chorus*) at Morro Colorado and Zapatero sites.

Shell part	Morro Colorado	Zapatero	Total
External edge	43	3	46
Internal edge	75	32	107
Distal edge	69	7	76
Body	234	149	383
Umbo		2	2
Total	421	193	614

Table 4. Manufacture marks present on the overall assemblage of mussel shell debris (*C. chorus*) at Morro Colorado and Zapatero sites.

Marks	Mark detail	Morro Colorado	Zapatero	Total
Cutting	Cutting	49	1	50
	Cutting and notchs	2		2
Total		51	1	
Sanding	Sanding	99	16	114
	Sanding and cutting	10	2	12
	Sanding and notchs	2		2
	Sanding, cutting, and notchs	1		1
Total		112	18	
Polishing	Polishing		1	1
Burning	Burning		1	1
Total number of shells with marks		163	21	184
Total number of shells without marks		258	172	

tant fishing artifact. This was especially important during the earlier occupations of Morro Colorado and Zapatero sites, when no navigation devices existed. Ethnographic research in coastal populations has shown that artifacts and activities that indicate skills and knowledge within a community are associated with higher social status for those who own them (e.g., Smith et al. 2003). Additionally, artifacts and/or activities may be considered as prestige goods due to their scarcity, the labor involved in their manufacture, and/or their importance for community life (e.g., Plourde 2009; Trubitt 2003). Following this framework, the production of shell fishhooks around Taltal may have been in a context of prestige goods management and higher social status for the ones in control of knowledge and skills to manufacture and use of this type of tool.

In this context, several questions emerge about the manufacture process of shell fishhooks. Did the differences observed between the MSFT assemblages found at Morro Colorado and Zapatero, and the decrease in the production of shell fishhooks in later times, have any implication on the past socio-economic organization of the groups that inhabited these locations? Did the use of navigation devices after 7000 cal BP have any effect on the prestige possibly associ-

ated with the production and use of shell fishhooks during the second part of the Middle Holocene? How were the *C. chorus* shells acquired, who was in charge of obtaining them, and who made the tools during the first and second part of the Middle Holocene around the Taltal area?

Despite the need for further research to understand the implications of the production of mussel shell fishing tools in the Middle Holocene of Taltal, it is important to emphasize the social role that this type of material culture may have had for prehistoric fishermen communities (e.g., Plew 1996), and the historical changes that could influence the higher or lesser production of these artifacts through the prehistory of the area. Processes of specialization in the manufacture of shell artifacts like shell fishhooks and beads have been linked to the development of social complexity and good exchanges along the Pacific and other areas (e.g., Arnold 2004; Erlandson and Jones 2002; Lynne 1991; Maccucci 1995; Trubitt 2003). Researchers have even used the quantity of shells (artifacts and debris) at a site and the relative lack of them elsewhere as signs of a specialized production of shell tools (e.g., Arnold and Graesch 2001; Feinman and Nicholas 1995). MSFT assemblage from Morro Colorado may fit in this general scenario, and could be proposed

as evidence of specialized production of *C. chorus* fishhooks within a period of decreasing residential mobility and high reliance on jack mackerel fishing. MSFT assemblage at Zapatero on the other hand, may be linked to the appearance of new technologies and fishing practices that would have changed the relative importance of the production and use of mussel fishing artifacts, even though jack mackerel continues to be the main species harvested.

CONCLUSIONS

Despite the fact that the “Shell fishhook Culture” was identified by Junius Bird in 1943, and that *C. chorus* fishhooks have been, since then, considered as diagnostics elements for dating the historical trajectory of human adaptations on the northern coast of Chile (Llagostera 2005; Núñez 1984; Standen et al. 2004), limited research has been done to understand the production of these artifacts and the social implications of the manufacture process of these mussel shell fishing tools (but see Boisset et al. 1969; Schiapacasse and Niemeyer 1984).

Tool production areas and manufacture processes can be identified from shell-working residues (e.g., Hocquenghem and Peña 1994; Lynne 1991; Martin 2009). Using this approach, we propose that the presence of preforms and manufacture debris of shell fishhooks and fishing weights at the sites of Morro Colorado and Zapatero indicates the existence of workshop areas along the coast of Taltal during the Middle Holocene. Even though these workshops may have also functioned at other sites along the arid coast of northern Chile, it is important to consider that *C. chorus* was probably limited or absent during prehistoric times at Taltal, and consequently was not part of the local diet. The scarcity of this mussel species, together with its importance for the manufacture of shell fishhooks, and therefore, for subsistence practices, especially during the first half of the Middle Holocene, suggests that the acquisition, production, and use of these artifacts may have had important social implications and also may have provided prestige

for those fishers with access to these artifacts. The development of navigation devices, the appearance of billfishing practices, and the probable increased use of fishing nets, would have significantly changed the social implications of shell fishhook production and use. The MSFT assemblages from Morro Colorado and Zapatero sites seem to reflect these transformations with a decrease in the production and use of these artifacts after 7000 cal BP.

The occurrence of fishing tools such as hooks and navigation devices such as canoes along the Pacific coast, has been linked to processes of social transformation and complexity (e.g., Arnold 2004; Erlandson and Jones 2002; Rick et al. 2002) and the coast of the Atacama Desert does not seem to be the exception. Results from the present study show, as in other places along the Pacific coast, that the manufacture of shell fishing tools is part of broader social changes that include technological specialization, growing populations, and marine resource intensification where fish dominated human subsistence economies. More data are needed to better understand *C. chorus* shell fishing tool assemblages at Morro Colorado and Zapatero sites and the socio-economic context of their production and distribution. Nevertheless, the information provided on MSFT at these two coastal sites is a contribution to the understanding of Middle Holocene Prehispanic shell tool production in Chile, South America, and the Pacific Coast. Ultimately, this research highlights the role played by different factors in the complex and dynamic socio-economic transformations that occurred within Middle Holocene Pacific coastal communities.

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