

Clams to Cash: How to Make and Sell Giant Clam Shell Products

**by
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Center for Tropical and Subtropical Aquaculture
Publication Number 125

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About the Author

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Acknowledgments

This manual was prepared as part of the work under a project titled “Aquaculture Extension and Training Support in the U.S.-Affiliated Pacific Islands--Year Six.” Financial support for this work was provided by the Center for Tropical and Subtropical Agriculture through a grant from the U.S. Department of Agriculture (U.S.D.A. grant # 92-38500-7262).

The author greatly appreciates the assistance of the Micronesian Mariculture Demonstration Center (MMDC) giant clam hatchery staff, especially Tom Watson, Don Hanser, Asap Bukurrou, Setts Mongami, Lawrence Sumor and Jay Oruetamor. These individuals spent countless hours creating giant clam shell craftware, patiently teaching and guiding our visitors and often contributing original thoughts and exceptional talents that led to better products and more satisfied customers.

A special thanks is extended to Noah Idechong, Theofanes Isamu and the late David Idip for helping to create a positive work environment at MMDC and for providing space, both literally and figuratively, for the expression of our entrepreneurial instincts. As a result, the shell products designed and created at MMDC were a source of delight and value to the many thousands of tourists, local residents and school children who visited Palau’s MMDC Gift Shop between 1989 and 1994.

Patti Killelea-Almonte did the layout and design of this publication. Bill Perryclear shot the photographs. The companion videotape was filmed and edited by Kevin Davidson and Gerald Heslinga.

The views expressed in this publication are strictly those of the author and do not reflect the views of the Center for Tropical and Subtropical Aquaculture or the U.S. Department of Agriculture or any staff of those agencies.

Note about the version downloaded from the Worldwide Web

The layout of this manual has been modified from the printed version. However, the content remains the same.

Introduction

Giant clam farms currently operate in many tropical Pacific nations, particularly in the islands of Micronesia, Polynesia and Melanesia. Much has been written about giant clam biology and the technical aspects of mariculture production. Less well explored, however, is the topic of processing and marketing giant clam products.

In order for clam farmers to realize the maximum return on capital and labor invested in their mariculture operations, they must thoroughly use all parts of the harvested specimens. This means developing strategies to fully exploit both meat and shells of the cultured clams and adding value to these raw products through creative processing and marketing.

This manual was written to help giant clam farmers process and sell the shells produced on their farms. Although clam shells often are viewed as a by-product of farming operations or even as a disposal problem, with a little effort and imagination, those clam shells can be converted to cash.

The methods described here were developed and proven over the five-year period from 1989 to 1994 by the staff of the Micronesian Mariculture Demonstration Center (MMDC) giant clam hatchery in the Republic of Belau. During that period, thousands of the shells grown on the MMDC farm were processed by the hatchery staff and marketed on-site to tourists and local visitors who patronized the MMDC gift shop. Occasionally, large orders for shell ornaments or crafted shell products were shipped abroad to international customers. In 1994, MMDC's shell-craft products became the Belau government's gift of choice for visiting dignitaries. By then, MMDC's shell-craft gifts had gained both a local and international reputation for quality and uniqueness at an affordable price.

A 10-minute videotape, shot at MMDC in late 1994 and edited in mid-1995, accompanies this manual. The video is intended as a supplement to the manual but may in fact be the primary training tool in areas of the Pacific where English is not commonly read or spoken.

We hope that the information presented here will encourage thoughtful and productive use of the region's increasing giant clam shell resource. As demonstrated by MMDC, an entrepreneurial approach to making and selling tridacnid shell products can significantly improve the overall economics of giant clam mariculture operations and can help Pacific island clam farmers more quickly achieve profitability.

Shell Storage: Where Value-Added Begins

On actively producing giant clam farms, clam shells are produced when clam meat is harvested and when mortalities occur. Storing giant clam shells can quickly become a problem if an efficient plan is not implemented. In our travels to giant clam hatcheries throughout the Pacific, we were dismayed to find that some had unsightly piles of dead clam shells accumulating.

At that point, we clearly saw that adding value to clam shells begins as soon as they are removed from the ocean or the growing tanks. If shells are simply thrown in a pile or scattered around the ground, they appear discarded and lacking in value. No one will expect to pay much, if anything, for them. Indeed, most visitors to the farm will feel free to help themselves to the shells. However, if the clam shells are cleaned, sorted by size and species and stored neatly, their value will already have begun to increase. People appreciate neatness and order, and they will pay for it.

After removing meat from the clam shells, lay the shells out neatly in plastic growing trays or on the ground, preferably on pavement (Figure 1). Within a week or two, the tropical sun will dry, bleach and remove any odor from the shells. The shells may then be processed further or placed into storage bins.

An efficient, virtually indestructible outdoor shell storage bin can be made from 2-foot by 4-foot panels of 1-inch marine mesh, which is available from C. E. Shepherd Co. (Figure 2). Simply stitch the panels together with 14-gauge electrical wire to produce a large, sturdy bin. If security is a concern, a mesh lid can easily be added to each bin.

A container that can store up to 20 tons of giant clam shells can be made using the side-wall of a 15-foot-diameter, 4-foot-high Clark “splasher pool” or its equivalent (Figure 3). Splasher pool rings can neatly and efficiently accommodate about 20 wire mesh bins (Figure 4). Storing giant clam shells in this manner sends the message that “these shells have value, and we care enough about them to clean, sort and store them carefully.”

Believe it or not, this approach will allow you to charge higher prices in your gift shop than if the shells were simply left scattered around on the ground. Shell pilferage will also be a smaller problem.



Figure 1.
Clam shells should be sorted by species and size and neatly set in a single layer to dry in the sun.



Figure 2.
Shell storage bins can be built by joining 2-by-4-foot panels of 1-inch marine mesh with 14-gauge electrical wire.



Figure 3.
Splasher pool rings form neat, efficient storage containers for giant clam shells. Shells are stacked directly in this pool ring.



Figure 4.
Splasher pool rings can hold up to 20 marine mesh bins filled with giant clam shells, as shown in this photo.

Post-Harvest Processing

Cleaning Giant Clam Shells

Three methods are commonly used for cleaning giant clam shells. The method or combination of methods to use depends on the product you wish to make.

Sun Drying

Sun drying is the cheapest and easiest way to clean clam shells, but it has some limitations. Sun drying results in a fairly clean rather than perfectly clean product. Simply lay the clam shells out neatly, in a single layer—not in a pile—on the ground or pavement. Within a few weeks, the natural elements of sun and rain will have done a good but not excellent job of bleaching the shells. Some small bits of dried tissue or detritus may remain on the inside or outside of the shells.

Naturally bleached shells can sometimes be sold “as is” to tourists for use as garden ornaments or curios. A contingent of tourists out there wants shells with a “natural” appearance, which means that an imperfectly cleaned shell is desirable to them, but these folks are a small minority. Most buyers want their shells as close to perfectly clean as possible, particularly, and understandably, those who plan to use the shells as salad bowls or sashimi dishes. In that case, chemical cleaning with acids and bases is necessary to reveal the underlying beauty and value of the shells.

Chemical Bleaching

Really white shells can be obtained by using a chemical bleach called sodium hypochlorite, which is commonly sold in grocery stores as liquid laundry bleach; Clorox is a widely available brand. Sodium hypochlorite is an extremely strong chemical base, which attacks and dissolves the proteinaceous scum and tissue remnants on dead clam shells. Use it with caution as it is extremely caustic and can burn skin and eyes on contact.

Place the shells to be bleached inside a dry, 5-gallon bucket. Add approximately 2 gallons of fresh tap water (not seawater) to the bucket. Then add about one-half gallon of bleach, straight from the bottle (Figure 5). Add more bleach if you want to clean the shells clean faster and less if time is not critical. The shells will bleach fully in two to three days on average. After that, remove the shells, rinse them in fresh water, allow them to dry and store them in a clean, dry area to prevent mildewing. The diluted bleach solution may be used again but will gradually lose strength and require a fresh infusion of straight bleach.

Chemically bleached shells of *Tridacna gigas*, *T. derasa*, *T. maxima* and *T. crocea* require no further chemical cleaning, although some shellcraft applications call for mechanical modifications such as grinding or drilling, which will be discussed later.

Although sodium hypochlorite effectively whitens and removes proteinaceous materials from giant clam shells, it will not dissolve the scaly calcium carbonate deposits that are particularly evident on the colored shells of *Hippopus hippopus*, *H. porcellanus* or *T. squamosa*. For that, an acid dip is necessary.



Figure 5.
To chemically bleach giant clam shells, pour about one-half gallon of household bleach into a 5-gallon bucket that contains 2 gallons of fresh water and the giant clam shells.

Acid Dipping

The acid dip is a simple and quick procedure used to remove white encrusting materials from the shells of certain clam species in order to bring out the vibrancy and depth of the underlying shell colors. Acid cleaning is rarely, if ever, needed on clam species whose shells are all white naturally, such as *T. derasa* and *T. gigas*. Using acid on these species is, we feel, just a waste of time because bleach alone will get the shells perfectly white and marketable.

However, bleaching is only the first step of a two-step chemical cleaning process for the colorful giant clam shells, especially *T. squamosa* and *H. hippopus*. The second essential step is the acid dip.

A word of caution about the acid dipping process is in order before describing it. Because strong acids, like strong bases, can burn skin, eyes and lung tissues on contact, it is essential to wear suitable eye protection and gloves and to use these chemicals only in a very well ventilated area—preferably outdoors. Never work alone with these materials and always have immediate access to fresh running water in case of an accidental spill or splash. Discuss the potential hazards of these materials with your employees in advance of their use and outline a practical first aid strategy for dealing with chemical burns that could occur on the job-site.

Most hardware stores carry a product called muriatic acid, which is a 30 percent solution of hydrochloric acid (HCl). Muriatic acid is commonly used in the building trades for cleaning concrete or bricks.

First, fashion a simple dipping tool (Figure 6) by making a cradle of 14-gauge wire on the end of a small aquarium dip-net. A 2.5-gallon, lidded bucket is used for the acid dipping procedure. Begin by adding one gallon of clean, fresh water to the bucket. Then add one-half gallon of muriatic acid. Always add acid to water, never the reverse, to prevent dangerous splattering.

Next to the acid bucket, set a five-gallon bucket of flowing, fresh water. This will be used to rinse acid off the shell after the acid dip. The flowing fresh water is also a good safety precaution in case of an acid burn.

Place a dry, previously bleached shell into the dipping cradle and immerse it fully into the acid for no more than a few seconds (Figure 7). Then quickly remove it, and immerse it in the fresh water bucket (Figure 8). Place it in a plastic tray in a breezy area to drip dry (Figure 9). When fully dried, the shells are ready for sale “as is” or for crafting into other products. With a little practice, you’ll be able to judge both the strength of the acid solution and the length of time required for the dipping.



Figure 6.
Giant clam shells can be dipped in an acid bath for cleaning. Form a cradle of 14-gauge wire on the end of a small aquarium dip-net.



Figure 7.
Place the shell in the cradle and briefly dip it in the bucket containing the acid mixture.



Figure 8.
After removing the clam shell from the acid, quickly place the shell in the bucket that has fresh water flowing through it.



Figure 9.
Place the rinsed shells in plastic trays that have holes in the bottom for drainage. Set the trays in a breezy area so the shells can dry.

Caution: If you are not very careful with this method, you can easily destroy a shell by leaving it in the acid dip too long. Be careful not to damage the lovely glossy surface of the concave inside of the shell; if the gloss is gone, you've overdone the acid dip. Under no circumstances should a shell be left indefinitely in the acid dip. It will get smaller and smaller and, eventually, disappear entirely.

After the acid dip and the fresh water rinse, lay the perfectly clean shells in a plastic tray to dry . When dry, they are ready for sale directly or for use in making any other type of shellcraft product.

A final note on chemical cleaning of giant clam shells. The acid dip is always the second step in the cleaning process. It should never be used if chemical bleaching has not been completed first. The reason is that acid dipping will not easily remove the proteinaceous material that sodium hypochlorite, used in step one, is so effective in stripping.

Grinding

Certain shellcraft applications require some grinding of the shell lip or hinge area. This is easily accomplished with a 10-inch bench grinder of the type commonly sold in hardware stores. For example, MMDC's bench grinder (Figure 10), manufactured by Delta Tool Corporation, was bought in Palau's local Ace Hardware store. Nearly any 8-inch or 10-inch bench grinder will do, however.

Sometimes *T. derasa* and *T. gigas* shells must be ground prior to use in making bowls or serving dishes. The grinding process removes nicks and irregularities in the lip of the shell and eliminates the sharpness of the lip, which in some circumstances could pose a risk to consumers.

Standard safety precautions in the use of bench grinders include: wearing eye protection, short sleeves, gloves and an industrial quality respirator designed specifically to remove dust particles (Figure 11). These masks and replacement filter cartridges are available at any good hardware store.

- Eye protection is essential because sharp-edged shell chips are inevitably thrown off the grinding wheel in the direction of the user's body.
- Long sleeves and other types of loose-fitting clothing must be avoided when using a bench grinder because the fabric may get caught in the wheel.
- Gloves should also be considered a mandatory safety item for the operator of a bench grinder. A grinding wheel can destroy human flesh astonishingly fast when one accidentally jams one's finger or thumb into the moving wheel. This is excruciatingly painful, not to mention potentially disfiguring, as those of us who have experienced it know. Don't take chances! Wear a pair of sturdy work gloves when operating your grinding wheel.
- A respirator is vital to prevent inhalation of the dust generated by grinding the shells edges.

Grinding the lip of a giant clam shells is a quick, easy process that, done properly, should not require more than one minute or so per shell. The shell lip is held lightly at a 90 degree angle to the face of the grinding wheel (Figure 12) and moved rapidly in a horizontal direction so that the entire length of the shell lip contacts the wheel. The object is not to remove large amounts of shell but simply to dull the edge of the lip and to smooth out irregularities. After grinding, rinse the shells in fresh water to remove dust before doing any further crafting.

H. hippopus shells used in making night lights also require some grinding. The *H. hippopus* shell base is held directly against the grinding wheel for perhaps 30 seconds or so, to flatten the base where it will be glued to the stand of the acrylic base night lights. The entire umbonal area of the *H. hippopus* shell is removed to allow mounting it shell directly on top of the bulb base fixture of the wall socket night lights.

Although a good bench grinder may cost \$200 or more, it is a very sound investment that will quickly pay for itself in shellcraft sales. Keep in mind, too, that the bench grinder has many other uses and will be in constant demand among friends, neighbors and family for sharpening knives and machetes. This is a nice little community service that does not reduce the effectiveness of the grinder for shellcraft production.



Figure 10.
A high quality 8- or 10-inch bench grinder is needed for some shellcraft work.



Figure 11.
When using a bench grinder, wear eye protection, a respirator and heavy work gloves. Do not wear long sleeves because they can catch in the grinding wheel.



Figure 12.
To remove the sharp edge from the shell lip, hold it at a 90-degree angle to the grinding wheel and rapidly move the lip's entire length along the wheel.

Hot Gluing

Many giant clam shellcraft products require the use of a tool called a hot glue gun (Figure 12), sometimes called a hot-melt glue gun. The hot glue gun is a manually operated, gun-like device that simply heats a 4-inch stick of solid glue until it liquefies and can be squirted out of the gun nozzle with a trigger. Most hardware stores and many department stores carry hot glue guns and glue sticks. Ace Hardware in Palau carries a sturdy, inexpensive gun made by the Loctite Corp. of Cleveland, Ohio. Many other acceptable brands exist, such as those made by Arrow or Surebonder. The best glue sticks are the rapidly setting ones that bond in 30 to 60 seconds.

Hot glue guns are used to bond giant clam shells to other shells or to other materials such as necklace closures, pin backs and earring backs or wires, which are collectively known as jewelry findings. Examples of shellcraft that require the use of hot glue guns include soap dishes, wasabi dishes, ash trays, candlestick holders, memo holders, shirt pins and night lights.

Hot glue guns are reasonably safe to use. However, the gun nozzle and the glue itself become very hot—certainly hot enough to burn a careless user. Feeling a blob of hot plastic burning through your flesh is not at all pleasant. This type of mishap can be prevented by wearing cloth gloves during any crafting steps requiring a glue gun. A further, simple safety precaution is to keep a five-gallon bucket filled with fresh water near the crafting bench. In the event of an accidental burn from the hot glue gun, pain and tissue damage can be minimized by immediately plunging the affected body part into the water bucket. One experience with a hot plastic burn should be sufficient to convince skeptics of the wisdom of this advice.



Figure 13.
A hot-glue gun and glue sticks are useful for making many shellcraft products. The best glue sticks to use are those that set in 30 to 60 seconds.

Shellcraft

Shells as Ornaments

Perhaps the simplest way to market giant clam shells is as ornaments or curios. With this approach, the shells are sold “as themselves” with no processing or value-adding steps beyond cleaning. Sometimes even the cleaning is omitted. In general, though, investing the effort to whiten the shells either through sun drying or chemical bleaching with Clorox is worthwhile. Wrapping the shell pairs with a ribbon and adding a sticker are two additional steps that cost little and are definitely cost-effective in that they allow a higher retail price.

In the early 1990s, MMDC sold thousands of giant clam shells as ornaments, primarily *T. derasa* (Figure 13) and *H. hippopus* (Figure 14). The *T. derasa*, most of which were 15 to 30 centimeters in shell length, were sun-dried, chemically bleached and sold for \$5 to \$10 per matched pair. Each *T. derasa* pair was wrapped with a colorful ribbon (Figure 15) to hold the shells together, and to each ribbon was affixed a small pink sticker stating that the specimen was a giant clam shell captive-bred at the MMDC in Palau.

H. hippopus and *T. squamosa* shells sold by MMDC as ornaments underwent both the chemical bleaching and the acid dip prior to sale. These shells proved extremely popular as ornaments. Three sizes were sold: 5-centimeter shells for \$3 per pair, 10-centimeter shells for \$5 per pair, and 12- to 14-centimeter shells for \$8 per pair. Beyond cleaning, the only processing used on these shells was adding a few drops of hot glue to the hinge area of the shell valves to keep them from falling apart on the gift shop shelves. A small gold sticker, available from Hydro-Gardens, Inc., identifying the product as a captive bred giant clam shell from Palau’s MMDC was placed on the base of each shell pair.

In visiting clam farms around the Pacific, we were surprised to find that some operators were not marketing their empty shells even as ornaments. The farmers were losing potential revenue on a daily basis, probably without even realizing it! Setting up a simple table and putting shells with price tags on the table takes very little effort. This is the simplest way to turn clam shells to cash.



Figure 14.
T. derasa shells can be cleaned and sold as ornaments. This is the easiest way to sell giant clam shells.



Figure 15.
Pairs of cleaned *H. hippopus* shells can be sold as ornaments.



Figure 16.
Pairs of cleaned *T. derasa* shells were tied together with colored ribbon to form a more eye-catching display.

Serving Bowls for Salads, Sashimi, Sauces, Candy and a Variety of Other Uses

Pacific Islanders have long known that giant clam shells make excellent serving bowls. Even today, many modern visitors to tropical island areas love to take home tridacnid shell bowls as souvenirs. Few gifts from the tropics are more beautiful, durable or functional. Now that clam hatcheries and farms are operating in many areas of the Pacific, captive-bred shell bowls represent a marvelous, environmentally sustainable market opportunity.

Nearly all of the giant clam species may be fashioned into dishes or bowls of some sort. *T. gigas*, *T. derasa* and *H. porcellanus* (China clams) are especially favored for larger bowls, while shells of the other, smaller species may be used for individual serving dishes.

For shells that will be used to serve food, whether salads, vegetables, sashimi, sauces or candy, special care should be taken to clean the specimens chemically to achieve the cleanest possible surface on both the inside and outside of the shells. For the predominantly white tridacnid shells (*T. gigas*, *T. derasa*, *T. squamosa*, *T. maxima* and *T. crocea*), sun drying should be followed by chemical bleaching and light grinding of the lip to remove nicks and sharpness. The cleaning process for shells of the colorful clam species, including *H. hippopus* and some *H. porcellanus*, should include sun drying, chemical bleaching and a brief acid dip; the shell lip should then be ground.

In making shell bowls and dishes, perhaps the most serious question confronting the crafter is how to make the shells sit flat on the table. It seems that when customers see a shell bowl for sale, the first thing they do is press on it to see if it wobbles! Obviously, bowls that wobble won't sell as easily. Two practical options exist to make the shells sit firmly on the table. One is to grind off part of the rounded umbonal area of the shell. This may be the best approach for smaller specimens. However, sufficiently grinding the umbonal of larger specimens is a very time-consuming process, and for that reason, it is generally not cost-effective.

If grinding the base of the shell is not practical, the second option is to use some kind of supplemental base that will keep the shell bowl flat and possibly even add value to it. Obviously, it is most desirable for island-based operations to use locally produced materials whenever possible. Bamboo is a raw material that is available on many Pacific islands. An attractive and functional shell base (Figure 16) can be made by cutting rings from a stout piece of dried bamboo. The rings should be about 1 inch thick and about 4 inches in diameter.

A large number of rings can be made quickly with a power cutoff saw. Sometimes called "chop saws," these neat tools are used by construction contractors to size lumber for framing houses. Chop saws cut bamboo rings like a knife slicing through butter.

Caution: Chop saws can lop off fingers just as easily as they cut bamboo, so they must be approached with the utmost respect.

Alternatively, the bamboo rings can be cut with reasonable ease with a hand saw, which is certainly a less risky approach. Apart from lightly sanding with fine sandpaper to remove splinters and roughness, no further processing of the bamboo rings is needed. Simply place one under a shell bowl and maneuver the bowl until it sits flat.

Figure 17 represents a typical serving dish arrangement. A large, 30-centimeter *T. derasa* bowl with a bamboo ring base is used as the main serving dish, and four to six smaller *T. derasa* shells, each about 15 to 16 centimeters long, are used as individual serving dishes. Note that the smaller dishes are not presented with bamboo bases; the umbonal area was flattened with a grinding wheel. A serving set of this type would retail for \$20 to \$35, depending on shop location.



Figure 17. Bamboo can be sliced into 1-inch-thick rings to form excellent, stable bases for clam shell serving dishes.



Figure 18.
A typical salad set could consist of a large shell for the main serving bowl and several smaller shells for individual serving dishes.

Pricing Considerations

Individual *T. derasa* serving bowls ranging from 25 to 30 centimeters in size sold for a retail price of \$6.00 each at the MMDC gift shop, but identical items sold for a retail price of \$30 each in Honolulu shops! Although this may appear to be a grand export opportunity, bear in mind that upscale retail shops in high-rent, high-traffic areas such as Waikiki or Ala Moana Center often use a “triple key” pricing system, a high markup form of “keystoning” in which the retail price represents a tripling of the store’s landed cost. Therefore, for the same item that retails in Waikiki for \$30, an island-based producer could expect to receive about \$10 less shipping costs, but only if he were dealing directly with the retailer.

In most cases, though, producers in remote areas will find dealing directly with foreign retailers to be impractical because of distance and communications constraints. Many island farmers don’t have frequent international mobility or the initial capital needed to develop offshore marketing relationships. More typically, they deal with wholesalers or distributors who come to the farm gate to purchase shells. If the island-based farmer is selling clam shells to a wholesaler or distributor, the farmer might expect to receive just \$3 per specimen for something that will retail for 10 times that amount in a distant city in Japan or the United States. In the case of heavy or bulky items like giant clam shells, shipping and handling costs must be researched very carefully because they are significant factors in determining prices.

The easiest way for farmers to avoid paying shipping costs for giant clam shells is to market them directly to consumers. Direct marketing is advantageous because the middlemen and their markups are avoided, and producers can achieve high returns by charging retail prices. Direct marketing's major drawback is that it requires the retailer to "be there" for the customers. That means establishing and staffing a shop of some sort and adapting to regular hours in the shop. This topic will be discussed more later.

Nothing is intrinsically wrong with export marketing of giant clam shells to wholesalers, but most producers find that the buyers want large quantities (on the order of 20 tons or more at a time) at very low prices. Selling the shells at retail prices close to where they were produced often makes better sense and helps keep more jobs and dollars at home. On the other hand, exporting raw materials, such as unprocessed clam shells, allows foreign crafters to gain employment and foreign wholesalers and retailers to enjoy markups that could have been reaped where the shells were produced. Therefore, if the area in which you produce giant clam shells has any sort of tourist industry, consider ways in which the visitors may be induced to tour your farm and pay cash for your shells and shell products.

Soap and Sponge Dishes

Some of the finer hotels in the Asia-Pacific region use giant clam shells as serving dishes and soap holders. Without a doubt, a finely crafted, natural product like a clam shell is vastly more appealing than the ubiquitous, mass-produced plastic fixtures one sees so frequently today.

MMDC developed a novel soap dish that is composed only of two *T. derasa* shells (Figure 18), one of which is slightly larger than the other. The larger shell forms the soap holder, and the smaller shell forms the base. The shells are held together with a generous squirt of glue from a hot glue gun. Of course, the top shell should be large enough to comfortably accommodate a bar of soap, and the base should be large enough to keep the completed dish stable.

The shells should be chemically cleaned with bleach, then subjected to an acid dip. A light pass on the grinding wheel is needed to remove nicks and sharpness. The shells are rinsed with fresh water, dried thoroughly, then glued. Try to select shells for the bases that will sit without wobbling on a flat surface. Some grinding may be required.

Soap dishes are one of the easiest types of giant clam craftware to make. In 1994, the MMDC gift shop retailed hundreds of *T. derasa* soap dishes for \$5 each. Most of the other giant clam species, especially *T. gigas*, *H. hippopus* and *H. porcellanus*, would also be suitable for soap dishes, but the sharp shell lips would have to be ground slightly first to remove the edge.

The same shell arrangement used for the soap dish can be used to display natural bath sponges. Now that the technology for farming bath sponges is well understood in the islands of Micronesia and a factory on the island of Pohnpei is producing fragrant soap bars, an excellent opportunity exists to bundle these local products into truly unique island-style gifts. What visitor to Micronesia would not welcome the chance to take home a locally woven basket holding Pohnpei soap, a cultured bath sponge and a giant clam soap dish?



Figure 19.
A soap dish fashioned from giant clam shells is an unusual, useful and beautiful decor item.

Wasabi Dishes

No meal at which Japanese sashimi is served would be complete without wasabi, the hot green radish paste mixed with soy sauce and enjoyed as a sashimi dip. A beautiful and functional wasabi-and-sauce dish (Figure 19) can easily be made from giant clam shells. More than 120 million people live in Japan, and virtually all of them use wasabi on a regular basis. The potential market for novel wasabi dishes is by no means insignificant.

The basic sauce dish is made like a soap dish, using a hot glue gun to fasten a slightly larger shell, which serves as the sauce holder, onto a slightly smaller, inverted shell, which serves as the base. The wasabi holder is a third, smaller shell that is glued to the hinge area of the sauce holder.

H. hippopus shells make perhaps the most attractive wasabi dishes (Figure 20). These dishes were marketed at MMDC as the “fancy” wasabi dish and proved especially popular with Japanese tourists. *T. derasa* shells also make nice wasabi dishes. This type was marketed at MMDC as the “standard” wasabi dish and was not as popular as those made with *H. hippopus*.

MMDC sold the standard *T. derasa* wasabi dishes for \$5 each and the fancy *H. hippopus* dishes for \$10 each, and the shop could never seem to keep enough of them stocked. This item was a real moneymaker when presented to appreciative consumers, especially elderly Japanese tourists. Local Japanese sushi chefs in Palau frequently came to the MMDC Gift Shop specifically to buy wasabi dishes for use in their restaurants. They were used by literally thousands of customers.

While on the subject of giant clam shells for holding wasabi and soy sauce, it is worth noting that some authentic Okinawan sushi bars use small giant clam shells for holding *hashi*, known as chop sticks in English. The *hashi oki* is simply a single small clam shell, about 5 centimeters long, inverted on the table top near the customer's place setting. One end of the pair of *hashi* is laid over the shell, the other end rests on the table. Japanese cooking is famous for its attention to detail and its subtle presentation touches, all of which enhance the dining experience. Using a giant clam shell for *hashi oki* is but one example of this philosophy.



A dish to hold Japanese *wasabi*, a hot mustard, and soy sauce can be fashioned by gluing together three clam shells of various sizes.



Figure 21. The MMDC Gift Shop charged a higher price for wasabi dishes made from *H. hippopus* shells than for wasabi dishes made from the shells of other species of giant clams.

Ash Trays

Using a lovely giant clam shell to hold cigarette ashes seems a shameful desecration. For this reason, the MMDC gift shop never sold clam shells specifically for use as ashtrays. Even the idea of a restaurant having clam shells filled with mouth-watering sashimi alongside similar shells filled with cigarette ashes is unappetizing. Yuck!

Sadly, smokers are everywhere in the Asia-Pacific region. It is truly a region of puffers. And they are an inventive lot, capable of turning just about anything—coffee cups, beer cans, sinks, newly waxed floors, the palms of their own hands, and yes, even giant clam shells—into ashtrays.

Smokers patronizing the MMDC gift shop frequently and quite shamelessly bought giant clam salad bowls, soap dishes, wasabi dishes, planters and even candlestick holders with the specific objective of using them not for their intended purpose but for ashtrays! The following conversation, or some variation of it, took place many times in the MMDC gift shop.

- Customer: *"What's this?"*
- Salesclerk: *"It's a salad bowl made from a giant clam shell. Of course, you could use it for serving sashimi, sauces, candy, or any other type of food."*
- Customer: *"Hmmm, that would make a great ashtray. Ethel, let's get a couple of these ashtrays."*

Because this manual gives instructions for crafting most of the shell products that might conceivably be used for ashtrays, the issue need not be belabored by repeating the techniques. If you would like to be in the ash tray business, just use giant clam shells to make virtually anything resembling a dish or bowl and label it "ashtray." Trust us: someone will buy it.

Night Lights

Whether one calls them “nite lites,” or, as they are more widely known, “night lights,” these nifty little gift items deserve more than a passing glance. Skeptics need simply to check out the high-rent, high-traffic shelf space in the Honolulu International Airport and tourist areas like Waikiki. Often, right near the T-shirts and frequently right next to the cash register, you’ll find shell night lights. This is a pretty fair indication of two things: First, night lights are an impulse item, which people buy on sight even if they did not come into the store with the intention of buying one. Second, night lights sell in huge numbers. Otherwise the valuable shelf space they occupy would be given to some more profitable item.

The economic reality has long been that the retail world is filled with too many different products chasing too little shelf space. Manufacturers compete in every conceivable way for the privilege of getting their products onto the shelves of high-volume retail establishments. Retailers—the good ones, anyway—continually evaluate their sales figures to determine which products are giving the best return per unit of shelf space. Products that don’t perform are soon replaced with better prospects. Therefore, if you see products like shell night lights displayed in prominent retail space in high-volume stores over long periods of time, rest assured that these products are meeting real demand in a profitable way.

Of the many giant clam products that were crafted by the MMDC staff, our night lights were a true hit. We had no trouble at all retailing the crystal acrylic lamps for \$24.99 each and the wall socket lamps for \$5.99 to \$9.99. Shop revenues soared whenever a busload of tourists entered the shop and all decided at the same time that they simply must have giant clam night lights. We instructed our sales staff to stress, “These lamps are hand crafted by local artisans. They glow in the dark with a soft, inspiring light.” Few customers could resist that pitch.

The colorful shells of *T. squamosa* and *H. hippopus* are by far the most suitable for making night lights, although some customers prefer an all-white light made from *T. derasa* shells.

A company in Honolulu called Ala Makana used to make night lights from giant clam shells imported from the Philippines. However, in the late 1980s, the Philippines government banned the export of giant clam shells. Apparently the accumulated stocks of Philippine giant clam shells are now depleted because finding giant clam shell night lights in Hawaiian gift shops is increasingly difficult. Other types of non-threatened shell species are being substituted. This does not mean that the demand for tridacnid shell lamps has diminished; in fact, their value may be presumed to have increased as a result of rarity.

Giant clam shell lamps illustrate an important fact of life in the tourist trade. Given a choice, most tourists prefer to buy a functional item rather than a merely ornamental item. That is to say, most would prefer to buy a clam shell that will be used as a lamp or as a planter or as a salad bowl rather than a shell that will simply sit on a shelf gathering dust. This is one reason that T-shirts and golf shirts with logos are so popular. They perform a useful function as clothing while allowing the buyer to make a statement about where he or she has traveled. A lot of tourist gift-buying fills an inner need to impress the folks back home. Functional items that will be used serve as constant reminders of the thoughtfulness of the gift giver.

Wall Socket Lights

The wall socket night lights (Figure 21) are a good way to use unpaired giant clam shells in the 8- to 10-centimeter size range. They are easy to make and probably represent the most profitable product possible for unpaired shells in this size range.

Use shells that have been chemically bleached, acid dipped and lightly smoothed around the shell lip on a grinding wheel. Use the wheel to grind off a flat area near the base of the umbonal area of the shell. The ground-off area is then glued directly to the bulb fixture with a hot glue gun. With a little practice, an unskilled worker can turn out about 20 of these per hour. It's not a bad use of time considering the retail value of the lights.

Crystal Acrylic Shell Lamps

The acrylic-base night lights (Figure 22) are our personal favorites of all the giant clam shellcraft items described in this manual. Consider these attributes: they are relatively easy to make, they command a hefty retail price (\$24.99), and they are truly lovely to behold in a darkened room. They are durable, compact and easy to transport. In short, they are the perfect gift item for tourists and the perfect Christmas present for their family members. It is no wonder that these were one of the most popular items ever sold in the MMDC Gift Shop. The only conceivable disadvantage of this product is that its construction requires a component, the lamp base, that must be imported. This entails up-front materials costs that are not characteristic of most of the other items in this manual.

The acrylic bases (Figure 23) used for these lamps are distributed by a California company called Venus Displays. Contact Venus directly for a price list and catalog. We found the 3-inch, square acrylic base to be the most practical for giant clam lamps; however, other sizes are available. The base unit includes the 7-watt lamp, socket, wire and switch, and cost about \$4.50 each wholesale in 1994.

Use paired shells in the 12 to 15 centimeter size range for making these lamps. Process the shells by chemical bleaching, followed by an acid dip. Grind the base of the shell pair, near the byssal opening, until flattened. Then grind out a circular opening about 3 centimeters in diameter, through which the bulb will pass. After rinsing and drying the shell pair, glue it carefully to the acrylic base using a hot glue gun. The base can accommodate a small sticker identifying your company; better yet, consider attaching a printed "hang tag" that bears a little background information on giant clams.

T. squamosa shells (Figure 24) make the most beautiful shell lamps. Unfortunately, they are considerably more difficult than the other species to clean properly, and the flutes or scales on the shells are prone to chipping, which lowers the value of the finished product. *H. hippopus* shells, on the other hand, are much easier to clean and have the added advantage of being virtually indestructible. In our opinion, they are the best all-around species for giant clam shell lamps.

The value of giant clam shell lamps seems to be closely linked with the richness of the colors in the shells. Clam farmers can and should influence the colors of the shells in land-based tanks by culturing herbivorous fish with the clams. One hypothesis for which there is good supporting evidence says that certain pigments in the waste products of the fish are deposited in the protein matrix of the clam shells, creating the rich yellow and reddish-brown hues one finds in *T. squamosa* and *H. hippopus*, respectively. Good herbivorous candidates for polyculture with clams are rabbitfish and surgeonfish. If you are a clam farmer and have not discovered this already, try fish-and-clam polyculture to see if it does not enhance the color and value of the shells you produce. As an added benefit, it will also greatly reduce algal fouling in your tanks.



Figure 22.
Front and back views of wall socket clam shell night lights are shown in this photo. The light plugs directly into an electrical outlet.



Figure 23.
Acrylic-base night lights are easy to make, popular and extremely popular. The base allows the lamp to stand on a tabletop.



Figure 24.
Acrylic-base night light foundations can be purchased from a mail order company in California.



Figure 25.
The delicate, fluted shells of *T. squamosa* make beautiful night lights.

Candlestick Holders

One day a customer walked into the MMDC gift shop and remarked that giant clam shells would make great candlestick holders. We set about developing a product that people would not hesitate to use at a “white tablecloth” dinner.” The result (Figure 26) was a commercial as well as aesthetic success.

H. hippopus shells, particularly the richly colored ones, are especially appropriate for candlestick holders, although any of the other giant clam species could potentially be used for this purpose. We liked the *H. hippopus* shells for both lamps and candlestick holders because the yellow-red markings on the shells showed beautifully when lit from inside the shell.

The method for making clam shell candlestick holders varies only slightly from the technique used for making soap dishes. Both products require a larger top shell glued with a hot glue gun to a stable base shell. Candlestick holders should be assembled from two matched pairs of shells because customers like to display them in pairs and will invariably hold the shells together at the bases to see if the pairs really match. If they are not perfectly matched, you may lose a sale.

Clam shells used for candlestick holders should be chemically bleached, then acid dipped before assembly. The lips of *H. hippopus* shells require no grinding, but if shells of other clam species are used, a light pass on the grinding wheel may be worthwhile to improve the shape of the shell lip.

When displaying candlestick holders, always have at least one set on the table with real, unlit candles in them. Even if the label on the shelf says that the items are candlestick holders, it makes a much stronger impression on customers if they actually see candles inserted in the shell bases.

Customers have told us that giant clam candlestick holders help create a romantic and exotic dinner setting. Could one find any better reason to use them?



Figure 26.
Candlestick holders made from two matched pairs of clam shells are more appealing to buyers. Displaying real, unlit candles in one set of the holders adds to their visual appeal.

Planters and Garden Ornaments

Throughout the Pacific Islands, giant clam shells have long been used to decorate gardens and gravesides. This practice remains so common in the Pacific that it hardly warrants a description. This is perhaps the most common use for giant clam shells on islands where the animals occur. After all, what island yard, garden or path would not look better if surrounded by a neat curbing of giant clam shells? It surely makes more sense than painting rocks white, a curious American custom.

If tridacnid shells are destined to be used as garden ornaments, there is really no need to go overboard in cleaning them. Exposing them to the sun and rain for a few weeks provides results that should be more than adequate for outdoor use.

However, chemical bleaching may be desirable for more elaborate creations. The MMDC staff developed a lovely *T. derasa* shell planter (Figure 27) nested in a simple macramé sling.

The planter hung from the MMDC gift shop ceiling beside the sales counter. Each morning, we placed fresh red hibiscus blossoms in the planter. We had no way of knowing if the presence of these fresh flowers increased sales in the shop, but judging by the number of compliments on the planter, we don't doubt that customers appreciated this touch. Fresh flowers, along with the polished marble floor of the shop, the richly stained wood interior and the spectacular "living wall" of reef tanks, were just one more subtle way to send the message "This is an upscale shop; expect merchandise to be priced accordingly."

The shell used in the planter was simply a large *T. derasa* prepared as though it were being used as a salad bowl. The macramé sling was bought for about \$1 at a shop called Betty's Imports, a large wholesaler of gift items in Waikiki. The planter sold for \$9.95 retail in Palau and would undoubtedly fetch two to three times that retail price in Waikiki.



Figure 27.
A *T. derasa* shell can be placed in a macramé or shell sling and used as a lovely, unusual planter or vase.

Shirt Pins

During the years of operation of the MMDC Giant Clam Hatchery, the facility was visited by hundreds of local school children. We often thought it would be nice to give them each a small souvenir clam shell to take home. When we tried this, very few kids expressed much interest in clam shells. Having grown up surrounded by giant clams, the kids found them too commonplace to regard with much appreciation.

One day the thought occurred to us that the school children might be more interested in giant clam shells that had first been crafted into some sort of novel jewelry. After trying a few ideas unsuccessfully, we began making colorful neon shirt pins (Figure 28) from yearling *T. derasa* shells. These achieved the desired effect. After touring the MMDC facility, the kids were more than eager to put the neon clam pins on their shirts or dresses and to wear them home. We hoped that this would perhaps stimulate some discussion with their parents about where they had been on their school field trip that day and what exciting things they had seen at the mariculture center. At least they took something tangible home.

Sadly, the giant clam shirt pins were never much of a hit with adult tourists, even when we jazzed them up with a nice display card. The shirt pins languished on the shop shelves and were far outsold by giant clam earrings and other items.

Despite “bombing” commercially, the shirt pins achieved the noble purpose of making hundreds of Palauan school kids happy for a few moments and, indirectly, helping their parents learn something about giant clam mariculture. Who knows whether some of those kids may grow up to be future clam farmers? Occasionally, we still see giant clam shirt pins worn around Koror.

Making the pins is simple. Use bleached *T. derasa*, *T. crocea* or *T. maxima* shells about 5 centimeters long. Spray paint both sides with neon spray paint from your local hardware store. When the paint is dry, use a hot glue gun to attach (Figure 29) a locking pin mechanism (which can be obtained for about 5 cents each from River Gems) to the back. That’s it. You won’t get rich making these, but you can sure make a lot of kids happy.

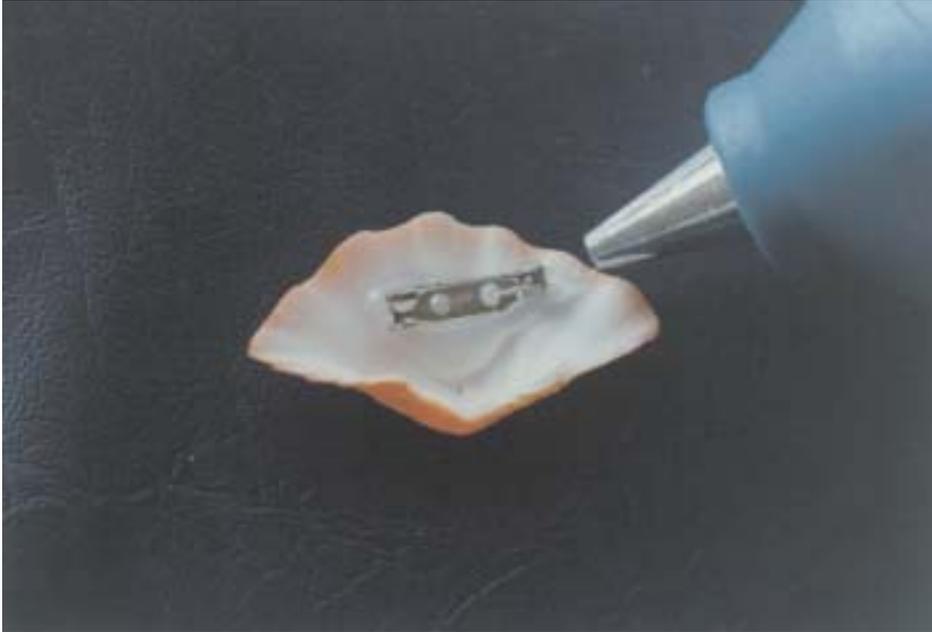


Figure 28.
To make a shirt pin, use a hot glue gun to attach a locking pin mechanism to the back of a small, painted, giant clam shell.

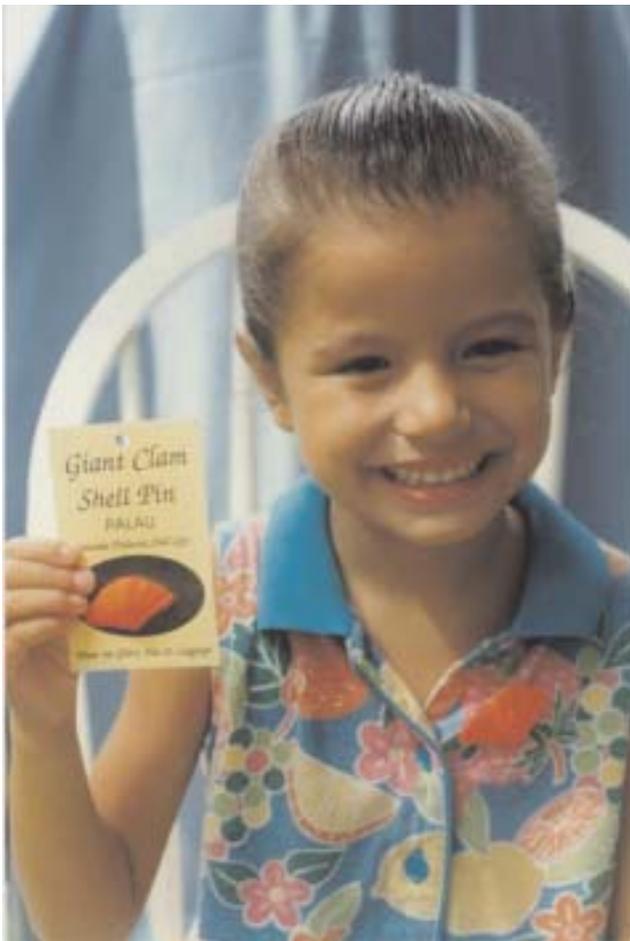


Figure 29.
Shirt pins made from baby giant clam shells can be enhanced by a display card that explains the origins of the shell.

Earrings

We had never paid too much attention to earrings before, but the search for new products to make with giant clam shells was indeed far ranging. Nothing was considered too far out or off limits. For example, once we even saw giant clam shells used as the functional components of brassieres in a glossy advertisement for the Royal Lahaina Resort (thanks to Professor W. K. Fitt for sharing his research on this topic with us). After toying with the idea of getting into mass production of giant clam shell bras, we had second thoughts. Several of the female members of our new-product focus group agreed that the giant clam shell bras looked fabulous, but they would have been uncomfortable as hell, impossible to play volleyball in and downright dangerous in other situations. Simply put, giant clam shell bras were deemed incompatible with today's active lifestyle. Sadly, the idea was scrapped.

Earrings are a different matter. Earrings are everywhere, in large numbers. Children and adults of both sexes wear them. Suffice it to say that earrings are BIG business. Most ladies love them, really love them. We derived enormous satisfaction from seeing customers buy our hand-crafted giant clam shell earrings and then seeing fashionable looking tourists—lean, cosmopolitan and healthy—wearing our earrings around Koror. Calvin Klein and other designers must get this feeling, albeit on a much grander scale. But for a time, at least, we felt the same heady rush of accomplishment in the fashion world.

In the course of daily operations, actively producing giant clam hatcheries will accumulate vast quantities of small giant clam shells. Even well managed hatcheries and nurseries have a low but steady attrition of stock, especially during the first 12 months post-fertilization. Over a period of years, the MMDC hatchery amassed such prodigious numbers of *T. derasa* shells from 1 to 5 centimeters long that we couldn't help but ask, "what in the world are we going to do with those shells?"

Well, as the saying goes, "necessity is the mother of invention." We developed giant clam shell earrings out of sheer desperation. The small clam shells accumulating at MMDC were such an obvious resource waiting to be exploited that not using them would have been a shame. Two types of earrings evolved from our jewelry design team: post earrings and French wire earrings.

Post Earrings

The first and simplest earrings, a post-type earring (Figure 29) made of a very small pair of *T. crocea* shells about 1 centimeter long, are ridiculously easy to make. Just lay about 100 matched pairs of shells on a table and add one or two drops of cyanoacrylate, which is sold in stores as Super Glue, to the backside of each one. Then carefully insert an earring post into the glue (Figure 30) and leave them overnight to dry. In the morning, you'll have fifty pairs of earrings with a retail value of \$5.99 to 7.99 each.

Some customers preferred the natural look of white earrings, but the majority seemed to like bright, tropical, neon colors. We learned to stick about fifty pairs of earrings at a time onto a plastic foam board to spray paint them. After the earrings dried, they were attached to earrings cards that we either made ourselves or purchased in bulk from River Gems. The post-type earrings are attached to the card by means of a "nut," which is also the device that holds the earring onto the pierced ear of the customer.

We investigated the idea of electroplating the giant clam earrings with silver or gold but never pursued it due to time constraints. The technology for metal plating jewelry is not too difficult, however, and is definitely worth a look. Instructional literature and video tapes can be obtained from River Gems.

French Wire Earrings

French wires (Figure 31) are S-shaped hooks that form the backbone of a very popular type of pierced earring. The top loop of the wire fits through the pierced ear, and the bottom part of the loop accommodates any number of gee-gaws and doo-dads. There are an infinite variety of ways to craft French wire earrings. The components, including wires, beads and gemstones, are available from River Gems. The River Gems catalog is a vast compendium of jewelry findings and an absolute necessity for anyone in the business. A companion catalog has thousands of supplies and tools used in the jewelry trade. These two catalogs and a little imagination open the possibility of actually beginning a career in the jewelry trade.

To make the basic French wire earring (Figure 32) from giant clam shells, we recommend starting with *T. derasa*, *T. maxima*, *T. crocea* or *T. squamosa* shells about 3 to 4 centimeters long. Chemically bleach the shells and grind off the sharp margins on each side so that the shells are more or less oval in shape. Use a 1/16-inch drill bit to make a small hole in the apex of the hinge. Add a 1/8-inch bead of some sort to the base of an earring pin, slide the pin up through the hole in the shell, then add several more beads. Finally, use a small set of needle-nose pliers to form a loop in the top of the pin. Close the loop around the base of the French Wire, and you have an earring ready to wear.

Keep some shells unpainted for customers who prefer “natural” earrings but do use three or four shades of neon spray paint to spray both front and back of the shells. At MMDC, the best sellers were pink, lime green and orange.

Incidentally, customers will sometimes ask how the shells were colored. Never say, “We spray painted them.” Instead, volunteer this:

“The actual formula is proprietary, but I can tell you this: these earrings were triple-coated with neon pigments and polymeric elastomers. The colors will last a lifetime because they’re molecularly bonded to the shell.”

This is another way of saying you spray painted them, but it sounds better.

An enormous variety of beads is available for use in making earrings. The beads range from inexpensive chips of glass or shells to gemstones of various types to silver and gold. To get a cheap source of beads for the clam shell earrings, we bought necklaces from Betty’s Imports in Honolulu for about a dollar each, then cut the string of the necklace to produce several hundred small shell beads. We also used silver-plated balls, but they were quite a bit more expensive.

Earrings are best displayed on cards, which you can obtain from River Gems or make yourself. The cards may be hung on rotating countertop displays called “spinners” or hung on wooden pegs set into the shop wall, a supporting beam or a wood carving. Many options are available for displaying earrings. Try to choose something that uses local materials and craftsmanship. At the MMDC Gift Shop, we inserted small wooden pegs into locally carved storyboards to create earring displays. This made efficient use of vertical space and allowed the earrings to be placed in high-visibility areas, such as next to the cash register.

French wire earrings retailed for \$7.99 to 9.99 at the MMDC Gift Shop, but these were also sold in the Palau Pacific Resort’s Duty Free Shop for \$14.99. The Duty Free Shop purchased the earrings from us for \$5.99 and applied a markup factor of 2.5 to get its retail price. We required Duty Free to order a minimum of \$250 to get the wholesale price of \$5.99 each.



Figure 30. Post-style earrings are simple to make from small giant clam shells, and the earrings sell extremely well.



Figure 31. To make post-style earrings, attach a post to a small clam shell with a few drops of a fast-setting, durable glue.



Figure 32. French-wire earrings made with clam shells that have been spray-painted in neon colors are popular items.



Figure 33. French-wire earrings can be made very easily with only needle-nose pliers, clam shells, colored beads and the French wire and pins.

Necklaces

We found that simple clam shell necklaces, like shirt pins, appealed mainly to the younger set. The basic technique for making a low-cost, costume jewelry necklace (Figure 33) involves using a single shell about 4 to 5 centimeters long as the necklace centerpiece and surrounding it with beadwork of many varieties. The clam shell is drilled with a 1/16-inch bit near the apex, and the resulting hole is fitted with a small ring (available from River Gems). The necklace is strung on 10-pound-test, monofilament fishing line that is fitted at each end with screw-in necklace closure findings. The findings and bead components are available from River Gems.

Costume jewelry shell necklaces are not a high-profit item. In fact, the labor required to put one together dictates that the retail cost should be about \$10 per unit. However, consider that these will be competing with similar shell necklaces, mainly from the Philippines, that wholesale for only \$1 to \$2 each in quantity. The low cost of the Philippines necklaces is possible because the bead stringing is usually done by barrio children who are paid next to nothing for their labors.

Other approaches to crafting clam shell necklaces are indeed possible and may offer a better return on investment than the simple bead necklaces described above. For example, a beautiful, high-end giant clam shell necklace (Figure 34) was developed by Praslin Farms in the Seychelles. The approach was to use a single, small (15 millimeter) *T. maxima* shell that had been plated with sterling silver or 14-karat gold. The pendant was attached to a fine matching necklace and presented in an expensive-looking jewelry box. Retail prices of the necklaces were on the order of \$70 to \$100, and in our opinion, the value was very good for the price. The River Gems catalog offers the equipment, supplies and educational materials, including manuals and videos, for those interested in pursuing metal plating.

Magnetic Memo Holders and Key Rings

Magnetic memo holders are not something to which we normally devote much thought, and in the grand scheme of things they may not count for a whole lot. But no one can deny that millions are currently in use around the world, performing their mundane jobs silently and reliably, day in and day out. Millions of additional memo magnets probably could be sold on an annual basis by imaginative and energetic entrepreneurs. Consider that every office needs them for attaching memos to metal file cabinets, and every household certainly needs them for sticking grocery lists, notes and the kids' school papers to the refrigerator door. Check out the housewares section or the office supplies section of any department store. There you will find magnetic memo holders, sometimes in a bewildering variety. Often they are cute or whimsical in design. Some people out there—people like you and me—earn a good living making refrigerator magnets that other people buy. Why not become a part of this trend? It's easy when you have thousands of giant clam shells accumulating at your farm or hatchery.

Three components are needed for memo holders: a clean clam shell about 5 centimeters long, a 1.5-centimeter circular magnet, which can be purchased from Ohio Ceramic Supply, and a dab of glue from your hot glue gun (Figure 36). Hundreds of memo holders can be made with no difficulty. Just set 100 clean shells concave side up on a work bench and glue the magnets to them. Leave some shells with the natural color and paint others with various colors of neon spray enamel. The best way to present them in the gift shop is to attach them to a vertical metal surface near the cash register. Try to find an exterior side panel from an old file cabinet or refrigerator. If none is available, buy a sheet of thin-gauge galvanized steel from your hardware store. The finished size should be about 18 inches wide by 24 inches tall. Spray paint it with a glossy white or black enamel and screw it to the wall in your gift shop.

Memo holders normally retail for only about \$2 to \$3 each. But no law says they must be sold individually. Six neon-colored, clam shell memo holders could be packaged into a zip-lock plastic bag and sold for \$9.95 retail. Don't forget to put a sticker on the back of each shell or even on the magnet itself. This is a gift item that will be gladly received, and frequently used, by people of all ages.

Brightly painted clam shells can also be fashioned into key rings. Simply drill a small hole near the base of the painted shell using a 1/16-inch drill bit and use needle-nose pliers to attach the jump ring of a key ring blank, which can be purchased from River Gems.

Aquarium Ornaments and Base Substrate

If you live in an area where aquarium fish exporters are operating, you probably have contacted them already to investigate the possibility of selling live baby giant clams for use as aquarium pets. But you may not yet have considered that dead tridacnid clam shells of all species are in demand as ornaments for use in fresh water and saltwater aquariums.

At least two options exist for marketing clam shells as aquarium ornaments. One is to sell clean, dried shells. These are most popular for fresh water aquarium tanks, or for saltwater tanks stocked primarily with fish (also called “fish tanks”). The alternative is to sell shells that have been aged in seawater for a year or so (Figure 37). The aging process allows the shell surface to be colonized with a variety of reef organisms—bacteria, algae and benthic marine invertebrates—that are regarded as beneficial to those aquarium tanks displaying coral reef life, also called “reef tanks.” The aged giant clam shells perform all the same functions as the material called “live-rock,” the aged, dead coral fragments that form the structure of the coral reef aquarium display.

Clean, dry shells can be packed for export in cardboard boxes with newspapers as stuffing material. The main consideration is choosing the most economical shipping method for the volume of material to be exported. The cheapest rates are for whole shipping containers, which are 20 to 40 feet long and hold approximately 20 to 40 tons of cargo. Smaller volumes can be sent parcel post via ship or air. Be sure to investigate shipping rates carefully before quoting a price to the customer and to specify either that the quote includes the cost of freight and any applicable insurance or that the customer will be expected to pay the freight charge upon arrival of the shipment.

Aged clam shells destined for use in saltwater aquariums must be exported by air freight in order to minimize loss of living organisms on the shells. The shells can be packed moist in wet newspapers, then wrapped in plastic bags before being placed in waterproof foam shipping boxes. Be sure to check with the airlines for their specific packing requirements, which vary considerably from one airline to the next. For example, some airlines require waxed boxes, while others require polyethylene bags both inside and outside cardboard cartons.

In addition, clean, dried clam shells ranging from 1 to 3 centimeters in size can be used as the base material in fresh water or saltwater aquariums. A 3- to 7-centimeter layer of shells looks great on the bottom of the tank and serves all the same functions as a layer of sand, gravel or coral rubble.

Be aware, though, that this marketing option is by no means the most cost-effective use of small shells. Small clam shells for this purpose may sell for about \$1 to \$3 per pound wholesale, so they are obviously much more valuable when crafted into jewelry. But in cases where a surplus of small shells exists, selling them for virtually any price, just to move them off the lot, is desirable. It also makes better business sense than letting them accumulate and take up space that could be used for a more productive purpose.

Be cautious, however, that selling shells in bulk does not result in their being used for some other purpose, which would “cannibalize” another of your more lucrative markets. Suppose, for example, that the customer who buys a ton of small shells from you for use as aquarium gravel belatedly decides that he wants to get into the shell earring business. You’ve just sold him a lifetime supply of raw material, probably at such a low price that he could undercut you at the retail end.



Figure 34. Spray-painted shells can be strung into necklaces in combination with colorful beads and other types of shells.



Figure 35. Clam shells can be silver- or gold-plated, attached to a bale and strung on a delicate, matching chain to make a more expensive costume jewelry necklace.



Figure 36. Clam shells can easily be fashioned into memo magnets or key rings.



Figure 37. A clam shell aged in seawater becomes colonized with algae and benthic marine invertebrates. Such aged shells command high prices in the aquarium market.

Setting Up Your First Gift Shop: A Case Study

The MMDC Gift Shop provides an instructive example of how small businesses often evolve. The MMDC giant clam hatchery was first established in the late 1970s as a conservation project designed to produce clam juveniles for restocking of depleted reef areas. By the mid-1980s, this objective had been broadened to include the development of large-scale mariculture operations for production of food and income. As soon as profitability became a serious objective of the program, it became obvious that maximizing revenues would require looking beyond food markets.

Ornamental markets seemed to hold much promise, so, beginning in the late 1980s, efforts were directed at developing aquarium markets as well as ornamental shell markets. The outcome of this diversified approach was such that by 1994, the six-person MMDC giant clam hatchery staff was successfully serving broadly diverse local and international customers. On any given day, the staff might begin by filling local restaurant orders for clam sashimi. Later in the morning, they would pack and export a 250-kilogram shipment of aquarium clams to the U.S. mainland. After lunch, a 100-kilogram shipment of chilled clam meat might be prepared for export to Okinawa or Saipan. Against this backdrop of commercial activities, the hatchery facility, ocean nursery and livestock were carefully maintained, research projects were planned, implemented and completed, thousands of tourists were served with brochures and friendly greetings, and the gift shop sold customers a wide variety of shellcraft items and apparel such as T-shirts, hats and tote bags screen-printed with the MMDC logo. Even the screen printing and design work was done on-site by the hatchery staff.

Clearly, by 1994 the MMDC clam hatchery had matured to the extent that many product types were offered simultaneously and many customers were satisfied on a daily basis. Staff had no idle time, and the various products being made found no shortage of demand. The clam hatchery facility grossed more than \$175,000 in sales—not grants—in 1994; about \$24,000 of that sum was derived from gift shop sales. Notably, this income was more than sufficient to cover all operating costs of the program, including utilities, wages and salaries of staff and management.

Surprisingly enough, for more than a decade after the MMDC's inception, it had no gift shop. During that time, thousands of potential customers passed through the facility without having the opportunity to buy anything. In retrospect, this was lost opportunity on a grand scale. To be fair, the prevailing view in the 1970s and early 1980s was that the facility could survive and prosper on research grants and contracts alone. No real need was felt to generate revenue internally and so no real effort was invested in earning money, apart from writing grant proposals. For a time, this approach was acceptable. Eventually, however, unmistakable signs of "donor fatigue" became evident, and the facility clearly needed to move toward self-sufficiency.

A policy breakthrough for the MMDC came in 1987, when the Palau government granted permission to begin a fee-based, export marketing program for giant clam products. This required that MMDC establish internal financial controls, produce regular financial reports, and subject all financial records to independent annual audits.

The MMDC Gift Shop itself had very humble origins, a fact that is particularly relevant to clam farmers and hatchery operators who have had no retail experience. At first, MMDC's "gift shop" was literally nothing more than a 4-by-8-foot sheet of plywood laid across two saw horses! We put clam shells with price tags on top of this makeshift table. We were fortunate in having a regular parade of tourists passing by the table. When someone wanted to buy a shell, one of the hatchery staff would stop what he or she was doing and make the sale. Note that this approach involved virtually nothing in the way of startup costs: no expensive capital investment and no shop employees.

Only after many months and about \$6,000 in sales did we consider improving the gift shop. We invested about \$3,000 in building a small, open-sided, 10-by-20-foot, roofed addition adjacent to the clam hatchery building. Several months and thousands of dollars in sales later, we added security screen to the walls of the shop.

Eventually, further income permitted the establishment of \$3,000 worth of further improvements, including shelving, a nicely paneled interior of stained wood and a beautiful floor of quarried pink Philippine marble. We then invested about \$5,000 more in four large aquarium tanks with state-of-the-art metal halide and actinic lighting. Many customers told us that our aquarium exhibits were the finest they had ever seen; their impact on customers was nothing short of extraordinary.

Even though the MMDC Gift Shop was small, it was a unique experience for customers. Most customers had never seen a giant clam before, let alone giant clam shellcraft and state-of-the-art coral reef tank displays. All customers seemed to appreciate the style and neatness of the shop.

Note that not a penny of debt was incurred in setting up the gift shop or the expansions and improvements. The construction was paid for solely by sales.

Our last improvement to the gift shop involved the addition of a \$3,000 screen-printing workshop and about \$4,500 worth of screen-printing equipment and supplies. This allowed us to print and sell thousands of MMDC T-shirts at \$16 each, which represented a net profit of more than \$10 each.



Figure 38.
The MMDC Gift Shop was built entirely with profits from selling giant clams.



Figure 39.
The MMDC Gift Shop used nautical items such as fishing nets to decorate, thus enhancing the marine theme of the shop.



Figure 40.
A reef tank lined one wall of the MMDC Gift Shop, further enhancing the shop's nautical theme.



Figure 41.
Attractive, carefully arranged displays attracted shoppers and increased sales.

Lessons Learned

The lessons learned from the MMDC gift shop experience are relevant to nearly any would-be entrepreneur, but are especially meaningful to those starting with very limited capital. Although the ways to market giant clam products are limited only by your imagination, we feel that people just getting involved in the shellcraft business, especially retail, will be best served by proven concepts. Once you begin making money, a portion of the profits can always be used to experiment with new approaches. In the beginning, however, stick to the basics and keep overhead down.

If you have giant clam shells accumulating on hand from your farming efforts, don't allow them to keep piling up while entertaining the fantasy that a ship from Taiwan will soon arrive to pay top dollar for the whole lot of them. It seldom—if ever—works that way. Instead, put serious thought into developing a program to sell the shells at your own farm or hatchery (direct marketing), or to sell the shells to other local retail establishments.

Adding value to your shell products through local crafting is a key concept. It creates employment for local artisans and increases the acceptable local price for the end products. As noted in the early part of this manual, adding value is much more than simply creating shellcraft products from unappealing raw materials. "Value Added" is a business strategy that should be expressed in all kinds of ways, ranging from the way the product is harvested, stored and crafted to the level of attention to detail in the shop decor to the way the staff and salespeople pay attention to the myriad of details that contribute to customer satisfaction.

How do you know when customers are satisfied? This all-important knowledge arises from customer feedback, both positive and negative. Basking in positive customer feedback is easy, and it will be plentiful if you approach your craftsmanship and salesmanship with energy and enthusiasm. Positive customer feedback can literally make your day; it makes you feel that all is right with the world. What is more difficult to detect, to accept and to correct is customer dissatisfaction.

Customer dissatisfaction may not be verbalized. More often, it will be expressed through apparent boredom, lack of interest or refusal to purchase. Lack of sales means something is wrong. Remember that successful retailing involves more than saying "May I help you?" to everyone who walks in the door. It often requires initiating a conversation with customers and volunteering information about not only the products but also the company philosophy and mission. If people like what you are doing, if they like your demeanor and feel that you are taking the trouble to educate or entertain them, they will make a purchase to show appreciation. The objective should be to make each and every customer have a positive experience in the gift shop. While this may not be achievable for 100 percent of the customers, it is true for the vast majority of them, the shop will thrive and grow.

In Conclusion

We hope that the topics covered in this manual and in the accompanying videotape have taken some of the mystery out of what is involved in starting a giant clam shellcrafting business. Beyond the purely technical aspects of creating the shellcraft products lies a series of challenges like those facing anyone who starts a small business. As your business grows, you will undoubtedly face questions relating to such topics as quality control, pricing, inventory control, record keeping, taxation and employee management. Take heart in knowing that sources of information and assistance are nearly everywhere for those willing to do a bit of looking.

Most communities have organizations designed specifically to help new businesses start; these organizations often offer access to a wealth of useful information. See if such sources are available in your area. For example, in America the U.S. Small Business Administration produces a series of booklets, manuals and videotapes covering nearly every aspect of small business. These gold mines of information should not be overlooked. Whatever problem you may have, the chances are good that someone has faced it before and written a book about it. Above all, don't overlook the **people** in your community who have been successful in other kinds of businesses. Seek them and ask for advice. You will probably find that they will be more than happy to provide guidance.

What stops most people from being successful in business? In our view, the greatest single constraint is that **they never attempt it in the first place**. As the saying goes, there's always a reason not to do it. *It's too hard, I'm too busy, and I don't know how*, are just a few of the host of other reasons people find not to try.

If you have giant clam shells to sell, try to create a setting in which people can view your products and selling can take place, even if it is a simple bench, a table top, or a shelf in a store owned by a friend or relative. You will, in all likelihood, be surprised at how easy the first sale comes. From that point on, listen to the customers and focus squarely on doing the things that make them happy.

Aside from retailing, few types of work provide such immediate feedback and gratification. When you get it right, you are instantly rewarded.

And who among us could not use the additional income generated by turning clams to cash?

Sources of Supplies and Equipment for Giant Clam Shellcrafting

Betty's Import and Export, Inc.

**Waikiki Shopping Plaza, 2250 Kalakaua Ave., Suite 508,
Honolulu, HI 96815**

Phone 808-922-3010 or 808-992-8476; Fax: 808-923-8271

Betty's is one of our favorite shops in Honolulu. Located on the fifth floor of the Waikiki Shopping Plaza in the heart of Waikiki, Betty's is bursting with a truly mind-boggling variety of jewelry and craftware made in the Philippines. Expect to pay wholesale prices for quantity purchases; bartering is allowed here just like in Cebu or Manila. A great place to pick up ordinarily hard-to-find components for shellcraft jewelry. Examples include bead necklaces, earring components, magnetic memo holders of every description and macramé.

Bluewater Displays and Packaging

**4432 Anaheim Ave., NE, Albuquerque, NM 87113
phone: 800-637-8303**

Bluewater is a member, along with River Gems and Rio Grande Albuquerque, of the Bell Group of Companies that specializes in every aspect of the jewelry industry. Bluewater offers an innovative line of display, packaging and salesman's sample merchandise. This is the source for earring cards and display stands, polyethylene bags, jewelry boxes and shipping boxes, and even screen-printing supplies for making custom display cards.

Hydro-Gardens, Inc.

**8765 Vollmer Rd, Colorado Springs, CO 80908
phone: (719) 495-2266; fax: (719) 531-0506**

Hydro-Gardens makes customized stickers that are great for adding a classy touch to your shellcraft products. MMDC used thousands of Hydro-Gardens' oval "Tomato Labels" on our giant clam shellcraft. The gold foil label was imprinted with fancy black lettering that read "Palau Giant Clam Captive-Bred MMDC." We also used the company's light pink fluorescent "Cucumber Label" with the same message for large ornamental shells. The labels cost very little, and they, no doubt, increased the value of the shellcraft products.

Loctite Corporation
Cleveland, OH 44128

Loctite makes hot-melt glue guns and glue sticks. The glue sticks come in at least 13 different varieties. An acceptable glue stick is their item number 81933, which is a 4-inch, general purpose, clear glue stick that bonds in 30 to 60 seconds. Buy the sticks in packs of 30 or cases of 720 to cut costs. The retail price of the glue sticks should be about \$0.25 or less per piece, while the glue guns will retail for about \$20.00. Note that many other companies besides Loctite make hot glue guns and glue sticks, but this is one of the largest and has a good reputation.

Ohio Ceramic Supply, Inc.
P.O. Box 630, Kent, OH 44240

Ohio Ceramic is the place to buy circular magnets for magnetic memo holders. Write for their catalog and price list. We purchased 800 of their 1/2-inch circular magnets for about \$0.10 each.

Rio Grande Albuquerque
6901 Washington NE, Albuquerque, NM 87109
phone: 800-545-6566

Rio Grande Albuquerque is a full-line supplier for tools, equipment and supplies for manufacturing jewelry. Equipment of interest to giant clam shell crafters includes Dremel electric drills for making tiny holes in earrings and necklaces, jewelry pliers for making French wire earrings, Cyanoacrylate (which is also sold under the brand name Super Glue) sold in bulk quantities, and manuals and videos on electroplating methods.

River Gems & Findings
6901 Washington NE, Albuquerque, NM 87109
phone: 800-443-6766

River Gems and Findings publishes a marvelous catalog that is THE definitive source for gemstones, jewelry findings and precious metals. Whether you want to buy authentic South Sea pearls at wholesale prices, earring components, hand-painted Peruvian ceramic fetishes, Indian glass beads, rhinestones, diamonds, rubies, sapphires or gold and silver by the ounce, this is the source. Be prepared to be absolutely blown away by this catalog, which, if you are serious, just might launch you into a career (or a least a lucrative hobby) in jewelry making.

Tideline

640 South Isis Ave, Inglewood, CA 90301
phone: 213-641-9106

Tideline is a wholesaler of dried coral, shells and other marine specimens. We do not suggest attempting to market your giant clam shells to this company. But their catalog will give you a good idea of current wholesale prices for shells and shellcraft items in the United States. If you operate a seaside gift shop, you will find that Tideline stocks many items that could be useful for your inventory of marine-related items or for decorating to create a nautical ambiance.

Venus Displays

10713 Ashby Avenue, Los Angeles, CA 90064
phone: 310-836-3177

Venus makes a neat selection of acrylic shell stands, including the acrylic lamp bases for giant clam shell night lights. The #150 "Urchin" light with cord-set, can be ordered in quantities of a gross (144) or more for about \$4.50 each. Be sure to check out their display stands, many of which can be used for presenting giant clams. Alan Levy is the owner-operator of Venus.