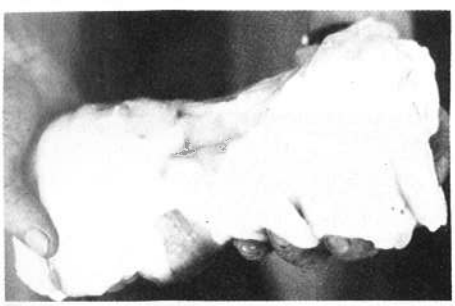

Some uses of giant clams: *(top)* for direct consumption in the market at Nuku'alofa, Tonga; *(center)* shells for sale in Tonga; and *(lower)* adductor muscle of a large *Tridacna gigas,* in Papua New Guinea ready for drying. Dried, it is a prized item in some Asian markets.

Giant Clams – *Food for the Future?*

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Giant clams are inhabitants of the reefs of the Indian and Pacific Oceans and have formed a significant part of the everyday diets of the peoples of Oceania and Southeast Asia for thousand of years. The entire clam, except the small kidney, is edible and the adductor muscles are highly prized for food in Southeast Asia. Stocks of tridacnids throughout the Indo-Pacific have been severely reduced as a result of the combined effects of increasing populations, pollution and habitat destruction and heavy fishing.

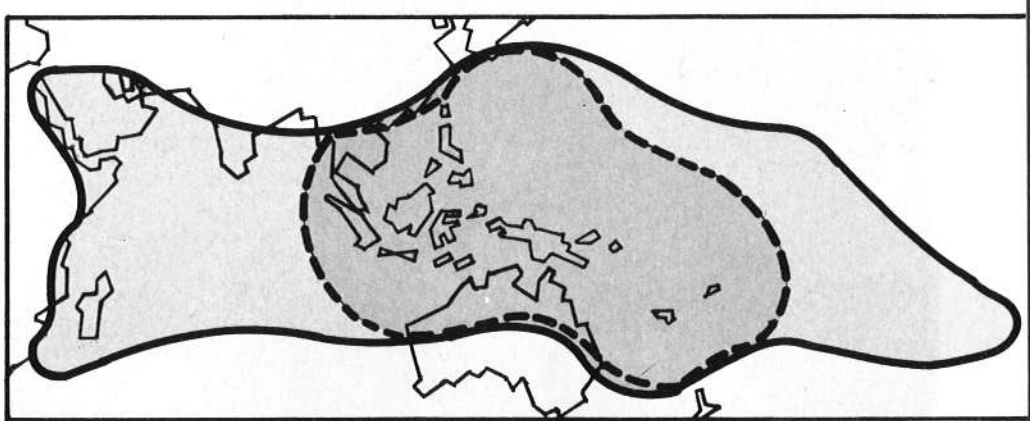
Of the six living species of tridacnids, the largest, *Tridacna gigas,* attains a shell length of up to 137 cm and a weight of over 300 kg. *T. derasa* reaches lengths of over 50 cm, and *T. squamosa* and *Hippopus hippopus* exceed 40 cm. The large sizes attained by these animals are related to the symbiotic relationship which they have with dinoflagellate algae called zooxanthellae, which live in a thin layer of tissue in the fleshy mantle of the clam and provide it with food. The clams are capable of full phototropy in shallow sunlit waters and are therefore the only self-feeding potential farm animal known to mankind.

Research work on the maricultural possibilities of giant clams has been done mostly at the Motupore Island Research Centre in Papua New Guinea and at the Micronesian Mariculture Demonstration Center in Palau (see article p. 5). These investigations have shown that within the equatorial regions, the growth rates of *T. gigas* and *T. derasa* are relatively rapid. For example, *T. gigas* can reach a shell length of 50 cm, and a flesh weight of 6 kg in 5 to 7 1/2 years, of which the first 12-18 months would be spent in a hatchery or nursery. Clams stocked onto reef areas at a length of 15 cm and a density of $5/m^2$ would theoretically produce around 60 t/ha (6,000 t/km^2)/year. This is an extremely high harvest rate and even harvests of one-tenth of this magnitude would be of interest to mariculturists.

These giant clams do not *require* any external phytoplanktonic food supplies to meet their calorific requirements, even though they do filter feed actively at all times–perhaps to replace nitrates and phosphates which are required by their symbionts.

Giant clams can be induced to spawn either by providing suitable conditions (as has been achieved in Palau) or by chemical means, in which fresh or freeze-dried gonad extracts, hydrogen peroxide or other chemicals are introduced to the mantle cavity. The larvae can be reared in large numbers, although mass culture techniques (suitable for producing the millions of juveniles required for a farming venture) are still to be developed. Juveniles, which are vulnerable to predators would have to be retained under protected nursery conditions until shell lengths of 10-15 cm are attained.

If large-scale cultivation of tridacnid clams is to be feasible, various options



Present known limits of distribution of tridacnid clams (solid line). Species of possible commercial interest have a narrower distribution (broken line).

Adult *Tridacna squamosa* from Papua New Guinea, about 30 cm long.

emerge. For example, hatcheries could simply provide a means of restocking depleted fishing grounds and supplying local demands. Alternatively, maricultural activities can be envisaged, either on communally-owned reef tracts (as is the case through much of Oceania), on privately-owned leaseholds or as national enterprises controlled by government authority. The realities which will emerge will depend very much upon the economics of the operations and upon the sociological features of the peoples involved. In this context, it should be noted that the area of distribution of *T. gigas, T. squamosa* and *H. hippopus* covers the waters of Burma, Indonesia, Malaysia, the countries bordering the South China Sea, the Philippines, Papua New Guinea and Australia and the countries of Oceania as far East as, and including the Marshall Islands, Kiribati, Tuvalu, Fiji, Vanuatu, New Caledonia, the Solomon Islands, and all of the Caroline Islands. This range could be extended to other tropical areas if the species were domesticated. The main point here is that sociological problems, which might impede development, relate very much to specific countries and will have to be evaluated individually.

The adductor muscle averages roughly 10% and the mantle 50% of the flesh weight. Pacific islanders normally consume the entire flesh of the animal. The mantle tissues consist of smooth white muscle with a taste and texture similar to cuttlefish or squid. The shells are highly favored items with tourists and shell collectors.

It is not possible to obtain estimates of current production and consumption rates of tridacnids. Most clams are directly consumed by islanders or coastal peoples or sold on local markets. Small (20 cm) *Tridacna maxima* are sold in American Samoa for US$1.00-3.00 each and large (40 cm) *T. squamosa* and *T. derasa* fetch $2.00-3.00 in Nuku'alofa, Tonga. Dried whole clams are exported from Sabah to Singapore and fetch about $15.00/kg. The dried adductor muscle is said to fetch up to $120.00/kg in Hong Kong where it competes with dried scallop muscle from Japan (which sells for about $90.00/kg). Consumption of dried adductor muscle of clams and scallops in Hong Kong alone amounts to about 450 t/year with a wholesale value exceeding $22.5 million/year.

As stated previously, annual harvests of tridacnid meat of 6,000 t/km^2 (60 t/ha)/year are conceivable, even under rather simple cultivation systems. Production rates of this magnitude could have a significant impact upon food supplies and upon the economies of tropical maritime nations. This being the case, the known extinction of *T. gigas* and *H. hippopus* in some areas, the threatened status of these and other species in many other areas, and the consequent or threatened loss of genetic diversity, are cause for great alarm and justification for substantial research efforts.

Attempting to induce spawning in *Tridacna gigas* with homogenized gonad tissue, Papua New Guinea.

Tridacna squamosa juveniles attached to a gravel substrate at the Palau hatchery.

ICLARM has recently embarked on a search for funding to support a major research effort on giant clams, including studies of the economics of clam farming and marketing, the status of Indo-Pacific stocks, growth rates relative to habitat and other ecological factors, spawning induction, larval and juvenile rearing techniques, and design and development of a pilot-scale clam hatchery in the equatorial Indo-Pacific.

Details of the research findings and ICLARM's proposed projects are available from the author. ●