Abalone

By **AP Surtida**

Abalone is a type of conch belonging to the family *Haliotidae* of the class *Gastropoda*. It inhabits rocky reef areas of coasts facing the outer sea. It feeds mainly on seaweeds, and has a demonstrated limited mobility.

There are about 100 species of abalone around the world, but the bigger species that are useful for commercial fishery are found in the temperate zone. Cold water and tropical zone species tend to be small in body size and is distributed in small numbers (Fishery Journal 1992). Countries which have commercial fishery of abalone include Japan, Korea, the Pacific coast of North America, South Africa, Australia, New Zealand and Mexico.

Japan's annual catch of abalone is about 4,000 tons. Japan also imports about 1,000 tons of fresh, frozen and refrigerated abalone annually from China, Korea and New Zealand, and another 1,000 tons of canned abalone and several hundred tons of processed (cooked) abalone from Australia. In addition, Japan exports several dozen tons of dried abalone to Hongkong and Taiwan.

According to Martin Johnston (Seafood International 1997), abalone is among the main contenders along with dolphin fish, scallops, Atlantic halibut, spotted wolffish, red drum, freshwater prawns and Atlantic cod, which constitutes aquaculture's third wave.

Johnston reports that intensive fish farming is a mere 30 years old, yet in such a short time producers have successfully managed to make farmed Atlantic salmon and rainbow trout a permanent fixture in European supermarkets.

A second wave of aquaculture products according to Johnston, reached the shelves in the early 1990s. This was dominated by imported farmed products such as: turbot, seabass, sea bream, tilapia and tiger prawn.

Like any healthy business, expansion and diversification are high on the fish farming agenda. The prime considerations for selecting new species are market demand and profitability, reports Johnston.

Abalone is considered the most valuable marine mollusc, which is available fresh, frozen, canned or dried and can be eaten raw or cooked. The foot of the larger varieties can provide several sliced steaks.

Abalone shells can be used to make jewelry, buttons and ornaments. In the Far East, it is also used as part of traditional medicine.

The largest species is the red abalone (*Haliotis rufescens*), found in North America, while the most economically important is *H. discus hannai* from Japan.

Different techniques have been used to induce them to spawn in captivity, including irradiated sea water in Japan and hydrogen peroxide in the US.

Upon reaching 5 mm, juveniles are transferred to growing tanks or can be seeded in the seabed. Mortalities are high. Recovery rates in Japan are 15-20%.

The first abalone farm in Mexico, Abulones Cultivados, was set up in 1992. Five years later, the first harvest consisted of 60,0000 pieces measuring 7.5-9.0 cm each. They were sold at US$35 per kilo (10-12 pcs).

Again, the Japanese are the biggest buyers of Mexican live abalone. They were sent to Japan by air in specially chilled and aerated containers. The trip was 36 hours, but the high retail price justified the effort.

Haliotis rubra abalone are farmed in the Channel Islands, according to the Johnston reports. In 1994, six tons worth US$ 167,000 was sold to the French market.

Abalone farming is now underway in a number of countries, including South Africa, Australia, and New Zealand. The latter variety (*H. iris*), known as *pana*, is especially valued for its beautiful purple and turquoise colored shell.

Tips for the new abalone farmer

For the would-be abalone farmer, it is important that one should familiarize himself with the product form and standards in order to deal effectively with the market. Below is a list (Oakes FR and Ponte RD, Aquaculture 1996) which provides a few broad generalizations about the relationships between abalone quality, value and marketplace which help distinguish the major product standards.

- **Color** - the color that is relevant in the market is that of the foot. Species with lighter pigmentation are generally considered better and usually command the highest prices. The darker,

heavily pigmented species are graded lower and require more trimming, washing or bleaching prior to sale.

- **Texture** - traditional abalone recipes use the meat in three general texture forms: tenderized by cooking, canning or pounding, raw meat with crisp texture, and dried.
- **Tenderized products** - canned and steak abalone are the best examples of tender forms in which abalone is marketed.

  In the major markets of China and Southeast Asia, most of the product consumed is imported canned abalone.

  Quality is determined by uniformity of the texture and whiteness of the meat. Subtidal species, such as *H. fulgens* and *H. laevigata,* are preferred for these attributes.
- **Abalone steak** - this is the traditional presentation in North America. The product is prepared by hand-pounding thin slices of meat from the foot portion of the large, west coast species (*H. rufescens, H. corrugata, H. fulgens, H. sorenseni, H. cracherodii*). Quality standards are based on tenderness, size

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Hatchery-bred abalone broodstock

AQD researcher Armando Fermin

The work of SEAFDEC/AQD

At SEAFDEC/AQD in Iloilo, Philippines, researchers have successfully spawned *Haliotis asinina* in captivity, and have grown the hatchlings into broodstock in 12 months.

According to AQD researcher Armando Fermin, abalone suffer from heavy fishing pressure like any other fishery stocks. That's why AQD is continuously refining the breeding and hatchery techniques it has developed to easily produce sufficient seeds for restocking, thus, helping restore natural abalone populations.

Fermin adds that they are also looking at the hatchery technology as a catalyst to the development of the abalone aquaculture industry in the Philippines.

"Our country is one of the major producers of abalone from capture fishery. In fact, the Philippine production of abalone from capture fishery is still on an upward trend, which is in contrast to other major producing countries like Australia, Japan, Mexico and New Zealand," says Fermin. "There are already processing plants in Cebu that are exporting canned abalone. These are sourced from fishers who collect abalone from nearby provinces of Samar, Negros and Surigao."

In addition to studies on broodstock and hatchery techniques, AQD is also exploring new research areas like larval settlement by artificial methods and grow-out culture in net cages in a nearby coastal community.

AQD has also refined some nursery practices that can now be recommended. According to Fermin, smaller juveniles (5-8 mm) should be sorted and separated from the large (14-16 mm) ones before they are reared in the nursery. This would prevent stunting the growth of the smaller ones.

Also, juveniles measuring 11 mm and weighing less than half gram can be stocked at 685 individuals per m^2. Fermin also recommends rearing juveniles in outdoor tanks as sunlight favors growth of microalgae, a natural source of food.

Juveniles reared outdoors consume more food, resulting in faster growth rates and shorter rearing period.

In terms of practical diet for juveniles, a diet with an optimal crude protein level at 27%; lipid at 5% and carbohydrates at 40% supports abalone growth better than seaweed alone.

Fermin concludes that AQD's future research results on abalone shall be able to provide hatchery seeds for aquaculture and searanching purposes.

A reseeding program to enhance natural populations shall also be developed to provide equal livelihood opportunities for small-scale fishers. -- *APS*

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and color. Premium large white steaks sell for US$100 per kg.

- **Raw abalone** - in Japanese cuisine such as sushi and sashimi dishes where abalone meat is eaten raw, a firm and crisp texture reminiscent of fresh cucumber is preferred.

  The desired texture comes from the firm meat of the cold water species (*H. discus, H. discus hannai, H. cracherodii*).
- **Dried abalone** - the most common type of processed abalone in Japan. This traditional Japanese product is prepared by boiling the meat and drying it in the sun. This product is produced in Japan's northern prefectures and is mostly exported to China. Historically, this was one of Japan's largest export items to China, but the Japanese domestic demand has virtually eliminated this trade.
- **Size** - Abalone are routinely graded by size, with certain sizes commanding premium pricing in each particular market. Larger is better but within certain limits. In Japan, the preferred size is 300 g abalone; in North America, the minimum size is 600-800 g. The Chinese fishery is dominated by *H. diversicolor diversicolor* and *H. diversicolor supertexta*, which mature at 60-85 g, and this product is exported to Southeast Asia. The Chinese consume primarily canned abalone with premium sizes determined by uniform piece count (pc) in each can -- for example, 1 pc or 715 g; 2 pc, 350 g; 3 pc, 240 g; etc.

Demand and prices for premium abalone products have risen steadily during the last few years, creating an economic environment in which abalone aquaculture is becoming increasingly attractive as a financial investment. As the industry becomes more established it will be important for abalone culturists to specialize in specific products designed for specific market niches.

Elsewhere, in Australia, in a report by Trevor Rees (Fish Farming International 1997), researchers at the University of Queensland are making great advances in a project to develop a viable tropical abalone aquaculture for *H. asinina*, otherwise known as the cocktail abalone. *H. asinina* is the fastest growing abalone in the world, has a delicate flavor, and has a convenient size for banquets, making it ideal for aquaculture.

The abalone industry in Australia contributes US$ 86 million a year to the Australian economy. *H. asinina* is targeted for both the domestic and export market for Southeast Asia, North America and Europe. They estimate *H. asinina* would fetch about US$ 38 a kilo in the Asian market.

H. asinina is ready for market in less than a year, compared with five years for some temperate species. In Thailand, the Eastern Marine Fisheries Development Center (EMDC) succeeded in the experimental breeding of *H. asinina* in 1989 (Singhagraiwan and Doi 1993). Since then they have intensively conducted relevant rearing experiments in order to establish reliable seed production techniques for *H. asinina.*

Presently, there is no commercial fishery for abalone in Thailand since wild stocks are not abundant and they are not a familiar food item to Thai people. However, when large-scale production becomes possible, potential demand for these abalone species will be created on the domestic and international markets. Aside from *H. asinina* other abalone species found in Thailand are *H. ovina* and *H. varia.*

The situation is similar in the Philippines, although there is an existing commercial abalone fisheries in the provinces of Iloilo, Guimaras, Negros, Samar, Surigao, Zamboanga, Palawan and Tawi-Tawi.

H. asinina is known locally as "lapas" or "sobra-sobra", *H. varia* is known as "kapinan." The other abalone found in Philippine waters is *H. ovina.*

H. asinina can grow to a maximum size of 10-11 cm in shell length while *H. varia* and *H. ovina* are relatively smaller with a maximum shell length of 6-8 cm.

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morning, he would feed trash fish in the evening or vice versa. Bayhon observes that shrimp fed *agiis* is good quality shrimp -- he terms it "masinaw" or smooth, healthy-looking shrimp -- and pollution is not a problem. As shrimp feeds, it leaves a fine powdery residue from uneaten shells. Tough-shelled *agiis* are eaten by mudcrab. "Mudcrab are ravenous eaters of *agiis*," says Mr. Bayhon. 'Thus, *agiis* not eaten by shrimp are consumed by mudcrab. There's not much waste," he continues.

Summary

Live *agiis* have been proven to be a good feed for shrimp for the past ten years by polyculture fish farmers in Capiz. It is popularly used in the area. Its cultivation period is short and seeds are readily available. It can reduce dependence on trash fish which is now getting to be scarce; it also seems much cheaper.

Perhaps the fast-growing tiny bivalve *agiis* can be scientifically investigated by students of aquaculture as feed for other commercial aquaculture species. Its scientific identification can be a good start. ###