

Agiis: a bivalve cultivated as live shrimp feed

By **MB Surtida** and **RY Buendia**

Agiis (no scientific name) is the Hiligaynon term for a tiny bivalve: shell length 1.2 cm, width 0.6 cm, shell color greyish with light brown patches. Its shell is soft, readily crushed by shrimp and crab. It is cultivated in the province of Capiz in the island of Panay, west central Philippines as live feed for shrimp and mudcrab, and sometimes for tilapia and milkfish.

water means mortality.

Agiis juveniles are gathered in the open sea (Pilar Bay) near the mouth of the Pontevedra River. Gatherers scoop them with a fine meshed scoop net with a bamboo frame. Depth of the scoop is ≥ 0.5 m; circular bamboo frame (with a handle) dia is ≥ 0.75 m. A can of juveniles sells for P30 but if one cultivates it, he can pay



One would think that these men are packing gravel. A very close look would show that it is cultivated *agiis*, being readied for market to shrimp owners



Agiis picked up from muddy substrate. Note the byssal threads that keep them attached to each other



Boy Bayhon examines shrimp fry offered by a fry dealer

Alejandro "Boy" Bayhon of Pontevedra, Capiz uses live *agiis* in his shrimp ponds in combination with trash fish (50:50) for the past 10 years. He cultivates *agiis* along Pontevedra River in Brgy. Mandulano and Quiaho in the town of Pres. Roxas on a 7-ha area. "It is good business," he says. He considers *agiis* lucrative as he sells a can at P45-60 (can size is about 0.5 m³). Most shrimp and mudcrab farmers near his area use *agiis* as live feed.



Adult (left) and juvenile *agiis*

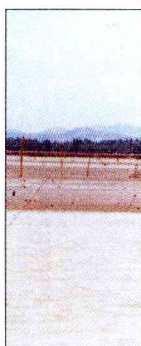
Agiis cultivation

Agiis is stocked in a substrate of pure mud with constant exchange of sea and freshwater. In parts of Pontevedra River where *agiis* are stocked, the mud substrate is almost 0.5 m thick. The River runs along several towns in the province of Capiz, thus it is sheltered and does not have much disturbance. Tidal exchange is constant. This exchange is considered important by *agiis* farmers because they say that shells turn hard in pure saline water, making the *agiis* feed suitable only for mudcrab while pure fresh-

water means mortality. P5 per can to his gatherers. A gatherer can sell 10-20 cans a day. In his 7-ha *agiis* cultivation field, Mr. Bayhon stocks 100-500 cans of juveniles. Broadcast of juveniles is usually done during low tide when the mud substrate is exposed. He would then leave the juveniles for two months, after which time he would harvest them.

The muddy substrate must have a depth of at least 0.25 m. Thicker mud is much better for sufficient shelter because the cultivated *agiis* can reach a thickness of about 0.25 m in the mud. A can of juveniles easily translates to 3-5 cans during harvest. Thus,

The muddy cultivation area of *agiis* in Brgy. Mandulano, Pres. Roxas, Capiz. If one runs a hand over the muddy site, one would feel the numerous small shells beneath one's palm



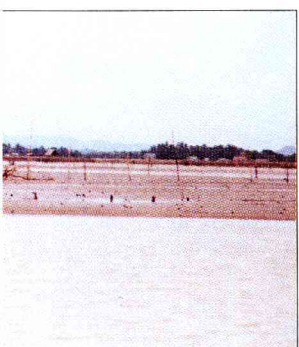
a can of juveniles (P30) can fetch P90-150 at harvest after a month.

February to October is the period when *agiis* juveniles are plentiful. But Bayhon says that most of the time, *agiis* is abundant year round. When *agiis* is not available in his area, he gets his juveniles from Hinigaran, Negros Island, but he complains that *agiis* from Negros are harder shelled than *agiis* from his home place.

Agiis is harvested with the use of a nylon mesh net sewed to resemble a cone almost 5 m long attached to a bamboo frame. At the muddy bottom, *agiis* (including mud) are scooped into the net, and pushed to the farthest end of the



A gatherer uses one hand to push *agiis* into the a net



A gatherer, at right, rinses the net of harvested *agiis* while another transfer *agiis* to the boat

cone while continuously rinsing it of mud as *agiis* is pushed to the closed end of the net. The *agiis* are further rinsed and transferred to boats.

Feeding

Bayhon polycultures shrimp with milkfish and mudcrab in 110-ha ponds. At a stocking density of 3 shrimp per m², he feeds 10 cans live *agiis* per day in combination with trash fish at age 1.5 months or at weight 20 g of shrimp. If he feeds *agiis* in the

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Trochus: the mollusc for buttons

By **MB Surtida**

Except for those who trade it, little is known about trochus, also called top shell (*Trochus niloticus*). It can be referred to as the button mollusc because its shell is a highly priced export commodity that is manufactured into buttons for fashion houses in many developed countries like Italy, Japan, United States, the United Kingdom, and Austria.

The trochus is a marine mollusc that resembles a spinning top. The iridescent, inner layer of the top shell called mother-of-pearl is the preferred part for manufacturing buttons. Aside from its shell being exported to developed countries, the trochus meat is edible and cooked, dried or canned occasionally for consumption. In 1994, it was estimated that 80% of the trochus harvest in the South Pacific were taken for subsistence purposes. Thus, trochus growing is a possible entry for social and economic development in coastal areas in the South Pacific and Southeast Asia.

The trochus characteristics

Trochus lives on coral reefs and reef flats. Its natural range is limited to a region from Ryukyu, through the Philippines, Indonesia, to Fiji, Vanuatu and northern Australia. But its geographical range has been "greatly enlarged by artificial distributions." They have been introduced successfully in many South Pacific countries because of its commercial value.

Trochus are mostly found in slabs of dead coral covered by small algae, diatoms, and marine protozoans (foraminifers). Large trochus stay in reefs that are exposed to wind. They usually cling to reef flats with their muscled feet. The depth they usually inhabit are the first ten meters but researchers have found some in 24 m depth.

Many countries in the South Pacific have been successful in collecting broodstock, inducing them to spawn, rearing larvae, and growing them to the preferred harvest size of 65-100 mm. Trochus broodstock are usually sizes 65-120 mm. It has been found that trochus spawns year-round every 2-4 months but in some places, spawning is defined during the warm months, October - April.

Twelve hours after fertilization, trochus eggs hatch. From trocophore to pediveliger stage, larvae are stocked 4-8 larvae per ml. Water is gently aerated and changed at least once daily. Larvae are then reared to veliger stage then transferred to juvenile rearing tanks.

One month prior to transfer of larvae to juvenile rearing tanks, algal cultivation should be started. The juveniles will be stocked in these rearing tanks when algae have grown on the walls and

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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 (Singhagruiwan 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 Thai-

land 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. ###