

Market potential and challenges for expanding the production of sea cucumber in South-East Asia

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Abstract

Sea cucumbers are fished worldwide, with more than 50 species commercially exploited. In South-East Asia, important sources of sea cucumber are Indonesia, the Philippines, Vietnam, Thailand and Malaysia, with Singapore and Hong Kong being major export destinations. The product is popular among oriental consumers due to its alleged ability to improve vigour and cure a number of ailments. Supply in South-East Asia is declining due to overfishing. While significant volume is being produced from sea ranching and pond culture, this is not enough to offset rapidly declining collection from the wild. This and the increasing demand for the product have kept prices at attractive levels. Nevertheless, high prices do not translate to improved income for coastal households as individual catch size remains small and the cost per unit of fishing effort high. The market offers high premiums for well-dried, good-quality sea cucumber. However, primary processing, which is the sole determinant of product quality, remains mostly at the village level, which employs traditional practices. The nature of the fishery itself, which is characterised by small catch volumes per day, leads to diseconomies of size, constraining large processing facilities that are compliant with 'good manufacturing practice' (GMP) and 'hazard analysis critical control point' (HACCP) standards from engaging in the business. The market also operates in the absence of officially formulated grades and standards that would guide transactions along the value chain.

The marketing system for sea cucumber in South-East Asia is generally inefficient, and marketing channels are multilayered. Information asymmetry encourages proliferation of redundant players in the distribution system, while high transaction costs keep the overall marketing margin high but the price received by collectors low. Unlocking the full potential of the sea cucumber industry calls for a set of well-conceived strategies that would sustain supply from the wild, increase the supply from aquaculture, improve primary processing and remove the inefficiencies in the distribution system. Emerging systems for more-efficient processing of the product should also be explored to address issues of economies of scale and improve returns on investment for GMP- and HACCP-compliant facilities, as well as the incomes of fishers and farmers.

Introduction

Marketing systems cover supply, demand and prices. Simple as it may seem, the complication becomes apparent when one considers that analysis of supply includes a range of concerns, from collection of the

product to processing and distribution. In addition, supply is not only about quantity, but quality as well. Similarly, analysis of demand covers a wide array of interests. Of particular importance are the geographical characteristics of demand, the nature of products demanded, specific product requirements and the trend in volume resulting from changes in taste and preference. Price may be viewed as the result of interaction between demand and supply. In a capitalist economy, the price system determines what, how and how much of a given commodity to

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produce. Price trends provide a snapshot picture of overall industry trends.

Since the marketing system covers supply, demand and prices, consideration of attendant issues crucial to each component is inevitable. In the case of sea cucumber, overexploitation is a crucial supply issue, as are inefficiencies in processing and distribution. Also important are issues on grades and standards, such as the application of 'good manufacturing practices' (GMP) and 'hazard analysis critical control point' (HACCP) methods. On the demand side, globalisation of demand and the increasing number of new sea cucumber products are interesting developments. Of course, supply and demand issues cannot be viewed in isolation. Understanding how one affects the other is at the core of a good marketing system analysis.

This paper is limited to establishing the major features of the marketing system for sea cucumber in South-East Asia. The opportunities and challenges associated with this system, especially in relation to expanding production in response to a growing demand, is the primary focus. The potential for aquaculture is also explored. The paper uses secondary data on production and marketing, as well as information/data generated from relevant studies conducted in the Philippines, Vietnam and Hong Kong. The paper also provides a synthesis of results and discussion from available literature on the subject. The first section outlines the marketing system, particularly in terms of features common to countries in South-East Asia. The second section discusses the marketing opportunities and challenges to expanding sea cucumber production in the region. The third section provides a synthesis of common marketing issues, and offers a set of recommendations on how to explore the opportunities, overcome the challenges, and deal with the various issues plaguing the sea cucumber industry in the region.

Major characteristics of the marketing system for sea cucumber in South-East Asia

The marketing system for sea cucumber in South-East Asia can be characterised in terms of the three fundamental components: supply, demand and price. Supply includes collection from the wild and production from ponds, but is not limited to these. All activities related to processing and distribution of the

sea cucumber products available to consumers are also viewed in this paper as part of supply. Demand is assessed in terms of the utility derived in consumption as well as in terms of its spatial and temporal nature. Characterisation of the marketing system in terms of price is limited to analysis of premium price for quality, price spreads and price trends.

Supply-related marketing system characteristics

There are a number of common threads that run across countries in South-East Asia when it comes to supply-related marketing system characteristics for sea cucumber. Most countries in the region are major sources of sea cucumber products, and the species profiles are more or less the same since the countries have a similar tropical environment. Collection from the wild is generally marginal, and carried out mostly by low-income households in coastal villages. Primary processing remains traditional, and processing techniques are generally the same across the region. Overexploitation of high-value species is a common problem, with each country pursuing specific initiatives to address the problem. Finally, almost all countries are exploring aquaculture as a significant supply source to improve the incomes of coastal households and lessen the pressure of overfishing in the wild.

South-East Asia is a major source of sea cucumber, with Indonesia, the Philippines and Malaysia among the top producers in the region. Despite the increasing demand and high price for the product, sea cucumber fisheries are mostly artisanal, with sea cucumber just an incidental catch to finfish. However, fishing activities where sea cucumber are targeted appear to have significantly grown during the past few years.

Recent reviews of the state of sea cucumber fisheries in South-East Asia showed alarming increases in fishing pressure. Overexploitation has led to local extinction of high-value species in some localities, and prompted closure of many national fisheries to allow stocks to recover, and to allow more sustainable management plans to be established (Purcell 2010). In the Philippines, the Bureau of Fisheries and Aquatic Resources (BFAR) considers sea cucumber to be a heavily exploited resource, and acknowledges that localised depletion has occurred in many fishing grounds. But BFAR possesses no quantitative census to support this claim (Gamboa et al. 2007).

In response to overfishing and declining catches, and spurred by high international prices, aquaculture, sea ranching and restocking have been attempted

in a number of countries (Macfadyen et al. 2009). The Australian Centre for International Agricultural Research (ACIAR) and the Worldfish Center are among the international organisations leading the development of sea cucumber aquaculture in South-East Asia. Hatchery and nursery protocols for high-value species, particularly *Holothuria scabra* (sandfish) are fairly well developed in the Philippines, Vietnam, Malaysia and Indonesia. Existing methods for sandfish grow-out include pond and pen culture as well as sea ranching.

Primary processing

In the Philippines, village assemblers are the ones who typically carry out primary processing. It is tedious and time consuming, and generally involves gutting, boiling, brushing, smoking and sun-drying (Brown et al. 2010). However, the processing steps depend on the species being processed, and techniques vary from place to place. Most collectors sell their collection fresh to assemblers or processors, while some process the sea cucumbers themselves before selling them to assemblers, processors or other traders. In southern Thailand, processing of sea cucumber involves gutting and boiling the animal in sea water for 1 hour. The fishermen then bury them in the sand overnight, before removing them and stepping upon them for 10–20 minutes to squeeze out their colour. The sea cucumbers are boiled again in water for 1 hour, then brushed to remove the spicules, before they are ready for consumption or dried for storage.

Primary processing of sea cucumbers in South-East Asia will likely remain traditional, small scale and limited at the village level. The nature of the fishery, which is widely dispersed and where daily collection volume from source villages is small, would not warrant economies of scale in processing. In Vietnam, a large processing company dropped sea cucumber from its processed product line because insufficient volume to achieve economies of scale could be sourced locally. A detailed example of the processing method employed in the Philippines, as well as the associated costs, is shown in Table 1. Total cost is PhP248 (about US\$6) for 12 kg of product.

Distribution system

Sea cucumber production in South-East Asia is for both domestic consumption and the export market (SEAFDEC 2009). However, the significance of the local compared with the export market varies significantly by country. Countries with small local demand

include the Philippines, Indonesia and Cambodia (see Labe 2009; Sereywith 2009; Wiadnyana 2009), where the bulk of production is exported and other consumption is limited to local Chinese residents. Significant local markets exist only in Vietnam and Malaysia.

The general product flow for sea cucumber involves fishers, village assemblers and processors, other local traders in the source areas, and exporters generally located in big cities (Figure 1). Fishermen sell the product to the collector or buyer either fresh or dried. Buyers also directly collect dried sea cucumber from fishers who opt to dry the products themselves. In the Philippines, though, village-level assemblers and processors do exist. They either wait at the landing sites to buy fresh sea cucumber, or the fishers themselves bring the catch to them. A village assembler carries out the primary processing, and stores the dried product until sufficient volume is accumulated for sale to exporters in the capital, Manila, and other big cities (Figure 2).

In Malaysia, sea cucumbers are sent to both domestic and international markets, although a small portion of fresh product is sold at fish markets for consumption by the local Chinese population. The domestic market also includes sales to processors for producing traditional medicines and other health-related products (Ibrahim 2009). However, a major proportion of sea cucumber in Malaysia is exported. In Vietnam, sea cucumber markets include dried and frozen product, although the volume of the latter is relatively small. Dried sea cucumbers are distributed to either domestic or overseas markets.

There are at least 635 firms involved in supplying sea cucumber products all over the world (Table 2). Typically, sea cucumber is one line in a variety of fishery and other agricultural products supplied. In the Philippines, supplier firms are engaged with a long list of high-value marine and agricultural products, including abalone and shark fin. Among South-East Asian countries, Indonesia has the largest number of firms (81) supplying sea cucumber products, followed by Malaysia (61) and the Philippines (50). There are 21 supplier firms in Vietnam, while Thailand has 9. Along the sea cucumber supply chain, supplier firms are among the downstream players responsible for bringing the products to both local and international consumers.

There are limited studies on the efficiency of the sea cucumber distribution system in South-East Asia. However, a recent study conducted in the Philippines

Table 1. Steps involved in processing sea cucumber, the corresponding resources needed, and the associated costs (Palawan processors, the Philippines, 2010)

STEPS	RESOURCES NEEDED	COSTS (Php/day)		
		Average	Minimum	Maximum
1. Gutting at the mouth	Petromax or lamp	2.17	1.85	2.78
	Flashlight	0.28	0.28	0.28
	Gasoline or kerosene	44.00	33.00	54.00
	Knife (good for 3 years)	0.03	0.06	0.06
2. Boiling for 5 minutes – 2 hours	Aluminium basin or big pan (good for 1–3 years)	0.63	0.32	1.11
	Scoop made of net (good for 7 months)	0.29	0.29	0.29
3. Mixing with papaya leaves for 1 hour	Pail (good for 1 year)	0.23	0.19	0.28
	Papaya leaves (can ask children to collect)	1.00	1.00	1.00
4. Boiling with salt for 1 hour	Match	1.00	1.00	1.00
	Salt	7.50	5.00	10.00
	Water	5.00	5.00	5.00
5. Brushing to remove outer layer (spicules)	Used laundry brush or toothbrush	-	-	-
6. Smoking for 1–24 hours	Wood (for both boiling and smoking)	7.50	5.00	10.00
	Screen	0.33	0.33	0.33
7. Sun-drying for 3–5 days until ‘stone dry’	Galvanised iron	0.06	0.06	0.06
8. Packing in plastic bag (holding until desired volume is attained, 2.5–5.0 kg)	Plastic cellophane (100 pc × PhP0.5–2.0/pc)	125.00	50.00	200.00
9. Transporting (tricycle)	Fare (to buying station and back)	44.00	44.00	44.00
TOTAL		239.02	147.39	330.19

Source: Brown et al. (2010)

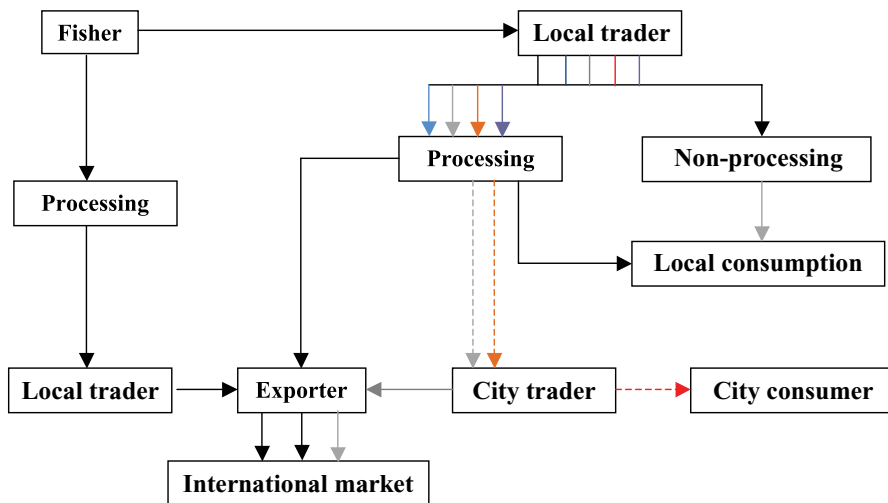


Figure 1. Typical product flow of sea cucumber in South-East Asian countries. Source: SEAFDEC (2009)

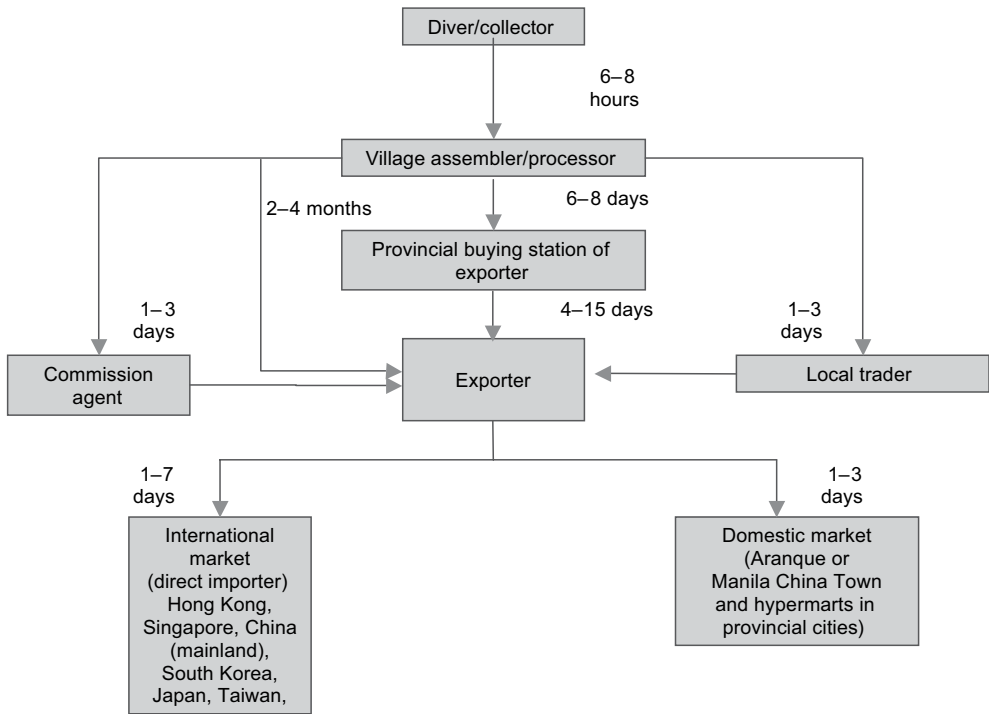


Figure 2. Product flow of sea cucumber in the Philippines. Source: Brown et al. (2010)

(Brown et al. 2010) showed that it appears to be multilayered and characterised by information asymmetry. Redundant market players such as agents proliferate, and are engaged in pure arbitrage (i.e. taking advantage of a price difference between multiple markets). Collectors, the most upstream players in the chain, are generally not aware of the price of sea cucumber at the downstream end, leading to inefficient pricing mechanisms and inequitable distribution of profits along the chain.

The sea cucumber industry is like an hourglass—large at each end and narrow in the middle. The number of upstream players is very large because collection takes place in so many coastal areas in the country. In contrast, the number of downstream players is fairly small. In the Philippines, there are only 45–50 firms involved in sea cucumber trade, four of which are very large and account for the bulk of the products moving along the value chain. The situation in the Philippines is similar to other countries in South-East Asia, particularly Indonesia and Vietnam. Interviews with traders in Vietnam indicate that two or three large buyers typically account for

the bulk of sea cucumber outputs in districts where a large volume is collected. However, the number of key Chinese customers catered to by existing supply chains is very large.

This suggests that industry control is in the hands of a few large exporters, who capture much of the value generated by the industry. In the Philippines, the net income of an exporter from a kilogram of *H. scabra* could reach more than PhP1,000 (Table 3). This becomes even more significant considering the volume that passes through each exporter’s business. Their power and influence along the entire chain becomes apparent on closer examination. Large exporters have established a vast network of buying stations, agents and relational marketing with assemblers and processors.

Value-chain mapping of sea cucumber in the Philippines showed the specific activities, associated costs and income received, as well as the opportunities and constraints faced by the upstream and downstream players along the chain (Brown et al. 2010) (Figure 3). Although similar studies are unavailable for other South-East Asian countries, the situation is

Table 2. Number and percentage of sea cucumber supplier firms by country

Country	No. of supplier firms	%	Country	No. of supplier firms	%
Indonesia	81	12.76	Australia	7	1.10
Malaysia	61	9.61	Cameroon	7	1.10
United States	55	8.66	Taiwan	7	1.10
Philippines	50	7.87	United Arab Emirates	7	1.10
China (Mainland)	42	6.61	Mauritania	5	0.79
Peru	32	5.04	Mauritius	5	0.79
Singapore	32	5.04	Morocco	4	0.63
Vietnam	26	4.09	Pakistan	4	0.63
Japan	25	3.94	Russian Federation	4	0.63
Sri Lanka	21	3.31	Spain	4	0.63
Egypt	19	2.99	New Zealand	3	0.47
Canada	18	2.83	Colombia	1	0.16
Mexico	18	2.83	Fiji	1	0.16
Maldives	17	2.68	Iceland	1	0.16
South Korea	17	2.68	Italy	1	0.16
Turkey	14	2.20	Mozambique	1	0.16
Hong Kong	13	2.05	United Kingdom	1	0.16
India	12	1.89	Uruguay	1	0.16
Thailand	9	1.42	Total no. supplier firms	635	

Source: Brown et al. (2010)

Table 3. Cost and return, per kg of high-quality *H. scabra*, to various sectors of the Philippine supply chain

Item	Collector (fresh product)	Assembler/processor (dried product)	Exporter (dried product)
Price received	300.00	4,200.00	5,364.00 ^a
Cost of product	0.00	3,000.00 ^b	4,200.00
Other costs ^c	15.07	58.21	61.67 ^d
Total costs	15.07	3,058.21	4,261.67
Net return	284.93	1,142.00 ^e	1,102.33

^a Based on US\$120/kg @ PhP44.7/US\$

^b Based on PhP300/kg fresh (10% dry-equivalent weight)

^c Based on Tables 14, 17 and 18 in Brown et al. (2010) (note: for exporter, Aquamarine cost was used)

^d Includes PhP8.47/kg cost (see Table 18 in Brown et al. (2010)) plus PhP0.70/kg shipment cost to Hong Kong (i.e. PhP7,000/10,000 kg) and opportunity cost of procurement capital of PhP52.50 (i.e. PhP4,200 × 1.25%/month)

^e Includes all costs in Table 17 in Brown et al. (2010) plus opportunity cost of procurement capital of PhP37.50 (i.e. PhP3,000 × 1.25%/month)

probably true also for Indonesia, which has a similar distribution system. A quick survey conducted by the authors also confirmed similarities with Vietnam, where a more detailed value-chain analysis is currently being prepared.

The Philippine study showed that collectors receive the lowest net income from every kilogram of sea cucumber, particularly *H. scabra*, while the net incomes of village-level assemblers, processors

and exporters are considerably higher. The study also confirmed that various players along the distribution system are already facing the problem of declining volume and increasingly smaller catch size. Increasing price and vibrant demand for the product remain as the most important opportunities available to these players. Aquaculture appears to be the most viable solution to halting the declining supply.

DIVER/COLLECTOR			PROCESSOR				TRADER/EXPORTER			FORWARDER/SHIPPER	EXPORT MARKET
Pre-Collection	Collection	Delivery	Receiving	Processing	Storing	Delivery	Receiving	Classifying/Packing	Storing	Shipping	
Preparation of: • banca • food • other fishing implements	• Travel to fishing site • Fin-fishing/Sea cucumber collection • Travel back to fish landing site	• Bring collected sea cucumber to assembler for processing	• Count the number of sea cucumbers • Pay gatherer per piece of sea cucumbers collected	• Gutting at the mouth • Parboiling • Mixing with papaya leaves • Boiling with salt • Brushing to remove outer layer • Smoking	• Packaging in plastic	• Transport to trader, buying station, or exporter	• Weigh the sea cucumbers • Further dry sea cucumbers that are not yet stoned	• Sort sea cucumbers according to species • Sort according to size	• Pack in sacks lined with plastic cellophane or as required by clients	• Secure minimum volume of sea cucumbers for shipment • Process required permits • Pay necessary transport/customs fees	• Hong Kong • Singapore • China Mainland • Korea • Taiwan • Japan • etc.
COST (PhP/kg)		15				21			9		
BUYING PRICE (PhP/kg)						300			4,200		
SELLING PRICE (PhP/kg)		300				4,200			5,364		
NET INCOME (PhP/kg)		285				1,179			1,155		
TIME (days)		0.3				6			15		

DIVER/COLLECTOR			PROCESSOR				TRADER/EXPORTER			FORWARDER/SHIPPER	EXPORT MARKET
Pre-Collection	Collection	Delivery	Receiving	Processing	Storing	Delivery	Receiving	Classifying/Packing	Storing	Shipping	
CONSTRAINTS											
<ul style="list-style-type: none"> • Declining volume • High fuel cost • Ban on compressor • Increasingly smaller sizes 			<ul style="list-style-type: none"> • Declining volume • Poor processing/product quality • Inadequate capital • Slow turn-over time 				<ul style="list-style-type: none"> • Declining volume • Poor quality • Increasingly smaller sizes 				
OPPORTUNITIES											
<ul style="list-style-type: none"> • Increasing price due to increasing demand • Increasing number of alternative uses • Possibility of sea-ranching/culture 			<ul style="list-style-type: none"> • Increasing price due to increasing demand • Increasing number of alternative uses 				<ul style="list-style-type: none"> • Increasing price due to increasing demand • Increasing number of alternative uses 				

Figure 3. Value-chain mapping of exported sea cucumber, the Philippines. Source: Brown et al. (2010)

Demand-related marketing system characteristics

Demand for sea cucumber comes mainly from the middle and upper classes in Asia, especially in China and Japan. International trade is dominated by the Chinese, whose preference for sea cucumber stems from its high nutritional content and health-giving properties. Traditional knowledge on sea cucumber as medicine exists; for example, the Cuvierian tubules used as crude plaster for minor wounds. Extracts

from the muscular body are used for tumours, fungal infections, high blood pressure, arthritis and muscular disorders (Trinidad-Roa 1987).

Hong Kong is still the major world market, followed by Singapore. However, Hong Kong generally re-exports products to mainland China. The product type, volume and value of global trade in sea cucumber are shown Table 4. World trade for sea cucumber continues to increase as the price for the product increases over time, with the Chinese population remaining the major consumers.

Table 4. Global trade in sea cucumber

PRODUCT FORM	YEAR		
	2005	2006	2007
Live, fresh, chilled			
Volume (million t)	56	34	67
Value (US\$'000)	375	392	424
Dried, salted in brine			
Volume (million t)	6,463	4,883	5,734
Value (US\$'000)	46,342	42,021	55,852

Source: Brown et al. (2010)

One notable characteristic of the Hong Kong market is the proliferation of herbs and medicine stores, which sell sea cucumber displayed in large glass jars (Figures 4, 5). A number of high-value tropical species can be found in these stores, including *H. scabra*, *H. fuscogilva*, *Thelenota ananas*, *H. whitmaei* and *Actinopyga lecanora*. Prices vary considerably from HK\$1,200 to HK\$1,500/kg, with reported sales of 6–7 kg/day.

In general, the Hong Kong market can be characterised as having:

- a high preference for particular species. *Apostichopus japonicus* is the most popular species

(also called *meihua* or *wuxing*), and is sold for up to HK\$8,000 per 600 g in the herb and medicine stores. *Holothuria scabra*, *H. fuscogilva*, *T. ananas* and *H. whitmaei* are also highly valued

- an apparent preference for product origin, with the general indication that all the sea cucumber being sold in the stores are from Japan, hardly acknowledging the huge importation of produce from South-East Asia
- a distinct preference for product quality and size, resulting in a wide price range, even within a single species (Table 5).



Figure 4. Herb and medicine store in Hong Kong



Figure 5. Sea cucumbers on display in a herb and medicine store, Hong Kong

Price-related marketing system characteristics

As mentioned, price behaviour provides a snapshot of the overall industry status. Two important characteristics of the sea cucumber marketing system that can be discerned based on price behaviour are stability and viability. Unlike most other agricultural or fishery product prices, which exhibit high seasonal variability, the price of sea cucumber has been stable for the past 5 years. This is remarkable considering that sea cucumber collection is somewhat seasonal. However, the product can be stored for very long periods when properly dried, which probably smooths out the seasonality effect.

Sea cucumber is still considered a minor commodity in official commodity statistics of countries in South-East Asia, and reliable time-series data on price by country are not available. In addition, prices vary by species, size and quality. Time series of average price data (i.e. average of the various species) would therefore have practically no analytical value. Price behaviour over time can be assessed only for the same species belonging to the same size and quality classification.

A useful set of data on sea cucumber prices covering the price range of several species traded in the Philippines during 2000–07 is provided by Labe (2009). For most commercially exploited species, the buying price (i.e. received by fishers) was three to four times higher in 2007 than in 2000. This phenomenal increase in sea cucumber price has been identified as the primary factor that induced overfishing, especially of the high-value species, in many countries. However, it is also possible that the increase in price was due to overfishing itself, as this would cause the supply curve to shift upward with increasing fishing effort (fishing cost) per unit catch. The sea cucumber industry appears to have been caught in a vicious cycle of high price leading to overfishing, which, in turn, leads to decrease in stock and total catch (supply), pushing the price even higher, and the cycle starts again. The depletion of wild sea cucumber stock may have the effect of low-value species becoming medium value, and medium-value species becoming high value, until many of the species have become depleted (Pe 2009).

Such high prices reflect the lucrative nature of sea cucumber production and trade. More importantly, high prices almost warrant the profitability of expanded production through aquaculture.

Table 5. Range of retail prices for dominant sea cucumber species in South-East Asia

Sea cucumber species	Value range (US\$)
<i>Stichopus hermanni</i>	62.50
<i>Stichopus chloronotus</i>	21.25–65.00
<i>Holothuria (Microthele) nobilis</i>	20.00–78.95
<i>Bohadschia argus</i>	20.00–30.00
<i>Apostichopus japonicus</i>	17.50–112.50
<i>Holothuria fuscogilva</i>	15.50–95.00
<i>Thelenota ananas</i>	12.50–67.50
<i>Holothuria scabra</i>	9.00–112.50
<i>Actinopyga lecanora</i>	8.00–71.25
<i>Actinopyga miliaris</i>	8.00–44.00
<i>Holothuria edulis</i>	8.00–22.50
<i>Stichopus variegatus</i>	6.75–62.50
<i>Actinopyga mauritiana</i>	5.00–15.00
<i>Holothuria</i> sp.	4.75–44.00
<i>Actinopyga echinites</i>	4.50–57.50
<i>Thelenota anax</i>	3.68–60.00
<i>Holothuria rigida</i>	3.00–59.00
<i>Holothuria impatiens</i>	2.50
<i>Holothuria atra</i>	1.75–22.50
<i>Pearsonothuria graeffei</i>	1.75–5.00
<i>Bohadschia marmorata</i>	1.40–23.75

Source: SEAFDEC (2009)

Marketing opportunities for expanding production

The current state of sea cucumber fisheries completely discounts any possibility of expanding production through increased collection from the wild. The resource is already overfished in South-East Asia. Regulating harvest and other conservation measures are being contemplated in various countries to encourage stock recovery. Obviously, aquaculture is the only means to expand production of sea cucumber in the region. The technical viability of hatchery, nursery and grow-out (pond, pen and sea ranches) has already been established for certain species such as *H. scabra*.

The financial viability of *H. scabra* culture seems very positive considering its high value. However, there are marketing opportunities and challenges associated with expanded production, and these must be clearly understood if South-East Asian countries are to benefit fully from aquaculture programs.

The demand for sea cucumber is the most important opportunity for expanded production. Consumers use sea cucumber not only as food, but also as medicine. Demand will probably be limited to Chinese consumers, at least in the near future; however, considering the increasing global trend towards health foods and alternative medicines, its popularity with other ethnic groups may increase.

Even assuming that demand will be limited to Chinese markets, the future of sea cucumber trade remains vibrant. China is the fastest growing economy in the world, with increasing gross domestic product, per-capita income and population growth—one in every five people in the world is Chinese. The distribution system for sea cucumber is well established in China, with numerous herb and medicine stores ensuring that consumer access to these products is very high. Another marketing opportunity is the increasing Chinese population in almost all countries in the world. Import demand from other countries can be expected to rise as Chinese residents increase.

The sea cucumber trade is well established in South-East Asia. In each country, local traders are present to move the product from fishers to exporters or city-based buyers. Additional volume from expanded production through aquaculture can easily be absorbed by existing market chains. Exporters are the key players in the sea cucumber trade, since most countries in South-East Asia export the product and only a small amount is consumed locally. However, the transaction cost involved in the export business is high, as coastal villages are widely dispersed. In the Philippines, exporters have to establish buying stations in many parts of the country or engage the services of procurement agents to be able to secure bigger volume. One opportunity that may be explored is direct market linkage between the sea cucumber farmers and exporters. Unlike collection from the wild, where daily volume is small and geographically dispersed, production from aquaculture comes in larger volumes from identified locations during predetermined periods. This could lower the search cost, and even transport and other costs normally incurred by exporters, and may entice them to transact directly with producers.

Marketing challenges

While market prospects are generally bright, there are a number of challenges that have to be addressed if countries in South-East Asia are to benefit fully from expanded sea cucumber production due to aquaculture. The absence of reliable market and trade information is a huge challenge. Updated price data, which could serve as the basis for formulating sound production and marketing decisions, do not exist. In the Philippines, information asymmetry persists—certain market players have greater access to information, giving them undue advantage, especially in price bargaining. Distribution systems become multi-layered, since those who have the latest information (especially on prices) can embark on pure arbitrage. While there are cases where product moves only along three layers (collector→processor→exporter), there are also instances where the product moves along two or three additional layers involving local traders and commission agents. These appear redundant and contribute to marketing inefficiency rather than adding real value to the product.

Another important challenge relates to primary processing, the single most important determinant of product quality and one for which the market pays a very high price. Primary processing methods currently in use are highly variable; no standard protocol is being followed, resulting in highly variable product quality. The methods employed are very traditional, without knowledge and consideration of existing standards for processed food products (e.g. GMP and HACCP).

A large processing firm in Vietnam that employs global standards has ceased to include sea cucumber in its product lines, since the volume of raw material (i.e. fresh sea cucumber) was too small for the firm to achieve economies of scale. This problem is perhaps true for other South-East Asian countries. As mentioned, sea cucumber collection is widely dispersed, and the volume from individual locations is small. Village-level processing, primarily carried out through traditional methods, will likely remain as a distinct feature of the industry in the region. Whether expanded production through aquaculture can change this is uncertain. Supply from aquaculture should be large enough and available on a continuous basis to encourage large processing firms to engage in processing the product.

The absence of officially formulated and well-implemented grades and standards for sea cucumber is another challenge. This is crucial since such measures

could guide transactions along the value chain. Fishers and village-level processors may not find the incentive to improve primary processing if they know that exporters would end up classifying good-quality product as lower grade based on arbitrary standards developed by the exporters themselves.

Finally, the structure of the sea cucumber market may be characterised as oligopsonistic (i.e. a market condition in which there are few buyers), resulting in market inefficiencies exacerbated by lack of adequate information along the chain.

Recommendations

South-East Asia is a major source of sea cucumber supplied to the world market. However, the fishery is mostly artisanal, carried out by low-income households. Sea cucumber is generally an incidental catch in finfish fishing, although fishery activities where it is targeted are becoming more significant. Given declining catch from the wild, a number of possibilities can be explored to meet the ever-increasing demand. For example:

- promoting aquaculture involving technically established protocols that can be explored to address demand and supply gaps
- expanding research to develop culture protocols for other high-value species
- improving support for efforts designed to generate new products from sea cucumber
- exploring new export destinations, especially in countries with significant Chinese populations
- establishing direct market linkage between producers and exporters to reduce market inefficiencies
- establishing regularly updated statistics and information systems for sea cucumber
- formulating and implementing official grades and standards
- improving village-level small-scale primary processing
- exploring strategies that could lead to the achievement of economies of scale in large-scale modern processing methods/facilities that observe international standards for processed food products.

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