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## A Report of Small-Scale Fishing Village in Southeastern Johor, Malaysia

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## **A Report of Small-Scale Fishing Village in Southeastern Johor, Malaysia**

AKIRA GOTO

*Miyagi Women's College*

### **Part 1. *Fishing and Marketing***

#### **INTRODUCTION**

It is estimated that there are 2 million fishermen in ASEAN countries. In these countries, fishing has been one of the most important aspects of life, providing the people with food and employment for generations. For instance, in Indonesia and the Philippines, marine resources comprise more than 60 % of protein intake in the diet. Most of the fishermen in these countries are engaged in small-scale fishing and dependent on middlemen for capital and marketing. These fishermen have been largely left aside by economic development. During the 70's and 80's, new kinds of problems occurred to these fishermen, such as the introduction of international capital and the beginning of large-scale production for export.

Malay fishermen, well known to us by R. Firth's classical study [1966], have also received a substantial influence from these economic changes. In the following section, I will offer a short history of socio-economic aspects of Malaysian fishing after the Second World War, mainly based on Ghee's [1990] critical review on this subject.

#### **1. MALAYSIAN SMALL-SCALE FISHING: A HISTORICAL REVIEW**

##### **1) Initial Development in the 50's and 60's**

This is the period in which the colonial government aimed to direct the development of the fishing industry in the economic reconstruction after the War. The government established a committee to offer advice for improving the economic status of fishermen. The committee proposed to establish a "co-operative" that could provide fishermen with loans for investment.

In the late 50's, the Five Year Project was initiated by the government. With this, the government attempted to establish fishermen co-operatives by offering loans: 1.4 million M dollars in the East Coast between 1957 and 63 and M \$841,000 in the West Coast between 61 and 66. Only a small percentage of these loans was

repaid, however. The failure of this loan-scheme probably resulted from the inadequate number of staff in administrative and supervisory work, high capital requirements, and the lack of co-ordination between the Departments of Fisheries and co-operatives.

## 2) Trawling Development: 1960-1970

In this period, trawl fishery started with insufficient development of economic infrastructure. This period is also characterized by the use of powered boats and fiber nets [FIRTH 1966]. Such devices were only available to finance-traders, and not to small-scale fishermen.

In 1959/60, trawl nets were introduced from Thailand to the West Coast, and this new type of gear, with its high efficiency and productivity, spread rapidly in the early 60's. At the same time, the trawl fishing was mainly operated by Chinese non-fishing capitalists and labor was often comprised of the unemployed from urban areas. Trawl fishing was thus qualitatively different from traditional fishing, and the former developed mainly unrelated to the latter. The exploitation of prawns and other resources in inshore zones by trawlers led to trouble with small-scale fishermen who had been fishing in inshore zones. This also included an ethnic conflict between Chinese and Malay fishermen. In addition, use of illegal, small-mesh nets seems to have caused over-exploitation, and, even in the 60's, the decline in the yield from trawl fishing was noticed.

The government, initially promoting trawl fishing, soon saw the need to control it, by limiting fishing hours, landing centers, and fishing grounds. These policies, coupled with licensing that began in 1975, have excluded, unfortunately, the small-scale fishermen with only limited amount of capital from trawl fishing. The policies, on the other hand, led to many illegal "mini-trawlers."

## 3) The Poverty Eradication Program: 1970

During the 70's, the marine fish catch in Peninsular Malaysia doubled, but the status of small-scale fishermen remained unchanged. In order to overcome their poverty, the government established *Majurikan* (Fisheries Development Authority of Malaysia). This organization was supposed to work for social development of small-scale fishermen by promoting the commercial operation of small-scale fishery in competition with the private sector. *Persatuan Nelayan* (Fishermen's Association) was also organized in 1971.

The *Majurikan* projects consisted of : (1) development of trawling in the East Coast, (2) joint ventures with foreign capital on deep-sea fishing in the East Coast and Kuching, and (3) the establishment of aquaculture farms, processing plants, ice factories, and marketing complexes in several ports. The projects were, however, limited to large fishing ports, and mainly promoted offshore fishery development. Many small fishing villages still lacked infrastructural support. Although equipment was offered to fishermen, these supplies were not equally available, or sometimes improper equipment was offered.

#### **4) Policy Development: the 80's**

During the 80's, the marine fish catch declined, and after 1983, Malaysia has become a net fish importer, mainly from Thailand. Jomo estimated that the average fisherman's income in Peninsular Malaysia peaked in the early 80's [1991: 7]. One of the main policies in the 80's was the introduction of the zoning system and licenses: less than 5 miles inshore zone for traditional fishing gear (A License), 5-12 mile zone for Malaysian owner-operated trawlers and purse-seines below 40 gross tons (B License), 12-30 mile zone to vessels exceeding 40 gross tons (C1 License), and beyond 30 miles for all foreign and partially Malaysia-owned vessels (C2 License). Together with this zoning system, mesh size of trawl net was regulated. These policies unfortunately caused several problems. For instance, the zoning system has eliminated all non-owner-operator fishing units (mostly poor fishermen) from the inshore waters. Also, regulations were not observed, and the zoning system did not well correspond to seasonal fluctuations of resources.

Reviewing the relevant literature, I strongly feel the necessity of field research on what is actually happening in the fishing villages, and a bottom-up approach for the systematic analysis of the present situation of small-scale fishermen. In particular, we need to ask how fishermen use resources in the local ecosystem with various traditional and introduced fishing techniques, and how they manage these resources in accordance with spatial and seasonal fluctuations in the ecosystem. In addition, attention should be directed toward how fishermen use resources differently for marketing and for domestic consumption.

## **2. SMALL-SCALE FISHING IN KAMPUNG SEDILI KECIL**

### **1) Overview of the Village**

I spent 7 weeks, from July 25 to Sept. 16 in 1991, for field research in fishing villages of southeastern Johor State (Figure 1). During this period, I spent 4 weeks in a fishing structure of a village, Kampung Sedili Kecil ("kampung" means village in Malay). Since I stayed one month in this village during my field work, I will describe fishing activities of this village in some detail.

Sedili Kecil is a small coastal village in southeastern Johor, inhabited by 600 people. The villagers are mostly Malay, although there is a man of Chinese origin who married Malay women. There is one mosque in the village, but no structure of other religions such as Chinese Buddhism or Hindu is present.

The village is located along Sedili Kecil River which flows into Jason Bay surrounded by Tanjung Sedili Kecil and Tanjung Lembu. The coast facing the bay is an extensive sandy beach. Small structures for operating fishing boats are situated along the river.

There is a paved road to Sedili Kecil from Tanjung Sedili. The villagers must use this road to go to big towns such as Kota Tinggi and Johor Bahru via Tanjung

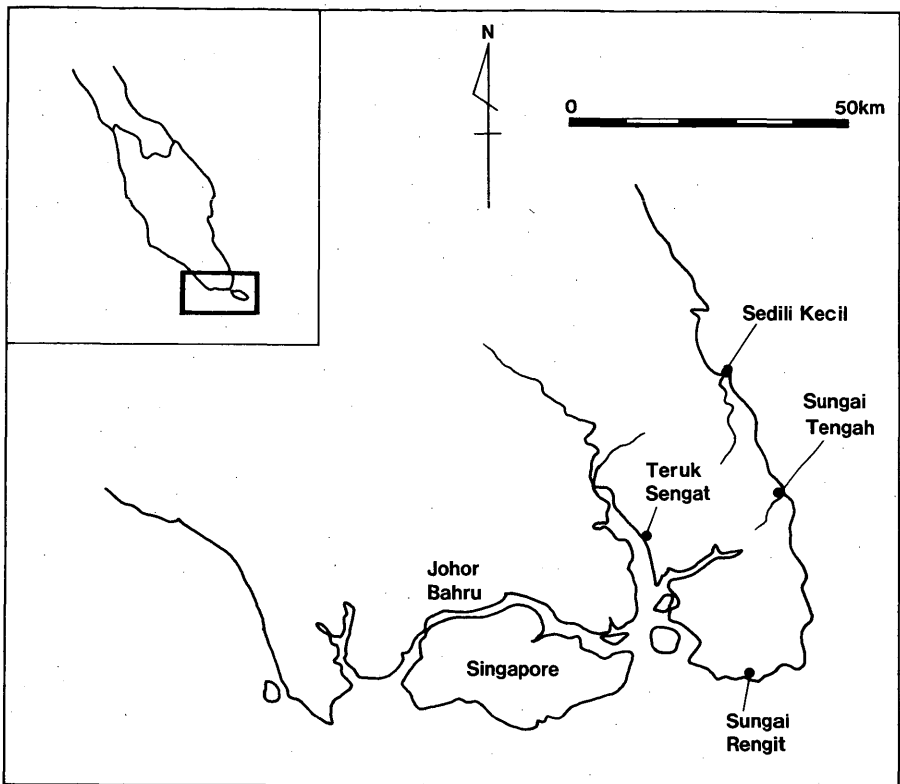


Figure 1. Map of Johor, Malaysia and Singapore

Sedili. This road will be widened and extended to a resort area, Desaru, in the future. A bridge for high-speed automobiles is under construction over the river. There are two general stores in the village, and most of the living supplies are available here, but villagers often go to Kota Tinggi for shopping.

There are around 60 full-time and part-time fishermen in the village (Table 1). Two hundred people are engaged in some kind of wage labor, and the rest of the villagers are aged persons, housewives, unmarried women, and children. In 1978, an investigation on income was carried out in Sedili Kecil. According to this research, the income from fishing comprised 43 % of total income in May/June, and 32 % in November (monsoon season). In contrast, at the Tanjung Sedili, a large fishing village, 75 % of total income came from fishing in May/June. This difference suggests the small-scale nature of fishing activities at Sedili Kecil. Also in Sedili Kecil, while income could cover expenditure in May/June, the situation was reversed in November, when offshore fishing becomes largely impossible [KHOO and ELLISTON 1984].

**Table 1.** Occupation Structure of Sedili Kecil Village (from KHOO and ELLISTON 1984: Table 13.1)

Occupation	All	Sample <sup>1)</sup>
Fishing & related activities	64	9
Farming	5	1
Petty business & crafts <sup>2)</sup>	25	3
Security services <sup>3)</sup>	3	—
Social services & education	1	—
Wage work <sup>4)</sup>	20	4
Forestry work <sup>5)</sup>	23	5
Total No. of occupation	141	22
Average No. of occupation/HH <sup>6)</sup>	2.9	3.1
Average HH size	6.4	8.0

1) Sample refers to households selected for income-expenditure study.

2) This includes retailing, hawking, petty brokerage, mat-weaving, carpentry as well as 'self-employed'.

3) This includes marine police, police, army, customs, and security guard.

4) This includes construction, factory, office service work, etc.

5) HH means "household."

## 2) Resources

The resource system in Sedili Kecil is influenced by the river. Jason Bay is covered with silt from the sedimentation of the river. This bay is a habitat of edible crabs (*e.g. ketem renjong; Scylla sp.*), and demersal fishes adapted to sandy bottoms, such as rays, *pari (Gymnura spp. and Dasyatis spp.)* and catfish, *semilang (Plotosus spp.)*. According to the data on fish species caught with seine nets in May, the estuary is more abundant in juvenile fish than in the beaches. In this season, juveniles of carangids, scomberomorus, and mullets tend to congregate near the mouth of the estuaries where the beaches are exposed. The sandy beach is inhabited by various bivalves, especially clams (*e.g. kupang, Perna viridis*), often collected for domestic consumption.

Along the river is the mangrove zone. The size of the mangrove zone is medium, and the dominant species are *Rhizophora apiculata* and *Hibiscus tiliaceus*. The mangrove trees are used for fuel, charcoal, building, fishing gear and other purposes. This mangrove zone and the river are habitats for various invertebrates such as crab, prawn, mollusks, and fish [WONG *et al.* 1984]. Villagers recognize that this zone is especially important for subsistence during the monsoon season.

The north and west sides of the village are covered with marsh derived from the activity of the river. Since 1984/85, two aquaculture farms of tiger prawn have operated, employing some villagers.

The fishermen of Sedili Kecil do not restrict their activities to the above

zones. Except for the monsoon season, they go outside of the bay, in order to catch commercially valuable resources, such as prawns, lobsters, kingcrabs and pelagic fishes. It is notable that fishermen of this village settle in fishing camps along the coast and stay there for one or two weeks to catch these resources.

### 3) Fishing Methods

The fishing method which I observed most frequently during my stay was drift or gill net (*jaring*). According to the statistics of the whole Johor State, fish comprise 70 % of total catch from *jaring* in weight, prawn, 10 %, and squid, 20 %. From my observation, most of the *jaring* were directed toward catching prawns, lobsters and kingcrabs. Fish caught with these crustaceans were often used for domestic consumption. Most of the fishermen use nets individually with out-board engine boats. Fishing with an A license boat is only occasionally observed. No one of the village owns a B License or larger boats.

For catching crabs, kingcrabs, and lobsters, nets with large mesh size of 10 cm are used. In the bay, these nets were left in the waters during the night with anchors and flags (*bandela*) with various colors. Early next morning, fishermen go out to the bay and find and lift their nets. After extracting the catch, fishermen set out drift nets, and continue these procedures a few times. Finally, fishermen set the nets out in a bay and return to the village. Usually, fishermen use two nets.

Since only live lobsters are sold to middlemen, fishermen carefully keep them alive in long, round bag nets (*gaju udang*), 80–90 cm long and of 3 cm mesh size. There is another type of bag net to keep lobsters and kingcrabs alive, one or two round wooden frames (80 to 90 cm diameter). This device is called *rajo*, and has a mesh size of 3 to 5 cm.

Three-layer nets (trammel nets) are used for prawns. They are usually called Apollo net, and the mesh sizes of the three layers are 12 cm, 5 cm, and 12 cm. In contrast with crab fishing above, prawn net fishing is carried out offshore, around a rocky point (e.g. Tanjung Gemo). The catch is mostly *udang toahe* (*Penaeus merguensis*), but, occasionally, *udang harimau* (*Penaeus monodon*) are caught. Compared with crab nets, extracting the catch from Apollo nets is time-consuming (2 to 3 hours for one net), since many kinds of small animals such as lobster, squids, crabs, and small fish are caught together.

Gill nets situated at the beach is another type of nets operated in the sea during my stay. Along the shallow sandy beach, several gill nets (mesh size varied from 4 to 10 cm) were situated, and crabs and juveniles of fish (e.g. triggerfish) were caught during low tides.

I also observed that drag-nets were operated by two fishermen at the beach at low tide. Each fisherman held a pole at the ends of the flat net, and dragged it into the shallow waters. After dragging from ten to fifteen minutes, one fishermen extracted fish from the net. The same net was used to encircle a fish school (e.g. mullet) from a boat at the estuary.

When fishermen go drift netting, they often bring hand-line equipment (*kail*

*mengali*). The equipment which I could observe in detail had U-shaped hooks (4 cm in shank length, 2 cm in width and point length). Hooks were attached to the leader of 85 cm long, with 25 g sinkers.

Besides drift/gill nets, the most frequently observed fishing technique was traps, especially *bubu*. *Bubu* were traditionally made of bamboo, but now they are made of weir nets framed with wooden poles. The *bubu* observed in the village is 170 cm in length, 65 cm in width, and 55 cm in height. *Bubu* is situated either in a river or shallow sea with stone anchors. From time to time, fishermen go to lift *bubu*, by using utensils called *purugayu* with two iron hooks. With *bubu*, fishermen can catch demersal fish such as *siakap* (*Lates* spp.), *merah* (e.g. *Lutjanus argentimaculatus*), *kerapu* (e.g. *Epinephelus* spp.), and *tangeli* (*Scomberomorus* spp.). *Bubu* is also used to keep alive fish, *blankas* (kingcrabs, *Tachypleus* spp.) and crabs until they grow to a commercially valuable size.

For catching squid (*sotong*) at sea, fishermen use a scoop net, *sauk*, with lights during night time. The scoop net is 45 cm in diameter, and 40 cm in depth. The mesh size is small, 1 cm, and the shaft is as long as 180 cm.

The villagers have a variety of fishing techniques for river fishing. At the river bank, cast net, *jala*, is used to catch fish, prawns and crabs. In order to catch *semilang* (catfish), bamboo traps of cylindrical shape are used. The traps have two series of mouths. The length varies from 140 to 150 cm, and the diameter at the mouth, from 30 to 40, and that at the end, from 20 to 25 cm.

Different types of traps are used in more inland waters. These have the same structure as the above traps, but are covered with wooden skin. The length is also smaller (around 100 cm). It is used to catch river prawns, *udang galah* (*Macrobrachium rosenbergii*).

There are special traps to catch crabs, called *bubu lipat*. One type of *bubu lipat* is half-egg shape: the long diameter is 60 cm, and short diameter 40 cm. Another type of trap used in more inland waters has a circular-shape (50 to 60 cm in diameter), and this is fixed on the river bottom by wooden sticks with bamboo barbs to hold the trap. These traps are used to catch mangrove crab (*ketam bankang* or *ketam bata*).

Mollusks are frequently collected by women and children for domestic consumption. A special kind of tool is used to dig clam shell, *kupang*, on the sandy beach at low tide (*air surut*). At the end of a wooden pole (from 100 to 120 cm in length), a small wooden plate (20 to 25 cm long) is attached horizontally. This plate has a half-circle iron plate, and this part is used to scrape the sand surface of sand. A string is attached at the middle of the pole, and the women and children drag the pole from the waist.

*Tiram*, river oyster (*Ostrea folium* and *Crassostrea* spp.), is found on the river rocks and wooden poles of fishing structures. At low tide, women were often scraping *tiram* from the poles, by knocking them with iron clubs.



### 3. FISHING METHODS IN LOWER JOHOR RIVER AND THE STRAIT OF SINGAPORE

In addition to the research at Kanjung Sedili Kecil, I stayed for ten days at Teruk Sangat along the Johor River, and for ten days at Sungai Rengit on the Strait of Singapore (Figure 1). In this section, I will describe fishing methods observed in these areas.

I visited fishing ports in Sungai Rengit and Sungai Musuh facing the Strait of Singapore. At the mini-complex of Sungai Rengit, there are 25 to 30 inboard-engine boats with A Licenses. Each boat is operated by two or three Chinese fishermen for drift-netting of pelagic fishes.

At the eastern port of Sungai Rengit and at Sungai Musuh, only out-board engine boats were operated by Malay fishermen. Their main fishing activity was directed toward catching lobster in the shallow coral-reef zone along the coast. The fishing technique employed is lift-net, *bintoh*. *Bintoh* is a cylindrical bag net with two or three round bamboo frames, whose diameter varies from 35 to 75 cm. *Bintoh*, with bait at the bottom, is sunk down to the coral and rocky bottom. When lobster comes in, fishermen pull up the string to catch lobsters alive. *Bintoh* fishing was observed from early morning to early afternoon.

Bag net in fishing stakes, *togok*, were observed along the same coast [CEM 1989]. These are operated by Chinese fishermen to catch prawns, fish and jellyfish. *Togok* are constructed by crossing palm tree trunks (8 to 10 m) to sustain horizontal stick to set nets.

In Teruk Sengat and adjacent villages along the eastern coast of lower Johor River, the main fishing activity is prawn fishing in the estuary. Individual fisherman, operating an outboard boat, uses an Apollo net to catch *udang kakimerah* (*Penaeus* spp.), which is valued at Singapore market. In contrast with the fishermen in Sedili Kecil, fishermen in this area bring only one net for each trip. They set the net across the estuary, and after drifting it for 15 to 30 minutes, they start hauling up the net. No flag is attached to the net, since it is easy to follow the drifting net in this calm water.

During my observation, fishermen went out from early morning to around noon, and operated netting for 5 or 6 times a day. Catch varied from 1 to 2 kg for each trip. Besides *udang kakimerah*, other resources, such as *udang harimau*, *udang sutu*, juveniles of *belangkas* (kingcrab) and fish are caught. Live prawns and larger fish are landed for marketing.

Along the Johor River and the Johor Strait, a variety of fishing techniques for inland water were used. In small streams, bamboo traps (*injap*) to catch mangrove crabs are used. These cylindrical traps appear to be similar to *lukah* used in Sedili Kecil, but they are much shorter (65 to 70 cm long, with diameter 25 cm). Also these traps have a mouth at both ends. At the middle of the cylindrical body, a rattan band is suspended. This band sustains a bamboo stick inside the trap, and the bait is attached to this stick. These traps are used in small streams.

At Pasir Puhet, a village facing the Johor Strait and at Tanjung Langsat of the western side of Johor River, I observed *injap* which is similar to those in Johor River area, but they are slightly different in structure. Instead of one rattan band at the middle, *injap* in these two villages have two rattan bands, which are 10 cm apart each other. The stick for holding the bait was situated perpendicularly between these two bands. Interestingly, *injap* of the same structure was used in Singapore as well [BURDON 1955]. Thus, there is a stylistic difference in the making of *injap* between the two sides of the Johor River.

In a small stream, south of Teruk Sengat, I observed a fisherman using *bintoh* to catch mangrove crabs. The structure of this trap was similar to that in Sungai Rengit, but the crab-*bintoh* had only one frame (net mesh size varied from 5 to 6 cm). For setting *bintoh*, a stick was used to fix the trap in the shallow bottom. A bait (*e.g. duri*) was attached to the middle of the stick.

Traditional *bintoh* in Island SEA area had a different structure, since *bintoh* reported in Singapore and Sarawak were made by crossing two curved shaft at the middle [BURDON 1955; CEM 1989]. Throughout my research, I did not see this type of *bintoh*, except for one village: Kong Kong at the western side of Johor River. There, this type of *bintoh* is still used for crab fishing.

A fish trap, *bubu* was frequently seen in the Johor River area. *Bubu* were made of weir frame, but they are smaller than those used in the sea (Sedili Kecil and Sungai Rengit). *Bubu* found at Teruk Sengat was 60 to 70 cm in length, 30 to 50 cm in width, and 20 to 30 cm in height. Also, *bubu* in this area were heart-shaped. It was used to catch such fishes as *kerapu* (*Epinephelus* spp.), *merah* (*Lutjanus* spp.), and *semilang* (*Plotosus* spp.). Although the shape of *bubu* was uniform along Johor River, *bubu* used in the zone adjacent to river mouth were larger to those used in more inland water.

Scoop nets, *sauk*, were used in Johor River. The scoop nets for fish were similar to those found in Sedili Kecil, but the nets for mangrove crabs had larger mesh size (2.0 cm) and similar frame (30 cm in diameter). The shaft was shorter, being 50 to 60 cm long. The scoop nets for prawn have finer mesh (1 cm) and a narrow frame (diameter 20 cm), but a longer shaft (90–100 cm).

Other type of nets were cast nets (*jala*) for river prawn (*udang sungai*), and V-shape scoop nets (*sodong*) for *udang kulago* (small prawns for making paste, *belachan*). Both had fine mesh size (0.5 to 1 cm). The latter had two crossed shafts (200 cm long), and at the lower end of the shaft, pieces of coconut shells were attached for easy movement in the shallow water.

#### 4. FORMS OF FISH MARKETING

##### 1) Introduction

One of the most characteristic features of the Malaysian fishing industry is the presence of middleman. The middleman is a broad concept that indicates people

engaged at some points in the processes of collecting, buying, transporting, distributing, and selling aquatic resources. Jomo distinguished three aspects in marketing chains concerning middleman [1991]: assembling, wholesaling, and retailing. He also classified middleman functions into five categories; (1) assembly and distribution, (2) provision of storage facilities, (3) participation and coordination, (4) marketing, and (5) distribution efficiency.

It has been widely known that fishermen with little capital have depended on middlemen for marketing fish, equipment, and credit. Probably, as Firth anticipated 30 years ago [1966], the beginning of the modern fishing industry in Malaysia after the Second World War has strengthened the fishermen's dependency on middlemen.

In the following, I will describe several forms of marketing observed in my research area, by focusing on the technological and ecological aspects. The relevant factors in my analysis are the distance to fishing grounds and fishing villages, fishing techniques, storage method, permanency of structures used for sales and degree of processing.

## 2) Wholesale Purchase at the Village

This is the most commonly found transaction which Firth has already analyzed in detail in Kuantan and Trengganu States. In Sedili Kecil, from everyday to once a week, individual fish dealers visit the village by automobile. Each buyer is specialized in items that he deals, either fish, crab, or lobster. Lobsters are sold in Singapore, but crabs and fish are mainly consumed at Johor Bahru and other big towns in Malaysia. Lobsters are bought at high price, from \$40 (Malaysian Ringgit) to \$53 per kg, and crabs are sold at a much lower price, \$3.0 per kg. Fish is sold by grade, which varies from \$1.5 to \$11 per kg.

Fishermen, on the other hand, are not necessarily specialized in catching particular resources. I have noticed, fish traps (*bubu*) are normally used to keep fishes alive until buyers come to the village. Lobsters are also kept alive in *gaju udang*, but crabs are kept in ice boxes.

## 3) Fishing Camps

Another form of marketing observed only in Sedili Kecil is a transaction in fishing camp. Wholesale purchase discussed above is a form in which buyers come to the villages where fishermen return with their catch. In this transaction, buyers go to the fishing camps located nearer to fishing grounds than the villages. The fishing camp where I stayed was located at the mouth of Sungai Tengah, close to the fishing ground for prawn, *udang toahe*. Fishermen in this camp specialized in catching prawns, although occasionally they catch other resources such as fish, lobster and kingcrabs. This camp is seasonal, and is abandoned during monsoon season.

A Malay buyer visits this camp every afternoon. He buys prawns at \$16.00 per kg. When he comes, fishermen shell prawns in ice boxes. After selling

prawns, they obtain fuel, engine oil, batteries for lights, and other necessities from the buyer. It seems that the formation of this kind of camp itself was dependent on the middleman's support.

#### 4) Wholesale Outlet Type

Another unique observation in Sedili Kecil is the presence of a permanent wholesale outlet in the village. This structure was built by a woman buyer from Thailand in 1984, and is inhabited by the buyer's family and workers. Some workers are recruited in this village, but others come from other parts of Malaysia (e.g. Penan) and Indonesia. The workers are engaged in landing, transporting and packing resources. The buyer owns fishing boats, engines and nets, and, occasionally, workers go fishing.

One of the main functions of this structure is to send kingcrabs to the market in Bangkok. The Malay villagers do not usually consume kingcrabs. Therefore, before 1984, fishermen were discarding kingcrabs when caught with nets. Nowadays, kingcrabs are sold at \$1.0 per individual. (The kingcrabs sold varied from 0.7 to 1.0 kg in weight, and smaller individuals could not be sold.) All the fishermen in the village, when they happen to catch kingcrabs, drop by this outlet and sell them.

Only female crabs are bought, since the eggs are the main part for consumption. Kingcrabs usually remain alive for one week even on land, and they are packed in rice bags and sent to Thailand. In each bag, 65 individuals are packed, and from my observation, approximately 2,000 individuals are sent by automobile to Thailand each time. During my observation in 1994, however, kingcrabs were contained in large ice boxes packed with ice, before transportation.

At this outlet, other resources such as crabs, prawns, lobsters and fish are bought. Except for lobster which must be kept alive, other resources are stored in ice boxes. One Malay buyer from Johor Bahru visited this place regularly to buy crabs and fish. On Friday, when fishermen return from fishing camps and bring live lobsters, several Chinese buyers come to this outlet in order to buy them. Occasionally, the people of this village or adjacent village, and tourists visit this outlet to buy crabs, fishes and prawns. Thus this outlet has multiple functions: wholesale, purchase and sale, and retail sales retailing directly to consumers.

#### 5) Sangkar Type

Along the Johor River, another type of fish sales is practiced. Fishing stakes, *kelong* and *togok*, are observed all over the lower Johor River and the Johor Strait. These fishing structures are owned by Chinese for a stable catch. But now, another structure, *sangkar*, are frequently seen in this area. This is a floating structure with dwellings, and used by Chinese and Malay middlemen. The fishermen, mainly Malay and *Orang Laut*, drop by one of the structures for getting necessary material in the morning, and bring prawns to one of these structures to sell every day. Middlemen weigh the catch to buy them at \$25 per kg. The

prawns are sold in the Singapore market at around \$40.

One of the important aspects of *sangkar* is that it has several pools covered with nets in which prawns, lobsters and fishes are kept alive. Fishermen in this area take air-suppliers on a fishing trip, and try to keep the prawns alive. Some fish, such as *kerapu* (grouper), are fed in pool until they grow to a commercial size. At Kong Kong on the western side of the river, larger *sangkar* are found. This is because the village is located behind a small island and protected from monsoon wind. Here, *sangkar* has the function of a "aquacultural farms," besides that of wholesaling. On some *sangkar*, workers are employed to stay semi-permanently and practice aquaculture. These structures also function as floating hotels to accomodate tourists from Singapore.

## 6. CONCLUSION

Fishermen in southeastern Johor practice small-scale fishing that is mostly beyond the scope of the official system. These fishing activities are practiced for both subsistence and sales. It seems that riverine-mangrove ecosystems are especially important for subsistence, while maritime fishery has gained in importance for commercial fish sales through time. Although recent studies on fisheries in SEA have focused on the commercial aspects, a well-balanced perspective is needed to comprise both subsistence and commercial aspects of fishing.

As Firth pointed out 50 years ago, fishery is organized around middlemen who dominate wholesale marketing. On the eastern coast of the Malay Peninsular in particular, the dichotomy between fishermen and middlemen often corresponds to ethnic differences. Also, Malay fishermen have experienced the introduction of foreign capitals to the economy. The foreign influence on Malay fishery has been noticed on the macro-level (*e.g.* trawling development on offshore sea), but they can be also observed in village level (*e.g.* Thai wholesales of kingcrab in Sedili Kecil).

## Part 2. *The Ecology of Space Use and Residue Formation*

### INTRODUCTION

#### 1) Material Process

The ecosystem is a fundamental ecological unit that refers to associated living organisms in a physical environment and to the structural and functional relationships among them. Humans obtain energy and nutrients from the environment, and use materials for living purposes such as shelter, clothes, and tools. Humans thus participate in the flow of energy and matter in the ecosystem,

and human culture is considered to be a part of the ecosystem. It is where ecological anthropologists have focused their attentions.

Although ecological anthropologists have made intensive studies on cultural aspects of food-getting, tool-making and tool-using, they have paid little attention to the aspects of discard behavior and residue formation. The excretion is an important part of ecological cycle, and some cultures intentionally use excreta of animals including humans for agriculture and domestication. In addition, "garbage" is now recognized to be one of the most serious problems in modern civilizations. When ecological anthropologists aim to understand the total ecological process, they should not avoid dealing with our discard behavior and residue formation.

In this paper, "material process" is defined as a whole process that consists of getting food and materials from the environment, cooking food, making artifacts, consumption of food, and discard of them. Material process concerns with (1) extraction (of energy, nutrients, materials from the environment), (2) transformation, and (3) returning them to the environment. The material process thus understood is an important aspect of the ecological process. Analytical concepts of ecological anthropology, such as food-consumption and time-allocation, are also relevant to the analysis of this material process.

Humans interact with the environment by their own cognition and values. Thus the study of material process should also consider cognitive system of each culture. For instance, the comparison on the concept of "debris" by culture is important [cf. RATHJE and MURPHY 1992: 9]. In addition, cross-cultural study of the discard location is valuable for examining how the industrialization influences our discard behavior [e.g. MURRAY 1980]. Humans tend to regard debris "dirty," but, in some occasions, the discard of artifacts and food residue (e.g. bones of first catch) is performed as rituals. Therefore we should consider symbolic aspects of residue as well [e.g. HODDER 1987].

## 2) Basic Problems —Site Formation and Discard—

The most serious attempts to inquire into material process have been made by archaeologists. Archaeologists have pursued analytical frameworks for explaining the variation of archaeological records (residue of past cultures) from contemporaneous units (e.g. houses, excavation units, sites, layers, etc.). If such variation is found between regions, we could refer to such factors as "cultures" or "different tribes" for explaining the variation. When the significant variation is found between smaller units, such as between houses in one site, the above "macro-scale" explanation is not tenable.

The variation in assemblages could come from: (1) cultural factors, such as differences in function of sites, differences in space use in one site, and differences in treatment of the same specimens (e.g. difference in the cooking method for fish), (2) natural factors, such as different effects of natural phenomena that deteriorate specimens, such as rain, and wind, and (3) physico-chemical factors such as

differences of preservability of parts of bones.

Disclosing the mechanism of the interactions among these factors is an indispensable step for study. Complex relationships among these factors are obtainable from the observation of living cultural systems. Most ethnographies are, however, lacking the information of these aspects of human behavior. Although some literature has extensive information of food-getting and tool-making, it does not refer to residue formation and discards behavior.

This dilemma has led archaeologists to do their own ethnoarchaeological research among the present societies [e.g. GOULD 1978]. Until today, many important studies have been accumulated [e.g. KENT 1987; LONGACRE 1991]. Among these researchers, Binford has explicitly developed analytical frameworks to bridge "static facts" which archaeologists deal with, and a "dynamic past" in which the above factors actually interacted [BINFORD 1978]. After Binford, several researchers have made serious studies on site formation, discard behavior, space use, and site structure, aiming to strengthen the "bridging argument" or "middle-range theory."

Several important concepts have been proposed. For instance, these researchers have noticed the importance of "use life" of artifacts [e.g. LONGACRE 1991]. The longer the use life of a type of artifacts is, the less likely they are discarded. Thus these artifacts tend to be of low percentage in archaeological assemblages. This observation has serious implications to the archaeological interpretation. Archaeologists have dealt with the differences of occurrence artifact types in assemblages as an index of the difference in the importance of activities that these types represent. The above observations tell us, however, that the different occurrences of artifact types might come from difference in use lives, not from the importance of activities. For instance, even if we find many arrowheads (used for hunting) in archaeological assemblages, we cannot easily conclude that hunting was important in the past.

### 3) Previous Studies

Some researchers including Binford, have particularly elaborated analytical techniques of site formation and space use of hunter-gatherers, such as, the Inuits, Australian Aborigines, and Kalahari San [e.g. KENT 1987]. One of the reasons why researchers focused on these hunter-gatherers was that their foraging economies provided comparable situations with Palaeolithic studies.

Also transitory settlement pattern of hunter-gatherers was advantageous for the study of site formation. It is relatively easy to relate residue to activities in their short-term camps. In settlements of sedentary people (e.g. agriculturists), however, it is often difficult to relate cultural residue to particular activities. In sedentary settlements, a wide range of activities have been practiced for years, and the cultural residue resulting from each activity accumulated in intermingled conditions. In this context, it is extremely difficult to differentiate residue by each activity.

On the other hand, an extensive research project has been done on the debris from industrial societies, namely the Garbage Project, by the staff of the University of Arizona. They have used the contents of the "disposal bag" as an analytical unit, and obtained several significant factors concerning households, such as ethnicity, socio-economic status, and household structure [RATHJE and MUPHY 1992]. In this case, disposal of garbage in plastic bags by household serves as an ideal situation to analyze the relationship between social units and disposal behavior.

Besides these studies on hunter-gatherers and industrial societies, we do not have many examples of the "in-between" societies (*e.g.* agriculturists and fishermen). Exceptions are studies on pottery-making agriculturists, such as Highland Maya and Kalinga of the Philippines [DEAL 1985; HAYDEN and CANNON 1983, 1984; LONGACRE 1991]. Although important observations on disposal behavior have been obtained from these studies, little information has been obtained on disposal of food debris of agriculturist. Moreover, the information of fishermen and fishing-oriented communities is scanty [cf. CHANG 1988; MEEHAN 1977].

The following section offers some analyses of space use and formation of cultural remains in a small-scale fishing community of Johor, Malaysia. These data will contribute to filling the theoretical gap mentioned above.

## 1. SPACE USE OF FISHING CAMP

### 1) Camp Structure and Activity

The fishing camp at Sungai Tengah is located at the northern bank of the river mouth (Figure 1). When I was staying in this camp, only 11 men were staying there. Their ages ranged from 15 to 52. Activities observed in the camp were simple: sleeping, cooking, eating, preparation for fishing (*e.g.* mending fishing equipment), preparing for marketing (*e.g.* putting prawns into ice boxes), leisure (*e.g.* playing cards), and resting. Fishermen were all Muslim, but I did not observe any religious activities. Everyday a middleman came to the opposite side of the river to buy prawn.

There were five temporary houses in the camp (Figure 2). Among them, three were build directly on the sandy shore beside the river. Another two were on the sandy bank. Houses were simply made of trunks of coconut trees, veneers, and vinyl sheets. The height of roofs of two houses was less than 150 cm, and it was not possible to stand up in these houses. These houses were only for resting and sleeping. The size of the houses ranged from 4 m<sup>2</sup> to 15 m<sup>2</sup>. Except for blankets and mosquito nets, there was no furniture in the houses.

There were eaves on southern or western side of houses. Four houses had cooking spots under these eaves in the western sides sheltered from sea wind. There were portable gas tanks and ranges in cooking spots. Beside cooking spots,



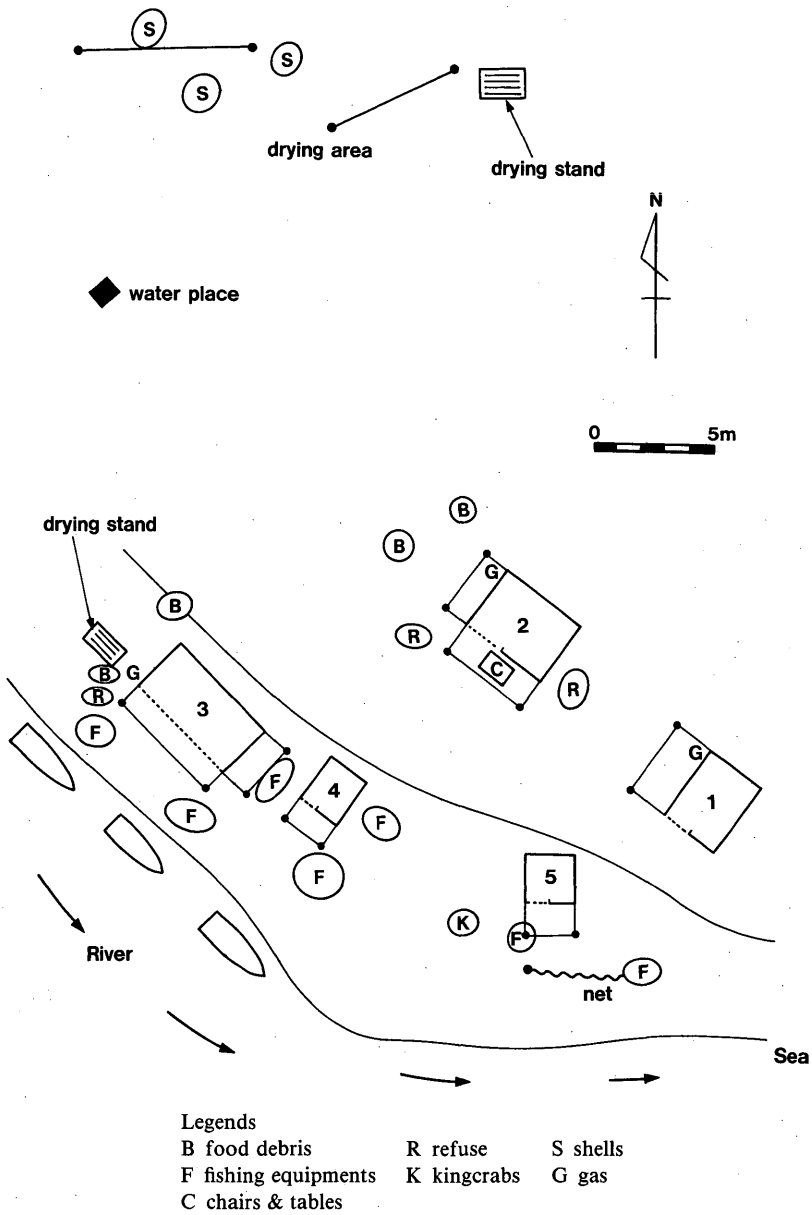


Figure 2. Spatial Organization of the Fishing Camp at Sungai Tengah

there were stands for drying dishes. Some houses had tables and long chairs under the eaves. There were communal structures, such as water spot and clothes lines. The water spot was used only for bathing and washing dishes. Drinking water was brought from the village. There was no toilet, and everyone went to the mangrove jungle for excretion.

The southern section of the camp, or the place between houses and river, was an area for storing fishing equipment and other facilities. Nets, flags for drift nets, traps, fuel tanks, ice boxes and other equipment were stored there. In front of House-5, there was a drying spot for drift nets. Its western side was used as a disposal for male kingcrab not exchanged with cash.

Fishermen used fish, lobster, crab and prawn of low quality for food. Scaling and removing intestines of fish were practiced on sandy shores beside the river. Extracting the catch from drift nets was time consuming, and it usually took two or three hours after fishing. This activity was practiced on the river shore. Debris from scaling and extracting were usually cleansed off by the river stream and resulted in little residue.

## 2) Food Debris

There found three spots for firing debris. These spots were located in the western sides of houses, in consideration of the east wind from the sea side. There, debris from daily life was discarded: paper products, drinking cans, plastic bottles, batteries, etc. But food residue was not usually mixed with this debris.

There were three other spots for discarding food debris. I observed that fishermen usually ate at tables and that they dropped or spat out smaller bones and exoskeletons of crustaceans where they ate. Thus these residues tended to accumulate around tables and chairs. In contrast, fishermen retained large bones (*e.g.* vertebrates and skulls of large fish) in dishes, and discarded them near cooking places before washing dishes. Usually, water buckets for washing dishes were located in the cooking place. Thus larger bones were discarded in the northern or western sides of the houses. Fishermen usually used House-2 and House-3 for eating and leisure. Spots for discarding large food debris were found near these houses.

## 3) Implications

We have here an example of the differentiated space use and discarding behavior among the fishermen. The distribution of houses, storing zones, and discarding spots was patterned in terms of natural conditions (*e.g.* wind, river, etc.) and fishermen's activity. Since the range of behavior was limited in this specific site, the spatial organization of this camp could be understood in relation to fishing and daily activities (*e.g.* cooking and eating).

## 2. FISHING STRUCTURES

### 1) Method

There are five fishing structures and landing places in Sedili Kecil village. These structures were used for harboring fishing boats, landing catches, mending fishing gear, marketing fish, pleasure fishing, and socializing. As the result of

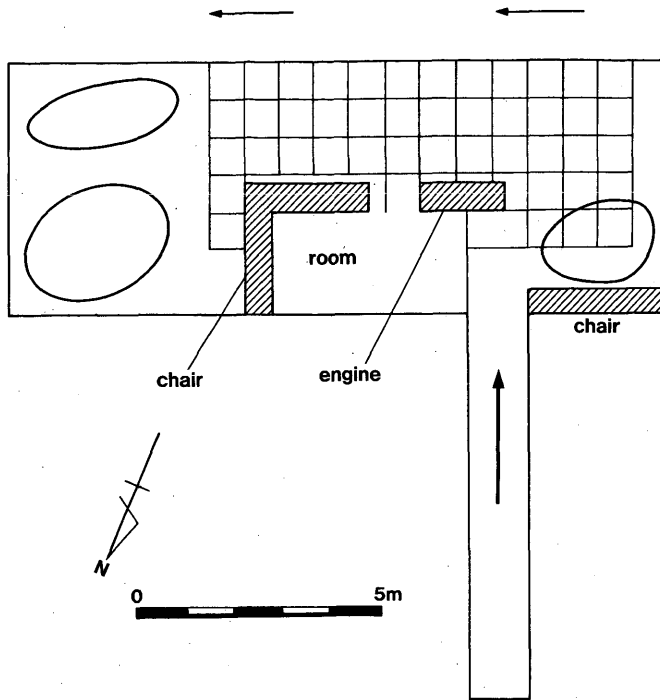


Figure 3. Spatial Organization of the Fishing Structure (S-3), Sedili Kecil

these activities, a variety of residue remains on these structures.

I examined the relationship between the kinds of activities and residue in one structure (S-3). This structure was a cabin built on the river. It had a small room in the northern part, where the engines for fishing boats were stored. Long chairs were situated at the southern and eastern sides of the house. The entrance was located at the northwestern part of the cabin. Nets were usually laid out on the western and eastern sides of the cabin.

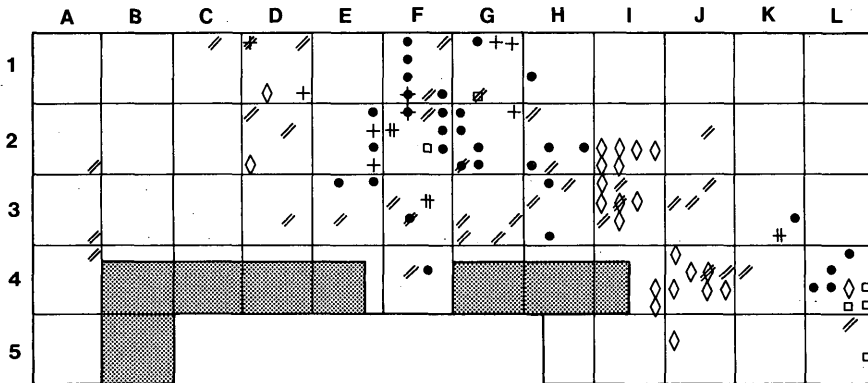
The floor of the cabin was made by arranging long wooden planks from west to east. The width of each plank was exactly 20 cm. The floor, divided by 20 cm from north to south, formed a nice grid system, whose basic unit is 20 cm × 20 cm square. This square was used to plot the location of each residue. The analytical unit consisted of 16 basic grids, with each zone 80 cm × 80 cm square (Figure 3). As shown below, several kinds of activities were observed in my research period, and I recorded the location of residue after each activity.

## 2) Results

The activities observed include net mending, landing catch, pleasure angling, and selling fish or lobster. The total residue recorded during the research period is shown in Table 2. The distribution of all the residue from these activities is

**Table 2.** Faunal Remains in Fishing Structures, S-3 Sedili Kecil

Remains	On the Floor (S-3)	Under Chair (S-3)	On the Floor (S-2)
Crab Scissors	3	6	8
Crab Legs	36	6	13
Kingcrabs	5	1	2
Lobsters	32	1	1
Fish Vertebrae	9+	2	1
Shells	43	30+	10
Sea Stars	1	0	0
Corals	4	0	0
<b>Total</b>	<b>133</b>	<b>48+</b>	<b>35</b>



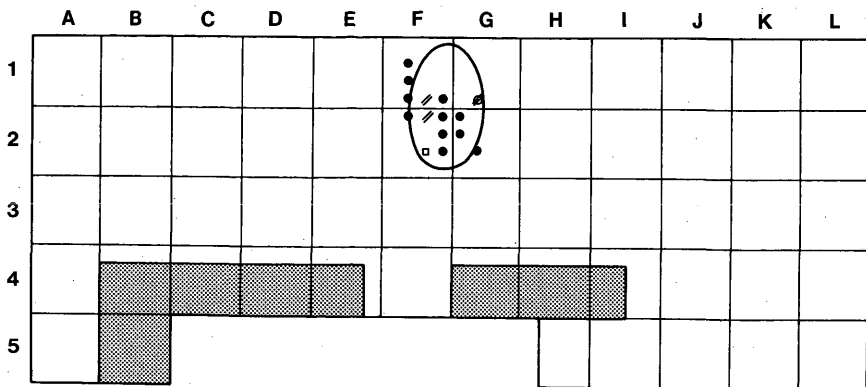
**Legends**

- crab
- kingcrab
- ◇ lobster
- + fish bone
- / shells
- # others
- range of nets

**Figure 4.** Total Residue Formation at the Fishing Structure, S-3, Sedili Kecil

indicated in Figure 4. From this distribution, the kinds of activity and the zones used are referable, to some extent. For instance, selling lobster practiced in zones, such as I1, I2, J2, J3, and J4 certainly left remains of lobster. In particular, net mending left residue where nets and catch were laid.

Crab and lobster left their exoskeletons, when nets were brought in the cabin



**Figure 5.** An Example of Residue Formation after a Fishing Activity (Landing Crabs) at the Fishing Structure, S-3, Sedili Kecil

or nets were brought out to boats. For instance, Figure 5 presents the debris distribution after landing crabs. Fish, however, left only scales when sold. The fish without scales left no trace. For instance one fish sale was practiced in zones of I1-I2 and J1-J3. No fish remain, however, is left in these zones (Figure 4).

In this kind of cabin, where cooking and eating were not practiced, bones, which are the most visible residue, did not remain. When people went angling for pleasure, the remains of fish were rarely found, because they usually took whole fish back houses. If people used shellfish for bait, fragments of shells were left over.

One strange phenomenon was that vertebrae of fish were found after fish sales. Fish were divided into several grades and sold by weight. Once, a middleman cut the stomach of a big grouper, removed small fish inside, and then scaled that grouper. The vertebrae of fish might come out from the stomach, and remained in situ. Without such special behavior, usually no fish bone was left, making scarce evidence from fish sales.

Shells left over were largely non-edible species. When edible shellfish (e.g. species of oysters) was collected from poles holding up the cabin, the meat was often extracted immediately, and shells were discarded on the river bank. In contrast, shells found in fishing cabins mostly came from net mending. Nets usually retained small shells or sea weeds on which small shells attached. Net mending also resulted in leaving useless invertebrates, such as starfish and small crabs.

Compared to fish catches and sales resulting a limited range of faunal remains, net mending tended to leave a wide range of remains that included non-edible species. Also faunal remains from net mending were mostly small fragments (Figure 6).

Concerning crab remains, the ratio of scissors to legs was significantly lower than expected. The theoretical ratio was 1: 4, but actual ratio was 1: 9 (Table 3).

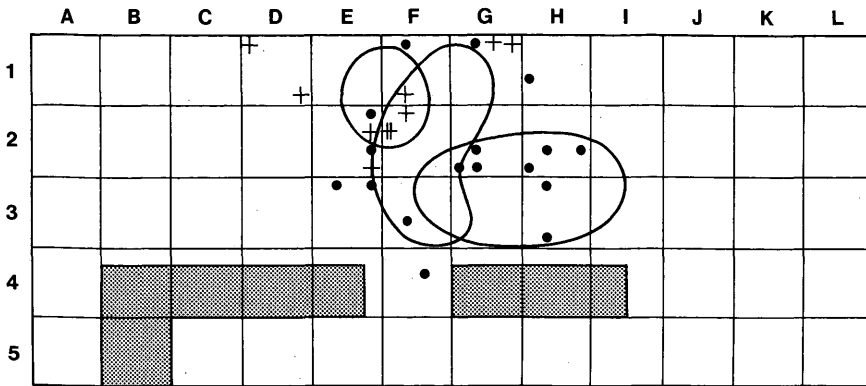


Figure 6. An Example of Residue Formation after a Fishing Activity (Net Mending) at the Fishing Structure, S-3, Sedili Kecil

In contrast to non-edible legs of this species, scissors were edible. In particular, fishermen were careful to retaining scissors along with the body for sales, although they were not so careful about legs. This is the reason why the ratio of scissors was lower than the theoretical ratio. (Then, the faunal remains from house sites, where crabs were eaten, must contain higher proportions of scissors.)

From the above observations, I argue that the factors relevant to the composition of faunal remains in fishing cabins are (1) kinds and size of fauna, (2) kinds of fishing equipment, and (3) kinds of activities. It should be pointed out that remains resulting from each activity are not necessarily logically related to that activity. For instance, net mending did leave fragments of crabs that were caught with that net, but also left small shells not directly related to net fishing.

### 3) Comparison

The above observation is intentionally limited to the phenomena right after each activity, because I aim to examine the “in situ” condition as a starting point. Archaeologists have noticed that the location of a finding is not necessarily the same with the primary location of discard.

The next problem I would like to raise is to how the “freshly made” remains change through time. The factors contributing change of place include natural factors, such as wind, rain, and influences of animals or insects. Cultural factors are also relevant, and these factors result in either intentional movement of debris, such as cleaning, and damping, or unintentional movement through kicking and tramping.

I have examined the distribution of residues in cabins with similar functions (Figure 7). Fishing structure S-2 was located 50 m down-stream from S-3. This cabin had a small room for storing fishing equipment in the northern side. In front of the room, three nets were laid out. People entered this cabin through zones B6 to B1. Also fishing boats were harbored at the eastern and southern

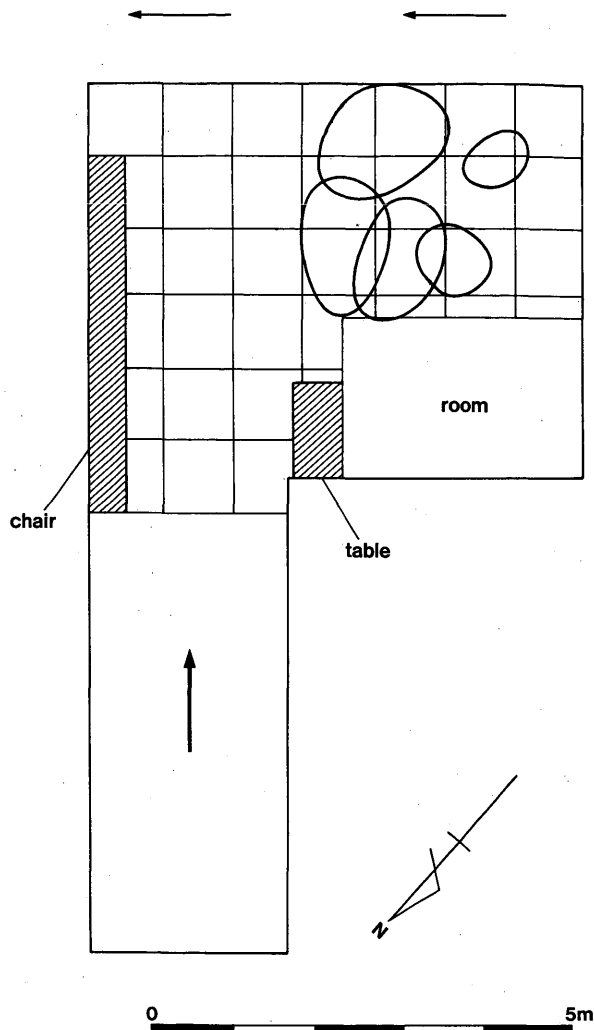


Figure 7. Spatial Organization of the Fishing Structure (S-2), Sedili Kecil

sides of the cabin. Thus the zones from A1 to C1 were most frequently used for landing catches and mending nets.

The distribution of residues on Aug. 30, 1991, is shown in Figure 8. Needless to say, we have no information on how long these residues stayed there. This pattern, however, will be helpful to infer how the distribution of residue in a primary location (in S-3) would change through time.

The kinds of residue at S-2 were not substantially different from those at S-3, but the marked difference is the distribution of the residue. In S-3, "in situ" residue densely distributed in zones where some kinds of activities were practiced, but in S-2, corresponding zones (A1 to C1 and B2 to B5) were characterized by a

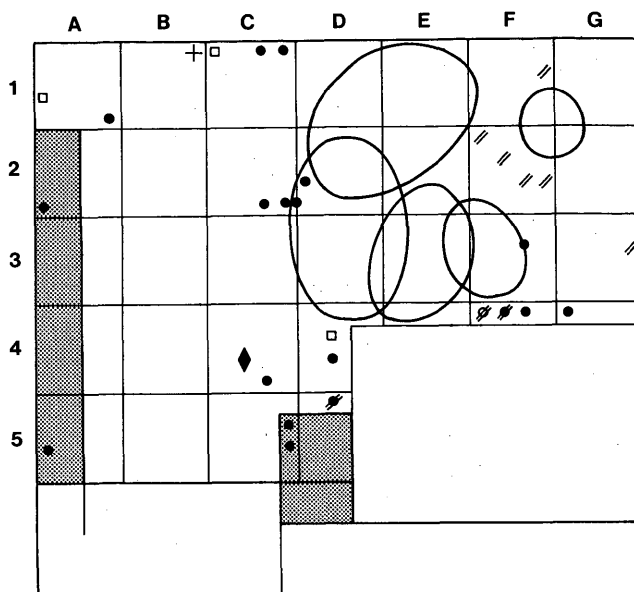


Figure 8. Total Residue Formation at the Fishing Structure, No. 3, Sedili Kecil

scarce distribution of residues.

These zones in S-2 were most frequently used, and also most frequently cleaned intentionally. Also, the same zones were often trampled, and the residue in these zones must have been influenced by these human behaviors. In addition, these open zones were most likely influenced by natural factors, such as wind and rain. If so, the zones least used would be where residues were most densely distributed. This expectation is met, if we examine the residues around nets (e.g. zones F1-F3, and C2.), under chairs (A1-A5) and tables (C4, C5, D4, and D5).

One of the widely accepted assumptions among the archaeologists is that the zones with dense distribution of specimens were most frequently used in the past. The above observations, however, describes a rather different picture: the more the zones were used, the less the residues were left over.

This is true, however, only under some conditions. For instance, food residues are less likely to remain in the multi-purpose zones. If people work out doors on the ground, some sort of residue will remain (e.g. shell debris from shell-money making under house floor in Langalanga, Solomon Islands). But if people work inside houses, cabins, or some kind of permanent structure, debris will be frequently cleaned out. Thus in reconstructing space use in the past from the distribution of residue, we have to consider such factors as: (1) the kinds of residues, (2) the kinds of activities, and (3) the kinds of structures (architectures).

From above, we have already inferred that the residues found around nets (zones C2, F2, F3, etc.) have accumulated through several cultural and natural factors, such as cleaning, trampling, and winds. Therefore, not all these remains



resulted from activities relevant to net fishing, such as landing catches, and net mending. Suppose this cabin was suddenly buried and archaeologists in the future find a dense distribution of faunal remains around artifacts relevant to nets (*e.g.* net sinkers). From this situation, archaeologists will think that the faunal remains, such as exoskeleton of crab and fish bones that "associated" with net sinkers were the animals caught with the nets. We must say that this interpretation, although it appears reasonable, is only partially true.

A final discussion is made of the ratio of different parts of crab remains. As shown in the previous chapter, the ratio of the scissors part was significantly lower than the theoretical ratio, because the scissors (edible part) were intentionally retained. This does not necessarily result in a low percentage of these parts in faunal assemblages accumulated through time. The scissors seem to be the most durable part of the crab body, and I myself found that the scissors parts were the most frequent in crustacean remain from prehistoric sites.

When we examine the ratio between the scissors and legs in Table 2, we notice that the ratio of scissors is significantly higher than the theoretical ratio. Table 2 then shows the content of faunal remains from zones under the chair in the northern side of S-3. These zones, like zones C5 and D5 in S-2, tend to have little effect from daily activities, and accumulate faunal remains through time. The composition of the remains is similar to that from S-2, that is, characterized by a high ratio of scissors parts.

These observations remind us that the composition of the faunal remains, particularly, the proportion among parts of one species, is a result from surprisingly complex processes. These processes are comprised of cultural factors, such as intentional treatment by humans, and cooking, and natural factors, such as the different preservability of body parts.

### 3. CONCLUSION

#### 1) Problems

Schiffer indicated the four dimensions in which artifacts are transformed in the process of site formation: (1) formal dimension, (2) spatial dimension, (3) frequency dimension, and (4) relational dimension. These dimensions are equally important in considering the formation of faunal remains. The formal dimension indicates the process in which the form (shape and size) of specimens is transformed. The spatial dimension is the changes in the location of specimens. The frequency dimension refers to the changes in the frequency of faunal species and/or body parts of one species through time. The relational dimension indicates the association among faunal remains, and also the relations between faunal remains and artifacts. The problems raised in this short report comprise all of these four dimensions. These problems also contribute to exploring the material cycle in the small-scale fishing communities.

The information of the relevance of faunal remains to such behavior as sales and mending fishing gear has been limited. Although this report has raised more questions than answers, I hope to have widened our perspective on residue formation.

## 2) Fishing Camps

(1) Like the hunter-gatherer's camp, the fishing camp observed in this study is spatially structured. Its components are house structures, working areas storing places, special-purpose zones (*e.g.* water place) and discard locations. Each component is situated with consideration to the wind direction and convenience.

(2) Food debris tends to be discarded in different locations from those of other trash. Some food debris, such as small fish bones are "dropped" where people eat, but others are brought to the discard spots. Thus the composition of faunal remains in eating places must be different from those in discard spots.

(3) Extraction of the catch from nets and processing of some marine fauna for cooking are done along the river bottom. These activities leave faunal remains, but most of the remains are washed away by the river, leaving little trace.

## 3) Fishing Cabin

(1) Several kinds of activities are practiced in the cabin, and a wide range of remains are left there. Since the cabin is never used for cooking or eating, fish, which were extracted from nets or sold, leave little trace, except for scales. After angling, only fragments of shellfish used as bait are found. Thus, fish have low visibility in this type of structures.

(2) Concerning crustaceans, large or complete portions of appendicular parts are left over after extraction and sales. Mostly small fragments are found after net-mending. Also a variety of remains, including species un-related to net fishing, are left over after net-mending.

(3) From (1) and (2), we may anticipate the following. If house sites are not excavated, and only special-purpose sites, such as the fishing cabin or working area are excavated, we have a quite skewed picture of the fishing activities and food consumption in the past.

(4) Edible scissors parts of crab are intentionally retained and brought to the places of consumption. Thus the ratio of scissors in the primary context is lower than the theoretical ratio. On the other hand, scissors are the most durable parts of the crab's body. If we examine the faunal remains accumulated through time, the scissors parts will show higher proportion than expected. Thus the proportion among parts must result from complex formation processes.

(5) One of the characteristics of the fishing cabin is that it is used frequently for different purposes. In the places used for activities, a dense distribution of remains is found right after each activity. Since such places tend to be used frequently, the debris tends to be swept away through intentional (*e.g.* cleaning) and non-intentional (*e.g.* trampling) human behaviors, and natural phenomena

(e.g. wind). Thus the places used most frequently show the least dense distribution of remains.

(6) In contrast, remains tend to accumulate under chairs and around nets, that is, places least used for daily activities. In particular, the fauna associated with nets did not necessarily result from "netting." Thus the functional argument based on the association between artifacts (e.g. net sinkers) and faunal remains is only partially supported in this case.

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