

## AN ETHNOGRAPHY ON THE WEDGE SEA HARE IN MACTAN ISLAND, THE PHILIPPINES

### ETNOGRAFI TENTANG KELINCI LAUT DI PULAU MACTAN, FILIPINA

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**Abstract.** The wedge sea hare (*Dolabella auricularia*) is a mollusk species found in tidal flats and is consumed as food around the Philippines. The practice of consuming its internal organs is probably found only on the Mactan Island. The Problem of this study is to clarify why people collect the internal organs of wedge sea hare. The objective is a gleaner who have special skills to identify the sea hare burrows. Participatory observation and measurement method were employed for this research. As a result, it found that the gleaners precisely identify occupied sea hare burrows using unique skills, and to remove the edible internal organs from the disposable body. Local people regard the internal organs as a nutrition. As a conclusion, this practice must be an adaptation to an environment where vegetable protein is scarce due to a limestone-based soil unsuitable for agriculture. Thus, the role of the wedge sea hare in a unique culture was also developed.

Keywords: wedge sea hare, internal organs, food culture, gleaning activity, the Philippines

**Abstrak.** Kelinci laut (*Dolabella auricularia*) adalah spesies moluska yang ditemukan di dataran pasang surut dan dikonsumsi sebagai makanan di sekitar Filipina. Praktik mengkonsumsi organ internalnya mungkin hanya ditemukan di Pulau Mactan. Masalah penelitian ini adalah untuk menjelaskan mengapa orang mengumpulkan organ internal kelinci laut. Tujuannya adalah seorang pengumpul yang memiliki keterampilan khusus untuk mengidentifikasi lubang kelinci laut. Metode pengamatan dan pengukuran partisipatif digunakan untuk penelitian ini. Sebagai hasilnya, ditemukan bahwa para pengumpul secara tepat mengidentifikasi lubang yang didiami kelinci laut dengan menggunakan keterampilan unik, dan mengeluarkan organ internal yang dapat dimakan dari tubuh yang bisa dibuang. Masyarakat lokal menganggap organ dalam sebagai nutrisi. Sebagai kesimpulan, praktik ini harus merupakan adaptasi terhadap lingkungan di mana protein nabati langka karena tanah berbatu dasar batugamping yang tidak cocok untuk pertanian. Dengan demikian, peran kelinci laut dalam budaya unik juga dikembangkan.

Kata kunci: kelinci laut, organ dalam, budaya makanan, kegiatan pengumpulan, Filipina

## INTRODUCTION

Faunal remains provide direct information on several topics of interest to the archaeologist (David and Kramer 2001). Thus, shellfish have become an attractive research subject in the field of archaeology, primarily because shells are easily retained as artifacts and are suitable as research objects. Moreover, Mollusk shells constitute a very large portion of materials recovered from archaeological sites (Vitales 2013). Archaeological research studies have also revealed that shellfish have played an essential role in human life since ancient times. For example, shell mounds have provided important information for archaeologists about the lifestyle,

environment, and behavior of ancient people (Safer and Gill 1986). However, archaeological and anthropological researches have focused on shellfish and not slug-like shells (Safer and Gill 1986; Shirai 1997a; Takeda 1995, 2004), such as the wedge sea hare; the sea slug, as a shellfish, may not have been the main focus of archaeological concern. Archaeology simply tends to rely on old evidence, but how should we deal with the problem of insufficient evidence? Therefore, we should not rely only on relics of the past; rather, an ethnoarchaeological point of view that restores the human past from present material and human behavior is a useful criterion. In this study, ethnoarchaeology refers to a combination of archaeological and ethnographic

approaches mainly focused on a living culture as comparative material (David and Kramer 2001). In addition, to trace the various aspects of culture and society that might have existed in the past, ethnoarchaeology attempts to create a model for explaining and interpreting the past by investigating people living in the modern era, as well as ethnographic records widely recorded during modern times (Sato 2010).

This study aims to clarify the collection of internal organs of wedge sea hares (*Dolabella auricularia*, *dunsol*, vernacular Cebuano) in tidal flats today and explore the process of human adaptation in the tidal flats from the viewpoint of anthropology applying ethnoarchaeological perspective. This study uniquely seeks to clarify the actual ecological and sociological conditions surrounding gleaning activities, and specifically explores how these activities contribute to subsistence in a tidal flat environment and a past society. Tidal flats have been a busy place where people rush to seek their daily food. The majority people occupied the valuable resources, such as a common shellfish, while the minority people had no choice but to glean the low value resources, such as a wedge sea hare, under the conflicts of competing for space and resources in the tidal flats environment. Although tidal flats today are busy and people separate their space and resources, these areas must have also been busy in ancient times. This paper aims to prove how humans have selected space and resources in the tidal flats environment, and for what reason.

Unlike other shellfish studies, this study addresses the internal organs, which are the only parts of the sea hare that are consumed, rather than the body; this is an unusual use of the shellfish that has not been elucidated thus far. This study provides new insights into the archaeological research on the use of shellfish.

Hypothesis of this study is that the way shellfish is used relates to the ecological environment on which people rely; they must discover the value of the internal organs to survive in a land composed of limestone, which is not suitable for agriculture, and to collect animal proteins from the tidal flats. Thus, the gleaning of shellfish was an adaptation strategy to survive in this particular environment. This study is important because the topic has not yet been

fully investigated. Using an ethnoarchaeological perspective, this anthropological study discusses the gleaning of the wedge sea hare's internal organs and the associated food culture, as practiced at the research site, and explores the cultural history.

## Previous Studies on Shellfish Use

Archaeological researchers at Tabon cave (situated on Palawan Island in the Philippines), which dates back to 5050–710 BC, excavated various artefacts made of shellfish: a lime container for betel chewing (*Arca* sp.), a hand axe (*Tridacna gigas*), a ladder (*Melo diadema*), a spoon (*Nautilus* sp.), a bracelet (*Conus literatus*) (Evangelista 2001; Fox 1970). Shellfish have also historically contributed to human nutrition and to the stabilization of social relations, such as shell money or prestige goods; they have provided an economic basis for relationships between groups, religions, and rituals. Since ancient times, they have been used for food, trade, and even as a curse to enemies (Safer and Gill 1986; Takeda 1995; Waselkov 1987). Shellfish have been used as money, dyes, and burial items (Tsuji 2013b). Globally, shellfish have also played a large role in folklore, such as the nomenclature of the taxonomical classification and organism recognition system, or folk beliefs relating to taboos in societies (Iida and Nawa 200; Matsui 1983: 1989; Tsuji 2013b), and they have also spurred creativity (Safer and Gill 1986). Humans have used shellfish for diverse purposes —shellfish trading motivated people's movements and travels (Goto 2010; Mori 2004; Ueda 2016; Yanagita 1967); shellfish were made into tools (e.g., fishing hooks and axes) for hunting (Chikamori 1989; Naora 1976; Ono 2011); shellfish have served as ancient ornaments and money (to indicate power or fortune) (Akimichi 1988; Malinowski 2010; Shirai 1997a, 1997b, 1997c; Stearns 1889; Thomas 1991), magical and religious objects (Alves et al. 2012; Leo Néto et al. 2012; Yamazato 1997), traditional medicine (Alves 2009; Alves and Alves 2011), new drug developments, architecture (Alcina 2004; Bautista 2003), and other modern chemical uses (Scales 2016); furthermore, shellfish are used as souvenirs (Alves et al. 2018; Dias et al. 2011; Nijman et al. 2015),

including pearls (Bain 1987; Yamada 2013); and they promote tourism (Gössling *et al.* 2004). Shellfish continue to not only enrich fisherfolks' lives by providing nutrition but also support the economy of the Philippines by providing revenue (Laureta 2008). While shellfish have captivated people for various reasons, humans' primary purpose for shellfish has always been to obtain a protein-rich food source. In particular, tidal flats are a treasury of easily procured protein-rich biological resources, mainly shellfish. Shellfish in tidal flats are also converted into cash for sustaining daily livelihood. Thus, shellfish have economic value as both a food and a commodity.

From an archeological viewpoint, previous studies on shellfish and gleaning activities in the Visayan Islands have shown that, since ancient times, Cebu has relied heavily on shellfish gleaning for food (Garong 2013). Based on a conchological and marine biological study, 331 kinds of shellfish have been recorded on the Panay Island in the Visayas region. Although 1,600 species of shellfish are commonly identified throughout the Philippines, it is estimated that more than 22,000 types of shellfish exist in the Philippines alone (Laureta 2008). However, based on species richness, species composition, gleaning points, and other characteristics of shellfish sold in the Philippine markets, a reduction in shellfish resources and a deterioration of the tidal flat environment appears to be underway (Schoppe *et al.* 1998; Seo and Tanangonan 2016). For example, the spider conch (*Lambis lambis*) is now a menu item for Cordova tourists, and it brings commercial economic benefits; however, its population is steadily declining because of increased gleaning activity and the degradation of its tidal flat environment (Tsuji 2015). Nevertheless, the majority of shellfish are consumed by fisherfolk, sold in the local markets, utilized in the shell craft industry (Floren 2003; Goto 2001, 2003a; Research and Information Division Office of the Secretary, Department of Commerce and Industry 1967), and exchanged in the souvenir trade (Wells 1989). Thus the Philippines is a major shellfish-producing country that has been experiencing difficulty in sustainably managing the ornamental shellfish population decline (Wood and Wells 1995).

As mentioned above, shellfish and humans have been inseparable from the past until the present. However, few previous studies have been conducted about slug-like shellfish. No ethnoarchaeological studies on sea hares found at present.

### **Previous Studies on Subsistence and Ecology in the Tidal Flat Environment**

The tideland has been an important space for human survival since ancient times, especially concerning food acquisition. Tidal flats, called "sea fields," are valued as sites where such resources can be gleaned easily (Takeda 1996; Takeda *et al.* 1998; Yano 2000). In the tidal flats of the Philippines' coastal area, various biological resources are extracted and used for a variety of purposes, including as food. Tidal flats have been important locations for the gleaning of various organisms--usually by women, children, and the aged without the aid of specialized technology--throughout the history of human evolution and adaptation to the environment (Lee and Takeda 1999; Takeda and Lee 2000; Takeda *et al.* 1998, 2001). However, because of environmental destruction caused by an increase in population, the tidal flat environment is deteriorating, and biological resources are decreasing. Currently, the overexploitation of commercially valuable resources and the sedimentation and nutrient runoff from coastal and inland developments have resulted in the degradation of nearly 70% of the reefs in the Philippines, and only 5% of the coral reefs are still in excellent condition (Schoppe 2000a). In addition, tidal flats in the Philippines are legally "open access," and therefore, no restrictions exist on the extraction of biological resources. It is reported that various organisms are decreasing in size due to extensive exploitation (Schoppe 2000b). As the growth of shellfish is slow, the rampant gleaning of immature organisms causes overfishing of the population. However, sustainable gleaning activities are possible, but they require either specialized skills or the extraction of resources that are difficult to access.

Since such gleaning activities require specialized skills, although they tend to require only simple tools and are associated with

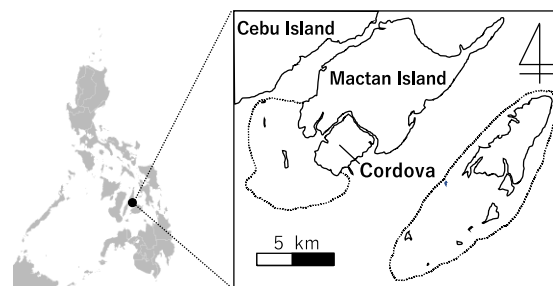
subjectively minor, and thus, low-value biological resources, they are unlikely to result in the overexploitation of resources because of the low value of the resources or difficulty of the skills. These kinds of activities are classified as “minor subsistence activities,” in which special techniques and knowledge are strongly harmonized with nature (Matsui 1998).

This may be the primary method of food acquisition for those living a hand-to-mouth existence. Much of the catch extracted in this manner will be consumed on the same day or sold at a local market. This gleaning activity can be technically classified into two types--general gleaning, in which available biological resources are extracted regardless of the type; and specialized gleaning, in which specific targeted biological resources are extracted (Schoppe 1998). The latter form requires specific techniques and tools. The extraction of the wedge sea hare's internal organs can be classified as specialist gleaning, based on a preliminary report indicating that specific skills are required to obtain the internal organs (Tsuji 2007b).

Women and children in the Philippines rarely participate in the traditional fishing activities of men. Instead, women, children, and the aged extract intertidal organisms, such as shellfish, sea urchins, sea cucumbers, and seaweed. Shellfish gleaning in the tidal flats is usually a woman's subsistence activity, while men use boats to fish in deeper waters (Chapman 1987; Kronen 2002; Matthews and Oiterong 1995; Rochers 1992). However, one report stated that women participated equally in the traditionally male fishing activities (Williams et al. 1998), although women's fishing was seen as a secondary food source compared to the men's catch. In Cordova, many unemployed men extract biological resources on the tidal flats (Tsuji 2007b). Thus, gender has no real importance in the context of gleaning activities; instead, only skills and techniques are important in this context. Notably, however, in addition to fishing expertise and skills, women have as much knowledge of the marine environment and the ecology of marine resources as men (Kronen 2002). In any case, tidal flats have supported human survival in terms of food acquisition for an extensive period.

## METHOD

This study was conducted on Mactan Island, which is part of the Visayan Islands in the central Philippine archipelago (Figure 1).



Source: Private

Figure 1 Location of the Research Site

Mactan Islanders' various fishing activities in the vast productive coral reef area support their livelihoods, and the fisherfolk use specific technologies for exploiting certain habitats (Rau 1979). For example, in Cordova, a town located on the southernmost tip of the island, in addition to shellfish (or other intertidal organism) extractions (*manginhas*, vernacular Cebuano), fishing activities using hand-knitted bamboo nets, such as *bantak*, *teming*, and *panggal* (vernacular Cebuano), and other similar activities, are widely conducted (Tsuji 2007a, 2013a). Shellfish diving activities (*manaon*, vernacular Cebuano) are also widely undertaken to search for gastropods of the Strombidae family, including the spider conch (*saang*, vernacular Cebuano) (Tsuji 2015). Thus, primary fishing methods can be seen in Cordova.

The main data for this study were collected from May 15 to October 1, 2005, as part of an ongoing research project (Tsuji 2007a, 2013a, 2015, 2016, 2018, 2019, and 2020 in press) that has been conducted since May 2000 in Sitio K (a section of villages) in Cordova. The methods include participative observations, a survey of catches using a spring balance, and interviews. Organism identification was accomplished by preparing specimens to confirm their scientific names while using illustrated references (cf. Abbott and Dance 1985; Kubo and Kurozumi 1995; Utsumi 1956; Utsumi et al. 1971); people in Sitio K provided the local names of organisms in Cebuano, the spoken language in the area. This study relied on information obtained from Mrs. Ma (hereafter, Ma), an old female resident



who specialized in gleaning wedge sea hare internal organs; she was 69-years-old when the primary research was conducted in 2005 and died in 2015 at the age of 79 years. Although the main data were collected in 2005, current gleaning activities remain nearly unchanged regarding the skills, conditions of the tidal flats' environment, and cultural values attached to internal organs.

In 2014, Cordova's population was 53,322; fisherfolk formed 35% and belonged to 3,496 households. The population growth rate was 4.33% (1995-2012), the highest in Cebu province, because of the population influx into the bedroom community surrounding the Mactan Export Processing Zone (MEPZ). Annual temperatures range from 18.3°C to 35.0°C; the dry and rainy seasons occur in February–May and June–January, respectively. The major industries are fishing, shellfish gleaning, seaweed farming, quarrying, service industries, day laboring, and ecotourism. In Cordova, 43% of households are engaged in general gleaning activities (Municipality of Cordova 2004, 2014), which is commonly carried out on the tidal flats when the tide is low.

This research was conducted mainly in Sitio K in Cordova, a slum adjacent to a public market, where about 300 people lived in 53 households as of 2015. Most residents work in fisheries, at the seafood market as salespeople, in the MEPZ, or in public transport. Unemployment is high, and many depend on day labor; therefore, the local people often turn to fishing in desperate times (Goto 2003b). Many women also support their households by gleaning biological resources from the intertidal zone. Since finances and space limitations restrict livestock rearing and home gardening, only a few domestic animals are raised in the area (Tsuji 2016). Furthermore, the limestone soil there is unsuitable for agriculture; therefore, vegetable and fruit consumption is supplemented with semi-domesticated tree leaves such as *Moringa oleifera* (*kalamungai*, vernacular Cebuano) (Hirata et al. 2015). Many people in Sitio K are malnourished; although seafood is readily available, vegetables and grains are relatively scarce (Tsuji, 2018).

This study is based on participatory observation and measurement method to

investigate how to glean wedge sea hare and to use the internal organs from a view point of anthropology using ethnoarchaeological perspective which examines the cultural history of people on tidal flat environment from their present behavior and biological resources utilization.

### Wedge Sea Hares

The wedge sea hare's appearance, behavior, and habits are quite uncommon compared to other shellfish (Figure 2). The hare, named after the rabbit ear-like protuberances on its head, is a gastropod mollusk belonging to the Aplysiidae family. It is characterized by a thick body (approximately 12-20 cm in length and 0.2-0.3 kg in weight), slow movements, and an internalized shell. It releases a purple ink cloud when threatened (Kubo and Kurozumi 1995; Utsumi et al. 1971). Although the life cycle is unknown, it is said that the mollusk is more abundant during spring tide and decreases during neap tide (Nishida et al. 2006a, 2006b). It is classified as a slug, rather than shellfish, because its shell has degenerated and become an internal structure (Scales 2016). In Cordova, it is also recognized as a slug based on its outward appearance, which is different than a shellfish. Generally, the body of a shellfish is used for food; however, in the case of the wedge sea hare, the internal organs and eggs are used for food instead of the body.



Source: Photo by the Author

Figure 2 Wedge Sea Hare, Cordova, 2005

The food culture around wedge sea hares, in the Philippines and in other countries, has been widely discussed. For example, the noodle-

shaped eggs of the related Kuroda's sea hare (*Aplysia kurodaï*) are consumed in various parts of Japan. There is also some local information indicating that the body is edible, but no systematic investigation into this claim has been made. In China, the eggs are called "sea flour" (*hai fen*, vernacular Chinese) (Koizumi 1994) and are used as ingredients in a variety of dishes. The eggs are also used in the cuisines of Samoa, Tonga, and Fiji (Singh and Vuki 2015). In the Philippines, especially in the Visayas, Mindanao, and Palawan areas, the eggs are called *lukot* (vernacular Cebuano) and served as *kinilaw* (vernacular Cebuano), which is a kind of marinade with vinegar (Figure 3) (Alegre and Fernandez 1991). It is reported that the eggs contain several nutritional elements, such as minerals and amino acids (Pepito et al. 2015). In Cordova, four specific internal organs (approximately less than 10% of the sea hare's weight) are consumed along with the eggs, although this does not appear to be the case elsewhere in the Philippines. The main body is not eaten. Most organs' biological names are unknown (probably, opaline gland, gill, anus, and anal siphon) (Kato 2009), but the folk names are *butbut* (anus), *dunggan* (ear), *atay* (liver), and *miroy* (bowels; vernacular Cebuano), named so because their shapes resemble human body parts and organs (Figure 4). The reasons for restricting consumption to these parts are unknown, and the food value of each part varies widely according to culture and geography. In markets, the parts are bagged in fresh water and sold for 0.76 USD per bag. The organs are not eaten raw but cooked. Although few people do the actual harvesting of the wedge sea hares, many consume them. Based on this fact, and because trading is carried out on a daily basis, it seems likely that the gleaning and consumption of the hare is traditional and widely practiced, and has been confirmed in Cordova. Currently, the only systematic descriptions of the hare have been on the use of its eggs and internal organs in the Philippines (Pepito et al. 2015; Tsuji, 2007b: 2019, and 2020 in press). Therefore, this study aims to encourage future cross-cultural studies on wedge sea hare utilization.



Source: Photo by the Author

Figure 3 Eggs of wedge sea hare, Cordova, 2005



Source: Photo by the Author

Figure 4 Edible internal organs of the wedge sea hare, Cordova, 2005. Upper left: *butbut* (anus), bottom left: *dunggan* (ear), upper right: *atay* (liver), bottom right: *miroy* (bowels).

## RESULTS AND DISCUSSION

### Spatial and Time Use

Ma gleaned the wedge sea hare's internal organs with her younger sister Ai, as permitted by tides and weather, on 48 of the 67 days during the rainy season from July to August 2005. Ma had a calendar with a tide chart, but she preferred to follow the tides based on the skills she inherited from her mother.

A survey of the gleaning activity was conducted for 11 days, from July to August 2005. Harvesting time was divided between morning and afternoon in relation to the tide. In the morning, Ma began gleaning at around 04:50 and returned home at around 09:00. In the afternoon, she began at around 14:15 and returned home at 18:40. The total gleaning time ranged between

2.50 and 4.06 hours, and the average activity time was 3.45 hours (Table 1). The activity time was divided into the time taken to walk from home to the tidal flats (round-trip) and the time for the harvesting activity. Subtracted from this activity time were the 20 round trips from home to the tidal flats to represent the substantial

gleaning time. During all activity periods, Ma remained aware of the tide. There were only a few others harvesting the internal organs of the wedge sea hare, and their gleaning space did not overlap. While no territorial conflicts were observed, many people were competing for shared resources in a limited space.

**Table 1** Time Spent Gleaning by Ma in the Tidal Flats in 2005

Date	Departure	Flat landing	Started gleaning	Finished gleaning	Went home	Total time
July 20, 2005	14:21	14:32	14:45	17:56	18:15	3:54
July 21, 2005	14:52	15:04	15:30	18:22	18:38	3:46
July 23, 2005	4:50	5:01	5:16	7:28	7:40	2:50
July 25, 2005	5:04	5:17	5:46	8:50	9:03	3:59
August 2, 2005	14:12	14:22	14:43	17:47	18:01	3:49
August 3, 2005	14:37	14:48	15:04	18:29	18:43	4:06
August 23, 2005	5:06	5:16	5:35	8:41	8:55	3:49
August 24, 2005	4:55	5:05	5:28	8:34	8:47	3:52

### Gleaning Technique

The tools required were primarily knives, hatchets, and spatulas. A hatchet and spatula were used to locate the wedge sea hare habitat under rocks and sand, and the knife was used to split the abdomen and remove the internal organs. Specific techniques to extract the hare from the burrows with hatchets or spatulas were also needed.

The harvesting activity was conducted on tidal flats that are mostly dry or in very shallow water. The space was safe to walk on during low tide. Many other shellfish gleaners also operated on the tidal flats, but the gleaning ground did not overlap because the wedge sea hare and other shellfish have different ecological habitats. The habitat of the wedge sea hare is typically benthic, located amid seaweed of the family Cymodoceaceae (referred to as *lusay*, vernacular Cebuano) or in the sand and under rocks, while other shellfish inhabit mainly rocky areas of the tidal flat. The wedge sea hares often form swarms for mating (Kubo and Kurozumi 1995), and up to six individuals could be caught in the area where one hare was initially gleaned. Here, hidden hares will often discharge purple liquid and reveal their location (Figure 5). Visual

confirmation of the burrows in the sand is easy, and if visibility conditions permit, gleaning is straightforward for the skilled. The author could not identify all the hares even after the burrows were pointed out many times. Local people say *mata-mata* (*mata* means “eyes” in the Philippine dialects) is necessary to see into the burrow hole, referring to the skill and ability of sharp vision (Kumakura 1998).



Source: Photo by the Author  
**Figure 5** Gleaning Wedge Sea Hares, Cordova, 2005

Wedge sea hare gleaning is affected by weather conditions and, at the time of the survey, the sea was often disturbed by strong winds, making burrows difficult to spot. Ma, however, was adept at spotting these burrows and harvesting the wedge sea hares, with only a few others apparently sharing this skill. She was also skilled at spotting burrows of peanut worms and sea cucumbers. According to her, the shape of each hole is different. This awareness likely reflects years of experience and intuitive practice that is difficult to describe verbally (Polanyi 2003; Shinohara 1998) and difficult to fully explain with words such as “intuition” or “knack” (Takekawa 1996). This ability may account for the rarity of the wedge sea hare gleaning practice.

### Gleaning Harvest

During the study period, Ma captured 37 kinds of organisms in addition to the wedge sea hare. These included 19 species of mollusks, one peanut worm, 14 echinoderm species, two types of crustacean, one species of finfish, and one type of marine algae (Table 2). The two (inedible) crustacean species were used as bait by an acquaintance for a *teming* trap; the other

organisms were sold in the local market or consumed at home. Judging from her catches, she tended to glean the wedge sea hare organs most (41.9%), followed by echinoderms (22.9%) and peanut worms (18.8%). It is clear that very few other people harvest these species, especially the wedge sea hares and peanut worms, which require special gleaning techniques. She also gleaned the wedge sea hare eggs (6.8%), varieties of mollusks (8.7%), a type of algae (0.6%), and a finfish (0.3%). She engaged in specialist gleaning, but she also appeared to utilize diverse fishing methods (Figure 6). The main target of Ma’s gleaning activity was the wedge sea hare, but it appeared that the harvest techniques, which varied based on environmental conditions, influenced the variety of the final catch. In addition, Ma’s harvest record for July 5, 2005 (Table 3) showed that wedge sea hares were gleaned many times during the evening low tide, especially from 16:00 to 18:00. A total of 111 individuals engaged in gleaning. Her notes implied that low tide periods are suitable for gleaning, suggesting that the wedge sea hares tend to move close to the tidal flats during low tides.

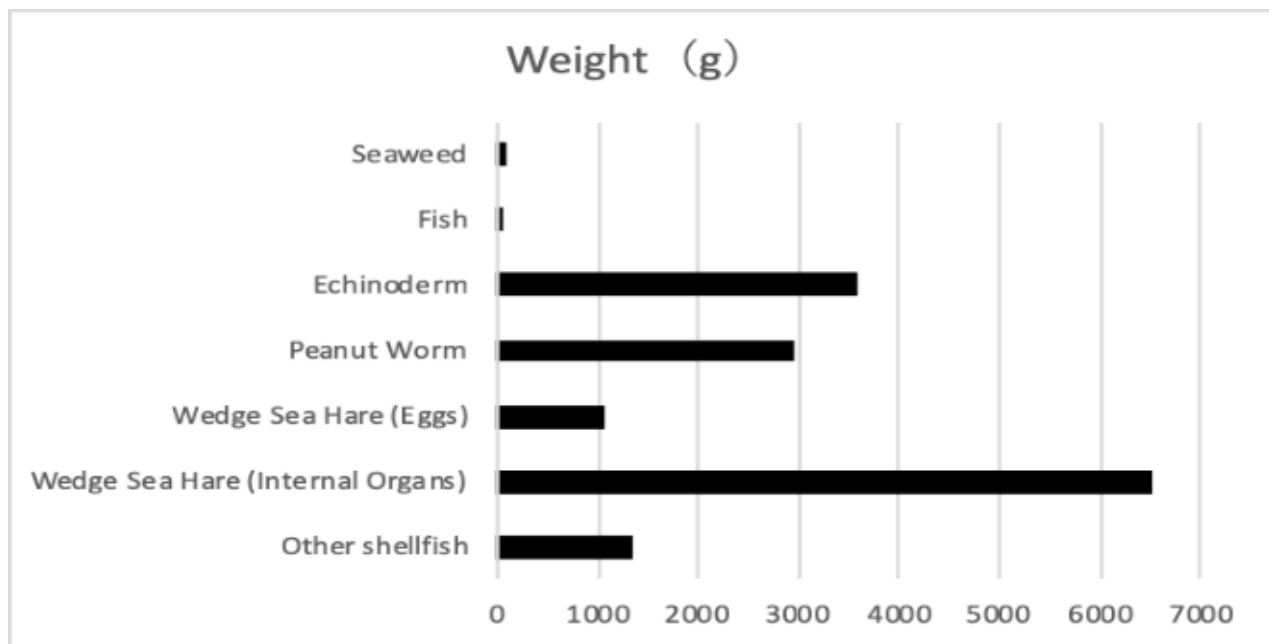


Figure 6 Total catch gleaned by Ma over 11 days from July to August 2005



**Table 2** Contents of Ma's Catch (for 11 days from July to August 2005)

Family Name	English Name (Scientific Name)	Local Name	Number	Weight (g)
<b>Shellfish</b>				
Trochidae	Commercial top shell ( <i>Tectus niloticus</i> )	samon	2	20
Trochidae	Maculated top shell ( <i>Trochus maculatus</i> )	turung-turung	2	30
Turbinidae	Common delphinula ( <i>Angaria delphinus</i> )	taktakon	8	220
Strombidae	Spider conch ( <i>Lambis lambis</i> )	saang babae	1	60
Strombidae	Diana conch ( <i>Strombus aurisdianae</i> )	bungkawil	1	40
Strombidae	Strawberry conch ( <i>Conomurex luhuanus</i> )	lisiw	1	30
Strombidae	Black-lipped conch ( <i>Strombus urceus</i> )	anikad	2	30
Naticidae	Pear-shaped moon ( <i>Polinices tumidus</i> )	buwan-buwan	1	10
Tonnidae	Black-mouthed tun ( <i>Tonna melanostoma</i> )	tanghuga	1	n.d.
Ranellidae	Angular triton ( <i>Cymatium femorale</i> )	hang-hang	2	50
Ranellidae	Hairy triton ( <i>Cymatium pileare</i> )	buta-buta	1	20
Voltidae	Bat volute ( <i>Cymbiola vesperilio</i> )	kibul	1	40
Aplysiidae	Wedge sea hare ( <i>Dolabella auricularia</i> ) [Internal organs]	dunsol	1,189	6,530
Aplysiidae	Wedge sea hare ( <i>Dolabella auricularia</i> ) [Eggs]	lukot	56	1,040
Arcidae	Scapha ark ( <i>Anadara scapha</i> )	litub	11	480
Pectinidae	Box scallop ( <i>Pecten pyxidate</i> )	pay-pay	1	20
Cyrenidae	Common mangrove clam ( <i>Geloina erosa</i> )	tuway	1	30
Veneridae	Youthful venus ( <i>Periglypta puerpera</i> )	bugatan	3	190
Cardiidae	Pacific yellow cockle ( <i>Trachycardium flavum</i> )	sud-sud	5	105
<b>Sipuncula</b>				
Sipunculoidea	Peanut worm ( <i>Sipunculus robustus</i> )	salpo	103	2,938
<b>Echinoderms</b>				
Toxopneustidae	Gracious sea urchin ( <i>Tripneustes gratilla</i> )	suwaki	21	1,055
Holothuriidae	Sea cucumber ( <i>Holothuria inhabilis</i> )	batunan	9	254
Holothuriidae	Sea cucumber ( <i>Holothuria pulla</i> )	tambi	1	30
Holothuriidae	Rigid sea cucumber ( <i>Holothuria rigida</i> )	sunlutan	15	435
Holothuriidae	Sandfish ( <i>Holothuria scabra</i> )	magallay	4	325
Holothuriidae	Tiger-tail sea cucumber ( <i>Holothuria hilla</i> )	mani-mani	1	10
Holothuriidae	Sea cucumber ( <i>Holothuria albiventer</i> )	suro-suro	3	95
Holothuriidae	Bawny white ( <i>Holothuria fuscogilva</i> )	angan	5	210
Holothuriidae	Sand sea cucumber ( <i>Holothuria arenicola</i> )	batuli	3	100
Stichopodidae	Selenka's sea cucumber ( <i>Stichopus horrens</i> )	hanginan	4	601

**Table 2** Contents of Ma's Catch (for 11 days from July to August 2005) (Continue)

Family Name	English Name (Scientific Name)	Local Name	Number	Weight (g)
Family unidentified	Sea cucumber (unidentified)	<i>butalin</i>	3	93
Family unidentified	Sea cucumber (unidentified)	<i>hanlangit</i>	11	160
Family unidentified	Sea cucumber (unidentified)	<i>pisod</i>	1	14
Family unidentified	Sea cucumber (unidentified)	<i>tilango</i>	2	188
<b>Crustacea</b>				
Calappidae	Red-spotted box crab ( <i>Calappa calappa</i> )	<i>kumo-kumo</i>	no data.	no data.
Inachoididae	Tuberculate pear crab ( <i>Pyromanias tuberculata</i> )	<i>yakow</i>	no data.	no data.
<b>Fish</b>				
Labridae	Sixbar wrasse ( <i>Thalassoma hardwicke</i> )	<i>labayan</i>	1	50
<b>Marine algae</b>				
Solieriaceae	Eucheuma ( <i>Eucheuma cottonii</i> )	<i>guso</i>	3	100

**Table 3** Contents of Ma's Capture on July 5 2005 (unit: pieces)

Time Period	Wedge Sea Hare (Internal Organs)	Wedge Sea Hare (Eggs)	Sea Cucumber	Sea Urchin	Shellfish	Seaweed
14:00-15:00	0	0	0	0	0	0
15:00-16:00	11	4	2	1	0	0
16:00-17:00	61	0	1	5	2	0
17:00-18:00	50	2	5	0	1	2
18:00-19:00	4	0	3	0	0	0
<b>Total</b>	126	6	11	6	3	2

### Marketing of the Wedge Sea Hare's Internal Organs

Ma removed four edible internal organs by laterally cutting the belly of the captured hare with a knife. The gleaned organs were placed in a bucket, and the main body was discarded into the sea. Since the eggs are easily spotted, those laid in the tidal flats were collected by hand and then transported separately from the internal organs.

Once done, she returned home and immediately washed the internal organs and placed them in plastic bags with fresh water. She brought the bagged organs and eggs to the market on foot and sold them alongside the peanut worms and sea cucumbers that she had

harvested. A plastic bag of the wedge sea hare's internal organs cost 0.38 USD in 2005 and 0.76 USD in 2018. The rise in price suggests that their market demand has increased. She rarely ate these at home; instead, the bulk of her catch was sold for cash. The other shellfish gleaners sell their catch in the market, but also use them in daily cooking. These gleaning activities represent a unique cultural characteristic in Cordova. In general, fisherfolk glean diverse organisms for a variety of uses--self-consumption, income, and trade. Thus, harvesting organisms in tidal flats has several cultural purposes including social, economic, and international trade and relations to support the gleaners' subsistence and income needs.

During the 46-day observation period in 2005, the daily income ranged from 0.19 to 1.90 USD, with an average income of 0.91 USD. The legal minimum wage on Mactan Island at that time was 4.66 USD per day, suggesting that it is extremely difficult for women to make a living by gleaning alone.

## CONCLUSION

This paper documented a method of primary food acquisition using simple tools and techniques in harvesting the internal organs of the wedge sea hare in Cordova, which is not widely consumed around the world.

The gleaners only target the wedge sea hare's internal organs and eggs because the body is not considered edible. The wedge sea hare's four most valued internal organs represent less than 10% of its total weight, and the remaining more than 90% is discarded into the sea—an extremely inefficient use of the resource. In this process, shell inside the body is also abandoned into the sea and hard to remain as an archaeological artifact. Less than 10% of the wedge sea hare's parts (internal organs besides the eggs) are eaten. This ratio is not applicable to other mollusks.

Whether people consider the hare to be edible or not is based on the history of specific food cultures and environments. Based on the author's research, it appears that people in Cordova transitioned into eating the wedge sea hare's internal organs based on necessity due to an increasing human population, an overuse of intertidal flats, lack of access to more common intertidal resources, and limestone land not suitable for agriculture, all of which have resulted in a shortage of marine and vegetable protein resources.

According to a previous study (Pepito *et al.* 2015), the eggs contain nutritional value because of their minerals and amino acids. The internal organs also naturally contain nutritious elements, and therefore are gleaned by people for food. The knowledge of internal organs as an important food source has been passed down from ancestors through the necessity of adapting to the intertidal flat environment as a subsistence strategy. As elucidated previously, Cordova is not suitable for agriculture and people must acquire

nutrition, including fat, protein, ash, carbohydrates, and minerals, from the sea to the fullest extent possible. Under such circumstances, some people have discovered the positive aspects of the internal organs, such as their nutritional value. The gleaning of the wedge sea hare's internal organs is an adaptation strategy to obtain extra nutrition that cannot be acquired from the more common sources of sea protein.

Diversifying food resource choices is considered one of the survival strategies of humans; separating the gleaning spaces and resources on the "battlefield" of the tidal flats is necessary to compete for food, or to escape from predicted troubles, such as quarrels or violence, which might cause a loss of opportunity to use the tidal flats environment and resources. Tidal flats and their resources reflect a long relationship with humans judging from the anthropological viewpoint. This is also an answer for the hypothesis suggested above.

As shown in the case of Cordova, gleaning the internal organs of the wedge sea hare is quite different from general shellfish harvesting. Furthermore, the wedge sea hare is a sea slug which has a different habitat and ecology from the general shellfish. Archaeologists have restored the past from shells, but since this species is a sea slug, it is difficult to use shells as a material. Therefore, notably, the method of ethnoarchaeology that examines past people's use of sea slugs from current people's behavior and culture is useful. This paper also suggests that anthropology can achieve an analogy of the past even though there is a lack of archaeological artifacts.

Hence, further research is needed to explore whether or not there are other reasons for harvesting or eating these organs. This study illuminated the gleaning of wedge sea hare's internal organs and their consumption as found in Cordova from an ethnoarchaeological viewpoint; it highlighted the scope of the cases that remain unreported globally, even in the archaeological and ethnoarchaeological literature. Finally, this study illustrated the diversity of shellfish gleaning and utilization in the Philippines, in contrast to general shellfish harvesting around the world. While additional research is necessary to clarify the relationship between human beings and

wedge sea hares, this study revealed one aspect amid many possible directions.

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