

**The Project of Conservation Dugong and Marine Species
on Phu Quoc – Tho Chu Area, 2013 – 2015**

**REPORT ON
INVESTIGATION OF SEA SNAKES IN VIETNAM**

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INTRODUCTION

Snakes, one of the most widely distributed extant vertebrate, are a significant part of global wildlife exploitation (Alves et al. 2008; Schlaepfer 2005), and Southeast Asia is a principal region for snake removal, trade, and utilization (Nijman 2010; Sodhi et al. 2004). In Vietnam, nonvenomous and venomous snakes are commonly collected from the wild, bred and raised in captivity, and traded locally, domestically and internationally. Nearly every part of the snake is utilized for culinary, medicinal and other purposes (Somaweera 2010; Yiming 1998). While there have been several studies on the conservation aspects of terrestrial snakes in the region, the exploitation of sea snakes (marine elapids, Elapidae) in Vietnam, or in Southeast Asia in general, has received very little attention apart from a few and limited reports (Auliya 2011; Bussarawit et al. 1989; Punay 1972, 1975). Notwithstanding defying danger, sea snakes have been harvested and utilized for their meat, blood, and skin for many years in southern Vietnam (Tu 1974; Warrell 1994). However, the true extent, driving force, and impact of this exploitation have to date not figured in conservation assessments.

The present study identifies what appears to be one of the largest marine reptile exploitation efforts on Earth centered around sea snakes. Specifically, our objectives were to establish the geographical location, temporal distribution, species composition, harvested biomass, and socio-economic aspects of present-day sea snake exploitation from the Gulf of Thailand via southern Vietnam.

Study objects in 2013 : Estimate the reserve of catching sea snakes in Thailand gulf of Vietnam and its species compositions in order to consider and suggest the law of protecting the wildlife also the sustainable development and management of the resource of sea snakes in Gulf of Thailand.

MATERIAL AND METHOD

1. Study sites location and dates

a. Vung Tau (10°21'N, 107°04'E): has two merchants *to harvesting sea snake on Thailand gulf.*

b. Song Doc (9°2'N, 104°49'E) is a fishing town in Tran Van Thoi district; is located in Ca Mau province, southwestern Vietnam

Date of implement. From April 2013 to April 2014.

The exact time of survey depend on Lunar cycle: monthly on from 9th to 13th of Lunar

2. Specimen collection and identification

Monthly collected the specimens of sea snakes in order to determine species compositions and biomass harvesting of 7 merchants in 2 sites above. In the fieldwork, semi-structured interviews were conducted with all known sea snake merchants at the study sites: 5 merchants in Song Doc, 2 in Vung Tau. Additionally, squid fishing vessel captains (30 individuals), fishermen (30). And included 20 middlemen, who buy snakes from returning squid fishing vessels and transport to merchants'

Species identification of sea snakes was based on published identification keys. Specimens are deposited at the Vietnamese Institute of Oceanography, Nha Trang, Vietnam and at WAR head office.

3. Biomass quantification and statistics

Trading process, and economics are based on our direct observations monthly, and on the relevant data obtained from the study subjects.

A "trading session" is defined as the four-six day window, fixed in each lunar synodic cycle (one month), when sea snakes are purchased by merchants from the returning squid fishing vessels.

The biomass of sea snakes captured and traded was measured at a trading "bottleneck", a defined point in time and space where all sea snakes are transited.

4. Laws, utilization of snakes, incentives for trading

Laws cited are based on present information of cites in Vietnam, and TRAFFIC Vietnam. Utilization of sea snakes was determined based on (i) our direct observations, including extensive, multi-year field observations (ii) visiting numerous markets, restaurants and inquiring about snake based products, and (iii) as a result of the data collection from the study subjects. At least some aspects of all forms of utilization reported here have been witnessed in 2013. Incentives for trading was determined based on data collection from the study subjects, and supported by our direct observations.

RESULT AND DISCUSS

RESULTS

1. Harvesting locations

Sea snakes sold commercially in southwestern Vietnam are collected and supplied by squid vessels (most commonly: *Loligo chinensis*, *L. japonica*, *L. beka*, and *Todarodes pacificus*) fishing vessels based in Song Doc and Vung Tau.

The actual harvesting localities are spread out across the central Gulf of Thailand (international water) between Vietnam, Malaysia, Thailand and Campodia. Sea snake harvesting locations provided by 20 individual squid vessel captains (carried out 2012). Each location represents the "best" or "usual" location for harvesting sea snakes per the captains' estimate. Squid vessels tend to return to the same location if it was "good" before. (Figure 1)

2. Type of vessels and sea snake harvesting

Squid fishing vessels, which range in length from 18-32 meters, are powered by single diesel engines and contain about 10 (range 7-25) crew. They are equipped with electric lamps in order to attract squids at night. Sea snakes are collected in their natural habitat at night as a valuable by catch of squid fishing when snakes surface, either, due to an apparent attraction to the on board light source or as a normal pattern of their natural history (i.e., to breath). Snakes are caught by hand lines or by dip nets when their surface. A hand line is normally used to catch squids but fishermen, also use them to collect sea snakes. Therefore, captured sea snakes often have hook injury marks. Once captured, sea snakes are placed live into seawater-filled plastic barrels for up to 20 days, until the vessels reach the near-shore and snakes are sold to merchants.

2.1. Initial trading

Squid fishing vessels returning from the Gulf of Thailand are met approximately 0-10 km offshore by middlemen traveling on speedboats in the early morning (04-10h) hours, to buy the sea snakes. Snakes purchased by middlemen are transported to the merchant bases in Song Doc where the catch is immediately weighed, sorted into two groups according to size, typically, above and below ~500g. The snakes are then stored in a basin filled with brackish water. Snakes are shipped out on the early afternoon of the same day in styrofoam containers filled with freshwater with added salt, each container holding about 17-18 kg of live snakes. Boxes have breathing holes cut on the top. Some ice is placed in the boxes, which are then taped shut. One box typically holds about 40 "large" or 60 "small" snakes. Sea snakes are transported to Ca Mau by boat, then by road to Ho Chi Minh City, then by road or airplane to other destinations, mainly Lao Cai (Lao Cai province, 22°29'N, 103°57'E) and on to China. Lao Cai is a major wildlife transport point from Vietnam to China.

2.2. Economics

Middlemen purchase the sea snakes from the fishermen for 200,000-800,000 VND/kg (1 USD=21,200 VND). Specifically, *Hydrophis* is 350,000- 800,000 VND/kg, *Lapemis* is 200,000-450,000 VND/kg, and the larger-sized, healthier specimens command higher prices. There does not appear to be a species-based price difference for the species *Hydrophis*. Snakes sold by middlemen to merchants at about 50,000 VND/kg more than purchased from fishermen. By comparison, squid are sold by fishermen at 150,000-450,000 VND/kg.

In 2013, there were 5 merchants trading sea snakes in Song Doc and 2 in Vung Tau, and the length these merchants have been trading snakes varies between 6-12 years. Sea snakes are captured and traded year-around, following the lunar synodic cycle described above. But, in January and February of 2014, trading session in Song Doc and Vung Tau were shut-down, because of border between Vietnam and China was controlled closely by polices of Vietnam about transporting wildlife.

2.3. Species composition

For alive sea snakes obtained from merchants' facilities indicate that *Hydrophis cyanocinctus* (Fig.2:A) and *Hydrophis curtus* (Fig.2:B) and constitute nearly all of the total snake biomass. The approximate proportion (by weight) for these two species varies between 50:50%. Based on snout-vent length and body mass, all sea snakes harvested appear to be subadults or adults. Juveniles (not harvested but born during the trading sessions to harvested females), as reported by fishermen, were observed in "August-October" and "December-March" in 2013, and typically number "5-8 juveniles" per female snake.

For dead sea snakes obtained from trawlers was 8 species (Fig. 2:from C to J)

2.4. Biomass of sea snakes harvested

Total of yield in 2013 was 55.007 kg (S.D.=+/- 1.600kg, the average biomass traded each month was 4.584 kg (standard deviation, S.D.=+/- 189kg; (Table 1). While this was going on, total of yield in 2012 was 84.000 kg approximately and the mean biomass exploited from the Gulf of Thailand via Song Doc and Vung Tau each month is 6,806 kg snakes.

These weight figures are consistent with weights estimated to be present on returning squid vessels reported that vessels typically return to port with 5-20 kg of snakes per vessel. There are approximately 900 squid fishing vessels based in Song Doc and Khanh Hoi. By comparison, squid vessels return to port with 800-1,500 kg of dried squid per vessel.

3. Applicable laws

The catching of sea snakes in international waters is regulated first by the United Nations (UN) Convention on the Law of the Sea, Section II, "*Conservation and Management of the*

Living Resources of the High Seas,” which establishes the right for Vietnamese nationals to engage in fishing on the high seas subject to Vietnam’s treaty obligations and agreements stipulating the rights and responsibilities of Coastal States.

Vietnam, as a member of the Food and Agriculture Organization (FAO) of the United Nations, is bound to the FAO Code of Conduct for Responsible Fisheries, adopted in 1995.

Domestically, sea snakes are not protected and the exploitation is completely within the legal framework of Vietnam. The catching of sea snakes in Vietnam’s islands, internal waters, territorial sea, Exclusive Economic Zone, and continental shelf fall under the regulation by the “Fisheries Law,” Law No.17/2003/QH11, December 10, 2003. The "Governmental Decree No 59/2005/ND-CP and Article 3" requires an organization or individual to hold a permit when collecting sea products.

4. Utilization of sea snakes

Sea snakes are consumed by humans and are presumed functional foods by range of health benefits, including increasing virility, reducing arthritis, alleviating skin problems, and enhancing well-being during pregnancy. The bulk of sea snakes are exported to China, and to larger Vietnamese urban areas for food consumption. As we have repeatedly witnessed in Song Doc, Vung Tau, Ho Chi Minh City, and other locations over the entire period of study, nearly all parts of the snake are used: the meat is made into delicacy soups or fried; the blood is mixed with alcohol for drinking enhancing health and virility; the heart and the gall bladder are considered to be potent elixirs, and whole sea snakes are submerged in rice wine as drinks. Sea snakes are the source of "Rheumatin" made of by The National Pharmaceutical Co. No. 25 and home-produced "sea snakes glues - Cao Đông Cô Rắn Biển" sold also to cure joint pain, back pain, anorexia, insomnia, and to strengthen healthy tendons and bones.

DISCUSSION

In light of the published figures on snake and reptile trading (Brooks et al. 2010; Brooks 2007; Nijman 2010; Zhou 2004), harvesting sea snakes in the Gulf of Thailand via southern Vietnam is one of the largest exploitations of venomous snake and marine reptiles in the world. Yet apart from a few reports (Auliya 2011; McCarthy & Warrell 1991; Punay 1975), sea snakes are not even mentioned in studies concerning reptile exploitation in Asia or globally (Nijman 2010; Zhou 2005). This underreported status is particularly notable.

The 10 commercially traded sea snake species reported here represent a significant proportion of the 21 species known in the Gulf of Thailand or of the 25 species known for Vietnam, including the east Sea (Kharin 2006; Rasmussen et al. 2011a). According to (Elfes et al. 2013), indicate that nine percent of sea snakes are threatened with extinction, 6% are Near Threatened, and 34% are Data Deficient. The species in this study, as well as all other species known from the Gulf of Thailand, are currently categorized as either Least Concern or Data Deficient.

It should also be noted that the volume of the harvest of sea snakes that we document here from the Gulf of Thailand in 2013 is a conservative estimate of the total harvest from the Gulf, other areas of Gulf of Thailand is not document.

Little is known of the basic biology of sea snakes or their role in ecosystem function(Rasmussen et al. 2011b), thus we have little understanding of the effect this exploitation

may have on populations or the wider ecosystem. Our results provide evidence that the mass of snakes harvested from the Gulf of Thailand has been decreasing since 2012. This decrease could be an indication of trending over exploitation in many years or it could reflect fluctuations due to known and/or unknown factors. For example, the observed decrease in the mass of the harvest could be due to fewer snakes harvested and/or smaller (possibly younger) snakes harvested. Both results could indicate over-fishing.

This particular sea snake harvest has been going on essentially unnoticed by national and international conservation organizations for more than a decade, in part because it apparently does not overtly conflict with laws within Vietnam.

CONCLUSION AND PROPOSES

Having identified one of the largest sea snakes exploitations in the world in the Gulf of Thailand.

Proposing the following key steps to further assess the threat of commercial harvesting of sea snakes: (i) Continue to monitor the harvest identified in this study to establish long term effects on population numbers and studying the biological characteristics of two sea snakes- *Hydrophis cyanocincys anh Hydrophis curtus* to basing for conservation. (ii) Identify the location, species spectrum, and volume of sea snake harvest at other location from the Gulf of Thailand and wider South China Sea. (iii) Initiate conservation monitoring programs in key harvest ports, along with consideration of policy changes that would regulate the harvest and trade of sea snakes.

Acknowledgments

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Figures and Table

Figures

Figure Legends

Figure 1. Representative sea snake harvesting locations provided by 20 individual captains in command of 20 different squid vessels. Each location represents the "best" or "a usual" location for harvesting sea snakes per the captains' estimate and the available GPS data. Squid vessels tend to return to the same location if it was previously "good". As there are hundreds of squid vessels involved in sea snake harvesting, the area plotted should be regarded as the minimum actual area affected.

Figure 2. Sea snake species recorded in Song Doc and Vung Tau. A, *Hydrophis cyanocinctus*; B, *Hydrophis (Lepamis) curtus*; C, *Hydrophis ornatus*; D, *H. fasciatus*; E, *Acalyptophis peronii*; F, *Acrochordus granulatus*; G, *Thalassophina viperina*; H, *Hydrophis lamberti*; I, *Aipysurus eydouxii*; J, *Lepamis platurus*

Table 1. Biomass of sea snake traded by each merchants, during each trading sessions in 2013

Figure 3: Some pictures supporting information for reporting on: Investigation of sea snakes in Vietnam

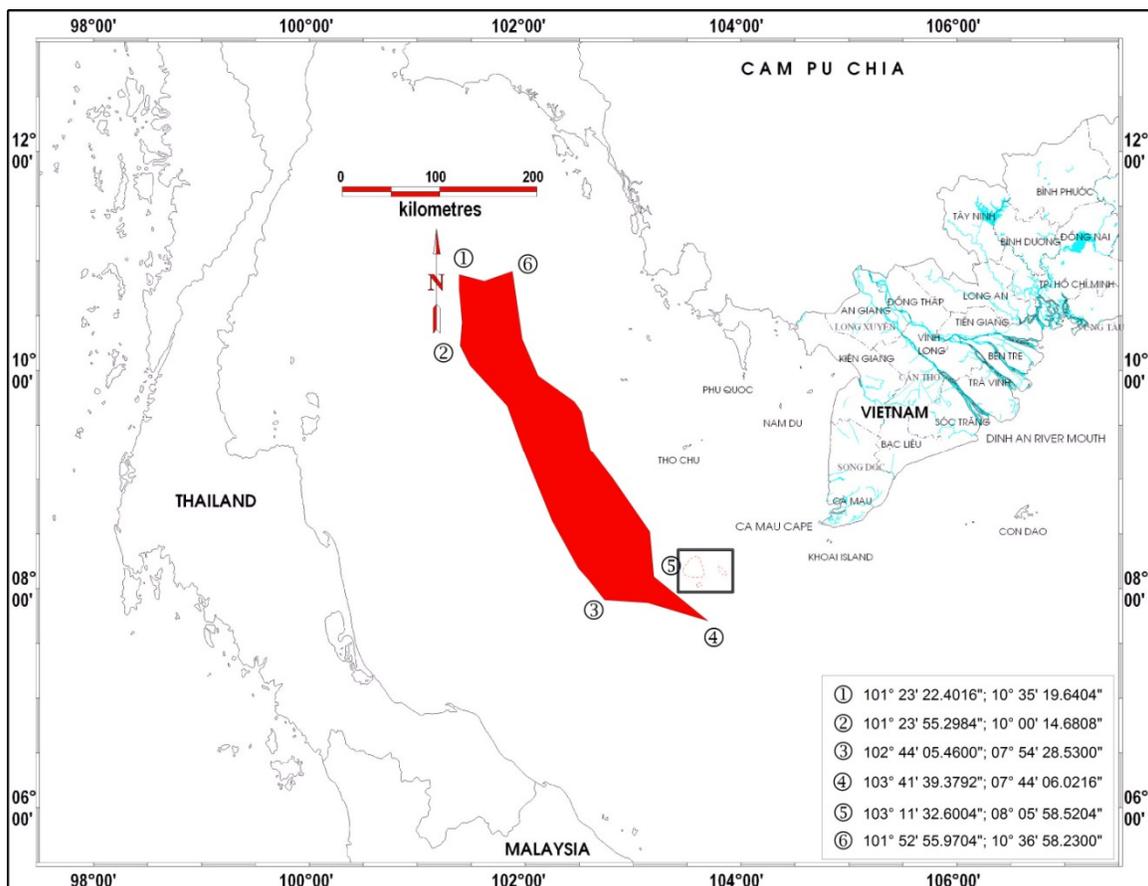


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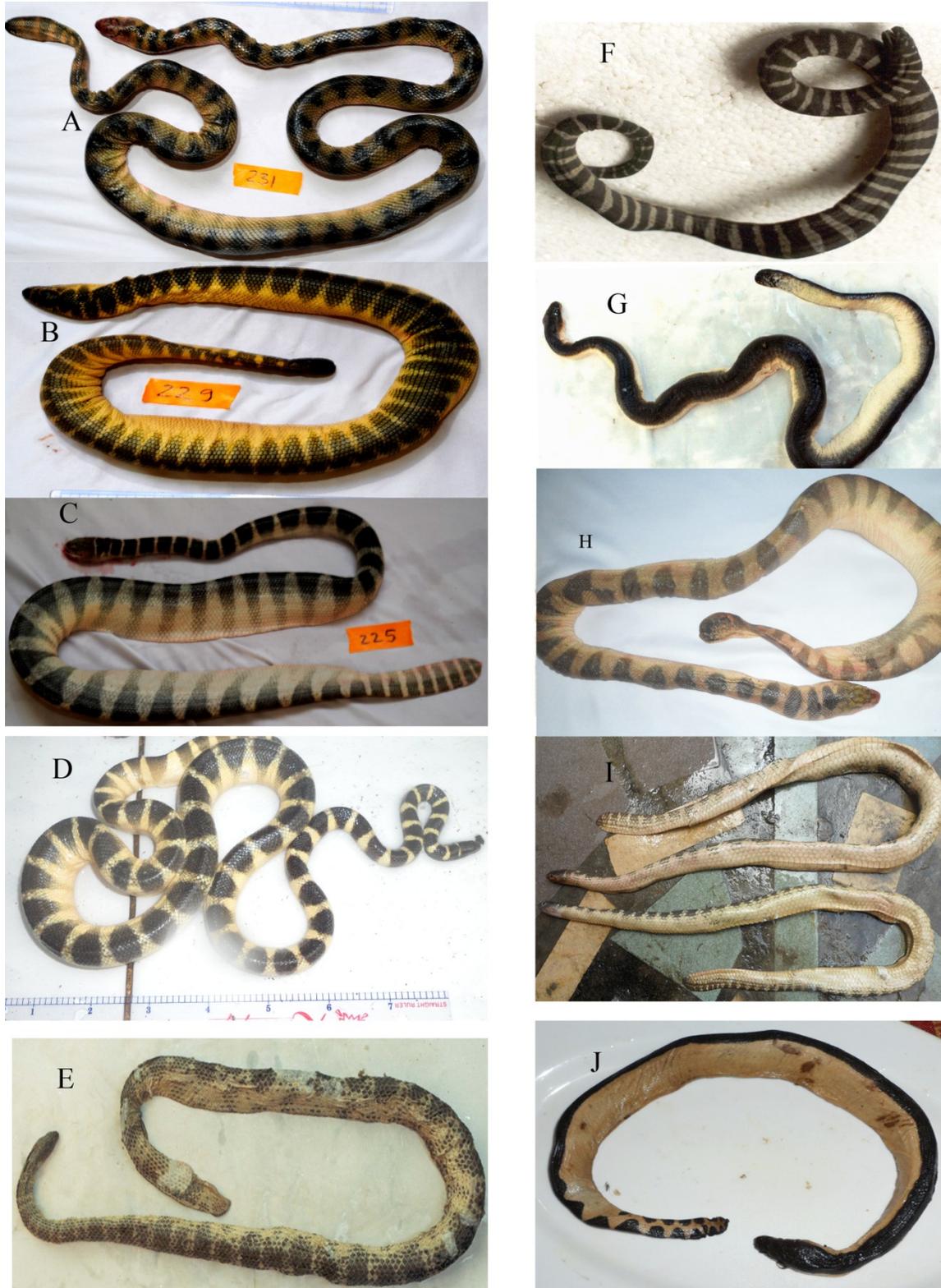


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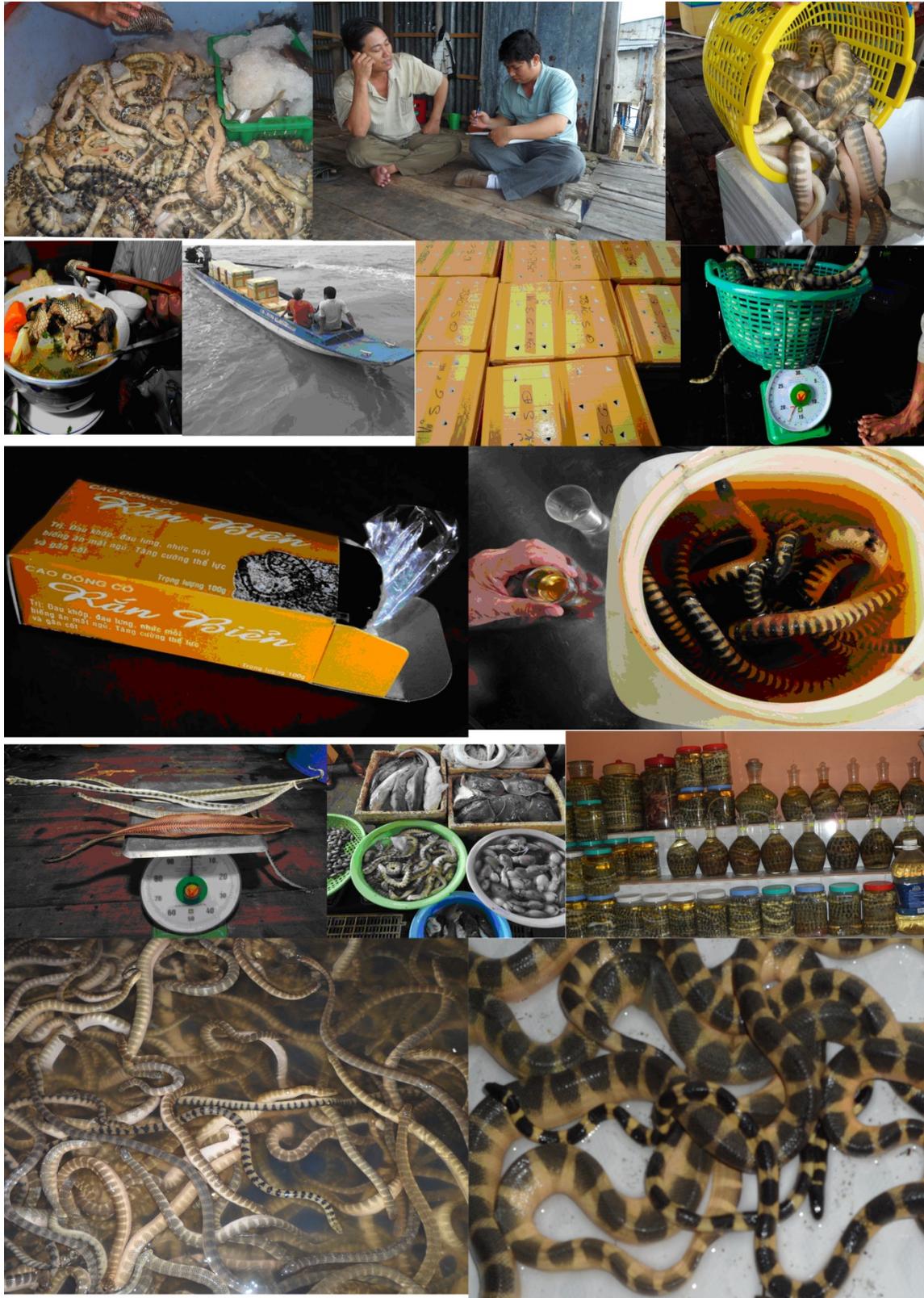


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