

## The Egg Trace Method of Identifying Diamondback Squid Fishing Grounds in Jamaican Waters.

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### ABSTRACT

Diamondback squid (*Thysanoteuthis rhombus* Troschel) fishing, a type of deep water fishing, started about 15 years ago in Japan. Diamondback squid exists all around the globe in tropical and sub-tropical marine areas, but at depth. Some smaller countries are yet to utilize this deep water squid resource. This new fishing activity was introduced to Jamaica in February 2004 by a Japanese technical assistance programme. This paper describes one way of finding diamondback squid fishing grounds with minimal cost, and within a relatively short period of time by utilizing the egg trace method which is proposed by the authors. In January, 2005 and February, 2006 two specimens were captured by special squid fishing gear off eastern Jamaica. A third specimen was taken in March, 2006 on the north coast. This was the first time that this species was recorded from Jamaica. It is thus a potentially new fisheries resource for the country. Diamondback squid fishing is proposed within the fisheries management plan for Jamaica. If the egg trace method is used as demonstrated in Jamaica it could make diamondback squid a new utilizable resource which may benefit great numbers of fishers in developing countries of the world.

KEYWORDS: Jamaica, diamondback squid, eggs, exploratory fishing, management, *Thysanoteuthis*.

### El método del Rastro del Huevo de Identificar las zonas de Pesca del Diamondback Calamar en Aguas de Jamaica.

La pesca del calamar del Diamondback (*Thysanoteuthis rhombus* Troschel), un tipo de pesca profunda, comenzado hace aproximadamente 15 años en Japón. El calamar del Diamondback existe todo alrededor del globo en áreas marinas tropicales y subtropicales, pero en profundidad. Algunos países más pequeños son todavía utilizar este recurso profundo del calamar. Esta nueva actividad de la pesca fue introducida a Jamaica en febrero de 2004 por un programa japonés de la asistencia técnica. Este papel describe una forma de encontrar las zonas de pesca del calamar del diamondback con coste mínimo, y dentro de un período del tiempo relativamente corto utilizando el método del rastro del huevo que es propuesto por los autores. En enero de 2005 y febrero de 2006 dos especímenes fueron capturados por el engranaje de pesca especial del calamar de Jamaica del este. Un tercer espécimen fue tomado en marzo de 2006 en la costa del norte. Éste era la primera vez que esta especie fue registrada de Jamaica. Es así las industrias pesqueras potencialmente nuevas. La pesca del calamar del Diamondback se propone dentro del plan de la gerencia de las industrias pesqueras para Jamaica. Si el método del rastro del huevo se utiliza según lo demostrado en Jamaica podría hacer calamar del diamondback un nuevo recurso utilizable que puede beneficiar a una gran cantidad de pescadores en los países en vías de desarrollo del mundo.

PALABRAS CLAVES: Jamaica, calamar del diamondback, huevos, pesca exploratoria, gerencia, *Thysanoteuthis*

### INTRODUCTION

Jamaica has a relatively narrow island shelf, particularly on the north coast. Water depth extends to several thousand meters only a few kilometers away from the coast line. The small scale fishermen practice mainly pot fishing in shallow water. The overall population increase has contributed to an increase in unemployment. Some of these persons started to engage in fishing, which is an activity that generally does not require a large initial investment. Increase in numbers of fishers in all fishing areas to around 20,000 using approximately 9,000 boats in 2006, along with other marine factors, has over time, resulted in over-exploitation which has reduced the mean size of fishes and decreased fisheries landings (Aiken, 1993; Aiken et al.,

2000). Among the factors that have complicated over-exploitation of fish resources is the urbanization of cities and villages, which has destroyed many mangrove areas, vital as nursery grounds for commercial fish and other harvestable species. Additionally, polluted effluent from human activities has resulted in poor coastal water quality and has negatively affected the coastal resources, including fishes, in several ways.

In an effort to realign focus on the important role of fisheries sector at the national level, the Fisheries Division approached the FAO to develop a specific Policy for Fisheries for implementation by the Government of Jamaica (GOJ) in the medium and short term. Within the overall management scheme, two new policies are proposed; 1)

new fishing licenses will not be issued for the first 5 years after the introduction of this policy. After 5 years, one new license shall be issued for each three retired fishermen, 2) parts of the relatively vast exclusive economic zone are not utilized at all, and as part of a utilization plan, deep water fishing should be encouraged.

Several island wide fisher's meetings were held to explain parts of this new fisheries policy, one on March 28th, 2004 at Montego Bay for north coast fishermen and one at Kingston on April 6th for south coast fishers. A few hundred fishers gathered at each meeting and lively discussions took place. Because all fishers were feeling the negative effects of overfishing, the new policy was generally accepted after these lengthy talks. The new fisheries legislation package is shortly to appear and be implemented in 2006.

In keeping with the strategy of encouraging offshore and deepsea fishing operations and to maximize the use of underutilized and non-traditional fishery resources, the Jamaican government asked the Japan International Cooperation Agency (JICA) to teach deep water fishing. JICA asked the Caribbean Maritime Institute to help with this request. They introduced two fishing methods, long line fishing at 200m – 300 m depth and diamondback squid fishing. Two days of training lecture and two days seagoing practice took place between February 10 to 13<sup>th</sup> 2004. However, there was no catch during the practice fishing sessions and thus no fishermen expressed interest in this new fishing technique.

In order to introduce a new fishing method to traditional or conservative fishermen, a successful catch should ideally be shown to them. It was essential to carry out a survey to identify good fishing grounds before the introduction of a new fishing method. However, it would cost

many million US dollars and several years to conduct a proper fishing ground survey of one country. It would be impossible to acquire such a large amount of aid money to a small emerging country such as Jamaica.

The authors proposed to several institutions to overcome this difficulty, namely

The Caribbean Maritime Institute (CMI), the University of West Indies (UWI), the Fisheries Division of the Government of Jamaica (GOJ), the JICA Jamaica office and Caribbean Fisheries Training and Development Institute (CFTDI) in Trinidad & Tobago. The authors explained to them that if they cooperated together, a simplified fishing ground survey could be carried out. This was agreed on in 2004. The survey was divided into 3 phases (Figure 1) according to availability of fishing boat. Phase one of the survey started in April 2004.

The diamondback squid (*Thysanoteuthis rhombus* Troscchel) is a large squid which can attain approximately 1.2m body length and weigh up 20kg. Figure 2 shows the second specimen captured in Jamaican coastal waters which was in the general size range as described in the literature. The life span is about one year. In Japan, Okinawan fishers and the Okinawa prefectural fisheries experiment station have together found a good method to catch them in commercial quantities. Although their actual behavior is not yet known precisely, they have found that the squid comes up from near-abyssal depths up to 500m deep to spawn where the depth of seabed is about 1,000m.

Possible fishing areas for this squid would be somewhere along the red line.

Provided the resources are present, diamondback squid fishing could be a profitable business judging from the fact that in Okinawa, there are many fishing villages where

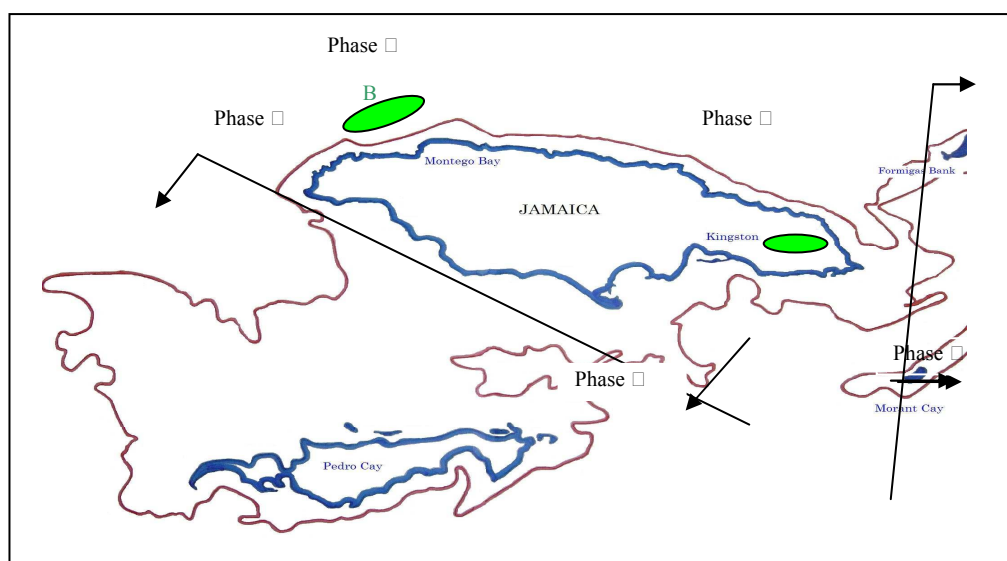


Figure 1. Map of fishing ground where fishing took place in the first phase of exploratory survey

their major product have switched from conventional fishes to diamondback squid.

## MATERIALS AND METHODS

### The first phase survey

Training ship CMI001 of the Caribbean Maritime Institute, in Kingston was used for the first phase. The nearest possible potential squid fishing ground near Kingston, based on bathymetric chart analyses, was identified as being near Morant Bay, St. Thomas, and this was surveyed three times. Then using fishermen's canoes, Montego Bay, St. James was surveyed three times. Unfortunately there was no catch of the squid at that time. However, during survey activities, we received very important news. As shown in Figure 2, diamondback squid produces an egg case of diameter 30cm and 1.5m length or more, which is round in shape and having a jelly-like texture. There is no other creature that produces a similar type of egg case. If we were able to find this egg case, then diamondback squid should be nearby. During the first phase, we met several fishermen who had observed this egg case before. If we survey only where egg cases are observed, the possibility of locating spawning areas would increase greatly.

We arranged to visit fishing villages with pictures of the egg case to locate the area where fishermen saw them. We limited our visits only to those villages where the 1,000m sea bed contour was close to the shore. These areas can be fished by their own small boat and may become financially feasible to practice squid fishing. We eliminated those areas where 1000m sea bed contour is far from shore because it would require a large amount of initial investment to start squid fishing even if good grounds were found. The area we selected was from Savanna-la-Mar in Westmoreland, going from that location westward around the westernmost tip of the island, then progressively eastwards along the north coast. We continued around the coast from Manchioneal, Portland in eastern Jamaica towards the southern coastline towards Kingston (See Figure 1). We eliminated ambiguous answers from fishers and ensured



**Figure 2.** Egg Case of diamondback squid

that sightings of jelly fishes were not confused with egg cases.

In the Second phase, we surveyed an area with the egg trace method measuring 25km on both the North and South Coasts. Along the south coast, 13 trial voyages were performed but actual fishing was carried out only 4 times because of strong winds, rough seas, and the malfunction of fishing gears.

## RESULTS

We found that there were only two locations where egg case presence was confirmed. The first was offshore Whitehorses in St. Thomas (Fig 1, area A) and an area between Green Island in Hanover and Whitehouse in St. James on the northwest coast. These two areas comprised only 50km of shoreline out of 350km surveyed. We support the view that even if egg cases were not sighted, there is a possibility that diamondback squid may exist, though in deep water. Since time and funds were limited, we felt that this method was a good and efficient way was to survey only those areas where egg cases are found. We thus named this practice the Egg Trace Method. In our case, we needed to survey only 15% of the total possible area. In our view given the small but successful results, it was a very economical and effective way to find new good fishing grounds for the diamondback squid.

As previously mentioned, during the second phase, a relatively small part (25 km) of the north and south coasts were examined. Fortunately on January 26, 2005, the first diamondback squid in Jamaica was caught (Figure 3). This was the first time that this species was recorded for Jamaica. It represents, therefore, a new fisheries resource for the island. The details of the fishing record for this catch are given in Table 1.

There were no signs on the bullet buoys marking the fishing gear that squids were hooked. But, when line No.1 was pulled up, two squids were hooked, one at each jig. The first squid was brought up to the boat, but the second one was brought to the gunwale, but dropped back into the sea. Both looked to be the same size. There was no catch on the other lines. The measurements of the first specimen caught was as follows.

Weight: 7.46 Kg (16.4 lb) ; Body length: 60 cm (1.97 ft) ;Tentacle length : 52 cm (1.71 ft); Body width:16 cm (0.52 ft) and Mantle width : 49 cm (1.61 ft)

Three exploratory voyages were attempted on the north coast. But bad weather prevented actual fishing. Moreover, the ship developed mechanical troubles and the squid season finished without any further catches.

During the survey, previously unknown peninsulas were observed under the water in both north and south coasts. These were good fishing grounds. However, exact locations and sizes of the peninsulas were not confirmed. On the south coast, the current was reported to run from east to west. But all flags with lines drifted from west to

**TABLE 1.** Details of the first diamondback squid longline catch 26 January, 2006.

Gear No. (L = 500m)	No. 1	No 2	No 3	No 4
Cast Start	06 : 40 am	07 : 08	07 : 25	07 : 35
Cast End	07 : 00	07 : 20	07 : 29	08 : 00
Pull Start :	09 : 55	10 :25	10: 38	11 : 00
Pull Finish :	10 : 20	10 : 32	10 :55	11 : 10
Submerged hrs	02 :55 hrs	03 :05	03 : 09	03 : 00
Seabed Depth (m)	1077 m	1077	1069	1062
CMI Dock Return	13 :10 pm			

January 26 (Wed) Weather : Fair, Wave height : 60cm - 1.2m, Wind : Mild North East

CMI Dock Departure: 04 : 45 am, Sailing time 2.00 hrs

Fishing Ground Arrival: 06 : 40 am Sailing time: 1 hr 55 mins.

Fishing Ground Position: Latitude N 17° 45.6', Longitude W 76° 31.1' (6 km off St. Thomas).

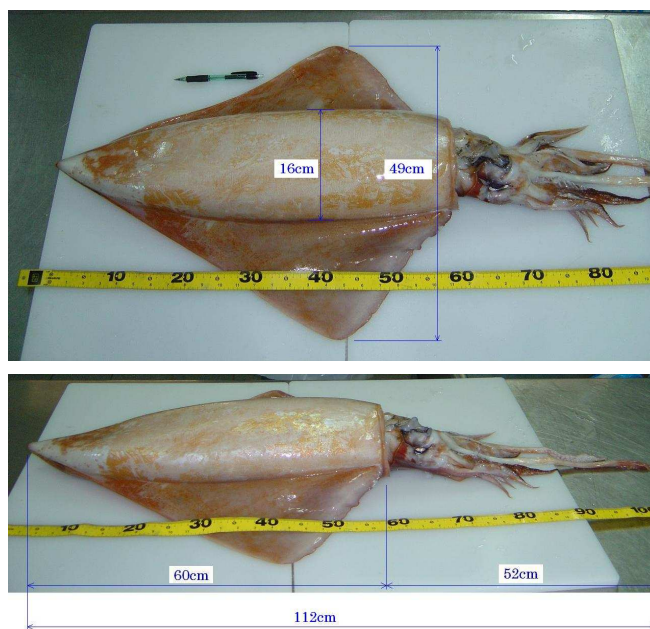


**Figure 3.** Second diamondback squid caught February 09, 2006.

east, contrary to the common understanding. This suggests that at that time of year there was a counter-current at a position 6km off the coast of St. Thomas.

#### DISCUSSION

It is our view that the egg trace method is effective as a simplified diamondback squid fishing ground survey method. In situations where there are insufficient funds and limited time, a nationwide survey focusing particularly on seabed depth and terrain, ocean currents, weather patterns



**Figure 4.** The first Diamondback Squid *Thysanoteuthis rhombus* Troschel caught in Jamaican waters, January, 2005.

and other features could be carried out. However, if both more funding and time are available, one should visit all fishing villages with pictures of squid egg cases. If there are any villages where the egg cases are observed, one should conduct trial fishing close to those villages. Other villages should be put aside for future survey when time and money allow. This could be a simplified method of survey.

Diamondback squid exists all around the globe in tropical and sub-tropical waters. If we want to apply the

method successfully developed in Jamaica to other parts of the world, then the following steps should be followed.

1. Choose a survey area where the sea bed contour is 1,000m and not far from the shore (not more than 16 km).
2. Visit fishing villages within proposed survey area with pictures of egg case.
3. Ask fishermen with those criteria. There should be multiple fishermen who saw egg cases. They should have seen egg cases recently and these should not be confused with jelly fish.
4. Trial fishing should be performed only in those areas where egg cases are sighted.
5. A workshop should be held in those villages where egg cases are observed. Safety at sea should be taught, how to handle fishes sanitarly, and how to carry out deep water squid fishing.
6. ) The Fisheries Division should regulate and control all deepwater fishing through a special licensing regime.

There are tremendous numbers of poor fishing villages around the globe in areas where the continental shelf is narrow and good shallow water fishing grounds are absent. At those areas, 1,000m sea bed contour is in many cases close to the shore. This would enable poor fishermen to go to these fishing grounds with their small canoe. By supplying new squid fishing gear developed in Japan (at only US\$250), they could discover a new food resource. This fishing technique is in our view, very simple. We support the view that finding new diamondback squid fishing grounds by the egg trace method could become one of the effective aids to poor fishing villages all over the globe.

A new fisheries management policy as part of the new Fisheries Act is under development in the Jamaican parliament. After it is enforced, a new scheme relating to deep water fishing is essential for sustainable resource management.

The authors recommended the following 4 points to the Fisheries Division.

1) In order to practice diamondback squid fishing, a deep water fishing license must be acquired. Fishermen who want to get this license are required to take a deep water fishing course at Caribbean Maritime Institute or equivalent places.

2) This deep water fishing course will consist of the following;

- a) safety on small boats
- b) sanitary fish handling techniques
- c) diamondback squid fishing
- d) sustainable resource management.

3) The quantity of catch must be recorded and be reported to the Fisheries Division periodically. Fisheries

Division should control all deep water fishing fishermen. If any unusual data appear on daily catch records, the precautionary principle will apply.

4) Zoning of fishing grounds should be introduced. Fishing cooperatives would have the right to fish within the designated zone and have an obligation to patrol illegal fishing within the zone.

### CONCLUSION

This paper describes a new squid fishing method called the egg trace method which enables the identification of diamondback squid fishing grounds using limited funds, and by taking only a short period of time. If this method is applied to fishing villages along tropical and subtropical sea coastlines where continental shelves are narrow, many poor fishermen could benefit by accessing a potentially new deep water fishing resource which have not yet been utilized.

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### GLOSSARY

CFTDI – Caribbean Fisheries Training Development Institute.

CMI – Caribbean Maritime Institute, Jamaica.

FAO – Food & Agriculture Organization of the United Nations.

GOJ – Government of Jamaica.

JICA - Japan International Cooperation Agency (JICA) is one of Japanese government aid organization formed in 1965.

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