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## Anchovies stick held box net: Design, operation and catch in Kelantan

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### Abstract

A study was conducted in Kelantan in 2016 that focusing on design of the new fishing gears and fishing operation of the anchovies stick held box net (ASHBN). The fishing operation was carried out during night by using metal halide lamp. It was found that, the species caught during the fishing operation were *Encrasicholina punctifer*, *Sardinella fimbriata*, *Amblygaster clupeioides*, *Dussumieria elopsoides*, *Rastrelliger kanagurta*, *Rastrelliger spp.*, *Sardinella sirm*, *Decapterus macrosoma*, *Loligo duvauceli* and *Selar crumenophthalmus*. The dominant catch was *Encrasicholina punctifer* which is about 92.7% from the total catch during that year and was appeared in every operation. As a conclusion, this gear is an innovation from anchovies purse seine and a great alternative to increase the catch of the anchovies in East Coast off Peninsular Malaysia.

**Keywords:** Anchovies, metal halide lamp, stick held box net, Kelantan, fishing gears

### Introduction

Light fishing has existed for thousands of years and the technology ranges from the use of simple torches on single boats to sophisticated and complex artificial illumination systems from multiple boats. Light fishing requires a multidisciplinary and complex approach to fishing; it is more than just fishing *per se*, but requires significant engineering of different types of light, from gas light systems to modern LED systems. It requires significant knowledge of physics, including light transmission in water and how it changes with conditions, as well as biology and physiology, including understanding how fish and other animals see and perceive the light, including knowledge of their response to light stimuli. Nowadays, the metal halide lamp is commonly used by fishermen to aggregate fish. ASHBN is one of the preferable fishing gears that using light to operate in Kelantan for capturing anchovies. Fish behavior can be pretentious even by artificial light stimuli. A common response of fish groups to the attendance of artificial light is to school and move near the light source<sup>[1]</sup>. The creation of underwater illuminated fields by means of artificial light is regularly exploited on fishing vessels in order to expand catches. Indeed, many fish of commercial attention react to visual stimulation by swimming near the light source and keeping aggregated closely<sup>[1, 3]</sup>.

ASHBN is an improved version of the squid castnet, with incorporated elements of a stick held box net. There are two patterns of net construction; one is to join 6-8 triangular pieces of the cutting pattern on 1 normal 2 bar (1N2B), and the other way is to join rectangular piece with different lengths, so the shortest one is at the top of the finished product and the longest one is at the bottom. At the bottom of the net, there is an iron chain sinker, and iron or stainless steel rings at 1 meter intervals. These rings are for the purse line, which is a 12-14 mm thick polyethylene or polypropylene, normal cross-rope.

The fishing operation is carried out at night, from a boat equipped with electric luring lights. The net is set on a iron stick, as for the stick held box net. The catch is mainly anchovies, but also squid and other fishes. Fishing is done mostly in Kelantan water, all the year around, and is the most wide-spread form of anchovies fishing in Kelantan water.

Light intensity is the main aspect in the operation of ASHBS to facilitate fishermen in increasing of catch. Fishes had been observed to possess a positive phototactic behavior<sup>[2, 4]</sup>.

The fishes will gather together toward the light sources when stimulus to light. Various color of metal halide lamp has become an important advance method to control the anchovies for capturing process. Freon and Misund [3] stated that various type of commercial interest showed response toward the light sources. This make ASHBN one of the suitable contributor fishing gears to exploit anchovies resources in Kelantan.

The aim of this study was to determine the design and efficiency of catch towards anchovies for the development of artificial light fishing in the future.

**Materials and Methods**

The research was conducted in the water of Kelantan with distance above 8 nautical miles from the shore.

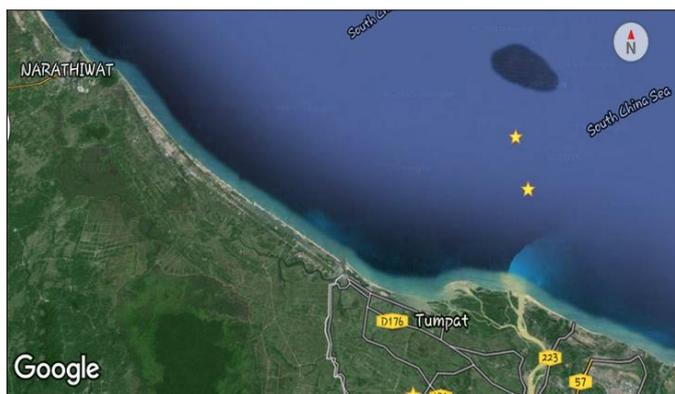


Fig 1: Map of the study location for ASHBN in Kelantan Water

**Research Period**

The operation was conducted on 17 and 18 May 2016 for the technique and fishing gear testing. From 2015 and 2016 for anchovies catch data collection.

**Design and Technical Specification**

ASHBN is construct like a box shape which comprise of net that has been modified, so that it is in the shape of a cube or a box. The upper edge is a rope with the hanging ratio 0.7-0.6, the bottom edge of the net there is an iron chain sinker, and iron or stainless steel ring at 1 meter intervals. These rings are for the purse line, which is a 12-14 mm thick polyethylene or polypropylene, normal or cross-rope. The two outer vertical edges and sometimes all four edges, have rings and rope attached, so that the net can be lifted like a curtain during setting. The purpose of this is to minimize the surface, therefore the resistance, of the net in the water. In all other respect, this gear is similar to an ordinary stick held cast net. The components of the ASHBN consist of:

- A body net made of polypropylene (PP)
- Weights (consist of lead)
- Rings (made of stainless steel)
- Floats
- Pulley
- Horizontal bars made from bamboo or iron which is mounted on the side of the vessel to open the net before the operation was started
- Light pole – which is mounted on the side of the vessel where the luring light was placed.

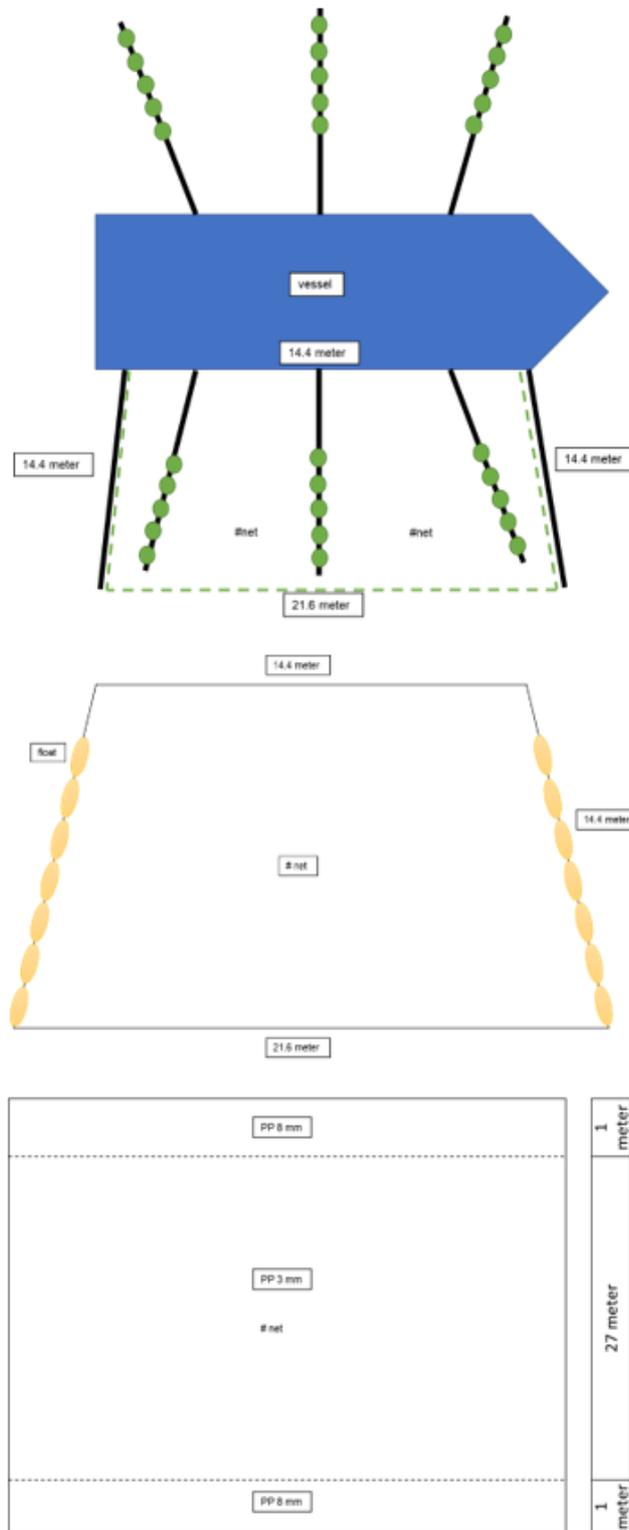


Fig 2: Schematic drawing of Stick Held Box Net

ASHBN is operated using a vessel <40 GRT and powered by 250-1000 Watts lamps. The net size is approximately 31-36 meter in depth and 73 meter long and the set of bamboo booms around 15 meter. The net is made of polypropylene, with a mesh size 3mm. The bottom selvedge also made of polypropylene with 8 mm mesh sizes. At the bottom of the net, a lead or sinker line attached to the stainless steel rings to form a purse line.

## Operation Procedure

In Kelantan, ASHBN is operated in water around the island with the luring light. The operation is performed by dropping down the box net onto the target and subsequently pulling the bottom purse line. The main species are anchovies. The operational step are as follows:

1. The length of the net circumference is 73 meter.
2. The total weight for the lead and rings is 335 kg.
3. The purse line is inserted through the rings which attached along the net
4. Metal halide lamp of 1000 W each are used as luring lamp and 8 unit of lamp are fixed to the bamboo poles on each side of the vessel. 6 poles were used in each vessel.
5. When reaching the fishing ground, an anchor is used to fix the vessel.
6. After sunset, all the lamp are switched on and the net is ready to be released.
7. When the anchovies are well aggregated around the vessel, the lamp are gradually dimmed. The anchovies are rushed towards the area that the lamp is still switched on, which is at the net side of the vessel. At this time, the intensity of the yellow light will further reduce and then switched off. While the red lamp is use to stop and differentiate the fish from anchovies is turn on then the net is drop onto the water.

## Data Recording

Catch data were collected by state fisheries assistant and be record by research assistant in Fisheries Research Institute.

## Data analysis

The meta-data used in the catch per unit effort (CPUE) analysis was taken from Department of Fisheries Statistics. The landing data of 72 unit ASHBN vessels within 2 years period was analyzed to generate the result of CPUE. Since the anchovy fishing fleet used almost the same gear and similar modus operation, the standardization of fishing effort was using the days at sea.

## Results and Discussion

From the study that was made almost two years in Kelantan State, there are a few species of anchovies that were identify in this country. *Encrasicholina heteroloba*, *Encrasicholina punctifer*, *Stolephorus indicus* and *Stolephorus commersonii* were the common species that were caught by the anchovies vessel operator. In Kelantan water, *Encrasicholina heteroloba* and *Encrasicholina punctifer* were the dominant species. Geting village in Tumpat district was the village that have a lot of anchovies vessel operator. The anchovies vessel was called by the local as "Pukat Suluh Bilis". This is because, the vessel use a high watt lamp, which is metal halide to attract the anchovies at night before they catch them. The phototactic behaviour has been observed previously in fish and squids, where they "aggregate in the illuminated zone of artificial lights" [2]. When the light was switched on, the squids lose its direction of movement immediately due to the direct stimulus behaviour [2] and thus were easily attracted and aggregated. Fish will lose its direction of movement when its self-

controlling system is disturbed, causing it to be easily attracted to the artificial light [5].

## Anchovies fishing area in Kelantan water

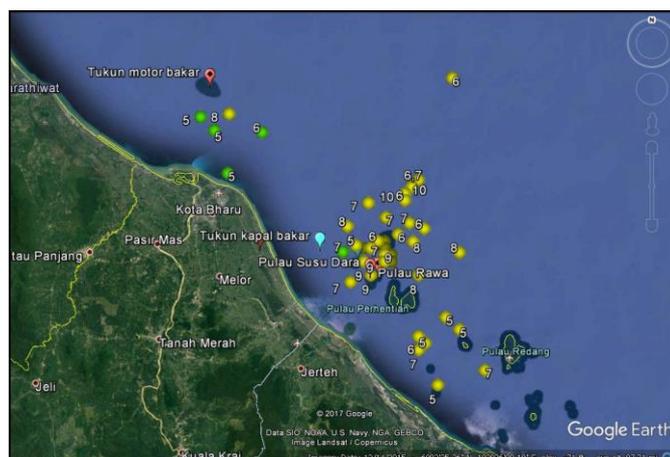


Fig 3: ASHBN fishing area in Kelantan water in 2015 and 2016

Figure 3 shows the ASHBN operation area in Kelantan water were nearly of a few island such as Susu Dara Island, Rawa Island and Perhentian Island. Also, in Tumpat area likes Tukun Motor Bakar.

## Fish catch composition by ASHBN

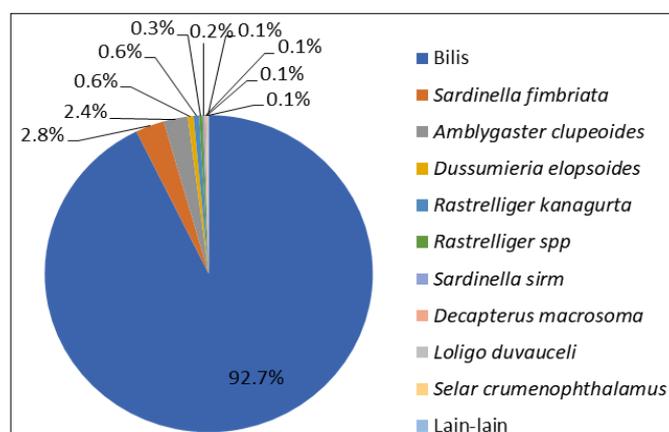
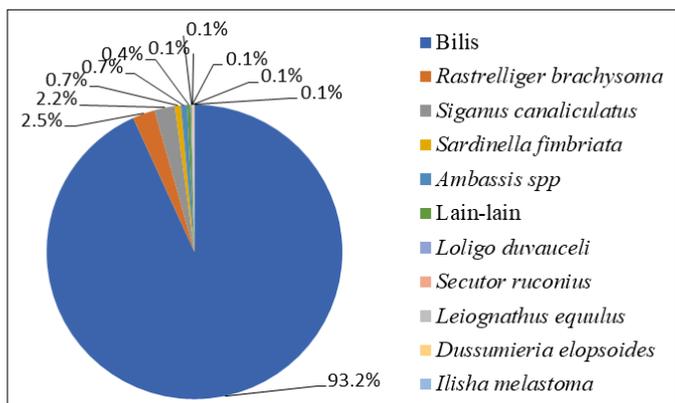


Fig 4: ASHBN catch composition in Tumpat, Kelantan.

Anchovies is the main catch of ASHBN in Tumpat, Kelantan which contribute 92.7% from the total catch (Figure 4). Other species that high in catch are *Sardinella fimbriata* (2.8%), *Amblygaster clupeioides* (2.4%), *Dussumieria elopsoides* (0.6%) and *Rastrelliger kanagartha* (0.6%) [6]. Although the result showed that other species also attracted by the artificial light, in facts, fishing with the artificial light effects were different between species [4] (Marchesan *et al.* 2005). As stated by Inoue [7] reported by Ibrahim and Hajisamae [2], every species has different favourable range of underwater illuminance following the theory of optimum light for aquatic animals.

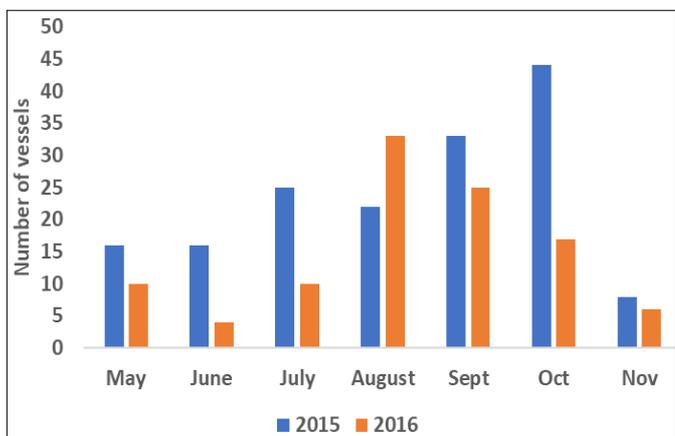
**Fish catch composition by anchovies purse seine (APS)**



**Fig 5:** Anchovies catch composition in Langkawi Island, Kedah.

Anchovies is the main catch of APS in Langkawi Island, Kedah which contribute 93.2% from the total catch (Figure 5). Other species that high in catch are *Rastrelliger brachysoma* (2.5%), *Siganus canaliculatus* (2.2%), *Sardinella fimbriata* (0.7%) and *Ambassis spp.* (0.7%) [6].

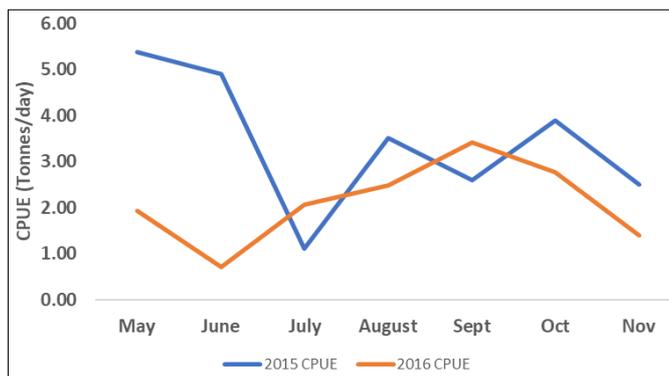
A comparison of anchovies being catch by these two fishing gears shows that APS captured more anchovies than ASHBN. This is because, APS operate all year long, while ASHBN only operated in certain month in a year. Commercial species of fish like *Rastrelliger spp.* also was highly catch by APS than ASHBN.



**Fig 6:** Number of ASHBN vessel in monthly operation for 2015 and 2016 in Kelantan.

From figure 6, there are a slightly increasing of ASHBN vessel operated in July until October for 2015 and in August for 2016. In Kelantan, catching season for anchovies is different from West Coast off Peninsular Malaysia which is all year long. The high abundance of anchovies is found from June until October only. In November to March, the number off ASHBN vessel operated is low due to monsoon season in East Coast off Peninsular Malaysia.

**Kelantan**

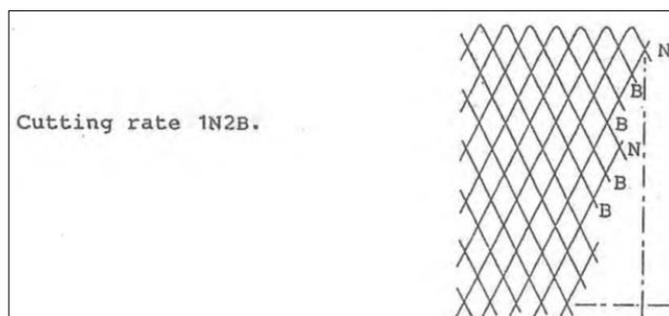


**Fig 7:** Catch Per Unit Effort for Anchovies Stick Held Box Net for 2015 and 2016 in Tumpat Kelantan.

Figure 7 shows the value of CPUE for anchovies in Tumpat, Kelantan. In May 2015 shows the highest CPUE which is 5.37 (tonnes/day) and the lowest CPUE 0.71 (tonnes/day) is recorded in June 2016.

Phototactic behavior (the attraction to artificial light) has been experiential both in fish and squids. Some pelagic fish species and squids are known to have a optimistic phototaxis by poignant towards and collective in the illuminated zone of artificial lights [1, 8, 9, 10, 11, 12].

**Appendix**



**Fig 8:** 1N2B net cutting pattern



**Fig 9:** ASHBN vessel in Tumpat Kelantan.

**Landing for anchovies in year 2015 and 2016 in Tumpat**



**Fig 10:** Metal halide lamp use in ASHBN vessel

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### Conclusion

The characteristics of the light source affected the response of the species towards artificial lights. This situation was also applied to other fish species. This fishing gear is one of the successful gears that catch the targeted species when being used with artificial light. Further study on the ecology, the visual behaviour, and the response of the dominant or targeted species to the artificial light might generate a useful information for the development of artificial light fishing. Additionally, this could improve the management of marine resources, as well as the economic and conservation issues.

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