Scope for mechanized fishing of teleosts with light attraction in Southeastern Arabian Sea

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The sense of vision coupled with powers of chemoreception is used by many fishes to orient and perform activities such as foraging, breeding and avoiding predators. In such cases their behaviour is affected by light stimuli, natural or artificial. These responses include changes in schooling behaviour, spatial distribution, migration, reproduction etc.

In fishing, artificial lights are often used to find or lure fish which are then harvested with encircling nets or other gears. In India light fishing is not widely practiced except for Chinese dipnet fishing in backwaters of Kerala.

Under an NAIP funded project on oceanic squids CMFRI conducted an extensive study for the exploration of resources purple back flying squid *Sthenoteuthis oualaniensis* in the Arabian Sea using a trawl converted for squid jigging using light attraction. The vessel operated bright overhead lights (18 metal halide lamps, 1.5 kW each) at night, for attracting and aggregating squids near the vessel and it was observed that besides squids a number of marine fishes were also attracted to the light. Major groups of fishes thus attracted were halfbeaks, sardines, anchovies, mackerel, horse mackerel, scads, dolphin fish and tunas.

Oceanic fish aggregation using lights

During August 2009 to April 2013 Hooks and lines operation was carried out in the squid fishing ground (8°N to 17°N lat 64°E to 76°E long) at night after 2 to 5 h of illumination. Six to eight numbers of hooks (#8,10) were tied alternately on a Polyamide monofilament line (50 m length and 0.8 mm thickness) and used for tuna and other pelagics. Sharks were caught by # 1-01 hooks with 1 mm thickness line of 50 m length.

Hook and line operations conducted in the squid jigging grounds in Arabian Sea, contributed a total

catch of 925 kg of fishes (Table.1), of which 75% was contributed by tunas such as *Euthynnus affinis* (Little tuna), *Sarda orientalis* (striped bonito), *Auxis rochei* (Bullet tuna), *Katsuwonus pelamis* (Skipjack tuna), *Thunnus albacares* (Yellowfin tuna) (Fig.2). The other groups in the catch were moonfish *Mene maculata*, horse mackerel *Megalaspis cordyla*, sharks such as *Carcharhinus falciformis* (Silky shark), and *C. limbatus* (Blacktip shark).

Table 1. Species composition in Hook and line catch at squid fishing ground

Fish group	Species	Size range (cm)	Avg catch wt.(kg)
Tuna	*Euthynnus affinis*	25-35	200
	Sarda orientalis	30-45	200
	Katsuwonus pelamis	30-45	120
	Thunnus albacares	30-60	100
	Auxis rochei	15-20	70
Others	*Megalaspis cordyla*	20-30	45
	Mene maculata	12-20	48
	Scomberoides tol	15-30	10
	Carcharhinus falciformis	75-100	72
	Carcharhinus limbatus	70-100	60

Coastal fish aggregation using lights

On the basis of aggregation of fishes observed in the oceanic waters, experimental light fishing trials with a purse-seiner was carried out in the coastal waters off Mangalore (Fig.2). Using a combination of two fishing vessels, *MV Titanic*, equipped with metal halide lights which served as the light source or the 'light-vessel' and *MV Angel*, a purse-seiner which functioned as the fishing vessel for setting and hauling the nets operations were made between 12° 49' N and 74° 46' E, 12° 53' N-74° 39' E and 12° 56' N-74° 40' E at 27 m depth during 11-14 January, 2013.

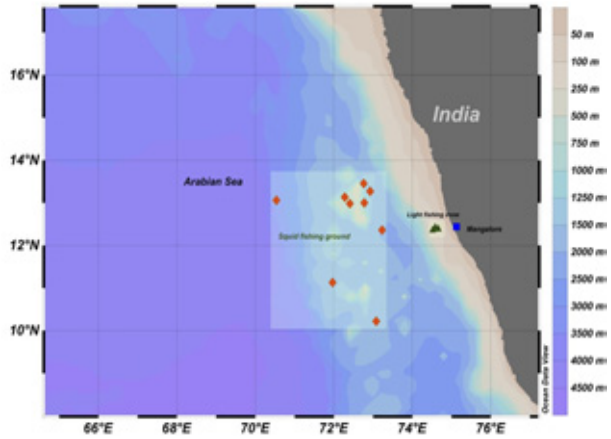

Fig. 1. Map showing the offshore H&L operation grounds and coastal purse seine net operation ground.

The fishing operation was conducted at night, between 21.00-22.00h. On reaching the ground, fish schools were aggregated using luring lights. Fishing operation began when the aggregation of fish was found adequate. The anchor of the light-vessel is hauled up and the net is shot surrounding the aggregated school of fish and the light-vessel. Once the purse-line is hauled, the light-vessel leaves the net by pushing the float line underwater and passing across the float-line.

Purse-seine catch was estimated as 12.1 t of mix pelagics from the coastal waters off Mangalore. The major groups contributing to the catch were Thryssa *sp.*, Carangids, squids, mackerel, whitefish, black pomfret, seer fish, dolphin fish, shrimps and miscellaneous fishes (Table 2). They were caught during a total of 3 fishing trips that carried out 2 hauls per trip. Maximum aggregation was recorded after five hours of illumination. The purse seine net operation without light conducted in the same cruise caught 1.5 t sardines only. The light fishing trials with purse-seine harvested mixed pelagics of commercially importance in a short period of time.

Light fishing is one of the best methods for aggregating and harvesting commercially important species during new moon phases. Light assisted purse-seining attempts to harvest fishes whose capture with standard purse-seines becomes ineffective when fishes are found in numerous small schools. Similarly, in situations where they are poorly concentrated or spread over vast areas, the

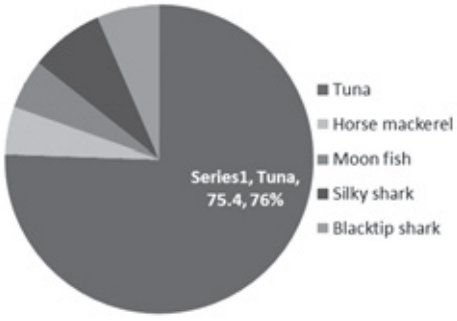

Fig.2. Mean percentage of species-wise catch in hook and line operations

Table 2. Catch composition in purse seine with different time intervals of illumination

Fish catch in purse seine net		***Duration of illumination (h) & Quantity (kg)***		
Species composition	**Common name**	**Qty (kg in 2 h)**	**Qty (kg in 3 h)**	**Qty (kg in 5 h)**
Thryssa mystax	Moustached thryssa		3000	5000
Carangids*:*				
Alepes djedaba	Shrimp scad	500	1000	1000
Megalaspis cordyla	Horse mackerel			
Decapterus russelli	Indian scad			
Rastrelliger kanagurta	Indian mackerel	100	100	
Lactarius lactarius	Faise trevally	100		
Uroteuthis (Photololigo) duvauceli	Indian squid	50	200	400
Parastromateus niger	Black pomfret	20	25	30
Scomberomorus commerson	Spanish mackerel	10		200
Trichiurus lepturus	Grey ribbon fish			200
Coryphaena sp.	Dolphin fish			200
Metapeaneus dobsoni	Flower tail shrimp	2		
Miscellaneous		5		
Total		787	4325	7030
Grand total		12,142 kg		

use of light enables concentrating them and capturing large quantities in a relatively short period of time. Purse seining with light is an option in coastal areas while hook and line operation can be considered as an accompanying gear during light assisted squid fishing in oceanic grounds. However, care should be taken to avoid the incidental catch/ by-catch of small sized and immature aggregating juveniles or non-commercial groups which may be attracted to the light. Furthermore, caution has to be exercised in determining the number of light fishing units in each fishing zone otherwise it may lead to over exploitation of resources.

Fig. 3. Purse seine net operation off Mangalore by MV Angel with light