Fishery Environmental Dynamics and Fishing Gear Research Laboratory

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- Research focused on the relationship between marine environment changes and biophysics of pelagic fishes by collected environmental variables from multi-sensor satellite data to investigate effects of climate changes on the catch rates, distributions of pelagic fishes, e.g. tunas and grey mullet (*Mugil cephalus* L.) in the Taiwan.
- The research direction on fishing gear and fishing method are mainly related to fish behavioral dynamics and conservation, such as reduce the bycatch rates, fish swimming dynamics and fishing gear relationship, mesh selectivity and fishery waste recycling. To find a balance between fishing gear and sustainable use of fisheries.

Research results(1): Marine environment changes and biophysics of pelagic fishes

(1) Effects of climate variability on the distribution and fishing conditions of yellowfin tuna (*Thunnus albacares*) in the western Indian Ocean

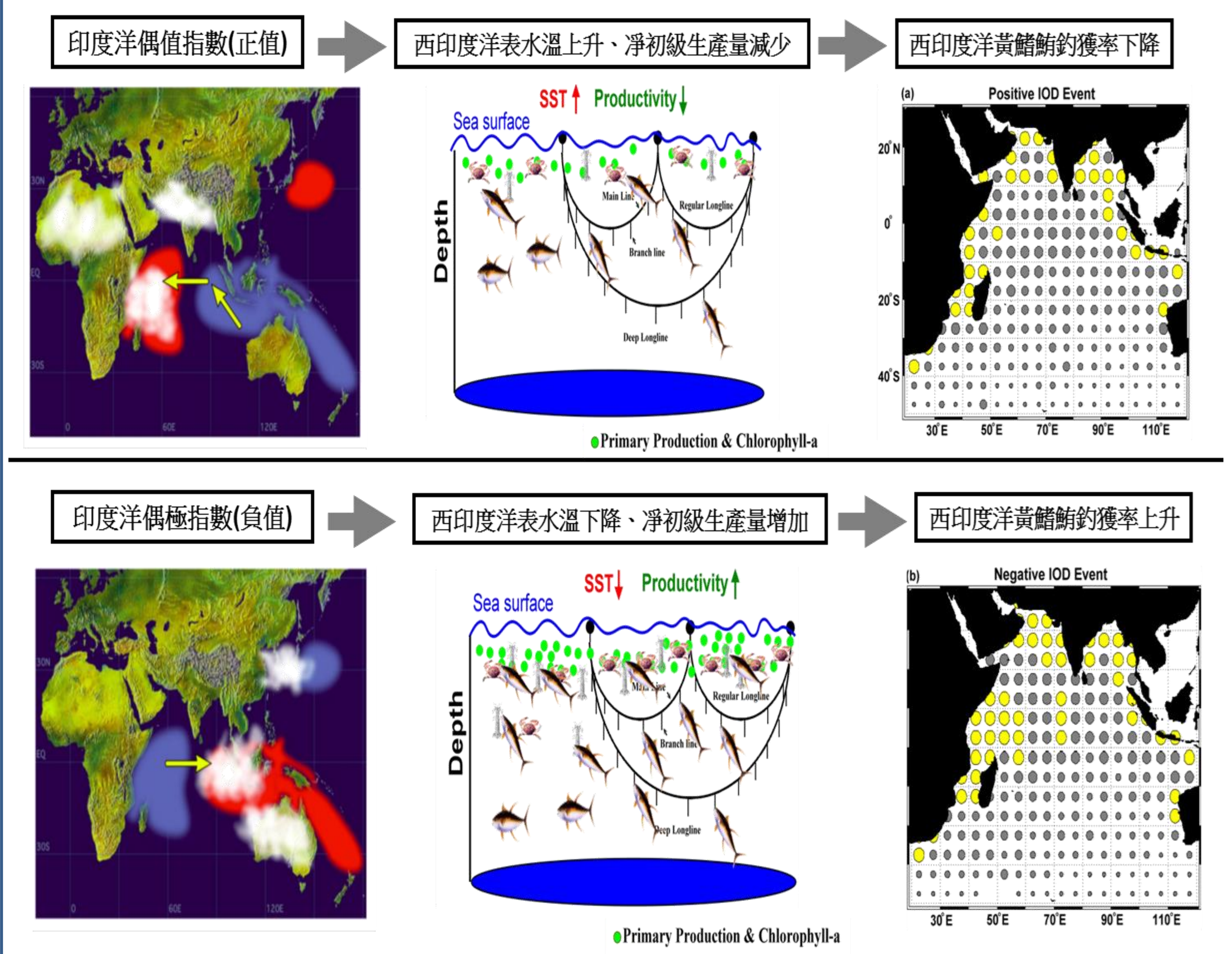

Fig. 1 Spatial distribution of standardized CPUE of yellowfin tuna during positive and negative IOD events

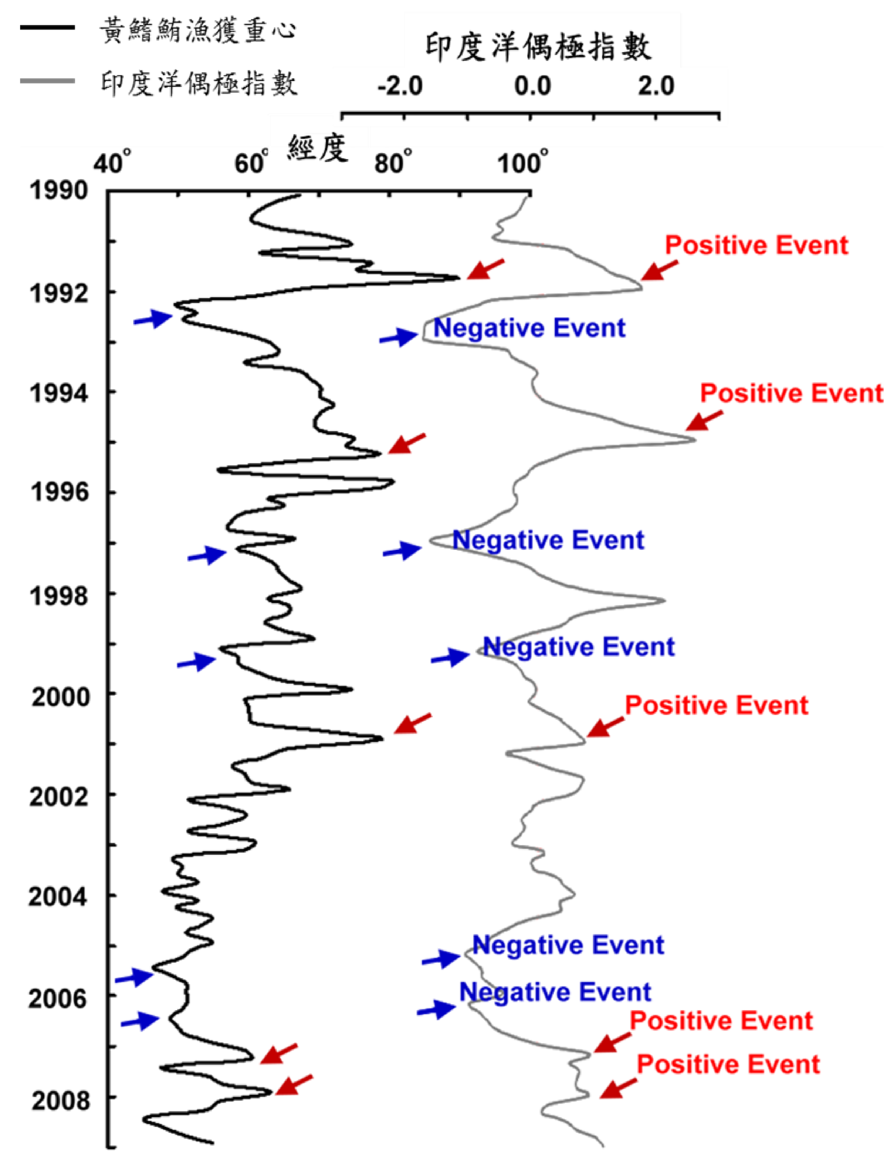

Fig. 2 Longitudinal gravitational center of standardized CPUE of yellowfin tuna and the DMI

(2) Cyclic Fluctuations of Climate Change Effects on the Annual Fishing Conditions of Grey Mullet (*Mugil cephalus L.*) in the Taiwan Strait

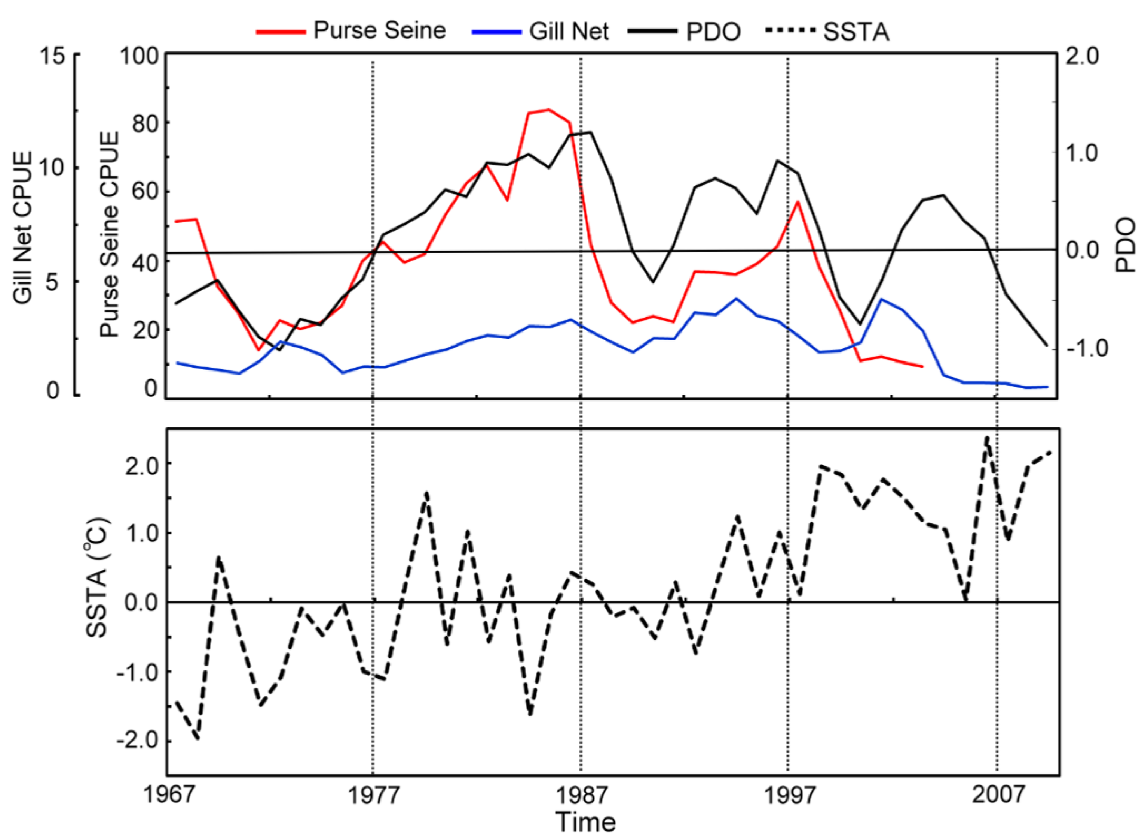

Fig. 3 Annual trends of (a) grey mullet CPUE of purse seiners and gill net with PDO and (b) winter SSTA

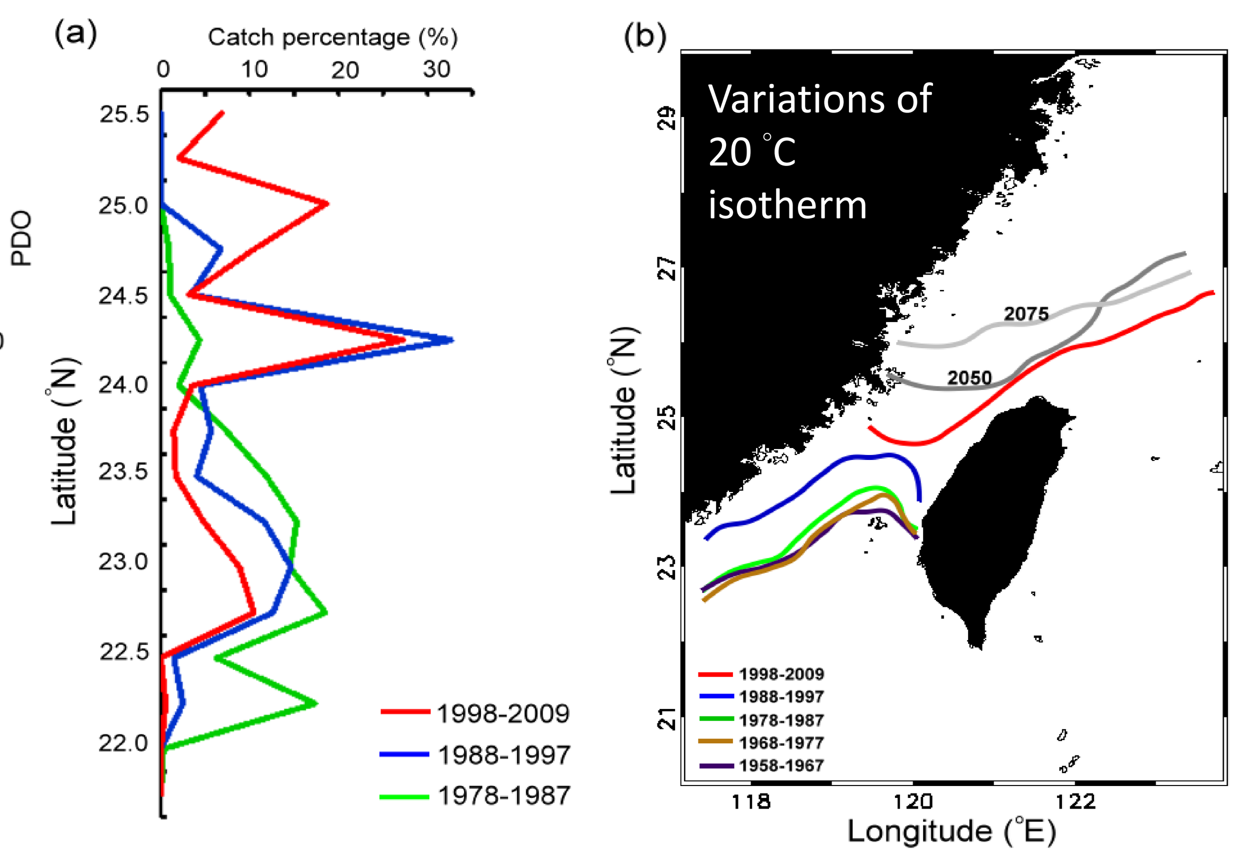

Fig. 4 (a) Latitudinal variations of the catch percentage of grey mullet (b) Latitudinal variations of the 20 °C isotherm in winter.

Research results(2): Fishing gear and sustainable use of fisheries

(1) Reduce the bycatch rates of seabirds in the longline fishing industry :

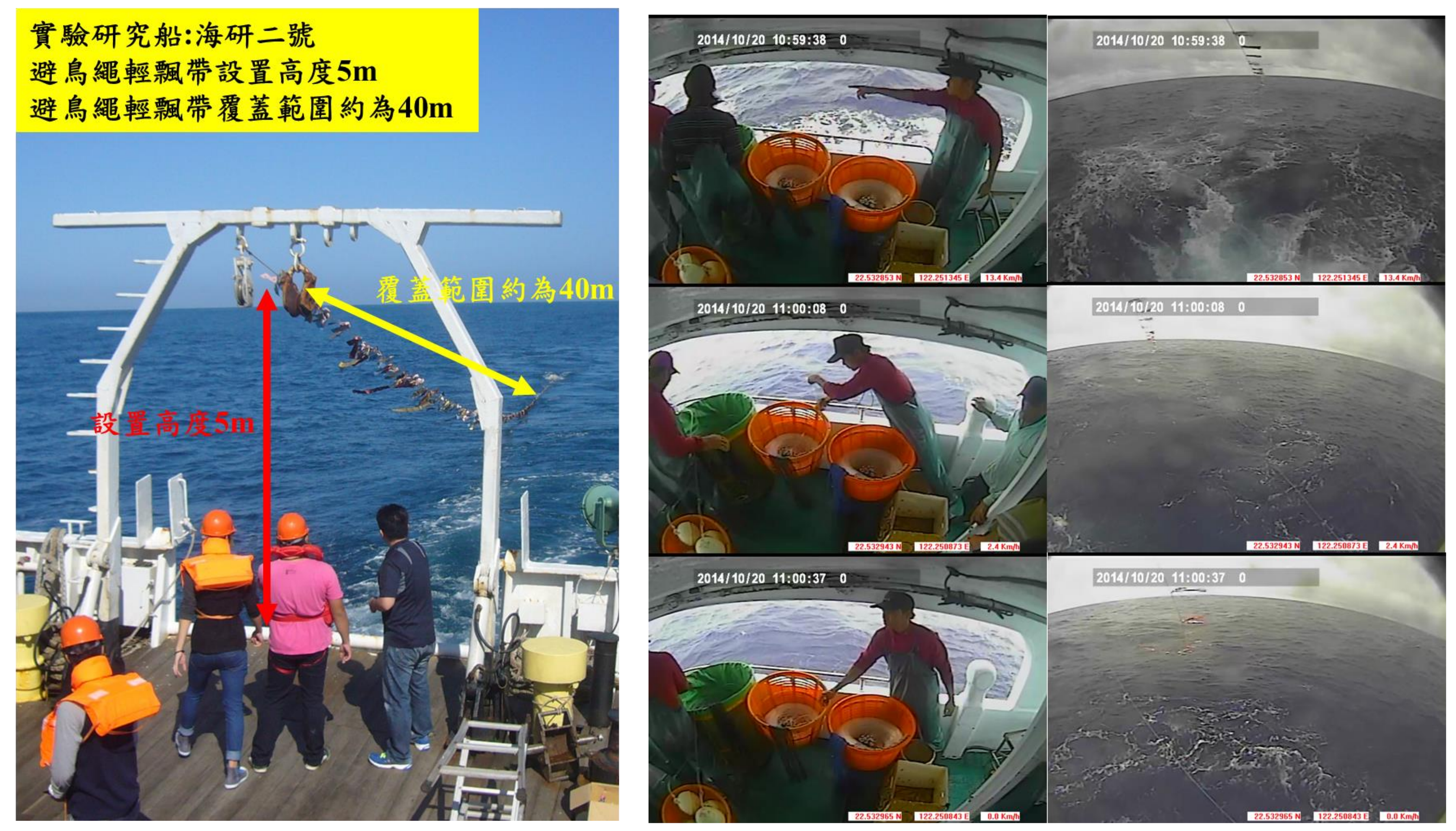

Fig. 5 Research on bird-scaring lines tangle with surface floats and lead to lost fishing gear

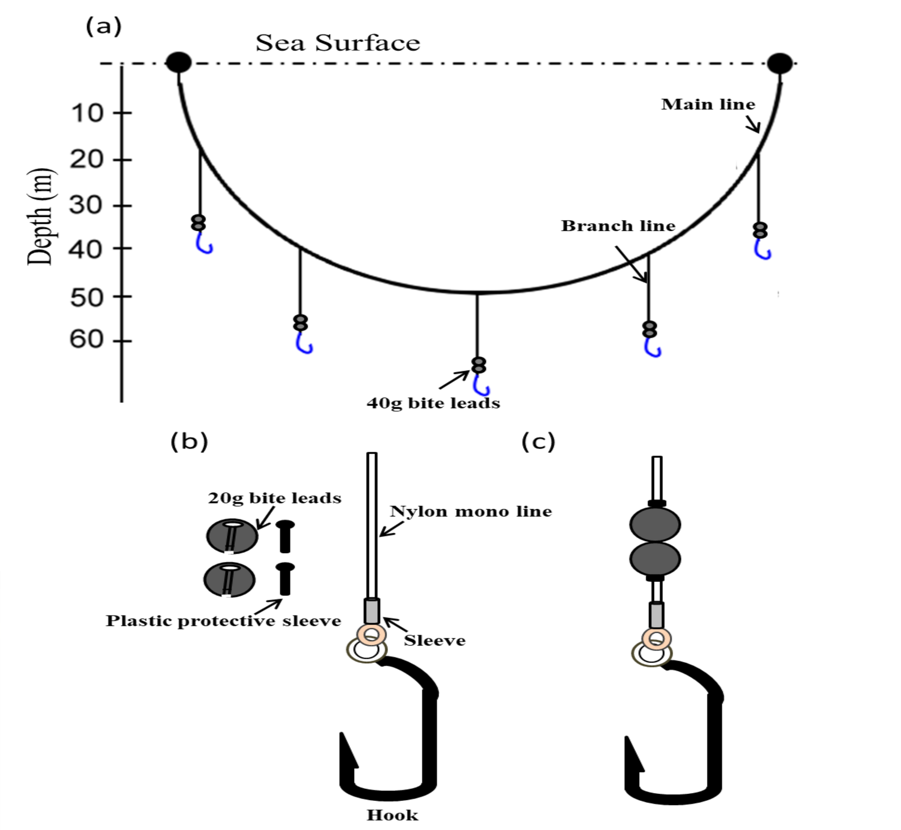

Fig. 6 (a) weighted branch lines (b, c) improved regime bite leads and slidable

(2) Swimming behavior of fishes with reefs

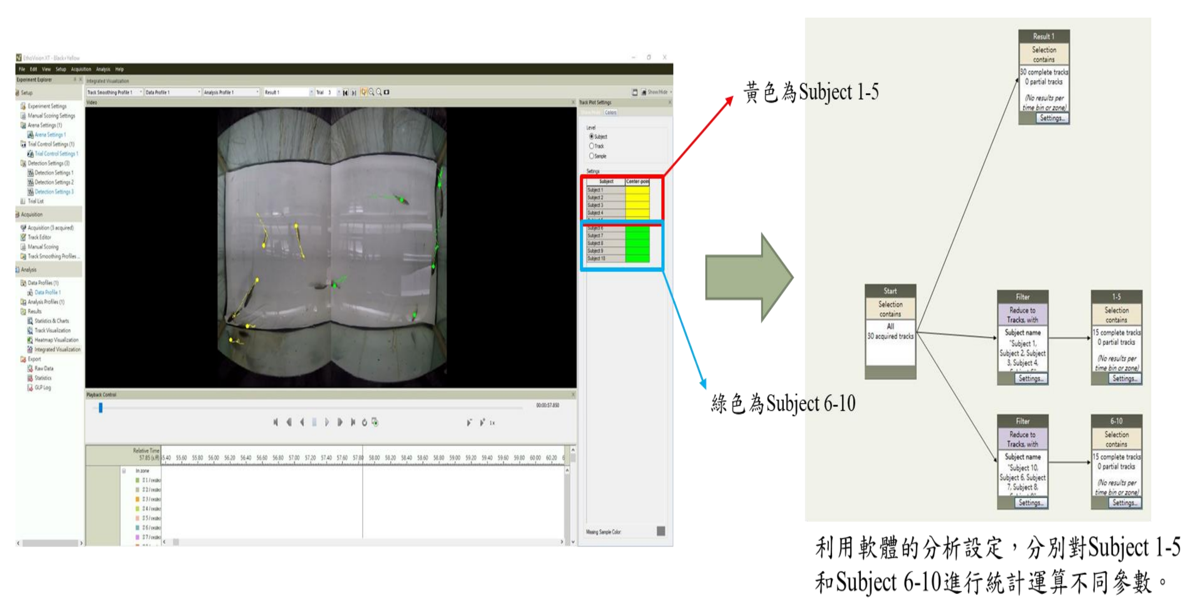

Fig. 7 Using animal trajectory tracking software

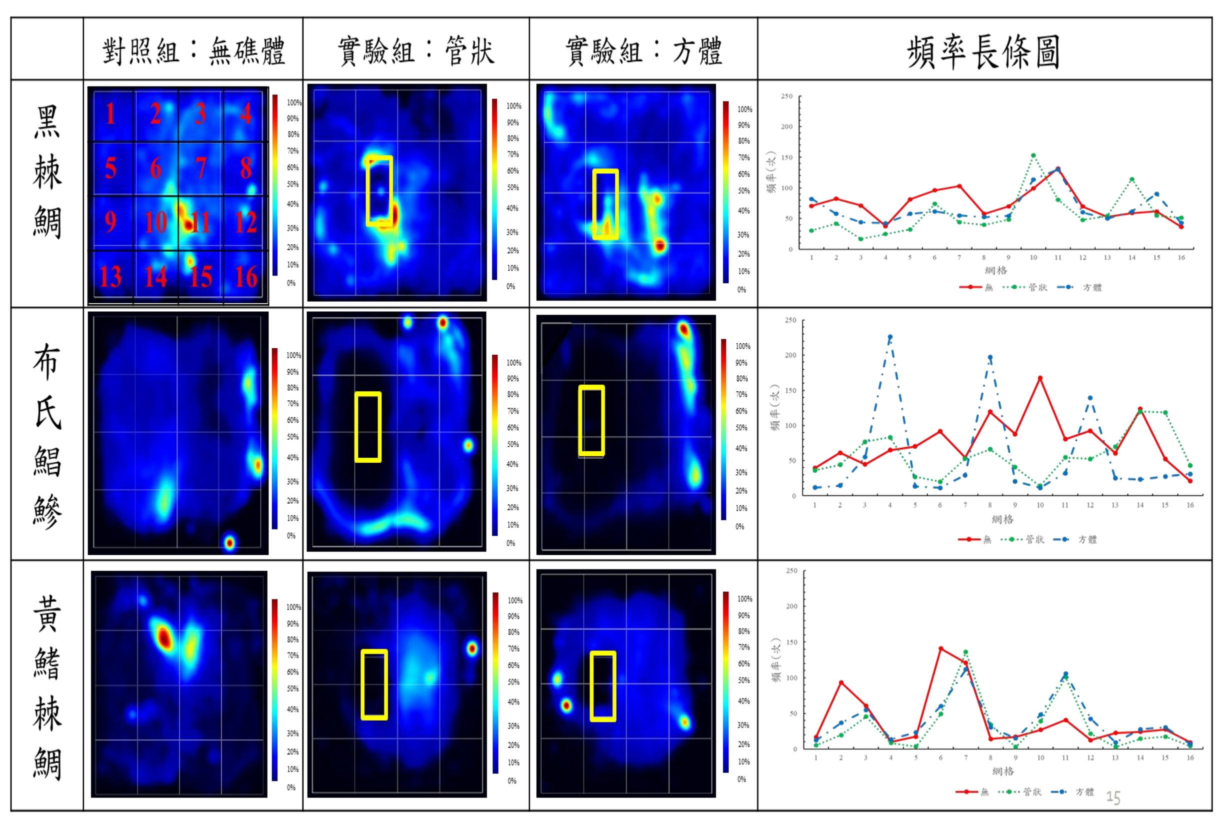

Fig. 8 Swimming behavior of fishes with reefs

(3) Investigation on mesh size selective

Fig.9 Photos on fishing gear and mesh size investigation

Species	Parameter L∞	Parameter K	Parameter t 0	Locality / Sex	Authors	Maturity Length	Appropriate Mesh Size
鮸魚 *Miichthys miiuy*	71	0.32	-0.97	Russian	Jarzhombek, 2007	54.8 cm	100 mm
弗氏絨鬚石首魚 *Micropogonias furnieri*	49	0.194	-1.47	Argentina / Unsexed	Haimovici, 1977	30.6 cm	
	54.7	0.12	-4.67	Brazil / Unsexed	Haimovici and Ignacio, 2005		
	57.5	0.277	-0.28	Brazil / Unsexed	Haimovici and Umpierre, 1996		
	60.1	0.219	-2.08	Brazil / Female	Vazzoler, 1971		
黑鯛 *Acanthopagrus schlegelii*	40.7	0.51	0.258	Tokyo Bay / Male	Yamashita et al., 2015	29 cm	103 mm
	43.9	0.346	0.258	Tokyo Bay / Female	Yamashita et al., 2015		
台灣馬加鰆 *Scomberomorus guttatus*	128	0.18	-0.46	India / Unsexed	Devaraj , 1981	40 cm	90 mm
日本花鱸 *Lateolabrax japonicus*	78	0.225	-0.76	off Sanriku / Unsexed	Yasuda and Koike, 1950	35.9 cm	調查中
	85	0.193	-0.66	Matsushima Bay / Unsexed	Hatanaka and Sekino, 1962		
	101	0.177	-0.76	Yangtze River / Unsexed	Sun et al., 1994		
	125	0.142	-0.27	Japan / Unsexed	Yasuda and Koike, 1950		
長鰳 *Ilisha elongata*	49.5	0.32	-0.41	Japan	Zhang and Takita, 2007	40.7 cm	154.8 mm
	49.5	0.26	-0.65	Korea / Both sexes	Kim et al., 2007		

Fig. 10 Biological parameters and optimal mesh size

漁場環境動態與漁具漁法研究室

- 本研究室主要收集多衛星遙測與模式演算水文環境資料結合臺灣遠洋與沿近海漁業漁獲資料，分析探討漁場環境因子與各時間尺度氣候變異指數間之變動關係，以釐清變動周期與關連性，並藉由找尋洄游性魚類潛在棲地位置，探尋海洋環境變遷對於漁場分布的改變，以提出未來建議與研究方向。
- 漁具漁法研究考量近年來海洋資源減少，因此研究方向主要與行為動態與保育相關為主題，如海鳥忌避措施研發、魚類游泳動態與漁具關係、網目選擇性與漁業廢棄物再利用等研究，盼能為漁具漁法與漁業永續利用間找到共存的平衡點。

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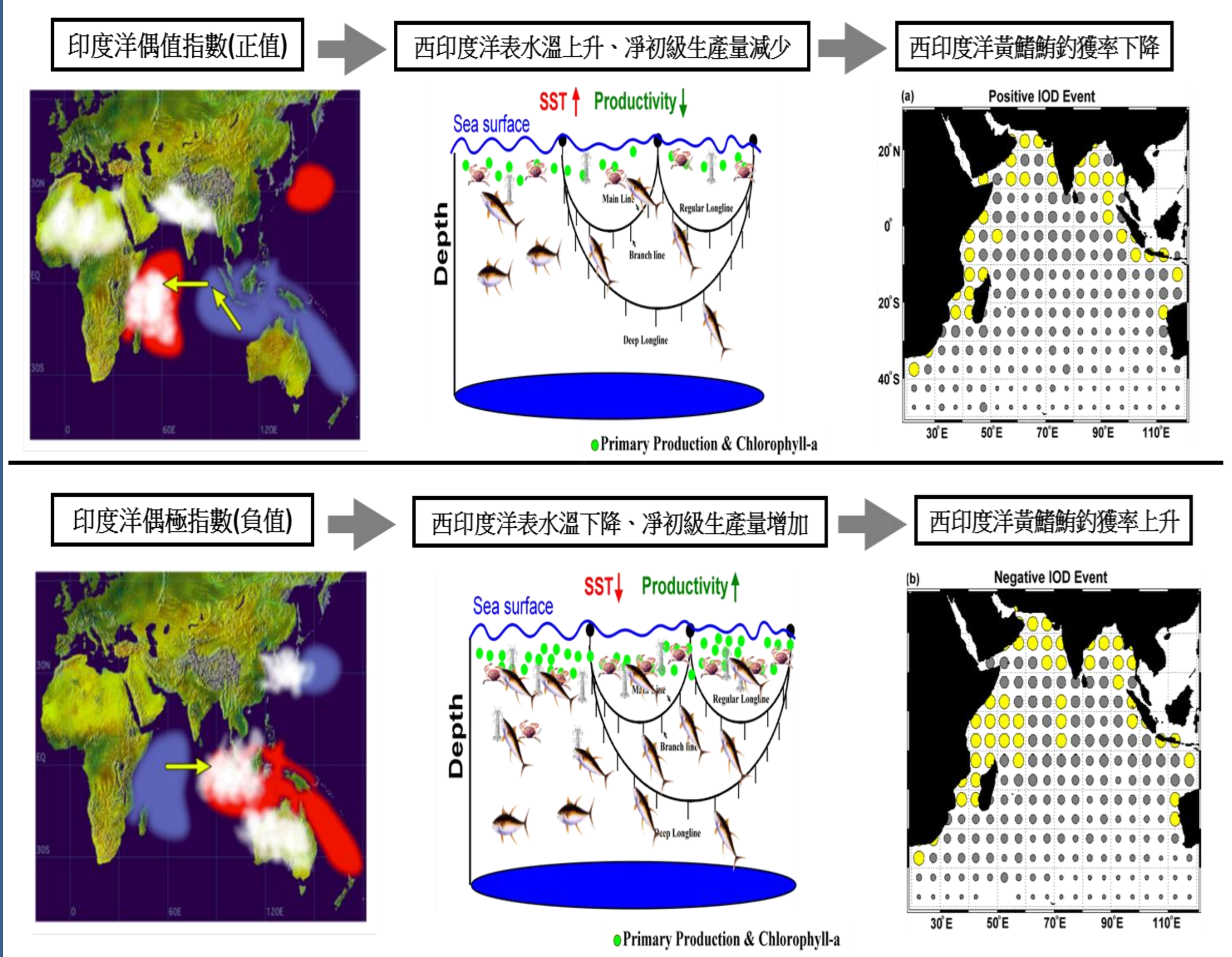
研究成果展示

海洋環境變異對臺灣遠洋與沿近岸漁場之影響

(1) 遠洋漁業:印度洋偶極正事件會使得印度洋西側海域表水溫出現異常的高值，黃鰭鮪的釣獲率則會減少，且黃鰭鮪的漁場重心位置也顯示與偶極正負值有相似的變動趨勢，推測原因與適水溫和初級生產力改變有關。



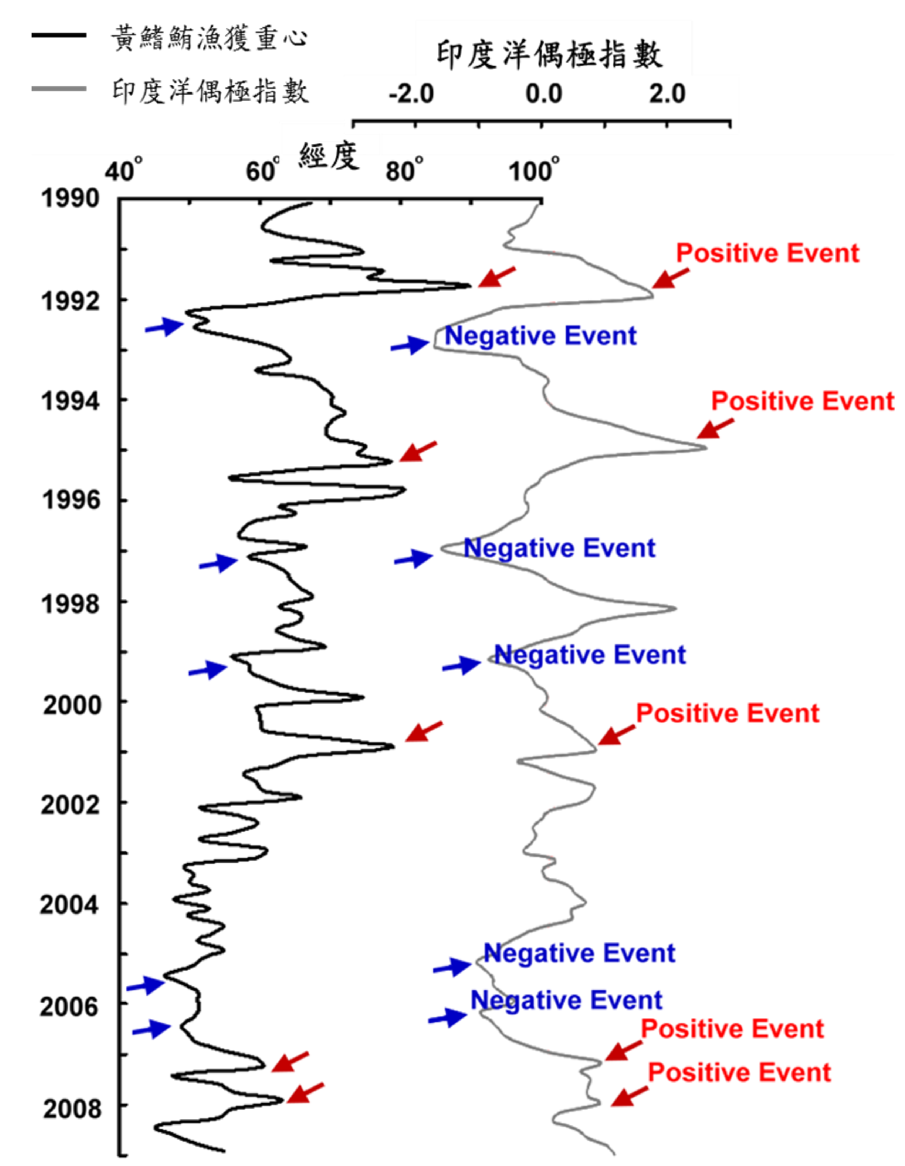
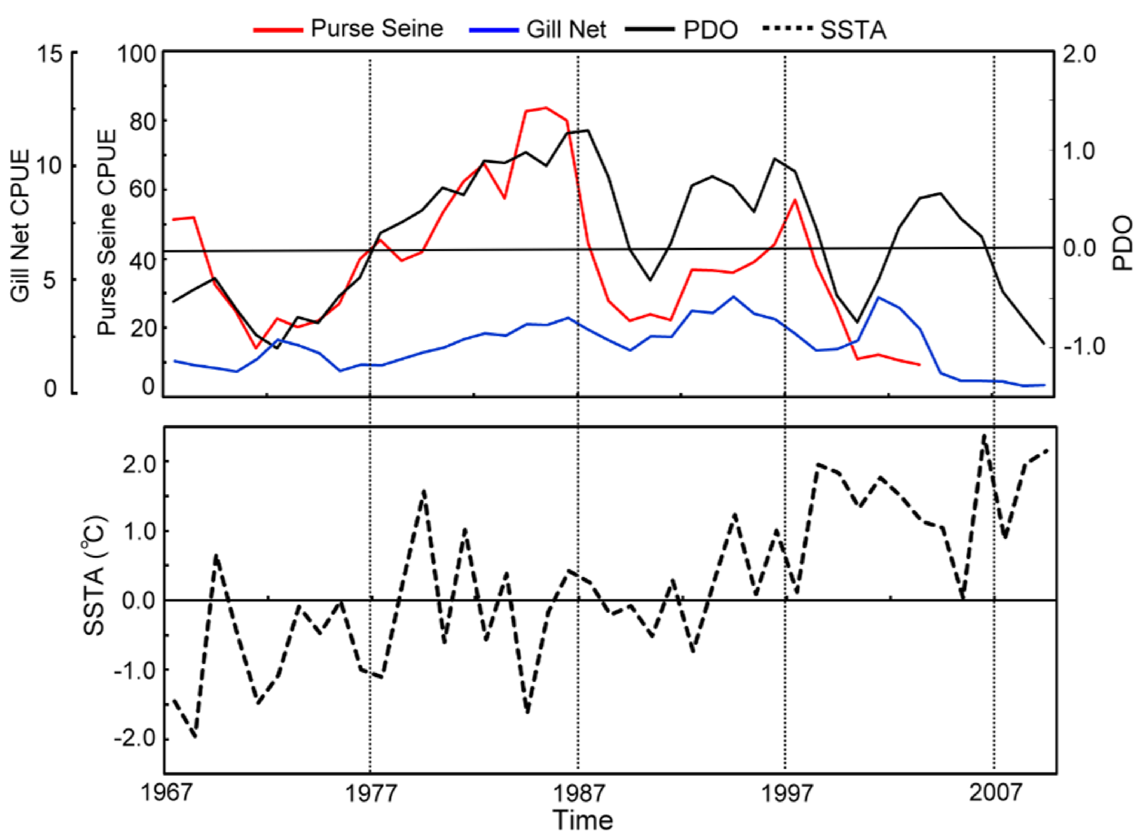


Fig. 1 印度洋海洋環境變動影響黃鰭鮪釣獲率關係圖　Fig. 2 印度洋黃鰭鮪漁獲重心與偶極指數變動圖

(2) 沿近海漁業:1980年後烏魚的捕獲量呈現逐年下降趨勢，研究顯示太平洋十年震盪等氣候變異指數與烏魚漁獲量具有顯著相關，另外烏魚主要漁獲位置從1977年後有明顯向北推移的情形，且漁獲量與表水溫長期變動特性呈現同步反向之變動趨勢，顯示烏魚漁況會受到氣候變遷影響而有所變動。



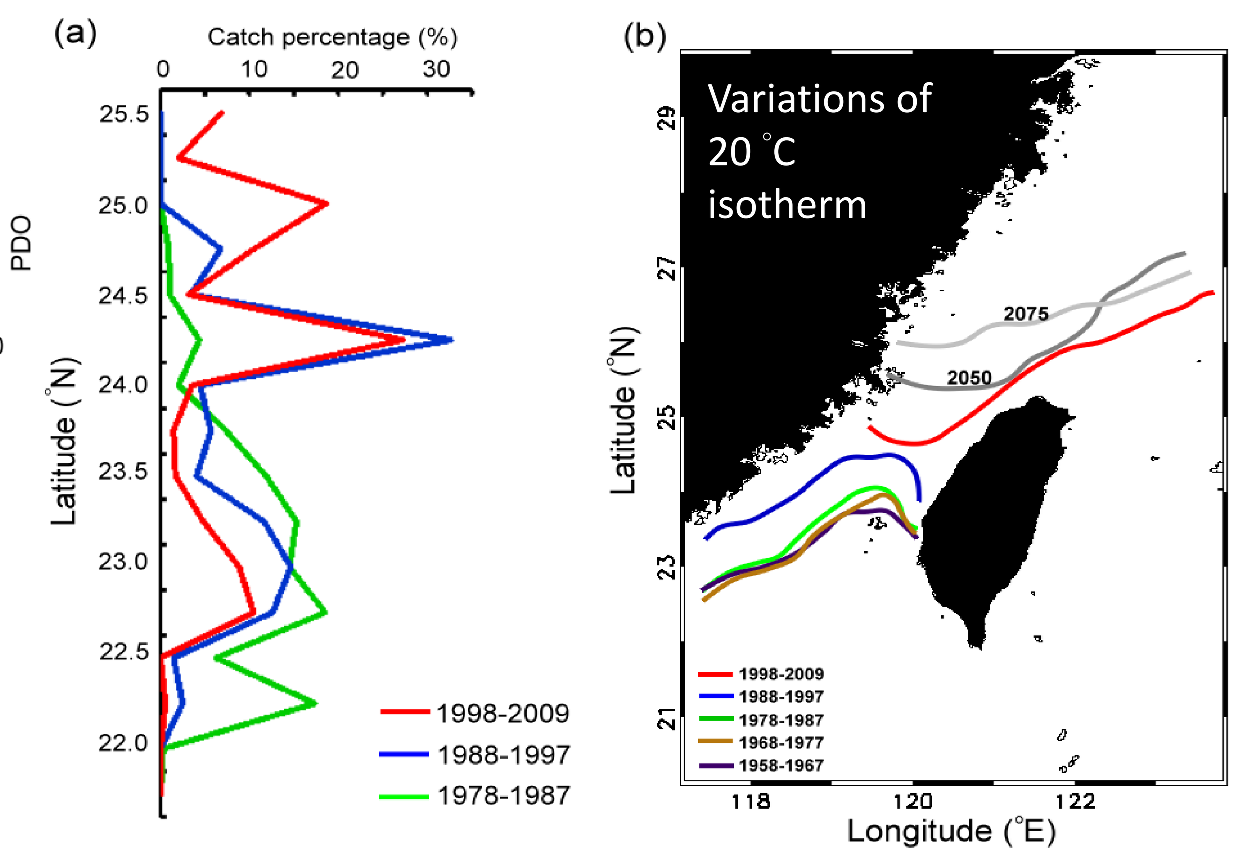


Fig. 3 PDO、SSTA與烏魚CPUE年別變動圖　Fig. 4 (a) 烏魚漁場變動與(b) 20°C等溫線位置關係圖

漁具漁法與漁業永續利用研究與調查

(1)海鳥忌避措施研究:

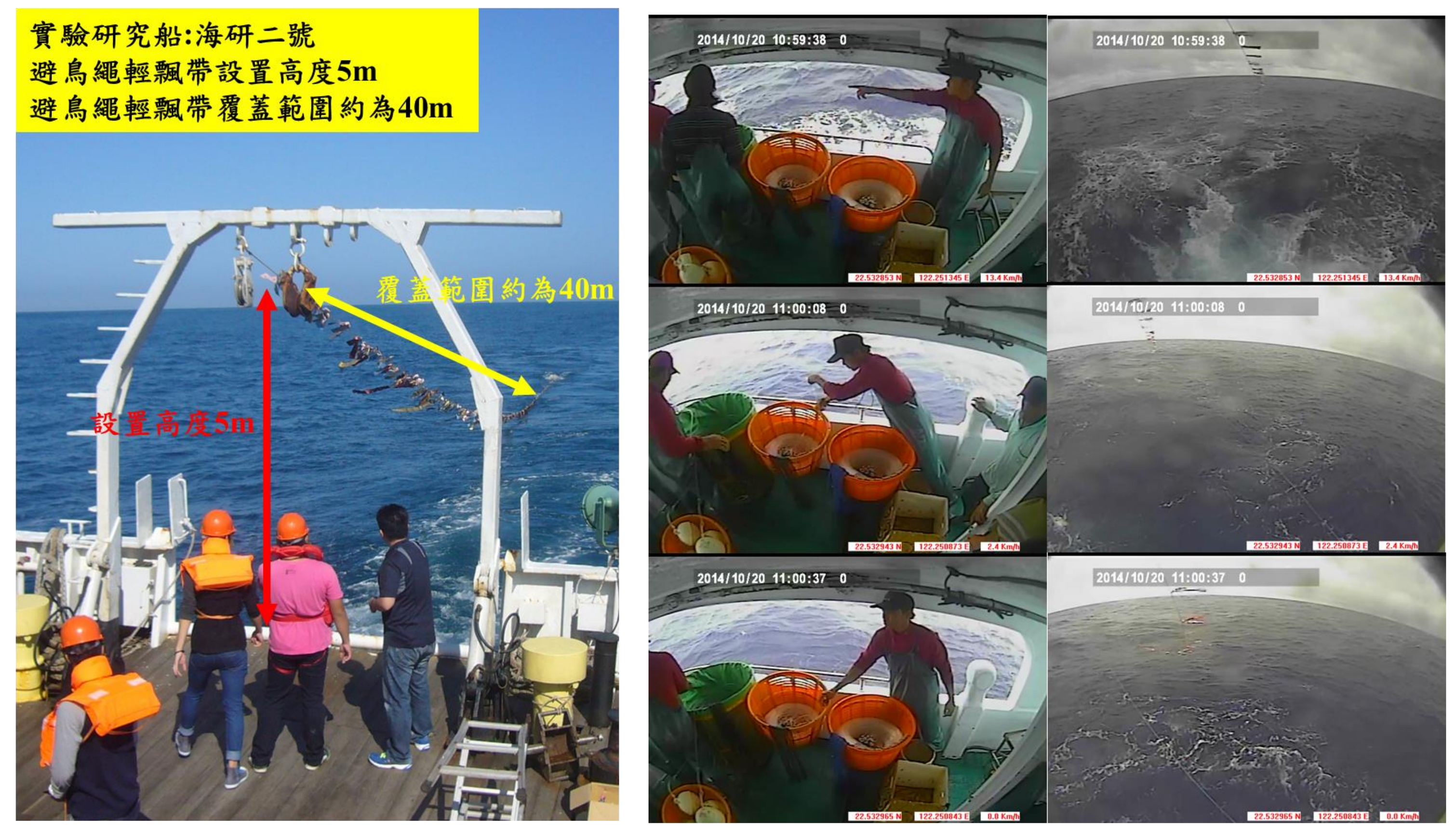


Fig. 5 現場實驗記錄避鳥繩覆蓋與主繩於水面中絞繩之情形

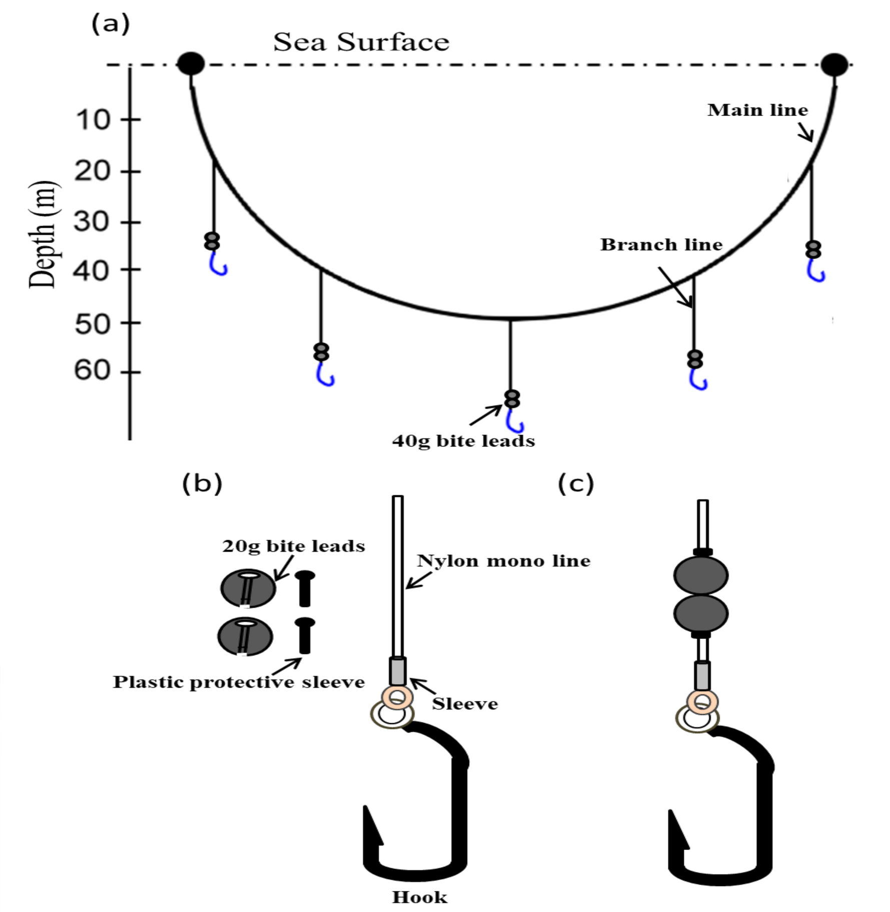


Fig. 6 (a) weighted branch lines (b, c) improved regime bite leads and slidable

(2) 魚類游泳行為與礁體放置前後關係

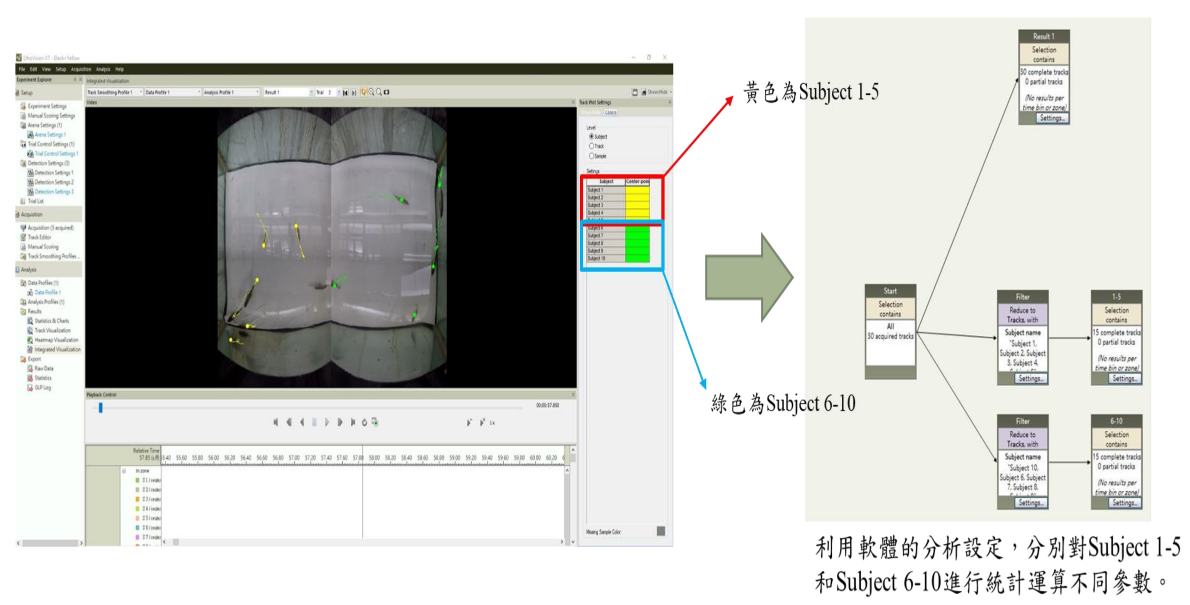


Fig. 7 動物軌跡追蹤系統實驗設計與軟體操作

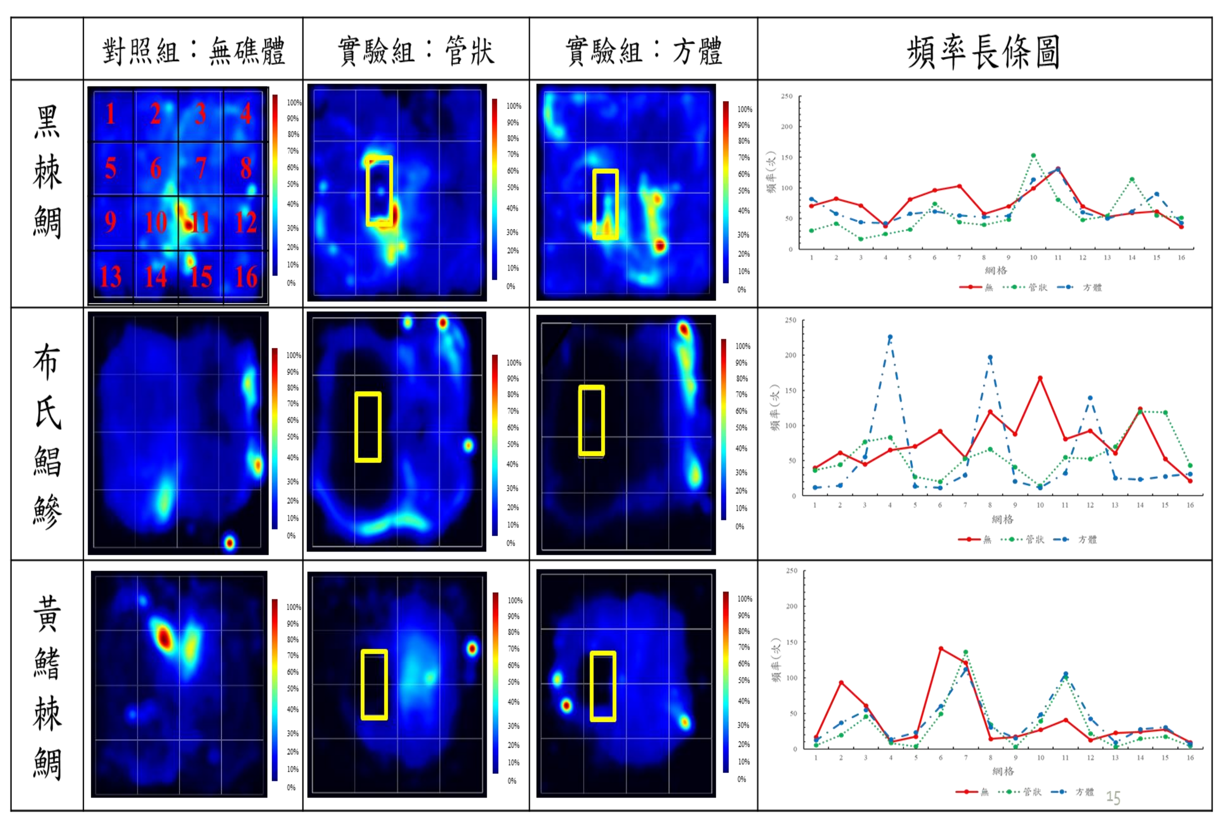


Fig. 8 魚類游泳熱點分布與魚礁放置變化關係

(3)最適網目大小選擇性調查與應用

Fig. 9 連江縣漁船捕具之網目大小調查

Species	Parameter L∞	K	t 0	Locality / Sex	Authors	Maturity Length	Appropriate Mesh Size
鮸魚 *Miichthys miiuy*	71	0.32	-0.97	Russian	Jarzhombek, 2007	54.8 cm	100 mm
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Fig. 10 連江縣主要漁獲物種生物參數與最適網目大小