



# 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

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

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

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

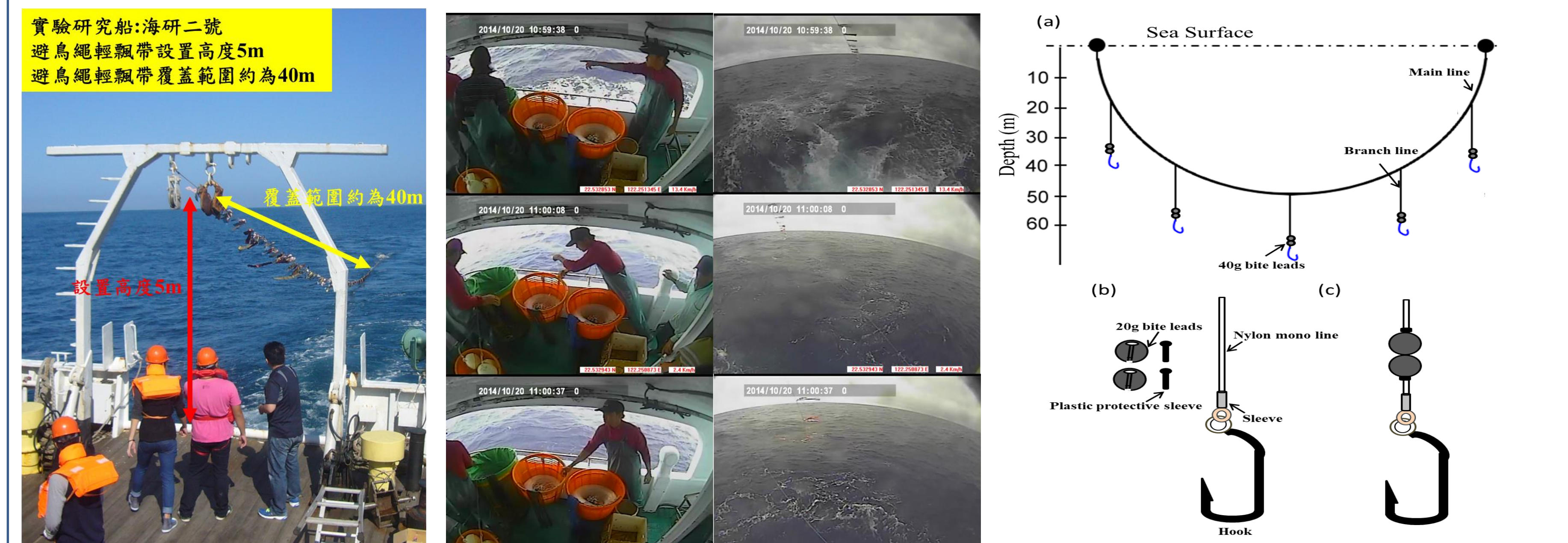
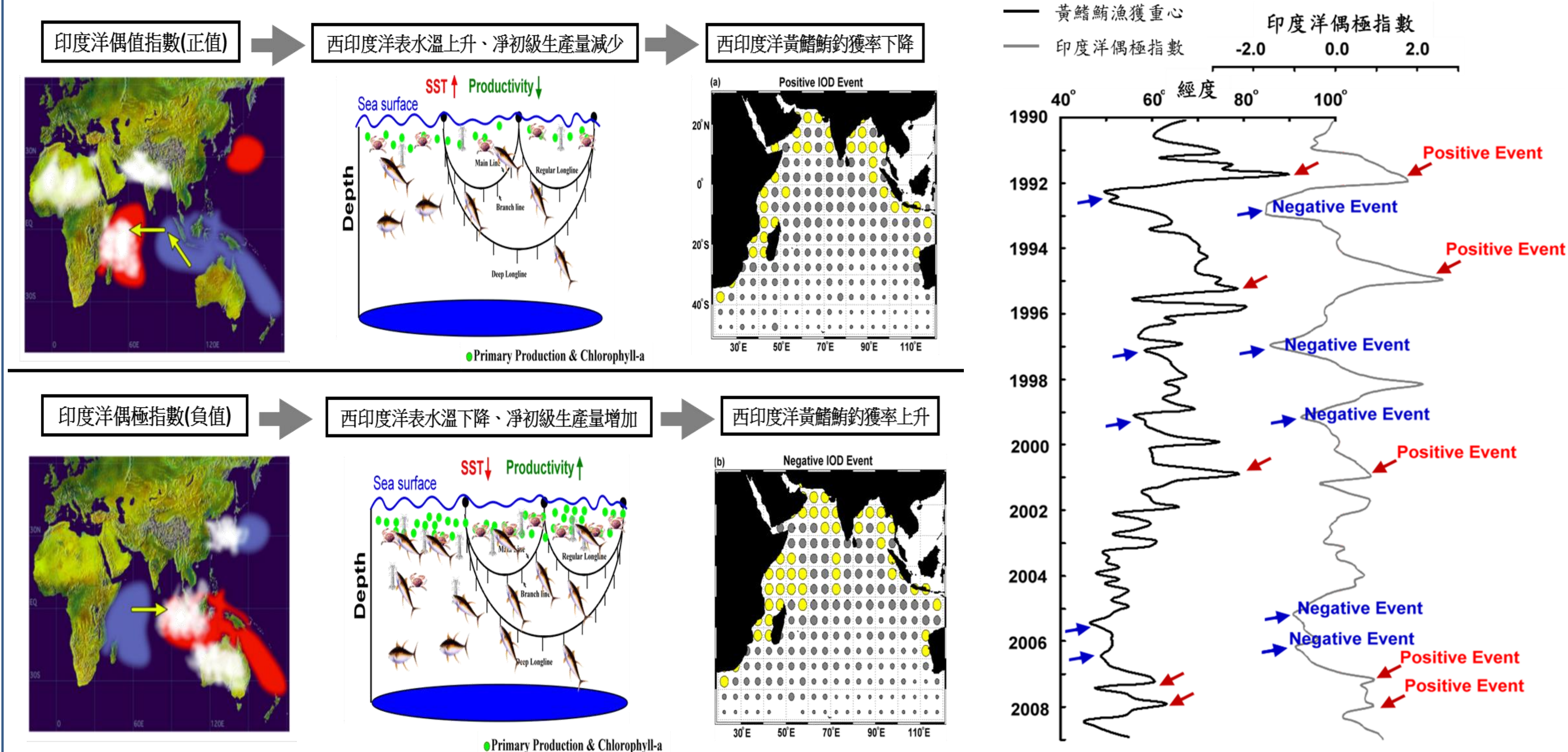


Fig. 5 Research on bird-scaring lines tangle with surface floats and lead to lost fishing gear  
Fig. 6 (a) weighted branch lines (b, c) improved regime bite leads and slidable

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

(2) Swimming behavior of fishes with reefs  
(3) Investigation on mesh size selective

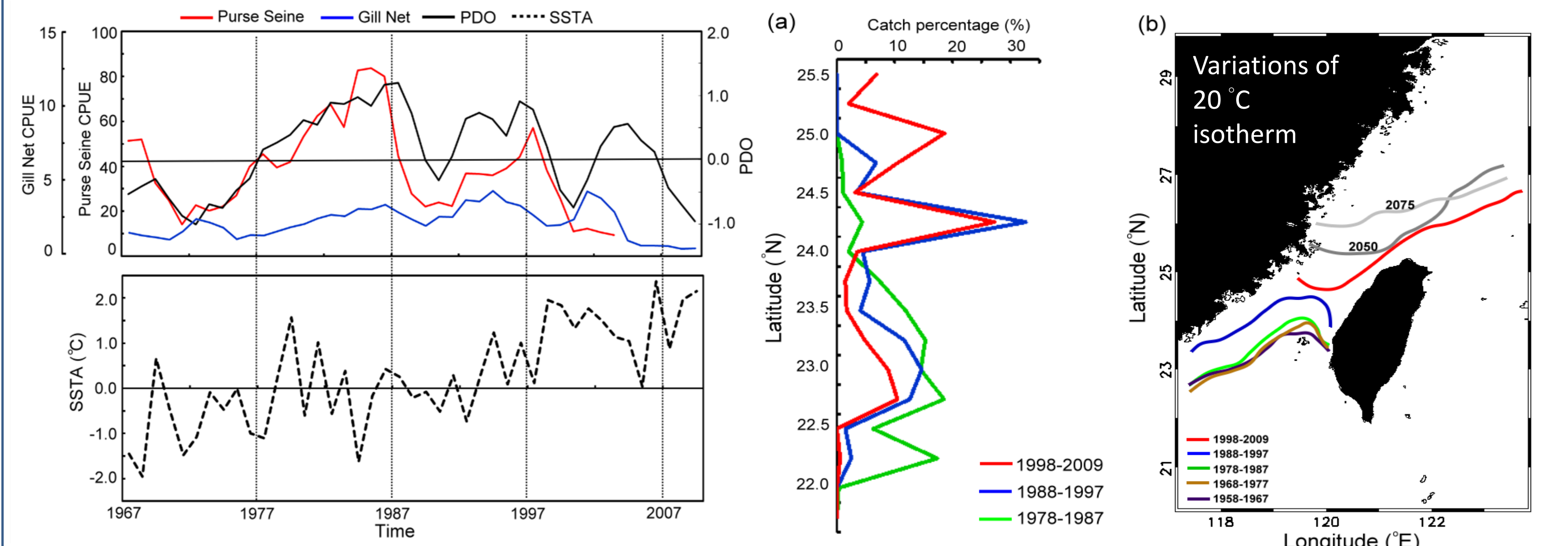


Fig. 3 Annual trends of (a) grey mullet CPUE of purse seiners and gill net with PDO and (b) winter SSTA  
Fig. 4 (a) Latitudinal variations of the catch percentage of grey mullet (b) Latitudinal variations of the 20 °C isotherm in winter.



Fig. 7 Using animal trajectory tracking software

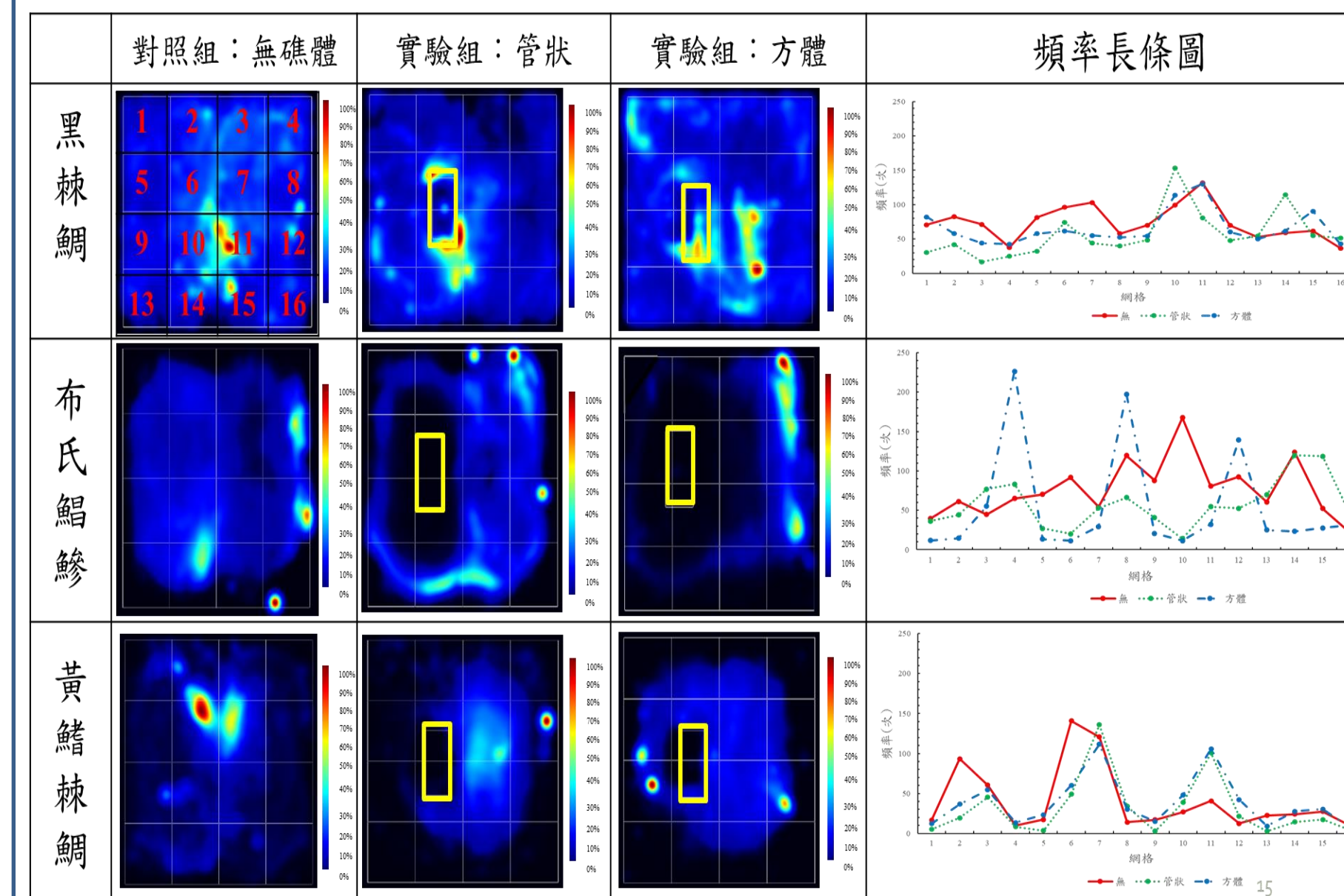


Fig. 8 Swimming behavior of fishes with reefs



Fig.9 Photos on fishing gear and mesh size investigation

Species <sup>a</sup>	Parameter <sup>a</sup>	Locality / Sex <sup>a</sup>	Authors <sup>a</sup>	Maturity Length <sup>a</sup>	Appropriate Mesh Size <sup>a</sup>	
鯉魚 <sup>b</sup>						
<i>Mitchells mitus</i> <sup>b</sup>	71 <sup>a</sup>	0.32 <sup>a</sup>	-0.97 <sup>a</sup>	Russian <sup>a</sup>	Jarzombek, 2007 <sup>a</sup>	54.8 cm <sup>a</sup>
布氏鰷 <sup>b</sup>	49 <sup>a</sup>	0.194 <sup>a</sup>	-1.47 <sup>a</sup>	Argentina / Unsexed <sup>a</sup>	Haimovici, 1977 <sup>a</sup>	100 mm <sup>a</sup>
<i>Microgogonas furnieri</i> <sup>b</sup>	54.7 <sup>a</sup>	0.12 <sup>a</sup>	-4.67 <sup>a</sup>	Brazil / Unsexed <sup>a</sup>	Haimovici and Ignacio, 2005 <sup>a</sup>	30.6 cm <sup>a</sup>
黑鯛 <sup>b</sup>	57.5 <sup>a</sup>	0.277 <sup>a</sup>	-0.28 <sup>a</sup>	Brazil / Unsexed <sup>a</sup>	Haimovici and Umpierre, 1996 <sup>a</sup>	
<i>Acanthopagrus schlegelii</i> <sup>b</sup>	60.1 <sup>a</sup>	0.219 <sup>a</sup>	-2.08 <sup>a</sup>	Brazil / Female <sup>a</sup>	Vazzoler, 1971 <sup>a</sup>	
台灣馬加鰹 <sup>b</sup>	40.7 <sup>a</sup>	0.51 <sup>a</sup>	0.258 <sup>a</sup>	Tokyo Bay / Male <sup>a</sup>	Yamashita et al., 2015 <sup>a</sup>	29 cm <sup>a</sup>
<i>Scomberomorus guttatus</i> <sup>b</sup>	43.9 <sup>a</sup>	0.346 <sup>a</sup>	0.258 <sup>a</sup>	Tokyo Bay / Female <sup>a</sup>	Yamashita et al., 2015 <sup>a</sup>	103 mm <sup>a</sup>
日本花鱸 <sup>b</sup>	128 <sup>a</sup>	0.18 <sup>a</sup>	-0.46 <sup>a</sup>	India / Unsexed <sup>a</sup>	Devaraj, 1981 <sup>a</sup>	40 cm <sup>a</sup>
<i>Lateolabrax japonicus</i> <sup>b</sup>	78 <sup>a</sup>	0.225 <sup>a</sup>	-0.76 <sup>a</sup>	off Sanriku / Unsexed <sup>a</sup>	Yasuda and Koike, 1950 <sup>a</sup>	
長鰱 <sup>b</sup>	85 <sup>a</sup>	0.193 <sup>a</sup>	-0.66 <sup>a</sup>	Matsushima Bay / Unsexed <sup>a</sup>	Hatanaka and Sekino, 1962 <sup>a</sup>	35.9 cm <sup>a</sup>
<i>Ilitsha elongata</i> <sup>b</sup>	101 <sup>a</sup>	0.177 <sup>a</sup>	-0.76 <sup>a</sup>	Yangtze River / Unsexed <sup>a</sup>	Sun et al., 1994 <sup>a</sup>	調查中 <sup>a</sup>
	125 <sup>a</sup>	0.142 <sup>a</sup>	-0.27 <sup>a</sup>	Japan / Unsexed <sup>a</sup>	Yasuda and Koike, 1950 <sup>a</sup>	
	49.5 <sup>a</sup>	0.32 <sup>a</sup>	-0.41 <sup>a</sup>	Japan <sup>a</sup>	Zhang and Takita, 2007 <sup>a</sup>	40.7 cm <sup>a</sup>
	49.5 <sup>a</sup>	0.26 <sup>a</sup>	-0.65 <sup>a</sup>	Korea / Both sexes <sup>a</sup>	Kim et al., 2007 <sup>a</sup>	154.8 mm <sup>a</sup>

Fig. 10 Biological parameters and optimal mesh size



# 漁場環境動態與漁具漁法研究室



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- 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。

## 海洋環境變異對臺灣遠洋與沿近岸漁場之影響

## 研究成果展示

## 漁具漁法與漁業永續利用研究與調查

(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。

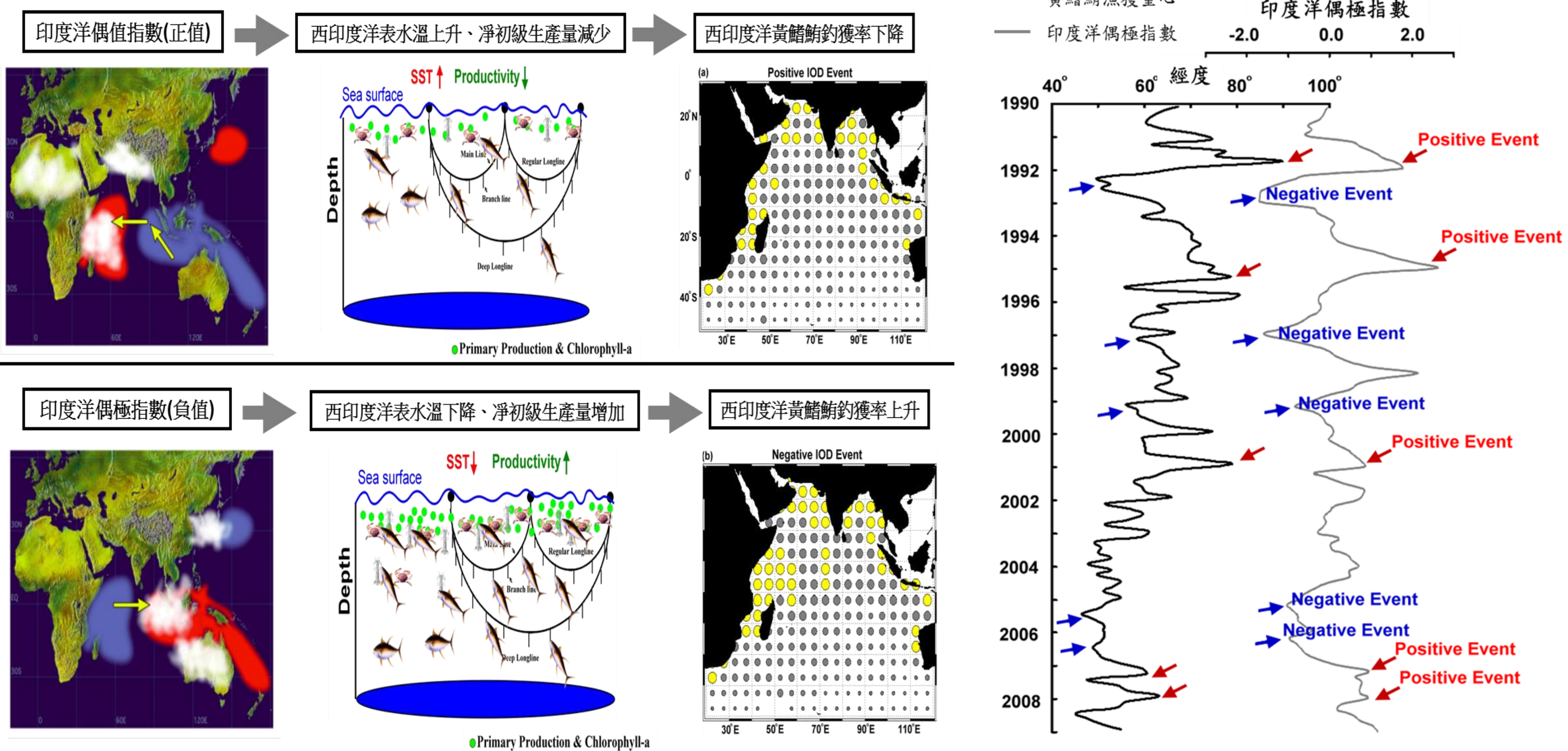


Fig. 1 印度洋海洋環境變動影響黃鰭鮪釣獲率關係圖 Fig. 2 印度洋黃鰭鮪漁獲重心與偶極指數變動圖

(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年後開始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。

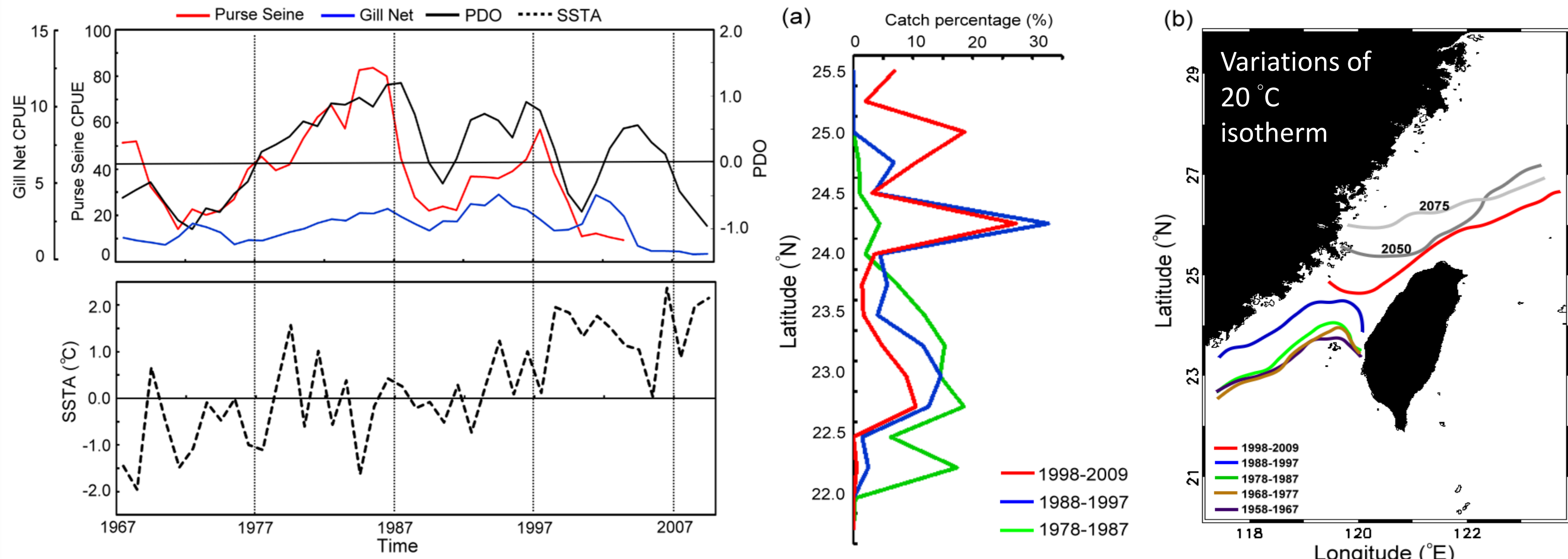


Fig. 3 PDO、SSTA與烏魚CPUE年別變動圖 Fig. 4 (a) 烏魚漁場變動與(b) 20°C等溫線位置關係圖

(1) 海鳥忌避措施研究:

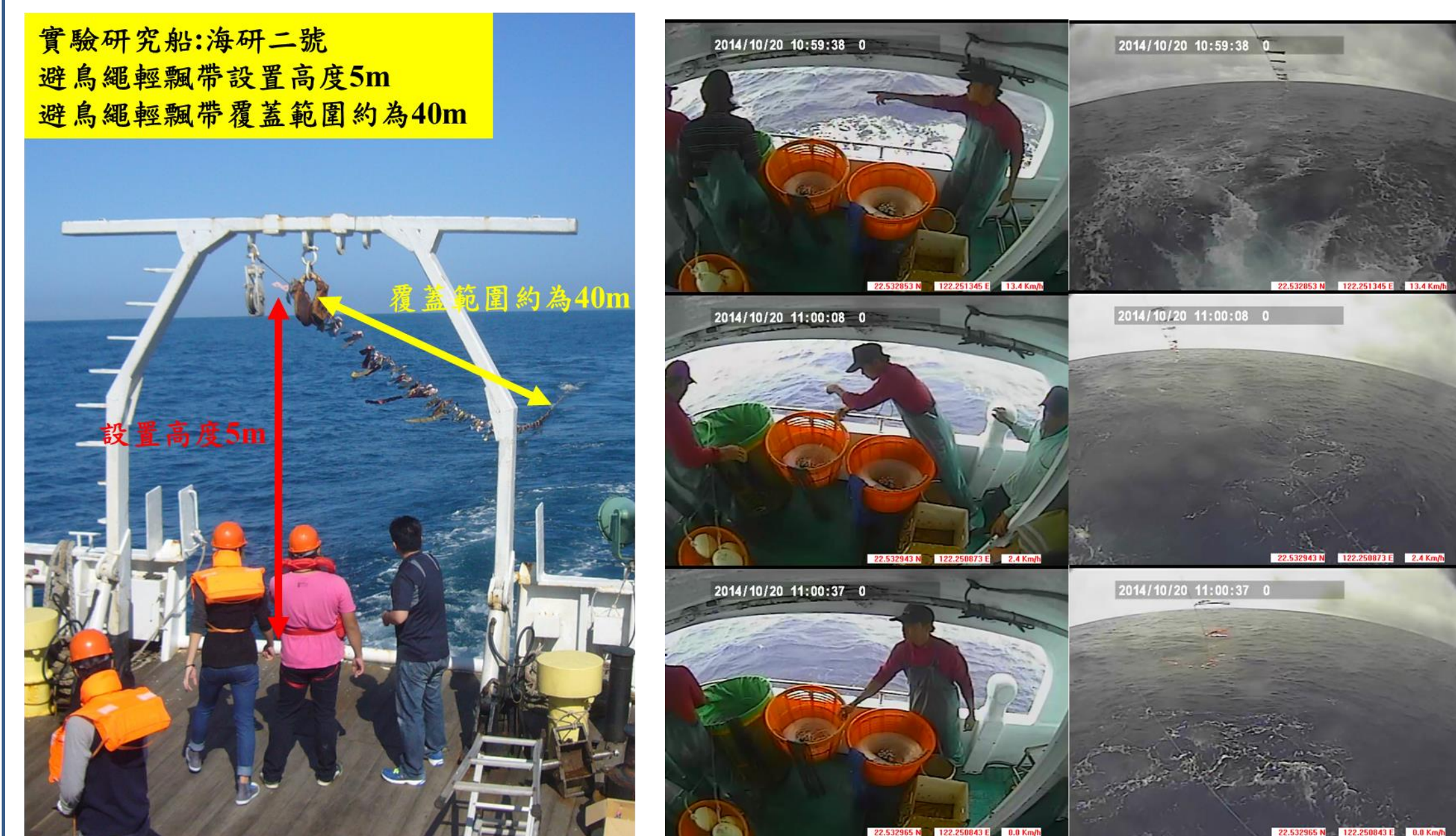


Fig. 5 現場實驗記錄避鳥繩覆蓋與主繩於水面中絞繩之情形

(2) 魚類游泳行為與礁體放置前後關係

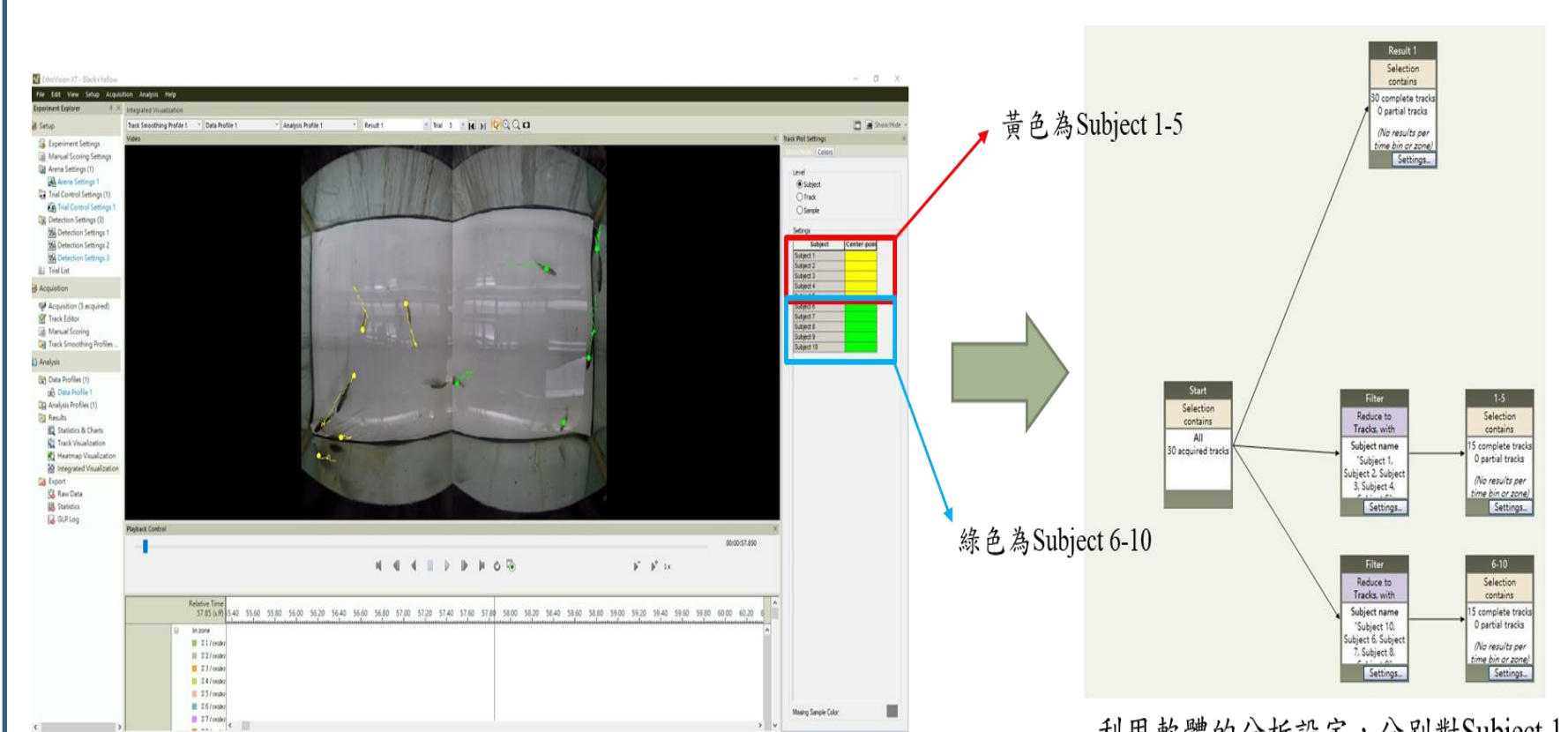


Fig. 7 動物軌跡追蹤系統實驗設計與軟體操作

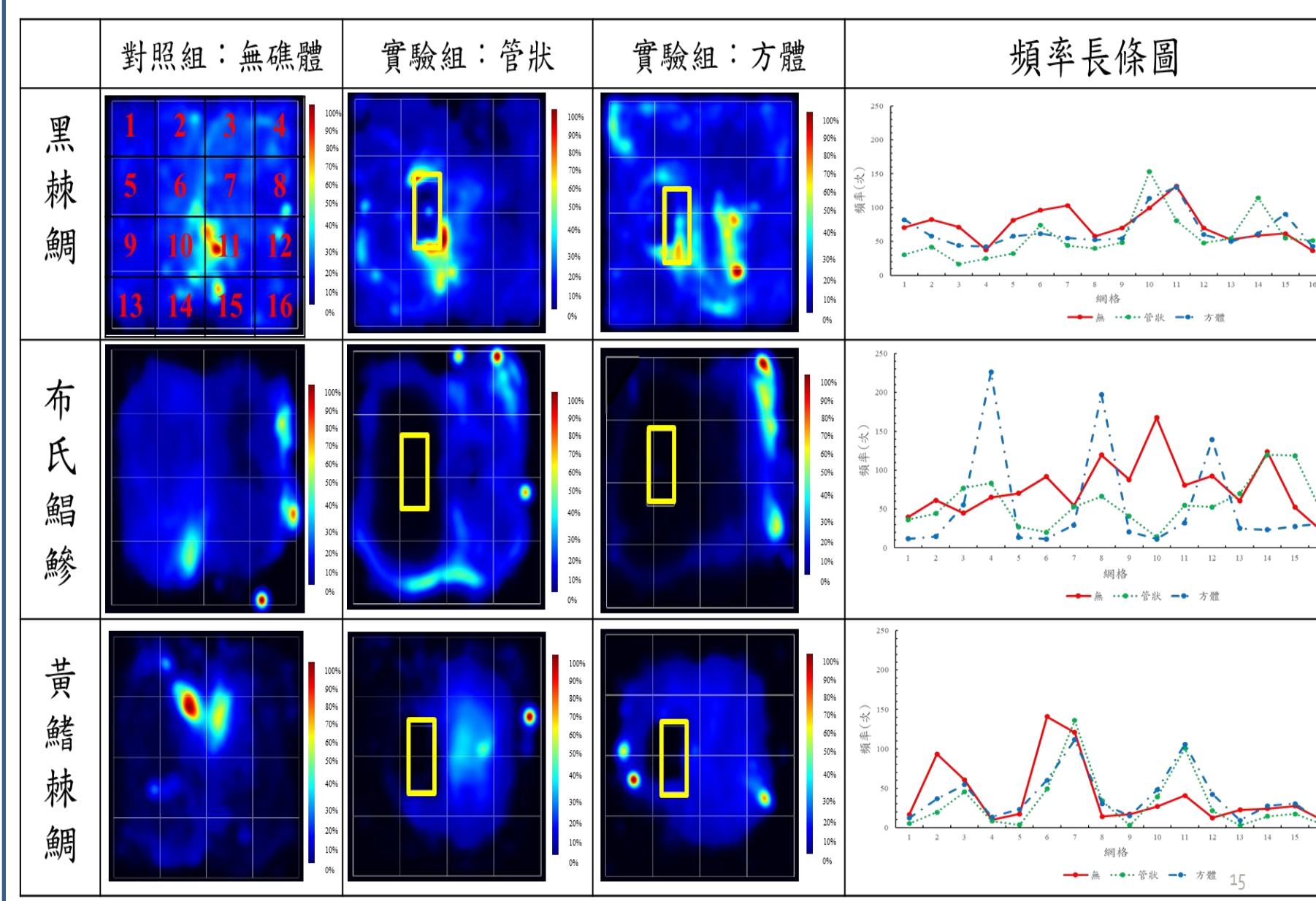


Fig. 8 魚類游泳熱點分布與魚礁放置變化關係

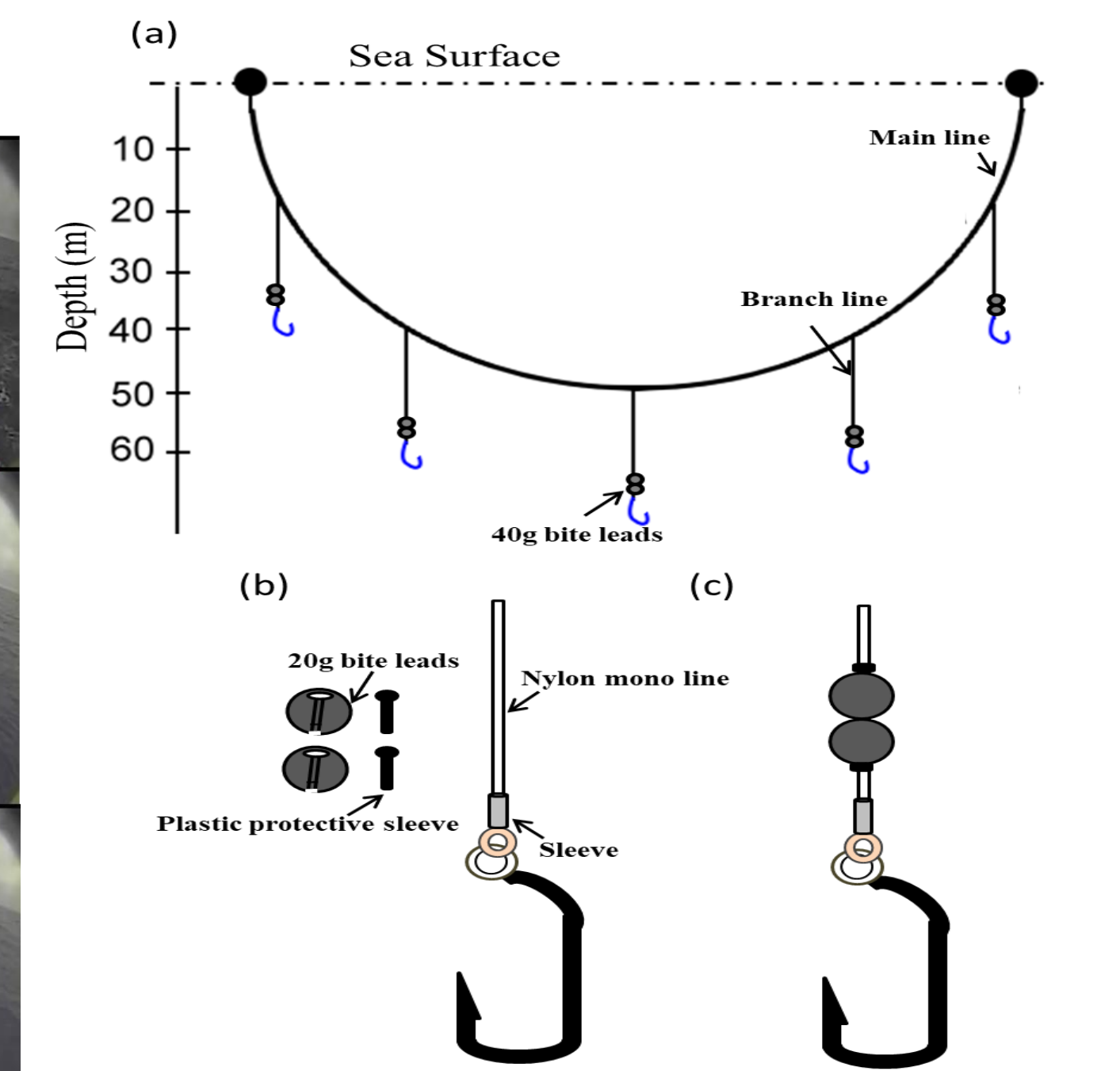


Fig. 6 (a) weighted branch lines (b, c) improved regime bite leads and slidable

(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	Locality / Sex	Authors	Maturity Length	Appropriate Mesh Size	
鮭魚	71	0.32	-0.97	Russian	Jarzhombek, 2007	54.8 cm
Mitchells mitta	49	0.194	-1.47	Argentina / Unsexed	Haimovici, 1977	100 mm
布氏鰷	54.7	0.12	-4.67	Brazil / Unsexed	Haimovici and Ignacio, 2005	30.6 cm
Microgogonas furnieri	57.5	0.277	-0.28	Brazil / Unsexed	Haimovici and Umpierre, 1996	
	60.1	0.219	-2.08	Brazil / Female	Vazzoler, 1971	
黑鯛	40.7	0.51	0.258	Tokyo Bay / Male	Yamashita et al., 2015	29 cm
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台灣馬加鰹	128	0.18	-0.46	India / Unsexed	Devaraj, 1981	40 cm
Scomberomorus guttatus	78	0.225	-0.76	off Saruku / Unsexed	Yasuda and Koike, 1950	90 mm
日本花鱸	85	0.193	-0.66	Matsushima Bay / Unsexed	Hatanaka and Sekino, 1962	35.9 cm
Lateolabrax japonicus	101	0.177	-0.76	Yangtze River / Unsexed	Sun et al., 1994	調查中
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長鰱	49.5	0.32	-0.41	Japan	Zhang and Takita, 2007	40.7 cm
Ilisha elongata	49.5	0.26	-0.65	Korea / Both sexes	Kim et al., 2007	154.8 mm

Fig. 10 連江縣主要漁獲物種生物參數與最適網目大小