PORSEC 2010

Connecting Regional Impacts to Global Environmental Change

PROCEEDINGS

fishery in Russian Exclusive Economic Zone in 2003 and sea level surface topography on satellite altimetry data it has been received that there is an clearly defined dependence between sea level surface topography and squid grounds formation.
The satellite sea surface temperature data were used also for monitoring of oceanographic conditions for the kelp Laminaria japonica reproduction that revealed its dependence on activity of the Primorye current.
The satellite data on the sea ice in the Okhotsk Sea allowed to understand relationships between ice conditions and atmospheric circulation and to classify seasonal features of ice processes in the main spawning grounds of herring at the northwestern coast of the Sea for forecasting the spawning.

Environmental preferences of swordfish, *Xiphias gladius*, in the southern Atlantic Ocean derived from CPUE and fishing effort data of Taiwanese longline fishery

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Swordfish, *Xiphias gladius*, is a commercially important highly migratory species, distributed throughout tropical and temperate waters of the world. In the Atlantic Ocean, swordfish is an important bycatch species by longline vessels targeting tunas and billfishes in the high seas. In this study, we used a generalized additive model to investigate the relationship between spatial/temporal distribution of swordfish and environmental variables using the Taiwanese distant water longline catch/effort and corresponding environmental data, and developed a habitat suitability index (HSI) model to evaluate the preference of this species for particular habitats in the southern Atlantic Ocean. We compared catch per unit effort (CPUE) and fishing effort data in HSI modelling. Our results suggested that the fishing effort-based HSI model tends to under-estimate the ranges of optimal habitats and over-estimate seasonal variations in the spatial distribution of optimal habitats. We concluded that a CPUE-based HSI model performs better in defining optimal habitats for swordfish. According to the CPUE-based HSI model, the optimal ranges of the following key habitat variables for the southern Atlantic swordfish are defined: 10°E~10°W for longitude, 5°N~5°S for latitude, 27-29°C for sea surface temperature, 0.1~0.2 mg m-3 for [illegible] concentration, and 15~30 m for mixed layer depth.

Chlorophyll-a concentration derived satellite impact on Sardinella lemuru in Bali Strait during Indian Ocean Dipole 1997 and 2006

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The Bali Strait region has long been considered as an important area for oily sardine fisheries. The productive pelagic fisheries in this area are sustained through enhanced biological production during seasonal coastal upwelling. The study is aimed at understanding the variability of chlorophyll-a (Chl-a) concentration during Indian Ocean Dipole (IOD) 1997 and 2006 and assessing their impact on *Sardinella lemuru* production. Monthly mean chl-a concentration during 1997-2007 in Bali Strait derived SeaWiFS satellite imagery. Monthly oily sardine catch data were obtained from the data of fish landing around Bali Strait. During 1997 and 2006 IOD, the Chl-a concentration increased significantly in Bali Strait can be related to upwelling intense. Usually, the Chl-a concentration reaches the highest in August-September related to upwelling generated southeast monsoon, but in 1997 and 2006 the Chl-a concentration was the highest until November. The relationship between Chl-a concentration and *Sardinella lemuru* catch is significantly positive. The increased catch of *Sardinella lemuru* during IOD can be attributed to abundance of Chl-a concentration due to the enhancement biological productivity.

Time series analysis of fishing condition of yellofin tuna (*Thunnus albacares*) and environmental variables based on Taiwanese regular and deep tuna longlines in the Arabian Sea

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In this study, the data of Taiwanese longline fishery were divided into two types: regular longline (RLL) and deep longline (DLL). Furthermore, we collected environmental variables to investigate the environmental effects on the CPUE fluctuation of yellowfin tuna in the Arabian Sea during the period of 1980-2005 by using advanced time series analysis, including the state-space approach to remove seasonality and wavelet analysis to investigate transient relationship. For large-scale environmental effects, we used the Dipole Mode Index (DMI) to represent the Indian Ocean Dipole, for the local environmental factors we collected sea surface temperature (SST), thermocline depth (D20).
The main factor that caused the interannual variation in CPUE of RLL and DLL might change with time. The RLL and DLL CPUE showed the positive correlation with SST form the beginning of 1980's to the middle of 1990's. The DMI also revealed positive correlation with RLL CPUE before the middle of 1990's but not with DLL. The RLL CPUE and D20 was found significant coherence of two phases with a periodicity 3 yr and showed the anti-phase; the DLL CPUE was also found two phases significant

Presenter: name with underline Corresponding author: *

Chlorophyll-a concentration derived satellite impact on *Sardinella lemuru* in Bali Strait during Indian Ocean Dipole 1997 and 2006)*

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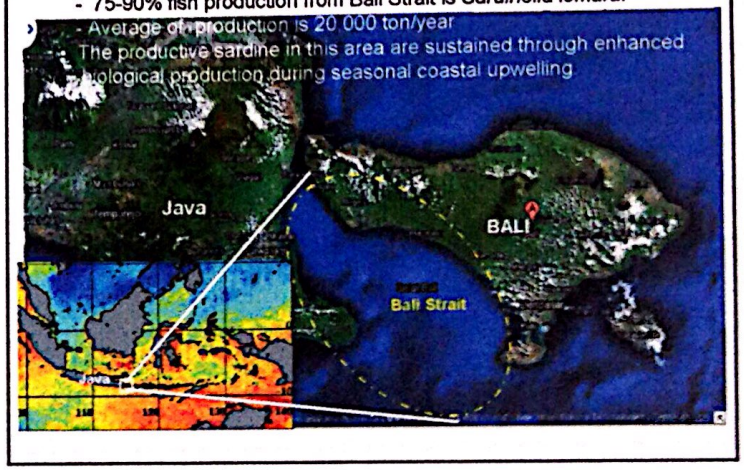
Introduction

- The Bali Strait → an important area for oily sardine fisheries:
  - 75-90% fish production from Bali Strait is *Sardinella lemuru*.
  - Average of production is 20.000 ton/year
  - The productive sardine in this area are sustained through enhanced biological production during seasonal coastal upwelling

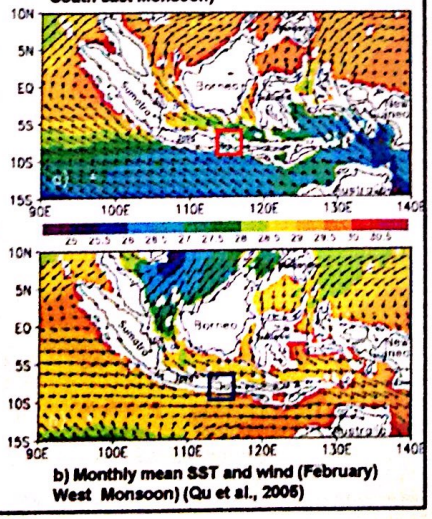


Variability of Indonesian Waters

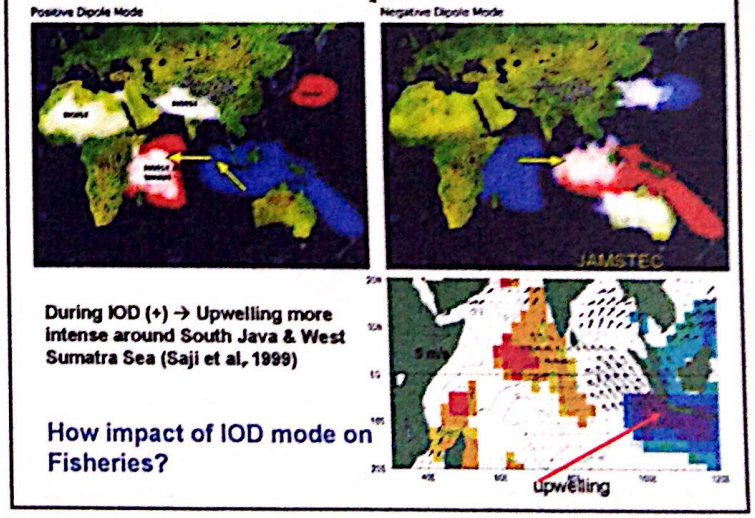
Indonesian waters and also Bali Strait influence by:

- Monsoon
- During South east Monsoon → Season Upwelling occured around South Java and Bali strait

IOD → upwelling more intense (Saji et al., 1999, Webster et al, 1999)



Inter-annual variability



During IOD (+) → Upwelling more intense around South Java & West Sumatra Sea (Saji et al., 1999)

How impact of IOD mode on Fisheries?

The Objectives:

The study is aimed at understanding the variability of chlorophyll-a concentration in Bali Strait during Indian Ocean Dipole 1997 and 2006 and assessing their impact on *Sardinella lemuru* production.

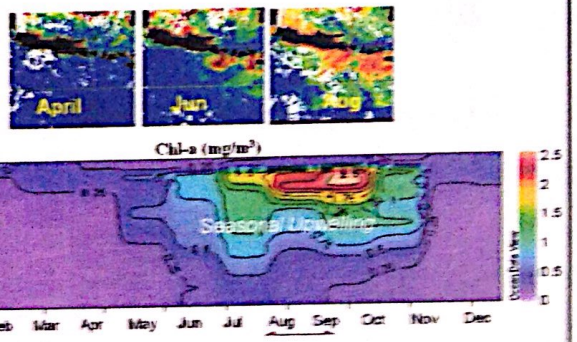
Data Sources:

(1) Monthly average of Chl-a concentration (SeaWiFS) from GIOVANNI (1997-2008).

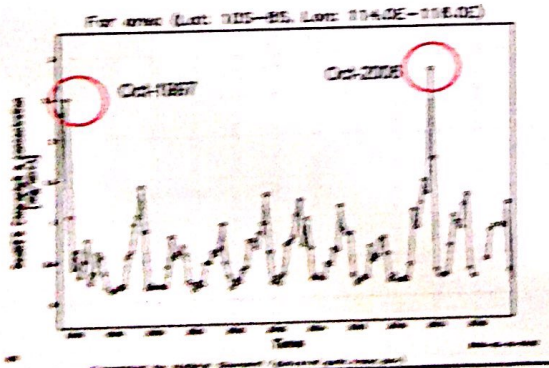
(2) Monthly catch of *Sardinella lemuru* from statistic data of local fisheries agency.

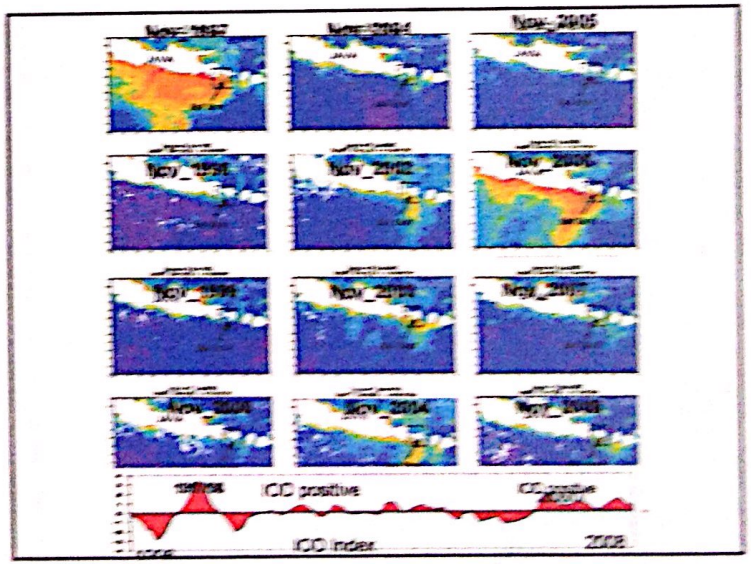
Results

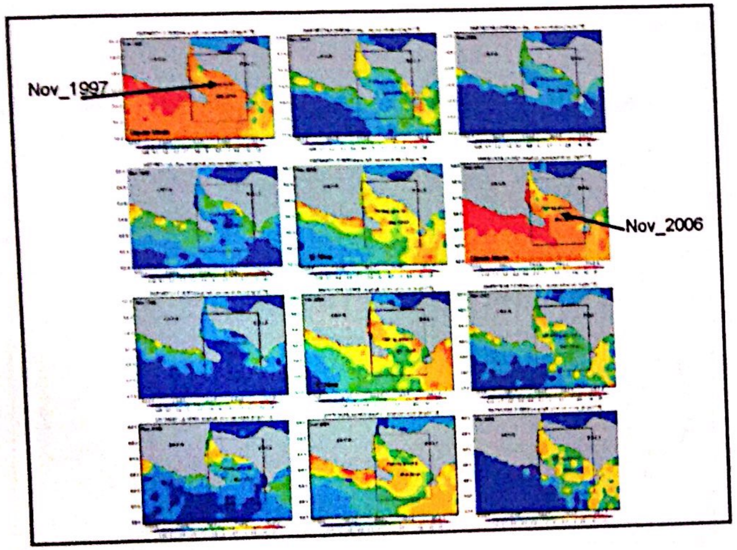
Usually, the Chl-a concentration reaches the highest in August-October related to upwelling generated southeast monsoon.

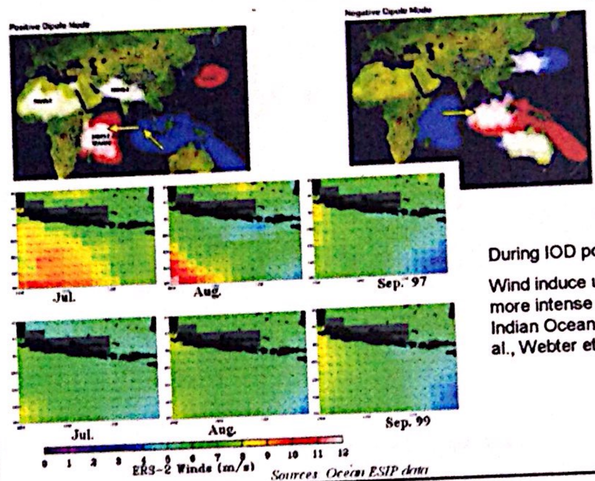


During 1997 and 2006, the Chl-a concentration increased significantly in Bali Strait can be related to upwelling intense during IOD positive.



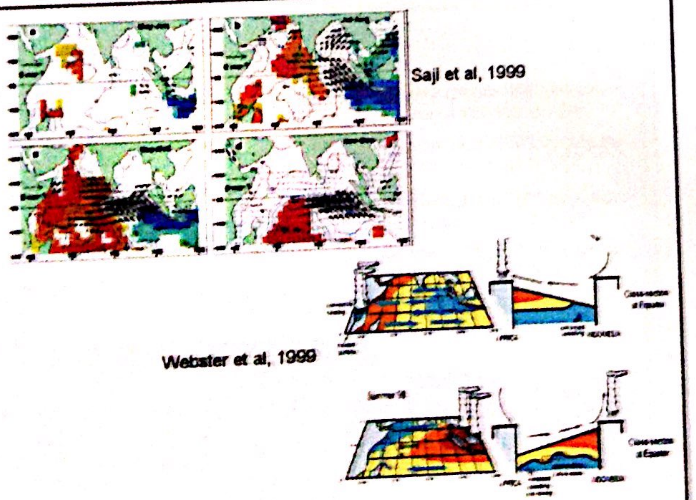






During IOD positive →

Wind induce upwelling more intense di Eastern Indian Ocean (Saji et al., Webter et al., 1999).



Positive anomaly of Chl-a Concentration during 2006

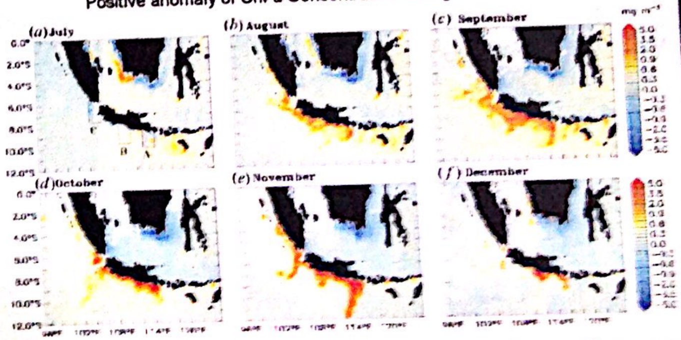
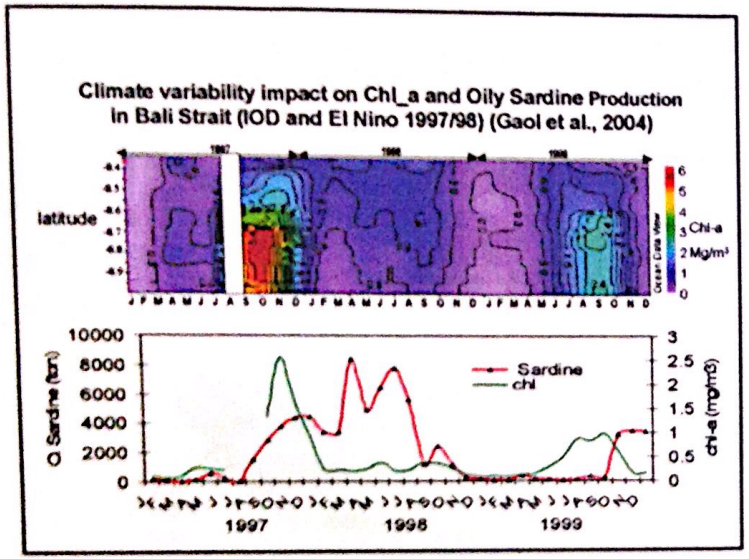
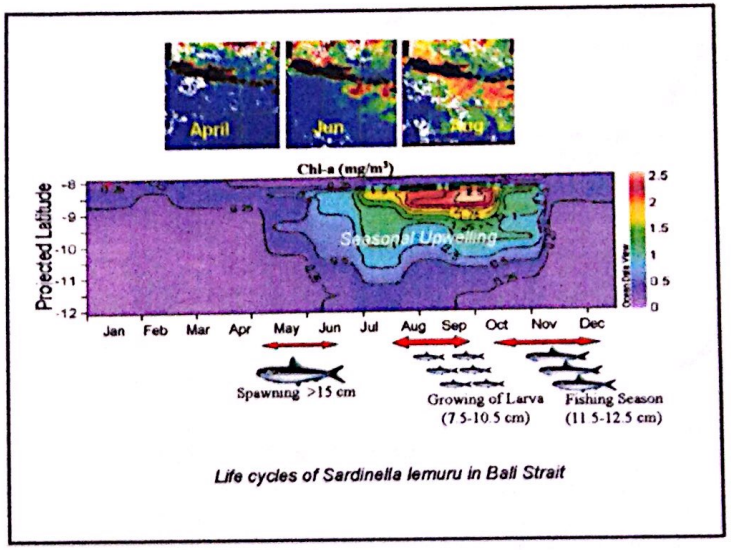
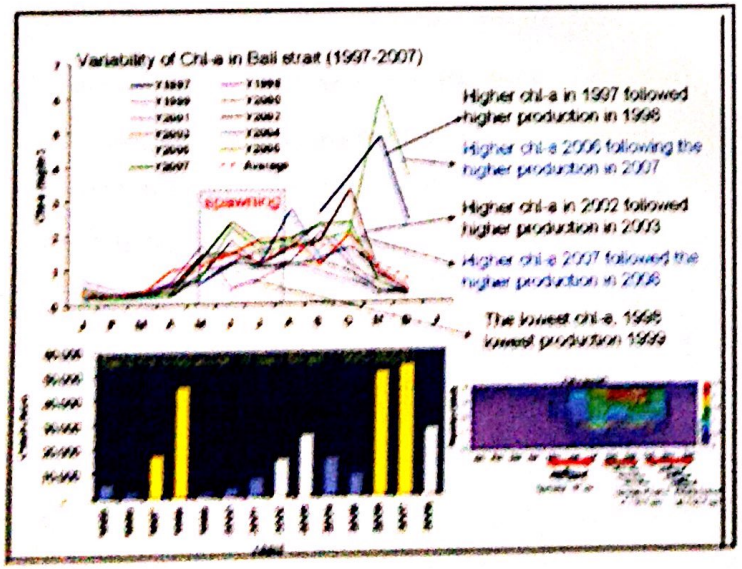


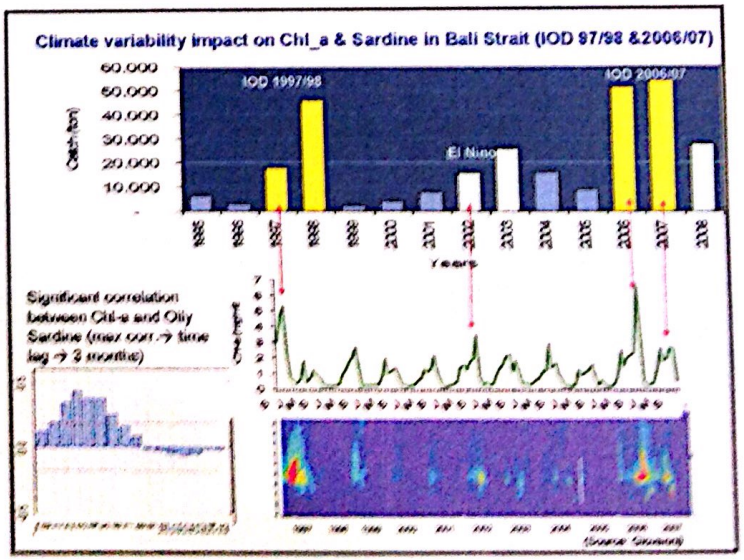
Figure 3. Monthly anomalies of SeaWiFS chlorophyll-a concentration (mg m^{-3}) along the southern coasts of Java and Sumatra for the period July–December 2006. The boxes shown in

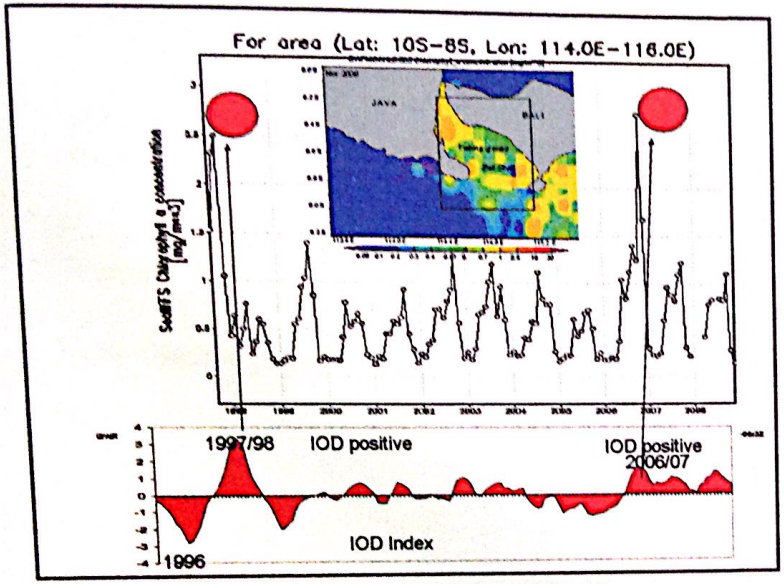
Iskandar et al, 2009

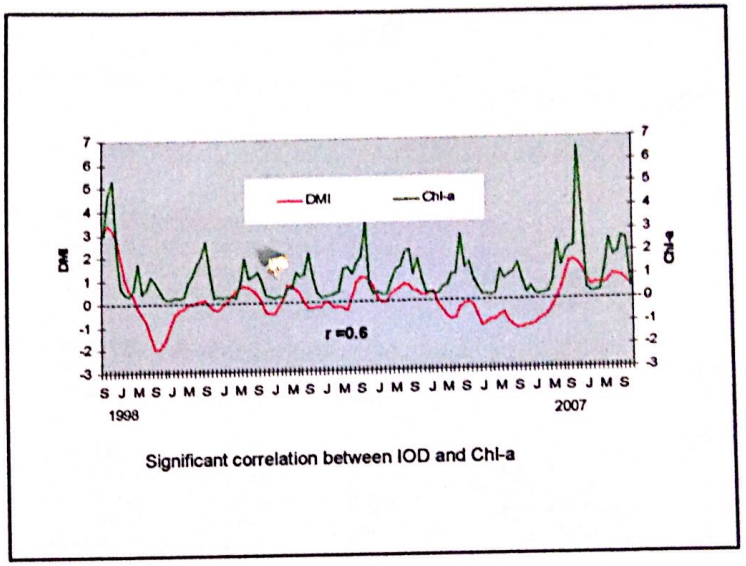










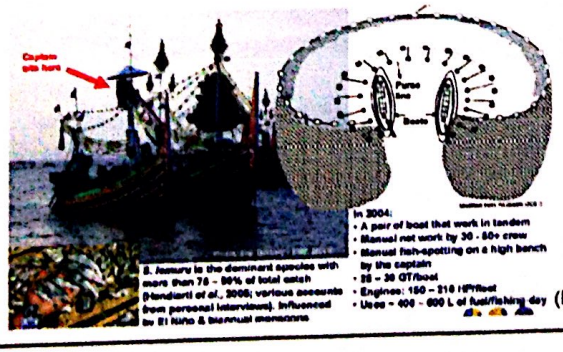


Significant correlation between IOD and Chl-a

Sardinella Lemuru Fisheries in Bali Strait

75-90% fish production from Bali Strait is *Sardinella Lemuru*.

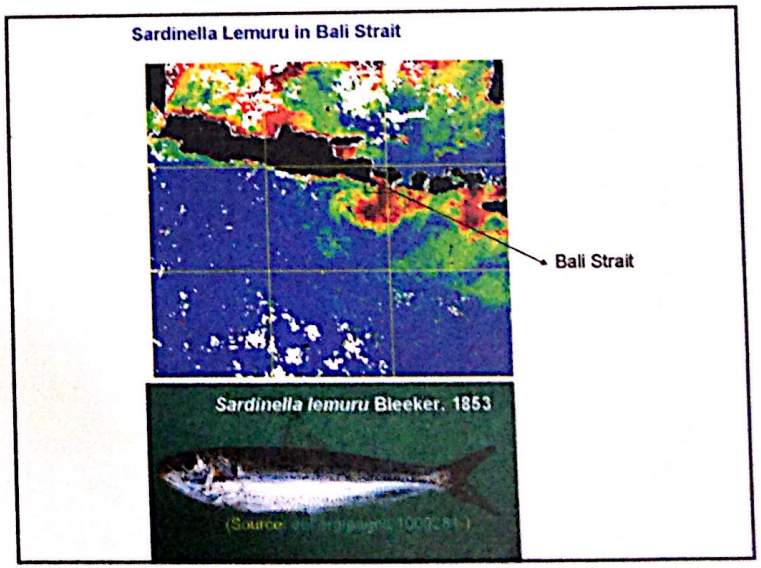
Average of production is 20,000 ton/year



In 2004:
- A pair of boat that work in tandem
- Manual net work by 30 - 50+ crew
- Manual fish-spotting on a high bench by the captain
- 25 – 30 GT/boat
- Engine: 150 – 210 HP/boat
- Uses ~ 400 - 600 L of fuel/fishing day

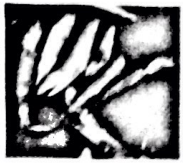
(About 200 units purseiner operated in Bali Strait

(Buhary, 2008)



Although fish production is high (1997/98 & 2006/07) but the fishermen suffered :

* Fishermen unprepared for the abundant of fish catch.
* Oily Sardine price → lowest



Summary

Usually, the Chl-a concentration reaches the highest in August-October related to upwelling generated southeast monsoon, but in 1997 and 2006 the Chl-a concentration was the highest until November.

During 1997/98 and 2006/07 IOD positive, the Chl-a concentration increased significantly in Bali Strait can be related to upwelling more intense.

The relationship between chl-a concentration and *Sardinella lemuru* catch is significantly positive. The increased catch of *Sardinella lemuru* during IOD positive can be attributed to abundance of Chl-a concentration due to the enhancement biological productivity.

Acknowledgment

- NASA GSCF and GIOVANNI for ocean color remote sensing data
- Fisheries Agency for Fish catch data
- APN

Thank you very much