

**Stock assessment of longtail tuna
in the NW Indian Ocean by ASPIC
using standardized CPUE
of drift gillnet fisheries in Oman**

Al-Kiyumi, Al-kharusi, Nishida
and Al-Anboori

Why SA in the NW Indian Ocean?

Concern applying the Omani STD_CPUE (tiny & remote area) to global catch (whole Indian Ocean)

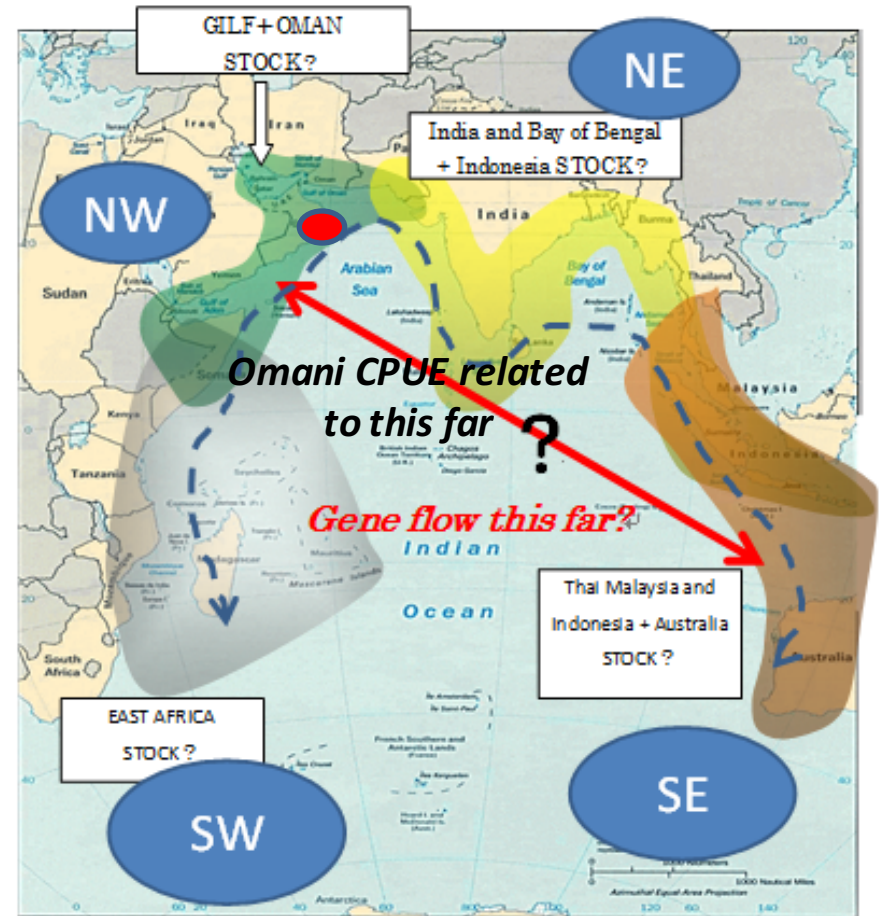
(1) STD_CPUE (Oman)
unlikely reflects other area
(Indonesia, Africa..)

But likely representative in NW

(2) Geographical features
Gene flow limit
Ecological niche and viscosity



NW Indian Ocean longtail hypothetical stock



Another important reason (NW Indian Ocean)

Neritic tuna project (Government of Oman)



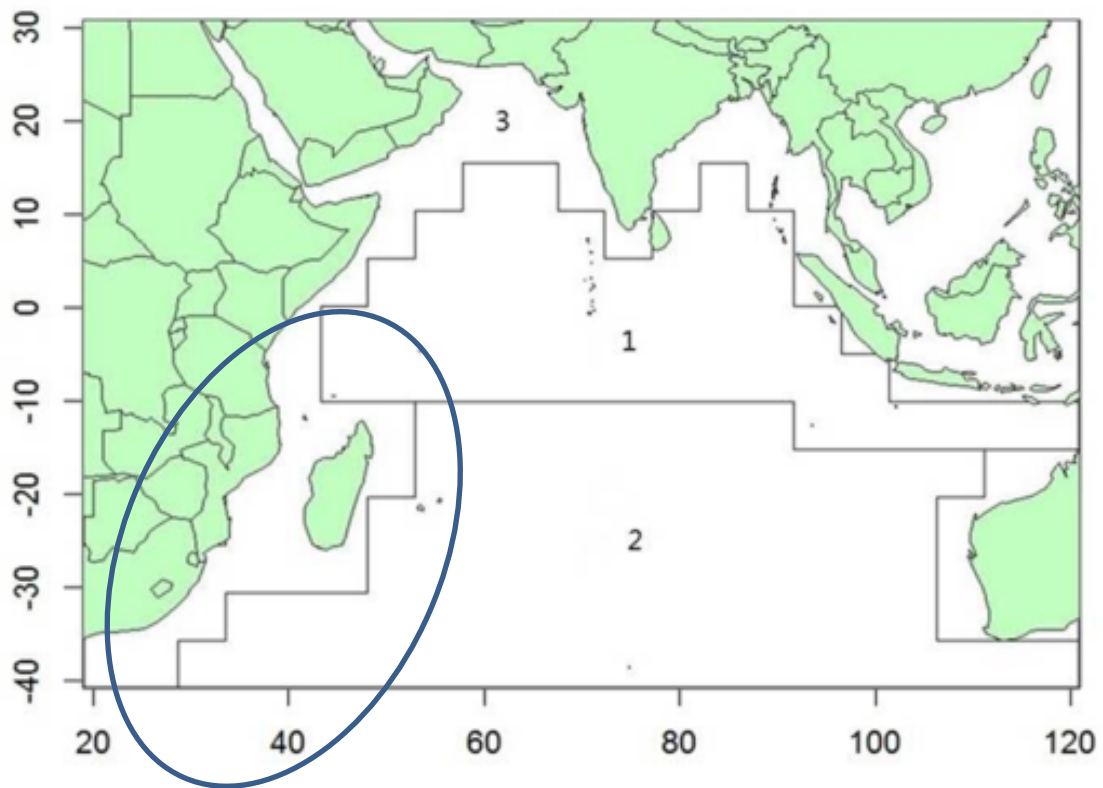
(ToR) They asked us to provide stock status in **NW Indian Ocean** (Oman and Gulf) (Geo-political reason)



→ like India interested in the **stock status around India** (1st day's presentation)

→ Like IOTC Swordfish stock status

Interested in **SW Indian Ocean (local depression)**



3 major reasons

Stock assessments in the NW Indian Ocean

limited & localized STD_CPUE (Oman) (NW)

Geo-political reason : interests in NW

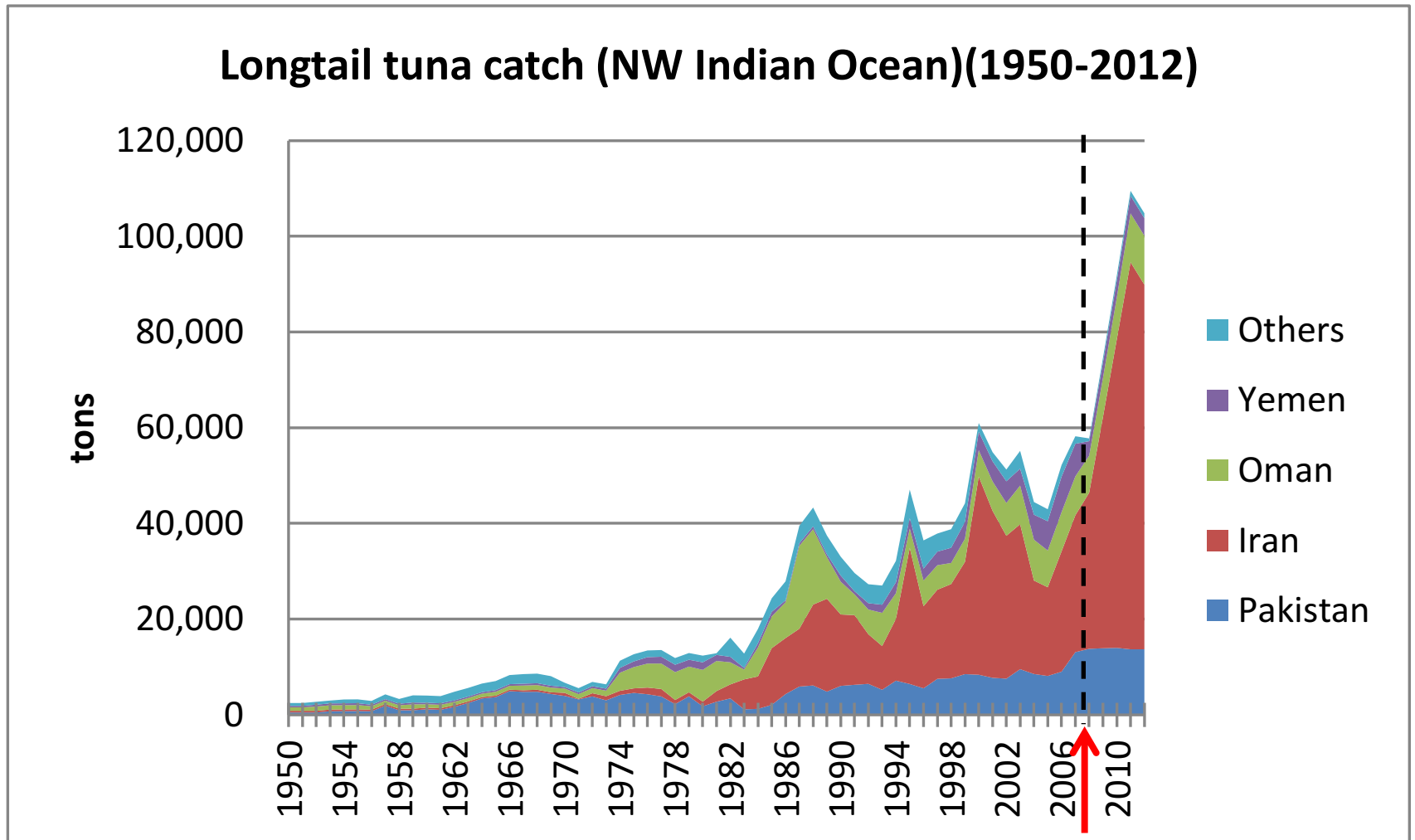
Concerning local depression (NW)



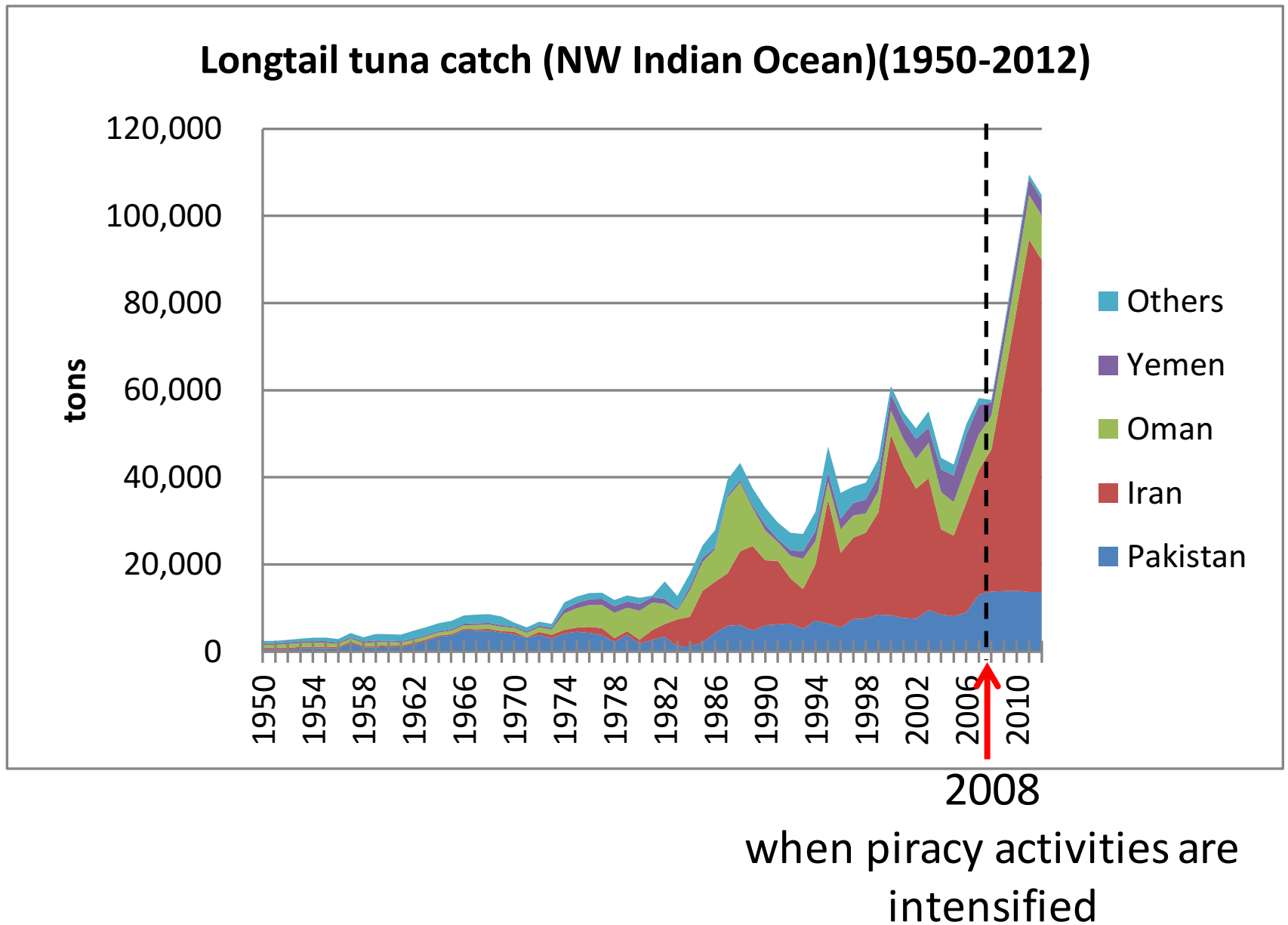
Hypothetical NW Indian Ocean stock

(**Caveat** : we get only limited view)

Input data (Catch in NW Indian Ocean)

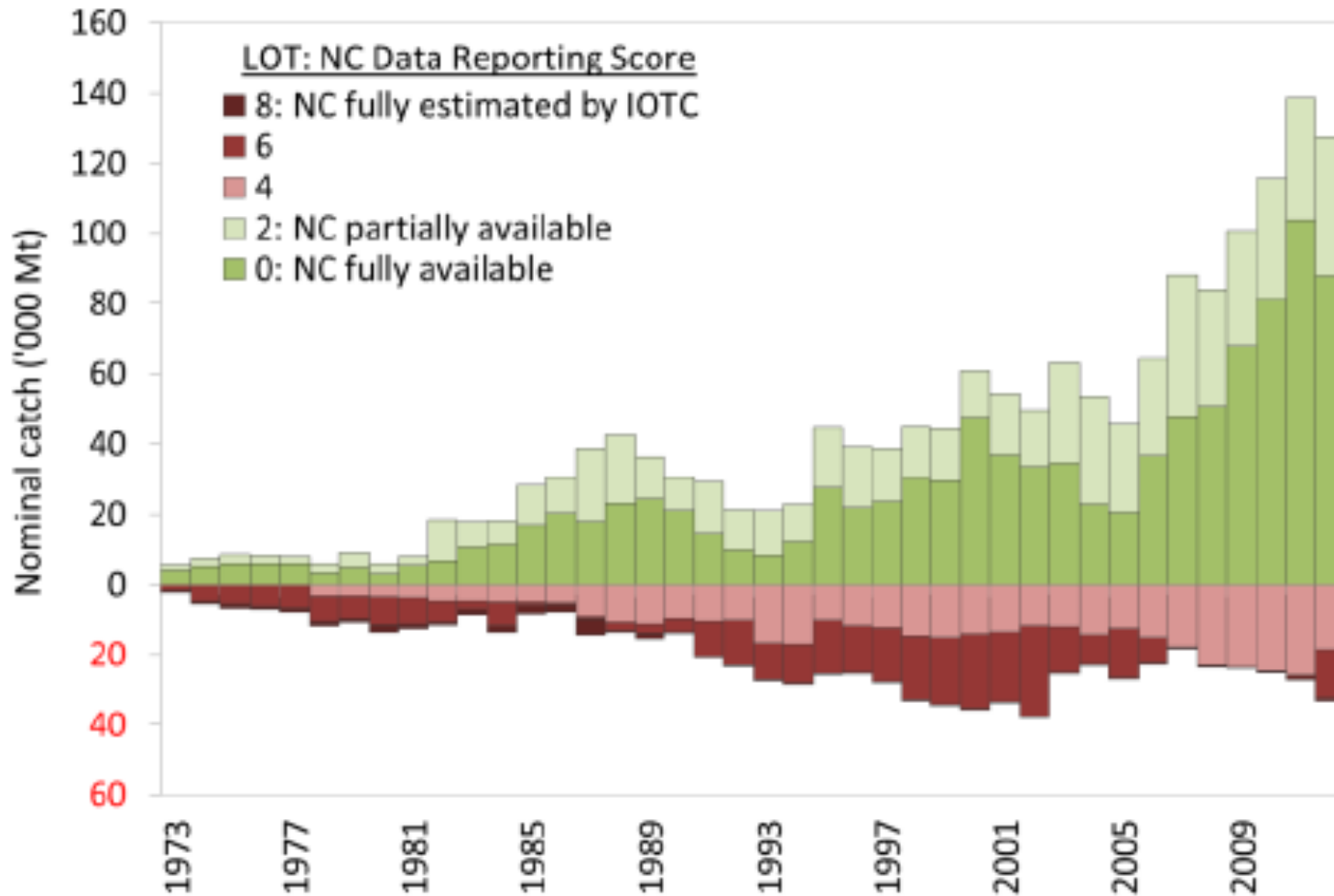


Input data (Catch in NW Indian Ocean)

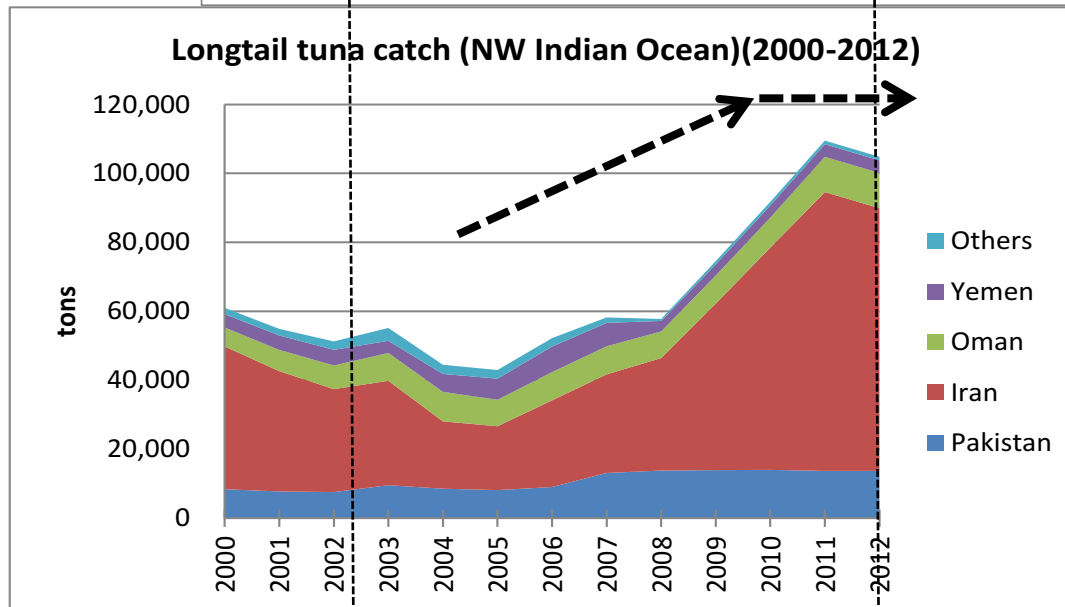
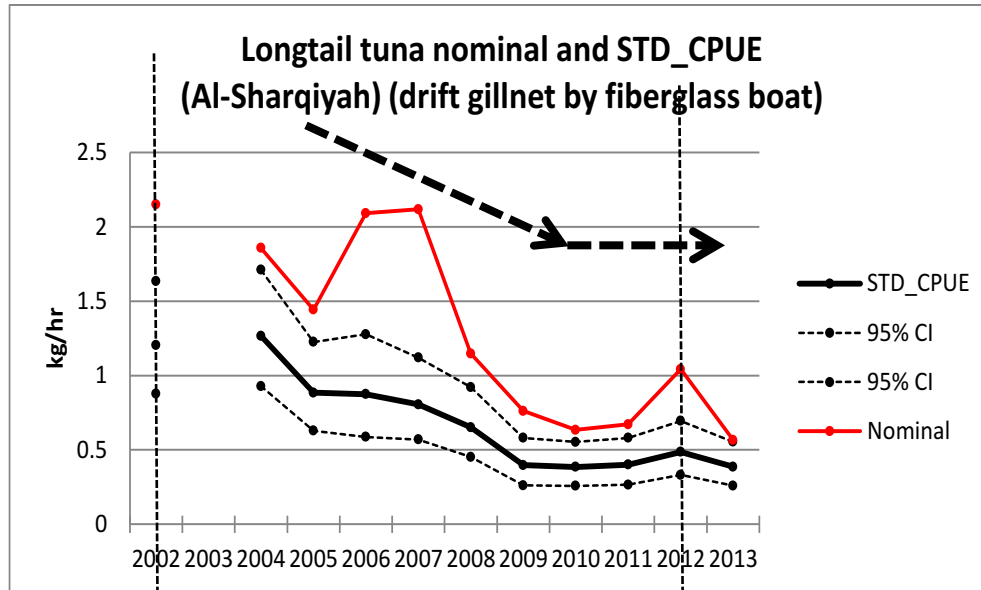


Uncertainty in catch (20-40%)(IOTC Secretariat)

Caveat ASPIC results affected



STD_CPUE (Oman) vs Catch (well reflected)



Stock assessments :ASPIC

A Stock-Production Model Incorporating Covariates (Prager, 2004-)

ASPIC Need to estimate 4 parameters

K : carrying capacity

B_0/K : Initial Biomass (1950) to K

q : Catchability

we assume $B_0=K$

Need to estimate 3 parameters (K, MSY and q)

Applying Schaefer and Fox PM

Initial ASPIC run

No conversions (Schaefer and Fox PM)

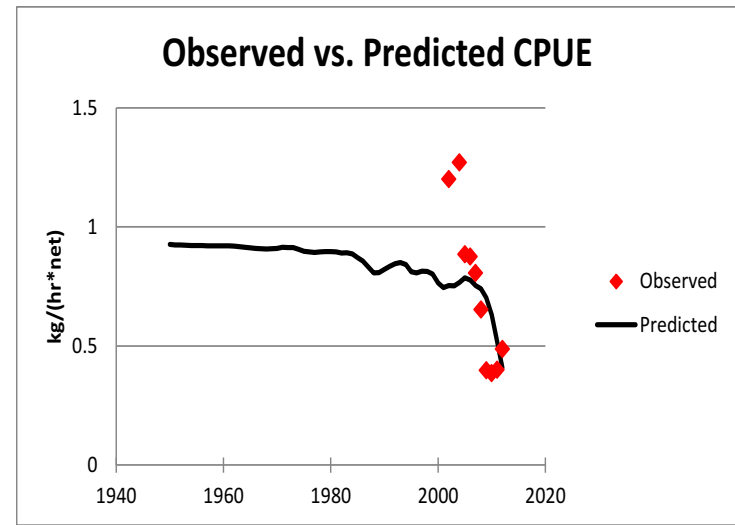
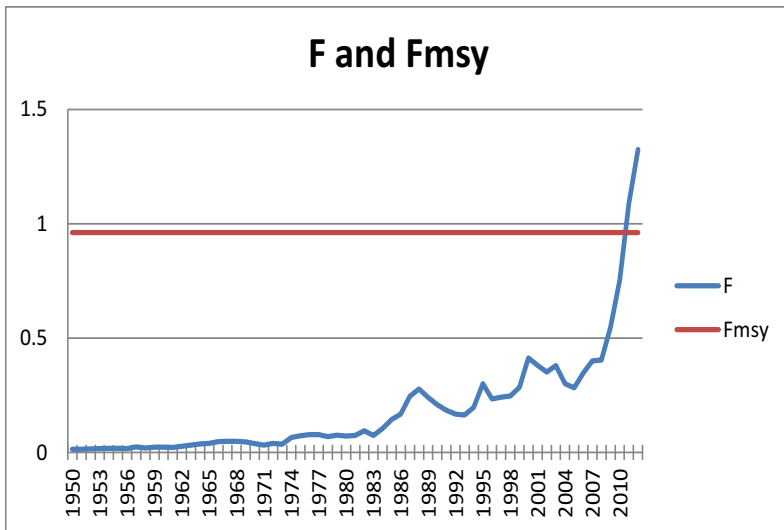
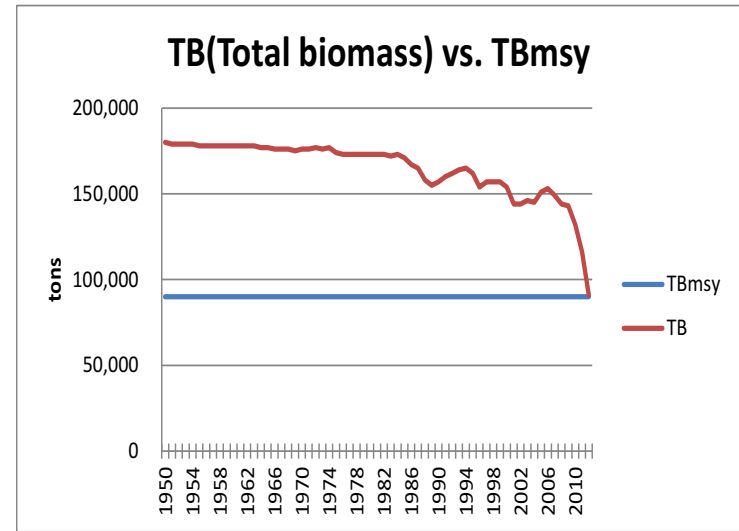
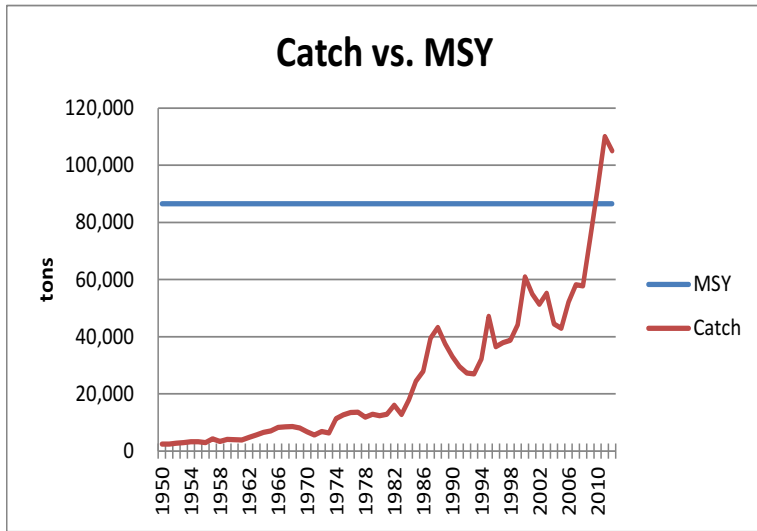


Fix K plausible ranges,
(100, 170, 180, 190 and 200 thousand tons)

Results

(NC: No conversion)

model	Schaefer					FOX
K (1000 tons)	R2	MSE	TB ratio	Fratio	MSY	NC
100	NC					NC
170	NC					NC
180 (best fit)	0.321	0.1483	0.789	1.379	86,490	NC
190	0.319	0.1488	0.780	1.409	85,160	NC
200	0.318	0.1493	0.770	1.440	83,770	NC

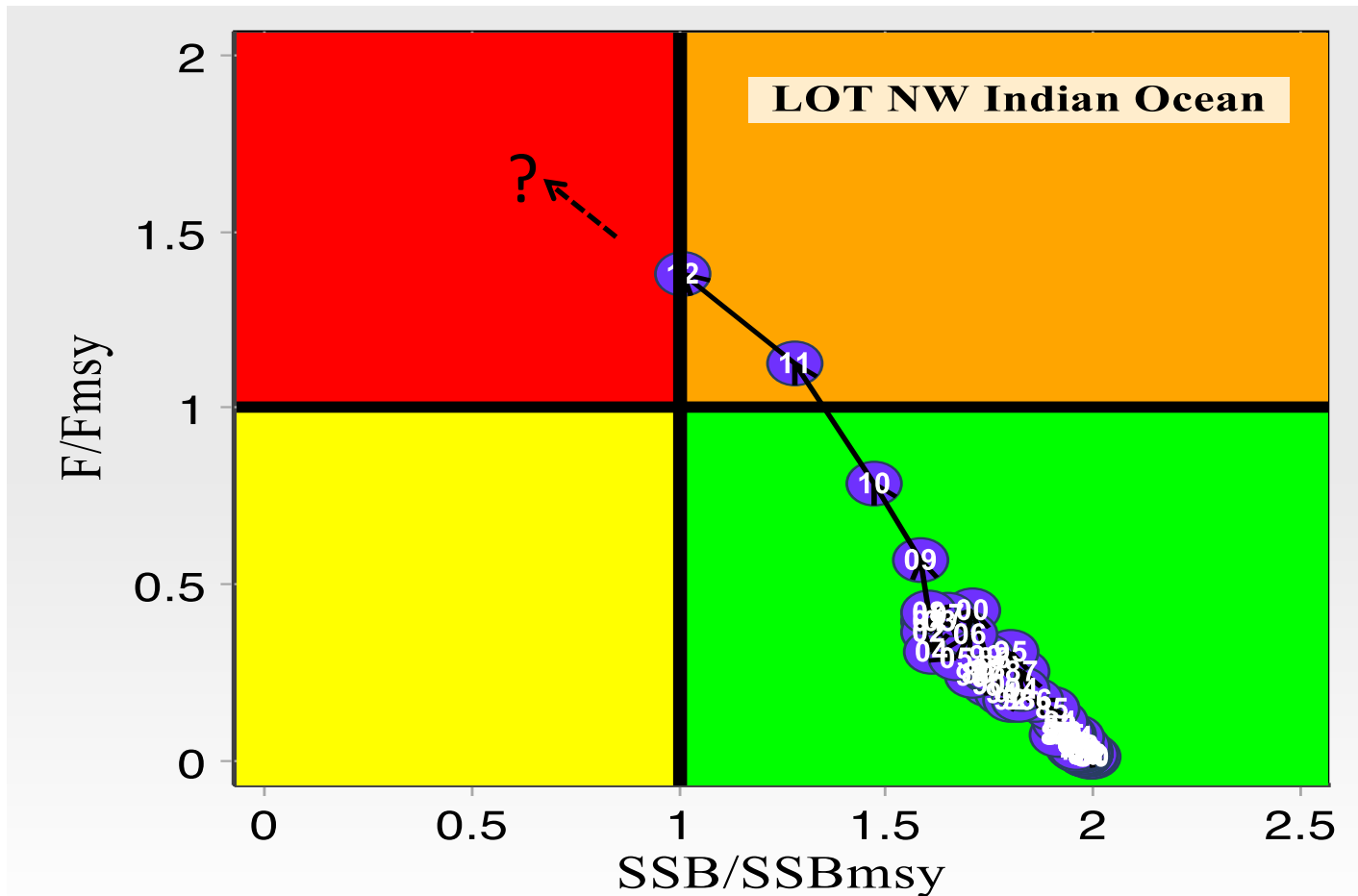


Results

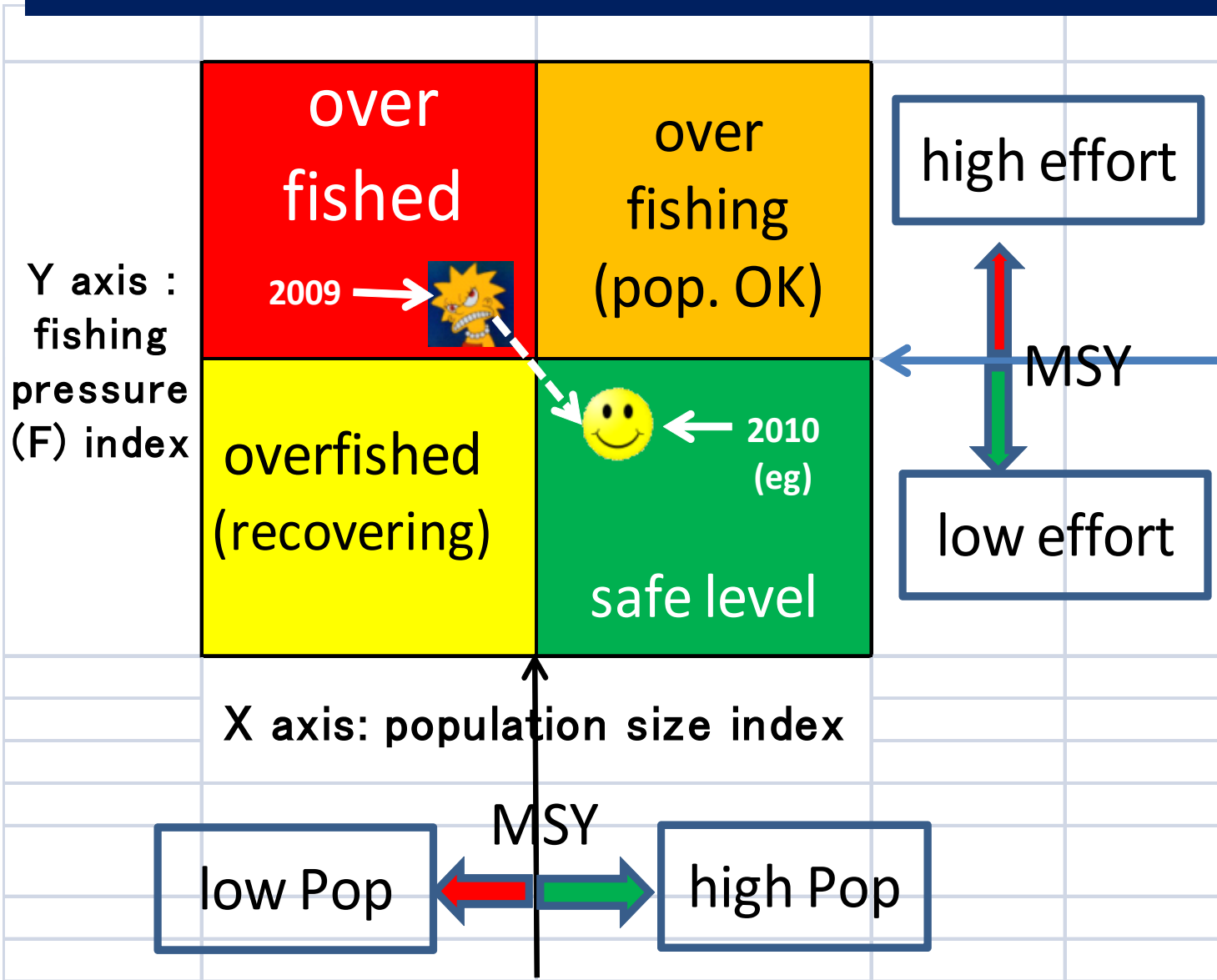
F : 38% higher than Fmsy

TB (Total biomass) = TBmsy

if current F continued, stock status will be overfishing



Status of stock : Kobe plot to represent **stock status in 4 phases**



Longtail tuna stock status summary (NW Indian Ocean hypothetical stock)

Management Quantity	ASPIC (Al-Kiyumi et al, 2014)
Most recent catch estimate (t) (2012)	105,000
Mean catch over last 5 years (t) (2008-2012)	87,800
MSY	86,500
Current Data Period (catch)	1950-2012
CPUE	Omani drift gillnet fisheries (annual) (2001-2012)
$F(2012)/F(MSY)$	1.38
$TB(2012)/TB(MSY)$	1.01
$TB(2012)/TB(1950)$	0.51

Discussion

Learn the story behind the data
Sudden increase/decrease Catch

→ will affect SA

Do not see only data

Socio economic → oil shock (price)

Fish price etc

natural disasters → tsunami

Piracy effect etc

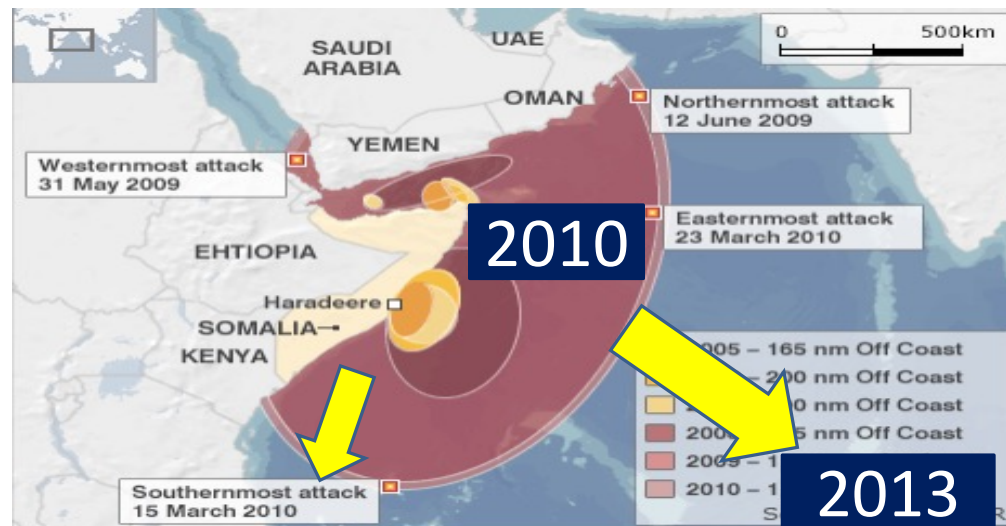
Discussion **Piracy effects**

To interpret the ASPIC results, piracy effect important to understand the situation.

Piracy activities : middle of 2000's off Somalia and intensified 2008 afterwards then extended to Central IO (2013)

Piracy impact on tuna fisheries

*Piracy zone expanded to the Mozambique channel (2010)
and further to the Central IO (Maldives) (2013)*



Drift gillnet fisheries in the NW Indian Ocean

Before 2008: **Catch Yellowfin tuna in high Seas**



After 2008 some attacked by pirates



Back to their EEZs and **catch more neritic tuna.**



Sharp increase in the neritic tuna catch

Major reasons

Stock assessments in the NW Indian Ocean

Geo-political reason : interests (NW)

Concerning local depression (NW)

Ecological reasons (Geographical features, gene flow limit, ecological niche and viscosity) (NW)



Hypothetical NW Indian Ocean stock

Caveat: results may be biased if NO such stock

ASPIC

Why 1st run not converged ?



Catch : long time series **63 years** (1950-2012)
(low catch **30 years** 1950-1970)

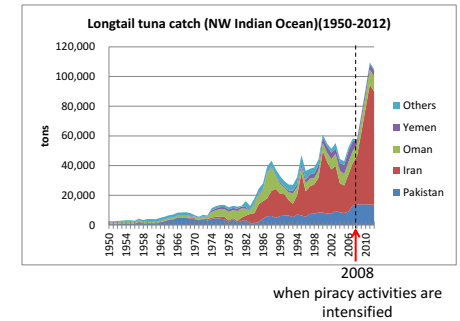
vs.

STD_CPUE : short period **11 years** (2002-2012)



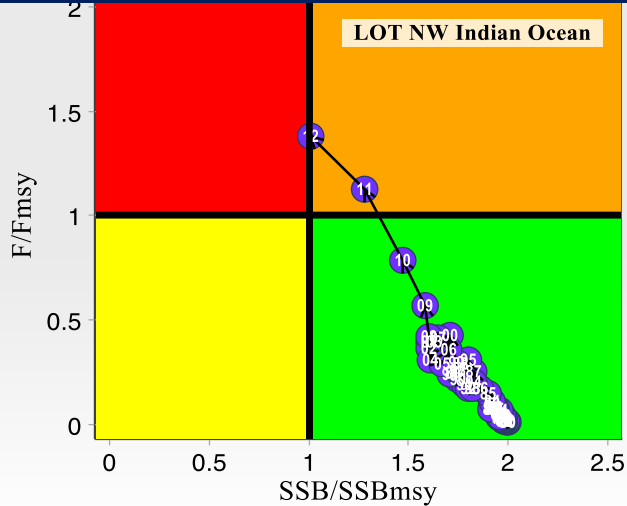
Population dynamics (catch vs CPUE)
could not explain this situation (GAP)

Input data (Catch in NW Indian Ocean)

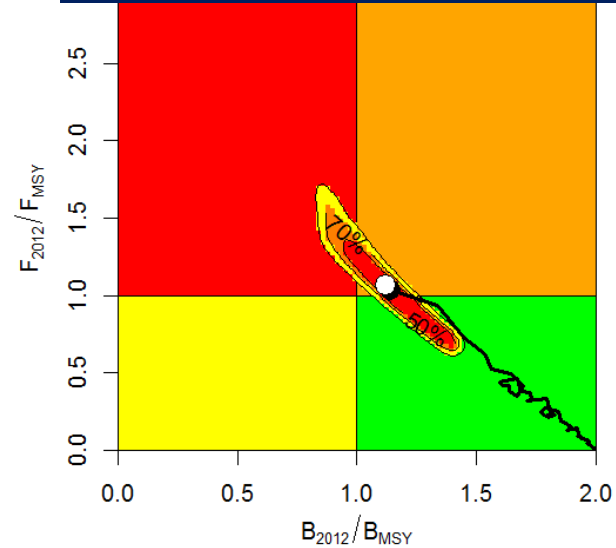


Important to compare to other SA result

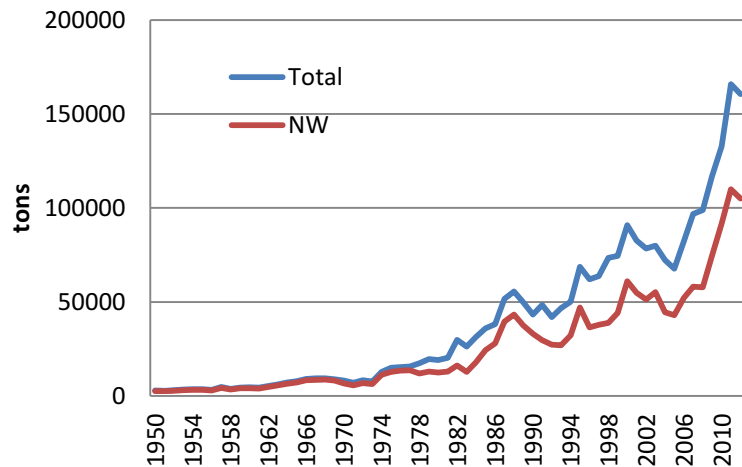
**ASPIC (NW Indian Ocean)
Al-Kiyumi et al (2014)**



**SRA (Whole Indian Ocean)
Zhou & Sharma (2014)**



longtail tuna catch (whole vs. NW IO)



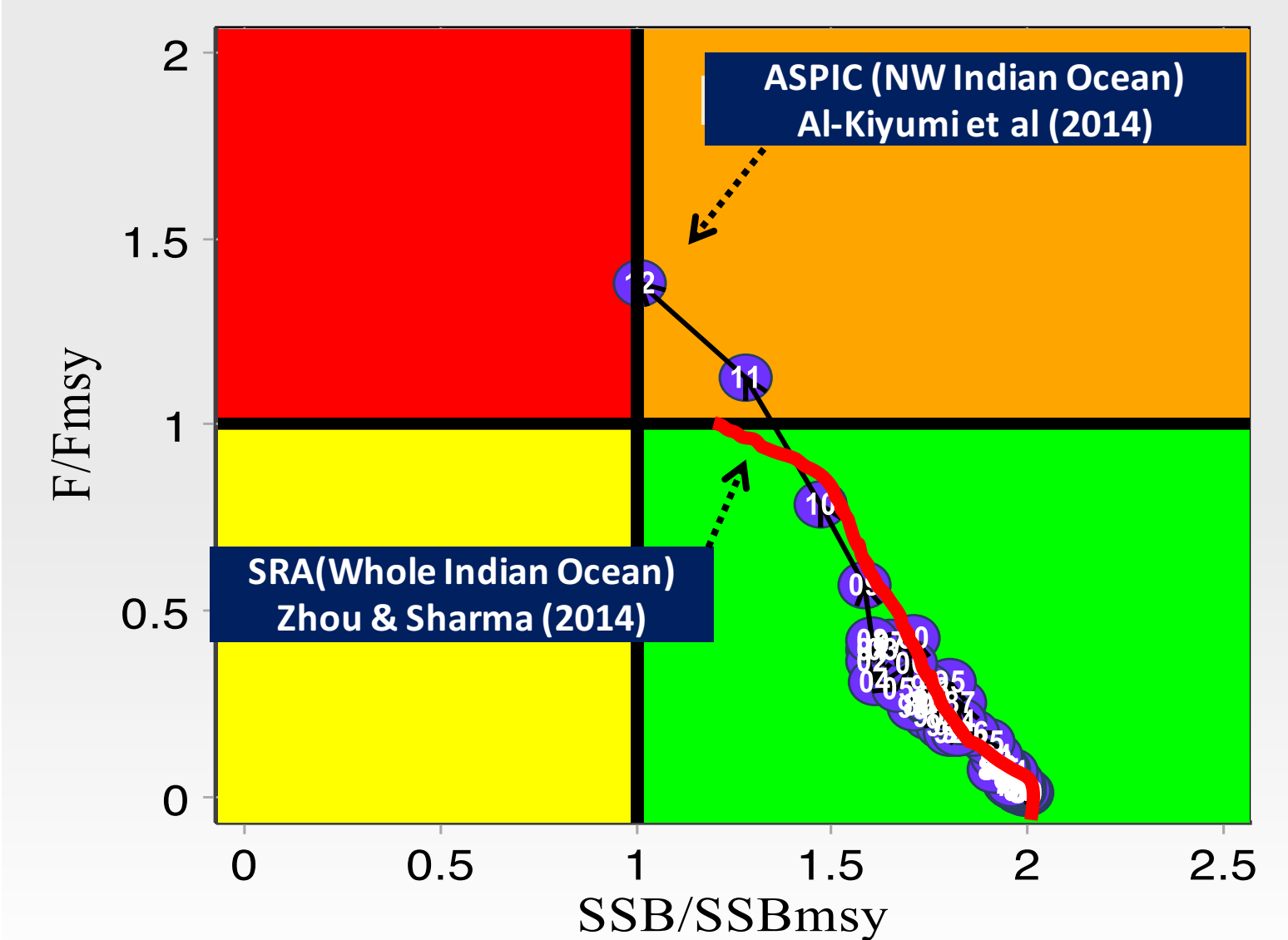
**Kobe plots : almost identical
except 2011-12 (see next page)**

why?



**Both catch : similar pattern
NW: F is much higher and
more intensified**

Almost identical except 2011-2012



Summary

Stock Status Longtail tuna in NW Indian Ocean
(with caution due to the hypothetical NW stock)

Overfishing

F is 38% higher than F_{msy}
TB (Total biomass) = TB_{msy}

Similar stock trajectory to SRA
(Zhou and Sharma, 2014)
except recent 2 years (2011-2012)

Application to SEAFDEC

Similar to the NW Indian Ocean case
(longtail, Kawakawa, Frigate etc)

- (1) Set the SE Asia **stock structure** hypothesis
- (2) **Compile historical data** (Catch + CPUE) for ASPIC
(SEAFDEC + WCPFC + IOTC + Member countries)
- (3) Data **massage** (evaluations) → Select data
- (4) Conduct CPUE standardization + **ASPIC**
- (5) **Management advise**

Later age based model or catch model (cross check)

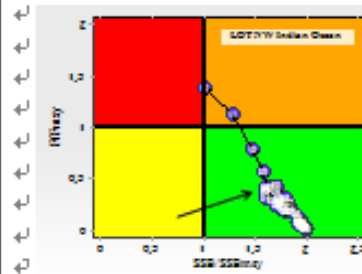
Neritic tuna SE Asia Hypothetical Stock



Executive summary

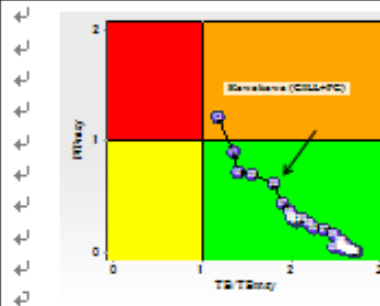
Oman Neritic tuna Project

LONGTAIL TUNA ↵



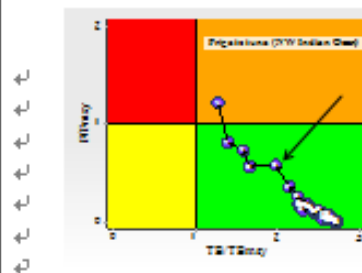
In 2012, F (fishing mortality rate) is beyond F_{msy} (38% higher than the MSY level), i.e., high fishing pressure, while the total biomass is about in the MSY level. It is clear if current F level continues, longtail tuna stock will be entering the overfishing stage from 2013. ↵

KAWAKAWA ↵



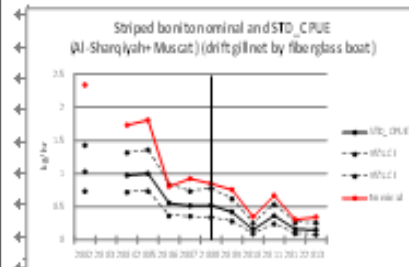
In 2012, F (fishing mortality rate) is beyond the F_{msy} level (21% higher than the MSY level), i.e., high fishing pressure, while the total biomass is 12% more than its MSY level (safe level). It is clear if the current F level continues, kawakawa stock will be entering the overfishing stage in the near future. ↵

FRIGATE TUNA ↵



In 2012 F (fishing mortality rate) is beyond F_{msy} (22% higher than the MSY level), i.e., high fishing pressure, while the total biomass is still in the safe zone, i.e., beyond the MSY level (27% higher). However, it is clear if current F level continues, frigate tuna will be entering the overfishing stage in the near future. ↵

STRIPED BONITO ↵



STOCK STATUS IS UNKNOWN. It is not possible to conduct stock assessment with the current catch information because it is incomplete. It is strongly recommended to make complete catch statistics through IOTC. Although the stock status is not known, there is a concern as standardized CPUE shows continuous and consistent decreasing trend as shown in the graph (left). ↵

Finally.. Whishing Neritic tuna forever !!

مرسی-

ありがとうございます
ごはんに
あそびます。

ဧည့်
ဇိ

- شُكْرًا جَزِيلًا.

Thank you so much.

Vielen Dank.

Merci beaucoup.

¡Muchas gracias!

Grazie mille.



感激不尽。

감사합니다.

Большое спасибо.

<http://gogakuru.exblog.jp/>

ขอขอบคุณ

Terima kasih banyak!