The Nature Conservancy – Indonesia Fisheries Conservation Program

The Nature Conservancy
Protecting nature. Preserving life

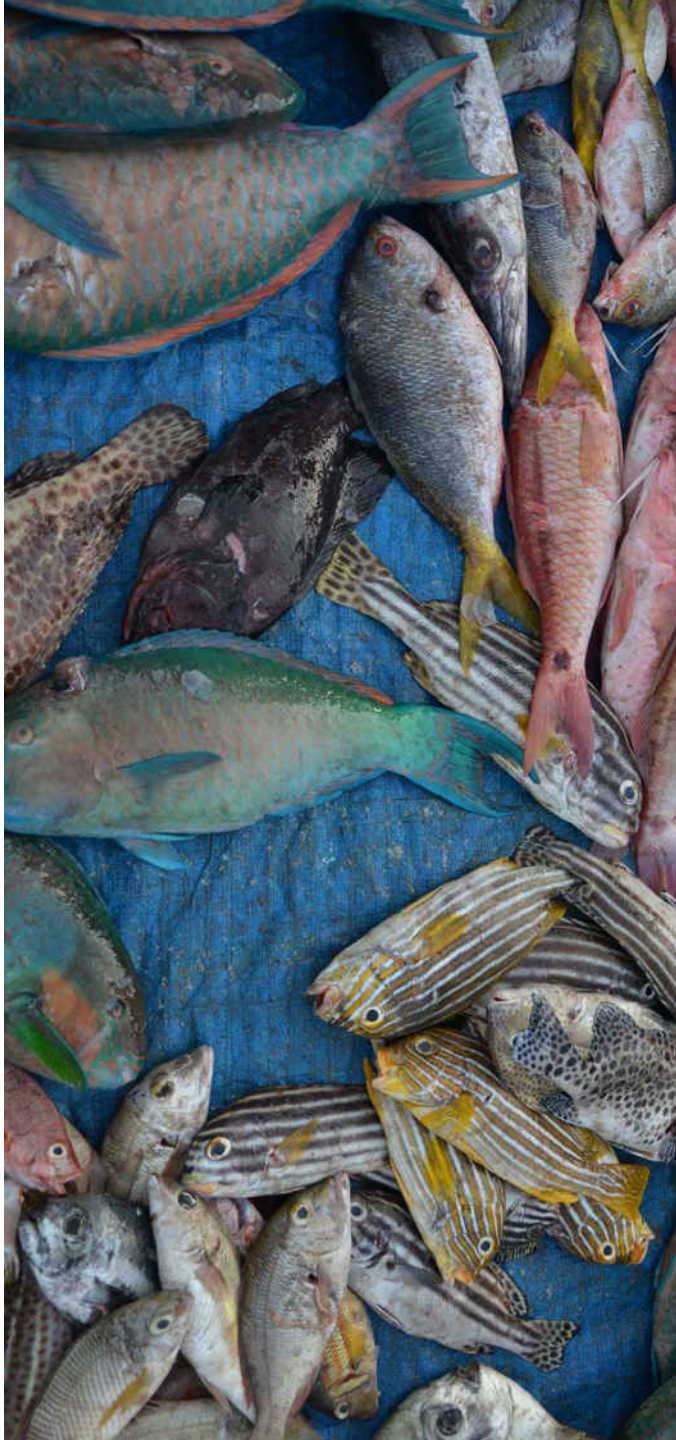
People & Nature Consulting International

Snapper Grouper Fishery | Tuna | Partnerships and Innovation

Brawijaya University, Malang
October 2016

The TNC Indonesia Fisheries Conservation Program: Addressing over-fishing

1. Management of deepwater snapper and grouper fisheries
2. Address capture of juvenile tuna, improve FAD management
3. Innovation
4. Policy and regulatory support towards sustainable fisheries



The challenge:

Management for sustainability of
deepwater snapper and grouper stocks

- Data-poor (insufficient data for conventional stock assessments)
- Multi-gear fishery (dropline, longline, handline)
- Multi-species
- Multi-fleet, boats of 10 GT – 150 GT
- Wide-ranging and dispersed
- Complex supply lines (including domestic transshipment)
- Export markets, which demand responsible sourcing

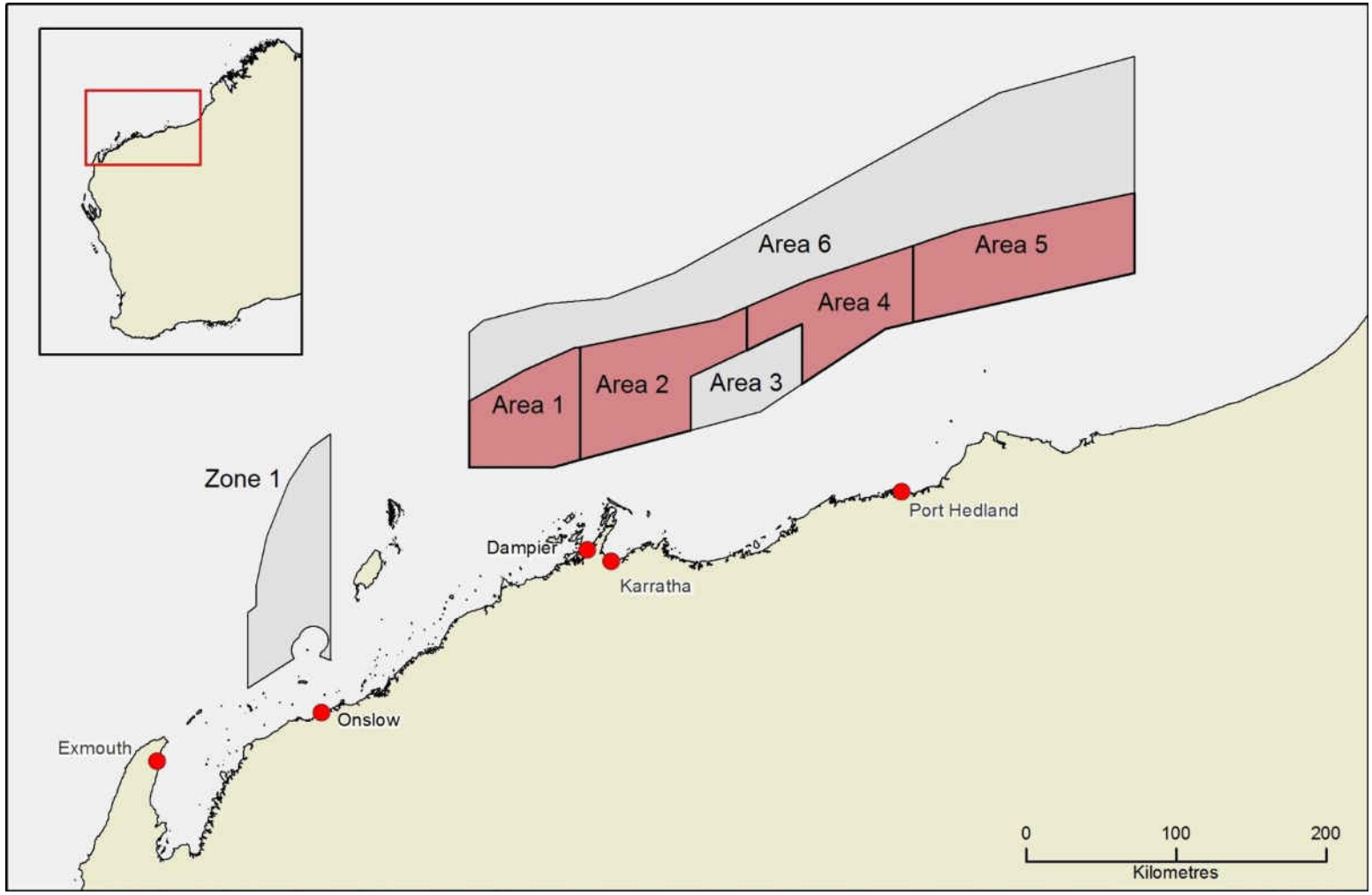
Management options

- Licensing (effort control)?
- Quota on catch volume?
- Gear regulations?
- Species-specific minimum size?
- Area-based restrictions?

The indicator species approach for managing mixed fisheries in Western Australia - a tropical fish-trawl example

Daniel Gaughan, Lynda Bellchambers, Corey Wakefield, Stephen Newman, Mathew Hourston, David Fairclough

Pilbara demersal fishery – spatial management

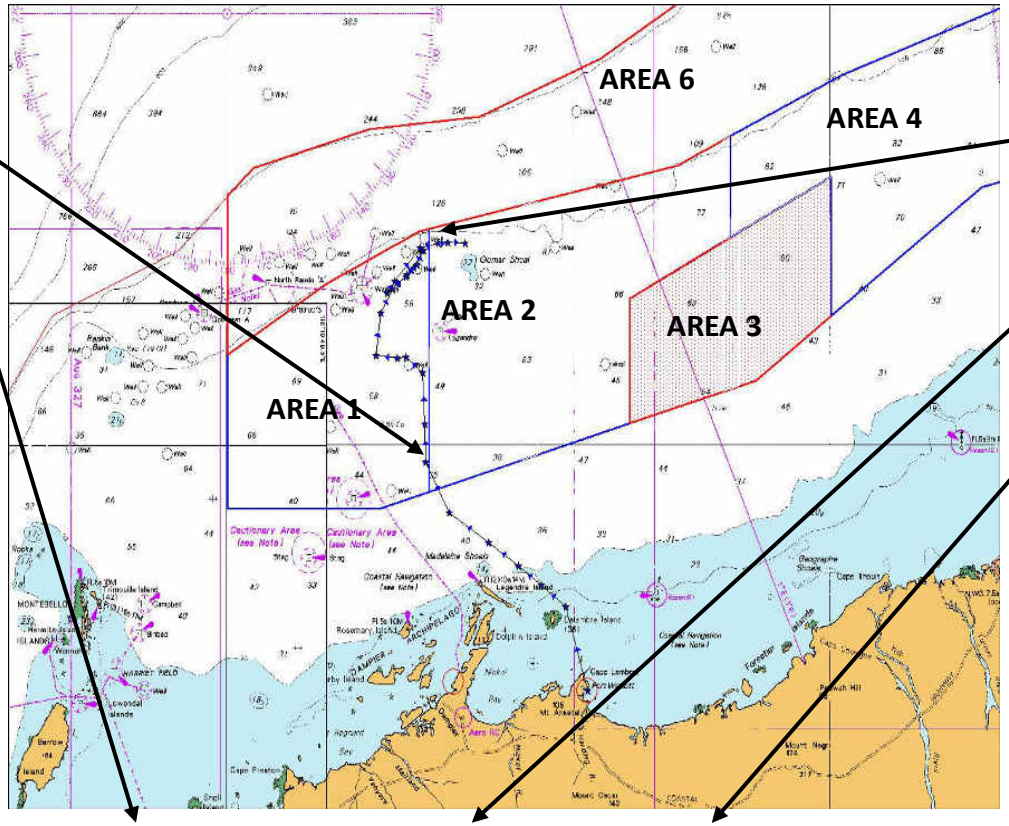


VMS-Time access management

Pilbara Fish Trawl Fishery

Vessel enters Area 1

VMS – Position/Time recorded in data base



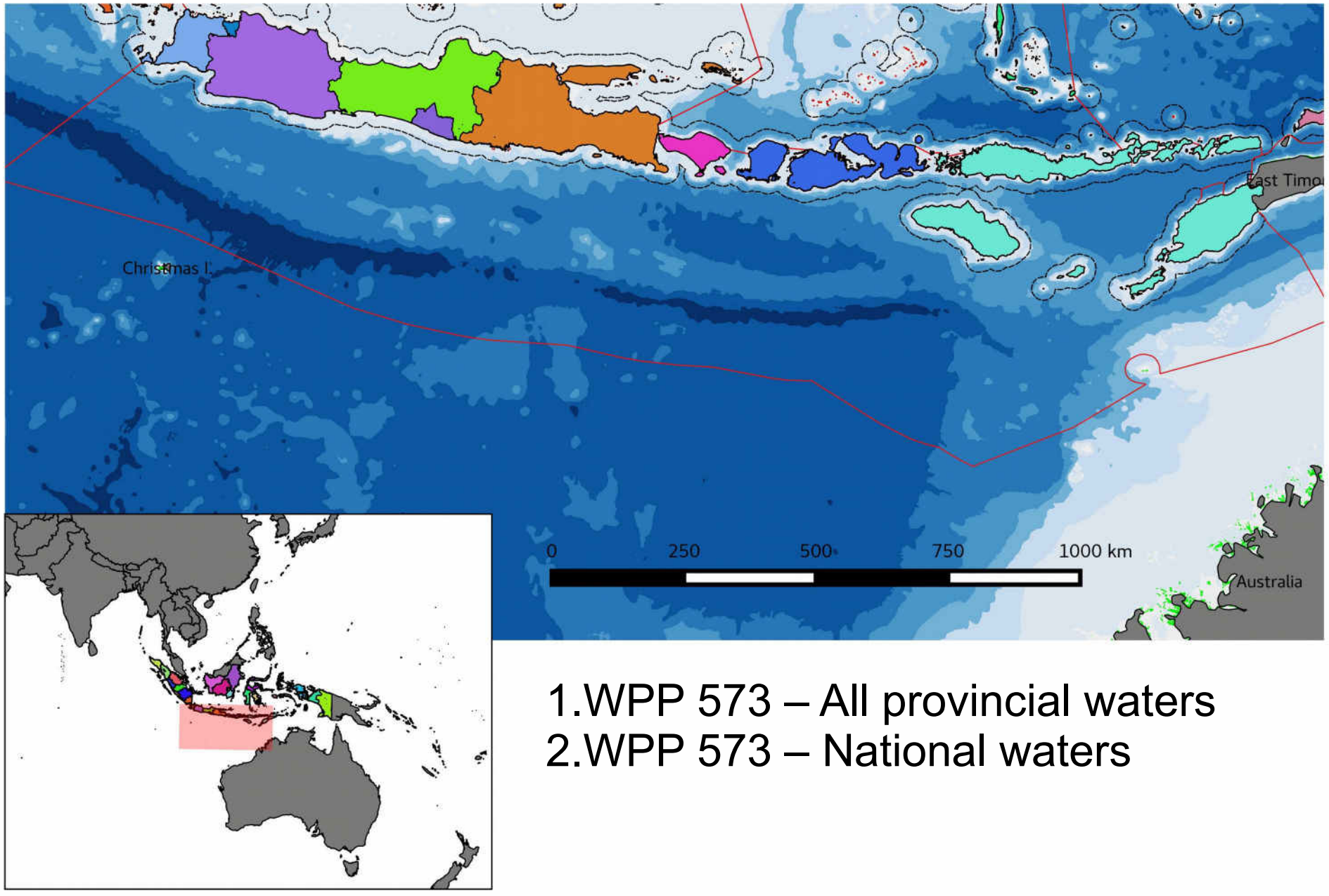
Vessel departs Area 1

VMS – Position/Time recorded in data base

Total time calculated in Area 1

Time deducted from allocated units for area 1

AREA	DATE/TIME Enter	DATE/TIME Depart	TIME Hours	TOTAL TIME USED	Total Time Available
					5000
AREA 1	06/04/2002 0:38	10/04/2002 5:26	100.8	100.8	4899

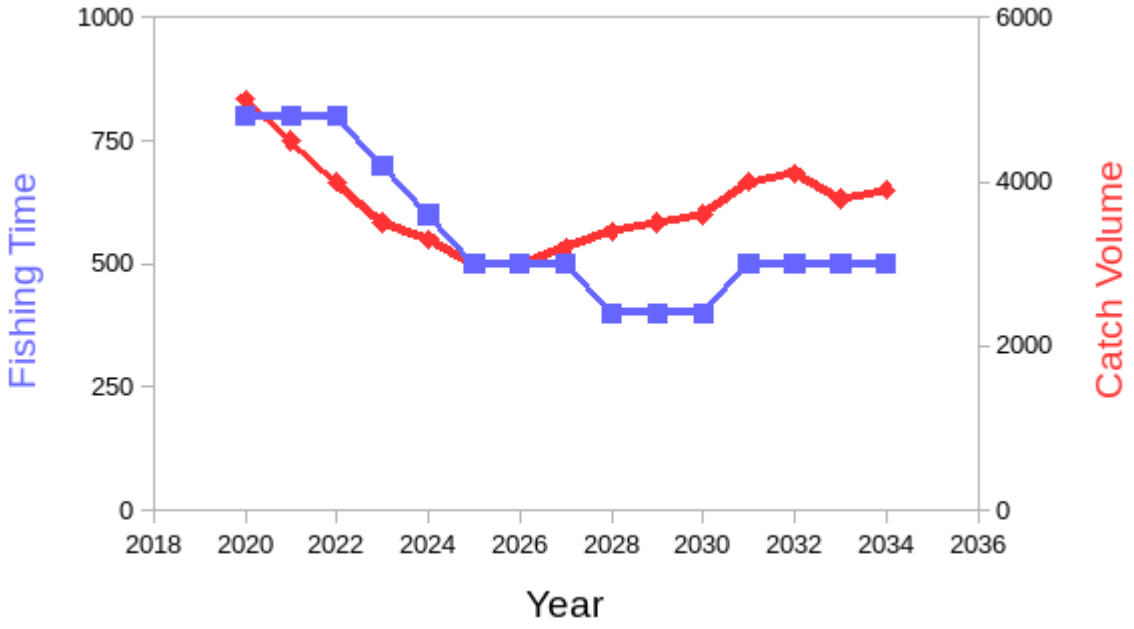


1. WPP 573 – All provincial waters
2. WPP 573 – National waters

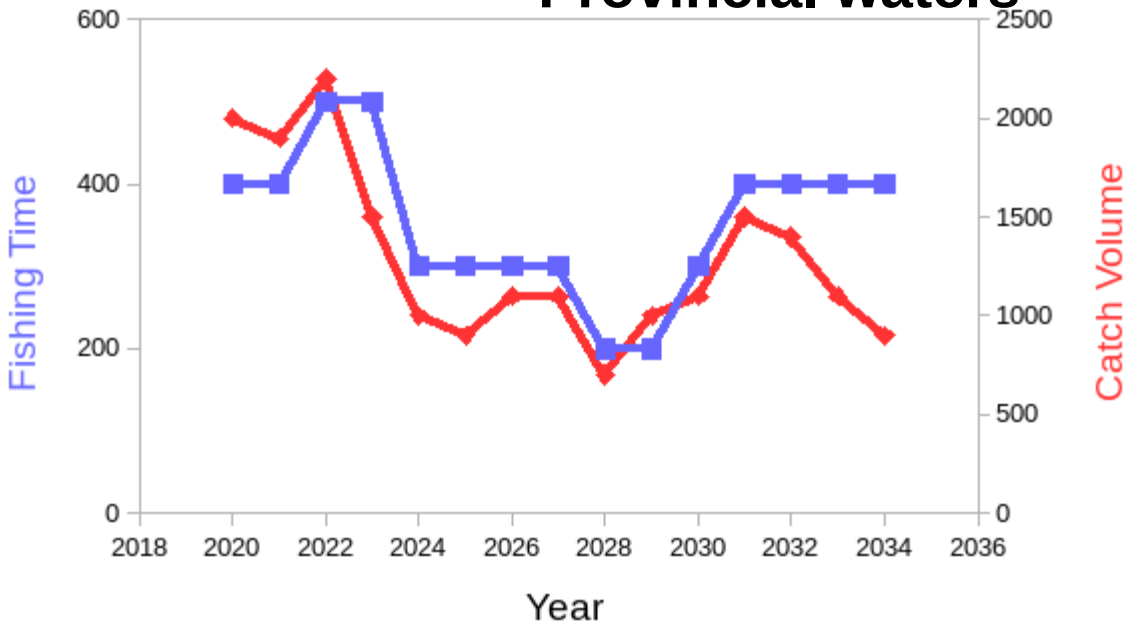
Example:

Different management scenarios and different outcomes within one WPP

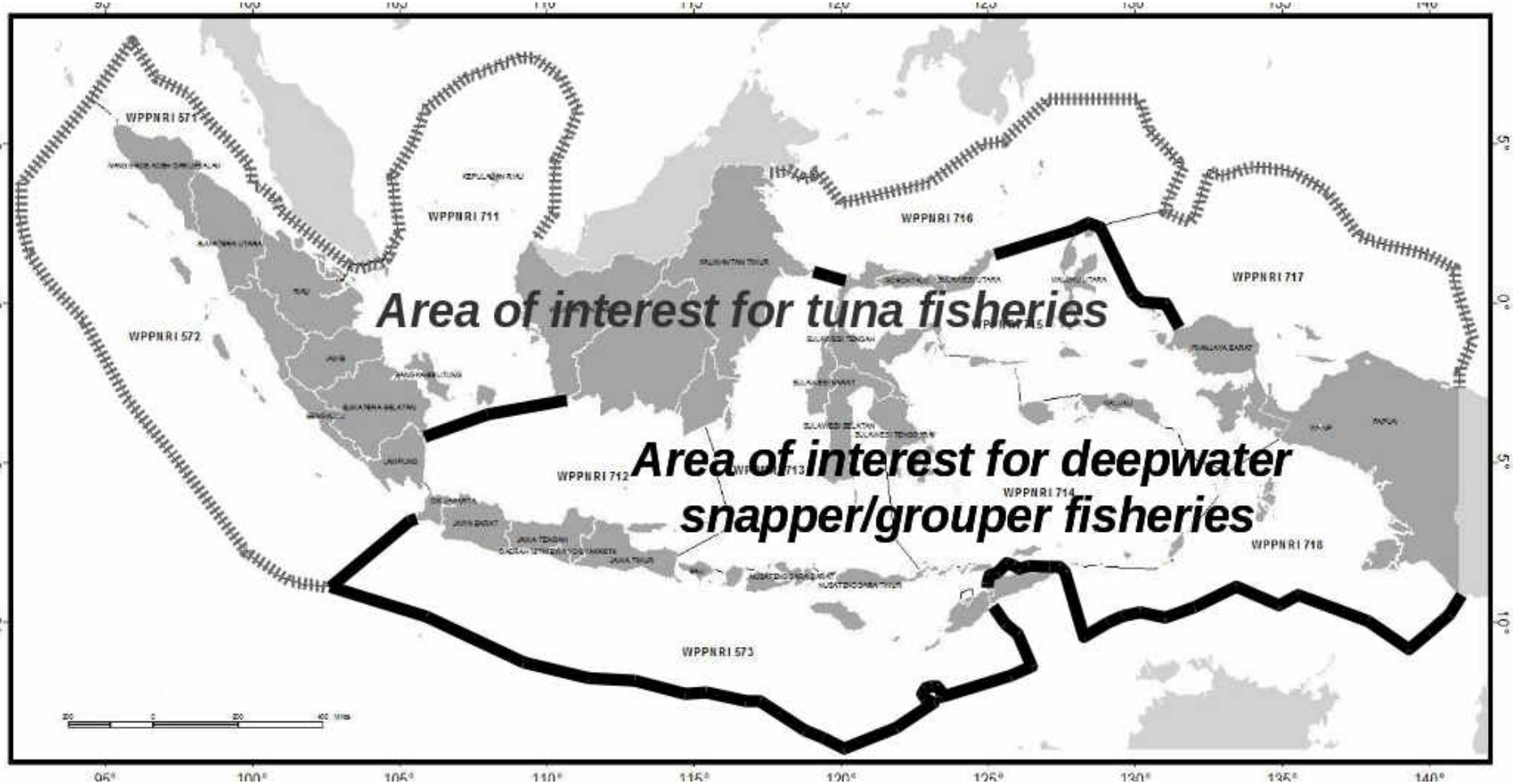
National waters



Provincial waters




THE PHILIPPINES
MALAYSIA
Kalimantan
Sumatra
Sulawesi
Maluku
Papua
Java
Nusa Tenggara
EAST TIMOR
Bali
AUSTRALIA


WPPNRI 571
WPPNRI 711
WPPNRI 716
WPPNRI 717
WPPNRI 572
Area of interest for tuna fisheries
WPPNRI 712
WPPNRI 713
WPPNRI 714
WPPNRI 718
Area of interest for deepwater snapper/grouper fisheries
WPPNRI 573

Grouper / snapper fisheries ≠ Coral reef fisheries

- Near-shore, shallow coral reef fishery:
  - 0 – 50 m,
  - mostly within 12 nm,
  - mostly < 10 GT, various gears
  - usually within 1 WPP, within 1 province
- Off-shore, deep slope fishery:
  - 50 – 500 m
  - nearshore and offshore
  - 0 – 30 GT, 30 – 100 GT, handline, dropline, longline
  - multiple WPP, multiple provinces


20
21
23
24
29
25
26
27

110 cm

Lutjanus sebae
Red emperor

70 cm

Lutjanus erythropterus
Crimson snapper

Small Sebae or big Erythroptorus?

1.4 m

Etelis sp

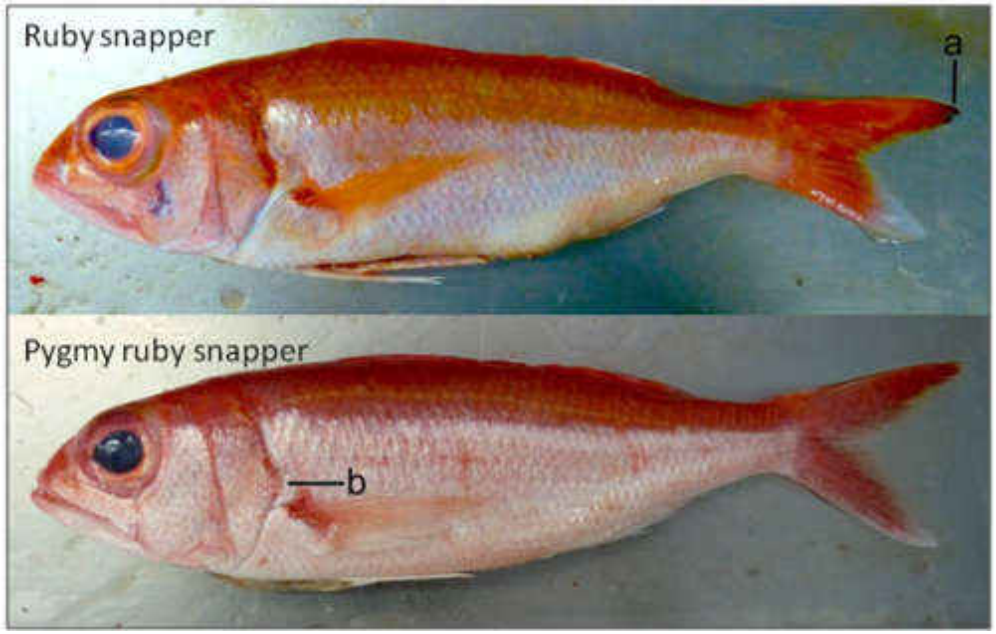
Giant ruby snapper

0.7 m

Etelis carbunculus

(formerly *E. marshi*)

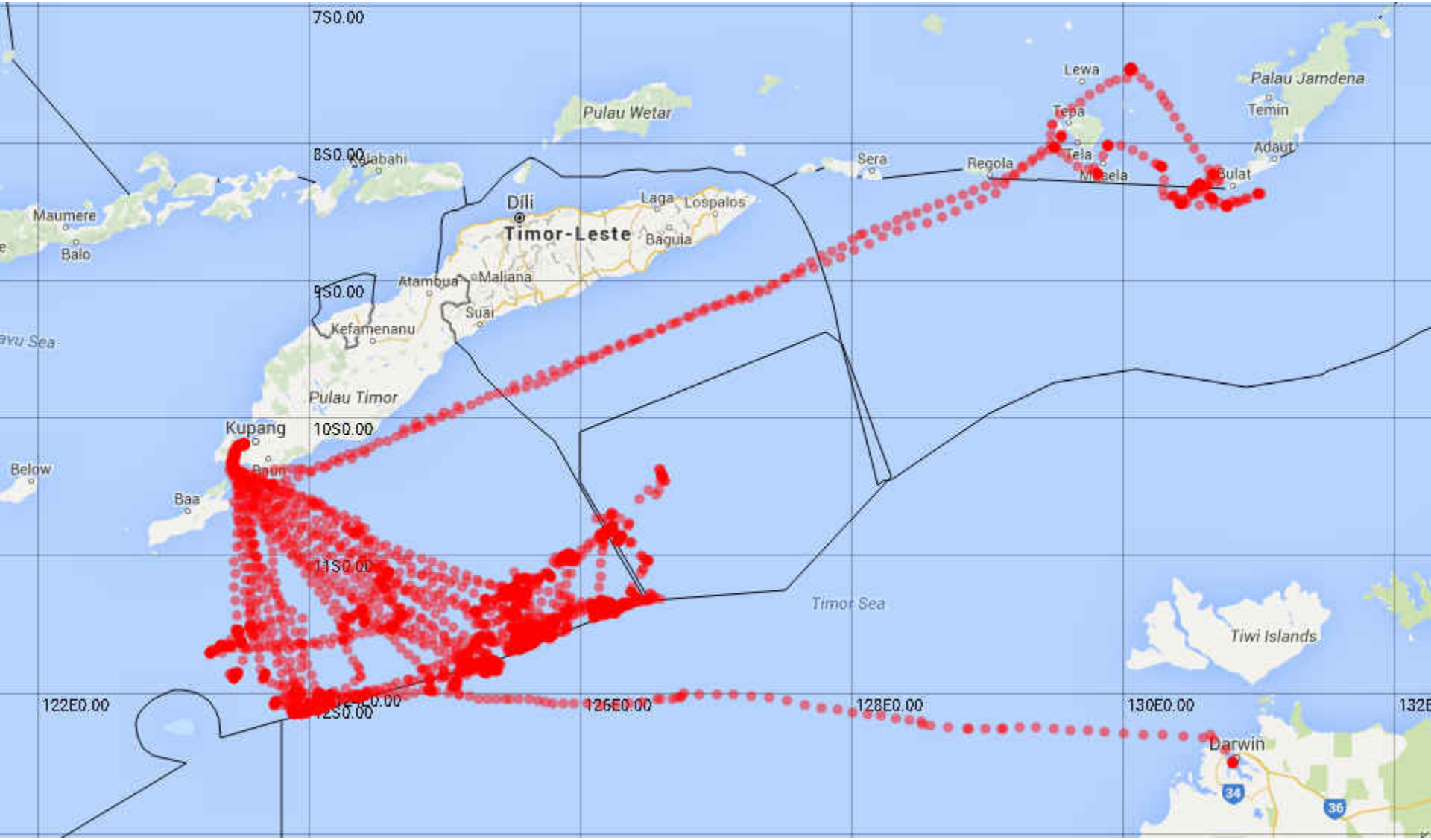
~~Pygmy~~ Ruby snapper



Described in 2016. Kupang grouper,
Epinephelus kupangensis

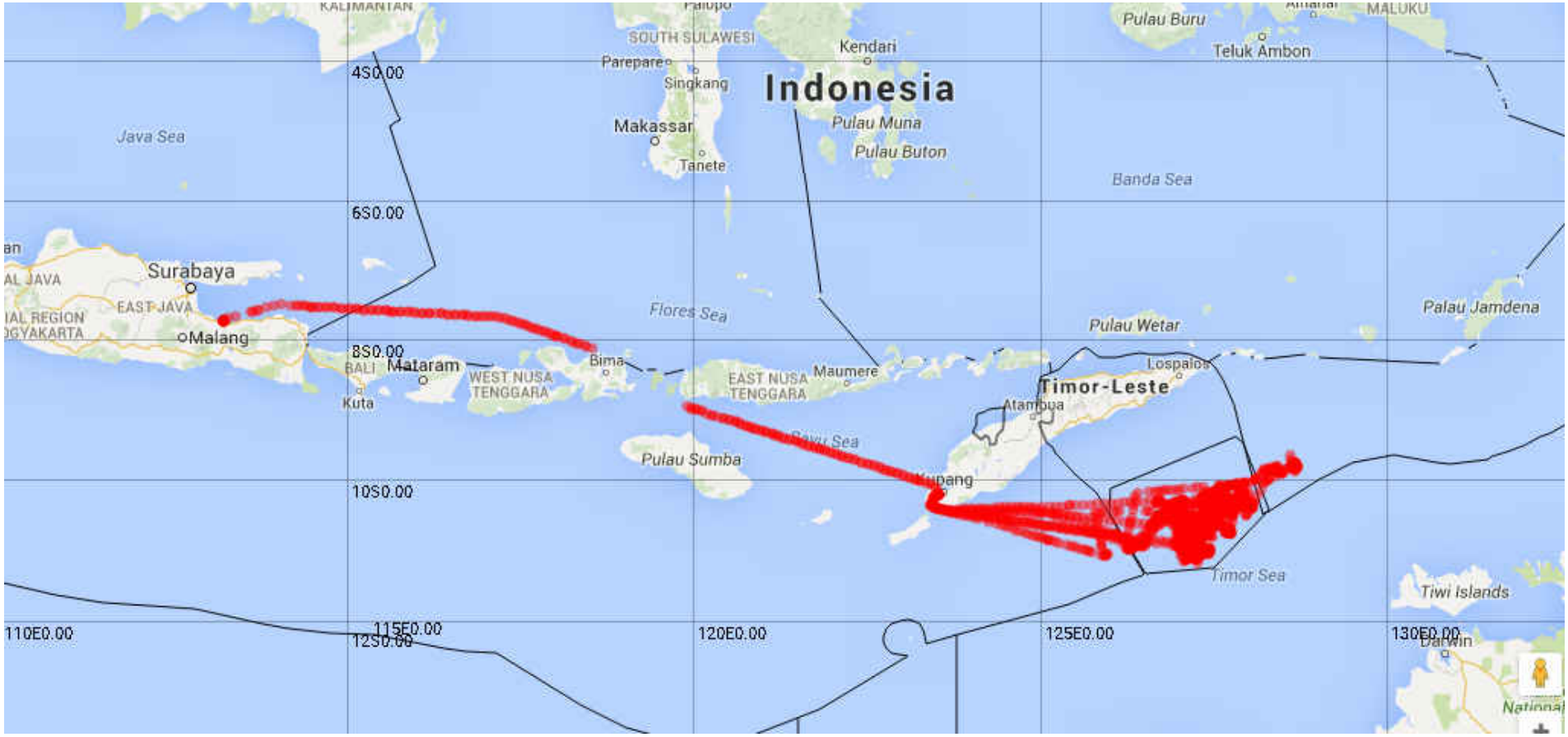
Dropliners, operating from Kupang

Dropliners, operating from Kupang

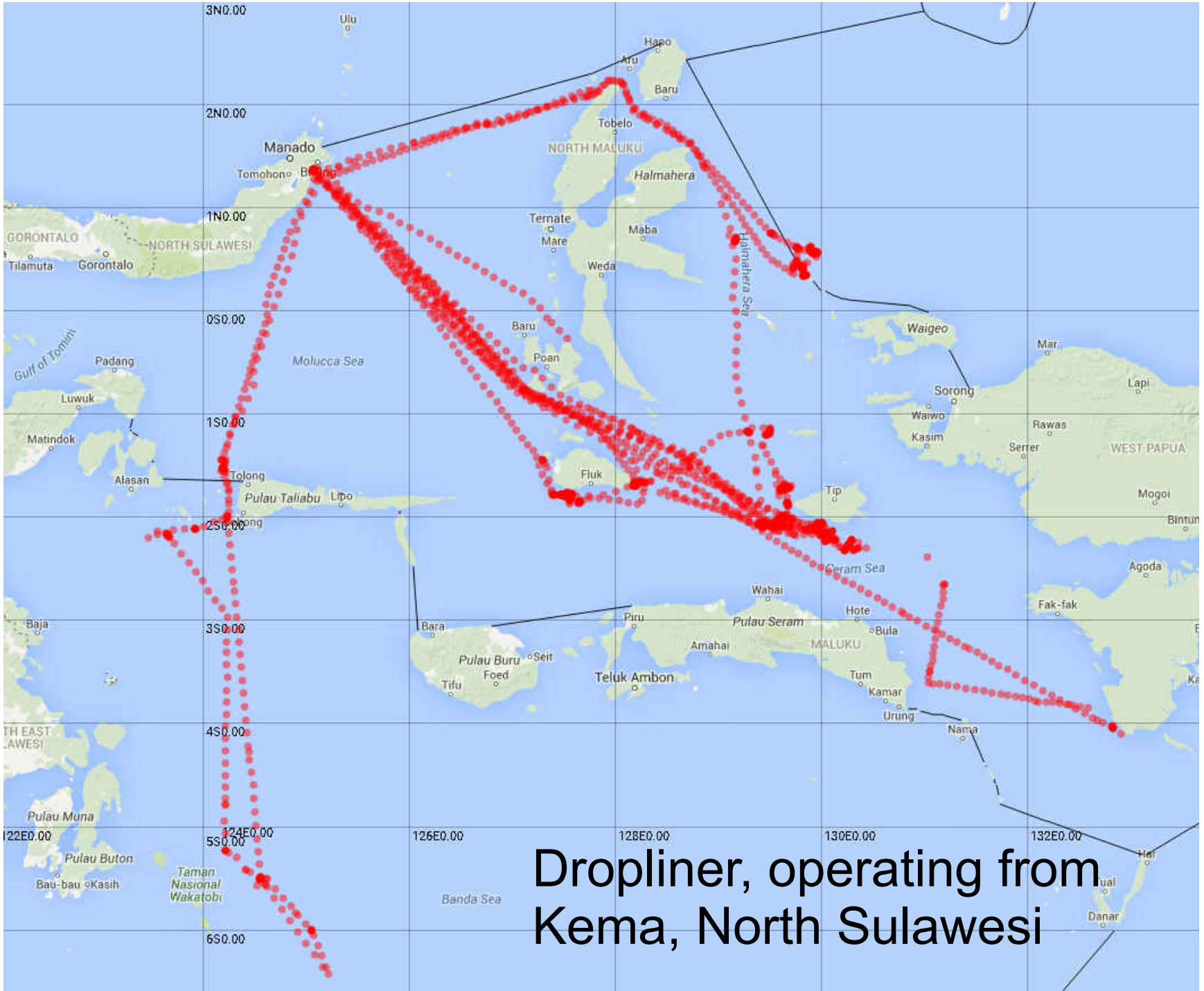


Longliner, operating from Probolinggo, Java

Longliner, operating from Probolinggo, Java



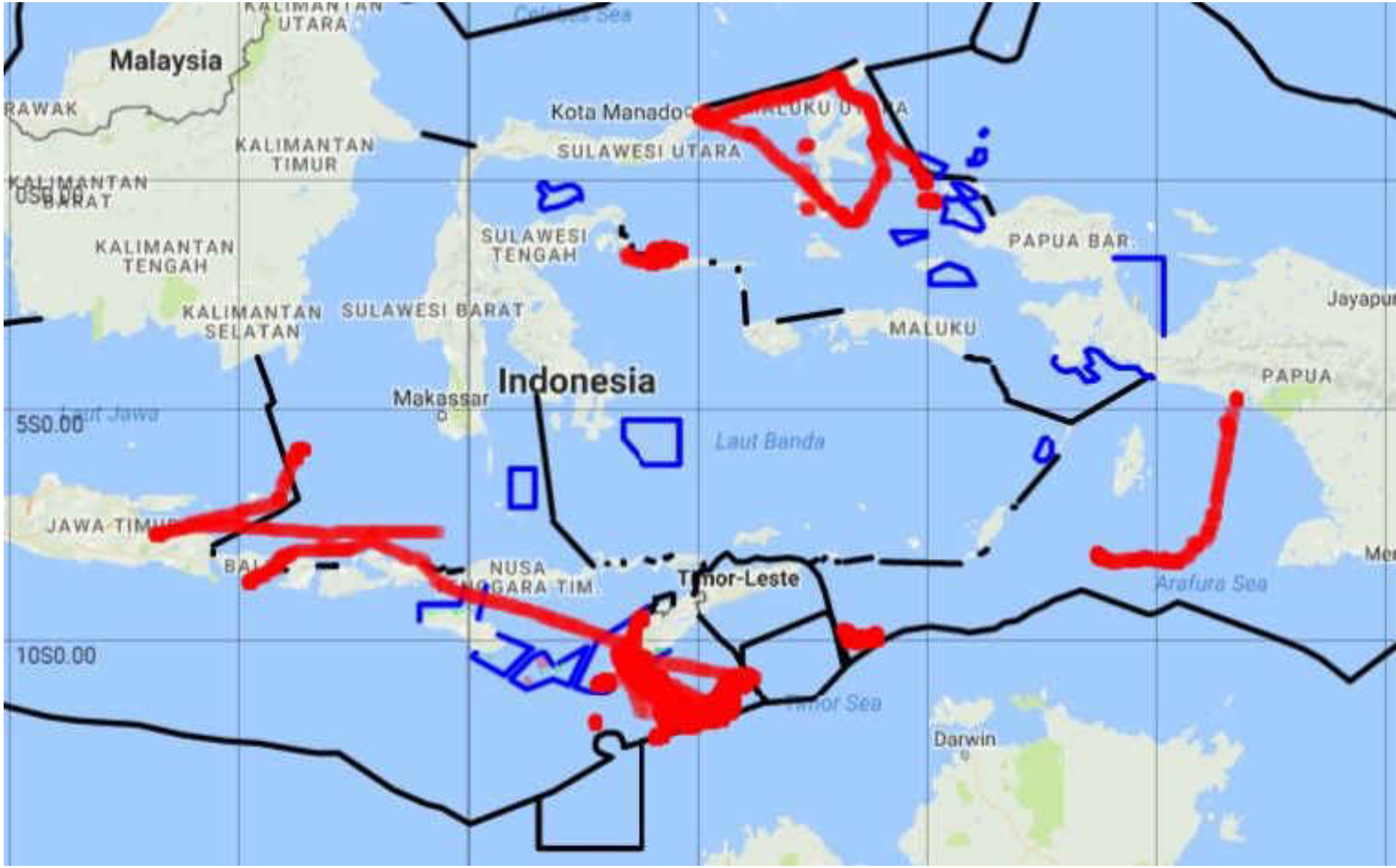
Dropliner, operating from Kema, North Sulawesi


Dropliner, operating from
Kema, North Sulawesi

Dropliner, operating from Benoa, Bali

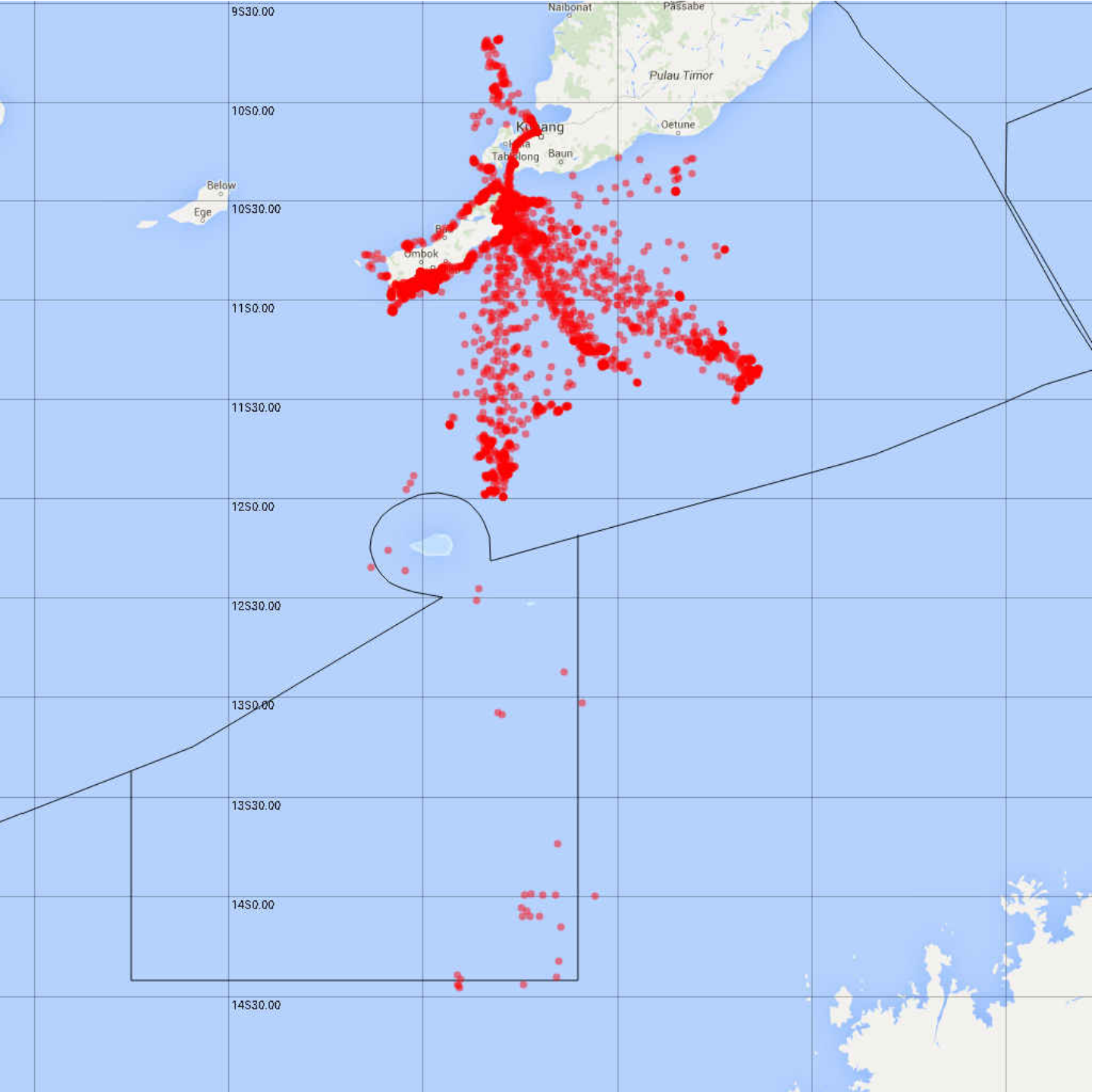
Dropliner, operating from Benoa, Bali

Increased compliance (Sep. 2016)?



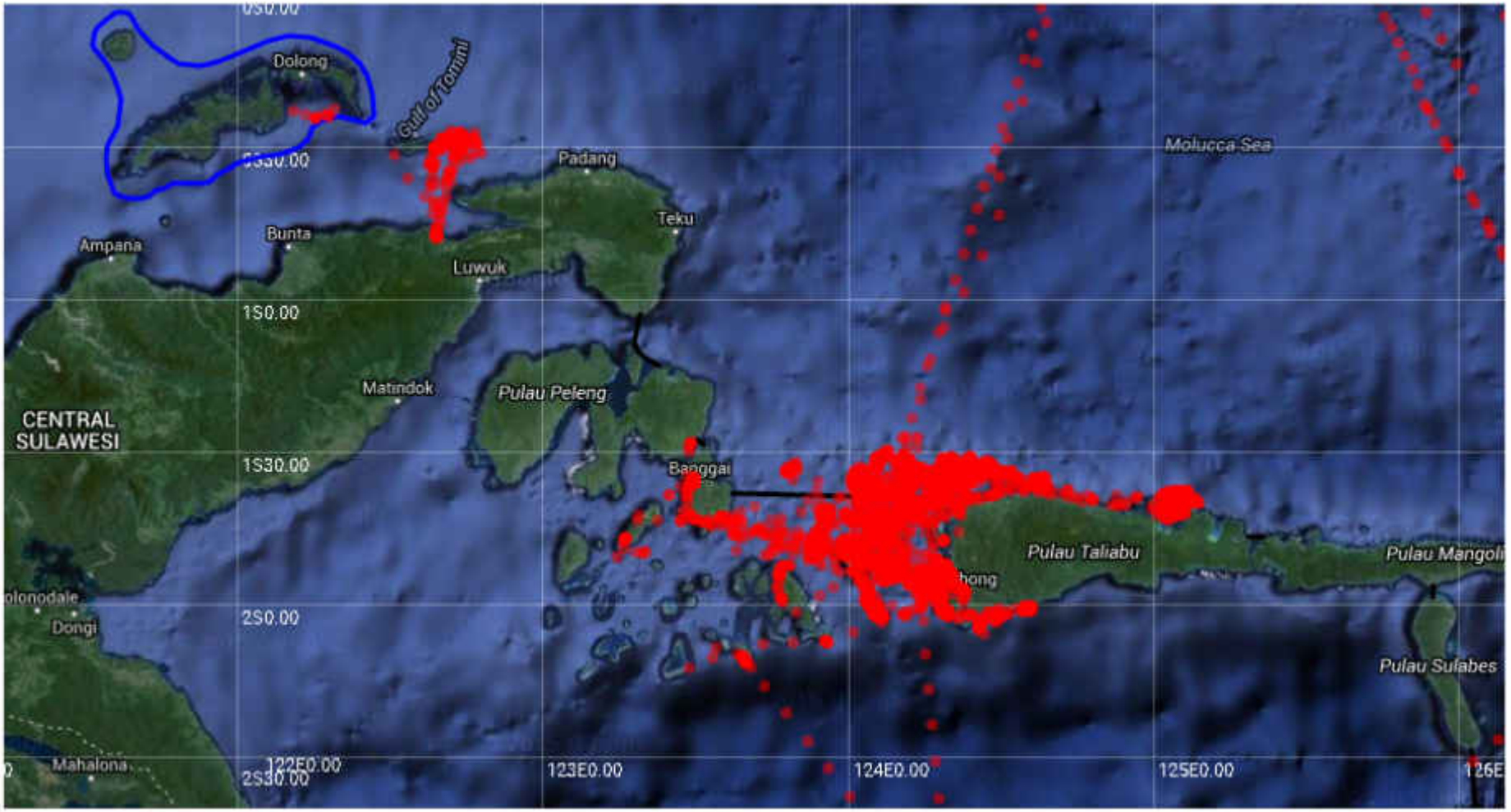
Handliner, operating from Rote, NTT

Papela fishing village, Rote



Handliner, operating from Rote, NTT

Small-scale vessels operating around the Sulu and Banggai Islands, east of central Sulawesi



Monitoring for management

- Smart weighing scale system, traceability
- Mobile Data Capture Unit
- Captain-Operated Data Recording system, FishFace
- Spot Trace
- I-Fish Community Database

Length-based stock assessment

Indicator (based on catch composition)	Low risk
% of fish below size at first maturity	< 10%
% of fish below optimum harvest size	< 50%
% of "mega-spawners"	> 30%
ratio F/M	< 0.5
Spawning Potential Ratio	> 0.4
ratio (minimum size for trade)/(size at first maturity)	> 1.1

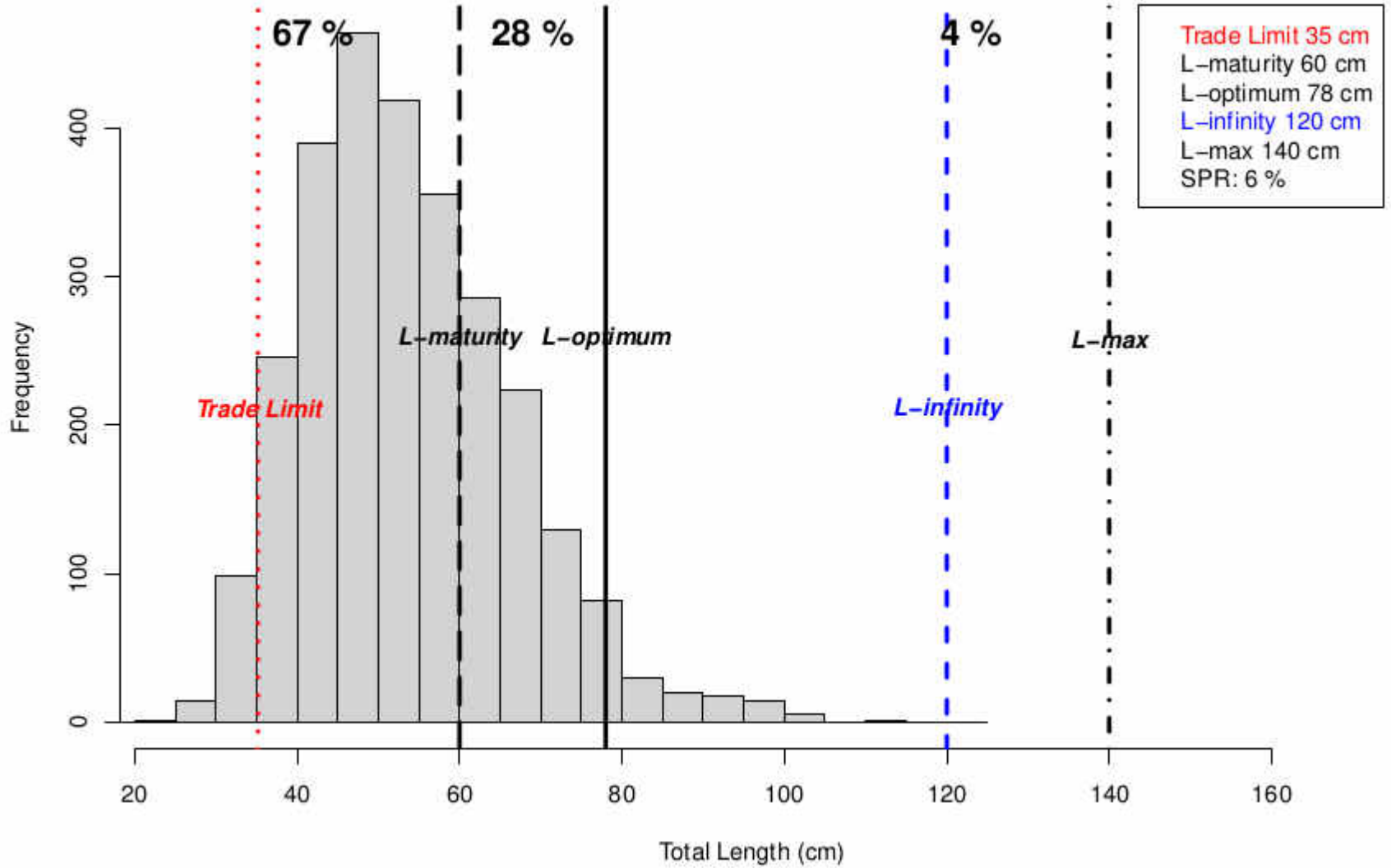
Estimating life-history parameters
(in absence of published values)

Parameters	**Method**
Maximum size (L max)	Size of largest fish (internet pictures, our own observations)
Asymptotic length (L infinity): "Mean length of a cohort of very old fish"	0.9 * L max
Length at first maturity (L mat)	Snappers: 0.5 * L infinity Groupers (♀): 0.5 * L infinity Groupers (♂): 0.65 * L infinity Emperors: 0.5 * L infinity large Carangids: 0.4 * L infinity all other families: 0.5 * L infinity
Optimum harvest size (L opt)	1.33 * L mat
Natural mortality (M)	Pauly (1980), based on ambient temperature (20 C) and L infinity

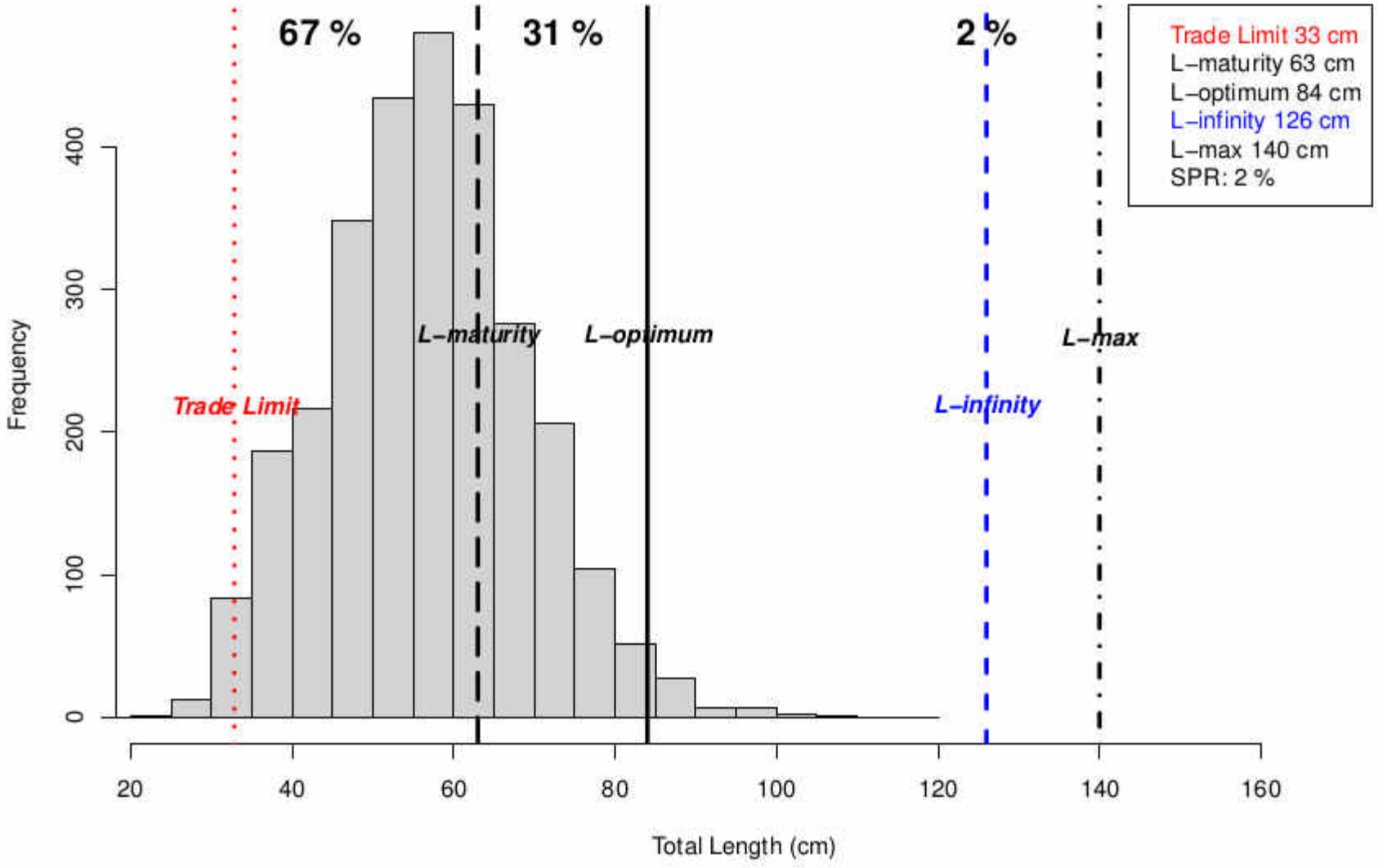
Estimating life-history parameters (cntd.)

Parameters	**Method**
Von Bertalanffy growth (K)	Froese and Binohlan (2000): M * (L opt/3*(L infinity – L opt))
Total mortality (Z)	Ault (1993): Right-hand side of the length-frequency distribution, combined with K and L infinity
Fishing mortality (F)	Z - M
Spawning Potential Ratio (current biomass of mature fish divided by biomass of mature fish in unfished situation)	Per-recruit, population model based on F, M, and growth parameter estimates

Year II, (ID #7) Length frequency of Etelis coruscans (Lutjanidae), n = 2796



#5) Length frequency of Etelis sp. (Lutjanidae), n = 2871



Year II, (ID #20) Length frequency of Lutjanus timorensis (Lutjanidae), n = 1141

1 %

36 %

64 %

Trade Limit 33 cm
L–maturity 26 cm
L–optimum 35 cm
L–infinity 54 cm
L–max 60 cm
SPR: 65 %

L–maturity

L–optimum

Trade Limit

L–infinity

L–max

Frequency

0 50 100 150 200 250 300 350

20 30 40 50 60 70

Total Length (cm)

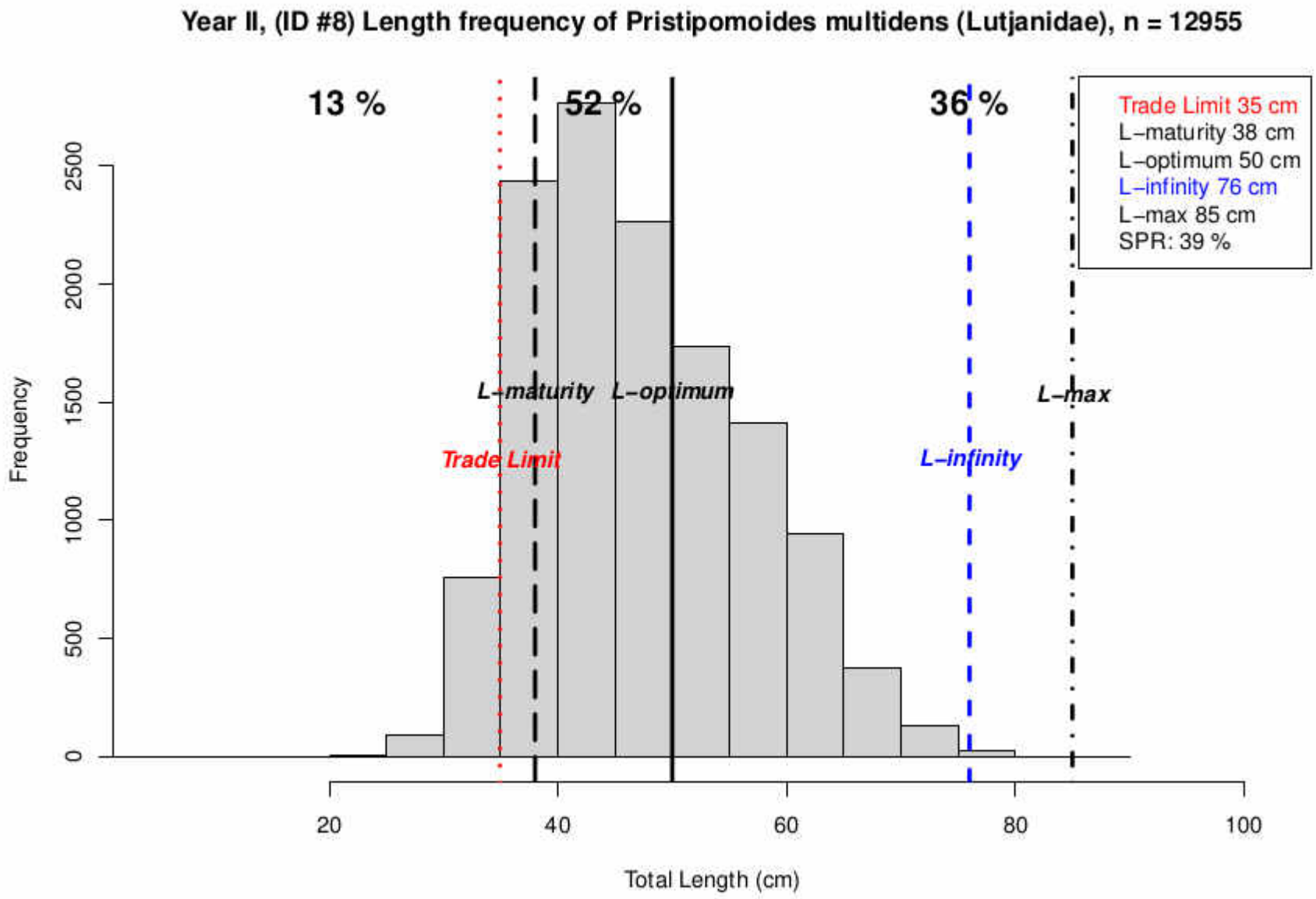
Table 4.1: Values of Indicator in Length-Based Assessment

#ID	Species	Immature %	Trade Limit Prop. Lmat	Exploitation %imm+%smat	Mega Spawn %	F vs M Ratio	SPR %
1	Aphareus rutilans	33	0.8	74	12	1.87	12
3	Aprion virescens	68	1.0	84	8	1.23	11
4	Etelis carbunculus	7	1.1	72	14	1.24	22
5	Etelis sp.	67	0.5	98	0	3.04	2
6	Etelis radiosus	46	0.9	71	18	0.65	32
7	Etelis coruscans	67	0.6	96	2	2.17	6
8	Pristipomoides multidens	13	0.9	64	22	0.67	39
9	Pristipomoides typus	8	1.0	58	28	0.63	41
10	Pristipomoides filamentosus	41	0.8	89	5	2.15	8

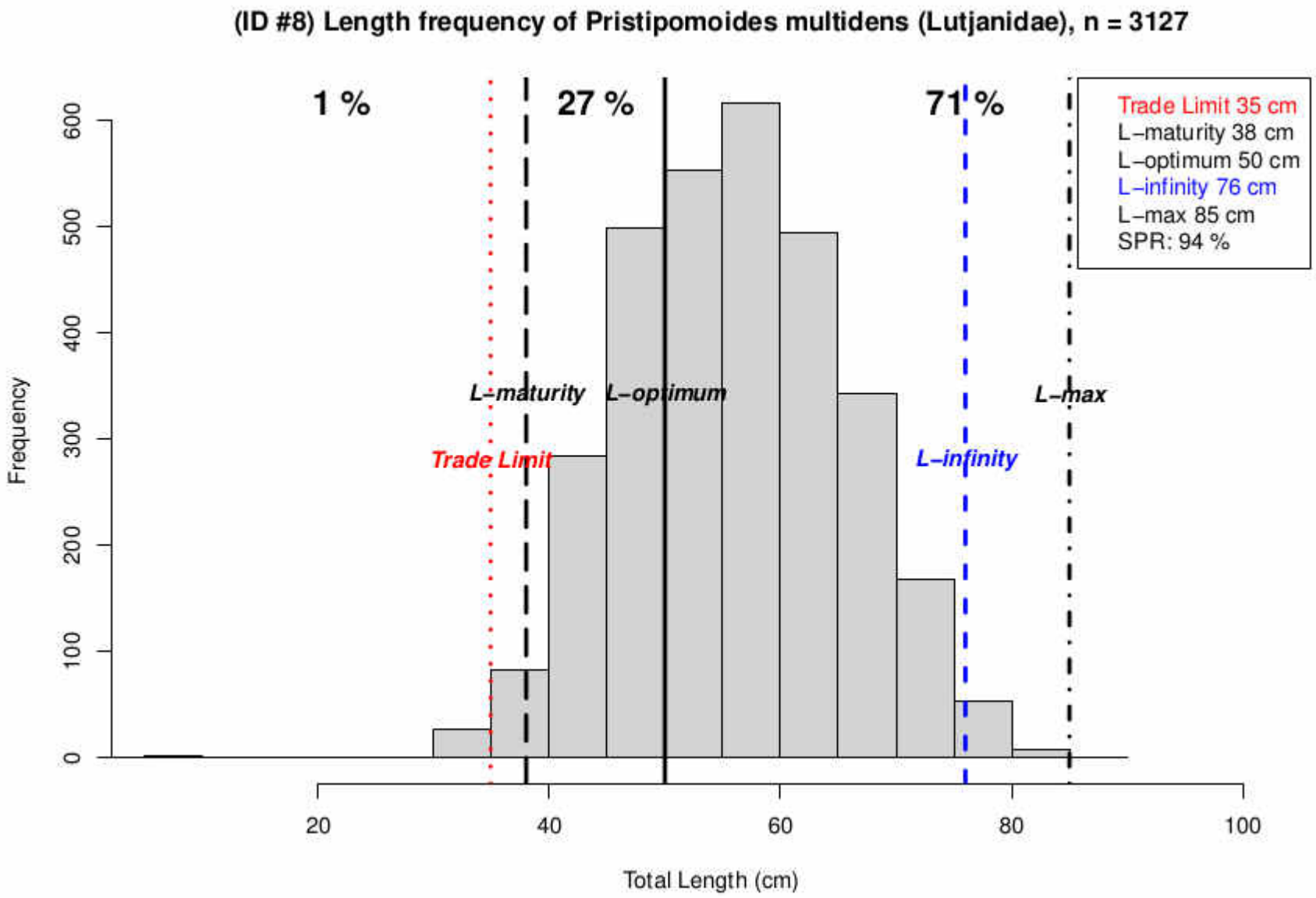
Table 4.2: Risk Level in Fisheries by Species and by Indicator

#ID	Species	Immature	Trade Limit	Exploitation	Mega Spawn	F vs M	SPR
1	Aphareus rutilans	high	high	high	high	high	high
3	Aprion virescens	high	medium	high	high	high	high
4	Etelis carbunculus	low	medium	high	high	high	high
5	Etelis sp.	high	high	high	high	high	high
6	Etelis radiosus	high	high	high	high	medium	medium
7	Etelis coruscans	high	high	high	high	high	high
8	Pristipomoides multidens	medium	medium	medium	medium	medium	medium
9	Pristipomoides typus	low	medium	medium	medium	medium	low
10	Pristipomoides filamentosus	high	high	high	high	high	high

WPP 573


Year II, (ID #8) Length frequency of Pristipomoides multidens (Lutjanidae), n = 12955
13 %
52 %
36 %
Trade Limit 35 cm
L–maturity 38 cm
L–optimum 50 cm
L–infinity 76 cm
L–max 85 cm
SPR: 39 %
L–maturity
L–optimum
L–max
Trade Limit
L–infinity
Frequency
0
500
1000
1500
2000
2500
20
40
60
80
100
Total Length (cm)

WPP 714 and 715



→ Difference in stock status between WPPs

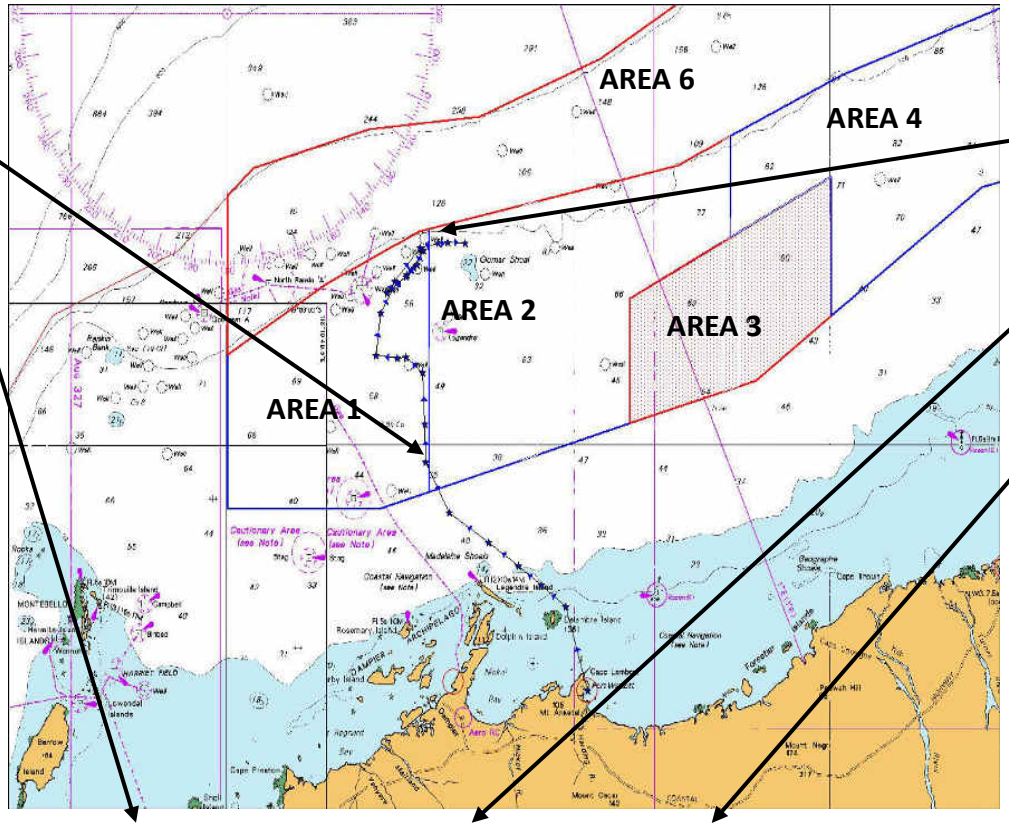
Looking Ahead

VMS-Time access management

Pilbara Fish Trawl Fishery

Vessel enters Area 1

VMS – Position/Time recorded in data base



Vessel departs Area 1

VMS – Position/Time recorded in data base

Total time calculated in Area 1

Time deducted from allocated units for area 1

AREA	DATE/TIME Enter	DATE/TIME Depart	TIME Hours	TOTAL TIME USED	Total Time Available
					5000
AREA 1	06/04/2002 0:38	10/04/2002 5:26	100.8	100.8	4899

Application in Indonesia

Current	Change
VMS only used for surveillance, by DJPSKP	VMS used for surveillance and fisheries control, by DJPSKP & DJPT
VMS only for boats > 30 GT	VMS for boats > 10 GT, fishing beyond 12 nm
VMS reports positions	VMS + spatial analytics
Effort control by licensing, by WPP (not flexible, high administrative costs, low compliance)	Effort control by allocated fishing hours, by fishing area (flexible, low administratve costs, high compliance)
Ad-hoc management	Adaptive management


Thank
you