Contrasting coconut crab (*Birgus latro*) abundances on Guguan and Alamagan

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Photo credit Isaac Chellman

Why coconut crab

- Ayuyu - valued game species
- Species of Greatest Conservation Need
- Many Mariana Islands have never been surveyed

Photo credit Lainie Berry

Saipan to Guguan ~180 km

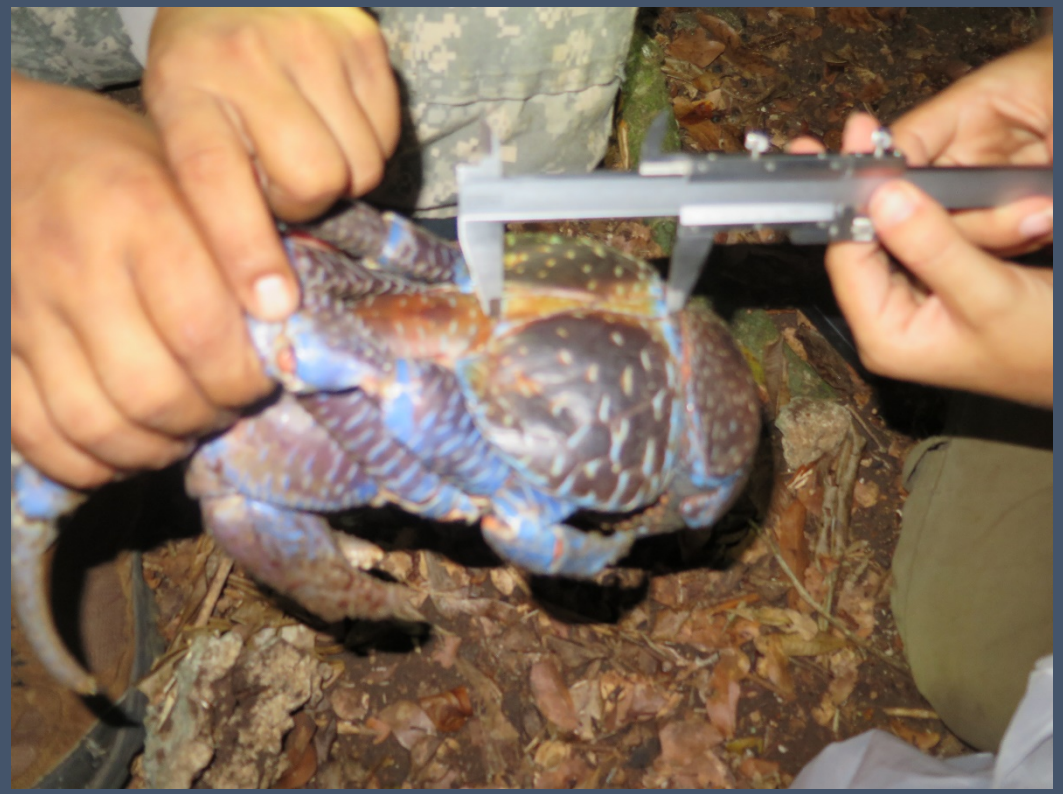
Guguan to Alamagan ~30 km

Survey methods

- Baited line-transect (Fletcher and Amos 1994)
- Two forest transects per island
- 20-25 stations per transect
- 20 meter spacing
- Bait (poni) 1-2 hours before sunset
- 3 consecutive nights survey per transect

Capture – Mark - Release

- Sex
- Weight
- Thoracic length (TL)
- Thoracic width (TW)
- Dactyl stage
- Deformities
- Female maturity



Relative abundance results

Guguan

- 123 baits set
- 260 crabs

260 crabs / 123 baits =

CPUE 2.11

Alamagan

- 150 baits set
- 99 baits available
- 4 crabs

4 crabs / 99 baits =

CPUE 0.04

Catch per Unit Effort = crabs caught per number of baits set and available – relative abundance index

Most recent CPUE values

Island	CPUE	Year	Source
Guam	0.15	2001	USFWS 2001
Aguiguan	0.31	2016	Liske-Clark et al. in prep
Tinian	0.11	2007	USFWS 2009
Saipan	0.24	1996	Kessler 2006
Sarigan	0.09	2006	Martin et al. 2008
Guguan	2.11	2016	Liske-Clark et al. 2016
Alamagan	0.04	2017	Murray et al. in prep
Pagan	0.004	2010	Vogt 2010
Asuncion	0.18	2008	Williams et al. 2009

Guguan mark-recapture analysis

- 258 crabs measured
- 78 recaptures of 62 individuals

Guguan mark-recapture analysis

- Conditional likelihood closed capture-recapture model in Program MARK 6.1
- Akaike's Information Criterion corrected for small sample size (AIC_c)
- Model-averaged **abundance estimates** based on Akaike weights (w_i)
- Covariates: sex, thoracic length [mm], dactyl stage, and deformities. Moonlight added only to the top model.

Guguan preliminary density estimates

Transect 2: **270 crabs** ± 58.5(SE) (95% CI = 155, 384)

166 crabs/ha

Transect 3: **158 crabs** ± 42.3 (SE) crabs, (95% CI = 75, 241)

98 crabs/ha

MMDM 37.04 m ± 39.89 (SD) (*n* = 27)

Effective Trapping Area (ETA) = 1.62 ha

Density = abundance estimate / ETA

Density estimate context

Island/Location	Density Estimate (crabs/ha)	Source
Tinian/MLA	5 in native forest; 2 in tangantangan	USFWS 2009
Guam/Haputo Beach area	13	USFWS 2001
Christmas Island/Indian Ocean	4.3-47.3	Drew & Hanson 2014
Taiaro Atoll/French Polynesia	142	Chauvet & Kadiri-Jan 1999
Guguan	**98-166**	Unpublished
Pigelmol/Sorol Atoll/FSM	354	Buden 2012

30 kilometers apart

Guguan

- Constitutionally protected island
- Little visitation
- **No feral ungulates**
- Native forest
- Abundant nesting seabirds
- Most recent confirmed eruption 1884

Alamagan

- Long history of human habitation
- Occasional visitation
- **Abundant feral ungulates**
- Mixed forest
- Few nesting seabirds
- Most recent confirmed eruption ~870

Management recommendations

- Eradicate feral pigs on Alamagan
- Maintain Guguan protections

Thank you

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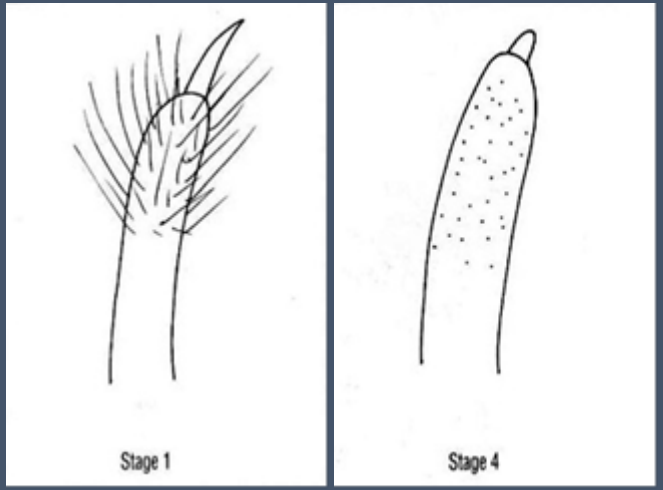
Questions?


Stage 1
Stage 4

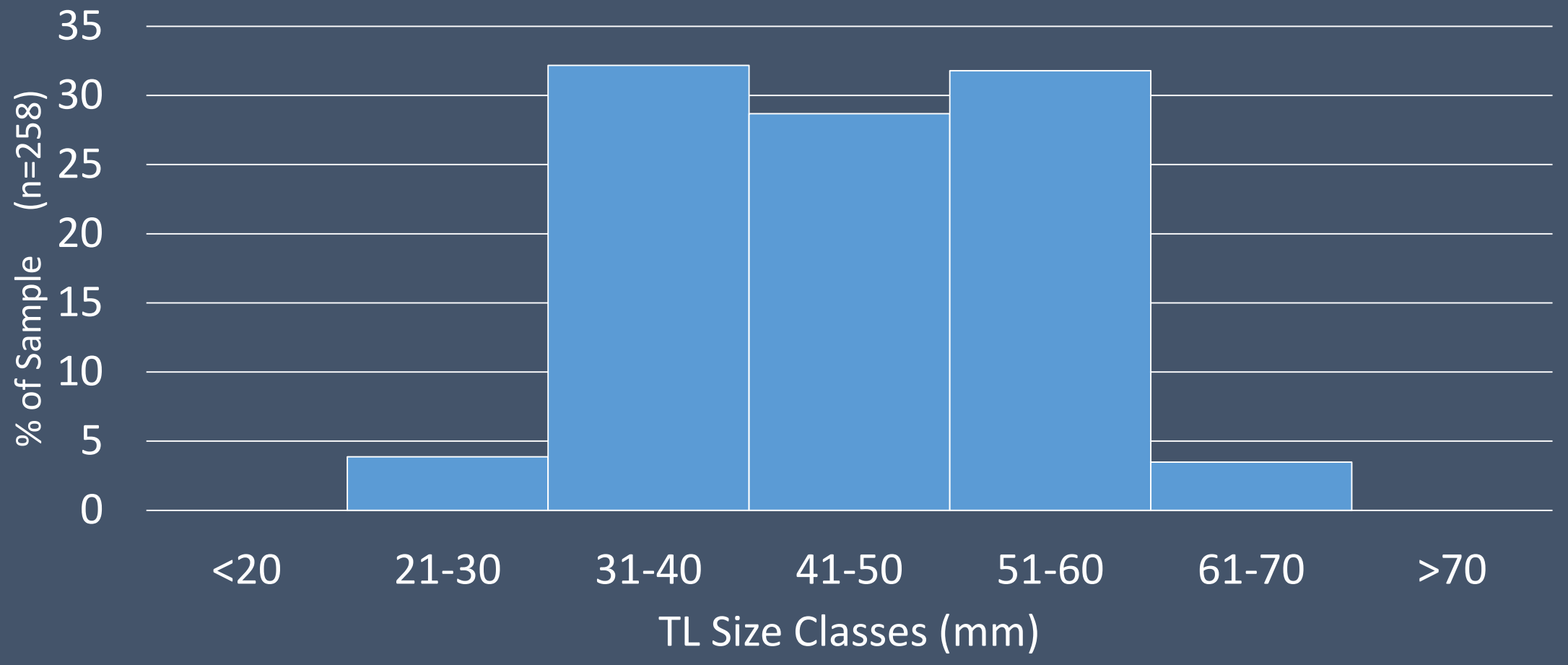
Size Factoids

- Adult sheds shell at **8-10mm TL**
- Male maturity 6 yrs/22mm TL
- Female maturity 9 yrs/**24.5mm TL** (21-32mm)
- CNMI legal minimum harvest size 3in TW → **36mm TL**

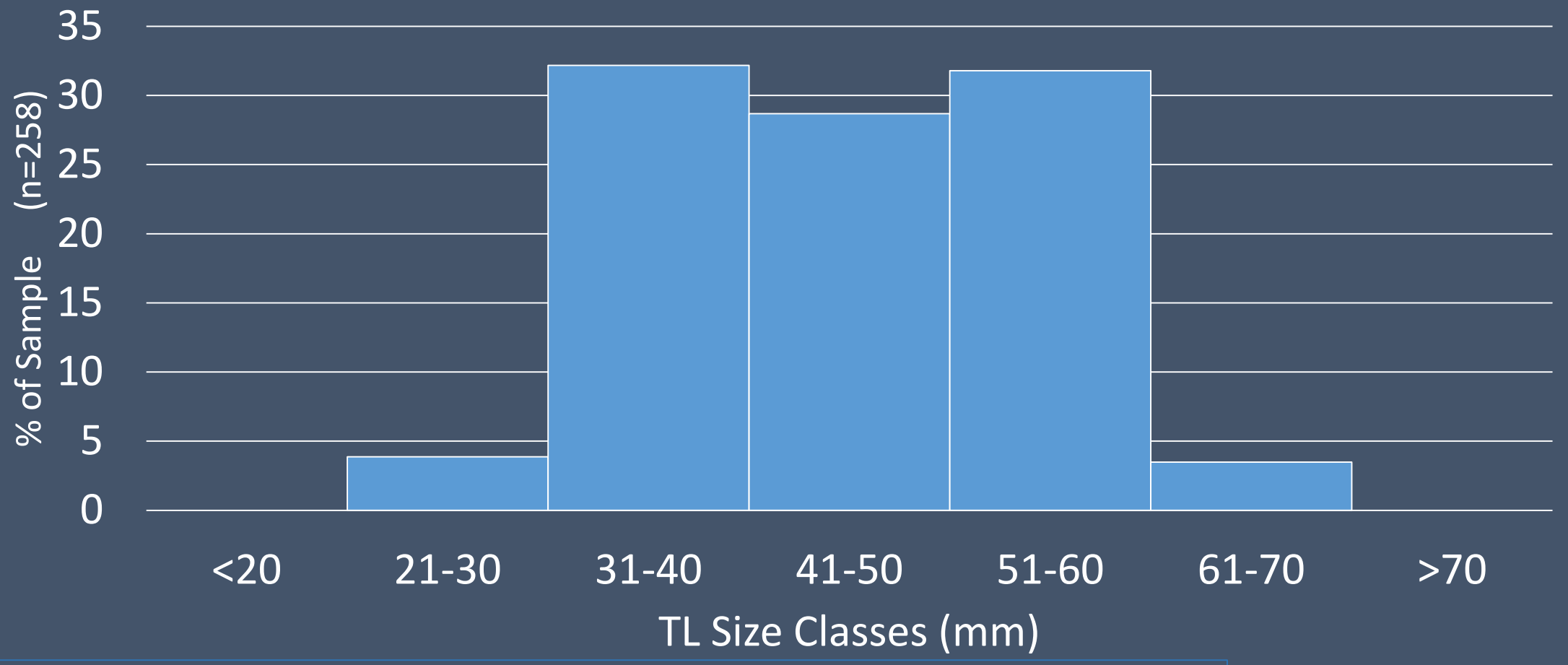
Photo credit Dacia Wiitala

Drew et al 2010, Sato et al 2013, Brown and Fielder 1991

Guguan Size Class Distribution

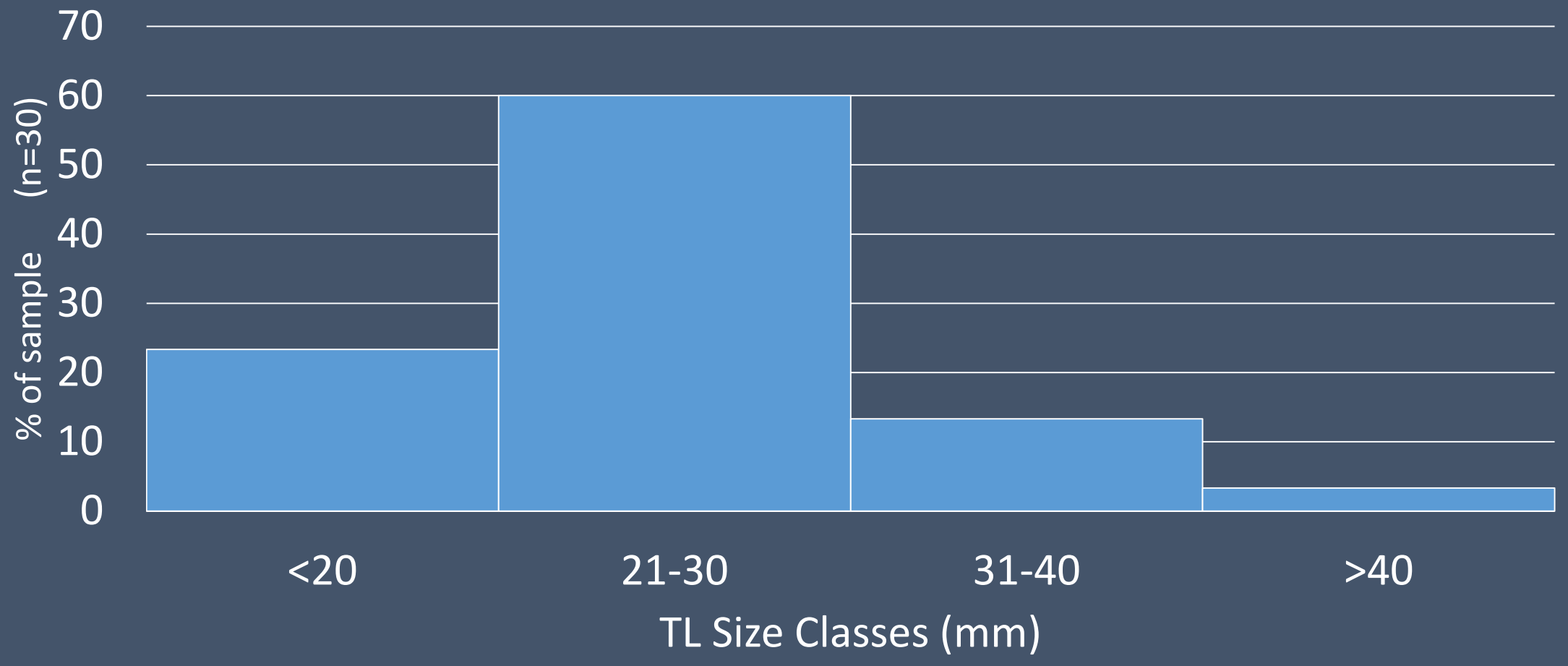


Guguan Size Class Distribution



Alamagan	**12, 14**	**21**	**53**

Aguiguan Size Class Distribution



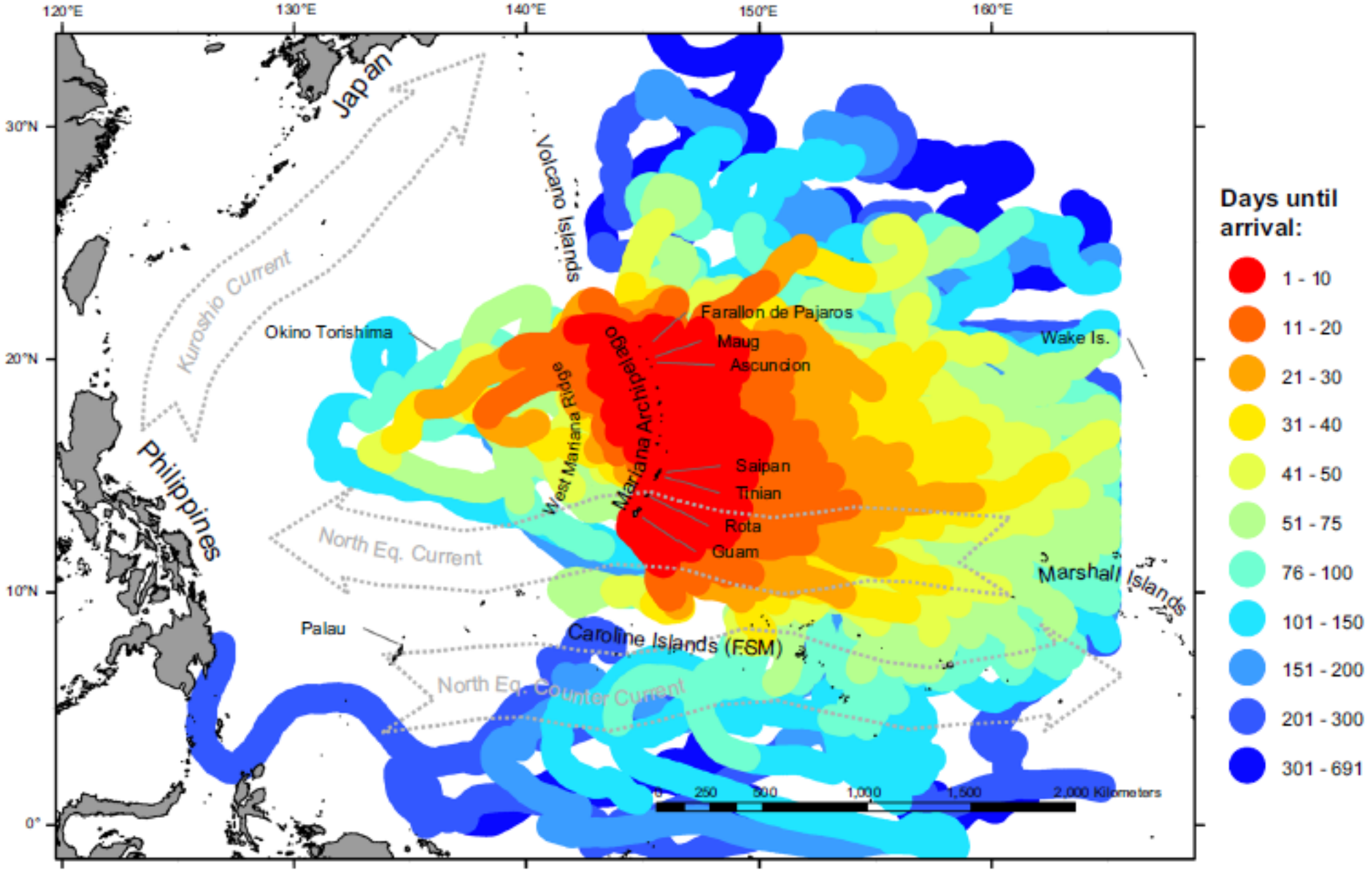


Fig. 1 Pathways of drifters arriving at the Marianas ($n = 144$). *Colors* denote the number of days prior to arrival and are stacked from shortest (*top*) to longest (*bottom*). Therefore, maximum possible distance travelled for incoming larvae is shown. General directions of major ocean currents are shown as *light gray arrows* (adapted from Reverdin et al. 1994 and Qui and Lukas 1996)

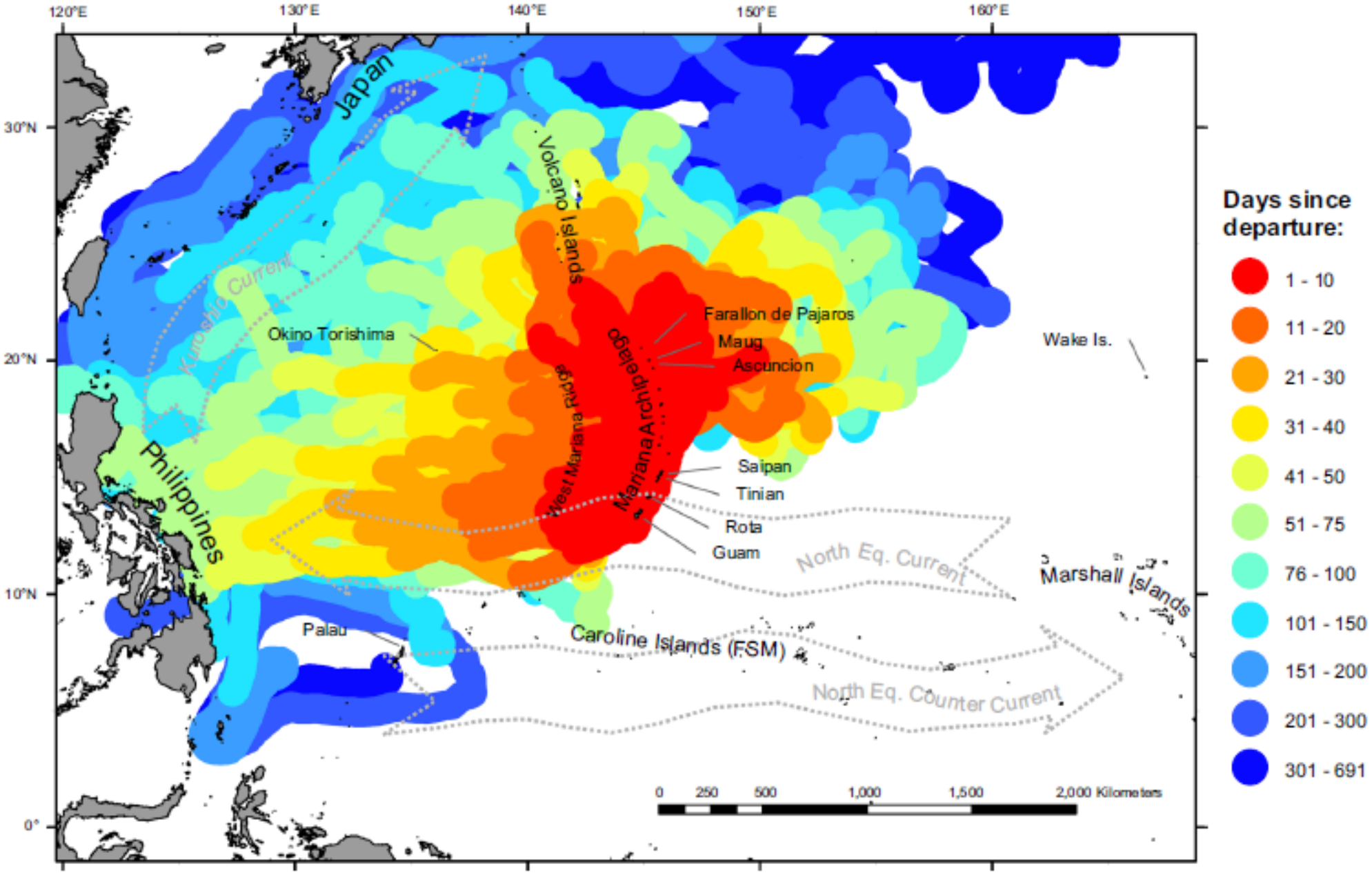


Fig. 2 Pathways of drifters departing the Marianas ($n = 130$). *Colors* denote the number of days after departure and are stacked from shortest (*top*) to longest (*bottom*). Therefore, maximum possible distance travelled for outgoing larvae is shown. General directions of major ocean currents are shown as *light gray arrows* (adapted from Reverdin et al. 1994 and Qui and Lukas 1996)