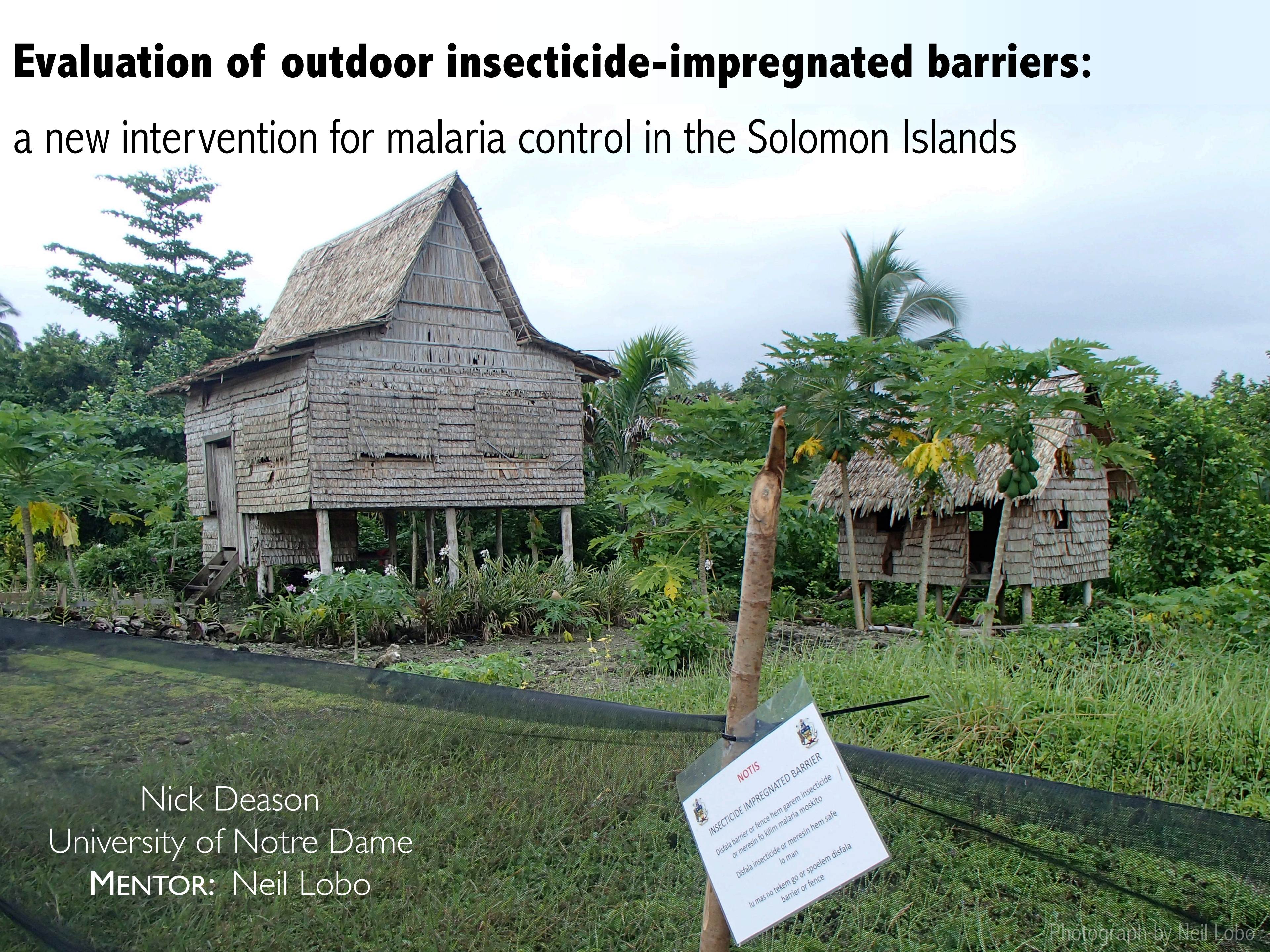
Evaluation of outdoor insecticide-impregnated barriers:

a new intervention for malaria control in the Solomon Islands



Nick Deason
University of Notre Dame
MENTOR: Neil Lobo

Photograph by Neil Lobo

Malaria

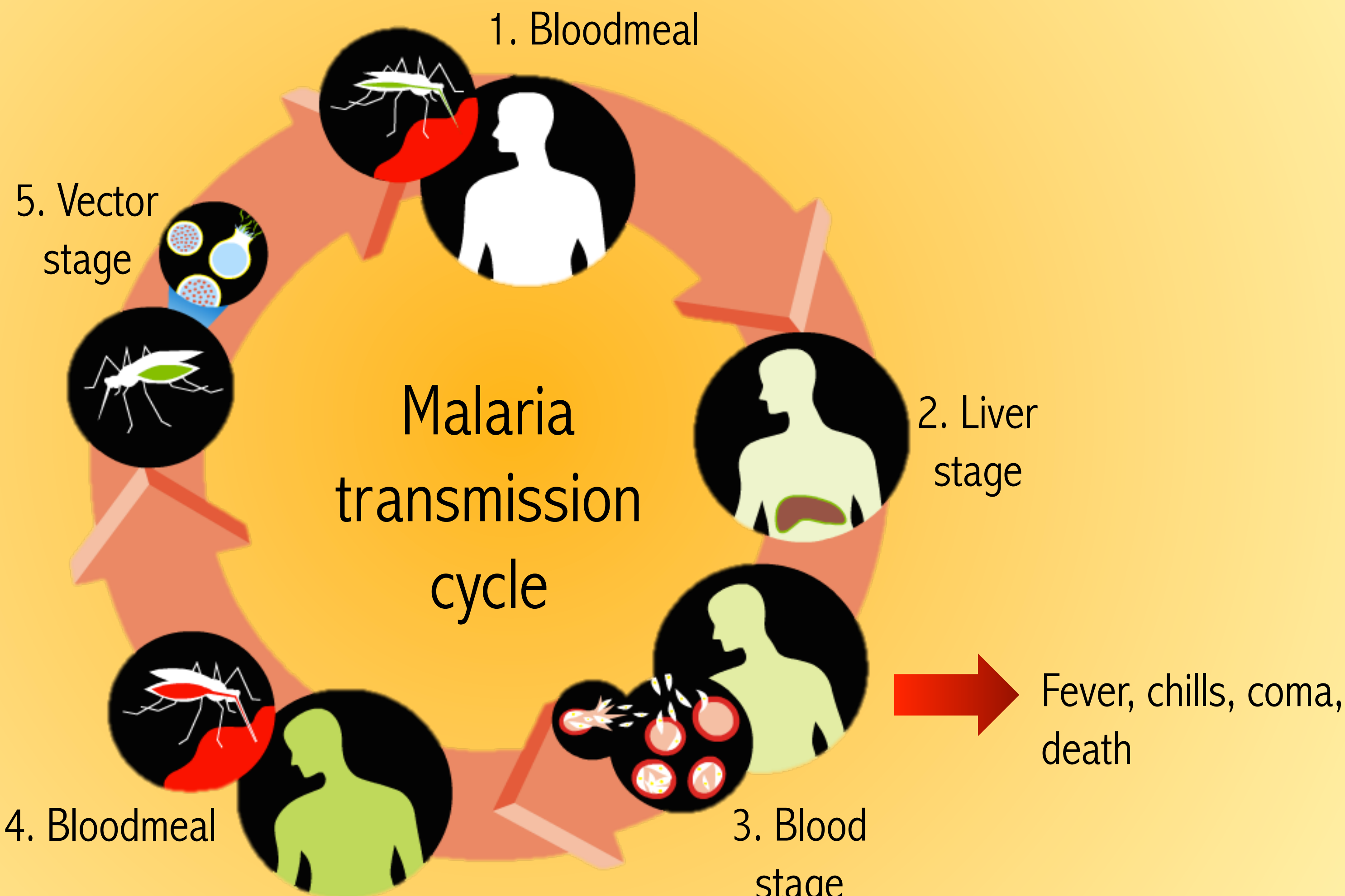
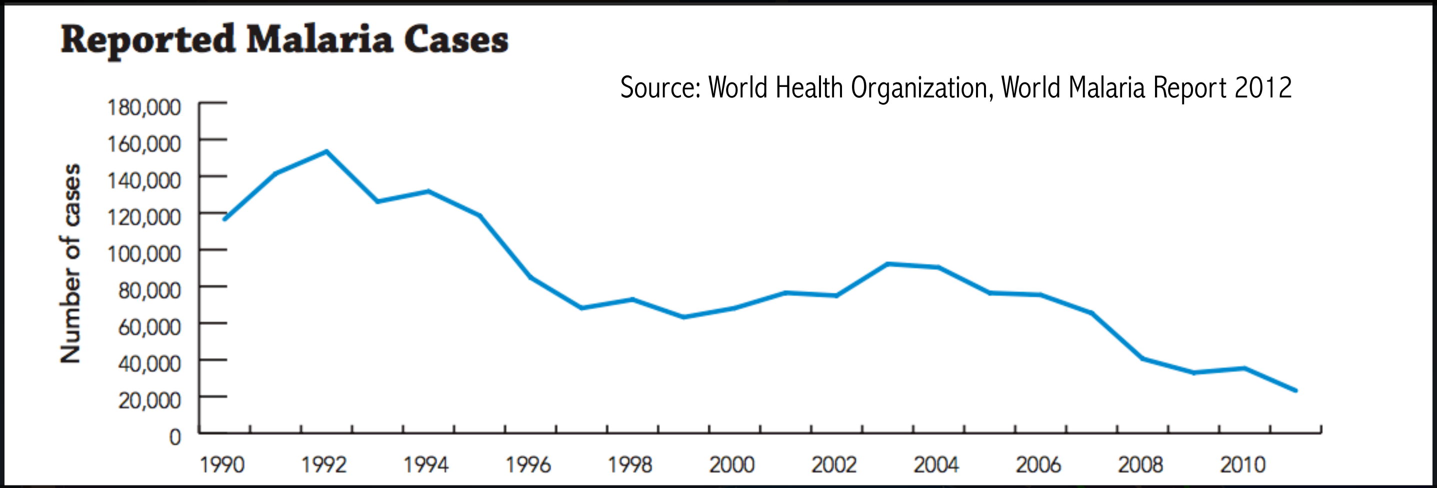
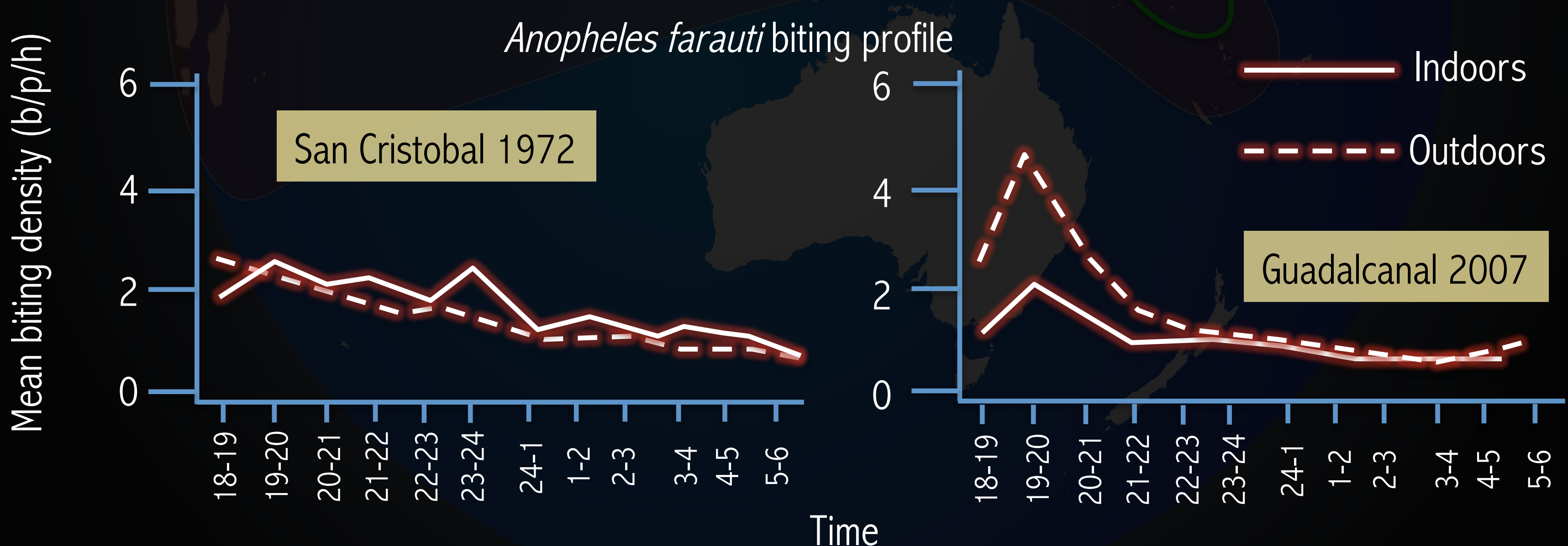


Illustration from Johns Hopkins Bloomberg School of Public Health

Malaria

in the Solomon Islands

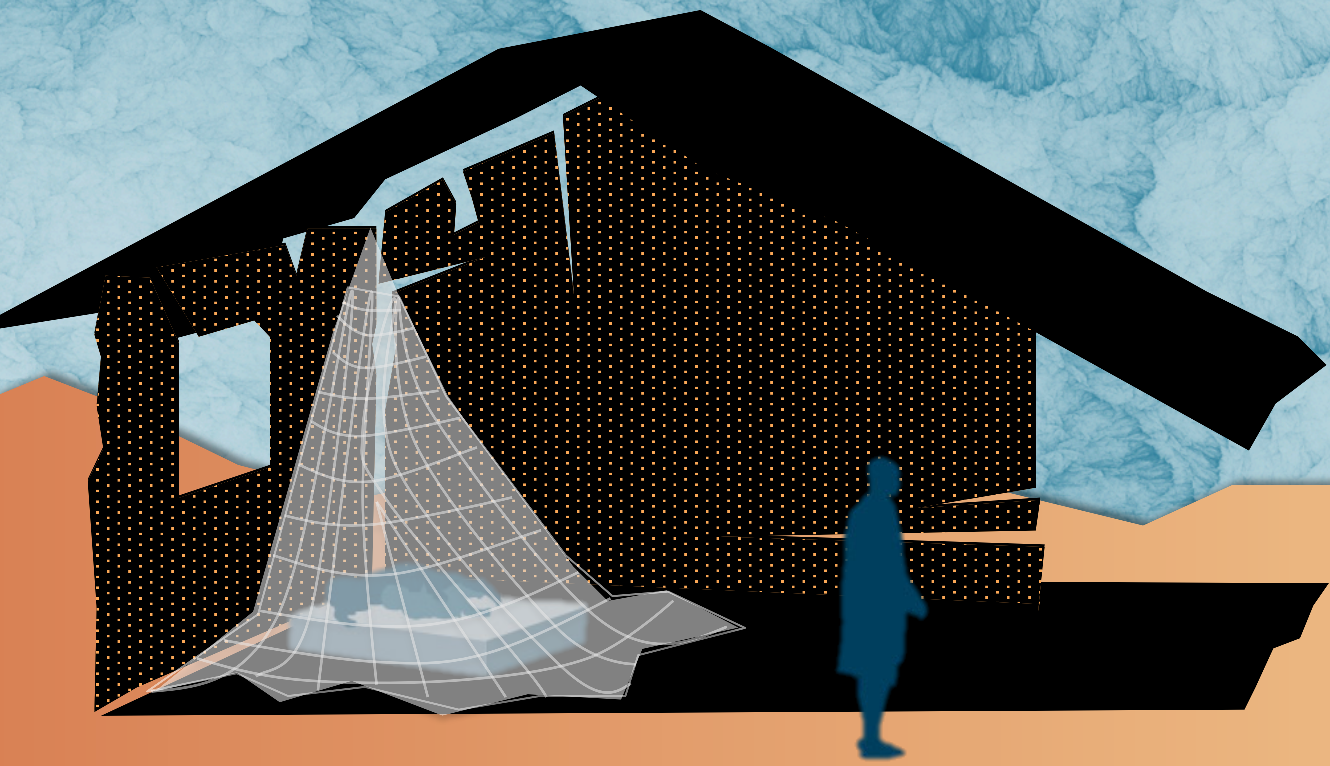




Source: Taylor (1975) and Malaria Transmission Consortium

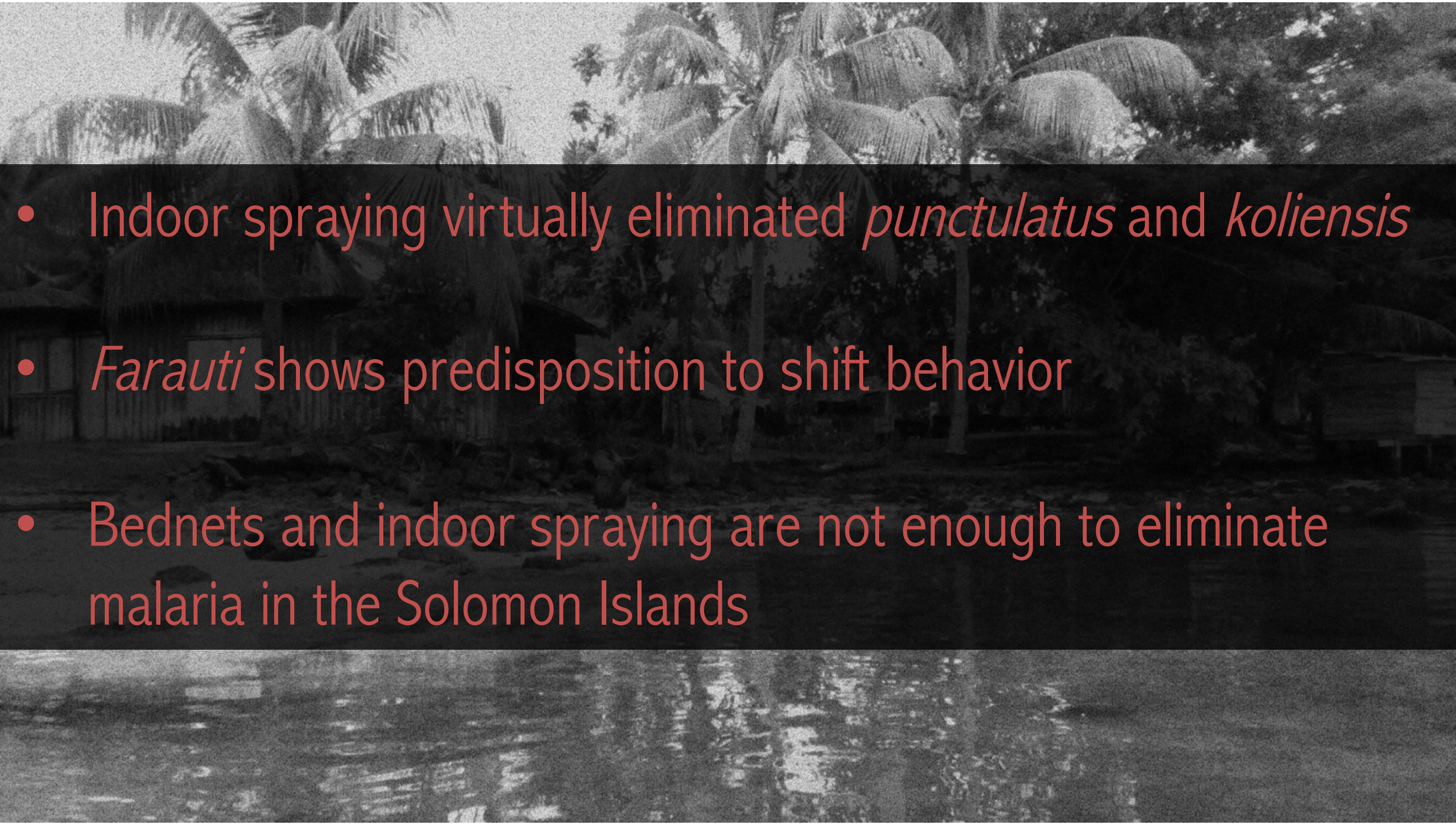
Current methods of vector control

1. Insecticide-treated bednets
2. Indoor residual spraying



Modified from illustration by Neil Lobo

Lessons from history



- Indoor spraying virtually eliminated *punctulatus* and *koliensis*
- *Farauti* shows predisposition to shift behavior
- Bednets and indoor spraying are not enough to eliminate malaria in the Solomon Islands

Research Goal

Design and evaluate an intervention to reduce malaria in the Solomon Islands while avoiding the limitations of traditional vector control.

Our intervention:

Insecticide-impregnated barriers

Edge of village

IIB

Breeding site

Our study

	Pre-intervention	Post-intervention
Humans	• Baseline malaria prevalence	• Malaria incidence cohort: blood samples every 2 months
Mosquitoes	• Biting rates • Infection rates • Species distribution • Parity (proxy measure for age)	• Biting rates • Infection rates • Species distribution • Parity } Every 3 months

Our study

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Field Work


Blood collection for baseline prevalence
Photograph by Neil Lobo


Recruiting incidence cohort
Photograph by Tom Burkot

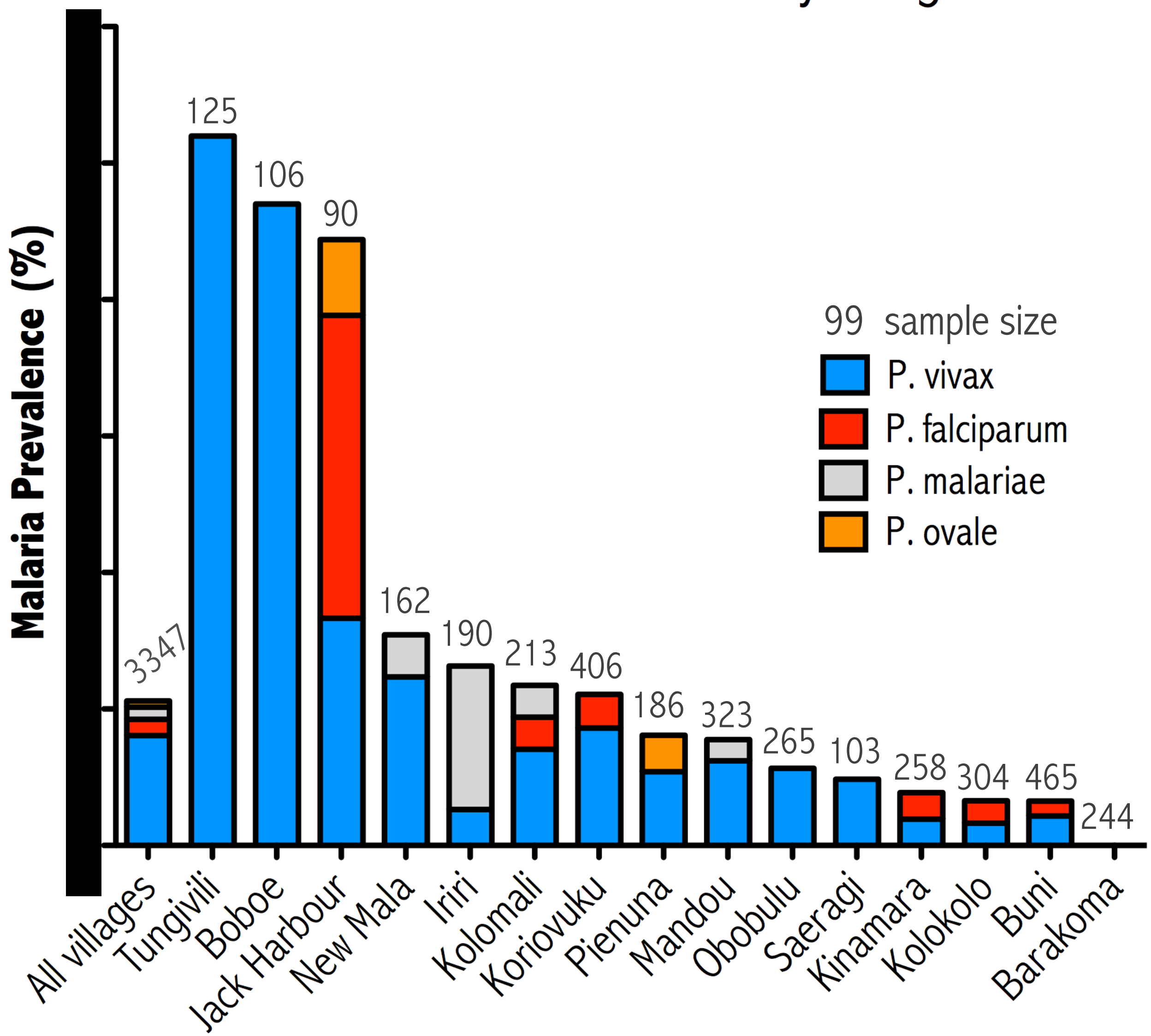
Human landing catches

Photograph by Danyal Odabassi

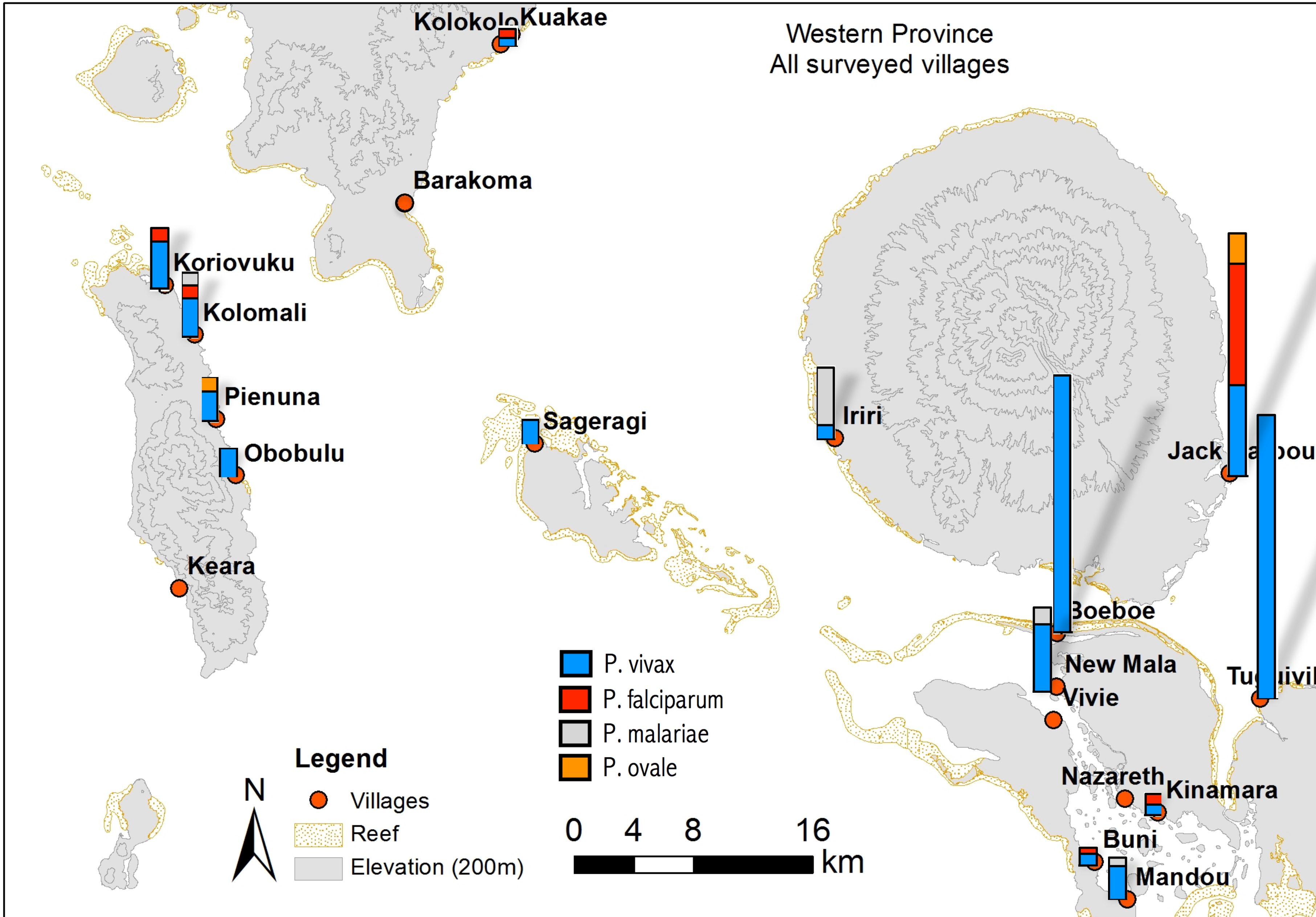
Constructing insecticide barriers

Results:

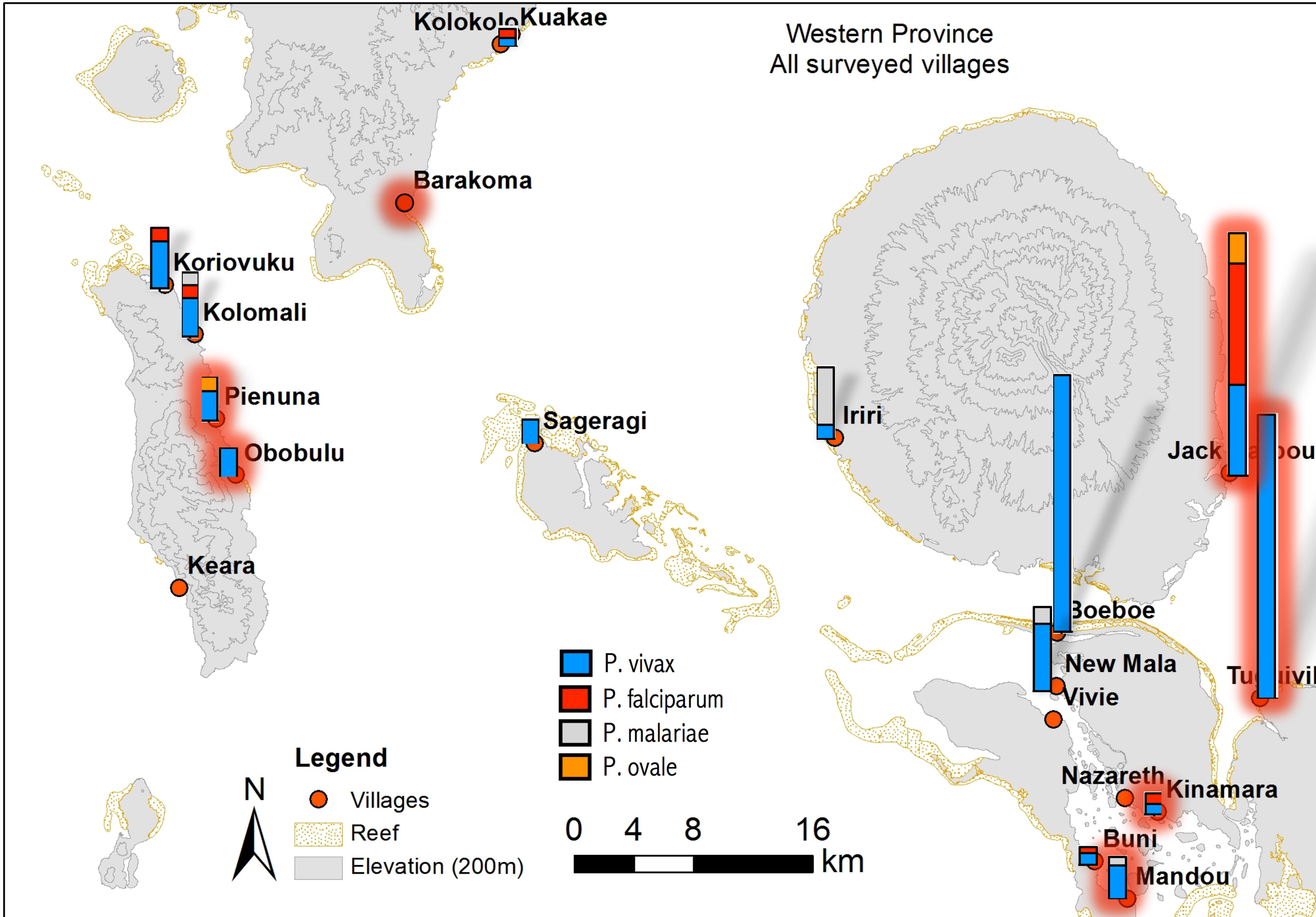
Baseline Malaria Prevalence by Village



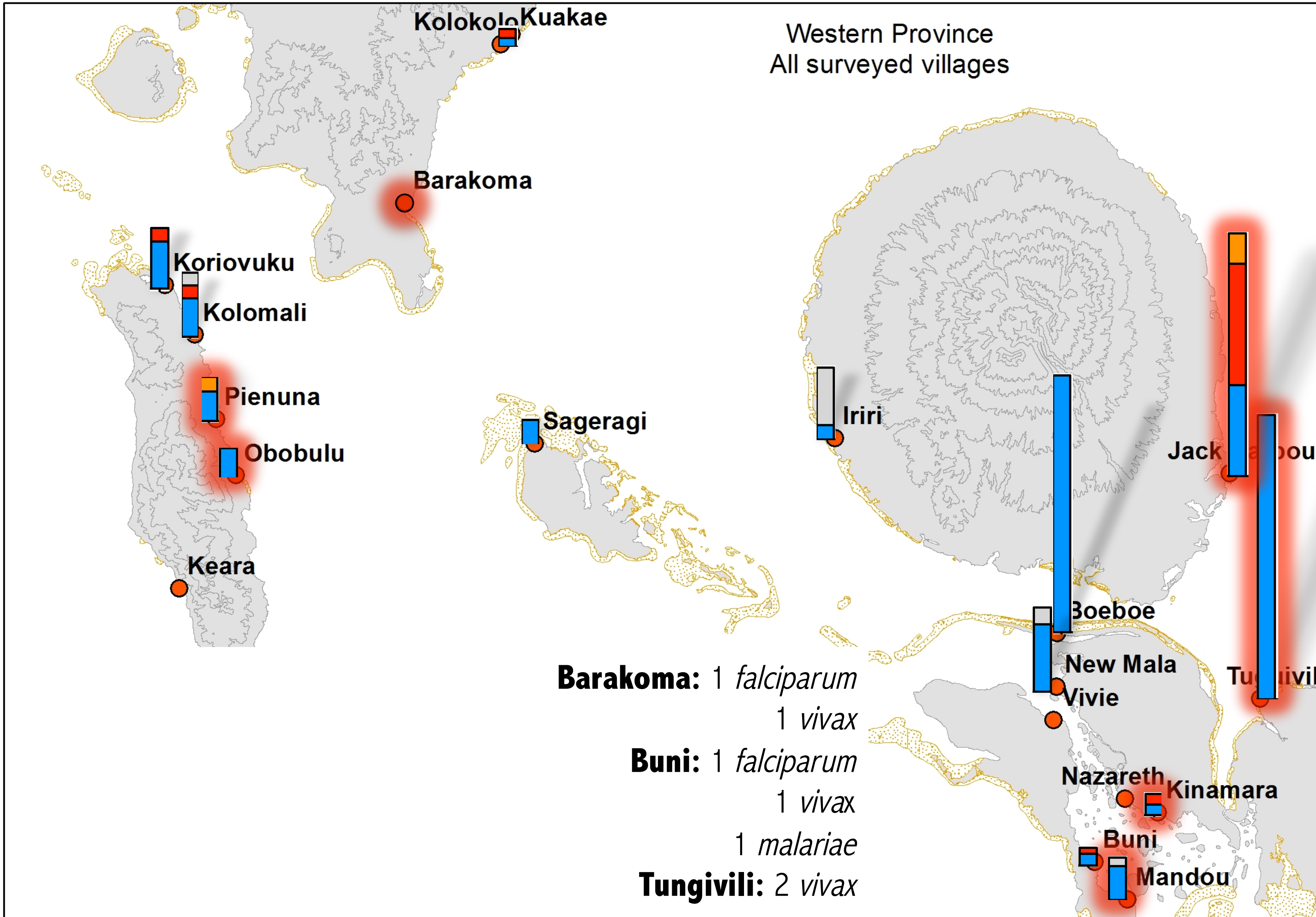
Results: Geography of baseline prevalence



These villages received IIBs



First incidence cohort blood collection



Barakoma: 1 *falciparum*
1 *vivax*
Buni: 1 *falciparum*
1 *vivax*
1 *malariae*
Tungivili: 2 *vivax*

Results:

Mosquito collections

- Collected in Human Landing Catches
- Identified by ITS2 ribosomal gene sequence

Results:

Mosquito collections

IIBs constructed

First Collection (May-June 2014) ITS2 analyses						
	Jack Harbour	Kinamara	Nazareth	New Mala	Obobulu	Saeragi
A. farauti	117	4	0	0	1	2
A. hinesorum	0	0	1	1	1	4
A. lungae	0	1	31	12	0	48
A. solomonis	0	1	1	0	0	2
total mosquitoes	117	6	33	13	2	56
Second Collection (September 2014) ITS2 Analyses						
	Jack Harbour	Kinamara	Nazareth	New Mala	Obobulu	Saeragi
A. farauti	108	1	1	13	2	0
A. hinesorum	0	0	0	0	0	3
A. lungae	0	1	1	0	0	17
A. solomonis	0	0	0	0	0	0
total mosquitoes	108	2	2	13	2	20

Conclusions

Parasites

- Malaria transmission is low, but persistent in Western Province
- 4 species of human *Plasmodium* found
- Not enough time has passed to make meaningful comparisons between IIB and control villages

Vectors

- A diversity of Anophelines, *farauti* still the only known vector
- Low abundances except in Jack Harbour, which has higher malaria prevalence and most *P. falciparum*

Future Work

	Pre-intervention	Post-intervention
Humans	• Baseline malaria prevalence	• Malaria incidence cohort: blood samples every 2 months
Mosquitoes	• Biting rates • Infection rates • Species distribution • Parity (proxy measure for age)	• Biting rates • Infection rates • Species distribution • Parity Every 3 months

Acknowledgments

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Oscar, Spencer, Halo, George, Leni, Colson

Ento team

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Questions?

Extra Slides

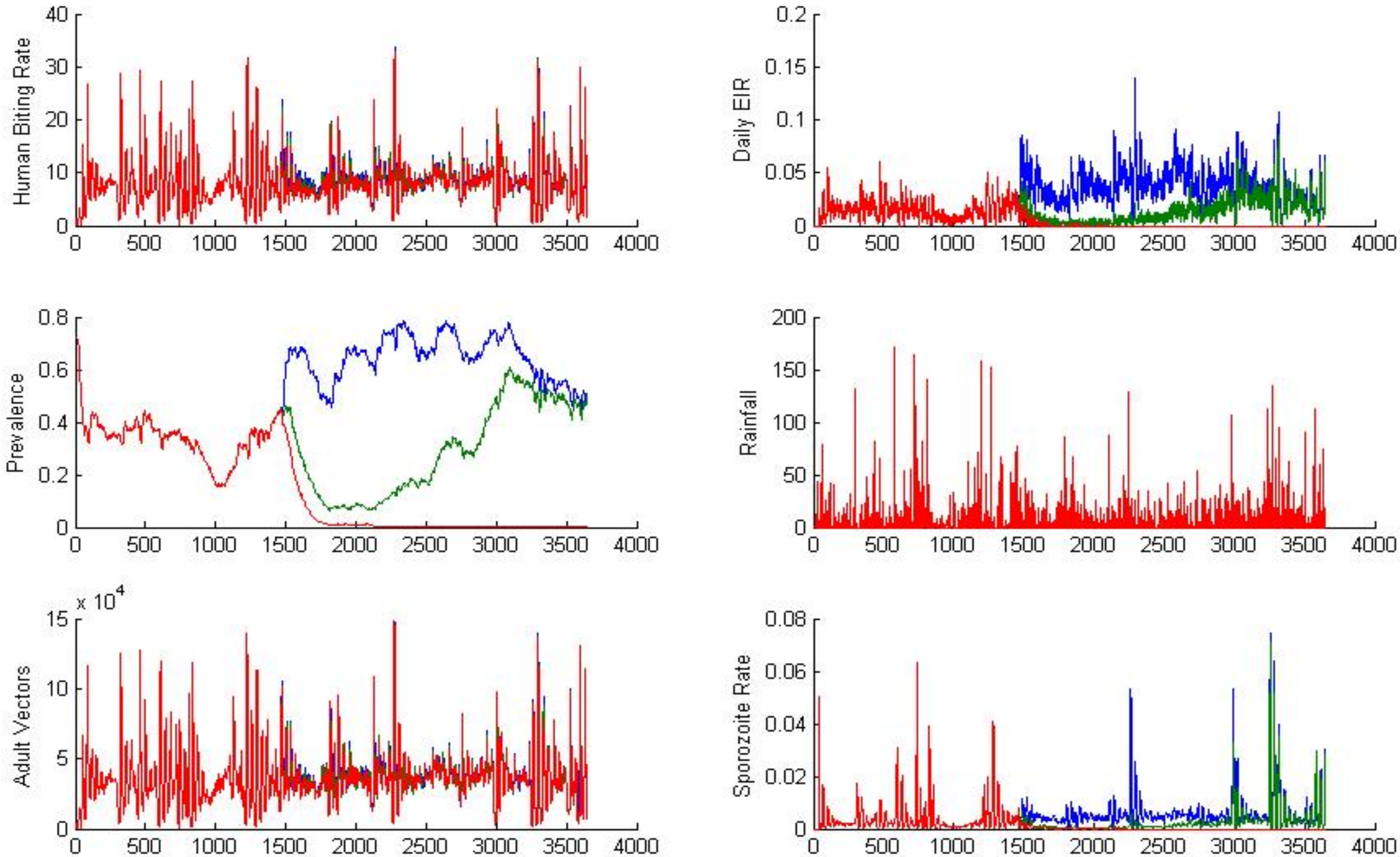
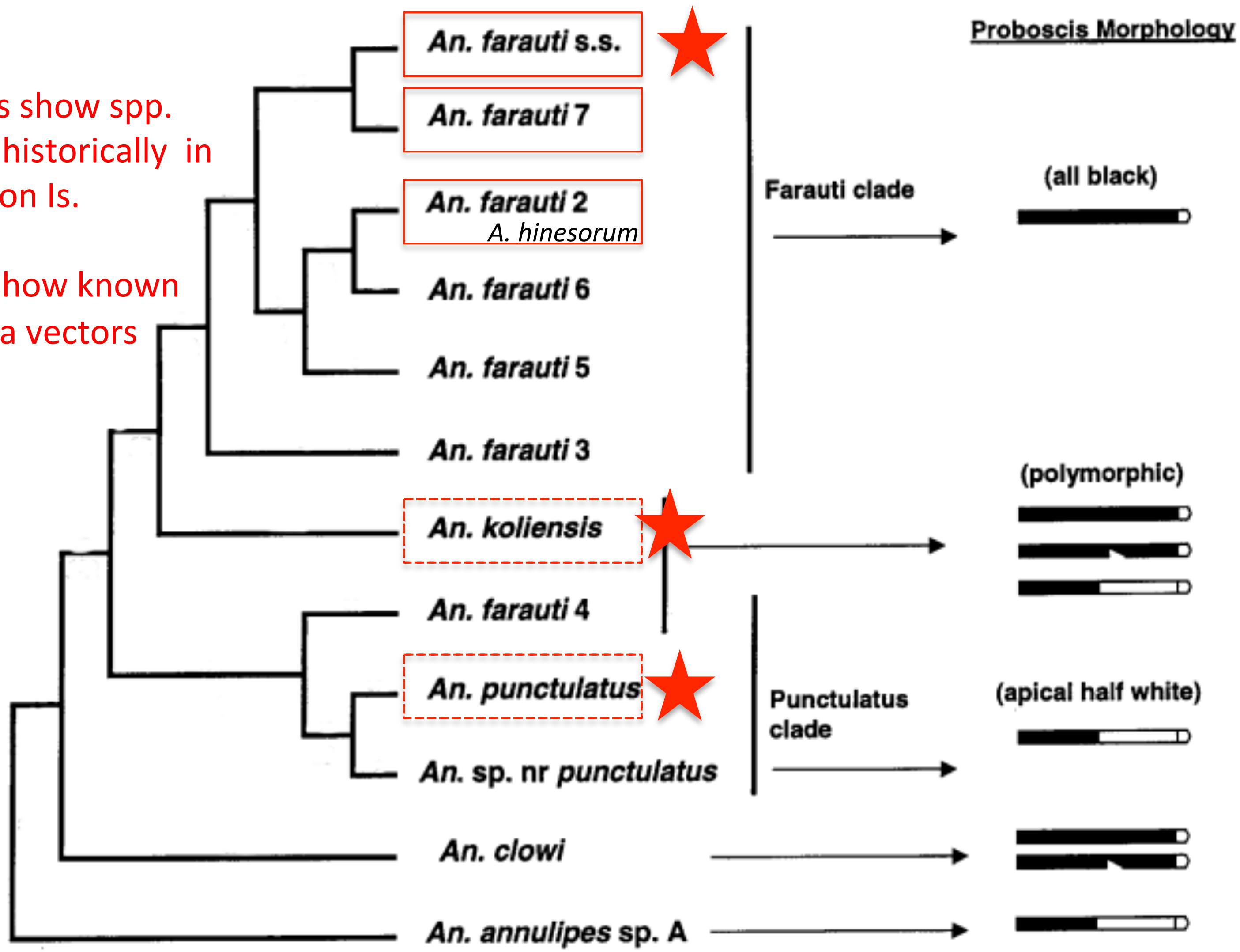


Figure 4: *EMOD simulations outputs using parameters developed for the Solomon Islands transmission system (blue is baseline) demonstrate that IIB may substantially impact the daily EIR and prevalence (top right panel, middle left panel) when used at 5% coverage (green) - with subsequent recovery in both outputs when IIB efficiency goes down. The simulations demonstrate that IIB may completely eliminate malaria when used at 10% coverage (red) and when ACTs are used for treatment. The human biting rate graphs did not change significantly as the primary impact is predicted to be on survivorship, with limited impact on total adult mosquito numbers.*

Punctulatus complex

*boxes show spp. found historically in Solomon Is.

Stars show known malaria vectors



From Beebe and Cooper (2002). *Distribution and evolution of the* Anopheles punctulatus *group (Diptera: Culicidae) in Australia and Papua New Guinea*