

# Grenada Dove and Hook-Billed Kite Population Assessment

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# Grenada (12°03'N, 61°45'W; 311 km<sup>2</sup>)



# Publications

- Rivera-Milán et al. (2016), Journal of Caribbean Ornithology, Special Issue
- Rivera-Milán et al. (2015), The Condor: Ornithological Applications 117:87–93
- Rusk (2008), Birdlife International Conservation Series 15:175–182
- Thorstrom and McQueen (2008), Neotropical Ornithology 19:221–228
- Blockstein (1988), Caribbean Journal of Science 24:127–136

# *Leptotila wellsi*



Photo by Greg R. Homel, Natural Encounters



# *Chondrohierax uncinatus mirus*



Photo by Howard P. Nelson, University of Chester

# Objectives

- 1) Estimate density (number/unit area) and population size (number in survey region), accounting for survey and site covariates
- 2) Assess the precision of abundance estimators, and make recommendations for monitoring population rate of change ( $-$ ,  $0$ ,  $+$ ), accounting for detection probability (perceptibility and availability)

# Survey Region (7,621 ha)



# Point-Count Survey Data

- Team of 2 observers
- 180 on-road and off-road points
- 79 points visited twice (15–31 July 2013)
- Points separated by 400 or 1,000 m
- 6-minute counts (detections/min)
- Radial detection distances (0–840 m)
- Distance category widths: 15, 30, 60, 100 m



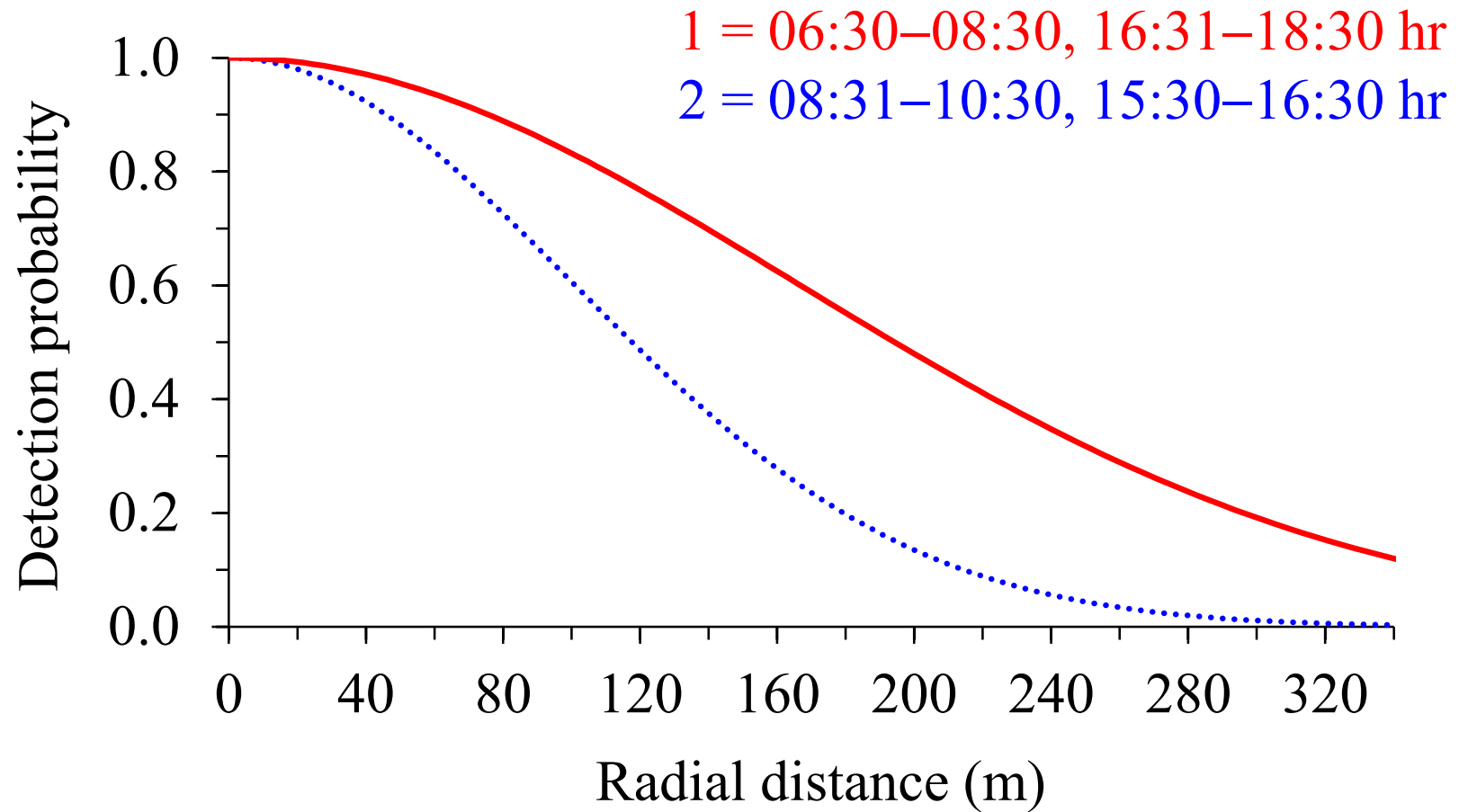
# Count Methods

- Conventional distance sampling
- Multiple-covariate distance sampling
- Hierarchical distance sampling
- Repeated count (2 visits/point)
- Time removal (2 3-min counts/point)

# Covariates

- Cluster size
- Detection distance
- Detection angle
- Detection time
- Detection form
- Time of day
- Point location
- Disturbance level
- Habitat availability
- Habitat type
- Canopy height
- Vegetation cover
- Food abundance
- Food diversity
- BWHA detection

# GRDO Detection: Time of Day ( $w = 340$ m)



## GRDO Detection: Time of Day ( $w = 340$ m)

Time of Day	$\hat{P}^*$	2.5%	97.5%
Good	<b>0.274</b>	0.159	0.472
Bad	<b>0.103</b>	0.055	0.193

**$*Z = 2.17, P = 0.03$**

## GRDO Detection ( $w = 340$ m)

Method	$\hat{P}$	2.5%	97.5%
Distance	<b>0.166*</b>	0.114	0.242
Repeated	<b>0.103†</b>	0.095	0.111

\*  $P_d$

†  $P_{ad} = P_a \times P_d$



# GRDO Abundance Estimates

Distance	Mean	2.5%	97.5%
$\hat{D}$	<b>0.021</b>	<b>0.014</b>	<b>0.030</b>
$\hat{N}$	<b>160</b>	<b>107</b>	<b>229</b>
Repeated	Mean	2.5%	97.5%
$\hat{D}$	<b>0.022</b>	<b>0.017</b>	<b>0.028</b>
$\hat{N}$	<b>168</b>	<b>130</b>	<b>213</b>

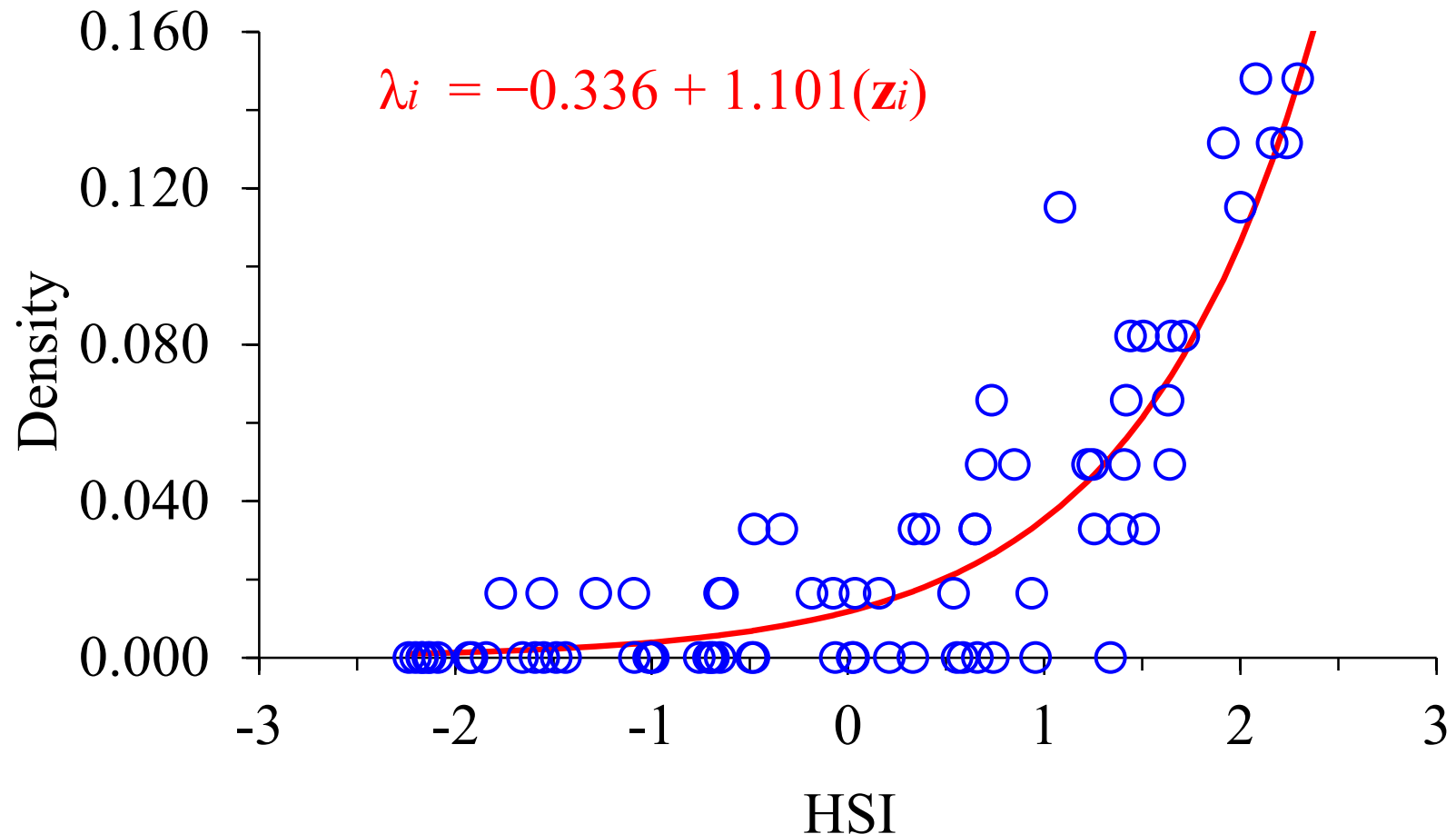
- Rusk (2008, unpubl. reports): 136–182 doves, assuming perfect detection and pairing of 62–91 calling males

# GRDO Abundance Covariates

Covariate	Level	Mean	SE	<i>Z</i>	<i>P</i>
Disturbance	<b>Low</b>	<b>0.018</b>	0.005	<b>-2.66</b>	<b>0.01</b>
	High	0.001	0.004		
Habitat	Low	0.015	0.002	<b>2.94</b>	<b>0.004</b>
	<b>High</b>	<b>0.035</b>	0.004		
Food	Low	0.005	0.002	<b>2.24</b>	<b>0.03</b>
	<b>High</b>	<b>0.015</b>	0.004		
Cover	Low	0.005	0.002	<b>2.22</b>	<b>0.03</b>
	<b>High</b>	<b>0.013</b>	0.003		

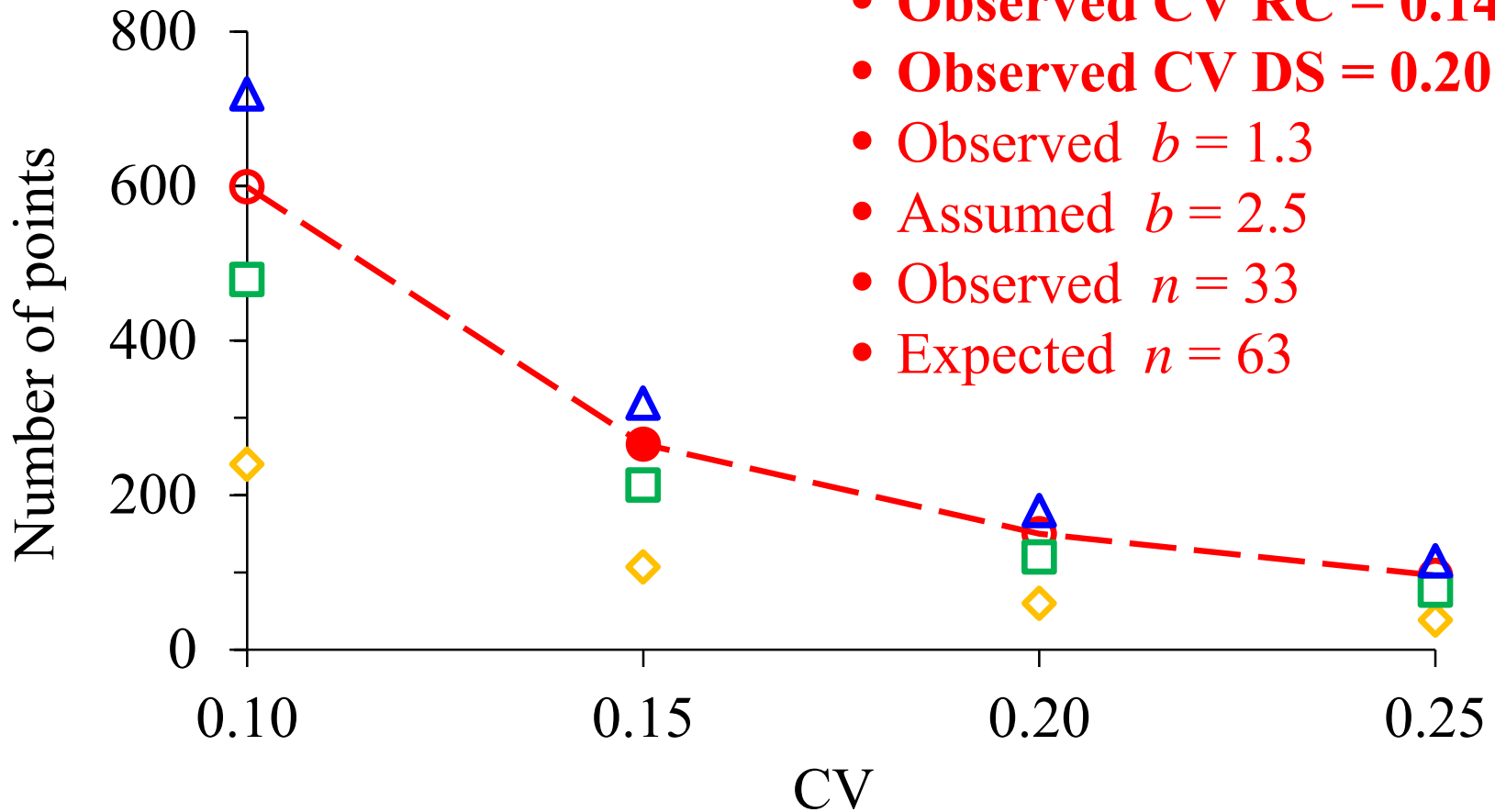
# GRDO Density: Habitat Suitability Index

(HSI = Habitat + Cover + Food – Disturbance)



# Number of Points for Desired $CV = 0.15$

- **Observed CV RC = 0.14**
- **Observed CV DS = 0.20**
- Observed  $b = 1.3$
- Assumed  $b = 2.5$
- Observed  $n = 33$
- Expected  $n = 63$



# Recommendations

- 1) Survey 150 points twice in July–August
- 2) Combine methods to gain precision ( $CV \leq 0.15$ )
- 3) Study ecological factors driving population dynamics (rain, cover, food, predation)
- 4) Use abundance estimates accounting for detection to evaluate management actions (habitat protection and restoration, predator removal)



# Reproduction and Survival

(Habitat, Cover, Food, Disturbance, Predation)



Photo by Bonnie L. Rusk, Grenada Dove Conservation Programme

# Climate Change and Local Weather

(Rain, Cover, Food → Calling, Nesting, Abundance)

Warmer, longer dry season  
Consecutive dry days

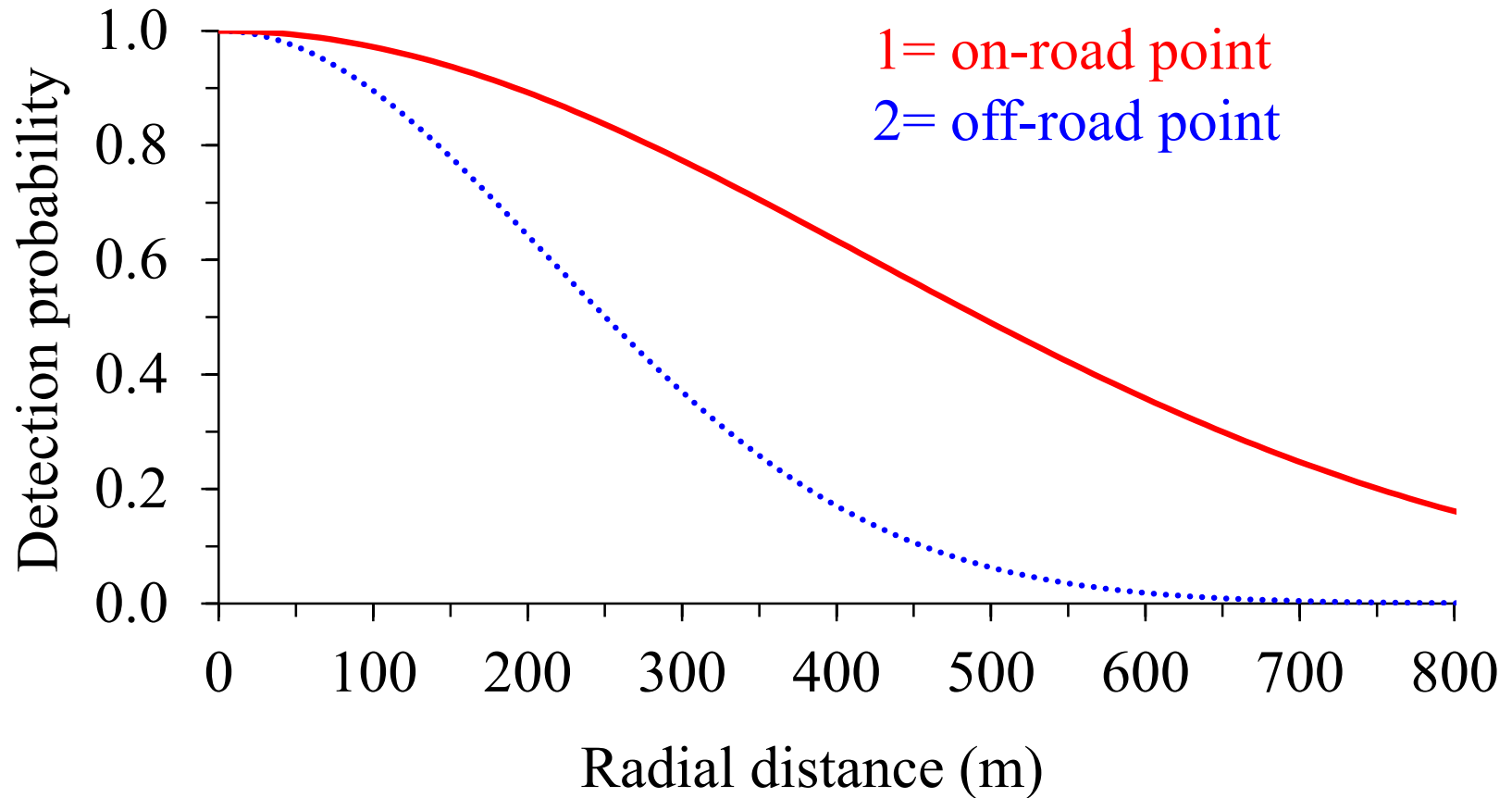


Heavy rainy days  
Hurricanes cat. 3–5



Photo by Bonnie L. Rusk, Grenada Dove Conservation Programme

# HBKI Detection: Point Location ( $w = 800$ m)



# HBKI Detection: Point Location ( $w = 800$ m)

Point location	$\hat{P}^*$	2.5%	97.5%
On	<b>0.438</b>	0.172	1.000
Off	<b>0.131</b>	0.071	0.242

**$*Z = 2.28, P = 0.02$**

## HBKI Density: Point Location ( $w = 800$ m)

Point location	$\hat{D}^*$	2.5%	97.5%
On	<b>0.001</b>	0.0004	0.003
Off	<b>0.006</b>	0.003	0.011

**$*Z = 2.71, P = 0.007$**



## HBKI Detection ( $w = 800$ m)

Method	$\hat{P}$	2.5%	97.5%
Distance	<b>0.219*</b>	0.146	0.327
Repeated	<b>0.130†</b>	0.091	0.187

\*  $P_d$

†  $P_{ad} = P_a \times P_d$

# HBKI Abundance Estimates

Distance	Mean	2.5%	97.5%
$\hat{D}$	<b>0.007</b>	<b>0.004</b>	<b>0.013</b>
$\hat{N}$	<b>57</b>	<b>33</b>	<b>96</b>
Repeated	Mean	2.5%	97.5%
$\hat{D}$	<b>0.007</b>	<b>0.004</b>	<b>0.010</b>
$\hat{N}$	<b>50</b>	<b>31</b>	<b>76</b>

- Thorstrom and McQueen (2008): 50–75 kites, assuming perfect detection of breeders and floaters

# Recommendations

- 1) Survey on-road and off-road points in xeric and mesic forests across the whole island
- 2) Repeat surveys before and after reproduction (May and October)
- 3) Explore the influence of site covariates on abundance estimation (cover, food, elevation)
- 4) Assess conservation threats (habitat loss, hunting, BWHA negative interactions)

# HBKI Nest Sites 2000–2006

(Thorstrom and McQueen 2008)



# Government, NGO, University Partnerships (Research, Monitoring, Management, Education)

- Ministry of Agriculture, Forestry and National Parks Department
- Grenada Dove Conservation Programme
- Department of Biological Sciences, University of Chester, UK
- Natural Resources Institute, University of Manitoba, Winnipeg, MB



# Thank You!

