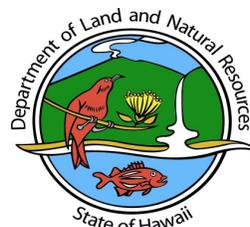
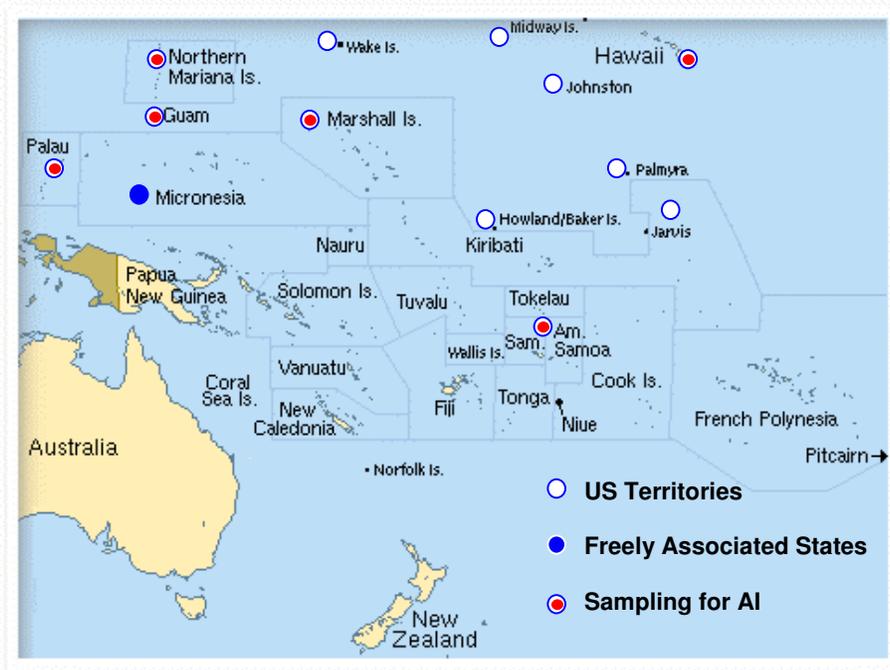


2006 / 2007 Avian Influenza Surveillance Report for the Pacific Islands

An interagency collaboration between U. S. Fish & Wildlife Service, U. S. Geological Survey, U. S. Department of Agriculture, State of Hawaii Department of Land & Natural Resources, American Samoa Department of Marine & Wildlife, and Palau Conservation Society

Compiled by:

Thierry M. Work & Renee Eismueller
USGS-National Wildlife Health Center-Honolulu Field Station



EXECUTIVE SUMMARY

In 2006, the US Departments of Interior (DOI) and Agriculture (USDA) were tasked with implementing surveillance for the presence of highly pathogenic avian influenza H5N1 (AI) in wild birds in the Pacific islands. This region was considered important for AI surveillance efforts because extensive interchanges (commercial and other) occur between US territories or affiliated states and areas enzootic for AI (e.g. Indonesia, China). Furthermore, because in many Pacific Island nations people co-habit closely with poultry that are a known source of AI infection in humans, it was thought that the risk of AI transmission of birds to humans was potentially highest in the Pacific islands. Implementing surveillance in this region posed particular challenges. First, because no existing programs involving capture of large numbers of birds of interest (shorebirds, waterfowl) existed, surveillance efforts in the field had to be built from scratch. Second, US affiliated states and territories in the Pacific islands encompass several time zones and posed significant logistical challenges regarding movement of specimens from collection sites to appropriate laboratories. Third, implementing surveillance efforts in many Pacific islands required careful negotiations with members to ensure that surveillance activities would serve the needs of the host nations and the objectives of DOI and USDA.

By necessity, this effort was an interagency collaboration. For example, field crews in Guam were partially funded by the US Fish & Wildlife Service Pacific Islands Office (USFWS) and USDA whereas in Hawaii, field crews were funded by USFWS and funds from USDA passed to the State of Hawaii Department of Land & Natural Resources (DLNR). The US Geological Survey National Wildlife Health Center-Honolulu Field Station (USGS-HFS) transferred funds to the USFWS which allowed the hiring of personnel in Palau through the Palau Conservation Society to implement AI surveillance efforts there. Finally, USFWS funded American Samoa Department of Marine & Wildlife to implement AI surveillance in that region. Staff hired for these efforts included two temporary assistants (DLNR through USDA), one AI coordinator and AI field technician (USFWS) and one AI technician (USGS-HFS). Agency roles for AI surveillance could be broadly broken down as follows: USFWS, DLNR, and USDA did coordination and implementation of sample collection and training; USGS-HFS did training, mortality investigations, coordination of sample shipments and submittal to laboratories, and served as a data repository. Strategies used to obtain samples in the Pacific islands included live bird netting, fecal sample collection, carcass collection, walk in traps, and duck traps. Fecal sample collection and carcass collection were the only sample methods tasked to both American Samoa and Palau. Fecal samples seemed to provide the highest return per unit effort spent in the field for all regions. Netting and use of walk in traps was effective in Guam whereas netting was less successful in Hawaii. Duck traps were used on Oahu only, however, this strategy seemed to provide large numbers of birds for given units of field effort. Carcasses provided the minority of AI diagnostic specimens. Overall, shorebirds (plovers and turnstones) were the most commonly sampled animals.

No AI was detected in >4000 samples. Surveillance for 2007-8 should focus on using appropriate trapping methodology in geographic areas that are most likely to maximize sample yield per unit effort thereby increasing our chances of detecting AI.

I. Percentage and total for samples taken in each of the regions.

Most samples came from Guam and Hawaii followed by American Samoa, Northern Mariana Islands, Marshall Islands, and Palau (Table 1). The Marshall Islands samples were the result of a two-week joint expedition by USFWS and USDA. The sample sizes in the graph below are broadly reflective of the number of personnel dedicated to AI surveillance in each region.

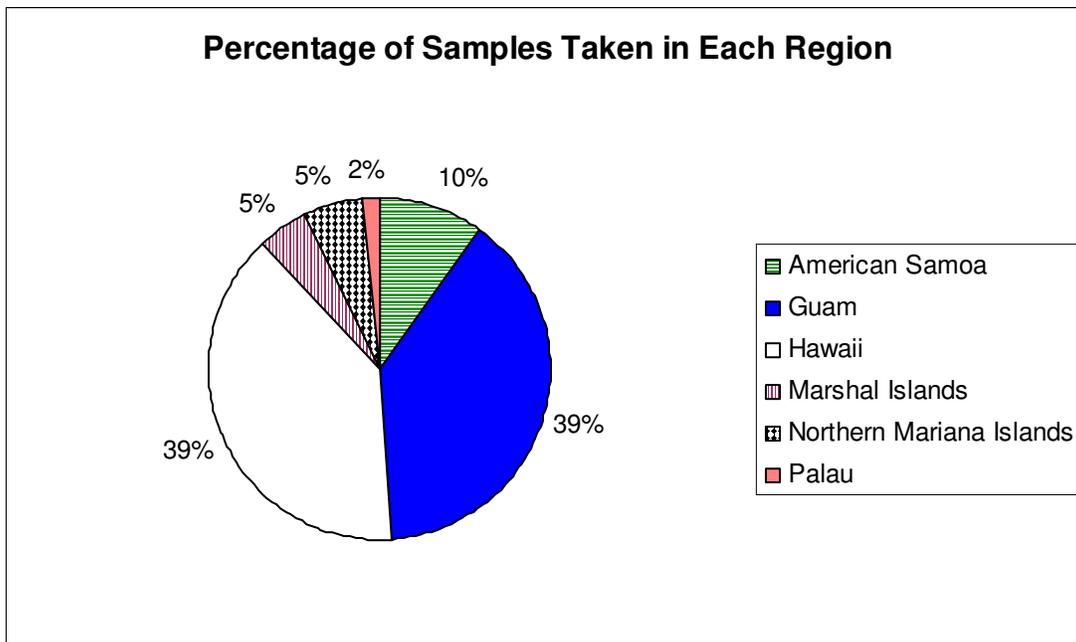


Table 1. Count of samples collected by region

Region	Total
American Samoa	400
Guam	1569
Hawaii	1579
Marshall Islands	188
Northern Mariana Islands	221
Palau	66
Grand Total	4023

II. Total number and percent of samples collected by sampling strategy.

Three of the five national strategies were used to collect samples for AI surveillance in the Pacific islands. Environmental samples (feces) were the most common followed by cloacal swabs from live birds and cloacal swabs from carcasses. Fecal samples were most commonly collected because this strategy seemed to maximize return on unit field effort (Table 2).

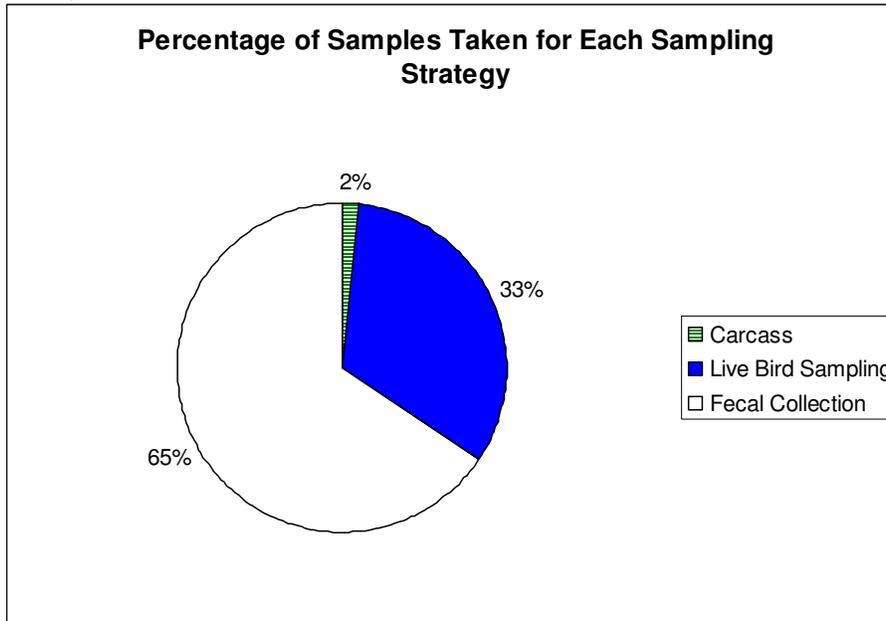


Table 2. Sample type by region. USDA and USDOI refer to labs where samples were analyzed.

Sample Type-Agency	American Samoa	Guam	Hawaii	Marshal Islands	Northern Mariana Islands	Palau	Grand Total
Carcass-DOI	5	3	57			3	68
Cloacal Swab-DOI	64	326	284		100		774
Cloacal Swab-USDA		208	260	3	70		541
Feces-DOI	243	731	825	91	51	63	2004
Feces-USDA	88	300	153	94			635
Tracheal Swab-USDA		1					1
Grand Total	400	1569	1579	188	221	66	4023

III. Laboratory Analysis

The majority of samples were analyzed at the National Wildlife Health Center, Madison, Wisconsin (see graph). Fecal samples for USDA were analyzed at the National Wildlife Research Center in Fort Collins, Colorado. Cloacal swabs for USDA were analyzed at the State of Hawaii Department of Health. Cloacal swabs and fecals for DOI were analyzed at the National Wildlife Health Center (Table 3).

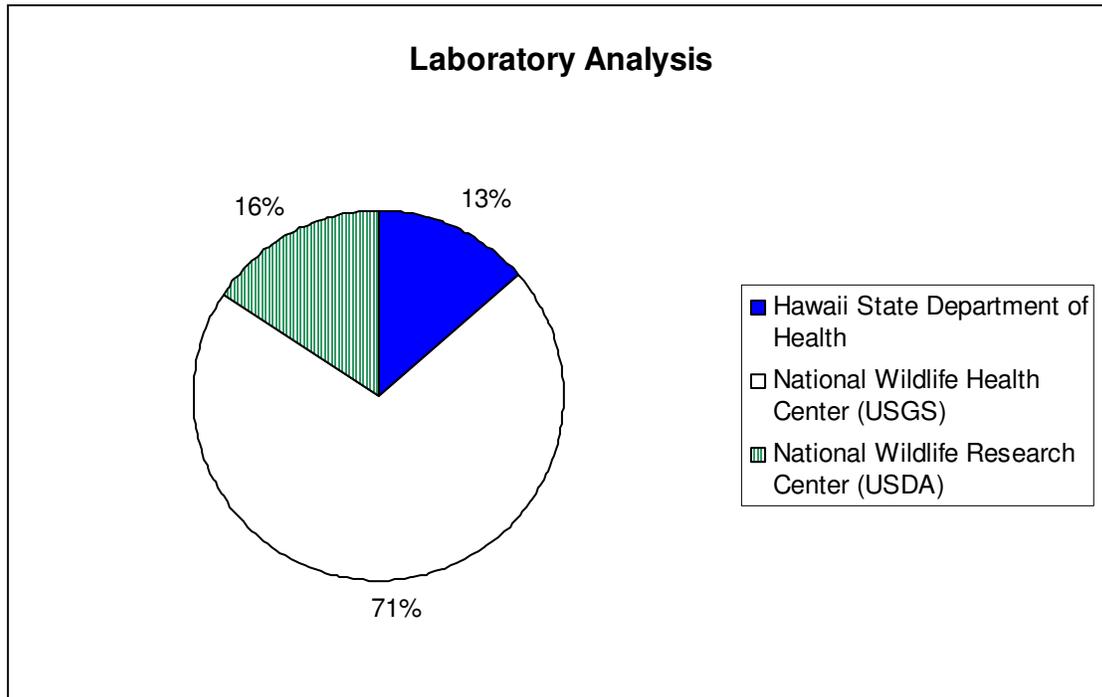
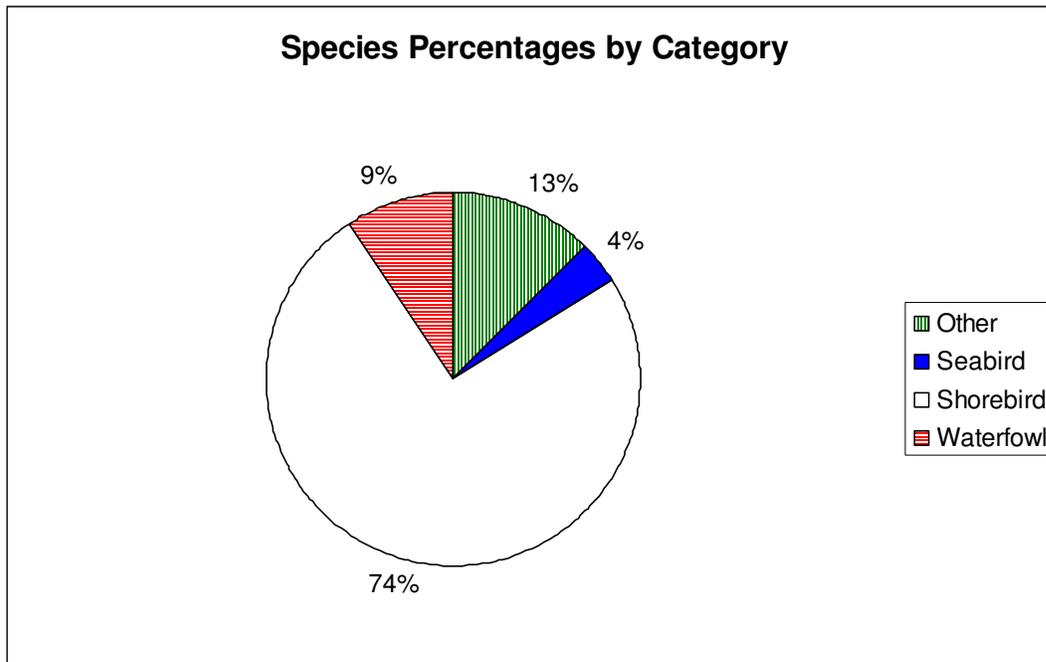


Table 3. Laboratory analyses by region

Region	Hawaii State Department of Health	National Wildlife Research Center (USDA)	National Wildlife Health Center (USGS)	Grand Total
American Samoa		88	312	400
Guam	209	300	1060	1569
Hawaii	260	153	1166	1579
Marshal Islands	3	94	91	188
Northern Mariana Islands	70		151	221
Palau			66	66
Grand Total	542	635	2836	4023

IV. Species Sampled

Birds targeted for AI surveillance in the Pacific region included shorebirds and waterfowl. Shorebirds (mainly Pacific golden plovers and ruddy turnstones) were the most numerous followed by “other species”, waterfowl, and seabirds. Hawaii, Palau, and CNMI were the only regions where waterfowl were collected (Tables 4 and 5).



Region	Shorebird	Waterfowl	Seabird	Other	Grand Total
American Samoa	386		3	11	400
Guam	1261	*	3	305	1569
Hawaii	977	372	136	94	1579
Marshal Islands	188				188
Northern Mariana Islands	129	2	1	89	221
Palau	60	1		5	66
Grand Total	3001	375	143	504	4023

* One pintail submitted by Guam for necropsy.

Species	Other	Seabird	Shorebird	Waterfowl	Grand Total
ACGO: Aleutian Canada Goose				1	1
AMWI: American Wigeon				2	2
AUSH: Audubon's Shearwater		1			1
BBPL: Black-bellied Plover			2		2
BBRA: Buff-banded Rail			5		5
BCNH: Black-crowned Night-Heron			3		3
BLBR: Black Brant				1	1
BLDR: Black Drongo			5		5
BLFR: Black Francolin	1				1
BTCU: Bristle-thighed Curlew			25		25
BWST: Black-wing stilt			3		3
CAEG: Cattle Egret			23		23
CAGO: Canada Goose				2	2
CBHG: Common Black-headed Gull			5		5
CHGO: Chinese Goose				1	1
COBO: Common Barn Owl	8				8
COGR: Common Grackle	1				1
COLK: Collared Kingfisher			5		5
COMO: Common Moorhen				2	2
COMY: Common Myna	66				66
COSA: Common Sandpiper			13		13
COSN: Common Snipe			5		5
DOGO: Domestic Goose				7	7
DRPE: Dark-rumped Petrel		4			4
EUWI: Eurasian Wigeon				2	2
FATE: Fairy Tern		1			1
GTTA: Grey-tailed Tattler			11		11
GWTE: Green-winged Teal				1	1
HACO: Hawaiian Coot				86	86
HAGO: Hawaiian Goose				19	19
HAMO: Hawaiian Moorhen				2	2
HAST: Hawaiian Stilt			5		5
HAWD: Hawaiian Duck				12	12
INEG: Intermediate Egret			7		7
JUMY: Jungle Myna	3				3
LEGP: Lesser Golden-Plover			1		1
LESC: Lesser Scaup				1	1
LTST: Long-toed Stint			9		9
MALA: Masked Lapwing	2				2
MALL: Mallard				148	148
MASA: Marsh Sandpiper			4		4
MODO: Mourning Dove	1				1
MONP: Mongolian Plover			1		1
MUSC: Muscovy Duck				6	6
NOPI: Northern Pintail				6	6

NSHO: Northern Shoveler				1	1
OHDU: Other Hybrid Duck (not MALL x ABDU)				69	69
PAGP, RUTU			117		117
PAGP, RUTU, WATA			10		10
PAGP, RUTU, WHIM			13		13
PAGP: Pacific Golden-Plover			1873		1873
PARH: Pacific Reef-heron			2		2
PEDU: Peking Duck				3	3
PESA: Pectoral Sandpiper			1		1
PHTD, INEG	2				2
PHTD: Philippine Turtle-Dove	384				384
PISN: Pintail Snipe			2		2
REJU: Jungle Fowl	12				12
RFBO: Red-footed Booby		2			2
RUFF: Ruff	7				7
RUTU, PAGP			20		20
RUTU, WHIM			14		14
RUTU: Ruddy Turnstone			541		541
RVBU: Red-vented Bulbul			6		6
SAND: Sanderling			19		19
SEPL: Semipalmated Plover			1		1
SHAS: Sharp-tailed Sandpiper			33		33
SNGO: Snow Goose				2	2
SNPL: Snowy Plover			1		1
SPDO: Spotted Dove	6				6
SWSN: Swinhoe's snipe			1		1
TAPE: Tahiti Petrel		1			1
TUSW: Tundra Swan				1	1
WATA: Wandering Tattler			33		33
WHIM: Whimbrel			85		85
WOSA: Wood sandpiper			43		43
WTSH: Wedge-tailed Shearwater		132			132
WWTE: White-winged tern		2			2
YCNH: Yellow-crowned Night-Heron			1		1
YEBl: Yellow Bittern			55		55
YEWT: Yellow Wagtail	1				1
ZEBD: Zebra Dove	7				7
Grand Total	504	143	3001	375	4023

V. Overall sampling method-Pacific islands.

Five methods were used to collect samples: Netting (mist net, cannon net, whoosh net, throw net), fecal collections, examination of carcasses, duck traps (used only on Oahu and Kauai), and walk in traps (used only in Guam). Overall, fecal collections and netting yielded the largest number of samples; however, duck traps were only deployed late in the sampling season (see Table 7 below).

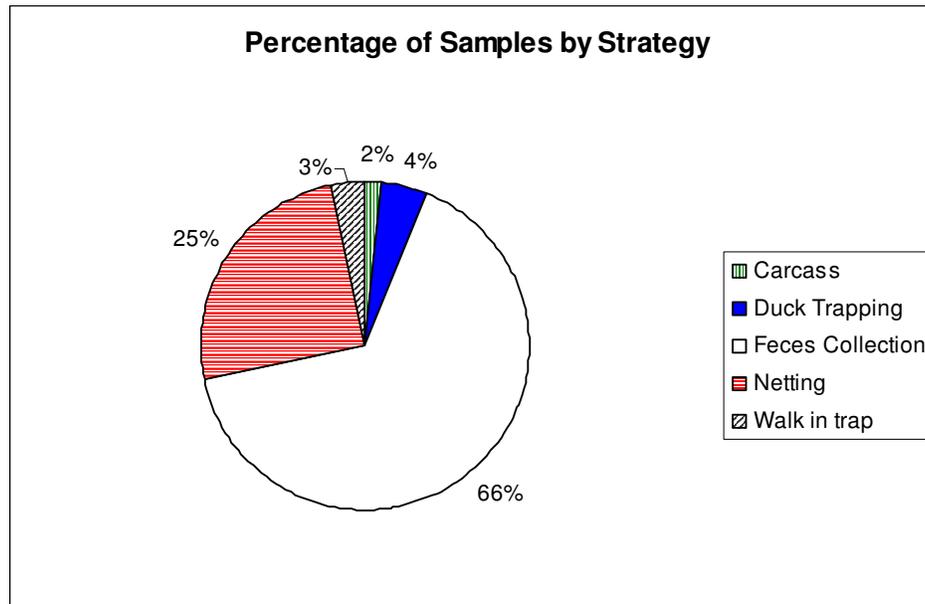


Table 6. Sampling strategy partitioned by region.

Region	Carcass	Duck Trapping	Feces Collection	Netting	Walk in traps	Grand Total
American Samoa	5		331	64		400
Guam	3		1031	404	131	1569
Hawaii	57	173	978	371		1579
Marshal Islands			185	3		188
Northern Mariana Islands			51	170		221
Palau	3		63			66
Grand Total	68	173	2639	1143		4023

VI. Hawaii sampling strategy.

Hawaii field crews consisted of two people from Hawaii Department of Land & Natural Resources, one person from USDA, and one to two people from USFWS. Netting efforts in Hawaii yielded large numbers of birds early on; however, this strategy was used only intermittently by personnel with variable experience. Accordingly, we resorted to collection of fecal samples in attempts to increase sample size and probability of detecting AI. Duck traps were deployed in late December-January at James Campbell NWR and proved to be an efficacious mean of collecting live bird samples as measured by amount of samples versus personnel hours spent in the field. Duck traps were also deployed in Kauai, however, because of timing (late in migratory season), they were not as effective as those deployed at James Campbell NWR.

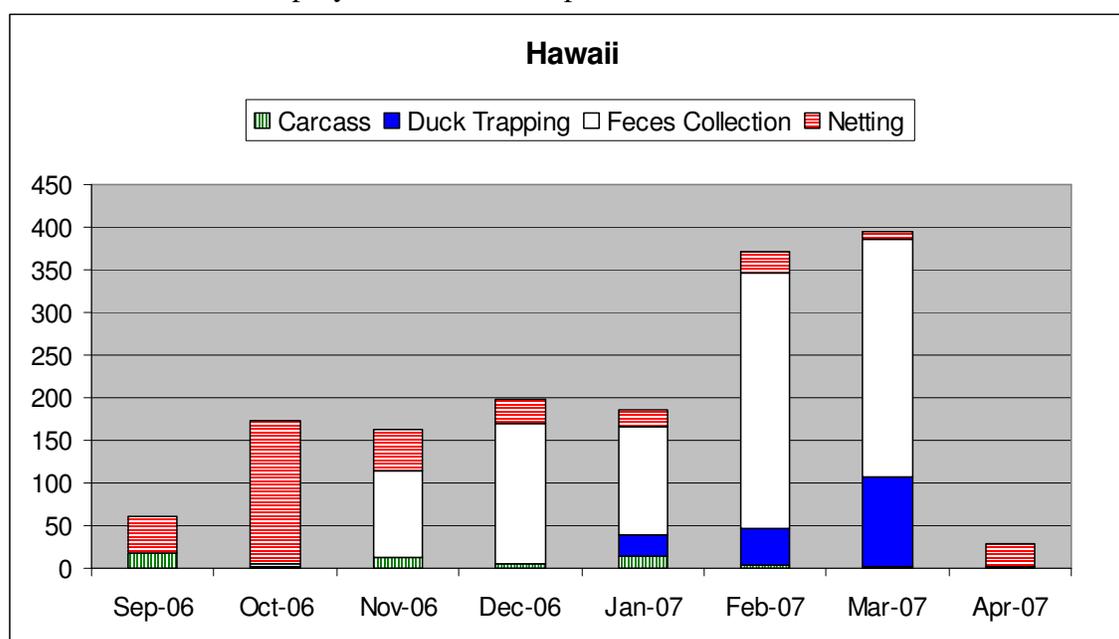


Table 7. Samples partitioned by month and collection strategy in Hawaii.

Month-Year	Carcass	Duck Trapping	Feces Collection	Netting	Grand Total
Sep-06	17	0	1	43	61
Oct-06	2	0	4	168	174
Nov-06	12	0	102	49	163
Dec-06	5	0	165	29	199
Jan-07	15	24	127	20	186
Feb-07	3	43	301	25	372
Mar-07	2	106	278	9	395
Apr-07	1	0	0	28	29
Grand Total	57	173	978	371	1579

VII. Guam sampling strategy.

Guam used 4 total staff, two funded by USDA and two by DOI for the first part of the sampling season and retained 4 DOI-funded staff from January to April 2007. All staff were employed by USDA.

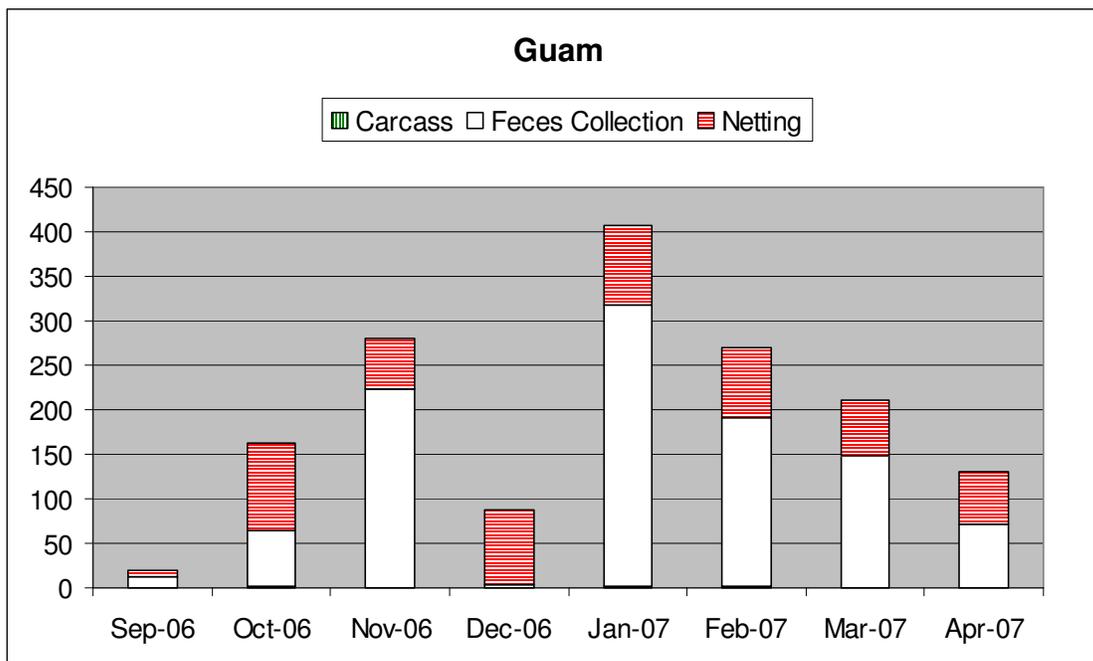


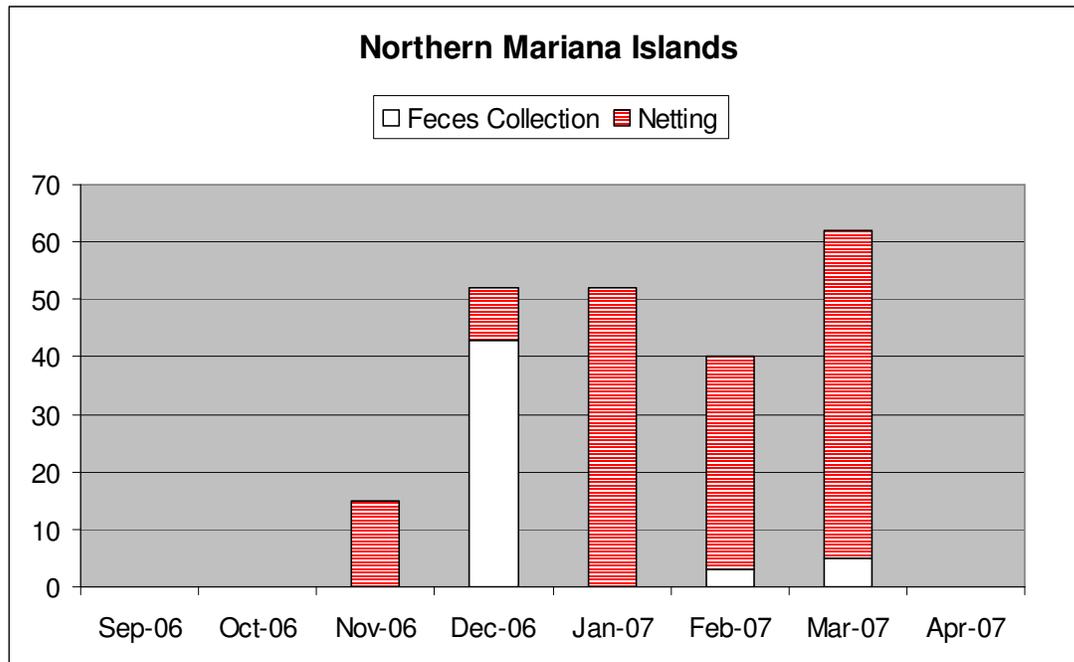
Table 8. Samples partitioned by month and collection strategy in Guam.*

Month-Year	Carcass	Feces Collection	Netting	Grand Total
Sep-06	0	13	7	20
Oct-06	1	64	97	162
Nov-06	0	224	56	280
Dec-06	0	3	85	88
Jan-07	1	316	91	408
Feb-07	1	190	79	270
Mar-07	0	149	62	211
Apr-07	0	72	58	130
Grand Total	3	1031	535	1569

*Note: 131 of birds classified as “Netting” were actually caught in walk in traps.

VIII. Northern Mariana Islands sampling strategy.

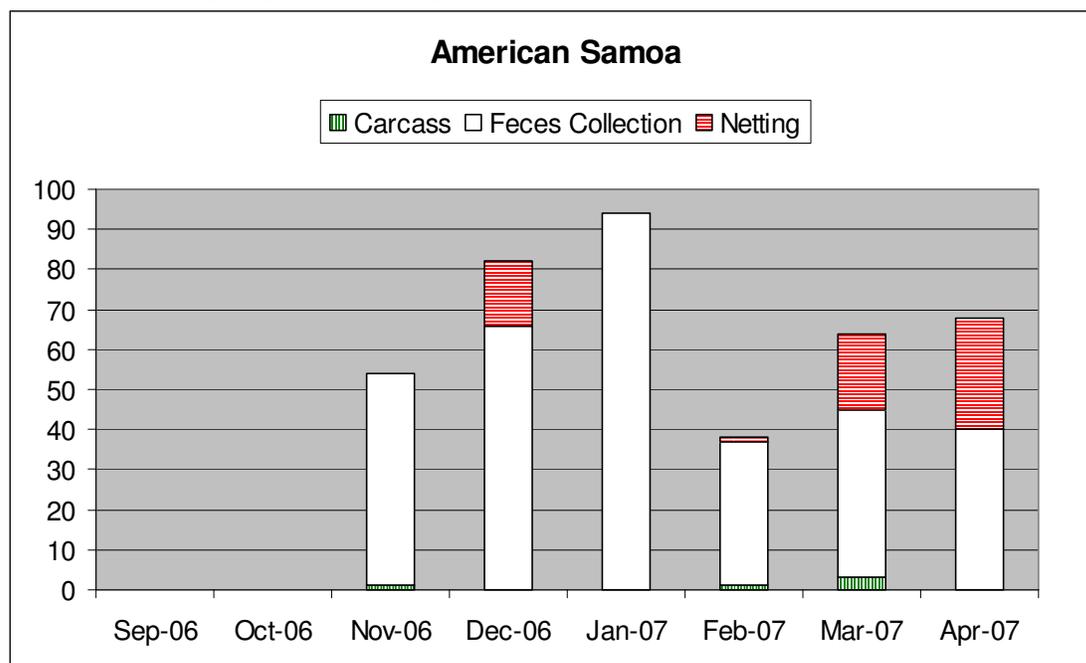
The sampling period in the Northern Mariana Islands was compressed because the crew from Guam was the only personnel available to carry out AI surveillance activities in this region. Sampling strategy and success were similar to that of Guam.



Month-Year	Feces Collection	Netting	Grand Total
Sep-06	0	0	0
Oct-06	0	0	0
Nov-06	0	15	15
Dec-06	43	9	52
Jan-07	0	52	52
Feb-07	3	37	40
Mar-07	5	57	62
Apr-07	0	0	0
Grand Total	51	156	221

IX. American Samoa sampling strategy.

The majority of sampling efforts in American Samoa comprised fecal collection. It was agreed that they would only collect samples one week a month to maximize efficiency in the field with limited personnel and lower shipping costs. Therefore the numbers reflect an intensive sampling effort during one week for each month.



Month-Year	Carcass	Feces Collection	Netting	Grand Total
Sep-06	0	0	0	0
Oct-06	0	0	0	0
Nov-06	1	53	0	54
Dec-06	0	66	16	82
Jan-07	0	94	0	94
Feb-07	1	36	1	38
Mar-07	3	42	19	64
Apr-07	0	40	28	68
Grand Total	5	331	64	400

X. Palau sampling strategy.

Funds were transferred to the USFWS from USGS to implement AI surveillance in Palau. The Palau Conservation Society sponsored one individual to carry out AI surveillance efforts in that region. Because of administrative delays in transferring funds, efforts to collect samples in Palau did not set out in earnest until January 2007. Because of limited personnel and capacity in Palau, fecal sampling and carcass collection were the only two collection methods used in this region. The lack of large numbers of migratory birds available for sampling in Palau made obtaining large sample sizes for AI surveillance problematic.

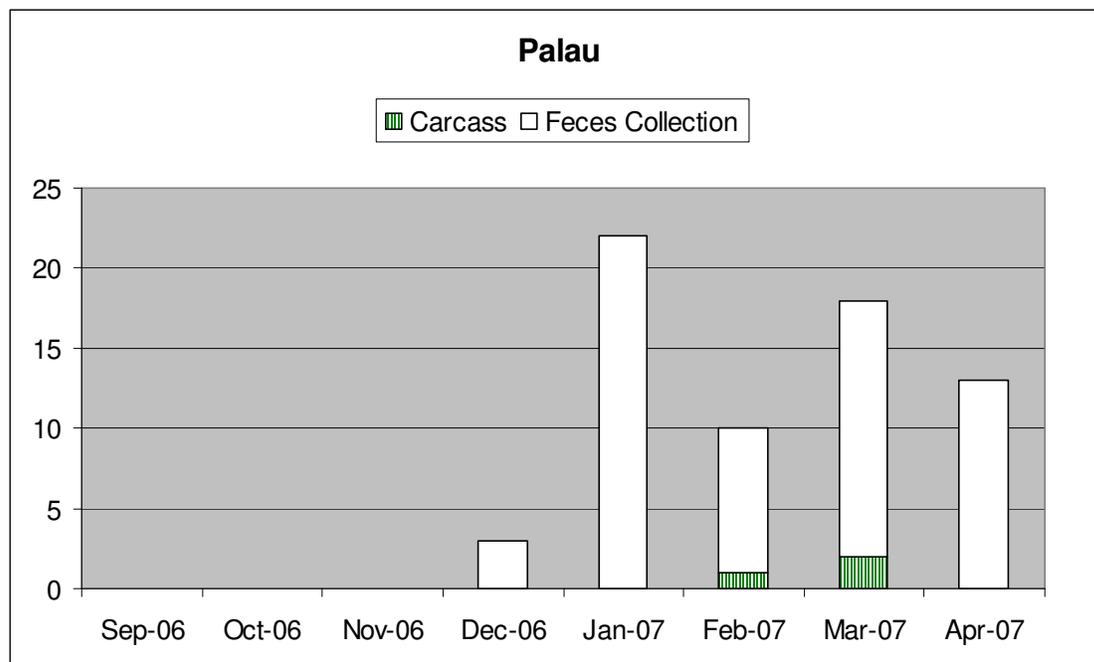


Table 11. Samples partitioned by month and collection strategy in Palau.

Month-Year	Carcass	Feces Collection	Grand Total
Sep-06	0	0	0
Oct-06	0	0	0
Nov-06	0	0	0
Dec-06	0	3	3
Jan-07	0	22	22
Feb-07	1	9	10
Mar-07	2	16	18
Apr-07	0	13	13
Grand Total	3	63	66

XI. Marshal Islands sampling strategy.

In late Nov-early Dec. 2006, USDA and USFWS did a joint collecting expedition in the Republic of the Marshall Islands. High winds at the time of the expedition precluded effective use of mist nets explaining the low numbers of live birds caught at that location. Accordingly, fecal sampling was substituted. Of 188 samples collected, 3 were from mist nets and the remainder from feces. Pacific golden plovers predominated.

XII. Top locations for sample size in each region partitioned by sample methods.

AMERICAN SAMOA	Feces Collection	Netting	Grand Total
Ta'u Airport	49		49
OFU Airport	38		38
NOAA	26		26
OMV-Tafuna	26		26
FAA Lot - Tafuna	20		20
Pago Park	17	1	18
Tafuna International Airport	9	7	16
Illili Golf Course	10	4	14
OMV Track Field	14		14
Leone High Field	4	8	12

GUAM	Feces Collection	Netting	Grand Total
Tiyan AOA	42	315	357
Naval Magazine	261	4	265
AAFB	145	60	205
S. Finegayan, Dededo	77	34	111
CCP, Yona	95	7	102
Yona	99		99
Polaris Point	46	8	54
Togcha Yona	34	19	53
FEMA, Barrigada	35	17	52
Comnavmar	44	1	45
Merizo		30	30

HAWAII	Duck Trapping	Feces Collection	Netting	Grand Total
James Campbell, NWR Kii Unit	173	100	1	274
Kualoa Beach Park		213	50	263
Kaena Pt.			128*	128
Ala Moana Beach Park		63		63
Hawaii Memorial Park		48		48
KMCBH: Wastewater Treatment		47		47
Waialoa State Park		13	26	39
Kanaha Waterfowl Sanctuary		35	2	37
Natural Energy Lab		23	14	37
Punchbowl Memorial Park		37		37

*Seabirds were pulled from burrows by hand.

MARSHAL ISLANDS	Feces Collection	Netting	Grand Total
Usaka	58		58
Dally Field	30		30
Roi-Namur	27		27
Lagoon	26		26
North End Of Inlet	23		23

NORTHERN MARIANA ISLANDS	Feces Collection	Netting	Grand Total
Marpi Dump, Saipan	2	107	109
Rota Airport	42	5	47
Tinian, airport	3	28	31
Susupe Rec. Center	3	21	24

PALAU	Feces Collection	Grand Total
Malakal	17	17
Meyuns	14	14
Airport Parking Lot	5	5
Long Island Park	4	4
Ngerbelas	3	3

XIII. Recommendations

- a. Sampling efforts for 2007-2008 should be tailored in specific regions to reflect capacity and expertise. For example, mist netting and fecal collections were successful in Guam and CNMI whereas duck traps and fecal samples were more productive strategies in Hawaii. Thus, emphasis for future surveys in those particular regions should focus on those methods.
- b. Better documentation of sampling effort and sample acquisition should be implemented to more effectively gauge how efficient a particular sampling method really is (e.g. documenting catch per unit effort).
- c. For all regions, airports appear to be a good source of shorebirds, and future collection efforts for that group of animal should continue in those areas or should be implemented in areas where airports were not sampled (e.g. Hawaii).
- d. Any netting should focus on times of heaviest passage migrant movements (Sept - Dec) and netting in locations with visual obstructions (ie, topography) that may limit the view of nets that shorebirds can get.

XIV. Acknowledgments.

The following provided constructive comments for this report, and their input is greatly appreciated: Earl Campbell (USFWS), Joshua Fisher (USFWS), Jeffrey Flores (USDA), Sam Goldstein (USDA), Megan Laut (Hawaii DLNR), Ruth Utzurum (AS-DMWR), and Daniel Vice (USDA).