

## **JOB PROGRESS REPORT RESEARCH PROJECT SEGMENT**

**STATE:** Territory of Guam

**PROJECT NO.:** W-1R-5

**SUB-PROJECT NO.:** W-3

**STUDY NO.:** 1

**JOB NO.:** 1

**JOB TITLE:** Population Size and Distribution of Wild Asiatic Water Buffalo on Guam  
(1460)

**PERIOD COVERED:** October 1, 1996 to September 30, 1997

### **SUMMARY**

Counts of feral Asiatic water buffalo (*Bubalus bubalis*) at Naval Ordnance Annex (NOA) showed no significant changes ( $P > 0.05$ ) in number of animals recorded per km during FY97. The base's buffalo population has shown a general increasing trend since the late 1970s.

### **BACKGROUND**

Asiatic water buffalo were introduced to Guam in the 1600s from the Philippines for use as beasts of burden (Wiles 1990). Known locally as carabao, these animals numbered about 2,000 prior to World War II. Many of the island's domestic animals were apparently let loose during the Japanese occupation, resulting in the creation of feral herds in the interior region of south-central Guam. The Division of Aquatic and Wildlife Resources (DAWR) began spotlight counts of carabao on NOA (formerly Naval Magazine) in 1966 while conducting Philippine deer (*Cervus mariannus*) censuses (Wiles 1990). The NOA herd averaged about 0.6-0.8 animals/km between 1966 and 1978 (Anderson 1980). Buffalo abundance peaked in 1982, when an average of 2.6 animals/km traveled was recorded. Population numbers decreased for several years thereafter, but increased again to 2.6 animals/km traveled in 1989 (DAWR 1983-1989). Biosystems Analysis Inc. (1989) estimated the carabao population on NOA to be 75-150 animals in 1987. In 1996, spotlight counts revealed an all time high of 2.8 animals/km traveled (DAWR 1996). Illegal hunting has been a major cause of mortality in the population (Conry 1988), but expanded anti-poaching efforts on the Annex by DAWR conservation officers and the Navy since the 1980s may be responsible for allowing the population to show steady growth. High buffalo densities have resulted in localized habitat damage on the base (Conry 1988, Biosystems Analysis Inc. 1989).

## OBJECTIVES

To monitor the status of the feral Asiatic water buffalo on Guam and to determine if control measures are necessary to maintain the population at a level compatible with the available resources.

## PROCEDURES

1. Conduct monthly spotlight counts on NOA. Analyze count data and compare with past data to estimate population trends.
2. Monitor carabao movements.

## RESULTS

### Spotlight Count Trends and Other Survey Results

Only five spotlight counts of water buffalo were made on NOA in FY97. The number of buffalo per count showed no significant change (Mann-Whitney  $U$ -Test,  $U = 21$ ,  $P > 0.10$ ) from last year, with an average of 2.8 animals/km seen in both years (Table 1). A mean of 65.4 animals was recorded per count this year. The largest number of buffalo recorded on a monthly count increased from 86 animals in FY96 to 108 animals in FY97.

Table 1. Results of monthly spotlight counts of feral water buffalo at the Ordnance Annex, FY97.

<b>Month</b>	No. animals observed	Km traveled	Animals/ km	Miles traveled	Animals/ mile
Oct	49	24.6	2.0	15.3	3.2
Nov	108	24.2	4.5	15.0	7.2
Jan	34	22.5	1.5	14.0	2.4
May	83	22.5	3.7	14.0	5.9
Jun	53	22.5	2.4	14.0	3.8
<b>Total</b>	327	116.3	-	72.3	-
<b>Ave</b>	65.4	23.3	2.8	14.5	4.5
<b>SD</b>	29.7	1.1	1.2	0.6	2.0

Analyses of spotlight counts from 1968-1997 for NOA (DAWR 1980-1996; this report) show an increasing trend in buffalo abundance (Figure 1). Counts were positively correlated (Pearson Correlation Coefficient  $r = 0.777$ ,  $P = 0.0001$ ,  $n = 26$ ). Simple linear regression suggests that the rate of increase (slope) of buffalo is 0.069 (SE = 0.012) per year.

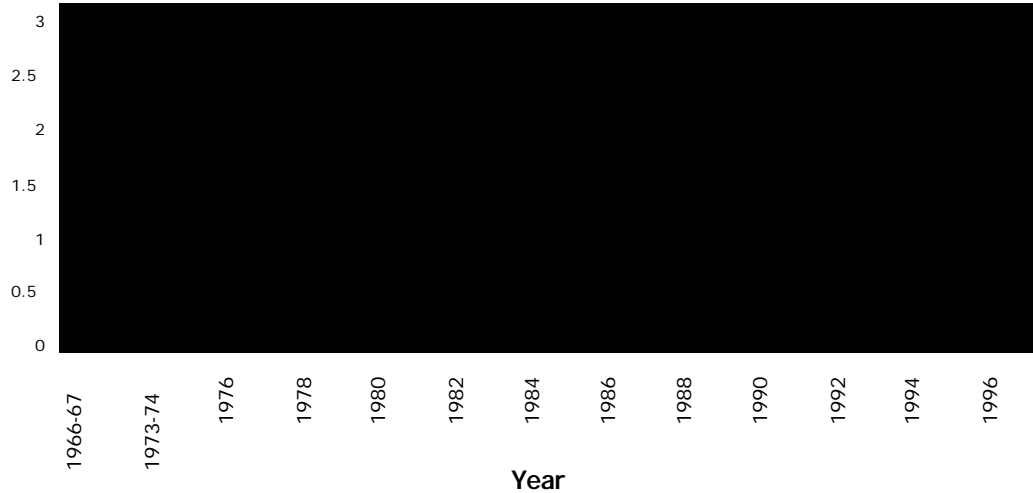


Figure 1. Results of water buffalo spotlight counts on Ordnance Annex from 1968-1997. Results are expressed as an annual mean of the number of animals seen per kilometer per count. Simple linear regression indicates that the rate of increase (slope) of buffalo is 0.069 (SE = 0.012) per year.

In November, DAWR staff assisted the U.S. Fish and Wildlife Service (USFWS) with a large mammal survey of NOA (Walker et al. 1996). Survey methodology replicated that used by Biosystems Analysis Inc. (1989) in a previous study. Transect results showed a two-fold increase ( $P = 0.012$ ) in water buffalo sign from 1989 to 1996, indicating that an overall increase in animal numbers has occurred on the base. Buffalo sign was most common in degraded ravine forests and savanna and least common in undisturbed ravine forest. The survey found two additional population parameters to be higher in 1996 than 1989. These were a greater mean calf to adult ratio (2.4:10 in 1996 vs. 1:10 in 1989) and a much greater daylight count of absolute buffalo numbers (60 animals in 1989 vs. 134 animals in 1996) (Walker et al. 1996, Biosystems Analysis Inc. 1989). These data strongly suggest that buffalo numbers have increased on the base and corroborate population trend results seen in DAWR spotlight counts (Figure 1).

Based on absolute count results (134 animals; Walker et al. 1996) and information derived from counts of recognizable animals (see below), a reasonable estimate of the current water buffalo population size on NOA is 200-300 animals.

#### Immunocontraception of Water Buffalo

Jay F. Kirkpatrick of Zoo Montana in Billings, Montana, was contracted by the Navy to assess the viability of using immunocontraceptives to reduce the water buffalo population on NOA. Porcine zona pellucida (PZP) vaccine has been a successful contraceptive in a variety of wild ungulates (Kirkpatrick 1995; Turner et al. 1992). The contraceptive effects are reversible through at least three years of treatment. The vaccine is administered intramuscularly with an

adjuvant using a dart gun. Target animals are initially treated with two inoculations given 3-6 weeks apart. A single booster (a third inoculation) will be administered 9 months after the initial treatment to determine if contraception can be sustained by annual booster vaccinations.

As part of this project, staff from the USFWS, DAWR, and Navy prepared an identification handbook of buffalo based on individual horn characteristics (31 females and 3 males were recognizable) and were trained in inoculation procedures. Twenty-four females were given the initial treatment of two inoculations from April 28 - May 6 and June 4 - 24. The single booster inoculation will be administered in March-April 1998. Follow-up observations of treated animals are being made on a weekly basis for signs of calving.

#### Other Activities

Preliminary studies on the movements of water buffalo on NOA are underway, based on the location of recognizable animals at least once a week. Behavior, social activity, weather, and time of day were also noted.

Several early morning sightings of small carabao herds were reported by the public along Route 17 in April. Tracks and/or dung were found near sightings. "Carabao Crossing" signs were posted along the highway in May to decrease the potential for automobile-carabao collisions. Two of the three signs were missing by late September, while the remaining sign had several bullet holes.

### **RECOMMENDATIONS**

Continue spotlight counts on NOA. Collect data concerning buffalo movements.

### **PROGRAM COST**

The estimated cost of the wild Asiatic water buffalo project under W-1R-5 is \$4,000.

### **LITERATURE CITED**

Anderson, R.D. 1980. Population size and distribution of wild carabao on Guam. Job Progress Report. Federal Aid to Fish and Wildlife Restoration, Guam. Guam Dept. Agric., Mangilao, Guam.

Biosystems Analysis, Inc. 1989. Natural resources survey for the U. S. Naval Magazine, Guam (NavMag). Naval Facilities Engineering Command, Pearl Harbor, Hawaii.

Conry, P.J. 1988. Management of feral and exotic game species on Guam. Trans. West. Sec. Wildl. Soc. 24:26-30.

Division of Aquatic and Wildlife Resources. 1980-1996. Job Progress Reports. Federal Aid to Fish and Wildlife Restoration, Guam. Guam Dept. Agric., Mangilao, Guam.

Kirkpatrick, J.F. 1995. Management of Wild Horses by Fertility Control: The Assateague Experience. Natl. Park Serv. Scientific Monogr., Natl. Park Serv., Denver, Co.

Turner, J.W., Jr., I.K.M. Liu, and J.F. Kirkpatrick. 1992. Remotely delivered immunocontraception in captive white-tailed deer. *J. Wildl. Manage.* 56:154-157.

Walker, R., G. J. Wiles, J. M. Morton, M. R. Lusk, and A. P. Marshall. 1996. Large mammal surveys on the Ordnance Annex. pp. 109-131 *in* U. S. Fish and Wildlife Service. Faunal survey for the Ordnance Annex, Naval Activities, Guam. U. S. Fish Wildl. Serv., Honolulu, Hawaii.

Wiles, G.J. 1990. Population size and distribution of wild Asiatic water buffalo on Guam. Job Progress Report. Federal Aid to Fish and Wildlife Restoration, Guam. Guam Dept. Agric., Mangilao, Guam.

Report was prepared by: Dana T. Lujan and Gary J. Wiles