Feeding habits of whistling ducks in the Calabozo Ricefields, Venezuela, during the non-reproductive period

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Introduction

Studies on the biology and ecology of waterfowl in Venezuela are rather scarce. Among the best known are studies by Mondolfi (1957, 1970) on *Cairina moschata* (Pato Real).

Food habit studies are especially relevant for species which affect human economic activities such as agriculture. Only by having at our disposal the necessary biological information about feeding habits can we adequately manage a given species at a given locality (Bonnette *et al.* 1961).

Whistling ducks are among the most attractive game species in the country, but they also cause some depredations in rice crops. Every year the numerous sport hunters who visit the Calabozo area provide an additional source of income which far compensates for crop losses (Bruzual 1971, 1972). Thus management of whistling ducks involves maintaining populations high enough to attract sportsmen, but low enough to keep depredations at a tolerable minimum. Populations must not reach carrying capacity, but neither must they decrease to the species' survival threshold.

One basic study which is necessary is that of the food ecology for each species, and along with it, the importance of rice in the diet of each species (e.g. comparative significance on depredations).

Management of ducks populations was attempted for the Calabozo area during 1971 through 1973; the present study is based on material collected during that time. It involves food habits for the non-reproductive season, when ducks concentrate in the study area.

Three species of whistling ducks occur:

Dendrocygna viduata (Linnaeus) (White-faced Tree or Whistling Duck – local name, Güire, Güiririí Cariblanco, Yaguaso Cariblanco).

Dendrocygna bicolor bicolor (Vieillot) (Fulvous Tree or Whistling Duck – local name, Tejé, Yaguaso Colorado, Güire).

Dendrocygna autumnalis discolor (L.) (Black-bellied Tree or Whistling Duck – local name, Güire, Güiririí, Pico Rosado).

Study area

The Guárico River Irrigation System occupies Calabozo and El Rastro Counties, Miranda District, in the state of Guárico, Venezuela (Figure 1).

The Guárico River Dam is located northeast of the city of Calabozo, and operates mainly for irrigation of rice farms in the area. The reservoir occupies an area of approximately 23,140 ha. The irrigated lands are located northwest and southwest of the city, and are limited by the dam on the north, the Guárico River on the east, Tiznados River on the west and the plains (Llanos) of Calabozo County on the south.

The rice area is extremely flat, with slopes up to only 0.3 to 0.8%, making it adequate for inundation, the general irrigation method practised in the area. Calabozo is 100 m above sea level.

There is a tropical rainy climate typical of savannahs, with a dry season from November to April, and a rainy season from April to November. More than 50% of the total precipitation takes place during June, July and August, and more than 100 mm may fall in a 24-hour period.

Among the states making up the vast natural region known as Los Llanos, Guárico has the broadest ecological diversity. Sarmiento and Monasterio (1970) divide the area into six ecological regions: mountains, hill country, mesiasc, alluvial plains, flood plains and sandy marshlands.

The Guárico River Irrigation System occupies a great portion of the alluvial plains. However, the vegetation typical of the 'Bancos de San Pedro' has been almost totally replaced by agricultural types. It is almost a treeless savannah;

Wildfowl 34 (1983): 20–26

Figure 1. Map of the study area.

dominant species are *Axonopus purpusii, Mesosetum cardonum, Andropogon selloanus* and several species of *Paspalum* and *Panicum.* In non-cultivated soils *Hyptis suaveolens* is dominant.

Near the potholes scattered outside the limits of the Irrigation System there are semideciduous corridors (forests), sometimes hundreds of metres wide. Dominant trees are *Pithecellobium saman, Enterolobium cyclocarpus, Ceiba pentandra, Spondias mombin* and *Licania pyrifolia.*

Use of the land in almost all of this region is more intense than in the others, not only due to the irrigation, but also because its soils are adequate for cultivation of corn, bananas, papayas, and other minor crops.

One of the limiting factors for wildlife is the marked contrast between the rainy season, with soils partially inundated and abundant pastures, and the dry season, when grasses dry out and water may be critically scarce. Such a situation is no longer present in the Calabozo area, where irrigation during the dry season has attracted thousands of waterfowl.

Materials and methods

Crop contents were analysed for food composition on 101 specimens: 67 *Dendrocygna viduata,* 21 *D. bicolor* and 13 *D. autumnalis.*

Ducks were shot during daily flights (around 6.00 a.m.) from the feeding grounds to the resting grounds, from January through July, the rice farming season.

For collection and initial handling of samples, the methods of Bartonek & Hickey (1969) were followed. To minimize the effects of post-mortem digestion, the digestive tract was separated and placed in 5% formalin solution immediately after capture.

Food items removed from crops were segregated and identified under a stereomicroscope. Individual crop volumes and total volume for each aggregated item were recorded. Results are given for frequency (percentage) of each food item, following Bartonek & Hickey (1969). The number is obtained by dividing the number of birds that consume a particular food into the total number of birds sampled. The same method is used to determine volume (percentage) of each item, equivalent to the 'aggregate volume' as defined by Larimore (1957), calculated by dividing total volume of a particular item into the total volume of samples.

Results

The analysis of food contents of the 101 crops are presented in Tables 1 to 3.

Table 1. Crop contents of 67 White-faced Whistling Ducks *Dendrocygna viduata* from Calabozo ricefields, Venezuela, 1971-73.

	Males (39*)		Females (28)	
	Frequency (%)	Volume (%)	Frequency (%)	Volume (%)
Plant (seeds)				
Oryza sativa	64.1	36.9	46.4	28.9
Oryza perennis	59.0	17.0	53.6	15.7
Hydromelia sp.			3.6	tr**
Caperonia palustris	79.6	1.8	57.1	5.1
Leersia hexandra	10.3	0.6	10.7	0.1
Paspalum distichum	15.4	tr	25.0	0.3
Echinochloa colonum	74.4	2.6	39.3	0.8
Echinochloa crusgalli	7.7	tr	7.1	tr
Cyperus articulatus	59.0	9.2	35.7	6.7
Cyperus rotundus	43.6	16.1	46.4	21.9
Scleria sp.	17.9	1.9	25.0	6.3
Sporobolus sp.	2.6	0.5	3.6	0.5
Paspalum sp.	33.3	0.9	28.6	0.5
Paspalum plicatulum	41.0	7.4	14.3	1.8
Heliconia sp.	5.1	0.6	7.1	0.8
Schaemun rugosum	7.7	1.4	7.1	0.6
Fimbristylis mileaceus	12.8	2.4	7.1	0.6
Unidentified grasses	7.7	tr	3.6	0.5
Fibres	51.3	0.1	50.0	0.5
Animal matter				
Hemiptera			3.6	0.5
Coleoptera			3.6	0.1
Himenoptera			3.6	tr
Oligochaeta			3.6	tr
Ferrous residues	23.1	0.5	28.6	6.0

* Sample size
** Trace: less than 0.1%

Table 2. Crop contents of 21 Fulvous Whistling Ducks *Dendrocygna bicolor* from Calabozo ricefields, Venezuela, 1971-73.

	Males (8*)		Females (13)	
	Frequency (%)	Volume (%)	Frequency (%)	Volume (%)
Plant (seeds)				
Oryza sativa	100.0	71.7	61.5	6.4
Oryza perennis	50.0	0.7	30.8	2.9
Hydromelia sp.			7.7	0.8
Caperonia palustris		tr**	30.8	tr
Leersia hexandra	12.5	tr	7.7	tr
Paspalum distichum	12.5	tr	30.8	tr
Paspalum sp.		tr	23.1	0.8
Echinochloa colonum	37.5	tr	53.8	1.0
Cyperus articulatus	12.5	27.6	46.2	4.0
Cyperus rotundus			7.7	17.0
Humenachne amplexicaulis			23.1	2.4
Scleria sp.			15.4	6.2
Sporobolus sp.			7.7	tr
Fimbristylis mileaceus			7.7	tr
Unidentified grass			7.7	tr
Fibres	37.5	tr	46.2	tr
Ferrous residues			7.7	1.0

* Sample size.
** Trace: less than 0.1%.

Table 3. Crop contents of 13 Black-bellied Whistling Ducks *Dendrocygna autumnalis* from Calabozo ricefields, Venezuela, 1971-73.

	Males (7*)		Females (6)	
	Frequency (%)	Volume (%)	Frequency (%)	Volume (%)
Plant (seeds)				
Oryza sativa	57.1	95.4	83.3	67.5
Oryza perennis	28.6	3.6	33.3	0.5
Caperonia palustris	28.6	tr**	33.3	tr
Leersia hexandra			16.7	tr
Paspalum distichum			50.0	tr
Paspalum sp.	14.3	tr	33.3	tr
Paspalum plicatulum			16.7	tr
Echinochloa colonum	28.6	tr	50.0	tr
Cyperus articulatus	14.3	1.0		
Cyperus rotundus			50.0	31.3
Scleria sp.	14.3	tr		
Sporobolus sp.	14.3	tr		
Schaemun rugosum			16.7	tr
Fimbristylis mileaceus			16.7	tr
Unidentified grasses			16.7	0.5
Fibres			83.3	tr
Ferrous residues			33.3	0.3

* Sample size.
** Trace: less than 0.1%.

Results are given in percentage frequency and percentage volume for each food item, for each sex, for the three different species of ducks.

Plants were found in all stomachs, grasses being the most common component. Among these, *Oryza sativa, O. perennis* and *Echinochloa colonum* were found in all three species of ducks; *Echinochloa crusgalli* was found only in three male (7.7% frequency) and two female (7.1% frequency) *D. viduata;* three species of *Paspalum* were found in *D. viduata* and *D. autumnalis,* but only two were present in *D. bicolor.*

Among the Cyperaceae, *Cyperus rotundus* and *C. articulatus* were found in all three species. *Caperonia palustris* (Euphorbiaceae) was also frequent in the three species.

Although rice *Oryza sativa* was present in all three species, 100% frequency was found only for the male *D. bicolor,* ranging from 46% in female *D. viduata* to 83% in female *D. autumnalis.* This strongly suggests that it is not rice which keeps the ducks in the ricefields, but rather the aquatic environment maintained in the area.

With respect to volumes represented by plant materials, *Oryza sativa* (rice) showed the highest figure of 95% for male *D. autumnalis;* 68% was found for females. 72% and 64% were found for male and female *D. bicolor,* respectively, and 37% and 29% for male and female *D. viduata.* Second in importance for volume is *Cyperus rotundus,* a persistent weed, ranging from 20% to 30% among the three species. *Oryza perennis* was found to be in about the same proportion as *C. rotundus* in *D. viduata,* and one specimen of *D. autumnalis* contained exclusively these buds. One interesting case was that of a male *D. bicolor,* which contained 46.5 ml of *Cyperus articulatus,* together with rice (4 ml). (It also contained 0.6 ml of *Oryza perennis).*

Details for other plant materials will be found in the tables. Both frequency and volume show great similarity for both sexes of the same species, but vary greatly among species, thus indicating some degree of specific selectivity.

In order to evaluate specific differences in the importance of rice in the diet, a two-way analysis of variance and a least significant difference test were performed. Table 4 shows rice volumes (Means ± S.E.) by sex and total for each species.

No differences were found ($P > 0.05$) in rice consumption between sexes within species, so results were pooled for species comparison. Rice consumption was found significantly lower ($P < 0.05$) in *D. viduata* than in the other two species. Difference between *D. bicolor* and *D. autumnalis* was non-significant.

Figure 2 shows the relationship between volumes of rice, the two weeds *Oryza perennis* and *Cyperus rotundus* (pooled), and other foods (pooled). The two weeds represented 35% of the diet for *D. viduata,* about the same proportion as rice (34%); other foods made up 31%. In *D. bicolor* the two weeds made up 11% volume, other foods 21%, while rice was 68%. In *D. autumnalis* rice comprised 80% volume, while the weeds were 19% and other foods only 1%. The two weeds mentioned are the most important weeds in the ricefields.

Animals were observed in only one stomach (a female *D. viduata),* representing 0.6% of total volume (Table 1). among these were broadly identified insects, mainly Hemiptera, Coleoptera

Table 4. Rice *Oryza sativa* content in three species of whistling ducks from Calabozo ricefields, Venezuela, 1971-73.

	Volume (% ± S.E.)		
	Males	Females	Total
Dendrocygna viduata	36.9 ± 8.7 (39)*	28.0 ± 11.6 (28)	34.2 ± 6.5 (67) a
Dendrocygna bicolor	71.7 ± 6.5 (8)	64.0 ± 24.9 (13)	67.7 ± 15.6 (21) b
Dendrocygna autumnalis	95.4 ± 45.3 (7)	78.7 ± 19.6 (6)	79.7 ± 21.7 (13) b

* Sample size.
a,b. Equal letters indicate no difference at 5% level.

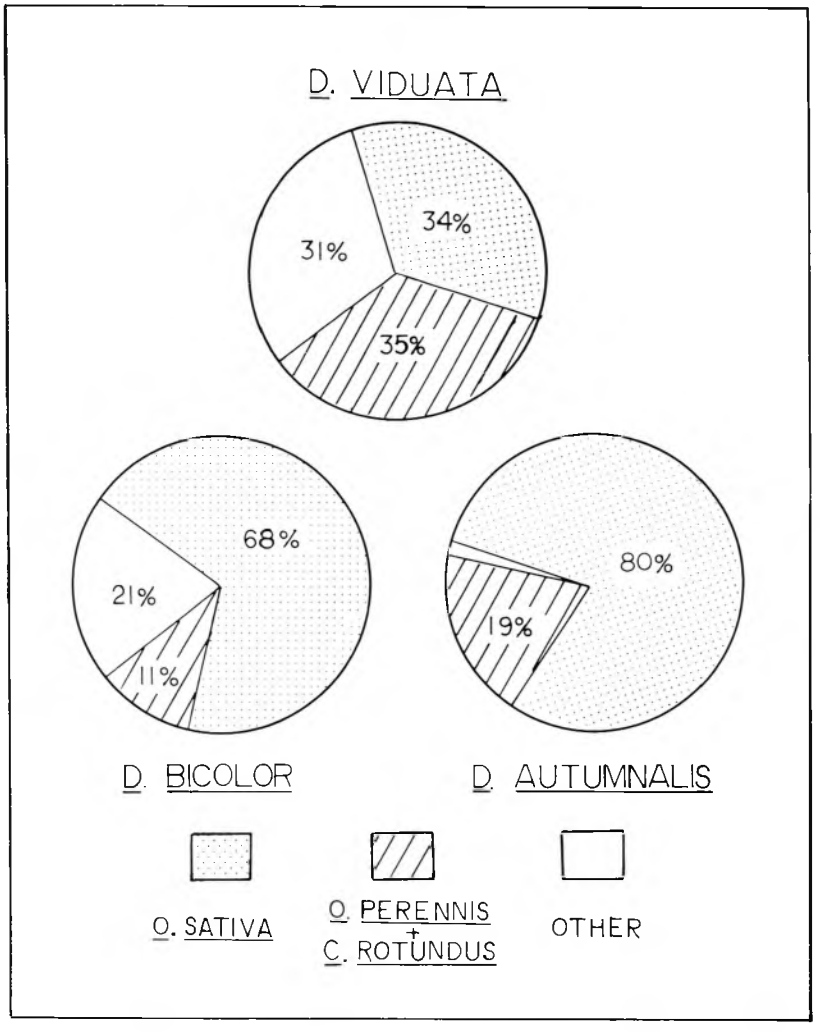

Figure 2. Diets of whistling ducks in the study area.

and some Hymenoptera. Traces of Nematoda and Annelida (Oligochaeta) were also found.

The absence of animals in the birds examined may be due to the eradication of invertebrates in the ricefields by pesticides. McCartney (1963) mentions 0.5% volume of insects for *D. bicolor* in ricefields from Louisiana. Bolen & Forsyth (1967) found 8% volume in animal contents for *D. autumnalis* in cornfields of Texas, where pesticide application is less intense. It is possible that during the reproductive season these birds include more animals in their diet, as is the case for other ducks such as *Anas acuta* (Krapu 1974).

Conclusions and recommendations

1. Among the species of whistling ducks, rice consumption appears to be about twice as important in *D. autumnalis* and *D. bicolor* as in *D. viduata*.

2. All three species consume both recently planted rice and mature rice from the ears tumbled either by wind or by the ducks themselves. The latter occurs when open spaces of water are present on

the ricefields.

3. Whistling ducks could possibly be used to control weeds such as *Oryza perennis* and *Cyperus rotundus,* since weeds comprised as much as two-thirds of the diet in *D. viduata*. Therefore we do not recommend opening a hunting season after the rice harvest, but rather inundating the fields and permitting ducks to feed on them. The hunting season should be limited to the rice planting season.

4. Frequency studies showed that ducks thrive on many plant species other than rice, and that the aquatic environment is more important to them than the presence of rice.

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Summary

Crop contents from 101 whistling ducks *(Dendrocygna)* in Venezuela were analysed. Three species were studied: 67 *D. viduata* (White-faced Whistling Duck), 21 *D. bicolor* (Fulvous Whistling Duck) and 13 *D. autumnalis* (Black-bellied Whistling Duck). Values are reported in frequency and volume (percentages).

Plant material made up nearly all the food and consisted of 18 species. For *D. viduata,* the most numerous plant species were *Caperonia palustris* and *Echinochloa colonum;* the species most represented by volume were *Oryza sativa, Cyperus rotundus* and *Oryza perennis.* For *D. bicolor,* the most frequent species were *Oryza sativa, Echinochloa colonum* and *Oryza perennis,* while highest volumes were found for *Oryza sativa, Cyperus articulatus* and *Cyperus rotundus.* For *D. autumnalis, Oryza sativa, Echinochloa colonum* and *Caperonia palustris* were most important in frequency, and *Oryza sativa* and *Cyperus rotundus* in volume. Animal material was found in only one crop.

There was no difference in rice consumption between *D. autumnalis* and *D. bicolor,* but both were higher than *D. viduata.*

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