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Parasites of the Collared Peccary from Texas[1]

WILLIAM M. SAMUEL[2] and WILLIAM A. LOW[3]

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Abstract

Results of a survey of the parasites of the collared peccary *(Dicotyles tajacu angulatus)* in Texas are presented. Three ectoparasites, *Amblyomma cajennense, Dermacentor variabilis,* and *Pulex porcinus* were very common on peccaries from south Texas, but less common or absent in arid west Texas. Sucking lice, *Pecaroecus javalii,* were common on peccaries from west Texas, but were not found in south Texas. The known range of this louse in Texas is extended into the Big Bend area. Two ticks, *Amblyomma inornatum* and *Haemaphysalis leporis-palustris,* were found infrequently.

Five of nine species of endoparasites found in this survey *(Dirofilaria acutiuscula, Parabronema pecariae, Parostertagia heterospiculum, Physocephalus* sp., and *Texicospirura turki)* were prevalent. Three species, *D. acutiuscula, Gongylonema baylisi,* and *Fascioloides magna,* are reported from North American peccaries for the first time. The geographic distribution of the large American liver fluke, *F. magna,* coincided with an area where the parasite is enzootic in white-tailed deer.

It is concluded that parasitism was of little importance in population control of peccaries during the period of the study.

An extensive study of reproduction and life-history of the collared peccary *(Dicotyles tajacu angulatus* (Cope, 1898))[25] in south and west Texas was conducted from July, 1964, to August, 1967, by Low. Peccaries handled in that study were examined secondarily for ectoparasites and obvious endoparasites. Samuel undertook a comprehensive survey of the endoparasites found in the peccaries collected in south Texas during the last 15 months of the study. This report is the result of both series of parasitological examinations.

Study Areas

Peccaries were collected from the Santa Gertrudis Division of the King Ranch, Kleberg Co., and the Welder Wildlife Refuge, San Patricio Co., in south Texas, and from the Ralph Watson Ranch, Crockett Co., and the Black Gap Management Area, Brewster Co., in west Texas. The west Texas areas are charac-

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terized by low rainfall (8 to 16 inches per year), sparse vegetation, and rocky, broken, rapidly-drained terrain. The Black Gap Area is in Thomas'[23] Trans-Pecos Vegetational Area, and the Watson Ranch is in the western edge of the Edwards Plateau Vegetational Area. The south Texas areas are characterized by less arid conditions (25 to 30 inches per year), chaparral and prickly pear *(Opuntia lindheimeri),* sandy and sand- and clay-loam soils and flat, poorly-drained terrain. Both the Welder Refuge and the King Ranch lie in transitional areas between Thomas'[23] Gulf Prairies and south Texas Plains; the Refuge is predominantly Gulf Prairie vegetation, and the King Ranch is predominantly south Texas Plains type.

Densities of peccaries differed greatly between study areas. Densities were approximately: Black Gap Management Area — one peccary/300 acres, Watson Ranch — one/200 acres, Welder Refuge — one/65 acres, and the King Ranch — one/30 to 100 acres.

Methods and Materials

Specimens were shot, numbered, taken intact to the laboratory and necropsied within 2 to 4 hours. Viscera from several animals were frozen prior to examination.

Ectoparasites were collected using the "search" technique assessed by Ignoffo[10] which in this case is appropriate because of the sparse, bristly hair of the host. Collections of ectoparasites for identification were made from 42 peccaries from south Texas, and the general level of infestation was noted on an additional 271 animals. Total collections of all ectoparasites were made from three peccaries which were placed in plastic bags with chloroform immediately after collection. All of the fleas were collected from a fourth, heavily-infested individual.

All 17 animals from the Watson Ranch were examined closely for ticks. Total counts of fleas were made on three peccaries from the Watson Ranch, and complete collections of lice were made from six peccaries. Five freshly-killed peccaries from the Black Gap Area were examined for ticks, lice, and fleas. An additional 52 peccaries killed by hunters up to 48 hours before examination were examined cursorily for lice and ticks.

The nasal passages, lungs, liver, esophagus, stomach, small and large intestines, caecum, mesenteries, abdominal cavity, subcutaneous fascia, and feces were examined for endoparasites. The technique of Samuel and Beaudoin[20] was followed for necropsy. Briefly, the stomach, small and large intestine, and caecum were separated, slit, and flushed repeatedly. Flushings were concentrated by repeated washing and decanting, stored in 10% formalin and examined under a binocular dissecting microscope. Nematodes were picked from the mucosa of the posterior portion of the stomach and from the esophagus under illumination and 2X magnification. The liver was sliced serially into ½ inch sections and examined for flukes and cysts. The trachea, bronchi, and larger bronchioles were cut their entire length, exposed and washed. Flushings were examined for lungworms under 2X magnification and light.

Results

Table 1 lists the prevalence and abundance of parasites in peccaries from south and west Texas. Ticks were found only on animals from the south Texas areas. *Amblyomma cajennense* (Fabricius, 1787) was by far the most numerous tick found. There appeared to be little change in abundance of adult *A. cajennense* throughout the year. Larvae and nymphs were present on peccaries throughout the year. The American dog tick *Dermacentor variabilis* (Say, 1821) was also found frequently, but never in high numbers. Abundance of this species was low from May through July (average: one adult/5 minute sampling period)

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but higher during the winter (average: seven adults/5 minute sampling period). Nymphs were collected from October through March. *Amblyomma inornatum* Banks, 1909, and the rabbit tick *Haemaphysalis leporis-palustris* (Packard, 1869) were encountered only rarely: on two and three animals, respectively.

No ticks were found on peccaries from the Watson Ranch and Black Gap Management Area although two male *Dermacentor albipictus* (Packard, 1869) were collected from a white-tailed deer on the Ranch.

Pulex porcinus Jordan and Rothschild, 1923, (*Juxtapulex porcinus* of some authors) was widespread and abundant on peccaries in south Texas and on the Watson Ranch; it reached its greatest abundance during the late spring and autumn. The densest infestation (192 fleas) occurred on a one week-old peccary caught in early summer. The peccaries from the Watson Ranch were less heavily infested with this flea than were the south Texas animals (based upon total counts and subjective evaluation), but all of the peccaries, except a solitary animal, collected there were infested. No fleas were found on five fresh, hunter-killed peccaries from the Black Gap Management Area.

The giant sucking louse (*Pecaroecus javalii* Babcock and Ewing, 1938) was found only on animals from west Texas. Peccaries from the Watson Ranch had lice in all life-cycle stages, but only egg cases were found on peccaries from the Black Gap Area.

Animals examined for endoparasites came almost exclusively from the King Ranch in south Texas. Specimens from west Texas were limited to fecal samples from four animals from the Watson Ranch and examinations of seven and 21 animals for filarids and liver flukes (Table 1). Seventeen peccaries from the Watson Ranch and four from the Black Gap Management Area were negative for the large American liver fluke *Fascioloides magna* (Bassi, 1875) Ward, 1917.

A spirurid (*Parabronema pecariae* Ivashkin, 1960) was found in the mucosa of the abomasal portion of the stomach in the two gastrointestinal tracts available from the Welder Refuge. (The collared peccary is a sub-ruminant whose stomach is divided into regions which are less developed than those of the true ruminant.) *Texicospirura turki* Chitwood and Cordero de Campillo, 1966, and *Parostertagia heterospiculum* Schwartz and Alicata, 1933, were recovered from the small intestine of both peccaries, and the two infections of *F. magna* were found during examination of seven livers from Welder-collected peccaries. Several of the liver flukes were "encapsulated", typical of mature parasite infections of cervids and some domestic ruminants.

A ciliate indistinguishable from *Balantidium coli* (Malmsten, 1857) Stein, 1862, was detected in the feces of one animal from the King Ranch.

Gongylonema baylisi Teixeira de Freitas and Lent, 1937, was found in the esophageal epithelium, *Physocephalus* sp., in the lumen and/or mucosa of the abomasal portion of the stomach, *Moniezia benedeni* (Moniez, 1879) Blanchard, 1891, in the anterior small intestine, and *Dirofilaria acutiuscula* (Molin, 1858) Chitwood, 1933, in the subcutaneous dorso-lumber fascia of hosts collected on the King Ranch.

In addition to the data in Table 1, it should be noted that: 1) 16 of 21 fecal samples from peccaries on the King Ranch contained eggs of *P. heterospiculum;* 2) most of the *Moniezia benedeni* were sexually immature; 3) the animal (P #113) containing 8717 *P. heterospiculum* was the only peccary which appeared to be ill when collected. No other parasites were abnormally abundant on or in this particular host, however, the axillar lymph nodes were swollen.

No parasites were observed in the lungs, heart, or nasal passages of 155, 35, and 100+ peccaries, respectively.

Table 2 lists the prevalence of endoparasites from three specific herds of peccary on the King Ranch. The major differences are the presence of *Moniezia* and the reduced prevalence of most nematodes in the herd from the sandy-soiled Canelo Pasture. There were no detectable differences in ectoparasites between the herds.

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TABLE 1. *Prevalence and abundance of parasites of the Collared Peccary in Texas.*

	South Texas areas		West Texas areas	
	Prev.[a]	Abund.[a]	Prev.	Abund.
Acarina				
Amblyomma cajennense	98% (42)	116 (62-167) (3)	0% (22)	———
Amblyomma inornatum	5% (42)	1 (1) (3)	0% (22)	———
Dermacentor variabilis	78% (42)	3 (1-5) (3)	0% (22)	———
Haemaphysalis leporis-palustris[c]	7% (42)	2 (2) (3)	0% (22)	———
Anoplura				
Pecaroecus javalii	0% (313)	———	88% (17)[d]	12 (5-29) (6)
Siphonaptera				
Pulex porcinus	100% (313)	85 (35-192) (4)	77% (22)[e]	38 (0-50) (3)
Protozoa				
Balantidium sp.	4% (25)[b]	———	0% (4)[b]	———
Nematoda				
Dirofilaria acutiuscula[c]	27% (48)	2 (1-5)	0% (7)	———
Gongylonema baylisi[c]	4% (46)	1	0% (4)[b]	———
Parabronema pecariae	36% (53)	5 (1-28)	0% (4)[b]	———
Parostertagia hetero-spiculum	91% (58)	476 (7-8717)	0% (4)[b]	———
Physocephalus sp.	86% (56)	55 (1-370)	0% (4)[b]	———
Texicospirura turki	48% (58)	7 (1-48)	0% (4)[b]	———
Cestoda				
Moniezia benedeni	9% (58)	1 (1-3)	0% (4)[b]	———
Trematoda				
Fascioloides magna[c]	1% (144)	2 (2-3)	0% (21)	———

[a]Prevalence = percent infected (number hosts examined); abundance = average number per infected host (range) (number examined if different than in prevalence column; only total collections included).

[b]Based on examination of feces only.

[c]Not previously recorded from the collared peccary in North America.

[d]An additional 52 animals from Black Gap were negative for adult *P. javalii*, although egg cases were found on four of 14 peccaries closely-examined for egg cases.

[e]Includes five peccaries from the Black Gap Management Area which were negative for fleas; all 17 peccaries from the Watson Ranch were positive.

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TABLE 2. *Prevalence of several endoparasites of peccaries from designated herds on the King Ranch.*

Species	Herd					
	Canelo*		Mesquite*		Upper Motas Negras*	
	percent infected	number examined	percent infected	number examined	infected percent	examined number
Dirofilaria acutiuscula	0	2	10	21	50	6
Gongylonema baylisi	0	7	18	11	0	6
Parabronema pecariae	0	7	21	19	67	6
Parostertagia heterospiculum	86	7	95	21	83	6
Physocephalus sp.	57	7	90	21	100	6
Texicospirura turki	29	7	67	21	50	6
Moniezia benedeni	43	7	0	21	0	6

*Name of pasture from which herd was collected.

Discussion

Texas' collared peccaries are hosts of a variety of parasites. Three of the four species of ticks found during this survey have been reported previously from peccaries.[5,6,8,12,15] McIntosh[15] described a new species, *Dermacentor halli*, collected from collared peccaries on the King Ranch; however, this species was not found during this study.

Another tick *(Amblyomma americanum)* reported previously from peccaries[6] was collected from feral pigs *(Sus scrofa)* and white-tailed deer *(Odocoileus virginianus)* at the Welder Refuge (Low, unpub. and Samuel[19]), but was not collected from peccaries.

The occurrence of the common rabbit tick *(Haemaphysalis leporis-palustris)* on collared peccaries from the King Ranch appears to be a new host record for this species. The tick was quite common on cottontail rabbits *(Sylvilagus floridanus)* from the Welder Refuge (J. du P. Bothma, *pers. comm.)*, but was found rarely in tick collections from peccaries.

No ticks were found on the peccaries from the Watson Ranch, and only two were found on a deer. This is likely a reflection of the effectiveness of an early tick control program[3] in the area, rather than unsuitable habitat. No ticks were found on peccaries from the Black Gap Area, although several *Dermacentor* sp. were collected from mule deer *(Odocoileus hemionus)* in the area.

Decreases in number of *Dermacentor variabilis* during the summer probably relates to the hot, usually dry conditions experienced at that time. *Amblyomma cajennense*, a southern species ranging into South America, is presumably better able to withstand the hot, dry summer periods without aestivating.

There is a difference in prevalence and abundance of *Pulex porcinus* between peccaries from the moister, coastal area

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of Texas, and those from the arid, desert areas of Texas, New Mexico, and Arizona. Average numbers of *Pulex porcinus* on animals from the King Ranch were twice as great as on peccaries from the Watson Ranch. No fleas were found on peccaries from the Black Gap Management Area, and Neal[17] found only *Pulex irritans* present on three of 85 peccaries from Arizona. Eads[5,6] and Jennings and Harris[12] have reported *P. porcinus* to be both prevalent and abundant on peccaries from south Texas. It has been suggested that *P. porcinus* is restricted to peccaries[5,6] but Samuel[19] found this flea on 14 per cent of 404 white-tailed deer from the Welder Refuge.

An increase in the number of fleas in the spring coincided with warmer weather. In the springs of 1965 and 1966, the number of newly-emerged fleas inhabiting the peccary bedding grounds was sufficient to drive the collectors out of the area. The hot, dry summers probably inhibit reproduction, but the return to moist, cool autumn conditions results in another increase in abundance.

The geographical distribution of the giant sucking louse *(Pecaroecus javalii)* contrasts with the distribution of fleas. Infested animals have been found in west Texas[2,14] and in this study, Arizona,[17] and New Mexico,[18] but not from the coastal areas of south Texas in this study. The occurrence of egg cases identical to those from Watson Ranch peccaries, from peccaries of the Black Gap Management Area extends the known distribution of *P. javalii* into the Big Bend region of Texas. Our records of dispersed occurrence suggest that this parasite is widely distributed within the range of its host in west Texas.

All of the animals that were collected from herds on the Watson Ranch were infested with the louse (not as stated by McDaniel, *et al.*[14]), but two solitary peccaries were free of the parasite. Possibly the herd behavior facilitates distribution of the louse. The frequent contact between individuals would permit mutual reinfestation during the critical molt periods of the host.

On the Watson Ranch, both fleas and lice were collected from the same host specimens. Fleas were almost completely restricted to the ventral areas of the host, whereas the lice were distributed over the haunches and along the back on the long guard hairs. This contrasted with the distribution of fleas over most of the surface area of the south Texas peccaries.

Of the nine species of endoparasites detected in this survey *Dirofilaria acutiuscula* and *Gongylonema baylisi* have been reported from peccaries only in Brazil [13,22] and *Fascioloides magna* has not been reported previously from this host. *Parabronema pecariae* (syn. *Parabronema* sp. Schwartz and Alicata, 1933),[4,16,21] *Texicospirura turki*,[4,16] *Parostertagia heterospiculum*,[21] *Moniezia benedeni*,[1] and *Balantidium* sp.[11] have been reported previously. The *Physocephalus* sp. is possibly an undescribed species, but is definitely not *P. sexalatus* (Molin, 1860) Diesing, 1891 (Chitwood, *pers. comm.*) which has been reported from the collared peccary from south Texas.[21]

The large American liver fluke *(F. magna)* is enzootic in white-tailed deer from the Welder Refuge,[9,19] but was not found in 39 deer livers from the King Ranch.[9] It may be more than an accidental occurrence that two of the seven livers examined from peccaries from the Refuge contained mature ("encapsulated") liver flukes. In addition, the recent finding of mature flukes in the liver of a feral pig from the Refuge (Samuel, unpub.) suggests that hosts other than ruminants are capable of maintaining natural infections. The Refuge, a rather small area (7800 acres), has at least four host species infected with *F. magna;* the three mentioned above, and cattle.

Peccaries are gregarious and travel in herds of two to 25 or more animals including all ages and both sexes, over a rather restricted home range. There appears to be little or no intermingling of different herds, but there is considerable splitting and regrouping of animals in a parent herd. Home ranges of different herds do overlap, but evidence of territoriality during this study is lacking, although the musk gland is used for marking vegetation in the home range. Other peccary herds in south Texas do

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establish definite territories which overlap 100-200 yards.[7] The social organization, plus the fact that the herd frequently uses the same bedding ground for long periods, suggests that there is equal opportunity for all animals from a given herd to be infected. However, differences between herds might occur. Based on the limited data available, the presence of *Moniezia benedeni* and the reduced prevalence of nematodes in the Canelo herd suggest the existence of important epizootiological relationships between the parasites and the environment. The Canelo Pasture herd is from an area which is extremely sandy, while the Mesquite and Upper Motas Negras herds are from sandy-loam and black, clay-loam sites. Each of these soil types supports different plant associations and probably different invertebrate fauna. Perhaps an intermediate host-soil relationship is responsible for the differences in prevalence since the prevalence of the ectoparasites and the only endoparasite lacking an intermediate host *(P. heterospiculum)* did not differ greatly between herds.

The role of peccaries as reservoirs of parasites and diseases is still largely unassessed. However, most of the endoparasites detected appear to be rather host specific, suggesting that endoparasitic transmission between peccaries and livestock is probably of little consequence. The finding of *F. magna*, a parasite pathogenic for cattle along the Gulf Coast of Texas, may be an important exception.

Of the common ectoparasites found in this study, *A. cajennense* and *D. variabilis* are found on other hosts including domestic animals and both play an important role in disease transmission.[21]

The collared peccary is rapidly becoming a sought-after game animal in the southwestern United States. It seems obvious that some of the parasites found during this study merit further attention in regard to their possible pathogenic effects on the host. For example, balantidial infections are usually nonpathogenic and the host serves as a carrier. However, under certain conditions in various hosts, the organisms invade the intestinal wall, causing diarrhea, abdominal pain, and rapid death.[16] The only apparently ill peccary collected contained 8717 *P. heterospiculum;* sufficiently emphasizing the potential importance of this worm to peccaries. Except for this one case, we have no evidence that parasites are important to population control of peccaries or that parasites played an important role in population control of peccaries during the period of our study.

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