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United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Veterinary
Services

APHIS 91-39

National Tick Surveillance Program

Calendar Year 1986

PROCUREMENT SECTION
CURRENT SIGNAL RECORDS

NOV 26 '87

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National Tick Surveillance Program Calendar Year 1986

During calendar year 1986, the collection and submission of ticks from native and imported animals plus plant and animal material was 55 percent greater than in 1985. There were 7,819 collections in 1986; 5,037 in 1985; 7,213 in 1984; and 10,207 in 1983.

Exotics in the United States

There has long been an interest in exotic animals in the United States, especially those species originating in Africa and Asia. This trend has accelerated in recent years, particularly in Texas. As exotic species have become endangered in their native homelands due to habitat destruction and increasing human population, there has been a sincere desire to preserve these species by providing them habitat in the United States. Many of these species come from areas of Africa and Asia not unlike those of the southwestern United States. Ranchers maintain these animals for various reasons, including the propagation of endangered species as a hobby, or to be hunted or harvested for profit.

The number of ranches with exotics has increased in recent years. In Texas these exotics are often called "Texotics." The Exotic Wildlife Association estimated in 1986 that some 600 ranches in Texas had one or more species of exotics. In 1984, a census by the Texas Department of Parks and Wildlife revealed 120,201 non-native game animals in Texas with at least 59 species represented. This compares to 71,500 such animals in 1979 and 13,000 in 1963. Preserves are also present in Florida, Hawaii, New Mexico, and other States. Some of the more interesting "Texotics" include sable antelopes, wildebeests, giraffes, oryxes, elands, nilgai, axis deer, sika deer, Pere David's deer, rhinoceroses, and zebras.

If not properly managed, some introduced species may increase to levels that threaten competing native species of wildlife. Some species may damage or destroy certain types of fragile habitat. A significant hazard with exotics exists if they are not properly inspected and tested, since they have the potential for introducing foreign animal diseases and parasites into the United States. As recently as 1984, *Amblyomma hebraeum*, a vector of heartwater (*Cowdria ruminantium*), was found in Texas on black rhinoceroses which had been imported from South Africa. Other potentially hazardous foreign ticks collected from recently imported exotic wild animals in past years include *Amblyomma variegatum*, *Rhipicephalus evertsi*, *R. pulchellus*, *R. appendiculatus*, *R. bursa*, and *Boophilus microplus*.

It is essential that all imported non-native, game-type animals, particularly the hoofed mammals, be properly quarantined, inspected, tested, and treated before being released on the range with native wildlife and domestic livestock. Many of these species share diseases and parasites with our native wildlife and livestock. Devastating diseases such as foot-and-mouth disease, rinderpest, African swine fever, and African

horse sickness can be introduced by clinically inapparent carrier animals. Several of the important tick-borne diseases that could be introduced on tick-infested animals include heartwater, babesiosis, anaplasmosis, and theileriasis. Federal and State animal health personnel, private veterinarians, wildlife biologists, and animal owners should carefully observe wildlife and livestock and immediately report suspected diseases and parasites to veterinary regulatory officials in the respective States. Veterinary Services Memorandum No. 591.24, entitled "Diagnostic Assistance Available to Zoos and Game Farms" (January 13, 1987), is available from the Federal Area Veterinarian-in-Charge of each State. It provides information on the services offered by the National Veterinary Services Laboratories, including the Foreign Animal Disease Diagnostic Laboratory, for the diagnosis of suspected exotic animal diseases and parasites.

Tropical Bont Tick and Heartwater Disease Feasibility Study

Resolution No. 7 of the 1986 U.S. Animal Health Association meeting urged the U.S. Department of Agriculture (USDA) and the Agency for International Development (AID) to fully support the principle of eradication of *Amblyomma variegatum* in the Caribbean region.

In late 1986, a study group of 10 persons with representatives from the USDA, Animal and Plant Health Inspection Service (APHIS), Agricultural Research Service (ARS), Office of International Cooperation and Development (OICD), and Inter-American Institute for Cooperation on Agriculture (IICA) was formed to write a feasibility proposal for management of the tropical bont tick and heartwater in the Caribbean. In addition to the 10 members of the study group, there were 8 specialists from the United States, Great Britain, France, the Netherlands, Guadeloupe, and the Food and Agriculture Organization of the United Nations (Rome, Italy) added to the study group as consultants. A draft proposal prepared in early December 1986 included the following:

1. An introduction to the problem.
2. Current information on the distribution of *Amblyomma variegatum*, heartwater, and dermatophilosis in the Caribbean.
3. Veterinary infrastructure and animal health regulations.
4. Economics.
5. Research requirements.
6. Management strategies and proposed budget.
7. Organizational framework.

In January 1987, a second meeting of the feasibility group was held in Washington, DC. The final version of the economic

study was prepared and will be presented to the members of the Caribbean Economic Community.

United States-Mexico Tick Technical Meeting

A joint meeting of tick research and eradication personnel from the United States and Mexico was held in McAllen, Texas, April 8 and 9, 1986. The meeting was hosted by the United States, and the participants included leading research and eradication officials from the two countries. The purpose of the meeting, latest in a series with Mexico, was to exchange information on research and eradication activities with regard to *Boophilus annulatus* and *B. microplus* in the United States and Mexico.

Some of the important topics discussed by U.S. personnel included:

1. The status of tick eradication in the United States.
2. Report on an experimental system for degrading coumaphos in the dip vat.
3. A discussion of new and promising tickicides by industry representatives.
4. The current status of *Boophilus* research by the ARS, including coumaphos resistant strains of *B. microplus*, effects of flumethrin pour-on against *B. annulatus*, genetic studies on *Boophilus* ticks, a study of biological and behavioral comparability between wild and hybrid *Boophilus* males, and the relationship between white-tailed deer and *Boophilus* ticks.
5. Investigations on the status of babesiosis in south Texas.
6. The survival of *Boophilus* on south Texas rangelands.

Topics discussed by the Mexican officials and researchers included:

1. Policies of tick eradication in Mexico.
2. Tick resistance in Mexico.
3. Diagnosis of blood parasites.
4. Evaluation of new acaricides.
5. The current status of tick eradication in Mexico.

Following the formal meeting, the participants toured the new USDA, ARS, Cattle Fever Tick Research Laboratory in Mission, Texas.

***Boophilus* Tick Eradication in Texas**

Tick eradication activities for 1986 were successful and relatively uneventful. Range conditions were very favorable following generous rainfall during the fall and winter months. All of the premises quarantined in the 22 additional counties in Texas, as the result of the Cameron County outbreak in December 1985, have been released. However, the Temporary Preventative Quarantine in Cameron County remains in effect.

In 1986, Veterinary Services Tick Eradication personnel apprehended 74 head of livestock from Mexico along the Texas-Mexico border from Brownsville to Del Rio. This compares to 105 head apprehended in 1985. Thirty of the 1986 apprehensions were cattle of which four were infested with *Boophilus* ticks. Thirty-four apprehensions were horses of which two were tick infested.

***Boophilus Microplus* Eradication in Puerto Rico**

Efforts to eradicate *Boophilus* from Puerto Rico continued under the cooperative program between the USDA and the Puerto Rico Department of Agriculture. During 1986 an additional eradication zone was established in the Southwestern part of the island with headquarters in Guanica. This brings the number of eradication zones to three, other headquarters being located in Arecibo and Juncos.

Due to the extensive activity in the eradication program, manual data processing has been very difficult. The field data is now being computerized, based on information obtained from a complete inspection ("scratching") of the livestock in the three eradication zones. The "scratch" provided data on the: (1) incidence and distribution of *B. microplus* and (2) an accurate census of livestock, owners, and premises. The computerized records greatly assist in rapidly determining the status of all livestock operations in the eradication zones. This computerized data allows for more accurate planning, budgeting, and execution for the eradication program.

Funding for the *Boophilus* eradication program comes from three sources: a Food and Nutrition Service (USDA-FNS) block grant, \$8.6 million; Veterinary Services (USDA-APHIS-VS), \$1.5 million; and the Commonwealth of Puerto Rico Department of Agriculture (PRDA), \$1.0 million. Funding this year permitted the acquisition of vehicles and equipment to permit the expansion mentioned above.

***Amblyomma Variegatum* in Puerto Rico**

The main island of Puerto Rico is essentially free of *A. variegatum*. Those herds that have not completed the 2-year treatment-inspection cycle are now within the *Boophilus* eradication schedule; rather than being scratched every 30 days, they are treated every 21 days. The last *A. variegatum*

collection on the main island was a male collected on November 29, 1985.

Program policy was changed in regard to the smaller islands of Culebra and Vieques. Animals on Vieques are not treated on a scheduled basis, although this service is available at nominal cost. Owners may apply for movement passes to transport animals off the island, and once animals are inspected and found clean, they are treated and allowed to move to their destination. Those destined for slaughter are treated and escorted to the abattoir. Although managed herds were put through routine treatment cycles, the feral cattle on the island prevented a successful eradication effort. Plans to deal with the issue are being formulated.

Animals on Culebra receive routine treatment for tick control. One herd is known to be currently positive for *A. variegatum*. Eradication efforts have produced limited success. Animals on the island may be moved to slaughter only after treatment and under escort.

1986 *Boophilus* Research Highlights Cattle Fever Tick Research Laboratory, USDA, Agricultural Research Service

Because of the occurrence of acaricide resistance within populations of *Boophilus microplus* in Mexico, there is a possibility that acaricide resistant ticks could be introduced into the United States. Such an introduction should not create an unmanageable problem, but additional research is needed to characterize the nature of the resistance and to test the efficacy of presently available and new acaricides. Therefore, research on acaricide resistant *B. microplus* continues to be a high priority at the Cattle Fever Tick Research Laboratory in Mission, Texas.

Each of 13 generations of a strain of *B. microplus* from Tuxtla, Chiapas, Mexico, have been exposed to increasingly higher concentrations of coumaphos to select a highly resistant strain of ticks. Ten groups of F_{13} larvae out of 42 had survival rates of 70 percent or greater after exposure to 1.0 percent coumaphos. Groups of F_{12} Tuxtla strain larvae, ca. 45 times less susceptible to coumaphos than non-resistant ticks, were placed on Hereford heifers at intervals prior to dipping so that when the cattle were dipped in 0.165 percent coumaphos, they would be infested with all three parasitic life stages of the resistant ticks. Simultaneously, an equal number of heifers were infested with larvae of a susceptible strain. The percent control of the susceptible strain was 99.6, but the percent control of the resistant strain was 82.0.

Evaluations of several new acaricides are planned, and tests of flumethrin, a pyrethroid, have been completed. Two different flumethrin formulations, a pour-on and an emulsifiable concentrate, were evaluated. One ml. of 1 percent flumethrin pour-on per 10 kg of body weight was applied evenly along

the midline of the back from in front of the shoulders to the tailhead to a group of cattle infested with all the parasitic life stages of *B. annulatus*. A second group of cattle, similarly infested with *B. annulatus*, were treated by spraying them with the emulsifiable concentrate at a concentration of 0.003 percent. Both formulations proved to be very efficacious. The percent control obtained with the pour-on was 97 and with the spray was 99.9. An evaluation of cyhalathrin, another pyrethroid, is scheduled for this summer. A dipping test of a wettable powder formulation of amitraz is underway at the present time.

The first year of funding for a 3-year pilot test of the sterile hybrid male *Boophilus* eradication method became available during FY 1987. When a lease agreement for pasture is reached with the Government of the United States Virgin Islands, the test will be initiated on St. Croix. A number of significant technical problems, including how to distribute the hybrid larvae, must be resolved if this technique is to become a component of an eradication campaign. The pilot test will provide an opportunity to resolve technical problems and to assess the practical potential of the method.

In spite of a variety of past attempts to determine the role of white-tailed deer in the ecology of *B. annulatus*, the degree to which deer contribute to dissemination and maintenance of this species has not been defined. Recent studies at Mission, which involved the use of confined, but unrestrained, deer infested repeatedly with *B. annulatus* larvae, have further elucidated this host-parasite relationship. Only 3 percent of the larvae on deer survive to become engorged females. This compares to 30 percent of those on cattle. Also, the engorged females from the deer were significantly smaller than ticks which engorged on cattle. If deer are restrained and cannot groom themselves, as hosts they are equally as suitable as cattle. It appears that the grooming behavior of deer reduces their importance as hosts of *B. annulatus*.

For the past year, U.S. Livestock Insect Research Laboratory scientists have been collaborating with ARS colleagues at the Insects Affecting Man and Animals Research Laboratory in Gainesville, Florida, on the development of an improved computer simulation of a *Boophilus* tick population model. This model will contribute to the development and testing of various eradication strategies, including the sterile hybrid male *Boophilus* eradication technology. A number of investigations to fill gaps in our knowledge of the ecology of *Boophilus* ticks are providing information to be used in the computer simulation model. A 2-year field study of the effect of climate on the development and survival of *B. microplus*, *B. annulatus*, and hybrid *Boophilus* ticks is more than half completed. Hybrid male *Boophilus* ticks derived from a cross between *B. annulatus* males and *B. microplus* females were equally competitive or superior to *B. microplus* males in studies of mating competitiveness. Investigations of host-seeking behavior demonstrated that within 4 days after hatching, over

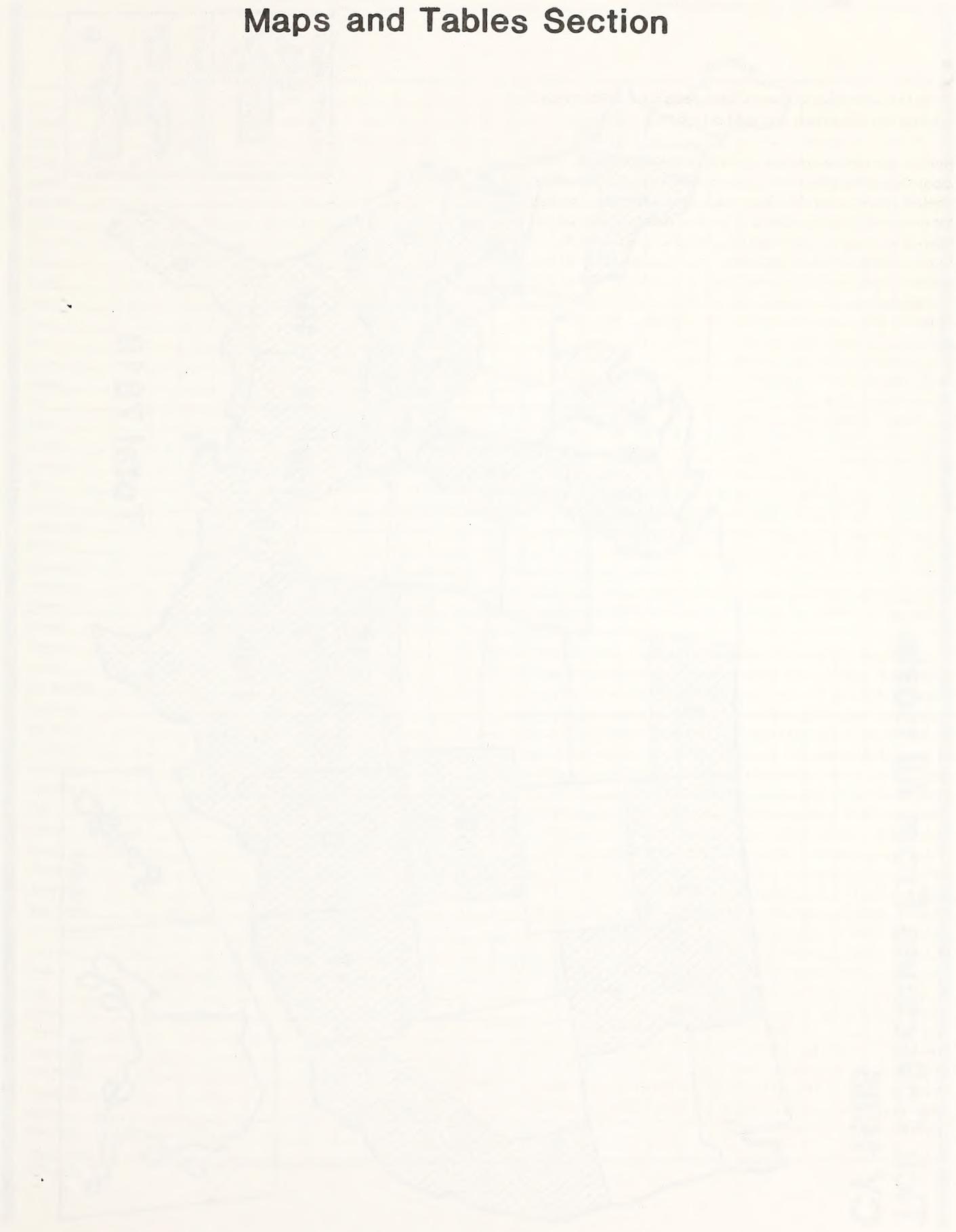
half of the *B. microplus* and *B. annulatus* larvae that hatch on a given day will attach and feed on the host.

Knowledge of fundamental aspects of the genetics of *Boophilus* ticks are critical steps in development of genetic control approaches. Tick isozymes serve as genetic markers for research on these ticks and several recent investigations have involved the analysis of enzyme characteristics. A number of isozymes have been characterized and used as genetic markers in an investigation of genetic similarity and variability between natural populations of North American *Boophilus* species. The results demonstrate a high degree of similarity between populations of *B. microplus* from Puerto Rico, Mexico, and south Texas. These data indicate that implementation of any genetic control method developed in the future would not be limited by the occurrence of genetically divergent populations of cattle fever ticks. Additional genetic research has documented linkage relationships among 12 enzyme loci in cattle fever ticks, and cytogenetic investigations are using chromosome staining techniques to elucidate details of the morphology of individual chromosomes. These cytogenetic data will be useful in a number of ways, including efforts to implement and improve the sterile hybrid male *Boophilus* technology.

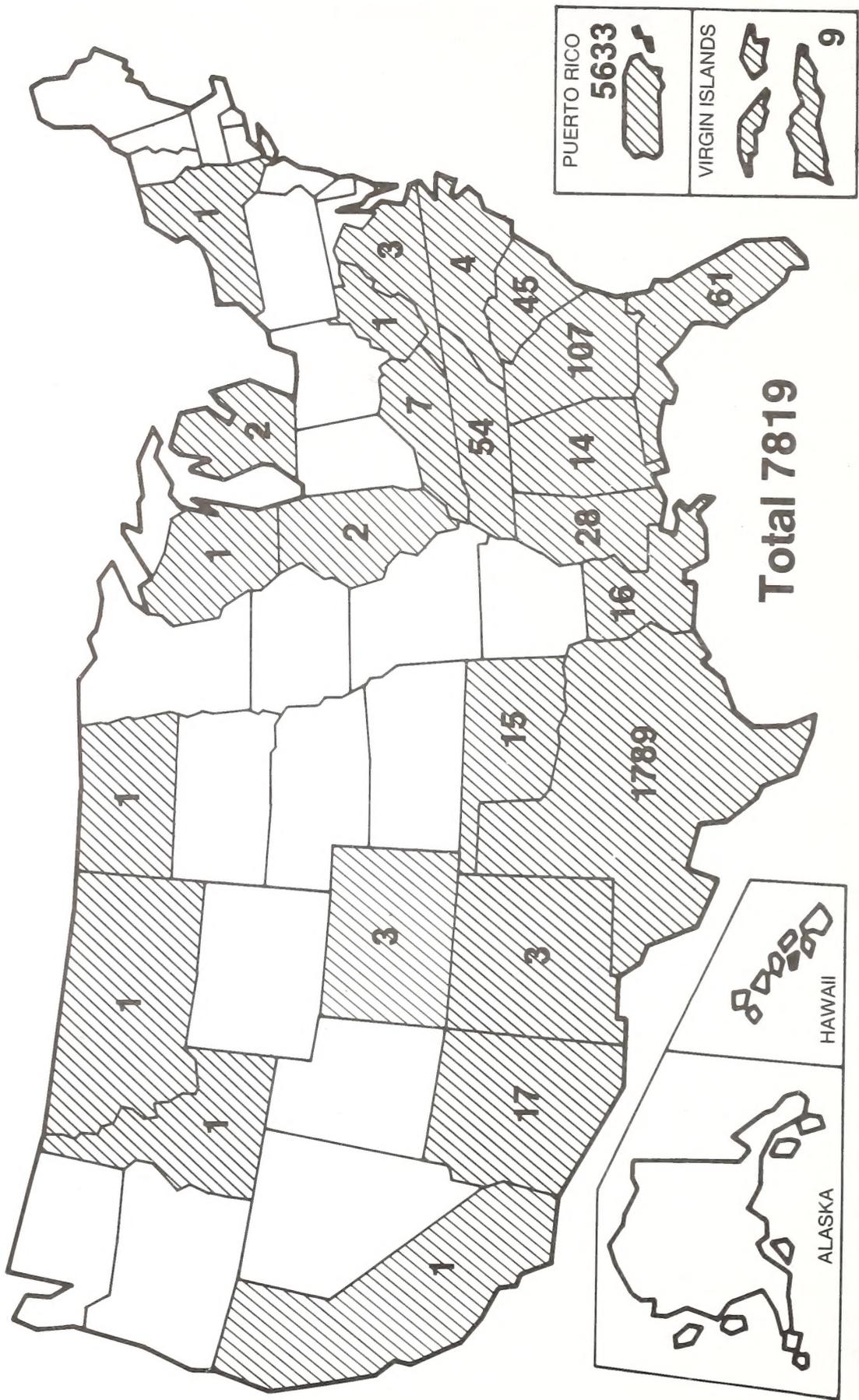
Proposed Model State Regulation for Control of Zoological Animals

The increased trade and interstate movement of zoological animals in recent years resulted in problems in control and dissemination of diseases and parasites in these animals. Many diseases of zoological-type animals also affect common domesticated food-type animals. Some of these economically important diseases and parasites include tuberculosis, brucellosis, exotic Newcastle disease, lethal avian influenza, and exotic ticks. Zoological animals also may produce environmental damage, crop destruction, and public safety and health concerns, as well as creating situations where there are violations of animal welfare laws. Because of the concern of livestock industry and animal health officials, the U.S. Animal Health Association requested that APHIS, USDA, develop a model State Regulation for Control of Zoological Animals. With the assistance of the Southeastern Wildlife Disease Study, University of Georgia, APHIS is currently developing the model regulation. The first draft was completed in October 1986 and has been sent for comment to over 150 organizations, agencies, and individuals. This proposed regulation is not intended to be passed into Federal law. It is to serve as a model for the various States to use to draft laws and regulations where a need exists. The revised draft of the model regulation should be completed in early 1987 after receiving input from the various interested parties involved with zoological animals.

Maps and Tables Section



Tick Collections From All Hosts CY 1986



REPORT OF TICKS COLLECTED

PERIOD

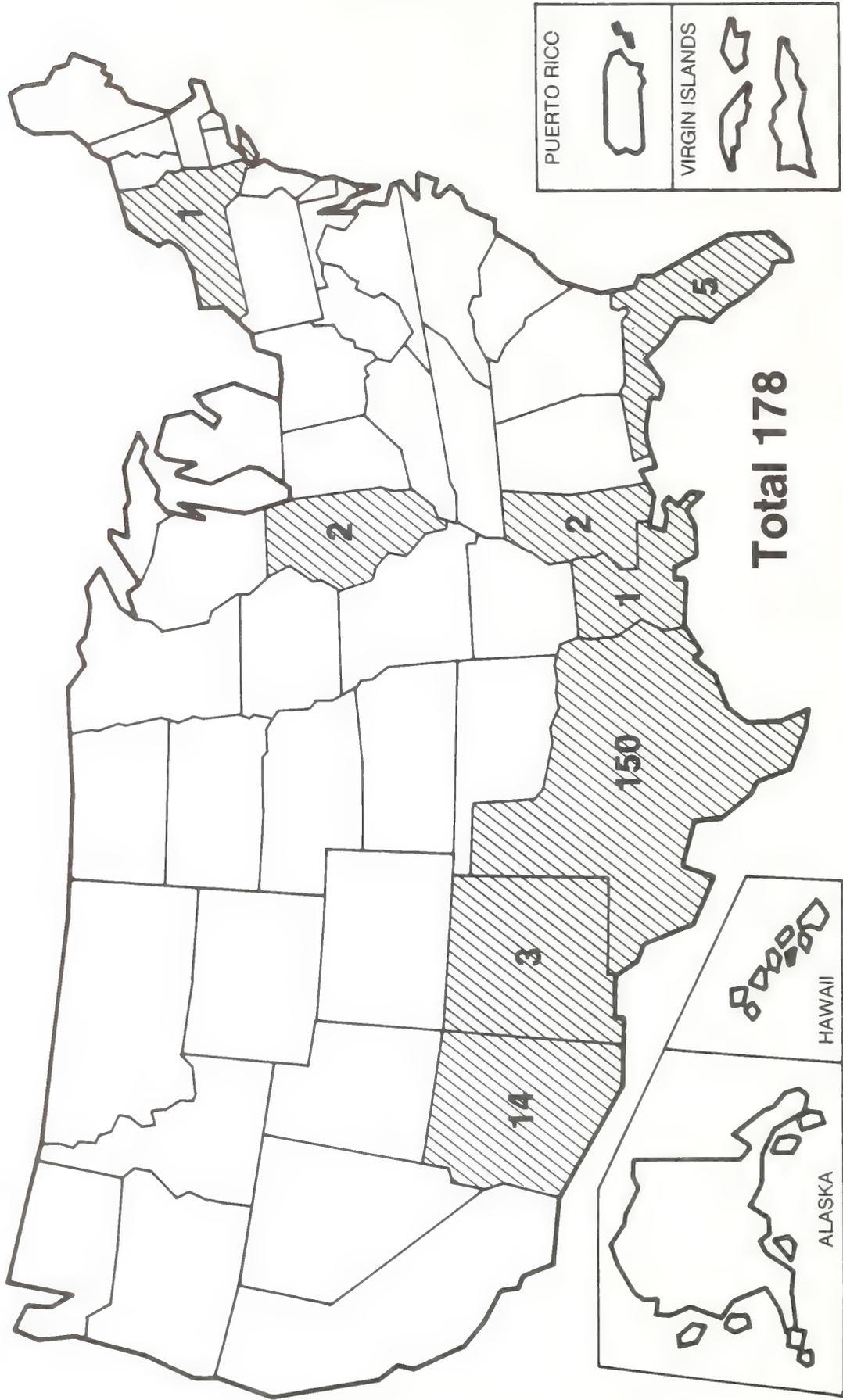
HOST

Calendar Year 1986

All Hosts

STATE	TOTAL	Cattle	Dogs	Horses & Hules	Moo Animals & Misc. Hosts	Native Wildlife	Animals & Products Offered For Entry
TOTAL	7819	5517	99	1668	91	266	178
Alabama	14	12				2	
Alaska							
Arizona	17	1	2				14
Arkansas							
California	1	1					
Colorado	3		3				
Connecticut							
Delaware							
Florida	61	16	5	8	2	25	5
Georgia	107	1				106	
Hawaii							
Idaho	1					1	
Illinois	2						2
Indiana							
Iowa							
Kansas							
Kentucky	7	3	4				
Louisiana	16					15	1
Maine							
Maryland							
Massachusetts							
Michigan	2					2	
Minnesota							
Mississippi	28	17			2	7	2
Missouri							
Montana	1		1				
Nebraska							
Nevada							
New Hampshire							
New Jersey							
New Mexico	3						3
New York	1						1
North Carolina	4	3			1		
North Dakota	1			1			
Ohio							
Oklahoma	15	4			2	9	
Oregon							
Pennsylvania							
Rhode Island							
South Carolina	45	8	4		4	29	
South Dakota							
Tennessee	54	21	3		11	19	
Texas	1789	1133	74	353	28	51	150
Utah							
Vermont							
Virginia	3		2	1			
Washington							
West Virginia	1	1					
Wisconsin	1		1				
Wyoming							
Puerto Rico	5633	4290		1302	41		
Virgin Islands	9	6		3			

Tick Collections From Animals And Products Offered For Entry CY 1986



REPORT OF TICKS COLLECTED

PERIOD

Calendar Year 1986

HOST
Animals and Products
Offered for Entry

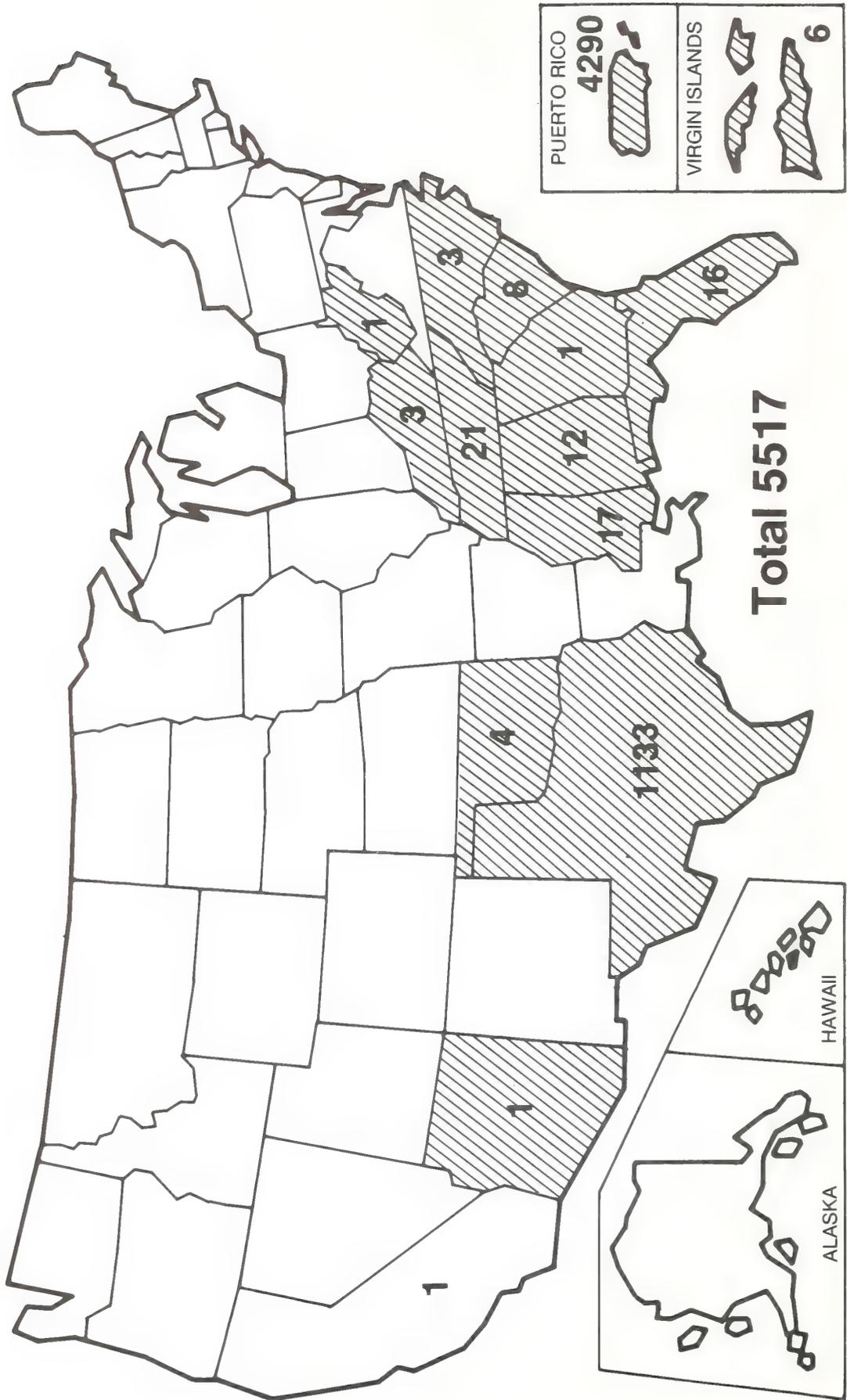
STATE	TOTAL	TICK SPECIES																			HOST						
		AMBLYOMMA AMERICANUM	AMBLYOMMA CA FERRENSIS	AMBLYOMMA ILLINOIS	AMBLYOMMA MACULATUM SPP.	AMBLYOMMA SPP.	ARGAS PERSCUS	BOOPHILUS ANNULATUS	BOOPHILUS MICROPLUS	BOOPHILUS SPP.	DERMACENTOR ALBIPICTUS	DERMACENTOR ANNOTATUS	DERMACENTOR PENN. (D. PENN.)	DERMACENTOR MICROLINEATUS	DERMACENTOR BITENSIS	DERMACENTOR OCCIDENTALIS	DERMACENTOR VARIEBILIS	DERMACENTOR SPP.	HAEMAPHYSALIS LEYDENSIS	IXODES PATRICIUS	IXODES SCAPULARIS	IXODES SPP.	ORNITHODOROS SPP.	OTIOBIUS MEGNINI	RHIPICEPHALUS SINGUINEUS	RHIPICEPHALUS SPP.	MISCELLANEOUS SPP.
TOTAL	178	1	10	1	1	5		15	60	27	31		3			4	8	1							7	3	1
ARIZONA																											
Douglas	7										6BO														1BO		
Nogales	7	1BO							1HO																5BO		
FLORIDA																											
Ft. Lauderdale	1				1P																						
Jacksonville	3				1P ^{no}																				2WP		
Miami	1		1PL																								
ILLINOIS																											
Chicago	2																1PL ^{au}								1WP		
LOUISIANA																											
New Orleans	1				1PL [*]																						
MISSISSIPPI																											
Jackson	2				1TH ^h																					1TH ^{ra}	
NEW MEXICO																											
Socorro	3										3BO																
NEW YORK																											
JFK Airport	1				1HH ^{an}																						
TEXAS																											
Brownsville	5		3BO						2BO																		
Del Rio	48		1BO					1BO	24BO	9BO*	6BO		2BO													5BO*	
Eagle Pass	34		1BO					8BO	11BO	12BO*	2BO																
El Paso	2										2BO																
Laredo	47		4BO	1BO	1BO*		4BO	2DH	21BO	5BO*	3BO				4BO	1BO*	1BO										
Presidio	13									1BO*	9BO		1BO			1BO*									1BO		
Raynoza	1								1BO																		

Key to Host
 BO Bovine
 DH Deer Hide
 HH Hedgehog
 HO Horse
 P Pineapple
 PL Plant
 TH Trophy Hide
 WP Wood Products

Key to Species
 an Amblyomma nuttalli
 su Dermacentor auratus
 h Amblyomma hebraeum
 no Amblyomma nodosum
 ra Rhipicephalus appendiculatus

*Nymphal Stage

Tick Collections From Cattle CY 1986



REPORT OF TICKS COLLECTED														PERIOD		HOST											
														Calendar Year 1986		Cattle											
STATE	TOTAL	AMBL.YOMMA AMERICANUM	AMBL.YOMMA CAJEMENSE	AMBL.YOMMA INTRA TOR	AMBL.YOMMA MACULATUM	AMBL.YOMMA SPP	ARGAS PERIS	BOOPHILLUS ANNULATUS	BOOPHILLUS MICROPLUS	BOOPHILLUS SPP	DERMACENTOR ALBIPICUS	DERMACENTOR SPINIOSUS	DERMACENTOR NIGROLINEUS	DERMACENTOR NIGROLINEUS	DERMACENTOR OCCIDENTALIS	DERMACENTOR VARIEGATUS	DERMACENTOR SPP	HAEMAPHYSALIS CALLIS	HAODES COCKREI	HAODES PACIFICUS	HAODES SCAPULARIS	HAODES SPP	ORNITHODOROS SPP	OTIOBIUS MEGNINI	RHINOCERUALUS SALICINUS	RHINOCERUALUS SPP	MISCELLANEOUS SPP
TOTAL	5517	224	238	7	290	29		15	4032	4	39		8	297	1	267	2					21			38	5	
Alabama	12	6			4											1						1					
Alaska																											
Arizona	1										1																
Arkansas																											
California	1														1												
Colorado																											
Connecticut																											
Delaware																											
Florida	16	5			6											1						4					
Georgia	1	1																									
Hawaii																											
Idaho																											
Illinois																											
Indiana																											
Iowa																											
Kansas																											
Kentucky	3	1														2											
Louisiana																											
Maine																											
Maryland																											
Massachusetts																											
Michigan																											
Minnesota																											
Mississippi	17	5			6											1						5					
Missouri																											
Montana																											
Nebraska																											
Nevada																											
New Hampshire																											
New Jersey																											
New Mexico																											
New York																											
North Carolina	3															3											
North Dakota																											
Ohio																											
Oklahoma	4	1														1						1			1*		
Oregon																											
Pennsylvania																											
Rhode Island																											
South Carolina	8	3			1											4											
South Dakota																											
Tennessee	21	16														5											
Texas	1133	186	238	7	273	10 ⁿ 16*		15	36	4*	38		8		248	2*					10				37*	5	
Utah																											
Vermont																											
Virginia																											
Washington																											
West Virginia	1															1											
Wisconsin																											
Wyoming																											
Puerto Rico	4290				3 ^v				3992						295												
Virgin Islands	6															4											2

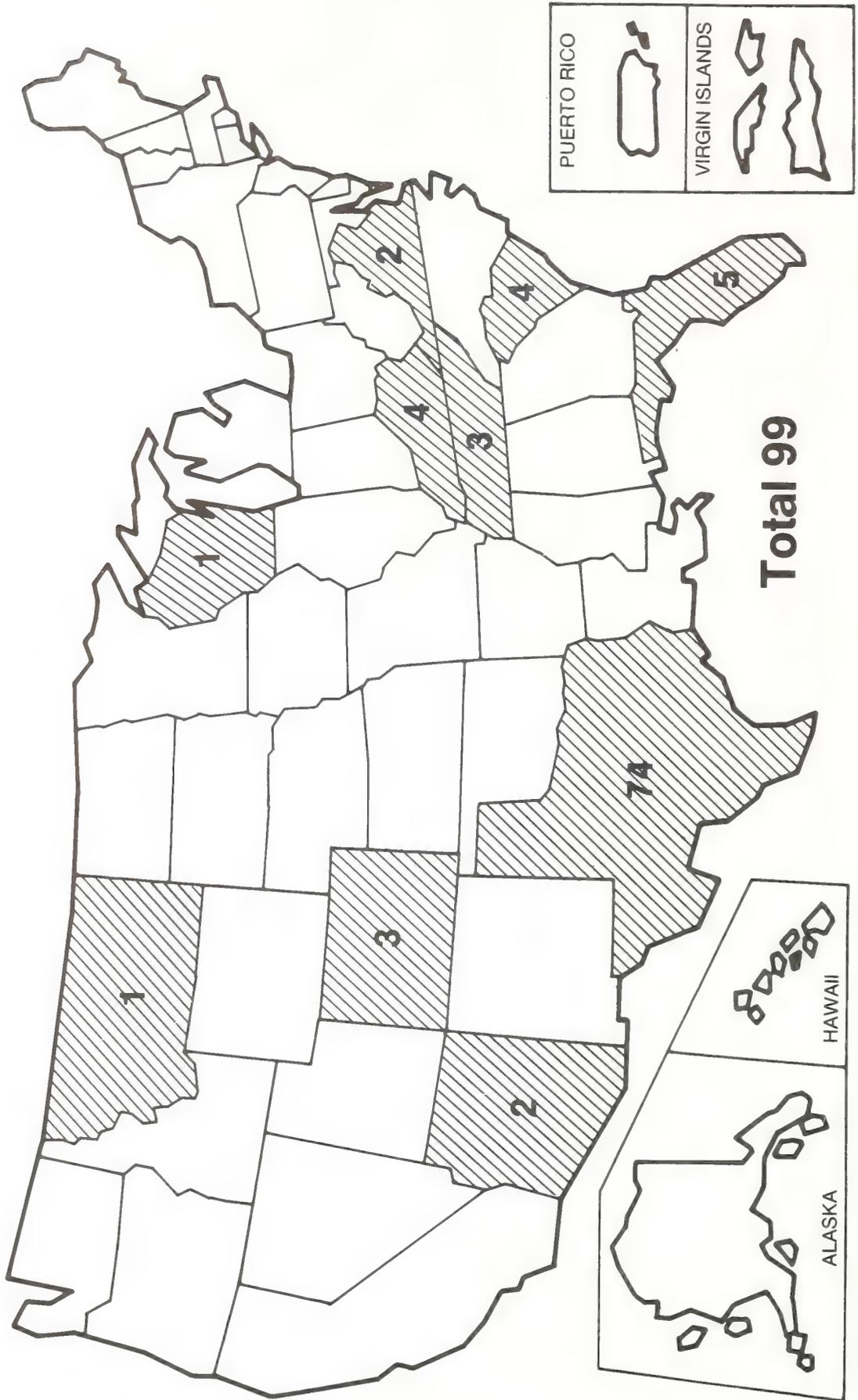
ANH FORM 5-55
MAY 1971

REPLACES ADE FORM 5-55, DEC 1964, WHICH IS OBSOLETE

Key to Species
n *Amblyomma inornatum*
v *Amblyomma variegatum*
*Nymphal Stage

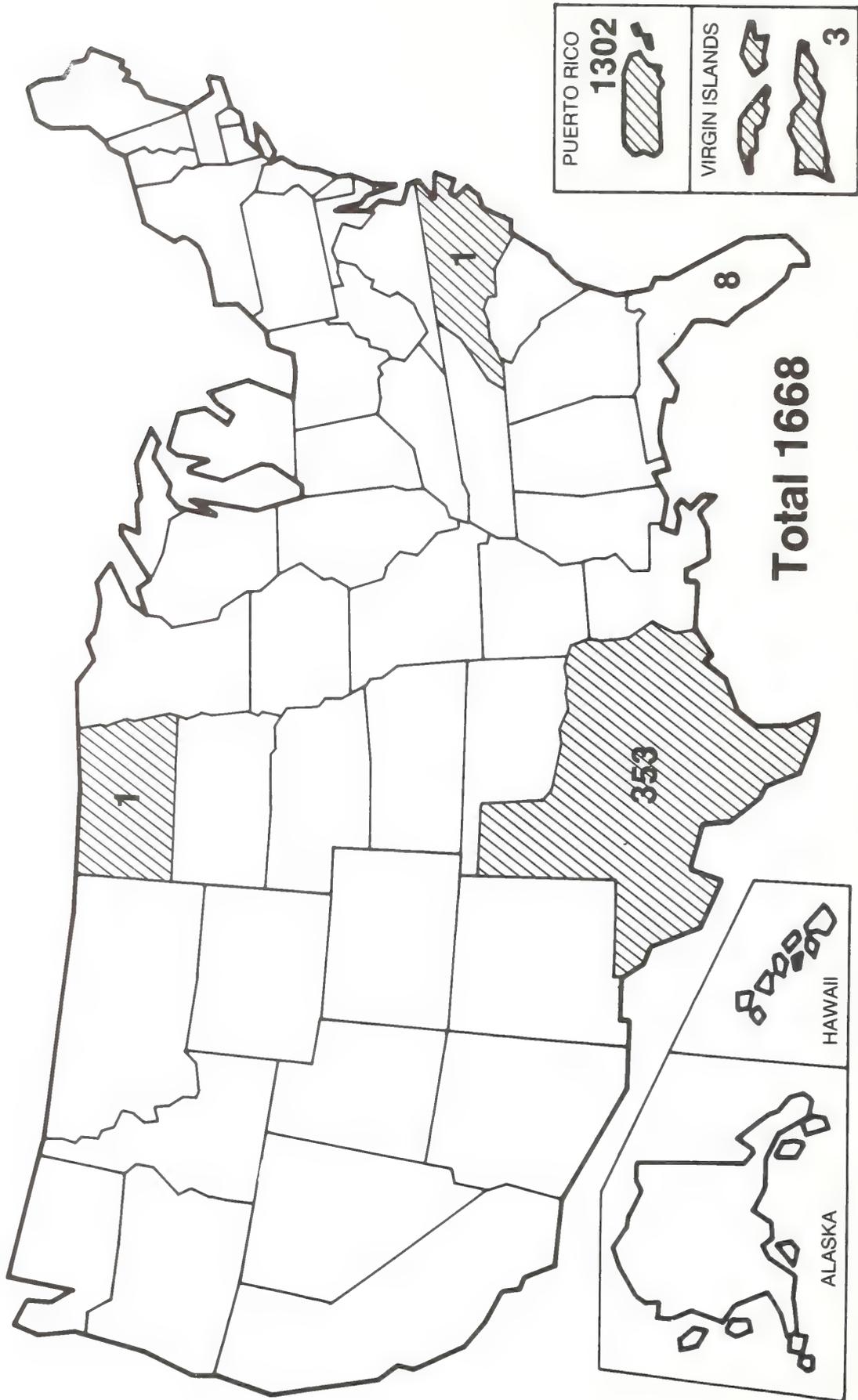
USDA-ARS

Tick Collections From Dogs CY 1986



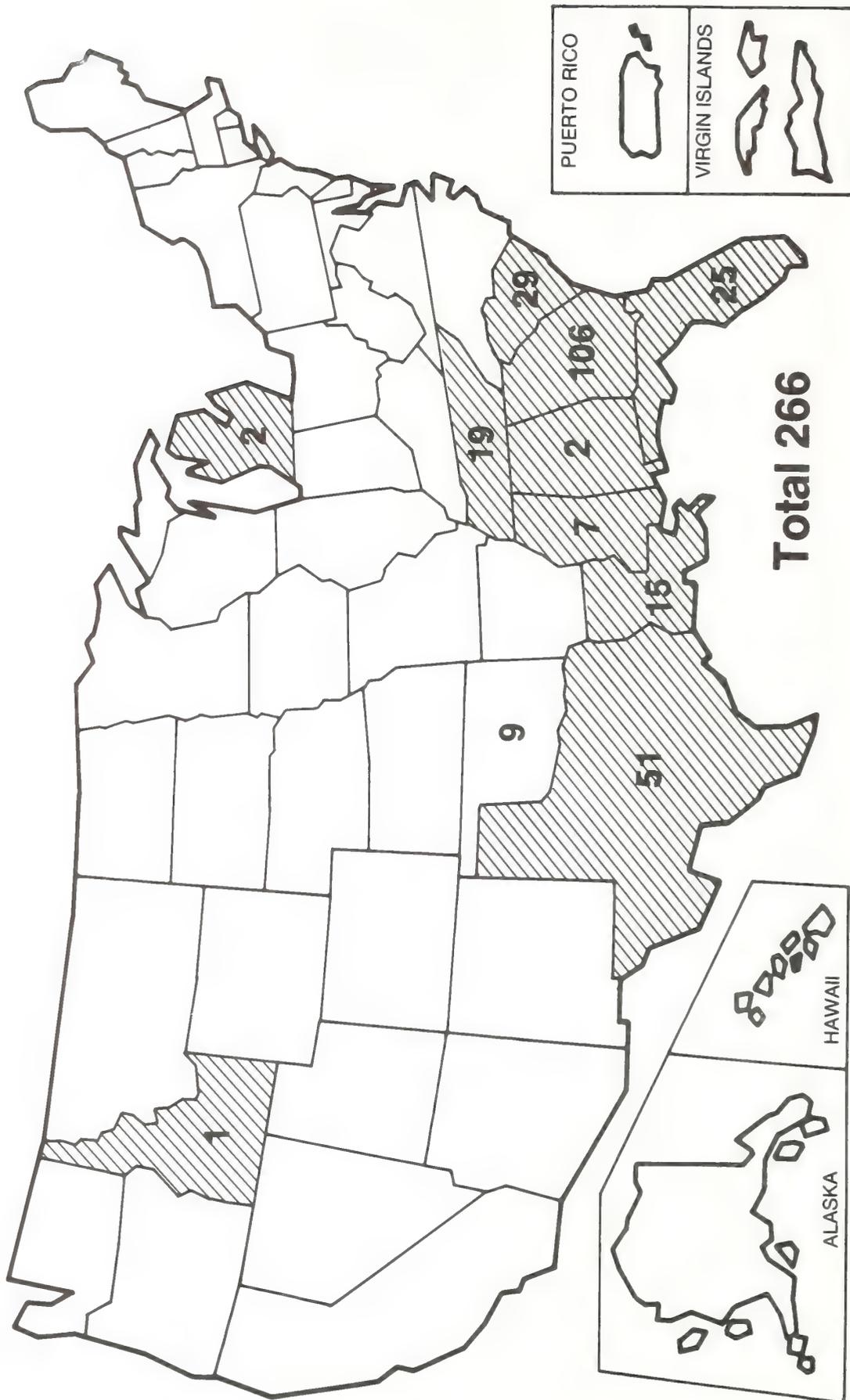
REPORT OF TICKS COLLECTED													PERIOD		HOST														
													Calendar Year 1986		Dogs														
STATE	TOTAL	AMBL.YOMMA AMERICANUM	AMBL.YOMMA CALIF.ENSENSE	AMBL.YOMMA INITIATOR	AMBL.YOMMA MACULATA	AMBL.YOMMA SPP.	ARGAS PERSICUS	BOPPHILUS ANNULATUS	BOPPHILUS MICROPLUS	BOPPHILUS SPP.	DERMACENTOR ALBIPICINATOR	DERMACENTOR AMERICANUS	DERMACENTOR V. G. GUSTI	DERMACENTOR AUGROLINEUS	DERMACENTOR TITENSIS	DERMACENTOR OCCIDENTALIS	DERMACENTOR ZARIWELI	DERMACENTOR SPP.	IXODES TRIPLIXALIS	IXODES TULUSTI	IXODES COCKEII	IXODES PACIFICUS	IXODES SCAPULARIS	IXODES SPP.	ORNITHODOROS SPP.	OTOBUS MEGALINI	RHIZOCEPHALUS SANGUINEUS	RHIZOCEPHALUS SPP.	MISCELLANEOUS SPP.
TOTAL	99	5		4	1											39						4	1		1	44			
Alabama																													
Alaska																													
Arizona	2																									1	1		
Arkansas																													
California																													
Colorado	3															2												1	
Connecticut																													
Delaware																													
Florida	5				2																		3						
Georgia																													
Hawaii																													
Idaho																													
Illinois																													
Indiana																													
Iowa																													
Kansas																													
Kentucky	4	1														3													
Louisiana																													
Maine																													
Maryland																													
Massachusetts																													
Michigan																													
Minnesota																													
Mississippi																													
Missouri																													
Montana	1															1													
Nebraska																													
Nevada																													
New Hampshire																													
New Jersey																													
New Mexico																													
New York																													
North Carolina																													
North Dakota																													
Ohio																													
Oklahoma																													
Oregon																													
Pennsylvania																													
Rhode Island																													
South Carolina	4																						1					3	
South Dakota																													
Tennessee	3	2														1													
Texas	74	2			2	1 ⁿ										31												38	
Utah																													
Vermont																													
Virginia	2															1												1	
Washington																													
West Virginia																													
Wisconsin	1																											1 ^d	
Wyoming																													
Puerto Rico																													
Virgin Islands																													

Tick Collections From Horses and Mules CY 1986



REPORT OF TICKS COLLECTED														PERIOD		HOST													
														Calendar Year 1986		Horses and Mules													
STATE	TOTAL	AMBL.YOMMA AMERICANUM	AMBL.YOMMA CALIFORNENSE	AMBL.YOMMA MITTENDORFII	AMBL.YOMMA MACULATUM SPP.	AMBL.YOMMA SPP.	ARGAS FLEBISICUS	BOPHILLUS ANNULATUS	BOPHILLUS MICROPLUS	BOPHILLUS SPP.	DERMACENTOR ALBIFRONS	DERMACENTOR VESPAZIUS	DERMACENTOR VENUSTUS & D. VENUSTUS	DERMACENTOR MICROPLUS	DERMACENTOR TITENS	DERMACENTOR SCUTELLATUS	DERMACENTOR VARIABILIS	DERMACENTOR SPP.	HEMAPHYSALIS PARVIVALIS	IXODES SODICEI	IXODES PARVITICUS	IXODES SCAPULARIS	IXODES SPP.	ORNITHODOROS SPP.	OTOBUS MESINII	RHIPICEPHALUS SANGUINEUS	RHIPICEPHALUS SPP.	MISCELLANEOUS SPP.	
TOTAL	1668	10	21	4	36	4			28		8		2	1297		256							2						
Alabama																													
Alaska																													
Arizona																													
Arkansas																													
California																													
Colorado																													
Connecticut																													
Delaware																													
Florida	8				2								5										1						
Georgia																													
Hawaii																													
Idaho																													
Illinois																													
Indiana																													
Iowa																													
Kansas																													
Kentucky																													
Louisiana																													
Maine																													
Maryland																													
Massachusetts																													
Michigan																													
Minnesota																													
Mississippi																													
Missouri																													
Montana																													
Nebraska																													
Nevada																													
New Hampshire																													
New Jersey																													
New Mexico																													
New York																													
North Carolina																													
North Dakota	1										1																		
Ohio																													
Oklahoma																													
Oregon																													
Pennsylvania																													
Rhode Island																													
South Carolina																													
South Dakota																													
Tennessee																													
Texas	353	9	21	4	34	4*			2		7		2	13		256							1						
Utah																													
Vermont																													
Virginia	1	1																											
Washington																													
West Virginia																													
Wisconsin																													
Wyoming																													
Puerto Rico	1302								26				1276																
Virgin Islands	3																												

Tick Collections From Native Wildlife CY 1986



Tick Collections From Zoo Animals And Miscellaneous Hosts CY 1986

