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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 1987

CURRENT STOCK RECORDS  
AGD/SERIALS BRANCH

FEB 8 '89

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## National Tick Surveillance Program Calendar Year 1987

During calendar year 1987, the collection and submission of ticks from native and imported animals, plus plant and animal material, was 30.63 percent greater than in 1986. There were 10,214 collections in 1987, 7,819 collections in 1986, 5,037 in 1985, and 7,213 in 1984.

### Antigua Pilot Tropical Bont Tick Eradication Project

During 1987 considerable progress was made in the organization of a Caribbean-wide program to eradicate *Amblyomma variegatum*, the tropical bont tick, and its associated diseases (heartwater and acute dermatophilosis) from the area. In March 1987, the feasibility proposal written by experts from the U.S. Department of Agriculture (USDA) and the Inter-American Institute for Cooperation on Agriculture (IICA), with the input of consultants from a number of international organizations, was finished and widely distributed. It was discussed at a workshop held in Barbados, West Indies, in March, where representatives from many Caribbean Islands, USDA, U.S. Agency for International Development (USAID), IICA, Food and Agriculture Organization (FAO), and other public and private organizations reviewed the document. The proposal described the present situation with the tick and diseases in the Caribbean. The group passed four resolutions: (1) establish an *Amblyomma* Program Council under the purview of the English-speaking Caribbean Community (CARICOM); (2) establish a pilot project to demonstrate tick eradication techniques on an island; (3) convene a donor's conference; and (4) seek emergency support for current tropical bont tick control activities on infested islands.

In September 1987, the \$2 million that Congress appropriated to USAID for a tropical bont tick program in the Caribbean was transferred to USDA in order to carry out a demonstration tick eradication program on Antigua. This demonstration project has three main facets: (1) an eradication component to be carried out by the Office of International Cooperation and Development (OICD) and USDA; (2) a research, information, and evaluation component to be carried out by OICD-USDA; and (3) a policy and strategy component to be carried out by USAID. Some of the funds given to OICD-USDA will be transferred to ARS-USDA for research on the biology and control of the tropical bont tick in the Caribbean. Other research will be on the economic aspects of eradication and the effects of the acaricides on wildlife.

The eradication component consists of four phases: (1) Planning Phase; (2) Preoperation Phase of 6 months, which includes education, training, surveillance, construction, and procurement; (3) Eradication Phase, which consists of application of acaricides (amitraz or permethrin) to all cattle, sheep, goats, and horses every 2 weeks for 2 years; and (4) Posteradication Phase, which consists of a followup surveillance for 6 months to determine if the ticks have been eliminated from the island. The eradication component is proposed to begin in 1988.

In November 1987, at a meeting in Rome, the Standing Committee of the Ministries of Agriculture of CARICOM established an *Amblyomma* Steering Committee. This committee will provide a focus for implementing a coordinated *Amblyomma* eradication program throughout the Caribbean.

### Updated on *Boophilus microplis* Eradication in Puerto Rico

The USDA and Puerto Rico Department of Agriculture continued their cooperative efforts to eradicate *Boophilus microplis* from the island. The program maintained an average of 9,000 premises under treatment (average number of animals per premise was 11). In excess of 2.5 million individual animal treatments were administered during the year.

The computerized field data system is in operation in two of the three eradication zones. The third system will be established by mid-1988. The system maintains such data as the location of the premises, number and type of animals, status in the treatment cycle, and changes in animal numbers or in the infestation status. The system permits program managers to rapidly assess the status of a premise, region, or the entire island. This allows more effective planning, budgeting, and execution of the eradication program.

The new eradication zone established last year is in full operation. Additionally, program success has allowed the Arecibo Region to move some resources forward into new areas toward the east. The other two regions (Guanica and Juncos) are expected to expand toward the center of the island in 1988. Approximately 7,000 premises were declared free during 1987.

Funding for the *Boophilus* eradication program, as in recent years, came 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. This cooperative funding permitted major purchases for the necessary program expansion and to retain the flexibility to meet day-to-day demands.

### Status of *Amblyomma variegatum* in Puerto Rico

The main island of Puerto Rico is considered free of *A. variegatum*. A Commonwealth imposed quarantine is in effect for the smaller island of Culebra, where *Amblyomma variegatum* is known to be present. Treatment of livestock on Culebra is mandatory and performed on a routine basis, but rugged terrain has hampered the gathering of animals and slowed eradication efforts. Movement of animals off the island is permitted only when the shipment is going directly to slaughter and only following inspection to ensure tick-free status and application of a pesticide treatment.

### ***Amblyomma variegatum* Reintroduced in the U.S. Virgin Islands**

*Amblyomma variegatum*, the tropical bont tick, was discovered on St. Croix, U.S. Virgin Islands, during July 1987. This tick had been considered eradicated since 1970, when the previous eradication program consisting of quarantine, rigorous individual animal treatment with coumaphos, and premises treatment with sprayable carbaryl came to an end. It is of interest that a few isolated male ticks were discovered sporadically on St. Croix after 1972, but no evidence of infestation or further spread could be found.

The current outbreak is limited to one area of about 31 acres of brush pasture on which cattle, horses, swine, dogs, and chickens roamed freely, as well as mongooses and a few head of deer. Several cattle had died of a condition resembling dermatophilosis. Clinical cases of dermatophilosis were subsequently observed. A 5-acre portion of the premise was found to be heavily infested and has been treated twice with sprayable chlorpyrifos.

Cattle, horses, swine, and dogs have been under quarantine and regular biweekly treatment with coumaphos. Cattle, swine, and chickens have now been removed from the premise. The biweekly scratch and treatment of all adjacent animals, as well as the trapping of chickens and mongooses for surveillance and elimination, is continuing. The hunting of deer has, thus far, been unsuccessful. The origin of this infestation is not clear.

### ***Boophilus* Research Highlights for 1987 from the Cattle Fever Tick Research Laboratory, USDA, Agricultural Research Service Kerrville and Mission, Texas**

Research began several years ago on organophosphate (OP)-resistant *Boophilus microplus* from Mexico and continued with investigations on the biochemical mechanisms accountable for the altered susceptibility of the ticks to coumaphos and related acaricides. One study determined that in the resistant strain, which originated near Tuxtla, Chiapas, Mexico, two types of the enzyme acetylcholinesterase (AChE) were present. One form of AChE was prone to inhibition by OP's, but the activity of the second form of AChE was less affected by these acaricides. These experimental results suggest that an altered AChE with decreased sensitivity to inhibition is probably an important factor in the altered susceptibility of the *B. microplus* in parts of Mexico to coumaphos, chlorfenvinphos, and related acaricides. A parallel investigation determined that in resistant ticks there was also enhanced metabolic detoxification of coumaphos and toxic metabolites of this compound.

As the age of tick larvae increases, the ticks undergo undetermined biochemical and physiological changes that

result in increased susceptibility to pesticides and lowered survival rates. It was hypothesized that a reduced quantity of AChE in older tick larvae is related to their increased susceptibility to acaricides. But, experimental evidence from investigations of the AChE of five species of ticks, including *B. microplus*, determined that in these ticks amounts of AChE actually increased with age.

Because of an apparent failure of amitraz to control *B. microplus* on cattle in the vicinity of Juncos, Puerto Rico, engorged females of this species were collected and shipped to the Cattle Fever Tick Research Laboratory for tests of their susceptibility. Groups of calves infested either with F<sub>1</sub> larval ticks from Puerto Rico or larvae of an amitraz-susceptible *B. microplus* strain from Texas were sprayed with 0.025 percent amitraz, prepared from the emulsifiable concentrate formulation. Initial comparisons of the degree of control of the Puerto Rico and Texas ticks indicated that the strain of ticks from Puerto Rico was as susceptible to amitraz as the ticks from Texas. This test was repeated with the second laboratory generation of ticks from Puerto Rico and a known amitraz susceptible strain of *B. microplus* from Texas. Once again, the test results indicated that the ticks from Puerto Rico were fully susceptible to amitraz.

A 0.025 percent concentration of amitraz wettable powder (WP), applied by immersing cattle in a dipping vat, controlled 99.8 percent of the *B. annulatus* on the animals. In addition to the evaluation of efficacy, a study was performed with the assistance of APHIS, VS personnel to determine the stability of the amitraz WP in a dipping vat under South Texas conditions. During a period of about 1 month, 4,056 head of cattle were dipped in an amitraz-charged vat. Test results demonstrated that the active ingredient settled very rapidly in the freshly charged vat, but that the amitraz remained in suspension longer as the amount of contamination in the vat increased. There was a tendency for the amitraz concentration to increase slightly after each replenishment, but in general the evaluation demonstrated that in a ranch vat in which large numbers of cattle are being dipped, amitraz WP remains stable and the concentration of the active ingredient can be maintained at the targeted level.

Because of a need by tick eradication officials for an acaricide to prevent the hatching of larvae from eggs deposited on tick-infested premises, such as a sales yard, the ovicidal activity of coumaphos, diazinon, dioxathion, chlorpyrifos, and crotoxyphos against *B. microplus* eggs of different ages was determined. Test results proved that of the acaricides tested, only crotoxyphos, applied topically at a rate of 0.5 percent active ingredient, would provide sufficient ovicidal activity ( $\geq 90$  percent reduction in hatch) against eggs ranging in ages from 1 to 20 days for the compound to have value in premise cleanup activities.

Investigations to more precisely determine the suitability of white-tailed deer as alternate hosts for *B. annulatus* have

continued. Comparisons were made of the total number of adult female ticks recovered from deer and bovine hosts and of the associated ovipositional and reproductive parameters of these ticks. Significantly fewer ticks were recovered from deer (302) than from cattle (3,818). The difference was attributed to the more efficient grooming behavior of the deer. The mean weight of the female ticks collected from deer was significantly less than that of ticks from cattle (240.13 mg and 344.66 mg, respectively). About 15 percent of the engorged females recovered from the deer weighed less than 100 mg, and these ticks had probably been removed prematurely by grooming. A significant difference in the mean percent hatch of eggs from deer (65.22) and cattle (74.33) was observed. The index of reproduction (IR), a value that is based on the total number of engorged female ticks from a host, the mean weights of the egg masses from these females, and the mean percent hatch of the eggs was 19.7 times greater when cattle rather than white-tailed deer were hosts. It was concluded that the deer are biologically suitable hosts, but they are considerably less efficient host for *B. annulatus* than cattle.

The efficacy of a 20.2 percent emulsifiable concentrate formulation of the pyrethroid acaricide cyhalothrin was tested using two concentrations (0.007 percent and 0.01 percent) as a whole body spray against *B. microplus* on cattle. Based upon IR calculations, the 0.007 percent AI treatment provided 92.4 percent control and the 0.01 percent AI treatment provided 97.3 percent control. An evaluation of an "improved" cyhalothrin formulation has been scheduled.

### **Boophilus Tick Program in Texas**

Tick eradication activities along the U.S.-Mexico border were successful in 1987. Thirty-four herds of Mexican livestock were apprehended by the Veterinary Services Tick Eradication Program employees along the Texas-Mexico border during this period. The herds totaled 26 cattle, of which 11 were infested with *Boophilus* ticks, and 22 horses which were free of cattle fever ticks. The total of 48 animals apprehended in 1987 compares to 74 Mexican animals apprehended in 1986.

The temporary preventative quarantine area in Cameron County was converted to a control purpose quarantine area to monitor livestock in the high-risk area. As a result, one premise was found infested with *Boophilus* ticks.

Three premises in the free area of Zapata County were found infested with cattle fever ticks in the vicinity of the previously infested Loma Llano Pasture. Range pasture conditions continued favorable due to adequate rainfall. Forage was abundant in most areas along the Texas-Mexico border.

### **Research Accomplishments for 1987 by Animal Diseases Research Unit (ADRU), USDA, Agricultural Research Service, Pullman, Washington, and Moscow, Idaho**

Light and electron microscopes were used to obtain the first clear evidence that *Anaplasma marginale* infects tick salivary glands. Morphology of two strains of the parasite in salivary glands of three experimentally infected species of *Dermacentor* ticks suggests that the parasite replicates in this tissue before being introduced into cattle. If further studies confirm that the organism seen in the salivary glands represents the tick-transmitted stage of *A. marginale*, the antigenic profile of this stage can be characterized and unique antigens possibly included in a vaccine to protect cattle against tick-transmitted anaplasmosis.

A cloned DNA probe from the gene coding for an *A. marginale* surface polypeptide was used to detect *A. marginale* infections in individual tick tissues from three *Dermacentor* species. The DNA probe can detect all strains of *A. marginale* thus far tested, but does not cross-hybridize with *A. centrale* or *A. ovis*. *Anaplasma marginale* infection of *Dermacentor* tick salivary glands was confirmed with the DNA probe, revealing that the parasite was present before it could be detected microscopically and before it was infective for cattle.

Immunization of cattle with a purified *A. marginale* surface protein of 36,000 M.W. induced protection against both homologous and heterologous challenge. Cattle that did not develop infections were confirmed negative by DNA probe.

Experiments with uninfested cattle and cattle infested with marked male/female *Dermacentor* ticks held together in indoor/outdoor pens revealed that approximately 30 percent of ticks recovered from the animals had transferred to new hosts. Interhost transfer by adult ticks may be an important means by which ticks transmit *A. marginale* in nature.

*Anaplasma marginale*-infected male *Dermacentor andersoni* held in packets off the host and in the field survived for 7 months and transmitted the parasite to susceptible calves after 121 days. The ticks appear to act as reservoirs of *A. marginale* through the summer and fall, but chronically infected vertebrate hosts appear to be the only significant overwintering reservoir of *A. marginale*.

### **Tick Identification and Vat Management Training Along United States-Mexico Border**

Tick identification and vat management training was conducted May 18 through June 6, 1987, for the personnel along the United States-Mexico border from Brownsville, Texas, to San Ysidro, California. The training included 52 State and Federal animal health personnel actively engaged

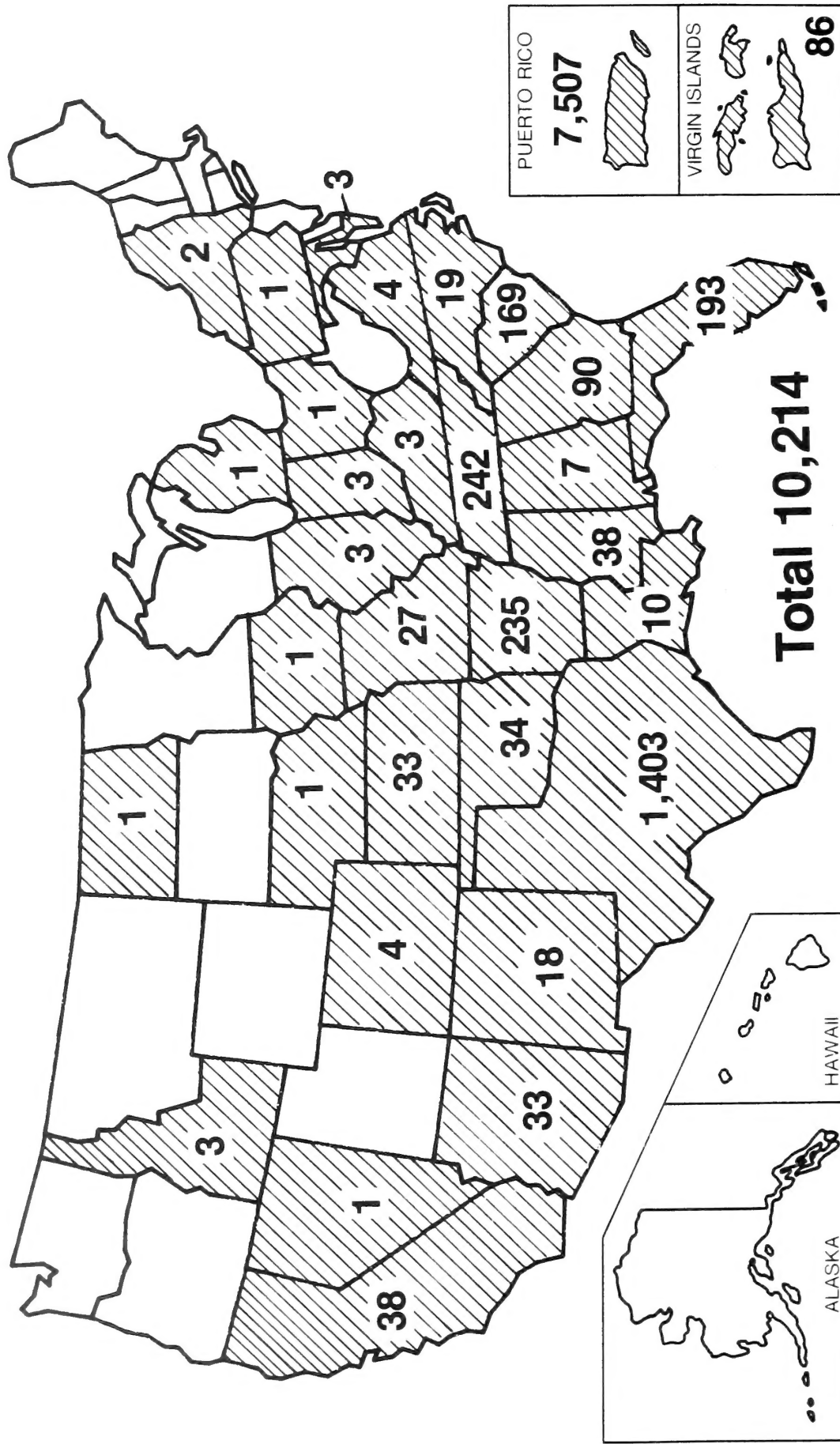
in the importation of livestock from Mexico. The training sites included Brownsville, Texas; Laredo, Texas; Del Rio, Texas; Presidio, Texas; El Paso, Texas; Nogales, Arizona;

and San Ysidro, California. Personnel from all the ports along the United States-Mexico border were represented at the training locations.



# Maps and Tables Section

# Tick Collections From All Hosts CY 1987



REPORT OF TICKS COLLECTED

USDA-APHIS

PERIOD

HOST

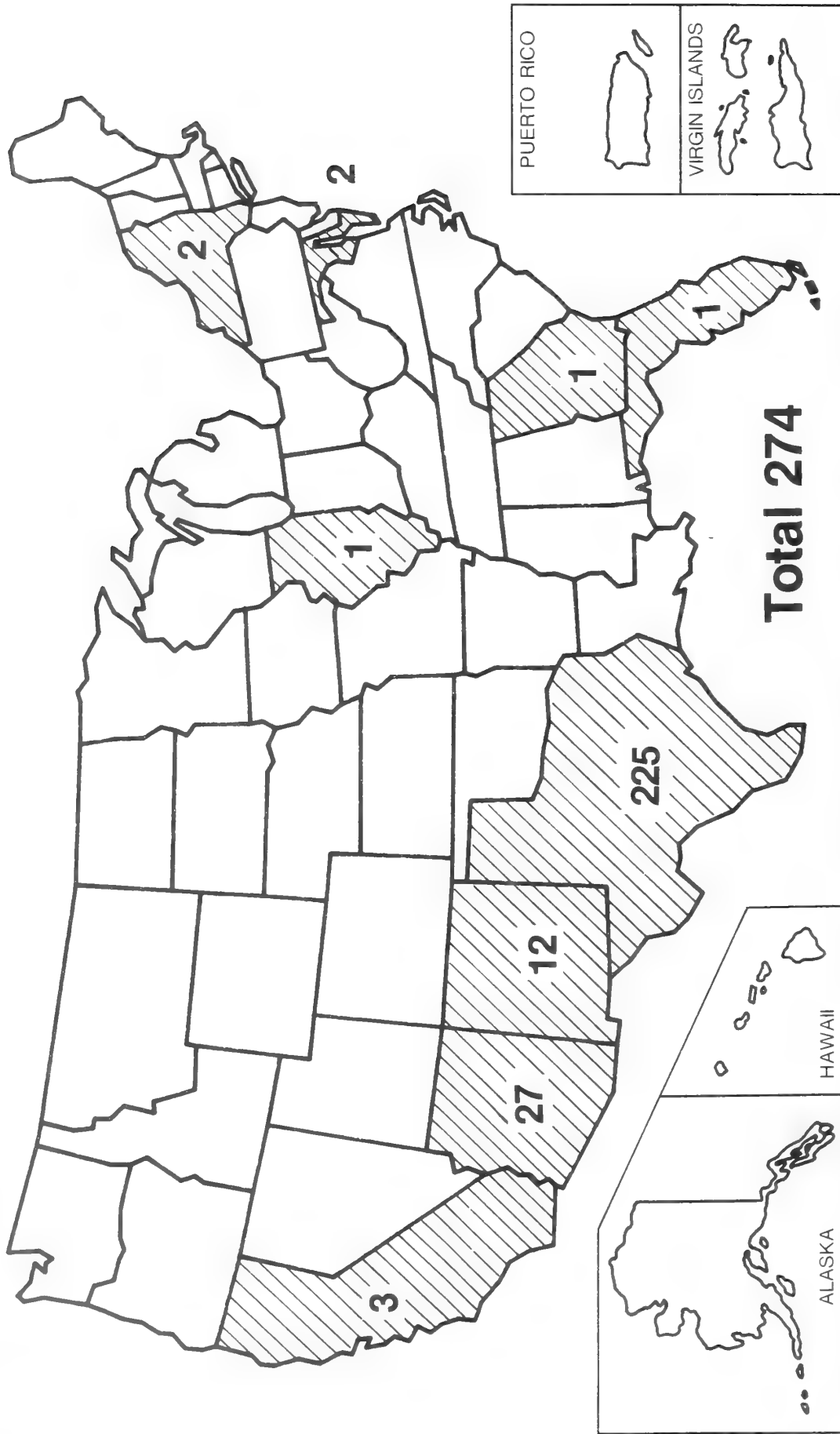
Calendar Year 1987

All Hosts

STATE	TOTAL	CATTLE	Dogs	Horses & Mules	Zoo Animals & F. v. Hosts	Marine Mammals	Animals & P. ro. ducts offered for entry
<b>TOTAL</b>	10214	7099	203	2163	160	315	274
Alabama	7	7					
Alaska							
Arizona	33	1	1		4		27
Arkansas	235	205	6	1	2		21
California	38	6	14		9	6	3
Colorado	4		3		1		
Connecticut							
Delaware							
Florida	193	117	37	20	3	15	1
Georgia	90	8	3		3	75	1
Hawaii							
Idaho	3	1	1			1	
Illinois	3		1	1			1
Indiana	3		2		1		
Iowa	1					1	
Kansas	33	29			1	3	
Kentucky	3	2			1		
Louisiana	10					10	
Maine							
Maryland	3				1		2
Massachusetts							
Michigan	1				1		
Minnesota							
Mississippi	38	27	9		2		
Missouri	27	23	4				
Montana							
Nebraska	1	1					
Nevada	1		1				
New Hampshire							
New Jersey							
New Mexico	18	2		1	3		12
New York	2						2
North Carolina	19	7	1			11	
North Dakota	1		1				
Ohio	1		1				
Oklahoma	34	22	1		1	10	
Oregon							
Pennsylvania	1			1			
Rhode Island							
South Carolina	169	11	16		11	131	
South Dakota							
Tennessee	242	207	13	1	18	3	
Texas	1403	726	83	310	31	28	225
Utah							
Vermont							
Virginia	4	4					
Washington							
West Virginia							
Wisconsin							
Wyoming							
Puerto Rico	7507	5660	2	1793	52		
Virgin Islands	86	33	3	35	15		

VS FORM T-4 (APR 84)

# Tick Collections From Animals and Products Offered For Entry CY 1987



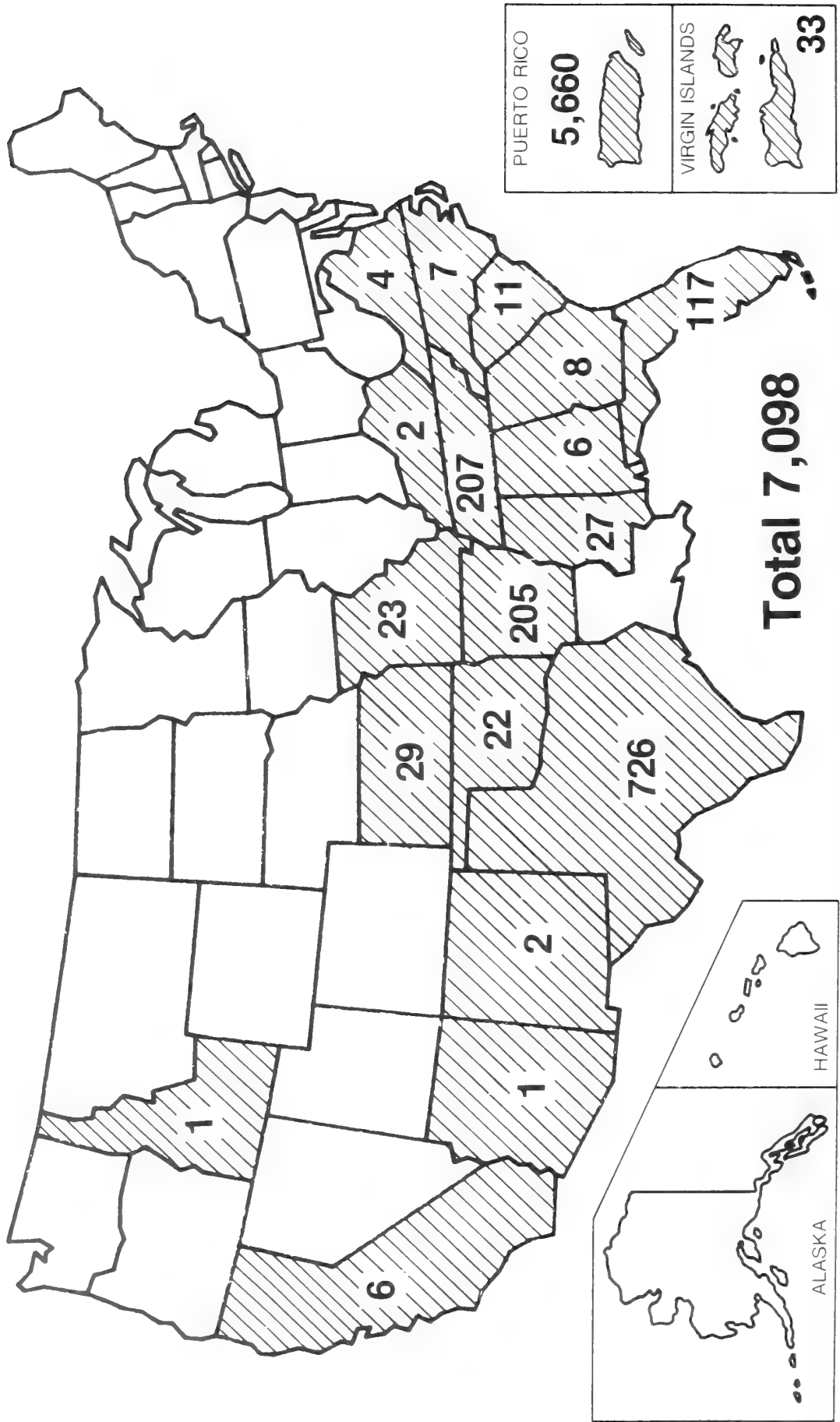
USDA-APHIS															PERIOD		HOST													
REPORT OF TICKS COLLECTED															Calendar Year 1987		Animals and Products Offered for Entry													
STATE	TOTAL	AMBLYOMMA AMERICANUM	AMBLYOMMA CALLENDERI	AMBLYOMMA BRITZTORI	AMBLYOMMA MACULATUM	AMBLYOMMA SPP	ARGAS FERSICUS	BODIPHILUS ANULATUS	BODIPHILUS MICROFILUS	BODIPHILUS SPP	DERMACENTOR ALBIPITELUS	DERMACENTOR PENNACENTUS	DERMACENTOR BENTLEYI	DERMACENTOR ALGIBANENSIS	DERMACENTOR ALLEYS	DERMACENTOR OCCIDENTALIS	DERMACENTOR VARIABILIS	DERMACENTOR SPP	HAEMAPHYSALIS LEPTOMALUS	HAEMAPHYSALIS SALSUS	IAODEX COCKLEI	IAODEX PACIFICUS	IAODEX STENILARIS	IAODEX SPP	ORNITHODOROS SPP	OTIOBIUS MEGNINI	RHIPOCEPHALUS SANGUINEUS	RHIPOCEPHALUS SPP	MISCELLANEOUS SPP	
<b>TOTAL</b>	274	15	3	2	4		26	115	22	53		2	3		3	10						1					8	5	2	
ARIZONA																														
Douglas	12									10B0						2B0 <sup>c</sup>														
Nogales	15									9B0																	6B0			
CALIFORNIA																														
San Ysidro	3						2B0																				1B0			
FLORIDA																														
Miami	1												1H0																	
GEORGIA																														
Atlanta	1				1TH <sup>h</sup>																									
ILLINOIS																														
Chicago	1							1PL																						
MARYLAND																														
Baltimore	2																											2X		
NEW MEXICO																														
Columbus	12									11B0		1B0																		
NEW YORK																														
Rock Tavern	2																												1 OS <sup>ht</sup>	1B1 <sup>hy</sup>
TEXAS																														
Brownsville	9	2B0						5B0	1B0*																			1DC		
Del Rio	41	1B0		1B0	1B0	24B0	2B0	2B0	3B0 <sup>c</sup>	4B0						3B0 <sup>c</sup>														
Eagle Pass	51	3B0		1B0 <sup>a</sup>	2B0	23B0	3B0	6B0 <sup>c</sup>	6B0	1B0					2B0	3B0 <sup>c</sup>				1B0										
El Paso	1							1B0																						
Hidalgo	2						1B0	1B0																						
Laredo	49	9B0	3B0	2B0	1B0	13B0	7DH	4B0 <sup>a</sup>	1B0	1B0			2B0		1B0												1B0			
Presidio	22							6B0		12B0						2B0 <sup>c</sup>											2B0 <sup>a</sup>			

Key to Host  
 B0 Cattle  
 DC Dog  
 DH Deer Hide  
 HO Horse  
 OS Ostrich  
 PL Plant  
 X Inanimate Object

Key to Species  
 h Amblyomma hebraeum  
 hy Hyalomma sp.  
 hc Hyalomma truncatum

\* Nymphal Stage

# Tick Collections From Cattle CY 1987



REPORT OF TICKS COLLECTED

USDA-APHIS

PERIOD

Calendar Year

HOST

Cattle

STATE	TOTAL	AMBLIOMMA AMERICANUM	AMBLIOMMA CALLENNENSE	AMBLIOMMA INTYCTOR	AMBLIOMMA MACULATUM	AMBLIOMMA SPP.	ARGAS FERSICUS	BODIPHILUS ANULATUS	BODIPHILUS MICROPLUS	BODIPHILUS SPP.	DERMACENTOR ALBIPICATUS	DERMACENTOR PARVIMACULATUS	DERMACENTOR PENN. & STANS.	DERMACENTOR AUGUSTULOIDES	DERMACENTOR ALIENS	DERMACENTOR OCCIDENTALIS	DERMACENTOR VARIABILIS	DERMACENTOR SPP.	HEMIPHYSALUS PARVUS	IXODES COCKLEI	IXODES PACIFICUS	IXODES SCAPULARIS	IXODES SPP.	ORNITHODOROS SPP.	OTOBIVUS MEGNINI	RHINCEPHALUS SANGUINEUS	RHINCEPHALUS SPP.	MISCELLANEOUS SPP.	
<b>TOTAL</b>	7098	471	111	4	269	30		5	5340	4	45		15	353		360	2				44				41	4			
Alabama	6	5														1													
Alaska													1																
Arizona	1																												
Arkansas	205	165															13					27							
California	6											2														4			
Colorado																													
Connecticut																													
Delaware																													
Florida	117	13			83											14						6				1			
Georgia	8	5			2											1													
Hawaii																													
Idaho	1										1																		
Illinois																													
Indiana																													
Iowa																													
Kansas	29	3			21											5													
Kentucky	2															2													
Louisiana																													
Maine																													
Maryland																													
Massachusetts																													
Michigan																													
Minnesota																													
Mississippi	27	14			4								1			6						1					1		
Missouri	23	8														14						1							
Montana																													
Nebraska	1																1												
Nevada																													
New Hampshire																													
New Jersey																													
New Mexico	2										2																		
New York																													
North Carolina	7																7												
North Dakota																													
Ohio																													
Oklahoma	22	13											1									5				3			
Oregon																													
Pennsylvania																													
Rhode Island																													
South Carolina	11	1												2			8												
South Dakota																													
Tennessee	207	84			1											121											1		
Texas	726	158	111	4	158	11 <sup>s</sup>		5	12	4	39		11	2		165	1 <sup>p</sup>				4				34				
Utah																													
Vermont																													
Virginia	4	2															2												
Washington																													
West Virginia																													
Wisconsin																													
Wyoming																													
Puerto Rico	5660				2 <sup>v</sup>				5307					350													1		
Virgin Islands	33				11 <sup>v</sup>				21				1																

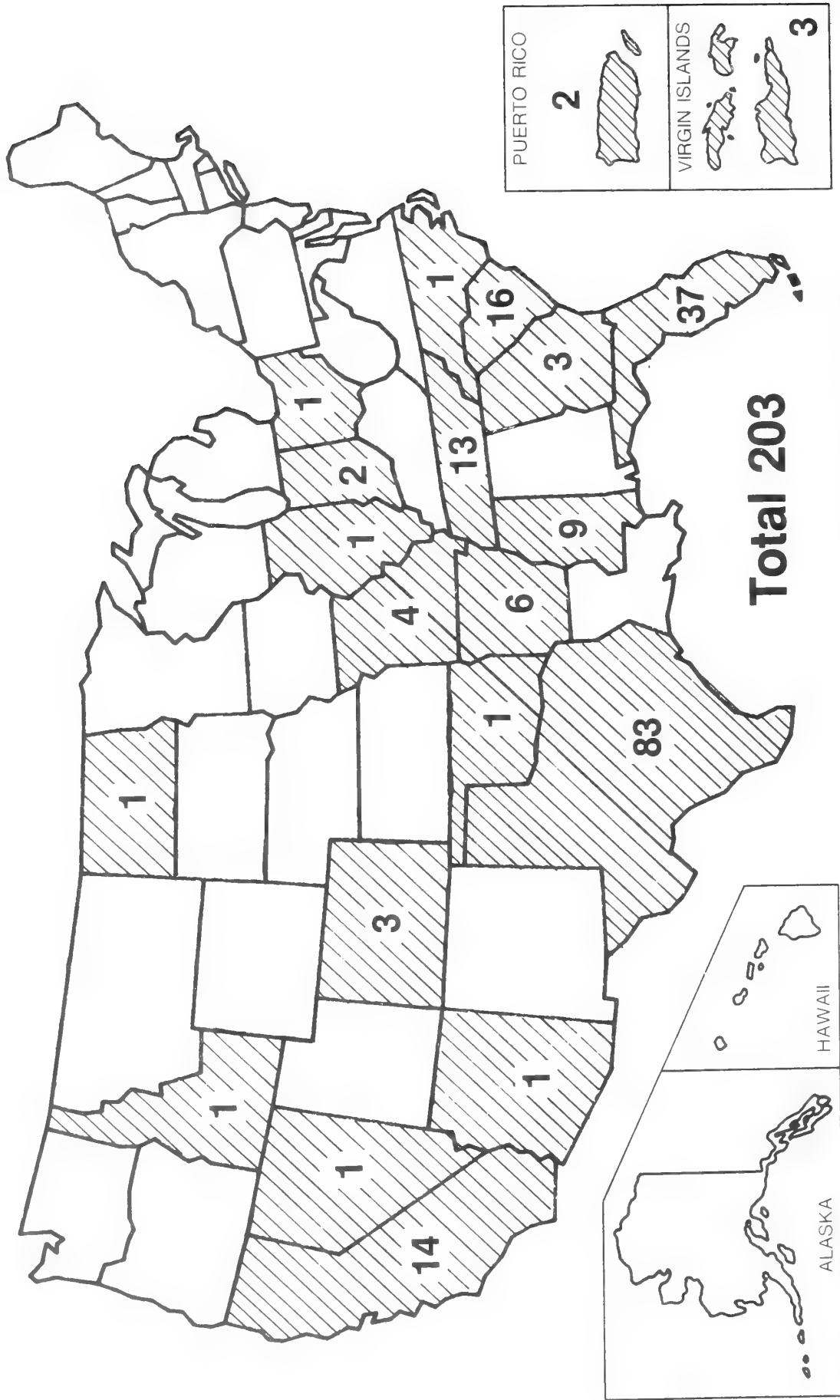
VS FORM T-4 (APR 84)

Key to Species

- i Amblyomma inornatum
- p Dermacentor parumapertus
- v Amblyomma variegatum

<sup>s</sup> Nymphal Stage

# Tick Collections From Dogs CY 1987





REPORT OF TICKS COLLECTED

USDA-APHIS

PERIOD

Calendar Year 1987

HOST

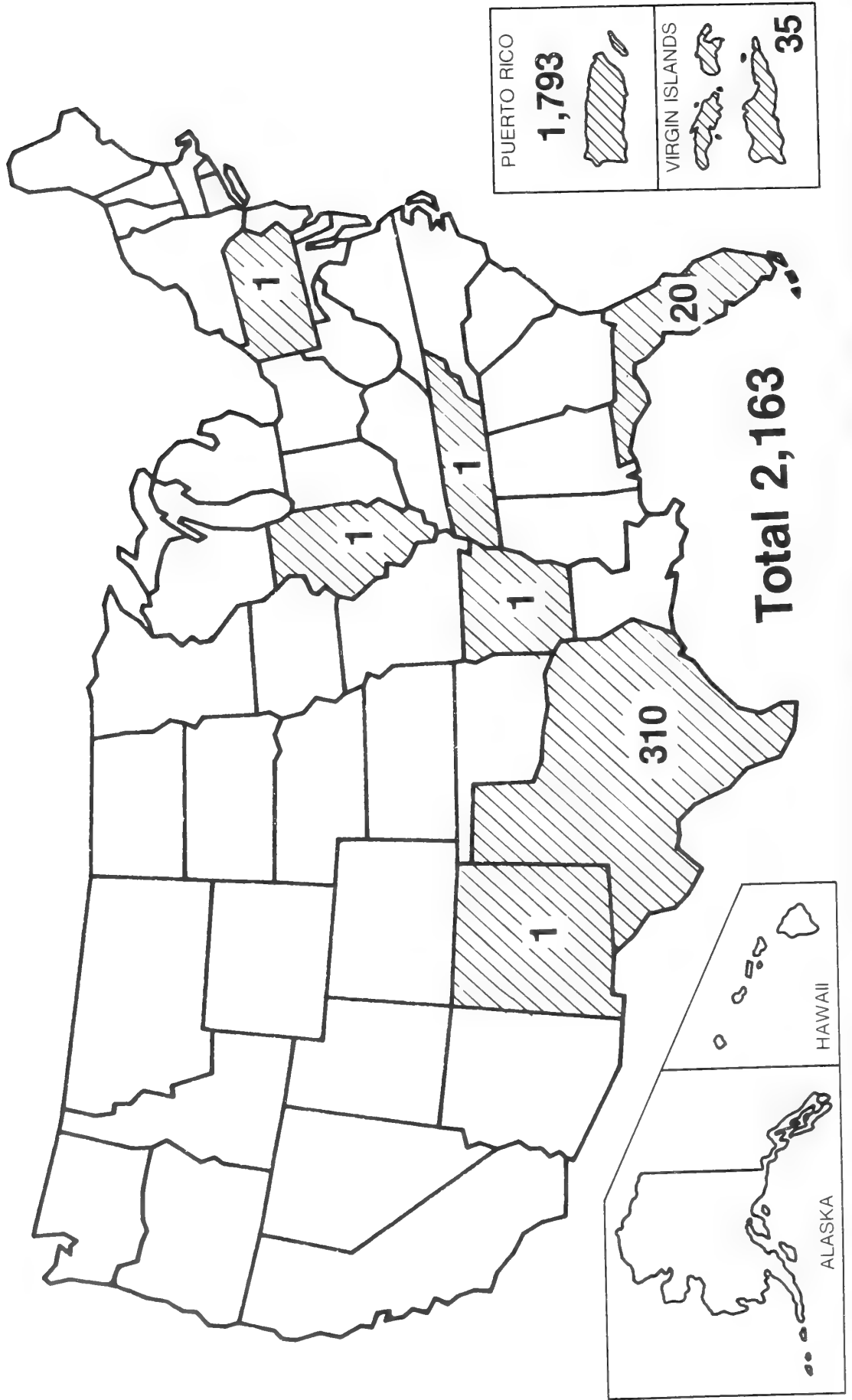
Dogs

STATE	TOTAL	AMBL.YONMA AMERICANUM	AMBL.YONMA CALIFORNENSE	AMBL.YONMA MEXICANUM	AMBL.YONMA MACULATUM	AMBL.YONMA SPP.	ARGAS PERDUCUS	BODYPHILUS ANNULATUS	BODYPHILUS MICROPILUS	BODYPHILUS SPP.	DERMACENTOR ALBIPUNCTUS	DERMACENTOR BREVIPALPUS	DERMACENTOR CENTROPALPUS	DERMACENTOR LACINIOSUS	DERMACENTOR SPP.	HAEMAPHYSALIS PARVIVALVIS	HAEMAPHYSALIS PALUSTRIS	IXODES GODEI	IXODES PACIFICUS	IXODES SCAPULARIS	IXODES SPP.	ORNITHODOROS SPP.	OTORHINUS MEGALINUS	RHIPICEPHALUS SANGUINEUS	RHIPICEPHALUS SPP.	MISCELLANEOUS SPP.
<b>TOTAL</b>	203	21			14	1					3			83			1	1	24				1	54		
Alabama																										
Alaska																										
Arizona	1			1																						
Arkansas	6													3											3	
California	14										1			7				1					1	4		
Colorado	3										2													1		
Connecticut																										
Delaware																										
Florida	37	1			9									5					21					1		
Georgia	3	1												2												
Hawaii																										
Idaho	1													1												
Illinois	1													1												
Indiana	2													2												
Iowa																										
Kansas																										
Kentucky																										
Louisiana																										
Maine																										
Maryland																										
Massachusetts																										
Michigan																										
Minnesota																										
Mississippi	9	2			1									3											3	
Missouri	4													3			1									
Montana																										
Nebraska																										
Nevada	1																								1	
New Hampshire																										
New Jersey																										
New Mexico																										
New York																										
North Carolina	1																								1	
North Dakota	1													1												
Ohio	1																								1	
Oklahoma	1																			1						
Oregon																										
Pennsylvania																										
Rhode Island																										
South Carolina	16	1			2									6					2						5	
South Dakota																										
Tennessee	13	3												9											1	
Texas	83	13			1	1*								40											28	
Utah																										
Vermont																										
Virginia																										
Washington																										
West Virginia																										
Wisconsin																										
Wyoming																										
Puerto Rico	2																								2	
Virgin Islands	3																								3	

VS FORM T-4 (APR 84)

\* Nymphal Stage

# Tick Collections From Horses and Mules CY 1987



USDA-APHIS													PERIOD		HOST															
REPORT OF TICKS COLLECTED													Calendar Year 1987		Horses and Mules															
STATE	TOTAL	AMBL-YOMMA AMERICANUM	AMBL-YOMMA CALJENNENSE	AMBL-YOMMA INTELTOR	AMBL-YOMMA MACULATUM	AMBL-YOMMA SPP.	ARGAS PERDUS	BOOPHILUS ANNULATUS	BOOPHILUS MICROPLUS	BOOPHILUS SPP.	DERM-CENTOR ALBERTICUS	DERM-CENTOR SPINOSUS	DERM-CENTOR SPINOSUS & D. SPINOSUS	DERM-CENTOR SUBTILICUS	DERM-CENTOR ZITTESE	DERM-CENTOR OCCIDENTALS	DERM-CENTOR ZARTHELE	DERM-CENTOR SPP.	HEMAPHYSALIS PARVITARS	IXODES COCKEI	IXODES FACILECUS	IXODES SCAPULIS	IXODES SPP.	ORNITHODOROS SPP.	OTOBUS MERNINI	RHIPICEPHALUS SANGUINEUS	RHIPICEPHALUS SPP.	MISCEL-LANEOUS SPP.		
<b>TOTAL</b>	2163	6	17	3	37	15		32			2		1	1797		246						6					1			
Alabama																														
Alaska																														
Arizona																														
Arkansas	1	1																												
California																														
Colorado																														
Connecticut																														
Delaware																														
Florida	20				3									9		2						6								
Georgia																														
Hawaii																														
Idaho																														
Illinois	1															1														
Indiana																														
Iowa																														
Kansas																														
Kentucky																														
Louisiana																														
Maine																														
Maryland																														
Massachusetts																														
Michigan																														
Minnesota																														
Mississippi																														
Missouri																														
Montana																														
Nebraska																														
Nevada																														
New Hampshire																														
New Jersey																														
New Mexico	1										1																			
New York																														
North Carolina																														
North Dakota																														
Ohio																														
Oklahoma																														
Oregon																														
Pennsylvania	1																									1				
Rhode Island																														
South Carolina																														
South Dakota																														
Tennessee	1															1														
Texas	310	5	17	3	34	1*		1		1		1	5		242															
Utah																														
Vermont																														
Virginia																														
Washington																														
West Virginia																														
Wisconsin																														
Wyoming																														
Puerto Rico	1793							28					1765																	
Virgin Islands	35				14 <sup>v</sup>			3					18																	

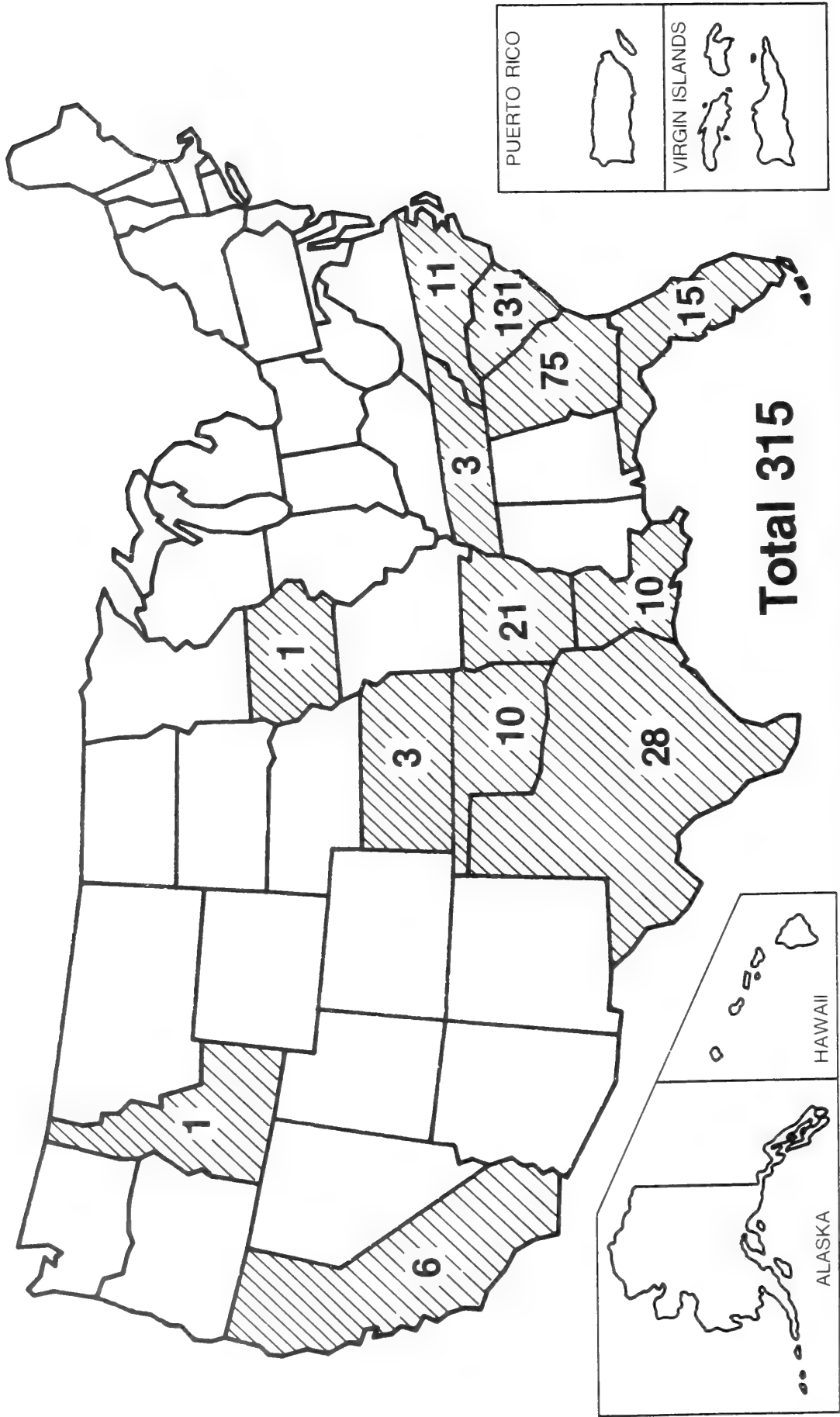
US FORM T-4  
(APR 64)

Key to Species \* Nymphal Stage

<sup>v</sup> *Amblyomma variegatum*

# Tick Collections From Native Wildlife

## CY 1987



REPORT OF TICKS COLLECTED

USDA-APHIS

PERIOD

Calendar Year 1987

HOST

Native Wildlife

STATE	TOTAL	AMBLIOMMA AMERICANUM	AMBLIOMMA CALIFORNENSE	AMBLIOMMA MEXICANUM	AMBLIOMMA MEXICANUM SPP.	ARGAS PERSICUS	BODYPHILUS ANULATUS	BODYPHILUS MICROPLUS	BODYPHILUS SPP.	DERMACENTOR ALBIPICTUS	DERMACENTOR VARIABILIS	DERMACENTOR VARIABILIS SPP.	DERMACENTOR DEBENTATUS	DERMACENTOR VARIABILIS	HAEMAPHYSALIS SALUSTIENSIS	IXODES EQUEI	IXODES PAVLOVICI	IXODES SCAPULARIS	IXODES SPP.	GNATHODOROS SPP.	OTOBUS MEXICUS	RHIPICEPHALUS SANGUINEUS SPP.	RHIPICEPHALUS SPP.	MISCELLANEOUS SPP.
<b>TOTAL</b>	315	115	1	20	1		1			3			2	50	19	11	1	56	21		2			
Alabama																								
Alaska																								
Arizona																								
Arkansas	21	15D								1D			2D	1BB				4D			2D			
California	6									1R								1D						
Colorado																								
Connecticut																								
Delaware																								
Florida	15	6D		6D														2D						
Georgia	75	1GF 4RC 34D		1CO 2D									1BB 1CO	1R 1RC	1GF 6RC 1SK		1CO	1RC <sup>1d</sup> 3RC <sup>2</sup>						
Hawaii																								
Idaho	1								1D															
Illinois																								
Indiana																								
Iowa	1																					1RC <sup>2</sup>		
Kansas	3												1RC									1R <sup>1</sup> 1RC <sup>2</sup>		
Kentucky																								
Louisiana	10	10D																						
Maine																								
Maryland																								
Massachusetts																								
Michigan																								
Minnesota																								
Mississippi																								
Missouri																								
Montana																								
Nebraska																								
Nevada																								
New Hampshire																								
New Jersey																								
New Mexico																								
New York																								
North Carolina	11	1CG 5D																					4D <sup>a</sup> 1BT <sup>b</sup>	
North Dakota																								
Ohio																								
Oklahoma	10	1CO 1D								1D					1MK								1BC 2CO 1MK 1RF 1D	
Oregon																								
Pennsylvania																								
Rhode Island																								
South Carolina	131	17B 19RC 1WT		6D	1CO <sup>2</sup>					1OD			1BC 3D	1RC				4OD 1GF				5D <sup>a</sup> 3RC <sup>x</sup>		
South Dakota													23RC											
Tennessee	3												1R			2RC								
Texas	28		1D	5D			1D			1D			1CO 1D	15R 1D				1D				1D <sup>1</sup>		
Utah																								
Vermont																								
Virginia																								
Washington																								
West Virginia																								
Wisconsin																								
Wyoming																								
Puerto Rico																								
Virgin Islands																								

VS FORM T-4 (APR 84)

Key to Host  
 BB Black Bear  
 BC Bobcat  
 BI Bird  
 CC Cougar  
 CO Coyote  
 D Deer

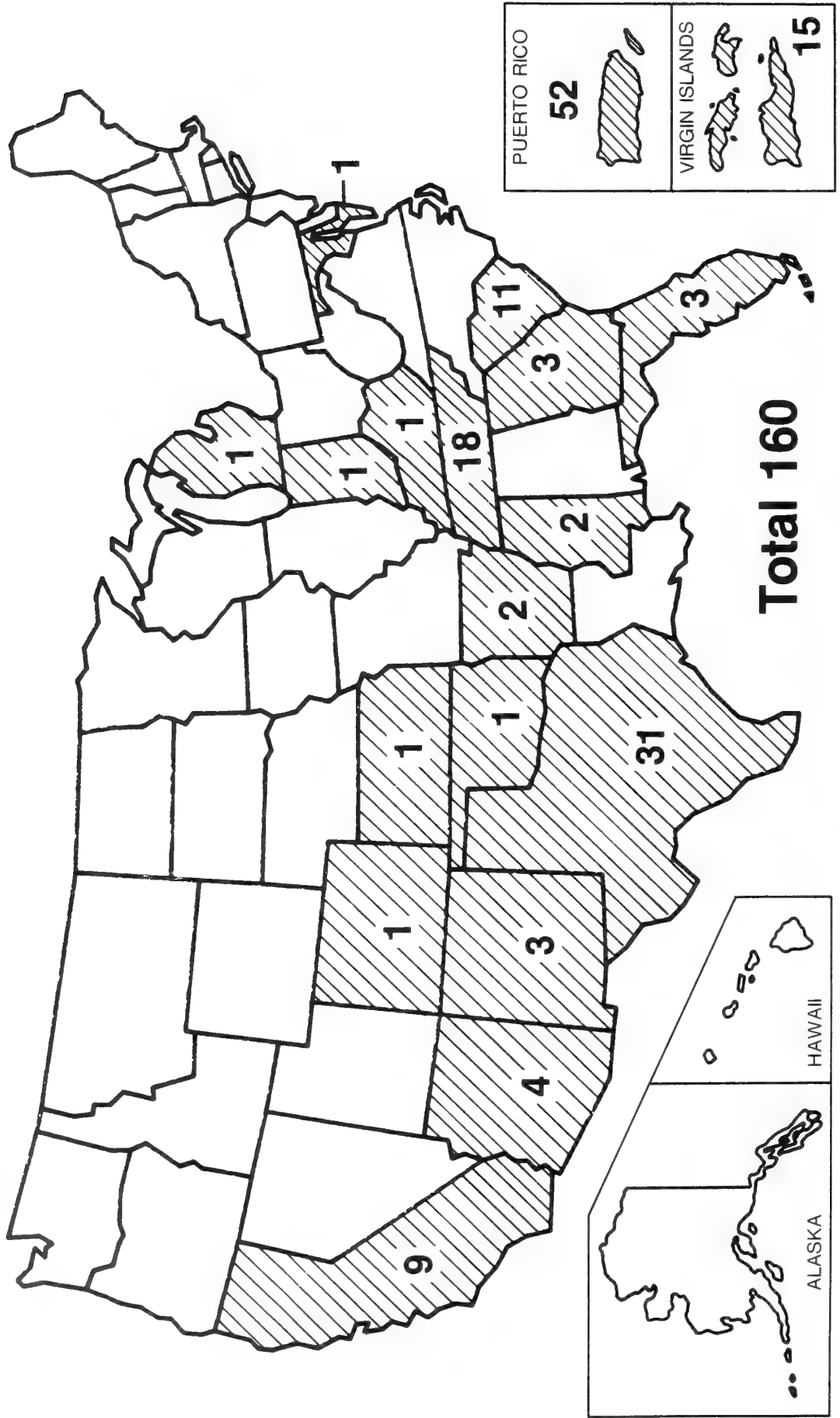
E Elk  
 F Fox  
 GF Grey Fox  
 MK Mink  
 OP Opossum  
 R Rabbit

RC Raccoon  
 RF Red Fox  
 SK Skunk  
 WT Wild Turkey

Key to Species  
 a Ixodes affinis  
 b Ixodes brunneus  
 d Ixodes dentatus  
 t Amblyomma tuberculatum

\*\* Larval Stage  
 u Ixodes (species undetermined)  
 x Ixodes texanus

# Tick Collections From Zoo Animals And Miscellaneous Hosts CY 1987









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