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Report T-622
The Status of Florida Tree Snails (*Liguus fasciatus*), Introduced to Everglades National Park

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INTRODUCTION

The Florida tree snail, Liguus fasciatus, in the family Bulimulidae, is unique among land snails in North America because of its bright colors and variable patterns. This species is tropical in origin being derived from West Indian forms. It is restricted to the tropical hardwood hammocks scattered throughout south Florida including the Florida Keys. There are 58 named color forms. Of these, 10 are extinct in their native habitat and 4 may soon become extinct. Other color forms are threatened by the eminent destruction of their habitat. It was the threat of extinction that prompted four snail collectors (Jones, Winte, Humes, and Von Paulsen) to approach the Superintendent of Everglades National Park in 1957 with the idea of introducing threatened color forms into the park. This report summarizes the results of this 23-year project.

GENERAL HISTORY, TAXONOMY AND DISTRIBUTION

History and Taxonomy

Early in the 1800's, naturalists and collectors found and collected Liguus in the Florida Keys. Several of these collections were taken to American and British museums. Thomas Say (1825) was the first to name and describe a Florida tree snail.

Until the early 1900's the tree snails of Florida were not well known because access to the region was limited and difficult. The Everglades, Atlantic Coastal Ridge and Florida Keys were sparsely populated and mostly unexplored. The building of the overseas railroad from Miami to Key West from 1904 to 1912 and the Ingraham Highway to Flamingo opened up more areas. At this time Charles T. Simpson began to travel the entire length of the railroad and highway system. He collected extensively in the hammocks of the Atlantic Coastal Ridge and Florida Keys. With the completion of the Tamiami Trail, connecting Miami with the west coast in 1928, the interior of south Florida became more accessible. The tree snail was discovered in the area now known as Pinecrest, further inland than it had ever been found before (Clench and Boss 1967). Joseph Farnum, Henry Frampton, Richard Deckert, followed by William Clench and others, visited and collected here.

Henry A. Pilsbry (1912) made the first study of the zoogeography and variations of Liguus in Florida. He named 15 forms as subspecies, classified under three species, L. solidus, L. fasciatus and L. crenatus. In 1920, Simpson described 18 new subspecies, bringing the total named forms to 35. Later papers by W. J. Clench (1929, 1933, 1935, 1942), H. G. Frampton (1932), M. F. Doe (1937), A. Pflueger (1934) and M. DeBoe (1933) described an additional 17 forms. Clench and Fairchild (1939) published a classification of Florida Liguus, which recognized 3 subspecies, solidus, lignumvitae, and roseatus under a single species L. fasciatus. The definitive taxonomic work on Florida Liguus was published by Pilsbry in 1946. He classified Liguus under a single species, 8 subspecies, 16 forms with 31 varieties. Since 1942, eight additional forms have been described (Humes 1954; Young 1952; Jones 1979) making a total of 58 color forms. Pilsbrys' taxonomic system is still the most widely used.

Distribution

The genus Liguus is native to Cuba, the Isle of Pines, Hispaniola, and Florida (Pilsbry 1946). The Florida tree snail is considered by most authors (Pilsbry 1946 and Simpson 1929) to have immigrated from Cuba. Figure 1 shows the distribution of the Liguus in south Florida. It was once found on the east coast as far north as Yamato in Palm Beach County and south through the Florida Keys to Key West. Inland, it occurs in hammocks from Immokalee southward through the Big Cypress Swamp and Everglades National Park (Young 1951). On the west coast it has been found on the shell mounds in the Ten Thousand Islands as far north as Marco Island, Collier County (Pilsbry 1946, Simpson 1921).

The area in which the tree snails are found have been divided into arbitrary geographical regions (Figure 1) and the hammocks in each region have been named and/or numbered. These regions are as follows: (1) Long Pine Key (LPK), located at the south end of the Atlantic Coastal Ridge inside Everglades National Park; (2) Central Plains (CP), the area lying south of an east-west line approximately 3.5 miles south of the Loop Road (S.R. 94); (3) Pinecrest (PC) region, the area around the Loop Road (S.R. 94); (4) Collier County (CC), the area north of the Tamiami Trail (U.S. 41); (5) Upper Keys, from Biscayne Bay to Lower Matecumbe Key; (6) Middle Keys, from Long Key to Bahia Honda Key; (7) Lower Keys, from Little Pine Key to Key West; (8) West Coast, from Lostman's Key to Marco Island; (9) Cape Sable and south coast; and (10) Atlantic Coastal Ridge.

PROJECT HISTORY

In 1957 a project to save the various color forms of Florida tree snails was proposed to Everglades National Park by Ralph H. Humes, and was approved by Superintendent Daniel B. Beard. Participating on the project were Archie L. Jones, Erwin C. Winte, Captain C. C. Von Paulsen, and Humes. They were long-time snail collectors and had become concerned over the decline and loss of various color forms. The purpose of this project was the preservation of those color forms whose native habitat occurred outside of Everglades National Park. This was accomplished by transplanting color forms into Everglades hammocks that were devoid of Liguus.

The product of this project over the past 23 years has been the successful introduction of 51 color forms into hammocks located in the rocky glade land immediately north of Long Pine Key (Figure 2). Since their introduction into the park, pictus, pseudopictus, solidulus, splendidus and septentrionalis have become extinct in their native locations. During the course of the project, delicatus, subcrenatus, and vonpaulseni have declined in their native habitat and may soon occur only in Everglades National Park.

Over this 23-year period much information was accumulated by Jones and Winte in the form of field notes and maps. Although some data are available in annual investigators reports (1957, 1958, 1962, 1965, 1967, 1968, 1969, 1970, 1971, and 1972), these reports gave only written description of the work for that particular year and not the exact location of each introduction into the park. To remedy this, in 1977 the park began to document the exact locations, color form(s) present, and history of each introduction.

METHODS

Introduction Area

Figure 2 shows the location of the introduction sites. The area is bounded on the south by the main park road, on the north by the park boundary, on the east by Taylor Slough and on the west by Shark Slough. This area is called the "rocky glades." It is characterized by oolitic limestone outcroppings in a sawgrass (Cladium jamaicensus) marsh with scattered tropical hardwood hammocks. Tropical hardwood species most commonly found are wild tamarind (Lysiloma latisiliqum), willow-bustic (Dipholes salicifolia), gumbo limbo (Bursera simaruba), and poisonwood (Metopium toxiferum). The hammocks vary in size from approximately 3 to over 10,000 square meters. There are approximately 400 hammocks in the area.

Mapping

A map was made to determine the exact location of each introduction. From January 1977 to March 1978, monthly trips were made in the introduction area. Hammocks were systematically mapped. Aerial photos were used to map each hammock. Hammocks were ground-truthed to determine the color form(s) present. Data recorded were hammock number, color form(s), origin of color form(s) and date introduced.

STATUS OF COLOR FORMS

The status of the Florida tree snail differs among color forms. Some forms, such as castaneozonatus, are common and widespread throughout the overall range of the species. Other color forms, such as fuscoflammellus, are rare and restricted to one or two hammocks. Populations of most color forms have changed during the past 50 or 60 years. The primary cause has been habitat destruction because of development. Extinction has also occurred as a result of natural causes such as fires and hurricanes. Fire destroyed the hammocks in which farnumi and violafumosus occurred. The 1935 hurricane destroyed the color form dohertyi. Of the 10 color forms extinct in their native habitat (Table 1), 8 are from the Florida Keys.

The following is a brief summary of the status of each color form in its native habitat and those introduced in Everglades National Park. This information is based on the field observations of Jones and Winte.

Color Form	STATUS: Native	STATUS: Introduced	Site Number
alternatus	Known only from Timm's (type locality) and Black Point Creek Hammock of the Atlantic Coastal Ridge. Occurs uncommonly with other color forms. Black Point Creek Hammock is destroyed.	Established in 3 mixed colonies.	2, 64, 115
aurantius	Common in the hammocks of PC, CC, and CP regions. Uncommon in the hammocks of LPK and Brickell Hammock. Occurs in mixed colonies except for a few pure colonies in the PC region, of which 2 were destroyed by fire.	Established in 3 pure and 2 mixed colonies.	33,74,88,125, 211
barbouri	Common and widespread in the PC, CC and CP regions. Usually found in mixed colonies.	Established in 9 pure and 12 mixed colonies.	1, 7, 11, 29, 31, 44, 57, 76, 91, 94, 96, 131, 148, 149, 169, 177, 180, 187, 207, 223, 225
beardi	Rare in mixed colony. Known only from a single hammock north of LPK region. Probably extinct except in park hammocks.	Established in 2 mixed colonies.	109, 159
capensis	Formerly common in mixed and pure colonies on Cape Sable, Flamingo and Cuthbert Lake. Presently found only at NW Cape Sable.	Established in 6 pure colonies.	47, 48, 134, 152, 156, 167
castaneozonatus	Abundant and widespread throughout the CC, PC, CP, and LPK regions, along the Atlantic Coastal Ridge, Ten Thousand Islands, Chokoloskee, Cape Sable and Upper Keys. Also found on Key Vaca. Occurs almost entirely in mixed colonies. Probably extinct at Key Vaca and Chokoloskee. Threatened at Marco Island.	Established in 15 mixed colonies.	5,10,12,17,18. 19, 54, 92, 98, 99, 100, 145, 175, 218, 230
castaneus	Occurs commonly in mixed colonies in LPK, rarely in Brickell and Cox's Hammock.	Established in 3 mixed colonies.	110, 147, 164
cingulatus	Uncommon. Found primarily in mixed colonies along the Atlantic Coastal Ridge, East and Middle Cape Sable, LPK, PC, CC, and CP. Formerly found on Key Largo and Key Vaca.	Established in 3 pure and 5 mixed colonies.	3, 30, 45, 120, 181, 218, 230, 231

Color Form	STATUS: Native	STATUS: Introduced	Site Number
clenchi	Uncommon in mixed colonies. Found only in the PC, CC, and CP regions.	Established in 9 mixed colonies.	11, 21, 73, 82, 83, 84, 98, 112, 180
crassus	Probably the rarest color form of Florida Liguus. Occurred only on Big Pine and Ramrod Keys. Very rare in mixed colonies. Extinct.	None.	
deckerti	Rare, occurring only in mixed colonies. Known only from Brickell Hammock, LPK hammocks 55 and 26, PC hammocks 40 and 43 and Cox's Hammock.	Established in 1 pure and 5 mixed colonies.	39, 77, 153, 175, 212, 220
delicatus	Formerly common in mixed colonies on Upper and Lower Matecumbe Keys and Indian Key. Found now only in Upper Hammock of Lower Matecumbe Key. Introduced on Lignum Vitae Key. This form will probably soon become extinct within its native range.	Established in 2 pure and 2 mixed colonies.	8, 13, 63, 128
dohertyi	Formerly occurred as a monomorphic colony in one beach hammock on Lower Matecumbe Key. Extinct. The hammock was destroyed by the 1935 hurricane.	None.	
dryas	Common in mixed colonies. Formerly found on No Name and Little Pine Keys. No longer found on No Name Key.	Established in 2 pure and 7 mixed colonies.	203, 209, 216, 217, 221, 227, 228, 237, 241
eburneus	Common in mixed and pure colonies on Atlantic Coastal Ridge and LPK region.	Established in 3 mixed colonies.	31, 32, 202
elegans	Common in Atoll Hammock (pure colony), rare in Upper Keys, CC, LPK, and PC. Occurs in mixed and pure colonies.	Established in 2 pure colonies.	233, 234
elliottensis	Uncommon in mixed colonies of Upper Keys, and Key Vaca. Possibly extinct on Elliott Key (type locality), elsewhere unchanged.	None.	
evergladesensis	Uncommon in mixed colony. Known only from a single hammock in the CC region.	Established in 4 pure colonies.	67, 70, 81, 165

Color Form	STATUS: Native	STATUS: Introduced	Site Number
farnumi	Uncommon in mixed colonies. Known only from PC hammocks number 7, 8 and 23. Extinct in PC 7 and possibly PC 8.	None.	
floridanus	Formerly common in mixed colonies. Found only in PC, CP, and CC regions.	Established in 7 pure and 5 mixed colonies.	11, 15, 16, 73, 75, 105, 106, 155, 172, 197, 208, 211
framptoni	Uncommon in mixed colonies. Known only from a few hammocks north of LPK region.	Established in 4 mixed colonies.	17, 18, 19, 59
fuscoflammellus	Known only from Timm's Hammock, Atlantic Coastal Ridge. Found rarely in mixed colony.	Established in 4 pure and 7 mixed colonies.	60, 71, 72, 115, 189, 190, 193, 194, 195, 200, 231
gloriasylvaticus	Known only from CC 10 (Bloodhound Hammock), CC 14 and Meon Hammock. Common in mixed colonies. Now found only in CC 10.	Established in 3 pure and 4 mixed colonies.	15, 16, 23, 24, 28, 126, 171
graphicus	Formerly common in mixed colonies of Lower Keys. Common but now restricted to Little Pine and No Name Keys.	Established in 5 pure and 5 mixed colonies.	76, 85, 89, 94, 103, 107, 127, 138, 162, 237
humesi	Uncommon in mixed colonies. Known only from a few hammocks north of LPK region.	Established in 1 pure and 4 mixed colonies.	17, 18, 19, 89, 95
innominatus	Rare in mixed colonies. Known only from No Name and Little Pine Keys. No specimens have been collected in recent years. May not be distinguishable from graphicus, with which it occurs.	Introductions were attempted of 2-year-old individuals. Later inspection proved them to be graphicus.	
kennethi	Rare in mixed colony. Known only from PC 13. Probably extinct except in park colonies.	Established in 1 pure and 1 mixed colonies.	20, 65
lignumvitae	Formerly common in mixed colonies on Lower Matecumbe Key and Lignum Vitae Key. Three pure colonies occurred on Lower Matecumbe Key, but were destroyed.	Established in 5 pure and 2 mixed colonies.	133, 135, 136, 137, 138, 139, 184
livingstoni	Uncommon to common in mixed colonies. Found in PC, CC, CP, LPK and Atlantic Coastal Ridge.	Established in 6 mixed colonies.	12, 50, 97, 102, 218, 230

Color Form	STATUS: Native	STATUS: Introduced	Site Number
lineolatus	Common in mixed colonies of the Upper Keys, Marco Island and Cape Sable. Found in pure colony on Russell's Key.	Established in 2 pure and 2 mixed colonies.	133, 143, 141, 144
lossmanicus	Abundant and widespread throughout the CC, CP, PC, LPK, Atlantic Coastal Ridge and Lostman's Key in the Ten Thousand Islands, occurring in both pure and mixed colonies.	Established in 14 mixed colonies.	1, 11, 21, 73, 82, 83, 84, 102, 142, 144, 148, 180, 218, 231
lucidovarius	Rare in mixed colonies. Known only from PC hammock 11	Established in 8 mixed colonies.	21, 82, 83, 84, 112, 116, 122, 166
luteus	Abundant throughout LPK and Atlantic Coastal Ridge. Also found on Key Vaca. Occurs in mixed and pure colonies. Near extinction on Key Vaca (type locality).	Established in 1 pure and 9 mixed colonies.	4, 17, 18, 19, 147, 164, 211, 218, 226, 230
margaretae	Rare in mixed colony. Known only from one hammock north of LPK region. Probably extinct except in park colonies.	Established in 1 pure and 2 mixed colonies.	109, 159, 235
marmoratus	Formerly uncommon and widespread throughout CC, PC, CP, and Atlantic Coastal Ridge. Also found on Cape Sable, Chokoloskee, Key Vaca and occasionally in the LPK region. Occurs in mixed colonies. Extinct on Cape Sable, Chokoloskee, and Key Vaca (type locality).	Established in 12 pure and 14 mixed colonies.	4, 11, 14, 33, 39, 77, 92, 104, 110, 111, 114, 118, 132, 145, 150, 153, 175, 199, 204, 205, 212, 214, 215, 222, 224, 231
matecumbensis	Formerly common in one pure colony on Upper Matecumbe Key (type locality) and in mixed colonies at Elliott Key, Flamingo and Coot Bay Hammocks. Now rare at type locality on Upper Matecumbe Key. Uncommon at Flamingo and Coot Bay.	Established in 1 pure colony.	210
miamiensis	Common throughout the Atlantic Coastal Ridge, LPK, PC, CC, and CP. Found primarily in mixed colonies. Only one pure colony (PC 37).	Established in 3 pure and 5 mixed colonies.	5, 54, 86, 87, 107, 198, 218, 230
mosieri	Uncommon in PC and LPK regions and along Atlantic Coastal Ridge. Found only in mixed colonies.	Established in 1 pure and 4 mixed colonies	12, 52, 218, 230, 231

Color Form	STATUS: Native	STATUS: Introduced	Site Number
nebulosus	Found only in CC 10 (Bloodhound Hammock). Uncommon in mixed colony.	Established in 4 mixed colonies.	15, 23, 90, 171
ornatus	Uncommon throughout Atlantic Coastal Ridge, LPK, CC, PC, and CP regions. Upper Florida Keys only on Totten Key and Key Largo. Occurs in mixed colonies.	Established in 5 pure and 12 mixed colonies.	12, 29, 30, 32, 100, 101, 130, 133, 141, 142, 143, 144, 158, 204, 218, 230, 232
osmenti	Found only on Howe Key. Common in pure colony.	Established in 1 pure and 3 mixed colonies.	121, 227, 228, 236
pictus	Formerly very rare in mixed and pure colonies on Big Pine Key and Key West. Extinct except in park colonies.	Established in 4 pure and 7 mixed colonies.	35, 38, 40, 60, 129, 140, 146, 173, 200, 237, 239
pseudopictus	Rare, formerly found only in the Middle Hammock of Lower Matecumbe Key. Extinct except in park colonies.	Established in 10 mixed colonies.	62, 68, 69, 123, 200, 205, 209, 216, 217, 219
roseatus	Formerly common and widespread throughout CP, CC, PC, LPK, Atlantic Coastal Ridge, Cape Sable, Ten Thousand Islands, and Upper Keys regions. Found in mixed and pure colonies. Endangered, if not extinct, in the Ten Thousand Islands and Cape Sable regions.	Established in 7 pure and 10 mixed colonies.	10, 37, 49, 53, 97, 98, 99, 100, 101, 102, 160, 161, 201, 202, 207, 218, 230
septentrionalis	Formerly common in beach hammocks of Atlantic Coastal Ridge from Yamato to Fort Lauderdale. Found only in pure colonies. Extinct except in park colonies.	Established in 5 pure and 8 mixed colonies	34, 58, 90, 91, 149, 193, 194, 195, 200, 206, 223, 229, 238
simpsoni	Formerly found in Upper Hammock in Lower Matecumbe Key, Plantation Key and Lignum Vitae Key. Common in mixed colonies. Now rare on Lower Matecumbe Key. Extinct on Plantation Key. It is doubtful it was ever native to this key.	Established in 6 pure and 3 mixed colonies.	6, 13, 63, 123, 124, 154, 176, 178, 179
solidulus	Formerly common in Lower Keys region. Primarily in mixed colonies, one pure colony known from Stock Island. Extinct except in park colonies.	Established in 3 pure and 8 mixed colonies.	40, 42, 62, 129, 140, 146, 174, 200, 203, 237, 240

Color Form	STATUS: Native	STATUS: Introduced	Site Number
solidus	Formerly rare. Known only from Key West, No Name Key, Little Pine Key and Watson's hammock on Big Pine Key. Found only in mixed colonies. Extinct.	None	
solisoccasus	Rare in mixed colonies. Known only from PC 101, CC 6 and 9.	Established in 3 mixed colonies.	1, 148, 204
splendidus	Found only in Middle Hammock of Lower Matecumbe Key. Rare in mixed colony. Extinct except in park colonies.	Established in 4 pure and 4 mixed colonies.	3, 22, 62, 68, 69, 78, 93, 185
subcrenatus	Formerly abundant in pure and mixed colonies on Lower Matecumbe Key and in a pure colony on Windley's Key. It is now extinct in all the Keys colonies except the Upper Hammock of Lower Matecumbe where it is endangered.	Established in 3 pure and 2 mixed colonies.	13, 43, 63, 66, 80
testudineus	Uncommon in Brickell and Matheson Hammocks of Atlantic Coastal Ridge. Found only in mixed colonies.	Established in 7 mixed colonies.	12, 166, 213, 218, 222, 224, 230
vacaensis	Formerly common, now rare in mixed colonies of Middle and Upper Keys, and Flamingo area.	None	
versicolor	Common in the mixed colony of Osteen Hammock (LPK 23). Uncommon or rarely found in other LPK hammocks. Rare in Brickell Hammock.	Established in 12 pure and 5 mixed colonies.	25, 46, 55, 56, 117, 119, 151, 157, 158, 163, 168, 183, 191, 193, 194, 195, 196
violafumosus	Formerly common in pure colonies. Known only from PC hammocks number 28 and 30. Extinct.	None.	
vonpaulseni	Formerly common in pure colony on Middle Torch Key. Endangered.	Established in 7 pure and 3 mixed colonies.	23, 26, 27, 36, 79, 120, 170, 181, 186, 188
walkeri	Common in the LPK and PC regions. Found in mixed colonies, and one pure colony (PC 9, type locality).	Established in 1 pure colony.	9
wintei	Common in pure colonies in a few hammocks north of LPK region.	None.	

INTRODUCTION SITES

A total of 51 color forms have been introduced into 241 sites (hammocks) in Everglades National Park between 1957 and 1980. For each site introduction the following information is given: (1) site (hammock) number, (2) color form or forms present, (3) year of introduction, and (4) origin of color form (geographical location). Asterisk (*) indicates those color forms that were not introduced but have become established as a result of 1) progeny of introduced forms and/or 2) immigration from nearby hammocks.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
1	solisoccasus *lossmanicus *barbouri	1976	CC 9, Collier Co.
2	alternatus *fuscoflammellus *castaneozonatus	1973	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
3	cingulatus	1961	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
	splendidus	1961	Lower Matecumbe Key, Upper Keys, Monroe Co.
4	marmoratus *luteus	1961	Key Vaca, Middle Keys, Monroe Co.
5	castaneozonatus *miamiensis	1961	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
6	simpsoni	1961	Upper Hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
7	barbouri	1961	PC 2, Monroe Co.
8	delicatus		Lower Matecumbe Key, Upper Keys, Monroe Co.
9	walkeri	1976	PC 9, Monroe Co.
10	castaneozonatus roseatus		Native
11	clenchi *lossmanicus *marmoratus *floridanus *barbouri	1964	Herald Sign Road, north of 50 mile bend, Tamiami Trail, Collier Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
12	castaneozonatus livingstoni mosieri testudineus ornatus lossmanicus	1964	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
13	subcrenatus delicatus simpsoni	1964	Upper Hammock of Lower Matecumbe, Upper Keys, Monroe Co.
14	marmoratus	1964	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
15	nebulosus *gloriasylvaticus *floridanus hybrids	1964	CC 10, Collier Co.
16	floridanus *gloriasylvaticus	1964	CC 10, Collier Co.
17	humesi framptoni luteus castaneozonatus	1965	North of LPK, Everglades National Park, Dade Co.
18	humesi framptoni luteus castaneozonatus	1965	North of LPK, Everglades National Park, Dade Co.
19	humesi framptoni luteus castaneozonatus	1965	North of LPK, Everglades National Park, Dade Co.
20	kennethi	1965	PC 13, Monroe Co.
21	lucidovarius clenchi *lossmanicus	1971	PC 11, Dade Co.
23	nebulosus *gloriasylvaticus	1964	CC 10, Collier Co.
	vonpaulseni	1966	Middle Torch Key, Lower Keys, Monroe Co.
24	gloriasylvaticus	1962	CC 10, Collier Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
25	versicolor	1962	Osteen Hammock (LPK 23), Dade Co.
26	vonpaulseni	1959	Middle Torch Key, Lower Keys, Monroe Co.
27	vonpaulseni	1959	Middle Torch Key, Lower Keys, Monroe Co.
28	gloriasylvaticus	1959	CC 10, Collier Co.
29	barbouri (blue)	1969	PC 55, Dade Co.
	ornatus		Key Largo, Upper Keys, Monroe Co.
30	cingulatus	1969	North of LPK, Dade Co.,
	ornatus		Key Largo, Upper Keys, Monroe Co.
31	barbouri (Binky)	1969	PC 89, Dade Co.
	eburneus		North of LPK, Dade Co.
32	ornatus	1969	Key Largo, Upper Keys, Monroe Co.
	eburneus		North of LPK, Dade Co.
33	marmoratus aurantius	1969	PC 22, Dade Co.
34	septentrionalis	1969	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
35	pictus	1969	Big Pine Key, Lower Keys, Monroe Co.
36	vonpaulseni	1969	Middle Torch Key, Lower Keys, Monroe Co.
37	roseatus	1972	Upper Key Largo, Upper Keys, Monroe Co.
38	pictus	1972	Big Pine Key, Lower Keys, Monroe Co.
39	deckerti marmoratus	1972	LPK 55, Dade Co.
40	solidulus	1977	Stock Island, Lower Keys, Monroe Co.
	pictus		Big Pine Key, Lower Keys, Monroe Co.
41	Unknown		

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
42	solidulus	1971	Stock Island, Lower Keys, Monroe Co.
43	subcrenatus	1969	Upper hammock of Lower Matecumbe, Upper Keys, Monroe Co.
44	barbouri (blue)	1977	PC 55, Dade Co.
45	cingulatus	1973	Upper Key Largo, Upper Keys, Monroe Co.
46	versicolor	1973	Osteen Hammock (LPK 23), Dade Co.
47	capensis	1973	Northwest Cape Sable, Monroe Co.
48	capensis	1973	Northwest Cape Sable, Monroe Co.
49	roseatus	1974	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
50	livingstoni	1974	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
51	virginus	1974	Haiti, West Indies
52	mosieri	1974	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
53	roseatus	1974	Upper Key Largo, Upper Keys, Monroe Co.
54	miamiensis *castaneozonatus	1974	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
55	versicolor (white tip)	1973	North of LPK. Hammock number 183 this report, Dade Co.
56	versicolor (white tip)	1973	Site number 183 this report, North of LPK, Dade Co.
57	barbouri	1973	Roberts Lake Strand, Pinecrest region, Monroe Co.
58	septentrionalis	1973	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
59	framptoni	1973	North of LPK, Everglades National Park, Dade Co.
60	pictus	1969	Big Pine Key, Lower Keys, Monroe Co.
	fuscoflammellus	1969	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
61	solidulus	1969	Stock Island, Lower Keys, Monroe Co.
	fuscoflammellus	1969	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
62	pseudopictus splendidus	unknown	Site number 69 this report, north of LPK, Dade Co.
63	subcrenatus delicatus simpsoni	1962	Upper hammock of Lower Matecumbe, Upper Keys, Monroe Co.
64	alternatus *castaneozonatus *fuscoflammellus	1958	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
65	kennethi	1958	PC 13, Monroe Co.
66	subcrenatus	1967	Upper Hammock of Lower Matecumbe, Upper Keys, Monroe Co.
67	evergladesensis	1958	8 miles north of Forty Mile Bend, Collier Co.
68	pseudopictus	1962	Middle Hammock of Lower Matecumbe, Upper Keys, Monroe Co.
	splendidus	1973	
69	pseudopictus splendidus	1965	Site number 68 this report.
70	evergladesensis	1973	8 miles north of Forty Mile Bend (U.S. 41), Collier Co.
71	fuscoflammellus (pink tip)	1958	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
72	fuscoflammellus (white tip)	1958	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
73	clenchi *lossmanicus *floridanus	1970	unknown
74	aurantius	1970	PC 10, Dade Co.
75	floridanus	1961	CP 8, Dade Co.
76	barbouri	1962	PC 89, Dade Co.
	graphicus	1962	Little Pine Key, Lower Keys, Monroe Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
77	deckerti *marmoratus	1966	LPK 55, Dade Co.
78	splendidus	1962	Middle Hammock of Lower Matecumbe, Upper Keys, Monroe Co.
79	vonpaulseni	1961	Middle Torch Key, Lower Keys, Monroe Co.
80	subcrenatus	1958	Upper hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
81	evergladesensis	1958	8 miles north of Forty-mile Bend (U.S. 41) Collier Co.
82	lucidovarius	1958	PC 11, Dade Co.
	*clenchi *lossmanicus *hybrids	1958	PC 88, Dade Co.
83	*lucidovarius	1958	PC 11, Dade Co.
	*clenchi *lossmanicus *hybrids	1958	PC 88, Dade Co.
84	lucidovarius	1958	PC 11, Dade Co.
	clenchi lossmanicus hybrids		PC 88, Dade Co.
85	graphicus	1970	No Name Key, Lower Keys, Monroe Co.
86	miamiensis	1962	PC 37, Dade Co.
87	miamiensis	1962	PC 37, Dade Co.
88	aurantius	1970	PC 10, Dade Co.
89	graphicus	1969	Little Pine Key, Lower Keys, Monroe Co.
	humesi	1969	North of LPK, Everglades National Park, Dade Co.
90	nebulosus	1969	CC 10, Collier Co.
	septentrionalis	1969	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
91	barbouri (blue)	1969	PC 55, Dade Co,
	septentrionalis	1969	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
92	marmoratus *castaneozonatus	1962	Cox's Hammock, Atlantic Coastal Ridge, Dade Co.
93	splendidus	1962	Middle Hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
94	barbouri	1968	PC 89, Dade Co.
	graphicus	1968	Little Pine Key, Lower Keys, Monroe Co.
95	humesi	1962	North of LPK, Everglades National Park, Dade Co.
96	*floridanus	1962	Eight miles north of Forty-Mile Bend (U.S. 41), Collier Co.
97	livingstoni *roseatus	1978	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
98	*castaneozonatus *roseatus	unknown	Upper Key Largo, Upper Keys, Monroe Co.
99	castaneozonatus *roseatus	1962	Upper Key Largo, Upper Keys, Monroe Co.
100	ornatus *castaneozonatus *roseatus	1962	Upper Key Largo, Upper Keys, Monroe Co.
101	ornatus *roseatus	1962	Upper Key Largo, Upper Keys, Monroe Co.
102	livingstoni *roseatus *lossmanicus	1968	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
103	graphicus	1969	No Name Key, Lower Keys, Monroe Co.
104	marmoratus	1962	PC 22, Dade Co.
105	floridanus	1958	8 miles north of Forty-Mile Bend (U.S. 41), Collier Co.
106	*floridanus	1958	8 miles north of Forty-Mile Bend (U.S. 41), Collier Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
107	graphicus	1969	No Name Key, Lower Keys, Monroe Co.
	miamiensis	1977	P.C. #37, Dade Co.
108	cingulatus	1970	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
	barbouri (green form)		From along Loop Road (S.R. 94), Pinecrest Dade and Monroe Counties
109	beardi *margaretae	1970	PC 88 and PC 11, Dade Co.
110	castaneus (black form) *marmoratus	1973	Loop Road (S.R. 94), Pinecrest Region, Dade or Monroe Co.
111	marmoratus	1973	Small hammock west of PC 24, Monroe Co.
112	lucidovarius *clenchi	1972	PC 11, Dade Co.
113	beardi	1974	PC 88 and PC 11, Dade Co.
114	marmoratus	1973	Small hammock west of PC 24, Monroe Co.
115	fuscoflammellus alternatus *castaneozonatus	1973	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
116	lucidovarius	1973	PC 11, Dade Co.
117	versicolor	1973	Site number 183 this report, north of LPK, Dade Co.
118	marmoratus	1973	Small hammock west of PC 24, Monroe Co.
119	versicolor	1973	Context Road north of Long Pine Key, Dade Co.
120	hybrid (vonpaulseni x cingulatus)	1973	Unnumbered hammock from LPK region, Dade Co.
121	hybrid (osmenti x unknown)	1972	From hammocks along 7-mile road, Hole-in-the-Donut area, Dade Co.
122	lucidovarius	1975	PC 11, Dade Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
123	simpsoni	1969	Upper Hammock of Lower Matecumbe, Upper Keys, Monroe Co.
	pseudopictus		Middle Hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
124	simpsoni	1969	Upper Hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
125	aurantius	1973	PC 10, Dade Co.
126	gloriasylvaticus	1969	CC 10, Collier Co.
127	graphicus	1969	No Name Key, Lower Keys, Monroe Co.
128	delicatus	1962	Upper Hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
129	pictus	1962	Big Pine Key, Lower Keys, Monroe Co.
	solidulus		Stock Island, Lower Keys, Monroe Co.
130	ornatus	1974	Upper Key Largo, Upper Keys, Monroe Co.
131	barbouri	1962	Roberts Lake Strand, Pinecrest Region, Monroe Co.
132	marmoratus	1962	CC 13, Collier Co.
133	ornatus *lineolatus	1967	Totten Key, Upper Keys
	*lignumvitae *hybrids		Lignum Vitae Key, Upper Keys, Monroe Co.
134	capensis	1969	Northwest Cape Sable, Monroe Co.
135	*lignumvitae	1961	Lignum Vitae Key, Upper Keys, Monroe Co.
136	lignumvitae	1958	Lignum Vitae Key, Upper Keys, Monroe Co.
137	*lignumvitae	1961	Lignum Vitae Key, Upper Keys, Monroe Co.
138	graphicus *lignumvitae	1962 1961	Big Pine Key, Lower Keys, Monroe Co. Lignum Vitae Key, Upper Keys, Monroe Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
139	*lignumvitae	1961	Lignum Vitae Key, Upper Keys, Monroe Co.
140	pictus	1965	Big Pine Key, Lower Keys, Monroe Co.
	solidulus		Stock Island, Lower Keys, Monroe Co.
141	ornatus *lineolatus *hybrids	1971	Totten Key, Upper Keys, Dade Co.
142	ornatus *lossmanicus *hybrids	1971	Totten Key, Upper Keys, Dade Co.
143	lineolatus *ornatus	1967	Totten Key, Upper Keys, Dade Co.
144	lineolatus *ornatus *lossmanicus *hybrids	1970	Totten Key, Upper Keys, Dade Co.
145	*castaneozonatus *marmoratus	1971	Cox's Hammock, Atlantic Coastal Ridge, Dade Co.
146	pictus	1971	Big Pine Key, Lower Keys, Monroe Co.
	solidulus		Stock Island, Lower Keys, Monroe Co.
147	castaneus *luteus	1976	Deckert Hammock, Long Pine Key Region, Dade Co.
148	solisoccasus *lossmanicus *barbouri	1976	CC 6, Collier Co.
149	septentrionalis	1970	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
	barbouri		PC 55, Dade Co.
150	marmoratus	1970	Unknown
151	versicolor	unknown	Site number 183 this report, north of Long Pine Key, Dade Co.
152	capensis	1973	Northwest Cape Sable, Monroe Co.
153	deckerti *marmoratus	1973	LPK 55, Dade Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
154	simpsoni	1973	Upper hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
155	floridanus	1973	Bloodhound Hammock, (CC 10) Collier County
156	capensis	1974	Hammock on northwest Cape Sable, Monroe Co.
157	versicolor	1974	LPK 72, Dade Co.
158	versicolor ornatus	1974	Context Road area, north of LPK, Dade Co.
159	beardi *margaretae	1974	PC 88 and PC 11, Dade Co.
160	roseatus	1974	Upper Key Largo, Upper Keys, Monroe Co.
161	roseatus	1974	Upper Key Largo, Upper Keys, Monroe Co.
162	graphicus (green line form)	1974	Big Pine Key, Lower Keys, Monroe Co.
163	versicolor (white tip)	1974	Hammock number 183 this report, north of LPK, Dade Co.
164	castaneus *luteus	1976	LPK 31, Dade Co.
165	evergladesensis	1974	Eight miles north of Forty-Mile Bend (U.S. 41), Collier Co.
166	lucidovarius	1974	PC 11, Dade Co.
	testudineus		Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
167	capensis	1974	Hammock on northwest Cape Sable, Monroe Co.
168	versicolor	1974	LPK 72, Dade Co.
169	barbouri (blue form)	1963	PC 55, Dade Co.
170	vonpaulseni	1963	Middle Torch Key, Lower Keys, Monroe Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
171	nebulosus *gloriasylvaticus	1967	CC 10, Collier Co.
172	floridanus	1968	CC 10, Collier Co.
173	pictus	1958	Big Pine Key, Lower Keys, Monroe Co.
174	solidulus	1958	Stock Island, Lower Keys, Monroe Co.
175	marmoratus *deckerti *castaneozonatus	1974	LPK 55, Dade Co.
176	simpsoni	1957	Upper hammock of Lower Matecumbe, Upper Keys, Monroe Co.
177	barbouri	1957	PC 2, Monroe Co.
178	simpsoni	1957	Upper hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
179	simpsoni	1957	Upper hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
180	clenchi lossmanicus barbouri	1976	Hammock number 183 this report, north of LPK, Dade Co.
181	vonpaulseni cingulatus	1975	Middle Torch Key, Lower Keys, Monroe Co. Native
182	unknown	unknown	unknown
183	versicolor		Native, north of LPK, Dade Co.
184	lignumvitae	1963	Lower hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
185	splendidus	1960	Middle Hammock, Lower Matecumbe Key, Upper Keys, Monroe Co.
186	vonpaulseni	1963	Middle Torch Key, Lower Keys, Monroe Co.
187	barbouri	1963	PC 2, Monroe Co.
188	vonpaulseni	1963	Middle Torch Key, Lower Keys, Monroe Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
189	fuscoflammellus (pink tip)	1958	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
190	fuscoflammellus (white tip)	1958	Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
191	versicolor (new form)		Native, north of LPK
192	septentrionalis	1961	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
193	septentrionalis	1957	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
	fuscoflammellus		Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
	*versicolor		Site number 196 this report, Dade Co.
194	septentrionalis	1957	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
	fuscoflammellus		Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
	*versicolor		Site number 196 this report, Dade Co.
195	septentrionalis	1957	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
	fuscoflammellus		Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
	*versicolor		Site number 196 this report, Dade Co.
196	versicolor (white tip)		Native, north of Long Pine Key, Dade Co.
197	floridanus	1962	CP 8, Dade Co.
198	miamiensis	1978	PC 37, Dade Co.
199	marmoratus	1958	Little Pine Key, Lower Keys, Monroe Co.
200	pictus	1958	Big Pine Key, Lower Keys, Monroe Co.
	pseudopictus		Middle hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
	fuscoflammellus		Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
	septentrionalis		Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
	solidulus		Stock Island, Lower Keys, Monroe Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
201	roseatus	1958	Upper hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
202	roseatus eburneus	unknown	unknown unknown
203	solidulus	unknown	Stock Island, Lower Keys, Monroe Co.
	dryas	unknown	Little Pine Key, Lower Keys, Monroe Co.
204	solisoccasus	1965	CC 12 (PC 101), Collier Co.
	*marmoratus *ornatus	1967	PC 101, Collier Co.
205	pseudopictus	1965	Middle hammock of Lower Matecumbe Key, Upper Key, Monroe Co.
	marmoratus (blue form)	1965	Key Vaca, Middle Keys, Monroe Co.
206	septentrionalis	1965	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
207	roseatus	1958	Upper Matecumbe Key, Upper Keys, Monroe Co.
	barbouri		PC 89, Dade Co.
208	floridanus	1968	PC 2, Dade Co.
209	pseudopictus	1976	Middle hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
	dryas		Little Pine Key, Lower Keys, Monroe Co.
210	matecumbensis	1959	Upper Matecumbe Key, Upper Keys, Monroe Co.
211	aurantius floridanus *luteus	1958	LPK, Dade Co. CP 8, Dade Co. Unknown
212	deckerti *marmoratus	1975	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
213	testudineus *Brickell color forms	1958	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
214	marmoratus	1958	PC 22, Dade Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
215	marmoratus (blue form)	1958	Key Vaca, Middle Keys, Monroe Co.
216	pseudopictus	1958	Middle Hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
	dryas		Little Pine Key, Lower Keys, Monroe Co.
217	pseudopictus	1963	Offspring from site number 216 this report
	dryas		
218	luteus lossmanicus miamiensis ornatus livingstoni cingulatus mosieri roseatus castaneozonatus testudineus	1958 and 1962	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
219	pseudopictus	1959	Middle Hammock of Lower Matecumbe Key, Upper Keys, Monroe Co.
	Brickell color forms		Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
220	deckerti	1978	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
221	dryas	1974	Little Pine Key, Lower Keys, Monroe Co.
222	marmoratus	1961	Stock from an introduced colony on Little Pine Key, Lower Keys, Monroe Co. Original source from Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
	testudineus	1958	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
223	septentrionalis	1975	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
	barbouri (blue form)	1975	PC 55, Dade Co.
224	testudineus marmoratus	1959	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
225	barbouri (blue form)	1962	PC 55, Dade Co.
226	luteus	1958	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
227	dryas	1958	Little Pine Key, Lower Keys, Monroe Co.
	osmenti		Howe Key, Lower Keys, Monroe Co.
228	dryas	1958	Little Pine Key, Lower Keys, Monroe Co.
	osmenti		Howe Key, Lower Keys, Monroe Co.
229	septentrionalis	1958	Boca Raton, Atlantic Coastal Ridge, Palm Beach Co.
230	miamiensis cingulatus castaneozonatus testudineus *luteus *lossmanicus *ornatus *livingstoni *mosieri *roseatus	1974	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
231	marmoratus		Cox's Hammock, Atlantic Coastal Ridge, Dade Co.
	cingulatus *mosieri *lossmanicus	1974	Brickell Hammock, Atlantic Coastal Ridge, Dade Co.
	*fuscoflammellus		Timm's Hammock, Atlantic Coastal Ridge, Dade Co.
232	ornatus	1974	Mahogany Hammock, Everglades National Park, Dade Co.
233	elegans	1975	Atoll Hammock, Everglades National Park Dade Co.
234	elegans	1975	Atoll Hammock, Everglades National Park Dade Co.
235	margaretae	1975	PC 88 and PC 11, Dade Co.

Site Number	Color Form(s) present	Year Introduced	Origin of Color Form
236	osmenti	1978	Howe Key, Lower Keys, Monroe Co.
237	pictus graphicus dryas solidulus	1978	Big Pine Key, Lower Keys, Monroe Co. No Name Key, Lower Keys, Monroe Co. Little Pine Key, Lower Keys, Monroe Co. Stock Island, Lower Keys, Monroe Co.
238	septentrionalis	1978	Boca Raton, Palm Beach Co.
239	pictus	1978	Big Pine Key, Lower Keys, Monroe Co.
240	solidulus	1978	Stock Island, Lower Keys, Monroe Co.
241	dryas	1978	Little Pine Key, Lower Keys, Monroe Co.

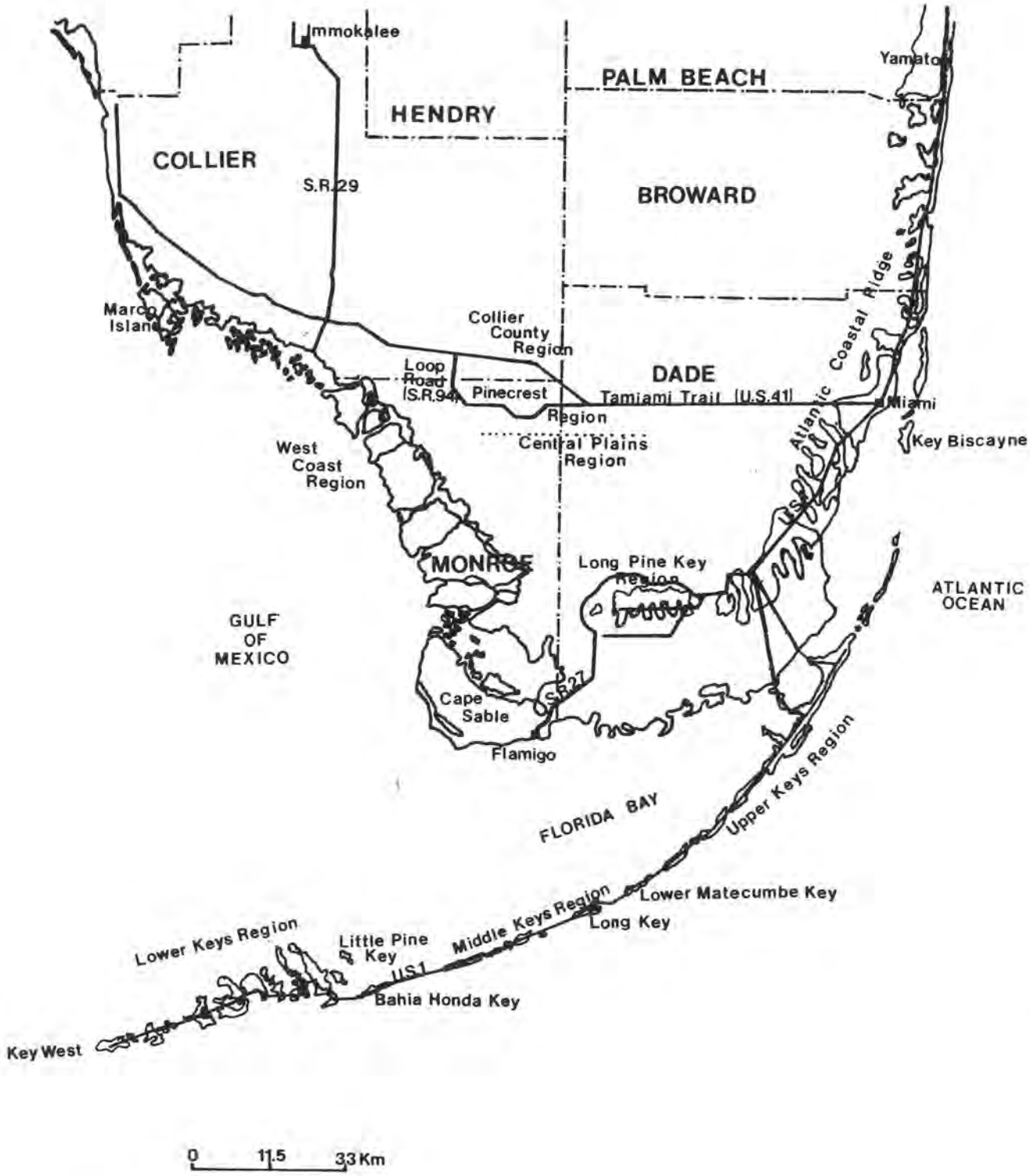

Figure 1. Distribution and geographical regions of Florida tree snails.

Figure 2. Area of introduced Florida tree snails in Everglades National Park.

Table 1. The 58 color forms of the Florida tree snail, Liguus fasciatus. Asterisk (*) indicates color forms extinct in their native habitat.

alternatus
aurantius
barbouri
beardi
capensis
castaneozonatus
castaneus
cingulatus
clenchi
crassus*
deckerti
delicatus
dohertyi*
dryas
eburneus
elegans
elliottensis
evergladesensis
farnumi*
floridanus
framptoni
fuscoflammellus
gloriasylvaticus
graphicus
humesi
innominatus
kennethi
lignumvitae
lineolatus
livingstoni
lossmanicus
lucidovarius
luteus
margaretae
marmoratus
matecumbensis
miamiensis
mosieri
nebulosus
ornatus
osmenti
pictus*
pseudopictus*
roseatus
septentrionalis*
simpsoni
solidulus*
solidus*
solisoccasus
splendidus*
subcrenatus
testudineus
vacaensis
versicolor
violafumosus*
vonpaulseni
walkeri
wintei

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