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Shark Attack in Virginia:

A Report to the Governor's Task Force

Submitted by

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Virginia Marine Resource Report No. 2001-14

WILLIAM & MARY

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VIRGINIA INSTITUTE OF MARINE SCIENCE

SCHOOL OF MARINE SCIENCE

Details of the shark attack that occurred Saturday 1 September, at Sandbridge, Virginia Beach, Virginia.

Richard Peltier, his sons David (10 years old, 130 lbs.), Robert, and his stepson Josh Sowers had been surfing about 200 yards north of the Little Island Fishing Pier from about 2:00pm until 6:00pm. The tide had been rising all day and was about high. The day was relatively cool (80°F) and the water was strikingly clear. The boys had been observing skates and small smooth dogfish lying on the bottom, unusual because visibility in the surf zone there is usually much lower. At about 6:00pm Richard had removed the tether to his longboard and was about to transfer it to David. They were standing in 3-4' of water with about 1' waves on a sandbar about 50 yards from shore. The two other boys were on their boards about 10' away. In the clear water, Richard suddenly noticed a large shark swimming parallel to and on the other side of the board. The shark was only a yard or two away. Richard estimated the length of the shark to be about the same or slightly larger than the longboard (9'). Richard's immediate reaction was to warn his sons and to pick up David to put him on the board. As he lifted the boy, he felt a tug and a great weight and the boy cried out. The shark had quickly turned and grabbed David by the back of the left thigh. While holding the boy with his left arm, Richard tried to pry the sharks mouth open with his right hand, then pounded on the sharks head and finally at its eye. The shark continuously, methodically shook its head back and forth, removing a large piece of tissue. When the shark fell away Richard placed the boy on the surfboard and rapidly pushed it to shore where the other two boys had already gone. Unbeknownst to Richard, the boys observed that the shark then circled back and followed him for a distance before turning out to sea and disappearing.

Medics were able to resuscitate the boy, but he succumbed later because of massive loss of blood. Subsequent discussion with Richard, Robert, and Josh including their examination of numerous shark illustrations established with little doubt the shark was a bull shark, *Carcharhinus leucas.* Calculations based on measurements of the bite in autopsy photos confirmed the size of the shark at 9'4".

Details of the shark attack that occurred Monday 3 September, at Hatteras Island, North Carolina.

On 3 September at around 6:00 pm, Natalia Slobodskaya (age 23 ca. 110 lbs) and Sergei Zaloukaev (age 28 ca. 200 lbs.) were swimming for around 5-10 minutes about 30-40' off the beach in 6' of water just outside the first bar and set of breakers on Hatteras Island, one mile south of the Avon fishing pier, North Carolina. The weather was clear, but the water was "murky." The woman was swimming without her eyeglasses (she is near-sighted) so her vision was not clear. The couple were apparently swimming side by side about two feet apart when a very large shark suddenly pushed between them and grabbed Natalia's left buttock. Sergei yelled shark and it subsequently grabbed and removed his right buttock as the couple struggled toward the beach. The shark continued its attack removing Sergei's right leg and Natalia's left foot. The shark departed. The couple reached shallow water where they continued to shout for assistance. They were finally pulled from the water by friends further up the beach who had not witnessed the attack. Both victims were conscious at first, but Sergei was in full cardiac arrest when medics arrived at 6:06 (according to Skeeter Sawyer, Dare County Public Safety Director). Both victims were rushed to the small Avon Medical Center, which had a doctor on duty, but no blood available for transfusions. Sergei was pronounced dead there, and Natalia was taken by helicopter to Sentara Norfolk General Hospital where she was cared for by surgeon Dr. Jeffrey Riblet. He described the bite on her buttock as 12" in diameter, indicating a shark of at least 10'3" in length. This incident occurred within the U.S. Park Service Cape Hatteras National Seashore, and was investigated by Chief Ranger Jeffrey Cobb.

Examination of photos of Natalia Slobodskaya's injuries show that virtually the entire left buttock was removed by one very clean symmetrical bite suggesting teeth in the upper and lower jaws of the shark were similar. Likewise, the left foot was cleanly bitten off, the tibia popped at the joint suggesting the shark rolled as it bit. Given the size of the bite (at least 12" across) and the symmetrical nature of the bite and the apparent rolling behavior, the most likely species was the tiger shark (*Galeocerdo cuvieri*).

Rogue Shark Theory

The theory of some who suggested that one individual rogue shark was responsible both for the Virginia and North Carolina attacks is unfounded. Examination of the patterns of attack documented in the International Shark Attack File suggest multiple attacks by one individual shark only occur at the same place and time, but not over a long period in widely separated localities. Rogue sharks are the product of fiction with no credible evidence in the scientific record. All available information points to two different species of sharks being involved in the attacks in Virginia and North Carolina in 2001. The Virginia attack was perpetuated by a bull shark and the North Carolina attack most likely was from a larger tiger shark.

Other unprovoked shark incidents in Virginia

In addition to the 2001 attack at Sandbridge, there has been only one shark incident in the surf zone that resulted in a bite and injury on record. That incident occurred in the summer of 1973, south of Sandbridge and involved a teenaged boy who was spearing crabs in waist deep water, wearing fins and snorkel. A menhaden steamer was working offshore about half a mile or so pumping fish blood and gurry into the water. The water was turbid. A shark 5-6' in length grabbed the boys elbow, but released it quickly, and fled leaping from the water. Examination of the tooth marks in the wound and the leaping behavior of the shark suggested it was a black tip or spinner shark. Haul seine capture of sharks in this area suggested that blacktips were much more common than spinners, thus the blacktip was identified as the most likely species. This was a typical mistake attack where a normal piscivorous shark species sees only part of a bather moving through the water and mistakes him or her as a small prey item. In this kind of attack the shark quickly releases its hold and flees. In this case the boy had severe lacerations but survived and had to undergo subsequent reconstructive surgery to recover use of his elbow.

A third incident involving a body surfer off Sandbridge was reported to the International Shark Attack File in 1999 but not independently confirmed. A man reported being charged and struck in the body by a large shark after which a wrestling match ensued. The victim reported being bruised but not bitten.

Two other incidents involved scuba divers who had been spearfishing and were trailing stringers of bleeding fish behind them. Both these incidents involved sand tigers. The first of the incidents took place in 1989 at Coral Gardens Reef 6 miles SSE of Chincoteague Inlet. The shark grabbed the divers string of fish and chased him to the boat. No injury was reported.

The second incident occurred in 1998 at a wreck called the Navy Barge, 22 miles SE of Rudee Inlet. Two divers, at about 40' depth, were transferring a speared fish onto a stringer when a sand tiger slowly swam up to them and took one divers' hand into its mouth. The hand was covered with a glove soaked with slime and blood. The other diver began to beat on the shark after which it opened its mouth and released the first diver. The shark retreated. The divers had observed sand tigers slowly cruising around the wreck all afternoon, had ignored them and continued to trail the fish stringer behind them. The injured man's hand recovered.

Shark Abundance in Virginia

The Virginia Institute of Marine Science has carried out a longline sampling program since 1973 to study the distribution, abundance and biology of sharks. This long-term assessment program contributes to the management of sharks along the Atlantic Coast. The program was expanded during 1980 and 1981 with Sea Grant support, thus providing a strong historical baseline concerning the sharks inhabiting coastal waters prior to the escalation of the recreational and commercial fisheries. More recently the survey has been supported by funding (1990-1993, 1998-2000) through the Wallop-Breaux program and the Virginia Marine Resource Commission Salt Water License Fund (1995-1997). Current funding is through a direct grant from National Marine Fisheries Service (NMFS) with a small supplement from VMRC. Future funding is tenuous. The recent studies have provided insights into the effects of the fishery expansions on the shark stock during the last 25 years. The Virginia database was the only available long-term fishery independent data source incorporated into the National Marine Fisheries Service Management Plan in 1994, 1996, and 1998. Thus its value has been recognized as an important tool in defining trends in East Coast shark abundance over a 25-year period.

The VIMS longline survey program is a depth-stratified field survey of the Chesapeake Bay and coastal waters from Cape Hatteras, NC to Cape Henolopen, DE. A unit of effort is a 100 hook longline covering approximately 1.25 nautical miles which is fished for 3 to 4 hours. Gear characteristics have been similar throughout the program (1973). The distribution of sampling effort for the longline program from 1973 to 2000 is shown in Figure 1. Eight standard stations plus ancillary localities are fished each month (May or June through September or October). Sampling for each month is completed within four days to reduce between station variability. Each fish is measured and sexed and biological samples are taken as needed for genetic, age/growth, and reproduction analyses. Healthy specimens not needed for samples are tagged and released for long-term studies on migration, habitat utilization, and age and growth.

The overwhelming trend in CPUE from 1974 through 1992 was a rapid decline in the stocks of large coastal species after 1980 to about 20-25% of their former abundance (Figure 2a). Abundance of these species was depressed to a minimum in 1992. The same trend of declining abundance is seen for each of the individual large coastal species common to the region: sandbar sharks (*Carcharhinus plumbeus)*, dusky sharks (*C. obscurus)*, tiger sharks (*Galeocerdo cuvieri)*, and sandtiger sharks (*Carcharias taurus)*, as shown in Figures 3-6. A small increase in abundance of large coastal sharks was observed in 1995 through 2000; however, overall biomass of large coastal sharks remained depressed (Figure 3b). This indicates a trend toward smaller individual sharks, or juvenescence of the stock, which is a primary symptom of growth overfishing within the stock. Larger sharks that might be potentially capable of inflicting severe injury (Figure 7) remain at levels of about 10-25% of their abundance in the late 1970s.

Even though the shark fauna in Virginia coastal waters is diverse (Figure 8), the risk of shark attack is very small in Virginia coastal waters. The risk is minute within Chesapeake Bay where an unprovoked shark attack has never been recorded. The shark fauna within the Bay is severely limited by the lower salinity there and is dominated by baby sandbar sharks (Figure 9). Sand tiger sharks, a principal predator on small sandbars, also occur in the lower Bay. Other than dogfishes, other shark species only occur as rare strays inside the Bay. This includes the very rare bull shark for which records occur as far up the Bay as Annapolis

Bull Shark Abundance in Virginia

The shark that attacked Richard Peltier was a bull shark, a large species that feeds on large prey such as sea turtles, cetaceans and other sharks, as well as on smaller fishes. Bull sharks are listed third after White and Tiger sharks on the ISAF list of attacks by species, and are to be considered dangerous. Bull sharks are rare in Virginia. VIMS longline data shows that the most recent bull shark capture was in September 1991 (table 1). Only 9 bull sharks have been captured out of a total 6,761 sharks taken in the program since 1973. The probability of a bull shark attack in Virginia waters must be considered extremely low.

The Politics and Science of Shark Attack

On Saturday, September 9th, the *Daily Press* published an article in the "Outlook" section by journalist Sean Paige reporting that management regulations restricting the catch of sharks were responsible for an increased number of shark attacks along the Atlantic coast in recent years. Similar articles subsequently have been published in fishery trade journals. In this article Mr. Paige distorted facts, selectively chose data, and ignored a large body of available information on shark stocks in order to promote a particular political agenda. Data from several scientific sources published as part of the National Marine Fisheries Service (NMFS) Fishery Management Plan in 1993 and supplemented by Stock Evaluation Workshop Reports in 1994, 1996, and 1998, clearly show that stocks of large coastal sharks declined dramatically from the early 1980s to the early 1990s because of overfishing. After the movie "Jaws" was released in the mid-1970s, the recreational fishery for sharks exploded along the East Coast of the U.S. and millions of sharks were brought to the docks where they were weighed, photographed and unceremoniously hauled off to rot in landfills. Data on shark abundance has been collected by the Virginia Institute of Marine Science (VIMS) shark ecology program since 1973. By 1985 the VIMS data show that large coastal sharks declined by 50%. Then in the mid-1980s the infrastructure developed, so that shark fins could be shipped from U. S. East Coast ports to Hong Kong, Singapore and Taiwan where there is a lucrative market for fins. Shark fins are used in some Asian cultures to make soup which can fetch up to $100 a bowl in more trendy Asian restaurants. With the trade infrastructure in place, the price paid for fresh fins leaped from a dollar or less a pound to $20-40 a pound. East Coast long-line fisheries focused on sharks for their fins and the commercial landings increased exponentially until 1989 after which the catch dropped despite high effort from the commercial fishery. The recreational fishery for large coastal sharks collapsed, and most tournaments were cancelled by the early 1990s. The VIMS data show that most shark populations reached their lowest level in 1992. Other data sets from the southeastern U.S. show a similar trend. In 1993 NMFS finally implemented a shark management plan that had been under development for five years. Had the plan been implemented in 1989 when the first draft was released for public comment, damage to the stocks could have been reduced. Regardless, the 1993 plan was flawed because it had used population models that were overly optimistic, resulting in an estimated population recovery rate of more than 26% a year. Shark biologists knew this rate was impossible. Large coastal shark species take eight to twenty years to mature, have young only every two or three years and have litters of eight to ten young or fewer. This limits their rate of recovery to less than 10% a year. Actually the average rate is closer to 5%. This points to the fallacy of Mr. Paige's assertion that sharks have increased rapidly because of the management plan. Sharks simply cannot increase rapidly because of natural biological constraints. Recovery has begun for some of the more productive large coastal species, but as with all species which have declined, protection leads first to increased numbers of juveniles not large adults. It will take many years before these small young sharks grow into large adults. Analysis of the VIMS data set shows that for sharks larger than 4 ½ feet, the population is still 10-25% of what it was in the late 1970s. If we follow Mr. Paige's logic, shark attacks should have been four to ten times higher in the 1970s than in the 1990s. Rather data in the International Shark Attack File (ISAF) shows that the 1970s had one-third the number of attacks as in the 1990s! <u>Shark attacks appear to have increased moderately over the last thirty years, but still are very rare events in the U.S. ranging over the last ten years from 20 to 51. These are minute numbers compared to the millions of humans who have been active, bathing, surfing, and diving in U.S. oceans each year.</u> The attack numbers are so small in most coastal states that they challenge valid statistical analysis. The state of Florida has (not surprisingly) logged the greatest numbers of shark attacks and the ISAF has found a tight correlation (95%) (Figure 10) between the human population census figures and the decadal numbers of shark attacks. If indeed there has been a significant increase in shark attacks it is undoubtedly due to larger numbers of people in the water in recent years, and modern electronic communications which have resulted in much better collection of shark attack statistics by the ISAF.

Figure 1. Longline stations fished by the VIMS Shark Ecology Program 1973-2000.

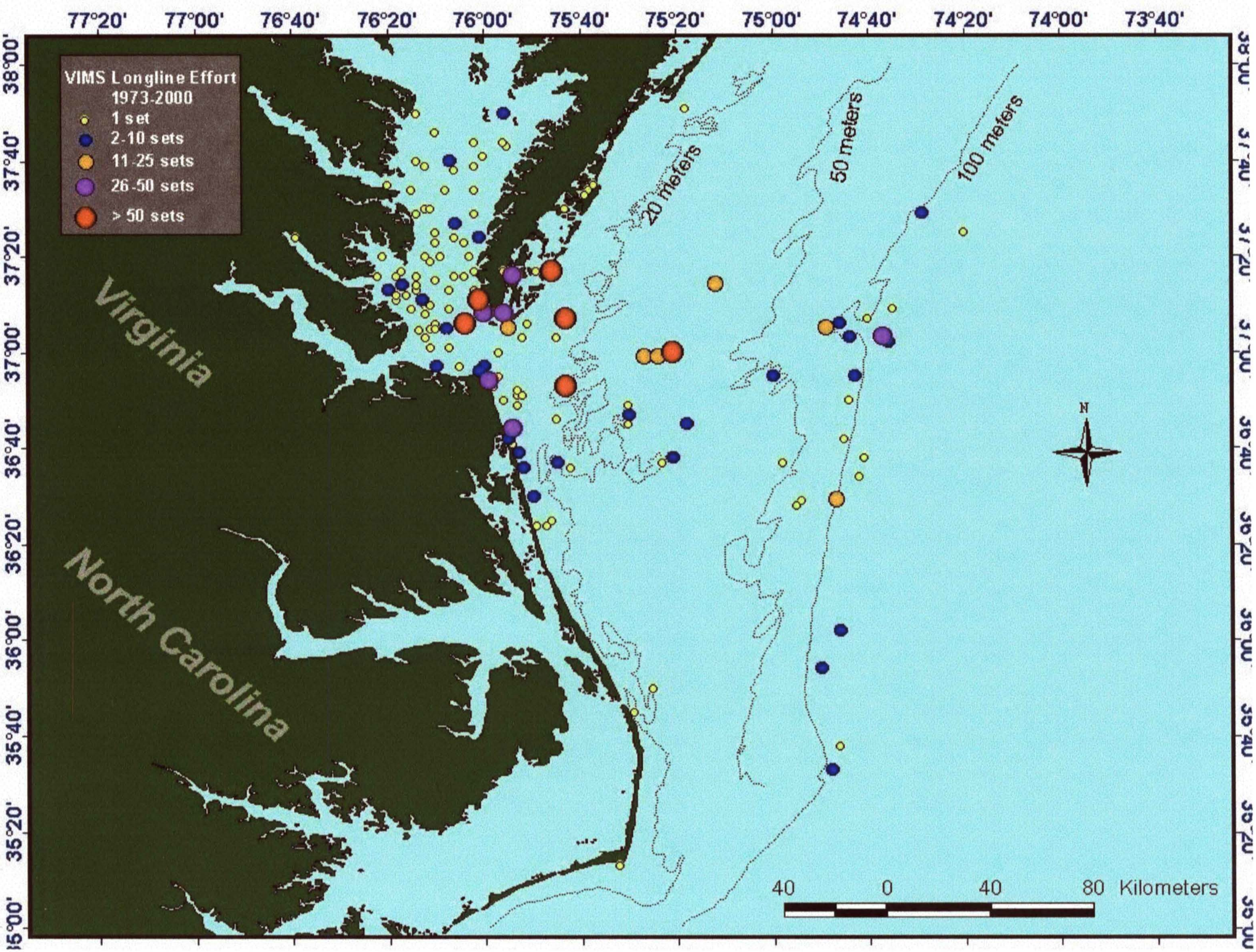
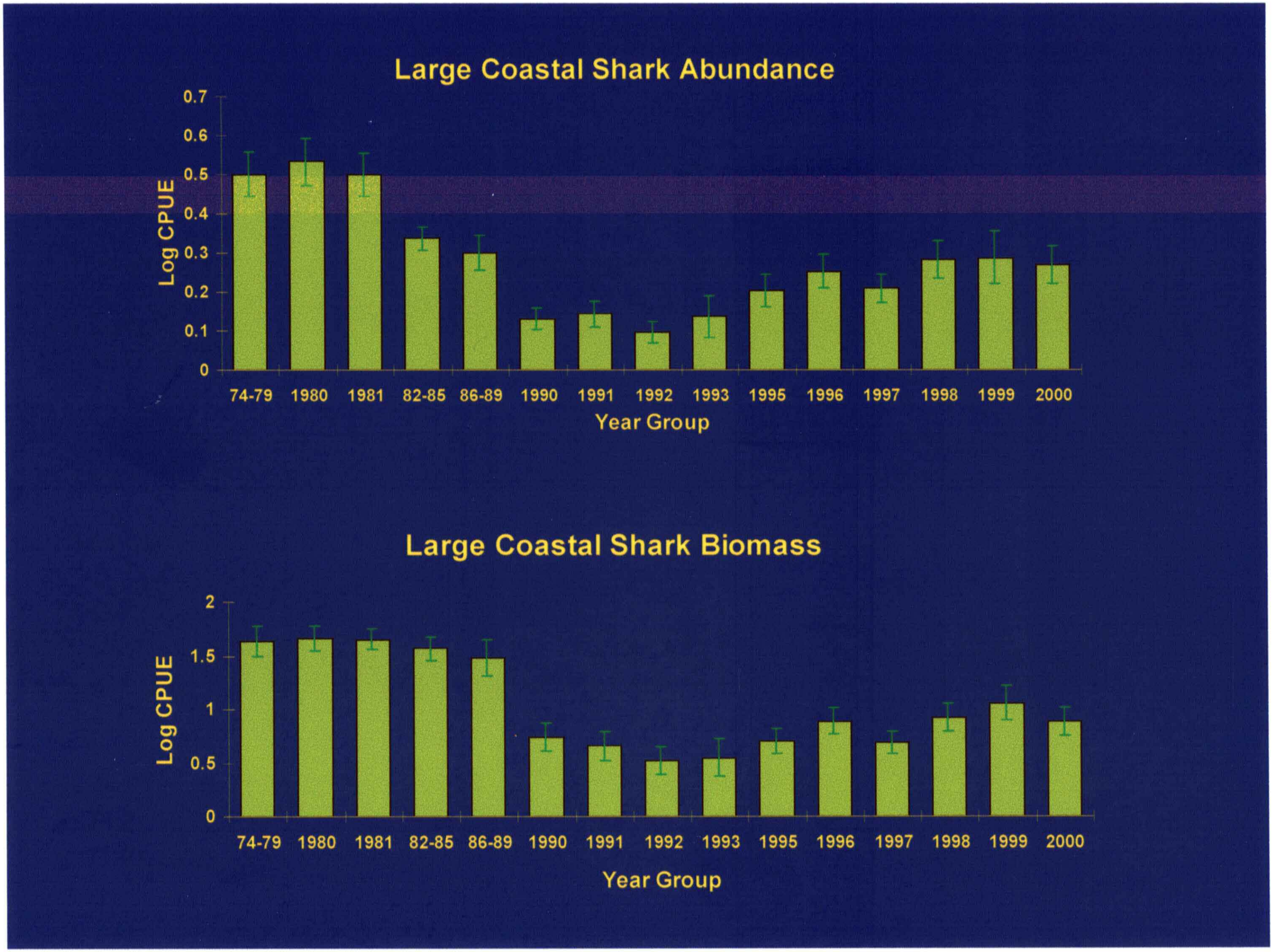

VIMS Longline Effort
1973-2000
1 set
2-10 sets
11-25 sets
26-50 sets
> 50 sets
Virginia
North Carolina
20 meters
50 meters
100 meters
N
40 0 40 80 Kilometers
77°20' 77°00' 76°40' 76°20' 76°00' 75°40' 75°20' 75°00' 74°40' 74°20' 74°00' 73°40'
38°00' 37°40' 37°20' 37°00' 36°40' 36°20' 36°00' 35°40' 35°20' 35°00'

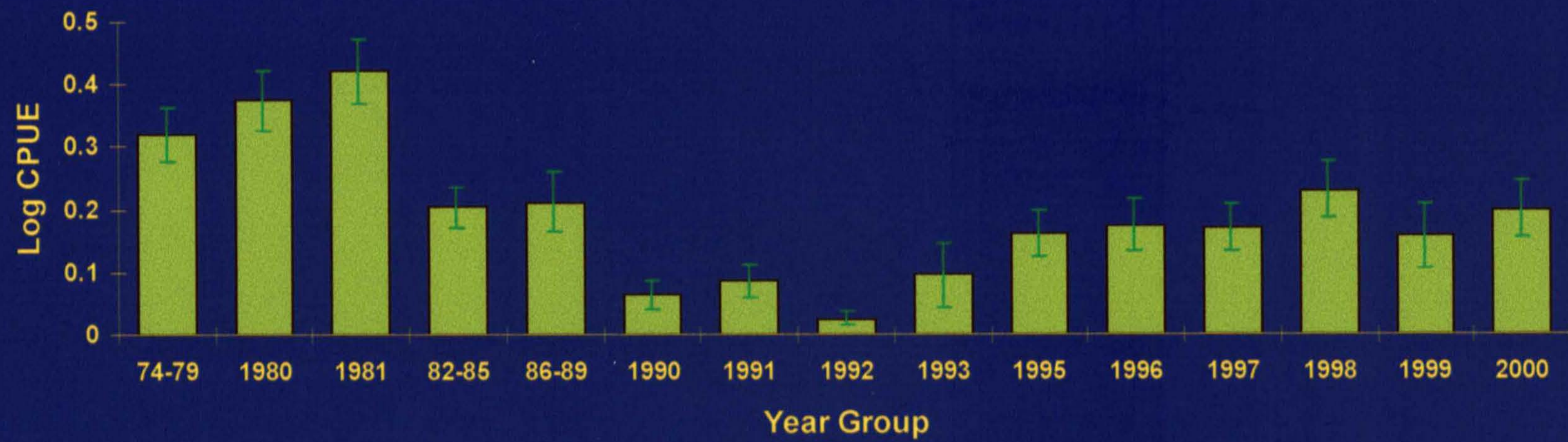
Figure 2. Log catch per unit effort for a) large coastal shark abundance, b) large coast shark biomass 1973-2000.



Large Coastal Shark Abundance
Log CPUE
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
74-79
1980
1981
82-85
86-89
1990
1991
1992
1993
1995
1996
1997
1998
1999
2000
Year Group
Large Coastal Shark Biomass
Log CPUE
2
1.5
1
0.5
0
74-79
1980
1981
82-85
86-89
1990
1991
1992
1993
1995
1996
1997
1998
1999
2000
Year Group

Figure 3. Log catch per unit effort for a) sandbar shark abundance, b) sandbar shark biomass from 1974-2000 (Error bars are standard error of the mean).

C. plumbeus (Sandbar Shark) Abundance



C. plumbeus (Sandbar Shark) Biomass

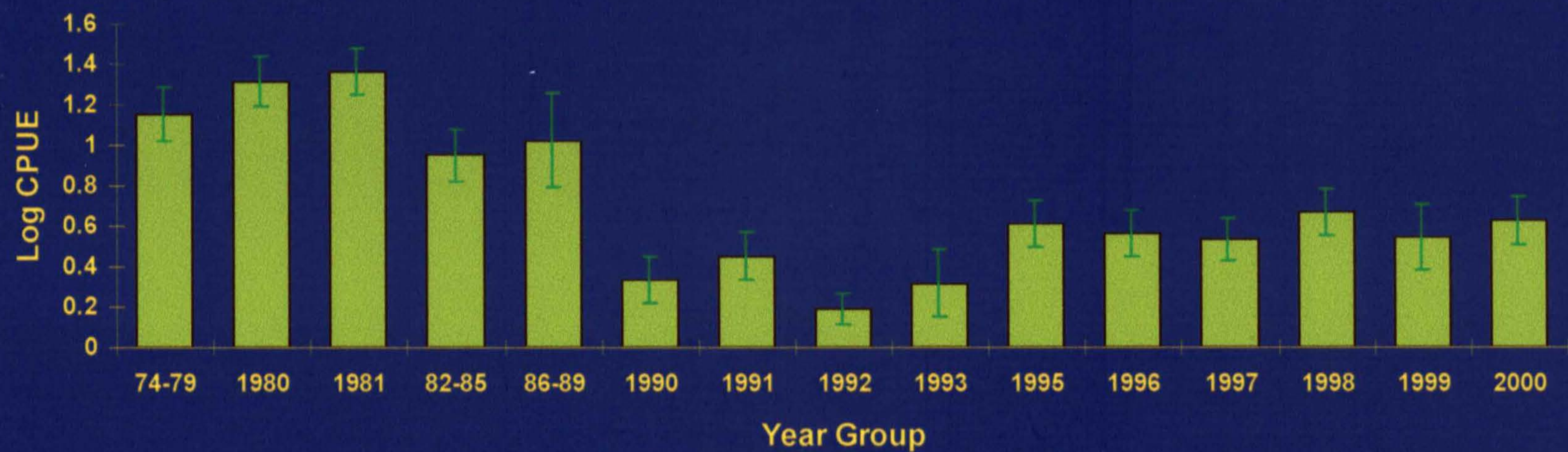
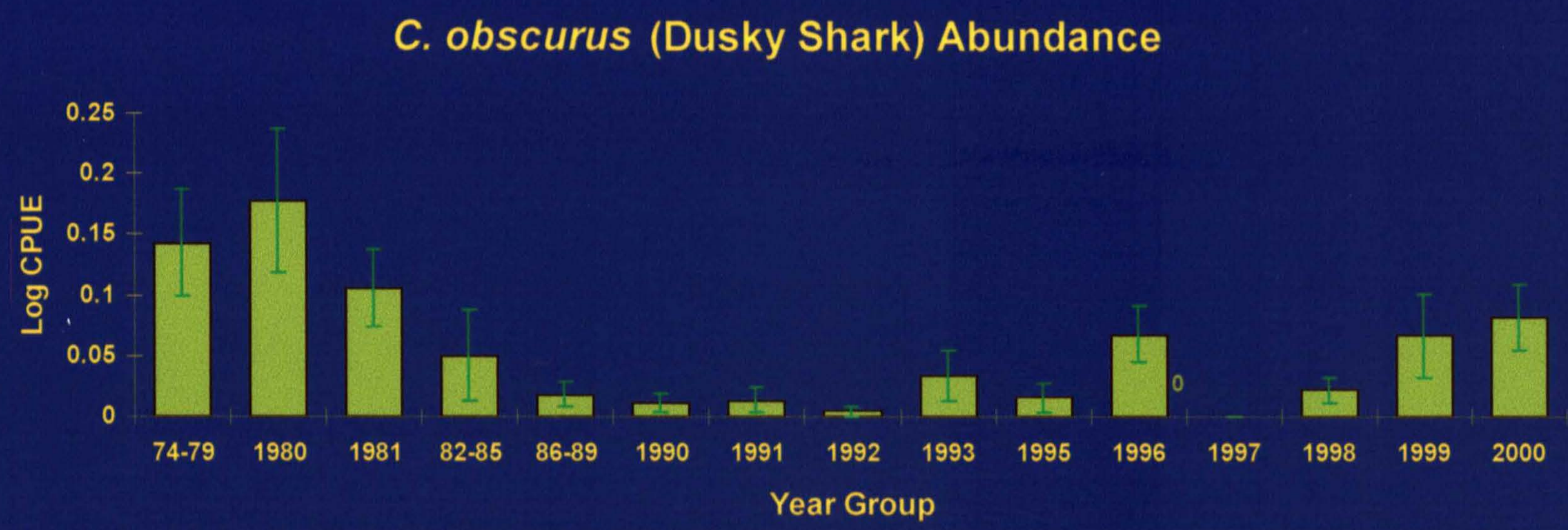


Figure 4. Log catch per unit effort for a) dusky shark abundance b) dusky shark biomass from 1974-2000 (error bars are standard error of the mean).


C. obscurus (Dusky Shark) Abundance
Log CPUE
0.25
0.2
0.15
0.1
0.05
0
74-79
1980
1981
82-85
86-89
1990
1991
1992
1993
1995
1996
1997
1998
1999
2000
Year Group

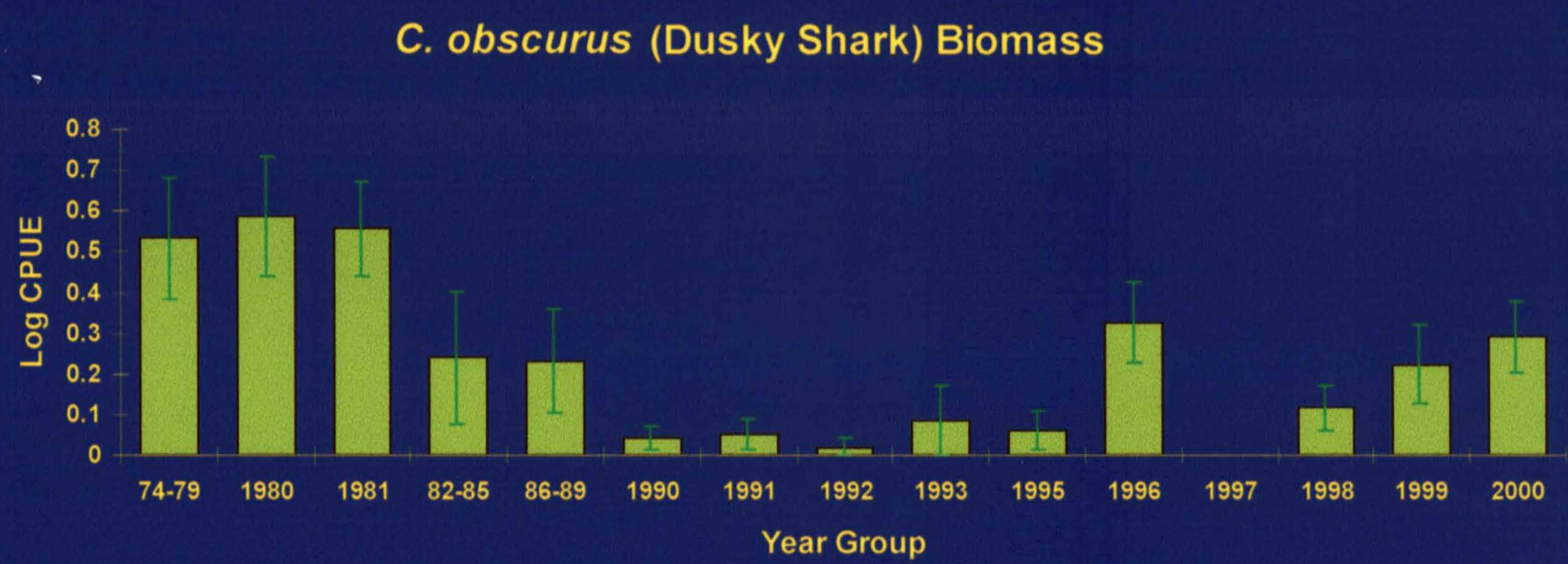
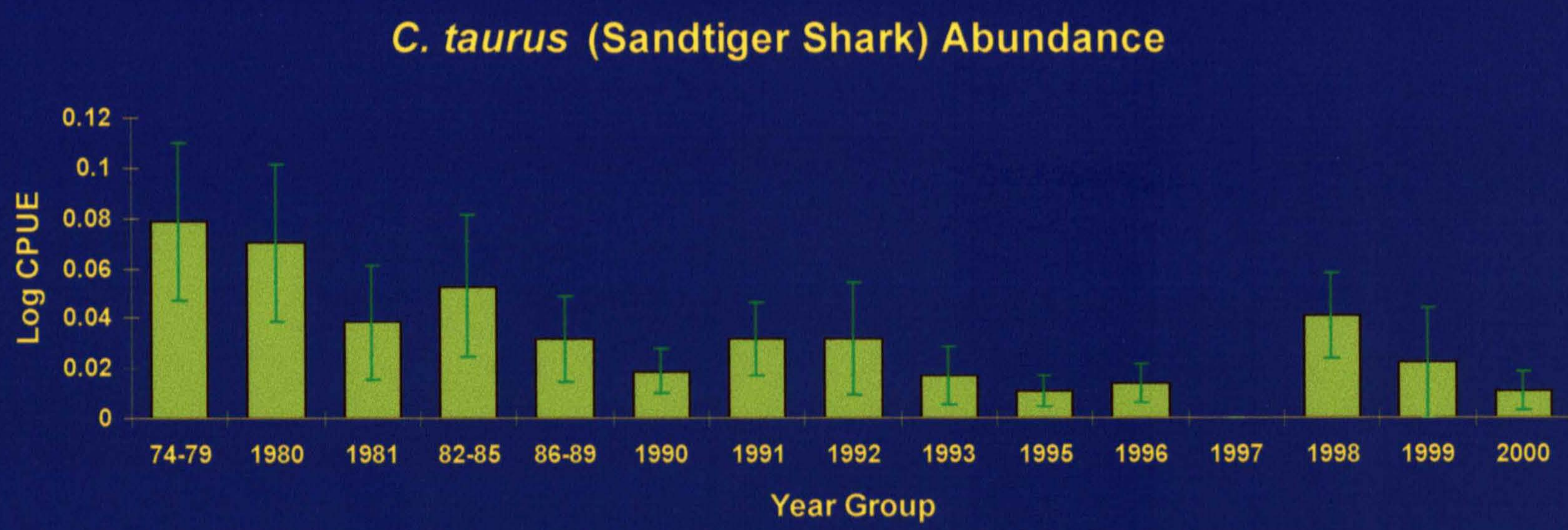

C. obscurus (Dusky Shark) Biomass
Log CPUE
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
74-79
1980
1981
82-85
86-89
1990
1991
1992
1993
1995
1996
1997
1998
1999
2000
Year Group

Figure 5. Log catch per unit effort for a) sandtiger shark abundance, b) sandtiger shark biomass from 1974-2000 (error bars are standard error of the mean).


C. taurus (Sandtiger Shark) Abundance
Log CPUE
0.12
0.1
0.08
0.06
0.04
0.02
0
74-79
1980
1981
82-85
86-89
1990
1991
1992
1993
1995
1996
1997
1998
1999
2000
Year Group

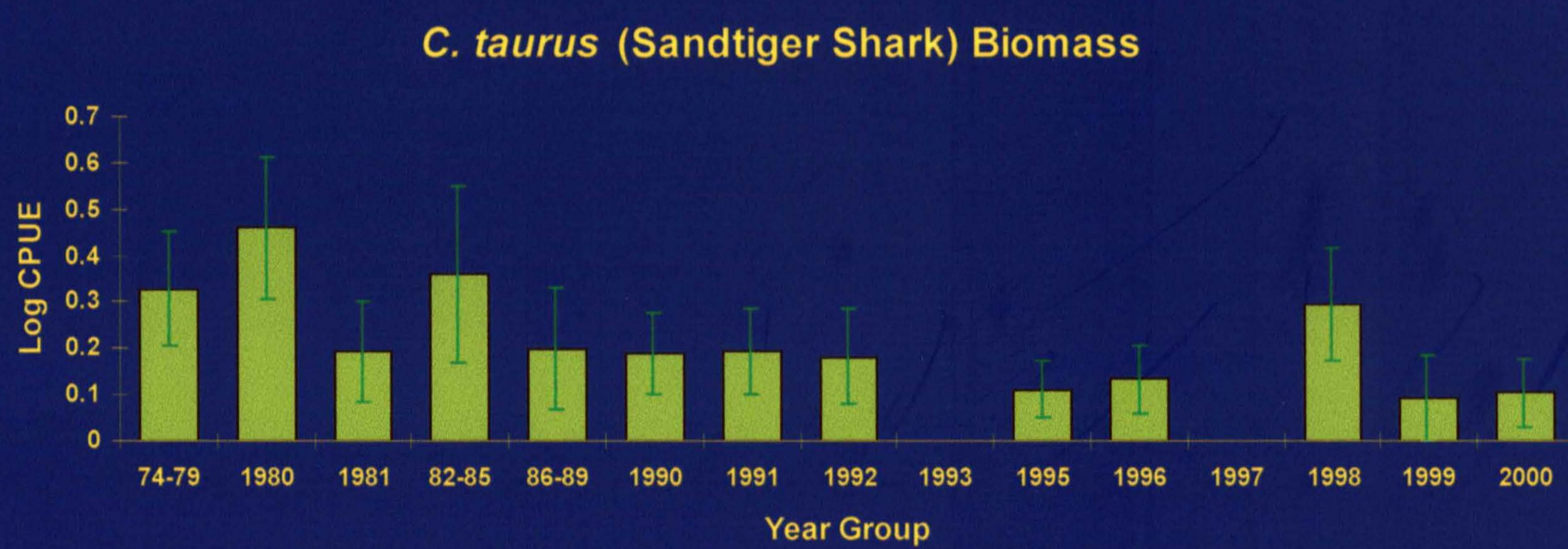
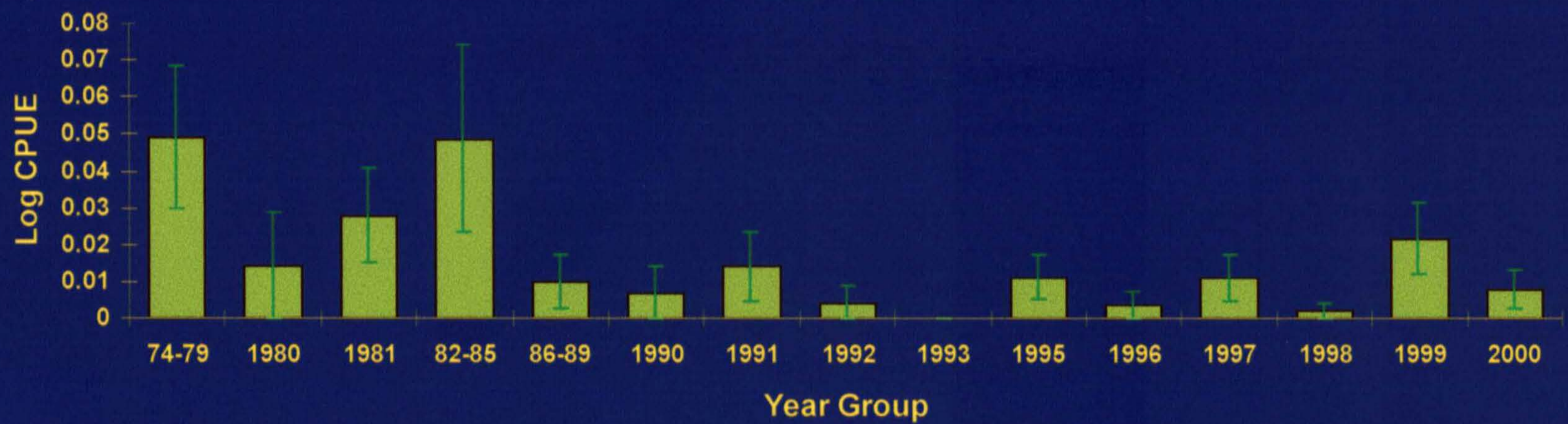

C. taurus (Sandtiger Shark) Biomass
Log CPUE
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
74-79
1980
1981
82-85
86-89
1990
1991
1992
1993
1995
1996
1997
1998
1999
2000
Year Group

Figure 6. Log catch per unit effort for a) tiger shark abundance, b) tiger shark biomass from 1974-2000 (Error bars are standard error of the mean).

G. cuvier (Tiger Shark) Abundance



G. cuvier (Tiger Shark) Biomass

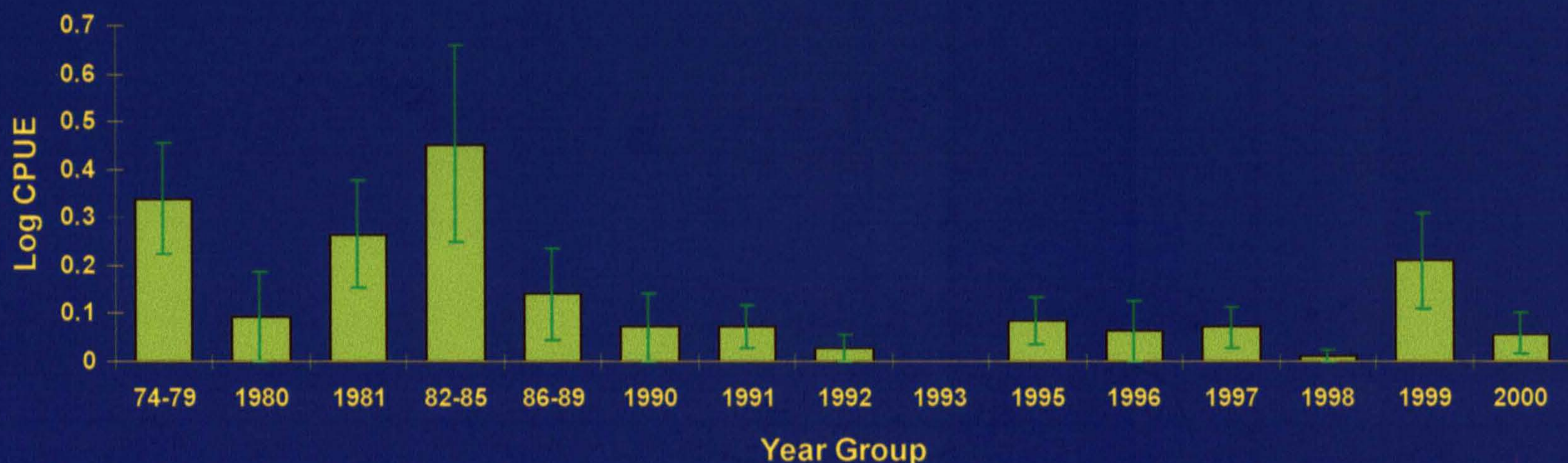
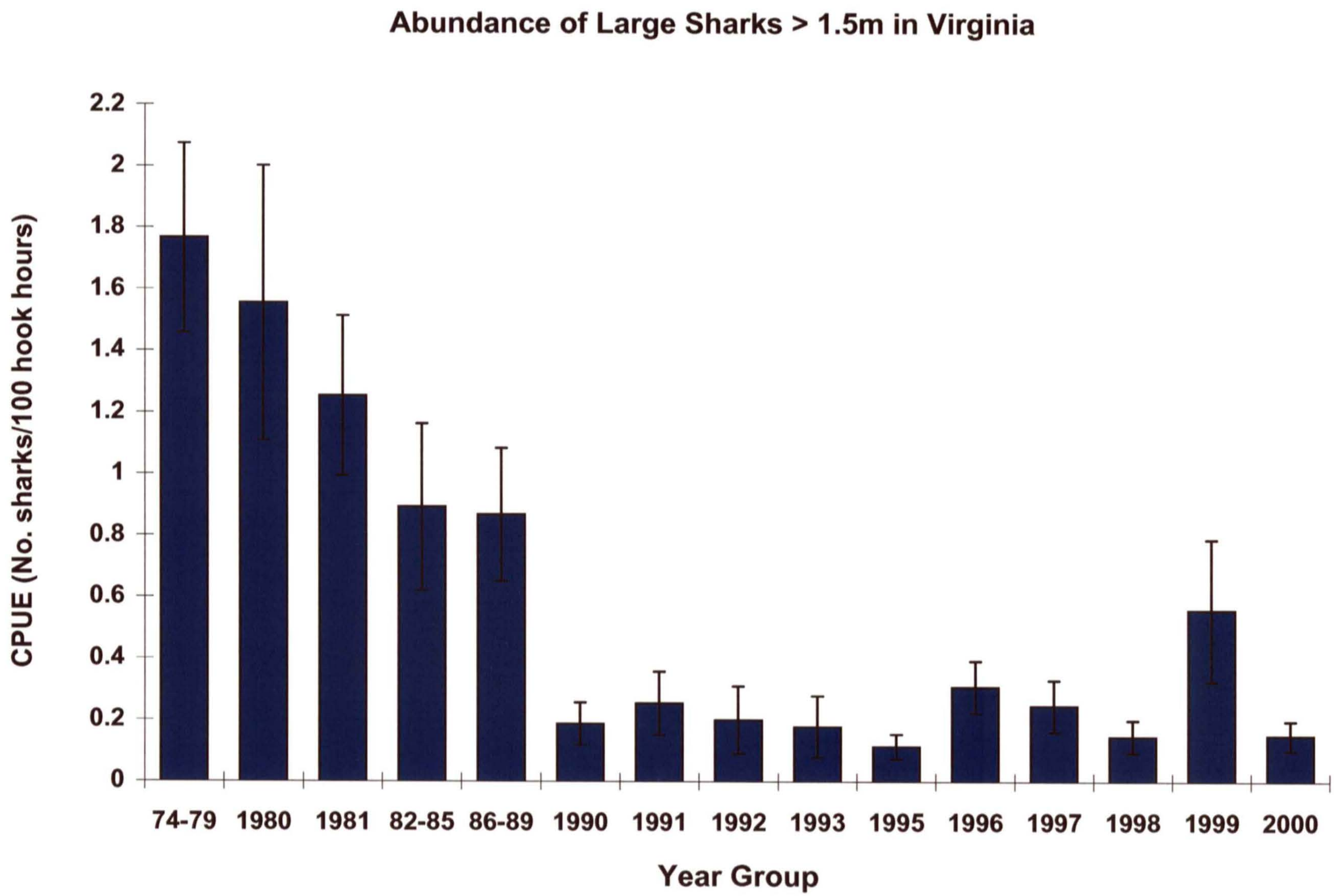


Figure 7. Abundance of large sharks in Virignia.



Abundance of Large Sharks > 1.5m in Virginia
CPUE (No. sharks/100 hook hours)
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
74-79
1980
1981
82-85
86-89
1990
1991
1992
1993
1995
1996
1997
1998
1999
2000
Year Group

Figure 8. Shark abundance by dominant species in the Virginia nearshore coastal zone
(data from VIMS longline surveys)

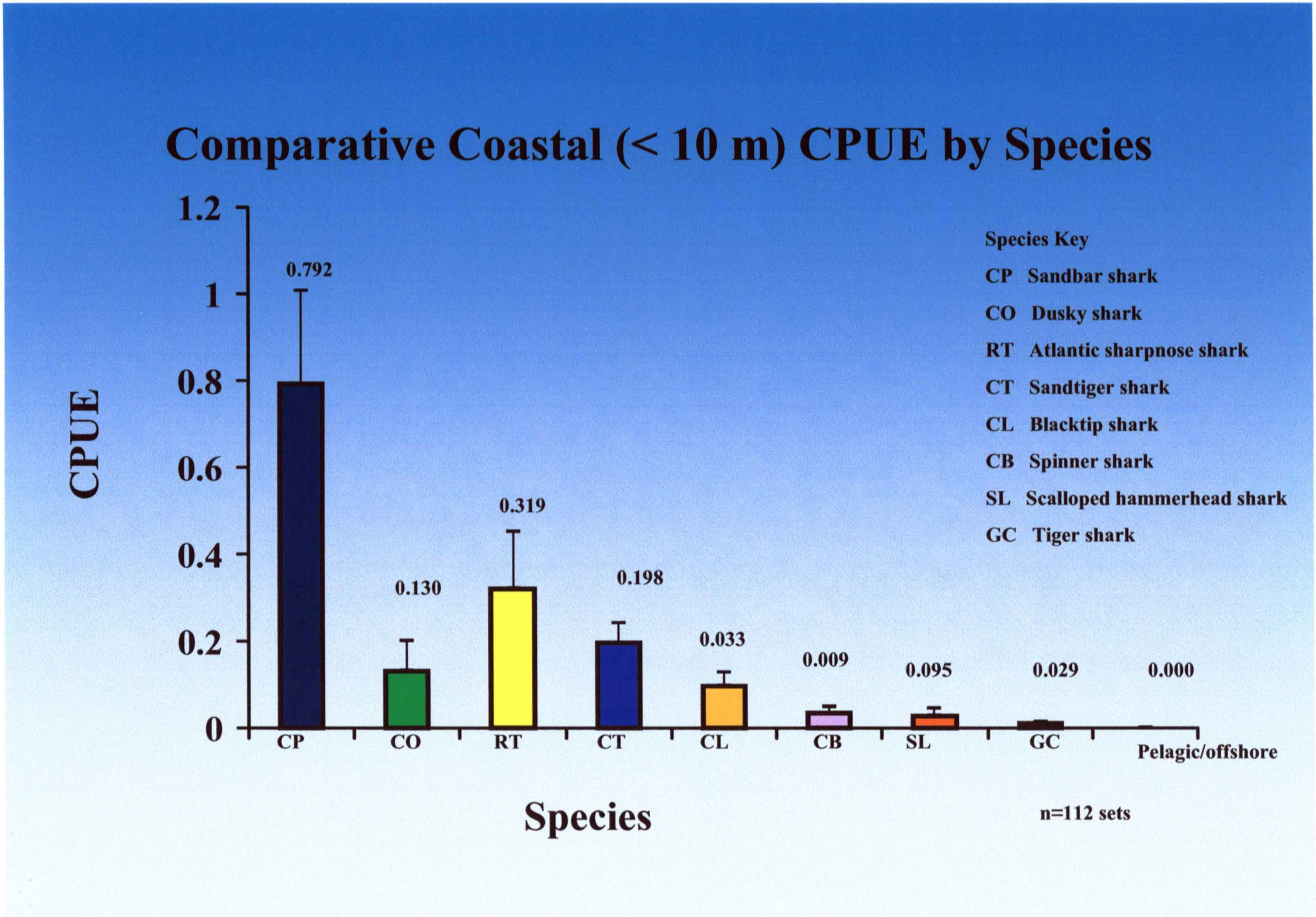

Comparative Coastal (< 10 m) CPUE by Species
1.2
1
0.8
0.6
0.4
0.2
0
CPUE
0.792
0.130
0.319
0.198
0.033
0.009
0.095
0.029
0.000
CP
CO
RT
CT
CL
CB
SL
GC
Pelagic/offshore
Species
Species Key
CP Sandbar shark
CO Dusky shark
RT Atlantic sharpnose shark
CT Sandtiger shark
CL Blacktip shark
CB Spinner shark
SL Scalloped hammerhead shark
GC Tiger shark
n=112 sets

Figure 9. Shark abundance by dominant species within Chesapeake Bay (data from VIMS longline surveys).

Comparative Bay CPUE by Species

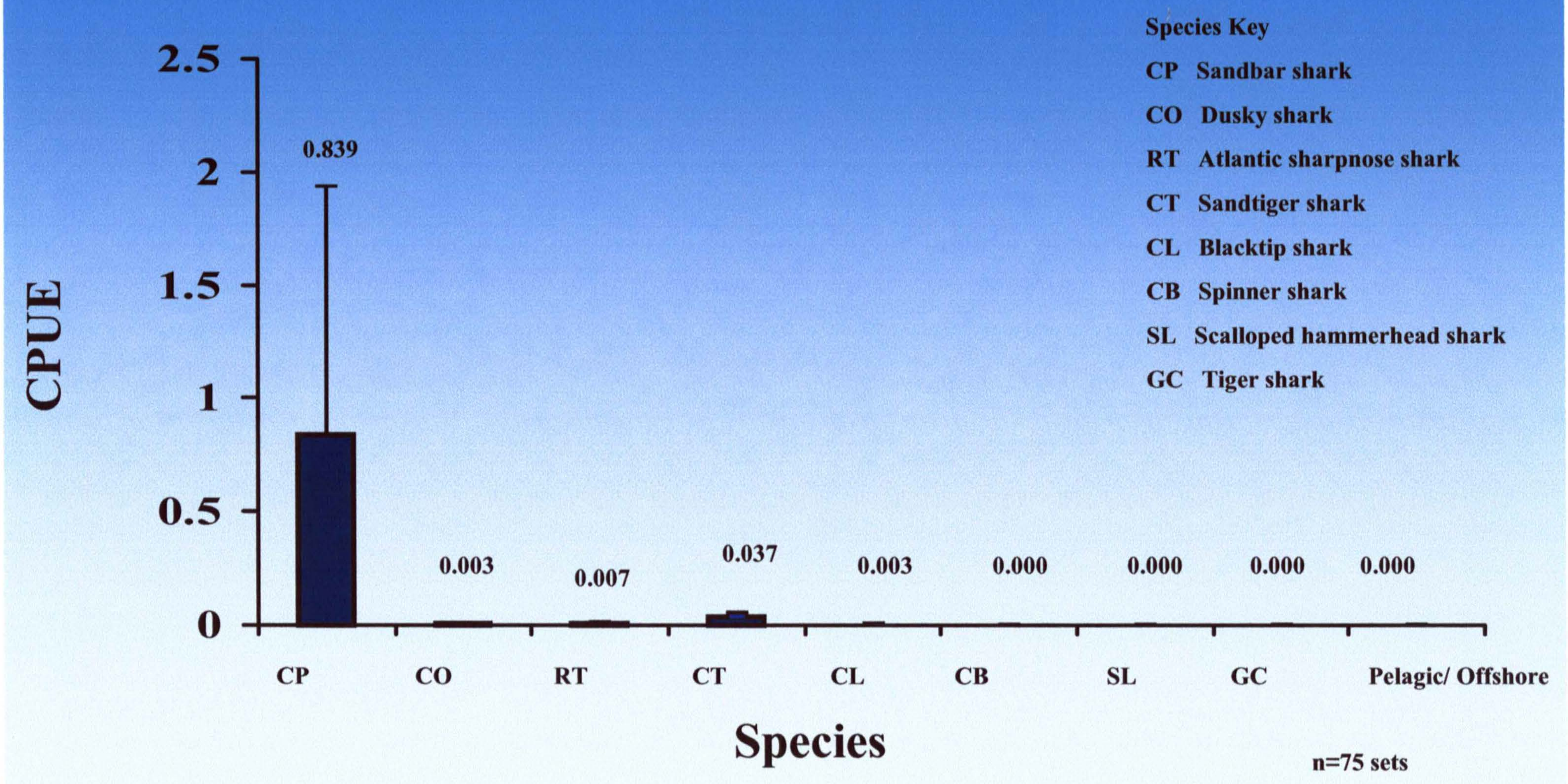


Figure 10. Number of shark attacks vs. human population growth in Florida

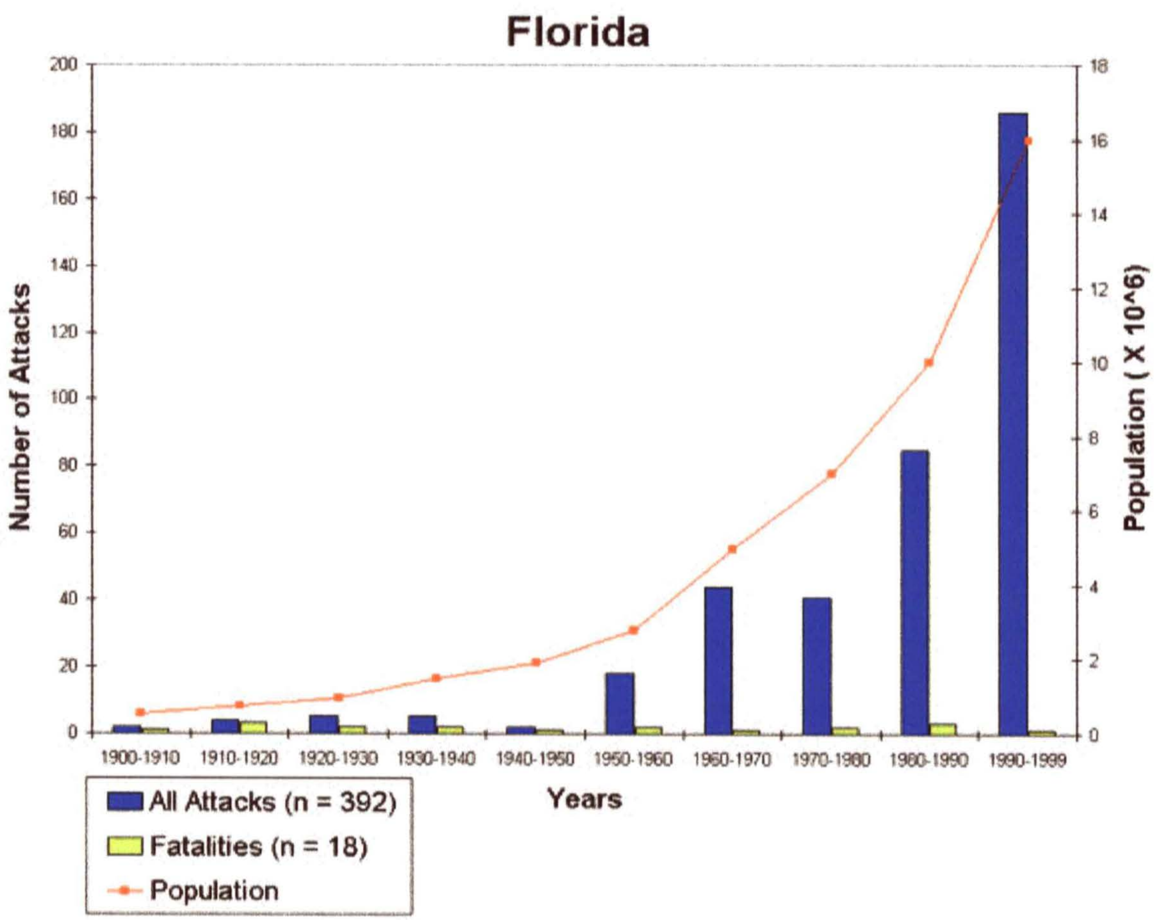

Florida
Number of Attacks
200
180
160
140
120
100
80
60
40
20
0
Population (X 10^6)
18
16
14
12
10
8
6
4
2
0
1900-1910
1910-1920
1920-1930
1930-1940
1940-1950
1950-1960
1960-1970
1970-1980
1980-1990
1990-1999
Years
All Attacks (n = 392)
Fatalities (n = 18)
Population

Table 1
Bull sharks caught by the VIMS longline project from 1973-2000

DATE	STATION	LATITUDE	LONGITUDE	SEX	PCL	FL	TL
July 22, 1976	Nautilus shoal	3705	7555	M	173	187	224
June 23, 1978	Sand shoal inlet	3717	7546	F	180	218	241
September 15, 1981	Sand shoal inlet	3717	7546	F	124	142	169
September 15, 1981	Sand shoal inlet	3717	7546	M	147	162	201
June 13, 1983	Magothy bay	3708	7556	M	143	158	199
June 15, 1984	Magothy bay	3708	7556	F	167	184	227
June 9, 1986	Chesapeake bay	3705	7608	F	163	178	223
June 9, 1987	Sand shoal inlet	3717	7546	M		157	209
September 20, 1991	Kiptopeke	3708	7600	F			170