CEPHALOPOD PREY OF THE APEX PREDATOR GUILD IN THE EPIPELAGIC EASTERN PACIFIC OCEAN

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OVERVIEW

- Sharks, billfishes, tunas, dolphins and mahi-mahi are the main predators on cephalopods in the Eastern Pacific waters (Perrin et al. 1973; Galvan et al. 1985,1989; Abitia-Cárdenas et al. 1997,1998, 1999, 2001;Aguilar 1998, Markaida and Sosa 1998; Galvan 1999. Olson and Galvan 2002; Rosas-Alayola et al. 2002) .

- The stomach contents of these predators permit to know the distribution and abundance of cephalopods, considering the difficulty to catch them with traditional methods.
- Pelagic predators have shown to be the most effective cephalopod samplers, considering their size mouth and velocity they can capture cephalopods of all sizes.

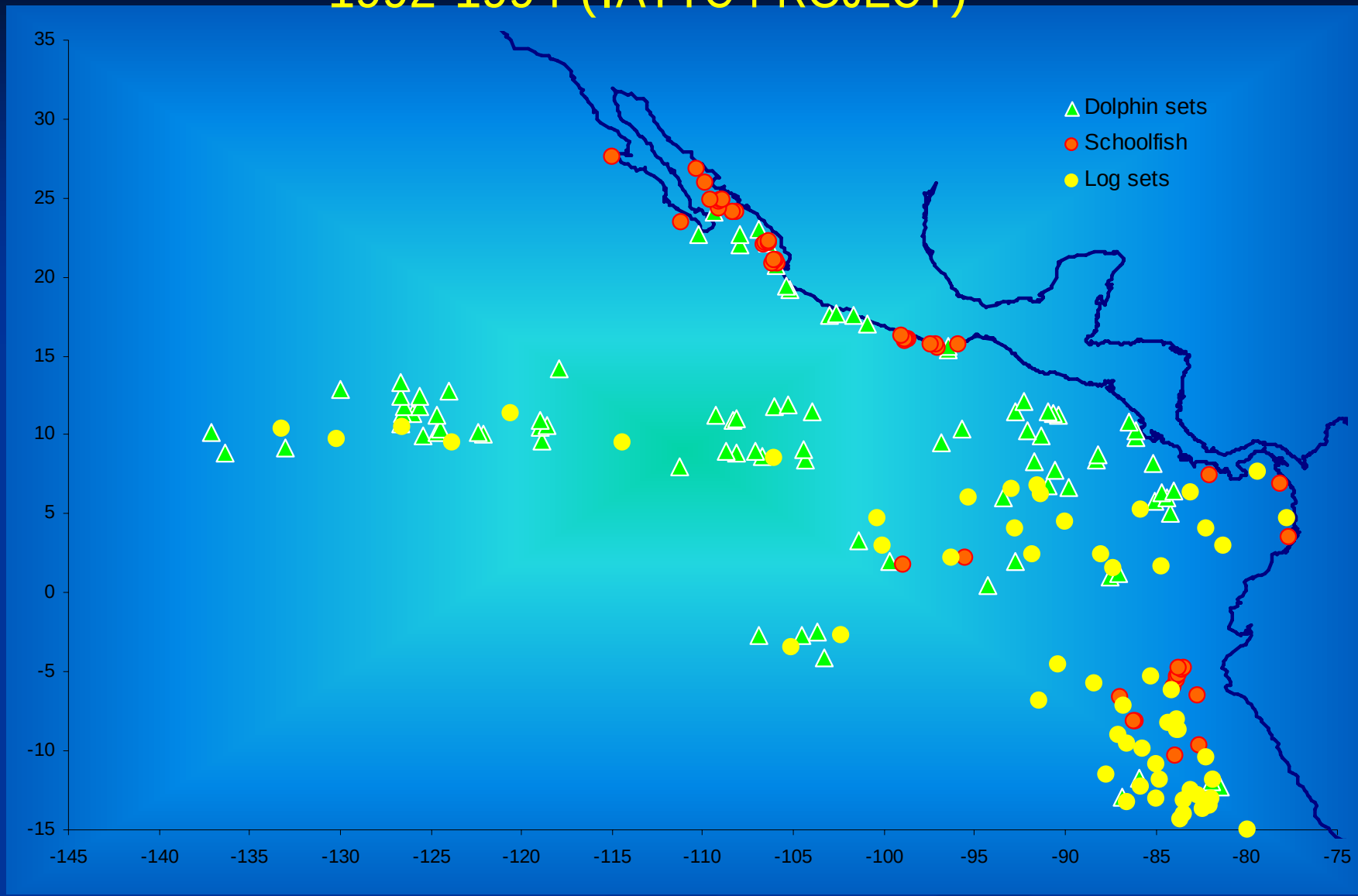
- One of the main problems to analyze the stomach contents in large predators is the advanced digestion state found in prey. In cephalopods, the mandibles (beaks) are the most frequent structure found in the stomachs, because their chemical composition is chitin, which is more resistant to predators gastric acids.

METHODS

- TWO DATA BASE WERE USED TO ANALYZE THE INFORMATION ON CEPHALOPODS IN THE EASTERN PACIFIC OCEAN:

- 1992-1994 . IATTC PROJECT. TO FOUND THE RELATIONSHIP BETWEEN YELLOWFIN TUNA AND DOLPHINS IN THE EASTERN PACIFIC OCEAN. PURSE-SEINERS FROM PANAMA, VENEZUELA AND MEXICO.

1992-1994 (IATTC PROJECT)

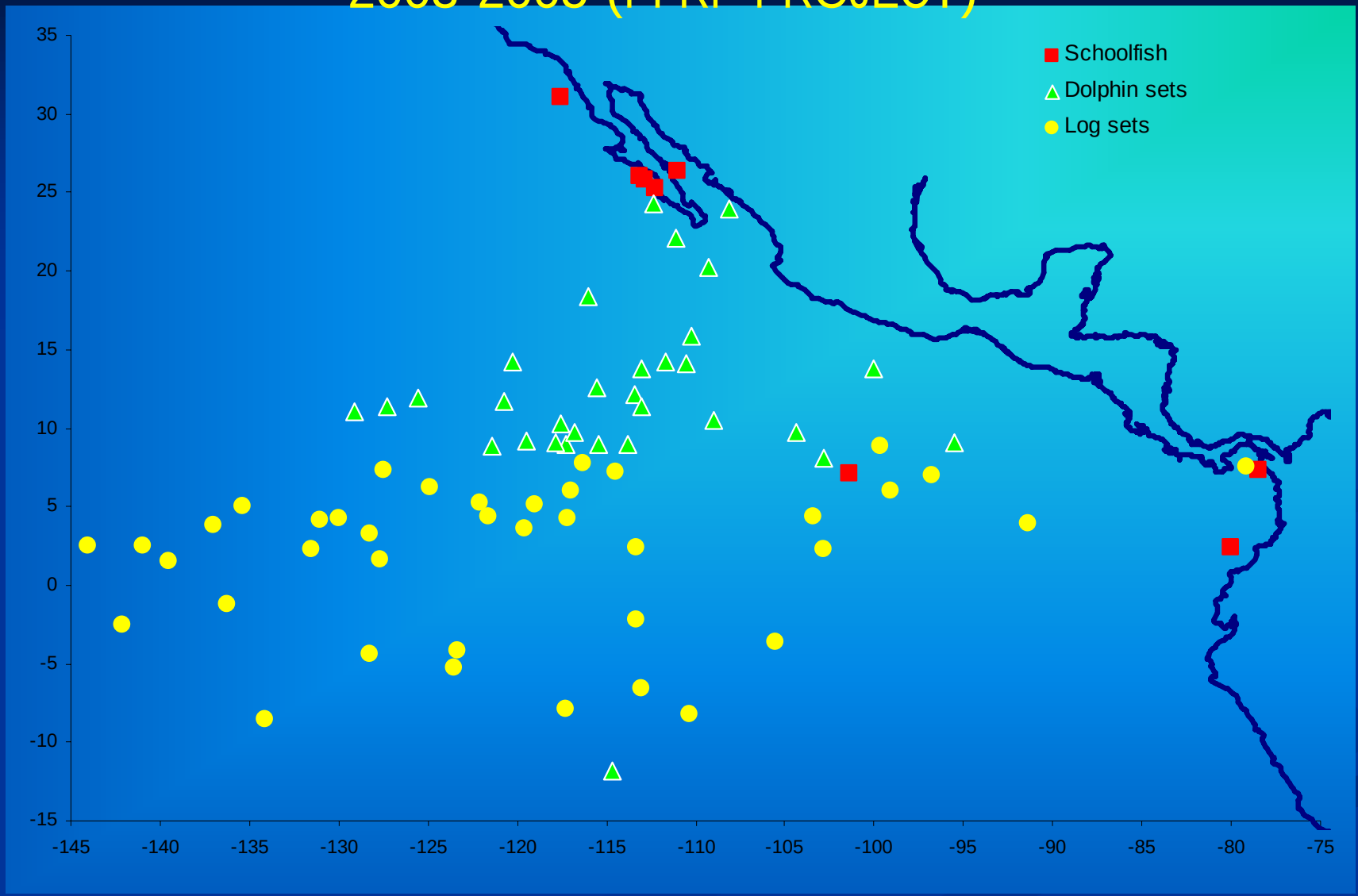


Predator		Number
Stenella attenuata	Spotted dolphin manchado	311
Stenella longirostris	Spinner dolphin	209
Delphinus delphis	Common Dolphin	51
Stenella coeruleoalba	Striped dolphin	5
Thunnus albacares	Yellowfin tuna	4831
Katsuwonus pelamis	Skipjack tuna	1205
Thunnus obesus	Bigeye tuna	80
Euthynnus lineatus	Black skipjack	100
Auxis spp.	Bullet tuna	55
Carcharhinus limbatus	Black tip shark	262
Carcharhinus falciformis	Silky shark	64
Carcharhinus longimanus	Whitetip shark	30
Carcharhinus leucas	Bull shark	2
Carcharhinus spp.	Other carcharhinids	82
Sphyrna spp.	Hammerhead shark	48
Isurus oxyrinchus	Mako shark	4
Prionace glauca	Blue shark	2
Alopias spp.	Thresher shark	12
Nasolamia velox	Whitenose sharka	2
Makaira indica	Black marlin	25
Makaira mazara	Blue marlin	15
Makaira spp.	Marlins	18
Tetrapturus audax	Striped marlin	8
Istiophorus platypterus	Sailfish	49
Coryphaena hippurus	Mahi-mahi	545
Acanthocybium solandri	Wahoo	235
Elagatis bippinulata	Rainbow-runner	48
Total		8298

1994-1995

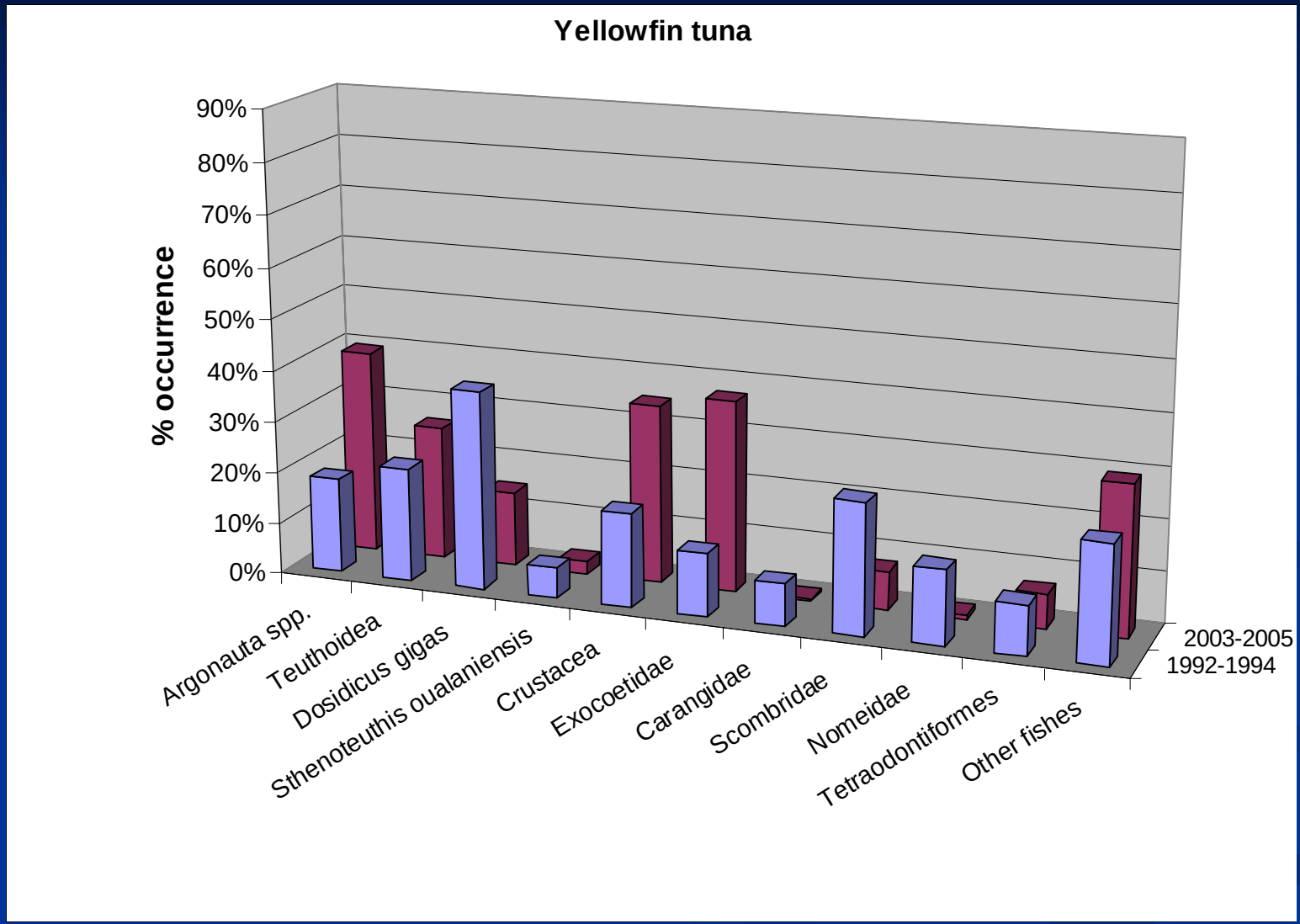
2003-2005. PFRP PROJECT. STABLE ISOTOPES AND FEEDING HABITS OF PREDATORS IN THE EQUATORIAL PACIFIC OCEAN. PURSE-SEINERS FROM ECUADOR AND MEXICO.

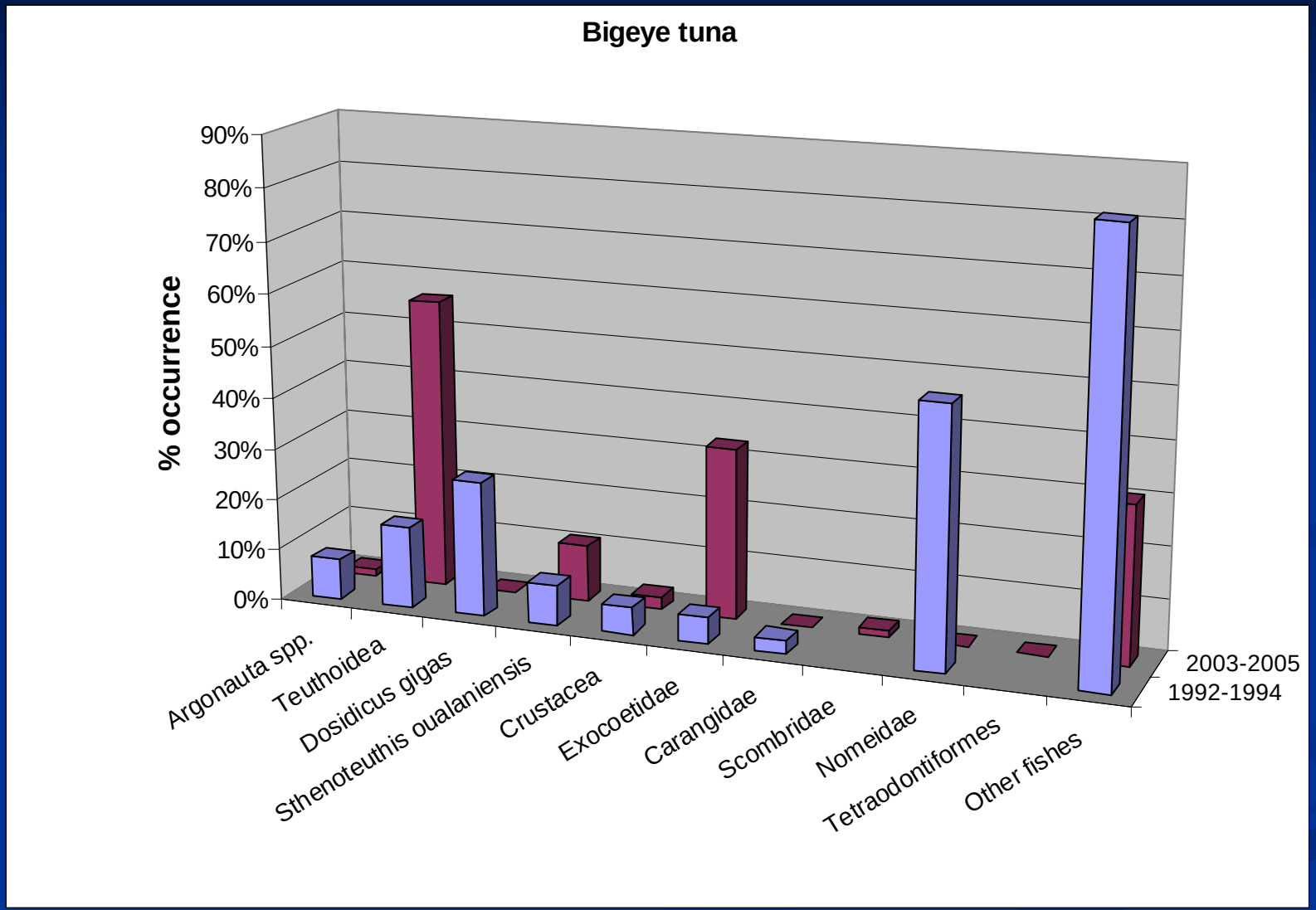
2003-2005 (PFRP PROJECT)

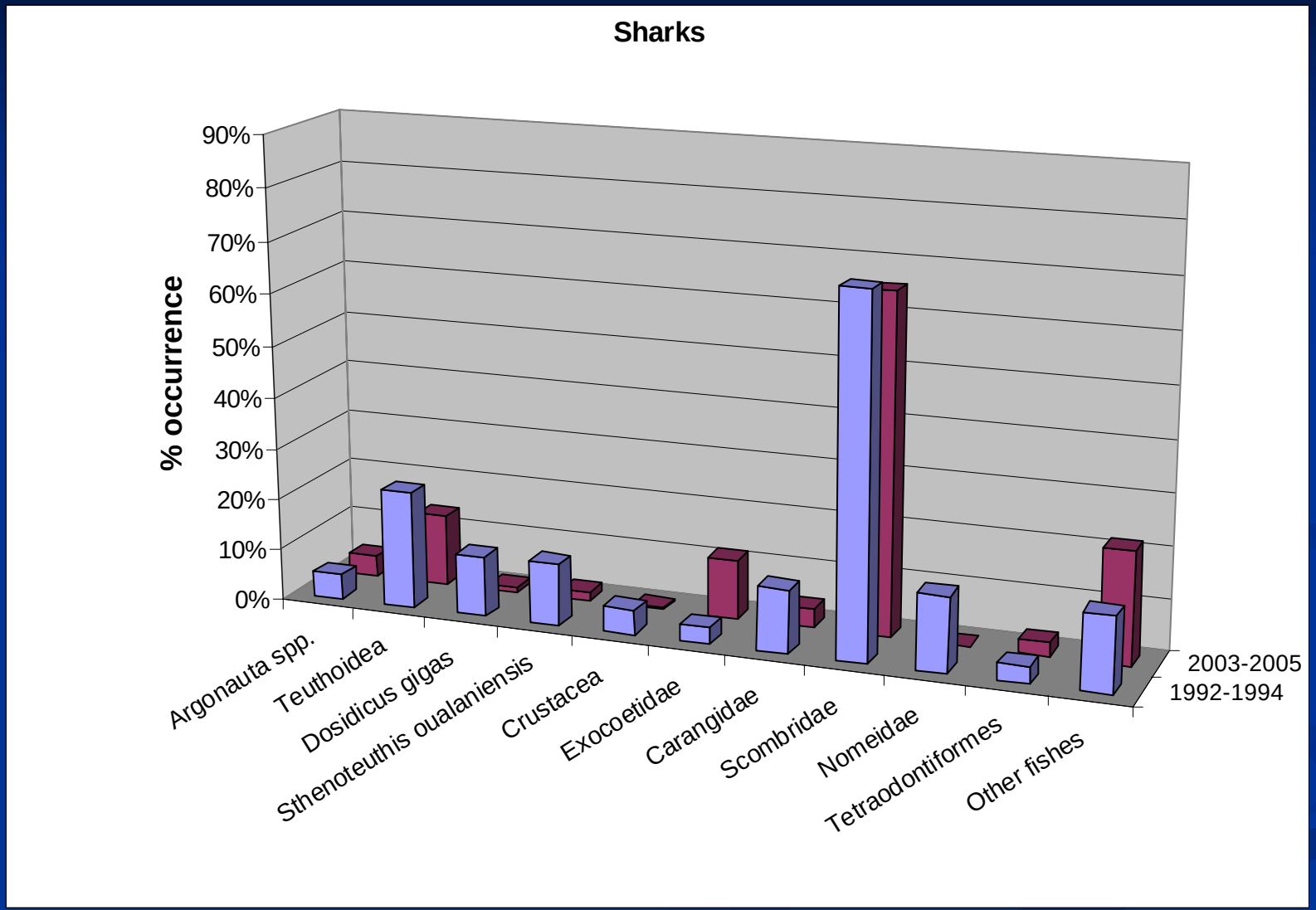


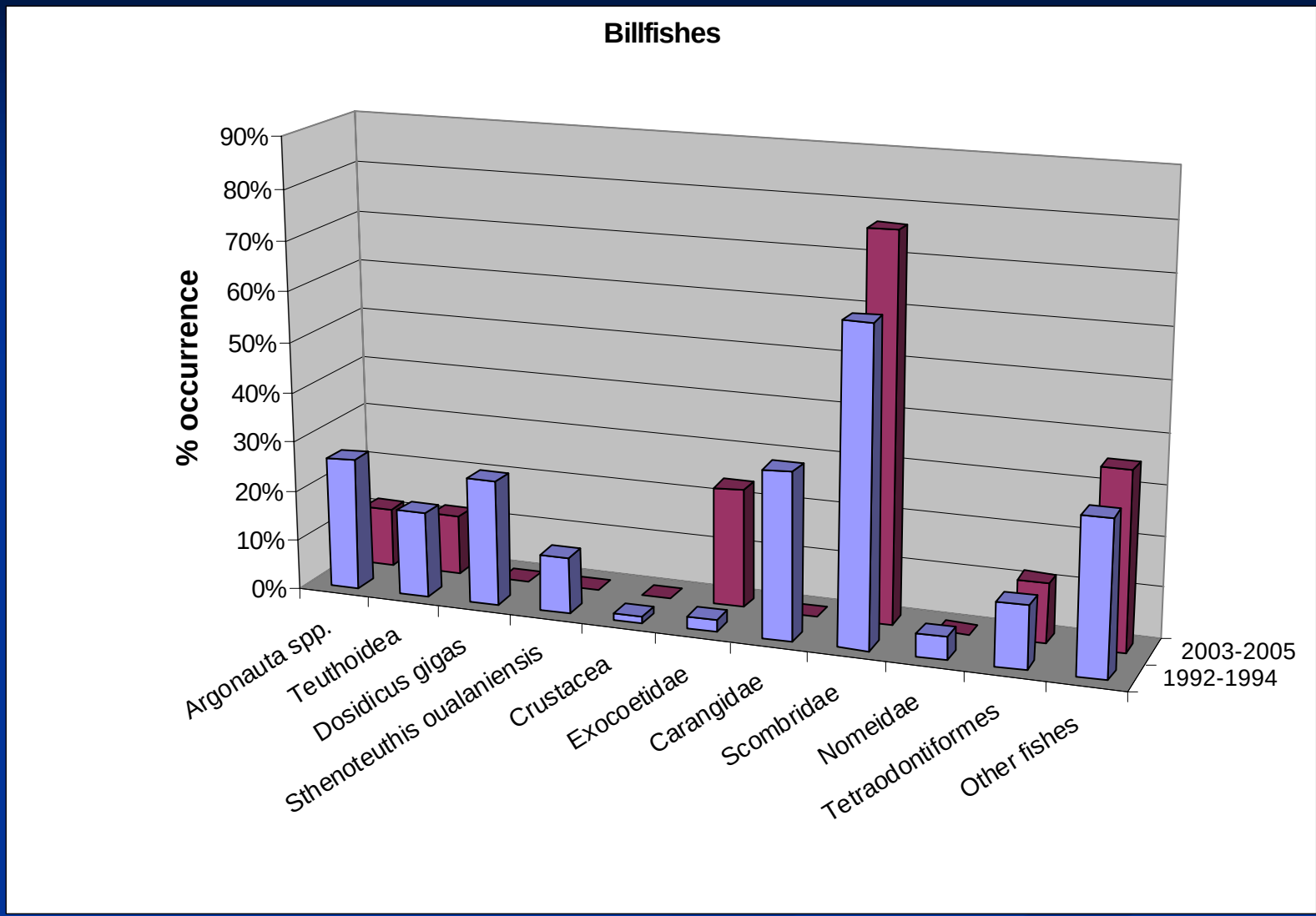
PREDATOR	NUMBER	PREDATOR	NUMBER
Alopias pelagicus	3	*Auxis rocheii.*	12
Carcharhinus falciformis	290	*Auxis thazard*	8
C. limbatus	5	*Euthynnus lineatus*	37
C. longimanus	4	*Katsuwonus pelamis*	310
Isurus oxyrinchus	2	*Thunus albacares*	937
Sphyrna spp.	1	*Thunnus obesus*	82
Sphyrna zygaena	3	*Thunnus orientalis*	7
Sphyraena ensis	2	*Stenella attenuata*	1
Sphyraena spp.	2	*Stenella longirostris*	1
Kiphosus elegans	18	*Uraspis helvola*	2
Kiphosus analogus	10	*Seriola lalandi*	3
Kiphosus spp.	2	*Seriola rivoliana*	46
Makaira nigricans	14	*Elagatis bipinnulata*	171
Istiophorus platypterus	1	*Decapterus macarelus*	23
Tetrapturus audax	1	*Caranx sexfasciatum*	8
Tetrapturus angustirostris	1	*Caranx* spp.	11
Acanthocybium solandrii	417	*Aluterus monoceros*	8
Lobotes pacificus	18	*Aluterus scriptus*	9
Corypahena hippurus	291	*Balistes polylepis*	1
C. equiselis	4	*Canthidermis maculatus*	92
TOTAL		2 488	

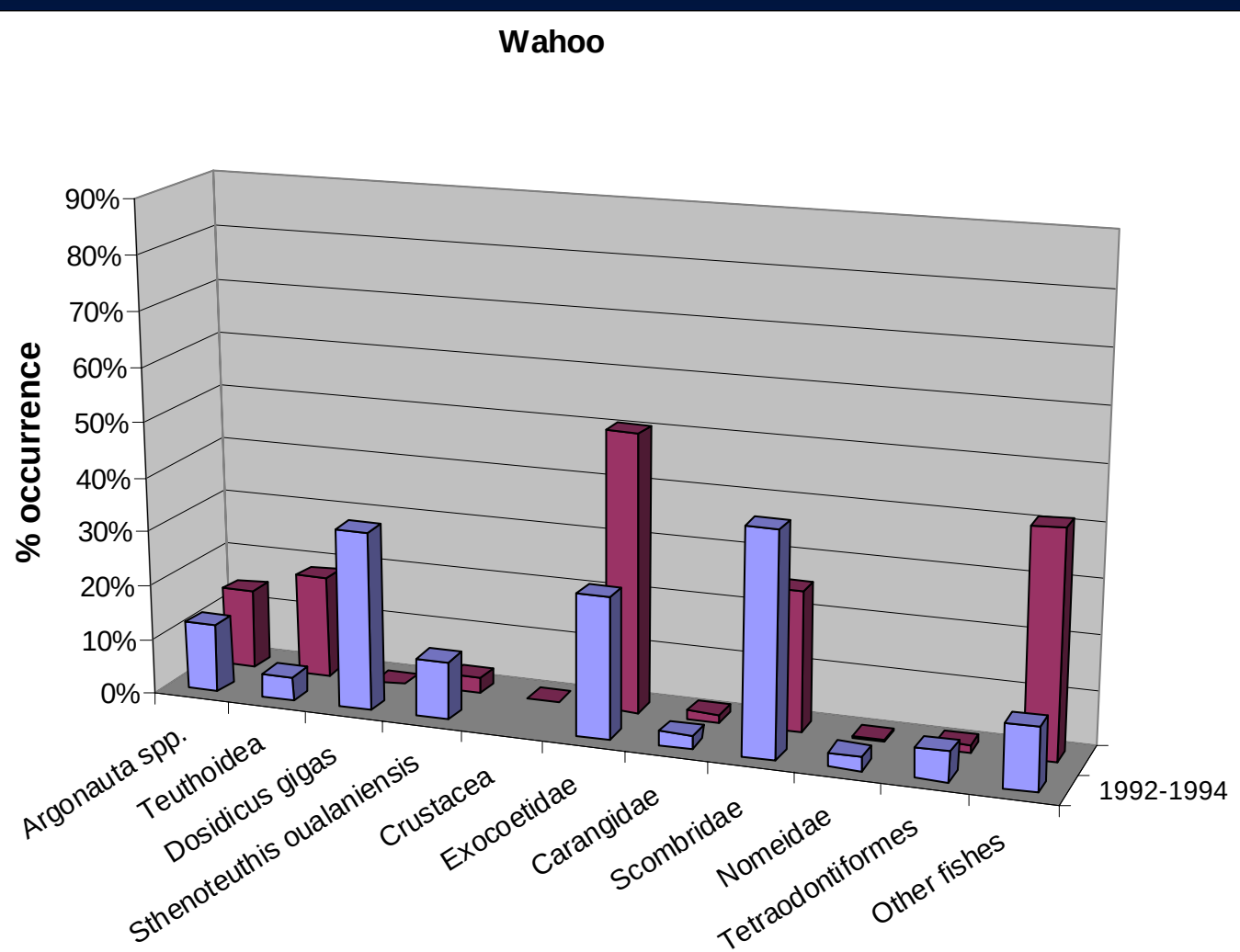
2003-2005

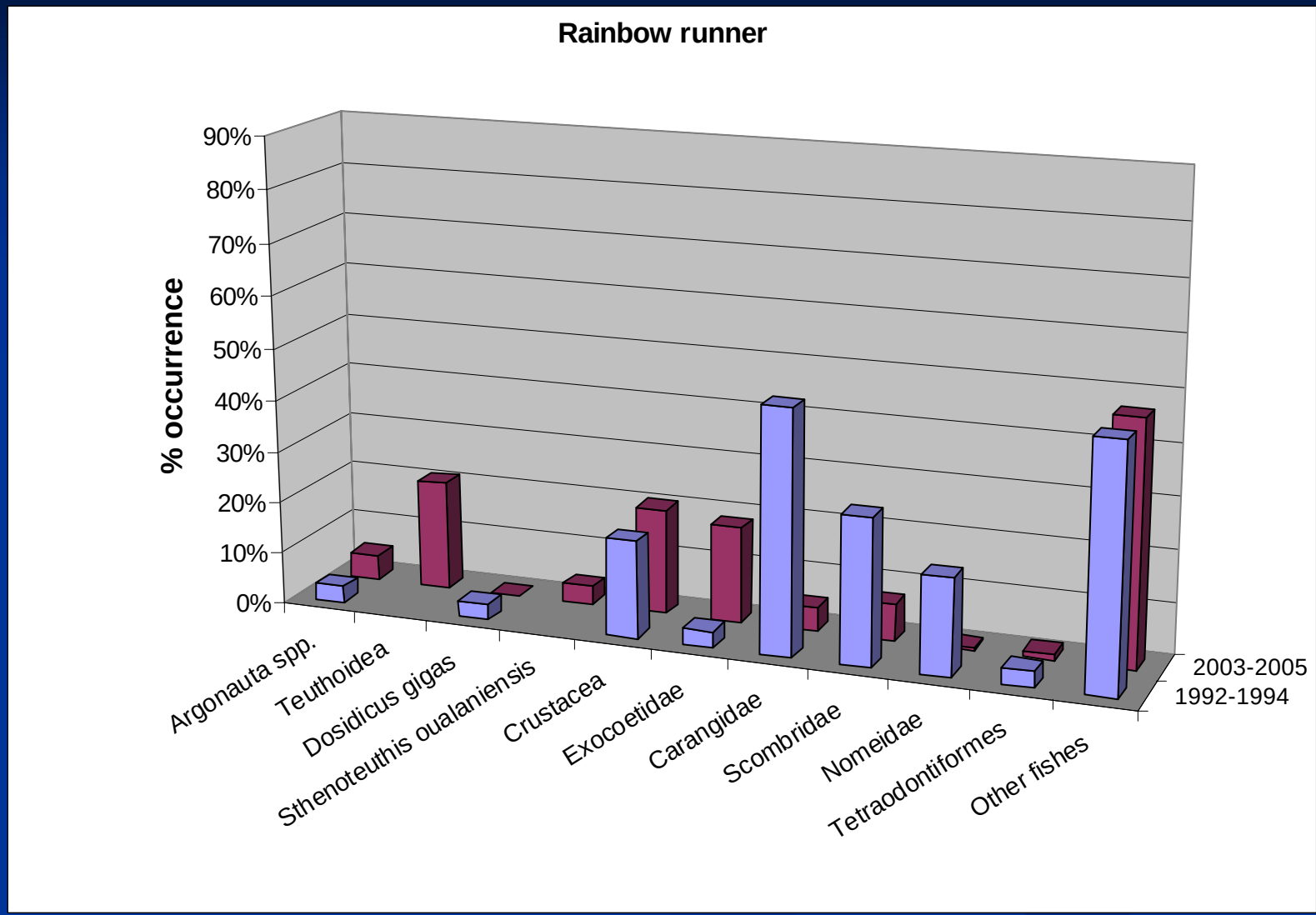

Yellowfin tuna
% occurrence
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Argonauta spp.
Teuthoidea
Dosidicus gigas
Sthenoteuthis oualaniensis
Crustacea
Exocoetidae
Carangidae
Scombridae
Nomeidae
Tetraodontiformes
Other fishes
2003-2005
1992-1994

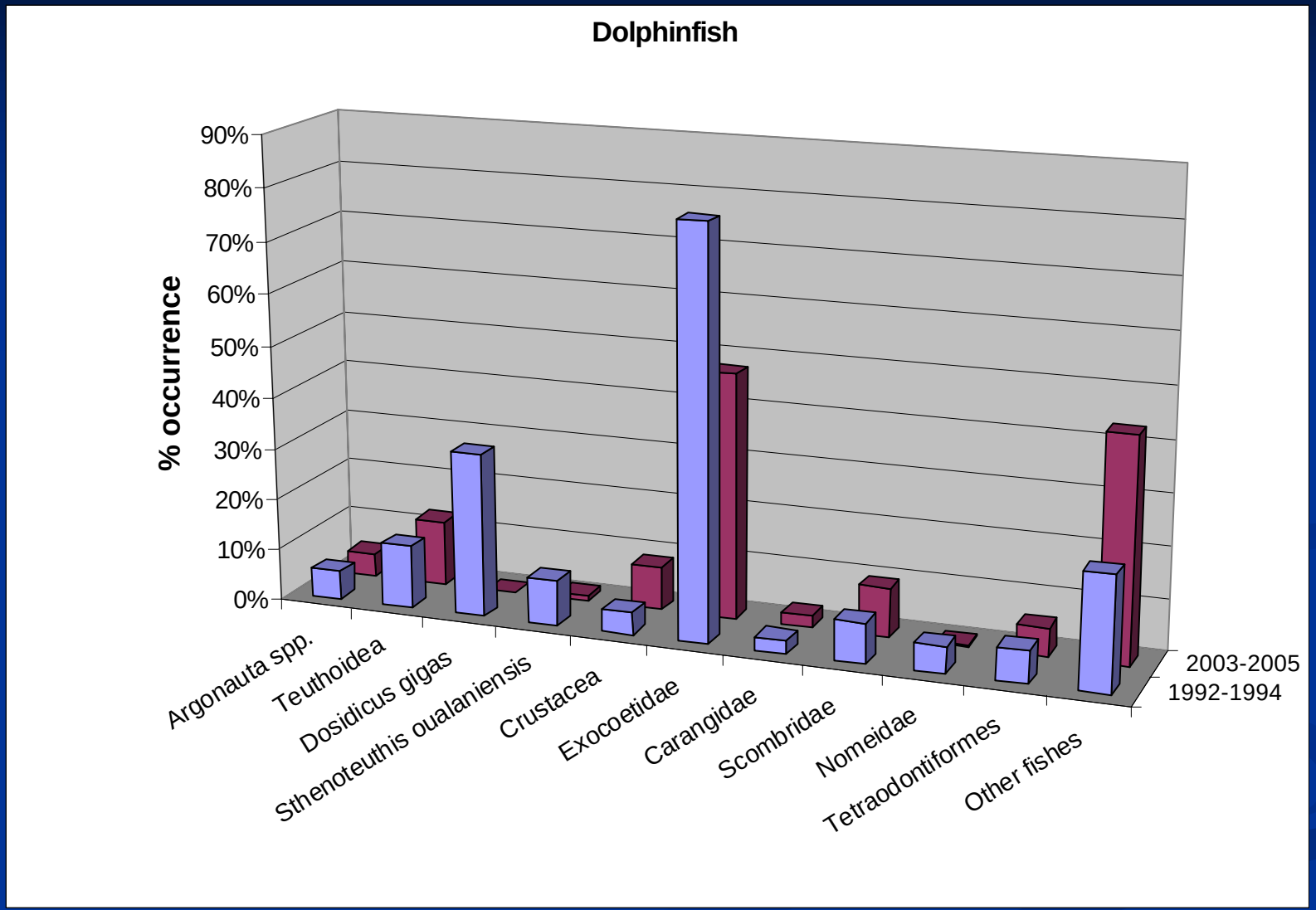

Bigeye tuna
% occurrence
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Argonauta spp.
Teuthoidea
Dosidicus gigas
Sthenoteuthis oualaniensis
Crustacea
Exocoetidae
Carangidae
Scombridae
Nomeidae
Tetraodontiformes
Other fishes
2003-2005
1992-1994

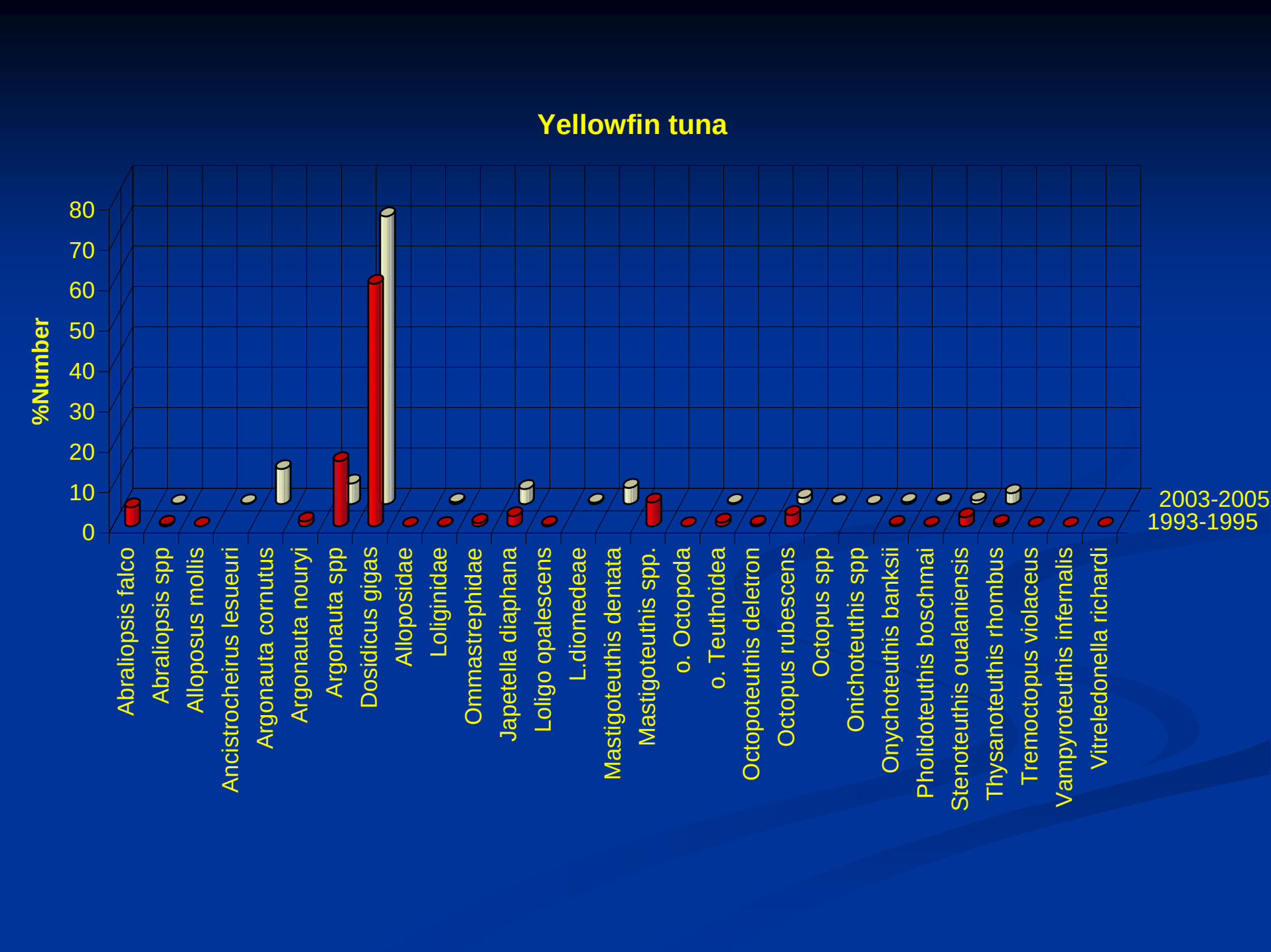

Sharks
% occurrence
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Argonauta spp.
Teuthoidea
Dosidicus gigas
Sthenoteuthis oualaniensis
Crustacea
Exocoetidae
Carangidae
Scombridae
Nomeidae
Tetraodontiformes
Other fishes
2003-2005
1992-1994


Billfishes
% occurrence
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Argonauta spp.
Teuthoidea
Dosidicus gigas
Sthenoteuthis oualaniensis
Crustacea
Exocoetidae
Carangidae
Scombridae
Nomeidae
Tetraodontiformes
Other fishes
2003-2005
1992-1994

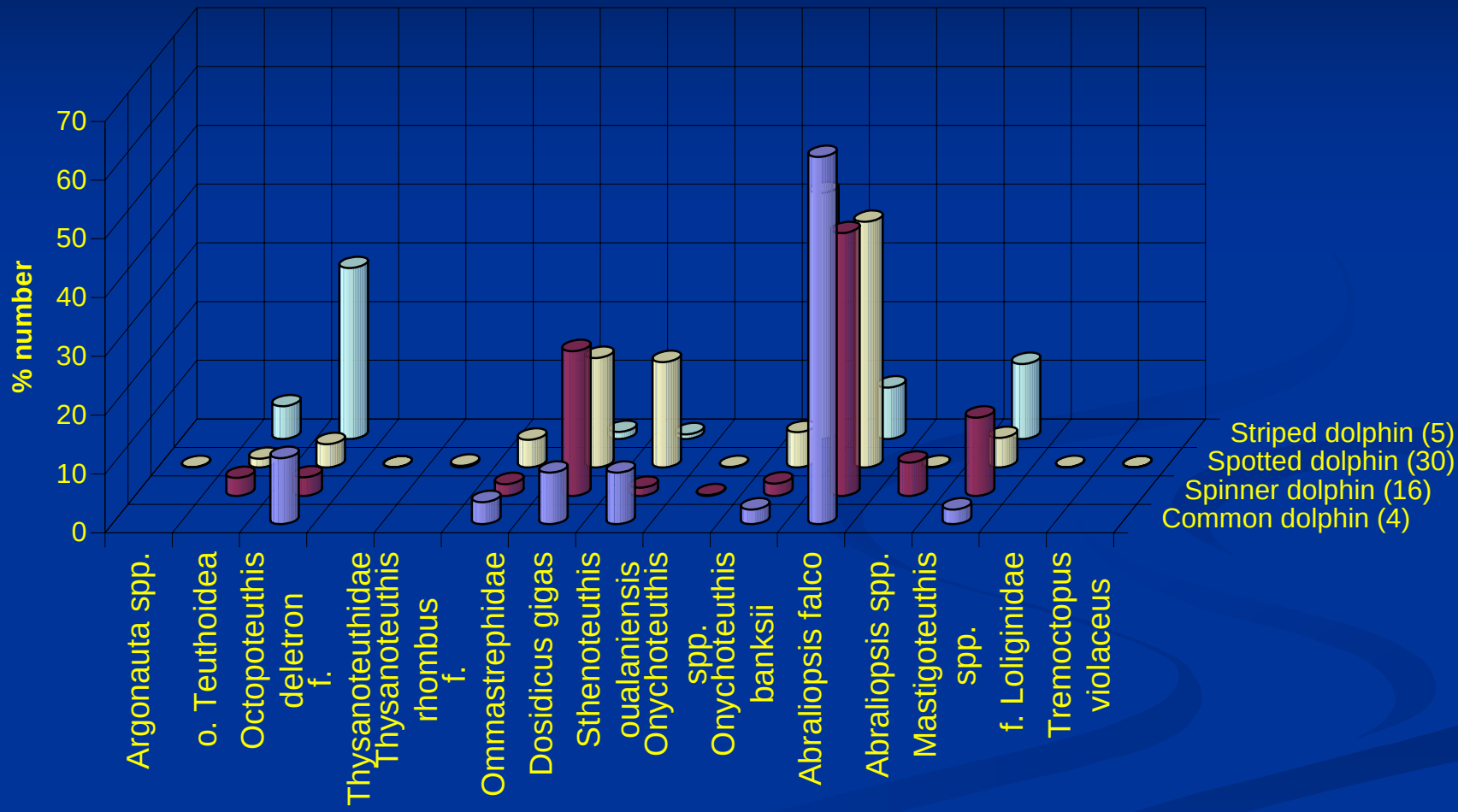

Wahoo
% occurrence
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Argonauta spp.
Teuthoidea
Dosidicus gigas
Sthenoteuthis oualaniensis
Crustacea
Exocoetidae
Carangidae
Scombridae
Nomeidae
Tetraodontiformes
Other fishes
1992-1994

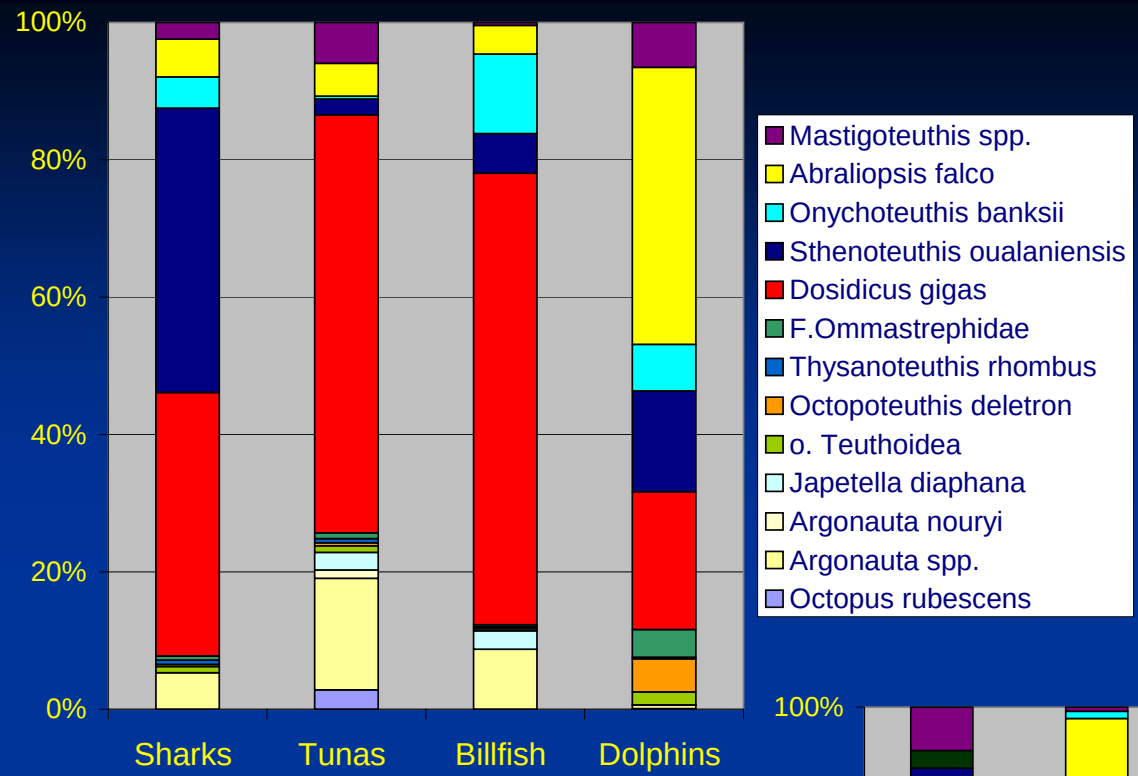

Rainbow runner
% occurrence
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Argonauta spp.
Teuthoidea
Dosidicus gigas
Sthenoteuthis oualaniensis
Crustacea
Exocoetidae
Carangidae
Scombridae
Nomeidae
Tetraodontiformes
Other fishes
2003-2005
1992-1994


Dolphinfish
% occurrence
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Argonauta spp.
Teuthoidea
Dosidicus gigas
Sthenoteuthis oualaniensis
Crustacea
Exocoetidae
Carangidae
Scombridae
Nomeidae
Tetraodontiformes
Other fishes
2003-2005
1992-1994


Yellowfin tuna
%Number
0
10
20
30
40
50
60
70
80
2003-2005
1993-1995
Abraliopsis falco
Abraliopsis spp
Alloposus mollis
Ancistrocheirus lesueuri
Argonauta conutus
Argonauta nouryi
Argonauta spp
Dosidicus gigas
Alloposidae
Loliginidae
Ommastrephidae
Japetella diaphana
Loligo opalescens
L.diomedeae
Mastigoteuthis dentata
Mastigoteuthis spp.
o. Octopoda
o. Teuthoidea
Octopoteuthis deletron
Octopus rubescens
Octopus spp
Onichoteuthis spp
Onychoteuthis banksii
Pholidoteuthis boschmai
Stenoteuthis oualaniensis
Thysanoteuthis rhombus
Tremoctopus violaceus
Vampyroteuthis infernalis
Vitreledonella richardi

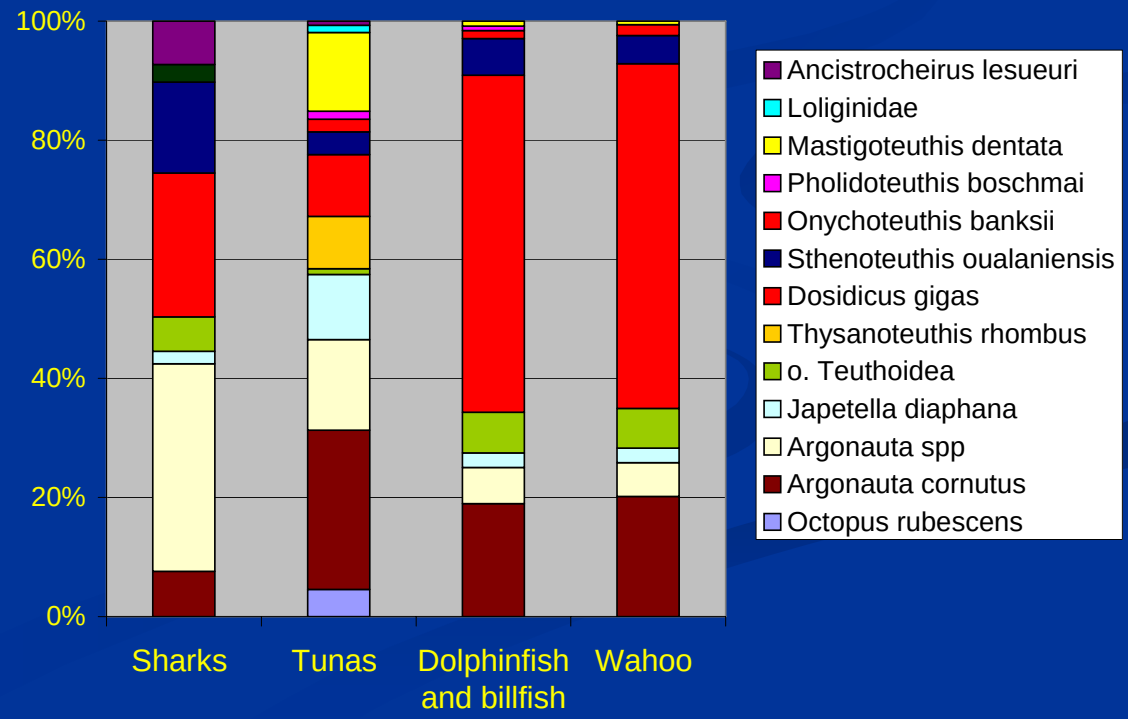
DELFINES (92-94)

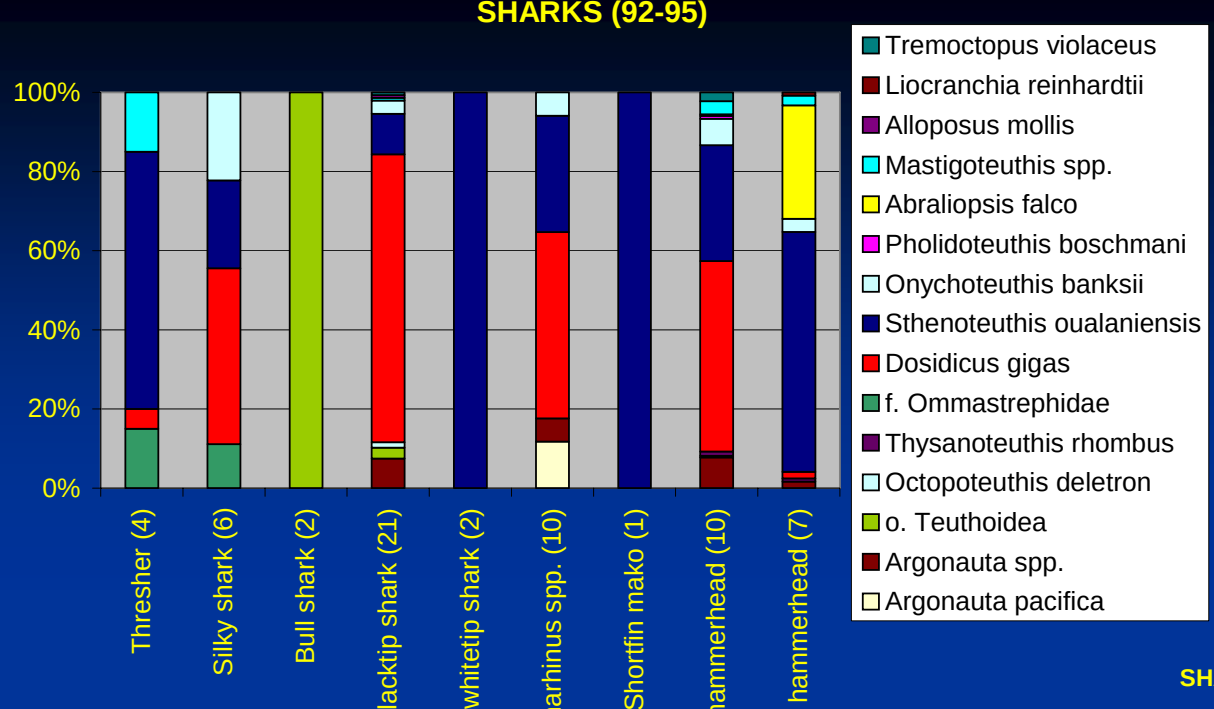


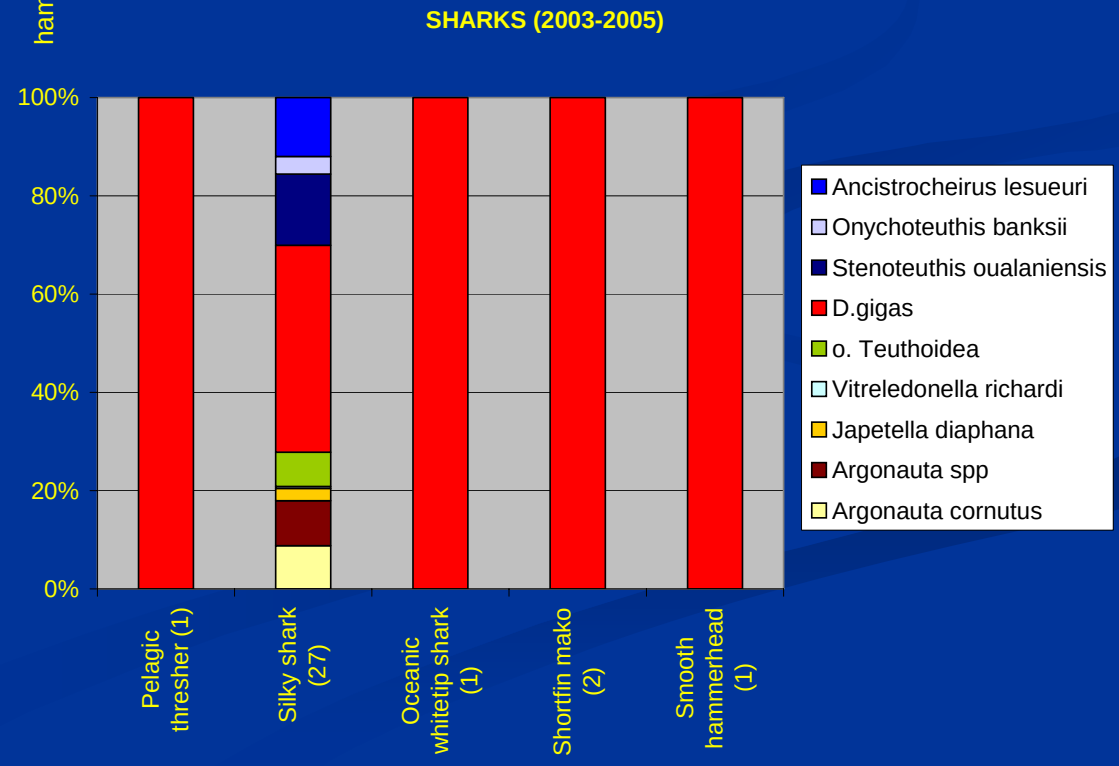


1992 - 1994

2003 - 2005

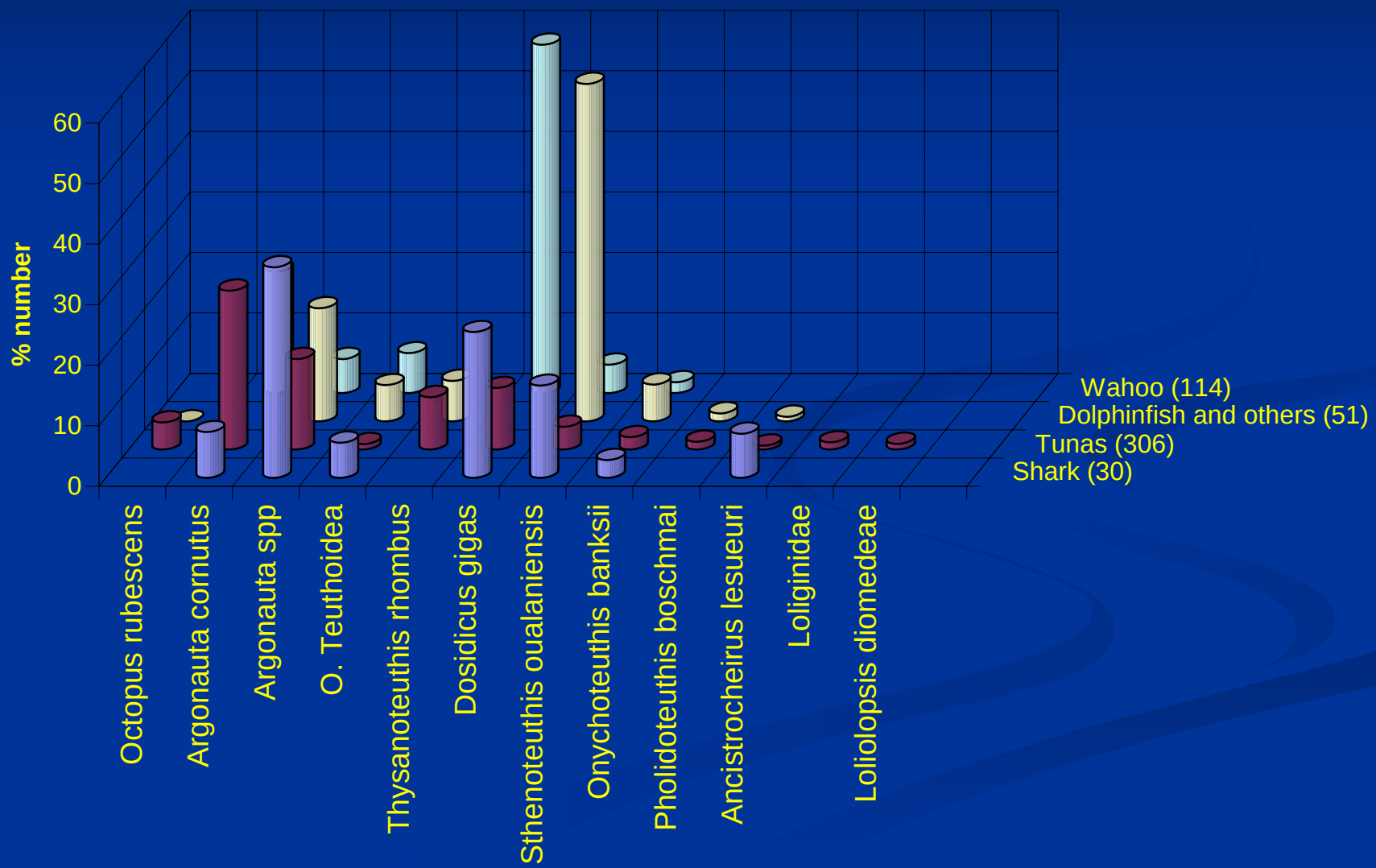



SHARKS (92-95)
100%
80%
60%
40%
20%
0%
Thresher (4)
Silky shark (6)
Bull shark (2)
Blacktip shark (21)
Oceanic whitetip shark (2)
Carcharhinus spp. (10)
Shortfin mako (1)
Smooth hammerhead (10)
hammerhead (7)
Tremoctopus violaceus
Liocranchia reinhardtii
Alloposus mollis
Mastigoteuthis spp.
Abraliopsis falco
Pholidoteuthis boschmani
Onychoteuthis banksii
Sthenoteuthis oualaniensis
Dosidicus gigas
f. Ommastrephidae
Thysanoteuthis rhombus
Octopoteuthis deletron
o. Teuthoidea
Argonauta spp.
Argonauta pacifica

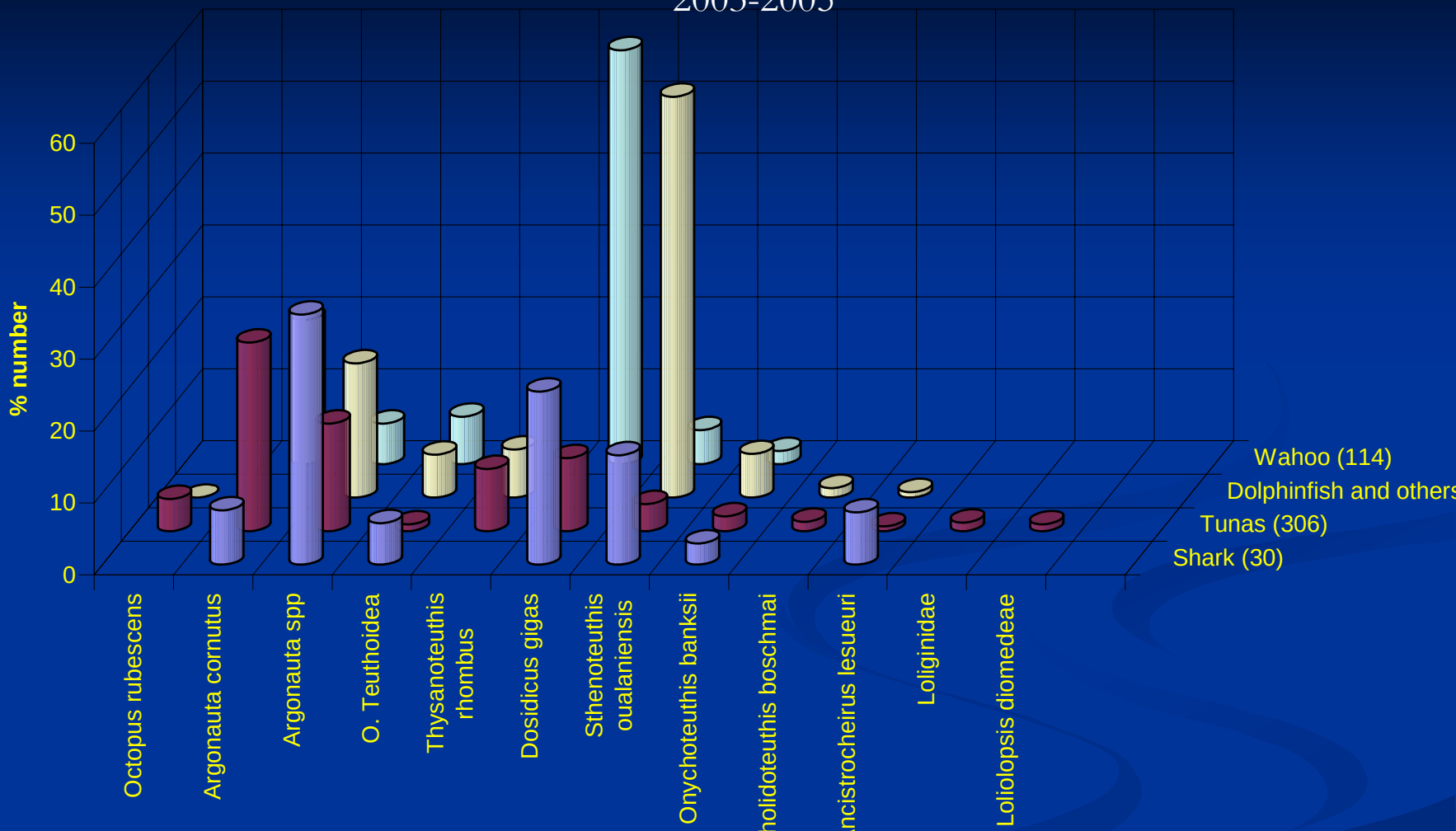

SHARKS (2003-2005)
100%
80%
60%
40%
20%
0%
Pelagic thresher (1)
Silky shark (27)
Oceanic whitetip shark (1)
Shortfin mako (2)
Smooth hammerhead (1)
Ancistrocheirus lesueuri
Onychoteuthis banksii
Stenoteuthis oualaniensis
D.gigas
o. Teuthoidea
Vitreledonella richardi
Japetella diaphana
Argonauta spp
Argonauta cornutus

EPICEPHALOPODS

1992-1994

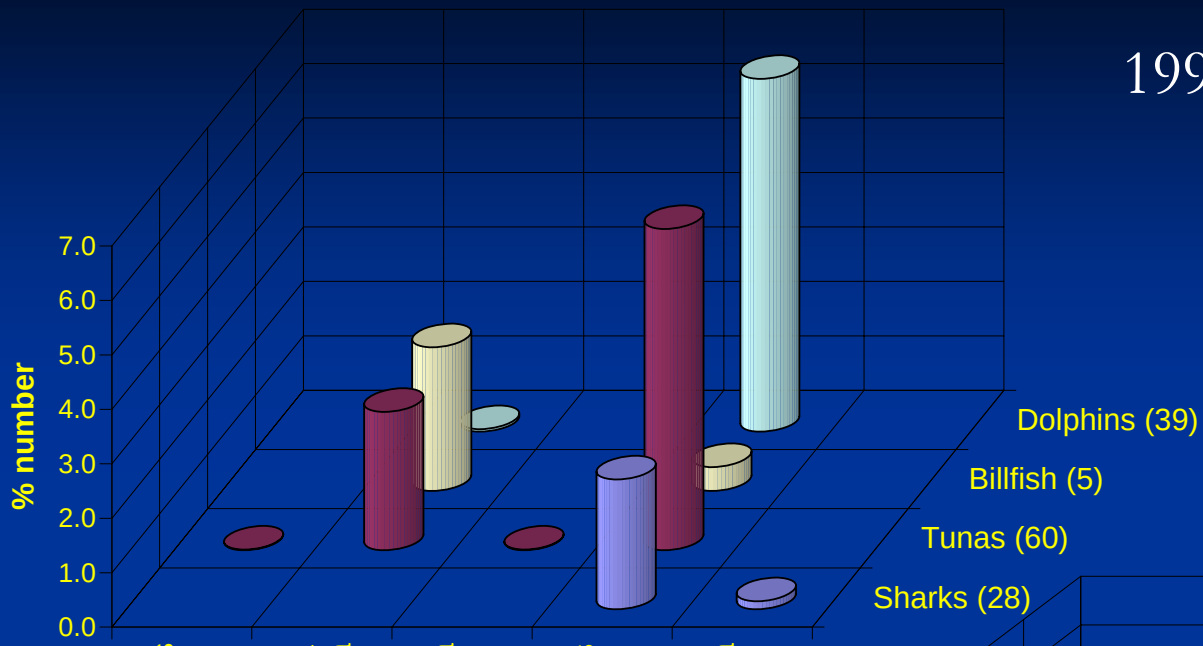


EPICEPHALOPODS
2003-2005

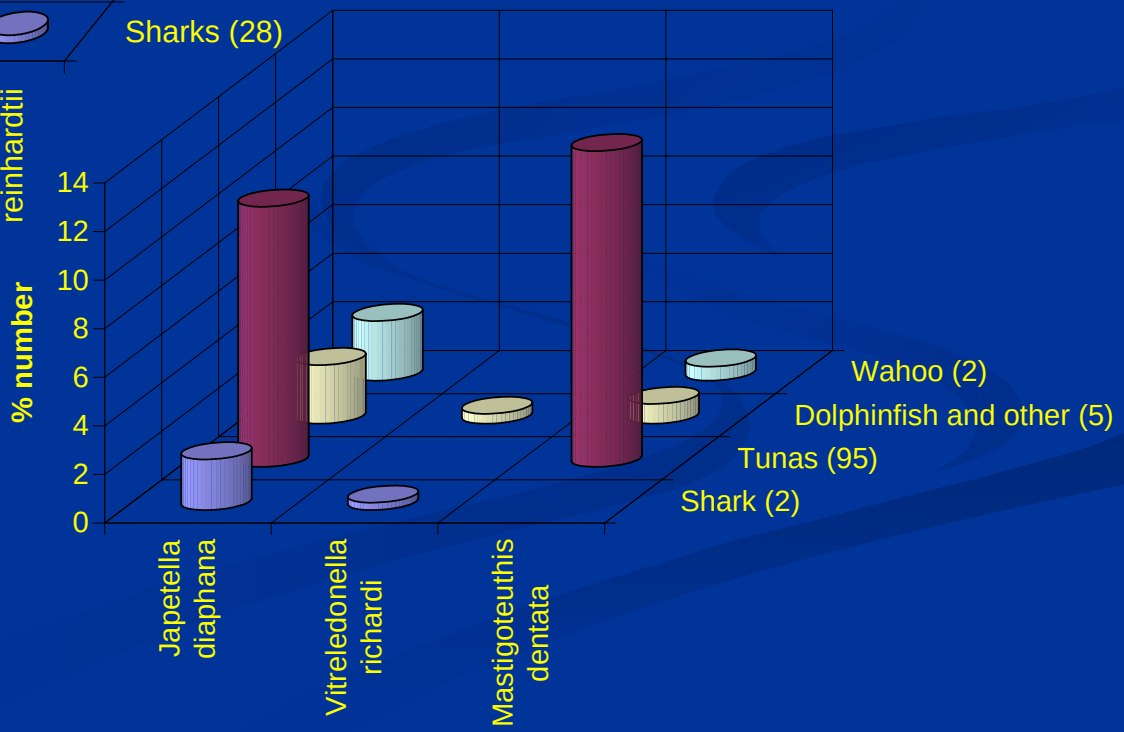


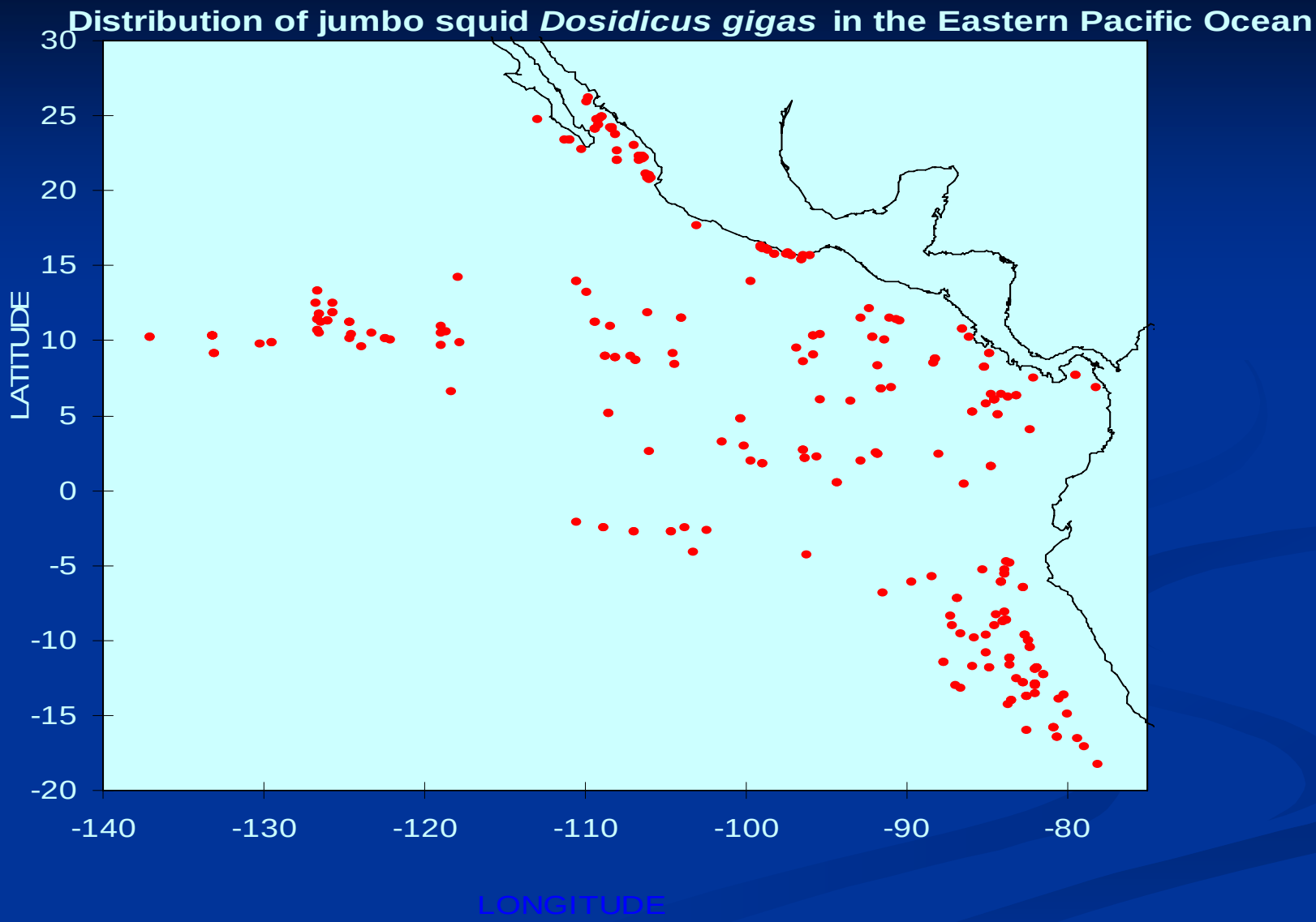
MESOPELAGIC CEPHALOPODS

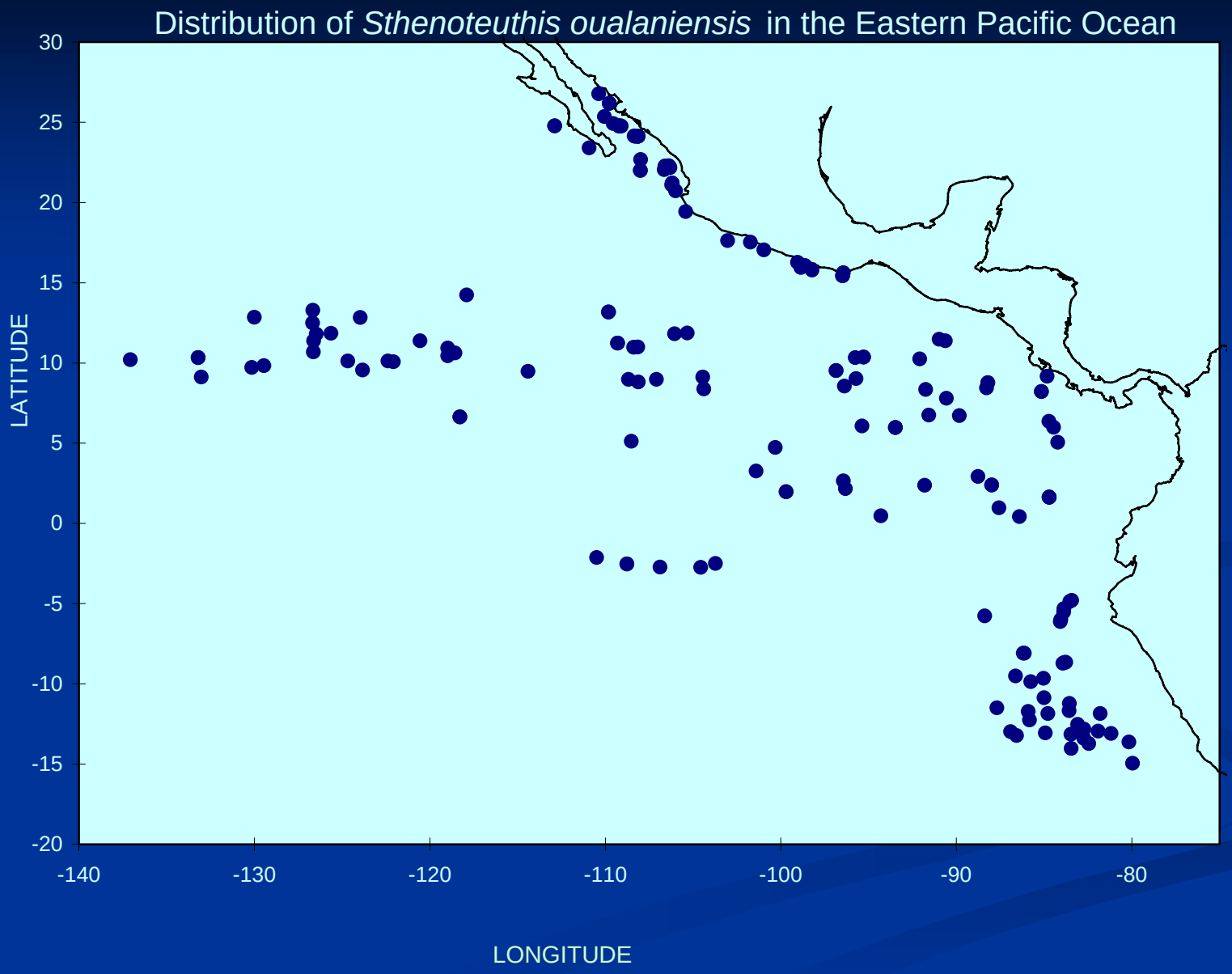
1992-1994

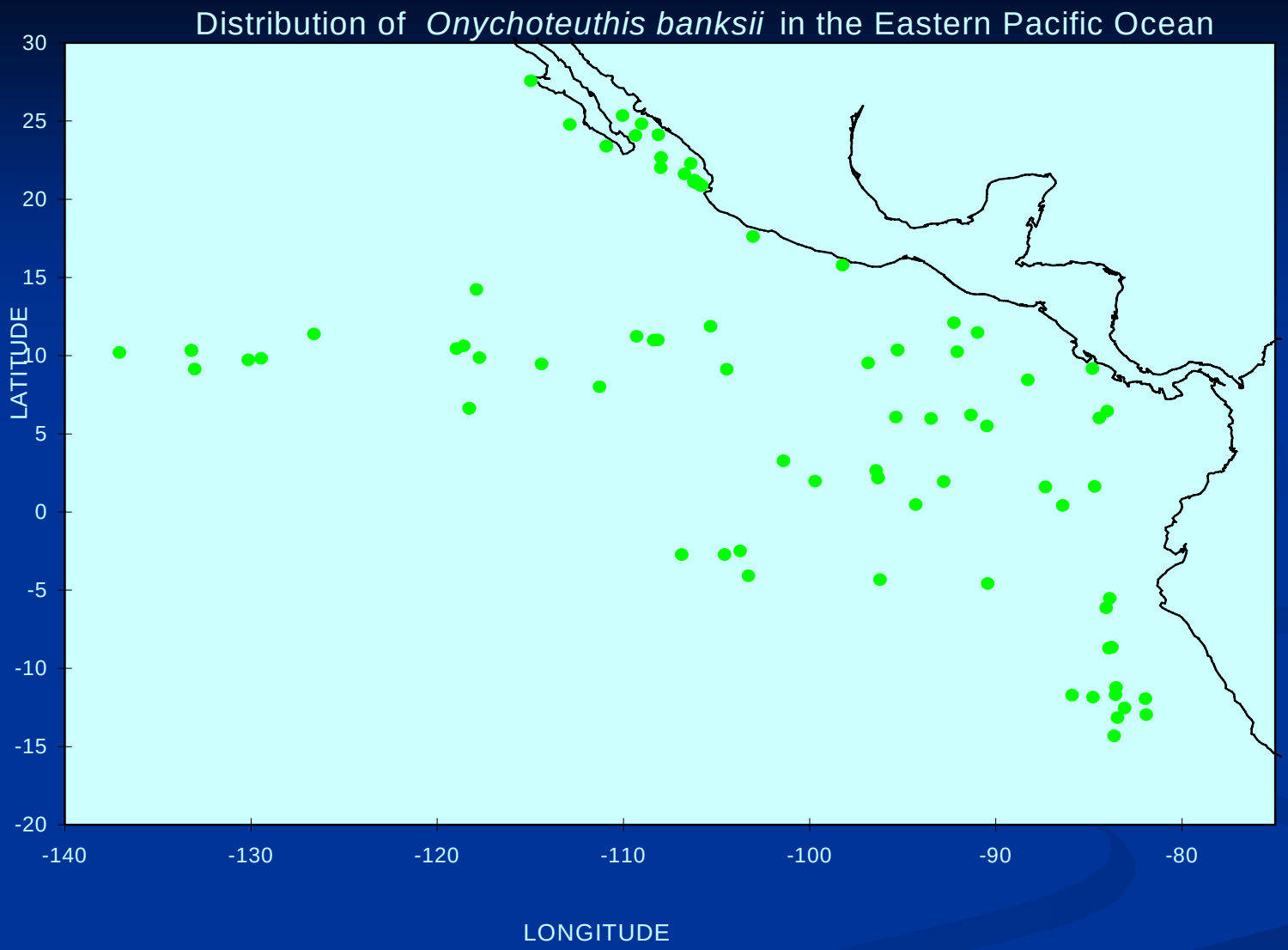


2003-2005




Distribution of jumbo squid *Dosidicus gigas* in the Eastern Pacific Ocean
30
25
20
15
10
5
0
-5
-10
-15
-20
LATITUDE
-140
-130
-120
-110
-100
-90
-80
LONGITUDE


Distribution of *Sthenoteuthis oualaniensis* in the Eastern Pacific Ocean
30
25
20
15
10
5
0
-5
-10
-15
-20
LATITUDE
-140
-130
-120
-110
-100
-90
-80
LONGITUDE


Distribution of Onychoteuthis banksii in the Eastern Pacific Ocean
30
25
20
15
10
5
0
-5
-10
-15
-20
LATITUDE
-140
-130
-120
-110
-100
-90
-80
LONGITUDE

SUMMARY

- A NUMBER OF 20 CEPHALOPOD SPECIES WERE IDENTIFIED FROM PREDATORS IN THE EASTERN PACIFIC OCEAN (EPO).

- BY FREQUENCY OF OCURRENCE, IN 2003-2005 *Dosidicus gigas* WAS CONSUMED LESS THAN IN 1992-1994.

- HOWEVER BY NUMBER OF ORGANISMS, *Dosidicus gigas* IN 2003-2005 WAS HIGHER IN STOMACHS OF PREDATORS IN THE EPO.

- DOLPHINS PREDATE MORE ON MESOPELAGIC SPECIES AS *Abraliopsis* spp.

- SHARKS CONSUME MORE *Dosidicus gigas*, *Sthenoteuthis oualaniensis* and *Argonauta* spp.

- THE LARGE PREDATORS IN THE EPO CONSUME MORE EPIPELAGIC THAN MESOPELAGIC CEPAHLOPODS.