ALCATRAZES
FAUNA & FLORA

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Pqc

Invertebrados Marinhos

~ 150 espécies de peixes em fundo rochoso

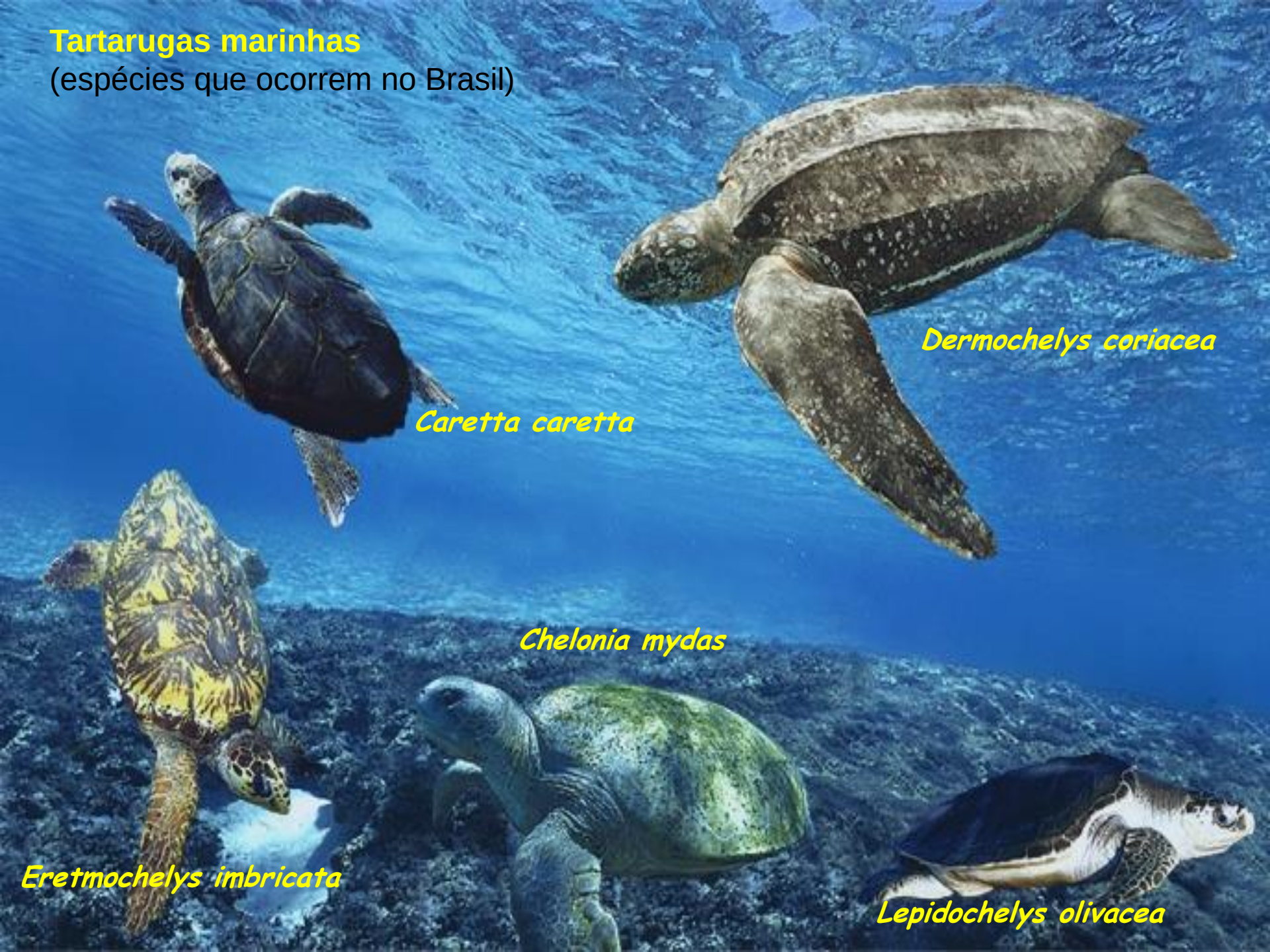
⟶ estimativas ~ 300 spp.

Novas ocorrências no Brasil com base em materiais de Alcatrazes

Heteroconger longissimus

único registro no Brasil

Tartarugas marinhas
(espécies que ocorrem no Brasil)



Cetáceos: baleias e golfinhos

Golfinhos (*Tursiops truncatus*) Saco do Funil, 2006

Baleia-de-Bryde (*Balaenoptera edeni*)

Falsa orca
(*Pseudorca crassidens*)

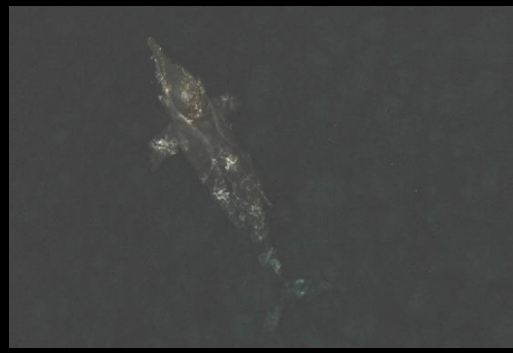
Golfinho-pintado-do-Atlântico
(*Stenella frontalis*)

Jubarte (*Megaptera novaeanglia*)

Espécies Alcatrazes = 8

Litoral norte de SP = 13

Golfinho comum (*Delphinus* sp.)



Golfinho-de-dentes-rugosos
(*Steno bredanensis*)

Aves marinhas

Fragata *(Fregata magnificens)*

Atobá-marrom *(Sula leucogaster)*

Thalasseus maximus

Trinta-réis-de-bando (*Thalasseus acuflavidus*)

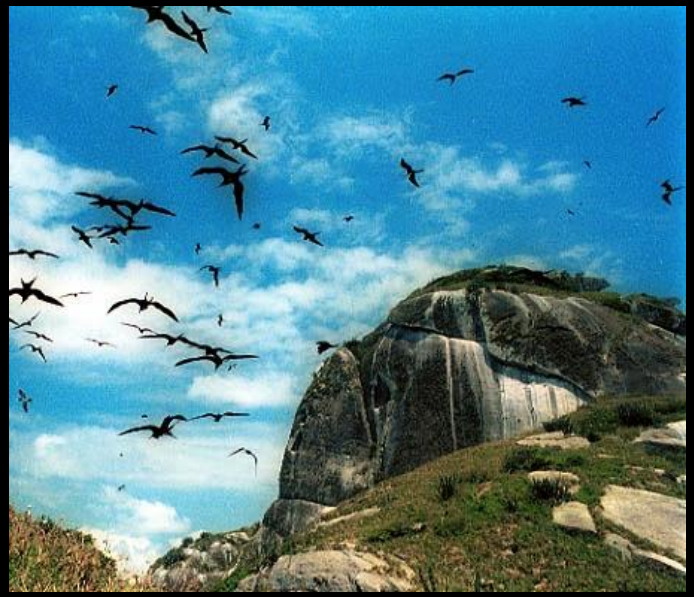
Trinta-réis-de-bico-vermelho (*Sterna hirundinacea*)

Gaivotão (*Larus dominicanus*)

Colônias estimadas de aves marinhas insulares no Arquipélago dos Alcatrazes

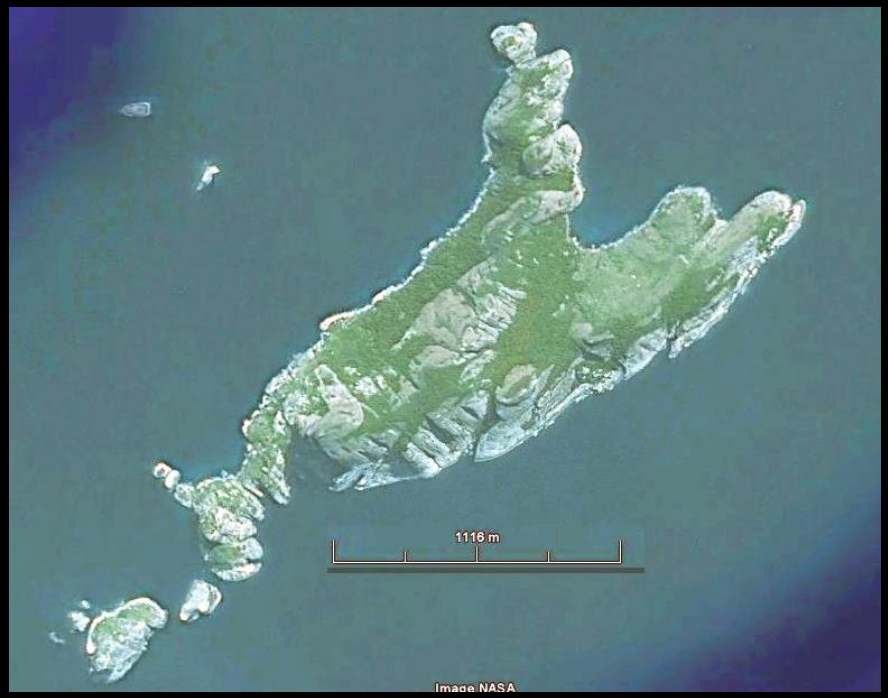
Ave / Ilha/Laje	*Sterna hirundinacea*	*Thalasseus acuflavidus*	*Thalasseus maximus*	*Larus dominicanus*	*Sula leucogaster*	*Fregata magnificens*
Amigos	10		120	30	200	
Alcatrazes	800			100	2.300	6.000
Porto				20	80	
Rasa				20	80	
Oratório		10		30	100	
Ite Caranha				10	40	
Tartaruga	40			30	200	
L. Trinta-réis			04			
SOMA	850	10	124	240	3.000	6.000

Obs. Estimativa geral de aves marinhas residentes 10 224 indivíduos



Ninhos de atobá no Saco do Funil e alvo

Vegetação

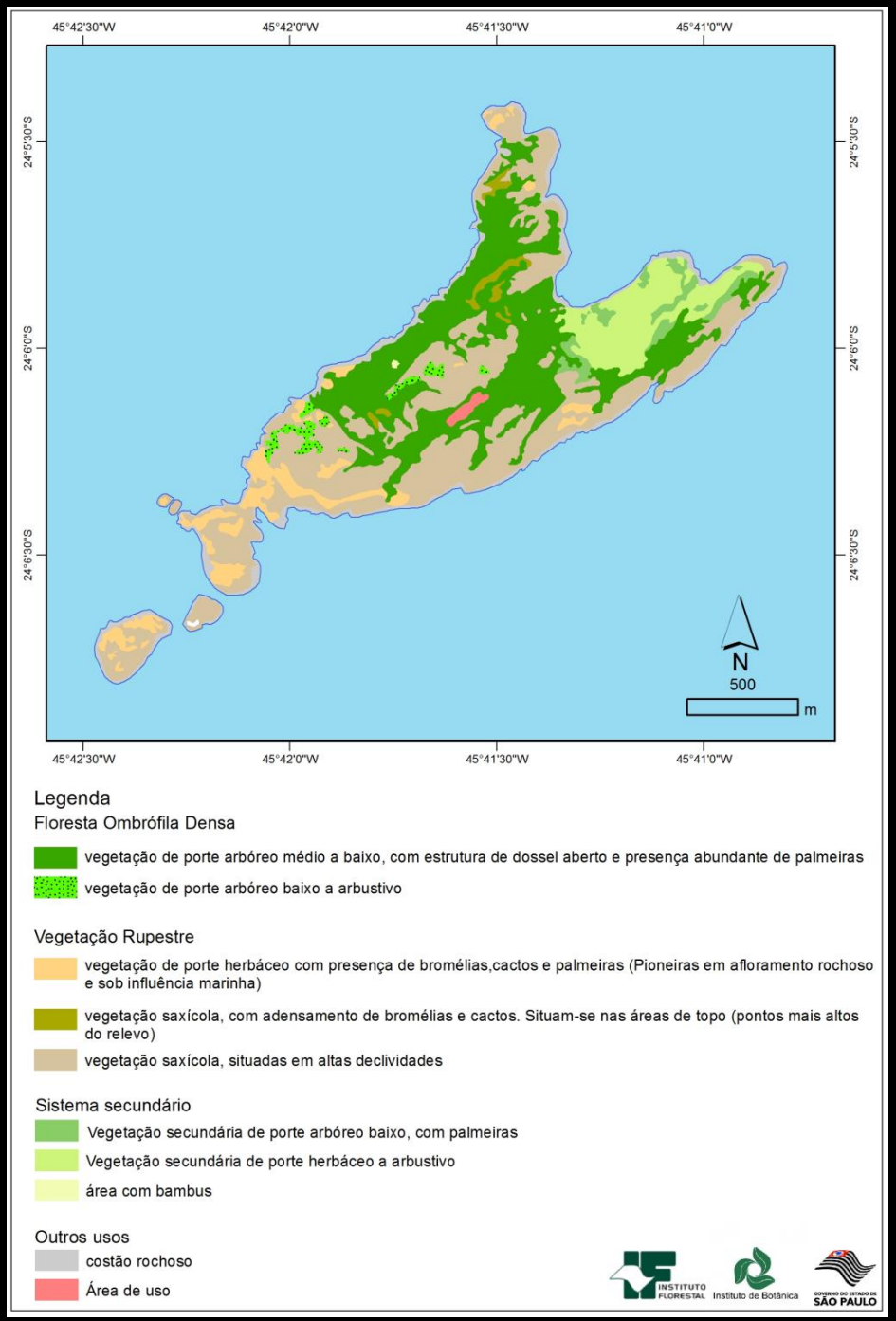


> 200 espécies de plantas

20 spp. de samambaias

\+

185 spp. de angiospermas



ESPÉCIES AMEAÇADAS da ESEC Tupinambás

Espécie	Lista vermelha			Localidade		
	SMA	IUCN	Brasil	Palmas	Cabras	Alcatrazes
Begonia larorum L.B.Sm. & Wassh.	EX					x
Begonia venosa Skan. ex Hooker	VU					x
Croton compressus Lam.	EN					x
Eugenia copacabanensis Kiaersk.	VU					x
Eugenia prasina O.Berg		VU				x
Manilkara subsericea (Mart.) Dubard		LR/cd		x		x
Myrcia ovata Cambess.	VU					x
Rudgea minor (Cham.) Standl.			VU	x		x
Sinningia insularis (Handro) Chautems	VU					x
Tabebuia cassinoides (Lam.) DC.		LR/cd		x	x	
Trichilia casaretti C.DC.		VU		x	x	x

Ainda não incluídos nas listas de ameaçadas:
Anthurium alcatrazensis Nadruz & Catharino - endêmica de Alcatrazes
Drypetes sp., coletado recentemente em Palmas, gênero sem referência para São Paulo

Begonia larorum

EXTINTA

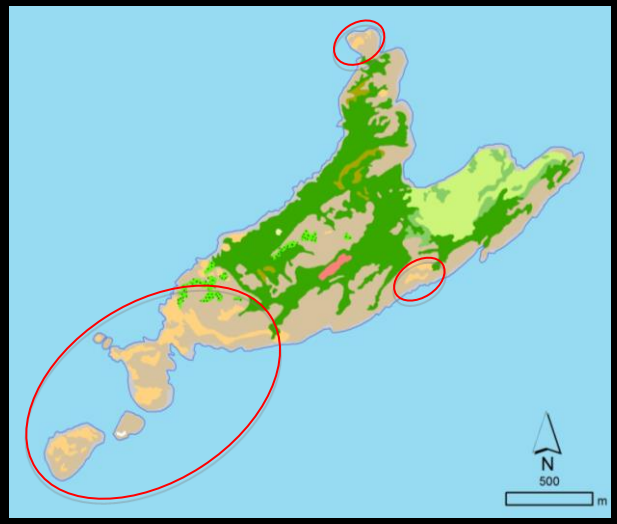
Anthurium alcatrazensis

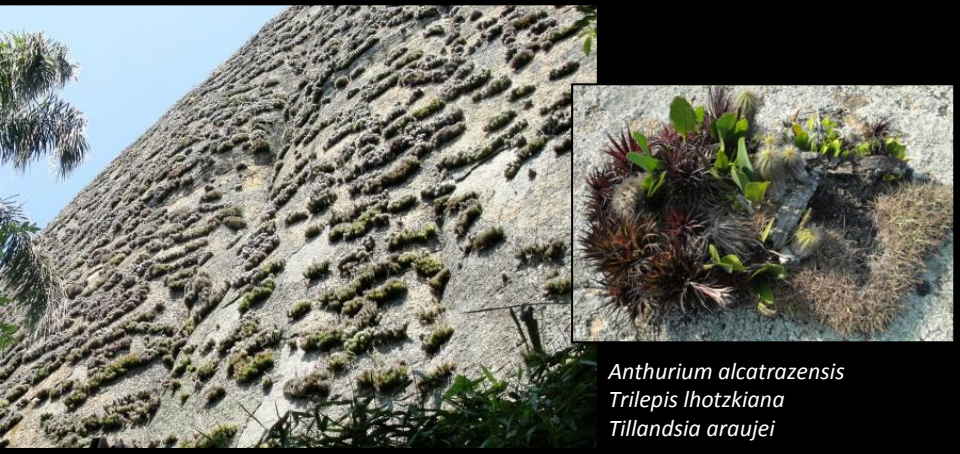
Begonia venosa

Siningia insularis
endêmica

Vegetação rupestre (81,8 ha – 45,5%)

Vegetação mais frágil, altamente especializada, onde ocorrem as espécies mais raras





Anthurium alcatrazensis
Trilepis lhotzkiana
Tillandsia araujei

Paredão com Tillandsia araujei

Neoregelia sp. *e Coleocephalocereus fluminensis*

Vriesea bituminosa

Cereus fernambucensis

Mata Ombrófila Densa (60,06 ha = 33,4%)

Plumbago scandens espécie rara, pouco coletada no Estado de São Paulo

Myrcia ovata
(ameaçada VU)

Croton compressus em perigo de extinção em São Paulo, onde só ocorre em Alcatrazes (EX)

Eugenia copacabanensis
(ameaçada,VU)

Rudgea minor ocorre amplamente na restinga do ES e RJ, mas em São Paulo, apenas nas ilhas da ESEC Tupinambás e Queimada Grande

Aves

Tabela 2. Expedições do Projeto Alcatrazes no Arquipélago 1989/2006.

N.º	Espécie	Nome popular	Registro	*Status*
1	*Diomedea exulans*	Albatroz-gigante	PA	VU
2	*Thalassarche chlororhynchos*	Albatroz-de-nariz-amarelo	PA	VU
3	*Macronectes giganteus*	Petrel-gigante	PA	
4	*Calonectris borealis*	Bobo-grande	PA	
5	*Puffinus puffinus*	Bobo-pequeno	PA	
6	*Puffinus gravis*	Bobo-grande-de-sobre-branco	PA	
7	*Pachyptila belcheri*	Faigão-de-bico-fino	PA	
8	*Pachyptila desolata*	Faigão-rola	PA	
9	*Oceanites oceanicus*	Alma-de-mestre	PA	
10	*Daption capense*	Pomba-do-cabo	PA	
11	*Stercorarius skua*	Mandrião-grande	PA	
12	*Spheniscus magellanicus*	Pinguim-de-magalhães	PA	
13	*Sula leucogaster*	Atobá-pardo	LF / PA	
14	*Fregata magnificens*	Tesourão; fragata	LF / PA	
15	*Larus dominicanus*	Gaivotão	LF / PA	
16	*Thalasseus maximus*	Trinta-réis-real	PA	VU
17	*Thalasseus acuflavidus*	Trinta-réis-de-bando	PA	VU
18	*Sterna hirundinacea*	Trinta-réis-de-bico-vermelho	PA	QA
19	*Chroicocephalus maculipennis*	Gaivota-maria-velha	PA	
20	*Sterna hirundo*	Trinta-réis-boreal	PA	
21	*Sterna trudeaui*	Trinta-réis-de-coroa-branca	PA	
22	*Sternula superciliaris*	Trinta-réis-anão	LF / PA	VU
23	*Haematopus palliatus*	Piru-piru; ostreiro; paiagu	PA	VU
24	*Actitis macularius*	Maçarico-pintado	LF / PA	
25	*Calidris fuscicollis*	Maçarico-de-sobre-branca	LF / PA	
26	*Arenaria interpres*	Vira-pedras	PA	
27	*Calidris alba*	Maçarico-branco	PA	
28	*Gallinago paraguaiae*	Narceja	PA	
29	*Phalacrocorax brasilianus*	Biguá	PA	
30	*Egretta thula*	Garça-branca-pequena	PA	
31	*Egretta caerulea*	Garça-azul	LF / PA	
32	*Theristicus caudatus*	Curicaca	PA	
33	*Bubulcus ibis*	Garça-vaqueira	PA	
34	*Coragyps atratus*	Urubu-de-cabeça-preta	LF / PA	
35	*Cathartes aura*	Urubu-de-cabeça-vermelha	PA	
36	*Rupornis magnirostris*	Gavião-carijó	LF / PA	
37	*Milvago chimachima*	Carrapateiro; pinhé	LF / PA	
38	*Caracara plancus*	Caracará	PA	
39	*Falco peregrinus*	Falcão-peregrino	PA	
40	*Falco deiroleucus*	Falcão-de-peito-laranja	PA	DD
41	*Geranoaetus albicaudatus*	Gavião-de-rabo-branco	PA	
42	*Aramides cajanea*	Saracura-três-potes	LF / PA	
43	*Laterallus viridis*	Sanã-castanha	PA	
44	*Leptotila rufaxilla*	Juriti-gemedeira	LF / PA	
45	*Columbina talpacoti*	Rolinha-roxa	LF / PA	
46	*Amazona farinosa*	Papagaio-moleiro	PA	CR
47	*Piaya cayana*	Alma-de-gato	PA	
48	*Crotophaga ani*	Anú-preto	LF / PA	
49	*Guira guira*	Anú-branco	LF / PA	
50	*Chaetura cinereiventris*	Andorinhão-de-sobre-cinzento	PA	
51	*Florisuga fusca*	Beija-flor-preto	PA	
52	*Polytmus guainumbi*	Beija-flor-de-bico-curvo	PA	VU
53	*Amazilia fimbriata*	Beija-flor-de-garganta-verde	PA	
54	*Hydropsalis parvula*	Bacurau-chintã	LF / PA	
55	*Megaceryle torquata*	Martim-pescador-grande	PA	
56	*Chloroceryle americana*	Martim-pescador-pequeno	PA	
57	*Knipolegus nigerrimus*	Maria-preta-de-garganta-vermelha	LF / PA	
58	*Hirundinea ferruginea*	Gibão-de-couro	PA	
59	*Tyrannus savana*	Tesourinha	PA	
60	*Tyrannus melancholicus*	Suiriri	LF / PA	
61	*Sirystes sibilator*	Gritador; maria-assobiadeira	PA	
62	*Myiodynastes maculatus*	Bem-te-vi-rajado	PA	
63	*Myiozetetes similis*	Bentevizinho-de-penacho-vermelho	PA	
64	*Pitangus sulphuratus*	Bem-te-vi	LF / PA	
65	*Megarynchus pitangua*	Neinei	LF / PA	
66	*Legatus leucophaius*	Bem-te-vi-pirata	PA	
67	*Myiarchus ferox*	Maria-cavaleira	LF / PA	
68	*Myiarchus tyrannulus*	Maria-cavaleira-de-rabo-enferrujado	PA	
69	*Contopus cooperi*	Piuí-boreal	PA	
70	*Lathrotriccus euleri*	Enferrujado	PA	
71	*Elaenia flavogaster*	Guaracava-de-barriga-amarela	LF / PA	
72	*Elaenia mesoleuca*	Tuque	LF / PA	
73	*Pyrocephalus rubinus*	Príncipe; verão	LF / PA	
74	*Pygochelidon cyanoleuca*	Andorinha-pequena-de-casa	PA	
75	*Troglodytes musculus*	Corruíra	LF / PA	
76	*Turdus rufiventris*	Sabiá-laranjeira	PA	
77	*Turdus amaurochalinus*	Sabiá-poca	LF / PA	
78	*Turdus albicollis*	Sabiá-coleira	PA	
79	*Cyclarhis gujanensis*	Pitiguari; gente-de-fora-vem	LF / PA	
80	*Coereba flaveola*	Cambacica; sebinho	LF / PA	
81	*Geothlypis aequinoctialis*	Pia-cobra	LF / PA	
82	*Tangara sayaca*	Sanhaçu-cinzento; sanhaço	LF / PA	
83	*Tachyphonus coronatus*	Tiê-preto; gurundi	LF / PA	
84	*Thlypopsis sordida*	Saí-canário	LF / PA	
85	*Saltator similis*	Trinca-ferro-verdadeiro	LF / PA	
86	*Cyanoloxia brissonii*	Azulão	LF / PA	VU
87	*Sicalis flaveola*	Canário-da-terra-verdadeiro	LF / PA	
88	*Sporophila caerulescens*	Coleirinho; papa-capim	LF / PA	
89	*Zonotrichia capensis*	Tico-tico	LF / PA	
90	*Sporophila angolensis*	Curió	PA	VU
91	*Anthus correndera*	Caminheiro-de-espora	PA	









Répteis

ANFISBENÍDEOS

Amphisbaena hogei (Amphisbaenidae), “cobra-de-duas-cabeças”

Leposternon microcephalum (Amphisbaenidae), “cobra-cega”

LAGARTOS

Hemidactylus mabouia (Gekonidae), “lagartixa”

Mabuya macrorhyncha (Scincidae), “lagarto”

Tupinambis cf. *merianae* (Teiidae), “teiú”

Colobodactylus taunayi (Gymnophtlamidae), “lagarto”

SERPENTES

Dipsas albifrons (Colubridae), “dormideira”

Siphlophis pulcher (Colubridae), “cobra-coral”

Micrurus cf.*corallinus* (Elapidae), “cobra-coral”

Bothrops alcatraz (Viperidae) - “jararaca-de-alcatrazes”

Herpetologica, 58(3), 2002, 303–312

A NEW INSULAR SPECIES OF PITVIPER FROM BRAZIL, WITH COMMENTS ON EVOLUTIONARY BIOLOGY AND CONSERVATION OF THE *BOTHROPS JARARACA* GROUP (SERPENTES, VIPERIDAE)

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ABSTRACT: We describe a new pitviper species, *Bothrops alcatraz*, of the *Bothrops jararaca* group, from Alcatrazes Island, off the coast of São Paulo, southeastern Brazil. It differs from the mainland coastal populations of *B. jararaca* in southeastern Brazil mostly by its darker coloration; smaller size; lower number of ventrals, subcaudals, and infralabials; number and shape of anterior cephalic scales; shape of hemipenis spines; intense coagulant activity of venom; and three specific venom proteins. From *Bothrops insularis*, another island species from southeastern Brazil, the new species differs mainly by its color pattern, smaller size, lower number of subcaudals in males, and absence of hemiclitoris in females. *Bothrops alcatraz* presents some features that may be viewed as paedomorphic within the *B. jararaca* group, such as small adult size, proportionally large eyes, intense coagulant venom activity, and diet composed of centipedes and lizards. We postulate that the dwarfism and characteristics of venom in *B. alcatraz* may be related to its diet (similar to that of juveniles of the mainland *B. jararaca*). *Bothrops alcatraz* and *B. insularis* may have originated through the isolation of populations of a *B. jararaca*-like ancestor on the Alcatrazes and Queimada Grande islands, respectively. The new species is regarded as critically endangered due to its very small area of occurrence and the declining quality of its habitat.

Key words: *Bothrops alcatraz*; Crotalinae; Evolution; Island endemics; Natural history; Southeastern Brazil

THE SYSTEMATICS of snakes of the genus *Bothrops* is notoriously difficult (Campbell and Lamar, 1989; Hoge and Romano-Hoge, 1981; Werman, 1992), although several species groups have been recognized recently (Cadle, 1992; Gutberlet, 1998;

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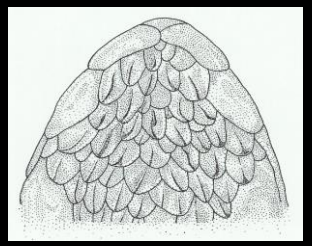
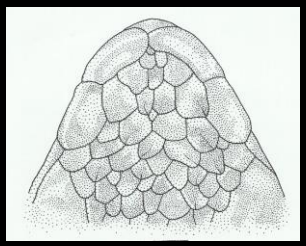
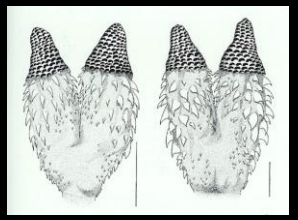
Jararaca-de-Alcatrazes

(*Bothrops alcatraz*)

Tamanho máximo = 50 cm







Bothrops jararaca

Bothrops alcatraz

Anfíbios

Cycloramphus faustoi

Scinax alcatraz

Leptodactylus cf. *marmoratus*

Cycloramphus faustoi

Scinax alcatraz

Anfíbios

Cycloramphus faustoi

Scinax alcatraz

Leptodactylus cf. *marmoratus*

Aranhas

39 espécies

Plesiopelma insular

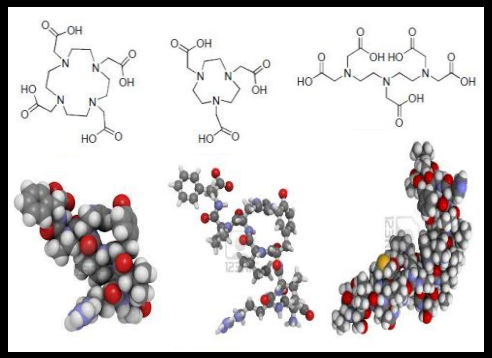
Selenops melanurus

Gasteracantha cancriformes

Anyphaenidae

Barychelidae, Gen. nov., sp. nov.

Stenoterommata sp.



brief communications

Tarantula peptide inhibits atrial fibrillation

A peptide from spider venom can prevent the heartbeat from losing its rhythm.

Atrial fibrillation is the most common sustained cardiac arrhythmia to occur in humans, secondary to valve disease, hypertension or heart failure. It is often associated with passive stretching of the atrial chamber arising from haemodynamic or mechanical dysfunction of the heart. Here we show that atrial fibrillation potentiated by dilatation in rabbit heart can be inhibited by blocking stretch-activated ion channels with a specific peptide from tarantula venom, without altering the resting action potential. Our findings open a window on cardiac arrhythmogenesis and point the way towards developing a new class of drugs.

Stretch-activated ion channels (SACs) are ubiquitous and have been studied in a variety of cardiac tissues[1–3]. Non-selective cationic SACs are permeant to Ca^{2+} ions as well as to Na^+ and K^+, whereas others are selective for K^+ and possibly Cl^- ions[4,5]. According to computer models, the excitatory currents carried by SACs can generate fast arrhythmias[4,5], but a lack of specific inhibitors has prevented the acquisition of matching data.

GsMtx-4 is a small (relative molecular mass, 4K) peptide found in the venom of the tarantula *Grammostola spatulata* (Fig. 1a). It specifically blocks cationic SACs in astrocytes and inhibits volume-activated currents in both adult astrocytes and cardiocytes. As a member of the neurotoxin-inhibitory 'cysteine-knot' family, GsMtx-4 has a binding affinity of about 500 nM for SACs in astrocytes. The specificity of its action is indicated by its lack of effect on the resting properties of rabbit ventricular cells and rat astrocytes[6]. At 4 μM (about 20 times the dose applied to suppress fibrillation), GsMtx-4 had no measurable effect on the action potential of isolated atrial heart cells (C. Baumgarten and H. Clemo, personal communication).

Using perfused rabbit hearts, we initiated fibrillation with a burst of high-frequency stimulation (Fig. 1b) at different right-atrial pressures[7,8]. Stretching the chamber increased the incidence and duration of fibrillation (Fig. 1b–d). At pressures above 12 cm H_2O, the probability of sustained fibrillation (for longer than 60 s) approached unity. Perfusion with 170 nM GsMtx-4 suppressed both the incidence and duration of fibrillation in all hearts ($n = 10$). At pressures below 17.5 cm H_2O, sustained fibrillation was completely inhibited in all preparations (data not shown).

The gadolinium ion (Gd^{3+}), a common but non-selective SAC inhibitor, can also suppress stretch-induced cardiac fibrillation[9], but its lack of specificity and non-applicability under physiological conditions[9] restrict its testing on SACs. Despite their different chemical structures, however, both GsMtx-4 and Gd^{3+} suppress fibrillation in a similar manner without altering the stretch-dependence of the effective refractory period[7] (Fig. 1e), perhaps because both reagents have a high positive-charge density.

The antifibrillatory effect we observe here cannot be driven by a change in surface-charge density, however, as this would alter the shape of the action potential. A different mechanism is also indicated by the persistence of the stretch-induced shortening of the refractory period while fibrillation is inhibited. It is possible that K^+-selective SACs[10], which are resistant to Gd^{3+} (ref. 11) and perhaps to GsMtx-4 as well, act to shorten the action potential under stretch.

The fundamental mechanism of fibrillation is viewed as the fragmentation of excitatory wavefronts, but the role of SACs in this process has not been studied directly. SACs convert gradients of stress into gradients of electrical activity, and sustained mechanical gradients can develop, particularly during repolarization, when the systolic pressure and the wall tension are high while contraction is waning. These gradients are exacerbated in regions of the heart weakened by myocardial infarction, for example.

Stretch sensitivity is not unique to the atrium, so GsMtx-4 should act similarly on all chambers[12]. As an investigative tool, this peptide should be useful for studying mechanical transduction at the molecular and whole-organism levels. We believe that GsMtx-4 could be the first of a new class of antiarrhythmic agents to be directed against the causes rather than the symptoms of fibrillation.

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Isolation and biochemical characterization of peptides presenting antimicrobial activity from the skin of *Phyllomedusa hypochondrialis*☆

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Phylloseptins

ABSTRACT

Amphibian antimicrobial peptides have been known for many decades and several of them have been isolated from anuran species. Dermaseptins are among the most studied antimicrobial peptides and are found in the skin secretion of tree frogs from the Phyllomedusinae subfamily. These peptides exert a lytic action on bacteria, protozoa, yeast, and filamentous fungi at micromolar concentrations, but unlike polylysines, present little hemolytic activity. In this work, two antimicrobial peptides were isolated from the crude skin secretion of *Phyllomedusa hypochondrialis* and tested against Gram-positive and Gram-negative bacteria, presenting no hemolytic activity at the tested concentrations. One of them was identified with the recently reported peptide PS-7 belonging to the phylloseptin family, and another was a novel peptide, named DPh-1, which was fully purified, sequenced by 'de novo' mass spectrometry and grouped into Dermaseptins (DPh-1).

Abbreviations:
Abs, absorbance
ACN, acetonitrile
AMP, Antimicrobial peptides
RP-HPLC, reversed-phase high performance liquid chromatography
TFA, trifluoroacetic acid
MS, mass spectrometry
MS/MS, tandem mass spectrometry
DTT, dithiothreitol

* During the review of this manuscript, the work of Brand GD et al. was published reporting the same sequence as DPh-1. See the reference in: Biochemical and Biophysical Research Communications 347 (2006) 739–746.

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ORIGINAL ARTICLE

Cytometry PART A
Journal of the International Society for Advancement of Cytometry

The Central Nervous System as Target for Antihypertensive Actions of a Proline-Rich Peptide from *Bothrops jararaca* Venom

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Additional Supporting Information may be found in the online version of this article.

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Email: henning@iq.usp.br

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DOI: 10.1002/cyto.a.20860

• **Abstract**

Pyroglutamyl proline-rich oligopeptides, present in the venom of the pit viper *Bothrops jararaca* (*Bj*-PROs), are the first described naturally occurring inhibitors of the angiotensin I-converting enzyme (ACE). The inhibition of ACE by the decapeptide *Bj*-PRO-10c (<ENWPHPQIPP) and other *Bj*-PROs was classically used to explain the pharmacological effects of these venom peptides in mammals resulting in a decrease of blood pressure. Recent studies, however, suggest that ACE inhibition alone is not sufficient for explaining the antihypertensive actions exerted by these peptides. In this study, we show that intracerebroventricular injection of *Bj*-PRO-10c induced a significant reduction of mean arterial pressure (MAP) together with a decrease of heart rate (HR) in spontaneously hypertensive rats, indicating that *Bj*-PRO-10c may act on the central nervous system. In agreement with its supposed neuronal action, this peptide dose-dependently evoked elevations of intracellular calcium concentration ($[Ca^{2+}]_i$) in primary culture from postnatal rat brain. The N-terminal sequence of the peptide was not essential for induction of calcium fluxes, while any changes of C-terminal Pro or Ile residues affected *Bj*-PRO-10c's activity. Using calcium imaging by confocal microscopy and fluorescence imaging plate reader analysis, we have characterized *Bj*-PRO-10c-induced $[Ca^{2+}]_i$ transients in rat brain cells as being independent from bradykinin-mediated effects and ACE inhibition. *Bj*-PRO-10c induced pertussis toxin-sensitive $G_{i/o}$-protein activity mediated through a yet unknown receptor, influx and liberation of calcium from intracellular stores, as well as reduction of intracellular cAMP levels. *Bj*-PRO-10c promoted glutamate and GABA release that may be responsible for its antihypertensive activity and its effect on HR.

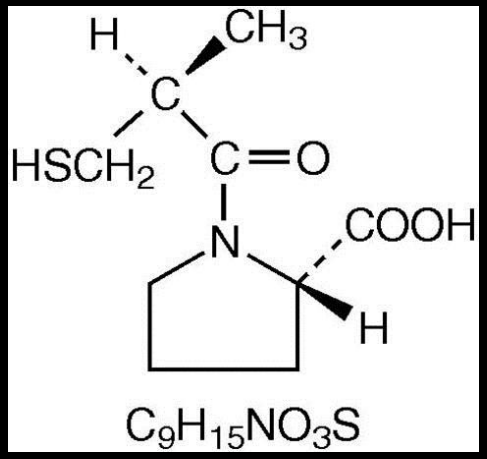
• **Key terms**

pyroglutamyl proline-rich oligopeptides; calcium signaling; G-protein coupled receptor; neurotransmitter release; cardiovascular homeostasis; neuronal cells; snake peptide; calcium imaging by confocal microscopy; fluorescence imaging plate reader analysis

ISAC
International Society for Advancement of Cytometry

ANIMAL toxins have largely contributed not only to the discovery and development of pharmaceutical compounds but also for the identification of protein targets for therapeutic interventions (1). In early 80s, a new class of therapeutic agents for the treatment of hypertension, namely the active site directed inhibitors of the angiotensin I-converting enzyme (ACE), was introduced (2). The pharmacological and biochemical properties of the bradykinin-potentiating peptides (BPPs), which are mainly proline-rich oligopeptides found in the venom of the Brazilian snake *Bothrops jararaca* (*Bj*-PROs) (3,4), were crucial for the development of the antihypertensive drug named Captopril (2,5). This compound represents one of the best examples of a target-driven drug discovery (reviewed in Ref. 6).

Bj-PROs belong to a class of oligopeptides consisting of 5–14 amino acids with both a canonical N-terminal pyroglutamyl moiety and a C-terminal prolyl residue


H
CH3
C
HSCH2
C=O
N
COOH
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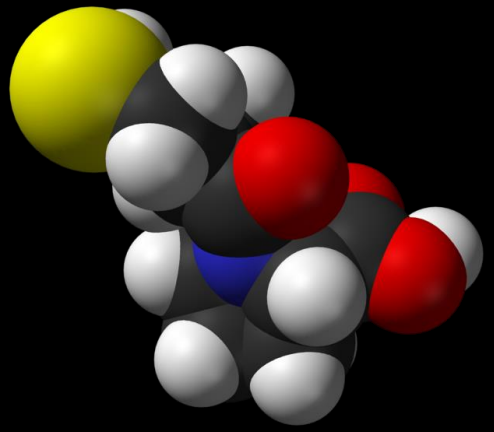
C9H15NO3S




Captopril
Medicamento Genérico
Lei nº 9.787/99
Uso Oral
USO PEDIÁTRICO E ADULTO
Contém 16 comprimidos
RANBAXY
50 mg
G
Medicamento Genérico
VENDA SOB PRESCRIÇÃO MÉDICA

PEPTIDES 29 (2008) 1293–1304

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Crotalphine, a novel potent analgesic peptide from the venom of the South American rattlesnake *Crotalus durissus terrificus*

Katsuhiro Konno [a,1], *Gisele Picolo* [b], *Vanessa P. Gutierrez* [b], *Patrícia Brigatte* [b], *Vanessa O. Zambelli* [b], *Antonio C.M. Camargo* [a], *Yara Cury* [b,*]

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Crotalphine
Antinociception
Opioid receptor
Pain
Snake venom

ABSTRACT

We have shown that the venom of the South American rattlesnake *Crotalus durissus terrificus* induces a long-lasting antinociceptive effect mediated by activation of κ- and δ-opioid receptors. Despite being mediated by opioid receptors, prolonged treatment with the crotalid venom does not cause the development of peripheral tolerance or abstinence symptoms upon withdrawal. In the present study, we have isolated and chemically characterized a novel and potent antinociceptive peptide responsible for the oral opioid activity of this crotalid venom. The amino acid sequence of this peptide, designated crotalphine, was determined by mass spectrometry and corroborated by solid-phase synthesis to be <EFSPENCQGESQPC, where <E is pyroglutamic acid and the two cysteine residues forming a disulfide bond. This 14-amino-acid residue sequence is identical to the γ-chain sequence of crotapotin, a non-toxic component of this snake venom. Crotalphine, when orally administered (0.008–25 μg/kg), induces antinociceptive effect in the prostaglandin E_2- and carrageenin-induced mechanical hyperalgesia models in rats and in the hot-plate test in mice. Crotalphine was also effective when administered by intravenous (0.0032–0.04 μg/kg) or intraplantar (s.c., 0.00006–0.3 μg/paw) routes. In the mechanical hyperalgesia models, crotalphine shows a long-lasting (5 days) antinociceptive effect. D-Phe-Cys-Tyr-D-Trp-Orn-Thr-Pen-Thr amide (CTOP) and N,N-diallyl-Tyr-Aib-Aib-Phe-Leu (ICI 174,864), antagonists of μ- and δ-opioid receptors, respectively, did not alter the antinociceptive effect of the peptide, whereas nor-binaltorphimine, an antagonist of κ-opioid receptors, blocked this effect. These results indicate that crotalphine induces antinociception mediated by activation of κ-opioid receptors and may contribute to the antinociceptive effect of the crotalid venom.

1. Introduction

Several snake venoms have been shown to display analgesic properties in humans and in experimental models of acute and chronic pain [3,6,12,22,34,39]. Among those is the venom of the South American rattlesnake *Crotalus durissus terrificus*. Data from the beginning of the last century indicate that this crotalid venom, when administered in different formulations

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Extraída do veneno da cascavel, a endogenous pain killer tem efeito analgésico de maior duração, além de não causar dependência ou tolerância

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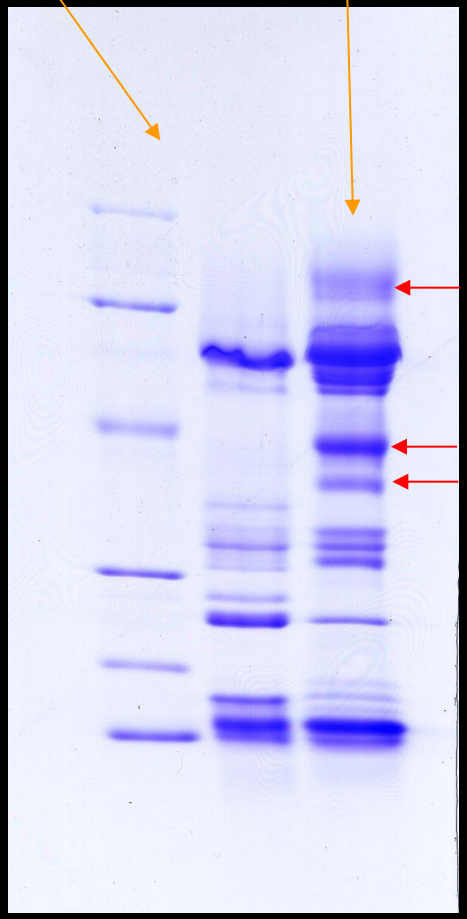
Bothrops alcatraz

Bothrops jararaca (pool)

Bothrops alcatraz



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Comparative Biochemistry and Physiology, Part C 141 (2005) 117 – 123

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Biological and immunological properties of the venom of *Bothrops alcatraz*, an endemic species of pitviper from Brazil

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Laboratório de Herpetologia, Instituto Butantan, Av. Vital Brasil, 1500, 05503-900, São Paulo, SP, Brazil

Received 12 December 2003; received in revised form 19 September 2004; accepted 20 September 2004
Available online 5 July 2005

Abstract

Bothrops alcatraz is a new pitviper species derived from the *Bothrops jararaca* group, whose natural habitat is situated in Alcatrazes Archipelago, a group of marine islands near São Paulo State coast in Brazil. Herein, the biological and biochemical properties of venoms of four adult specimens of *B. alcatraz* were examined comparatively to a reference pool of *Bothrops jararaca* venom. Both venoms showed similar activities and electrophoretic patterns, but *B. alcatraz* venom showed three protein bands of molecular masses of 97, 80 and 38 kDa that were not present in *B. jararaca* reference venom. The i.p. median lethal dose of *B. alcatraz* venom ranged from 5.1 to 6.6 mg/kg, while it was 1.5 mg/kg for *B. jararaca* venom. The minimum hemorrhagic dose of *B. jararaca* venom was 0.63, whereas 2.28 μg/mouse for *B. alcatraz* venom. In contrast, *B. alcatraz* venom was more potent in regard to procoagulant and proteolytic activities. These differences were supported by western blotting and neutralization tests, employing commercial bothropic antivenom, which showed that hemorrhagic and lethal activities of *B. alcatraz* venom were less effectively inhibited than *B. jararaca* venom. Such results evidence that *B. alcatraz* shows quantitative and qualitative differences in venom composition in comparison with its *B. jararaca* relatives, which might represent an optimization of venom towards a specialized diet.

Keywords: Viperidae; *Bothrops alcatraz*; Island species; Venom activities; Serum neutralization

1. Introduction

The neotropical pitviper, *Bothrops jararaca* (Wagler, 1824) occurs in southeastern Brazil, from southern Bahia (14° 48S, 39° 03′W) to Rio Grande do Sul (29° 45′ S, 57° 07′ W), extending westwards into the extreme eastern Mato Grosso do Sul (23° 05S, 55° 13′W) (Campbell and Lamar, 1989; data from the Museum Collection of Instituto Butantan). It is also known in disjunctive populations on marine islands, mainly in São Paulo State coast (Campbell and Lamar, 1989).

Bothrops jararaca is a forest dweller that may live in disturbed habitats and is also found in umbrophilous forest or semi-decidous seasonal forest, including highly degraded formations and even cultivated fields (Sazima, 1992). This species is abundant in southeastern Brazil and is the cause of most of human snakebites (90%) in the region (Fan and Cardoso, 1995).

Bothrops jararaca venom has been the object of many investigations, showing a broad range of actions, such as activation of blood coagulation cascade and platelets (Nahas et al., 1979; Zingali et al., 1990; Kamiguti and Sano-Martins, 1995), induction of local and systemic hemorrhage (Mandelbaum et al., 1976; Assakura et al., 1986; Kamiguti et al., 1991), and also induction of edema and inflammation (Cury et al., 1994; Farsky et al., 1997).

Differences in venom composition and activities depend upon snake age (Kamiguti et al., 1987; Furtado et al., 1991a,b) and individual variations. In fact, Schenberg (1961) noticed more than fifty immunological varieties of *B. jararaca* venom. In addition, Monteiro et al. (1997) have observed more than one isoform of bothrojaracin, a potent inhibitor of thrombin, isolated from individual venoms.

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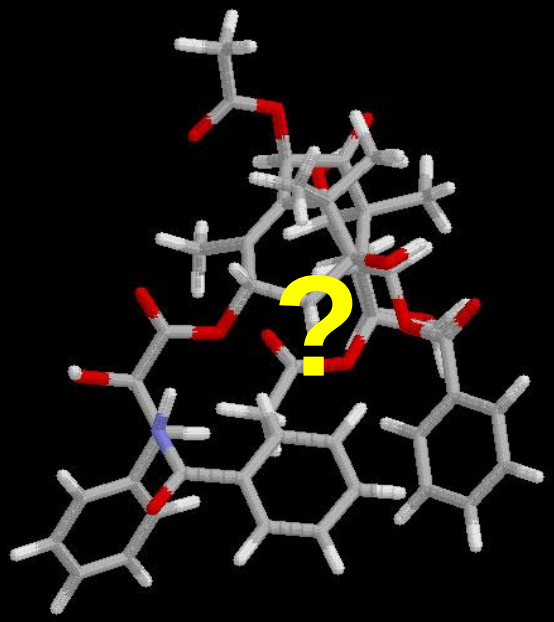
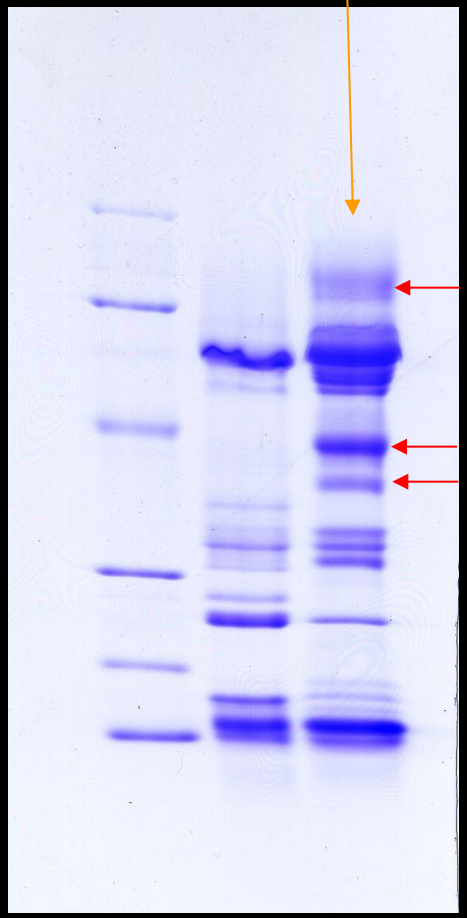
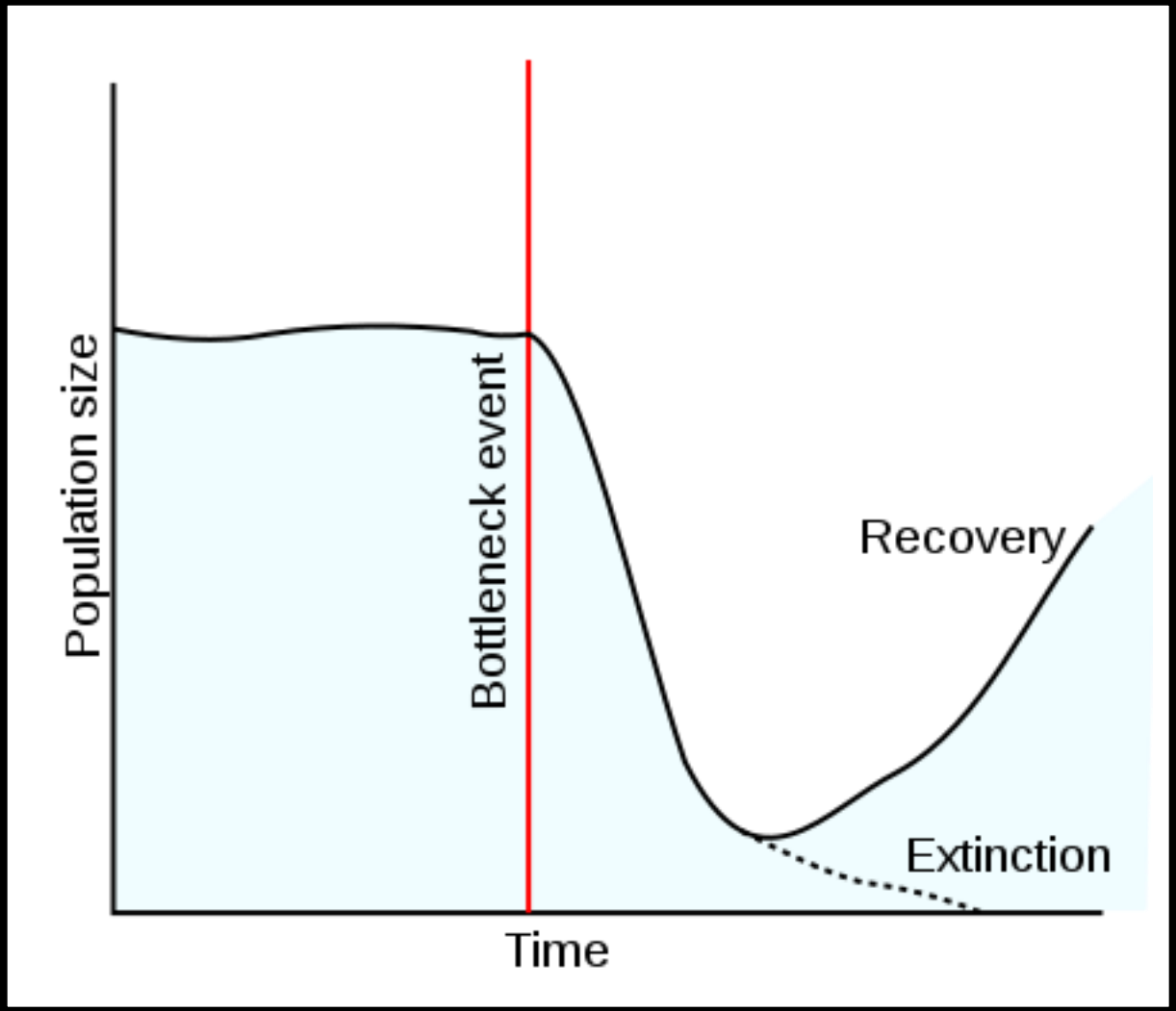
doi:10.1016/j.cca.2004.09.016

Bothrops alcatraz



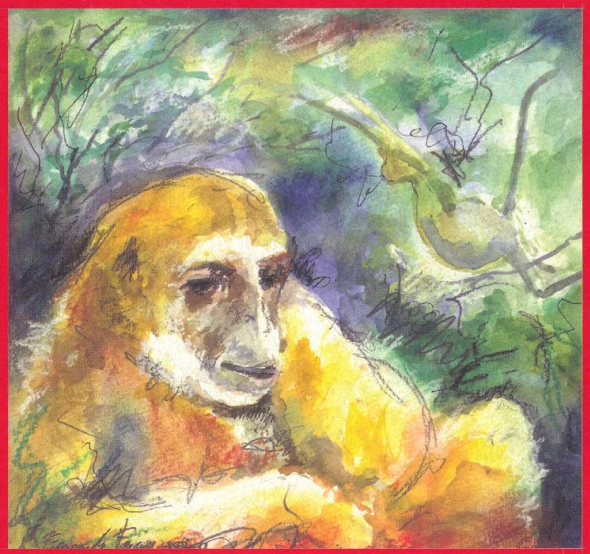



MARINHA DO BRASIL


Population size
Bottleneck event
Recovery
Extinction
Time

Lista da Fauna Brasileira Ameaçada de Extinção

Incluindo as Listas das Espécies Quase Ameçadas e Deficientes em Dados



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LISTA OFICIAL DA FAUNA BRASILEIRA AMEAÇADA DE EXTINÇÃO

The IUCN Species Survival Commission

2000 IUCN Red List of Threatened Species™

Compiled by
Craig Hilton-Taylor

IUCN
The World Conservation Union

The IUCN Red List of Threatened Species™ 2012.2

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Formicivora littoralis

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Amazing Species

Cycloramphus faustoi

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR	EW	EX

Summary | Classification Schemes | Images & External Links | Bibliography | Full Account

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Taxonomy [top]

Kingdom	Phylum	Class	Order	Family
ANIMALIA	CHORDATA	AMPHIBIA	ANURA	CYCLORAMPHIDAE

Scientific Name:	*Cycloramphus faustoi*
Species Authority:	Brasileiro, Haddad, Sawaya & Sazima, 2007
Taxonomic Notes:	In the *Cycloramphus eleutherodactylus* group. It can be distinguished from other congeners by a combination of morphological characters and advertisement call features (Brasileiro *et al.* 2007).

Assessment Information [top]

Red List Category & Criteria:	Critically Endangered B2ab(ii,iii) ver 3.1
Year Published:	2008
Assessor/s:	Cinthia Brasileiro
Reviewer/s:	Ariadne Angulo and Simon Stuart
Contributor/s:	

Justification:
Listed as Critically Endangered because its area of occupancy is less than 10 km², its distribution is confined to an island, and there is the potential threat of human-induced fires on the island.

Geographic Range [top]

Range Description:	*Cycloramphus faustoi* is only known from Saco do Funil (24 05 58.4 S, 45 41 42.3 W) at the island Ilha dos Alcatrazes (135 ha), municipality of São Sebastião, state of São Paulo, southeastern Brazil (Brasileiro *et al.* 2007). The species was recorded between 20 and 100 m asl, but it may occur a little higher (maximum elevation on the island: 150 m asl). (C.A.Brasileiro pers. comm. 2008).
Countries:	**Native:** Brazil (São Paulo)

Cycloramphus faustoi

Scinax alcatraz

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR	EW	EX

Summary | Classification Schemes | Images & External Links | Bibliography | Full Account

View Printer Friendly

Taxonomy [top]

Kingdom	Phylum	Class	Order	Family
ANIMALIA	CHORDATA	AMPHIBIA	ANURA	HYLIDAE

Scientific Name:	*Scinax alcatraz*
Species Authority:	(B. Lutz, 1973)
Taxonomic Notes:	This species was removed from synonymy (as a subspecies) of *Scinax catharinae* by Peixoto (1988).

Assessment Information [top]

Red List Category & Criteria:	Critically Endangered B1ab(iii)+2ab(iii) ver 3.1
Year Published:	2004
Assessor/s:	Miguel Trefaut Rodrigues, Carlos Alberto Gonçalves da Cruz
Reviewer/s:	Global Amphibian Assessment Coordinating Team (Simon Stuart, Janice Chanson, Neil Cox and Bruce Young)
Contributor/s:	

Justification:
Listed as Critically Endangered because its Extent of Occurrence is less than 100 km2 and its Area Of Occupancy is less than 10km2, all individuals are in a single location, and there is continuing decline in the extent and quality of its habitat on the Ilha de Alcatrazes, southern Brazil.

Geographic Range [top]

Range Description:	This species is known only from the type locality: Ilha de Alcatrazes, an island off the coast of the state of São Paulo, Brazil. The maximum elevation of the island is no more than 100m asl.
Countries:	**Native:** Brazil
Range Map:	Click here to open the map viewer and explore range.

Scinax alcatraz

Bothropoides alcatraz

NOT EVALUATED NE | DATA DEFICIENT DD | LEAST CONCERN LC | NEAR THREATENED NT | VULNERABLE VU | ENDANGERED EN | **CRITICALLY ENDANGERED CR** | EXTINCT IN THE WILD EW | EXTINCT EX

Summary | Classification Schemes | Images & External Links | Bibliography | Full Account

Taxonomy [top]

Kingdom	Phylum	Class	Order	Family
ANIMALIA	CHORDATA	REPTILIA	SQUAMATA	VIPERIDAE

Scientific Name:	*Bothropoides alcatraz*
Species Authority:	(Marques, Martins & Sazima, 2002)
Common Name/s: English – Alcatrazes Lancehead	
Synonym/s:	*Bothrops alcatraz* Marques, Martins & Sazima, 2002 *Bothrops sp.*
Taxonomic Notes:	Was originally listed as *Bothrops* sp.

Assessment Information [top]

Red List Category & Criteria:	Critically Endangered B1ab(iii)+2ab(iii) ver 3.1
Year Published:	2004
Assessor/s:	Marques, O.A.V., Martins, M. & Sazima, I.
Reviewer/s:	Hilton-Taylor, C. & Pollock, C.M. (Red List Programme Office)
Contributor/s:	

Justification:
The Alcatrazes lancehead is known only from one location: a small island off southeastern Brazil (total area 1.35 km²). Although the species is relatively common on the island, its highly restricted range and continuing decline in habitat quality, as a result of the island being used target practice by the Brazilian Navy, qualify the species for the Critically Endangered category.

History:	2000 – Critically Endangered

Geographic Range [top]

Range Description:	*Bothrops alcatraz* is known only from Alcatrazes Island (1.35 km²), the largest of four small islands of Alcatrazes Archipelago, approximately 35 km from the coast of São Paulo, southeastern Brazil.
Countries:	**Native:** Brazil (São Paulo)

Bothrops alcatraz