

# Python versus Python !!!

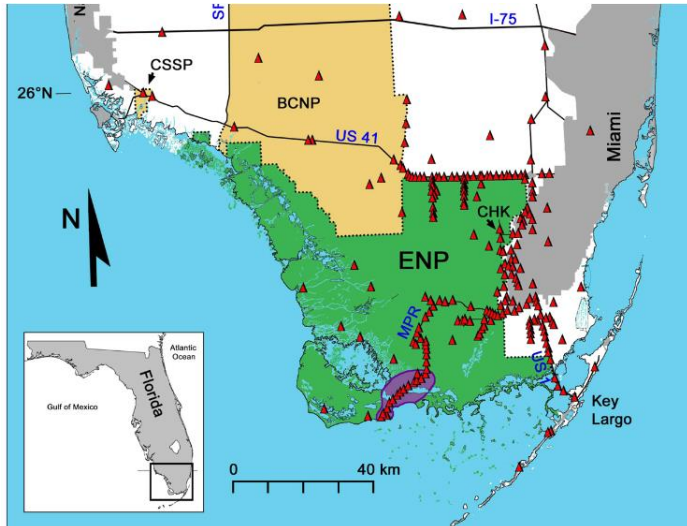


Saving the Everglades one byte at a time?

# The Problem



# Pythons Are Wildly Successful



Numerous: 30,000 – 300,000 (estimated in 2007) 1/

Prolific . Typically lay 40-50 eggs, and can do so once a year. 2/

Well Fed: Between 2003-2011 99.3% decline for raccoons,  
98.9% for opossum, 87.5% for bobcats, 94% for deer 2/

1/ Snow, R. W., K. L. Krysko, K. M. Enge, L. Oberhofer, A. Warren-Bradley, and L. Wilkins. 2007a. Introduced populations of *Boa constrictor* (Boidae) and *Python molurus bivittatus* (Pythonidae) in southern Florida. Pp 416-438. In R. W. Henderson and R. Powell (Eds.). *Biology of the Boas and Pythons*. Eagle Mountain, UT: Eagle Mountain Press.

2/ Dorcas, M. E. and J. D. Willson. 2013. Hidden giants: problems associated with studying secretive invasive pythons. In: W. Lutterschmidt (ed.), *Reptiles in Research: Investigations of Ecology, Physiology, and Behavior from Desert to Sea*. Nova Science Publishers, Inc., Hauppauge, NY.

# ...and Not So Easy Find

You can't see them – they're well-camouflaged ambush hunters. 1/



31 x 25 meters. 10 pythons, 190-30 min. hunts. 2 found.

1/ Dorcas, M. E. and J. D. Willson. 2013. Hidden giants: problems associated with studying secretive invasive pythons. In: W. Lutterschmidt (ed.), Reptiles in Research: Investigations of Ecology, Physiology, and Behavior from Desert to Sea. Nova Science Publishers, Inc., Hauppauge, NY.

images: <http://comp.uark.edu/~jwillson/publications/2012%20-%20Dorcas%20et%20al%20-%202012%20-%20Impacts%20of%20pythons%20on%20mammals%20-%20PNAS.pdf>





# 2016 Python Challenge™



2016: ~600 participants. One month. 102 pythons. 1/

2013: ~1600 participants. One month. 68 pythons.

Between 2000 and 2012, NPS reports fewer than 2000 removed. 2/

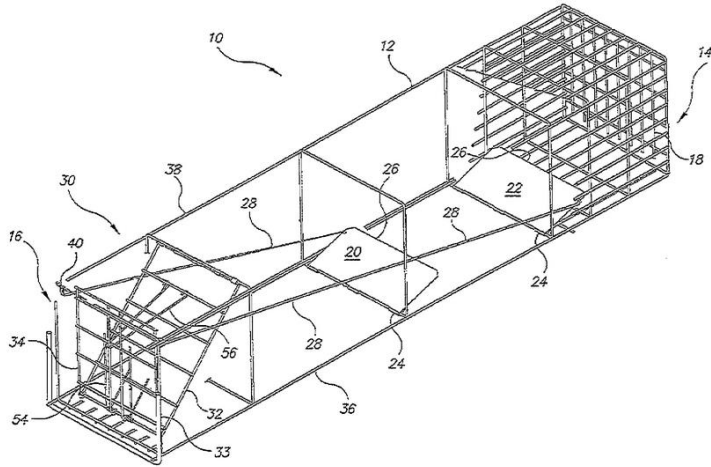
1/ <http://pythonchallenge.org>

2/ <http://www.nps.gov/ever/learn/nature/burmesepythonremoval.htm>

# What's Been Tried

- Dog-assisted humans
  - labor intensive
  - density 0.05-.75/ha, probably
  - geo-limited
- Drone detection
  - like to hide
  - cold-blooded
- Hunting
  - lots of restrictions
  - labor intensive
  - geo-limited
- Trapping
  - 12 patented designs, glue, net, trap-door, noose, etc.
  - mostly indiscriminate

# John Humphrey's Large Reptile Trap



- Discriminant for large, heavy animals
- Awesome!
- Human intervention for retain/release decision

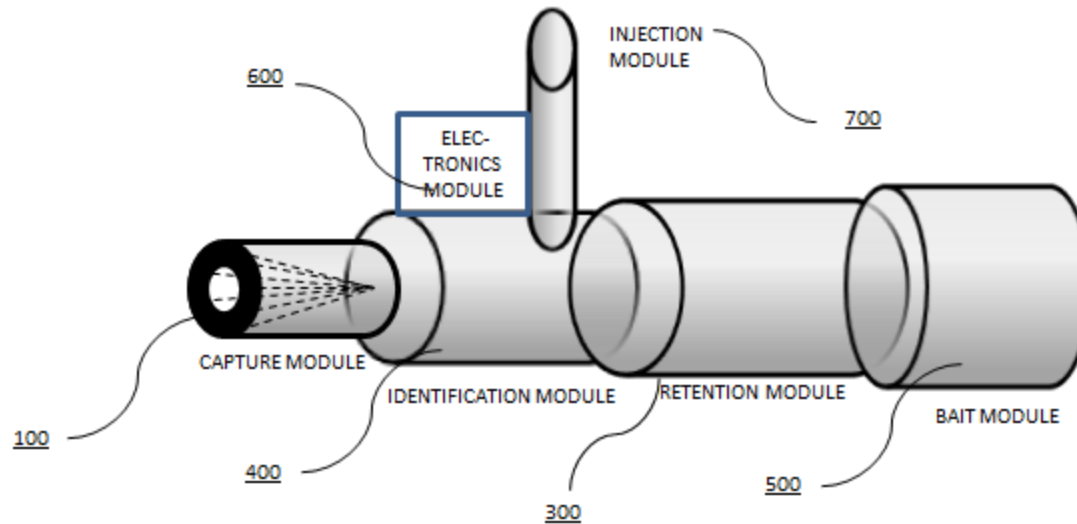
# But I Think We Can Do Better

- Built on an Artificially-Intelligent Platform, a Trap Could Provide:
  - Unattended Mode for Months
  - Discriminant Capture of All Pythons
  - Possibility of Remote Human Intervention
  - Means of Population Research in the Deep Bush

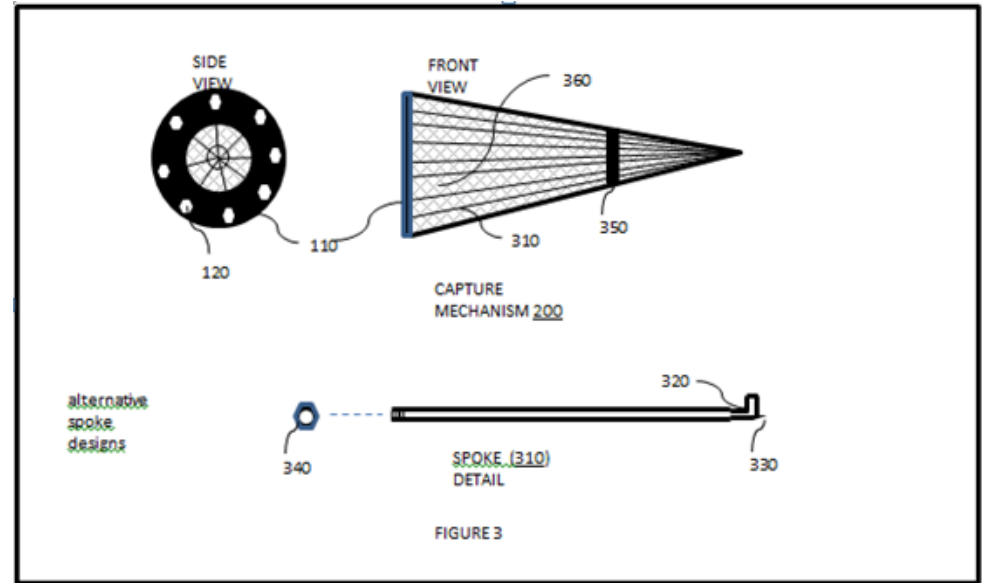
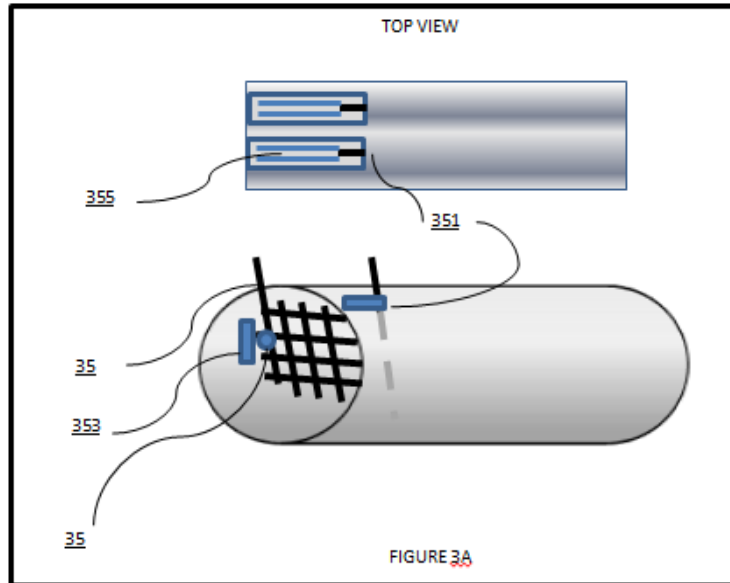




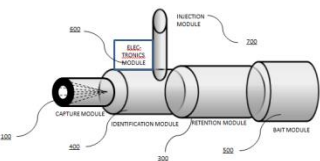
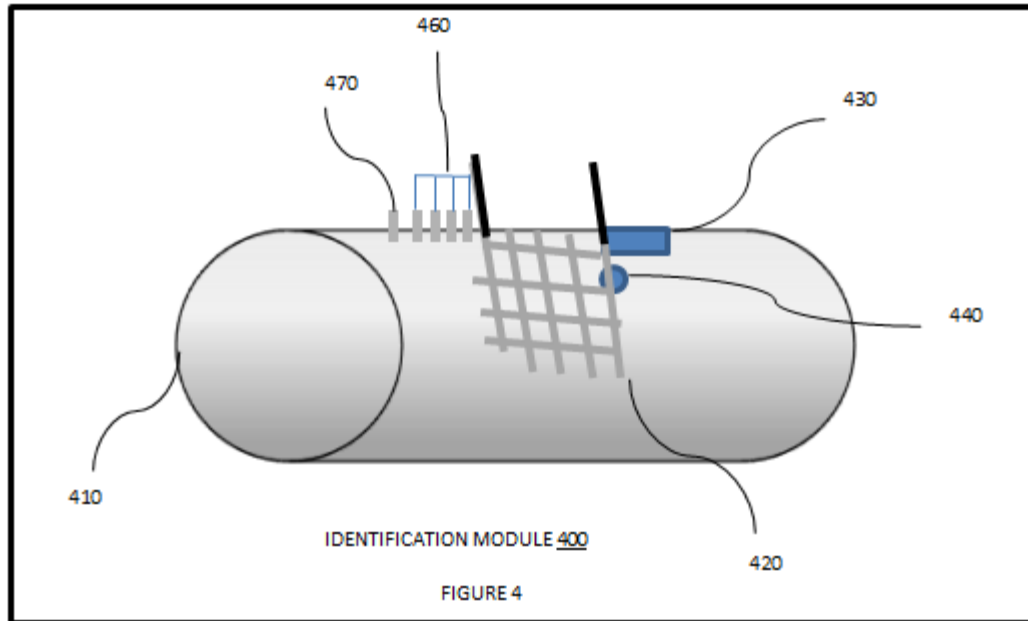
# Here's The Idea ...



# Catch Us A 'Thon

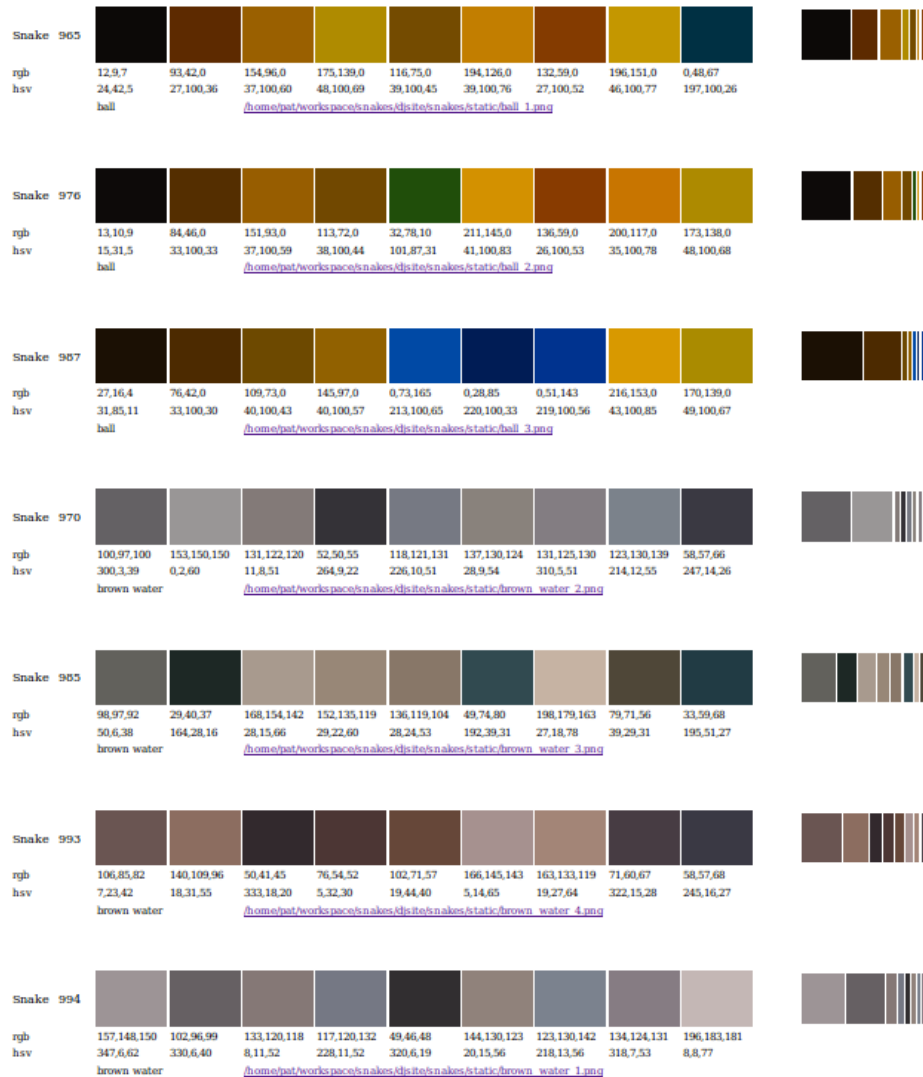


# Take a Photo in the Snake Boudoir



# Figure Out What We've Caught

Snake Palette

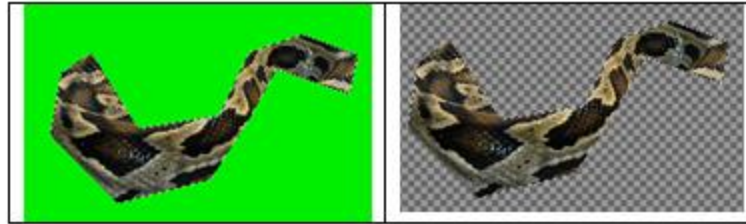


Starting with images captured from the Web...

- reduce palette to “most popular” colors
- determine % associated with each
- store info (with several color models) in database
- create “digital signature” of each.



# Analyze the Captured Image



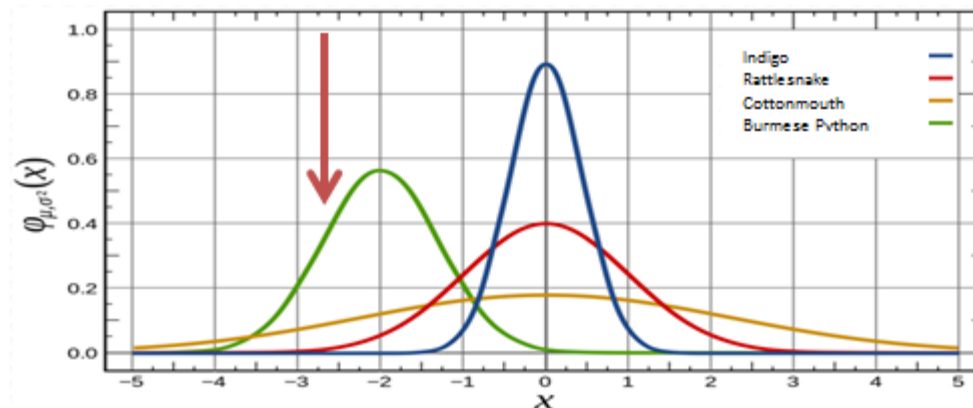
Snake 969

rgb	30,24,21	103,95,82	154,142,110	91,78,51	166,160,146	134,120,93	70,56,39	209,201,169	197,185,154
hsv	20,30,12	37,20,40	44,29,60	41,44,36	42,12,65	40,31,53	33,44,27	48,19,82	43,22,77
burmese	<a href="#">/home/pat/workspace/snakes/dsite/snakes/static/burmese_4.png</a>								

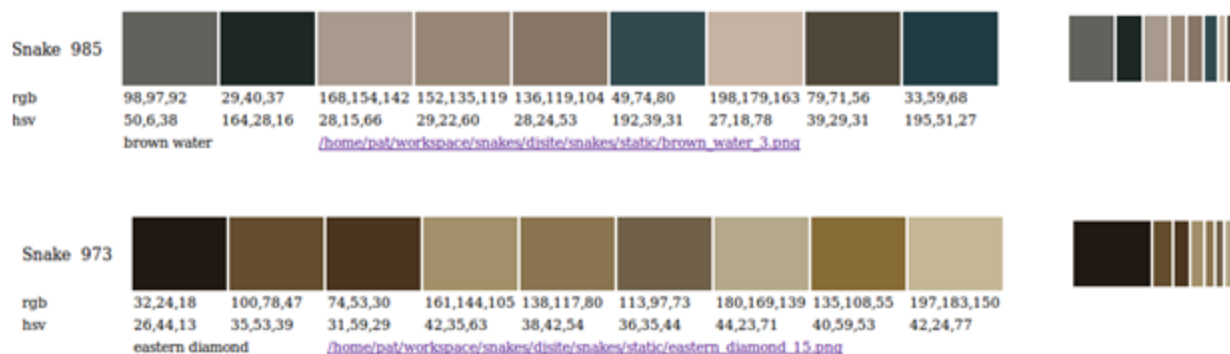


Snake 1003

rgb	76,87,99	39,42,44	58,70,83	49,58,69	95,112,136	73,66,59	118,135,158	139,156,179	161,177,201
hsv	211,23,39	204,11,17	211,30,33	213,29,27	215,30,53	30,19,29	215,25,62	215,22,70	216,20,79
indigo	<a href="#">/home/pat/workspace/snakes/dsite/snakes/static/indigo_4.png</a>								



# Color Alone Isn't Always Sufficient



Especially when:

- Large variations in phenotype within single species \*\* 1/
- Similarities between color distribution between species (esp. threatened ones)
- Samples in database not yet large enough to detect small differences
- Samples in database not yet controlled for lighting, etc.

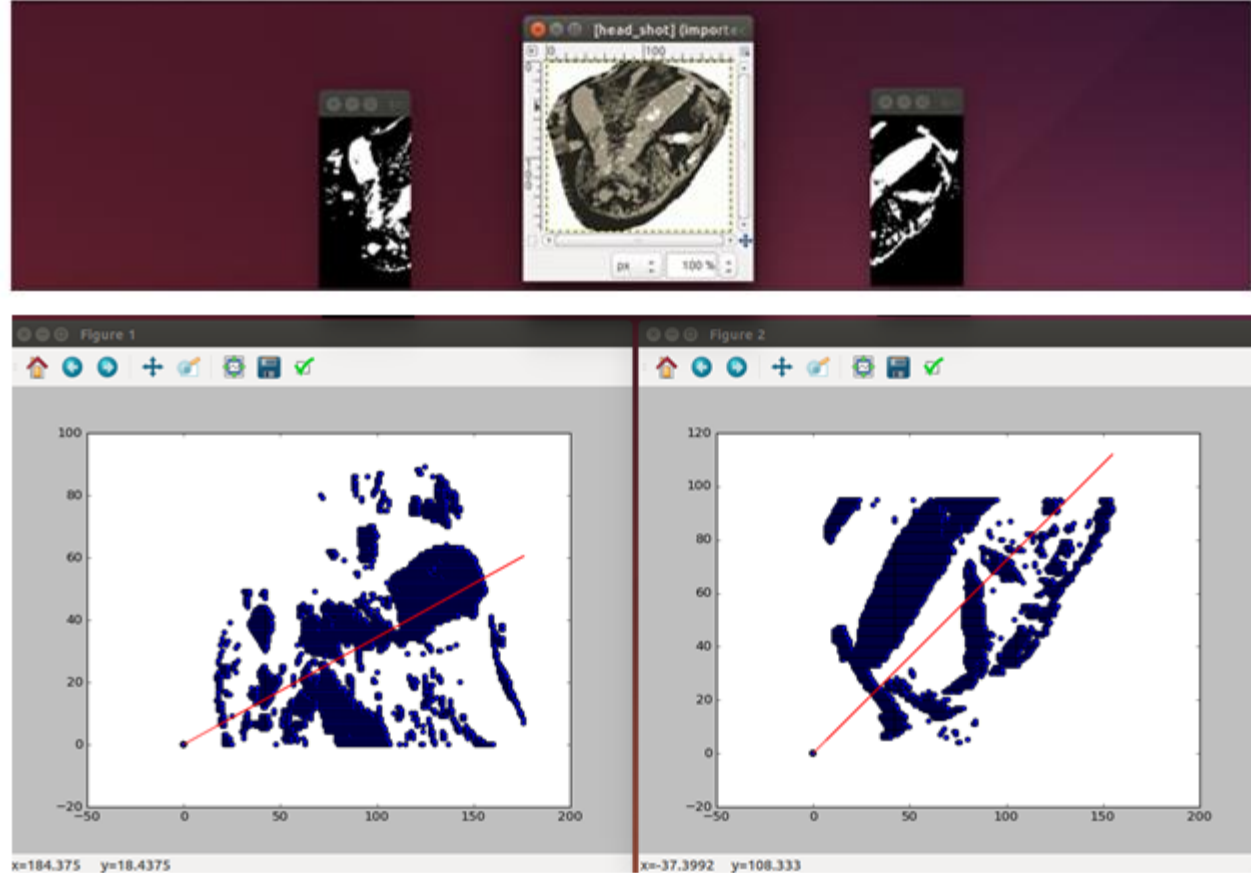
\*\* Burmese pythons in the Everglades are know to be of a narrow genotype. Yea!



# But Pythons Have Beauty Marks



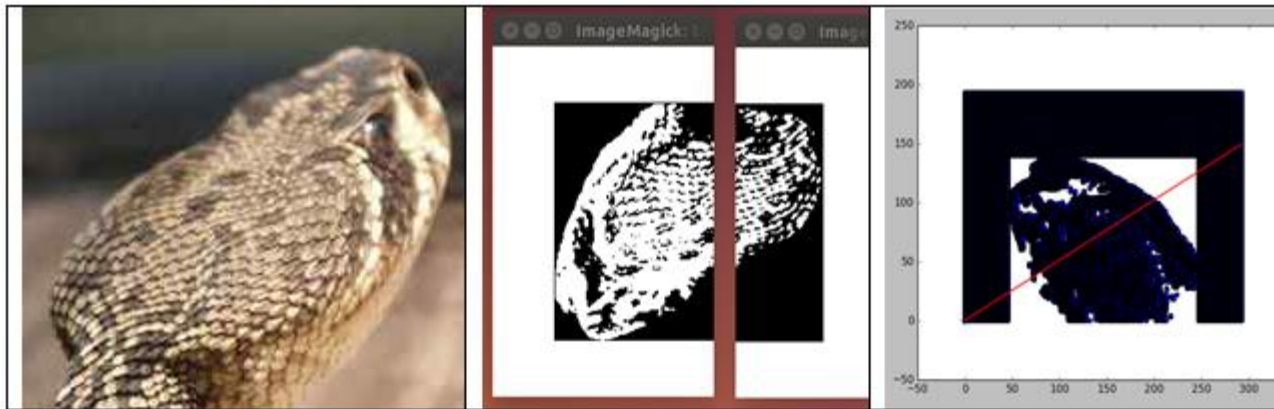
# Example Stats



Results for rotation: -5, split: 50  
left beta = 0.34 R2 = 0.78  
right beta = 0.72 R2 = 0.75

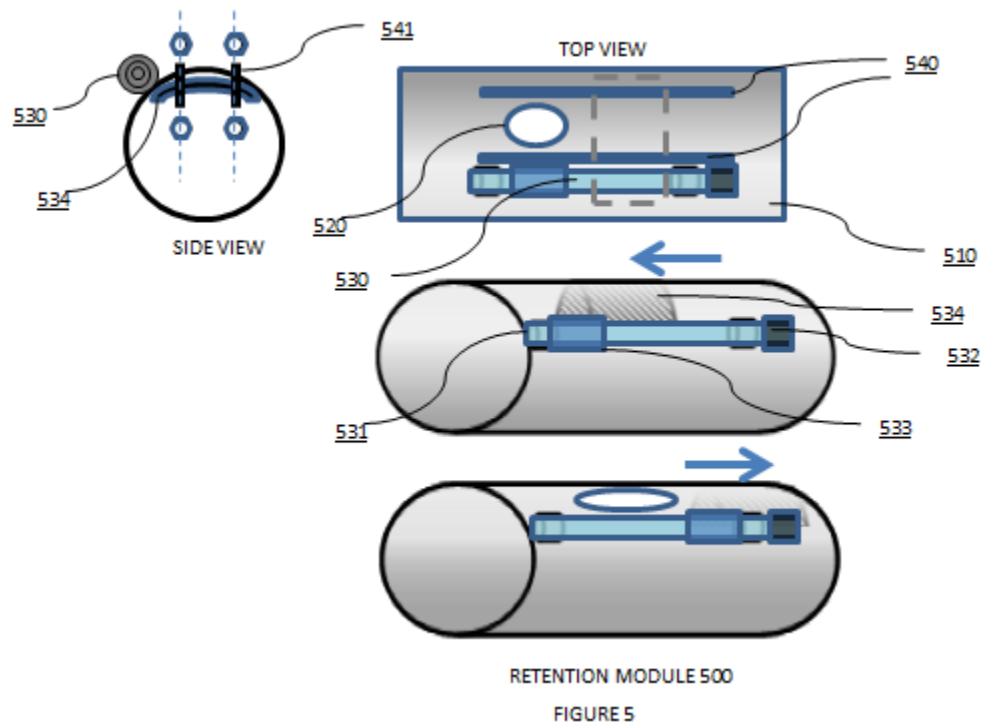


# By Comparison ... Eastern Diamondback



Results for rotation: 0, split: 60  
left beta = 0.51  $R^2 = 0.55$   
right beta = 0.26  $R^2 = 0.44$  the

# Retain, if Desired



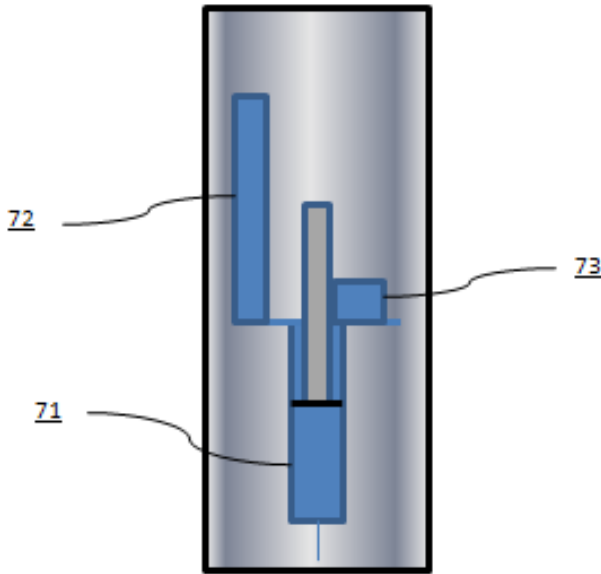
# ... or Worse

Candidates Include:

- Second-generation anticoagulants such as brodifacoum, bromadiolone, difenacoum, and difethialone
- Acetaminophin
- Warfarin / Coumadin

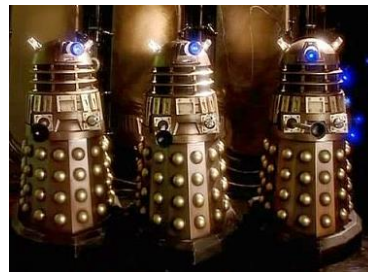
...the idea being to kill the beast with certainty, but not too quickly (think 95 degree heat and 30 pounds of dead python ....)

The dosages are small enough to be manageable, if snakes are anything like rats, but who knows? Here's the table for warfarin 1/ 2/:



INJECTION MODULE 700

FIGURE 8

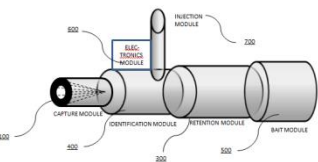


		Dose (mg/kg)			
		Rat	Cat	Rabbit	Snake?
			3	5	8
Weight (kg)	10	30	50	80	
	20	60	100	160	
	30	90	150	240	
	40	120	200	320	
	50	150	250	400	
	60	180	300	480	
	70	210	350	560	
	80	240	400	640	
	90	270	450	720	
	100	300	500	800	

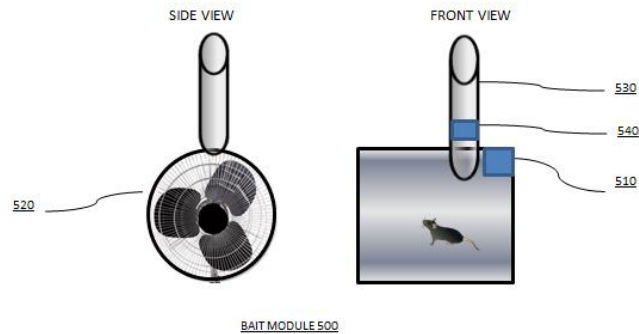
1/ <http://www.cdc.gov/niosh/idlh/81812.html>

2/ <http://pmep.cce.cornell.edu/profiles/extoxnet/pyrethrins-ziram/warfarin-ext.html>

image: [https://en.wikipedia.org/wiki/Dalek#/media/File:Daleks\\_appearance.jpg](https://en.wikipedia.org/wiki/Dalek#/media/File:Daleks_appearance.jpg)



# How To Attract?



Provide tender rodents in attended mode.

Attract and trap rodents in unattended mode.

... or provide scents / bio material from prey. These fine products are available 1/

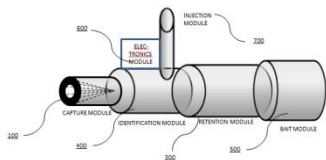
Welcome to the **Pee Mart!** Your best discount online source for 100% real, undiluted predator pee and animal urine.

**We offer FREE SHIPPING to ALL orders to the US and Canada too!**

For express shipments, please order by 10am EST for same day service.

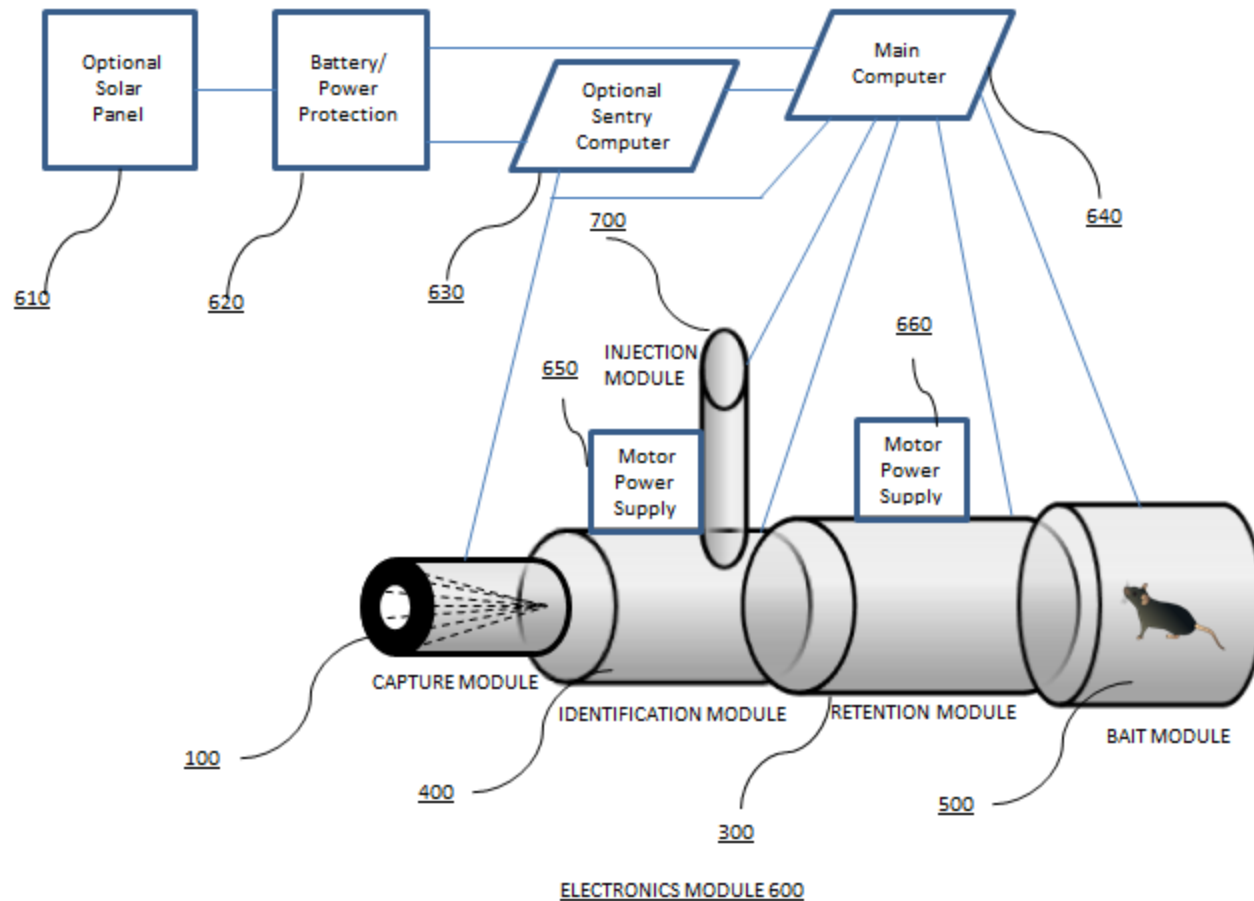
Coyote Urine, Fox Urine, Bobcat Urine, Raccoon Urine, Mt. Lion Urine, Cougar Urine, Panther Urine, Wolf Urine, Bear Urine,

Whitetail Deer Urine, Whitetail Doe in Heat Urine, Whitetail Buck in Rut Urine, Rabbit Scent, Squirrel Scent, Skunk Scent





# Power For Extended Operation



# Comms (Still to be Worked Out)

Communications topics:

- Considerations: content / mode / bandwidth / power
- Mesh grid network SPOC to outside the 'gold standard'
- Ham/ satellite (low bandwidth) /cell all possible

Not required, if we only want basic recognition/capture.

# Work in Progress – Stay Tuned



- Initial testing of key components/software
- Invitation to test in Gainesville
- Provisional patent (in case it's needed)
- Next steps: refine requirements/identify funding

# Thank You!!



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