

Wild animal monitoring

Behavioural animal monitoring

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Biodiversity decline worldwide

WILDLIFE POPULATION DECLINE BETWEEN 1970 AND 2010



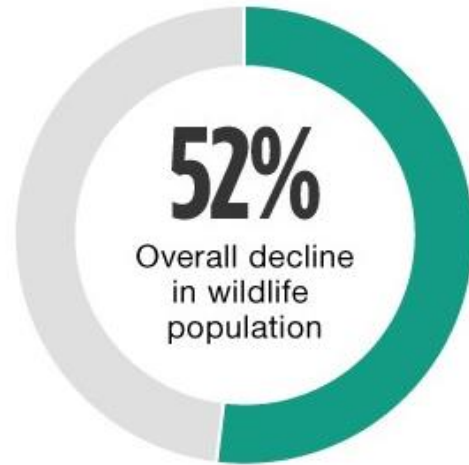
76%
Freshwater species



39%
Terrestrial species

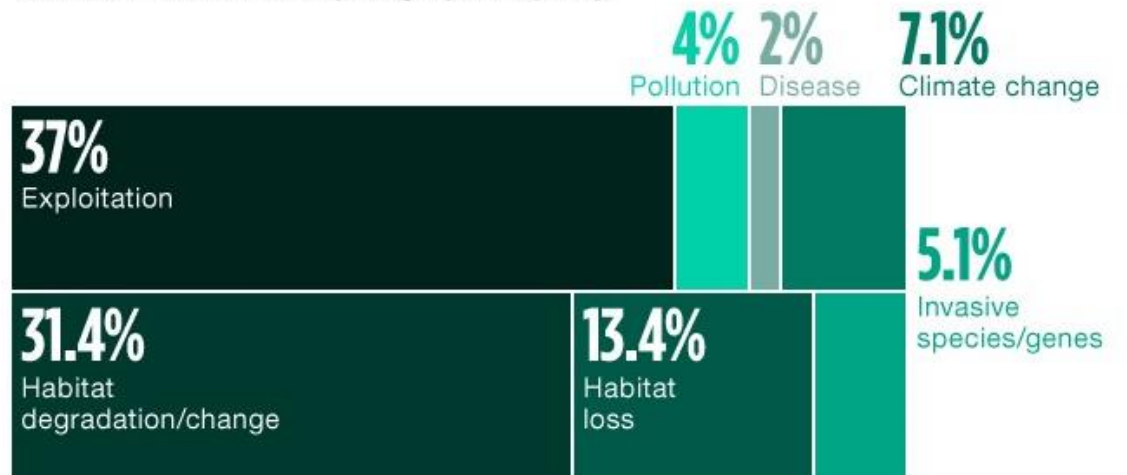


39%
Marine species



SOURCE: World Wide Fund for Nature (WWF)

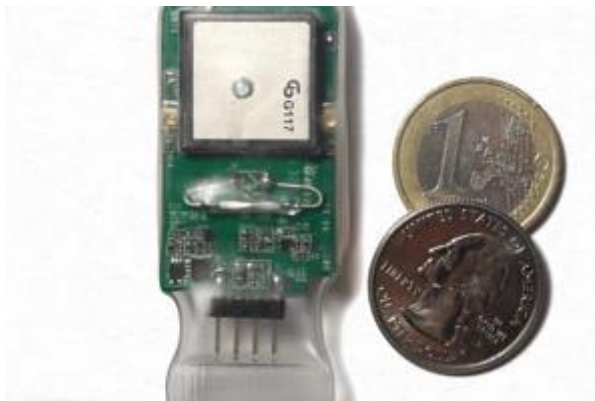
MAIN THREATS TO SPECIES



SOURCE: World Wide Fund for Nature (WWF)

Innovation in technology to the advantage of biological research

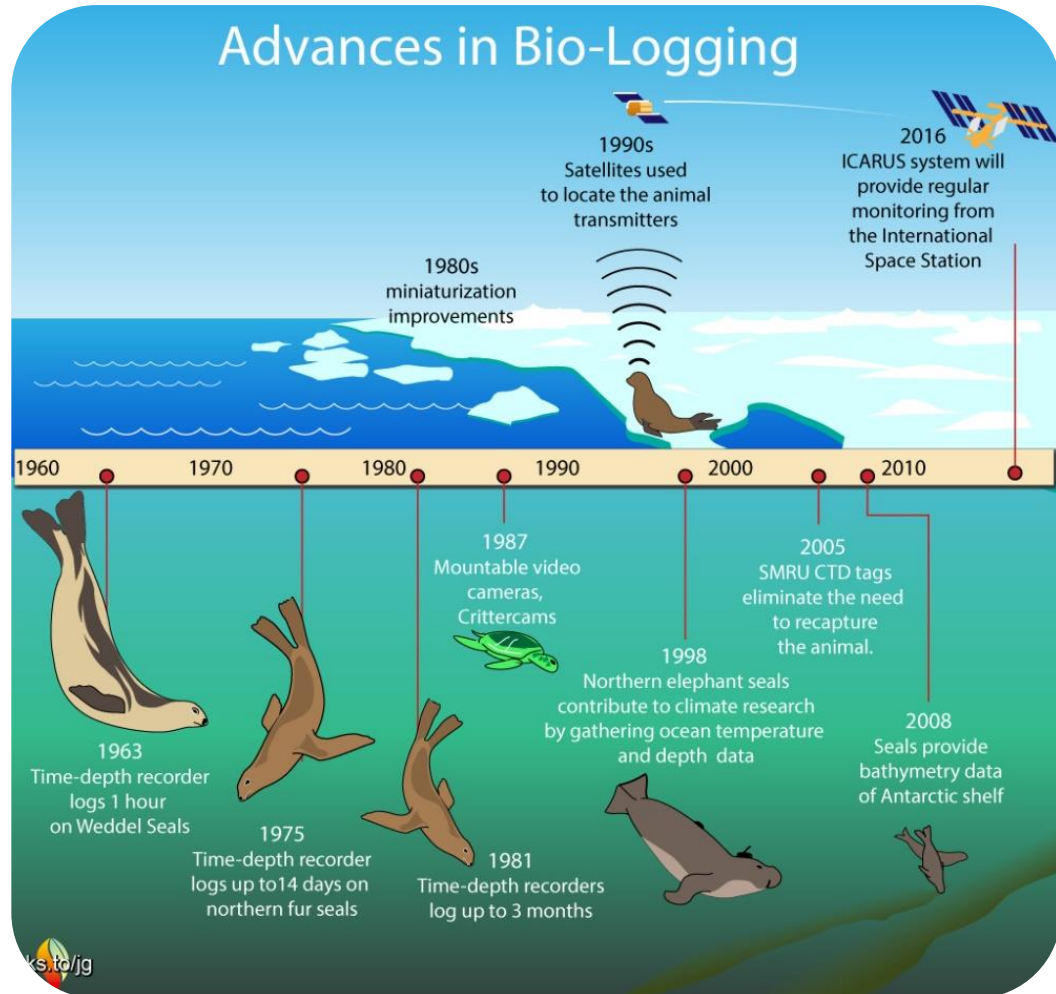
The traditional way to assess populations of vertebrates was to observe their distribution from a ship or plane. In the 1960s biologists attached balloons and kitchen timers to marine mammals to investigate their behaviour.



The explosion of miniature sensors are available for remotely monitoring the activities of wild animals.

Electronics sensors have the ability to sense and record all aspects of animal's locomotion.

Bio-logging and telemetry



“Bio-logging: the use of miniaturized animal-attached tags for logging and/or relaying data about an animal’s movements, behaviour, physiology, and/or environment”

(Rutz & Hays, 2009)

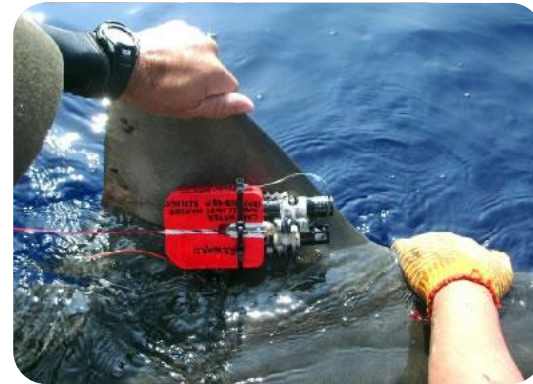
Bio-logging and telemetry

“Bio-telemetry:

the monitoring, recording, and measuring of a living organism’s basic physiological functions, such as heart rate, muscle activity, and body temperature, by the use of telemetry techniques.”
(The America heritage dictionary)

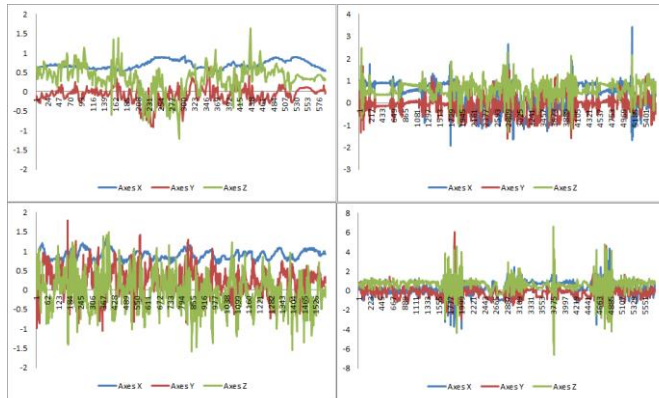


Electronics sensors attached to animals to monitor their activity

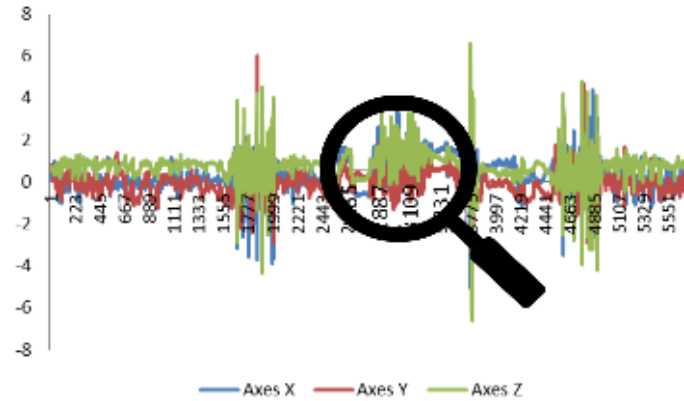


Analysis of biologging and biotelemetry data

Collecting data



Processing data



- Human observation
- Automatic system

Classification



Swimming

Eating

Walking

Neural Networks - to support ecologists

Neural networks models can be used to automatically identify patterns of activity within streams of sensor data.

Patterns are learned by models through a training phase;

Automatically adapt the model to different tasks and contexts;

Robust enough to cope with noisy data.

The neural network makes us able to monitor wild animals in their natural environment. It provides a good chance for conservation programs on large scale. These programs will be developed thus avoiding the obtrusiveness of humans in the wild environment.

Tortoise@



Tortoise@ is an autonomous bio-logging system for large scale applications to identify the tortoise nest activity.

In terms of ethological research the Tortoise@ system provides the opportunity to make automatic an important procedure to assist tortoise populations.

Article Source:

Localizing Tortoise Nests by Neural Networks



Barbuti R, Chessa S, Micheli A, Pucci R (2016) Localizing Tortoise Nests by Neural Networks. PLoS ONE 11(3):

Results obtained for Tortoise@

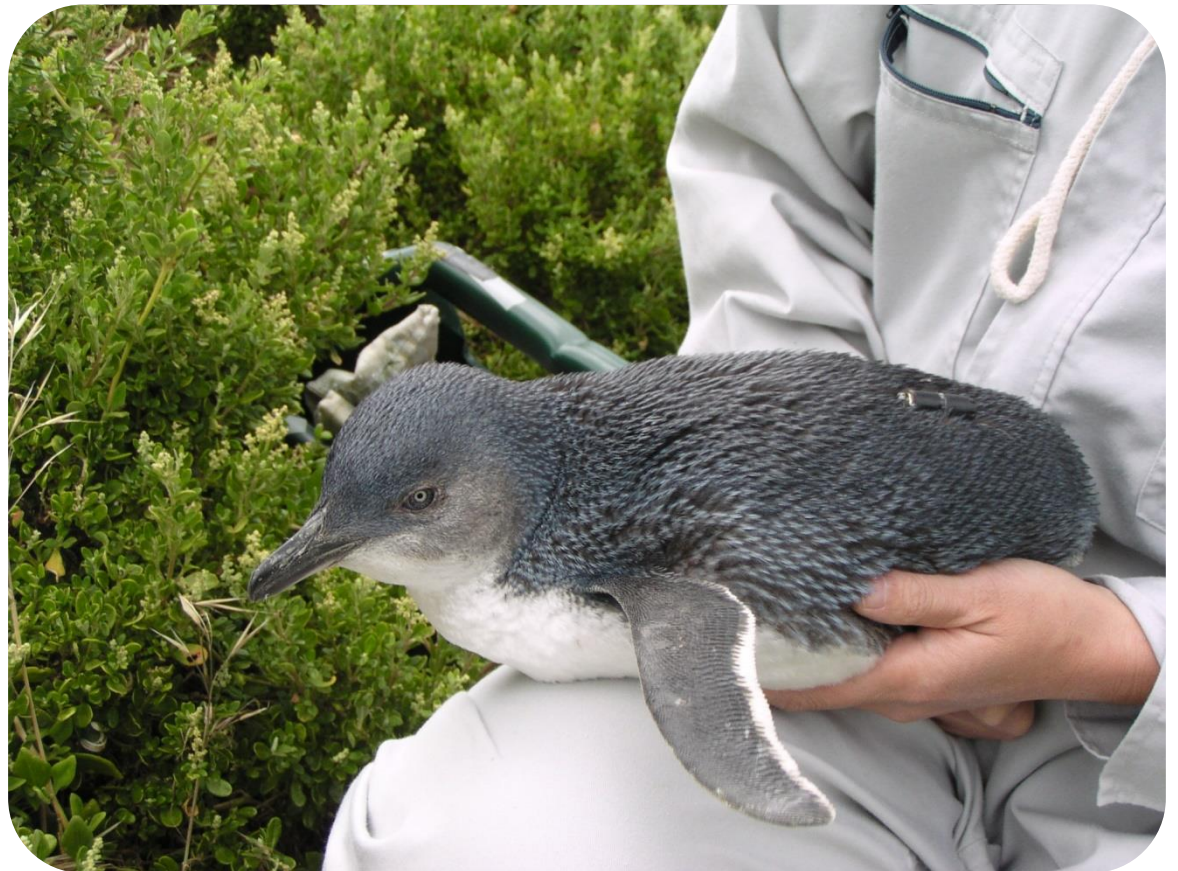
	Test accuracy	Memory storage request
Neural network	96.24 %	1844 bytes
Neural network opt 1	95.51 %	388 bytes
Neural network opt 2	94.34 %	196 bytes

Prey capture by penguins

The machine learning approach can be useful to classify the behaviour of wild animals at unprecedentedly fine scales.

The technique applied is developed to identify a prey capture signature for little penguins accelerometry, in order to quantify food intake remotely.

Collaboration:
University of Pisa, The University of Queensland, and Macquarie University



Prey capture by seals



Work in progress...

Collaboration:
University of Pisa, The University of Queensland, and Macquarie
University





Thank you

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