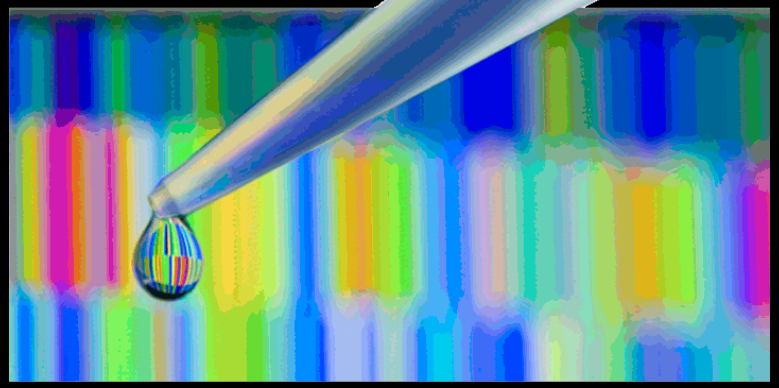
From Biodiversity Inventories to Genomics:

towards sequencing the global genome



Jonathan Coddington

Associate Director for Science

Smithsonian

National Museum of Natural History


Global Genome Initiative
Vision
Preserving the genomic diversity of life on Earth
Mission
Global network
Evolutionary & Ecological Research
Genomic biorepositories
Genomes of key branches of tree of life
Public Awareness and Understanding

Biodiversity Genomics

- What's out there?
- What do we have?
- How did it evolve?
- How does it work?
- Evolution, ecology, conservation environmental management
- Training the next generation

Biodiversity Genomics (to date)

- Multicellular life + protists 1022 “forms”
- Bacteria, Archaea 11,876 forms
- Viruses 3,570 forms

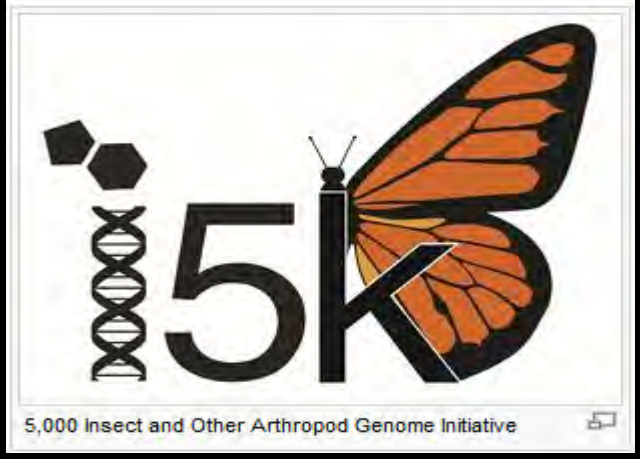
Ex http://www.ncbi.nlm.nih.gov/genome/browse/

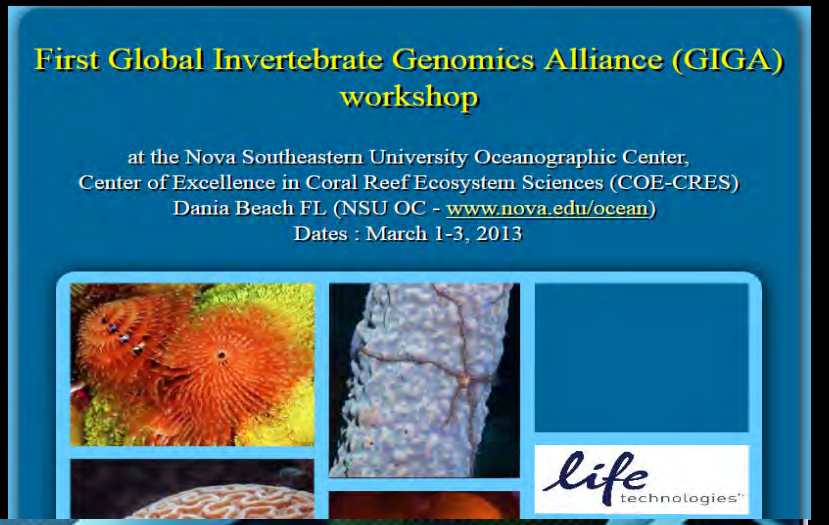
Biodiversity Genomics

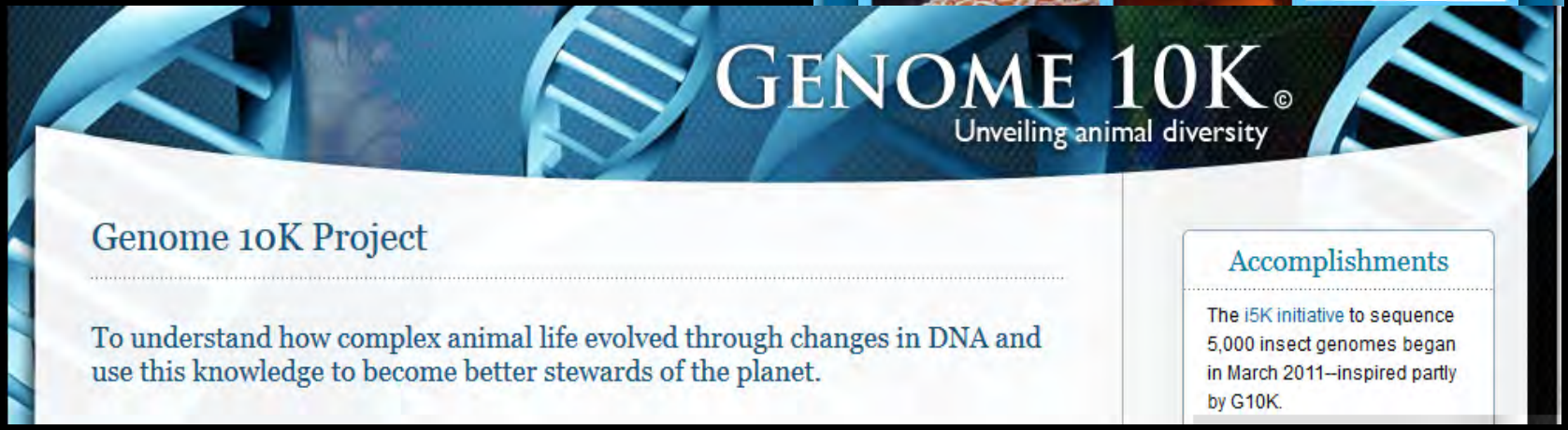
5000 insects

7,500 Invertebrates

10,000 vertebrates







Understanding Ourselves

News.nationalgeographic.com

Understanding Disease

The Future of Natural History Genomics?

News | Science

Scientists produce cloned embryos of extinct frog

15 March 2013

The genome of an extinct Australian frog has been revived and reactivated by a team of scientists using sophisticated cloning technology to implant a "dead" cell nucleus into a fresh egg from another frog species.

The bizarre gastric-brooding frog, *Rheobatrachus silus* – which uniquely swallowed its eggs, brooded its young in its stomach and gave birth through its mouth – became extinct in 1983.

But the Lazarus Project team has been able to recover cell nuclei from tissues collected in the 1970s and kept for 40 years in a conventional deep freezer. The "de-extinction" project aims to bring the frog back to life.

In repeated experiments over five years, the researchers used a laboratory technique known as somatic cell nuclear transfer. They took fresh donor eggs from the distantly related Great Barred Frog, *Mixophyes fasciolatus*, inactivated the egg nuclei and replaced them with dead nuclei from the extinct frog. Some of the eggs spontaneously began to divide and grow to early embryo stage – a tiny ball of many living cells.

Although none of the embryos survived beyond a few days, genetic tests confirmed that the dividing cells contain the genetic material from the extinct frog.

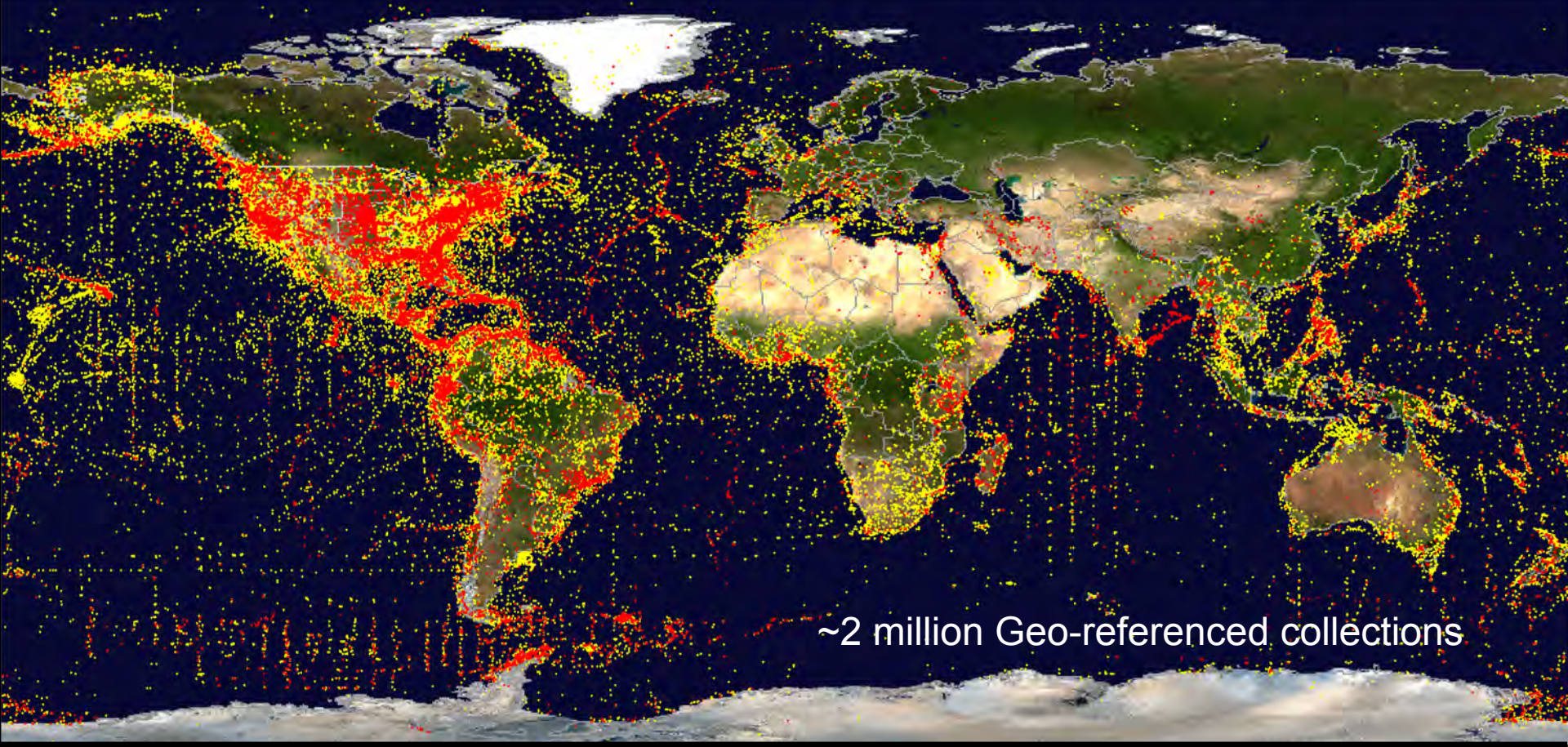
The results are yet to be published.

"We are watching Lazarus arise from the dead, step by exciting step," says the leader of the Lazarus Project team, Professor Mike Archer, of the University of New South Wales, in Sydney. "We've reactivated dead cells into living ones and revived the extinct frog's genome in the process. Now we have fresh cryo-preserved cells of the extinct frog to use in future cloning experiments.

An artist's impression of the gastric-brooding frog. Artwork: Peter Schouten

Article Tags

UNSW / gastric-brooding frog / extinction / Lazarus Project / TEDx / Professor Mike Archer


~2 million Geo-referenced collections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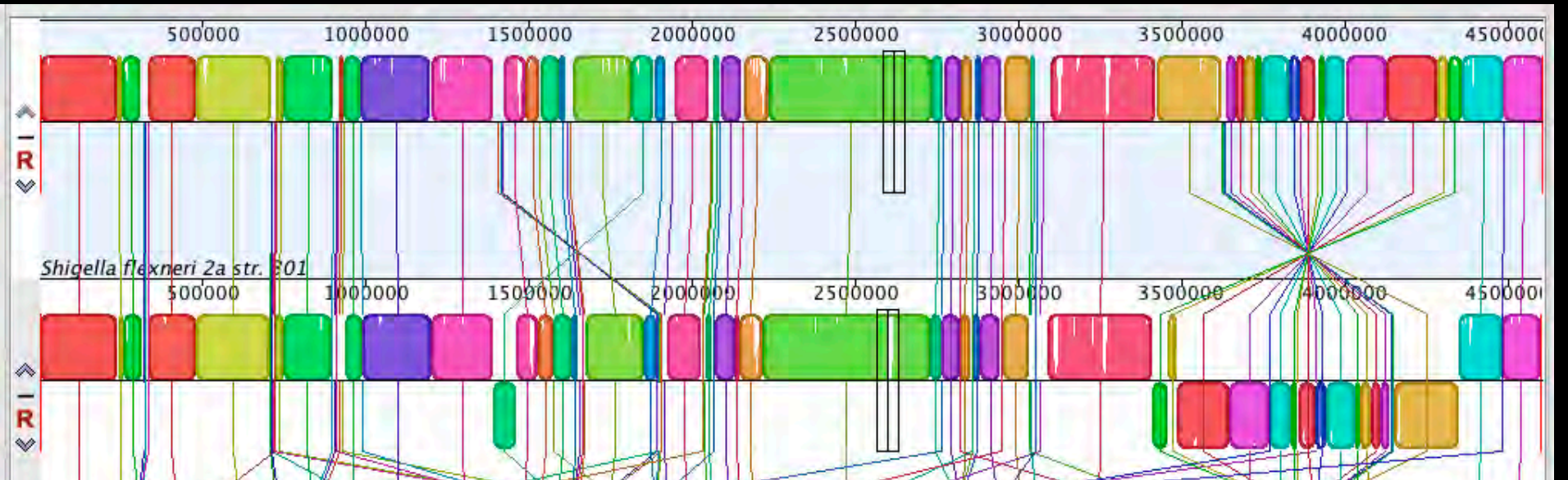
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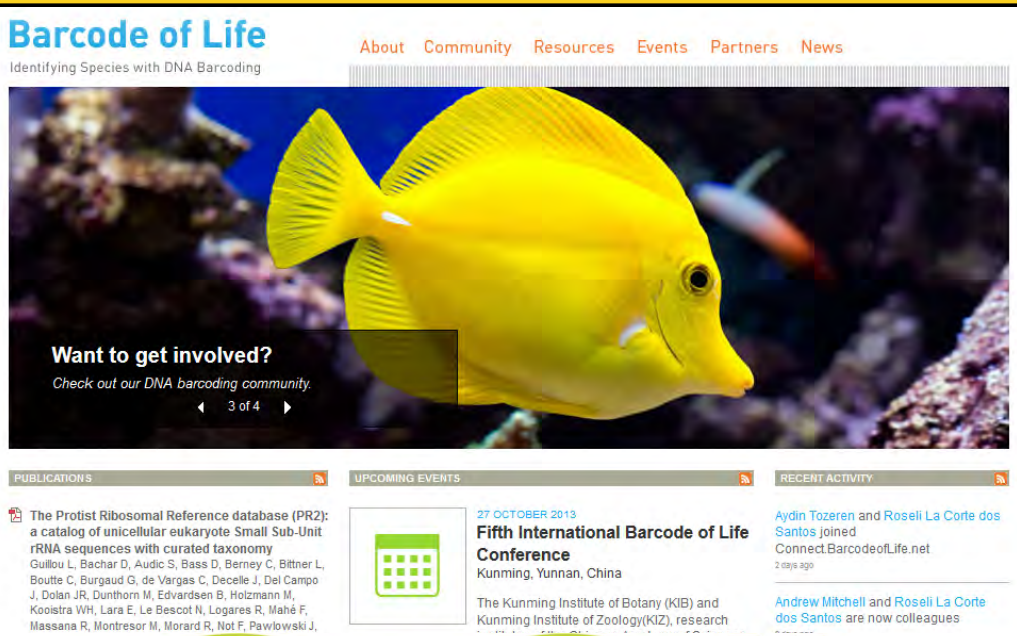
NMNH Biorepository 4-5M 2ml tube capacity

58 Freezers

24 Nitrogen Tanks

NMNH Biodiversity Portfolio



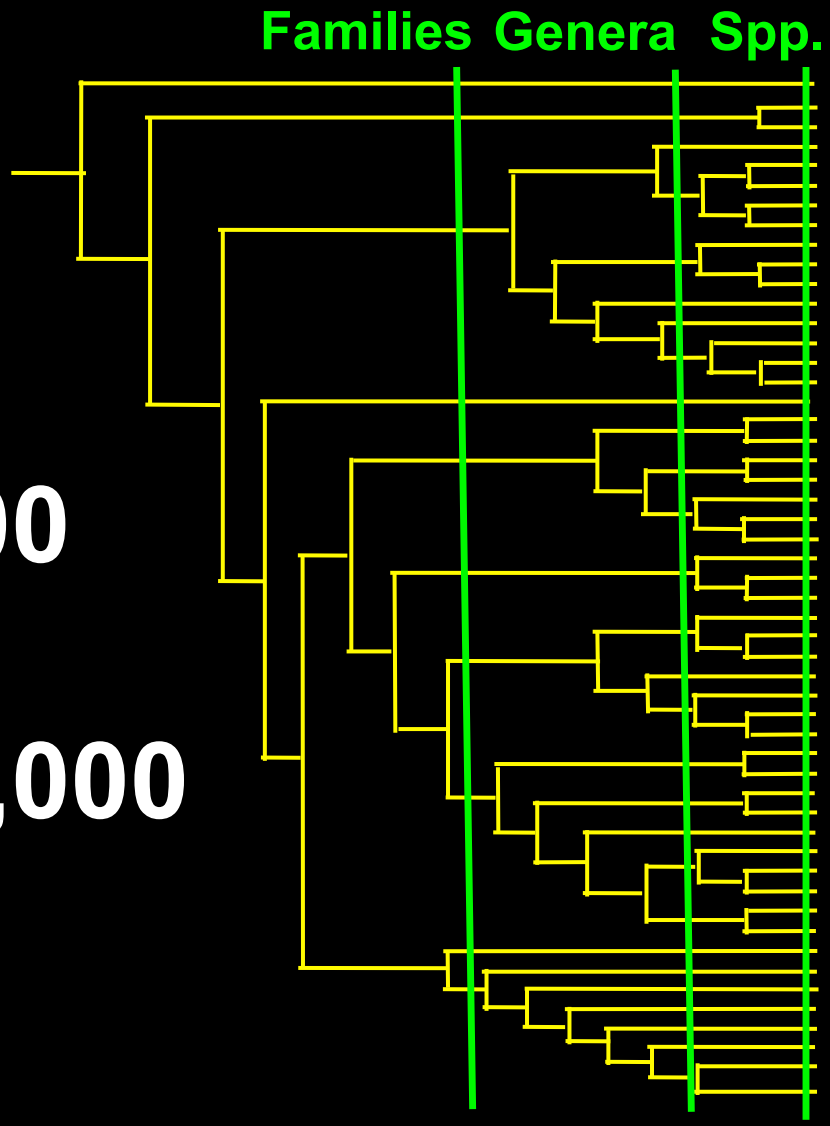
22 Biorepository Partners

Feasibility

FAMILIES ~ 9500

GENERA ~ 200,000

SPECIES >12,000,000

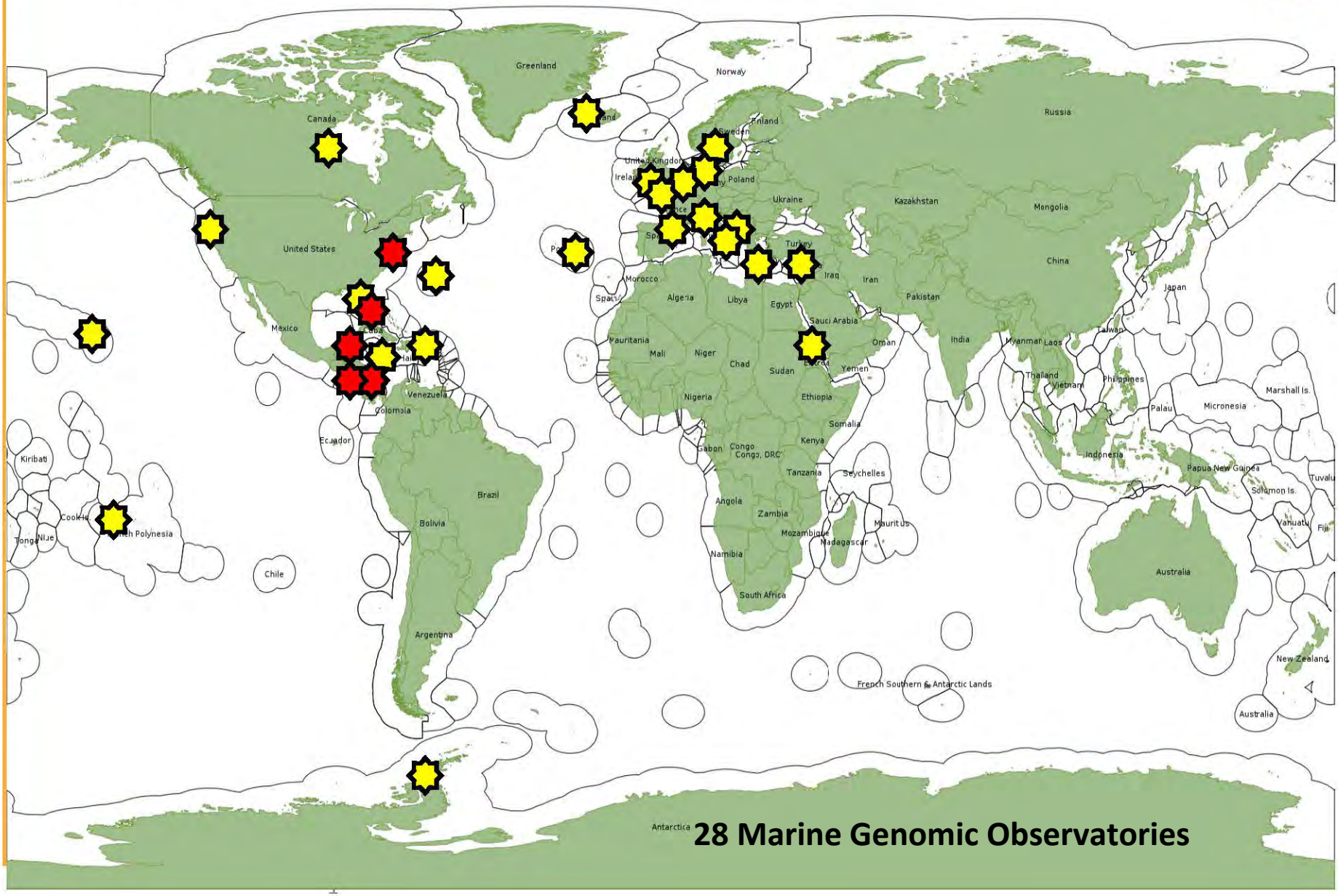


Geography

Smithsonian Institution Forest Earth Observatory, Tennenbaum Marine GEO

40 plots, 4,346 genera (“trees”) **~60% world total?**

OSD and TMO Collaboration sites



28 Marine Genomic Observatories

Preserving and Understanding Genomic Diversity

Genome: Unlocking Life's Code