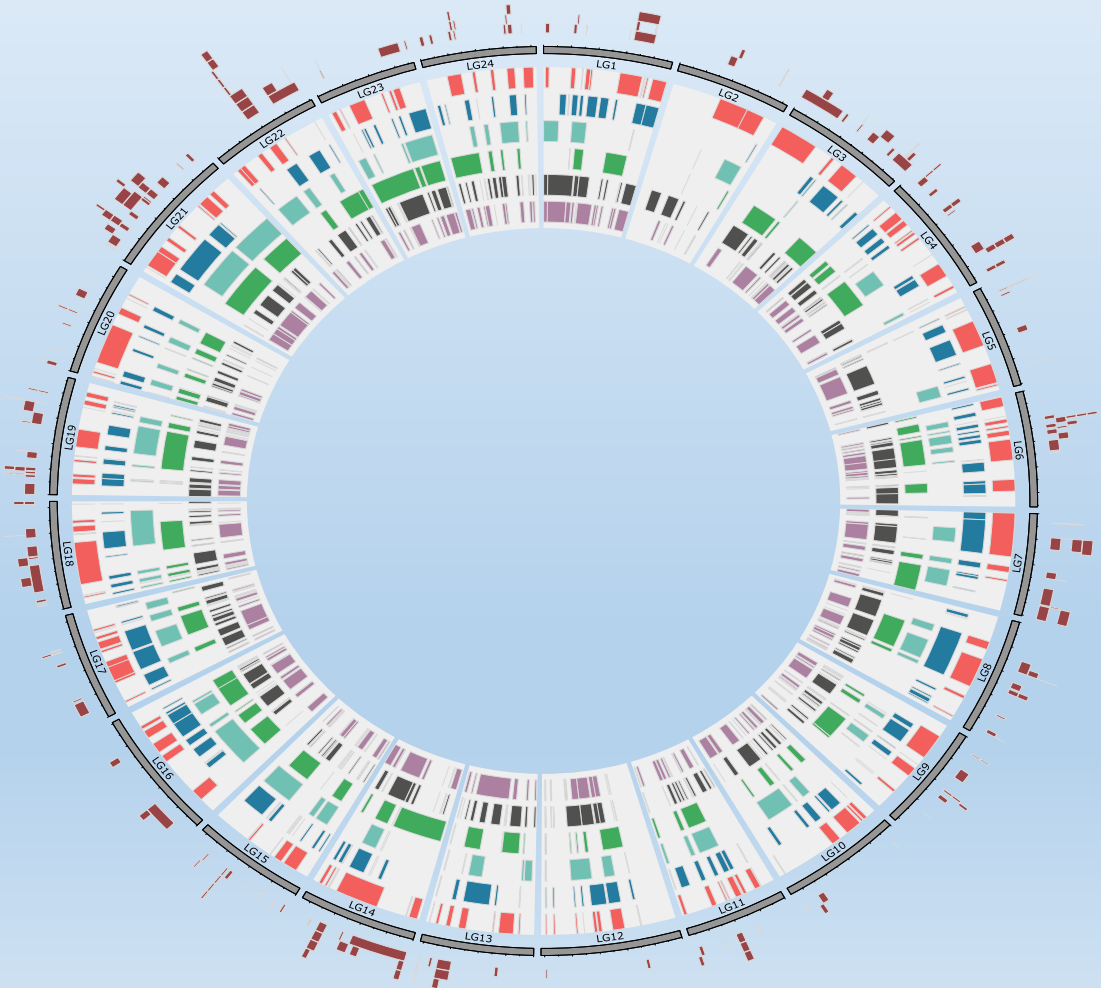
TEXAS A&M UNIVERSITY CORPUS CHRISTI | HARTE RESEARCH INSTITUTE FOR GULF OF MEXICO STUDIES

C-IMAGE-II

MGL Marine Genomics Laboratory

Omics approaches to Understanding Impacts of Oil Spills on Macroorganisms



Omics

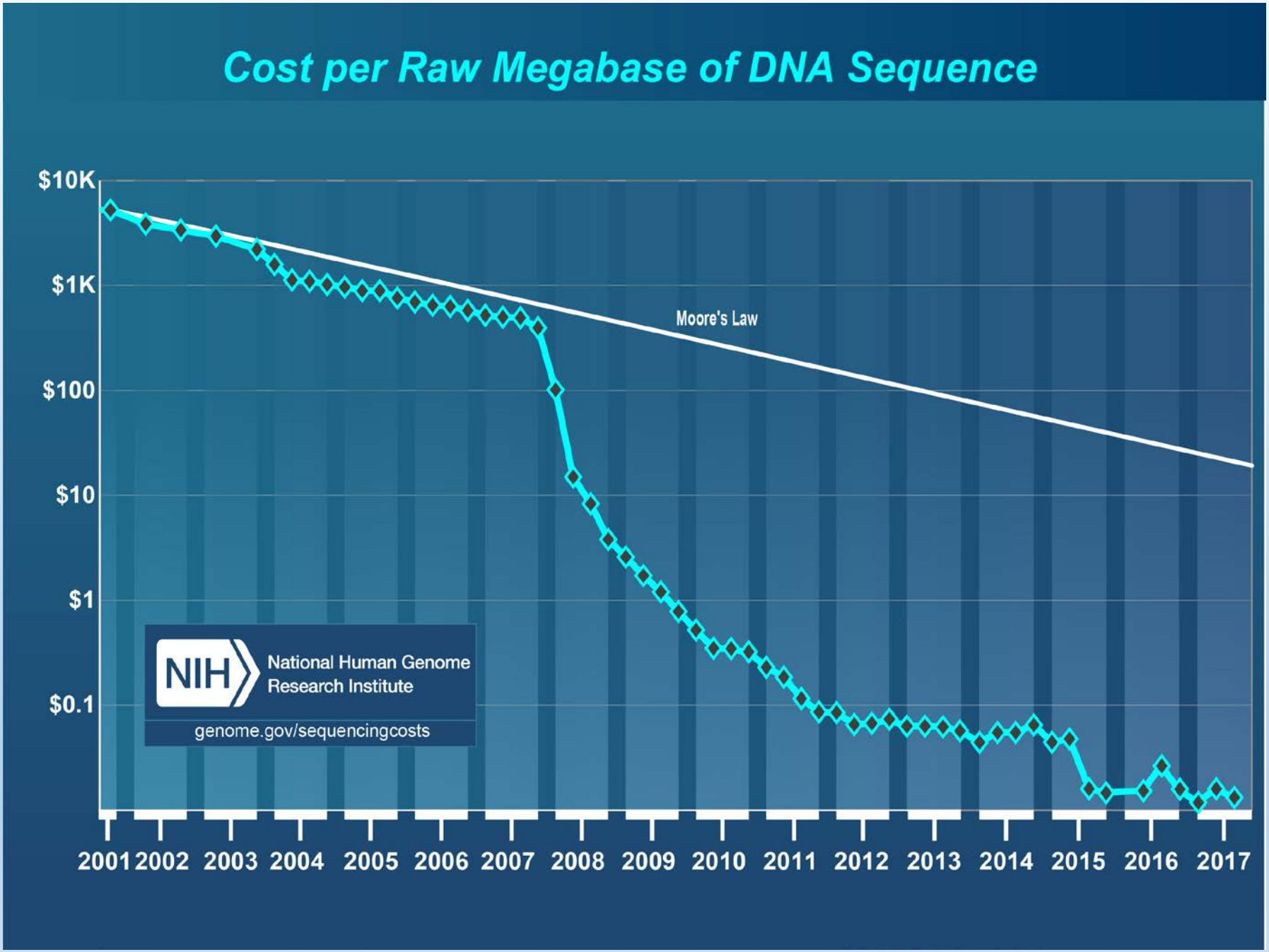
Vast improvement in technology

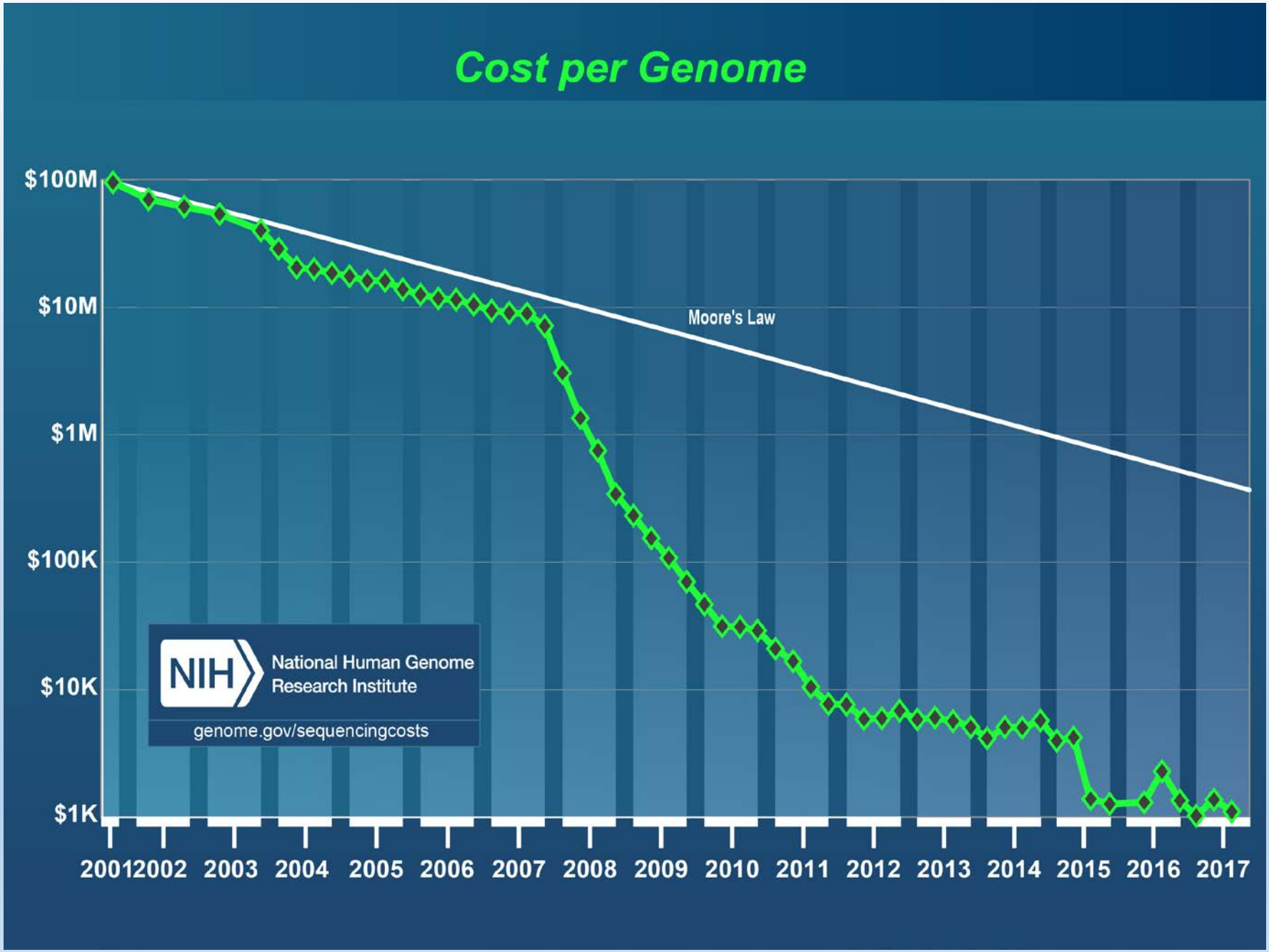
96 wells of Sanger sequencing (~600 bp) = 57,600 bp

4,000 SNP-loci (125 bp –paired) = 1,000,000 bp (per individual)

Whole-genome sequence ~ 1,000,000,000 bp

Much less expensive per base


Cost per Raw Megabase of DNA Sequence
$10K
$1K
$100
$10
$1
$0.1
Moore's Law
NIH
National Human Genome Research Institute
genome.gov/sequencingcosts
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017


Cost per Genome
$100M
$10M
$1M
$100K
$10K
$1K
Moore's Law
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2001
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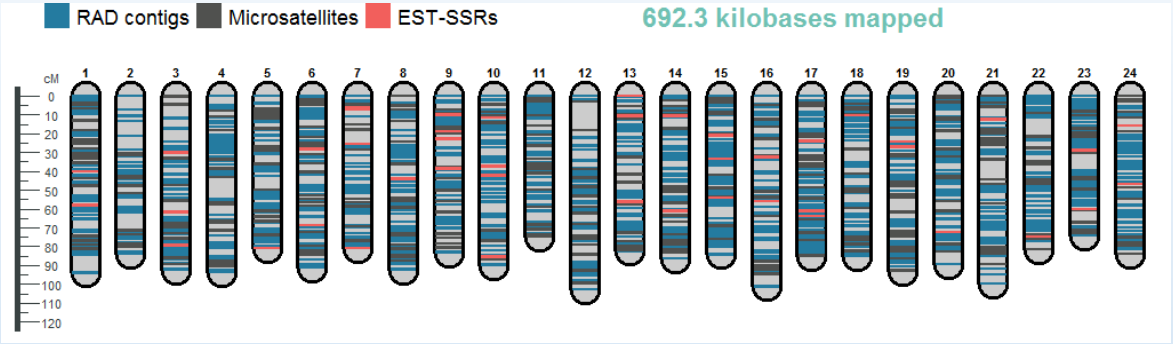
Red Drum Genome



Basic Stats:

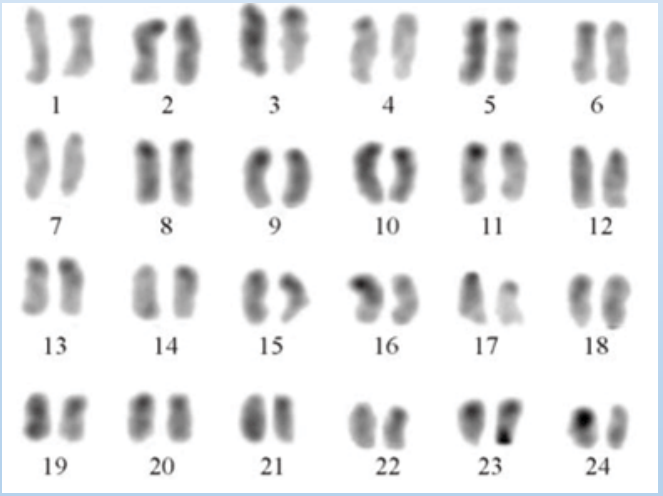
31 SMRT Cells

1 HiSeq

3,389 contigs

0.68 Gb of assembled sequence

Average coverage 50X



(*L. synagris*; Rocha and Molina 2008)

Genome size ~ 0.8 Gb

Bottom line ~ $20,000

Organismal Impacts (non-lethal)

Wild populations

- Noisy
- Lots of extrinsic factors
- Measure of population effects

Laboratory setting

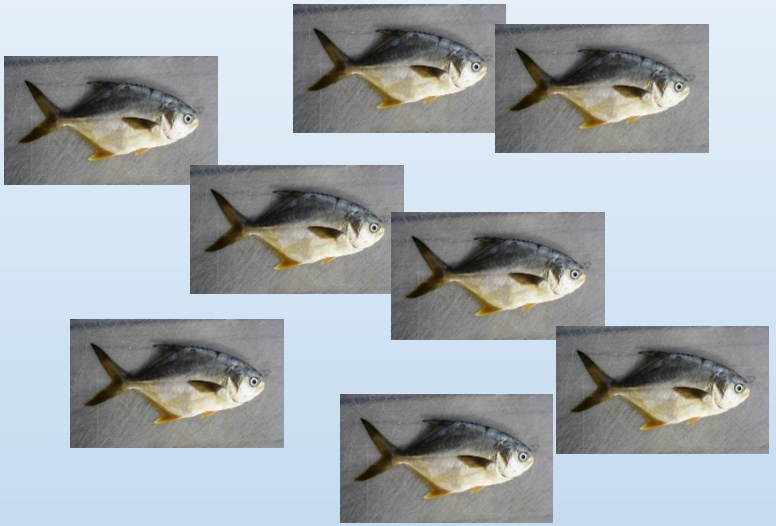
- Controlled
- Manipulation possible
- Measure of individual effects

Making connections is vital

Organismal Impacts (non-lethal)

Current generation

Next generation



Selection

- Adult condition
- Feeding ecology
- Biological response

Fitness

- Reproduction
- Adult fecundity
- Offspring survival
- Gene Expression

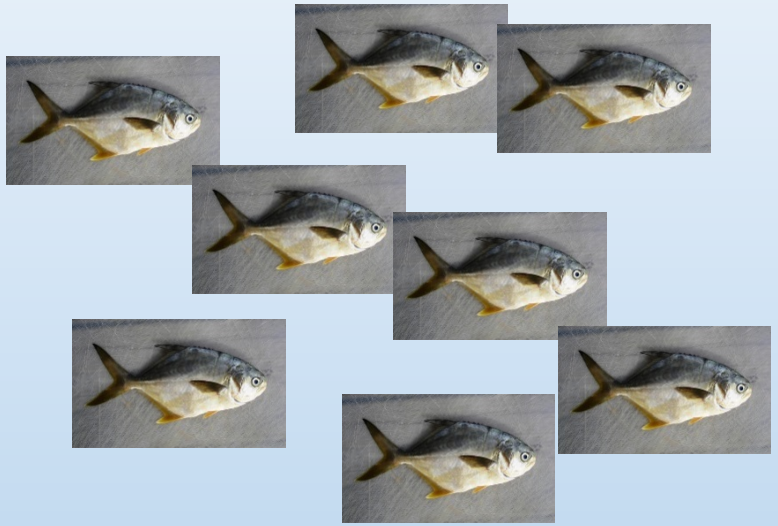
Heritable change

- Epigenetic gene regulation
- Anthropogenic evolution

Approaches

Current generation

Next Generation



OMICS

- **Transcriptomics – gene expression**
- **Methylomics – gene regulation**
- **Genomics – gene frequency change**

Needs and Direction

Acute exposure: fairly easy to detect

Variation in response by species and environment

Need for laboratory verified assays

Challenge with “non-model” species

Needs and Direction

Chronic exposure and impairment: more difficult

- **Research limited to few species**
- **Need for laboratory verified assays**
- **Often from “high-pollution” environments**

Needs and Direction

Anthropogenic evolution: permanent genetic change

Less information

Presents restoration challenge