



Diversity Initiative for the  
Southern California Ocean

**DISCO** 

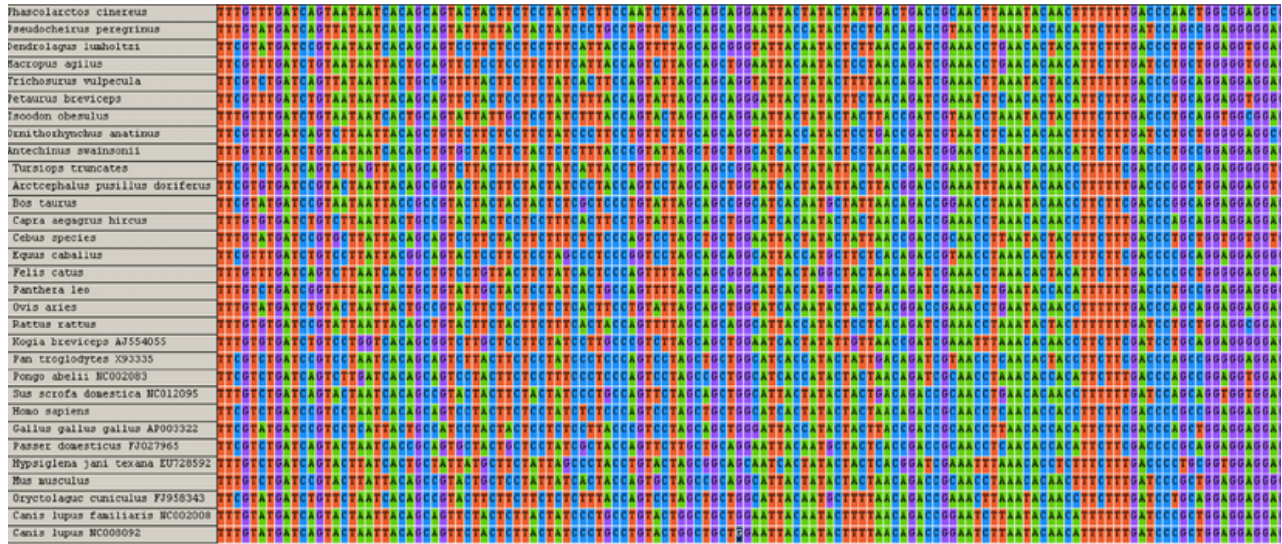


# Diversity Initiative for the Southern California Coast

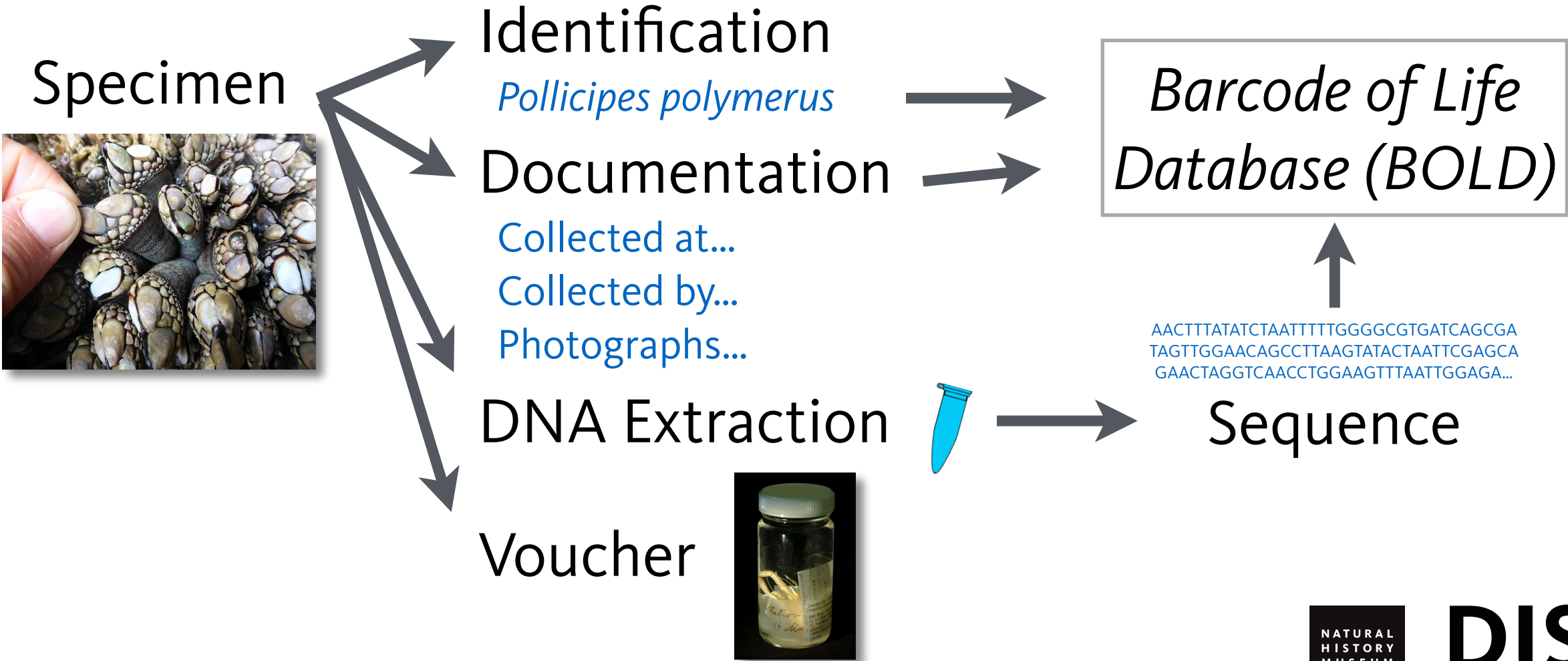
- Natural History Museum of Los Angeles County
- Goal — New approaches to biodiversity research and monitoring that greatly accelerate our ability to discover and investigate marine invertebrates
- Focal area — Southern California  
Pt. Conception – Mexican border; 0 – 1,000 m  
(but actually, we're not picky)



# DNA Barcoding



There are short regions of the genome that vary appropriately to distinguish between species.





# Identification With DNA Barcoding

Query Specimen



Identification  
*Pollicipes polymerus*

DNA  
Extraction



*Barcode of Life  
Database (BOLD)*

Search

```
AACTTTATATCTAATTTTTGGGGCGTGATCAGCGA  
TAGTTGGAACAGCCTTAAGTATACTAATTTCGAGCA  
GAACTAGGTCAACCTGGAAGTTTAATTGGAGA...
```

Sequence



# Identification With DNA Barcoding

- Works if and only if there is a sequence in the reference library at BOLD
- Coverage is very good for some taxa (fishes)
- Coverage is poor for some taxa (marine inverts)

*Basically — that's booooooooooring*



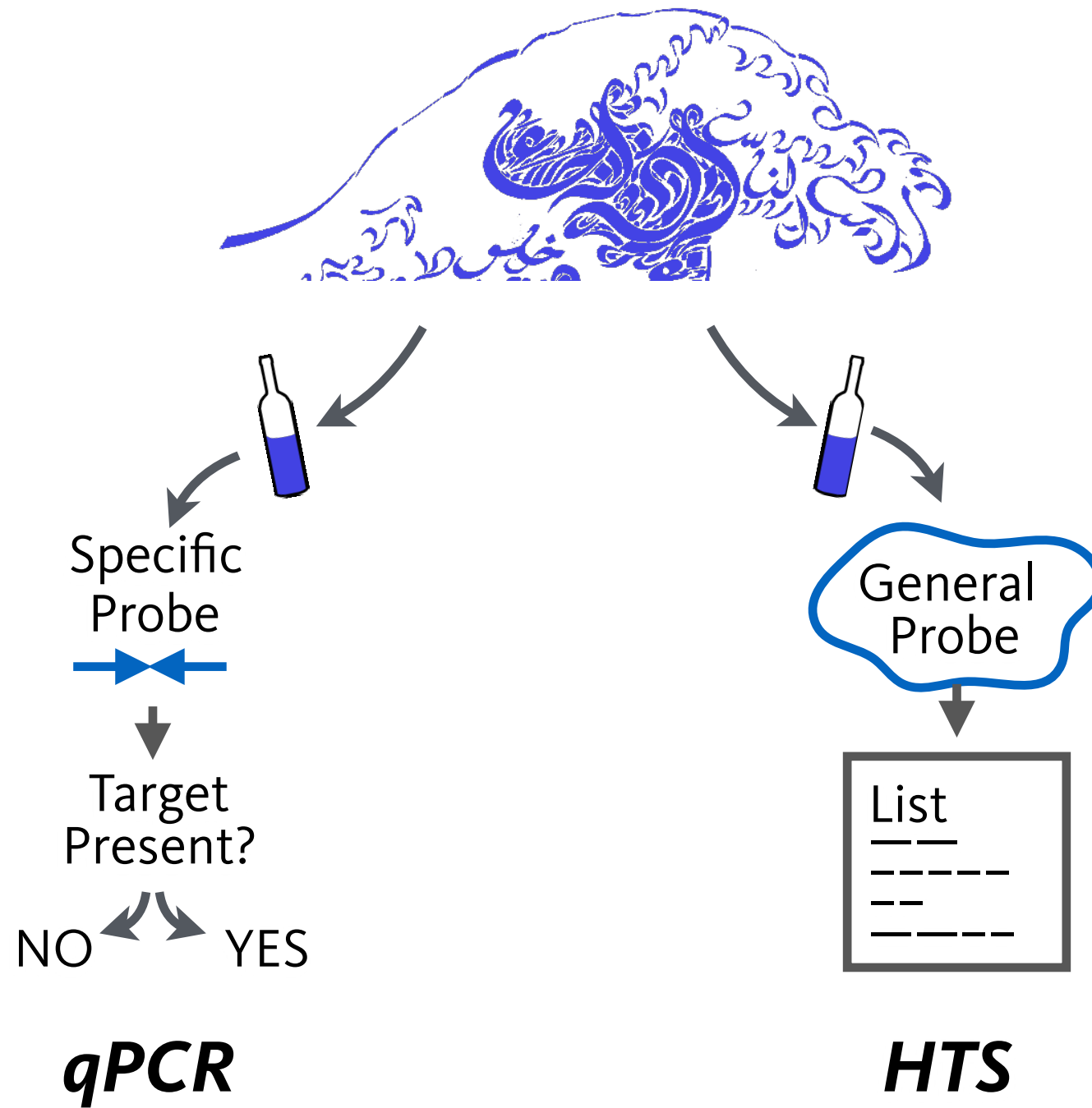
# Environmental DNA

- Organisms shed DNA (cells, cell fragments)
- DNA persists in seawater for a finite time
- What if you could sequence DNA from the water?

***You can.  
That's not boring.***



# eDNA



# eDNA

- Applies to seawater samples or whole-community scrapings (*e.g.* a scraping from a dock or plate)
- *Hunting* (specific — qPCR)  
targeted invasive species, threatened species, ...
- *Gathering* (general — High Throughput Sequencing)  
inventory of entire communities in one pass



# This is a new tool

- Like any tool, it has its own set of qualities
  - Not a replacement, but a supplement to other tools
- Potential for getting a lot of data with little work
- Recent “proof of concept” examples
  - Ryan Kelly *et al.* (UW) — seawater from Puget Sound
    - 10 phyla, 135 families, 1664 OTUs
  - Leray & Knowlton (SI) — settling plates
    - 22 phyla, 2179 OTUs
- The problem right now: poor reference coverage
  - Leray & Knowlton: 10.9% matched to a reference



# DISCO at NHM

Natural History Museum of Los Angeles County



LOS ANGELES COUNTY

Diversity Initiative for the Southern California Ocean





- Massive marine collections
- Deep curatorial expertise in specimen preservation
- Active role as repository for vouchers



# DISCO Team



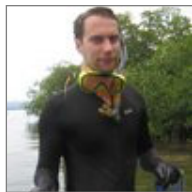
**Regina Wetzler**

*Associate Curator and Director of the Marine Biodiversity Center*



**Dean Pentcheff**

*DISCO Program Coordinator*



**Adam Wall**

*Collections Manager of Crustacea*



**Leslie Harris**

*Collections Manager of Polychaetes*



**Kathy Omura**

*Collections Manager of the Marine Biodiversity Center*



**Jenessa Wall**

*Assistant Collections Manager of the Marine Biodiversity Center*

# What Are We Doing?

- **NHM** — past decade terrestrial, now expanding marine
- **Building the library** for an estimated 3,000 – 5,000 marine invertebrates of Southern California
  - Partnership with MARINe (specimens & vouchers)
  - Support from NPS (Santa Monica Mountains)
  - Marine Bioblitz (Malibu Pier)
  - Citizen Science initiatives (King Harbor)
  - Support from Whale Tail & USC Sea Grant (Orange County)



- **System development for eDNA**
  - vernal pools
  - collaboration with UCLA (Barber Lab) and USC (Genome Core Facility)





Soon, we will be able to inventory entire  
marine communities at once.

*That, in part, will be because of you.*

