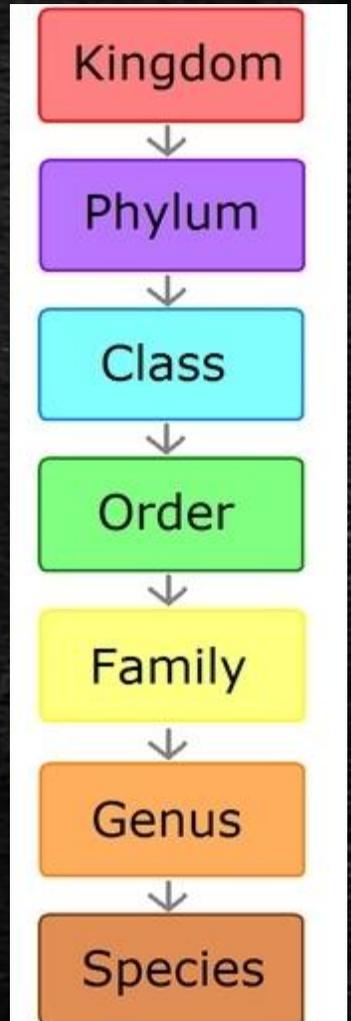


The phylogeography of the
Placozoa suggests a taxon-rich
phylum in tropical and sub-
tropical waters

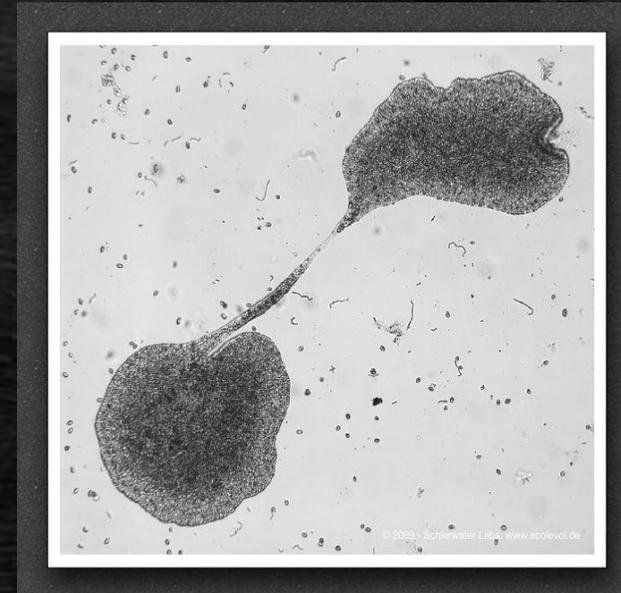
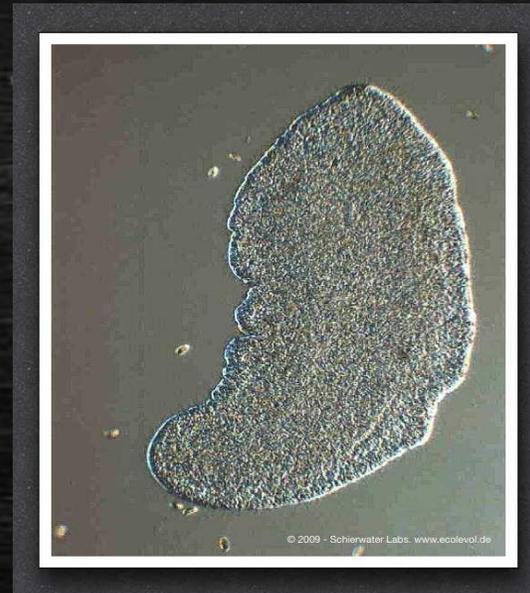
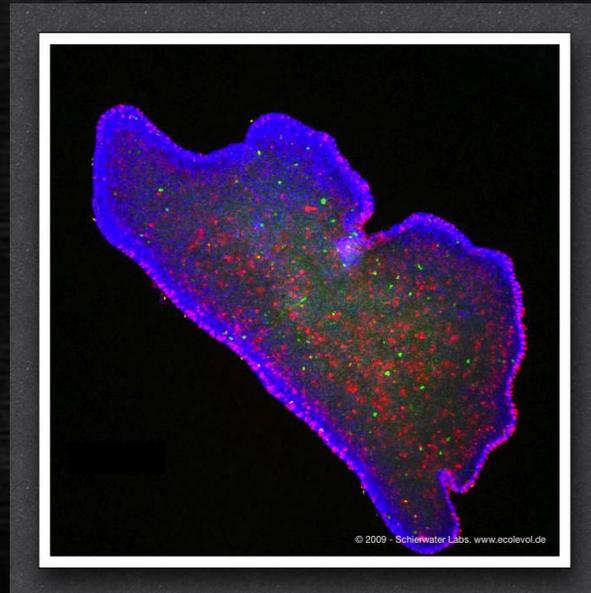
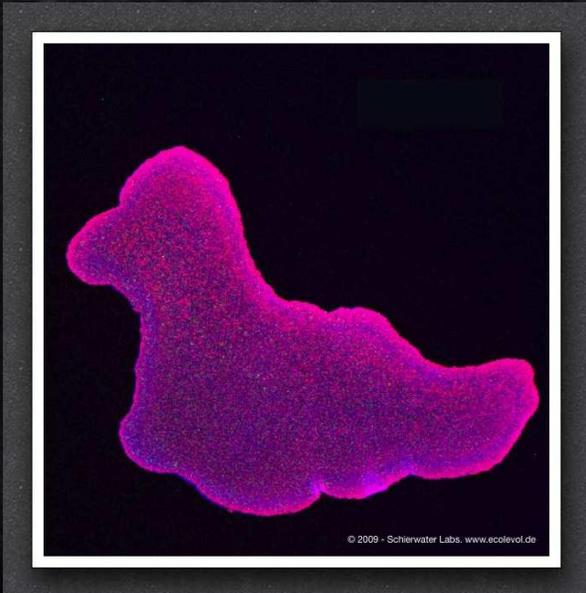
M. Eitel and B. Schierwater

Phylum Placozoa

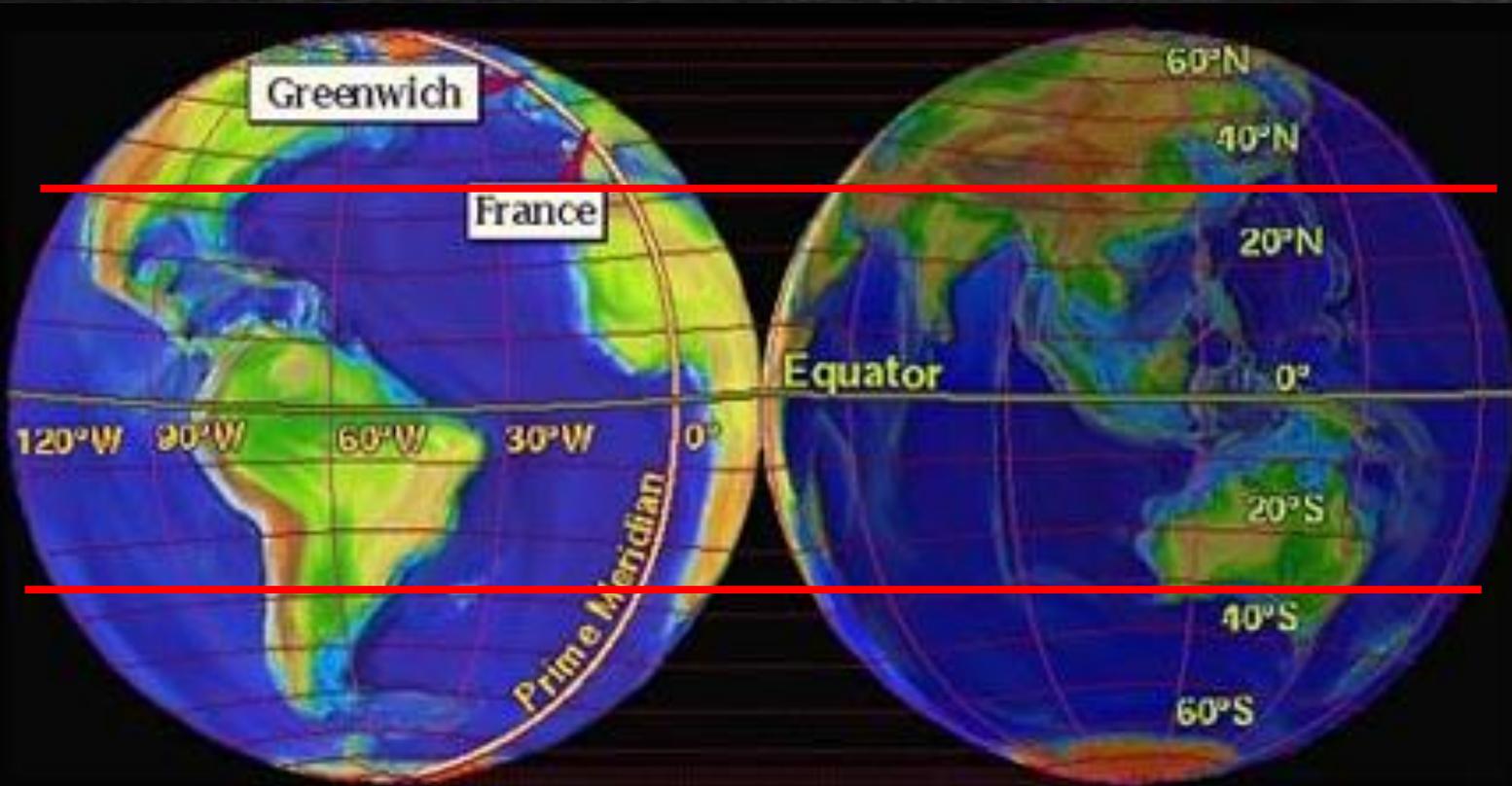
- This phylum is composed of one species *Trichoplax adhaerens*
- Largest taxonomic group to be comprised of only one species
- Species is broken down into Clades and then to Haplotypes
- Clades are groups that consist of an ancestor and all of its descendants
- Haplotypes are specific DNA sequences that are located at adjacent locations on chromosomes and are inherited together



- Up to 2mm in diameter
- Simplest Metazoan body plan
- Scale like protection layer faces water
- Nutritional layer faces bottom
 - Ciliated for slow movement
- Gland cells excrete enzymes for extra cellular digestion
 - algae & biofilm
- Interconnected fiber cells provide fast movement and shape changes
- Asexual budding, binary fission, some sexual reproduction in lab setting



Habitat



-Mostly unknown

-Conclusions: Warm tropic & Sub-tropic waters

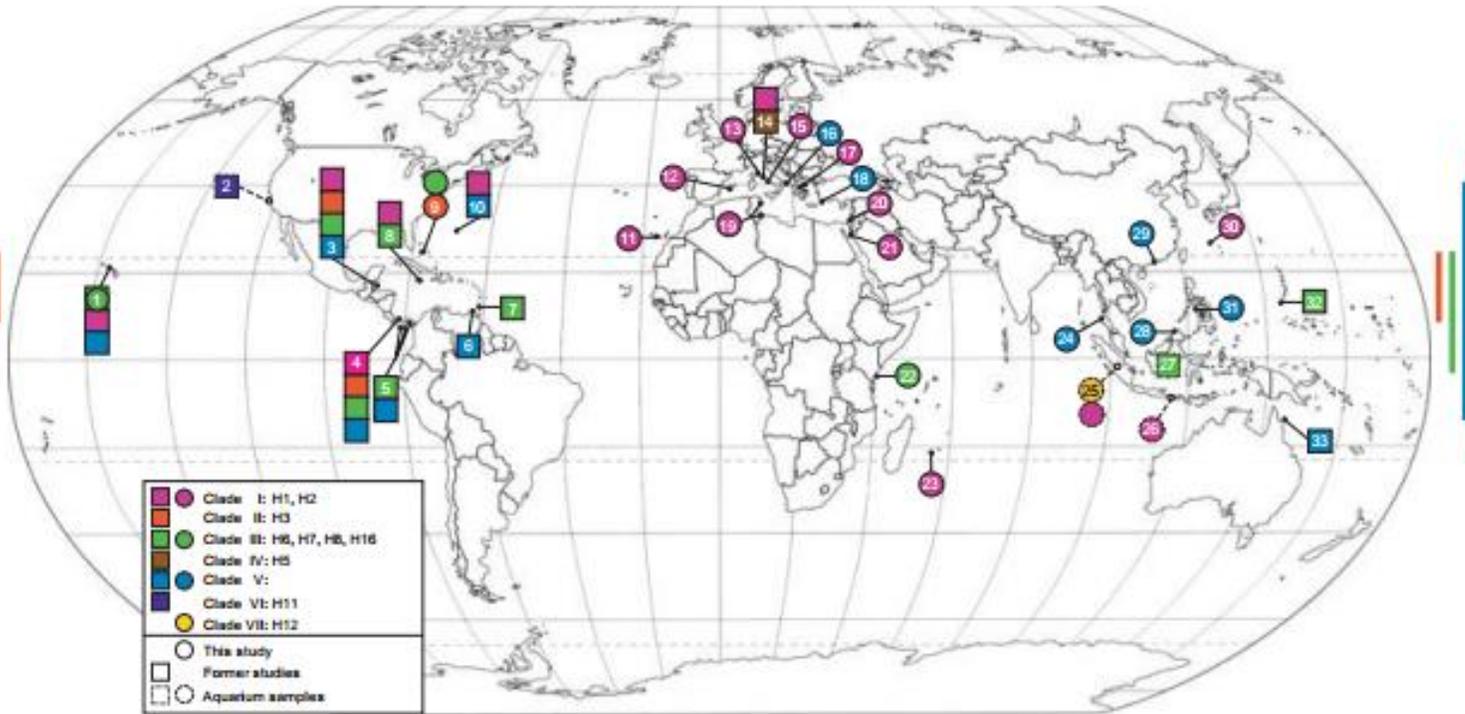
-30°N-30°S Latitude

-Mangrove roots, reefs, boat docks, stony beaches, eulittoral, and littoral zones

-Never on sandy beaches, where there is high wave activity, or freshwater input

-Unknown population density

The experiment:



- Sample 39 tropical and sub-tropical locations
- Depths of 1-20 meters
- By collecting stones, coral, and mussel shells. Dropping glass slides in racks hung by ropes in boat docks and coral reefs.
- Molecular analyses done with samples in lab (genome sequencing)

-Of the total 39 sites, 23 were positive sites for Placozoans

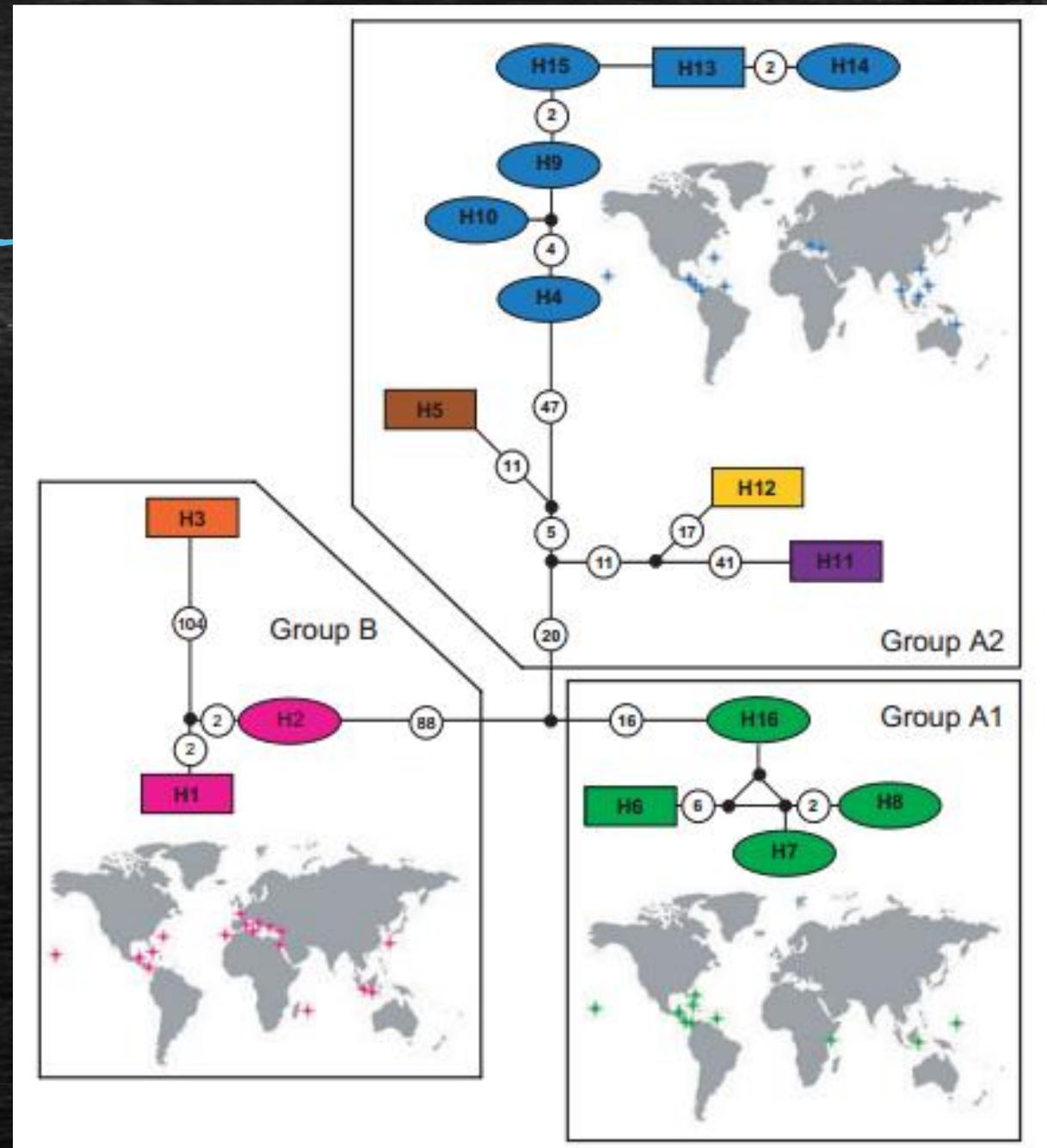
-Using the 16s sequence on the ribosomal subunit there were 6 known clades and 11 haplotypes before the study

-After sampling and analyses were finished the clades were increased to 7 and the haplotypes to 16

Oceanographic Region	Clade	Haplotype	Sampling site	Habitat type	Genotyped isolates	No. in Fig. 2	Date of collection	Sampled by	
Mediterranean Sea	I	H1	Cala Rajada (Majorca), Spain	Stone pool	1	12	10/2006	SL	
		H2	Castiglioncello, W Italy*	Stony beach	4	13	05/2008	SL	
		H2	San Felice Circeo, E Italy*	Muddy water pond	2	15	10/2007	Co	
		H2	Katerini, Greece	Boat dock/harbour	2	17	08/2008	SL	
		H2	Ormos Panagias	Boat dock/harbour	1	17	05/2009	SL	
		H2	Port of Hammamet, Tunisia	Boat dock/harbour	3	19	04/2006	SL	
		H2	Zarzis, Tunisia	Stony beach	4	19	07/2008	SL	
		H2	Caesarea, Israel	Stony beach	8	20	01/ 2007	Co	
		V	H9	Turunç, Turkey	Stony beach	3	18	08/2007	SL
		V	H10	Otranto, E Italy*	Stony beach	4	16	08/ 2008	SL
Indian Ocean	I	H2	Réunion	Coral reef	4	23	12/2006	Co	
		III	H16	Mombasa, Kenya	Coral reef	2	22	05/2007	SL
		V	H4	Laem Pakarang, Thailand	Stony beach	3	24	03/2008	SL
Indo-Pacific	I	H2	Bali, Indonesia (AS)	Unknown	3	26	?	SL	
		H2	Indonesia (AS)	Coral reef	3	25	?	SL	
		VII	H12	Indonesia (AS)	Coral reef	2	25	?	SL
W Pacific Ocean	I	H2	Chatan (Okinawa), Japan	Boat dock/harbour	2	30	03/2007	SL	
		V	H4	Kota Kinabalu (Sabah), Malaysia	boat dock/harbour	3	28	09/2005	SL
		H4	Hong Kong, China	Mangroves	2	29	03/2007	Co & SL	
		H13	Hong Kong, China	flow through seawater system	8	29	04/2006, 09/2007	Co & SL	
C Pacific Ocean	III	H14	Hong Kong, China	flow through seawater system	1	29	04/2006	Co & SL	
		H15	Boracay, Philippines*	stony beach	4	31	09/2007	SL	
		H8	Oahu, Hawaii	Boat dock/harbour	1	1	05/2007	SL	
Caribbean	II	H3	Bahamas	flow through seawater system	1	9	2001	SL	
		III	H8	Bahamas	flow through seawater system	1	9	2001	SL
E Atlantic Ocean	I	H2	Puerto de la Cruz (Tenerife), Spain	stone pool	6	11	08/2007	SL	

Distribution:

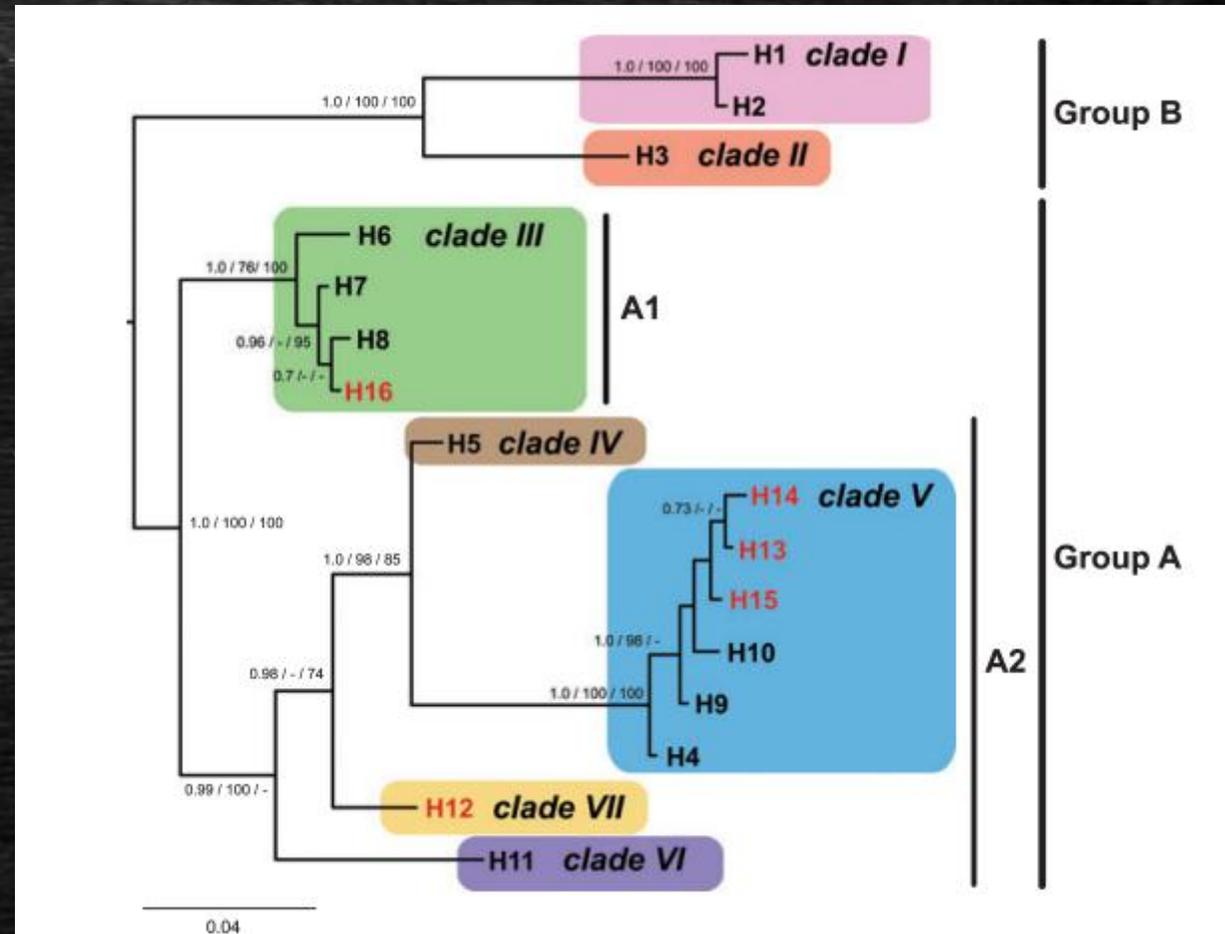
-Some clades had cosmopolitan distributions and some endemic



Differences in DNA sequences:

-Out of 536 nucleotide positions the analysis resulted in making 7 clades in 2 groups, A and B.

-A is separated into A1 and A2



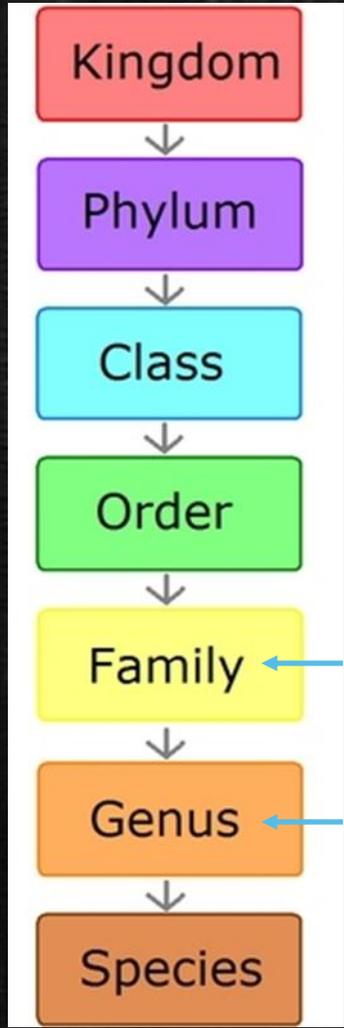
Analyzing the mean pairwise nucleotide distances between and within clades:

The distances within clades was between 1.6%-2.1%

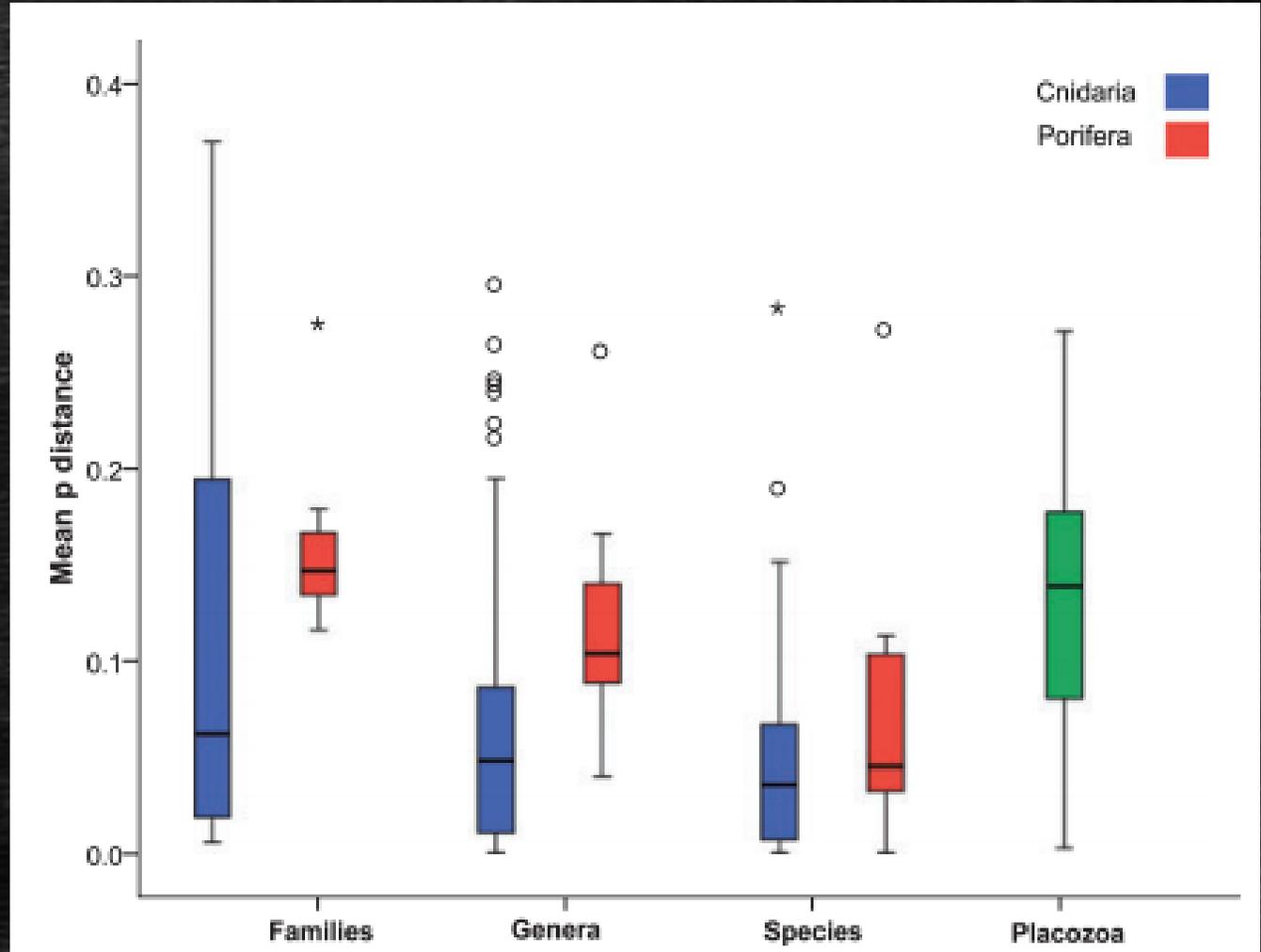
The distances between clades was between 3.8%-21.5%

Level of comparison	Distance
Highest pairwise distances within clade I	0.8
Highest pairwise distances within clade III	2.1
Highest pairwise distances within clade V	1.6
Lowest minimal pairwise distances between clades	3.8
Highest minimal pairwise distances between clades	21.5
Mean of all minimal pairwise distances between clades	13.0
Minimum of all pairwise distances between haplotypes	0.2
Maximum of all pairwise distances between haplotypes	26.7

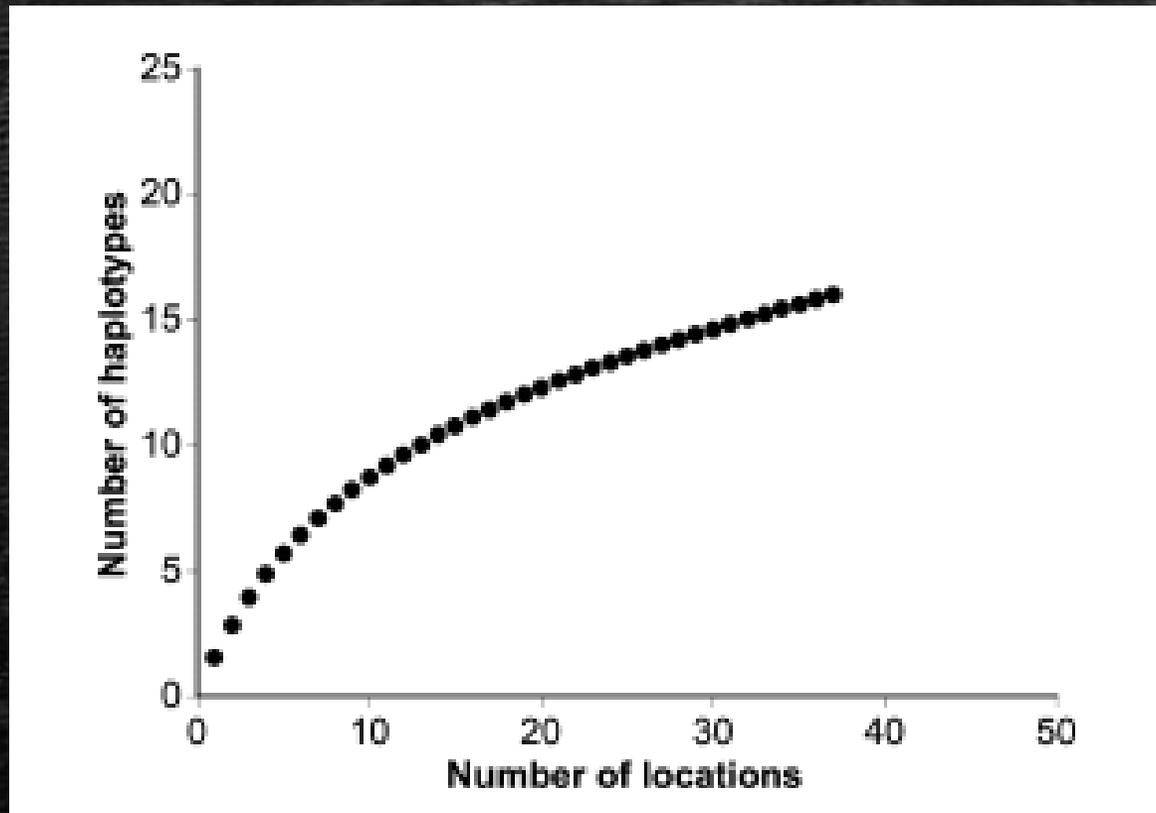
Comparisons to Porifera and Cnidaria Phyla:



- The distances between haplotypes were at the same order of magnitude as the distance between families or genera in Porifera and Cnidaria
- So?
- The mean distance between clades reflects a number that separates taxonomic categories in Porifera and Cnidaria



Summary: Phylogeography, unexpected high biodiversity



- Never more than a single haplotype, in a single sample, from a single site:
 - niches and competition
- Clades have individual niches and cover different amounts of areas
 - Clade ranges: $II < III < V < I$
- Haplotypes are euryoecious and stenoecious
- Evidence concludes that there could be several dozen to 100s of species, with complicated diversity and distribution
- More research should be considered given then amount of haplotypes found per number of locations sampled
- Researching a basal organism may help us understand other benthic organisms in general

Citation:

- Eitel, M., and B. Schierwater. "The Phylogeography of the Placozoa Suggests a Taxon-rich Phylum in Tropical and Subtropical Waters." *Molecular Ecology* 19.11 (2010): 2315-327. Print.
- "Trichoplax Pictures." *Trichoplax Pictures*. N.p., n.d. Web. 26 Feb. 2014.
- *Scientific Classification*. N.p., n.d. Web. 26 Feb. 2014.
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