

Ecospace Development Update

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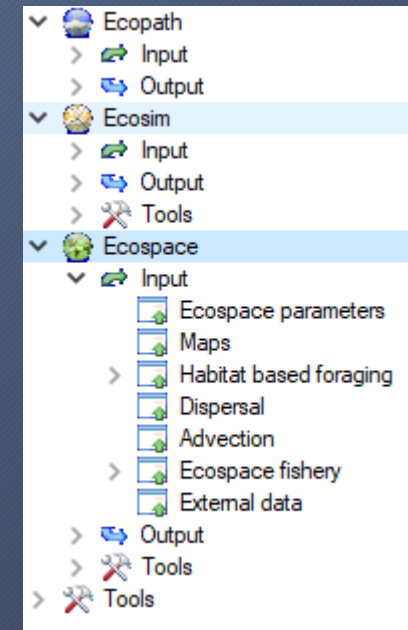
Outline

- Model Background
- Meeting Update
- Model Progress
- Review Panel



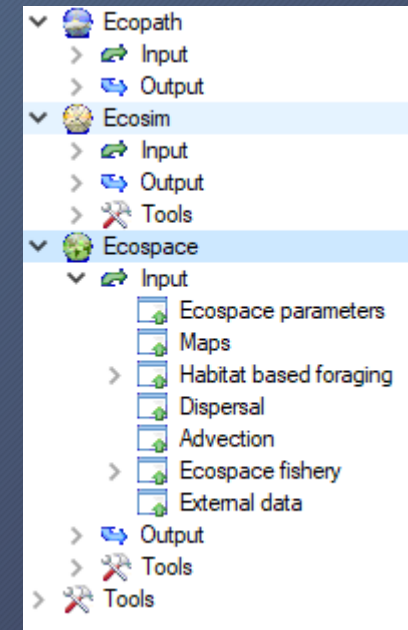
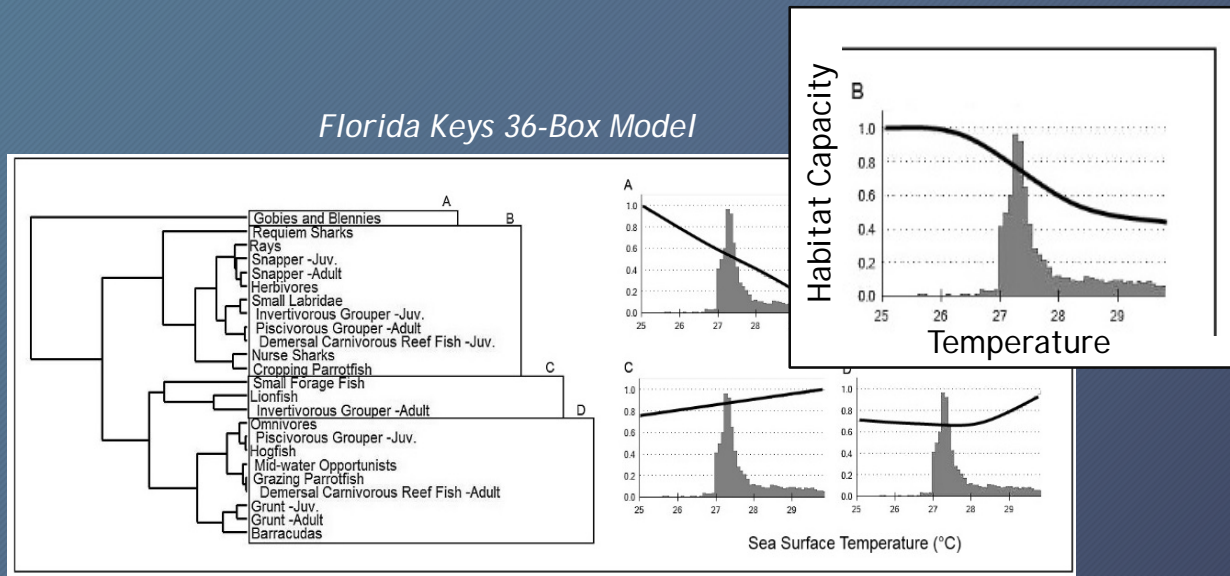
Model Background

- Ecopath, Ecosim, and Ecospace (EwE)
 - Snapshot in time (Ecopath) ->
 - Trophic dynamics over time (Ecosim) ->
 - Trophic dynamics over time and space (Ecospace)



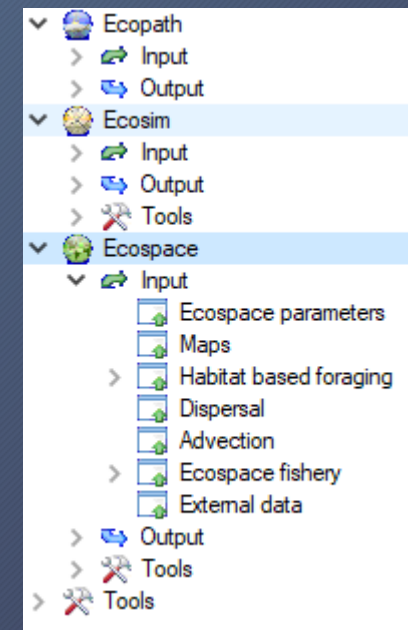
Model Background

- Ecopath, Ecosim, and Ecospace (EwE)
 - Trophic dynamics over time and space (Ecospace)
 - Habitat Capacity Functions
 - Any raster product with ecological importance



Model Background

- Ecopath, Ecosim, and Ecospace (EwE)
 - Trophic dynamics over time and space (Ecospace)
 - Maps and Environmental Drivers
 - Known environmental relationships
 - Data availability
 - Resolution



July Meeting Outcomes

- Maps and Environmental Drivers
 - Known environmental relationships
 - Data availability
 - Resolution

Hydrobiologia (2008) 612:5–20
DOI 10.1007/s10750-008-9493-y

FISH HABITAT MAPPING

Modelling of essential fish habitat based on remote sensing, spatial analysis and GIS

Vasilis D. Valavanis · Graham J. Pierce · Alain F. Zuur · Andreas Pali Alexis · Anatoly Saveliev · Isidora Katara · Jianjun Wang

Global Ecology and Biogeography, (Global Ecol. Biogeogr.) (2012) 21, 272–281




RESEARCH
PAPER

Bio-ORACLE: a global environmental dataset for marine species distribution modelling

Lennert Tyberghein^{1*}, Heroen Verbruggen¹, Klaas Pauly¹, Charles Troupin², Frederic Mineur³ and Olivier De Clerck¹

Ocean Heat Content Reveals Secrets of Fish Migrations

Jiangang Luo, Jerald S. Ault , Lynn K. Shay, John P. Hoolihan, Eric D. Prince, Craig A. Brown, Jay R. Rooker

Published: October 20, 2015 • <https://doi.org/10.1371/journal.pone.0141101>

July Meeting Outcomes

- Maps and Environmental Drivers
 - Known environmental relationships
 - Discussed ~70 possible covariates
 - Ranked covariates by “importance”

Biochemical

	SST Maximum	SST Mean	SST Minimum	SST Range	SST May Oct	SST Nov Apr	Seabed Temp	Bottom Temp	Salinity	Bottom Salinity	Chla Mean	Chla Max	Chla Min	Chla Range	Chla Sum Max	Chla Win Max	Chla Prim Prod	PAR	pH
SST Maximum	1																		
SST Mean	0.984	1																	
SST Minimum	0.955	0.991	1																
SST Range	0.129	-0.043	-0.169	1															
SST May_Oct	0.968	0.991	0.988	-0.089	1														
SST Nov_Apr	0.969	0.979	0.968	-0.014	0.969	1													
Seabed Temp	0.327	0.298	0.259	0.219	0.283	0.256	1												
Bottom Temp	0.841	0.828	0.801	0.113	0.816	0.824	0.346	1											
Salinity	0.318	0.370	0.393	-0.282	0.370	0.323	0.031	0.354	1										
Bottom Salinity	0.074	0.092	0.103	-0.102	0.088	0.087	-0.108	0.127	0.242	1									
Chla Mean	-0.235	-0.300	-0.341	0.371	-0.315	-0.269	0.303	-0.214	-0.536	-0.162	1								
Chla Max	-0.051	-0.095	-0.126	0.260	-0.103	-0.071	0.212	-0.050	-0.438	-0.103	0.816	1							
Chla Min	-0.008	-0.036	-0.056	0.166	-0.036	-0.012	0.147	-0.006	-0.376	-0.022	0.620	0.715	1						
Chla Range	-0.051	-0.092	-0.119	0.235	-0.100	-0.073	0.189	-0.051	-0.376	-0.111	0.731	0.948	0.465	1					
Chla Sum_Max	-0.030	-0.072	-0.102	0.256	-0.077	-0.048	0.298	-0.013	-0.437	-0.110	0.715	0.713	0.652	0.604	1				
Chla Win_Max	0.003	-0.036	-0.071	0.254	-0.047	-0.046	0.399	-0.022	-0.267	-0.111	0.604	0.544	0.398	0.498	0.618	1			
Chla PrimProd	0.121	0.050	-0.007	0.423	0.031	0.051	0.494	0.119	-0.296	-0.157	0.682	0.525	0.285	0.513	0.526	0.581	1		
PAR	0.892	0.920	0.927	-0.122	0.924	0.907	0.246	0.729	0.322	0.083	-0.230	-0.036	-0.008	-0.032	-0.030	-0.022	0.062	1	
pH	0.446	0.429	0.409	0.106	0.423	0.429	0.010	0.438	0.205	0.013	-0.260	-0.151	-0.172	-0.108	-0.196	-0.113	-0.088	0.354	1

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July Meeting Outcomes

- Maps and Environmental Drivers
 - Known environmental relationships
 - Discussed ~70 possible covariates
 - Ranked covariates by “importance”

#	Importance	Environmental Driver or Covariate
1	1	Depth
2	1	Temperature
3	2	Current Velocity
4	3	Salinity
5	3	DO Range
6	4	Ph

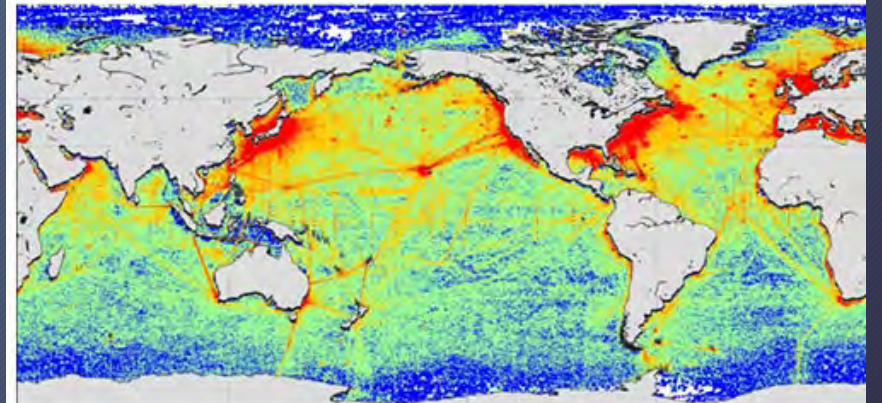
July Meeting Outcomes

- Maps and Environmental Drivers
 - Known environmental relationships
 - Data availability

#	Importance	Environmental Driver or Covariate	Source	Resolution	Temporal Res.
1	1	Depth	SAFMC, FWC	TBD	
2	1	Temperature	NASA (Aqua-MODIS)	4 Km	2002 -
3	2	Current Velocity	Model Derived (NEMO)	9 Km	
4	3	Salinity	Model Derived (NEMO, WOD)	9 Km	
5	3	DO Range	WOD Interpolation	TBD	TBD
6	4	Ph	WOD Interpolation	TBD	TBD

WORLD OCEAN DATABASE

The World Ocean Database (WOD) is an NCEI product and an [IODE](#) (International Oceanographic Data and Information Exchange) project. This work is funded in partnership with the NOAA OAR [Ocean Observing and Monitoring Division](#).



The **World Ocean Database 2018** [updates](#) previous versions of the WOD to include approximately 3 million new oceanographic casts added to the WOD and renewed quality control.

July Meeting Outcomes

- Maps and Environmental Drivers
 - Known environmental relationships
 - Data availability
 - 27 trophic groups and counting

Group Name	Scientific name	Representative species	DO Range	DO mean	Depth Range	Depth mean	Salinity Range	Salinity mean	Current Velocity range	Current velocity mean	Temperature range	Temperature mean	pH range
Coastal bottlenose dolphin	<i>Tursiops truncatus (coastal ecotype)</i>	Coastal bottlenose dolphin											
Offshore dolphins	<i>Tursiops truncatus (offshore ecotype)</i> <i>Delphinus spp.</i>	Offshore bottlenose Common dolphin											
Pilot whales	<i>Globicephala macrorhynchus</i>	Short-finned pilot whale											
Beaked whales	<i>Mesoplodon bidens</i> <i>Ziphius cavirostris</i>	Sowerby's beaked whale Cuvier's beaked whale											
Sperm whales	<i>Physeter macrocephalus</i> <i>Kogia simus</i>	Sperm whale Dwarf sperm											
Baleen whales	<i>Megaptera novaeangliae</i>	Humpback whales											
Manatees	<i>Trichechus manatus latirostris</i>	Florida manatee											
Planktivorous sharks	<i>Rhincodon typus</i> <i>Cetorhinus maximus</i>	whale shark basking shark											
Large coastal sharks	<i>Carcharhinus leucas</i> <i>Carcharhinus obscurus</i>	bull shark dusky shark			10-50m	30 m	0->30‰				11->30		
Small coastal sharks	<i>Rhizoprionodon terraenovae</i> <i>Sphyrna tiburo</i>	Atlantic sharpnose shark bonnethead											
Dogfish sharks	<i>Mustelus canis</i> <i>Hexanchus griseus</i>	smooth dogfish sixgill shark											
Pelagic sharks	<i>Isurus oxyrinchus</i> <i>Sphyrna lewini</i>	shortfin mako scalloped hammerhead											
Pelagic rays	<i>Rhinoptera bonasus</i> <i>Manta birostris</i>	cownose ray Atlantic manta ray											
Demersal rays/skates	<i>Raja eglanteria</i> <i>Dasyatis sayi</i>	clearnose skate bluntnose stingray											
Adult king mackerel	<i>Scorpaenopsis cavalla</i>	king mackerel											
Juvenile king mackerel	<i>Scorpaenopsis cavalla</i>	king mackerel											
Spanish mackerel	<i>Scorpaenopsis maculatus</i>	Spanish mackerel			10-50m	30 m	18->30‰				21->30		
Juv Spanish mackerel	<i>Scorpaenopsis maculatus</i>	Spanish mackerel			10-50m	30 m	.5->30‰				11->30		
Bluefish	<i>Pomatomus saltatrix</i>	bluefish			10-200m	105 m	18->30‰				16-25	70.5	

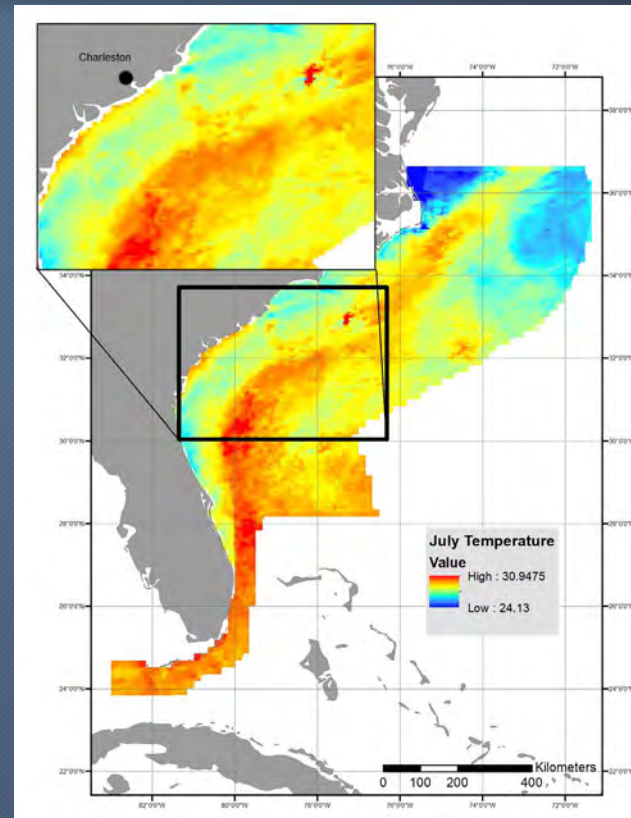
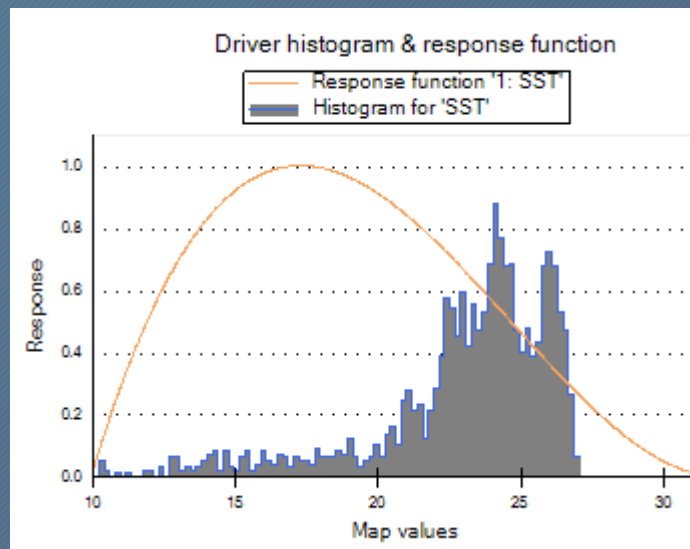
Trial Run in Ecospace

- Identify potential computational and logistical issues
- Establish base extent maps



Trial Run in Ecospace

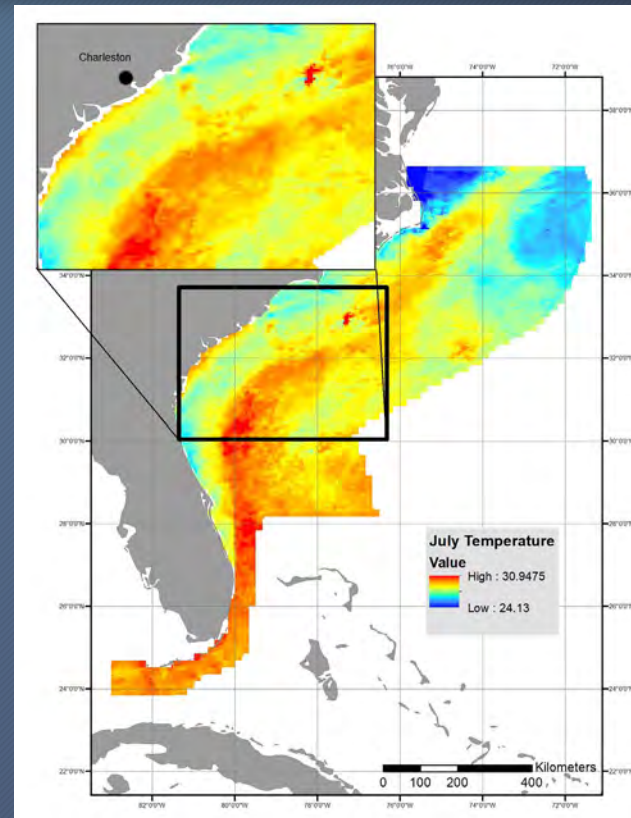
- Sea Surface Temperature
 - 4 Km MODIS SST, one year (2017)



4 Km. Resolution

Trial Run in Ecospace

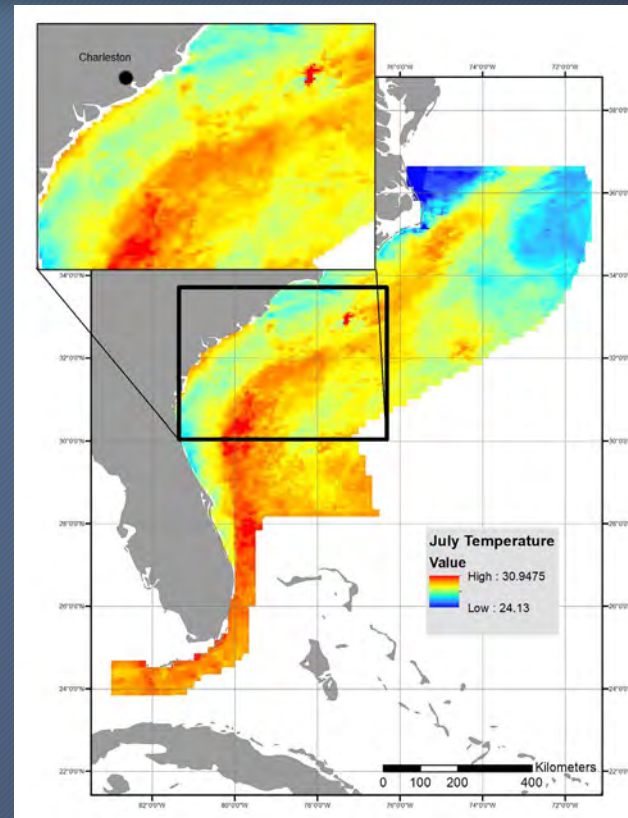
- Sea Surface Temperature
 - ~~• 4 Km MODIS SST, one year (2017)~~
 - 15 Km MODIS SST, one year (2017)



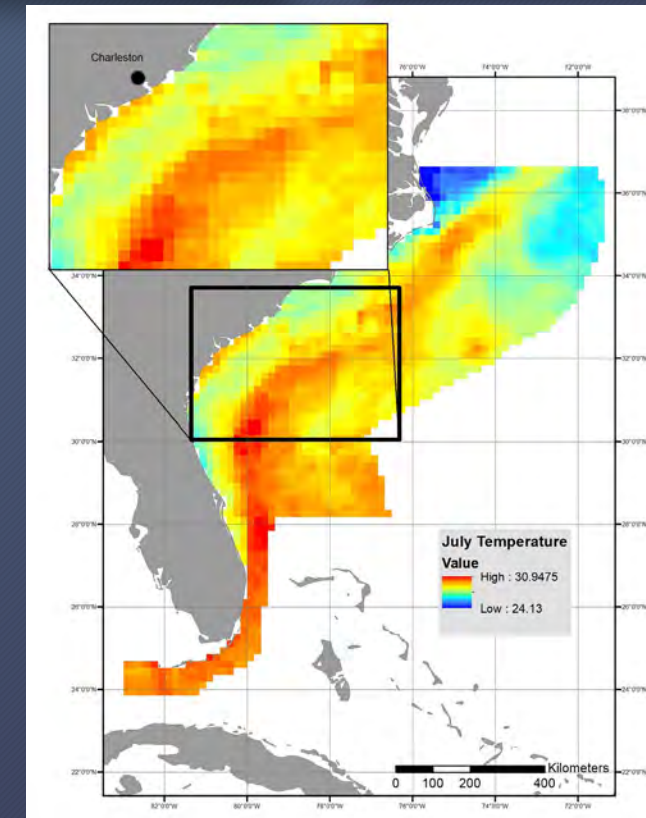
4 Km. Resolution

Trial Run in Ecospace

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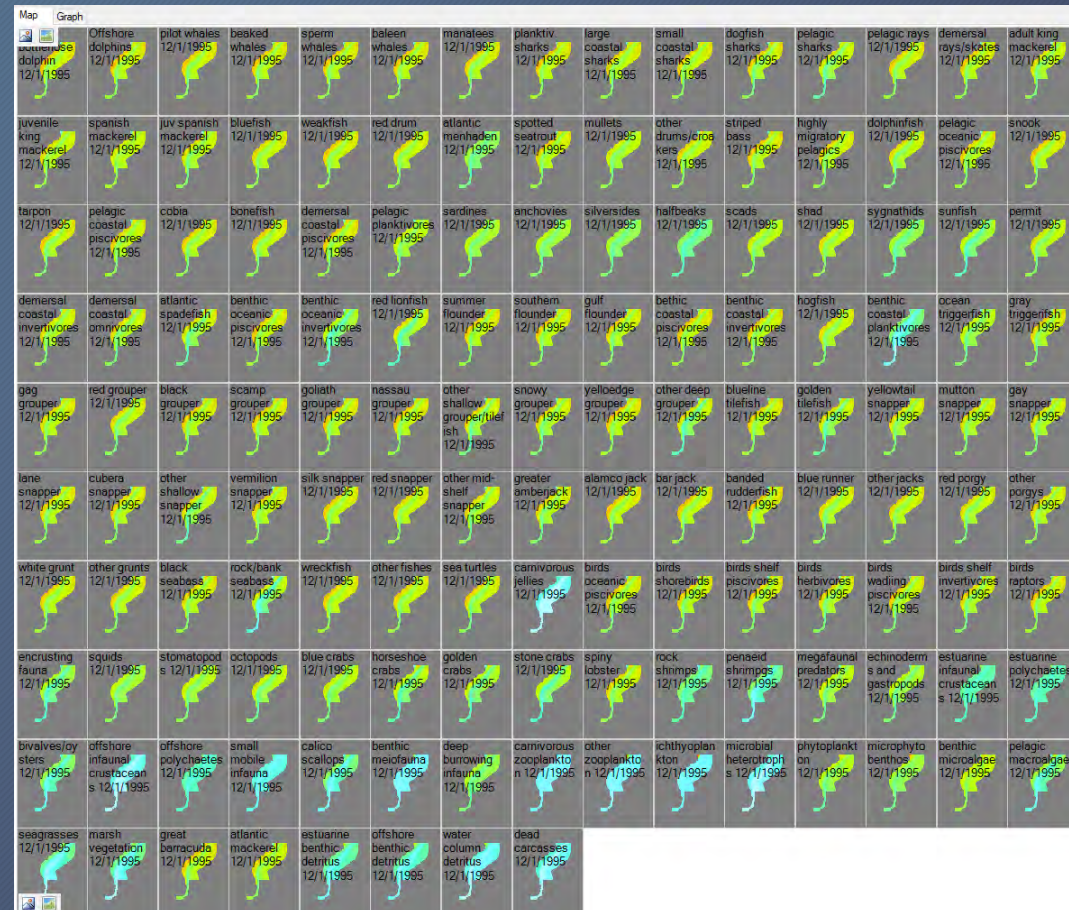
4 Km. Resolution



15 Km. Resolution

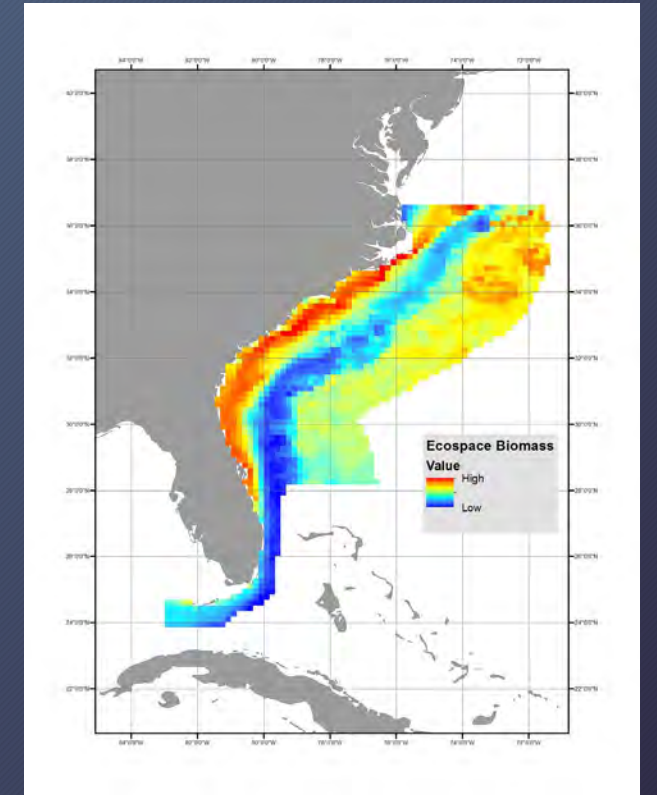
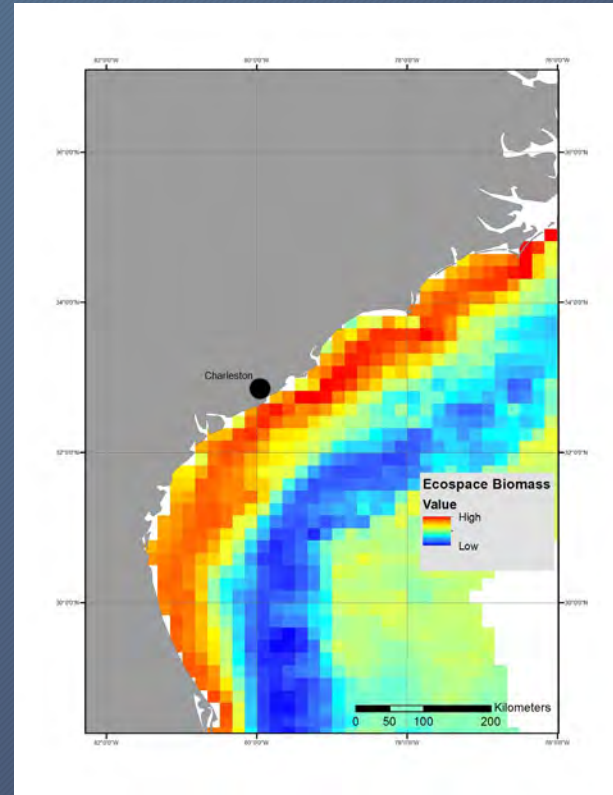
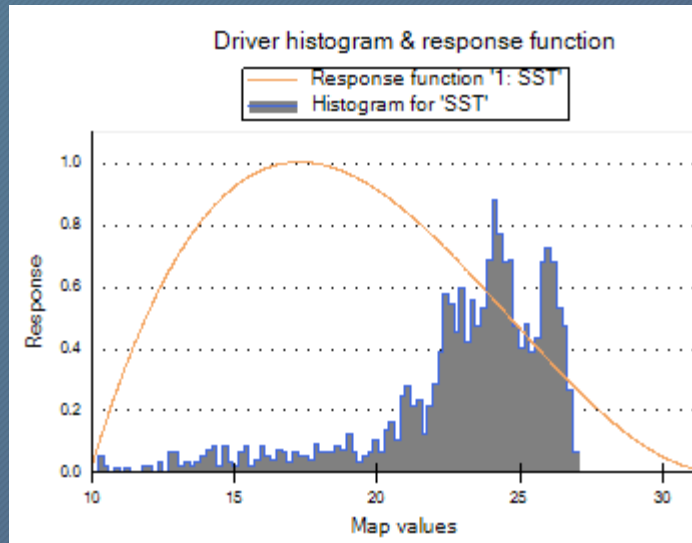
Trial Run in Ecospace

- Sea Surface Temperature
 - 4 Km MODIS SST, one year (2017)
 - 15 Km MODIS SST, one year (2017)



Trial Run in Ecospace

- Sea Surface Temperature
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15 Km. Resolution

Timeline Moving Forward

- Review panel webinar Nov/Dec
 - Ecopath and Ecosim balancing
- Continue to investigate environmental relationships and data availability given resolution tradeoffs
- Ecospace development update April 2020 SSC meeting