

ARISTOTLE UNIVERSITY OF THESSALONIKI





# **ODYSSEA**

# WP4 – Ecosystem modelling workshop Ecopath with Ecosim



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727277

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# **Studied ecosystem**

Таха	Common name
1. Tursiops truncatus	Bottlenose dolphin
2. Delphinus delphis	Short-beaked common dolphin
3. Scyliorhinus canicula	Lesser spotted dogfish
4. Squalidae	Dogfish sharks
5. Merluccius merluccius	European hake
6. Mullus barbatus	Red mullet
7. Mullus surmuletus	Surmullet
8. Sardina pilchardus	European pilchard
9. Melicertus kerathurus	Caramote prawn
10. Parapenaeus longirostris	Deep water rose shrimp





Таха	Functional group
1. Tursiops truncatus	1. Dolphins
2. Delphinus delphis	1. Dolphins
3. Scyliorhinus canicula	2. Sharks
4. Squalidae	2. Sharks
5. Merluccius merluccius	3. Hake
6. Mullus barbatus	4. Red mullets
7. Mullus surmuletus	4. Red mullets
8. Sardina pilchardus	5. Sardine
9. Melicertus kerathurus	6. Shrimps
10. Parapenaeus longirostris	6. Shrimps





Таха	Functional group
Tursiops truncatus	Dolphins
Delphinus delphis	Dolphins
Scyliorhinus canicula	Sharks
Squalidae	Sharks
Merluccius merluccius	Hake
Mullus barbatus	Red mullets
Mullus surmuletus	Red mullets
Sardina pilchardus	Sardine
Melicertus kerathurus	Shrimps
Parapenaeus longirostris	Shrimps

Low trophic level	Invertebrates	Fish	Other
Phytoplankton	Zooplankton (copepods)	Sardine	Dolphins
Discards	Shrimps	Hake	
Detritus		Sharks	



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Other production	3	Hake	1 000	0 600	0 587	3 700				0.200					
🗸 🔿 Fishery	4	Red mullets	1 000	0 100	1 908	7 192				0.200					
Definition of fleets	5	Sardine	1.000	2 200	- 1 778	= 11.67				0.300					
🗔 Landings	6	Shrimps	1.000	0.400	3,000	9 500				0.000					
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Status														-	Þ
① 18:00 Enter Biomass for all detritus groups befor	re pr	roceeding to Eco	sim.											-	Ţ
<ol> <li>18:00 Value '0.9' accepted for variable 'DietCom</li> </ol>	р' .														í
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	uted	Ecotrophic Effic	ciencies (E	E) invalid	for one or	nore group	(s).								
① 18:00 Enter Biomass for all detritus groups befor	re pr	roceeding to Eco	sim.			5 1									
⊞ ① 18:00 Ecopath diets have changed		č													
☐ ① 18:00 Diet for one or more groups does not sum	to 1	. Do you want to	normalize	diets to 1	for ALL pr	edator grou	ps?								
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		Group name	level	(fraction)	area (t/k	(t/km²)	biomass	biomass	Efficienc	consump	(t/km²/ve	(/year)			
	1	Dolphins	4 055	1 000	0.0200	0.0200	0.0800	13.81	0.000	0.006	()	())			
	2	Sharke	3.875	1.000	0.0200	0.0200	0.000	4.080	0.000	0.000					
	2	Uako	2 760	1.000	0.0700	0.0700	0.030	2 700	1.255	0.171					
	3		3.700	1.000	0.000	0.000	1.000	7 100	0.402	0.109					
Definition of floots	4	Red mullets	3.244	1.000	0.100	0.100	1.906	7.192	0.403	0.205					
	D D	Sardine	3.000	1.000	2.200	2.200	1.778	11.07	0.554	0.152					
	6	Shrimps	2.778	1.000	0.400	0.400	3.000	9.500	0.643	0.316					
	11/	Copepods	2.111	1.000	6.000	6.000	20.00	65.00	0.551	0.308					
	8	Phytoplankton	1.000	1.000	9.000	9.000	117.3		0.261						
	9	Discards	1.000	1.000					0.669						
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🗔 Basic input	1 Dolphins 0.0800 0.080	0 0.000 1.000	
Diet composition	2 Sharks 0.698 0.129 0.56	0.184 0.816	
🗔 Detritus fate	3 Hake 0.587 0.280 0.930 -0.62	3 0.477 0.523	
Other production	4 Sardine 1.778 0.500 0.440 0.83	3 0.281 0.710	
🗸 🔿 Fishery	F         Shimps         2 220         0 297         0 006         105	5 0.116 0.994	
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5: Shrimps (Imported diet)		<b>a</b> (	DDYSSEA_test
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### **Balancing the model**

Keep **track of changes** when trying to balance the model

Avoid changing the more reliable data (pedigree)

Changes easier to **explain** are probably better assumptions

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🗸 🚍 Ecopath														
🗸 🔿 Input				Habitat	Biomass		Producti	Consum	Ecotroph	Producie	Biom	Biom		
🗔 Model parameters		Group name	Trophic	area	in habitat	Biomass (t/km²)	on /	ption /	ic	on /	accumul.	acc. rate		
🗔 Basic input		•	level	(fraction)	area (t/k	(UKIIF)	biomass	biomass	Efficienc	consump	(t/km²/ye	(/year)		
Diet composition	1	Dolphins	4.055	1.000	0.0200	0.0200	0.0800	13.81	0.000	0.006				
🗔 Detritus fate	2	Sharks	3.875	1.000	0.0700	0.0700	0.698	4.080	0.184	0.171				
Other production	3	Hake	3.760	1.000	0.600	0.600	0.587	3.700	1.255	0.159				
🗸 🔿 Fishery	4	Red mullets	3.244	1.000	0.100	0.100	1.908	7.192	0.403	0.265				
Definition of fleets	5	Sardine	3.000	1.000	2.200	2.200	1.778	11.67	0.554	0.152				
🗔 Landings	6	Shrimps	2.778	1.000	0.400	0.400	3.000	9,500	0.643	0.316				
🗔 Discards	7	Copenods	2 111	1 000	6,000	6,000	20.00	65.00	0.551	0.308				
🗔 Discard mortality rate	8	Phytoplankton	1.000	1.000	9,000	9,000	117.3	00.00	0.261	0.000				
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🗔 Model parameters		Group name	Trophic	area	in habitat	Biomass (t/km²)	on /	ption /	ic	on /	accumul.	acc. rate				
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Other production	3	Hake	3.749	1.000	0.600	0.600	0.587	3.700	1.129	0.159						
🗸 🔿 Fishery	4	Red mullets	3.244	1.000	0.100	0.100	1.908	7.192	0.635	0.265						
Definition of fleets	5	Sardine	3.000	1.000	2.200	2.200	1.778	11.67	0.554	0.152						
🗔 Landings	6	Shrimps	2.778	1.000	0.400	0.400	3.000	9.500	0.643	0.316						
Discards	7	Copepods	2.111	1.000	6.000	6.000	20.00	65.00	0.551	0.308						
🗔 Discard mortality rate	8	Phytoplankton	1.000	1.000	9.000	9.000	117.3		0.261							
🗔 Discard fate	9	Discards	1 000	1 000					0.669							
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🗔 Other production	3	Hake	3.743	1.000	0.600	0.600	0.587	3.700	0.985	0.159				
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Definition of fleets	5	Sardine	3.000	1.000	2.200	2.200	1.778	11.67	0.554	0.152				
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Diet composition	1	Dolphins	4.054	1.000	0.0200	0.0200	0.0800	13.81	0.000	0.006						
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🗔 Landings	6	Shrimps	2.778	1.000	0.400	0.400	3.000	9.500	0.643	0.316						
🗔 Discards	7	Copepods	2.111	1.000	6.000	6.000	20.00	65.00	0.551	0.308						
🗔 Discard mortality rate	8	Phytoplankton	1.000	1.000	9.000	9.000	117.3		0.261							
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5: Sardine (Diet of 10: Detritus)													🖨 ODYSSEA †	est		
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#### ODYSSEA\_test - Ecopath with Ecosim 6.5.14040.0 $\times$ <u>File View Ecopath Ecosim Ecospace Tools Windows Help</u> 🛃 🤤 Ecopath 💌 🕲 Ecosim 💌 🕲 Ecospace 💌 🌒 Ecotracer 💌 🛃 C:\Users\donna\Desktop\UNIVERSITY\Research projects\ODYSSEA\ECOPATH workshop\ODYSSEA test.EwEmdb ņ **-** × 🙆 Start 🍃 Basic input 🍃 Diet composition 🍃 Pedigree 🍃 Landings 🍃 Discards 🍃 Model Parameters 🍃 Basic estimates 🖉 Flow diagram Navigator 🗸 🔿 Input $\land$ Show groups... Options 🐱 Save to image... Layout: 🖆 🐱 🞜 Model parameters Lobitot 🗔 Basic input Diet composition 🗔 Detritus fate Given Strategy Other Production v 🖙 Fishery Definition of fleets 5 🗔 Landings 🗔 Discards 🗔 Discard mortality rate 🗔 Discard fate Gff-vessel price Dolphins 🗔 Non-market price 4 🗸 🄀 Tools Sharks 🗔 Growth input Hake 🗔 Pedigree 🌄 Traits 🗸 🐃 Output Red mullets Basic estimates 3 Sardine 🗔 Key indices 🗸 🐃 Mortality rates Shrimps 🗔 Mortalities Predation mortality rates 🗔 Fleet fishing mortality rates Consumption Copepods 2 > Siche overlap Electivity Search rates > 🐃 Fishery > 🐃 Particle size distribution 🗸 🎇 Tools Discards Phytoplankton Detritus 1 🗔 Flow diagram Statistics Pre-bal > 🛸 Network Analysis > 🛸 Value chain 🛞 Ecosim 🧐 Status 🛛 🧾 Remarks 5: Sardine (Diet of 10: Detritus) ODYSSEA test 19:43 .... Q L w P x∎ 2<sup>R</sup> へ ៉ 🗇 🀑 ENG 0 $\Box$ 02/07/2018



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v 🖻 Input	<b>^</b>									
🗔 Model parameters	Parameter	Valuo	Unite							
🗔 Basic input		Value	01113							
Diet composition		422.971	t/km²/year							
Detritus fate	Sum of all exports	923.880	t/km²/year							
🗔 Other production	Sum of all respiratory flows	132.105	t/km²/year							
🗸 🔿 Fishery	Sum of all flows into detritus	1001.701	t/km²/year							
Definition of fleets	Total system throughput	2480.655	t/km²/year							
🗔 Landings	Sum of all production	1181.405	t/km²/year							
🗔 Discards	Mean trophic level of the catch	3.061								
🗔 Discard mortality rate	Gross efficiency (catch/net p.p.)	0.001								
🗔 Discard fate	Calculated total net primary production	1055.700	t/km²/year							
Gff-vessel price	Total primary production/total respiration	7.991								
🗔 Non-market price	Net system production	923.596	t/km²/year							
🗸 🔆 Tools	Total primary production/total biomass	57.406								
🗔 Growth input	Total biomass/total throughput	0.007	/year							
🗔 Pedigree	Total biomass (excluding detritus)	18.390	t/km²							
🗔 Traits	Total catch	1.319	t/km²/year							
🗸 🐃 Output	Connectance Index	0.365								
🗔 Basic estimates	System Omnivory Index	0.144								
🗔 Key indices	Total market value	1.035	1							
🗸 🐃 Mortality rates	Total shadow value	0.000	1							
🗔 Mortalities	Total value	1.035	1							
Predation mortality rates	Total fixed cost	0.000	1							
Fleet fishing mortality rates	Total variable cost	0.828	1							
	Total cost	0.828	1							
> 🐳 Niche overlap	Profit	0.207	1							
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Diet composition	Sum of all	consumption	422.971	t/km²/year						
🗔 Detritus fate	Sum of all	exports	923.880	t/km²/year						
Other production	Sum of all	respiratory flows	132.105	t/km²/year						
🗸 🔿 Fishery	Sum of all	flows into detritus	1001.701	t/km²/year						
Definition of fleets	Total system	em throughput	2480.655	t/km²/year						
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🗔 Discards	Mean trop	hic level of the catch	3.061							
🗔 Discard mortality rate	Gross effic	ciency (catch/net p.p.)	0.001							
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🗔 Off-vessel price	Total prim	ary production/total re	spiration 7.991							
🗔 Non-market price	Net syster	n production	923.596	t/km²/year						
🗸 🔆 Tools	Total prim	ary production/total bi	omass 57.406							
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