ARISTOTLE
UNIVERSITY OF
THESSALONIKI

MARINE FISHERIES
and FISH BIOLOGY

ODYSSEA

WP4 – Ecosystem modelling workshop
Ecopath with Ecosim

Test exercise

Donna Dimarchopoulou

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

Studied ecosystem

Taxa	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

Taxa	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

Taxa	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	

ODYSSEA

Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

New Model... Ctrl+N
Open Model... Ctrl+O
Open Recent Model
Open Output Location... Alt+O
Import Model
Export Model
Close Model
Save Model Ctrl+S
Save Model As...
Compact Model Database...
Print... Ctrl+P
Exit

Ecotracer

Start

Refresh

EWE 6.5 RELEASED

7 July 2016: A new version of EwE, version 6.5, has been released.

For details, see: EwE 6.5 release notes – EwE change log – EwE open ticket list

Download now - EwE 6.5.14040 (19.4 MB)

EwE – Ecobase integration

Dear Ecopath user,

We are pleased to announce that EcoBase, the open-access database for all the Ecopath with Ecosim (EwE) models published worldwide, is now accessible on-line for all users. As per mid October 2016, 443 Ecopath models are referenced and described in EcoBase, among which 176 models are fully and freely available for download.

EcoBase is a non-commercial initiative, created by a group of scientists involved in ecosystem modeling, and now supported by the Ecopath Research and Development Consortium. It has the ambition of making all EwE models published to date discoverable, accessible, and reusable to the scientific community. We believe that such a collaborative approach will contribute to develop researches in the field of trophic modelling or ecosystem approaches, and will enhance interactions and collaborations within the scientific community.

-> if you are interested in EcoBase, discover the database on http://ecobase.ecopath.org and download all models you want using the File / Import model menu of EwE 6.5 (you just have to endorse the data access agreement, and thus to cite the authors of the models you use in all your publications).

-> if you have published one or several Ecopath models, please upload your models in EcoBase using the export facilities in File / Export model menu available in EwE 6.5 and **enjoy to be part of these new collaborative scientific dynamics.**

Best regards
Didier Gascuel and Jerome Guitton,
on behalf of the EcoBase working group,
of the Ecopath Research and Development Consortium

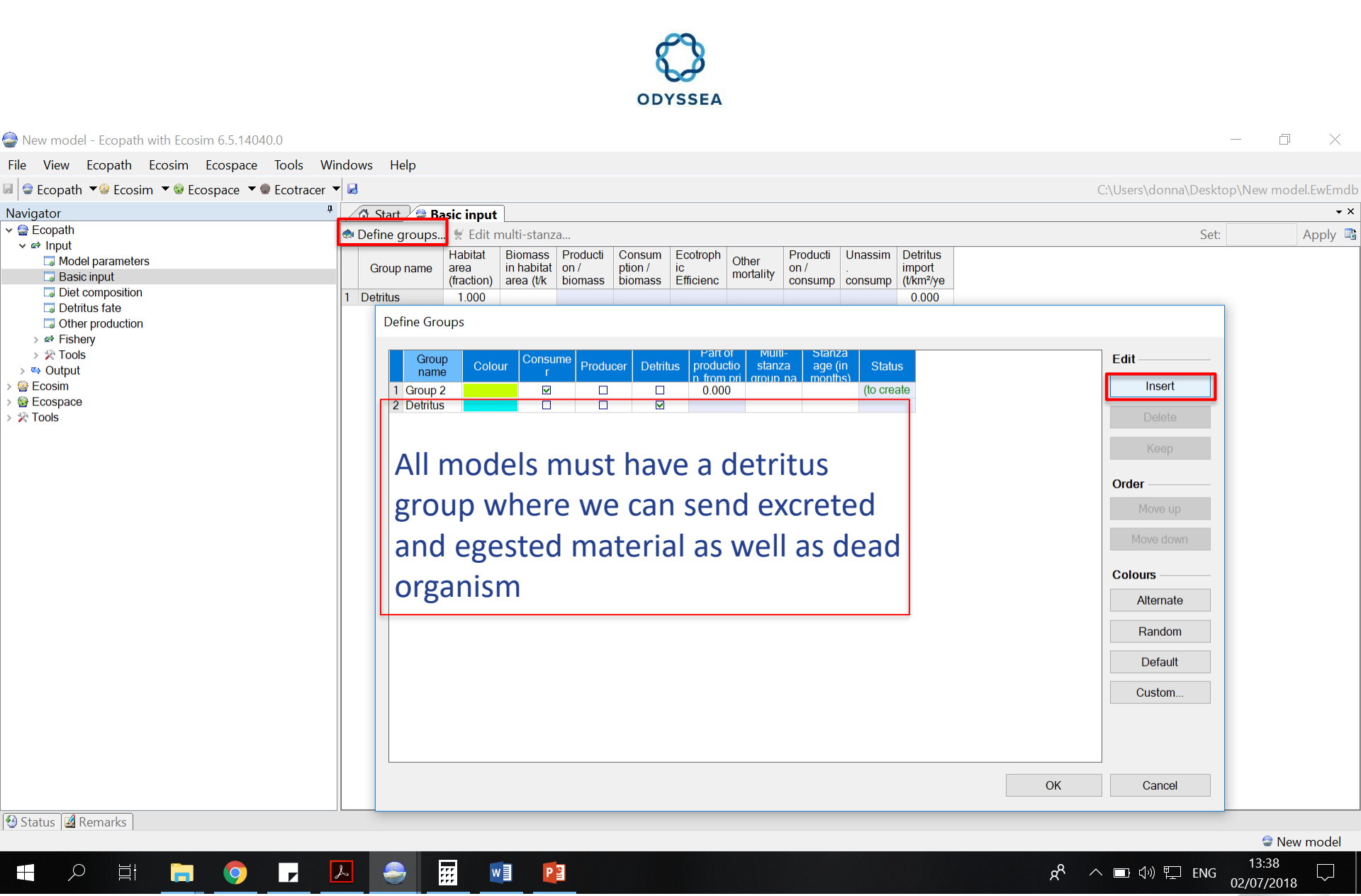
UPDATES

View on Facebook

Get involved!

Status Remarks

ENG 13:37 02/07/2018


ODYSSEA
New model - Ecopath with Ecosim 6.5.14040.0
File View Ecopath Ecosim Ecospace Tools Windows Help
Ecopath Ecosim Ecospace Ecotracer
C:\Users\donna\Desktop\New model.EwEmdb
Navigator
Ecopath
Input
Model parameters
Basic input
Diet composition
Detritus fate
Other production
Fishery
Tools
Output
Ecosim
Ecospace
Tools
Start
Basic input
Define groups...
Edit multi-stanza...
Set:
Apply
Group name
Habitat area (fraction)
Biomass in habitat area (t/k
Producti on / biomass
Consum ption / biomass
Ecotroph ic Efficienc
Other mortality
Producti on / consump
Unassim . consump
Detritus import (t/km²/ye
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Define Groups
Group name
Colour
Consume r
Producer
Detritus
Part of productio n from pri
Multi-stanza group na
Stanza age (in months)
Status
1 Group 2 0.000 (to create
2 Detritus
All models must have a detritus group where we can send excreted and egested material as well as dead organism
Edit
Insert
Delete
Keep
Order
Move up
Move down
Colours
Alternate
Random
Default
Custom...
OK
Cancel
Status
Remarks
New model
ENG
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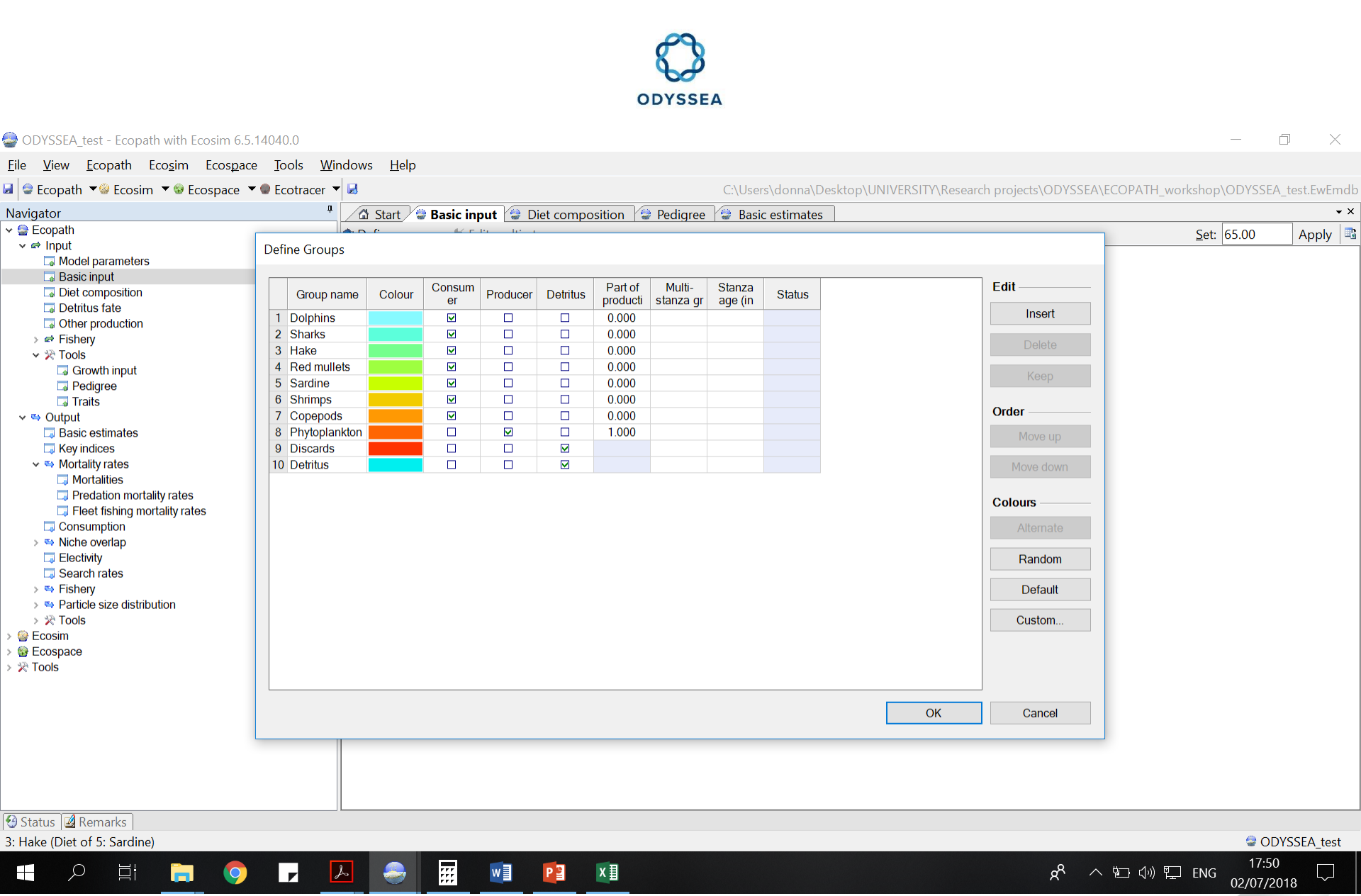
02/07/2018


ODYSSEA
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Ecopath Ecosim Ecospace Ecotracer
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Navigator
Ecopath
Input
Model parameters
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Diet composition
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Fishery
Tools
Growth input
Pedigree
Traits
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Basic estimates
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Mortality rates
Mortalities
Predation mortality rates
Fleet fishing mortality rates
Consumption
Niche overlap
Electivity
Search rates
Fishery
Particle size distribution
Tools
Ecosim
Ecospace
Tools
Start
Basic input
Diet composition
Pedigree
Basic estimates
Set: 65.00
Apply
Define Groups
Group name
Colour
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Producer
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Status
1 Dolphins 0.000
2 Sharks 0.000
3 Hake 0.000
4 Red mullets 0.000
5 Sardine 0.000
6 Shrimps 0.000
7 Copepods 0.000
8 Phytoplankton 1.000
9 Discards
10 Detritus
Edit
Insert
Delete
Keep
Order
Move up
Move down
Colours
Alternate
Random
Default
Custom...
OK
Cancel
Status
Remarks
3: Hake (Diet of 5: Sardine)
ODYSSEA_test
ENG
17:50
02/07/2018

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

Ecopath Ecosim Ecospace Ecotracer C:\Users\donna\Desktop\UNIVERSITY\Research projects\ODYSSEA\ECOPATH_workshop\ODYSSEA_test.EwEmdb

Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
    - Tools
      - Growth input
      - Pedigree
      - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Basic estimates

Define groups... Edit multi-stanza... Set: 0.000 Apply

	Group name	Habitat area (fraction)	Biomass in habitat area (t/k	Production / biomass	Consumption / biomass	Ecotrophic Efficienc	Other mortality	Production / consump	Unassim. consump	Detritus import (t/km²/ye
1	Dolphins	1.000	0.0200	0.0800	13.81				0.200	
2	Sharks	1.000	0.0700	0.698	4.080				0.200	
3	Hake	1.000	0.600	0.587	3.700				0.200	
4	Red mullets	1.000	0.100	1.908	7.192				0.200	
5	Sardine	1.000	2.200	1.778	11.67				0.300	
6	Shrimps	1.000	0.400	3.000	9.500				0.200	
7	Copepods	1.000	6.000	20.00	65.00				0.400	
8	Phytoplankton	1.000	9.000	117.3						
9	Discards	1.000								0.000
1	Detritus	1.000								0.000

Status Remarks

10: Detritus (Detritus import) ODYSSEA_test

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ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

Ecopath Ecosim Ecospace Ecotracer C:\Users\donna\Desktop\UNIVERSITY\Research projects\ODYSSEA\ECOPATH_workshop\ODYSSEA_test.EwEmdb

Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
    - Tools
      - Growth input
      - Pedigree
      - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Basic estimates

Define groups... Edit multi-stanza... Set: 0.000 Apply

	Group name	Habitat area (fraction)	Biomass in habitat area (t/k	Production / biomass	Consumption / biomass	Ecotrophic Efficienc	Other mortality	Production / consump	Unassim. consump	Detritus import (t/km²/ye
1	Dolphins	1.000	0.0200	0.0800	13.81				0.200	
2	Sharks	1.000	0.0700	0.698	4.080				0.200	
3	Hake	1.000	0.600	0.587	3.700				0.200	
4	Red mullets	1.000	0.100	1.908	7.192				0.200	
5	Sardine	1.000	2.200	1.778	11.67				0.300	
6	Shrimps	1.000	0.400	3.000	9.500				0.200	
7	Copepods	1.000	6.000	20.00	65.00				0.400	
8	Phytoplankton	1.000	9.000	117.3						
9	Discards	1.000								0.000
1	Detritus	1.000								0.000

Group name	Habitat area (fraction)	Biomass in habitat area (t/k	Production / biomass	Consumption / biomass
Dolphins	1.000	0.0200	0.0800	13.81
Sharks	1.000	0.0700	0.698	4.080
Hake	1.000	0.600	0.587	3.700
Red mullets	1.000	0.100	1.908	7.192
Sardine	1.000	2.200	1.778	11.67
Shrimps	1.000	0.400	3.000	9.500
Copepods	1.000	6.000	20.00	65.00
Phytoplankton	1.000	9.000	117.3	

Status Remarks

10: Detritus (Detritus import) ODYSSEA_test

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ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

Ecopath Ecosim Ecospace Ecotracer C:\Users\donna\Desktop\UNIVERSITY\Research projects\ODYSSEA\ECOPATH_workshop\ODYSSEA_test.EwEmdb

Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
    - Tools
      - Growth input
      - Pedigree
      - Traits
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    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Basic estimates

Define groups... Edit multi-stanza... Set: 0.000 Apply

	Group name	Habitat area (fraction)	Biomass in habitat area (t/k	Production / biomass	Consumption / biomass	Ecotrophic Efficienc	Other mortality	Production / consump	Unassim. consump	Detritus import (t/km²/ye
1	Dolphins	1.000	0.0200	0.0800	13.81				0.200	
2	Sharks	1.000	0.0700	0.698	4.080				0.200	
3	Hake	1.000	0.600	0.587	3.700				0.200	
4	Red mullets	1.000	0.100	1.908	7.192				0.200	
5	Sardine	1.000	2.200	1.778	11.67				0.300	
6	Shrimps	1.000	0.400	3.000	9.500				0.200	
7	Copepods	1.000	6.000	20.00	65.00				0.400	
8	Phytoplankton	1.000	9.000	117.3						
9	Discards	1.000								0.000
1	Detritus	1.000								0.000

Group name	Unassim. consump
Dolphins	0.200
Sharks	0.200
Hake	0.200
Red mullets	0.200
Sardine	0.300
Shrimps	0.200
Copepods	0.400
Phytoplankton	

Status Remarks

10: Detritus (Detritus import) ODYSSEA_test

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ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

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Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
    - Tools
      - Growth input
      - Pedigree
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      - Mortalities
      - Predation mortality rates
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Start | Basic input | **Diet composition** | Pedigree | Basic estimates

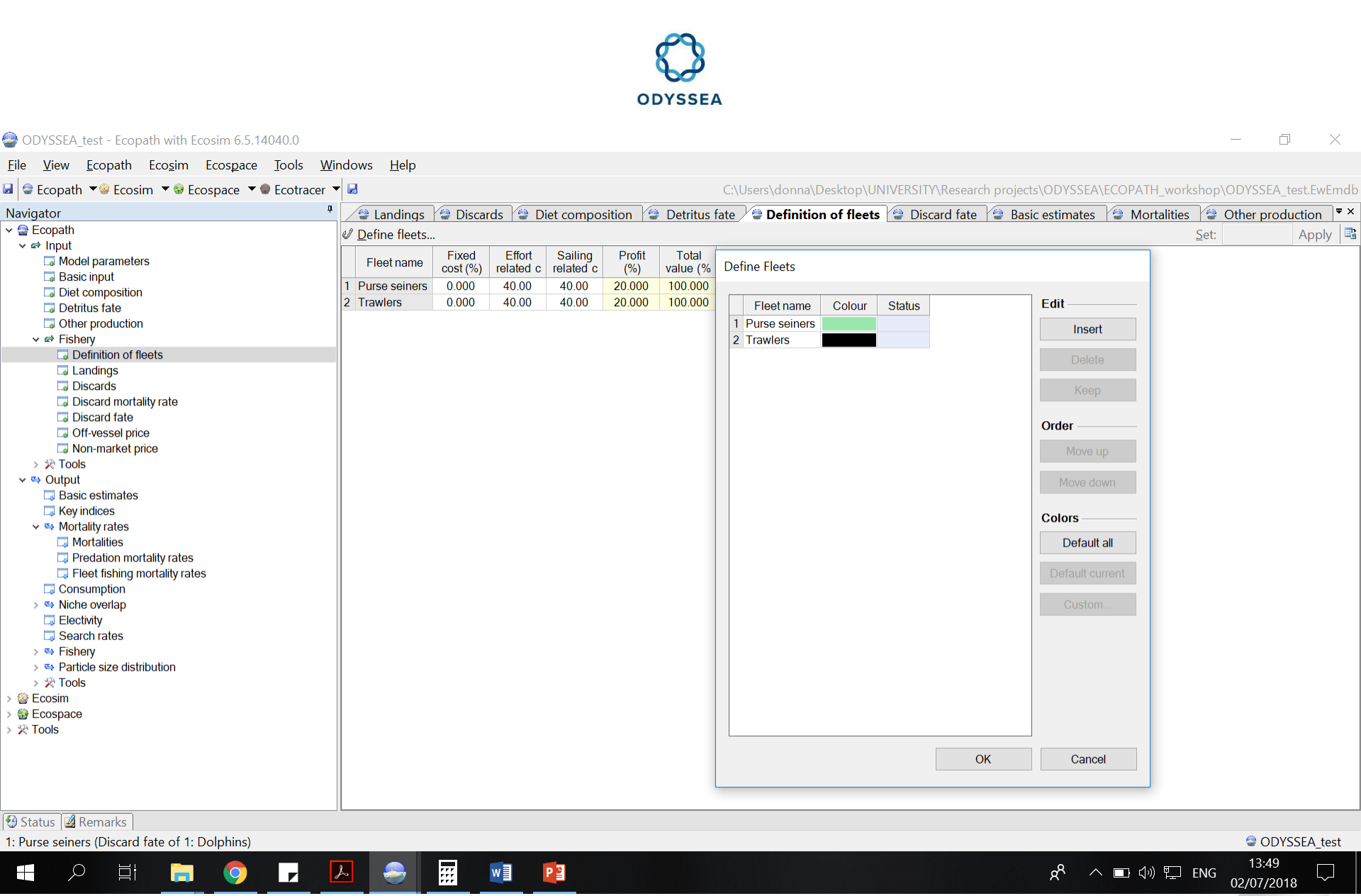
Sum diets to one Set: 0.000 Apply

	Prey \ predator	1	2	3	4	5	6	7
1	Dolphins							
2	Sharks							
3	Hake	0.0600	0.300	0.090				
4	Red mullets	0.0400	0.100	0.010				
5	Sardine	0.900	0.100	0.400				
6	Shrimps		0.100	0.200	0.200			
7	Copepods		0.400	0.300	0.800	0.900	0.700	0.100
8	Phytoplankton					0.100		0.700
9	Discards						0.0500	
10	Detritus						0.250	0.200
11	Import	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	Sum	1.000	1.000	1.000	1.000	1.000	1.000	1.000
13	(1 - Sum)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Status | Remarks

1: Dolphins (Diet of 1: Dolphins) ODYSSEA_test

ENG 17:56 02/07/2018


ODYSSEA
ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0
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Ecopath Ecosim Ecospace Ecotracer
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Navigator
Ecopath
Input
Model parameters
Basic input
Diet composition
Detritus fate
Other production
Fishery
Definition of fleets
Landings
Discards
Discard mortality rate
Discard fate
Off-vessel price
Non-market price
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Predation mortality rates
Fleet fishing mortality rates
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Landings
Discards
Diet composition
Detritus fate
Definition of fleets
Discard fate
Basic estimates
Mortalities
Other production
Define fleets...
Set:
Apply
Fleet name
Fixed cost (%)
Effort related c
Sailing related c
Profit (%)
Total value (%
1 Purse seiners 0.000 40.00 40.00 20.000 100.000
2 Trawlers 0.000 40.00 40.00 20.000 100.000
Define Fleets
Fleet name
Colour
Status
1 Purse seiners
2 Trawlers
Edit
Insert
Delete
Keep
Order
Move up
Move down
Colors
Default all
Default current
Custom...
OK
Cancel
Status
Remarks
1: Purse seiners (Discard fate of 1: Dolphins)
ODYSSEA_test
ENG
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ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

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Navigator

- Ecopath
  - Input
    - Model parameters
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    - Other production
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      - Landings
      - Discards
      - Discard mortality rate
      - Discard fate
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      - Non-market price
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      - Traits
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      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
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Start | Basic input | Diet composition | Pedigree | **Landings** | Discards

Set: Apply

	Group name	Purse seiners (t	Trawlers (t/km²/ye	Total
1	Dolphins			0.000
2	Sharks	0.00200	0.00300	0.005
3	Hake		0.100	0.100
4	Red mullets		0.01000	0.010
5	Sardine	0.800		0.800
6	Shrimps		0.120	0.120
7	Copepods			0.000
8	Phytoplankton			0.000
9	Discards			0.000
10	Detritus			0.000
11	Sum	0.802	0.233	1.035

Status Remarks

(derived value selected) ODYSSEA_test

ENG 17:59 02/07/2018

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

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Ecopath Ecosim Ecospace Ecotracer C:\Users\donna\Desktop\UNIVERSITY\Research projects\ODYSSEA\ECOPATH_workshop\ODYSSEA_test.EwEmdb

Navigator

- Ecopath
  - Input
    - Model parameters
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    - Detritus fate
    - Other production
    - Fishery
      - Definition of fleets
      - Landings
      - Discards
      - Discard mortality rate
      - Discard fate
      - Off-vessel price
      - Non-market price
    - Tools
      - Growth input
      - Pedigree
      - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Landings | **Discards**

Set: Apply

	Group name	Purse seiners (t	Trawlers (t/km²)	Total
1	Dolphins			0.000
2	Sharks	0.00200	0.00200	0.004
3	Hake		0.0400	0.040
4	Red mullets		0.00500	0.005
5	Sardine	0.200		0.200
6	Shrimps		0.0350	0.035
7	Copepods			0.000
8	Phytoplankton			0.000
9	Discards			0.000
10	Detritus			0.000
11	Sum	0.202	0.082	0.284

Status Remarks

(derived value selected) ODYSSEA_test

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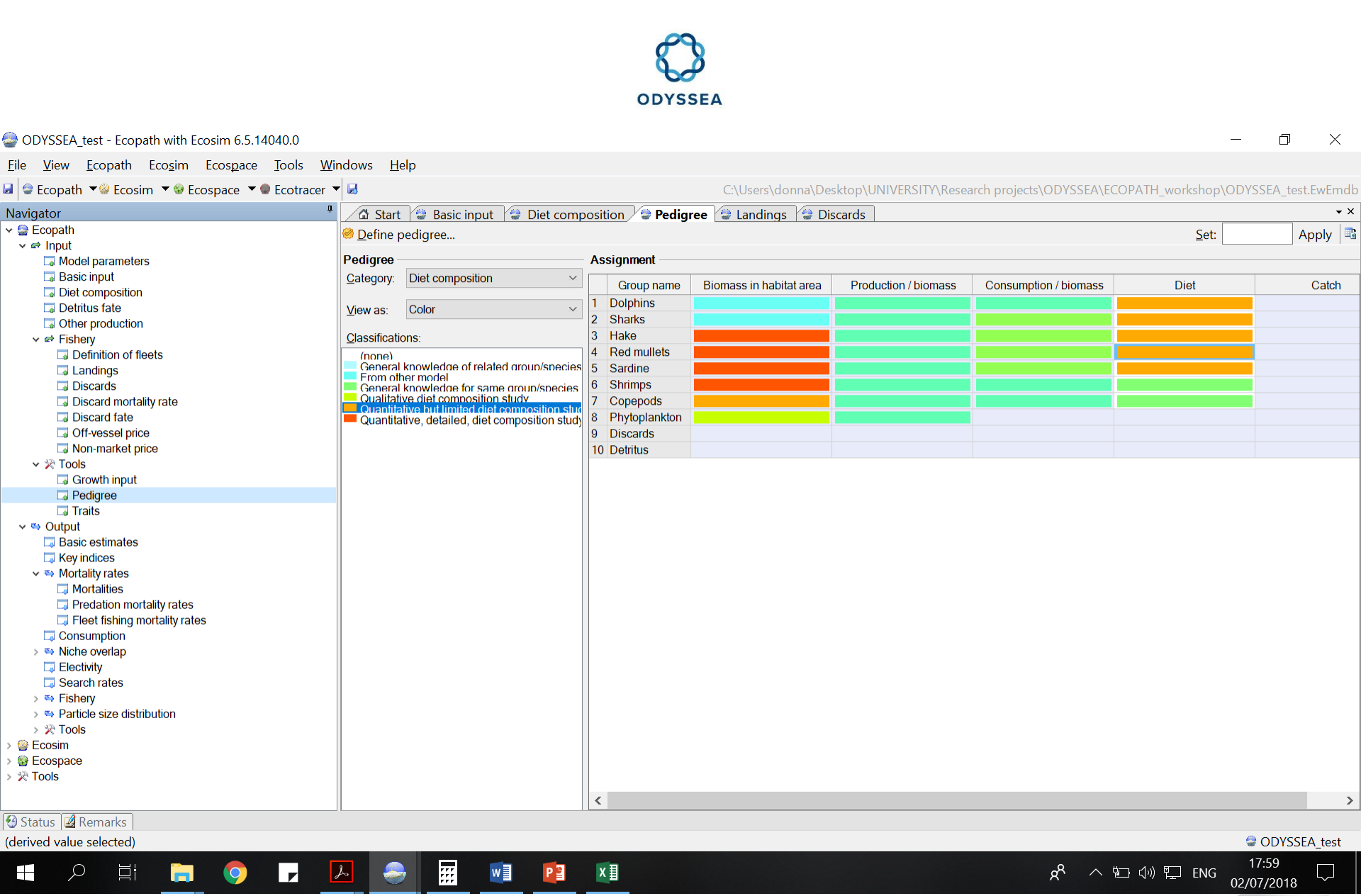
ODYSSEA
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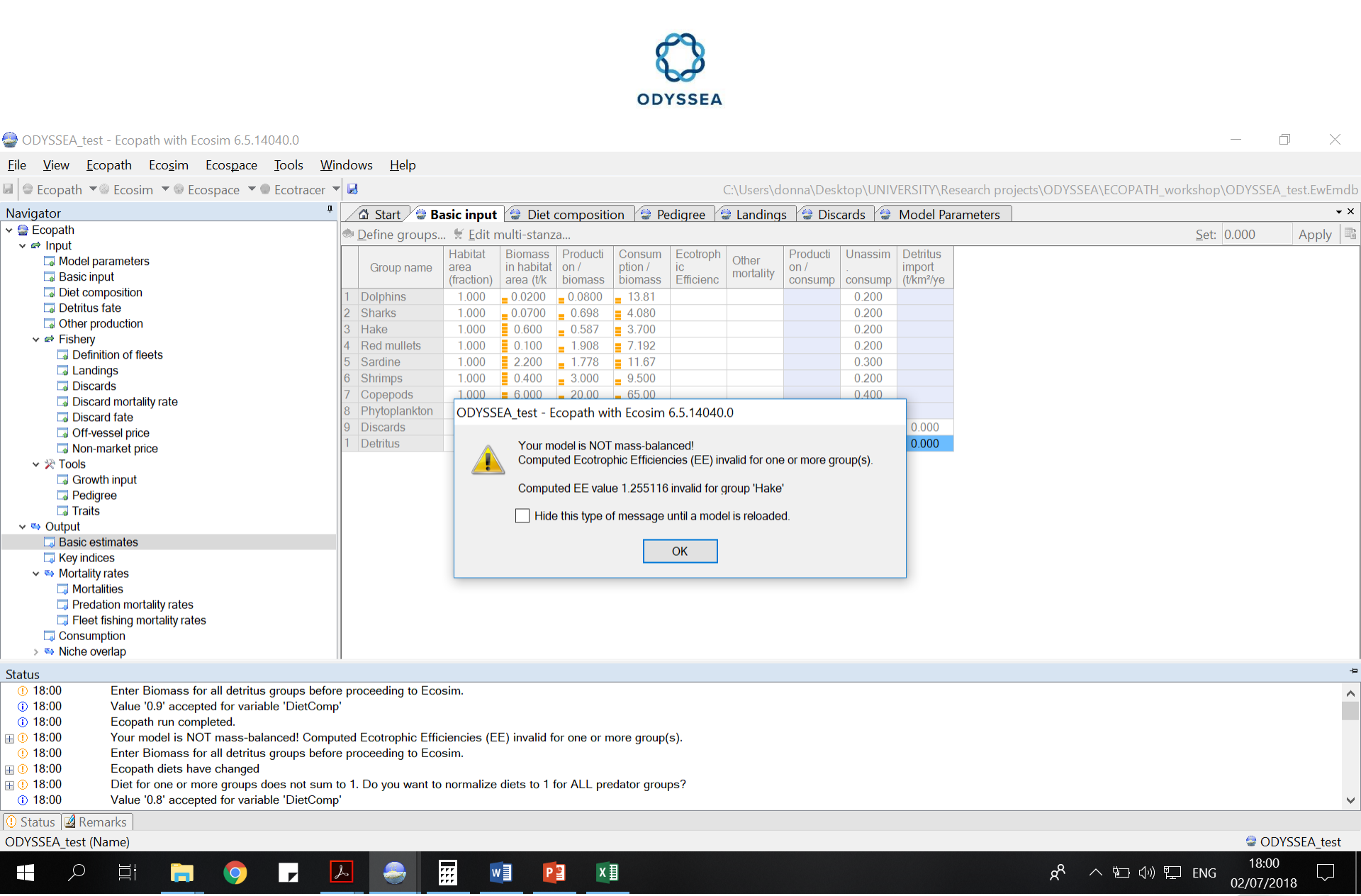
Start
Basic input
Diet composition
Pedigree
Landings
Discards
Define pedigree...
Set:
Apply
Pedigree
Category: Diet composition
View as: Color
Classifications:
(none)
General knowledge of related group/species
From other model
General knowledge for same group/species
Qualitative diet composition study
Quantitative but limited diet composition stu
Quantitative, detailed, diet composition study
Assignment
Group name
Biomass in habitat area
Production / biomass
Consumption / biomass
Diet
Catch
1 Dolphins
2 Sharks
3 Hake
4 Red mullets
5 Sardine
6 Shrimps
7 Copepods
8 Phytoplankton
9 Discards
10 Detritus
Status
Remarks
(derived value selected)
ODYSSEA_test
ENG
17:59
02/07/2018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Niche overlap
Start
Basic input
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Pedigree
Landings
Discards
Model Parameters
Define groups...
Edit multi-stanza...
Set: 0.000
Apply
Group name
Habitat area (fraction)
Biomass in habitat area (t/k
Producti on / biomass
Consum ption / biomass
Ecotroph ic Efficienc
Other mortality
Producti on / consump
Unassim . consump
Detritus import (t/km²/ye
1 Dolphins 1.000 0.0200 0.0800 13.81 0.200
2 Sharks 1.000 0.0700 0.698 4.080 0.200
3 Hake 1.000 0.600 0.587 3.700 0.200
4 Red mullets 1.000 0.100 1.908 7.192 0.200
5 Sardine 1.000 2.200 1.778 11.67 0.300
6 Shrimps 1.000 0.400 3.000 9.500 0.200
7 Copepods 1.000 6.000 20.00 65.00 0.400
8 Phytoplankton
9 Discards 0.000
1 Detritus 0.000
ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0
Your model is NOT mass-balanced!
Computed Ecotrophic Efficiencies (EE) invalid for one or more group(s).
Computed EE value 1.255116 invalid for group 'Hake'
Hide this type of message until a model is reloaded.
OK
Status
18:00 Enter Biomass for all detritus groups before proceeding to Ecosim.
18:00 Value '0.9' accepted for variable 'DietComp'
18:00 Ecopath run completed.
18:00 Your model is NOT mass-balanced! Computed Ecotrophic Efficiencies (EE) invalid for one or more group(s).
18:00 Enter Biomass for all detritus groups before proceeding to Ecosim.
18:00 Ecopath diets have changed
18:00 Diet for one or more groups does not sum to 1. Do you want to normalize diets to 1 for ALL predator groups?
18:00 Value '0.8' accepted for variable 'DietComp'
Status Remarks
ODYSSEA_test (Name)
ODYSSEA_test
ENG
18:00
02/07/2018

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

Ecopath Ecosim Ecospace Ecotracer C:\Users\donna\Desktop\UNIVERSITY\Research projects\ODYSSEA\ECOPATH_workshop\ODYSSEA_test.EwEmdb

Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
      - Definition of fleets
      - Landings
      - Discards
      - Discard mortality rate
      - Discard fate
      - Off-vessel price
      - Non-market price
    - Tools
      - Growth input
      - Pedigree
      - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Landings | Discards | Model Parameters | **Basic estimates**

	Group name	Trophic level	Habitat area (fraction)	Biomass in habitat area (t/k	Biomass (t/km²)	Production / biomass	Consumption / biomass	Ecotrophic Efficienc	Production / consump	Biom. accumul. (t/km²/ye	Biom. acc. rate (/year)
1	Dolphins	4.055	1.000	0.0200	0.0200	0.0800	13.81	0.000	0.006		
2	Sharks	3.875	1.000	0.0700	0.0700	0.698	4.080	0.184	0.171		
3	Hake	3.760	1.000	0.600	0.600	0.587	3.700	1.255	0.159		
4	Red mullets	3.244	1.000	0.100	0.100	1.908	7.192	0.403	0.265		
5	Sardine	3.000	1.000	2.200	2.200	1.778	11.67	0.554	0.152		
6	Shrimps	2.778	1.000	0.400	0.400	3.000	9.500	0.643	0.316		
7	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			
1	Detritus	1.000	1.000					0.079			

Status Remarks

ODYSSEA_test (Name) ODYSSEA_test

ENG 18:00 02/07/2018

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

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Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
      - Definition of fleets
      - Landings
      - Discards
      - Discard mortality rate
      - Discard fate
      - Off-vessel price
      - Non-market price
    - Tools
      - Growth input
      - Pedigree
      - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Definition of fleets | Discard fate | Other production | Discard mortality r | Off-vessel price | Pedigree | Basic estimates | **Mortalities**

	Group name	Prod/biom or Z	= Fishing mort. rat	+ Predatio	+ Biomass	+ Net migratio	+ Other mort. rat	Fishing mort. / to	Proportion natural
1	Dolphins	0.0800					0.0800	0.000	1.000
2	Sharks	0.698	0.129				0.569	0.184	0.816
3	Hake	0.587	0.280	0.930			-0.623	0.477	0.523
4	Sardine	1.778	0.500	0.440			0.838	0.281	0.719
5	Shrimps	3.339	0.387	0.996			1.955	0.116	0.884
6	Copepods	62.47		22.62			39.85	0.000	1.000
7	Phytoplankton	117.3		87.24			30.06	0.000	1.000

This is Ecopath Master Equation I and Hake isn't mass-balanced!

Status Remarks

5: Shrimps (Imported diet) ODYSSEA_test

ENG 16:53 02/07/2018

ODYSSEA

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

1. Are the **P/Q** values physiologically realistic? i.e. **0.1-0.3** for most groups, perhaps lower for top predators (dolphins) and **higher** for very small organisms (**copepods**)?
2. Often the problem is the **consumption by predators**, so check the Predation mortality rates, and identify the quantitatively most important predators. Check the diet compositions values for these predators.
3. Are the ***P/B, Q/B*** and ***B*** values appropriate for this group? Compare with other similar models and the literature.
4. Check if **landings** exceed the biomass values of a functional group. Maybe the distribution in the study area was incorrectly estimated.

ODYSSEA

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

1. Are the **P/Q** values physiologically realistic? i.e. **0.1-0.3** for most groups, perhaps lower for top predators (**dolphins**) and **higher** for very small organisms (**copepods**)?
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3. Are the ***P/B, Q/B*** and ***B*** values appropriate for this group? Compare with other similar models and the literature.
4. Check if **landings** exceed the biomass values of a functional group. Maybe the distribution in the study area was incorrectly estimated.

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

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Navigator

- Ecopath
  - Input
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    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
      - Definition of fleets
      - Landings
      - Discards
      - Discard mortality rate
      - Discard fate
      - Off-vessel price
      - Non-market price
    - Tools
      - Growth input
      - Pedigree
      - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Landings | Discards | Model Parameters | **Basic estimates**

	Group name	Trophic level	Habitat area (fraction)	Biomass in habitat area (t/k	Biomass (t/km²)	Production / biomass	Consumption / biomass	Ecotrophic Efficienc	Production / consump	Biom. accumul. (t/km²/ye	Biom. acc. rate (/year)
1	Dolphins	4.055	1.000	0.0200	0.0200	0.0800	13.81	0.000	0.006		
2	Sharks	3.875	1.000	0.0700	0.0700	0.698	4.080	0.184	0.171		
3	Hake	3.760	1.000	0.600	0.600	0.587	3.700	1.255	0.159		
4	Red mullets	3.244	1.000	0.100	0.100	1.908	7.192	0.403	0.265		
5	Sardine	3.000	1.000	2.200	2.200	1.778	11.67	0.554	0.152		
6	Shrimps	2.778	1.000	0.400	0.400	3.000	9.500	0.643	0.316		
7	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			
1	Detritus	1.000	1.000					0.079			

Status Remarks

ODYSSEA_test (Name) ODYSSEA_test

ENG 18:00 02/07/2018

ODYSSEA

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

1. Are the **P/Q** values physiologically realistic? i.e. **0.1-0.3** for most groups, perhaps lower for top predators (dolphins) and **higher** for very small organisms (**copepods**)?
2. Often the problem is the **consumption by predators**, so check the Predation mortality rates, and identify the quantitatively most important predators. Check the diet compositions values for these predators.
3. Are the ***P/B, Q/B*** and ***B*** values appropriate for this group? Compare with other similar models and the literature.
4. Check if **landings** exceed the biomass values of a functional group. Maybe the distribution in the study area was incorrectly estimated.

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

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Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
  - Fishery
    - Definition of fleets
    - Landings
    - Discards
    - Discard mortality rate
    - Discard fate
    - Off-vessel price
    - Non-market price
  - Tools
    - Growth input
    - Pedigree
    - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Landings | Discards | Model Parameters | Basic estimates | **Predation mortal...**

	Prey \ predator	1	2	3	4	5	6	7
1	Dolphins							
2	Sharks							
3	Hake	0.0276	0.143	0.333				
4	Red mullets	0.110	0.286	0.222				
5	Sardine	0.113	0.0130	0.404				
6	Shrimps		0.0714	1.110	0.360			
7	Copepods		0.0190	0.111	0.0959	3.850	0.443	6.500
8	Phytoplankton					0.285		30.33

Status Remarks

(multiple items selected) (Pred. mort.) ODYSSEA_test

ENG 18:39 02/07/2018

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

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Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
  - Fishery
    - Definition of fleets
    - Landings
    - Discards
    - Discard mortality rate
    - Discard fate
    - Off-vessel price
    - Non-market price
  - Tools
    - Growth input
    - Pedigree
    - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | **Diet composition** | Pedigree | Landings | Discards | Model Parameters | Basic estimates | Predation mortalit...

Sum diets to one Set: Apply

Prey \ predator	1	2	3	4	5	6	7
1 Dolphins							
2 Sharks							
3 Hake	0.0600	0.300	0.090				
4 Red mullets	0.0400	0.100	0.010				
5 Sardine	0.900	0.100	0.400				
6 Shrimps		0.100	0.200	0.200			
7 Copepods		0.400	0.300	0.800	0.900	0.700	0.100
8 Phytoplankton					0.100		0.700
9 Discards						0.0500	
10 Detritus						0.250	0.200
11 Import	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12 Sum	1.000	1.000	1.000	1.000	1.000	1.000	1.000
13 (1 - Sum)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Status Remarks

(multiple items selected)

Prey \ predator	1	2	3
1 Dolphins			
2 Sharks			
3 Hake	0.0600	0.300	0.090
4 Red mullets	0.0400	0.100	0.010

Since it seems that there is not enough **hake** in the studied ecosystem, predators feeding on hake might turn to other **demersal** species such as **red mullets**.

Prey \ predator	1	2	3
Dolphins			
Sharks			
Hake	0.0600	0.300	0.070
Red mullets	0.0400	0.100	0.030

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

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Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
      - Definition of fleets
      - Landings
      - Discards
      - Discard mortality rate
      - Discard fate
      - Off-vessel price
      - Non-market price
    - Tools
      - Growth input
      - Pedigree
      - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Landings | Discards | Model Parameters | Predation mortalit... | **Basic estimates**

	Group name	Trophic level	Habitat area (fraction)	Biomass in habitat area (t/k	Biomass (t/km²)	Production / biomass	Consumption / biomass	Ecotrophic Efficienc	Production / consump	Biom. accumul. (t/km²/ye	Biom. acc. rate (/year)
1	Dolphins	4.055	1.000	0.0200	0.0200	0.0800	13.81	0.000	0.006		
2	Sharks	3.871	1.000	0.0700	0.0700	0.698	4.080	0.184	0.171		
3	Hake	3.749	1.000	0.600	0.600	0.587	3.700	1.129	0.159		
4	Red mullets	3.244	1.000	0.100	0.100	1.908	7.192	0.635	0.265		
5	Sardine	3.000	1.000	2.200	2.200	1.778	11.67	0.554	0.152		
6	Shrimps	2.778	1.000	0.400	0.400	3.000	9.500	0.643	0.316		
7	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			
1	Detritus	1.000	1.000					0.079			

Status Remarks

3: Hake (Diet of 3: Hake) ODYSSEA_test

ENG 18:48 02/07/2018

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

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Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
  - Fishery
    - Definition of fleets
    - Landings
    - Discards
    - Discard mortality rate
    - Discard fate
    - Off-vessel price
    - Non-market price
  - Tools
    - Growth input
    - Pedigree
    - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | **Diet composition** | Pedigree | Landings | Discards | Model Parameters | Basic estimates | Predation mortalit...

Sum diets to one Set: Apply

	Prey \ predator	1	2	3	4	5	6	7
1	Dolphins							
2	Sharks							
3	Hake	0.0600	0.300	0.090				
4	Red mullets	0.0400	0.100	0.010				
5	Sardine	0.900	0.100	0.400				
6	Shrimps		0.100	0.200	0.200			
7	Copepods		0.400	0.300	0.800	0.900	0.700	0.100
8	Phytoplankton					0.100		0.700
9	Discards						0.0500	
10	Detritus						0.250	0.200
11	Import	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	Sum	1.000	1.000	1.000	1.000	1.000	1.000	1.000
13	(1 - Sum)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Status Remarks

(multiple items selected)

	Prey \ predator	1	2	3
1	Dolphins			
2	Sharks			
3	Hake	0.0600	0.300	0.090
4	Red mullets	0.0400	0.100	0.010

Since it seems that there is not enough **hake** in the studied ecosystem, predators feeding on hake might turn to other **demersal** species such as **red mullets**.

	Prey \ predator	1	2	3
1	Dolphins			
2	Sharks			
3	Hake	0.0600	0.200	0.060
4	Red mullets	0.0400	0.200	0.040

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

File View Ecopath Ecosim Ecospace Tools Windows Help

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Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
      - Definition of fleets
      - Landings
      - Discards
      - Discard mortality rate
      - Discard fate
      - Off-vessel price
      - Non-market price
    - Tools
      - Growth input
      - Pedigree
      - Traits
  - Output
    - Basic estimates
    - Key indices
    - Mortality rates
      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Landings | Discards | Model Parameters | **Basic estimates**

	Group name	Trophic level	Habitat area (fraction)	Biomass in habitat area (t/k	Biomass (t/km²)	Production / biomass	Consumption / biomass	Ecotrophic Efficienc	Production / consump	Biom. accumul. (t/km²/ye	Biom. acc. rate (/year)
1	Dolphins	4.054	1.000	0.0200	0.0200	0.0800	13.81	0.000	0.006		
2	Sharks	3.820	1.000	0.0700	0.0700	0.698	4.080	0.184	0.171		
3	Hake	3.743	1.000	0.600	0.600	0.587	3.700	0.985	0.159		
4	Red mullets	3.244	1.000	0.100	0.100	1.908	7.192	0.901	0.265		
5	Sardine	3.000	1.000	2.200	2.200	1.778	11.67	0.554	0.152		
6	Shrimps	2.778	1.000	0.400	0.400	3.000	9.500	0.643	0.316		
7	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			
1	Detritus	1.000	1.000					0.079			

Status Remarks

5: Sardine (Diet of 10: Detritus) ODYSSEA_test

ENG 18:50 02/07/2018

ODYSSEA

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

1. Are the **P/Q** values physiologically realistic? i.e. **0.1-0.3** for most groups, perhaps lower for top predators (dolphins) and **higher** for very small organisms (**copepods**)?
2. Often the problem is the **consumption by predators**, so check the Predation mortality rates, and identify the quantitatively most important predators. Check the diet compositions values for these predators.
3. Are the ***EE, P/B, Q/B*** and ***B*** values appropriate for this group? Compare with other similar models and the literature.
4. Check if **landings** exceed the biomass values of a functional group. Maybe the distribution in the study area was incorrectly estimated.

ODYSSEA

ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0

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Navigator

- Ecopath
  - Input
    - Model parameters
    - Basic input
    - Diet composition
    - Detritus fate
    - Other production
    - Fishery
      - Definition of fleets
      - Landings
      - Discards
      - Discard mortality rate
      - Discard fate
      - Off-vessel price
      - Non-market price
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      - Pedigree
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    - Key indices
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      - Mortalities
      - Predation mortality rates
      - Fleet fishing mortality rates
    - Consumption
    - Niche overlap
    - Electivity
    - Search rates
    - Fishery
    - Particle size distribution
    - Tools
- Ecosim
- Ecospace
- Tools

Start | Basic input | Diet composition | Pedigree | Landings | Discards | Model Parameters | **Basic estimates**

	Group name	Trophic level	Habitat area (fraction)	Biomass in habitat area (t/k	Biomass (t/km²)	Production / biomass	Consumption / biomass	Ecotrophic Efficienc	Production / consump	Biom. accumul. (t/km²/ye	Biom. acc. rate (/year)
1	Dolphins	4.054	1.000	0.0200	0.0200	0.0800	13.81	0.000	0.006		
2	Sharks	3.820	1.000	0.0700	0.0700	0.698	4.080	0.184	0.171		
3	Hake	3.743	1.000	0.600	0.600	0.587	3.700	0.985	0.159		
4	Red mullets	3.244	1.000	0.100	0.100	1.908	7.192	0.901	0.265		
5	Sardine	3.000	1.000	2.200	2.200	1.778	11.67	0.554	0.152		
6	Shrimps	2.778	1.000	0.400	0.400	3.000	9.500	0.643	0.316		
7	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			
1	Detritus	1.000	1.000					0.079			

Small pelagics don't die of old age, EE expected close to 1

Predation and fishing!

Status Remarks

5: Sardine (Diet of 10: Detritus) ODYSSEA_test

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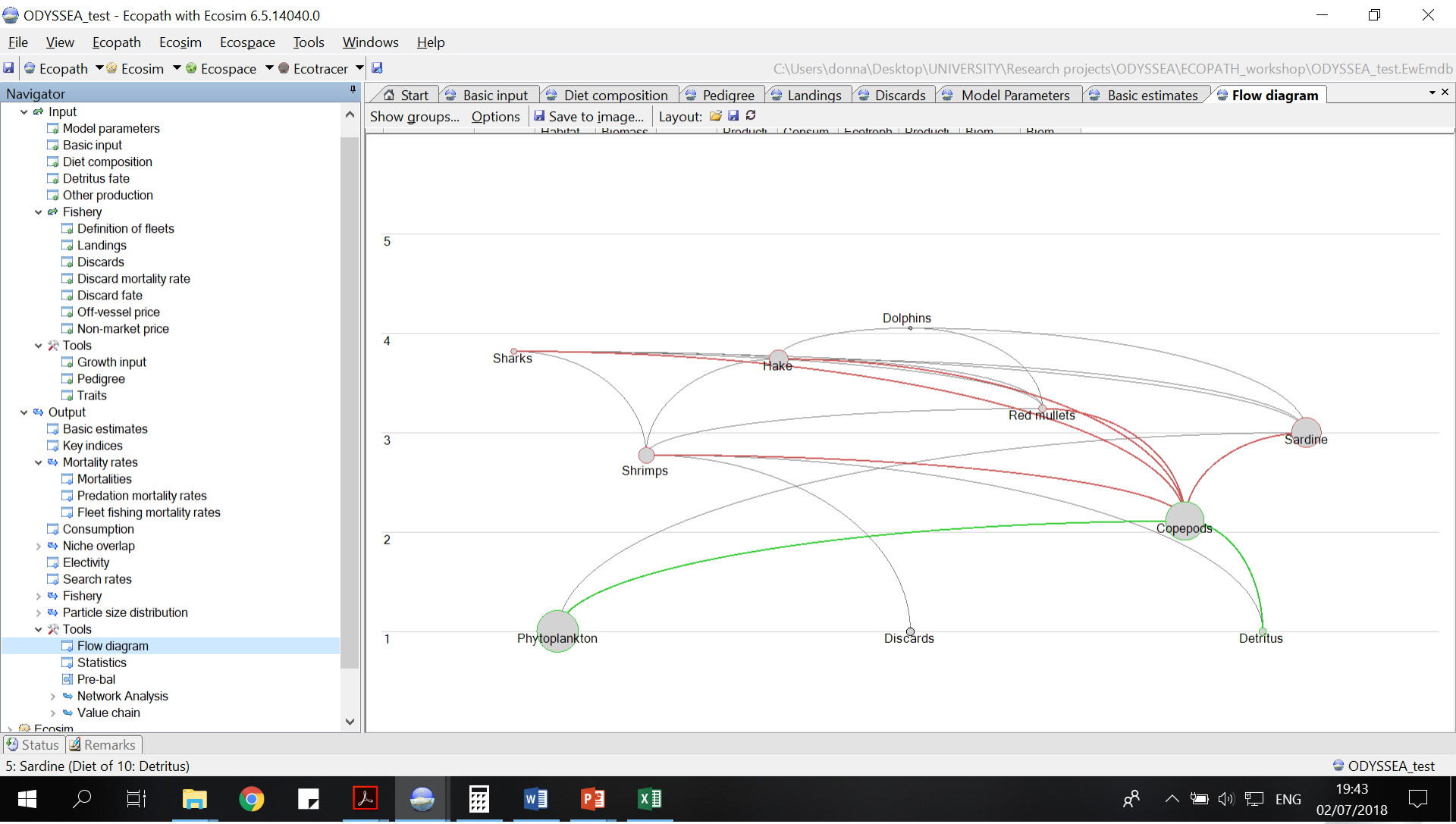
ODYSSEA


ODYSSEA_test - Ecopath with Ecosim 6.5.14040.0
File View Ecopath Ecosim Ecospace Tools Windows Help
Ecopath Ecosim Ecospace Ecotracer
C:\Users\donna\Desktop\UNIVERSITY\Research projects\ODYSSEA\ECOPATH_workshop\ODYSSEA_test.EwEmdb
Navigator
Input
Model parameters
Basic input
Diet composition
Detritus fate
Other production
Fishery
Definition of fleets
Landings
Discards
Discard mortality rate
Discard fate
Off-vessel price
Non-market price
Tools
Growth input
Pedigree
Traits
Output
Basic estimates
Key indices
Mortality rates
Mortalities
Predation mortality rates
Fleet fishing mortality rates
Consumption
Niche overlap
Electivity
Search rates
Fishery
Particle size distribution
Tools
Flow diagram
Statistics
Pre-bal
Network Analysis
Value chain
Ecosim
Start
Basic input
Diet composition
Pedigree
Landings
Discards
Model Parameters
Basic estimates
Flow diagram
Show groups...
Options
Save to image...
Layout:
5
4
3
2
1
Dolphins
Sharks
Hake
Red mullets
Sardine
Shrimps
Copepods
Phytoplankton
Discards
Detritus
Status
Remarks
5: Sardine (Diet of 10: Detritus)
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02/07/2018

ODYSSEA

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Navigator

- Input
  - Model parameters
  - Basic input
  - Diet composition
  - Detritus fate
  - Other production
  - Fishery
    - Definition of fleets
    - Landings
    - Discards
    - Discard mortality rate
    - Discard fate
    - Off-vessel price
    - Non-market price
  - Tools
    - Growth input
    - Pedigree
    - Traits
- Output
  - Basic estimates
  - Key indices
  - Mortality rates
    - Mortalities
    - Predation mortality rates
    - Fleet fishing mortality rates
  - Consumption
  - Niche overlap
  - Electivity
  - Search rates
  - Fishery
  - Particle size distribution
  - Tools
    - Flow diagram
    - Statistics
    - Pre-bal
    - Network Analysis
    - Value chain
- Ecosim

Start | Basic input | Diet composition | Pedigree | Landings | Discards | Model Parameters | Basic estimates | Flow diagram | **Statistics**

Parameter	Value	Units
Sum of all consumption	422.971	t/km²/year
Sum of all exports	923.880	t/km²/year
Sum of all respiratory flows	132.105	t/km²/year
Sum of all flows into detritus	1001.701	t/km²/year
Total system throughput	2480.655	t/km²/year
Sum of all production	1181.405	t/km²/year
Mean trophic level of the catch	3.061	
Gross efficiency (catch/net p.p.)	0.001	
Calculated total net primary production	1055.700	t/km²/year
Total primary production/total respiration	7.991	
Net system production	923.596	t/km²/year
Total primary production/total biomass	57.406	
Total biomass/total throughput	0.007	/year
Total biomass (excluding detritus)	18.390	t/km²
Total catch	1.319	t/km²/year
Connectance Index	0.365	
System Omnivory Index	0.144	
Total market value	1.035	1
Total shadow value	0.000	1
Total value	1.035	1
Total fixed cost	0.000	1
Total variable cost	0.828	1
Total cost	0.828	1
Profit	0.207	1
Ecopath pedigree index	0.314	
Measure of fit, t*	0.811	
Shannon diversity index	1.221	

Status Remarks

5: Sardine (Diet of 10: Detritus) ODYSSEA_test

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Navigator

- Input
  - Model parameters
  - Basic input
  - Diet composition
  - Detritus fate
  - Other production
  - Fishery
    - Definition of fleets
    - Landings
    - Discards
    - Discard mortality rate
    - Discard fate
    - Off-vessel price
    - Non-market price
  - Tools
    - Growth input
    - Pedigree
    - Traits
- Output
  - Basic estimates
  - Key indices
  - Mortality rates
    - Mortalities
    - Predation mortality rates
    - Fleet fishing mortality rates
  - Consumption
  - Niche overlap
  - Electivity
  - Search rates
  - Fishery
  - Particle size distribution
  - Tools
    - Flow diagram
    - Statistics
    - Pre-bal
    - Network Analysis
    - Value chain
- Ecosim

Start | Basic input | Diet composition | Pedigree | Landings | Discards | Model Parameters | Basic estimates | Flow diagram | **Statistics**

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Total cost	0.828	1
Profit	0.207	1
Ecopath pedigree index	0.314	
Measure of fit, t*	0.811	
Shannon diversity index	1.221	

Status Remarks

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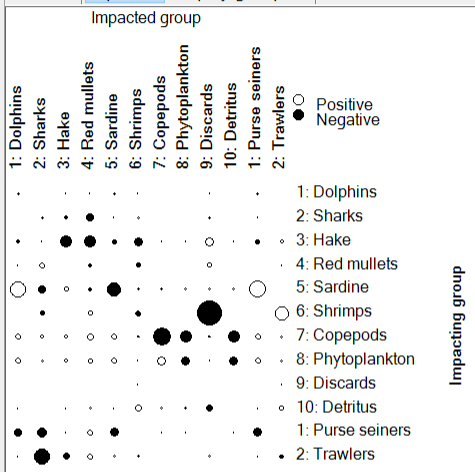
Navigator

- Discards
- Discard mortality rate
- Discard fate
- Off-vessel price
- Non-market price
- Tools
  - Growth input
  - Pedigree
  - Traits
- Output
  - Basic estimates
  - Key indices
  - Mortality rates
    - Mortalities
    - Predation mortality rates
    - Fleet fishing mortality rates
  - Consumption
  - Niche overlap
  - Electivity
  - Search rates
  - Fishery
  - Particle size distribution
  - Tools
    - Flow diagram
    - Statistics
    - Pre-bal
    - Network Analysis
      - Trophic level decomposition
      - Flows and biomasses
      - Primary production required
      - Mixed trophic impact
        - Impact data
        - Mixed trophic impact plot
      - Keystoneness
      - Ascendency
      - Flow from detritus
      - Cycles and pathways
      - Loss of Production index

Pedigree | Landings | Discards | Model Parameters | Basic estimates | Flow diagram | Statistics | Pre-bal | **Network analysis**

Mixed tropic level impacts

Refresh | Options | Display groups... | Save to EMF file



Labels
- Draw slanting
- (•) No. and name
- ( ) Number only
- ( ) Name only

Data
- (•) Circles
- ( ) Rectangles
- ( ) Colors

Plot
- Draw grid lines
- Fit to available
- [x] Draw legend

Status | Remarks

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Navigator

- Discards
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- Discard fate
- Off-vessel price
- Non-market price
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  - Fishery
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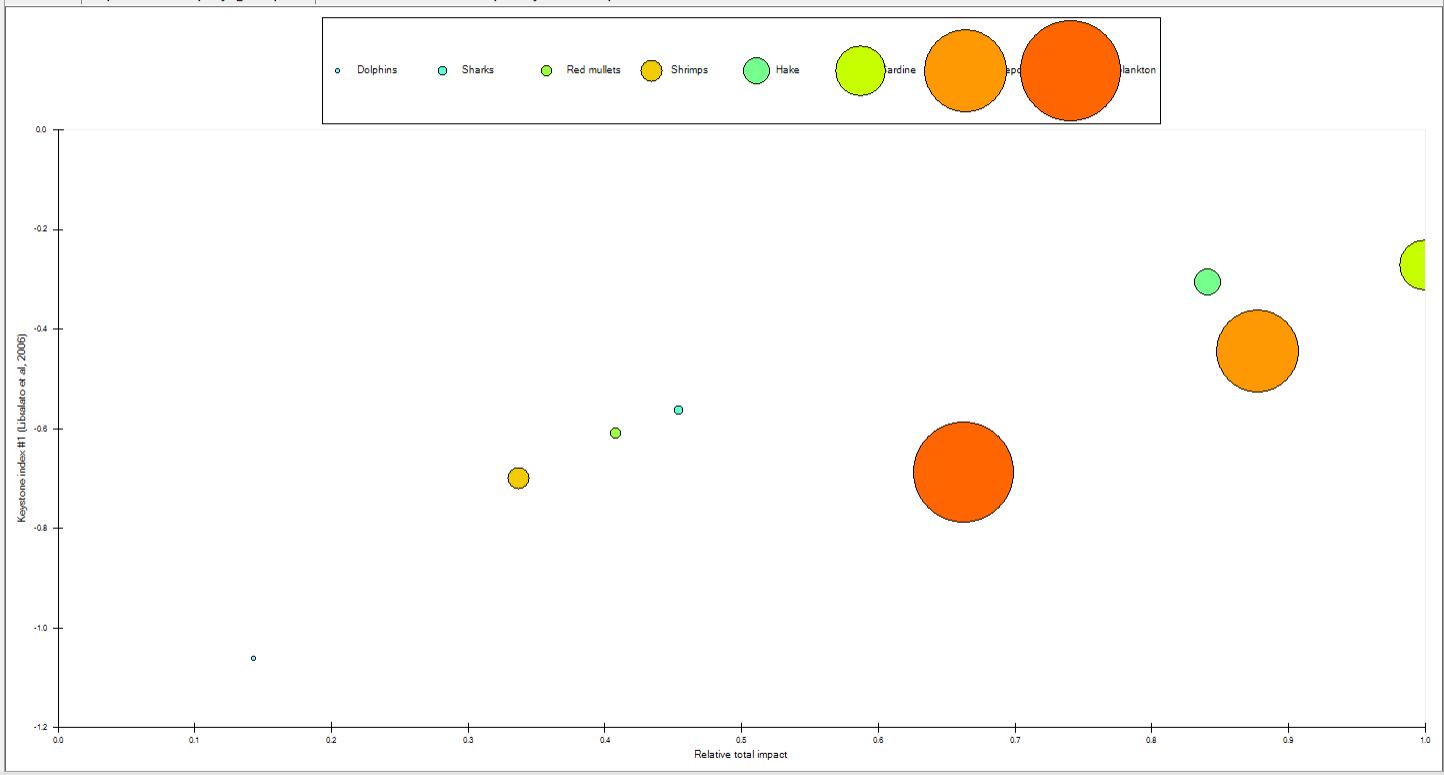
    - Statistics
    - Pre-bal
    - Network Analysis
      - Trophic level decomposition
      - Flows and biomasses
      - Primary production required
      - Mixed trophic impact
        - Impact data
        - Mixed trophic impact plot
      - Keystoneness
        - Keystoneness graph
        - Keystoneness table
      - Ascendency
      - Flow from detritus

Pedigree | Landings | Discards | Model Parameters | Basic estimates | Flow diagram | Statistics | Pre-bal | **Network analysis**

Keystoneness

Refresh | Options | Display groups... | Save to CSV file | Graph style | Graph content



Status | Remarks

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