

A GUIDE TO THE ECOPATH II SOFTWARE SYSTEM (VERSION 2.1)

U.S. National Marine Fisheries Service

Villy Christensen

and

Daniel Pauly

SOFTWARE 6

**INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT
MANILA, PHILIPPINES**

**A guide to the ECOPATH II
software system (version 2.1)**

**V. CHRISTENSEN
D. PAULY**

Reprinted February 1993

**Published by the International Center for Living
Aquatic Resources Management
MC P.O. Box 2631, Makati
Metro Manila 0718, Philippines**

**Christensen, V. and D. Pauly. 1992. A guide to the ECOPATH II
software system (version 2.1). ICLARM Software 6, 72 p.
International Center for Living Aquatic Resources Management
Manila, Philippines.**

**Cover : Selected organisms from the Bolinao reef ecosystem,
Northern Luzon, Philippines (Drawing by O. Espiritu).**

ISSN 0116-6964

ICLARM Contribution No. 637

No fish is an island...

TABLE OF CONTENTS

1.	ABSTRACT	1
2.	INTRODUCTION	2
3.	The ECOPATH II Model	4
4.	ON ECOPATH II VERSION 2.1	5
4.1	Changes from Version 1.0 to 2.0	5
4.2	New features in Version 2.1	6
4.3	Future upgrades	8
4.4	Copyright and liability	8
5.	DEFINING THE SYSTEM	8
6.	THE ENERGY BALANCE OF A BOX	9
6.1	Consumption	9
6.1.1	<i>Producer</i>	9
6.1.2	<i>Import</i>	10
6.2	Mortality Coefficients	10
6.2.1	<i>Immigration</i>	11
6.2.2	<i>Export</i>	11
6.2.2.1	Catches	11
6.2.2.2	Emigration	11
6.2.3	<i>Predation mortality</i>	12
6.2.4	<i>Other mortality</i>	12
6.3	Respiration	12
7.	PARAMETRIZATION	13
7.1	Consumption	13
7.2	Production	15
7.3	Predation	15
7.4	Nonassimilated food	16
7.5	Other mortality	16
8.	INSTALLING AND RUNNING ECOPATH II	16
8.1	Installation	17
8.2	Running ECOPATH II	17

9.	ENTERING THE DATA - ECODATA	18
9.1	File comments	19
9.2	Parameter units	19
	9.2.1 <i>Energy-related units</i>	19
	9.2.2 <i>Nutrient-related units</i>	19
	9.2.3 <i>Time units</i>	19
9.3	Detritus and total primary production	20
	9.3.1 <i>Detritus biomass</i>	20
	9.3.2 <i>Detritus export and import</i>	20
	9.3.3 <i>Total primary production</i>	21
9.4	Entering values for basic input parameters	21
	9.4.1 <i>Naming the groups/species</i>	21
	9.4.2 <i>Producer, consumer or both?</i>	22
	9.4.3 <i>Exports include catch or harvest</i>	22
	9.4.4 <i>Total biomass</i>	22
	9.4.5 <i>PB - the production/biomass ratio</i>	22
	9.4.6 <i>QB - the consumption/biomass ratio</i>	22
	9.4.7 <i>EE - the ecotrophic efficiency</i>	22
	9.4.8 <i>GE - the food conversion efficiency</i>	22
	9.4.9 <i>The harvest screen</i>	23
	9.4.10 <i>Nonassimilated food</i>	23
	9.4.11 <i>The diet composition</i>	24
9.5	On the need for input parameters	25
9.6	Saving the data	26
10.	EDITING THE DATA	26
10.1	Selecting an input file	26
10.2	Changing parameter values	26
10.3	Adding new groups	27
10.4	Deleting groups	27
10.5	Saving the changes	27
11.	PRINTING THE INPUT DATA	27
12.	ESTIMATING THE MISSING PARAMETERS	27
12.1	Selecting an input file	27
12.2	The estimation procedure	27
12.3	Evaluation of an ECOPATH II run	28
	12.3.1 <i>Are the EE's between 0 and 1?</i>	29
	12.3.2 <i>Ecotrophic efficiency of detritus</i>	29
	12.3.3 <i>Are the "efficiencies" possible?</i>	30
12.4	Printing the results	30

12.5	Estimated parameters, indices and ratios	30
	12.5.1 <i>Flows to the detritus</i>	30
	12.5.2 <i>Food intake</i>	31
	12.5.3 <i>Amounts exported or eaten</i>	31
	12.5.4 <i>Net efficiency</i>	31
	12.5.5 <i>Trophic levels</i>	31
	12.5.6 <i>The omnivory index</i>	32
	12.5.7 <i>Respiration</i>	32
	12.5.8 <i>Assimilation</i>	33
	12.5.9 <i>Respiration/assimilation</i>	33
	12.5.10 <i>Production/respiration</i>	33
	12.5.11 <i>Respiration/biomass</i>	33
12.6	Summary statistics	33
	12.6.1 <i>Total system throughput</i>	35
	12.6.2 <i>Total primary production</i>	35
	12.6.3 <i>System primary production/respiration</i>	35
	12.6.4 <i>System primary production/biomass</i>	35
	12.6.5 <i>System biomass/throughput</i>	36
	12.6.6 <i>Net system production</i>	36
	12.6.7 <i>System respiration/biomass</i>	36
	12.6.8 <i>The efficiency of the fishery</i>	36
	12.6.9 <i>Total system biomass and catches</i>	36
	12.6.10 <i>Connectance index</i>	37
	12.6.11 <i>System omnivory index</i>	37
12.7	Breakdown of mortalities	37
12.8	Selection indices	38
12.9	Saving the results	39
13.	GRAPHICAL REPRESENTATION OF FLOWS	39
13.1	The do-it-yourself approach	39
13.2	Rules and recommendations	40
	13.2.1 <i>Using the Y-axis</i>	40
	13.2.2 <i>Using the X-axis</i>	40
14.	CYCLES AND PATHWAYS	42
14.1	Selecting an input file	42
14.2	Printer or screen?	42
14.3	The cycles and pathways menu	42
	14.3.1 <i>From primary producers to consumer</i>	43
	14.3.2 <i>From producers to consumer via a specified prey</i>	44
	14.3.3 <i>From a prey to all top predators</i>	44
	14.3.4 <i>All cycles</i>	44
	14.3.5 <i>From producers to all top predators</i>	44
	14.3.6 <i>Saving - no</i>	44

15. NETWORK FLOW INDICES	44	
15.1 Ascendency	45	
15.2 Cycling index	46	
15.3 Trophic aggregation	46	
15.4 Mixed trophic impacts	48	
15.4.1 <i>Graphical representation</i>	50	
15.4.2 <i>Hard copy</i>	52	
15.5 Saving	52	
16. AGGREGATION OF GROUPS	52	
16.1 Selecting an input file	52	
16.2 Aggregation of specified groups	53	
16.3 Minimizing the decline in ascendency	53	
16.4 Saving and using the aggregated file	55	
17. EXPORT TO SPREADSHEETS	55	
18. SCOR WG	55	
19. ACKNOWLEDGEMENTS	55	
20. REFERENCES	56	
APPENDICES		
Appendix 1.	Definition of some terms relevant to the construction of steady-state trophic ecosystem models.	59
Appendix 2.	Dimensions, units and definitions of some ecosystem indices presented in Ulanowicz (1986).	61
Appendix 3.	Definitions and symbols of variables used in Appendix 4.	64
Appendix 4.	Description of algorithms.	67