System Formulation

Part 2: Running the model

ExtendSim Model with input and ouput

The SPICOSA SSA 7.6, Søndeledfjorden, Norway Version 1.20 (19 July 2009)

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1. What you need



It is possible to set simulation duration up to 50 years. You can run up to 100 simulations.



2. General description



2.1 Environmental component (NC)

The ecosystem model is a demographic model that projects the abundance of the coastal cod (*Gadus morhua*) population in SSA 7.6 (Søndeledfjorden, Norway) in numbers by age (0 - 10 years age groups) forward in time.

- The model is running with yearly time-steps over a period of 1-50 years.
- Recruitment of 0-group cod are randomly picked by the model from a distribution of historical data.
- The total population size and the strength of the different year-classes of cod is a function of natural predators (as birds and mammals) and fishing mortality (caused by tourists and commercial) and other human activities (Eco-tourists etc).
- The cod spawning stock (SS) consists of age-groups 4-10.
- The default fishable stock consists of age-groups 2-10, however, will vary between user groups
- Several policy instruments influence the dynamics of the cod population: TAC (total allowable catch on each year-class per year), amount of bottom habitat occupied by marinas, and the number of predators (birds and mammals) which can be controlled by hunting.

In the following tables and figures you can view the different tables used in the ecosystem component in the model.

Input Tables	Content Table	Corresponding table in Part 1
CodDatas (1)	Default values on the cod	Table 1.1 and Table 1.5
	population	
EcosystemData (3)	Default values for different	
	input parameters	
0-GroupRecruitment (6)		
Indicators (31)	Values for the different	
	indicators (traffic lights)	
Output Tables		
PopulationHistory (2)	Numbers of cod in the	
	different year-classes	
WeigthHistory (8)	Lengths and weights of cod in	
	the different year-classes	
DyingHistory (10)	Cod dying in the different	
	year-classes	

Structure mode, 🗃 🖓 🖾 🛄 🛄



1.2 Social component

Several policy instruments influence the dynamics of the cod population: TAC (total allowable catch on each year-class per year), amount of bottom habitat occupied by marinas, and the number of predators (birds and mammals) which can be controlled by hunting. (The model reflects the 2008 situation without any regulations).

In the figure below are given the different tables used in the social component in the model. The input tables are given in the table below with corresponding tables in "Part 1- Description".

Input Tables	Content Table	Corresponding section in
		Part 1
Construction regulations (19)	Boat marinas construction	Section 2.5.2.1
	Sandy beaches construction	
Tourist Service Level (21)	Used to calculate	Section 4.2
	FisherTourist	
Landscape quality (23)	Landscape quality index	
Fishers Service Level (24)	Used to calculate	Section 4.2
	FisherTourist	



1.3 Economic component

The main aim of economic component is to estimate (net) local economic benefits from tourism in the Søndeledfjord area. This is set equal to Risør municipality in our case. The economic benefits/costs related to tourism that we consider come from 1) expenditures from tourists visiting the area (except 2nd home building and maintenance), and multiplicator effects of those expenditures, 2) the building and maintenance of 2nd homes + multiplicator effects, 3) changed income in commercial fishery due to changes in the coastal cod stock due to tourism (fishing + habitat changes), and 4) net local costs of coastal cod stock enhancement.

In the figure below are given the different tables used in the economic component in the model. The input and output tables are given in the table below with corresponding tables in "Part 1- Description".

Input Tables	Content Table	Corresponding table in Part 1
Touristfactors (17)	Contain default values of	Table 3.3
	parameters	
OtherParameter (27)	Contain default values of	Table 3.4
	parameters	
HumanHarvest (30)	Contain default values of	Table 1.3
	parameters	
CommersialFisheryData (31)	Contain default price for cod	Chapter 3.3
2ndHomeData (32)	Default economical	Chapter 3.2
	parameters	
Output Tables		
TouristHistory (16)	Number of tourist-days in the	
	different categories	
ExpenditureHistory (28)	Cost in the different	
	categories	
LocalBenefHistory (29)	Income from the different	
	categories	

3. Changing Input parameters

3.1 General

When running the model you can change the input values by selecting the four tables in the upper left corner of the front page of the model. These tables are the same as in the database described under section 1.



3.2 Environmental components (NC)

Input data for the ecosystem model

Four option					20			10		
Four option					Ecos	syster	m data	a		
					Cou	JEich	Data			
						JEISH	Data			
					B	irds o	data			
							data			
						ears (Jala			
Ecosystem data	Viev	ver "CodFi	ish[1]->E	cosystem	Data[3]" (L	ocal	Cod Re	gulation Model v	1.20.mox)	
Ecosystem uata							A CONTRACTOR OF			
	+ 200									
	Record #	DataName			Value	Unit		Short comment		
							_			
	1 2	Real time Availat High/Low habitat	ble habitat limit		0,65 5,00	km2 km2		This value changes during simul: See Chapter 4.3	ation (new constructions)	
	3	1-Group abundan	ice limit		99,00	fishes		To set recultment		
	4 5	Spawning low limi	uttiplier it		15315,00 50.00	Numbe	ant K er Age 2-10	See chapters 1.4 and 6.2 Chapter 1.7: minimum number o	f 2-10 aroups	
	6	Average G1 pop.			42889,00	fishes		Table 1.1; used to calculate 0-gn	oup mortality (canibalism	i)
	7	C factor for mort	tality tality		0,50	Numbe	er er	Non autopredation mortality mor autopredation mortality	tality	
	9	H factor for mort	tality		1,00	Numbe	er	Habitat factor lower means smal	ll fishes can hide better.	
	10	Total Area of Fior	rd ahitat		23,55	km2 km2		Total area used for density calcu this is initial value	ulations	
	12	Minimum 60			9317,00	fishes		Minimum recruitment possible		
				20 JP 1	T . TH	noneo	-	Maximum regratement possible		
Codfish data	Viev	wer "Codf	"ish[1]->	>CodData	s[1]" (2009	9-07-1	9GL. n	nox)		
	-		-							
	* *		€							
	Record #	₩ La 는 = Age	Ξ MeanLen	ngth StdDev	Surviva	l Rate	Initial	Density(fish/km2)	biomas(tons)	Density(tons/km
	Record #	F & 는 -	≕ MeanLen	ngth StdDev	Surviva	l Rate	Initial populatio	Density(fish/km2)	biomas(tons)	Density(tons/km 2)
	Record #	Age	MeanLen	2,10 3,00	Surviva 64,21% 65,00%	l Rate	Initial populatio 158306 42889	Density(fish/km2) n 6722 1821	6.304	Density(tons/km 2) 0.268
	+ 2 Record #	Age 0 1 2	MeanLen 9,63 23,80 36,90	2,10 3,00 3,30	Sunviva 64,21% 65,00% 85,00%	l Rate	Initial populatio 158306 42889 26014	Density(fish/km2) n 6722 1821 1105	6,304 12,019	Density(tonsAm 2) 0,208 0,510
	+ 2 Record #	Age 0 1 2 3 4	MeanLen 9,63 23,80 36,90 47,00 50	2,10 2,10 3,00 3,30 7,00 7,00	Surviva 64,21% 65,00% 85,00%	I Rate	Initial populatio 158306 42889 26014 8998	n 6722 1821 1105 382 392	6,304 12,019 9,115 2,009	Density(tons/km 2) 0,268 0,510 0,387 0,485
	Record #	Age 0 1 2 3 4 6	MeanLen 9,63 23,80 36,90 47,00 52,20 59,00	2,10 3,00 3,30 7,00 9,70	Surviva 64,21% 65,00% 85,00% 85,00% 90,00%	I Rate	Initial populatio 158306 42889 26014 8998 2819 1157	Density(fish/km2) 6722 1821 1105 382 120 49	6.304 12,019 9,115 3,880 2,291	Density(tonskm 2) 0,268 0,510 0,387 0,165 0,097
	Record #	Age 0 1 2 3 4 5 6	9,63 23,80 36,90 47,00 52,20 59,00 70,00	2,10 3,00 3,30 7,00 7,40 9,70 10,20	Sunriva 64,21% 65,00% 85,00% 85,00% 85,00% 90,00%	I Rate	Initial populatio 158306 42889 26014 8998 2819 1157 535	Density(fish/km2) 6722 1821 1105 382 120 49 23	6.304 6.304 12.019 9.115 3.890 2.291 1.783	Density(tons/km 2) 0,268 0,510 0,387 0,185 0,097 0,074
	Record #	Age 0 1 2 3 4 6 6 7 7	9,63 23,80 36,90 47,00 52,20 59,00 70,00 71,90 71,90	2,10 3,00 7,00 7,40 9,70 10,20 12,60	Surviva 64,21% 65,00% 85,00% 85,00% 90,00% 90,00% 90,00%	I Rate	Initial populatio 158306 42889 26014 8998 2819 1157 535 215 20	Density(fish/km2) 6722 1821 1106 382 120 49 23 6	6.304 12.019 9.115 3.800 2.291 1.753 0.762	Density(tonskm 2) 0,268 0,510 0,387 0,087 0,087 0,097 0,097 0,097 0,097
	Record #	Age 0 1 2 3 4 6 6 7 8 9	9,63 23,80 35,90 47,00 52,20 59,00 70,00 71,90 71,90 82,00	2,10 3,00 3,30 7,00 7,40 9,70 10,20 12,60 10,60 10,00	Surviva 64,21% 85,00% 85,00% 85,00% 85,00% 80,00% 90,00% 90,00% 90,00% 90,00%	I Rate	Initial populatio 158306 42889 26014 8998 2819 2819 2819 2819 2157 535 215 98 40	Density(fishkm2) n 7722 1821 1106 382 120 40 23 9 4 4 9 4 4 23 9 4 4 23 9 4	biomas(tons) 6,304 12,019 9,115 3,890 2,291 1,763 0,762 0,464 0,209	Density(tonskm 2) 0,208 0,610 0,387 0,165 0,097 0,074 0,097 0,074 0,092 0,002 0,009
	Record # 1 2 3 4 5 6 7 8 9 10 11	Age 0 1 2 3 4 5 6 7 8 9 10	9,63 23,80 35,90 47,00 52,20 59,00 70,00 71,90 71,90 82,00 85,00	2,10 3,00 3,30 7,40 9,70 10,20 12,60 10,00 10,00	Surviva 64,21% 85,00% 85,00% 80,00% 90,00% 90,00% 90,00% 90,00% 100,00%	I Rate	Initial populatio 158306 42889 20014 8998 2819 1157 535 215 535 215 98 40 27	Density(fish/km2) n 6722 180 180 180 180 182 120 40 23 9 4 23 9 4 2 2 9 4 2 1	biomas(tons) 6.304 12,019 9,115 3,890 2,291 1,763 0,762 0,762 0,464 0,209 0,167	Density(tonskm 2) 0.268 0.510 0.387 0.485 0.485 0.485 0.407 0.402 0.407 0.402 0.402 0.409 0.409
Birds data	Record #	Age 0 1 2 3 4 5 6 7 8 9 10 wer "CodF	MeanLen 9,63 23,80 35,90 47,00 62,20 69,00 70,00 71,90 71,90 73,30 85,00 (ish[1]->	ngth StdDev 2,10 3,00 7,40 7,40 10,20 10,20 10,00 10,00 Birds[7]"	Surviva 64,21% 65,00% 85,00% 85,00% 80,00% 90,00% 90,00% 90,00% 100,00% (Local Coo	l Rate	Initial populatio 158306 42889 20014 8998 2819 1157 636 215 98 40 27 ulation	Density(tish/em2) n 6722 1821 1105 182 120 42 23 24 4 2 2 1 Model v 1.20, mo:	biomas(fons) 6.304 12.019 9.115 3.880 2.281 1.763 0.762 0.762 0.762 0.167 x)	Density(tonskm 2) 0.288 0.510 0.387 0.0165 0.047 0.022 0.024 0.022 0.009 0.007
Birds data	Record #	Age 0 1 2 3 4 6 6 7 8 9 10 wer "CodF	9,63 23,80 36,90 47,00 52,20 59,00 70,00 70,00 82,00 86,00 86,00 (ish[1]->	stdDev 2,10 3,00 7,40 9,70 10,20 12,60 10,60 10,00 Birds[7]"	Surviva 64,21% 66,00% 86,00% 86,00% 90,00% 90,00% 90,00% 100,00% 0,00% (Local Coo	l Rate	Initial populatio 158306 42889 28014 8998 2819 1157 535 215 535 215 98 40 27 ulation	Density(fish/em2) 6722 1821 1005 120 42 23 9 4 2 1 Model v 1.20, mot	biomas(tons) 6,304 12,019 9,115 3,880 2,281 1,783 0,762 0,464 0,209 0,157 X	Density(tonskm 2) 0,208 0,510 0,387 0,055 0,047 0,074 0,052 0,052 0,052 0,052 0,057
Birds data	Record # Record # 1 2 3 4 5 6 7 8 9 10 11 Viev	Age 0 1 2 3 4 5 0 7 8 9 10 wer "CodF	■ MeanLen 9,63 23,80 35,90 47,00 52,20 59,00 70,90 70,90 70,90 70,90 79,30 85,00 *5,00 *5,00 *5,00 *5,00 *5,00 *5,00 *5,00 *7,00 *7,00 *7,00 *7,00 *5,00 *5,00 *7,00 *7,00 *7,00 *7,00 *5,00 *5,00 *7,00 *7,00 *7,00 *5,00 *5,00 *5,00 *5,00 *7,00 *5,000 *5,000	2,10 3,00 3,30 7,40 9,70 12,80 10,80 10,80 10,00 Birds[7]"	Surviva 64,21% 66,00% 85,00% 85,00% 90,00	l Rate	Initial populatio 158306 42889 28014 8998 2819 1157 535 215 535 215 98 40 27 Ulation	Density(fish/km2) 0722 1821 1105 382 120 49 23 9 4 2 1 Model v 1.20,mov	biomas(tons) 6,304 12,010 9,115 3,800 2,201 1,753 0,762 0,464 0,209 0,157 X)	Density(tonskm 2) 0,208 0,510 0,387 0,165 0,047 0,047 0,020 0,020 0,009 0,009 0,009
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Birds data	Image: Provide with the second # 1 2 3 4 5 6 7 8 9 10 11 Image: Provide with the second # 1 2 3 4 5 6 6 7	Age 0 1 2 2 3 4 6 0 7 8 9 1 1 1 2 2 1 1 1 2 2 1 1 1 1 1 1 1 1 1	MeanLen MeanLen 9,63 23,80 36,90 47,00 52,20 59,00 70,00 71,90 82,00 85,00 ish[1] -> ption ption ption ption ption	StdDev 2,10 3,00 3,00 3,00 7,00 10,20 10,00 10,00 10,00 10,00 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40	Suniva 64,21 % 66,00 % <th< th=""><th>l Rate</th><th>Initial populatio 158306 42899 20014 8998 22819 1157 635 635 215 98 40 27 Listion Con Con Stra</th><th>n Density(tish/em2) 6722 1821 1825 1825 1826 1827 192 192 193 193 193 193 193 193 193 193</th><th>biomas(tons) 0.304 12.019 0.109 2.201 1.763 0.464 0.209 0.157 X)</th><th>Density(tonskm 2) 0.260 0.570 0.175 0.077 0.074 0.020 0.000 0.000 FishesEatenper bird 36.69 220.63 220.61 0.00</th></th<>	l Rate	Initial populatio 158306 42899 20014 8998 22819 1157 635 635 215 98 40 27 Listion Con Con Stra	n Density(tish/em2) 6722 1821 1825 1825 1826 1827 192 192 193 193 193 193 193 193 193 193	biomas(tons) 0.304 12.019 0.109 2.201 1.763 0.464 0.209 0.157 X)	Density(tonskm 2) 0.260 0.570 0.175 0.077 0.074 0.020 0.000 0.000 FishesEatenper bird 36.69 220.63 220.61 0.00
Birds data	Record # Record #	Age	MeanLen 9,63 23,80 36,00 47,00 70,00 71,00 71,00 71,00 85,00 85,00 85,00 85,00 11]->	StdDev 2,10 3,00 3,00 7,00 7,00 6,70 10,20 10,20 10,20 10,20 10,20 10,20 Birds[7]" Value 0,000e+00 0,000e+00 1,000e-11 6,000e+21 1,000e-12 0,000e+00 0,000e+00 0,000e+00	Sunriva 64,21 % 65,00 % 65,00 % 66,00 % 60,00 % 60,000	l Rate	Initial populatio 158306 42889 20014 8998 2319 1157 535 215 98 40 27 Ulation Con Num	Density(fish/em2) 6722 1821 1105 382 120 4 23 9 4 21 110	biomas(tons) 6,304 12,019 9,115 3,840 2,201 1,753 0,762 0,209 0,157 X) fishes than seals 1	Density(tonskm 2) 0,206 0,510 0,387 0,165 0,097 0,012 0,020 0,020 0,000000
Birds data	Record #	Age 0 0 1 1 2 2 3 4 6 7 8 9 10 Ver "Coolf" Pata	MeanLen MeanLen 9,63 23,80 35,90 47,00 52,20 59,00 70,00 71,90 82,00 85,00 ish[1]->	Ingth StdDev 2,10 3,00 3,00 3,00 7,40 7,40 7,40 7,40 10,20 10,20 10,00 10,00 10,00 10,00 10,000 10,00 0,0000+400 0,0000+400 0,0000+400 0,0000+400 0,0000+400 0,0000+400 0,0000+400 0,0000+400 0,0000+400 0,0000+400 0,0000+400 0,0000+400	Surviva 64,21 % 65,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 60,00 % <t< th=""><th>l Rate</th><th>Initial populatio 158306 42890 220014 2000</th><th>n Density(tistMem2) 6722 1821 1821 192 120 40 23 0 4 2 1 Model v 1.20.mo: mment ment ment birds ange that cornorans eat bigger t</th><th>biomag(tons) 0.004 12.010 0.115 2.300 2.300 0.762 0.762 0.464 0.209 0.157 X)</th><th>Density(tonskm 2) 0.860 0.810 0.850 0.965 0.965 0.074 0.020 0.020 0.000 0.000 FishesEatenper bird 36.69 226.83 200 200 200 200 200 200 200 200 200 20</th></t<>	l Rate	Initial populatio 158306 42890 220014 2000	n Density(tistMem2) 6722 1821 1821 192 120 40 23 0 4 2 1 Model v 1.20.mo: mment ment ment birds ange that cornorans eat bigger t	biomag(tons) 0.004 12.010 0.115 2.300 2.300 0.762 0.762 0.464 0.209 0.157 X)	Density(tonskm 2) 0.860 0.810 0.850 0.965 0.965 0.074 0.020 0.020 0.000 0.000 FishesEatenper bird 36.69 226.83 200 200 200 200 200 200 200 200 200 20
Birds data	Record # Record # 1 2 3 4 5 7 7 8 9 10 Record # 1 2 3 4 5 6 7 8 9 10 1	Age 0 1 2 3 4 6 0 1 2 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0	MeanLen 9,63 23,80 35,00 47,00 52,20 50,00 71,00	StdDev 2,10 3,00 3,00 7,00 7,00 7,00 9,70 10,20 12,20,91 12,20,91 10,00 10,00 0,000e+00 1,000e+01 1,000e+00 1,000e+01 1,000e+00 1,000e+01 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00 0,000e+00	Sunriva 64,21 % 65,00 % 65,00 % 65,00 % 66,00 % 60,00 % <td< th=""><th>I Rate</th><th>Initial populatio 158306 42889 28014 8998 2819 1157 535 535 535 2819 1157 535 215 98 40 27 Col Col Num</th><th>n Density(tish/em2) 0722 1821 1105 120 4 23 9 4 2 1 Model v 1. 20, mo mment nber of birds ange that cormorans eat bigger t</th><th>biom.as(tons) 6,304 12,010 0,115 3,800 2,201 1,701 0,702 0,167 0,200 0,167 x) fishes than seals !</th><th>Density(tonskm 2) 0,206 0,010 0,387 0,165 0,047 0,047 0,002 0,000 0,000 FishesEatenper bird 36,69 220,83 220,83 220,83 220,83 220,83 0,00 0,00 0,00 0,00 0,00 0,00 0,00</th></td<>	I Rate	Initial populatio 158306 42889 28014 8998 2819 1157 535 535 535 2819 1157 535 215 98 40 27 Col Col Num	n Density(tish/em2) 0722 1821 1105 120 4 23 9 4 2 1 Model v 1. 20, mo mment nber of birds ange that cormorans eat bigger t	biom.as(tons) 6,304 12,010 0,115 3,800 2,201 1,701 0,702 0,167 0,200 0,167 x) fishes than seals !	Density(tonskm 2) 0,206 0,010 0,387 0,165 0,047 0,047 0,002 0,000 0,000 FishesEatenper bird 36,69 220,83 220,83 220,83 220,83 220,83 0,00 0,00 0,00 0,00 0,00 0,00 0,00
Birds data	Record # 1 2 3 4 5 6 7 8 9 10 11 2 3 4 5 6 1 12 12 12 12 12 12 12 12	Age 0 1 2 2 4 6 0 7 8 9 1 1 2 2 4 6 0 7 8 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	MeanLen 9,63 23,80 37,00 52,20 59,00 71,90 71,90 71,90 71,20	Ingth StdDev 2,10 3,00 3,00 3,00 7,40 7,40 7,40 7,40 10,20 10,20 10,00 10,00 10,00 10,00 9,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40 0,0000+40	Surviva 64,21 % 65,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 66,00 % 60,00 % <t< th=""><th>I Rate</th><th>Initial populatio 26014 26014 26014 26014 2615 2715 272 272 27 27 27 27 27 27 27 27 27 27 2</th><th>n Density(tistMem2) 6722 1821 182 182 192 49 9 4 2 1 Model v 1.20.mo: mment mment mber of birds</th><th>biomag(tons) 0.304 12.010 9.380 2.291 1.753 0.762 0.464 0.209 0.167 x) fishes than seals I</th><th>Density(tonskm 2) 0.2610 0.3610 0.3610 0.367 0.074 0.022 0.024 0.020 0.020 0.007 FishesEatenper bird 30.69 220.83 200.000</th></t<>	I Rate	Initial populatio 26014 26014 26014 26014 2615 2715 272 272 27 27 27 27 27 27 27 27 27 27 2	n Density(tistMem2) 6722 1821 182 182 192 49 9 4 2 1 Model v 1.20.mo: mment mment mber of birds	biomag(tons) 0.304 12.010 9.380 2.291 1.753 0.762 0.464 0.209 0.167 x) fishes than seals I	Density(tonskm 2) 0.2610 0.3610 0.3610 0.367 0.074 0.022 0.024 0.020 0.020 0.007 FishesEatenper bird 30.69 220.83 200.000

Version 1.20

eals data		wer "CodFish[1]	->Seals[9]	" (Local Cod Regu	lation Model v 1.20.mox)	
	que des Record #	Data	Value	Unit	Comment	FishesEatenper Seal
	1	Initial population	0,0000e+00	seals	Number of seals	
	2	Population	0,0000e+00	seals	Number of seals (delta)	
	3	0-group consumption	1,0900e-01	fish/seal/year/density		249,95
	4	1-group consumption	4,0100e-01	fish/seal/year/density		568,48
	5	2-group consumption	0,0000e+00	fish/seal/year/density		0,00
	6	3-group consumption	0,0000e+00	fish/seal/year/density		0,00
	7	4-group consumption	0,0000e+00	fish/seal/year/density		0,00
	8	5-group consumption	0,0000e+00	fish/seal/year/density		0,00
	9	6-group consumption	0,0000e+00	fish/seal/year/density		0,00
	10	7-group consumption	0,0000e+00	fish/seal/year/density		0,00
	11	8-group consumption	0,0000e+00	fish/seal/year/density		0,00
	12	9-group consumption	0,0000e+00	fish/seal/year/density		0,00
	13	10-group consumption	0.0000e+00	fish/seal/vear/density		0.00

3.3 Social component (SC)

Two option			1000	223	(a)				
ine option			6 66	11 See	rielCome -	21			
				22] 200	ciercomp -				
	Est Salvas								
				Eernsher	S				
			10000	101	1.1.1				
			IN 6	etfishing	data				
			-						
			Liele	1					
			Helb						
				OIEN					
Eal fichars	/ Viev	ver "CodFish[1]-	>EelFisher	s[11]" (Local)	Cod Regulation Model v	1.20 mox)			
Let fishers									
	#	原 🛦 🗠 🛎							
	Popped #	ID at a) (aluo	Unit	Commont	Firber Ester Per			
	11000101	0.00	varac.	om	oomment	Fisher			
	1	Initial Eal fishers	3.0000e+00	fishers	Number of fishers				
	2	Delta	0,0000e+00	fishers	Number of fishers				
	3	0-group consumption	3,7200e-01	density multiplyier		853,06			
	5	2-group consumption	6 3300e-01	density multiphyler		2202.20			
	6	3-group consumption	0.0000e+00	density multiphyler		0.00			
	7	4-group consumption	0.0000e+00	density multiplyier		0.00			
	8	5-group consumption	0,0000e+00	density multiplyier		0,00			
	9	6-group consumption	0,0000e+00	density multiplyier		0,00			
	10	7-group consumption	0,0000e+00	density multiplyier		0,00			
	11	8-group consumption	0,0000e+00	density multiplyier		0,00			
	12	9-group consumption	0,0000e+00	density multiplyier		0,00			
	13	10-group consumption	0,0000e+00	density multiplyier		0,00			
Not fishing data	📕 Vi	ewer "CodFish[1]->NetFi	ishing[15]" (L	ocal Cod Regulation M	iodel v 1.20.mox)			
Net fishing uata	EXCLUSION								
		周国と王王							
	The second second			100000					
	Record	# Data	Value	Unit	Comment	Catch(tons)			
	1	Initial Fleet	3,0000e+	-00 Boats	Commercial fleet				
	2	DeltaFleet	0,0000e+	-00 Boats	Commercial fleet				
	3	Days at sea	1,7000e+	-01 days	Commercial fleet				
	4	D-group consumption	0,0000e+	-00 fish/year		0,00			
	5	1-group consumption	0,0000e+	-00 fish/year		0,00			
	6	2-group consumption	2,7859e+	-04 fish/year		13,07			
	7	3-group consumption	1,226De+	-03 fish/year		1,34			
	8	4-group consumption	1,5677e+	-03 fish/year		2,30			
	9	5-group consumption	3,5176e+	-03 fish/year		7,50			
	10	6-group consumption	1,6796e+	-02 fish/year		0,59			
	11	7-group consumption	2,0706e+	-02 fish/year		0,80			
	12	8-group consumption	1,6116e+	02 fish/year		0,83			
	13	9-group consumption	4,4200e+	00 fish/year		0.02			
	14	10-group consumption	6.8000e+	00 fish/vear		0.04			
	100000	1 . a		No. of the second se		(535)			

In addition the fishing effort, coefficients in the Schaffer model and minimum fish size (represented by minimum year-class) (Table 1.3 in the document "Part 1: ExtendSim Model description") can be changed Extend input table "HumanHavest (30)".

Viewer "CodFish[1]->HumanHarvest[30]" (2009-06-11GL.mox)

- ·	原国日本									
ecord #	Category	Effort Indicator	Percent Effort (FE)	Unit	Catchability Coef (q)	FE×q	Min year class (x-10)	Harvests on (tons)	Fishing potential	Harvest (tons)
	Hotel tourist	tourist days	0%	days	0,000e+00	0,000e+00	0	103,564	32820	0,000
	Camping tourist	tourist days	2%	days	1,000e-05	2,000e-07	1	102,956	33566	0,691
	2nd Home owners	tourist days	3%	days	1,330e-05	3,990e-07	0	103,564	115563	4,775
	2nd Home renters	tourist days	3%	days	1,330e-05	3,990e-07	0	103,564	100188	4,140
	Fishing tourists	tourist days	75%	days	1,670e-05	1,252e-05	2	101,758	2588	3,298
	Commercial fishers	vessel davs at sea	100 %	davs	6.667e-03	6.667e-03	2	101,758	51	34,598

Table 1.3 in the document "Part 1: ExtendSim Model description".

Category	El - Effort Indicator	FE - Fishing effort as proportion of	Fishing effort unit	q - Catchability coefficient	Catch per unit effort indicator, per cod stock		Example El value	"Normal" cod stock	Example harvest
		EI			unit (= FE * q)	Year-classes		biomass	tonnes
						harvested on		(tonnes)	biomass
								30	
Hotel tourists	Tourist days	0	days	х	x	x	32 000		0,00
Camping tourists*	Tourist days	2 %	days	1,00E-05	0,000002	1-10	35 000		0,21
2nd home owners	Tourist days	3 %	days	1,33E-05	0,0000004	0-10	115 000		1,38
2nd home renters*	Tourist days	3 %	days	1,33E-05	0,0000004	0-10	100 000		1,20
Fishing tourists**	Tourist days	75 %	days	1,67E-05	0,0000125	2-10	4 000		1,50
Recreational fishers	Active days	75 %	days	1,67E-05	0,0000125	2-10	4 000		1,50
Commercial fishers***	vessel days	100 %	vessel davs	0.006666667	0.006666667	2-10	50		10.00
Commercial honers	ai 36a	100 /0	vesser days	0,00000007	0,00000001	2-10	50		10,00
							Sum harvest tonnes		15,79
* Not counting Fishing	tourists, even	though they ma	y be staying at t	his type of accom	odation				
** Each boat with fishing	ng tourist catc	hes 1,5 kg cod	per day, and ha	ve ca 3 tourists pe	r boat on average	(Volstad 2009, p	orelim result	s survey)	
*** Commercial fisherr	nen catch abo	ut 10 tonnes co	d per year in the	e Søndeledfjord sy	stem. We assume	with 50 vessel of	ays.		

3.4 Economic component (EC)

Three option		1 1769	221 8	Comp				
	Tourist Factors							
	Cod price							
	Coa price							
	Economy comp.							
Tourist Factors	Views	er "CodFish[1]->TouristFactor	rs[17]" (Local Cod	Regulation Model v 1, 20. mox)				
	Record #	actor		InitiatiValue Value Hotel 2nd home Fishing founds 2nd home Camping				
	1 80 2 8 3 4 5	stal number of tourist-day (t-d) loat faolities in town center (hoat places)* areal of conflict eith locale (result of an equation)* tandard on tourist related services (1-10)		2.62+46 1.15+46 -1.62+52 -5.05+22 -5.05+22 -1.05+54 -1.60+43 -1.00+42 0.05+64 0.50+64 0.50+64 0.50+64 0.50+64 0.50+64 0.50+64 0.50+64 0.05+64 0.5,65+64 0.5,65+63 2.5,65+63 2.5,65+63 2.5,65+63 2.5,65+63 5,65+64 0.5,65+64 0.5,65+64 0.50+64 0.5,65+65+64 0.5,65+64 0.5,65+64 0.5,65+64 0.5,65+64 0.5,65+64 0.5,65+64 0.5,65+65+64				
	6 A 6 A 7 H 8 C	Ind homes for rest (+beds) lecomodation capacity for fishing tourists (Heds for local capacity (beds)" Camping capacity (beds)"	initial + value = stars × beds)	0,000+e0 0,0				
	9 L 10 R 11 m 12 R	andscape quality index (1-10) legulation on second home construction (1-10) egulation on boat marine construction (1-10) legulation on sandy beaches construction (1-10)		8,00=40 8,00=40 5,00=40 5,00=40 7,50=40 4,00=40 4,00=40 2,00=40 5,00=40 5,00=40 0,00=4				
	13 0 14 F 15 T	tate er coastal cod stork (xg) legulation on tourist fishing (1-10) movel cost index - fuel prices ioneixy's relative cost level - exchange rate NOK per	r Baro	7,200-07 7,200-07 7,200-07 7,200-07 7,200-07 7,200-07 7,200-07 20,				
	18 T 19 T 20 0	Winkering expenditure tourism to Number of persons per day to Number of Days hally average expenditure (NOK)		0.00e+60 0.0				
	22 22 23 Y	isond brance (x5) isony brance (x5) isony proth in SDP in Nonay (%) (/4)	a)	0,004-00 3,044-01 (,0048-0 0,042-0 0,042-0 0,042-0 0,042-0 1,0428-0 0,042-0,042-0,040-0,000-0,000-0,000-0,000-0,000-0,000-0,000-0,000-0,000-				
Cod price		AND STORE AND	ine an ine with the					
cou price	Vie	wer "CodFish	[1]->Cor	nmercialFisheryData[33]" (Local Cod				
	# 	厕 🖬 는 😑						
	Record #	Name Va	ilue	Unit				
	1	Cod Price 16,	,00	NOK/ kg				
Economy Comp	Viev	wer "CodFish[1]	->OtherP	arameters[27]" (2009-07-19GL.mox)				
	₽ 22	應 La. 는 王						
	Record #	Parmeter	Value	Comment				
	1	Beta54 Beta9ccs	0,02000	Dybedal 2006 assumes 5% of 2nd homes are rented out, in 50 days per year, Pure questimate. Each toppe of coastal cod increases index by 0.1 point				
	3	Beta9birds	0,02000	Pure guessimate. Each comorant increases index by 0.02 point				
	4 5	Beta 9seals Beta950	-0,00400	Pure guesstimate. Each comorant increases index by 0.02 point Pure guesstimate. Each 50 new 2nd homes (above 1500) decrease index by 0				
	6	Beta991	-0,00100	Pure guesstimate. Each 50 boat places decrease index by 0.05 point				
	7	Beta992 Beta3	-0,00100 5000.00000	Pure guesstimate. Each 50 m2 of constructed sandy beaches decrease index To calculate conflict indicator				
	9	Neutral Fishing tourist	45000,00000	Could be actual number of tourist.days of tourist fishers				
	10	Beta50	0,00833	see section 3.2 version 1.00 2nd home extraors. Data (calculated)				
	12	bk	3,68000	For GDP influence, see page 33				
	13	Municipality inhabitants	6938,00000	inhabitants				
	14	fishing days per habitant	1,00000	days per year used in equation 3-10				
	16	e (-deltat)	0,05000	used in equation 3.15				

3.5 Indicators

Viewer "CodFish[1]->Indicators[31]" (Local Cod Regulation Model v 1.20.mox)									
Record #	Indicator	Value	Unit	GreenLimit	RedLimit	Max			
1	Cod biomass (2-10 group)	3,24e+00	tons / km2	1,00e+00	6,00e-01	3,00e+00			
2	0 group density	1,29e+03	fishes / km 2	4,00e+03	1,00e+03	3,00e+04			
3	1 group density	5,57e+02	fishes / km 2	1,50e+03	5,00e+02	5,00e+03			
4	Demographic index	1,83e-01	1G D / 2-10D	1,00e+00	5,00e-01	2,00e+00			
5	Level of conflict (equ.3.1)	9,54e+00	Index	1,00e+00	5,00e+00	1,00e+01			
6	Commercial cod fishing		tons / year	1,00e+01	7,00e+00	2,00e+01			
7	Local economic benefits	6,23e+07	NOK	5,00e+08	2,00e+08	1,00e+09			
8	Number of tourist days	3,26e+02	Persons/day	1,00e+03	2,00e+02	5,00e+03			

4 Regulations and Scenarios

Three options	Regulations
	Tourist fisher accomodations
	MPA Habitat
	MPA Cod
Tourist fisher accommodation The standard is indicated by number of stars (1-5 – worst to	[428] ServiceLevel <codfish> [X] One Star (20% capacity utilization)</codfish>
best), according to NHO's (The Confederation of Norwegian Enterprises) classification system for fishing tourism	C Two Stars (40%) Three Stars (60%) Four Stars (80%)
that beds in premises with 5 stars are utilized 100% for the 180	(Five Starts (100%) 200 beds
day season. I star gives only 20% capacity utilization (36 days).	Comments 17 3 6
Number of dedicated beds for tourist fishers can be changed.	
MPA habitat	Viewer "CodFish[1]->Construction regulations[19]" (Local Co
Option 1: Non	
Option 2: No new sandy beaches	
Option 3: No new sandy beaches and marinas over depths less	
than 25 m	
MPA cod	d [502] MPACod ≺CodFish>
Option 1: Non	No regulation (default) No fishing during spawning period with nets and trawl Cancel
Option 2: No fishing during spawning period (3 months) with nets	 No fishing during spawning period with any fishing gear No fishing of cod through the whole year with nets and trawl No fishing of cod through the whole year with any fishing gear
Option 3 : No fishing during spawning period (3 months) with nets and hooks	
Option 4: No fishing of cod through the whole year with nets and trawl	
Option 5 : No fishing of cod through the whole year with nets, trawl and hooks	

Eel-fishers



2nd homes

The present numbers of 2^{nd} homes in the study area is 1523. Over the next years it might expand to nearly 2000. The effect of each 2^{nd} home is that the available 0-group cod habitat is reduced with $50m^2$.

Recreational fishers



Camping tourists

The numbers of camping tourists are dependent on parameters given in the economical component.	Touristday76094
	catch(tons): 0,3

Tourist fishers

The present numbers of tourist fishers are dependent on the number of beds available and quality of the facilities	celta con co uelta con co min size 35 fishes/year :0
---	---

Commercial fishers





0-group and 1-group cod can be produced artificially for release. This option gives the possibility to produce and release both year- classes.		D- 1- fist	group/year :0 group/year :0	
Double click on the picture and double click on "stock enhancement" bottom		Stock I	0] Enhance Enhancement	ni
You are now able to change the number of 0- and 1-group cod and the production cost for these	Viev T	wer "Codi R L 는	Fish[1]->Sto = Enhancement	ckEnhancen
	1 2	D-group 1-group	0,0000e+00 0,0000e+00	8,00 12,00

5. Output and export of data

5.1 General



In addition the model shows the changes in fisheries and a set of indicators as the model progress.



5.2 Environmental (Cod population)

This table gives the number of cod by age-groups over a 1-50 years period.

t III		*									
Record #	0-Group	1-Group	2-Group	3-Group	4 Group	5-Group	6-Group	7-Group	8-Group	9-Group	10-Group
1	725062	48155	29211	10105	3162	1302	602	743	108	45	27
,	255194	16241	29211	10104	3166	1298	603	241	110	45	31
3	108692	20127	9852	10104	3166	1300	601	242	110	46	30
4	83526	7354	12209	3408	3166	1299	601	241	110	45	31
5	88294	9353	4461	4223	1068	1299	601	241	109	45	31
3	49105	9138	5674	1543	1323	438	601	241	110	45	31
7	339388	5125	5543	1963	483	543	203	241	110	45	31
3	79846	41498	3109	1917	615	198	251	81	110	45	31
)	506361	2326	26173	1075	601	252	92	101	37	45	31
10	4290	69143	1411	8707	337	247	117	37	46	15	31
11	50842	42	41942	488	2728	138	114	47	17	19	10
12	93673	7597	26	14508	163	1120	64	46	21	7	13
13	311038	10390	4608	9	4545	63	518	26	21	9	5
14	207888	30900	6302	1594	3	1866	29	208	12	9	6
15	1006864	9197	18744	2180	499	1	864	12	94	5	6
16	401153	104847	5579	6484	683	205	1	346	5	39	3
17	239692	960	63600	1930	2031	280	95	0	167	2	26
18	46353	34540	583	21999	605	834	130	38	0	65	1
19	44975	1776	20952	202	6892	248	386	52	17	0	44
20	5573	6276	1078	7247	63	2829	115	155	24	7	0
21	57505	651	3807	373	2271	26	1309	46	70	10	5
22											
23											
24											
25											

This table gives the weight of the cod by age-groups over a 1-50 years period.

		2012					
Record #	0-Group	1-Group	2-Group	3-Group	4 Group	5-Group	6-Group
1	62419	49871	39871	17974	6824	3570	2302
2	21969	16803	39854	17974	6836	3582	2275
3	9357	20873	13452	17947	6829	3594	2231
4	7191	7632	16690	6027	6868	3550	2289
5	7601	9751	6080	7492	2299	3576	2234
6	4227	9488	7735	2731	2834	1211	2263
7	29217	5292	7583	3488	1041	1472	758
8	6874	43009	4267	3399	1306	533	953
9	43591	2382	34309	1874	1294	677	352
10	369	71736	1927	15492	741	690	419
11	4377	44	57280	863	5853	371	447
12	8064	7838	34	25763	329	3091	239
13	26776	10749	6282	12	9849	167	1923
14	17897	32060	8594	2813	5	5115	106
15	86678	9552	25543	3847	1080	3	3242
16	34534	108674	7658	11443	1470	571	0
17	20634	988	86765	3423	4413	763	351
18	3990	35738	793	39047	1296	2263	497
19	3872	1858	28604	354	14837	673	1460
20	480	6537	1471	12875	135	7704	430
21	0	D	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	D	0	0
28	0	0	0	0	0	0	0
29	0	0	D	0	D	0	0
30	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0
34	0	0	0	D	0	0	0
35	0	0	0	0	0	0	0
36	0	0	0	D	0	0	0
37	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0
39	0	0	0	0	D	D	0
40	U	0	0	0	0	0	0

By choosing results the below figure will appear. The figure shows the average number (solid blue) and weight (solid red) of cod + the same values from the last run as stippled

In addition the values for:

- Density 0-1-gr (number km⁻²)
- Biomass (2-10 yrs) (ton km⁻²)
- Commercial fishing (2-10 yrs) (ton km⁻²)
- Conflict Factor
- Local income

are given below and present output values from the model.



5.3 Economic

The results from the economic run will be displayed and exported similar to the ecosystem data (Not available yet)

This table gives the number of person pr day (T_0) over a time period (1-50 years) selected. The same Table as TouristHistory in Databases. Corresponds to Table 3.3 and 3.5.

Record #	Second home howners	Fishing tourists	Second gome renters	Staying at hotel	Camping	Total
1	12500	45000	9000	4500	6000	77000
2	10969	43452	7464	2969	4469	69323
3	11123	228267	192279	187784	4623	624075
4	27	143663	107675	103180	0	354546
5	5418	114057	78069	73574	0	271117
6	7087	91683	55695	51200	587	206250
7	8384	81765	45777	41282	1884	179092
3	8927	73741	37753	33258	2427	156106
9	9387	92580	56592	52097	2887	213543
10	8238	102293	66305	61810	1738	240386
11	7701	125617	89629	85134	1201	309283
12	6323	130767	94779	90284	0	322153
13	6066	108187	72199	67704	0	254156
14	7426	85624	49636	45141	926	188753
15	8734	97223	61235	56740	2234	226166
6	7986	108036	72048	67553	1486	257110
7	7367	170311	134323	129828	867	442695
8	3655	201999	166011	161516	0	53318D
19	1845	152583	116595	112100	D	383125
20	4847	121434	85446	80951	0	292678
21	6655	91330	55342	50847	166	204329
22	D	D	D	D	0	0
23	0	0	0	0	0	0
24	D	U	D	U	U	0
25	D	D	D	D	D	D
26	lu lu	U	U	U	U	U
u	U	U	U	U	U	U
28	D	0	0	0	0	0
29	lu lu	U	U	U	U	U
30	U	U	U	U	U	0
31	U	U	U	U	U	U
32	U U	U	U	U	U	U

This table gives the income over 1-50 years period.

셈 Vie	Viewer "CodFish[1]->LocalBenefHistory 1[29]" (2009-07-19GL.mox)									
ANNA. MANN										
the star										
Record #	Second home howners	Fishing tourists	Second gome renters	Staying at hotel	Camping	L6	L7	com. Fishery	Stock Enhancement	Total
li.	18044775	0	4503600	0	26345088	0,00	7505568,00	144040	0	56543071
	20766988	910383	15431909	150936	29700397	0,00	7505568,00	215985	D	74682166
	20564956	945710	15421938	261671	31909641	26073052,97	7593242,22	185934	0	102956144
	19842278	472074	15335644	0	27305923	0,00	7593696,00	123306	D	70672922
	20602044	930612	15444003	250070	31171752	0,00	7593696,00	239100	0	76231277
	20539840	926993	15372461	199271	32040068	7276946,42	7618165,73	65024	D	84038770
	20298741	833572	15535469	329295	30492021	0,00	7618176,00	327483	0	75434757
	20546359	929668	15398611	225624	31862354	0,00	7618176,00	177175	0	76757968
	20532363	914674	15334271	149349	32105134	2371656,82	7626151,02	120657	0	79154255
)	20451039	842456	15274514	30123	31545931	0,00	7627968,00	56497	0	75828527
1	20546191	901686	15297213	91704	32002231	0,00	7627968,00	70552	0	76537545
2	20536878	923560	15356633	180651	32101997	911353,89	7631032,55	25932	0	77668037
)	20502979	982669	15586488	491570	31926010	0,00	7632864,00	392386	0	77514966
4	20517516	911789	15336534	153443	32128035	0,00	7632864,00	130445	0	76810627
5	20531618	892023	15267383	55927	32111779	139234,82	7633332,20	38174	0	76669471
3	20532295	902137	15302135	102257	32070855	135065,83	7638214,18	67317	0	76750276
7	20530753	908807	15322788	131355	32073932	6485,53	7642677,81	99948	0	76716746
3	20533285	902394	15297154	97374	32105913	0,00	7647552,00	79459	0	76663131
)	20534368	894358	15272628	62953	32104884	24253,28	7647633,55	59704	0	76600782
)	0	0	0	0	D	0,00	0,00	0	0	0
1	0	0	0	0	0	0,00	0,00	0	0	0
2	0	0	0	0	D	0,00	0,00	0	0	0
3	0	0	0	0	0	0,00	0,00	0	0	0
ε.	120	12	1 20	100	10	CONTRACTOR C	1 1 2 1 2 1	1.10	20	6.

5.4 Export of data to MS Excel

The data from each run are automatically saved in a Excel spreadsheet named (Exportresults.xls)



ExportedData.xls Microsoft Office Excel 97-2003 Work... 462 KB

Remember to save the excel file with a new name if you like to keep the data.

The following data are exported and listed in the following order:

- Number and weight of each year-class (0-10) of cod
- 2nd Home owners
- Commercial fishing
- Density 0-gr (number km⁻²)
- 2nd Home renters
- Hotel
- Camping
- Density 1-gr (number km⁻²)
- Density (2-10 yrs) (number km⁻²)
- Biomass (2-10 yrs) (ton km⁻²)
- Cod demographic index: E1 = N1/ N(2-10); N1 = Density 1-gr, N(2-10) = Density (2-10 yrs)
- Conflict Factor
- Number of 2nd homes (absolute numbers, and total number allowed (R50).

One row in the excel sheet represents one simulation (1-50 years; columns) and there is room for up to 100 simulations (row 3 to row 102). Between row 104 and row 111 are the calculated minimum (Min), maximum (Max); median, average, number of simulations (Count), standard deviation (Stdev), 5%-percentile and 95%-percentile values over the number of simulations chosen for each of the year in the simulation.

6. Adopting the model to other local cod stocks and fjord systems

The model can easily be adapted to other fjord systems and their cod stock. You have to change the parameters given chapter 2.

7 Calculations

7.1 Cod population

7.1.1 Estimating annual recruitment (Number of 0-group cod)

The left figure shows where the annual recruitment is calculated in the model and the right figure shows the content of the recruitment box. The abundance of the 0-group cod in the population is modeled as a function of the area of suitable habitats (eelgrass etc; at present the default value is 1) for recruitment, the strength of the 1-group cod and that the spawning stock (year-classes 4-10) consist of more than 100 cod.



7.1.2 Estimating cohort sizes over the chosen time frame

The calculations in the ecosystem model take place in the block shown to the right. When open it the structure will be seen as below. Average numbers of code in the different year-classes of cod are calculated in the different "multi average" boxes.





7.1.3 Estimating survival from 0-group to 1-group cod

The mortality caused by 1-group cod on the 0-group cod can be changed by entering this input-table and changes the value in the last line.

셈 Vier	wer "CodFish[1]->Ecos	ystemData[3]" (2009-06-2	5GL.mox)
₽	🕅 🖾 는 😑 Recruitement	multiplier		
Record #	DataName	Value	Unit	Short comment
1	Real time Available habitat	0,65	km2	This value changes during simulation (new constructions)
2	High/Low habitat limit	5,00	km2	See Chapter 4.3
3	1-Group abundance limit	99,00	fishes	To set recultment
4	Recruitement multiplier	15315,00	Constant K	See chapters 1.4 and 6.2
5	Spawning low limit	50,00	Number Age 1	2-10 Chapter 1.7; minimum number of 2-10 groups
6	Awerage G1 pop.	42889,00	fishes	Table 1.1; used to calculate 0-group mortality (canibalism)
7	C factor for mortality	0,50	Number	Non autopredation mortality mortality
8	P factor for mortality	0,50	Number	autopredation mortality
9	H factor for mortality	1,00	Number	Habitat factor lower means small fishes can hide better.
10	Total Area of Fiord	23,55	km2	Total area used for density calculations
11	Initial available habitat	0,65	km2	this is initial value
12	Minimum GD	9317,00	fishes	Minimum recruitment possible
13	Maximum GD	412572,00	fishes	Maximum recruitment possible

The survival from 0-group cod to 1-group cod are calculated in the three figures shown below.







7.2 Social calculations

As avoiding/limiting the level of conflict between locals and tourists is a definitive objective in the policy issue, it would be useful to have this indicator as an output of the model. In addition, it is an input to the function determining how attractive the area is for tourists.

7.3 Economic calculations



