%%%%

% Philip\_Jacobson\_MS\_IV\_Model\_files

%%%%

clear all;

% set matcont folder to current WD

%cd('\\storage-og.slu.se\home$\phja0001\Program Files\MATLAB\R2018b')

cd('C:\Program Files\MATLAB\R2018b\matcont6p6')

% Run mextex if you run matcont for the first time, shuold reply: "mexw6"

% mexext

% show current WD

pwd

% Run matcont 6p6 (download from <https://sourceforge.net/projects/matcont/files/matcont/>)

matcont

%---------------------------------------------------------------------------------%

%

% deRoos 2013 Model in box 3.2 and 3.3 (57 and 58) an page 94-100

%

% This is what goes into matcont (copy paste):

%------------ Name ------------%

Scenario\_iii

%------------ Coordinates ------------%

% Resource Juveniles river, Juveniles Sea, Adults

Rriver,Rsea,Jriver,Jsea,Adult

%------------ Initial values of state variables ------------%

Rriver=2

Rsea=2

Jriver=1

Jsea=1

Adult=1

%------------ Parameters ------------%

H\_Jriver,H\_Jsea,H\_Adult,W\_Jriver,W\_Jsea,W\_Adult,Rmaxriver,Rmaxsea,z\_jriver\_jsea,z\_jsea\_Ariver,sigma,p,Jriver\_Mort,Jsea\_Mort,Ariver\_Mort

H\_Jriver, % Ingestion half-saturation resource density

H\_Jsea, % Ingestion half-saturation resource density

H\_Adult, % Ingestion half-saturation resource density

W\_Jriver, % Representative weight in this stage, see fig. 3.13

W\_Jsea, % Representative weight in this stage, see fig. 3.13

W\_Adult, % Representative weight in this stage, see fig. 3.13

Rmaxriver, % Maximum resoruce biomass density in river

Rmaxsea, % Maximum resource biomass in sea

z\_jriver\_jsea, % Jriver to jsea size ratio

z\_jsea\_Ariver, % jsea to adult river size ratio3

sigma, % Conversion efficency

p, % Resoruce turnover rate

Jriver\_Mort % Jriver Stage dependent mortality

Jsea\_Mort % Jsea Stage dependent mortality7

Ariver\_Mort % Ariver Stage dependent mortality

%------------ Parameter values ------------%

H\_Jriver=1 % Ingestion half-saturation resource density

H\_Jsea=1 % Ingestion half-saturation resource density

H\_Adult=1 % Ingestion half-saturation resource density

W\_Jriver=7.2 % representative weight Jriver

W\_Jsea=1488 % representative weight Jsea

W\_Adult=8000 % representative weight Amat

Rmaxriver= 3 % River- Resource maximum biomass density

Rmaxsea=10 % Sea- Resource maximum biomass density

z\_jriver\_jsea=0.0053 % Stage-specific size ratio

z\_jsea\_Ariver=0.00475 % Stage-specific size ratio

sigma=0.7 % feed conversion efficency.

p=0.1 % Resource turn-over rate, Box 3.3

Jriver\_Mort=0.03 % Stage-dependent mortality, value from box 3.3, page 57.

Jsea\_Mort=0.03 % Stage-dependent mortality, value from box 3.3, page 57.

Ariver\_Mort=0.03 % Stage-dependent mortality, value from box 3.3, page 57.

%------------ Model System ------------%

% Mass-specific max ingestion rate, box 3.3

M\_Ingestion\_Jriver=0.1\*W\_Jriver^-0.25

M\_Ingestion\_Jsea=0.1\*W\_Jsea^-0.25

M\_Ingestion\_Ariver=0.1\*W\_Adult^-0.25

% Mass-specific Maintenance rate, box 3.3

T\_Maintenance\_Jriver=0.01\*W\_Jriver^-0.25

T\_Maintenance\_Jsea=0.01\*W\_Jsea^-0.25

T\_Maintenance\_Ariver=0.01\*W\_Adult^-0.25

% Mass- and stage-specific mortality. box 3.3

Mort\_Jriver=Jriver\_Mort\*W\_Jriver^-0.25

Mort\_Jsea=Jsea\_Mort\*W\_Jsea^-0.25

Mort\_Ariver=Ariver\_Mort\*W\_Adult^-0.25

% Functions

% Resoruces

% Intrinsic resource turnover, box 3.2

G\_R\_river=p\*(Rmaxriver-Rriver)

G\_R\_sea=p\*(Rmaxsea-Rsea)

% Feeding

% Resource intake rate of juveniles in the river

W\_Resoruce\_intake\_rate\_Jriver=(M\_Ingestion\_Jriver\*Rriver)/(H\_Jriver+Rriver)

% Resource intake rate of juveniles at sea

W\_Resoruce\_intake\_rate\_Jsea=(M\_Ingestion\_Jsea\*Rsea)/(H\_Jsea+Rsea)

% Resource intake rate of Adults

W\_Resoruce\_intake\_rate\_Ariver=(M\_Ingestion\_Ariver\*Rsea)/(H\_Adult+Rsea)

% Net energy production

% Net energy production in juveniles in the river

v\_netenergy\_production\_Jriver=sigma\*W\_Resoruce\_intake\_rate\_Jriver-T\_Maintenance\_Jriver

% Net energy production in juveniles in the ocean

v\_netenergy\_production\_Jsea=sigma\*W\_Resoruce\_intake\_rate\_Jsea-T\_Maintenance\_Jsea

% Net energy prouction in Adult river stage

v\_netenergy\_production\_Ariver=sigma\*W\_Resoruce\_intake\_rate\_Ariver-T\_Maintenance\_Ariver

% Maturation functions/stage transition functions p.95 %%% Only the

% positive net energy biomass that moves between stages

% This if else loops to make the v\_c values always positive = the net energy biomass production

if(v\_netenergy\_production\_Jriver>0), v\_netenergy\_production\_Jriver\_positive=v\_netenergy\_production\_Jriver,else v\_netenergy\_production\_Jriver\_positive=0, end

if(v\_netenergy\_production\_Jsea>0), v\_netenergy\_production\_Jsea\_positive=v\_netenergy\_production\_Jsea,else v\_netenergy\_production\_Jsea\_positive=0, end

if(v\_netenergy\_production\_Ariver>0), v\_netenergy\_production\_Ariver\_positive=v\_netenergy\_production\_Ariver,else v\_netenergy\_production\_Ariver\_positive=0, end

% Stage transition functions, rate of biomass transfer out of life-stages:

Epsilon1\_transition\_from\_Jriver\_Jsea=(v\_netenergy\_production\_Jriver\_positive-Mort\_Jriver)/(1-z\_jriver\_jsea^(1-(Mort\_Jriver/v\_netenergy\_production\_Jriver\_positive)))

Epsilon2\_transition\_from\_Jsea\_Ariver=(v\_netenergy\_production\_Jsea\_positive-Mort\_Jsea)/(1-z\_jsea\_Ariver^(1-(Mort\_Jsea/v\_netenergy\_production\_Jsea\_positive)))

% system functions,p.95 %%%%

Rriver'=G\_R\_river-(W\_Resoruce\_intake\_rate\_Jriver\*Jriver)

Rsea'=G\_R\_sea-(W\_Resoruce\_intake\_rate\_Jsea\*Jsea)-(W\_Resoruce\_intake\_rate\_Ariver\*Adult)

Jriver'=(v\_netenergy\_production\_Ariver\_positive\*Adult)-(Epsilon\_transition\_from\_Jriver\_Jsea\*Jriver)+(v\_netenergy\_production\_Jriver\*Jriver)-(Mort\_Jriver\*Jriver)

Jsea'=(Epsilon1\_transition\_from\_Jriver\_Jsea\*Jriver)-(Epsilon\_transition\_from\_Jsea\_Ariver\*Jsea)+(v\_netenergy\_production\_Jsea\*Jsea)-(Mort\_Jsea\*Jsea)

Adult'=(Epsilon2\_transition\_from\_Jsea\_Ariver\*Jsea)+(v\_netenergy\_production\_Ariver\*Adult)-(v\_netenergy\_production\_Ariver\_positive\*Adult)-(Mort\_Ariver\*Adult)