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SMR/1108 - 13

COURSE ON "MEDITERRANEAN SEA(S) CIRCULATION & ECOSYSTEM FUNCTIONING" 2 - 20 November 1998

Trieste, Italy

"Introduction to Ecological Modeling"
(Part II)

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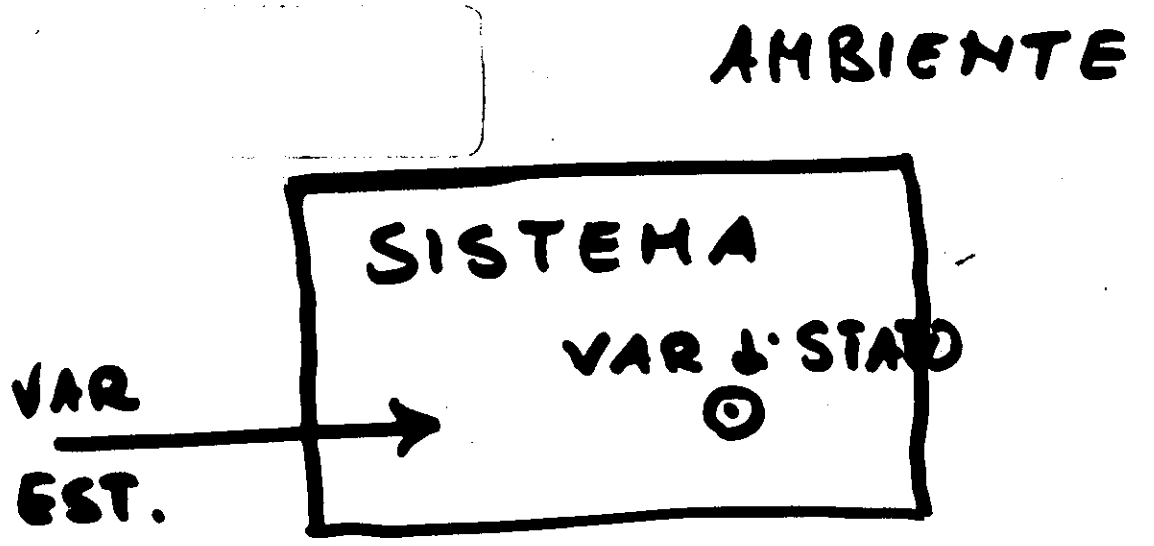


VARIABILI ESTERNE o FORZANTI

funzioni di controllo

campo di variabilità

VARIABILI DI STATO

dipendenti e indipendenti

campo di variabilità

EQUAZIONI

eq. molto precise

COSTANTI

valori dipendenti solo da unità di misura

PARAMETRI

a valori diversi, diversi comportamenti del modello

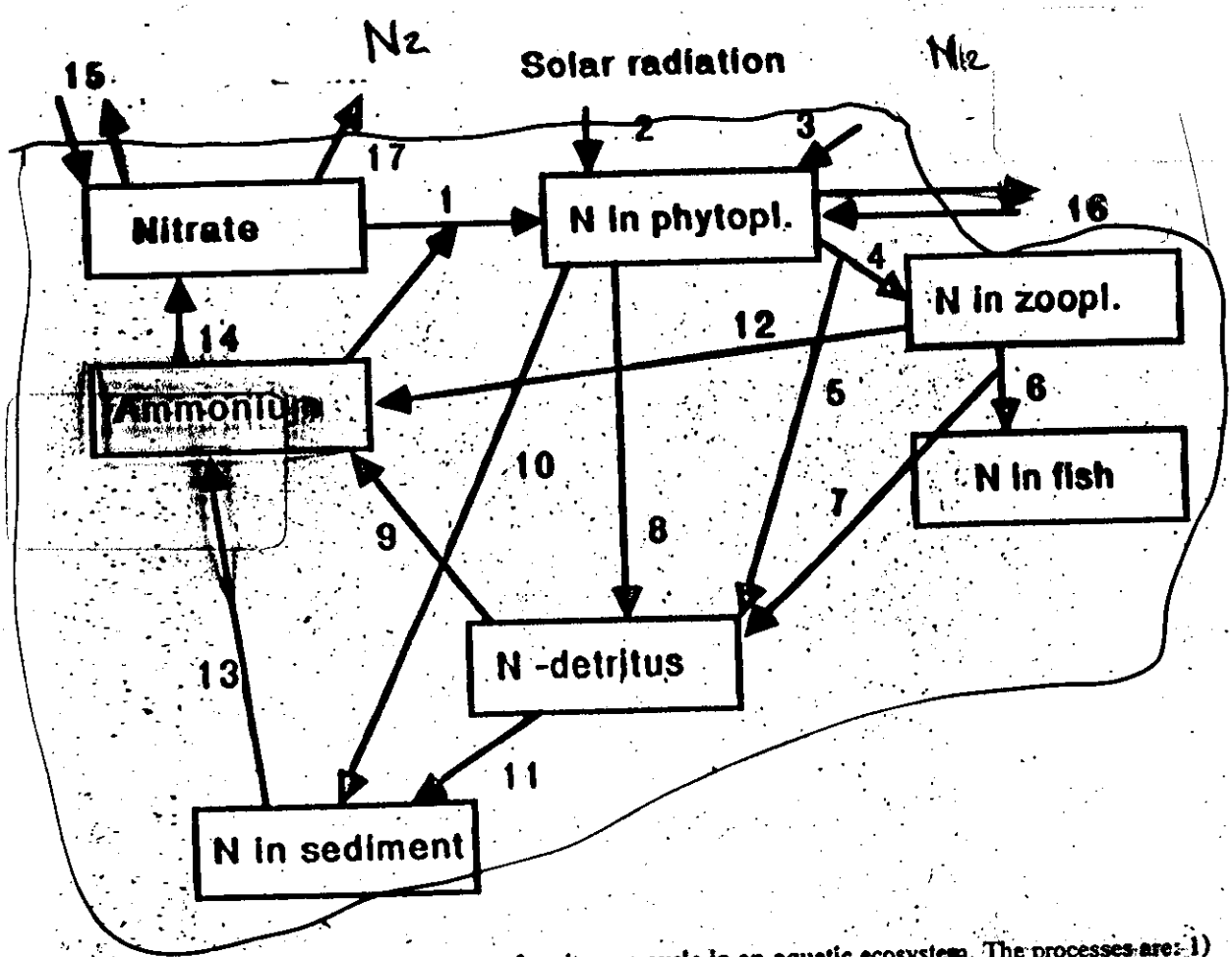


Fig. 2.1: The conceptual diagram of a nitrogen cycle in an aquatic ecosystem. The processes are: 1) uptake of nitrate and ammonium by algae; 2) photosynthesis; 3) nitrogen fixation; 4) grazing with loss of undigested matter; 5), 6) and 7) are predation and loss of undigested matter; 8) mortality; 9) mineralization; 10) settling of algae; 11) settling of detritus; 12) excretion of ammonium from zooplankton; 13) release of nitrogen from the sediment; 14) nitrification; 15) and 16) are inputs/outputs; and 17) denitrification.

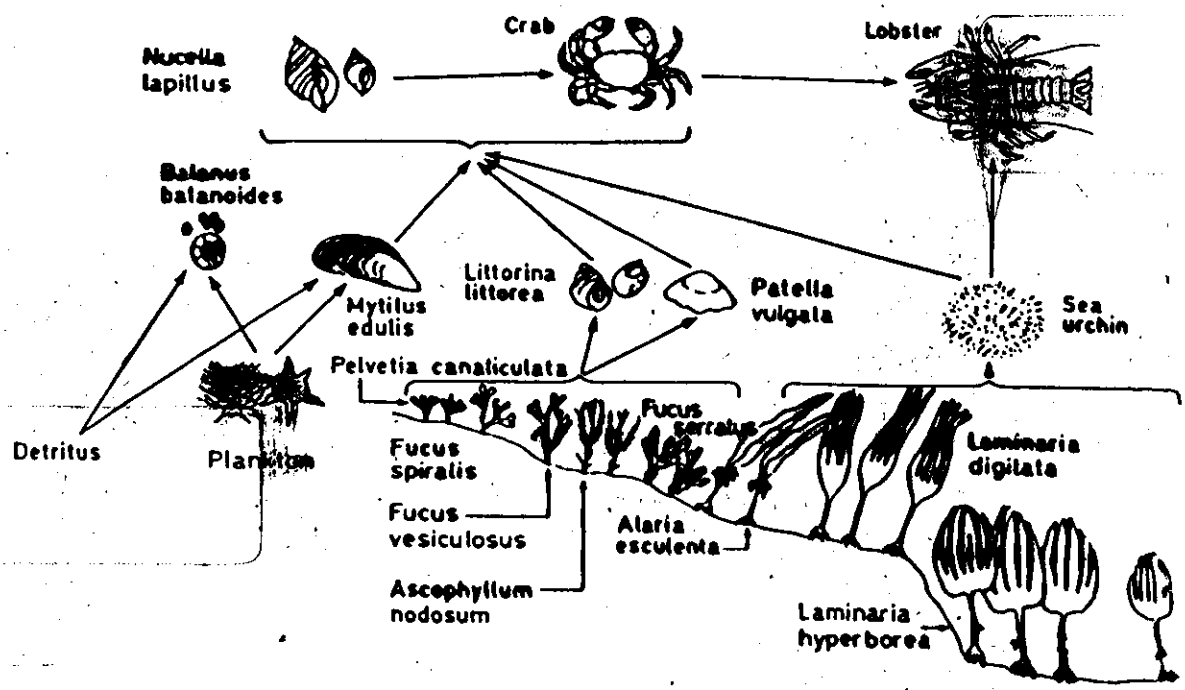


Fig. 3.6: Generalized food webs of the Hardangerfjord rocky shores (reproduced from Seip, 1983).

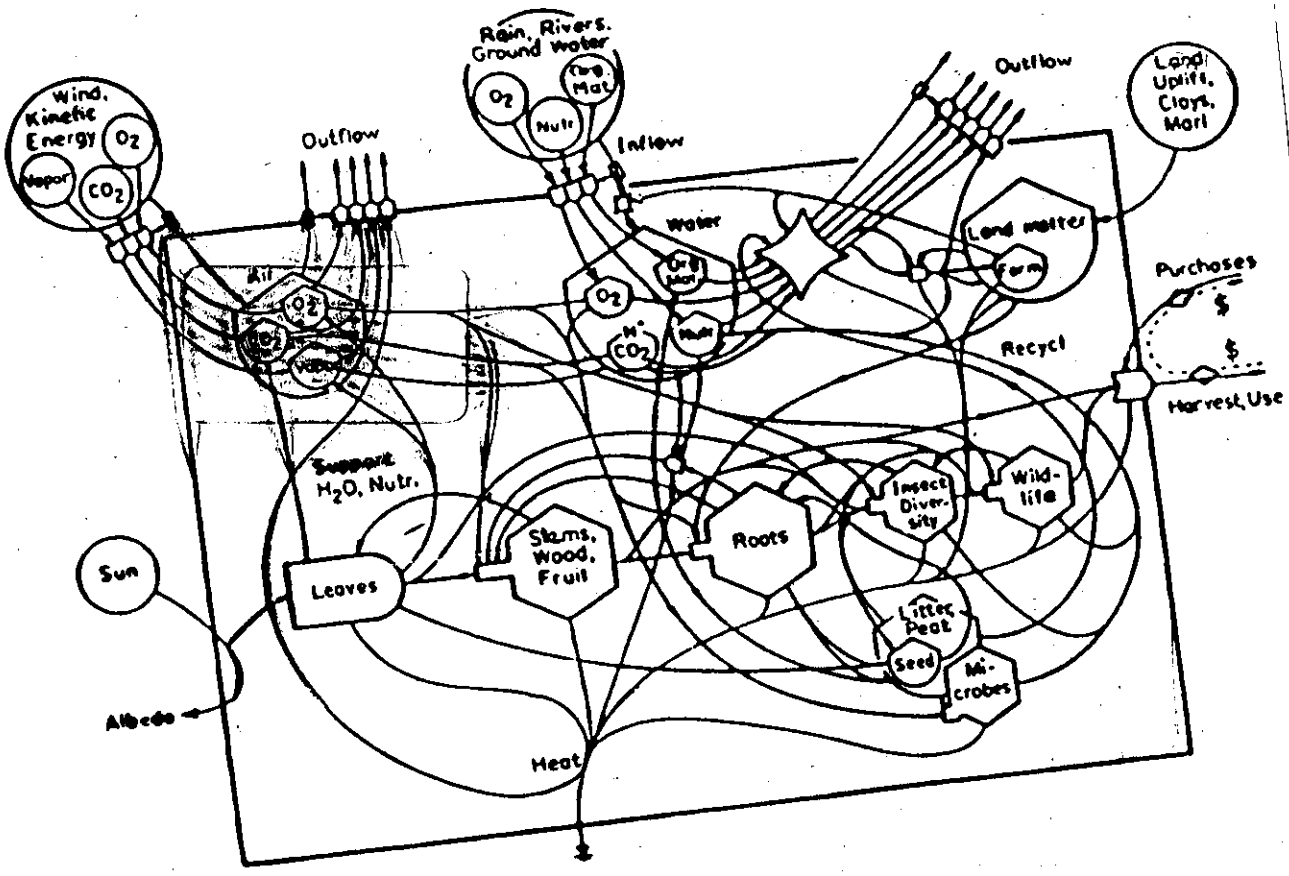
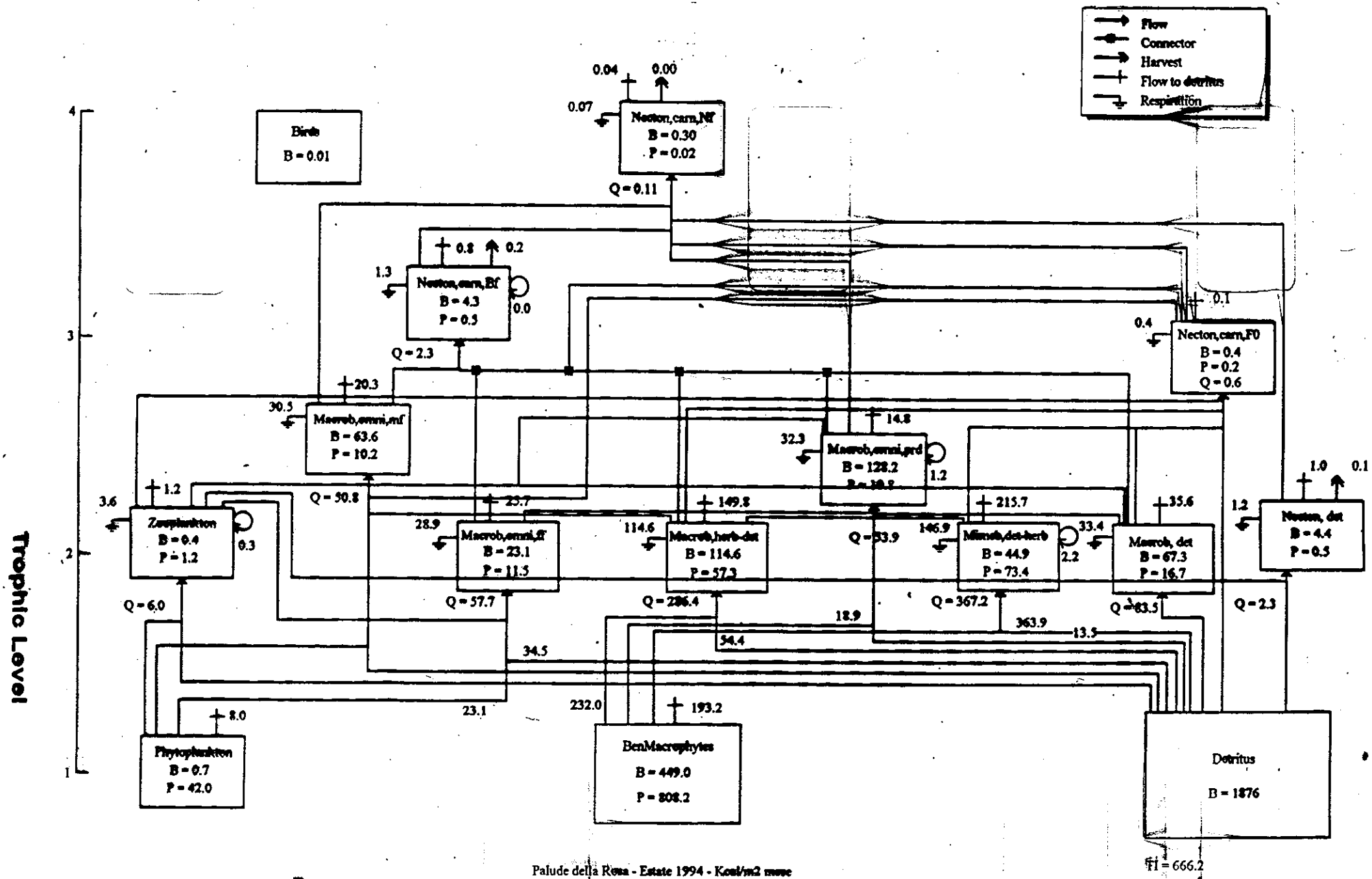


Fig. 3.13: General conceptual energy circuit model of a floodplain swamp (from Odum 1983).



Palude della Rosa - Estate 1994 - Kcal/m2 mese

Figura 1

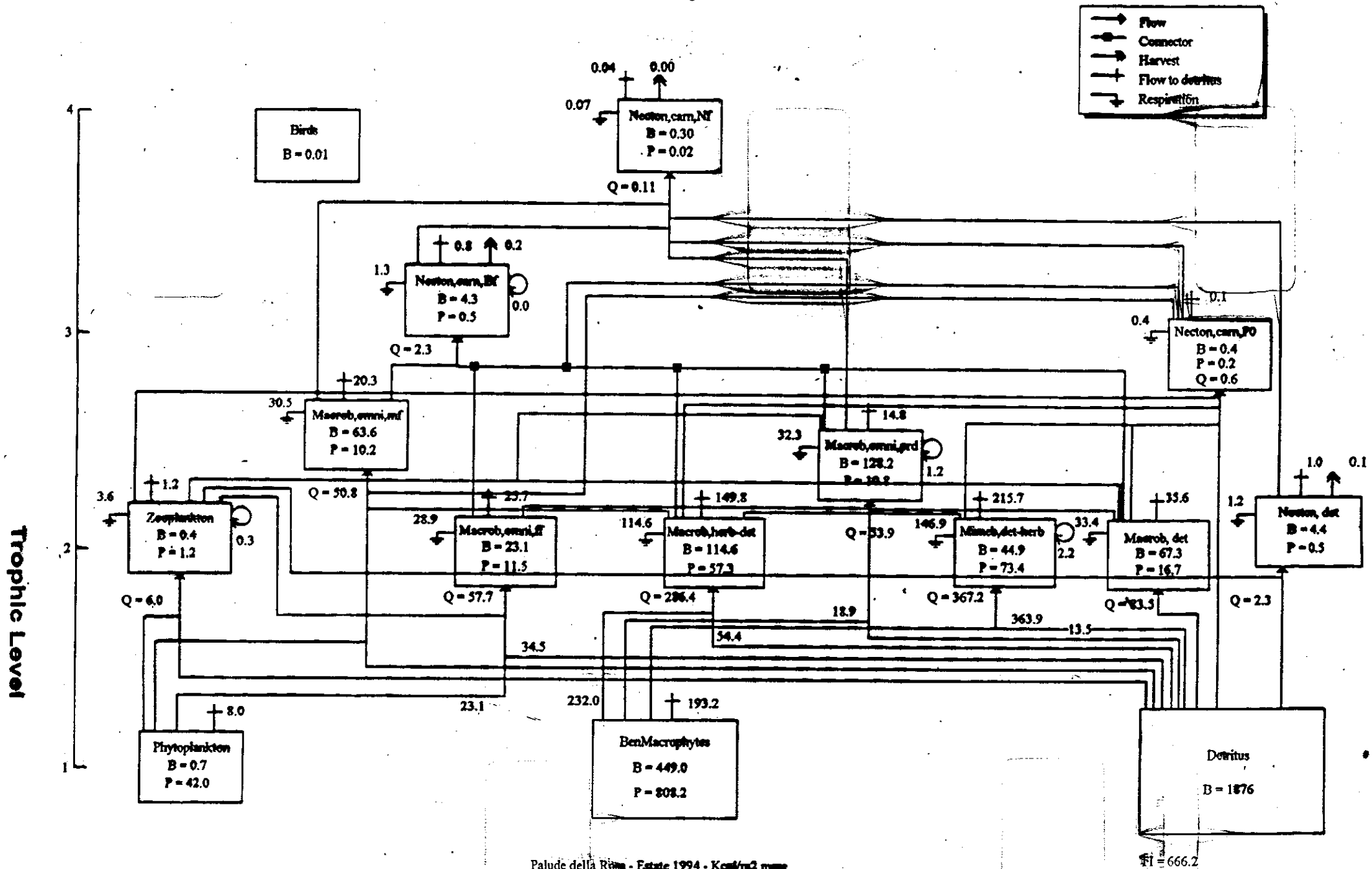

Flow
Connector
Harvest
Flow to detritus
Respiration
Trophic Level
4
3
2
1
Birds
B = 0.01
Necton,carn,Nf
B = 0.30
P = 0.02
Necton,carn,Bf
B = 4.3
P = 0.5
Necton,carn,P0
B = 0.4
P = 0.2
Q = 0.6
Macrob,omni,mf
B = 63.6
P = 10.2
Macrob,omni,grd
B = 128.2
Zooplankton
B = 0.4
P = 1.2
Macrob,omni,ff
B = 23.1
P = 11.5
Macrob,herb-det
B = 114.6
P = 57.3
Mimob,det-herb
B = 44.9
P = 73.4
Macrob, det
B = 67.3
P = 16.7
Necton, det
B = 4.4
P = 0.5
Phytoplankton
B = 0.7
P = 42.0
BenMacrophytes
B = 449.0
P = 808.2
Detritus
B = 1876
FI = 666.2
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Figura 1

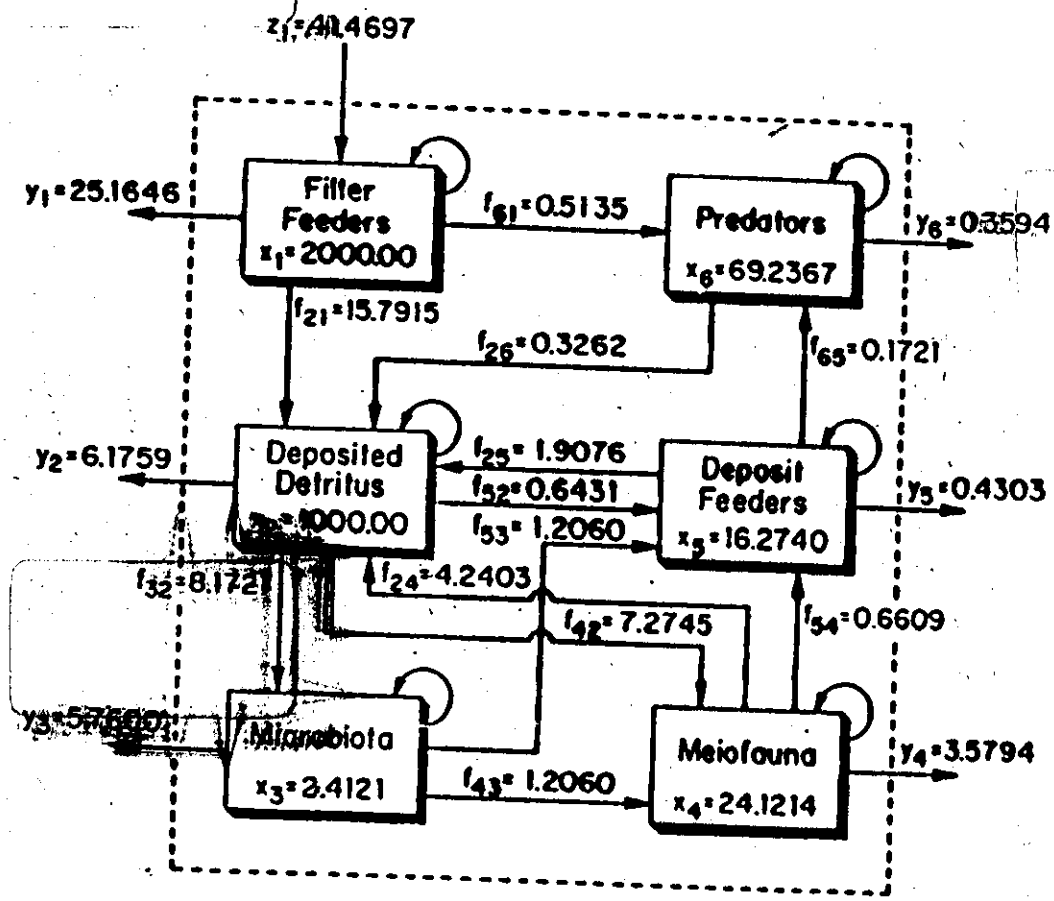

Figure 8. Intertidal oyster reef model. Numbers within the rectangles indicate steady state standing crop energy storages (x_i, i=1,...,6, in kcal m^{-2}), and those associated with arrows denote energy flows (input z_1, output y_j, and internal f_{ij}, i,j=1,...,6, in kcal m^{-2} d^{-1}).

Un sistema dinamico può essere formalmente rappresentato dalle eq. seguenti che vengono definite specifica di sistema ad eq. diff. ordinarie (ODESS ord. diff. eq. syst. specification)

$$\dot{\underline{x}} = \underline{f}(\underline{x}, \underline{u}, \underline{p}, t) \quad 1$$

$$\underline{y} = \underline{g}(\underline{x}, \underline{u}, \underline{p}, t) \quad 2$$

$$\underline{x}(t_0) = \underline{x}_0 \quad 3$$

$$0 \leq \underline{h}(\underline{x}, \underline{u}, \underline{p}, t) \quad 4$$

$\underline{x}$ vettore di stato n-dimensionale
$\underline{u}$ vettore degli input m-dimensionale
$\underline{y}$ vettore degli output p-dimensionali
$\underline{p}$ vettore di n_p costanti dette parametri
$\underline{f}, \underline{g}, \underline{h}$ funzioni vettoriali
$\underline{h}$ rappresenta le limitazioni poste su $\underline{x}$ e $\underline{p}$