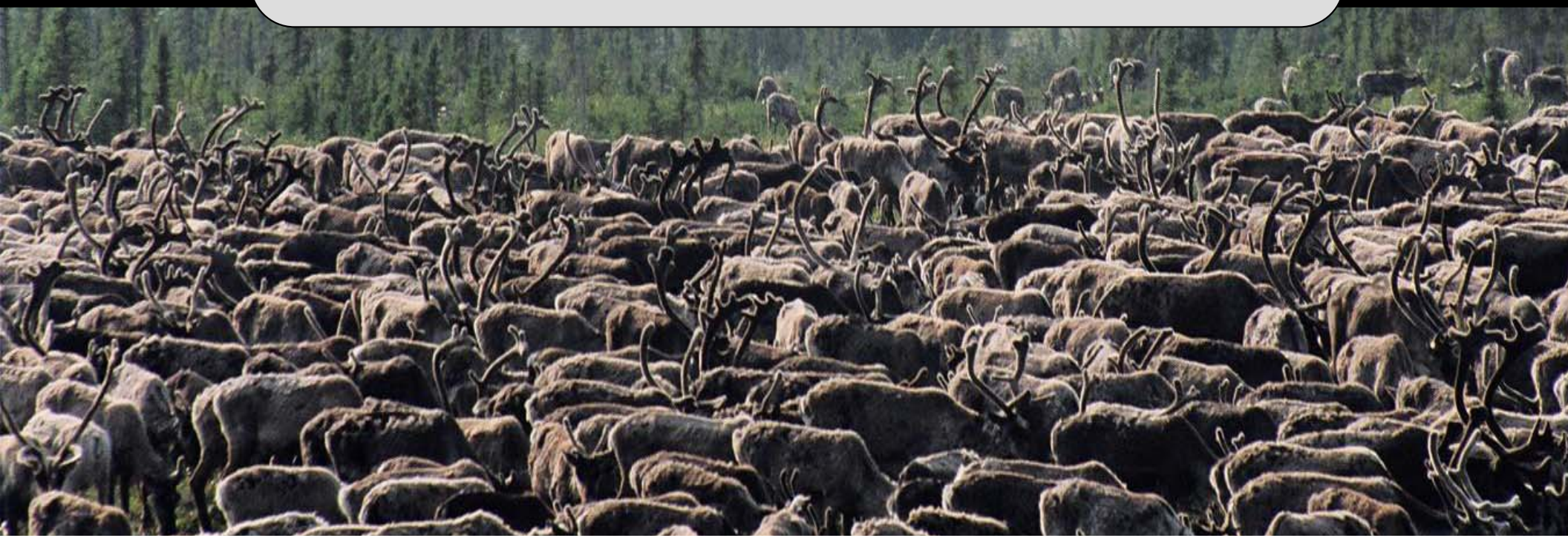
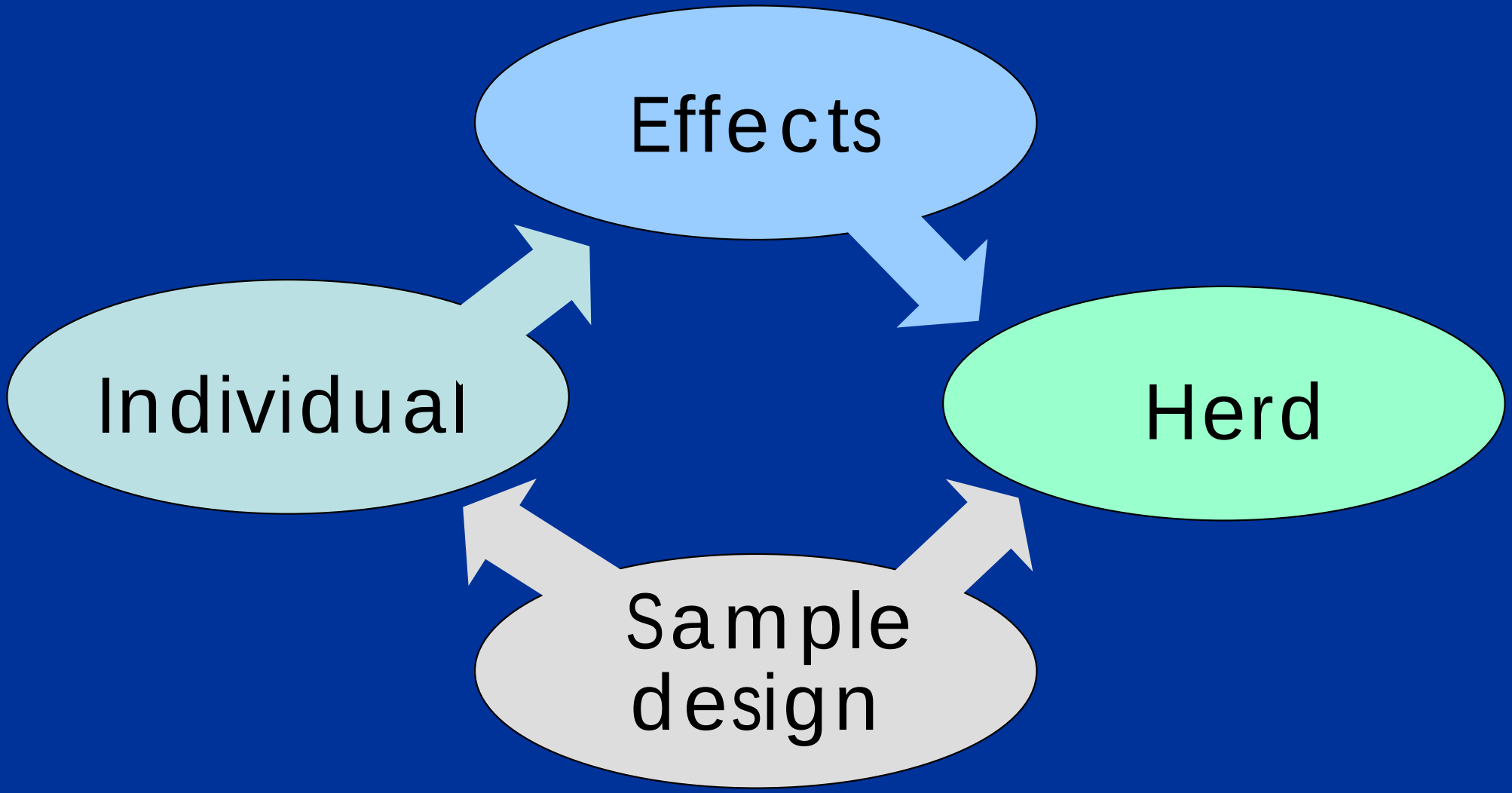


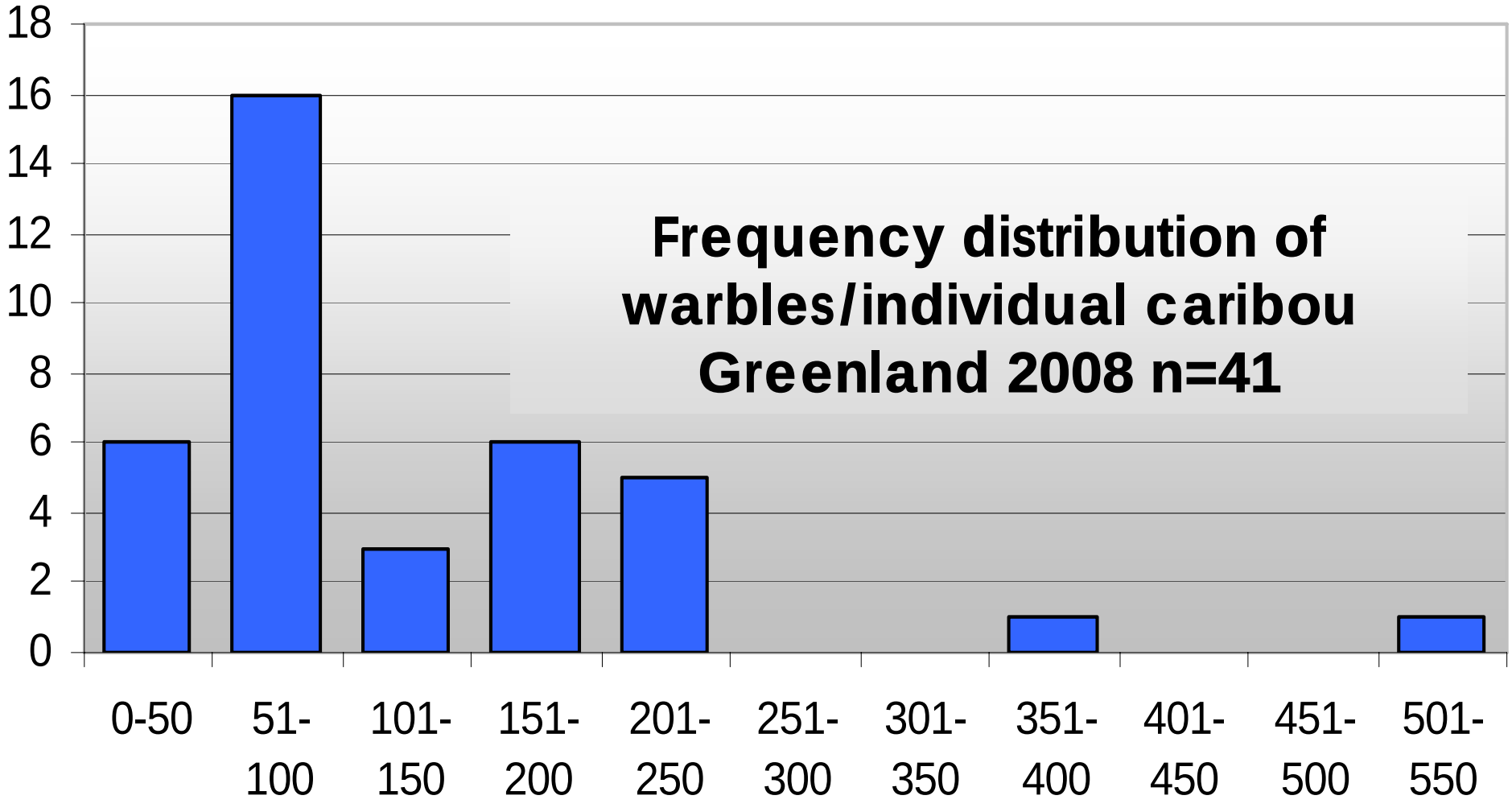
Linking pathogens to the population level



Linking parasites from individual to population level



Sample design

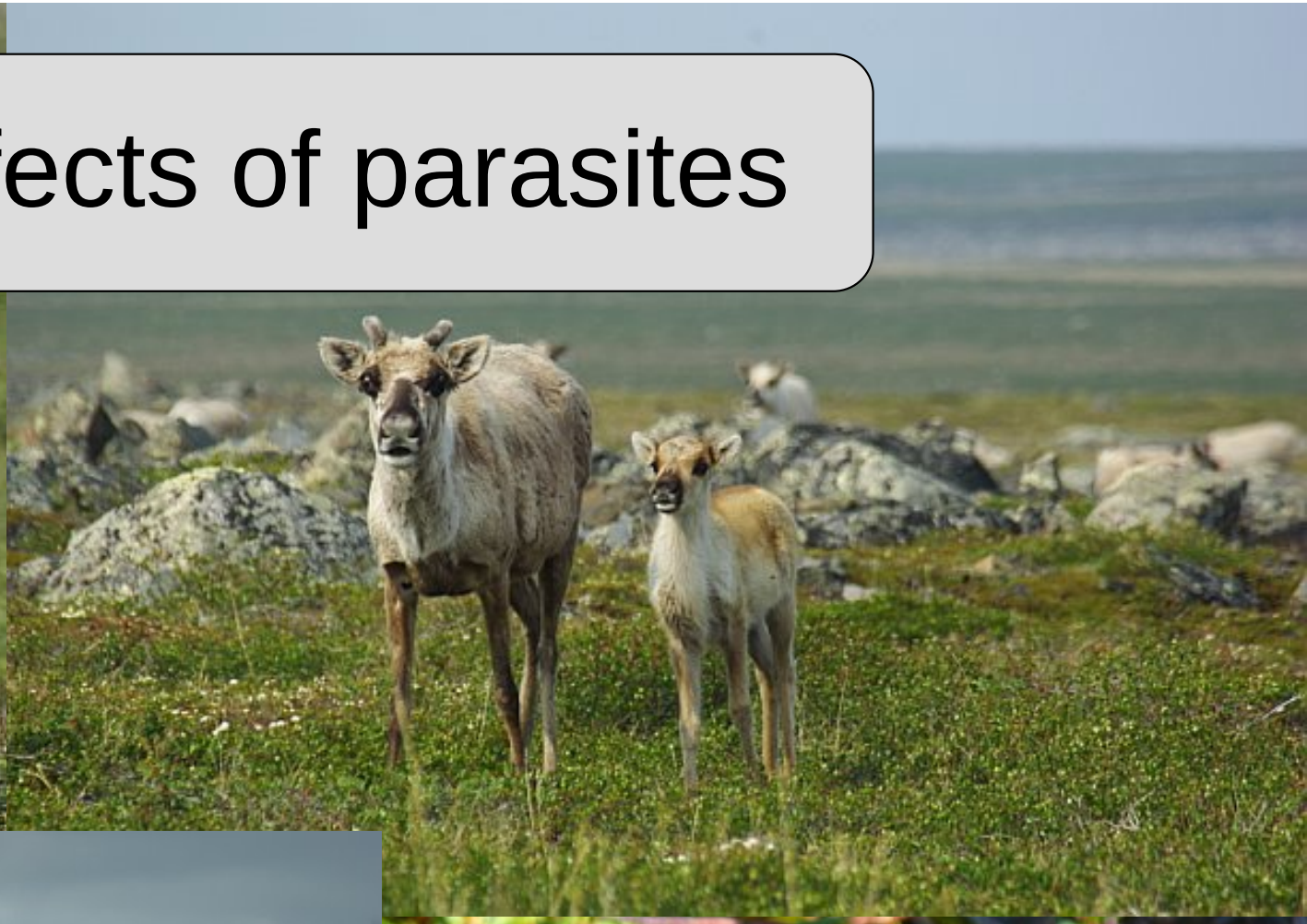


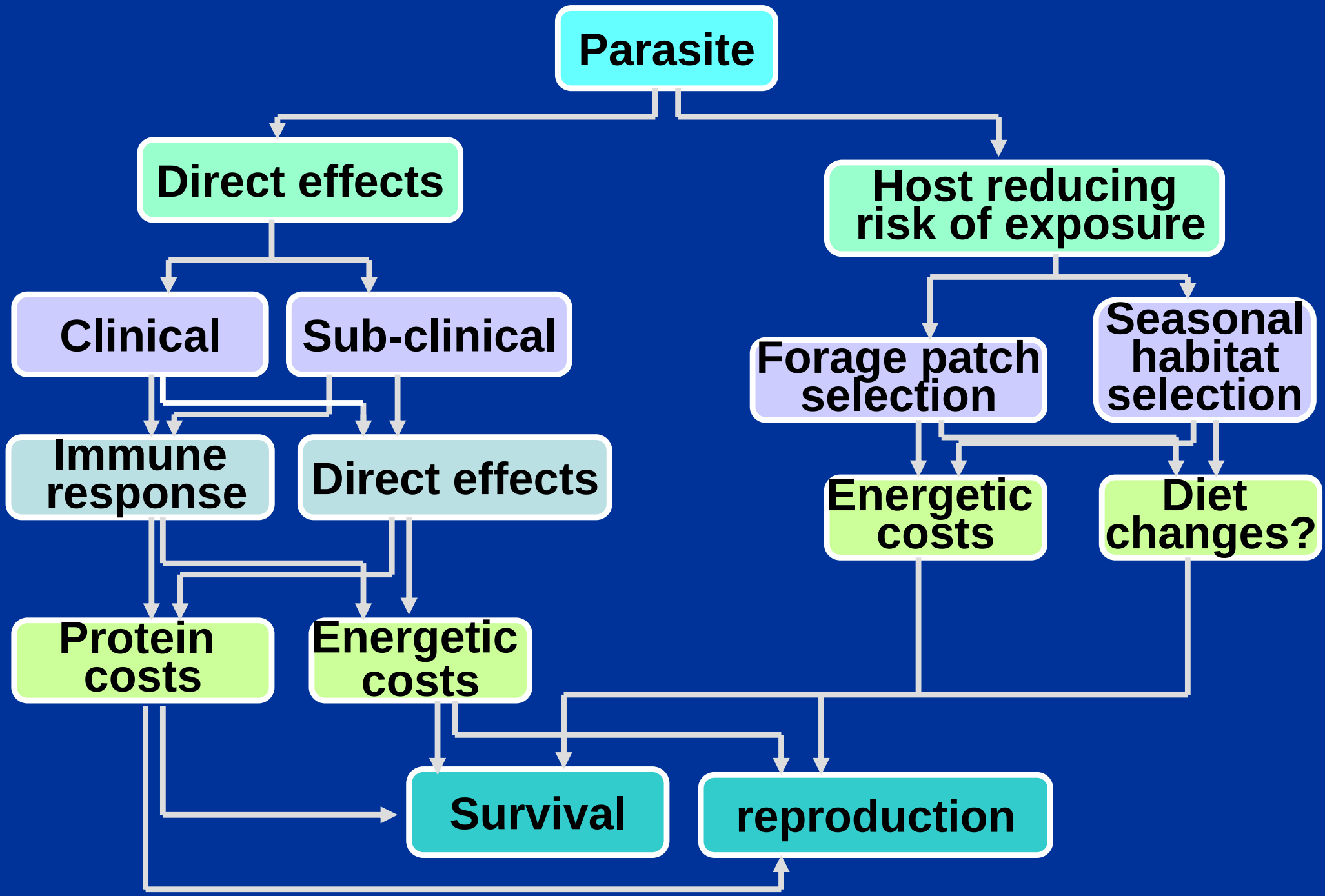
Effects

Individual

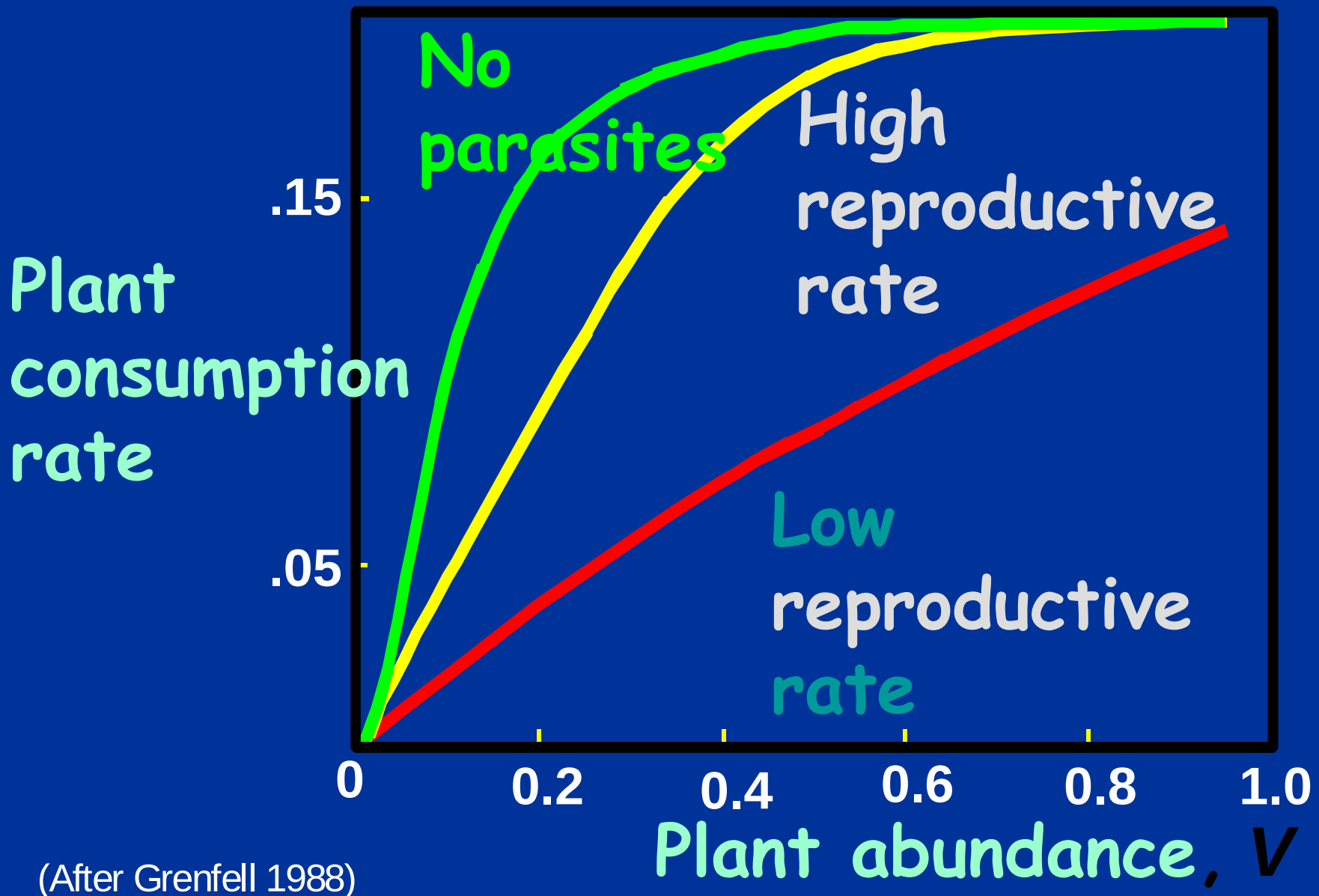
Herd

Effects of parasites

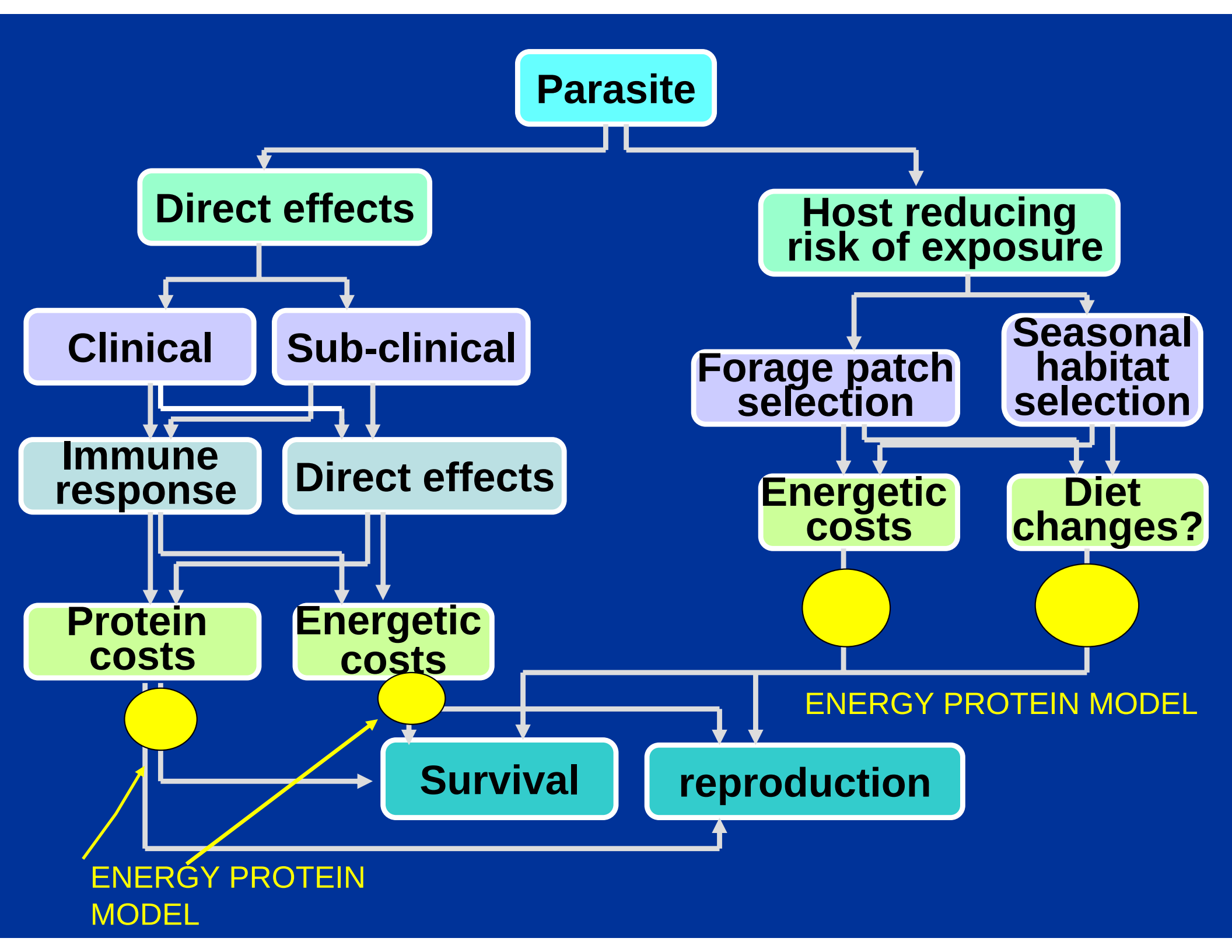



Parasite
Direct effects
Host reducing risk of exposure
Clinical
Sub-clinical
Forage patch selection
Seasonal habitat selection
Immune response
Direct effects
Energetic costs
Diet changes?
Protein costs
Energetic costs
Survival
reproduction

Parasite - herbivore consumption curve



(After Grenfell 1988)


Parasite
Direct effects
Host reducing risk of exposure
Clinical
Sub-clinical
Forage patch selection
Seasonal habitat selection
Immune response
Direct effects
Energetic costs
Diet changes?
Protein costs
Energetic costs
ENERGY PROTEIN MODEL
Survival
reproduction
ENERGY PROTEIN MODEL

WARBLE FLIES

- WARBLE MASS v DATE
- WARBLE GR v DATE
- WARBLE METABOLISM

BMR=293*0.2*mass(kg0.75)

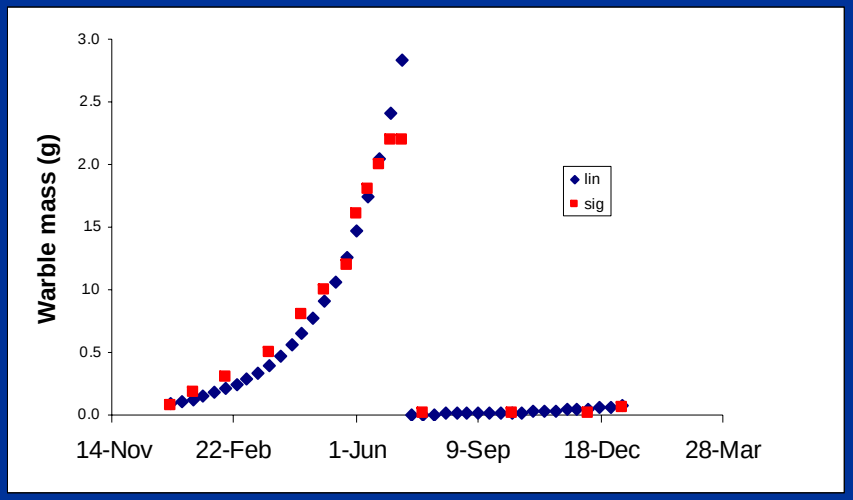
- WARBLE GROWTH

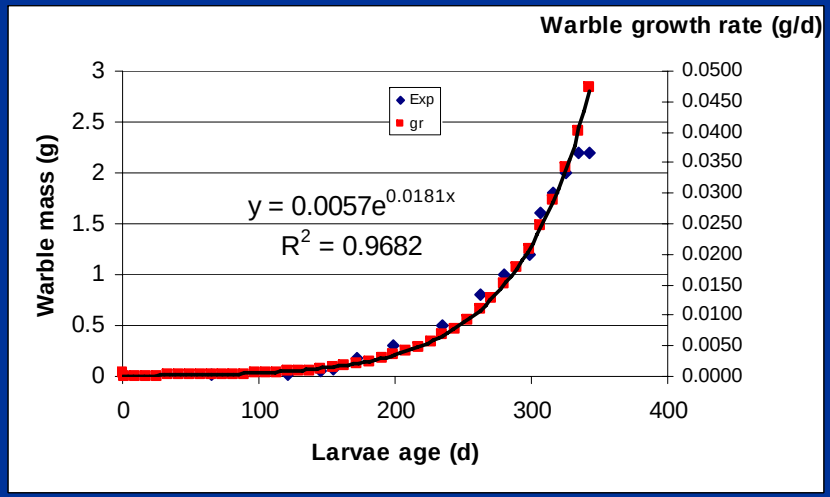
NE=g/d*33.16(kJ/g)*0.3(gDM/g)

- METABOLIC COST

BMR + NE

(BMR + NE)*No WARBLES





WARBLE FLIES

- WARBLE MASS v DATE
- WARBLE GR v DATE
- WARBLE METABOLISM

BMR(kJ/kg.75.d) =293*0.05

MER(kJ/kg.75.d) =293*0.05/0.85

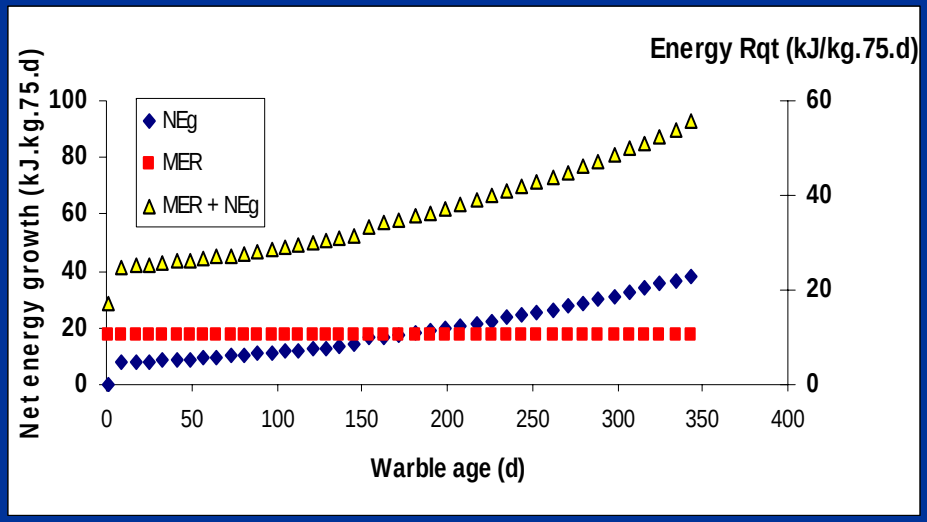
- WARBLE GROWTH

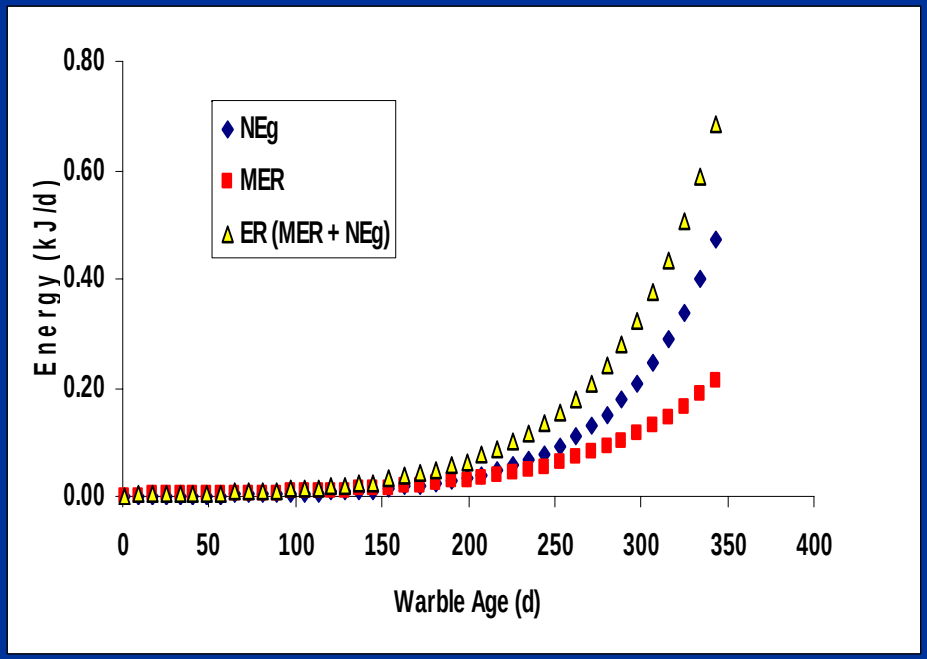
NEg =g/d*33.16(kJ/g)*0.3(gDM/g)

- METABOLIC COST

MER + NEg

(MER + NEg) * # WARBLES





WARBLE FLIES

- WARBLE MASS v DATE
- WARBLE GR v DATE
- PROTEIN METABOLISM

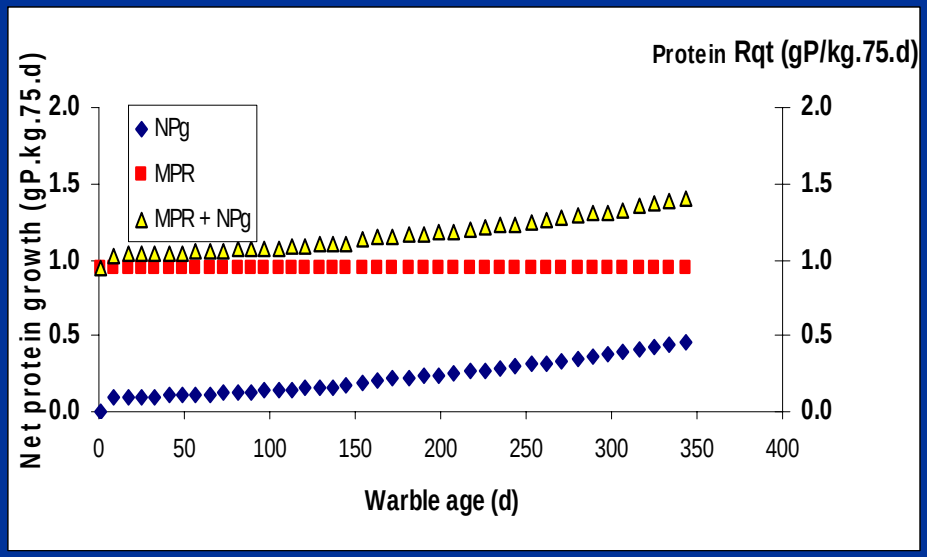
BPR(gP/kg.75.d) =0.12*6.25
MER(kJ/kg.75.d) =0.4/0.80

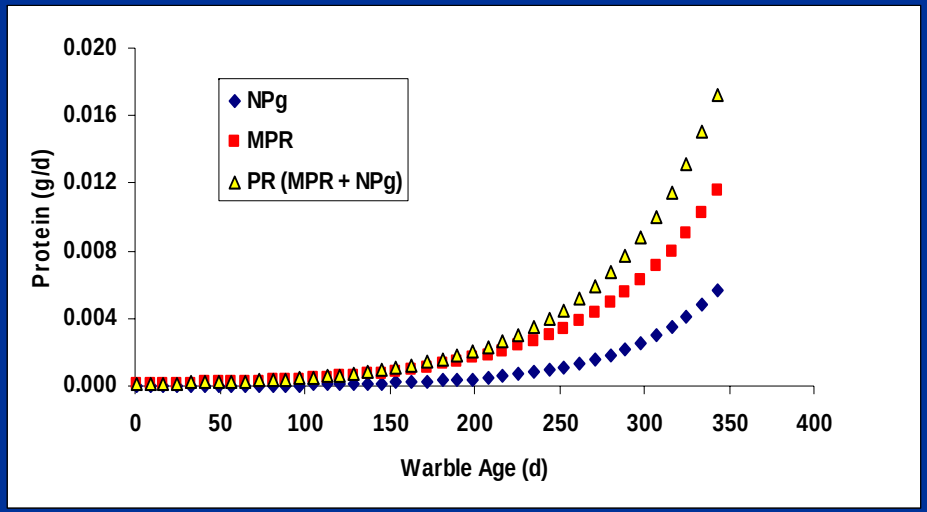
- WARBLE GROWTH

NPg =g/d*0.4(gP/gdm)*0.3(gDM/g)

- PROTEIN COST

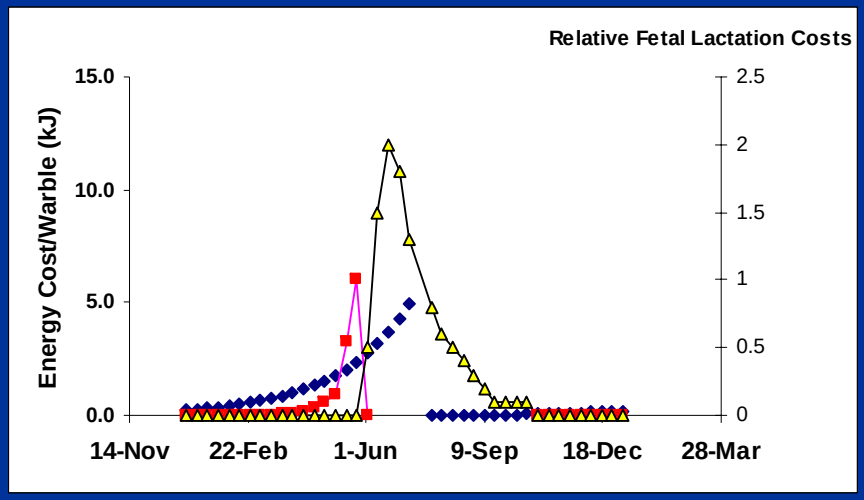
MPR + NPg
(MPR + NPg) * # WARBLES

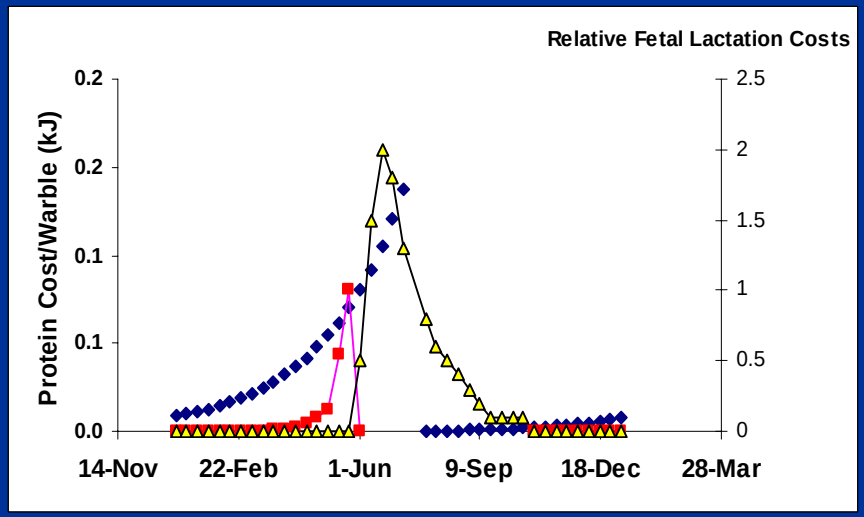




WARBLES: TIMING OF COSTS

- MOST ENERGY DEPOSITION OCCURS WHEN FETAL AND LACTATION COSTS ARE HIGHEST
- WINTER COSTS FOR SUB-ADULTS CAN AFFECT SURVIVAL & REPRODUCTION





WINTER COSTS 50 KG CALF

- 1000 WARBLES COULD REPRESENT A COST OF NEARLY 10% OF MER AT EMERGENCE FOR A 50 KG CALF
- AND 25% OF DIGESTIBLE PROTEIN INTAKE