

# Bioenergetics

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**8- Pattern of deposition of nutrients**

**9- Energy Utilization**

## Pattern of deposition of nutrients

- Live weight gain is associated with the accretion of water, proteins, carbohydrates, fats, minerals, etc.
- The amount of these components deposited per unit of live weight gain is not constant but
- Rather changes with fish species and size, feed used, etc.

## Pattern of deposition of nutrients

- Patterns of nutrients deposition have received little attention in the past.
- Experimental evidences suggest that nutrient and energy deposition, and consequently carcass composition, follow rational patterns.
- Recognizing the rationality and certainty of patterns of nutrient depositions could help explain several phenomena and lead to the development of applications.

## Pattern of deposition of nutrients

- Fig.10 shows absolute (g or kJ per fish) of rainbow trout of various size fed practical diet with 20-22 g digestible protein (DP) per MJ digestible energy (DE).
- The absolute contents of water, protein, lipid and gross energy of fish **increase in a highly linear fashion with weight of the animal.**

# Pattern of deposition of nutrients

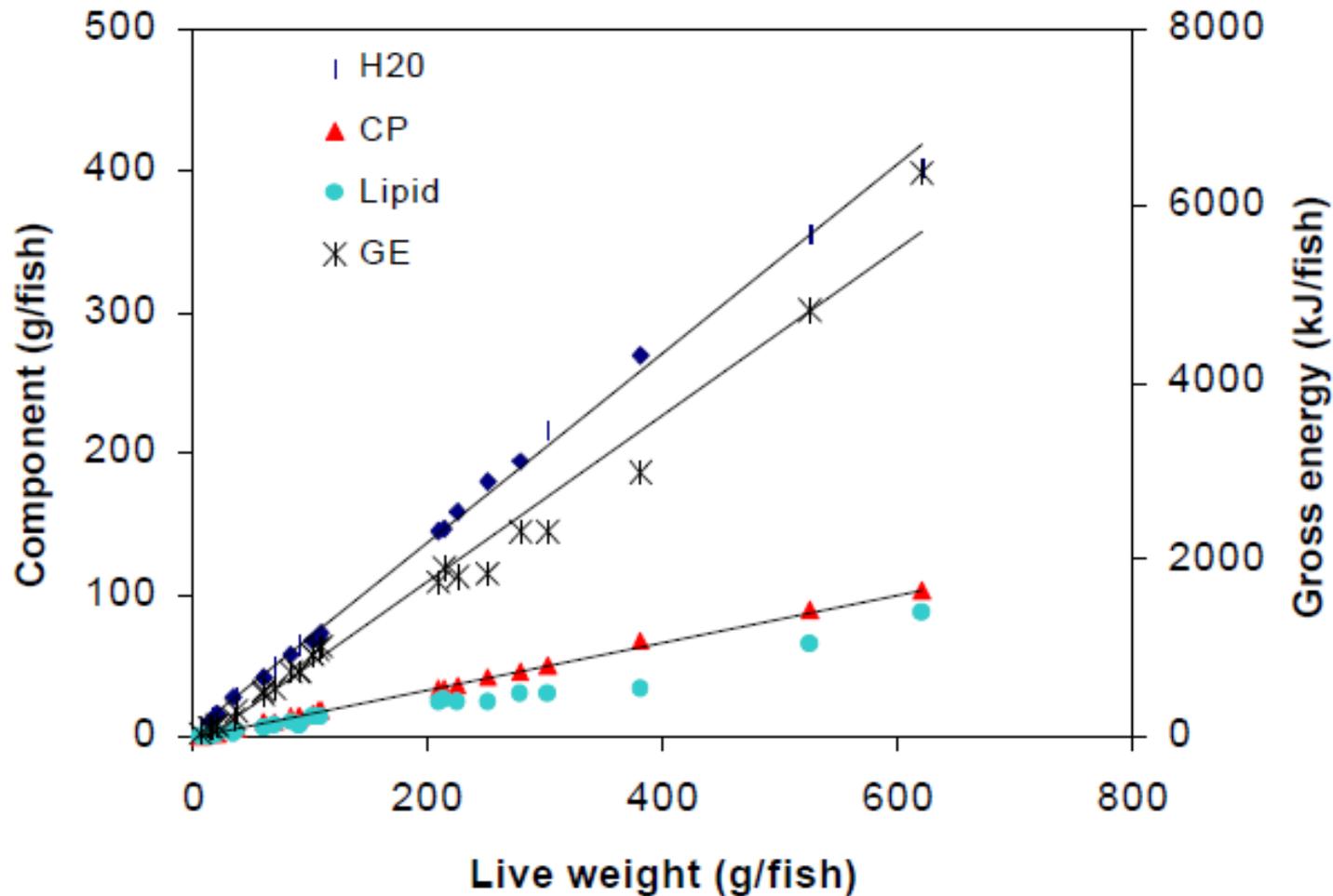


Figure 10. Chemical composition (absolute amounts, g/fish or kJ/fish) of rainbow trout over various sizes fed practical diets.

## Pattern of deposition of nutrients

- Figure 11 show that when expressed in as relative composition (e.g. % of body weight) (or kJ/g),
- **protein** content of the fish **increases** slightly then remains approximately **constant**.
- **Moisture** tends to **decrease rapidly** with fish size up to about **100 g** live weight, then **decreases slowly**.
- **Lipid and gross energy (GE)** **increases very rapidly** with size also up to **100 g** live weight then **increases linearly very slowly**..

# Pattern of deposition of nutrients

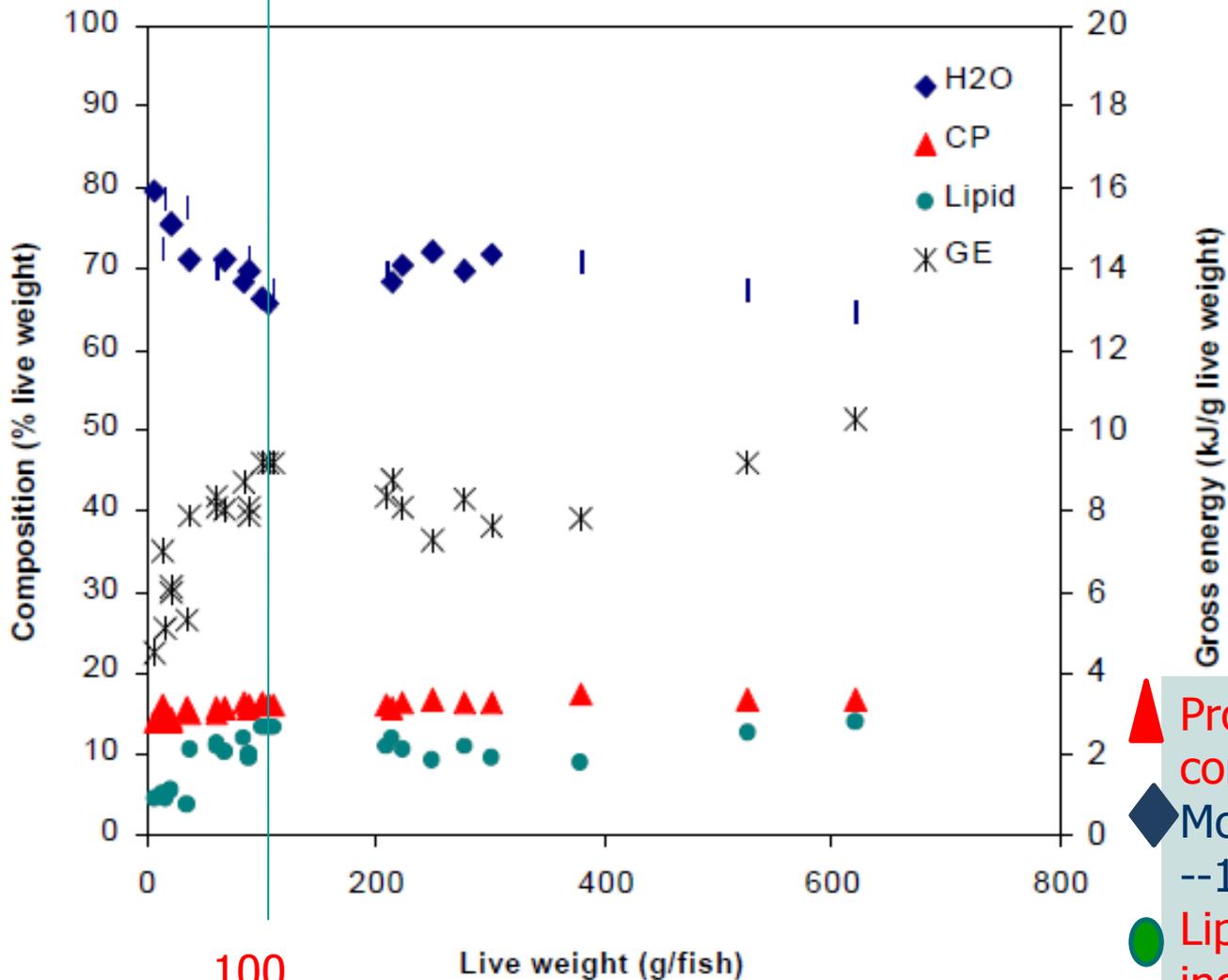


Figure 11. Chemical composition (relative amounts, % or kJ/g) of rainbow trout over various sizes fed practical diets

- ▲ Protein increases --- constant.
- ◆ Moisture decrease rapidly --100 g decreases slowly.
- Lipid and gross energy increases very rapidly 100 increases linearly very slowly..
- \* GE

## Pattern of deposition of nutrients

- This has serious implications since it explains:
- The gradual decreases in feed efficiency of fish with increasing live weight.
- Larger fish contain more dry matter (protein, lipid, mineral, gross energy) per unit of live weight than smaller fish.
- One gram of live weight gain represents greater amounts of nutrient deposited for a large fish compared to a smaller one.

## Pattern of deposition of nutrients

- If the cost of depositing nutrient is similar in smaller and larger fish, then feed requirement per unit of live weight gain should increase with fish size. This effect should be most dramatic before 100g live weight.

## Pattern of deposition of nutrients

- The results from a number of studies clearly show that this increase in lipid content of fish of increasing body weight is not due to enhanced deposition of lipid compared to that of protein as the animal increases in size.
- Rainbow trout deposited protein and lipid according to the same ratio regardless of fish size (10-110 g live weight) and water temperature (6 to 15°C). Similar proportionality of protein and lipid deposition at increasing feed intakes has been reported in domestic animals .It is apparent that the increase in lipid content (% of carcass) of fish of increasing live weight is the result of the low lipid and relatively high protein contents (expressed as % of body weight) of the body of fish at first feeding.