

Nutritional Considerations for the Mediterranean Fish

Dr. Süreyya Özkızılcık

What does a fish need?

NRC Nutrient Requirements of Fish (1993) recommendation:

- 10 amino acids
- n-3 & n-6 fatty acids
- 6 macro-minerals
- 6 trace-minerals
- 4 fat soluble vitamins
- 11 water soluble vitamins
- nitrogen
- energy

Proteins and their functions

They supply raw material for somatic growth (muscle cells)

They catalyze reactions (enzymes)

■ Special functions

Immune system, (antibodies)

Transport oxygen (haemoglobin)

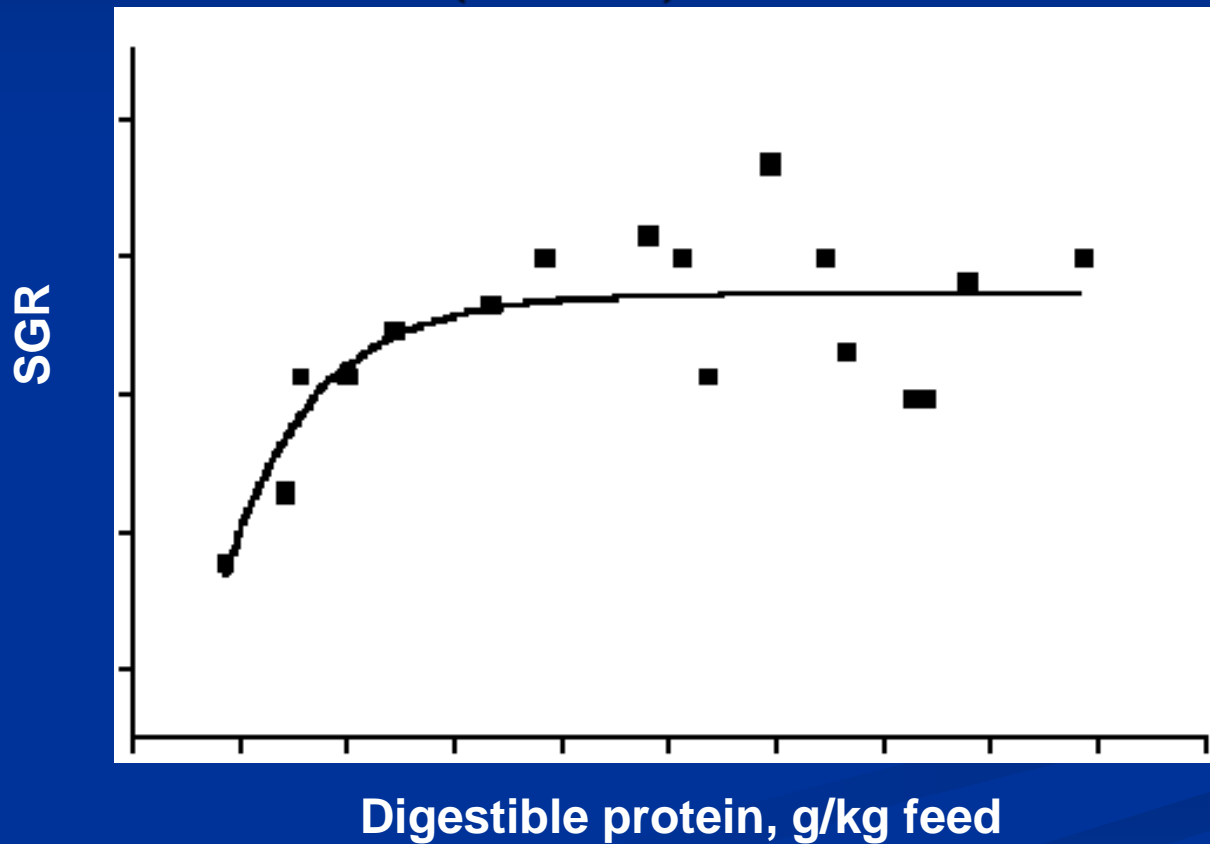
Hormones (gonadotropin, insulin)

How do we determine the protein and amino acid requirements of fish?

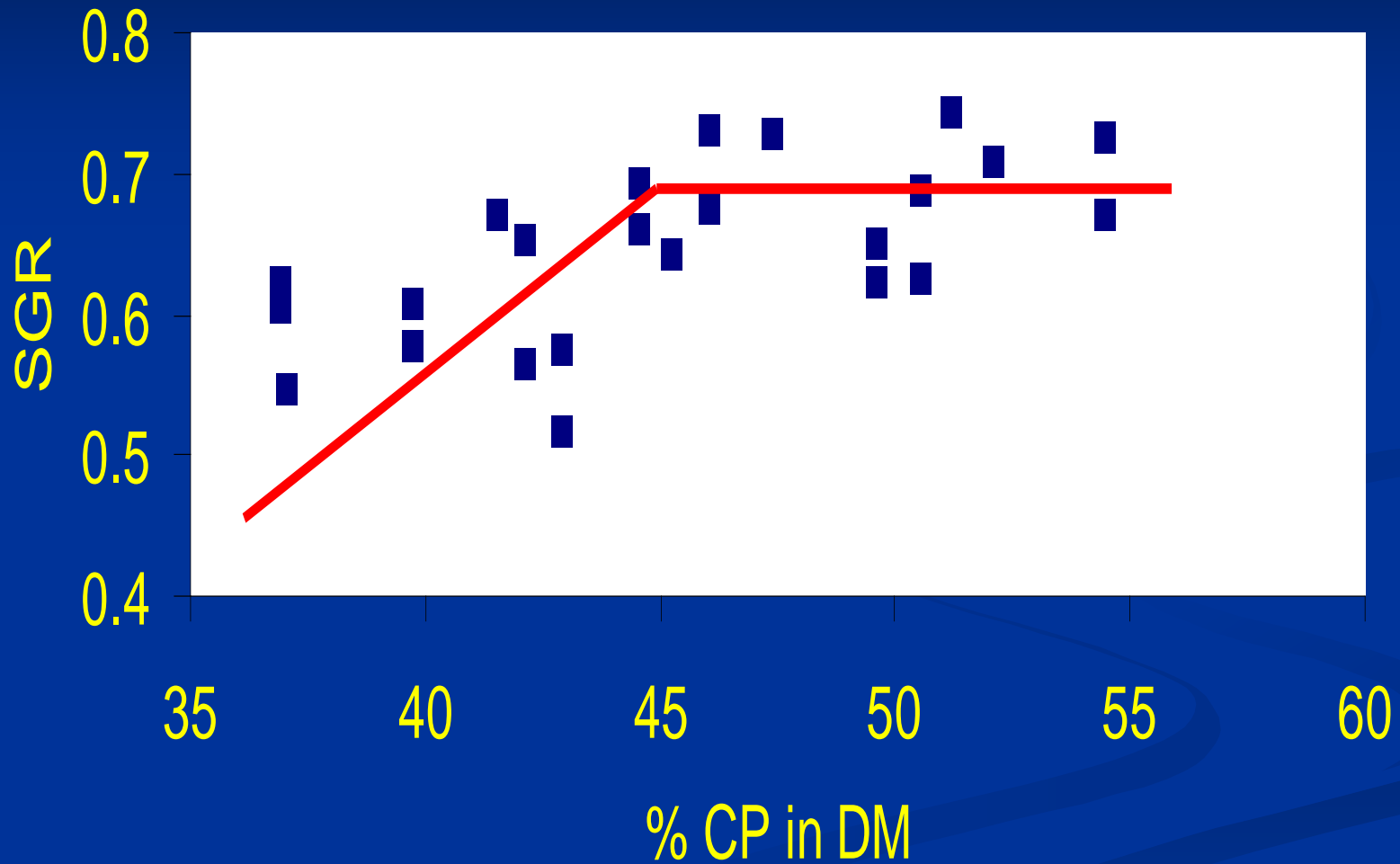
1. Fish egg amino acids?
2. Whole body amino acid profiles?
3. Stomach content of wild fish?
4. Trial and Error!

Determination of Protein Requirements

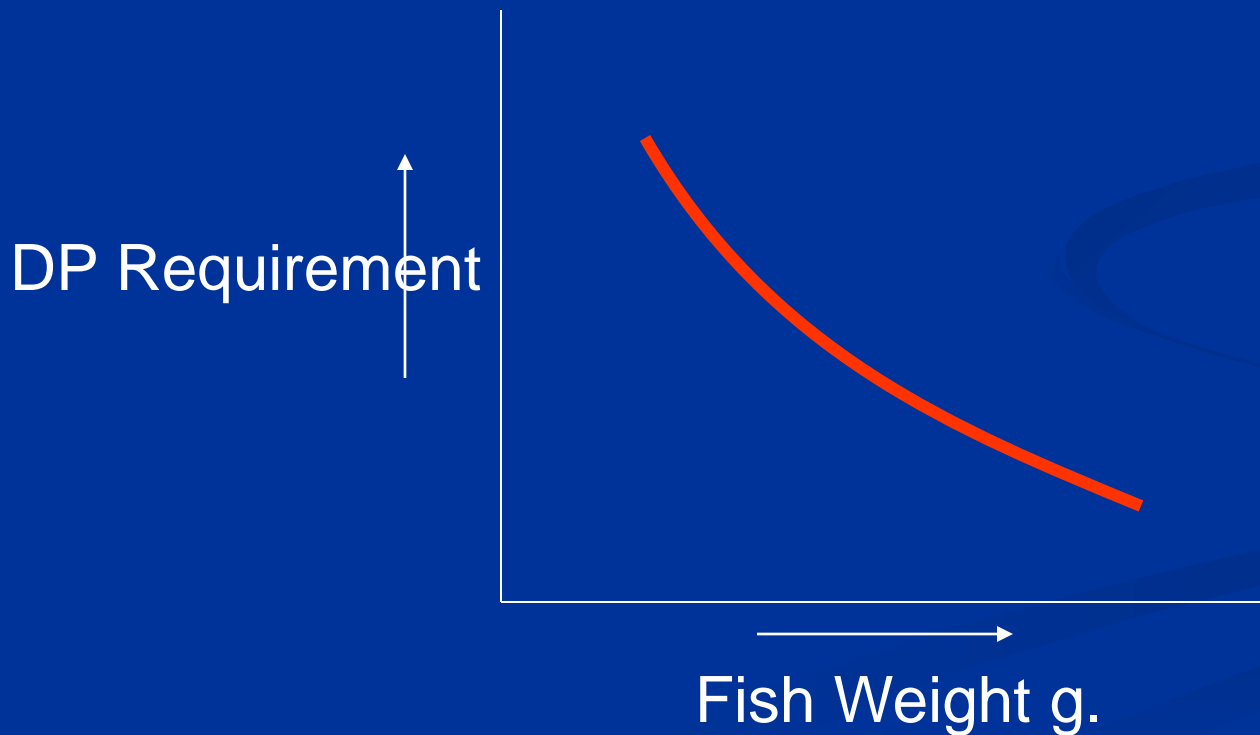
Dose-response curves (salmon)



Sea Bream (D/R)



As fish grows protein requirement drops.



Amino Acid Requirements

- Fish require 10 essential amino acids in their diets

Threonine

Methionine

Valine

Phenylalanine

Arginine

Histidine

Lysine

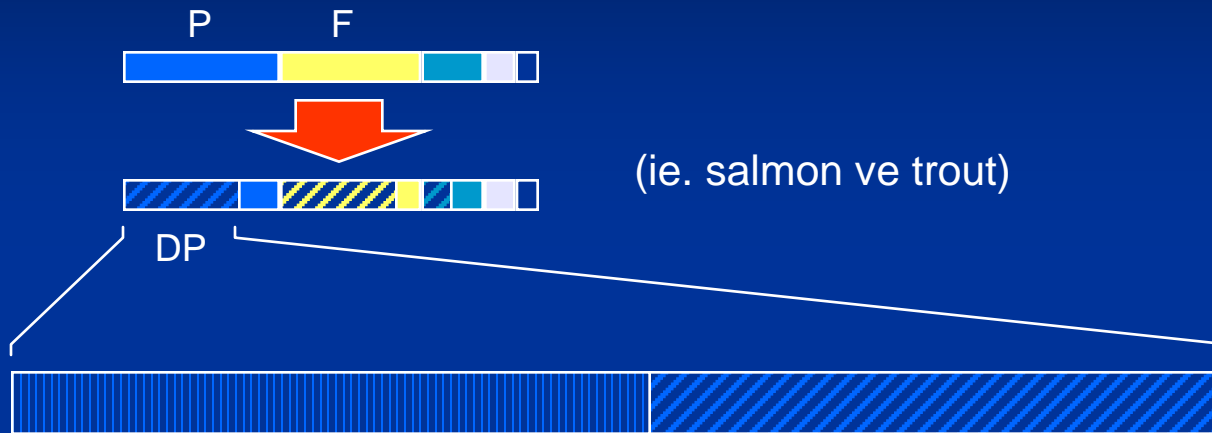
Isoleucine

Tryptophan

Leucine

- The minimum law!

Protein Metabolism



Digestible essential AA

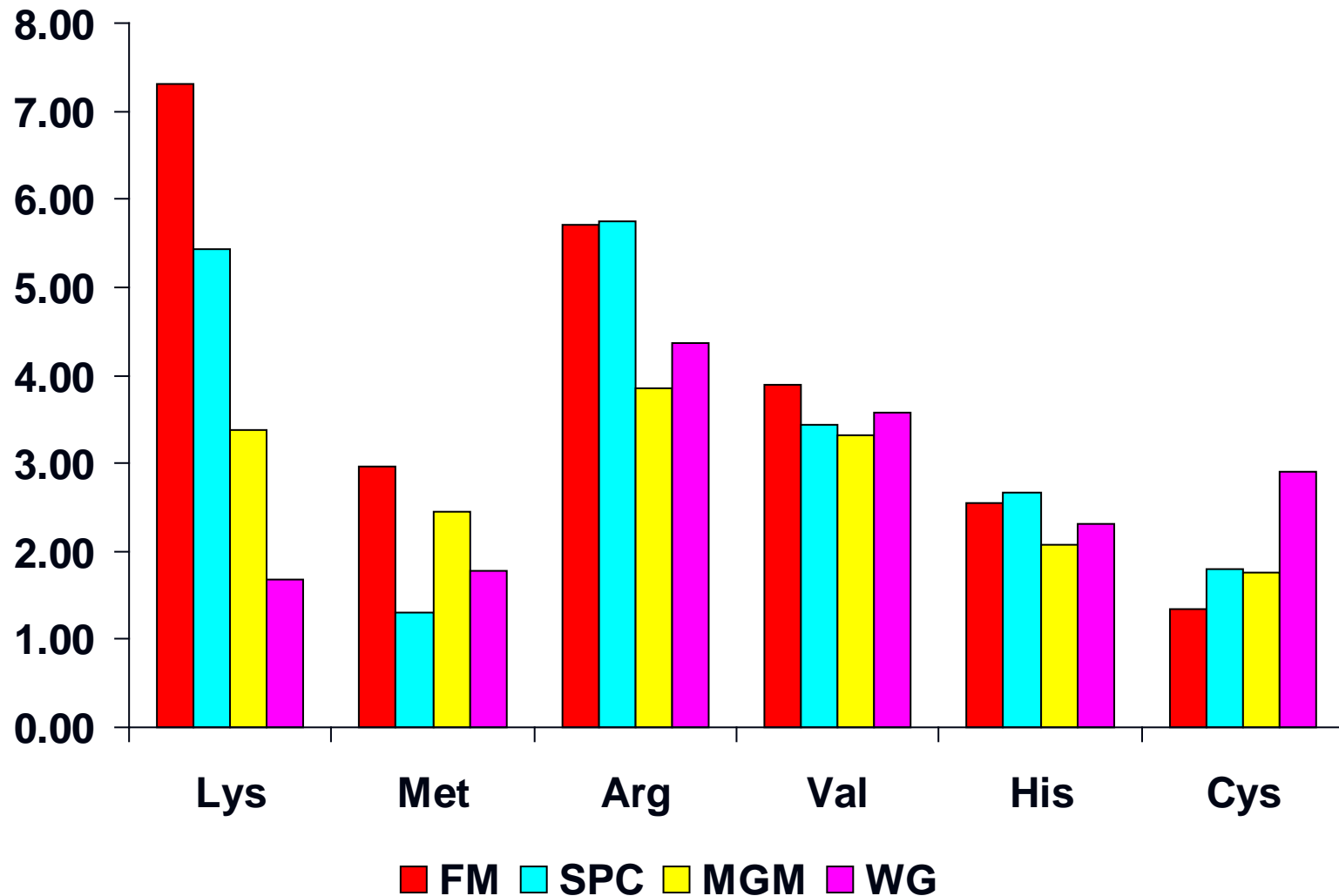
- Arginine
- Histidine
- Isoleucine
- Leucine
- Lysine
- Methionine
- Phenylalanine
- Threonine
- Tryptophan
- Valine

Digestible non-essential AA

Semi-essential AA

- Cysteine
- Tyrosine

Amino acid contents of various raw materials used in aquafeeds



Functional properties of hydrolyzed proteins

Enhanced appetite (high palatability)

Increased HCl production

Reduced pH in the stomach

Increased pepsin production

Stimulates CCK (Cholesystokinin release)

Antioxidative effect on flesh (polar phenolic compounds)

Fat absorption/emulsification effect

Antiallergenic, Ulcerative colitis

Increased protein digestion

Very high digestibility (>95%)

Triggers immune response (non-specific, white blood cells proliferation!)

Salt replacement (aid in osmoregulation through FAA)

Enhanced growth

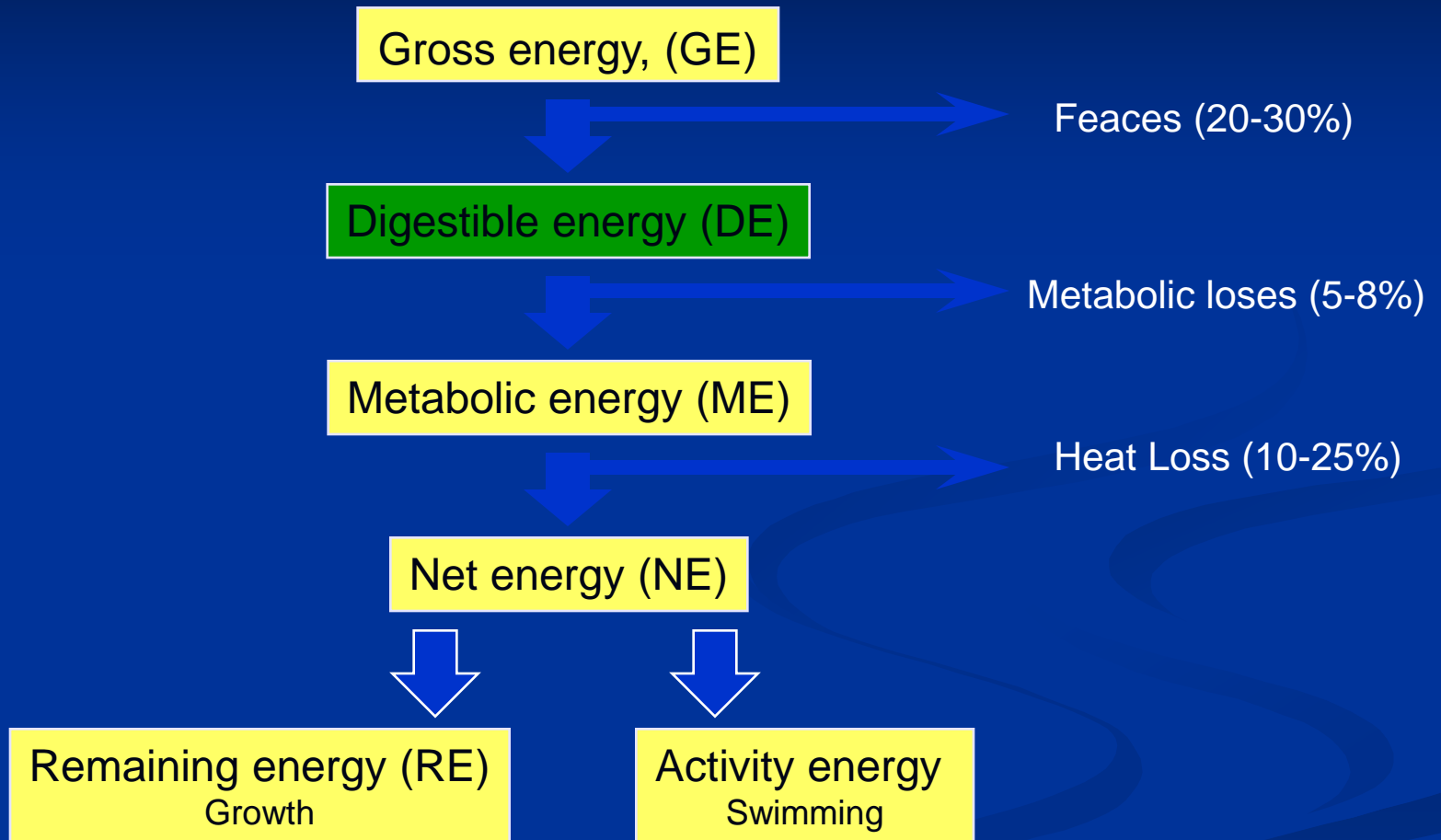
DP&DE ratio

Protein Sparing Action

Save proteins for growth

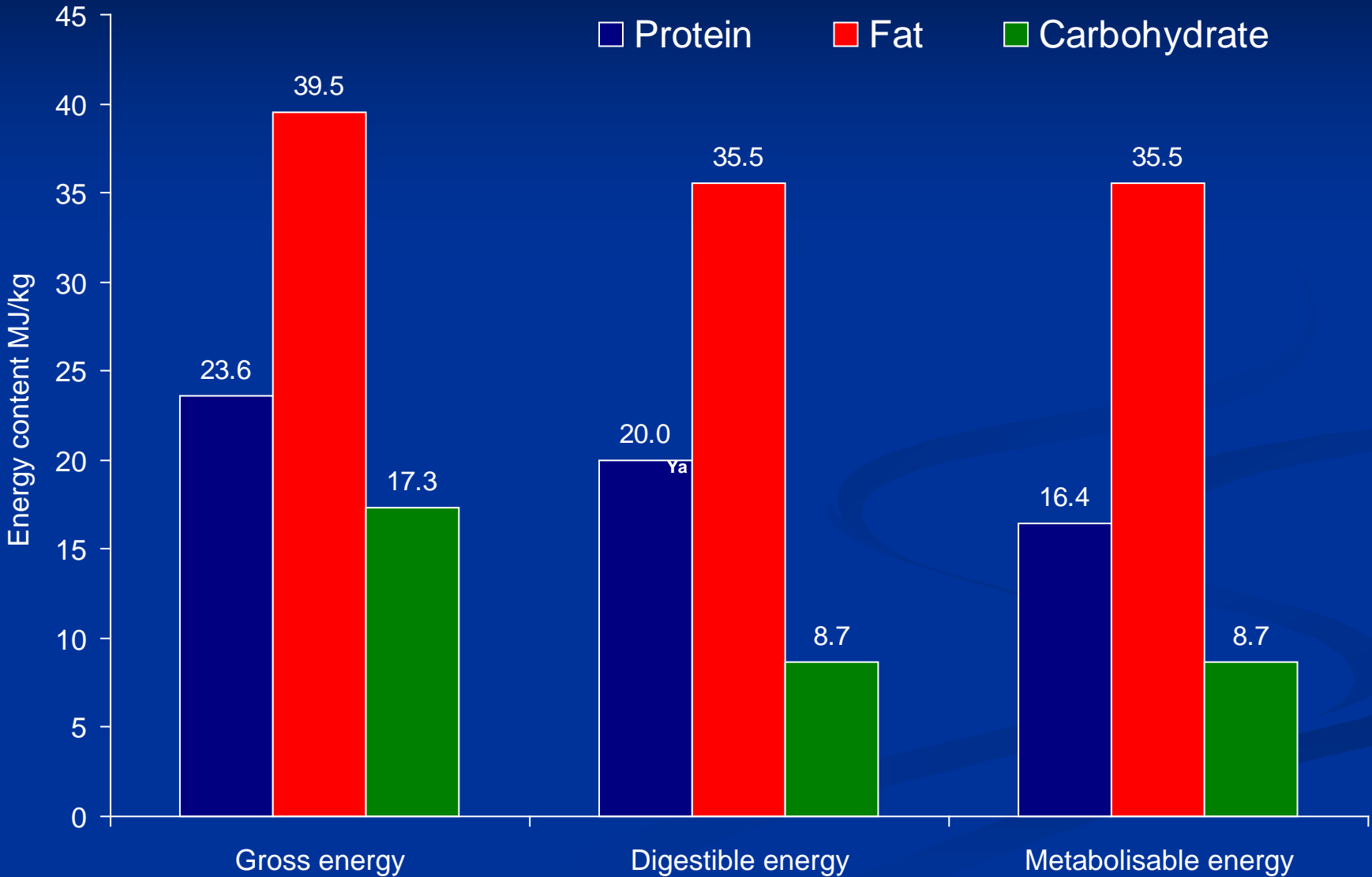
Burn Fats and Carbos to supply energy

Energy Budgets

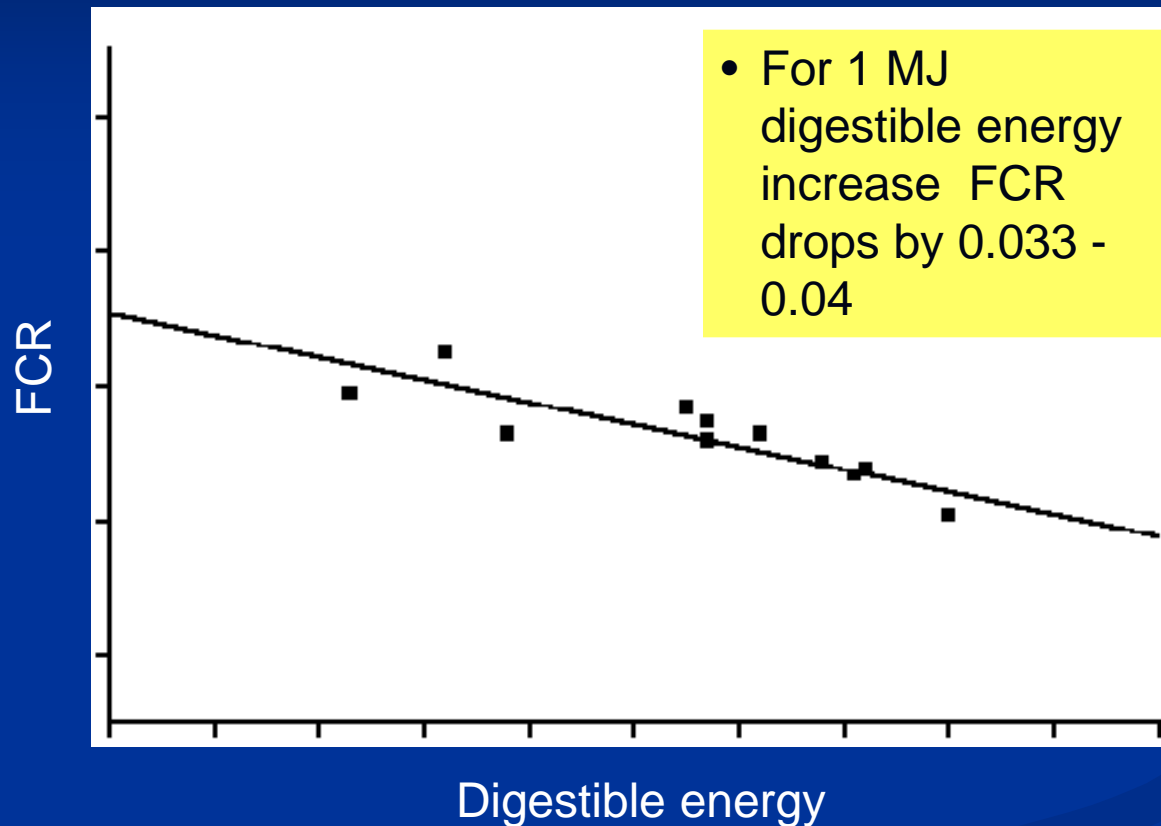


from Kaushik and Medalé, 1994

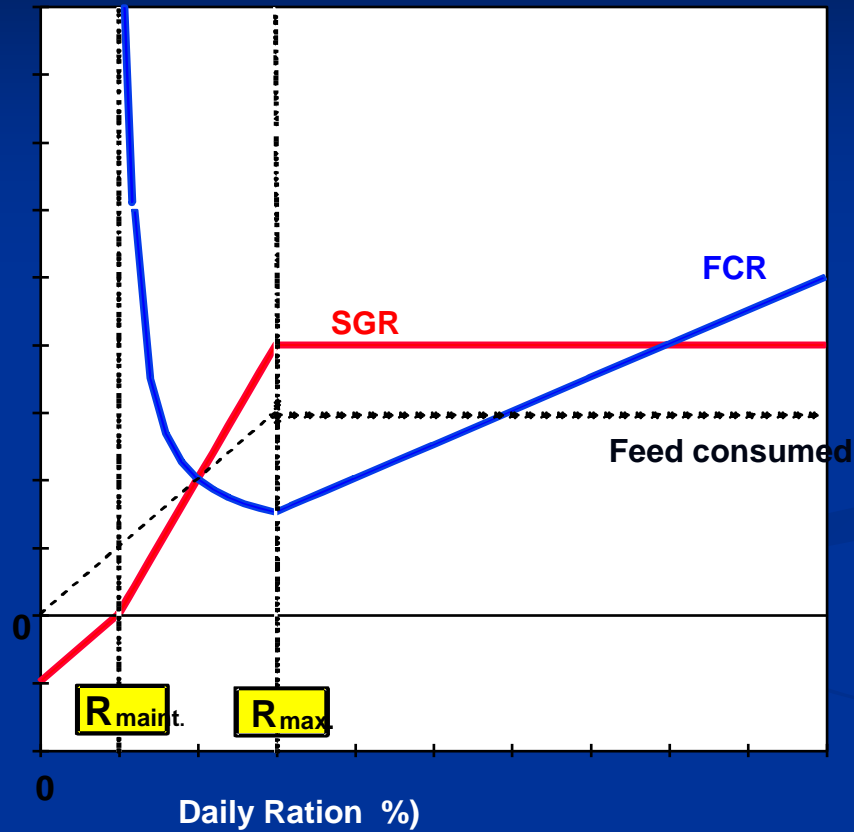
Caloric values of the main ingredients



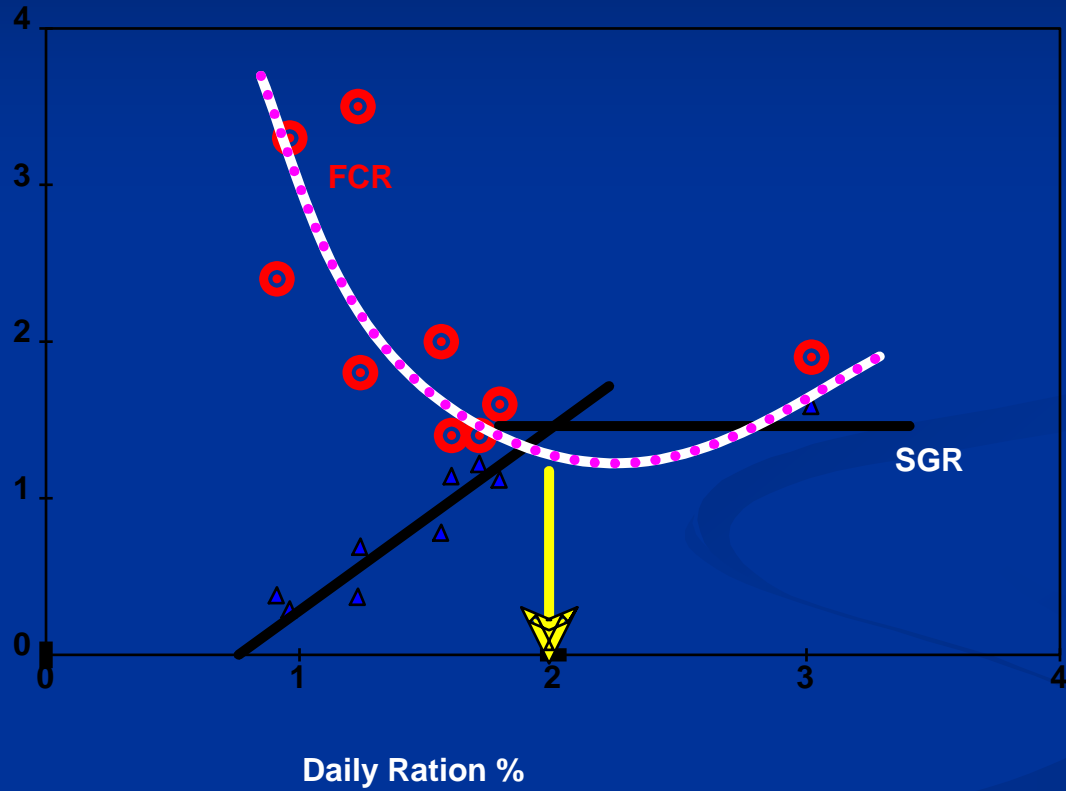
Digestible energy and FCR



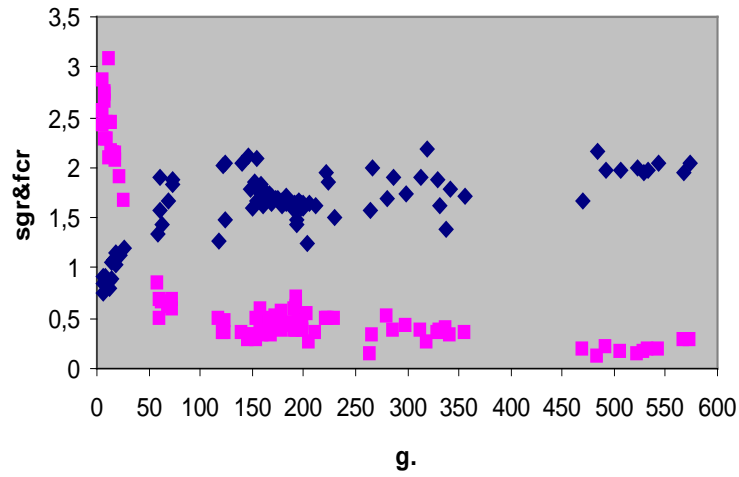
How much to feed? Growth Rate Curves (GRC)



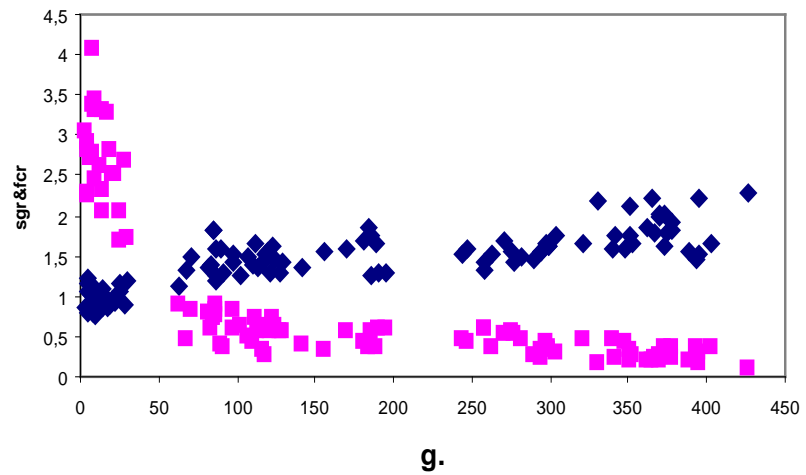
Growth and FCR in Sea Bream



Sea Bass SGR & FCR



Sea Bream SGR & FCR



Thanks