Formulated feed development for common octopus (*Octopus vulgaris*).

Jesus Cerezo Valverde

Formulated feeds have been recently developed that are acceptable to octopus with good growth rates and feed efficiency. It was deduced that such feeds should be stable in water and with a firm and homogenous (non-granular) texture, have a degree of flexibility so as not to disaggregate during manipulation. Also, the presence of chemical substances that might lead to rejection had to be avoided. Fish, crustacean or mollusc paste mixed with different binders (alginates or gelatines) gave a moist feed (>70% water) with a texture that was suitable for manipulation and ingestion. Semi-moist feeds (41-54 % water) include approximately similar parts of water and dry ingredients (meals or freeze-dried or protein concentrates). Also include binder such as gelatine, starch or gums. Specific growth rates were between 0.4-1.4 % body weight/day. Noteworthy is the high feed efficiency rates obtained with semi-moist feeds (80-116% of the food consumed). Our results suggest that efforts should be aimed towards improving intake, by optimizing textures or including attractants, as well as improving nutritional composition. In this sense, studies on short-term starvation and exhaustive studies on the biochemistry of cephalopods and their natural diets are helping us in understanding nutritional requirements for cephalopods.

COST Action FA1301 *CephsInAction* (14-16 March Meeting, Barcelona)

Optimal water quality parameters for common octopus (*Octopus vulgaris* Cuvier, 1797) maintenance.

1. Temperature
2. Oxygen Levels
3. Water flow rates
4. Nitrogen compounds
5. Salinity

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TEMPERATURE VALUES FOR OCTOPUS: GROWTH

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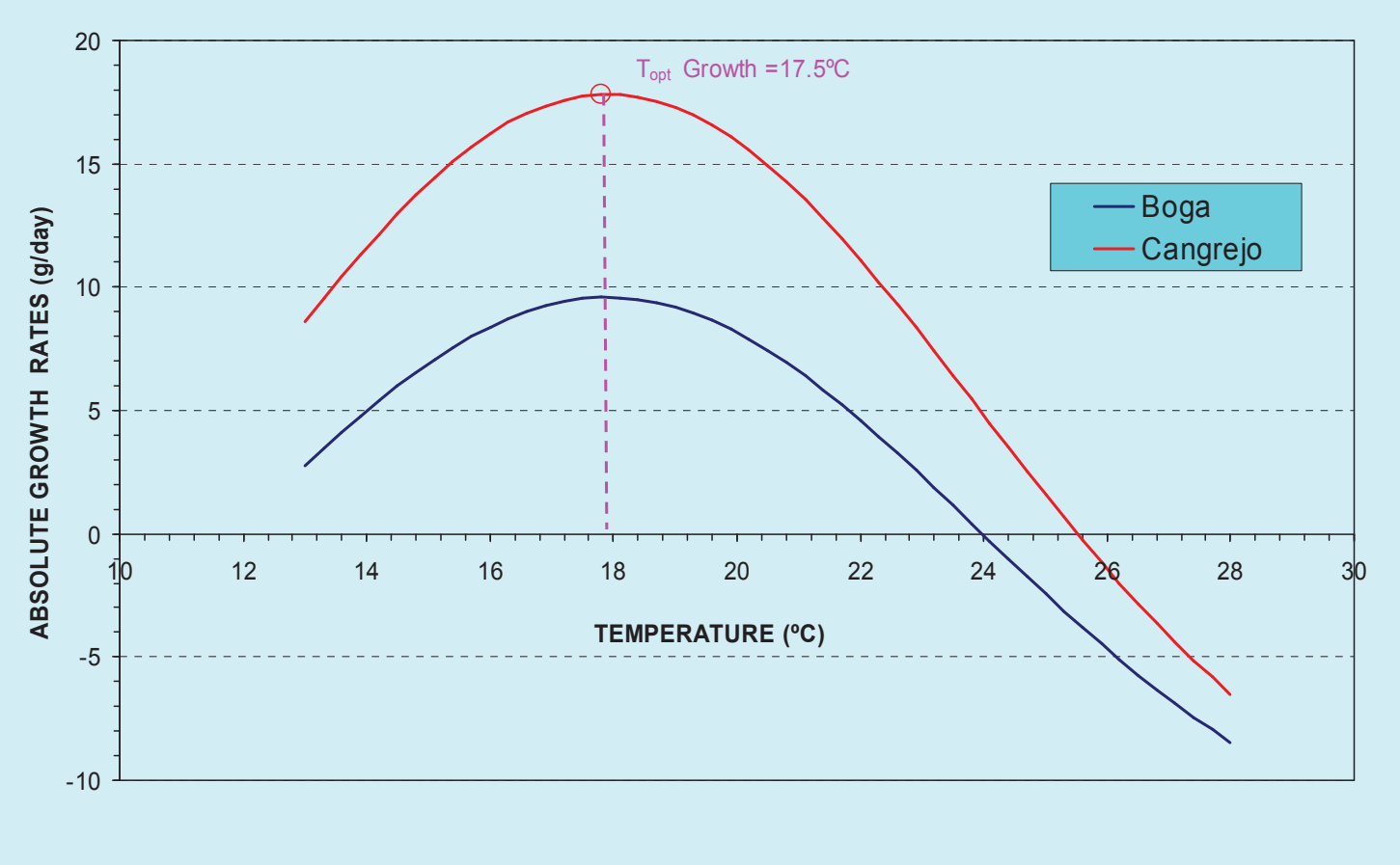
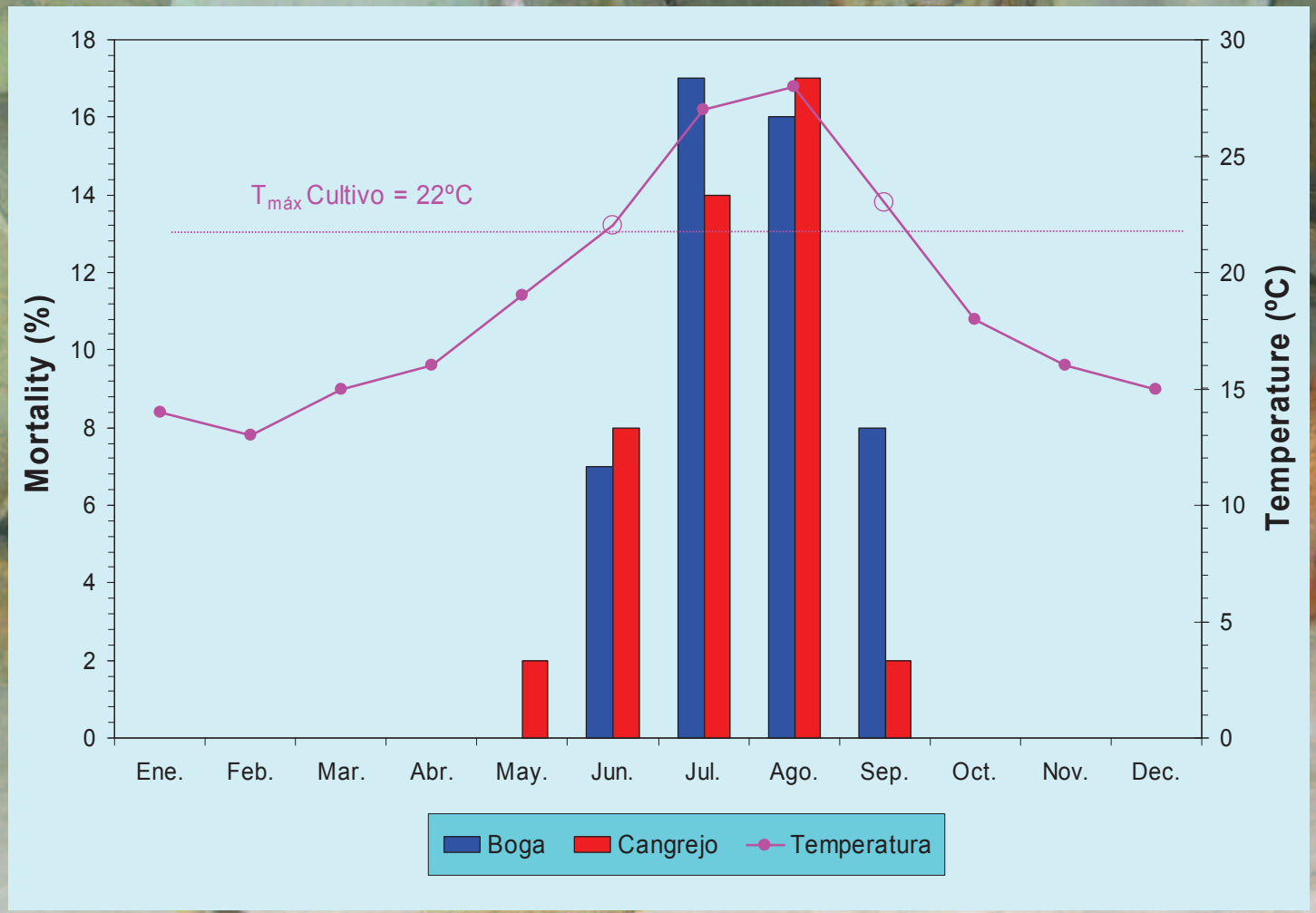
Maximum Growth Rates: 17-19ºC



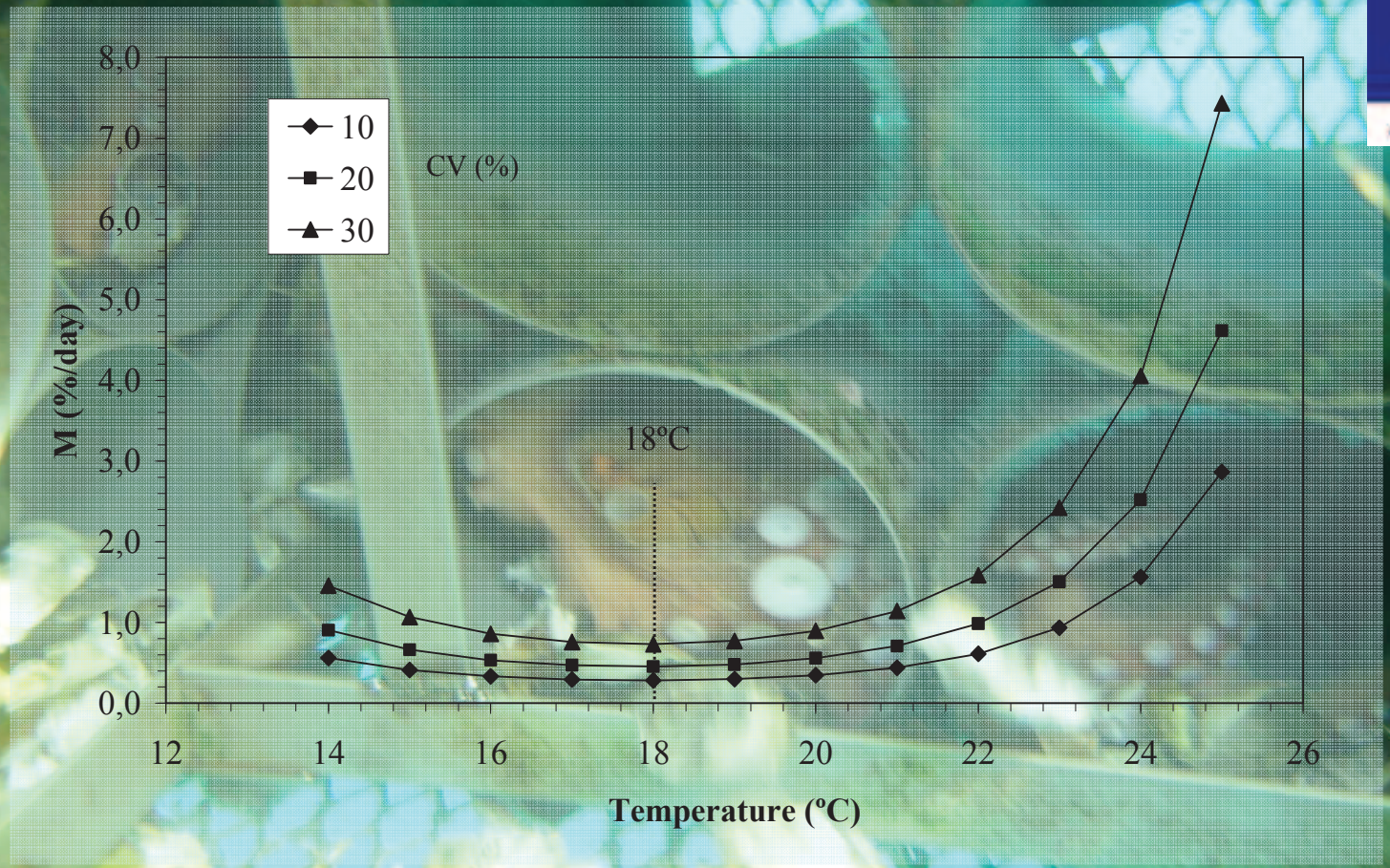
Aguado Giménez, F. & García García, B. (2002). Growth and food intake models in *Octopus vulgaris* Cuvier (1797): influence of body weight, temperature, sex and diet. Aquacult. Int. 10: 361-377

TEMPERATURE VALUES FOR OCTOPUS: SURVIVAL (TANKS)



Aguado Giménez, F. & García García, B. (2002). Growth and food intake models in *Octopus vulgaris* Cuvier (1797): influence of body weight, temperature, sex and diet. Aquacult. Int. 10: 361-377

TEMPERATURE VALUES FOR OCTOPUS: SURVIVAL (OFF-SHORE SEACAGES)



García García, B., Cerezo Valverde, J., Aguado-Gimenez, F., García García, J., Hernandez, M.D. Growth and mortality of common octopus *Octopus vulgaris* reared at different stocking densities in Mediterranean offshore cages. Aquacult. Res., 40: 1202-1212.

Suitable dissolved oxygen levels for octopus

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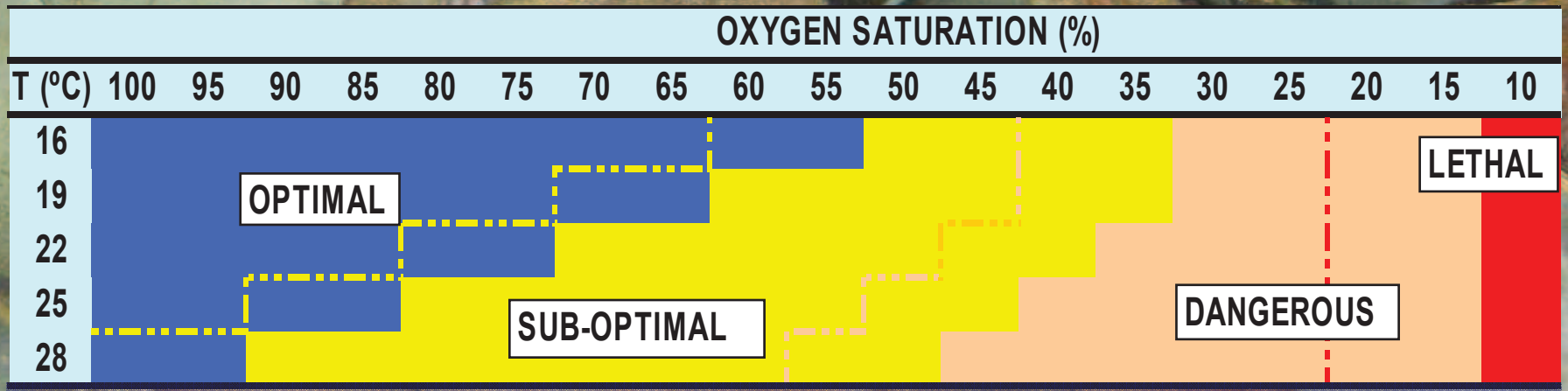
1. Depending on Temperature and Body Weight

2. Oxygen saturation levels for *O. vulgaris*:



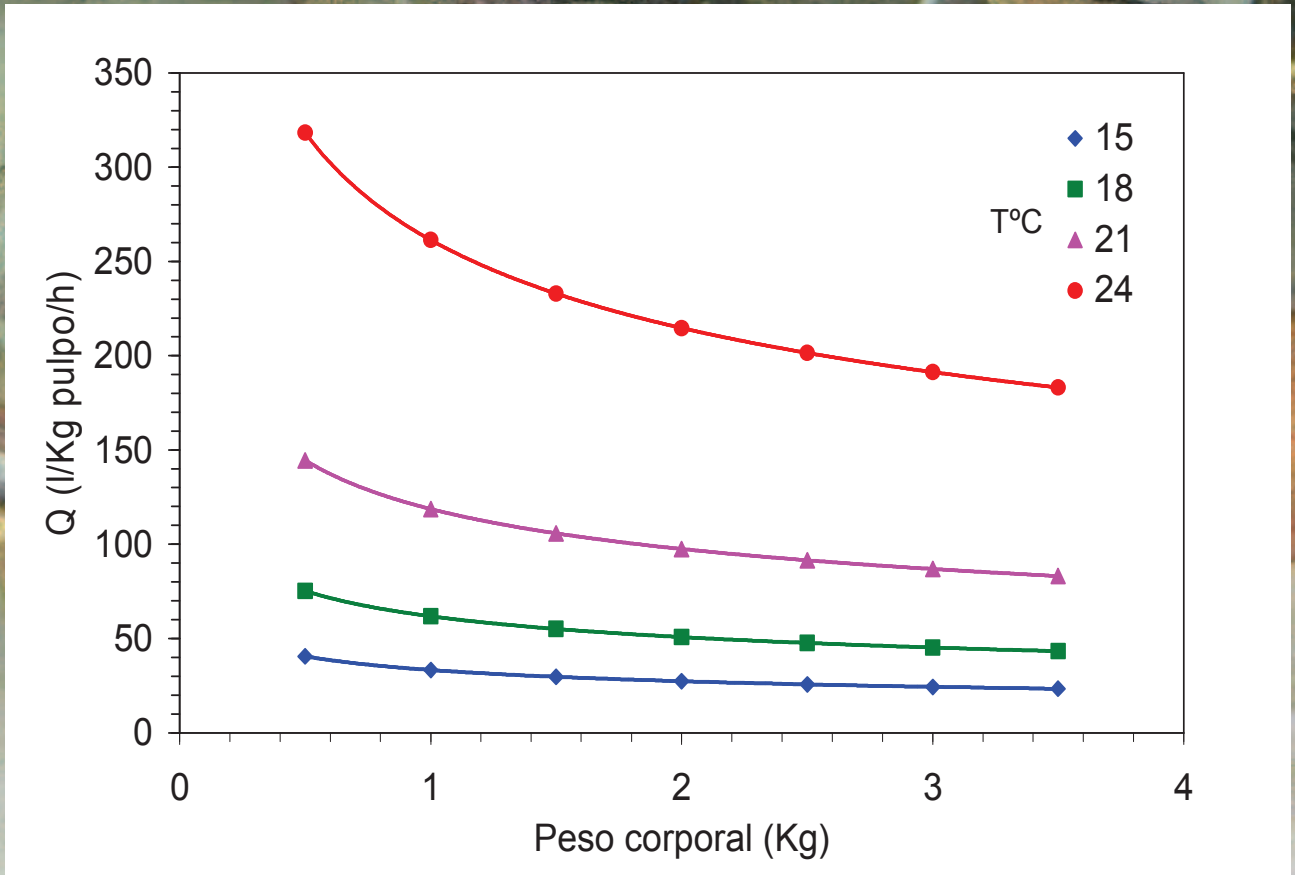
Values estimated for a 500-g body weight animal at different temperatures

-Optimal: Vf and MO2 are not disturbed;
-Sub-optimal: Vf is disturbed but not MO2;
-Dangerous: both Vf and MO2 values are disturbed;
-Lethal: Vf stopped for 60 s.

Cerezo Valverde, J. & García García, B., 2005. Suitable dissolved oxygen levels for common octopus (*Octopus vulgaris* Cuvier, 1797) at different weights and temperatures. Aquaculture, 244: 303-314.

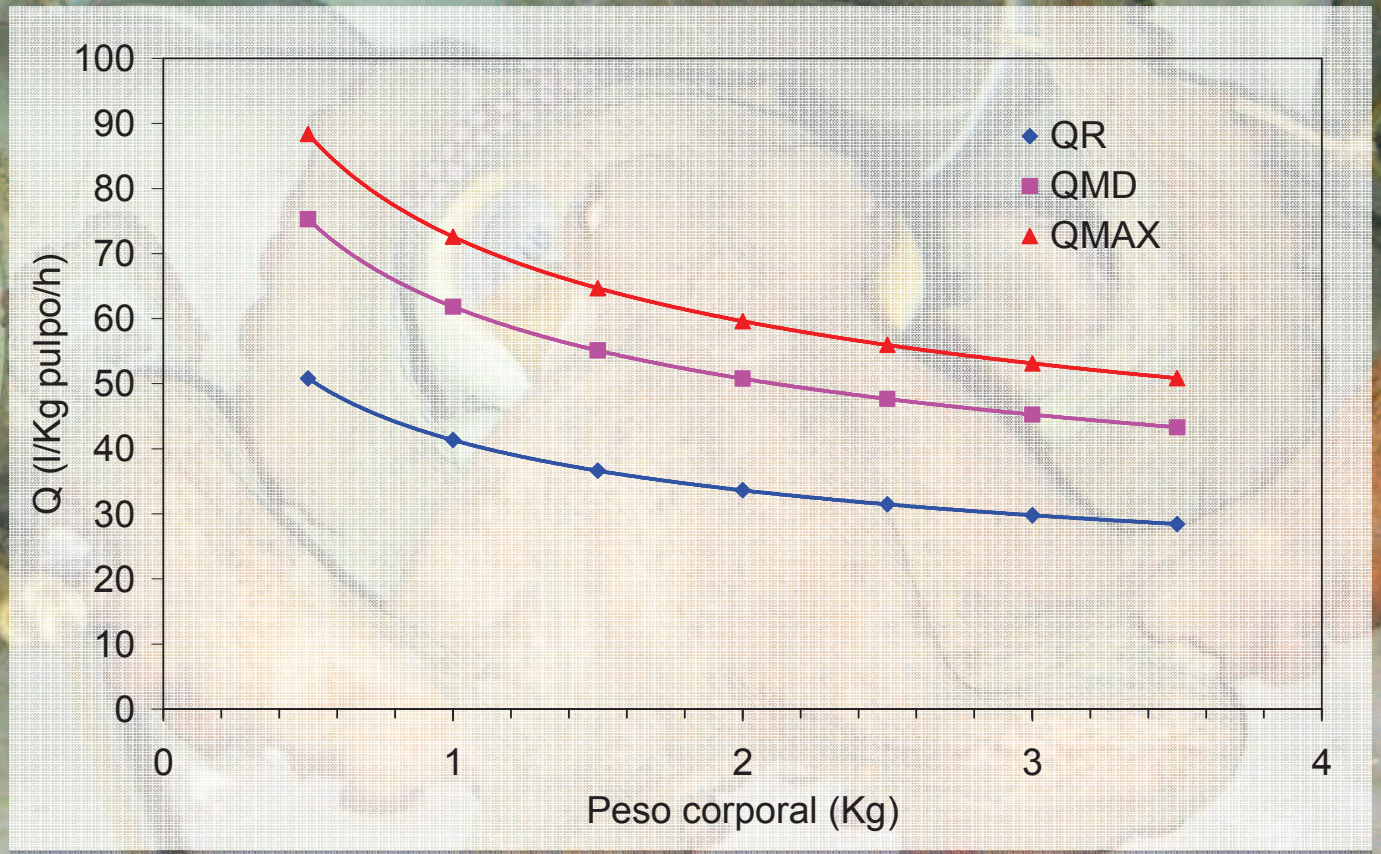
WATER FLOW RATES FOR OCTOPUS: TEMPERATURE & BODY WEIGHT

Mean Daily Flow Rates with Feeding at different temperatures and body weight (litres/kg/hour)



Cerezo Valverde, J. & García García, B. (2004). Influence of body weight and temperature on post-prandial oxygen consumption of common octopus (Octopus vulgaris).(2005/Aquaculture, 244: 303-314)

WATER FLOW RATES FOR OCTOPUS: FEEDING



QR = Mean Daily Flow Rates (Starvation-Routine Status)

QMD = Mean Daily Flow Rates with Feeding

QMAX = Maximum Flow Rates to cover maximum peak post-feeding

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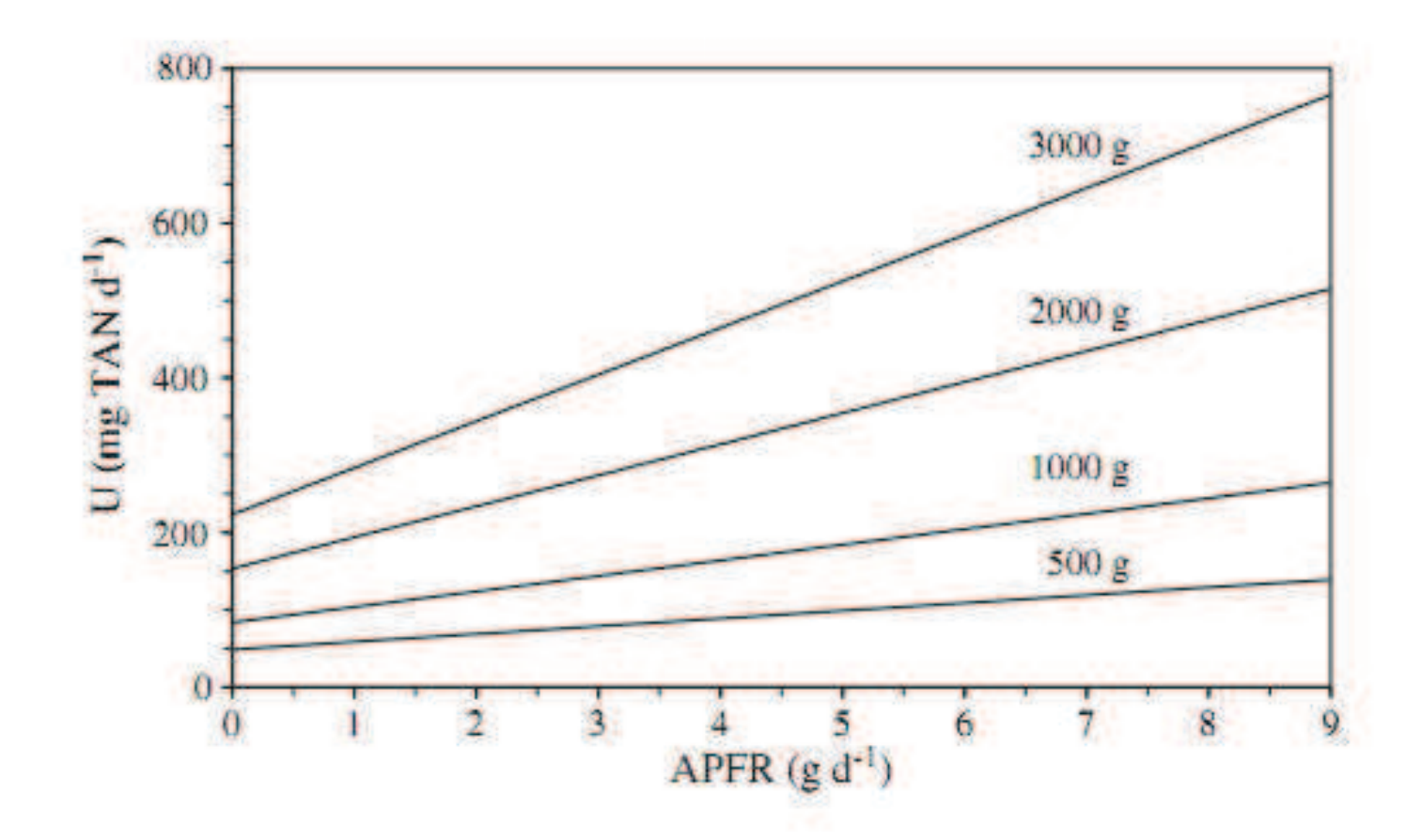
NITROGEN COMPOUNDS

NITROGEN COMPOUNDS	Aquaculture Research Purposes (Subadults-Adults)
TAN ($N\text{-}NH_4^+ + N\text{-}NH_3$) (mg/L)	<1.00
$N\text{-}NH_3$ (mg/L)	<0.1
$N\text{-}NO_2$- (mg/L)	0.1
$N\text{-}NO_3$- (mg/L)	20.0

NITROGEN COMPOUNDS: AMMONIA EXCRETION



García García B., Cerezo Valverde J., Gómez E., Hernández M.D., Aguado-Giménez, F. (2011). Ammonia excretion of octopus (*Octopus vulgaris*) in relation to body weight and protein intake. Aquaculture 319: 162-167.

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SALINITY VALUES FOR OCTOPUS

-PERSONAL OBSERVATION (IMIDA): Abrupt changes in salinity (37 to 34 gr/L on the same day) cause massive escapes.

-CHAPELA et al. (2006), Rías Galicia: High mortality below 32 gr/L

-DELGADO et al. (2011), IRTA: No differences in growth or survival in a range of 29-34 gr/L