Insectmeal in aquafeeds: consumers perception

Melenchón F.[1], Larrán A.M.[1], de Mercado E.[1], Sanz Calvo M.A.[1], Tomás-Almenar C.[1], Cardenete G.[2], Fabrikov D.[3]

1 Agro-Technological Institute of Castilla y León (ITACyL)
2 Zoology Department, University of Granada
3 Biology and Geology Department, University of Almería

EUROSENSE 2020 A Sense of Innovation
9th European Conference on Sensory and Consumer Research
ONLINE: Live and On-demand   13–16 December 2020

Insects are a good protein alternative for fish food, but Spanish citizens have prejudices

More than 5 yearly million tons of fishmeal are being extracted from the sea to feed aquaculture fish (FAO, 2020)

WE NEED ALTERNATIVE PROTEIN SOURCES IN AQUACULTURE

INSECTS are sustainable and have shown good performances, both in fish growth and as functional ingredients by enhancing the antioxidant system. However, they seem to worsen the ω-3 fatty acid profile of the fillet, which could be fixed through different strategies. In other words... they need more research, but they LOOK PROMISING!

WHAT IS THE PERCEPTION OF THE CONSUMERS?

CONSUMER PERCEPTION
SENSORIAL ANALYSIS + OPINION SURVEY

Raw fish
• Fillet
• Whole fish

Cooked fillets (trained panellists)

METHODS – sensorial analyses(*)

3 Experiments on rainbow trout; 3 Growth trials (up to 140, 90, and 415 g respectively; different diets, 4 replica)

1st: control + 2 HI diets + 2 TM diets
2nd: control + 3 HI diets + 1 TM diet
3rd: control + TM diet

Sensorial analysis in raw fish

Sensorial analysis in cooked fillet of 3rd trial

Recirculating system
T. 13-15 °C
Ox. 8-10 ppm
12:12 h L/D

* HI ➔ Black soldier fly (*Hermetia illucens*)
TM ➔ Mealworm (*Tenebrio molitor*)
-1st trial: 15% (H15, T15) and 30% (H30, T30) fishmeal replacement with both insectmeals.
-2nd trial: 30% (H30) and 50% (H50) fishmeal replacement with HI (one of them, omega-3 enriched, Hm50) + 50% fishmeal replacement with TM (T50)
-3rd trial: 50% fishmeal replacement with TM (T50)
Attributes measured for both raw and cooked fish analyses described in results. Sensorial analyses in raw fish based on a modified version of QI method (Bremner, 1985).

METHODS – survey

Meanwhile...
Survey: 70 potential Spanish consumers
Would you eat...?
Personal opinion on insect-fed aquaculture fish
But... why?!
Give a reason!

- **Two different insects tested as feed** for different life stages of rainbow trout

- Only a **small difference in colour** between "traditional" and insect-fed rainbow trout

- **Insects almost do not interfere with consumers perception**!

-Panellists did not highlight any differences.

- Surveys reveal a **quite strong rejection** towards insect-fed fish

- When asked why, **reasons tend to diverge** (some cannot even give a real reason!)

- **Sensorial analyses do not agree** with survey...

- Are we facing **cultural prejudices**? It is all in the mind of the consumer!

Discussion

Our results match the current bibliography, since it has already been described that insect-based diets can lead to changes in fish fillet colour (Iaconisi 2017; Iaconisi 2018). However, the work of Borgogno (2016) described small changes in several attributes such as tenderness and metallic flavour when using higher inclusion levels of HI, which means that more research is needed in this topic.

Talking about the survey, the results were kind of expected due to cultural reasons. Bazoche (2020) described that some factors such as neophobia, personal information concerning environmental consciousness, or even gender, can influence these opinions. In this way, education and consciousness raising about environmental sustainability could help on the topic of introducing insects as a viable protein alternative for fish.

References

- Bremner, H. A. 1985. A Convenient, Easy-to-Use System for Estimating the Quality of Chilled Seafood. Fish Process. Bull., 7: 59-70.
- Borgogno M. et al. 2016. Inclusion of Hermetia illucens larvae meal on rainbow trout (Oncorhynchus mykiss) feed: effect on sensory profile according to static and dynamic evaluations. J. Sci. Food Agric., 97: 3402-3411.
- Iaconisi V. et al. 2017. Dietary inclusion of Tenebrio molitor larvae meal: Effects on growth performance and final quality treats of blackspot sea bream (Pagellus bogaraveo). Aquaculture, 476: 49-58.
- Iaconisi V. et al. 2018. Mealworm as dietary protein source for rainbow trout: Body and fillet quality traits. Aquaculture, 484: 197-204.
- Bazoche P., Poret S. 2020. Acceptability of insects in animal feed: A survey of French consumers. J Consumer Behav., 1–20
- FAO. 2020. The state of world fisheries and aquaculture, sustainability in action.

RESULTS (Sensorial analysis)

Sensorial perception in raw fish...

Sensorial analysis (raw, 1st trial)	CONTROL	H15	H30	T15	T30	SEM
Acceptability	2.28	2.91	2.52	2.68	2.43	0.25
Colour	3.1	3.42	3.99	3.8	3.94	0.26
Texture	1.52	1.57	2.23	1.91	1.36	0.29
Odour	1.96	2.7	2.96	2.51	2.93	0.25
QIm	2.89	2.22	2.83	3.22	2.94	0.29

Sensorial analysis (raw, 2nd trial)	CONTROL	H30	H50	Hm50	T50	SEM
Acceptability	3.00	3.37	2.78	3.39	3.08	0.46
Colour	4.76ab	5.38a	3.65b	5.77a	4.78ab	0.34
Texture	2.18	2.58	2.53	2.28	2.27	0.45
Odour	2.43	2.56	2.73	2.74	2.18	0.41
QIm	5.00	3.93	5.93	4.02	3.79	0.60

QIm ➔ Quality Index method; Diets explained in methods section; SEM ➔ Standard Error of the Mean

The highest inclusion of *Hermetia illucens* (18% in feed), decreased the colour intensity of raw fillet.
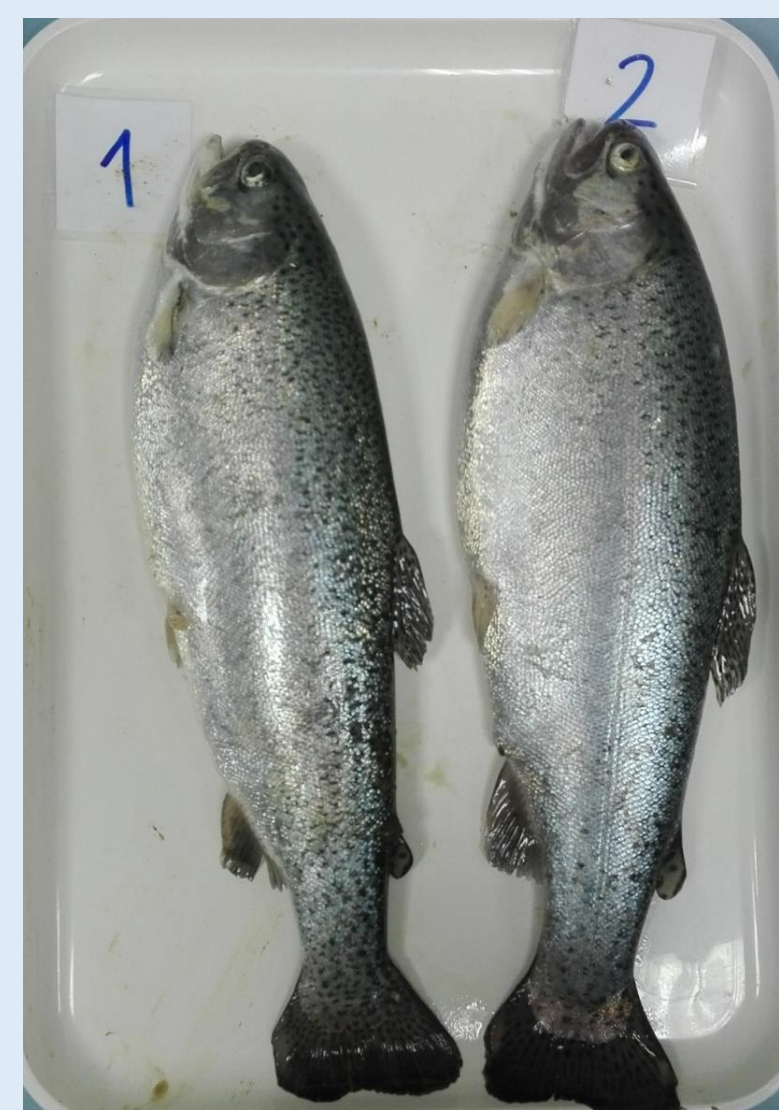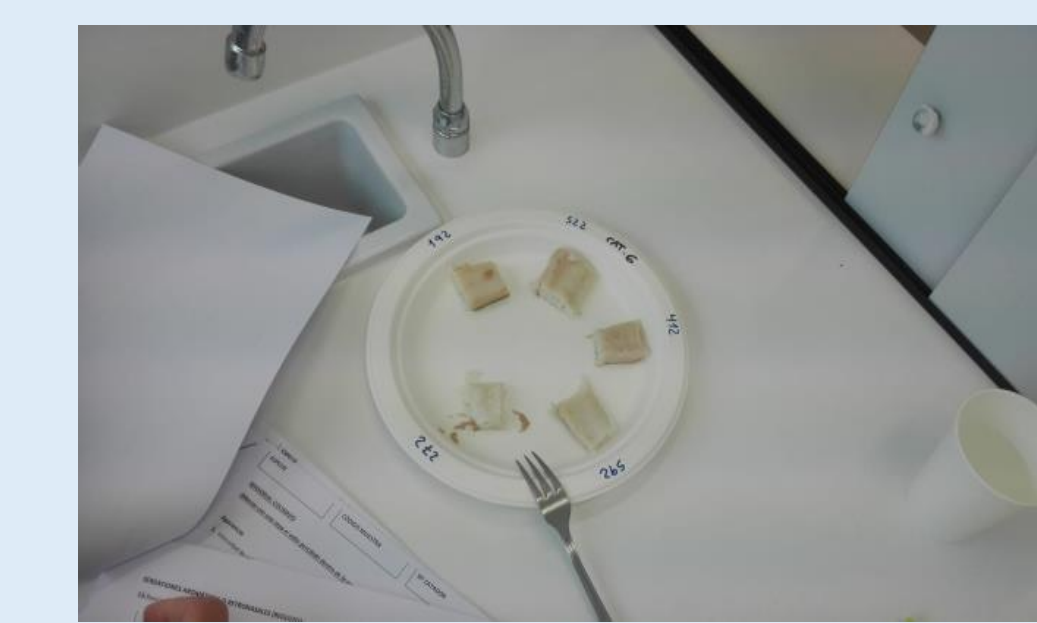
Sensorial perception after cooking...

Sensorial analysis (cooked, 3rd trial)	CONTROL	T50	SEM
General Appearance			
Brightness	9.04	9.03	0.24
Exudate colour	7.48	7.53	0.67
Colour intensity	7.22	6.99	0.57
Colour uniformity	7.84	7.86	0.33
Odour intensity	6.58	5.74	0.49
Taste			
Sweet	2.37	1.46	0.46
Salty	1.95	2.05	0.56
Bitter	0.6	1.26	0.40
Sour	0.37	0.44	0.18
Texture			
Hardness	2.72	2.41	0.56
Juiciness	5.46	4.79	0.53
Fatty	2.49	3.49	0.65
Gumminess	4.18	3.24	0.63
Teeth adherence	3.79	3.16	0.62
Flavour			
Rancid	1.33	1.29	0.43
Vegetable	1.53	0.91	0.33
Earthy	3.41	3.58	0.66
Sea	2.98	2.78	0.59
Fatty sensation	1.86	2.24	0.52

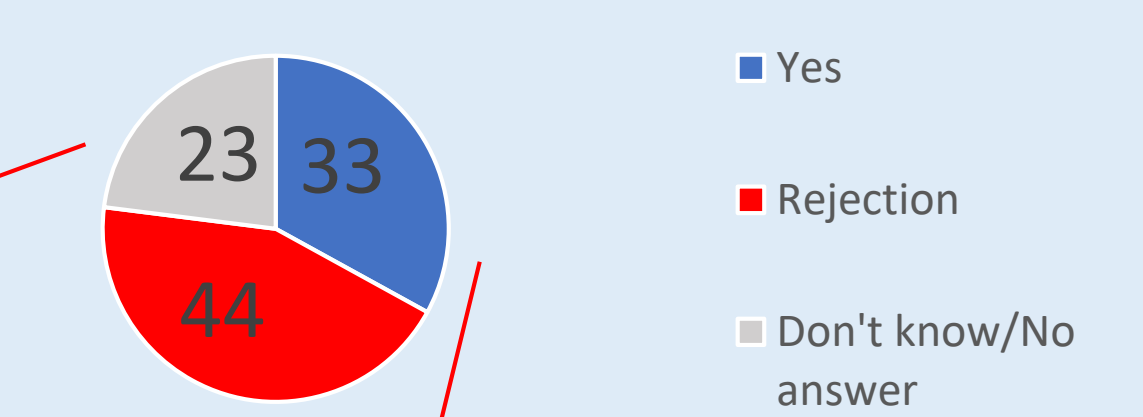Diets explained in methods section; SEM ➔ Standard Error of the Mean

The panellist did not notice any significant changes in fish fed the highest inclusion of *Tenebrio molitor* (18% in feed, 50% fishmeal replacement).
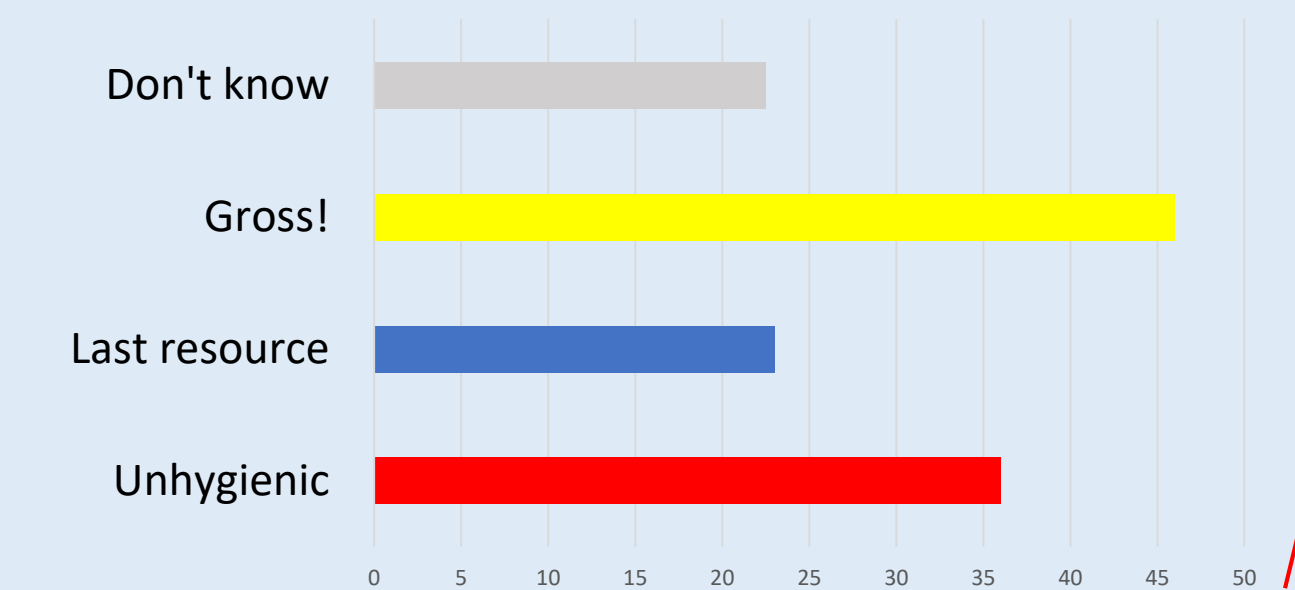
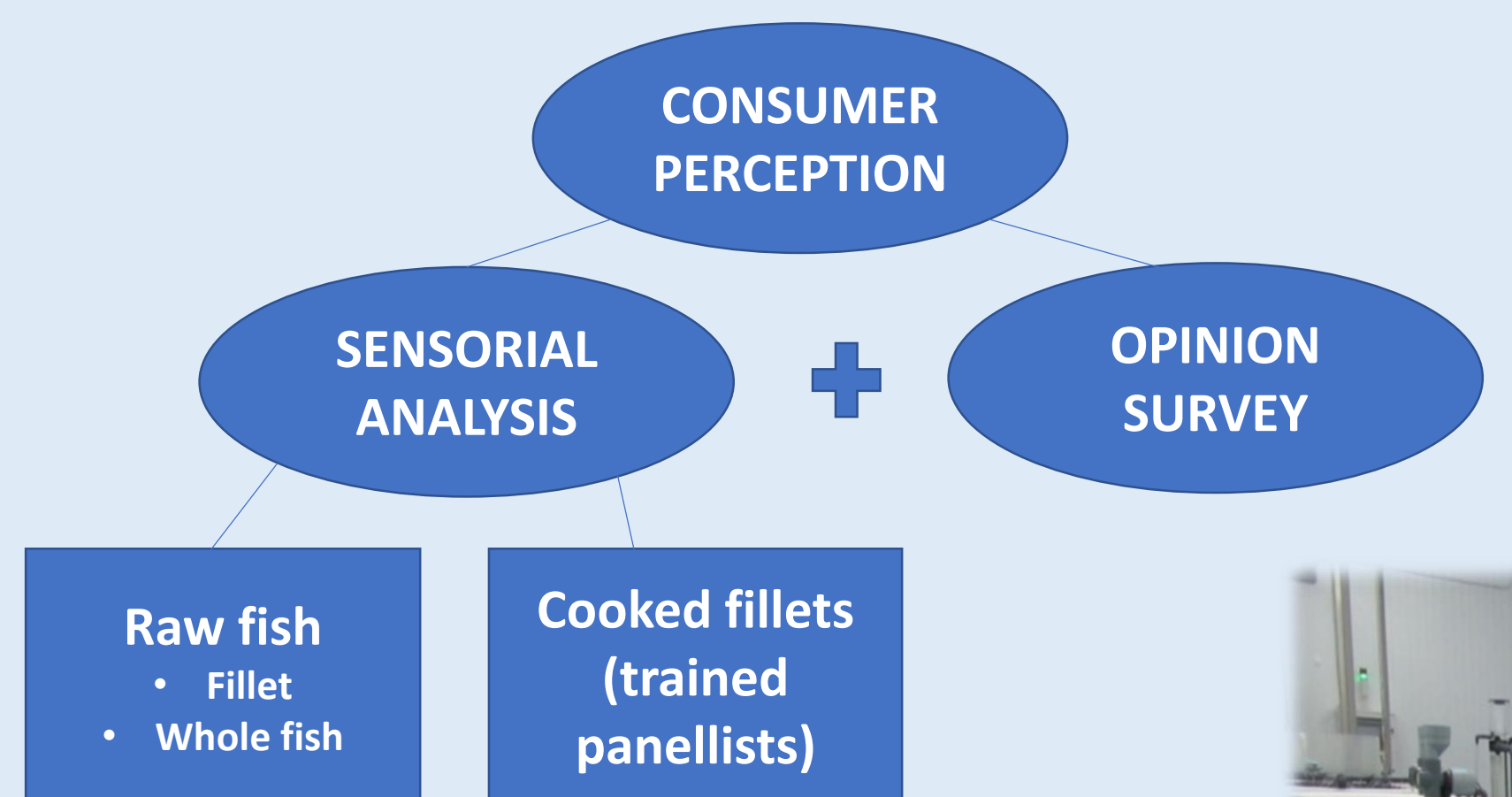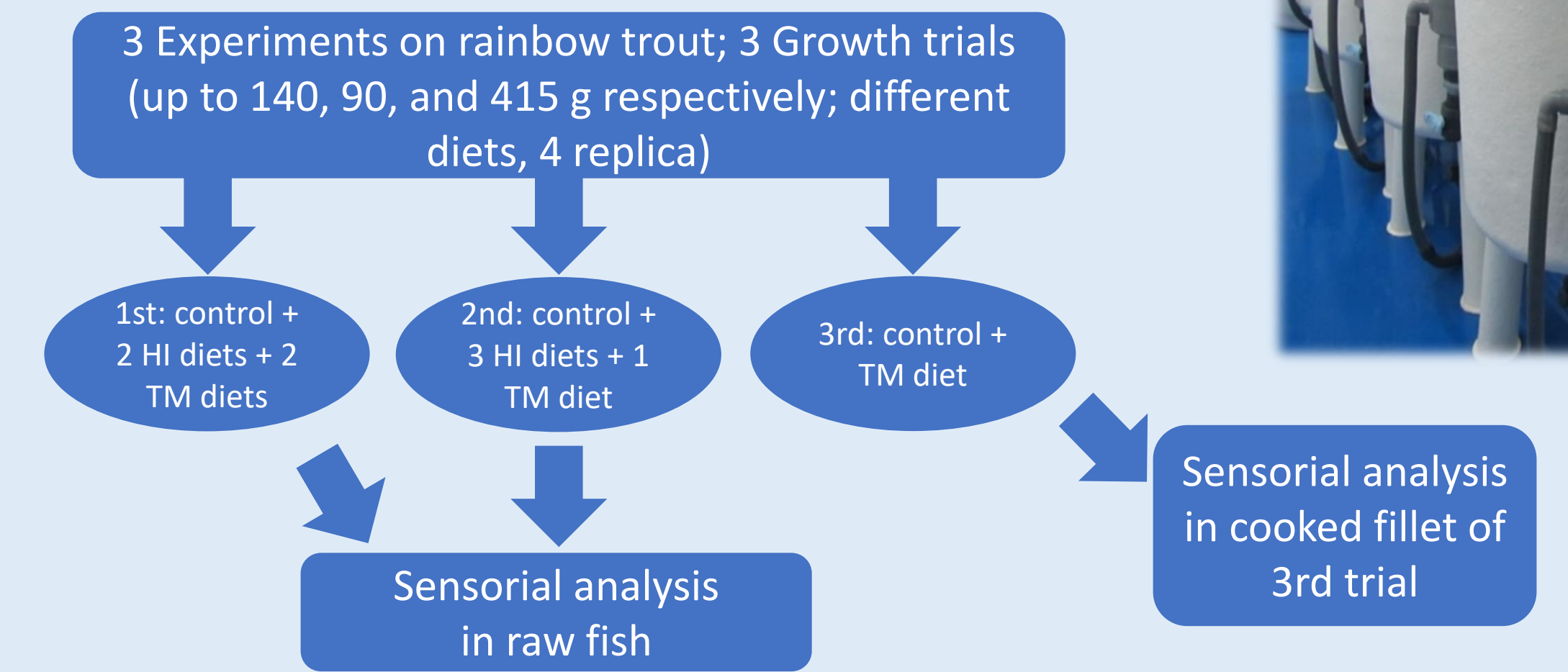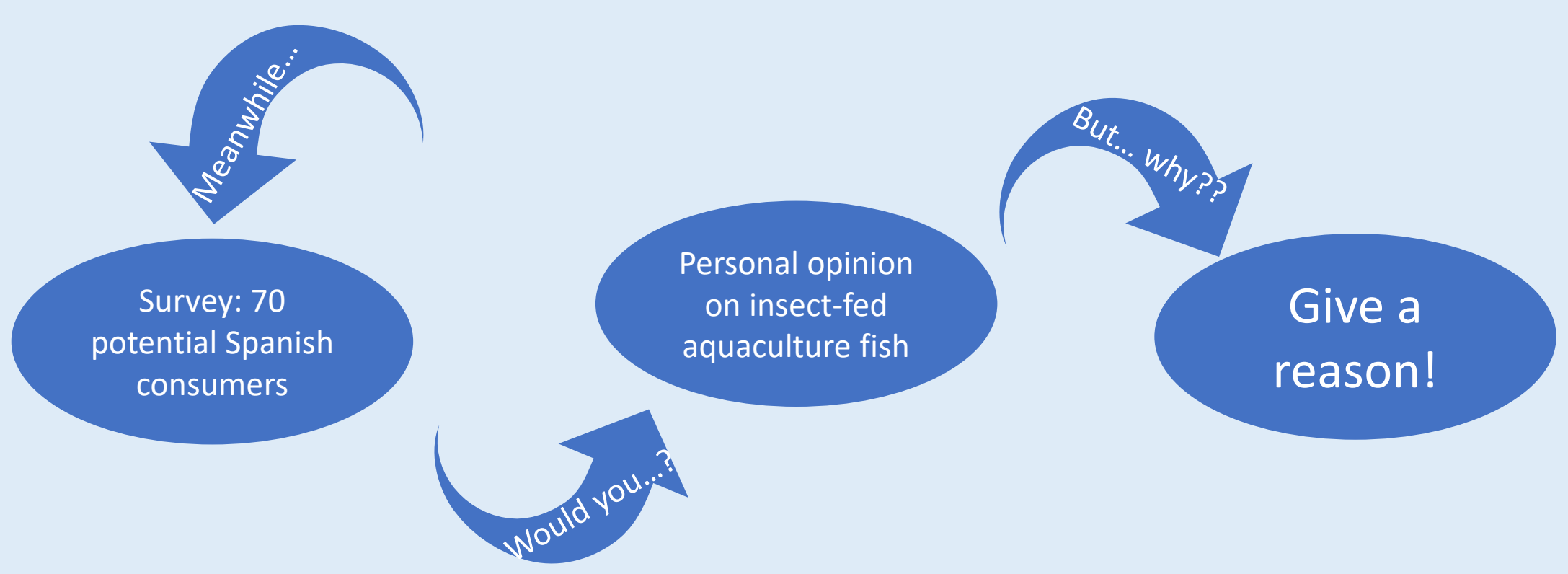### RESULTS (Survey)

Would they consume? (%)

- Yes: 33
- Rejection: 44
- Don't know/No answer: 23

Why not? (% inside rejection)
- Don't know
- Gross!
- Last resource
- Unhygienic

There are cultural motives and prejudices.