New trends in fish consumption patterns and the changing role of family-rooted food habits: A latent class approach

Nela Filimon[1] and Francesc Fusté-Forné[2]

[1] Department of Business, University of Girona. Carrer Universitat de Girona, 10, 17003 Girona, Spain. Serra Húnter Associate Professor. Telephone number: +34 972 41 80 40. E-mail: nela.filimon@udg.edu

[2] Department of Business, University of Girona. Carrer Universitat de Girona, 10, 17003 Girona, Spain. Serra Húnter Associate Professor. Telephone number: +34 972 41 80 40. E-mail: francesc.fusteforne@udg.edu

Abstract

The study analyzed Spaniards' fish consumption preferences and identified three clusters with latent class techniques: cluster 1 (36% of the sample, no fish consumers with family tradition); cluster 2 (32%, fish consumers with no family tradition); cluster 3 (32%, fish consumers with family tradition). Age, occupational status, and individuals' and family's own preferences for fish were determinant in segmenting the sample. Covariates such as, knowledge about farmed fish, distribution channels, fish species, motives/barriers, and socioeconomic variables, were used to profile the clusters. Findings show consumers' lack of knowledge about farmed fish, the increasing role of working environment in defining food preferences, and that fish consumption habits rooted in the family are not binding for the younger and adult generations, among others. Findings could contribute to design adequate communication campaigns to increase the knowledge about farmed fish and enhance the role of food-related cultural resources reproduced across generations.

Keywords: Farmed fish, latent class analysis, fish species, motives/barriers, cultural reproduction of food habits.

New trends in fish consumption patterns and the changing role of family-rooted food habits: A latent class approach

1. Introduction and brief review of the literature

Fish is an important component of the Mediterranean diet, which became part of UNESCO's intangible cultural heritage of humanity (UNESCO, 2020). The increasing consumption of fresh fish and seafood products, either farmed or wild, has attracted much attention from the researchers in the field, with a focus on various issues, such as, wild fish as a scarce resource and the necessity to preserve the marine resources (Atalah and Sanchez-Jerez, 2020), the sustainability of farmed fish (Hoque, 2021), the quality of the wild versus farmed fish (Rickertsen et al., 2017), fresh fish's distribution channels (Carreras et al. (2023), consumers' response to seafood safety issues (Hoque and Myrland, 2022), consumers' perceptions, beliefs (Claret et al., 2014; López-Mas et al., 2021; Osmond et al., 2023), and literacy (Pulcini et al., 2020) about farmed versus wild fish, as well as their consumption habits and preferences (Carrassón et al., 2021; Osmond et al., 2023; Pulcini et al., 2020, etc.), among others.

Several studies have also analyzed consumers' socioeconomic and demographic variables in relation to their food consumption behavior and food choices, in different contexts, such as, generational cohorts and sustainability issues (Makowska et al., 2024), generational cohorts and attitudes towards healthy and quality food choices (Savelli et al., 2023) or generational changes, food-related lifestyles and the role of the cultural context (Arenas-Gaitán et al., 2022). In the same vein and related to fish consumption, in particular, Carrason et al. (2021) found that age and also gender, together with the lack of information and consumption habits, were contributing to consumers' misperception towards farmed fish in favor of wild fish; Pulcini et al. (2020) looked into Italian consumers' preference for farmed organic aquatic food and their willingness to pay a premium price for it and found that consumers' lack of knowledge, and a high price, among others, greatly explained the low level of consumption; Thong and Solgaard (2017) investigated the motives for seafood consumption and identified nine, for the French consumers: weight control and convenience were the most important, other motives being health, mood, sensory appeal, natural content, price, familiarity and ethical concern; authors also found that demographics such as personal status, family size, place of residence, among others, were important determinants. Overall, while most findings show the significant role of consumers' awareness and of various socioeconomic and demographic variables, other variables such as individuals' occupational status and likeliness of eating fish, family's fish consumption habits, and their role on the reproduction of fish consumption habits, have received less attention.

Concerning the methodological approach focused on identifying segments of fish consumers, several findings could be mentioned: Claret et al. (2014), for example, analyzed consumers' perceptions and beliefs about farmed and wild fish, and identified three clusters of fish consumers (traditional/conservative, connoisseur, and open to aquaculture), and variables such as knowledge about fish, education level, gender and age, had a significant contribution in profiling the clusters; in a recent study on Croatia, Krešić et al. (2022) described four segments of farmed fish consumers (the enthusiasts, the supporters, the indifferent, and the sceptics), confirming the significant role of sociodemographic variables such as age, income, employment, region of residence, and physical activity; López-Mas et al. (2021) segmented the consumers in five countries (France, Germany, Italy, Spain, and the United Kingdom) based on the assessment of 19 beliefs on aquaculture vs. wild fish with the purpose of highlighting the attributes contributing to improve the image of the farmed fish, often affected by the lack of proper knowledge; the authors identified five clusters: pro-wild fish, slightly pro-wild fish, balanced view, open to aquaculture, and pro-aquaculture; Masi et al. (2022) analyzed the two

most farmed fish species (sea bass and sea bream) in four Mediterranean countries (France, Spain, Italy, Greece) and identified 11 clusters; socioeconomic variables, purchasing habits and preferences, products' attributes, and labeling, were found significant in determining consumers' profiles in clusters.

In this line, we focused on Spaniards' fish consumption preferences and identified three latent clusters of fish consumers and their profiles: cluster 1, no fish consumers but with family tradition (36% of the sample); cluster 2, fish consumers with no family tradition (32%,), and cluster 3 (32%), fish consumers with family tradition. The analysis was based on a dataset of 473 observations, collected in 2024. We aimed to expand existing evidence by considering the age and other variables, such as, occupational status and consumers' private environment (i.e., individuals' likeliness of eating fish, family's preference towards fish) to segment the sample. This association falls into Bourdieu's cultural reproduction theory (Bourdieu, 1973), according to which individuals are likely to inherit family cultural resources transmitted across generations. Hence, food and fish, by extension, as a factor of Mediterranean cultural and culinary identity and tourism attraction (see Fusté-Forné, 2022; Arenas-Gaitán et al., 2022) offers an opportunity to investigate the impact of family's fish-related cultural resources (i.e., fish preferences, eating habits, gastronomic preferences, culinary knowledge, etc.) on their members' attitudes and preferences towards fish. The study unfolds as follows: section 1 presents the introduction and brief literature review, section 2 is dedicated to data and the methodology, in section 3 the results are discussed, and in section 4 we present the main conclusions and implications.

2. Methodology
2.1. Data and variables

The data were collected during the first trimester of 2024 and the selection of the respondents followed a convenience quota sampling method, based on age and gender, mapping the structure of the Spanish population (INE, 2023). A total of 473 individuals (15 years of age and older), answered questions related to: sociodemographic variables, most consumed fish species, farm fish vs wild fish preference and motives, and main purchasing channels used to buy fish. The main statistics are given in Table 1.

Table 1. Main statistics of the data set

Variable	(%)	Variable	(%)
Gender		**Education (finished studies)**	
Women	53.1	Primary school	12.5
Wen	46.9	Secondary school	37.8
Age		Vocational training	21.4
15-24 years	35.0	University and above	28.3
25-54 years	29.1	**Personal status**	
55+ years	35.9	Single w/no kids	30.9
Occupational status		Couple no kids	18.0
Employed	31.7	Couple w kids	41.2
Self-employed	10.4	Divorced/widowed	9.9
Student	15.2	**Monthly revenue (€)**	
Student & working	18.0	<1,000	27.7
Retired/Unemployed, other	24.7	1,000-2.000	29.0
Fish purchasing place		>2,000	17.3
Market	34.7	Prefer not to say	26.0
Traditional fishery	48.2	**Most preferred species**	
Supermarket	76.5	Salmon	68.5

Online w home delivery	5.7	Cod	44.2
Establishments take-away food	4.4	Sardines	40.0
Frozen food stores	21.1	Shrimps	52.4
Grocery shops	2.1	Squids	49.7
Motives for pref. farmed fish		Mussels	37.2
Flavor	35.7	Cuttlefish	33.6
Quality	42.9	Anchovies	24.1
Healthy	46.4	Tuna	52.6
Fresh	50.0	Rap	28.3
Price	21.4	Sea bass	18.6
Proximity	25.0	Pike	42.5
Origin	28.6	Golden fish	38.7
Sanitary controls	35.7	**You like fish?**	
Fish preference		Yes	67.2
Wild fish	68.9	No/depends on the specie	32.8
Farmed fish	5.9	**Your family eats fish?**	
Indifferent	25.2	Yes /no	89.0 /11.0

2.2. Research design and data analysis

To identify latent profiles of fish consumers we performed latent class analysis (LCA, Lazarsfeld and Henry, 1968), suitable to explore categorical variables (Daenekindt and Roose, 2014). The analysis was performed with Latent Gold 4.5 software (Vermunt and Magidson, 2008). With LCA, the sample is organized in clusters and each observation is assigned to only one cluster (Magidson and Vermunt, 2001). Two variables (age and occupational status) and two active covariates, used as restrictions, were used to segment the sample: 1) whether the respondent likes to eat fish: yes (67.2%); no or it depends on the species (32.8%); 2) whether the fish is eaten in the respondent's family: yes (89.0%); no (11.0%) (see Table 1). LCA starts by estimating the null model (1-class LCA) and the number of latent classes is gradually increased by one class at a time, if the model is not a good fit for the data, until it fails to reject the null model. The goodness of fit statistics for the selected LCA model (with 3 classes or clusters) are shown in Table 2 (lowest values are preferred): the Bayesian Information Criterion (BIC), the Akaike Information Criterion (AIK), the Consistent Akaike Information Criterion (CAIC) and the chi-squared likelihood-ratio statistic (L2), this last statistic accounting for the unexplained association among the variables analysed (see Raftery, 1986; Dayton, 1998, etc.). Among the models with a p-value>0.05 (a good fit for the data), the most parsimonious one (with less parameters) is preferred.

Table 2. Goodness of fit statistics for the LCA model

LCA	BIC(LL)	AIC(LL)	CAIC(LL)	No. par.	L²	df	p-value	Class Error
1-class	2502.7849	2477.8941	2508.7849	6	604.6974	50	2.90E-96	0.0000
2-class	2108.5502	2046.3232	2123.5502	15	155.1265	41	3.60E-15	0.0056
3-class	**2049.7014**	**1950.1382**	**2073.7014**	**24**	**40.9414**	**32**	**0.13**	**0.0567**
4-class	2091.534	1954.6346	2124.534	33	27.4378	23	0.24	0.1083

2.3. The parameters of the 3-clusters model

In Table 3 are presented the estimates of the selected model and the first row stands for the relative size of each segment or cluster: cluster 1 (36% of the sample) and cluster 2, and 3, 32% each, respectively. We present the LCA estimates following the row profile format due to its intuitive interpretation. Thus, the values in Table 3 indicate, for example, whether the individuals classified in a cluster are over- or under- represented among the individuals with a similar behaviour. Consumers in cluster 1, for example, are more likely to be over-represented (see bold figures) among young people (15-24 years), all students with some of them also working, who do not like fish (or depend on the specie) although their family do eat fish; cluster 1 (36%) average profile would be therefore given by young people, *no fish consumers with family tradition*; cluster 2 (32%) probabilistic profile is given by adults (25-54 years,), active in the labour market (either employed or self-employed), who like fish in spite of not being consumed by their family (adult *fish consumers with no family tradition*); the profile of cluster 3 (32%) is given by elderly fish consumers (55+ years), not active in the labour market (retired, unemployed or housework), whose families also eat fish (elderly *fish consumers with family tradition*). Overall, generational patterns (age) and occupational status have a significant contribution in the identification of the three clusters of fish consumers and the cultural reproduction of the fish consumption habits across generations.

Table 3. Probabilistic patterns of fish consumers (row profiles, %)

	Cluster1 *(no fish consumers with family tradition)*	Cluster2 *(fish consumers with no family tradition)*	Cluster3 *(fish consumers with family tradition)*	Total
Clúster size (%)	**36%**	**32%**	**32%**	100%
(s.e.)	(0.0227)	(0.0701)	(0.0693)	
A. Indicators				
Age				
15-24 years	**100%**	0%	0%	100%
25-54 years	5%	**93%**	2%	100%
55+ years	0%	13%	**87%**	100%
Occupational status				
Employed	8%	**71%**	20%	100%
Self-employed	10%	**71%**	18%	100%
Student	**100%**	0%	0%	100%
Student and working	**97%**	1%	2%	100%
Retired/unemployed/housework	0%	8%	**92%**	100%
B. Active covariates (restrictions)				
Do you like fish				
Yes	30%	**34%**	**36%**	100%
No/Depends on the specie	**50%**	27%	23%	100%
Your family eats fish				
Yes	**37%**	30%	**33%**	100%
No	33%	**47%**	20%	100%

3. Main results and discussion
3.1. Most preferred fish species

Clusters' profiles in relation to the most preferred fish species has shown that young people, Cluster 1 (*no fish consumers with family tradition*) are more likely to consume only three fish species – salmon, tuna and squid; Cluster 2, adult (fish consumers with no family tradition) and Cluster 3, elderly (fish consumers with family tradition), both manifest a greater preference for variety, being over-represented in nine fish species each; although the two clusters do share the preference for some species (cod, sardines, mussels, anchovies), they differ when comes about the species they do not like – cluster 2 (tuna, rap, sea bass, pike) and cluster 3 (salmon, shrimps, squid, tuna) – and have also specific fish preferences (cluster 2 -salmon, shrimps, squid, sepia and cluster 3 – rap, golden fish, sea bass and pike). Overall, the generational pattern still holds, the variety of the most preferred species increasing with age, together with individuals' likeliness of consuming fish, which is a determinant factor, independent of the family tradition towards fish consumption.

3.2. Distribution channel: Place for fish purchasing

The probabilistic profiles of the clusters are presented in Table 4. Findings show that Cluster 1 (36%) is more likely to use commercial channels like supermarkets, establishments with take-away food and groceries; cluster 2 (32%) prefer online shopping with home delivery, frozen food stores and the establishments with take-away food delivery; cluster 3 (32%), the elderly segment, are the ones preferring the market and the traditional fisheries (usually delivering mostly fresh fish), and also the online purchase with home delivery.

Table 4. Place for fish purchase (probabilistic row profiles %)

	Cluster1	Cluster2	Cluster3	Total
Size (%)	**36%**	**32%**	**32%**	100%
Market				
Yes	31%	28%	**42%**	100%
No	40%	34%	26%	100%
Traditional fishery				
Yes	34%	28%	**38%**	100%
No	39%	35%	26%	100%
Supermarket				
Yes	**40%**	32%	27%	100%
No	25%	30%	45%	100%
Online with home delivery				
Yes	19%	**44%**	**37%**	100%
No	38%	31%	31%	100%
Establishments with take-away food				
Yes	**40%**	**38%**	22%	100%
No	36%	32%	32%	100%
Frozen food stores				
Yes	35%	**38%**	27%	100%
No	37%	30%	33%	100%
Grocery				
Yes	**39%**	32%	29%	100%
No	36%	32%	32%	100%

3.3. Farmed vs wild fish preference. Motives and barriers

Clusters' profiles for these variables have returned the following results: the young segment, cluster 1 (*no fish consumers with family tradition*) is more likely to choose farmed

fish instead of the wild one, in spite of not perceiving any difference between the two types; the motives backing their choice are related to fish quality, being healthy and fresh, the price, origin and the sanitary controls; cluster 2, the adult consumers (*fish consumers with no family tradition*) prefer the wild fish due to its flavor; cluster 3, the elderly *fish consumers with family tradition*, are indifferent between farmed and wild fish and the motives are the price, proximity, origin and fish's freshness. As for the barriers to more consumption of farmed fish, cluster 1 states the lack of information, cluster 2, the high price and lack of variety, and cluster 3, has little interest in farmed fish.

3.4. The socioeconomic profile of the fish consumers

These variables contributed to complete the profile of the cluster, identifying the following distinctive features: consumers in cluster 1 are more likely to be women, single or living in couple without kids, either with lower revenues (<1,000 euros) or preferring not to disclose this information; students (some also working) ; cluster 2 is more likely to be over-represented among men, employed, and living in couple with kids; they also have, on average higher revenues (1,000-2,000 euros or above) and higher level of finished studies (university or more) although vocational training was also overrepresented for this segment; cluster 3, are men, with primary school or vocational training, not active in the labor market (retired, unemployed or engaged in house works), some living in couple with kids and others being divorced/widowed; their revenues oscillate between 1,000-2,000 euros with some of them choosing not to give this information.

4. Conclusions

LCA identified three balanced clusters of fish consumers: cluster 1 (36%) is the young women segment (15-24 years), not found of fish although their families do eat fish, cluster 2 (32%) the adult men (25-54), who do eat fish, most likely in the labor environment as their family does not eat fish; cluster 3 (32%) is the elder segment (55+), mostly men, traditional fresh fish consumers, whose families also do eat fish. Age and individuals' own preference for fish contribute to segment the sample; the cultural reproduction factor, that is, the transmission of fish-related consumption habits across generations is not determinant for the young and adult consumers (cluster 1 and 2); while the young ones do not preserve it, the adults form their fish consumption habits outside the family environment, most likely at work; the variety of preferred fish species increases with age, the socioeconomic variables contributing to differentiate clusters' profiles; lack of information about farmed fish is the main barrier for the young cluster while the adults (cluster 2) claim a lower price and more variety; wild fish is preferred by cluster 2 only, due to its flavor. Purchasing channels confirm existing evidence regarding the preference of older fresh fish consumers (cluster 3) for the traditional market and fishmongers (Carreras, et al., 2023). Findings are informative about the increasing role of the working environment in the formation of food consumption habits; they could also contribute to assist decision-makers in designing adequate communication campaigns to increase knowledge and awareness about farmed fish and its qualities and enhance the role of food-related cultural resources reproduced across generations. The analysis could be expanded to include sustainability issues and other countries, to measure the impact of the cultural context on the formation of farmed versus wild fish consumption preferences, among others.

References

Arenas-Gaitán, J., Peral-Peral, B., and Reina-Arroyo, J. (2022). Food-related lifestyles across generations. *British Food Journal*, 124(5), 1485-1501.

Atalah, J., and Sanchez-Jerez, P. (2020). Global assessment of ecological risks associated with farmed fish escapes. *Global Ecology and Conservation*, 21, e00842.

Bourdieu, P. (1973). Cultural Reproduction and Social Reproduction. In R. Brown (Ed.), *Knowledge, Education, and Cultural Change* (pp. 71-84). London: Tavistock Publications.

Carrassón, M., Soler-Membrives, A., Constenla, M., Escobar, C., Flos, R., Gil, J.M., Luzón, V., Piferrer, F., Reig, L. (2021). Information impact on consumers' perceptions towards aquaculture: Dismantling the myth about feeds for farmed fish, *Aquaculture* 544, 737137.

Carreras-Simó, M., Codinach-Segura, S., Filimon, N., and Fusté-Forné, F. (2023). Exploring consumer preferences for local food: The case of traditional coastal fishmongers in Costa Brava (Catalonia, Spain). *Journal of Agriculture and Food Research*, 11, 100527.

Claret, A., Guerrero, L., Ginés, R., Grau, A., Hernández, M.D., Aguirre, E., Benito Peleteiro, J., Fernández-Pato, C., and Rodríguez-Rodríguez, C. (2014), Consumer beliefs regarding farmed versus wild fish, *Appetite* 79, 25-31.

Fusté-Forné, F. (2022). Seafood 'speaks' in Costa Daurada's Michelin-starred restaurants (Catalonia, Spain). *Journal of Marine and Island Cultures* 11, 293-298.

Hoque, M.Z. (2021). Sustainability indicators for sustainably-farmed fish in Bangladesh. *Sustainable Production and Consumption*, 27, 115-127.

Hoque, M.Z., and Myrland, Ø. (2022). Consumer preference for fish safety inspection in Bangladesh, *Aquaculture*, 551, 737911.

INE (2023). National Institute of Statistics. https://www.ine.es

Krešić G, Dujmić E, Lončarić D, Zrnčić S, Liović N, Pleadin J. Profiling of Croatian Consumers Based on Their Intention to Consume Farmed Fish. *Foods*. 2022; 11(14), 2158.

López-Mas, L.; Claret, A.; Reinders, M.J.; Banovic, M.; Krystallis, A.; Guerrero, L. (2021). Farmed or wild fish? Segmenting European consumers based on their beliefs, *Aquaculture* 532, 735992.

Makowska, M., Boguszewski, R., and Hrehorowicz, A. (2024). Generational differences in food choices and consumer behaviors in the context of sustainable development. *Foods*, 13(4), 521.

Masi, M.; Di Pasquale, J.; Vecchio, Y.; Pauselli, G.; Tribilustova, E.; Adinolfi, F. (2022). A cross-sectional study in Mediterranean European countries to support stakeholders in addressing future market demands: Consumption of farmed fish products. *Aquaculture Reports* 24, 101133.

Osmond, A.T.Y., Charlebois, S., and Colombo, S.M. (2023). Exploratory analysis on Canadian consumer perceptions, habits, and opinions on salmon consumption and production in Canada. *Aquaculture International* 31, 179–193.

Pulcini, D., Franceschini, S., Buttazzoni, L., Giannetti, C., & Capoccioni, F. (2020). Consumer Preferences for Farmed Seafood: An Italian Case Study. *Journal of Aquatic Food Product Technology*, 29(5), 445–460.

Rickertsen, K., Alfnes, F., Combris, P., Enderli, G., Issanchou, S., and Shogren, J.F: (2017). French consumers' attitudes and preferences toward wild and farmed fish. *Marine Resource Economics*, 32, 59-81.

Savelli, E., Murmura, F., and Bravi, L. (2024). Healthy and quality food attitudes and lifestyle: a generational cohort comparison. *The TQM Journal*, 36(8), 2693-2722.

Thong, N.T.; Solgaard, H.S. (2017). Consumer's food motives and seafood consumption. *Food Quality and Preference*, 56, 181-188.

UNESCO (2020). *La dieta mediterrània* (The mediterranean diet): https://ich.unesco.org/es/RL/la-dieta-mediterranea-00884