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ASSESSING CONSUMER ATTITUDES TOWARDS THE INVASIVE RAYED PEARL OYSTER *Pinctada imbricata radiata* (LEACH 1814)

Ziou A.[1]*, Douligeri A.[1], Theodorou J.A.[1], Katselis G.[1], Moutopoulos D.K.[1]

Abstract
The paper focuses on the preferences of Greek consumers on the consumption of the non-invasive edible shellfish species, *Pinctada imbricata radiata*. For that to be true, a consumer survey was conducted and a total of 133 randomly selected consumers filled in a specially designed questionnaire. Aspects such as frequency, quantity of fish, points of purchase and criteria when buying fish (e.g. freshness) were covered. The majority of respondents prefer buying bivalve shellfish "once a week" and 1.5-2 kg per family meal. The most preferable points of purchase are traditional fishmonger shops and local markets and freshness is the most important criterion. The 78.2% of the respondents consume bivalves all along the year and prefer a certification of bivalve quality. Preferences vary according to socio-economic factors and participants' origin.
Keywords: *Shellfish Market, Consumer Preferences, Criteria Of Buying Shellfish, Greece*
*Corresponding author: Ziou A. (athinaziou@gmail.com)

1. Introduction

The rayed pearl oyster *Pinctada imbricata radiate*, a non-indigenous species (NIS) of Indo-Pacific origin, has been reported in Aegean since mid-1960 and recently in Ionian Sea (Theodorou *et al*. 2019). Although the species was categorized as is minor commercial interest (Katsanevakis *et al*. 2011), it is harvested for edible purposes, especially in the areas with high natural stocks availability such as Saronikos and Evoikos Gulf (Aegean Sea). However, the commercial exploitation of the species is prohibited, because there is a regulation gap due to its absence on the list of Presidential Decrees 86/98, 227/2003, and 109/2002 regulating the shellfish eradication, even though the species is not treated as endangered (Katsanevakis *et al*. 2011).

The demand for shellfish products has not increased and the per capita consumption in Greece is still low (Theodorou *et al*. 2011). Most of the shellfish production is exported to European markets, mainly to Italy and France. On the other hand, the traditional Greek consumer's attitude has been rapidly changing, mainly due to socio-economic changes such as the improvement of the standards of living, the great expansion of media, the promotion of biological products, the development of the tourism industry, etc. The present study aims to investigate the consumers' preferences and attitudes on the purchase and consumption of the edible pearl oyster. This would prove to be very beneficial for a more rational organization of the distribution roots, which in turn would promote shellfish consumption in Greece.

2. Material and Methods

Research was undertaken through a specially designed questionnaire (Batzios *et al*. 2003) distributed to randomly selected consumers throughout Greece during spring-summer 2020. Apart from demographic questions related to age, social and economic issues of the respondents, other questions examined in the present study were "*Shellfish known and tried at least once*", "*Frequency and quantity of shellfish consumption*", "*Criteria of shellfish freshness*", "*Frequency of shellfish purchase by species*", "*Points of purchase*", "*Preferred pearl-oyster products*", "*Quantity of package preference*", "*Packaging material preference*", and "*Announcements of the veterinary services*".

Data was statistically analyzed addressing variables of respondent's demographic (residence and age) and socio-economic (net monthly family disposable income and education level) status. Chi-square (χ^2) procedure was used and a number of statistical tests of independence were performed to examine the possible relation between each of the above-mentioned characteristics of respondent's demographic and socio-economic status with the questions on the consumer's preferences and attitudes towards shellfish (Zar 2010). Furthermore, in case of significance, the Adjusted Standardized Residuals in the cross-tabulation tables were carefully examined to detect departures from independence. All statistical analyses were carried out using the statistical package IBM SPSS statistics v 26.0.

3. Results

A total of 133 questionnaires were answered and 59.6% of the respondents were female. The mean age of the participants were 41.1 years (SD=16.2) with 2/3 of them living in urban areas (63.2%), whereas almost 1/3

of them inhabits at the Greek coastal cities (30.8%) and the rest at in non-coastal areas (6.0%). The majority of the respondents stated that they had graduated University (69.2%). A percentage of 18.9% of the responders were private employers, 17.8% were University students and 7.3% were public employers. Married participants were slightly higher than single ones (50.8% vs 45.3%) with the majority of the participants had two children (68.7%).

Almost all the responders have tried at least once bivalves (98.4%) and a great percentage of them they have tried at least once smooth clams (87.9%), flat oysters (85.7%), cockles (78.9%), scallops (73.6%) and razor shells (51.1%), whereas less than a quarter of the respondents (24%) knew or have tried at least once the rayed pearl oysters. Bivalve species were more common to consumers of urban areas than to other areas (χ^2, $P<0.05$). Younger consumers and those of higher education level seemed to know or have consumed shellfish in higher percentages compared to those of lower education (χ^2, $P<0.05$).

The majority of the responders stated that they usually purchased shellfish from traditional fishmonger shops (36.07%) and from supermarkets (25.1%) and this behavior did not significantly differed (χ^2, $P>0.05$) with place of residence, age and level of education. More than the half responders stated that they consume bivalves only in special cases (53.3%) and more than a quarter of the respondents reported that their family consumed bivalves once in a month (26.3%) and these attitudes did not differ significantly (χ^2, $P>0.05$) with the age and the level of education, whereas significantly differed (χ^2, $P<0.05$) with the place of residence. Consumers from urban area purchased significantly (χ^2, $P<0.05$) more often bivalves in their family, than the consumers from coastal and non-coastal areas. More than half of the respondents (58.7%) also stated that the amount of bivalves that they usually buy and consume in their family was up to 1kg, whereas a third (35.8%) purchased between 1.5 and 2 kg, whereas only 4.5% consumed more than 2.5 kg. This behavior did significantly differ (χ^2, $P>0.05$) with the resident place, age and educational level.

With respect to "*Criteria of shellfish freshness*" most of the respondents have stated that the first criterion they examined was "*shellfish odor*" (37.1%), second in priority order was "*shells (closed or not)*" (37.1%), third was "*expiration and shell removal date*" (32.3%) and fourth was "*clarity of packaging water*" (48.4%). The respondents stated that they prefer mussels "*very often*" (47.2%), "*often*" (30.7%) and "*seldom*" (16.5%). For cockle they answered that they buy it "*seldom*" (37.1%) and "*often"*(31.9%). For oysters the corresponding percentages are 38.5% and 27.5%. Scallops are eaten by the consumers "*seldom*" (43.9%), "*often*" (15%) and "*never*" (28%). The majority of the respondents (62.4%) "*never"* prefer pearl-oysters and (12.9%) "*seldom*". Also, 66.3% never prefer horse mussels and "*almost never*" (15.1%, while for smooth clams 43.2% prefer them "*seldom*" and 24.3% "*often*" (Figure 1). The most preferred pearl-oysters product was "*fresh alive in bulk*" (51.4%) and second in order was "fresh *alive, packed in net*" (33.7), and third "*fresh alive in vacuum*" (24.2%). The less preferred product was "*deshelled, breaded nuggets*" (50%). More than half of the respondents, in case of choosing fresh alive pearl-oysters in netting bags, purchased 1 kg (56.8%), a behavior that was not significantly (χ^2, $P>0.05$) different with the place of residence, age and educational level.

In case of purchased fresh alive pearl oysters in a vacuum consumers preferred a quantity of 6 pieces (29.4%) or 12 pieces (18.5%), which was not significantly (χ^2, $P>0.05$) different with the place of residence, age and educational level. In case of choosing pearl oysters without shell frozen, the majority of the respondent choose 250gr (46.8%), a behavior that it was not significantly (χ^2, $P>0.05$) different with age and educational level, whereas was significantly (χ^2, $P<0.05$) different with the place of residence. In case of choosing pearl oysters without shell breaded nuggets, consumers preferred a quantity of 250gr (38.1%) or 500gr (29.8%), a tension that it no significantly (χ^2, $P>0.05$) different with the place of residence, age and educational level. In case of choosing pearl oyster "*deshelled in jar with brine*" consumers stated the preferred 250gr (37.8%) or 500gr (29.4%), a behavior that it was significantly (χ^2, $P>0.05$) different with the place of residence, age and educational level. In case of choosing pearl oyster without shell in jar with olive oil and oregano, most consumers preferred up to 500gr (41.7%) or 250gr (32.5%), a tension which was no significantly (χ^2, $P>0.05$) different with the place of residence, age and educational level. In case of choosing pearl oyster "*deshelled, smoked in jar*", the most preferred quantity was 250gr (40.2%) or 500gr (33.3%), which was not significantly (χ^2, $P>0.05$) different with the place of residence, age and educational level. The vast majority of the respondents stated that they preferred a "*transparent container*" (90.4%) or "*glass material*" (90.4%) for the pearl-oyster packaging, whereas the less preferred container was "*vase"* (1.8%) and the less preferred material was "*metal*" (0.8%), behaviors that were not significantly (χ^2, $P>0.05$) different with the place of residence, age and educational level. The majority of the respondents (81.1%) trusted the announcements of the veterinary services regarding the hygiene of shellfish, an attitude that it was not significantly (χ^2, $P>0.05$) different with the place of residence, age and education level of the respondents.

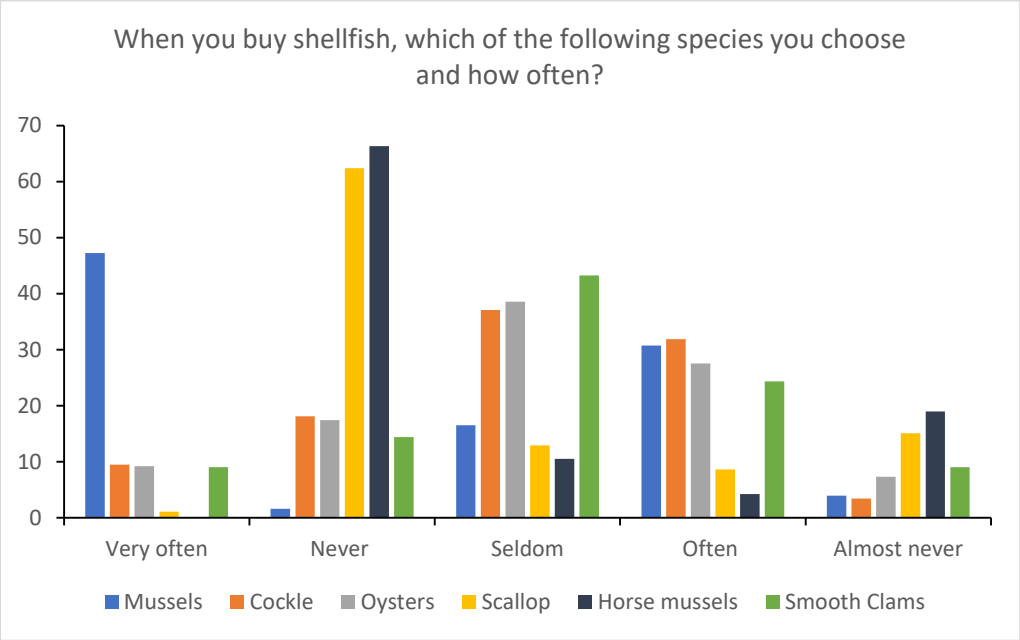

Figure 1. Frequency of shellfish purchase per species.

4. Discussion

There is a lack of tradition in shellfish consumption, in spite of the presence of a wide range of shellfish species in the Greek seas (Theodorou *et al*. 2011). This characteristic preference is related to the lack of confidence Greek consumers exhibit to seafood, owing to the fact of not having adequate information on health and safety issues or considering their taste unsatisfactory (Batzios *et al*. 2003).

The sampling frame regarding the place of residents followed the distribution of the corresponding variables in the entire country. For instance, respondents from urban area contributed more than half of the respondents (66.6%), which is mirror the spatial distribution of the Greek citizens (HELSTAT 2014). The vast majority of Greek consumers knows in higher frequency to purchase and taste mussels than pearl oysters. The need to control an invasive species such as pearl oyster and mitigate its impact to the ecosystem could be harmonized taking also into account the economic benefits gained from this species as a fishery resource (Kleitou *et al*. 2021).

Consumers from urban areas seem much better informed, compared to those from other Greek areas as they were preferred and consumed more frequently and in more quantities bivalves in their family. There is a clear preference of buying shellfish from the traditional fish shops, despite the rapid development and expansion of the Super Markets in Greece over the last years. Traditional fish shops, are considered by the consumers that are routinely inspected by veterinarians who issue a certificate on shellfish sea origin, hygienic condition, freshness and quality (Batzios *et al*. 2003, 2004). This pattern was in line with the statements of the respondents regarding the most critical issues that they examine when purchase shellfish; they first examine "*shellfish odor*", second in priority was "*shells (closed or not)*", and third was "*expiration and shell removal date*".

In the present study more than half of the respondents stated that the most preferred pearl-oyster product was "*fresh alive in bulk*". In this context, food safety and health conditions are of great importance for the consumers. Health is an issue frequently mentioned as a reason for specific food choices and its emphasizing role is a growing trend and has a great influence on attitudes towards eating seafood (Olsen 2003). Greek consumers clearly trust the confirmation provided by the veterinary authorities, concerning the enforcement of E.U. legislation on shellfish hygiene, regardless of their income level or age. The information dispersed by the media on shellfish safety, strongly influences the consumers' purchasing behavior, regardless of their demographic and socio-economic status. However, the media quite often over-emphasize the restriction advice given by the veterinary authorities and the consumers question the shellfish hygiene and their safety status. This situation could be changed whether consumers were properly educated on shellfish safety matters. Thus, the media not only has to play the role of interdiction announcements but should also educate the consumers on issues of shellfish safety and quality.

The findings of this study could prove to be quite helpful for Greek producers and marketers of shellfish in order to identify new business opportunities and plan more efficient marketing strategies, which in turn would promote shellfish consumption. One successful approach to establishing the latter goal could be the organization of local festivities promoting the consumption of various shellfish species with different ways of cooking.

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