RESULTS OF INTERVIEW WITH FRESHWATER AND MARINE AQUACULTURE AND FISHERIES INDUSTRIES REPRESENTATIVES IN ALBANIA

1. Freshwater and Marine Aquaculture Stakeholders

In the graphics of Figure 1 are shown the relative results of the gender composition of the interviewed persons during the conduction of the surveys to the aquaculture stakeholders. The questionnaire surveys were conducted by ACEPSD and Agriculture University of Tirana staff members to representatives of freshwater aquaculture farms located in Fier, Gjirokaster, Diber and Elbasan, while Alb-Adriatico 2013 staff members conducted the questionnaire survey in the Vlora region (Vlore, Radhime and Orikum). As it is shown, the freshwater aquaculture farms representatives were all males, while 2 of the marine aquaculture farms representatives never answered to the relative question, though all the remaining interviewed persons were males.

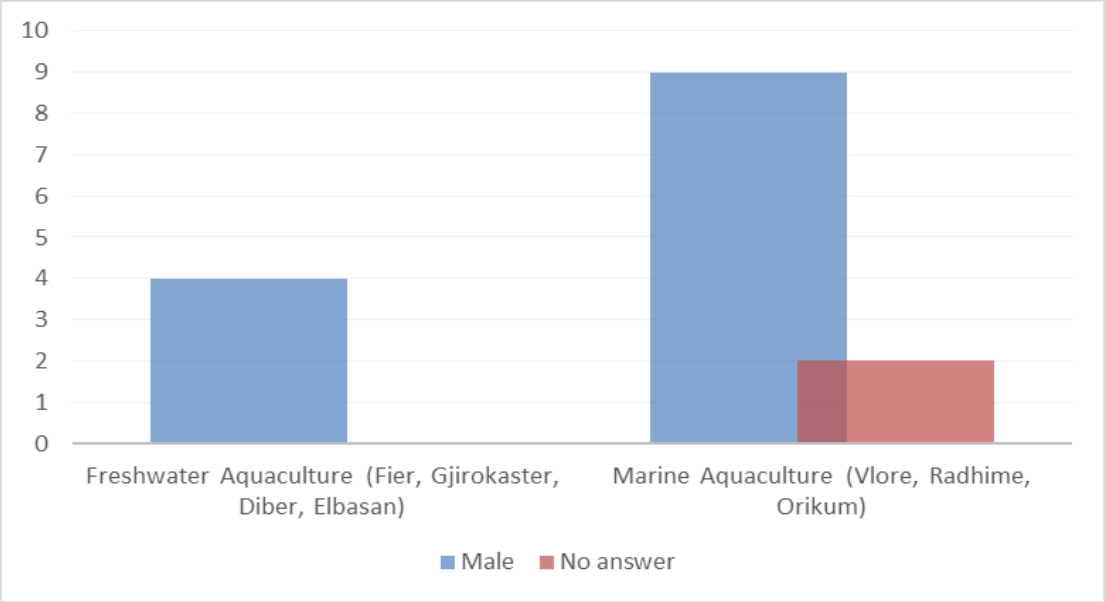

Figure 1. Graphical presentation of the gender composition of the interviewed persons during the questionnaire-based surveys.

Regarding the age composition of the interviewed persons, it was shown a higher variability in age composition in the marine aquaculture in comparison to the freshwater aquaculture (Figure 2). Considering the total sample, it can be underlined that interviewed people were mostly young men from 18 to 36 years old.

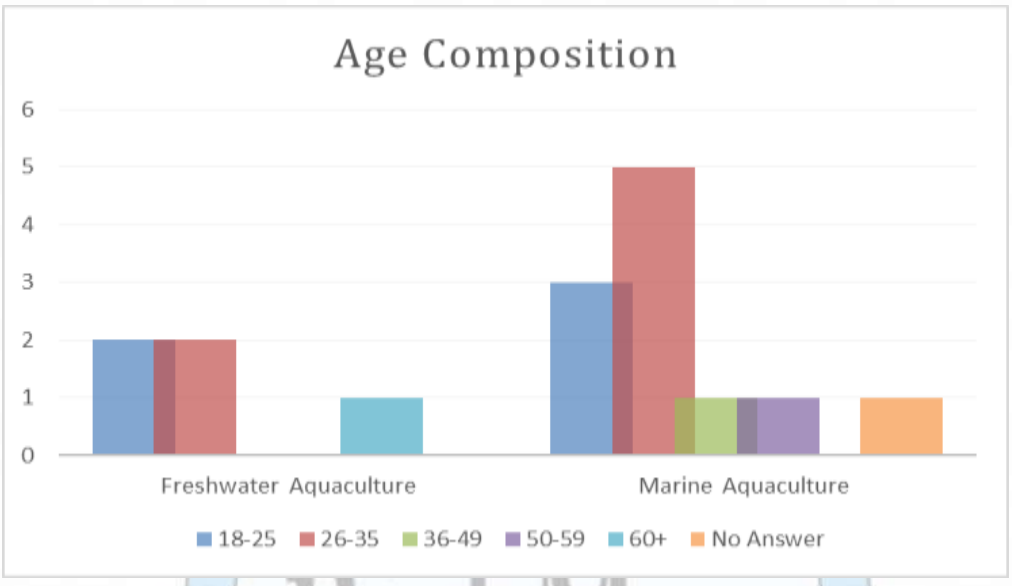

Figure 2. Graphical presentation of age composition of the interviewed persons during the questionnaire-based surveys.

Considering the education level of the sample, all interviewed persons from the marine aquaculture were equally included in two categories of education (middle school and high school), while the level of education of the interviewed persons from freshwater aquaculture resulted to be higher in comparison to the other sub-sector (Figure 3).

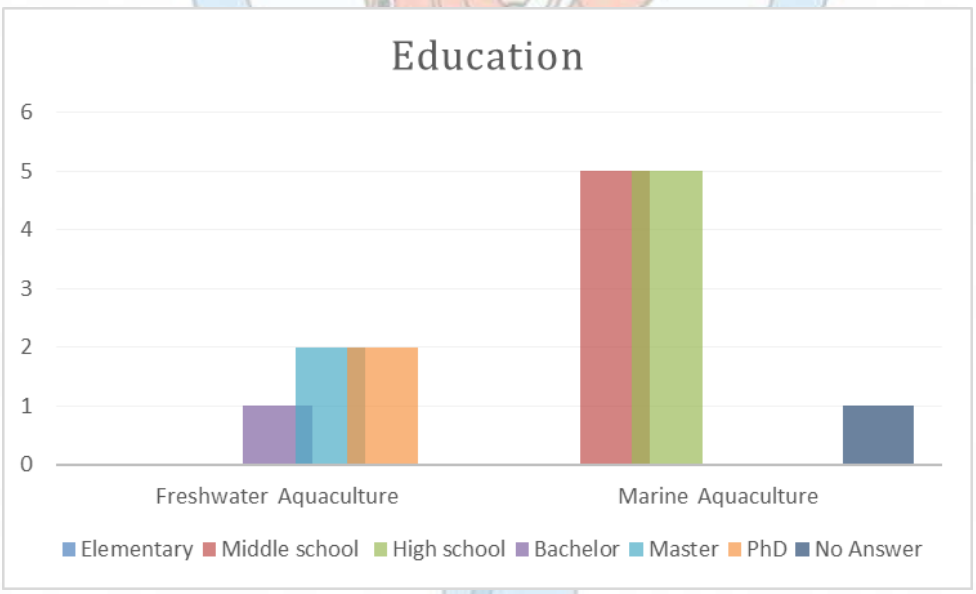

Figure 3. Graphical presentation of education level of the interviewed persons during the questionnaire-based surveys.

In the freshwater aquaculture sector, there was not a clear distribution of the response: 60% of the interviewed know (20% of them vaguely) what is a Non-Native Species NNS (Figure 4), while the remaining 40% does not know what a NN species is. Considering interviewed persons from the marine aquaculture, most of them vaguely (40%) or do not know (36%) what a NNS is (Figure 4).

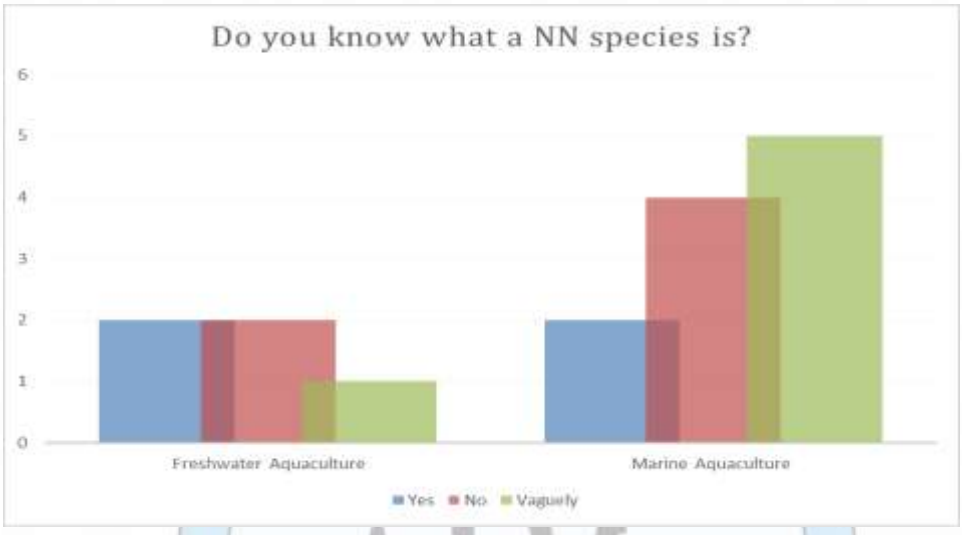

Figure 4. Graphical presentation regarding the answers to the question "Do you know what a Non Native species is?" corresponding to the interviewed persons during the questionnaire-based surveys.

To the question "According to you which of the following definitions is the most suitable to define as NN species?" (Figure 5), most of the interviewed from the freshwater aquaculture answered that it is a species of another region of the world, useful to man, which does not cause damage to the environment or to human life. Regarding marine aquaculture, most of them answered that NN species is a species that has always lived in its original environment, which is now expanding dramatically and causing very serious impacts to ecosystems.

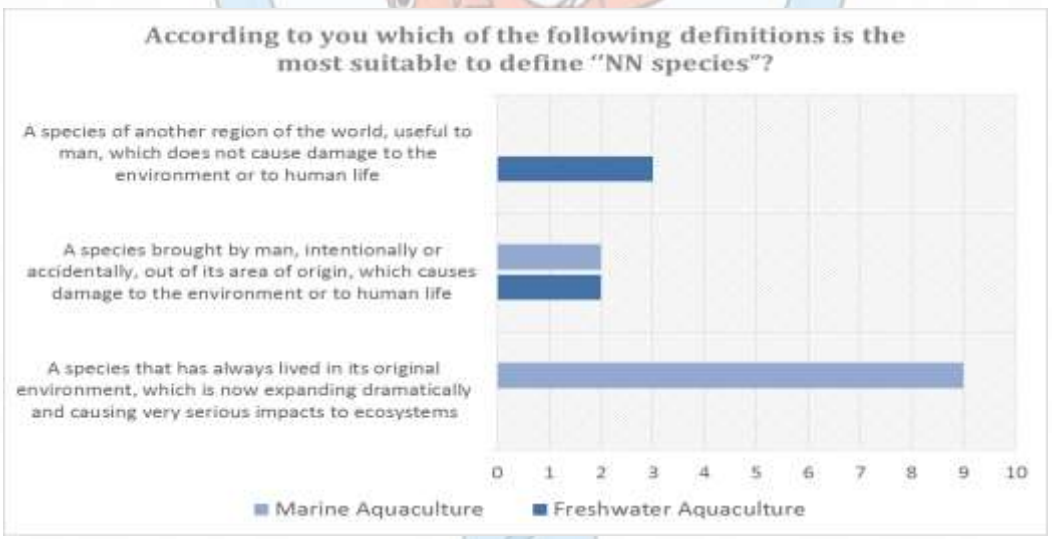

Figure 5. Graphical presentation regarding the answers to the question "According to you which of the following definitions is the most suitable to define NN species?" ; corresponding to the interviewed persons during the questionnaire-based surveys.

As it is shown in Figure 6, most of the interviewed from freshwater aquaculture agree to the statement (a), while in the case of marine aquaculture most of them never knew or have a clear opinion about it. Regarding this sub-sector, the same happened with the other statements (b, c, d). Most of the interviewed from freshwater aquaculture agree with the statement (b), while regarding the statement (c) and (d), the interviewed from freshwater aquaculture disagree with them.

Considering the total samples of the interviewed (both freshwater and marine), there is a high percentage of people whose response to this question was ''I don't know''. This can be interpreted as a clear alarming sign that people working in the aquaculture sectors have not enough knowledge about the threat posed by NN species and underline the importance to strengthen their awareness by education and disseminations.

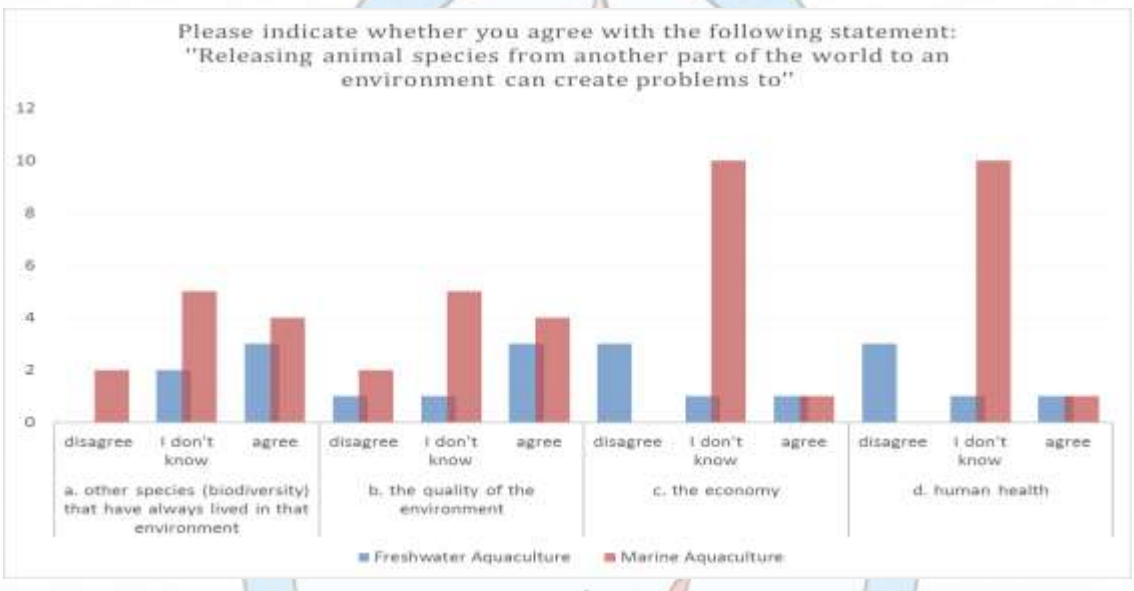

Figure 6. Graphical presentation regarding answers relative to the agreements with the statements "releasing animal species from another part of the world to an environment can create problems to.."

The results reported in Figure 7 also underline those shown in Figure 6: most of the interviewed from the marine aquaculture sub-sector (Figure 7) never knew or do not have a clear opinion (not agree or disagree) regarding the suggested actions to undertake, to prevent and to reduce the damage caused by animal species that are released in aquatic environments where they have been present (a), (b), (c) and (d), respectively, while the interviewed corresponding to the freshwater sector mostly disagree with the statements (a), (b) and (c), respectively.

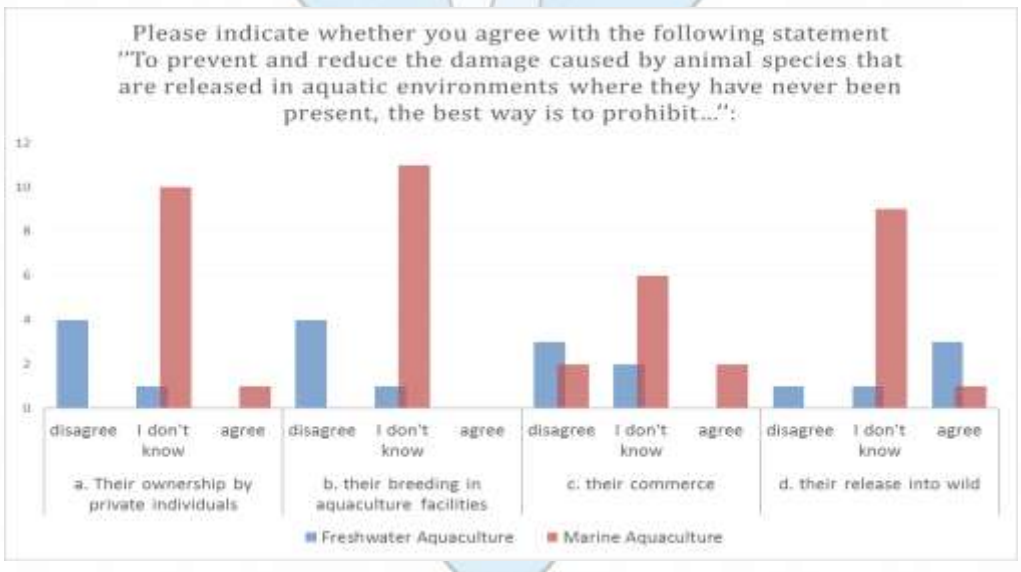

Figure 7. Graphical presentation regarding answers relative to the agreements with the statements "to prevent and reduce the damage caused by animal species that are released in aquatic environments where they have never been present, the best way is to prohibit…"

Most of the interviewed representatives from the freshwater aquaculture farms agree with the question of Figure 8, while in the case of marine aquaculture, the interviewed persons were included in two categories, those who don't know about it and the remaining ones who agree with that.

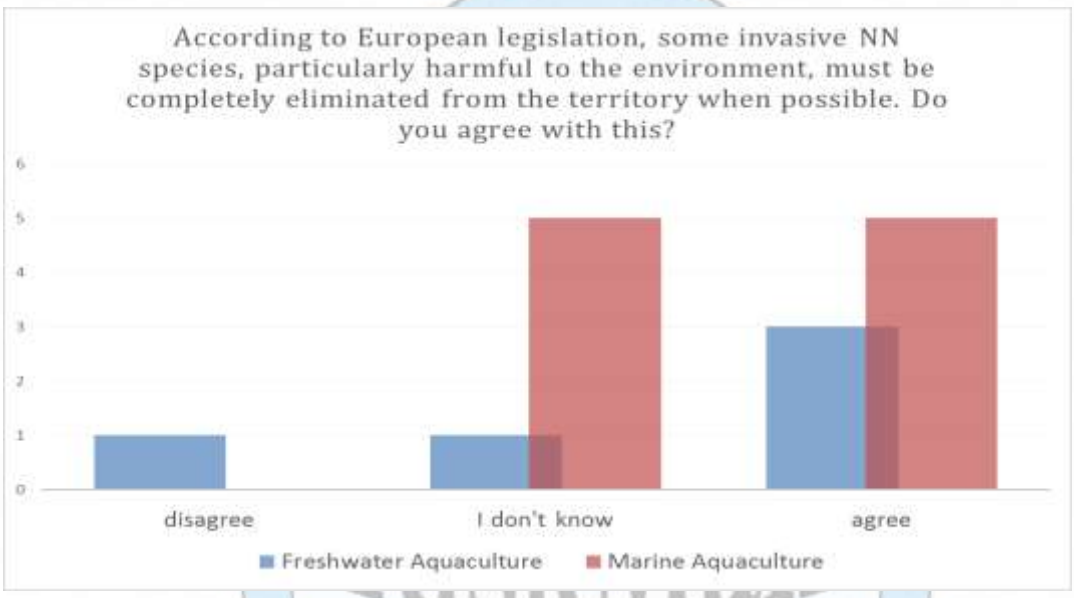

Figure 8. Graphical presentation regarding the answers to the question "According to European legislation, some invasive NN species, particularly harmful to the environment, must be completely eliminated from the territory when possible. Do you agree with this?".

To the question shown in Figure 9, most of the representatives of both sub-sectors answered that they agree with the controlling of the number of individuals in the aquatic environment. Regarding the other statement, most of the interviewed from the freshwater aquaculture answered that they agree with removing all individuals from that environment, while the interviewed from the other sub-sector never knew what to choose between the answers.

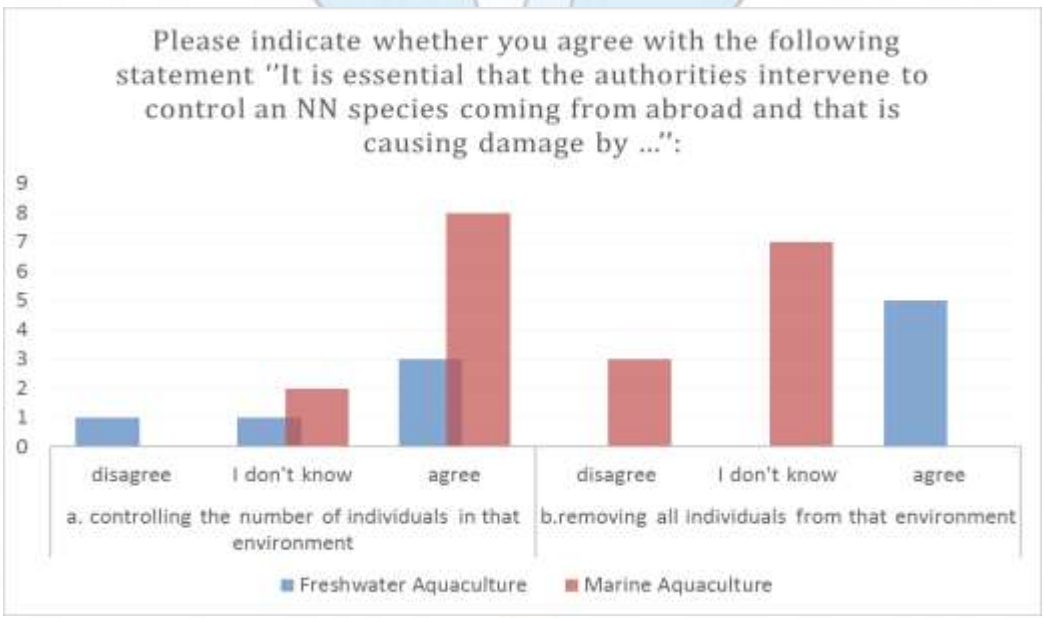

Figure 9. Graphical presentation regarding answers relative to the agreements with the statements "it is essential that the authorities intervene to control an NNS species coming from abroad and that is causing damage by..."

In Figure 10, it is shown that most of the representatives of freshwater aquaculture farms disagree with the suggestion on stopping the breeding of NN species if this would reduce the risk of damage to the environment, the economy and human health, while the contrary happened in the marine aquaculture, where most of them didn't know how answer to the relative question.

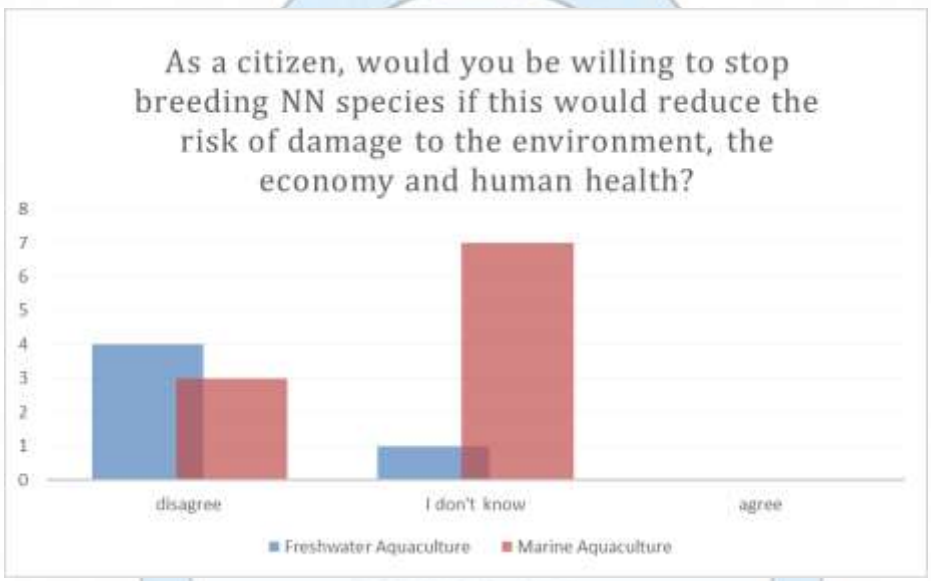

Figure 10. Graphical presentation regarding the answers to the question "As a citizen, would you be willing to stop breeding NN species if this would reduce the risk of damage to the environment, the economy and human health".

In addition, the freshwater aquaculture (according to the answers graphically shown in Figure 11) includes land based intensive aquaculture (tanks/ponds) and other technologies, while marine aquaculture is represented by sea based intensive aquaculture (cages) technologies.

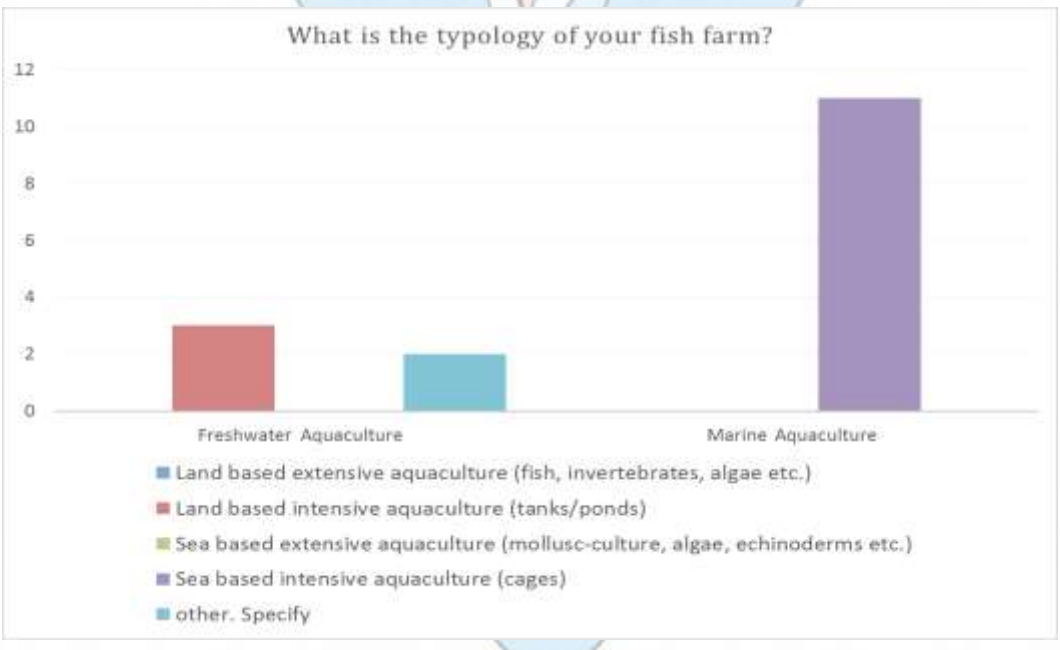

Figure 11. Graphical presentation regarding the answers to the question "What is the typology of your fish farm".

According to the answers emerged during the questionnaire survey (Figure 12), freshwater aquaculture species are represented by rainbow trout (*Oncorhynchus mykiss)* and common carp (*Cyprinus carpio*), while marine aquaculture species are represented by gilthead seabream (*Sparus aurata*) and european seabass (*Dicentrarchus labrax*).

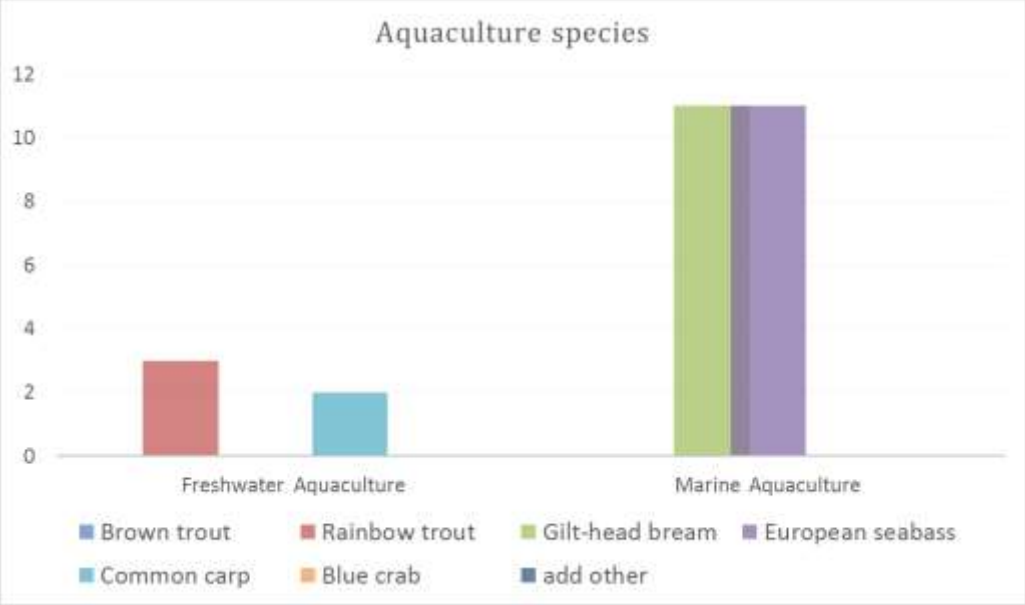

Figure 12. Graphical presentation regarding the aquaculture species in the two analyzed sub-sectors.

To the question "Do you know which of the cultured species in your farm are NN-species to the country/area/", freshwater farms representatives answered that rainbow trout and common carp enter the NN species category (Figure 13), while in the other sub-sector (according to the answers of the representatives) gilthead seabream and European seabass represent NN species.

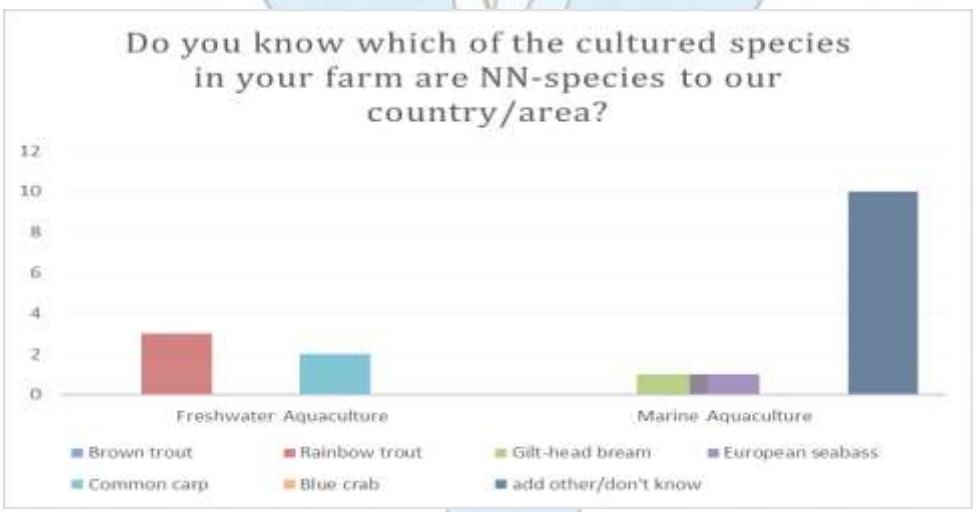

Figure 13. Graphical presentation regarding the answers to the question "Do you know which of the cultured species in your farm are NN-species to our country/area?".

Furthermore, most of the representatives of both sub-sectors (Figure 14) answered that the potential risk that samples could escape and enter to the surrounding natural water bodies/sea is none or low. Only 1 response given by one of the interviewed persons from Freshwater Aquaculture underline a potential high risk that samples could escape and enter to the surrounding natural water bodies/sea given the location of their fish farm.

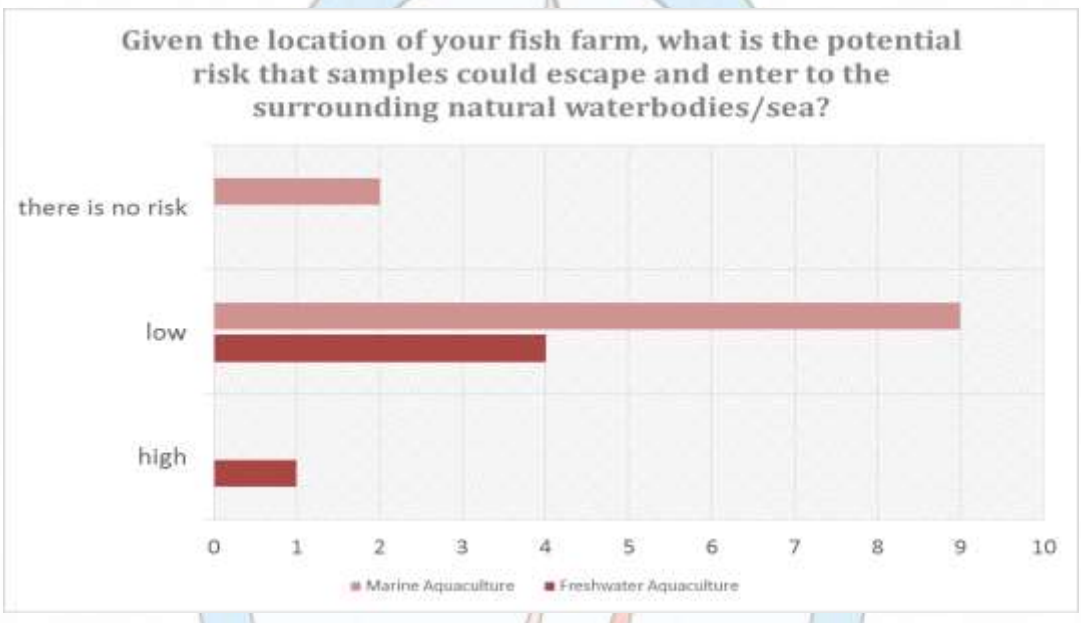

Figure 14. Graphical presentation regarding the answers to the question "Given the location of your fish farm, what is the potential risk that samples could escape and enter to the surrounding natural water bodies/sea?".

With regard to Figure 15, it is interesting to note that most of the marine aquaculture farms representatives answered that they would be available to collaborate with the researchers/scientists/company representatives who conducted the questionnaire surveys, while no answer came out from the representatives of the freshwater aquaculture farms (Figure 15).

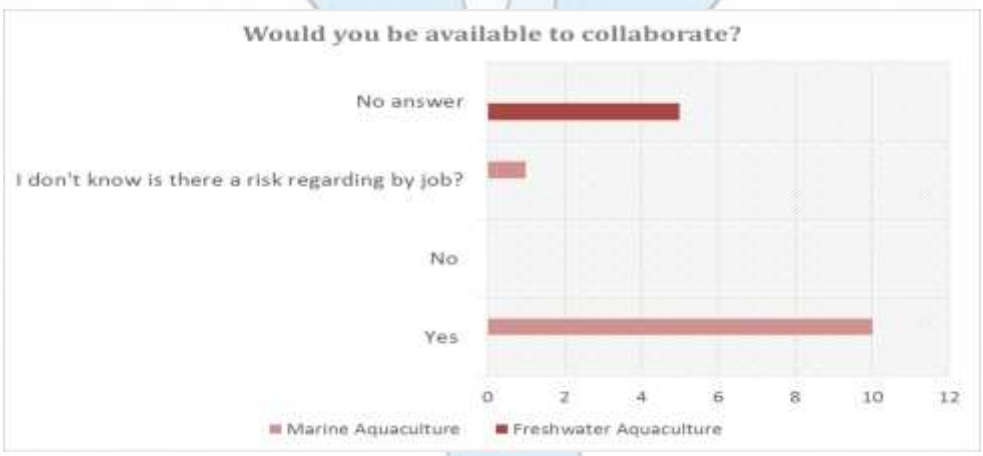

Figure 15. Graphical presentation regarding the answers to the question "Would you be available to collaborate?".

2. Marine, Coastal and Lagoon Fisheries stakeholders

The questionnaire surveys were conducted by the staff members of AUT and ACEPSD along the coast of Durres, Shengjin and Lac. In Durres, the investigated harbours and ports are represented by fishing port of Durres, Currila harbour and Cape of Rodon. Lagoons of Merxhan, Ceke and Drini Delta represent the areas of Shengjin-Lac region. Alb-Adriatico 2013 conducted the surveys in the coastal areas of Vlore, including Orikum and Radhime. As it is shown in the graphics of Figure 16, though males are those mostly (or exclusively, like in the case of Vlore) involved in the fisheries, in Durres one of the interviewed was represented by a female.

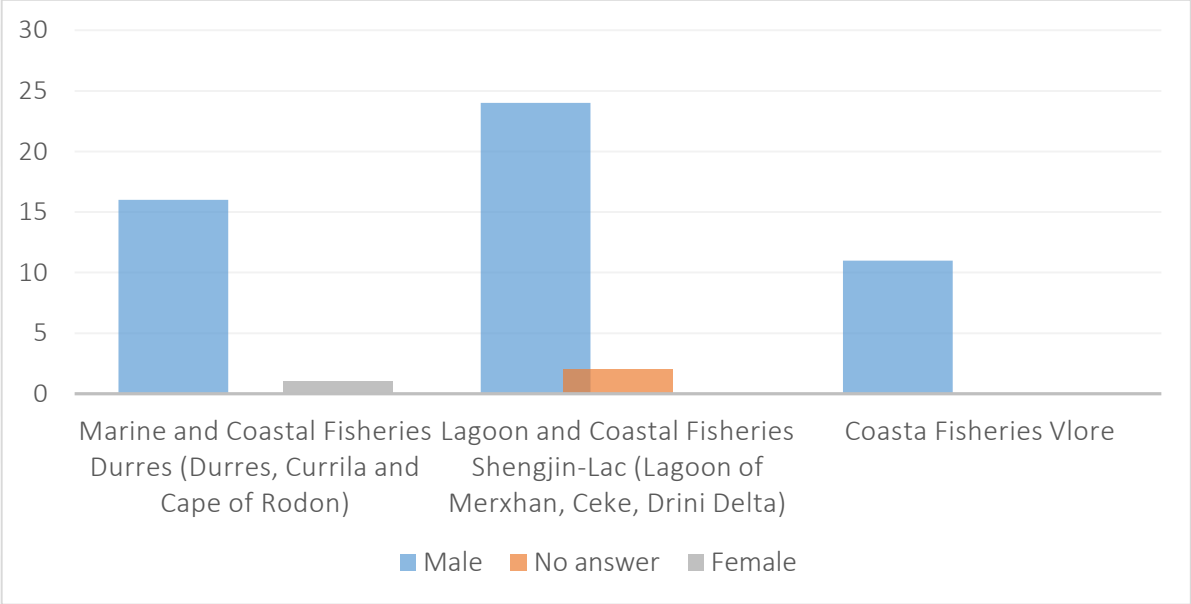

Figure 16. Graphical presentation of the gender composition of the interviewed persons during the questionnaire-based surveys.

Regarding the age composition (Figure 17), most of the fishers working in the commercial and artisanal fisheries are included in the age category 36-49 and over 60 years old, respectively. In Shengjin-Lac coastal areas (including lagoons) most of the fishers are older than 50 years. In Vlore coastal areas, the fishers (involved in artisanal/small-scale fisheries) are mainly represented by persons, who are 36-49 years old.

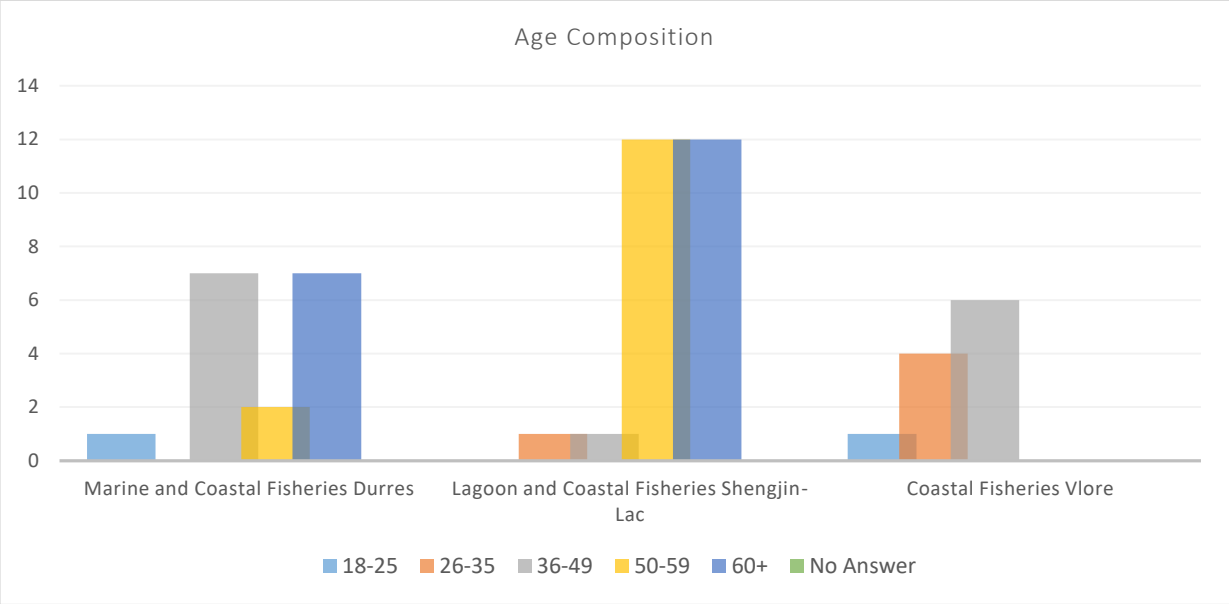

Figure 17. Graphical presentation of age composition of the interviewed persons during the questionnaire-based surveys.

Differently from the Vlore and Shengjin-Lac areas (Figure 18), the interviewed fishers from Durres represent persons with a higher variability regarding the education levels in comparison to the fishers from the other two regions. Most of the fishers from Durres had a bachelor degree, while in the lagoons and coastal areas of Shengjin-Lac and Vlore, the majority of them had completed high school studies. None of the interviewed fishers showed to have a PhD or exclusively just the elementary school education level.

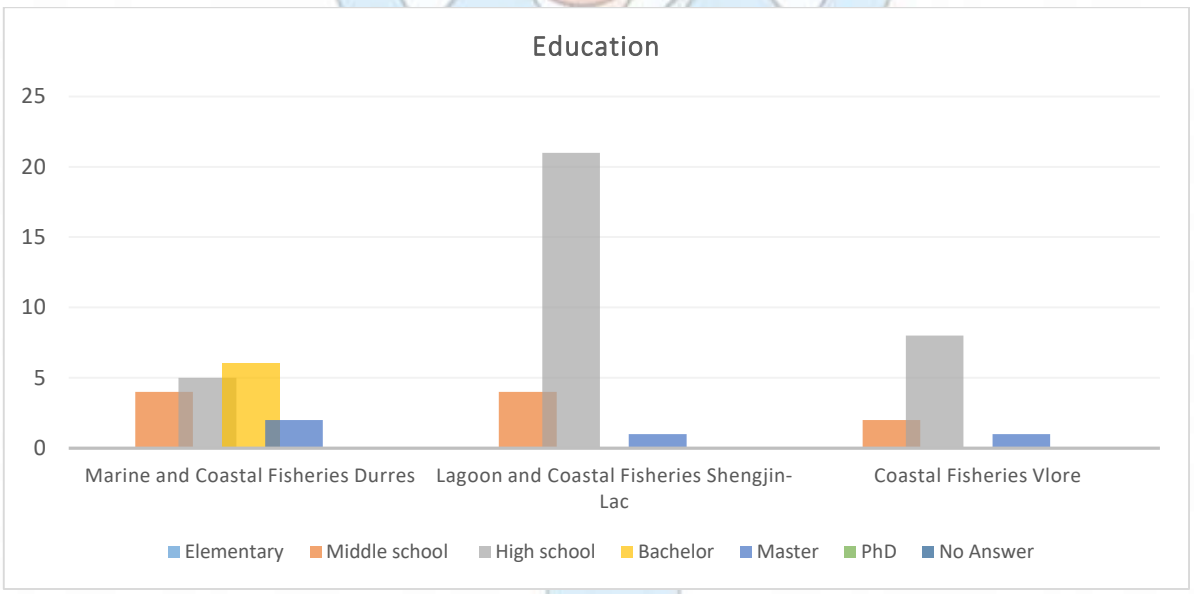

Figure 18. Graphical presentation of education level of the interviewed persons during the questionnaire-based surveys.

To the question ”Do you know what a Non-Native (NN) species is?” (Figure 19), most of the interviewed fishers from Durres and Vlore answered that they had information about them, while all the fishers from Shengjin-Lac answered that they had information about these species.

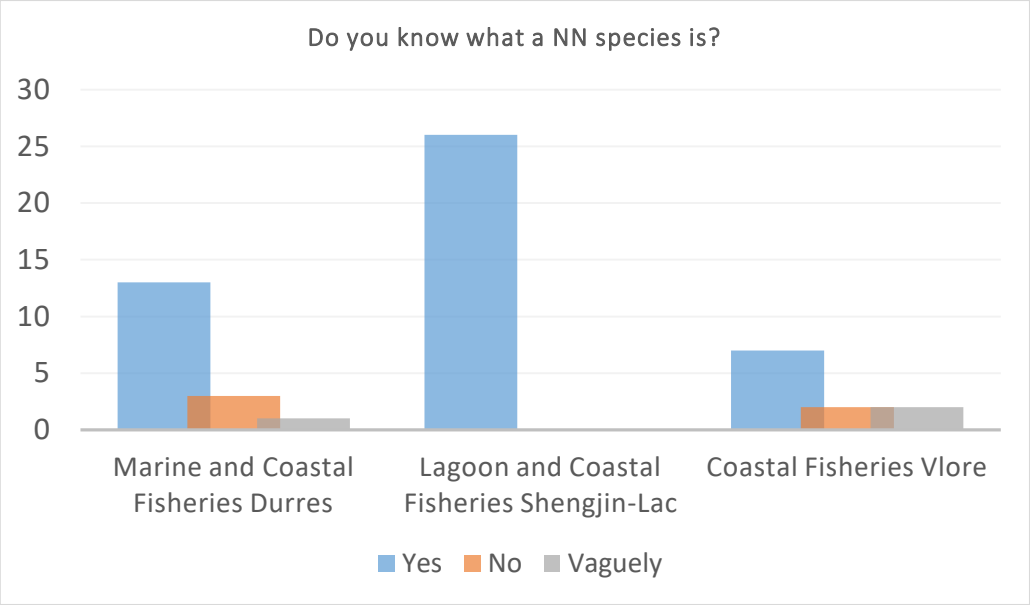

Figure 19. Graphical presentation regarding the answers to the question “Do you know what a Non Native species is?” corresponding to the interviewed persons during the questionnaire-based surveys.

It is also interesting to note that regarding the question “According to you which of the following definitions is the most suitable to define as NN species?” (Figure 20), all the interviewed fishers from Shengjin and Lac answered that NN species represent species brought by man intentionally or accidentally out of its area of origin, which causes damage to the environment or to human life. Most of the interviewed fishers from Durres answered the same way, while most of the fishers from Vlore answered that NN species is a species that has always lived in its original environment, which is now expanding dramatically and causing very serious impacts to ecosystems.

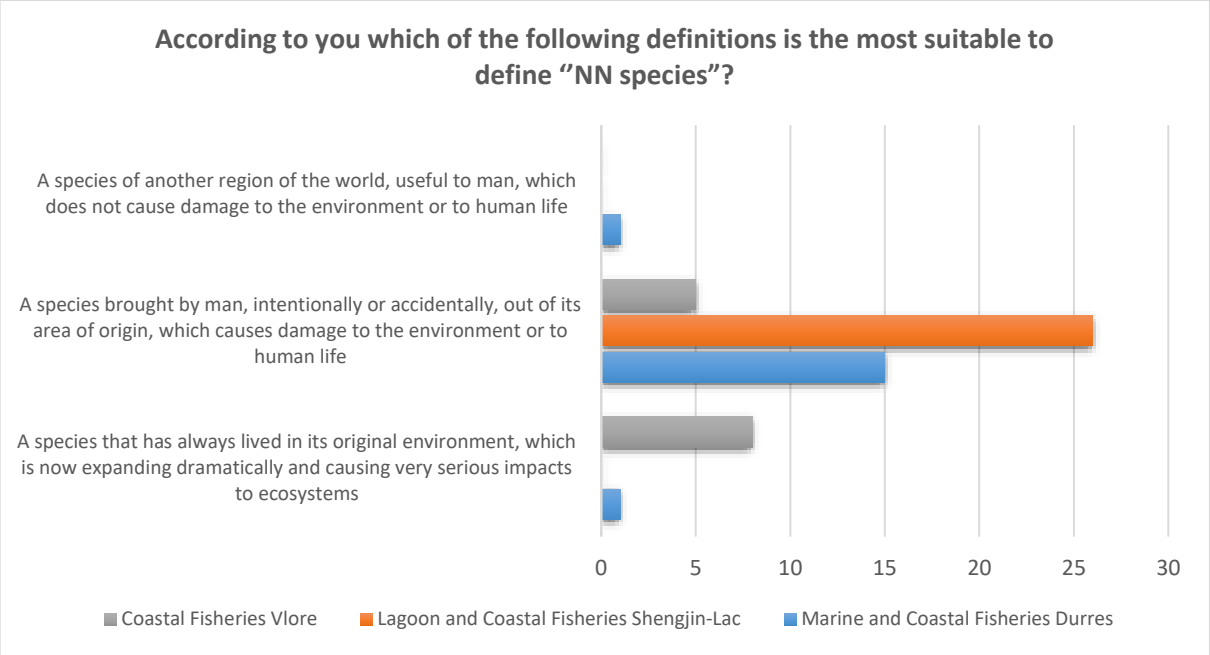

Figure 20. Graphical presentation regarding the answers to the question "According to you which of the following definitions is the most suitable to define NN species?" ; corresponding to the interviewed persons during the questionnaire-based surveys.

Regarding the agreement of the interviewed fishers (Figure 21) with the statement "Releasing animal species from another part of the world to an environment can create problems to…", most of the interviewed fishers from all the investigated coastal areas answered that they agree with (a) statement, though there were some of the fishers from Durres and Vlore who don't have information about statement (a). Similarly, to the statement (a), most of the interviewed fishers agree with statement (b). Furthermore, most of the interviewed fishers agree with the statement that releasing animal species from another part of the world to an environment can create problems to the economy (statement c), though some of them answered that they don't have information about it. It is interesting to note that most of the interviewed fishers from all the considered coastal areas answered that it could create problems to human health (statement d), while some of the fishers from Shengjin, Lac and Vlore don't know the answer to this question.

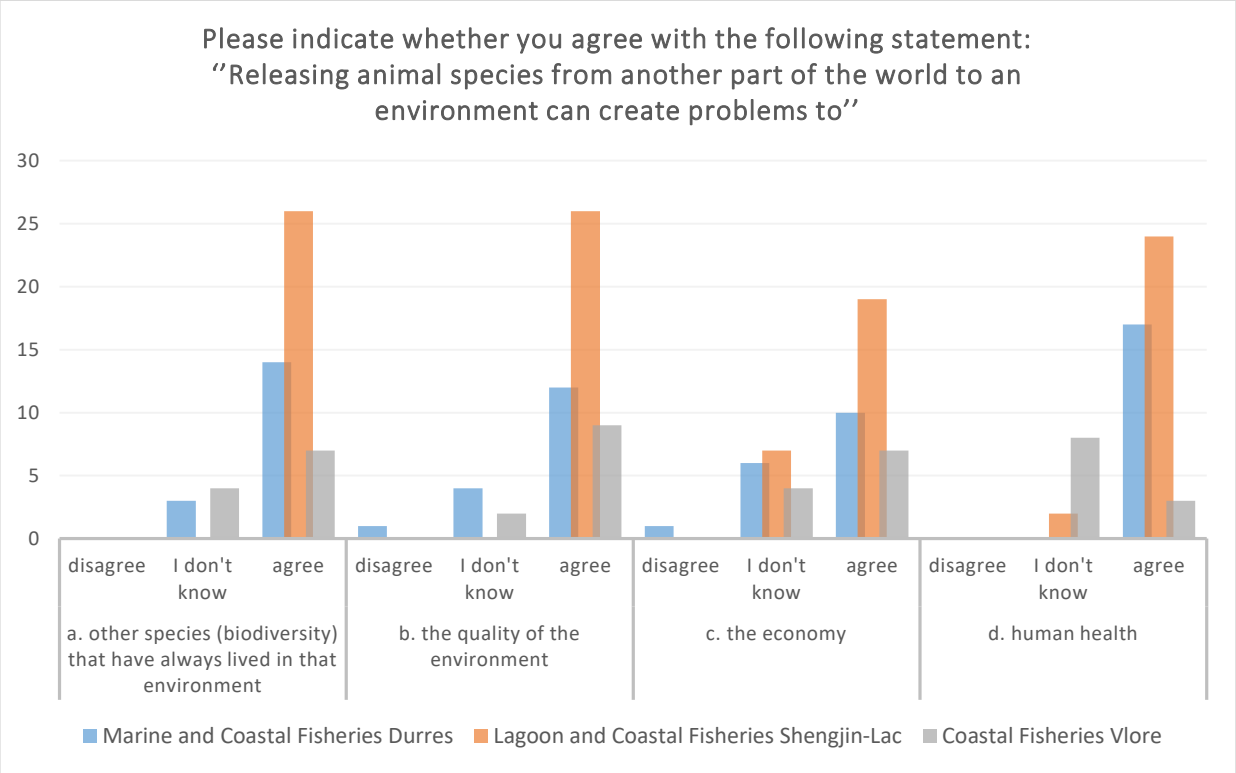

Figure 21. Graphical presentation regarding answers relative to the agreements with the statements "releasing animal species from another part of the world to an environment can create problems to.."

Regarding the agreement to another statement (Figure 22) "To prevent and reduce the damage caused by animal species that are released in aquatic environments, where they have never been present, the best way is to prohibit…", most of the interviewed fishers from Durres, Lac and Shengjin agree that the best way is to prohibit ownership by private individuals (statement a), while all the interviewed fishers from Vlora don't know the answer about this statement confirmation. Regarding the statement (b), most of the interviewed fishers from all the investigated coastal areas agree with the statement that the best way is to prohibit their breeding in aquaculture facilities, though there are some of them, who don't know about it. It is interesting to note that most of the interviewed fishers from Vlore disagree with the statement that the best way is to prohibit their commerce, while most of the interviewed fishers from the remaining coastal areas agree with this statement (statement c); though some of the interviewed fishers don't know the answer. In addition, regarding the statement d, most of the fishers from Vlore don't know the answer, while most of the fishers from the other coastal areas agree with the statement that the best way is to prohibit their release into the wild. However, some of the fishers disagree and others don't know the answer.

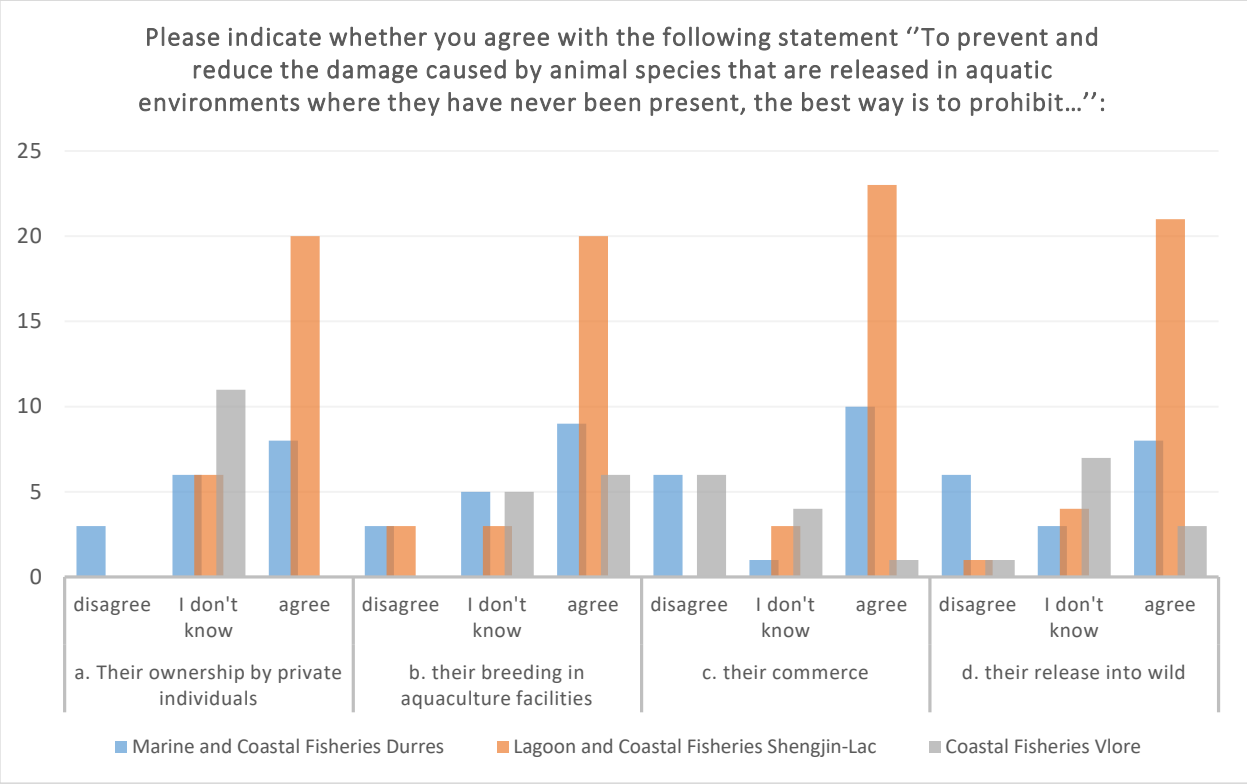

Figure 22. Graphical presentation regarding answers relative to the agreements with the statements "to prevent and reduce the damage caused by animal species that are released in aquatic environments where they have never been present, the best way is to prohibit…"

Furthermore, to the question "According to European legislation, some invasive NN species, particularly harmful to the environment, must be completely eliminated from the territory when possible. Do you agree with this?" it is interesting to note (Figure 23) that while most of the interviewed fishers from Vlore and Durres answered that they agree, all the interviewed fishers from the lagoons and coastal areas of the North Albania (Shengjin and Lac) answered that they agree with these NNS must completely eliminated from the territory when possible.

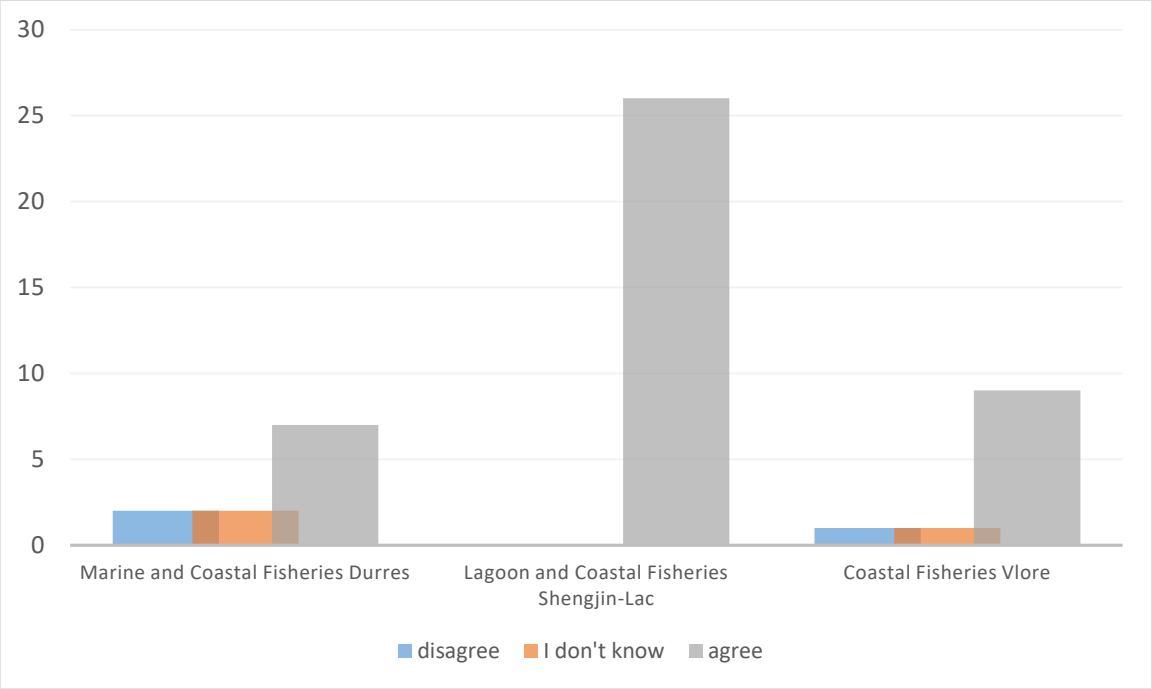

Figure 23. Graphical presentation regarding the answers to the question "According to European legislation, some invasive NN species, particularly harmful to the environment, must be completely eliminated from the territory when possible. Do you agree with this?".

Regarding the statement "it is essential that the authorities intervene to control an NN species coming from abroad and that is causing damage by …", (Figure 24) most of the interviewed fishers agreed with the statement a (controlling the number of individuals in that environment), though some fishers from Vlore and Durres don't know the answer, while fishers from Durres disagree with this statement. Similarly, the most of the interviewed fishers agree with the statement b (removing all individuals from that environment), though some of them don't know the answer and some of the fishers from Durres disagree with this statement.

Furthermore, it is interesting to note that none of the interviewed fishers (Figure 25) from the three coastal regions answered positively to the question "As a citizen, would you be willing to stop breeding NN species if this would reduce the risk of damage to the environment, the economy and human health", while all the interviewed fishers from Shengjin-Lac disagree with it. In Durres most of the fishers disagree with this, while the rest of them answered that they don't know. Though most of the fishers from Vlore disagree with it, there is no big difference in numbers in the comparison of the fishers who disagree and those who don't know the answer.

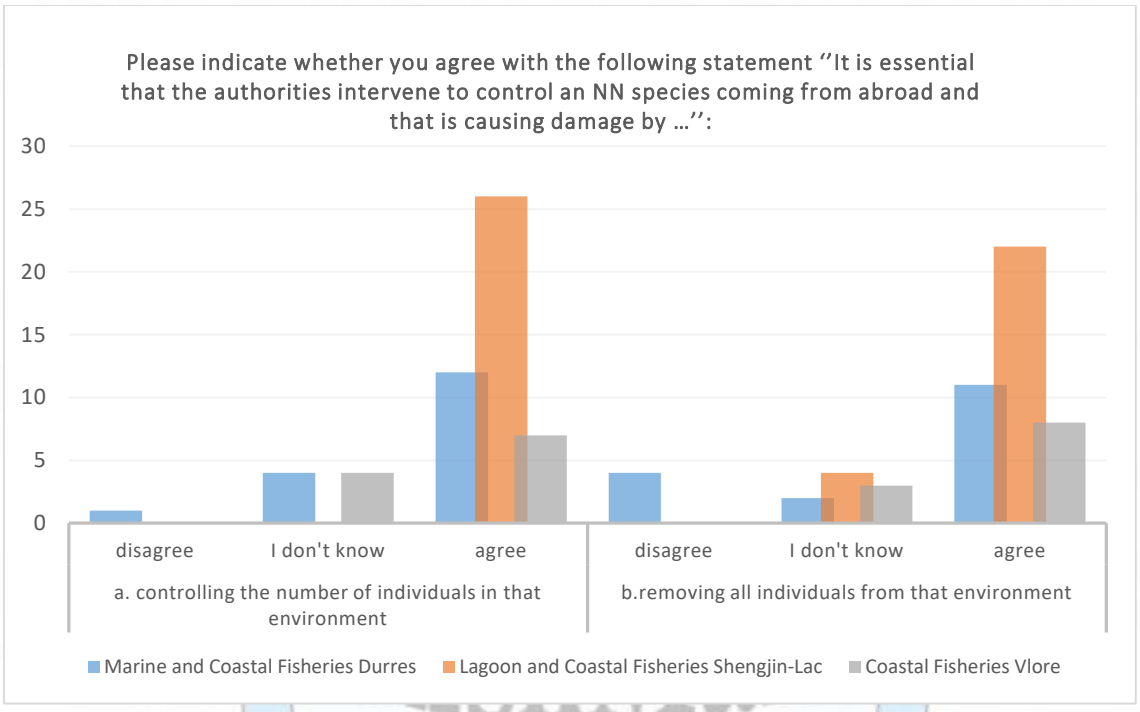

Figure 24. Graphical presentation regarding answers relative to the agreements with the statements "it is essential that the authorities intervene to control an NNS species coming from abroad and that is causing damage by..."

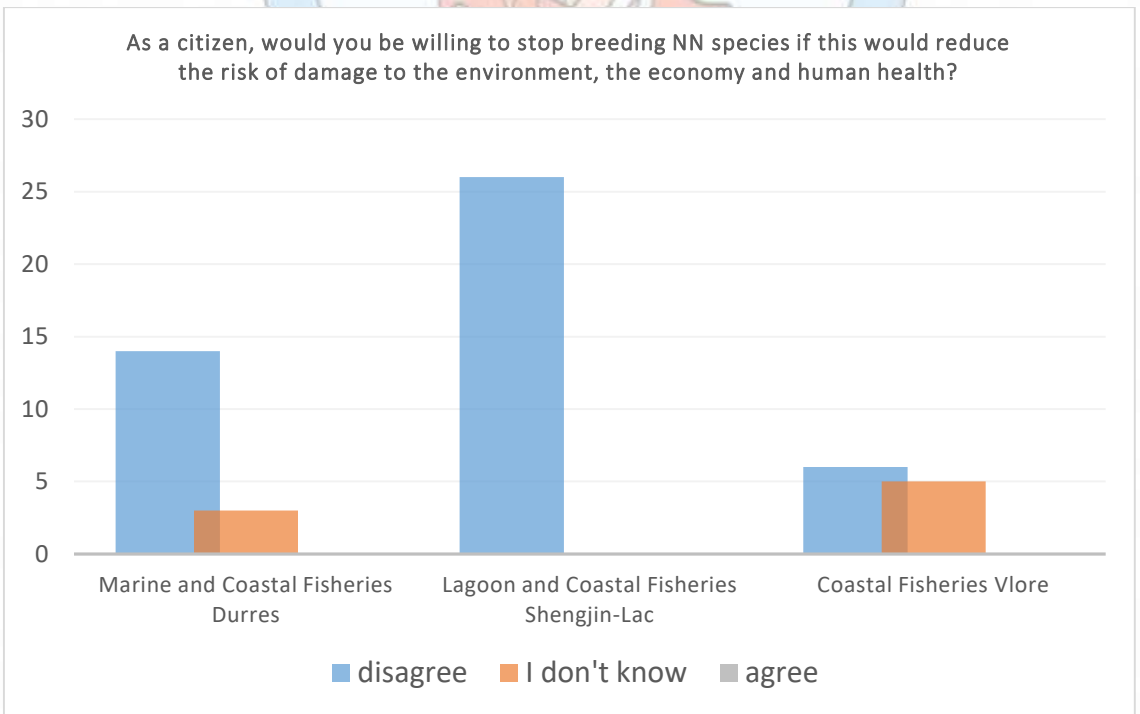

Figure 25. Graphical presentation regarding the answers to the question "As a citizen, would you be willing to stop breeding NN species if this would reduce the risk of damage to the environment, the economy and human health".

Regarding the question about the species usually caught in the three investigated coastal regions (Figure 26), it emerged out that there is a higher variability in species composition in Durres fisheries in comparison to the other two coastal regions. This is mainly linked to the fact that the fishers from Durres include commercial fishers, artisanal fishers and recreational fishers, while the fishers from the other regions are represented by artisanal and recreational fishers. According to the interviewed fishers from Durres, the most frequent fished species were represented by red mullet (*Mullus barbatus)*, shrimps, gilthead seabream (*Sparus aurata)*, European seabass (*Dicentrarchus labrax*) and European hake *(Merluccius merluccius)*. The interviewed fishers from Shengjin-Lac declared that the most frequent fished species are represented by gilthead seabream, European seabass, Atlantic blue crab (*Callinectes sapidus*), European eel (*Anguilla anguilla*), Mugilidae members (ex. *M. cephalus*) and shrimps. Furthermore, the fishers from Vlore declared that the most frequent fished species are represented by gilthead seabream, European seabass, European hake and red mullet.

To the question "Have you ever caught one unknown fish or another aquatic organism?" (Figure 27), most of the fishers from Durres answered positively, though there were some that answered like "not me personally, but some colleagues do". It is interesting to note that most of the fishers from Shengjin-Lac answered negatively, while some of them answered positively and the remaining interviewed fishers answered like "not me personally, but some colleagues do". In Vlore, the 5 of the interviewed fishers answered positively, while the other 5 answered negatively and 1 of them never answered to this question.

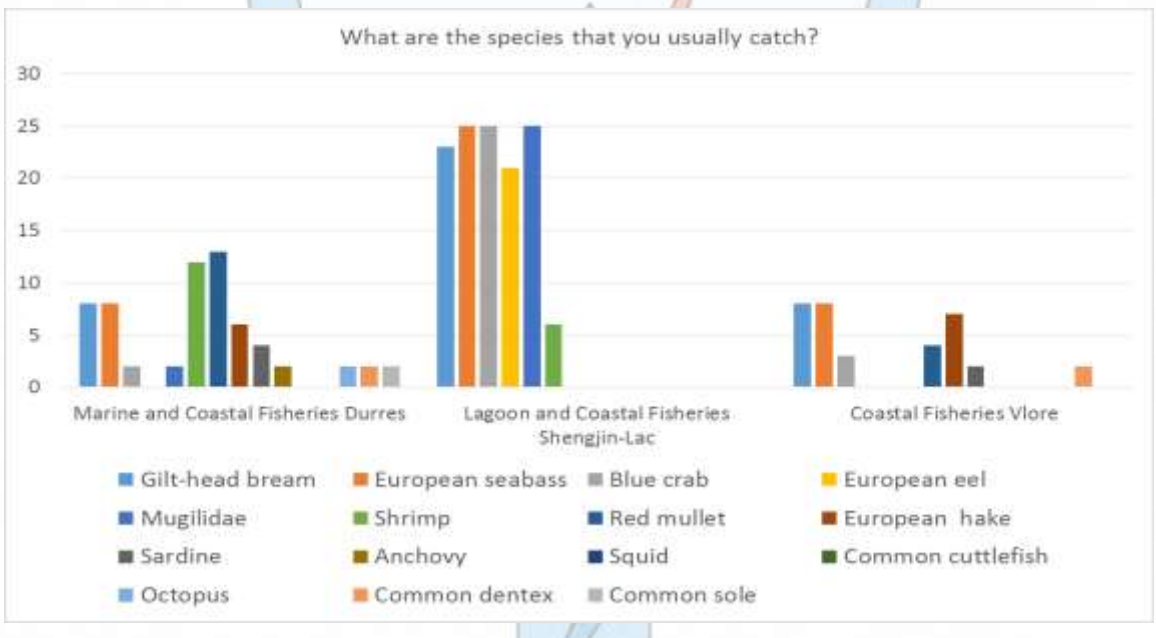

Figure 26. Graphical presentation regarding the answers to the question "What are the species that you usually catch?".

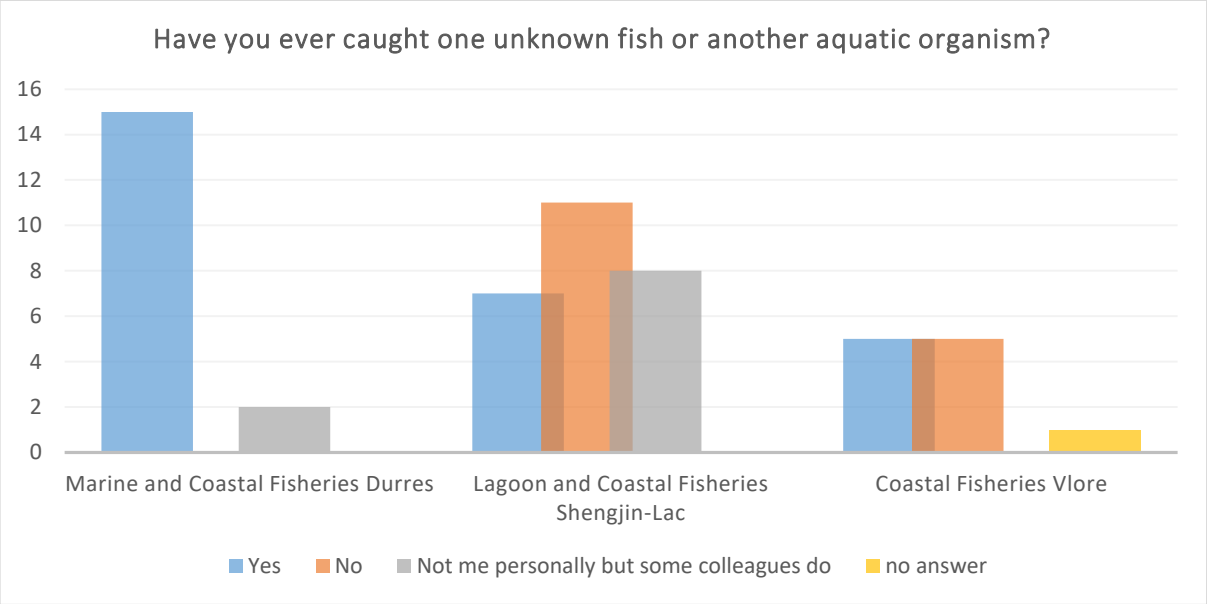

Figure 27. Graphical presentation regarding the answers to the question "Have you ever caught one unknown fish or another aquatic organism?" ; corresponding to the interviewed persons during the questionnaire-based surveys.

Half of the interviewed fishers in the Vlore region declared that each of them has fished Atlantic blue crabs in the Bay of Vlora all year along by using nets, while generally the relative dimensions were 30-50 g per individual. Most of them declared that they were consuming or selling them. In the region of Shengjin-Lac, most of the interviewed fishers used fyke net, gillnets and traps to catch the Atlantic blue crabs (about 18cm or up to 140g), which were mostly discarded due to the problems created by the relative abundance. These declarations came by fishers from Laguna e Cekes (Vain), Zajed, Drini river delta and Lagoon of Merxhan. Most of them declared that they were collecting them during winter (December), though some of the fishers declared that the crabs were observed during the months of May, June, December and January. The questionnaire surveys in Currila and Cape of Rodon (Durres region) were conducted toward the small-scale and recreational/subsistence fisheries, who declared that they were using mainly trammel nets and hooks/longlines to catch NN species. The NN species were represented by *Callinectes sapidus*, *Siganus luridus*, *Siganus rivulatus*, *Fistularia commersoni*, *Pomatomus saltatrix*, *Sparisoma cretense*, *Percnon gibbesi*, *Aplysia dactylomela* and *Lagocephalus sceleratus*. The commercial fishers of the Bay of Durres are represented by fishers working on trawlers. During the fishing activities, they have encountered mainly *Callinectes sapidus*, *Pomatomus saltatrix*, *Siganus luridus*, *Siganus rivulatus*, *Fistularia commersoni*, *Sparisoma cretense*, *Percnon gibbesi* and *Lagocephalus sceleratus.* According to most of the commercial fishers, the fished NN species were discarded though one of them declared that some of them are sold in the market (not venomous ones). Commercial fishers declared that they have fished *Siganus rivulatus* and *Fistularia commersoni* in 2018, while *Lagocephalus sceleratus* has been fished by a trawler in 2016. Just one of the small-scale fishers declared that individuals of *P. saltatrix* were regularly sold in the market. Regarding the collaboration availability (Figure 28) of the interviewed fishers, most of the interviewed fishers (from all the investigated areas) answered positively. In Durres, there were also some fishers, who never preferred to answer this question, while the remaining ones declared that they didn't know if it could be a risk for the relative job. The remaining fishers from Shengjin-Lac didn't prefer to answer the question, while the remaining fishers from Vlore declared that they didn't know if it could be a risk for the relative job.

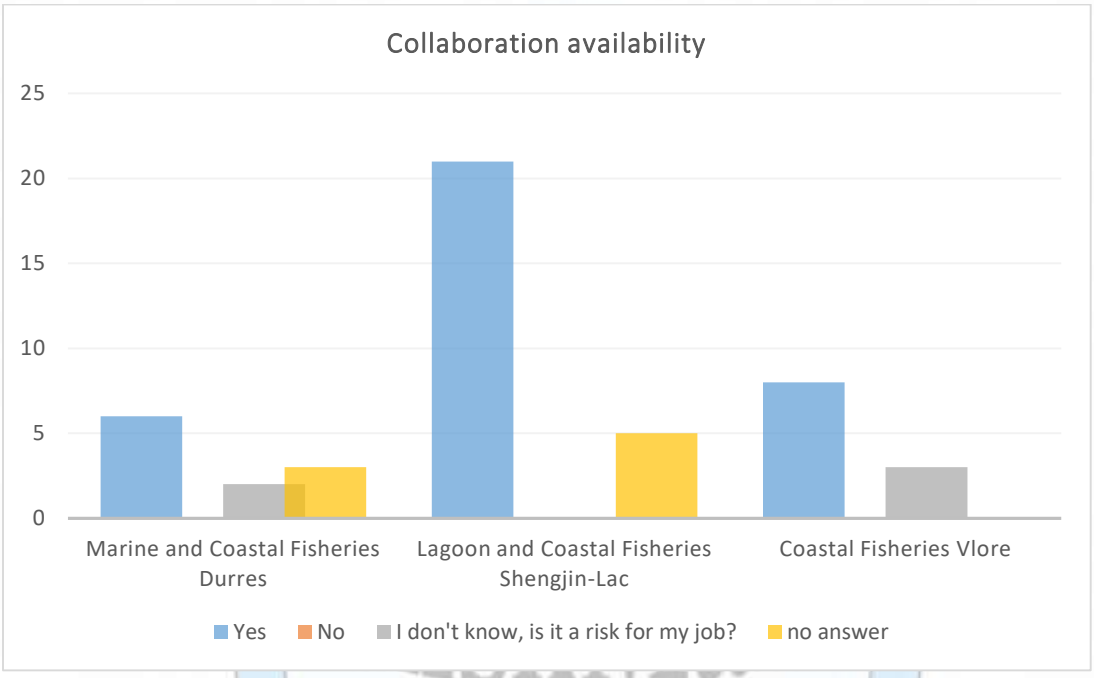

Figure 28. Graphical presentation regarding the answers to the question "Would you be available to collaborate?".

CONCLUSIONS

Regarding the aquaculture subsectors, it was found that the freshwater aquaculture farms representatives showed to have a higher education level in comparison to the representatives of the marine aquaculture farms. It was found a positive correlation between the education level and the knowledge about the NN species. For example, the marine aquaculture farms representatives declared that gilthead seabream and European seabass were representing NN-species in the country. However, all the representatives of the freshwater aquaculture farms didn't prefer to answer the question "Would you be available to collaborate?", while most of the representatives of marine aquaculture sub-sector expressed their availability to collaborate with scientists about the NN species issues.

In the fisheries sub-sectors, most of the interviewed fishers from the Vlore region were included in the age category of 36-49 years old and no older fishers were interviewed during the questionnaire surveys in Vlore. The education level profiles of Shengjin-Lac and Vlore were similar between them. It was also interesting to note that differently from the other investigated regions, all the fishers from Shengjin-Lac answered positively to the question "Do you know what a Non Native species is?". Furthermore, all the fishers from Shengjin-Lac agree with the statement that NN species must be completely eliminated from the territory when possible, which probably indicates that these species are becoming more problematic in this region in comparison to the other two investigated regions, which show similar profiles regarding the answer to this question. However, it is important to note that most of the interviewed fishers (according to the answers) showed to be available in the future collaboration with the scientists, who conducted the questionnaire surveys.