

**ANALYSIS OF UNIVERSITY STUDENTS' PERCEPTION OF
AND ATTITUDES TOWARDS BIODIVERSITY**

M.Sc. THESIS

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Department of Climate and Marine Sciences

Earth System Science Programme

Thesis Advisor: Prof. Dr. Hasan Nüzhet DALFES

JANUARY 2015

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VE BİYOÇEŞİTLİLİKLE İLGİLİ TUTUMLARININ ANALİZİ**

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For my grandfather and Mr. Spock,

FOREWORD

The number of the problems nature has which caused by us, get more and more everyday. We, the scientists, are quite good at spotting and defining them, finding solutions for each of them but this fact does not stop this number to go up. It is because, no matter how hard we try to solve these problems, there is an essential point without which the solutions always stay theoretical; human factor. Without the support and participation of people, solutions cannot achieve their aimed goals completely. This is why I chose to do this research; I do refuse to believe that people just do not care about nature 'consciously'.

I would like to thank my advisor professor Prof. Dr. Hasan Nüzhet DALFES for bearing the labors of this study with me and his guidance, my family and friends for their endless support and patience, especially my brother Ertunç, Ulaş, Elif, Arıkan, Hakan and Tuğçe, with whose help the questionnaire reached more people than I could make on my own. I also want to thank my unofficial advisor Yeliz YILMAZ, for every hard time she was there for me all the way long, Ahmet Tuncer DURAK for just being awesome and Damla ŞAHİN-ALTUN for all her support. And of course, I thank Oğuzhan KANMAZ, my love, my better half, my best friend for making everything seem possible and easy, from the high school desks we shared to this very point and making life worth living 'always'.

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ABBREVIATIONS

CBD	: Convention on Biological Diversity
IUCN	: International Union for Conservation of Nature
etc	: et cetera
DK	: Do not know
LPI	: Living Planet Index
WWF	: World Wide Fund for Nature
TEMA	: Türkiye Erozyonla Mücadele Ağaçlandırma ve Doğal Varlıkları Koruma Vakfı

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ANALYSIS OF UNIVERSITY STUDENTS' PERCEPTION OF AND ATTITUDES TOWARDS BIODIVERSITY

SUMMARY

Loss of biodiversity is among the greatest environmental threats. Immediate, dense and serious steps for conservation should be taken globally. Governmental support and public volunteering are essential for steadily working conservation plans in both national and global scales. Public support for environmental solutions is essential for problem solving. Yet most people do not know what biodiversity is, how it is related to them, what the threats are to biodiversity and eventually what to expect as impacts of biodiversity loss. These facts lead to insensitivity about biodiversity loss and to underestimate its consequences. When people do not know why to care, public support for solutions remain inadequate to be successful. To raise awareness of biodiversity, educating people plays a key role and to do that it is essential to know how to reach them effectively and what they know and what they do not know. Turkey has an enormous amount of biological diversity assets. Yet this tremendous richness brings great responsibility to protect it. Massive urbanization, dams, mining, overfishing, wildfires... etc. seriously threaten Turkey's biodiversity richness. Although governmental and non-governmental organizations conduct campaigns and try to raise awareness of biodiversity loss and its effects, without public support and interest, plans for conservation cannot work properly and a well-planned nature education and informing people about what they should know of biodiversity are essential to achieve this goal. In Turkey, nature education basically consists of biology courses which students take until finishing high school and unfortunately for a number of reasons these courses are often neglected by students. Because young population includes future technology developers, decision makers and solution finders, it is extremely important to educate them about environment and environmental issues. In the present study, from different universities, 200 randomly selected students (100 male and 100 female students) were asked to participate in a questionnaire about biodiversity, biodiversity loss and some basic biodiversity related subjects. Respondents filled the questionnaire by themselves, then the answers were interpreted and categorized by the researcher and the research advisor. To analyze the answers statistically, R Language and R Studio were used. According to the results, when they were asked to spontaneously name 10 living things, 57% of the students could give 10 names. There was no sign of plant blindness, as students often included plants in their answers. To classify all the living things, students used 'Human-plants-animals' system the most (33%). When they were asked to define where humans are in their classification, 46% of the students stated that humans are in a separate group from all living things. 50.5% of the students failed to give a right comment about a very basic food chain. 63% of the students said that they heard the term biodiversity and they know what it means. Students showed 'school' as their first source of hearing about biodiversity and social

networks as the way they learn news and events about biodiversity the most. When they were asked to name three reason which cause the most biodiversity loss in Turkey, top answers were 'pollution', 'hunting' and 'climate change'. They ranked biodiversity loss as a 'very important' problem for both global and local scales. They stated that, minimum requirements for a species to be under conservation are to be dangerously decreased in number on earth and have a unique unfillable role in ecological system. When they were asked, why it is important to protect biodiversity 41% of the students were unable to give an answer. Results indicate that a better planned nature education is needed for young population and this education should start earlier. Families should also take responsibility in nature education. Young population's confusions about environmental issues and terms should be cleared. Helping them to gain ability to evaluate environmental problems from nature's angle and a better understanding of interactions between nature and humans are also important.

ÜNİVERSİTE ÖĞRENCİLERİNİN BİYOÇEŞİTLİLİK ALGISI VE BİYOÇEŞİTLİLİKLE İLGİLİ TUTUMLARININ ANALİZİ

ÖZET

'Biy çeşitlilik' ya da 'biyolojik çeşitlilik', canlıların tür içi ve türler arası çeşitliliği ve ekosistem çeşitliliği olmak üzere üç ölçek kapsayan bir terimdir. Genellikle sadece türler arası çeşitlilik anlamında, aslında çok da yanlış olmayan bir anlamda kullanılsa da, diğer iki ölçek anlama katılmadığında, biyoçeşitlilik kaybının gerçek boyutlarını görebilmek ve anlayabilmek zorlaşır. Biyoçeşitlilik, kirlilik, iklim değişikliği, kentleşme veya insanların kaynak ihtiyacı (Odun, elektrik, ... gibi) giderilmesine bağlı yaşam alanı kayıpları, avlanma, orman yangınları, bilinçsiz tarım, ... gibi sebepler yüzünden her gün daha çok tehdit altında kalmaktadır. Biyoçeşitlilik tanımının tüm yönleriyle kavranmasının önemi de bu tehditler göz önüne alındığında daha açık hale gelir. Biyoçeşitlilik sadece türler arası boyutta ele alınırsa yalnızca av gibi sebepler yüzünden tehlike altına girdiği düşünülebilecekken, tür içi ve ekosistem çeşitliliği de hesaba katıldığında biyoçeşitliliğin her türlü tehdide karşı ne kadar kırılğan olduğunun farkına varılır. Biyoçeşitlilik kaybının önüne geçilmesinde en önemli adım şüphesiz eğitimidir, çünkü biyoçeşitliliği tehdit eden bütün faktörler göz önüne alındığında neredeyse hepsinin altında insan bilinçsizliğinin ve duyarsızlığının yattığı açıkça görülmektedir. Resmi kuruluşlar ve sivil toplum örgütlerinin doğa sorunlarının çözümünde insanların desteğini almak için yürüttüğü kampanyaların, hedef topluluk bahsi geçen sorunla ilgili bilgi sahibi olmadıkça, hatta bunu bir sorun olarak bile değerlendirmedikçe başarılı olma şansları azdır. Çünkü insanlar bu konularda bilinç sahibi olmadıklarında, onları lokal veya global çözümlere destek vermek bir yana, kişisel boyutta önlemler almaya (söz gelimi çöplerini metal, plastik ve kağıt olarak ayırmaya) ikna etmek bile neredeyse imkansızdır. Türkiye biyoçeşitlilik açısından çok zengin bir ülkedir. Hem Avrupa hem Asya kıtasında yer alması, farklı topografik ve toprak özellikleri bir arada bulundurması, farklı bölgelerinde farklı iklimlerin etkili olması Türkiye'ye biyoçeşitlilik açısından eşsiz nitelikler kazandırır. Türkiye'de 3000'i endemik olmak üzere 11000'in üzerinde bitki türü tanımlanmıştır, hayvan türlerinin ise 80000 civarında olduğu varsayılmaktadır. Dünyadaki otuz dört biyoçeşitlilik sıcak noktasından üçü Türkiye'dedir. Bütün bu zenginliğe rağmen, gelişmekte olan bir ülke olmanın getirdiği bir takım problemler, Türkiye biyoçeşitliliğini ciddi anlamda tehdit etmektedir. Nüfus artışı, kentleşme, barajlar, avlanma, madencilik, ... ve daha pek çok sebep tarafından tehdit altında olan bu zengin biyoçeşitliliği korumak büyük bir sorumluluk getirmektedir. Biyoçeşitliliğin korunması ve tehditlerin en aza indirilmesi için uygulanabilecek bütün çözümlerin en önemli parçası yine toplum desteğidir. Bu desteğin en yüksek seviyeye çekilebilmesinin tek yolu da insanlara biyoçeşitlilik ve biyoçeşitlilik kaybı hakkında bilinç ve duyarlılık kazandırmaktır. İnsanlar neyin tehlike altında olduğunu, bunun kendileriyle olan bağlantılarını, biyoçeşitlilik kaybı sonucunda ne gibi etkilerin onları

beklediğini bilmedikleri sürece, onları çözümlerin gerekliliğine inandırmak oldukça zordur. Bu bilincin kazandırılmasında en büyük rolü eğitim oynar. Türkiye’de doğa eğitimi, temel olarak öğrencilerin liseyi bitirene kadar aldıkları biyoloji derslerinden ibarettir. Ancak pek çok kez, öğrencilerin üniversite giriş sınavına dayalı yararlılık yetersizlik değerlendirmeleri, derse ayrılan sürenin ders programının tam ve etkin şekilde anlatılmasına yetmemesi, laboratuvar ve geziler gibi imkânların, her okulda aynı yeterlilikte olmaması gibi pek çok sebep yüzünden biyoloji derslerinin istenilen seviyede başarıya ulaşamadığı da belirtilmiştir. Bu çalışmada hedef grup olarak, üniversite öğrencileri seçilmiştir. Bu sayede çalışmanın, hem geleceğin çözüm üreticileri, teknoloji geliştiricileri, karar alıcıları olacak olan üniversite öğrencilerinin doğa ve doğa sorunlarına olan aşinalıkları, bakış açıları ve bazı basit değerlendirmeleri yapmaktaki başarılarına dair fikir vermesinin yanında, verdikleri cevaplar ışığında aldıkları ve aslında almaları gereken doğa eğitimi hakkında da ipuçları verebilmesi amaçlanmıştır. Bu çalışmada, İstanbul ilindeki farklı üniversitelerden, rastgele seçilmiş, 100 bayan ve 100 erkek olmak üzere toplamda 200 öğrencinin katıldığı biyoçeşitlilik algısı üzerine hazırlanmış bir anket yapılmıştır. Anket sorularının çoğu, daha önce yapılmış benzer çalışmalardan derlenmiş olup, bir uzman yardımıyla, Türkiye eğitim sistemine ve öğrencilerin anlama seviyelerine göre değişiklikler ve sadeleştirmeler yapılmıştır. Anket toplamda on iki soru içermektedir. Öğrencilere, doğa ve insan algıları, biyoçeşitlilik, biyoçeşitlilik kaybı ve ilgili konulardaki bilgileri ve görüşleri hakkında sorular sorulmuştur. Biyoçeşitlilik terimini daha önce hiç duymamış olan ya da duyup anlamını bilmediğini ifade eden katılımcılara, ankete devam etmeden önce, üzerinde biyoçeşitlilik tanımının yer aldığı kartlar verilmiştir. Öğrenciler anketleri kendileri doldurduktan sonra, cevaplar araştırmacı ve danışmanı tarafından değerlendirilmiş ve mümkün olan en geniş ölçüde kategorilere ayrılmıştır. Cevapların istatistiksel analizleri R ve R Studio ortamında yapılmıştır. Öğrencilerden akıllarına ilk gelen on canlıyı yazmaları istendiğinde sadece %57’si on canlı örneği yazabilmiştir. Bitki isimleri ve insan içeren cevapların sayısı kayda değerdir. Öğrencilerin %62’si biyoçeşitlilik ya da biyolojik çeşitlilik terimini ilk kez duydukları kaynak olarak ‘okul’ cevabını vermişlerdir. Öğrencilerin tüm canlıları sınıflandırmakta en çok kullandıkları sistem ‘İnsan-hayvan-bitki’ olmuştur. %46.5’lik bir grup insanı diğer canlılardan tamamen ayrı sınıflandırırken, %33.5’lik bir grup insanı hayvan kategorisine dahil etmiştir. %63’lük bir grup biyoçeşitlilik terimini daha önce duyduğunu ve ne anlama geldiğini bildiğini belirtmiş, %75’lik bir grup biyoçeşitlilik kaybını dünya için çok önemli bir sorun olarak derecelendirmiştir. Buna rağmen öğrencilerin %41’i biyoçeşitliliğin korunmasının neden önemli olduğu sorusuna herhangi bir yanıt verememişlerdir. Aynı şekilde basit bir besin zincirinde, tek bir basamağın çıkarılmasının ne gibi sonuçlar doğurabileceği konusunda öğrencilerin sadece %46.5’i doğru şekilde fikir yürütebilmiştir. Biyoçeşitlilik kaybının Türkiye için çok önemli bir sorun olduğunu düşünen öğrenciler %59.5’lik bir grupken, Türkiye’de biyoçeşitlilik kaybına sebep olan en önemli 3 sebep, kirlilik, av ve iklim değişikliği olarak belirtilmiştir. Sonuçlar ayrıca, resmi kuruluşlar ve sivil toplum örgütleri tarafından, doğa sorunları ve bunların çözümleri, doğa haberleri ve aktiviteler için genç nüfusa ulaşmanın en iyi yolunun sosyal ağlar olduğunu göstermiştir. Öğrenciler herhangi bir türün koruma altına alınabilmesi için dünya üzerinde sayıca çok azalmış olma ve doğada yeri doldurulamayacak bir rolü olma koşullarının yeterli olduğunu belirtmişlerdir. Sonuçlar, genç nüfusun daha erken yaşlarda, daha iyi planlanmış bir

doęa eęitimine başlamasının ve ailelerin de doęa eęitiminde sorumluluk almalarının öneminin altını çizerek niteliktedir. Ayrıca, gençlerin biyoçeşitlilik gibi konularda sıklıkla yaşadıkları kavram karışıklıklarının giderilmesi, doęa sorunlarını insanlar açısından olduğu kadar doęa açısından da ele alabilecek düzeyde bilinç sahibi olmaları ve doęa - insan arasındaki ilişkileri daha iyi kavrayabilmeleri için çözümlerin bulunmasının gereklilięi varılabilecek çıkarımlar arasındadır.

1. INTRODUCTION

Biodiversity has become a central concern in environmental management [1]. People become more and more aware of and interested in preserving biodiversity and how to do that. However, because there are misconceptions about the term 'biodiversity', the level and content of these awareness and interest does not fulfill the real amount which the issue deserves. Though the term biodiversity contains three scales of diversity (within and between species and between ecosystems) it is mostly used in the meaning of diversity between species. Even though this usage is not completely wrong, without mentioning the other two scales, the term remains inadequate to represent both; all the ecosystem services and the present and possible results of biodiversity loss, especially for laypeople. As a contracted form of 'biological diversity', the term 'biodiversity' stands for the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems [2].

Loss of biodiversity is among the greatest environmental threats [3]. Rapidly growing demands of energy, land and resources, become more and more threatening for natural systems every day. Immediate, dense and serious steps for conservation should be taken globally. Governmental support and public volunteering are essential for steadily working conservation plans in both national and global scales. Initiatives like Convention on Biological Diversity (CBD) and organizations like International Union for Conservation of Nature (IUCN) help establishing unity between international efforts to preserve biodiversity and inspiring governments and people for new measures. The Living Planet Index (LPI), which is an indicator of the state of global biological diversity, based on trends in vertebrate populations of species from around the world [4], shows an overall decline of 52 per cent between 1970 and 2010 and "This global trend shows no sign of slowing down" [5]. According to the same report,

habitat loss and degradation, and exploitation through hunting and fishing are the top causes of this decline and climate change follows these, as the second. According to Eurobarometer [6], more than 8 in 10 European Union citizens (84%-93%) felt that biodiversity loss was a very or 'fairly' serious problem at national, European and global levels, yet, compared to almost three-quarters (72%) who thought that it would only have an impact in the future. In the present environmental circumstances, status and changes of natural systems, expecting the 'impact' of biodiversity loss to take place in the future may seem irrational but instead, this question should be asked "Do people really know what is being lost and what to expect as an 'impact'?" or even that one; "Do they consider biodiversity loss as a problem?" and if so "How important is it?".

In the interest of recruiting public support for preserving biodiversity, it is essential to understand and analyze why people refuse or do not care to support. In macro scales the answer could mostly be economic yet in individual scales it is mostly because people are not informed about what is biodiversity, biodiversity loss and how it is and will be affecting them. And when people do not know these facts, it is hard to convince them even to sort their garbage into metals, paper and plastics. Lack of ability to see a bound between themselves and biodiversity is also a problem as every day more and more people start to live in cities. For example, as people spend less and less time in natural areas, it becomes a distant subject to bother for them. No conservation acts would succeed unless the general public cares and they are unlikely to care enough if they no longer experience nature directly [7]. This is a more serious problem for the young population as they born into these circumstances, without a bound with the nature. And there is another group of people who feel responsible for the nature yet do not know what to do to preserve it. According to Eurobarometer [6], more than a quarter (28%) of respondents answered that they were not making any attempts to protect biodiversity. However, most of these respondents said this was because they did not know what to do to stop biodiversity loss. Campaigns, projects and plans for conservation should be shaped after these facts are evaluated in order to reach more people.

Elucidating people about ecosystem services is one of the best ways to show the real dimensions and possible and present effects of biodiversity loss. People judge the

value of organisms by their beauty, usefulness or rarity and the visual attractiveness of a species strongly influences their opinion of whether it should be protected or not [8]. This angle of judgment is also the same for ecosystems. Although ecosystem services like carbon cycling, recreational opportunities, avoiding erosions and floods, food (like fish, wild fruits...) generally known this knowledge should be widened to medicines, fuel, fiber, climate regulation, job opportunities, tourism etc., hence people could gain a better understanding of how biodiversity, in all three scales, affects their everyday life and that biodiversity loss is more than just the extinction of some species which they have never heard of. Additionally the reason why people do not care to avoid biodiversity loss may be connected with their point of view about where 'the human' stands in nature. With an anthropocentric view, assuming that humans have every right on nature and everything can be exploited and can be extinct as long as it is for quenching the needs of humans, may result in not caring to support preservation acts. Hence educating people well, especially the young population, about nature, rising interest and awareness for environmental issues as a part of education and analyzing what people really need to know basically are important in that manner.

1.1 Biodiversity, biodiversity loss and conservation in Turkey

Turkey is a transcontinental country, located on Western Asia (Anatolia) and Southeastern Europe (East Thrace). This unique geographical location, different topographic and edaphic structure and different climate effects on different regions bring Turkey enormous amount of biological diversity assets. There have been above 11000 plant species identified in Turkey, 3000 of those being endemic species. It is estimated that animal species are around 80000 and three of thirty-four (twenty-five hotspots and nine prospective) global high diversity hotspots are located in Turkey: the Mediterranean, the Caucasus and the Irano-Anatolian. Despite a 10000 year history of often intense natural resource exploitation and human land use Turkey has retained an astonishing amount of biodiversity for a temperate country of its size, is a center of genetic diversity and has a rich heritage of traditional knowledge of biocultural diversity [9]. Biodiversity has important cultural and commercial value for nearly 20 million rural people in Turkey [9]. This enormous richness in biodiversity brings

great responsibility to protect it. In 1992 Turkey signed the CBD and approved it in 1996 and is a member of IUCN. Turkey has 40 national parks, 31 nature reserve areas, 80 wildlife protection areas, 189 nature parks and 109 natural monuments, and in 2012, estimated land area under protection was %7.24 of all land area of the country. There are also great efforts of non-governmental organizations like World Wildlife Fund-Turkey, Greenpeace, Doga Dernegi and The Turkish Foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats (TEMA) for raising awareness and funds for projects. Yet, Turkey's environmental issues are inherited from thousands of years ago, thus they are not easy to overcome. Today, as a developing country, rapid growth of population leads to massive urbanization which is a very serious threat for biodiversity. Forest fires, overgrazing, infrastructure projects, deforestation, mining, dam constructions, poaching, overfishing are just a few of the other threats to biodiversity in Turkey [9]. In 2014, Turkey ranked 133th out of 178 countries in Environmental Performance Index [10] on biodiversity and habitat conservation issue and 66th in overall ranking. These facts are indicating that further measures for preservation are urgently needed.

1.2 Nature education and students in Turkey

As mentioned before, without general public's support and awareness, plans for conservation cannot work properly and a well-planned nature education and informing people about what they should know of biodiversity are essential keys to achieve this goal. In Turkey, nature education basically consists of biology courses which students take until finishing high school. Along with the fact that these courses are not enough for a proper nature education by themselves, there is also another fact that biology courses are often neglected by students as they go through a 'memorize until the exam and forget after the exam' system, mostly because of the university entrance exam-based studying. Of course there are also many other reasons, including student-related, teacher-related and curriculum-related issues. Biology questions which the university entrance exam contains are less than any other field's questions such as mathematics. This fact leads students to lose interest in biology and focus on other subjects which have more questions in the exam. Some students find biology

curriculum too dense to study and the outcome of their effort in the exam is not worth it, while some of them find biology courses 'useless', when compared to the 'useful' courses such as mathematics and physics. Science teachers also have troubles, such as teaching the long list of biology subjects in a very limited time [11]. After students graduated from high school, depending on their chosen study area in university, they may be never to take biology-related courses again.

It is also mentioned that almost no direct interaction with the nature is a serious problem for young people because when they cannot make a bound with nature, nature loses its importance or even existence for them and eventually, among their other problems and worries about future, biodiversity loss could not find a rank which it deserves.

In the present study, a randomly selected group of higher education students were asked to participate in a questionnaire about some basic biodiversity related concepts and biodiversity loss in order to get an idea about their perception of and attitudes towards these subjects. Shortly, these questions were addressed:

- (1)How familiar are the students with the term 'biodiversity' and biodiversity related subjects?
- (2)Where do they see humans amongst all the living things? Is the point of view on this subject, influences their opinions about other matters about biodiversity?
- (3)Do they see biodiversity loss as a local and/or global problem? If so, how important it is for them?
- (4)In their opinion, what are the main threats to biodiversity in Turkey?
- (5)What is the best option to reach them to inform them about biodiversity?

2. MATERIAL AND METHOD

2.1 Universities in Istanbul

Istanbul is located in northwestern Turkey, within the Marmara Region and considered to be the cultural and educational heart and the largest city of the country by population. In 2013, 14.160.167 people (18.5% of total population of the country) were living in Istanbul and this count contains people from almost every city in Turkey [12]. Hence Istanbul can be considered to be representing all the country by its population. Istanbul is also a highly preferred city for higher education by young population from all over the country, as it has 39 universities within (8 public and 31 private) and most of them are among the leading universities of Turkey. These assets lead the city to be also representative of higher education students from different cities and different backgrounds thus an appropriate choice for the study.

2.2 Students

From different campuses of different universities, 200 randomly selected students (100 male and 100 female students) were asked to participate in the questionnaire. Their subjects of study vary from engineering to economics. Students were approached in campus cafeterias and around-university cafés, where they feel comfortable and have spare time to participate in the study. Filling in the questionnaire took participants, between 10 to 15 minutes approximately. All participants were asked about their age, gender and subject of their studies. The questionnaire was filled in by the participants then the answers were interpreted and categorized by the researcher and the research advisor.

2.3 Questionnaire

To collect data for the present study, a questionnaire was used. In order to assess public awareness and sensibility levels about environmental matters and obtain efficient public participation in decision-making process for planning attempts, the most preferred detection method is public questionnaire surveys [13]. The questionnaire which was used in this present study has twelve questions. It has both open ended and multiple choice questions. To construct the questionnaire, some questions of three previous studies were used [14] [15] [6]. While some questions are used as they were in these previous studies, some of them had adjustments, simplifications and purpose alterations, due to the differences between education systems and focus groups. Because the researcher is not qualified properly in survey methods, an eminent consultant helped forming the questionnaire. Original language of the questionnaire is Turkish and English translated version can be found in Appendix.1. To analyze the results statistically, R Language (R Language version 3.1.2) and as an integrated development environment R Studio (R Studio version 0.98.1091) were used.

2.4 Questions

Question 1: Participants were asked to write down the names of 10 living things come to their mind first. This question is meant to show which organisms were highly mentioned when asked about 'living things' and if the plants were mentioned as often as any other (or mentioned at all), or if there were signs of plant blindness [16]. Answers also can provide data about if the respondents considered 'humans' as a 'living thing'.

Questions 2 and 3: Second question is a classifying question and also a primer to the third one, as the answer for this question may and may not contain humans. The third question will show what the place of humans is, amongst all the other living things in students' opinion and so it will help understanding the answers for other following questions.

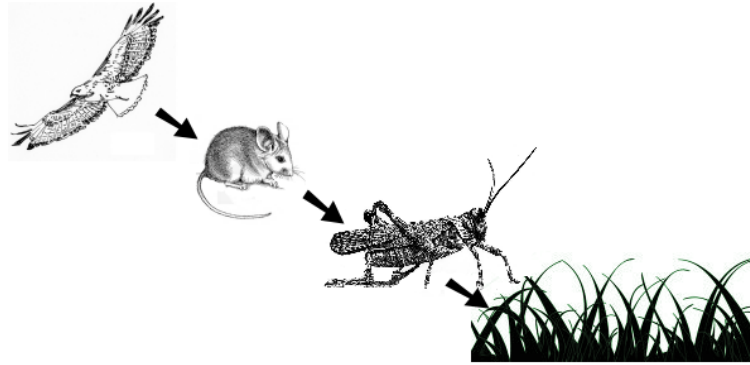


Figure 2.1: The food chain used in question 4.

Question 4: Forth question is a basic food chain question, it can help understanding how much the respondent knew about ecological connections in a very basic level. The question asks, in a certain area where hawks, grasshoppers, mice and grasses live (Figure 2.1), if the mice were out of the system, how the entire food chain would be affected, by this change. Participants are expected to comment on at least how the previous or the next step would be affected, if not on the entire food chain.

Questions 5, 6 and 7: Respondents are asked if they ever heard of the term biodiversity. There are three answers they can choose; 'Yes I heard and I know what it means', 'Yes, I heard but I do not know what it means' and 'No, I never heard of it'. If the respondents choose 'Yes I heard and I know what it means' answer, then they are asked where they heard this term for the first time and which source of information they use most to learn news and developments about biodiversity is. If the respondents choose the other answers ('Yes, I heard but I do not know what it means' and 'No, I never heard of it'), a biodiversity definition card (definition card is in Appendix.3) is given to them and they are told to pass the following questions (6th and 7th questions) without answering. 6th and 7th questions may help analyzing which ways can be chosen to reach and inform young population about biodiversity more effectively.

Question 8: Eighth question asks respondents which three reasons can be causing the most biodiversity loss in Turkey, in their opinions.

Question 9: In ninth question, they were asked to choose an importance level for biodiversity loss, first for Turkey and then for global scale. Answers for this question may shed light on if the youth considered biodiversity loss as a problem to care or not

and if they did, how important it was for them. It may also show that if they were in the common delusion of 'the problem is real but takes place far away'.

Question 10: Respondents were asked, which conditions a species should have in order to be under protection, they are allowed to choose more than one answer. Among the answers respondents will choose, there are human-centered and nature-centered alternatives so the chosen answers may show if the participants considered preservation as a kind of protection of human benefits or as an act that, if necessary, do not require human related reasons.

Question 11: In this question, participants were asked to write their opinion about why protecting biodiversity is important. The question has the same spirit with the tenth question, to see if they considered protection acts as protection of nature-related human benefits or if they had nature based reasons in their minds.

Question 12: Finally, an open ended question asks if the respondents might describe their relationship with the nature shortly. The answers to this question may help understanding how young population see themselves connected with the nature, on which points they see this connection and what they call as a relationship with nature.

3. RESULTS

3.1 Evaluation of the Answers

3.1.1 Question 1: Naming ten living things

Students were asked to spontaneously name ten living things and %57 of all students could name exactly ten living things (Figure 3.3). Although most frequently cats, dogs and birds were named, answers containing plant names were enough to clear plant blindness possibility (Figure 3.1). Female students named plants more often than male students (67% and 50%, respectively; Chi-square value 5.952, $p = 0.0147$). Mentioning humans among ten living things was also highly frequent (Figure 3.2) and female students included humans more than male students (63% and 53%, respectively; Chi-square value 2.0525, $p = 0.152$).

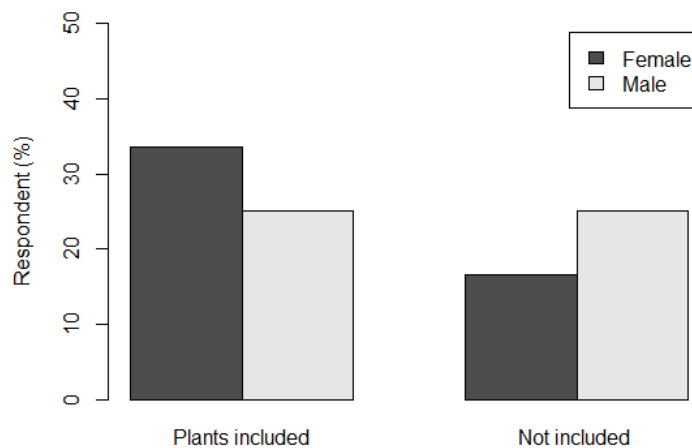


Figure 3.1: Comparison of answers which include and do not include plants.

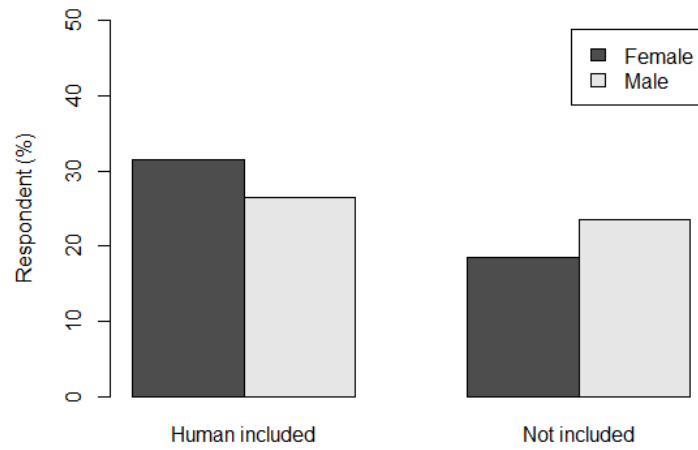


Figure 3.2: Comparison of answers which include and do not include humans.

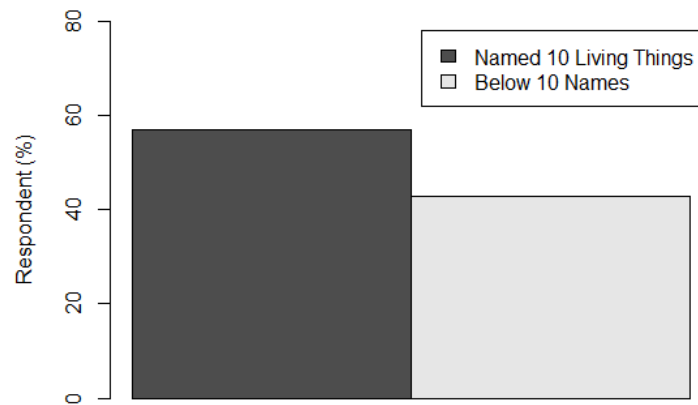


Figure 3.3: Students who could give 10 names of living things and who could not.

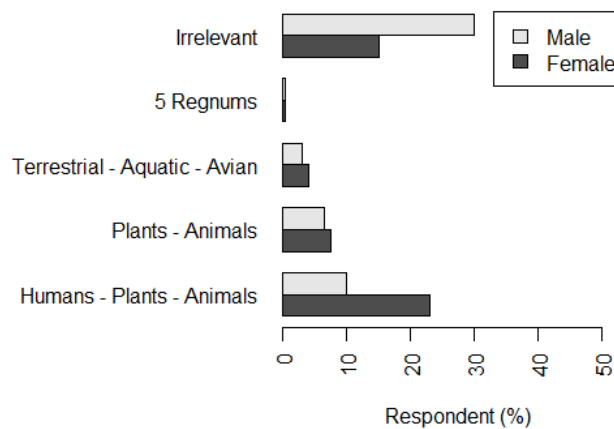


Figure 3.4: Systems which students used for classifying living things.

3.1.2 Question 2: Grouping living things

Students grouped all living things in main categories. Three most frequent grouping systems were; 'Humans - plants - animals', 'Plants - animals' and 'Terrestrial – aquatic - avian'(Figure 3.4). Female students more often used 'Humans - plants – animals' system for grouping than male students (46% and 20%, respectively; Chi-square value 15.28, $p = 9.234e-05$). 1% of the students (1 male and 1 female student) used five-regnum classification.

3.1.3 Question 3: Place of humans amongst all living things

Participants were asked to give humans a place in the system they used for grouping living things. 46.5% of all participants stated that humans were a totally separated group than all the other living things. 33.5% of the participants classified humans as animal (Figure 3.5). Female students classified humans separately more often than male students (57% and 20%, respectively; Chi-square value 8.8634, $p = 0.002909$) whereas male students more frequently classified humans as animals (40% and 27%, respectively; Chi-square value 3.7931, $p = 0.05147$).

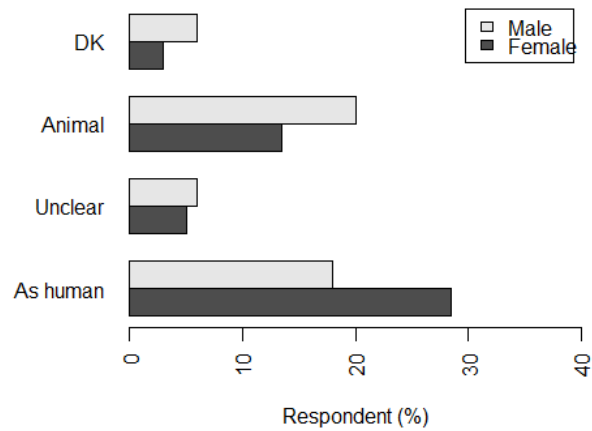


Figure 3.5: Students who classified humans as animals and who did not (DK=Do not know).

3.1.4 Question 4: Commenting on basic connections

Students commented on a basic food chain alteration between hawks, mice, grasshoppers and grass. 46.5% of all respondents could comment correctly (Figure 3.6). Male students correctly commented on the question more frequently than female students (49% and 44%, respectively; Chi-square value 1.7196, $p = 0.1897$).

3.1.5 Question 5: Familiarity with the term 'Biodiversity'

Students asked to define their familiarity with the term 'biodiversity'. 63% of all students stated that they heard the term before and they know the meaning of the term whereas 11% stated that they have never heard of the term before (Figure 3.7).

3.1.6 Question 6: First source of hearing about biodiversity

The students, who replied previous question as 'I heard and I know what it means', were asked about their first source they heard about the term 'biodiversity'. 62% of all students showed school as their first source. It was followed by documentaries (Figure 3.8).

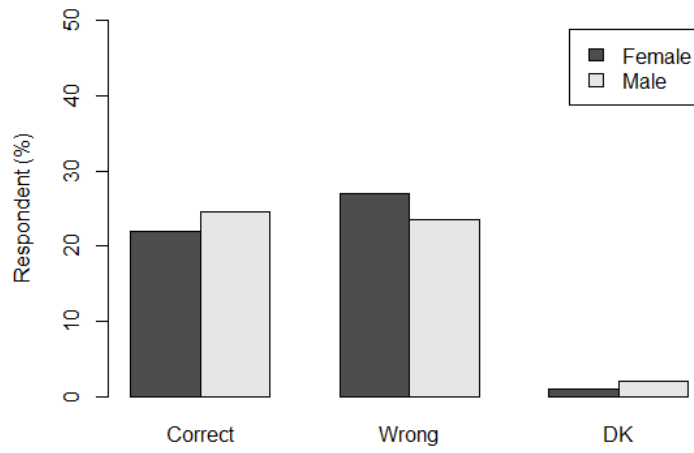


Figure 3.6: Commenting on a simple food chain.

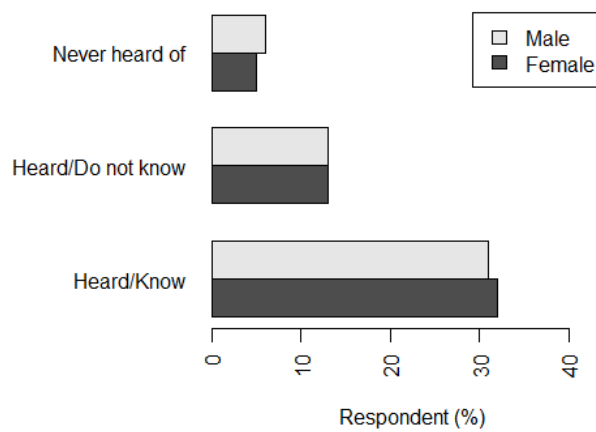


Figure 3.7: Familiarity with the term biodiversity.

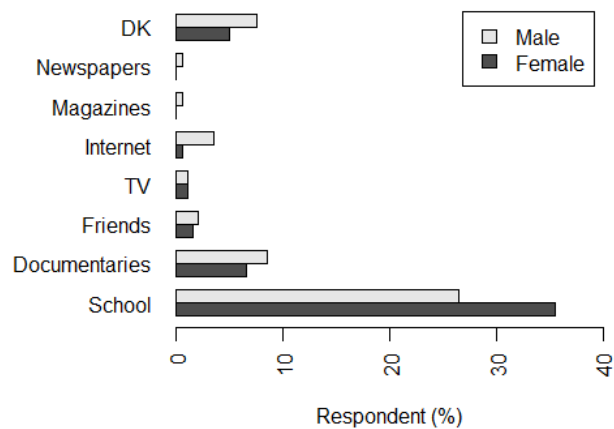


Figure 3.8: First source of hearing about biodiversity.

3.1.7 Question 7: Sources of information about biodiversity

Participants replied which sources they see biodiversity related news, events etc., most frequently. Social networks were the top answer for both male and female students and followed by television and school (Figure 3.9).

3.1.8 Question 8: Top three causes of biodiversity loss in Turkey

Students were asked to name three reasons which cause biodiversity loss the most in Turkey. 'Pollution' was the most frequent reason students, followed by 'hunting' and 'climate change' (Figure 3.10).

3.1.9 Question 9: Importance of biodiversity loss at local and global scales

Students defined the importance of biodiversity loss problem for both global and local scales. 75.5% of the students stated that the biodiversity loss is a very important problem for the world (Figure 3.11) and 59.5% stated that the problem is very important for Turkey (Figure 3.12). Female students more often ranked the problem as very important, than male students for both global scale (79% and 72%, respectively; Chi-square value 1.3245, $p = 0.2498$) and for Turkey (65% and 64%, respectively; Chi-square value 2.5106, $p = 0.1131$). When compared, seriousness of biodiversity

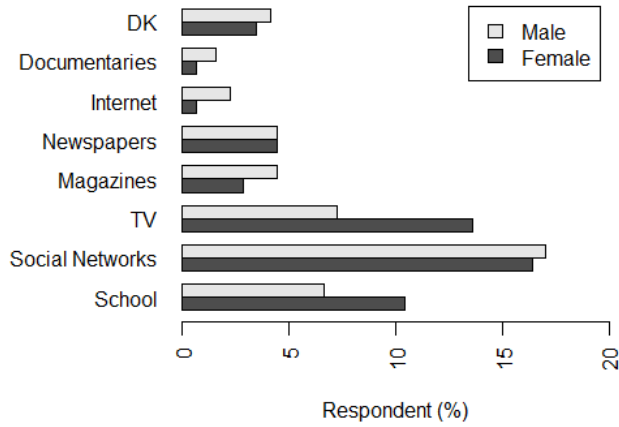


Figure 3.9: Sources which students mostly use to learn about biodiversity related news, activities and events.

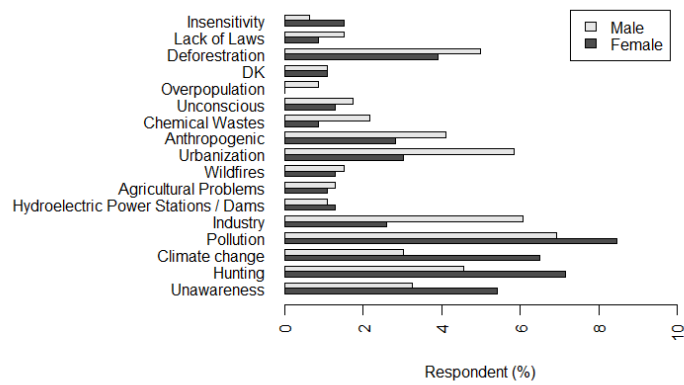


Figure 3.10: Reasons which cause the most biodiversity loss in Turkey according to students.

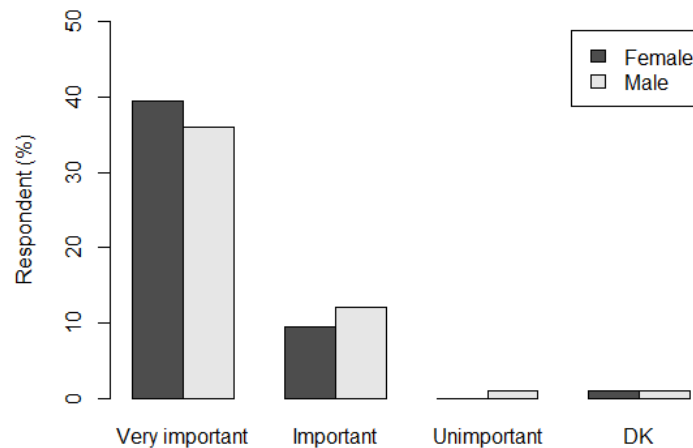


Figure 3.11: Ranking the importance of biodiversity - global scale.

loss problem was more frequently ranked as 'very important' for global scale than local scale (Figure 3.13).

3.1.10 Question 10: Opinions about conservation requirements at species scale

Participants were asked to choose the minimum requirements of a species to be under conservation, out from four given choices. Most frequently given combination of the alternatives was the second and the third choice combination and was given by 24% of the students (Figure 3.15). In the evaluation of the items one by one, second and third items were the top answers (Figure 3.14).

3.1.11 Question 11: Why protecting biodiversity is important

When asked to define why to protect biodiversity is important, 41% of the students could not give a proper answer. 22.5% of the students referred to natural balance/benefits for nature whereas 22.5% referred to human life (Figure 3.16).

3.1.12 Question 12: Notes on students' connections with nature

In the end of the questionnaire students were asked to define their relationship with nature very shortly. This was not a question to evaluate, it was asked for to see what kind of things are, the students thought related to nature. The answers varied from 'I

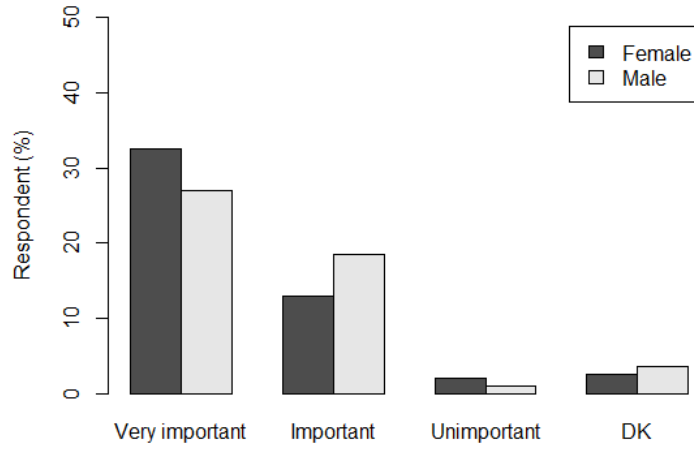


Figure 3.12: Ranking the importance of biodiversity - local scale.

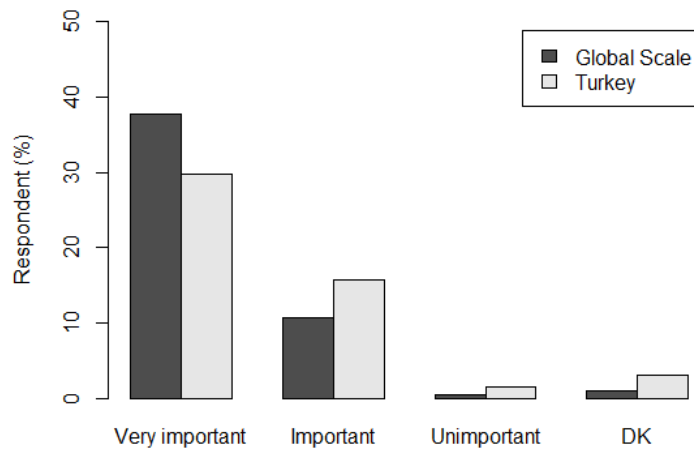


Figure 3.13: Comparison of both rankings.

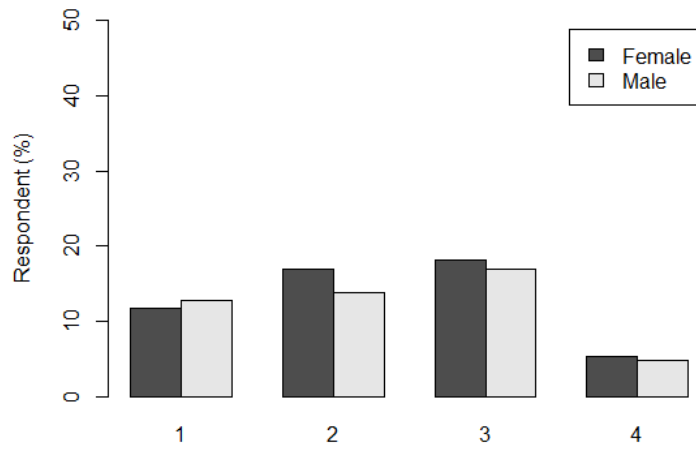


Figure 3.14: Answers for each item in question 10.

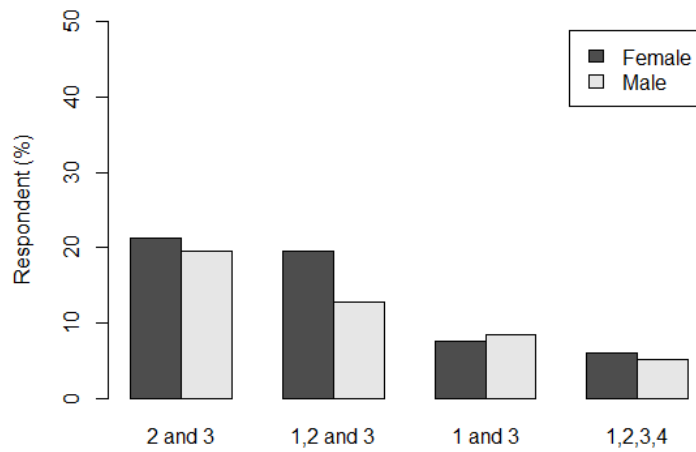


Figure 3.15: Top four item combinations.

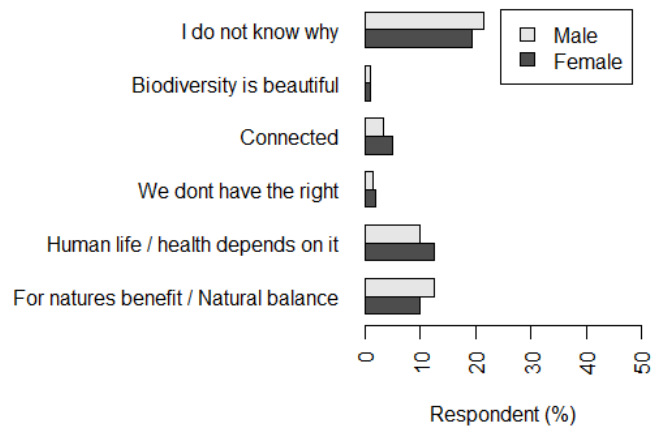


Figure 3.16: Why is it important to protect biodiversity in your opinion?

have a dog' (Male, 21), 'I like to go for walking in the forest' (Female, 21), 'Medicines I use, food I eat'(Female, 20), 'It is refreshing to see forests and the sea'(Female, 23) to 'The relationship between me and the nature started on the time I was born and will end in the time when I am dead. In fact even then it will continue!'(Male, 22), 'Even just because I am breathing air, I cannot think any moment that I am not connected to nature'(Male, 24). When considered, the answers for that question revealed that in fact the young people are aware of the strong and essential bound between the nature and themselves. They just need a better and clear understanding of every dimension of this bound.

4. DISCUSSIONS

The present results show that, students who were participated in this study did not show signs of plant blindness as they often placed different taxa of plants in their answers (from 'tree' to 'broccoli'). Female students mostly wrote 'flowers' such as roses, hyacinths and tulips whereas male students wrote mostly tree species like oak, willow and pine. Animals which were written the most, for both genders were; cat, dog, bird and snake although there were exotic animals like sloths, rhinos, tapirs and even dinosaurs in considerable numbers. For these answers, it may be said that watching documentaries or movies helps young people to widen their awareness of the species as they have no chance to see these animals in their everyday life or not even this century. This is quite important, because as discussed before, people tend to care more about the species they see or at least know of. Male students often referred animals such as lion, eagle, canary and crocodile which are mascots of Turkey's leading football teams. Students also write 'humans' down among ten living things quite often. It may be said that, at least for question 1, participants see 'humans' as one of the living things. A remarkable fact about question 1 was, when the respondents read the first question, almost all of them asked "What do you mean by 'living thing'?" thus, question 1 was the only question which the participants required extra information for. This is surprising but may be ascribed to their momentary confusion about 'living thing' concept although it is a familiar concept.

The answers to question 2 show that, they mostly placed humans in a different category/group than other living things, and they pointed out that this place was not just different than the other groupings they did, but also was 'above' them. Most participants who grouped humans separated from other living things, elaborated their answers to question 3, by adding describings like; 'above all of them', 'at the top of all living things', 'totally different than other living things' or 'most advanced of all'.

The fourth question, was a very basic food chain question yet most of the students failed to give a correct comment. This fact should be taken seriously, because disability of seeing even simple and basic interactions between species make people give wrong judgments about the importance of the species and how every species is connected to all, and this leads to insensitiveness about biodiversity loss unfortunately.

The results show that most of the students were familiar with the term 'biodiversity', they heard it before and they know what the term means. Most of the students replied 'school' for their first source of hearing about the term biodiversity. This reflects reality because, as discussed before, nature education in Turkey is mainly based on biology courses. This is also an important fact to be taken seriously as it indicates how important schools are for environmental education and if nature education started at younger ages, it could be more effective on children and young people.

Participants gave 'social networks' answer as their most used way to learn about biodiversity and related issues and events, followed by 'television' answer. As in the most part of the world, in Turkey, young people use internet and social networks densely. Thus these results may give an idea on how to reach young population most effectively to inform them about environmental issues and to raise their awareness about biodiversity and biodiversity loss.

Locally in Turkey, participants replied that the three main cause of biodiversity loss were 'pollution', 'climate change' and 'hunting'. These answers indicate their awareness about environmental issues in Turkey. Istanbul, where the study took place, is the leading city of Turkey in the numbers of motor vehicles its residents have. Also, there are lots of factories in and around the city. There is also the fact that, because Istanbul is an over-crowded city, even the home-waste handling is a problem. These points may clear the reason why students answered 'pollution' the most. Since the industrial revolution, the input of organic and inorganic substances into the environment by humans has become a growing threat to biodiversity [17]. Yet, even after the participants read the biodiversity definition card, the number of answers including urbanization, unawareness and green area/habitat loss, etc., which also massively and directly cause biodiversity loss, were under expectation. It may be interpreted as, the students in fact, defined 'pollution' also as one of the main

environmental problems in Turkey (mostly in Istanbul), more than just stating a cause of biodiversity loss. Climate change is a very serious threat for nature in every way, approximately 20% to 30% of all plant and animal species are threatened by a high risk of extinction, if increases in global average temperature exceed 1.5 to 2.5 °C [18]. Climate change is also one of the most well-known environmental problems as it has the attention of the media all over the world. Thus it is not a surprising result that the students came up with that answer and may underline the importance of the media for awareness about environmental issues.

Hunting is also a well-known problem in Turkey as it is a hot topic because of the recent fishing restrictions and its echoes. Although the students were unclear about the sort of the hunting, the answers may be related to these restrictions. There was also an interesting point about the results to be mentioned, while the participants gave answers such as hunting, urbanization, industry and population increase, they also included 'humans' with these answers. It may be representing their delusional perception about anthropogenic effects as if they accepted hunting, urbanization, etc. and human disturbance on nature as different causes.

Biodiversity loss was mentioned as a 'very important problem' both in local and global scales. In Turkey, where biodiversity, in all three scales, is so rich and suffers more and more everyday due to the massive urbanization, industrialization, etc., this result was not surprising. It also should be mentioned that, students did not show a considerable sign of the delusion of 'biodiversity loss is important in global scale but not locally', which was mentioned before. Yet, according to the total percentages of answers, 'very important' rank given to the global scale was still more frequent than the local scale.

Highest percentage of students mentioned that, the minimum requirements for a species to be under conservation were to be dangerously decreased in number on entire earth and to have a unique and unfillable role in ecological balance. It is quite significant that human-related requirements such as being harmless to humans were not mentioned as much as the nature-related requirements in students' opinion. However, item one (being important as an industrial stock or being a precious food resource) was highly mentioned, as the second, third and fourth top combinations included this term. Students' answers for question 11 also support their answers for question 4. As they

have some confusions about the term biodiversity and lack of recognizing interactions within it, although 63% of them claimed to know what the term means, they failed to give a proper reason why protecting biodiversity is important. One of the least mentioned reasons but an impressive one was, 'It is not logical to think like, humans have the right to decide whether it is important or not' (Female, 24).

Although the results show that 63% of the participants were aware of the term biodiversity and know what it means, when compared with the other answers, it is clear that there is still confusions. As they most frequently gave the answer 'I heard and I know what it means' to question 5 and 'Very important' to question 9, when asked to define why it is important to protect biodiversity, 41% of them could not give an proper answer, instead responded like 'I don't know why but it is important' (Male, 22) or 'Somehow important' (Female, 21). It is also considerable that, although 63% of participants claimed that they heard about the term biodiversity and know what it means, only 46,5% of all students could give a correct answer to question 4, where they were asked to figure out the interactions within a very basic food chain.

Comparison of the results of classifying humans as a separate group and other answers is also considerable. Results show that all of the students who replied question 10 (what requirements of a species should have in order to be protected), with combinations which includes 4th item (being harmless to mankind) also classified humans as a separate group and deepened their answers with statements like 'Above all' or 'Most advanced of all'. Seeing humans as the most advanced or at the top of or at least just 'separated' from the living things, may cause serious perception problems because this judgment consciously or unconsciously gives the idea of 'humans have every right on nature, to consume sources, violate wild life, destroy forests, pollute waters... etc. as these are just results of humans' everyday needs which should be quenched in a way'. It can be interpreted as students need a better understanding of human-nature relationships and limits which humans should respect in order to live together.

5. CONCLUSIONS

In this study, awareness level of the term biodiversity of higher education students was found to be 63% which is a moderate level. For young people, high awareness of biodiversity and biodiversity loss and a correct perception on the importance of biodiversity loss problem are very important, as they are the future scientists, engineers, economists, journalists, etc. Their perception on the biodiversity, biodiversity loss and other environmental issues will have a key role on more realistic sustainable designs and solutions, and eventually on the future of our planet. Results of the present study show that they have also some struggles, even on defining interactions within a quite simple food chain. Lack of awareness of these bounds may lead to failure on perceiving the importance of biodiversity.

Solutions for conservation problems and other biodiversity related issues cannot be properly applied unless there is enough support from people. To raise this support level, people should be educated and well-informed about biodiversity, its importance, how it is connected to human life and well-being and why it should be protected. Otherwise the solutions will be under-supported or even be protested by public as in the case of recent fishing restrictions in Turkey. In that case, fishers protested the restrictions by not sailing for three days and complained about turning back to their homes empty-handed and spending their boats' fuel in vain. The point which they missed was, if they do not follow the new regulations and wait until the fish are mature enough to reproduce, etc., soon they will remain empty-handed dangerously often or maybe even lose their job for good.

As the results show, students stated that a species needs to fit in two terms to be protected; to have a unique role in the ecological balance and to be dangerously decreased in number on entire earth. It is important for young people to understand that every species deserves to exist and this is not because of their human related importance but simply because of what they are.

It should be remembered that, for students, describing biodiversity loss problem as 'very important' may not always mean that they understand the problem correctly thus they can participate in the probable solutions. A similar study showed that, 84.9% of 410 students have not participated in an activity about environmental issues although 65% of the all students have stated that they were sensitive to environmental issues [19]. Thus, reasons for their unwillingness about participating in such activities also should be investigated. According to the answers, the best way to reach and enlighten young population about environmental issues and to inform them about news, campaigns, events about biodiversity, is to use social networks. This point may be useful for both governmental and non-governmental organizations to raise support and awareness for their current and future projects and campaigns.

As mentioned before, in Turkey the nature education is based on biology courses and higher education students stated that their first source of hearing about biodiversity was school. This result may suggest that, education for nature and environmental issues should be taken more seriously and start at earlier ages such as kindergarten level. One of the important outcomes of an effective environmental education is to lead positive changes in students' attitudes and behaviors toward environment [20]. To raise students' interest for biodiversity and related environment issues, nature education should be planned very fastidiously. An effective nature education should include hands-on experiences, trips and this education should be a life long learning process rather than a course in school curriculum. A study in India showed that, an active biodiversity education program can help raising student's knowledge, interest and skills in order to protect and conserve local natural resources and biodiversity [21]. Results also show that families also should take responsibility on educating their children about environmental subjects as none of the answers was 'family'. For young people, learning environmental issues as a part of biology courses at school may not be enough as they may see it as just a probable question on exams. Also, nature education, should be a separated concept from biology courses and be a life long learning process. As previously discussed, although the students' awareness level was 63% and they ranked biodiversity loss problem as 'very important' both for world and Turkey, 41% of them failed to state why it is important to protect biodiversity. Hence their confusions

and misconceptions about biodiversity and other environment related issues should be cleared out in order to make them gain a better point of view on environmental problems. They mentioned pollution, hunting and climate change mostly when they were asked to name three reasons for biodiversity loss in Turkey. Answers including, wildfires, green area loss and urbanization were under expectation although these are known reasons of environmental problems in Turkey. This fact may be underlining the importance and power of media support to inform and reach more people about the environmental issues.

An important point which is observed in the results that participated students were not totally unaware of environmental subjects and issues in fact, yet they had serious confusions and misconceptions. This may be considered as a more dangerous situation than being totally unaware of these facts, because to change their existing but incorrect knowledge is harder than teaching them something new. They can recognize human benefits which are related to nature and they are slightly aware of the consequences of biodiversity loss. Yet, seeing nature through an anthropocentric point of view is one of the basic reasons of biodiversity loss. Young people should understand that humans do not 'own' any rights over nature and natural resources are not indefinite or replaceable if once lost, despite nature's amazing strength against the human interference. Nothing lives 'for' humans but they do live 'with' humans, and as long as we share this planet, humans should respect every single living thing regardless of their look, role in nature, habitat or the services they provide to humans. Living things do not need people to 'give' them rights which they already have or protect their 'rights', only necessity is to respect their limits. Relationship between humans and nature is not a one-way thing and should be a fair trade off. These facts are immensely important for a proper nature education.

This study conducted in Istanbul, with 200 randomly selected higher education students. Further research can be done by including more cities or the whole country with more universities and students involved. This study underlined the importance of current biology courses, by using the answers of higher education students (undergraduate and graduate students) hence further research can also include high school students in order to see their before and after the exam answers. The study

can be extended with a wider and predefined student group and more questions thus answers can be evaluated together with socio-demographics such as family income, place of residence, job, field of study, etc. Hopefully, results of this present study would help the further researches on the subject.

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APPENDICES

APPENDIX A.1 : Questionnaire and Definition Card

APPENDIX A.1

- 1) Can you please write down the names of ten living things that come to your mind first?
- 2) If you were asked to classify all the living things into main groups, how would you classify them?
- 3) Regarding your classification, what do you think is the place of human beings?
- 4) In a food chain of grasshoppers, mice, hawk and grass, mice are hypothetically out of the picture. How would the entire food chain be affected?
- 5) Have you ever heard of the term biodiversity before?
 - Yes I heard of it, and I know what it means
 - Yes I heard of it, but I do not know what it means
 - No, I never heard of it before

(If your answer is 'Yes I heard of it, but I do not know what it means' or 'No, I never heard of it before', please ask the biodiversity definition card from the pollster and do not answer question 6 and 7)
- 6) Where did you hear this term for the first time?
- 7) What is the source that you see news, events and activities about biodiversity and related subjects mostly?
- 8) In your opinion, what would be the three reasons which cause the most biodiversity loss in Turkey?
- 9) For global scale, biodiversity loss is...
 - a very important problem
 - an important problem
 - an unimportant problem
 - I do not know

For Turkey, biodiversity loss is...

 - a very important problem
 - an important problem
 - an unimportant problem
 - I do not know

Figure A.1: First page of the questionnaire

CURRICULUM VITAE

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